



UNITED ARAB EMIRATES
MINISTRY OF CLIMATE CHANGE
& ENVIRONMENT

The United Arab Emirates' First Long-Term Strategy (LTS)

Demonstrating Commitment to
Net Zero by 2050

2023

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“Future generations will be living in a world that is very different from that to which we are accustomed. It is essential that we prepare ourselves and our children for that new world.”

THE LATE SHEIKH ZAYED BIN SULTAN AL NAHYAN

Founding Father of United Arab Emirates



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Table of Acronyms

ACE	Action for Climate Empowerment
ADAFSA	Abu Dhabi Agriculture and Food Safety Authority
ADGM	Abu Dhabi Global Market
ADNOC	Abu Dhabi National Oil Company
AGEDI	Abu Dhabi Global Environmental Data Initiative
AIM for Climate	Agriculture Innovation Mission for Climate
AQ	Air Quality
AYC	Arab Youth Centre
AYCCC	Arab Youth Council for Climate Change
BEV	Battery Electric Vehicle
BRT	Bus Rapid Transit
CBUAE	Central Bank of the United Arab Emirates
CCfDs	Capture Carbon Contracts for Difference
CCRN	Climate Change Research Network
CCS	Carbon Capture and Storage
CCUS	Carbon Capture Utilisation and Storage
CH ₄	Methane
CLIX	Climate Innovations Exchange
CO ₂	Carbon Dioxide
CO ₂ e	Carbon Dioxide Equivalent
COP28	United Nations Climate Change Conference or Conference of The Parties of the
DAC	Direct Air Capture
DEWA	Dubai Electricity & Water Authority
DoE	Department of Energy Abu Dhabi
DSCE	Dubai Supreme Council of Energy
DSM	Demand Side Management
EAD	Environment Agency – Abu Dhabi
EGA	Emirates Global Aluminum
EMEA	Europe, Middle East and Africa
ENEC	Emirates Nuclear Energy Company
EN-WWF	Emirates Nature in Association with World Wide Fund for Nature
ETAF	Energy Transition Accelerator Financing
ETF	Enhanced Transparency Framework
EV	Electric Vehicle
EWEC	Emirates Water and Electricity Company
FDI	Foreign Direct Investment
F-gases	Fluoridated Gases
GA	Government Accelerators

GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIAHS	Globally Important Agricultural Heritage System
GW	Gigawatt
GWP	Global Warming Potential
ICBA	International Centre for Bio Saline Agriculture
ICE	Internal Combustion Engines
ICTU	Information to Facilitate Clarity, Transparency, And Understanding
IEA	International Energy Agency
IoT	Internet of Things
IPCC	Intergovernmental Panel on Climate Change
IRENA	International Renewable Energy Agency
ITC	Integrated Transport Centre
LEED	Leadership in Energy and Environmental Design
LTS	Long-Term Strategy
MAC	Mangrove Alliance for Climate
Masdar	Abu Dhabi Future Energy Company
MBRIF	Mohammed Bin Rashid Innovation Fund
MENA	Middle East and Northern Africa
MOCCAE	Ministry of Climate Change & Environment of UAE
MOEI	Ministry of Energy and Infrastructure of UAE
MOHRE	Ministry of Human Resources and Emiratization of UAE
MOIAT	Ministry of Industry and Advanced Technology of UAE
MRV	Measurement, Reporting and Verification
MRF	Material Recovery Facility
MTPA	Million Tons Per Annum
MW	Megawatts
MWQI	Marine Water Quality Index
N₂O	Nitrous Oxide
NAP	National Adaptation Plan
NbS	Nature-Based Solutions
NCCAP	National Climate Change Adaptation Programme
NDC	Nationally Determined Contribution
NDCA	National Dialogue for Climate Ambition
Ne'ma	National Food Loss and Waste Initiative
NGOs	Non-Governmental Organisations
NPOs	Non-Profit Organisations
NZS	Net Zero Strategy
ODP	Ozone Depletion Potential
OECD	The Organization for Economic Cooperation and Development

PACE	Partnership for Accelerating Clean Energy
PHSSR	Partnership for Health System Sustainability and Resilience
PPAs	Power Purchase Agreements
PPPs	Public-Private Partnerships
RAKTDA	Ras Al Khaimah Transport Authority
RDF	Refuse Derived Fuels
RTA	Road and Transport Authority Dubai
SAFs	Sustainable Aviation Fuels
SDGs	Sustainable Development Goals
SDME	Solar Decathlon Middle East
SEWA	Sharjah Electricity and Water Authority
SMEs	Medium-Sized Enterprises
SNE	Single National Entity
Solar PV	Solar Photovoltaic
SWFG	Sustainable Finance Working Group
T&S	Transport and Storage
TAQA	The Abu Dhabi National Energy Company
TWL	The Thermal Work Limit
UACA	The UAE Alliance For Climate Action
UAE	United Arab Emirate
UIP	University Innovation Program
UNEP	United Nation Environment Programme
UNDP	United Nations Development Programme
UNFCCC	United Nation's Framework Convention on Climate Change
WETEX	Water, Energy, Technology, And Environment Exhibition
WIM	Warsaw International Mechanism
WiSER	Women in Sustainability, Environment and Renewable Energy
WRI	The World Resources Institute
WWF	World Wildlife Fund

An aerial photograph of a beach. The top half of the image shows the ocean with vibrant turquoise water. A line of white, foamy waves is breaking onto the shore. Below the waves is a wide, sandy beach with a light tan color. The bottom half of the image shows the beach extending further inland, with some faint tracks or patterns in the sand. The overall scene is bright and clear, suggesting a sunny day.

Foreword

1 Foreword from Her Excellency Mariam Almheiri

It is my pleasure to introduce the first Long-Term Strategy of the UAE. The ambitious plan presented here is intended to guide our nation's climate actions in addressing one of the most pressing threats to humankind. It reflects our commitment and efforts to reach net zero emissions by mid-century and aims to inspire the UAE's society as well as the global community in taking similar actions towards a more sustainable future.

Climate change is one of the greatest challenges of our time, and we are committed to tackling it head-on. The climate crisis has unambiguous and significant consequences that cannot be overlooked. These consequences are no longer restrained to the most vulnerable parts of the world but are widespread and call for our collective action.

The UAE is well-versed in withstanding adverse climate conditions. We live in an arid region, where rainfall is precious and fertile vegetation is scarce. We are accustomed to extreme temperatures, and value the rare cool winter breeze. Our society is particularly vulnerable to the impacts of climate change. However, we want to combat climate change not only for the sake of our nation, but for the entire globe.

The UAE has always been a forward-looking nation, and we are determined to build a sustainable future for our people and the world. Our goal is to transform our nation into a model for sustainable development, where economic growth goes hand in hand with environmental protection. We believe that a sustainable future is not just desirable, but essential. We must ensure that our children and grandchildren inherit a planet that is healthy, safe, and sustainable.

The UAE has a long-standing commitment to climate action and was the first GCC country to ratify the Paris Agreement. In 2022, the UAE announced a strategic initiative to pursue net zero by 2050, the first such initiative in the region, with the goal of transforming its economy in accordance with the objectives of the Paris Agreement. The first submission of the UAE's Long-Term Strategy represents another step in our journey to act on climate change. With it, we intend to solidify and provide transparency on our plans to tackle climate change, both in terms of mitigation and adaptation. Consequently, we provide extensive details of our UAE Net Zero by 2050 Strategic Initiative, as well as our adaptation strategies. Regarding mitigation, we present our ambitious decarbonisation targets at national and sectoral levels. These are detailed in sectoral pathways, which are built upon concrete decarbonisation measures that are supported by comprehensive policies to be deployed by UAE's government entities. With respect to adaptation, we approach expected impacts of climate change and demonstrate how we intend to adapt to the consequences of the climate crisis.

Our ambition is to create a sustainable future that is built on the principles of innovation, collaboration, and inclusion. We will work with our partners in government, industry, and civil society to achieve our goals, and we will engage with the international community to share our experiences and learn from others.

We are confident that the UAE can become a global leader in sustainable development. This LTS reflects collaboration between stakeholders from the public, private, and non-governmental sectors to create the policies, investments, and partnerships necessary to forge a future that is prosperous, inclusive, and sustainable. It is a living document that will evolve as we make progress towards our goals, and we remain committed to periodic updates to ensure its ongoing relevance. We invite you to join us on this journey as we work towards a sustainable future for all.

We understand that achieving these targets requires deploying a whole-of-nation effort across many sectors and taking impactful measures. We enable the transition to net zero with comprehensive financing mechanisms, a forward-looking technology and R&D strategy, thorough upskilling programmes, and transparent reporting mechanisms. For this reason, we are acting on all these fronts to fully leverage decarbonisation opportunities to build a more diversified, strengthened, just, and inclusive economy. We see this challenge as an opportunity for innovation, diversification, and sustainable growth. By investing in



renewable energy and other green technologies, we can futureproof industries, create new jobs and uncover novel economic opportunities, while protecting our environment for future generations and enabling a better quality of life for our nation.

Moreover, we acknowledge the need for unity, and consequently followed a whole-of-society approach to develop the UAE Net Zero by 2050 Strategic Initiative. I personally thank all stakeholders for their valuable contributions to the UAE Net Zero by 2050 Strategic Initiative and nation's first LTS. May their efforts and ambition — embedded in the UAE's decarbonisation vision — inspire many others to tackle this global challenge.

HE Mariam bint Mohammed Saeed Hareb Almheiri

Minister of Climate Change and Environment of United Arab Emirates

2 Acknowledgements

The UAE's first LTS was developed in a whole-of-society approach in collaboration with government entities, private sector, and non-state actors. The Ministry of Climate Change and Environment would like to thank all individuals and organisations for their active participation and contributions.

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National Stakeholders

Government entities

Abu Dhabi Agriculture and Food Safety Authority
Ajman Municipality
Climate Change Research Network
Department of Energy Abu Dhabi
Department of Municipalities and Transport
Dubai Electricity & Water Authority
Dubai Supreme Council of Energy
Emirates Water and Electricity Company
Environmental Agency Abu Dhabi
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Fujairah Environment Authority
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Ministry of Defence
Ministry of Economy
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Ministry of Industry and Advanced Technology
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Environment Protection and Development Authority
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Semi-Government/Inter-Governmental/Private Sector

Abu Dhabi Future Energy Company (Masdar)
Abu Dhabi Global Market (ADGM)
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Abu Dhabi Waste Management Company
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Executive Summary



3 Executive Summary

Changes observed in Earth's climate since the mid-20th century are unequivocally driven by human activities and are leading to significant impacts on biodiversity, human health, society, and the economy worldwide. The world has already warmed by 1.1 °C versus pre-industrial revolution values and is projected to reach 2.8 °C of warming by around 2100 if we continue on our current global trajectory. The UAE is in a region particularly vulnerable to the impact of climate change. If the world does not drastically reduce Greenhouse Gas (GHG) emissions, we will face extreme temperatures with higher humidity levels, droughts, heavier precipitation, high sea water salinity, and sea level rise. As a signatory of the Paris Agreement, the UAE recognises the critical issue of climate change, and the consequent need to develop mitigation and adaptation strategies.

As such, the UAE is acting on both fronts to tackle climate change. In terms of mitigation, the nation has developed the UAE Net Zero by 2050 Strategic Initiative, alongside existing multiple efforts that are embedded and highlighted in this LTS. The present LTS, developed in parallel with the Third Update of Second Nationally Determined Contribution (NDC), is the first time the UAE has introduced long-term targets beyond 2030. The UAE is committed to reducing domestic economy-wide GHG emissions to as close to zero as possible by 2050 (as described in this LTS), with any remaining emissions removed from the atmosphere using nature-based solutions or carbon removal technologies. The LTS details sectoral pathways to these targets that cover the entire UAE economy, including power and water generation, industry, transport, buildings, waste, and agriculture. The sectoral pathways include key decarbonisation measures, such as renewable energy, energy storage solutions, low-carbon hydrogen, carbon capture and storage (CCS), and green materials, which the nation plans to deploy through 2050. These measures will be supported by the enactment of new policies and regulations.

Regarding adaptation, the UAE is adjusting systems and society to withstand the impacts of climate change, which will likely be exacerbated by the

region's harsh and arid environment. The UAE has assessed its overall and sector-specific vulnerability to climate change and has developed plans to incorporate, execute, and track adaptation efforts across the nation in the sectors of energy, infrastructure, health, environment, and food systems.

Acting on climate change is of utmost importance for the UAE. While reducing climate-related risks, climate action will also enable the UAE to grow and diversify its economy, build new revenue streams, increase jobs, and raise exports. Through the deployment of the UAE Net Zero by 2050 Strategic Initiative, the UAE expects to grow its GDP by around AED 1 trillion¹ by 2050 (1.4% real CAGR²) and create approximately 160,000 jobs while future-proofing an additional 40,000 jobs. In the longer-term (2023-2080), the nation expects to generate an additional AED 70 billion as investments are outweighed by cost savings over time, especially as fossil fuel consumption decreases. Ultimately, the UAE expresses its aspiration to become a prominent actor in green technologies and to support decarbonisation efforts globally.

Decarbonising the UAE's economy will require a whole-of-society effort, with the involvement of corporations, civil society, NGOs and academia, alongside federal- and emirate-level government entities. In addition, it calls for adequate financing, innovation, capability building, and consideration for the role of education and culture, as well as vulnerable groups such as women, youth, and people of determination. The UAE is developing policies and initiatives to tackle these areas, as well as a monitoring, reporting and verification (MRV) mechanism to oversee and accelerate the implementation of the UAE Net Zero by 2050 Strategic Initiative.

With the submission of its first LTS, the UAE therefore intends to solidify and provide transparency on their plans to tackle climate change. The UAE is looking to examples of nations which are already taking pioneering action worldwide and hopes to drive many others to follow suit.

¹ Includes expected impact of exports.

² Cumulative GDP increase from Net Zero by 2050 Strategic Initiative, in real terms, discounted at 4%





Introduction

4 Introduction

Climate change is a defining challenge for modern society. The Earth is warming rapidly, which drives sea level rise, increased droughts, flash floods, wildfires, and other extreme weather events that cause societal and economical losses. This warming is unequivocally caused by human activity.³ Biodiversity is shrinking as habitats are affected — including habitats for human beings. Climate change impacts are already visible worldwide. In the most fragile parts of the world, such as small island developing states, people are already being pushed out of what was once considered a constant throughout life — their homes.

The UAE is in a region particularly vulnerable to the impact of climate change. The nation faces extreme temperatures that have already increased more than the global average. Challenges such as rain scarcity, significant sun exposure, aridity, high sea water salinity, and sea level rise — all of which are projected to become more significant with climate change — are already part of our reality.⁴

The UAE therefore recognises the need to urgently act on climate change. For this reason, the nation has been increasing its climate action ambitions steadily throughout the years. It was the first nation among Gulf Cooperation Council (GCC) countries to ratify the Paris Agreement in 2016.⁵ Since then, the UAE has advanced four increasingly ambitious NDCs,⁶ each with improved targets versus previous ones. This level of ambition is embedded in each strategy, project, and plan put forward to tackle climate change. The UAE's LTS, presented in this document, is a step forward in the announcement the UAE Net Zero by 2050 Strategic Initiative.

The UAE believes in the transformational potential of the UAE Net Zero by 2050 Strategic Initiative. It is not merely a way to reach net zero emissions by mid-century. Rather, it is a tool to unlock societal progress, economic diversification, value creation, and citizens' well-being. Net zero can help society prosper with gross domestic product (GDP) growth enabled by new jobs in novel industries and

increased exports. It is furthermore a tool to link the UAE's near-term actions to its long-term goals.

Net zero thus closely aligns with our four key Centennial 2071 pillars. Net zero *supports a future-focused government* by strengthening the UAE's positioning on climate action ahead of the 28th Conference of the Parties to the UN Framework Convention on Climate Change (COP28) and by promoting new, future-oriented technologies and capabilities in the nation's society and economy (e.g., sources of renewable energy). It *builds a diversified knowledge-based economy* by contributing to GDP improvement with employment growth and exports, and diversification from oil- and gas-related GDP through deployment of technologies such as low-carbon hydrogen and CCS. Net zero *fosters excellent education* when supported by a government that leads by example and deploys policies and measures that enact climate change mitigation for citizens who are themselves prepared to act through capability building programmes and upskilling. Lastly, net zero *nurtures a happy and cohesive society*, through benefits such as reduced road congestion, pollution, and noise levels, which, together with increased economic opportunities, increase citizens' well-being.

We believe in the power of constant evolution and innovation, building upon what has been done before. Recalling our history as a nation that is not deterred by barriers and is constantly inspired by a vision of an improved tomorrow, we therefore stand committed to act on climate change.

Together, we can turn the ambition of net zero into reality. Together, we have the potential to transform the ordinary into something extraordinary, as we build an emissions-free, diversified, and cohesive economy which leverages Emirati values to build a long-lasting legacy that mitigates and adapts to climate change effects.

³ IPCC, AR6 Synthesis Report

⁴ COP26, Futures We Want, National Oceanic and Atmospheric Administration

⁵ UNFCCC.

⁶ Official document submitted to the UNFCCC that states short-term targets to reduce national emissions and adapt to the impacts of climate change. The Paris Agreement requires each Party to prepare, communicate, and maintain successive nationally determined contributions it intends to achieve.





Section 1: Net Zero – Why Is It Necessary?

Section 1: Net Zero – Why Is It Necessary?

5 Climate Change – Our Common Global Problem

5.1 The Science of Climate Change

Climate change is one of humanity's most pressing challenges. Since early signs of it were observed in the 20th century,⁷ climate change has been accelerating, with its consequences becoming apparent throughout the entire globe. Disastrous storms, devastating wildfires, intense droughts and sweeping floods are on the rise worldwide, sparing no region.⁸ While the array of effects is wide, the cause is clear: GHG emissions from human activity.⁹

Origin of Emissions: Humanity and The Industrial Revolution

Humanity is constantly evolving and seeking to improve its quality of life, using available resources for this purpose. This has driven several historic and economic milestones throughout the course of its existence. Among these milestones, the Industrial Revolution stands out in particular.

The Industrial Revolution, which began in Britain in the 18th century, represents an economic and societal turning point, as it transformed economies that had been based on agriculture and handcrafts into economies based on large-scale manufacturing. It introduced new machines, power sources, and ways to organise work. It also made existing industries much more productive and efficient and increased overall wealth.

The resulting progress brought striking advantages, yet such progress could not be achieved without a

cost. The Industrial Revolution introduced the use of fossil fuels to power new machines, first with coal and later with oil and natural gas. And while fossil fuels come from a natural energy reservoir occurring on Earth, their use – largely through combustion – results in the release of certain gases into the Earth's atmosphere. These gases increase the naturally occurring greenhouse effect, ultimately leading to temperature increases and driving climate change.¹⁰ While energy generation is the most important source of GHGs from human activities, other major sources include certain industrial processes that release GHGs directly (such as cement or steel manufacturing) or changes in land use and forestry.

The Greenhouse Effect

The greenhouse effect is the natural warming of the Earth that occurs when GHGs trap heat that radiates from Earth towards space and bounce it back to the planet.¹¹ This mechanism allows Earth to maintain its temperature within a range that accommodates life as we know it. Without the greenhouse effect, the average temperature on Earth's surface would be below the freezing point of water.¹²

Primary GHGs include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), water vapour (H₂O), and fluorinated gases (F-gases). The degree to which they influence the average temperature on Earth depends on three factors: 1) their concentration in the atmosphere; 2) how long they remain in the atmosphere; and 3) how effectively they trap heat (also known as their global warming potential).¹³

⁷ Climate NASA

⁸ IPCC, AR6

⁹ IPCC, AR6

¹⁰ Climate NASA

¹¹ Climate NASA

¹² IPCC

¹³ IPCC, AR2



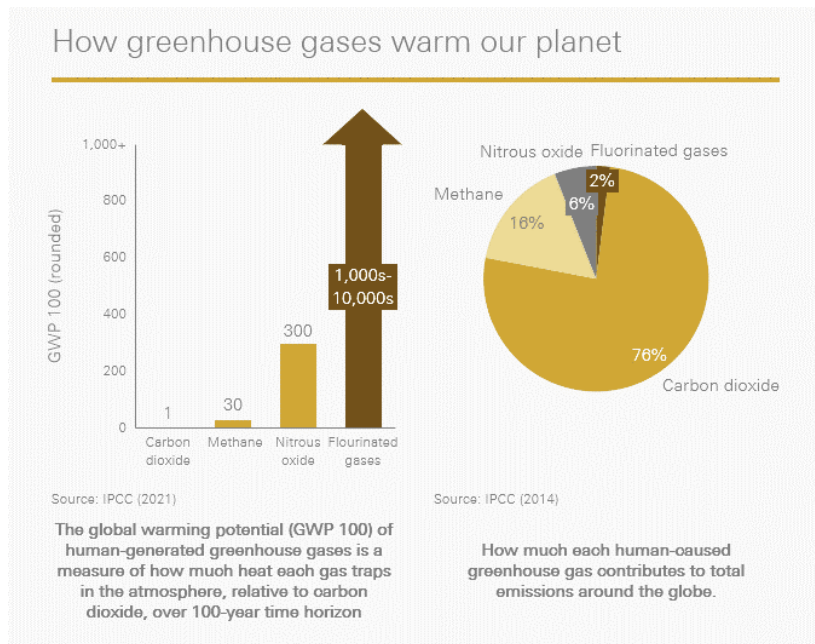






Figure 1: Overview of the GHG mechanism (IPCC)

An overview of the different GHGs and their characteristics is presented in the table below

Table 1: Overview of GHGs

CARBON DIOXIDE	CO₂	
Carbon dioxide (CO ₂) is a long-lasting GHG that accounts for the majority (76%) of human caused GHG emissions. Once emitted, 40% of it remains in the atmosphere after 100 years, 20% after 1,000 years, and 10% for up to 10,000 years. ¹⁴		
METHANE	CH₄	
Methane (CH ₄) accounts for 16% of human caused GHG emissions. It remains in the atmosphere for only about a decade. However, its global warming impact is roughly 80 times greater than that of CO ₂ over a 20-year time scale, making it a critical GHG to address in the near-term. Over a 100-year time scale its global warming potential is still almost 30 times greater than CO ₂ . ¹⁵ Major sources of CH ₄ from human activity include leakage from the production and transport of fossil fuels (including natural gas), ruminants, and waste.		
NITROUS OXIDE	N₂O	
Nitrous oxide (N ₂ O) represents around 6% of human caused GHG emissions. It is a very powerful greenhouse gas, as it remains in the atmosphere for around a century and has a global warming potential almost 300 times that of CO ₂ on a 100-year time scale. ¹⁶ The most important sources of N ₂ O are from agriculture, changes in land use, and certain industrial processes.		
FLUORINATED GASES	F GASES	
Fluorinated gases (F-gases) are man-made, originating in manufacturing and industrial processes. Despite accounting for only around 2% of man-made GHG emissions, F-gases can have a global warming potential		

¹⁴ Climate NASA, IPCC AR4, AR5

¹⁵ Climate NASA, IPCC AR4, IPCC AR5, IPCC AR6, Climate Watch

¹⁶ Climate NASA, IPCC AR4, IPCC AR5, IPCC AR6, Climate Watch

up to the tens of thousands of times that of CO₂ and whilst most F-gases are relatively short-lived, some can linger in the atmosphere for thousands of years.¹⁷

WATER VAPOUR

H₂O



Water vapour (H₂O) is distinct from other GHGs because its concentration is not directly linked to human activities, but rather to the warming resulting from other GHGs that are emitted because of human activity. When the air warms due to water vapour, it holds more water, and since water vapour is a GHG, it absorbs more heat and then even more water, increasing the warming and creating a feedback loop.¹⁸

CO₂ is naturally released into the atmosphere from land and ocean sources and then reabsorbed by the same sources. Before the industrial revolution, this process was in balance.¹⁹ However, the industrial revolution broke this balance, leading to an increased concentration of GHGs in the Earth’s atmosphere as emissions from human activity built up due to fossil fuel combustion, industrial processes, and land use changes.

This process is driven by activity across the several economic sectors. In 2019, global emissions reached 59±6.6 gigatonnes (Gt) CO₂e, distributed across five main sectors. Energy systems is the top emitter, followed by heavy industry, Agriculture, Forestry & Other Land Use (AFOLU), transport, and buildings²⁰.

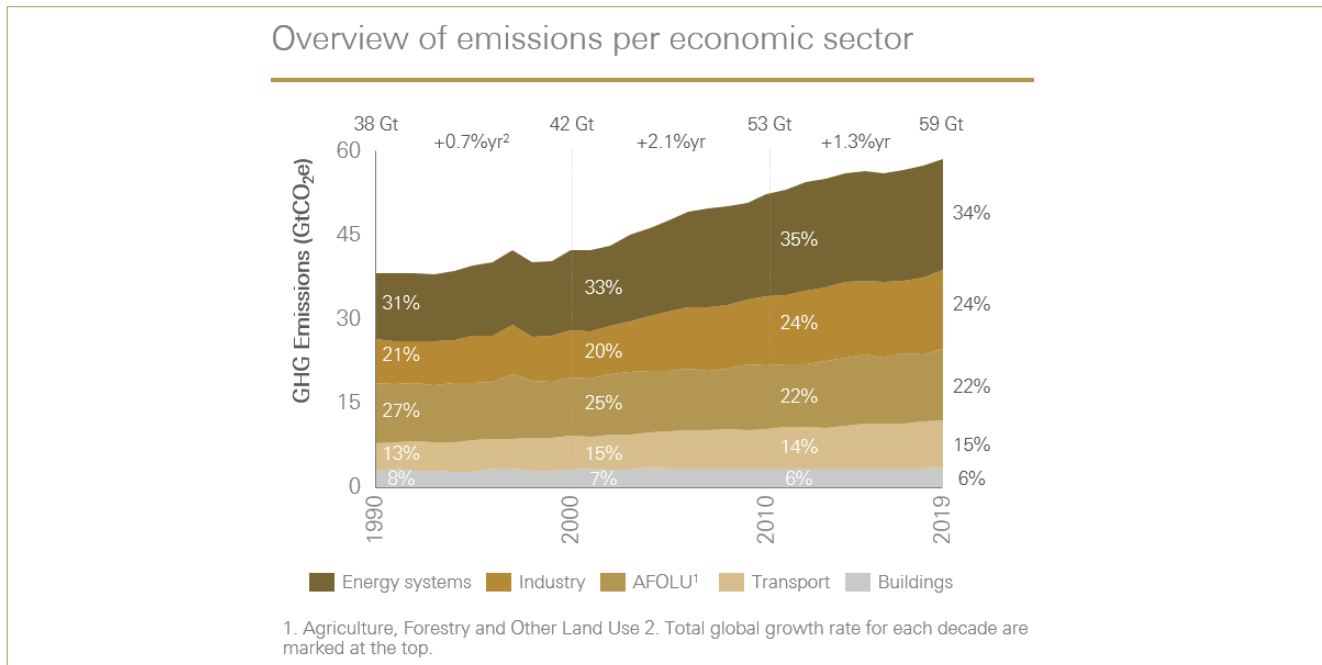


Figure 2: Overview of emissions per economic sector (IPCC AR6)

Atmospheric concentration of CO₂ is now 150% higher than it was at the beginning of the Industrial Revolution. The global average CO₂ levels in the atmosphere were 415.7±0.2 parts per million (ppm) in 2021, the most recent year for which consolidated global figures are available.²¹ Just over 60 years ago, in 1959, it stood only at 316 ppm.²² The pace of the increase is stepping up: approximately 42% of all the CO₂ emissions since 1850 occurred between 1990 and 2019.²³

The science is unequivocal. While Earth’s climate has changed throughout its existence, current global warming is happening at a rate not seen in the past 10,000 years.²⁴ Scientific information collected from natural

¹⁷ Climate NASA, IPCC AR4, IPCC AR5, IPCC AR6

¹⁸ Climate NASA

¹⁹ Climate NASA

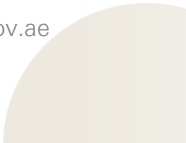
²⁰ IPCC, AR6

²¹ World Meteorological Organization (WMO), State of the Global Climate 2022

²² National Oceanic and Atmospheric Administration (NOAA)

²³ IPCC, AR6 Synthesis Report

²⁴ Global surface temperature increased faster since 1970 than in any other 50-year period over the last 2000 years (IPCC, AR6 Synthesis Report).



sources such as ice cores and tree rings, as well as modern equipment such as satellites, shows clear signs of a changing climate.²⁵ 'Since systematic scientific assessments began in the 1970s, the influence of human activity on the warming of the climate system has evolved from theory to established fact,'²⁶ notes the Intergovernmental Panel on Climate Change (IPCC).²⁷

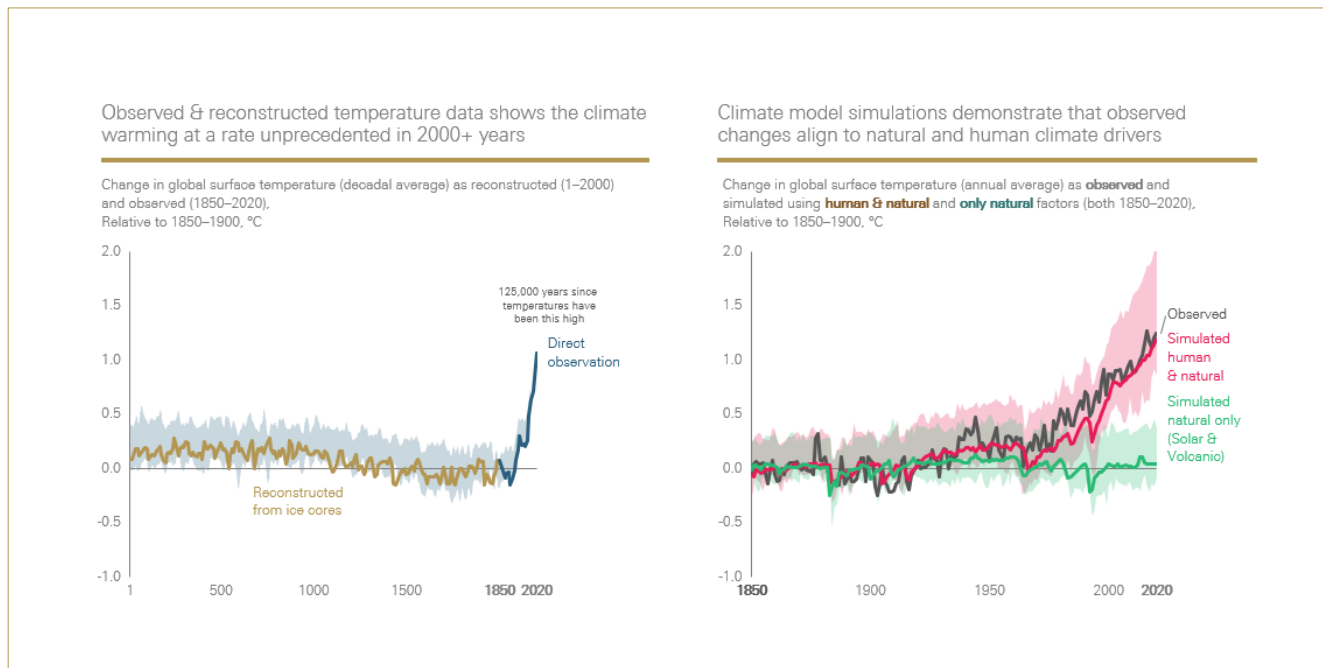


Figure 3: Climate model simulations (IPCC, AR6)

If no additional actions are taken to complement the policies already in place, emissions will keep increasing, and temperatures will rise, potentially reaching an increase of 2.8 °C above pre-industrial levels by the end of the 21st century.²⁸

The world's nations have started to respond. In 1992, countries agreed to an international treaty — the United Nations Framework Convention on Climate Change (UNFCCC)²⁹ — to tackle climate change. Since then, the global community has continued to strengthen the implementation of the UNFCCC through further agreements and decisions. Most recently, the Paris Agreement, was agreed in 2015 and entered into force in 2016. The Paris Agreement established global goals for climate change action. Its primary goal was to limit global average temperature increase to 'well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels.' Since then, many countries have effectively recognised the importance of keeping the option to limit warming to 1.5 °C within reach. Although even 1.5 °C already implies significant impacts, exceeding that level carries increasing and unacceptable risks of severe climate impacts, many of which will result in loss and damage that cannot be managed.³⁰

5.2 Global Impacts of Climate Change

As a result of human activity, the Earth is warming at a rate not seen over recent millennia,³¹ and global temperatures have already surpassed the pre-industrial average by 1.1 °C. There is a higher than 50% chance that the 1.5 °C threshold set by the Paris Agreement is reached or crossed between 2021 and 2040.³²

²⁵ Climate NASA

²⁶ IPCC, AR6

²⁷ United Nations body created to provide governments at all levels with the scientific information to develop climate policies.

²⁸ United Nations, Emissions Gap Report 2022

²⁹ Framework for international cooperation to combat climate change that aimed to stabilise GHG concentrations at a level that would prevent dangerous anthropogenic interference with the climate system by developing rules for limiting GHG emissions and tackling the resulting climate change, and coping with impacts that are inevitable. UNFCCC.

³⁰ Paris Agreement

³¹ IPCC, AR6 Synthesis Report

³² IPCC, AR6

Impacts are already visible worldwide. Global sea levels are rising at rates which are unprecedented over the past 2,500-plus years.³³ Mass loss of glaciers and ice sheets doubled in the 2015–2019 period, compared with the period between 2000 and 2004. Climate disasters increased fivefold between 1970 and 2019, driven by climate change and more extreme weather. From 2011–2020 alone, extreme weather events led to \$2.5 trillion in losses worldwide.³⁴

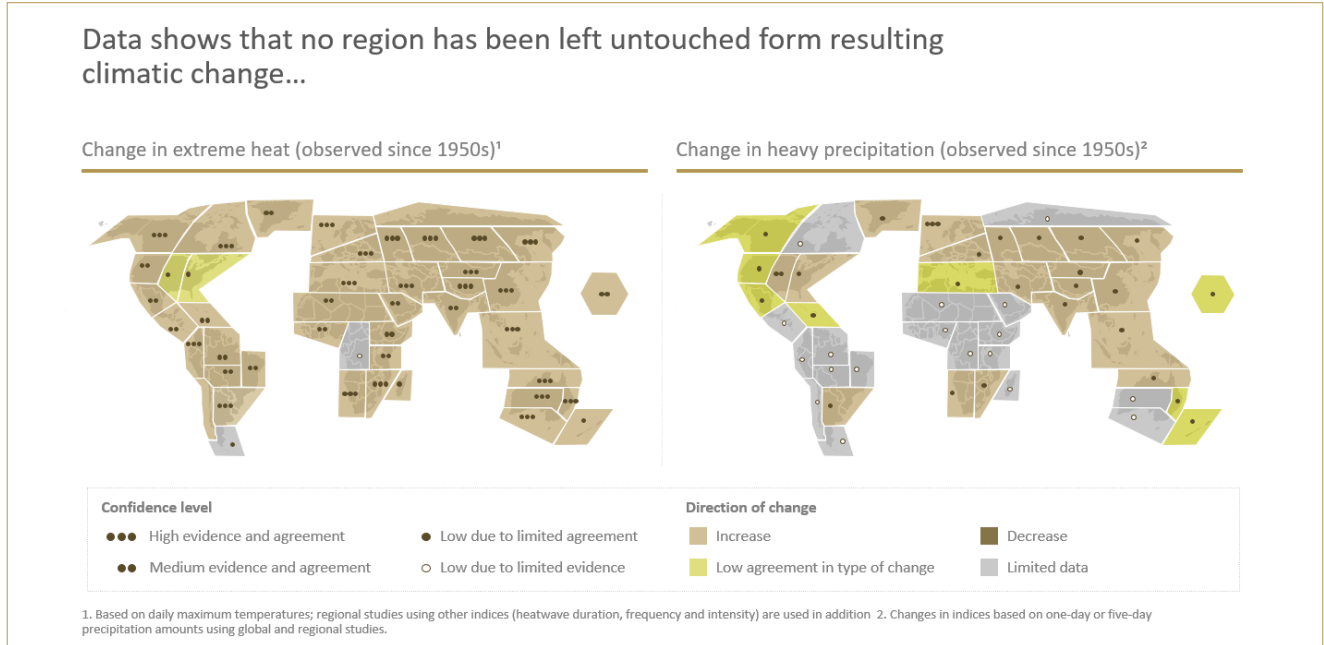


Figure 4: Climate change impacts worldwide (IPCC, AR6, UNFCCC, World Meteorological Organization Report)³⁵

There is significant confidence that climate change is responsible for observed global and regional impacts on ecosystems and human systems. This includes impacts on water scarcity and food systems, health and wellbeing, and infrastructure, cities, and settlements. Climate impacts are comprehensive, and the great majority are adverse.³⁶

Human systems	Select examples; hotspot areas											
	Impacts on water scarcity and food production				Impacts on health and wellbeing				Impacts on cities, settlements and infrastructure			
	Water scarcity	Agriculture/lives stock health and production	Animal and livestock health and productivity	Fisheries yields and agriculture production	Infectious diseases	Heat, malnutrition and other	Mental health	Displacement	Island flooding and associated damages	Flood/storm induced damages in coastal areas	Damages to infrastructure	Damages to key economic sectors
Global	±	—	●	—	—	—	—	—	—	—	—	—
Africa	—	—	—	—	—	—	○	—	—	—	—	—
Asia	±	+	—	—	—	—	—	—	—	—	—	—
Central and South America	±	—	±	—	—	—	Not assessed	—	—	—	—	—
Small Islands	+	—	—	—	—	—	○	—	—	—	—	—
Arctic	±	+	—	—	—	—	—	—	—	—	—	+

Confidence In attribution to climate change: ● High or very high, ● Medium, ● Evidence limited, insufficient

Impacts In human systems in panel (b): — Increasing adverse impacts, ± Increasing adverse and positive impacts

Figure 5: Degree of confidence in attributing impacts to climate change (select examples, based on IPCC, AR6)

³³ Climate NASA

³⁴ IPCC, AR6, UNFCCC, World Meteorological Organization Report

³⁵ Agreement refers to the extent to which a statement reflects the current state of knowledge, based on the level of substantiation and degree of consensus among experts.

³⁶ IPCC, AR6

Climate change’s impacts on nature, human life, and global economies will continue to accelerate. At 3 °C of warming,³⁷ 3–29% of species assessed in terrestrial ecosystems will likely face very high risk of extinction between 2041 and 2100. Over the same period, at a 2 °C or higher global warming level, food security risks due to climate change will lead to malnutrition and micro-nutrient deficiencies.³⁸ Mental health challenges, namely anxiety and stress, are expected to further increase in all assessed regions, particularly for children, young adults, the elderly, and people with underlying health conditions.³⁹ All in all, a trajectory of 3 °C warming may come at a cost that could represent a 15% loss in global GDP and an irreparable loss of biodiversity by 2100.⁴⁰

With each degree of global warming, climate change impacts and risks become increasingly complex and more difficult to manage. Humankind lives within a narrow temperature band, and each degree of warming impacts 1 billion people, displacing them from areas with favourable climates.⁴¹ Even slight changes in average global temperature make a difference; if the average global temperature increases 2 °C compared with its pre-Industrial Revolution level, impacts and risks in the form of biodiversity loss, wildfires, sea level rise, and coral reef decline are projected to be 10–60% worse than under a 1.5 °C scenario.⁴²

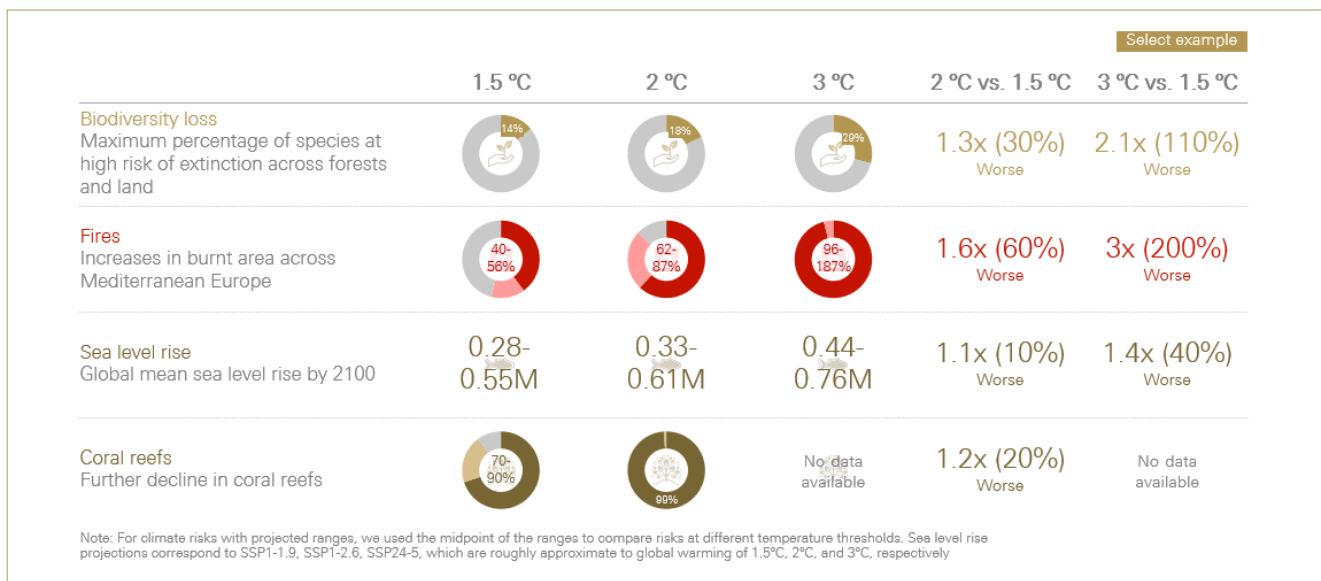


Figure 6: Impacts of climate change under different temperature levels (IPCC, AR6)

Increasing climate change drives the climate system towards tipping points, critical boundaries which, when surpassed, generate feedback loops that can accelerate climate change beyond the direct impact of human-caused emissions. Moreover, tipping points can lead to a new potentially stable phase with long-lasting and potentially irreversible results (at least over a timescale of decades or more). Tipping points associated with climate change include the loss of Arctic Sea ice, as well as the loss of Greenland and West Antarctic ice sheets, degradation of tundra, thinning of permafrost,

collapse of the Asian monsoon system, changes in the West African monsoon and the Sahel, and loss of biodiversity in ecosystems such as forests and coral reefs.⁴³

Permafrost thinning is illustrative of how tipping points work. Permafrost refers to permanently frozen ground, which occurs mostly in parts of the Northern Hemisphere, such as remote areas of Europe and Western Siberia. It stores significant amounts of GHGs, including CO₂ and CH₄, because it traps the remains of dead plants beneath an

³⁷ Closest temperature to our current 2.8°C trajectory (as per UN Emissions Gap report), from the stated by IPCC, AR6

³⁸ Concentrated in Sub-Saharan Africa, South Asia, Central and South America and Small Islands. High confidence assessment from IPCC AR6.

³⁹ IPCC, AR6

⁴⁰ UN, Network for Greening the Financial System

⁴¹ IPCC Climate Change 2021 – The Physical Science Basis

⁴² IPCC, AR6

⁴³ IPCC, AR6

insulating layer that melts and refreezes on a regular basis. As global temperatures increase, permafrost risks melting beyond its normal level. This can potentially release the GHGs that it stored for millennia, which in turn can increase global warming and accelerate even more permafrost melt, creating a disastrous feedback loop. Although well-established, the specific impacts and timing of tipping points are not yet sufficiently understood. As such, climate modelling is not yet factoring this in, likely leading to conservative estimates of the risks ahead.

Ultimately, the negative impacts of human activity can lead to the breaking of the planetary boundaries within which human life can continue to develop and thrive. The planetary boundary concept has been presented by scientists in terms of nine worldwide planetary boundaries⁴⁴:

- 1) Stratospheric ozone depletion, referring to the decrease of the ozone layer that exists in the atmosphere and filters out ultraviolet radiation (UV) from the sun. UV can cause a higher incidence of skin cancer in humans and damage to terrestrial and biological systems.
- 2) Loss of biosphere integrity, including biodiversity loss and extinctions.
- 3) Chemical pollution and the release of toxic and long-lasting substances such as synthetic organic pollutants, heavy metal compounds, and radioactive materials, which can lead to loss of fertility and permanent genetic damage in species.
- 4) A changed climate where recent evidence suggests that the Earth has already transgressed this planetary boundary and is approaching several Earth system thresholds.
- 5) Ocean acidification, which involves changes in ocean chemistry that lead to a reduction of substances used by marine species for shell and skeleton formation and hampers the ability of organisms such as corals, shellfish, and plankton to grow and survive.
- 6) Increasing freshwater consumption where the hydrological cycle is under stress and water is becoming increasingly scarce, calling for further intervention in water systems.
- 7) Land systems change where human interference in land, such as the conversion of natural vegetation to agricultural land, reduces biodiversity and impacts water flow, as well as other important natural element cycles.
- 8) Nitrogen and phosphorus flow to the biosphere and oceans are increasing rapidly. These elements are essential for plant growth, and as such are used for stabilising production, which interferes with several natural systems (e.g., waterways, coastal zones, the terrestrial biosphere).
- 9) Atmospheric aerosol loading where humans are changing aerosol loading through atmospheric pollution and land-use changes. This affects the hydrological cycle, the climate, and the health of living organisms.

Some of these boundaries have already been crossed (as illustrated in Figure 7) and serve as a learning opportunity. The ozone layer, for instance, has been severely weakened in the past due to the presence of chemical substances of human origin in the atmosphere, potentially leading to the above-mentioned damages for human health and ecosystems. Fortunately, humanity has heard the alarm about the ozone layer and taken actions to change course. We are now on a positive trajectory to reverse the damage, thanks to an agreement from countries worldwide to stop using ozone-depleting substances.⁴⁵ This offers an approach that can be replicated in other areas. If humanity works together to change its behaviour, progress can be made on critical climate challenges.

Climate change has already transgressed its planetary boundary and is nearing several Earth system thresholds.⁴⁶ It thus becomes clear that — similar to what was done to heal the ozone layer — humanity must act with urgency to prevent the most severe consequences.

⁴⁴ Stockholm Resilience Institute, The nine planetary boundaries

⁴⁵ Formalised in the Vienna Convention for the Protection of the Ozone Layer (1985) and the Montreal Protocol on Substances that Deplete the Ozone Layer (1987). European Environment Agency.

⁴⁶ Stockholm Resilience Centre, The Nine Planetary Boundaries

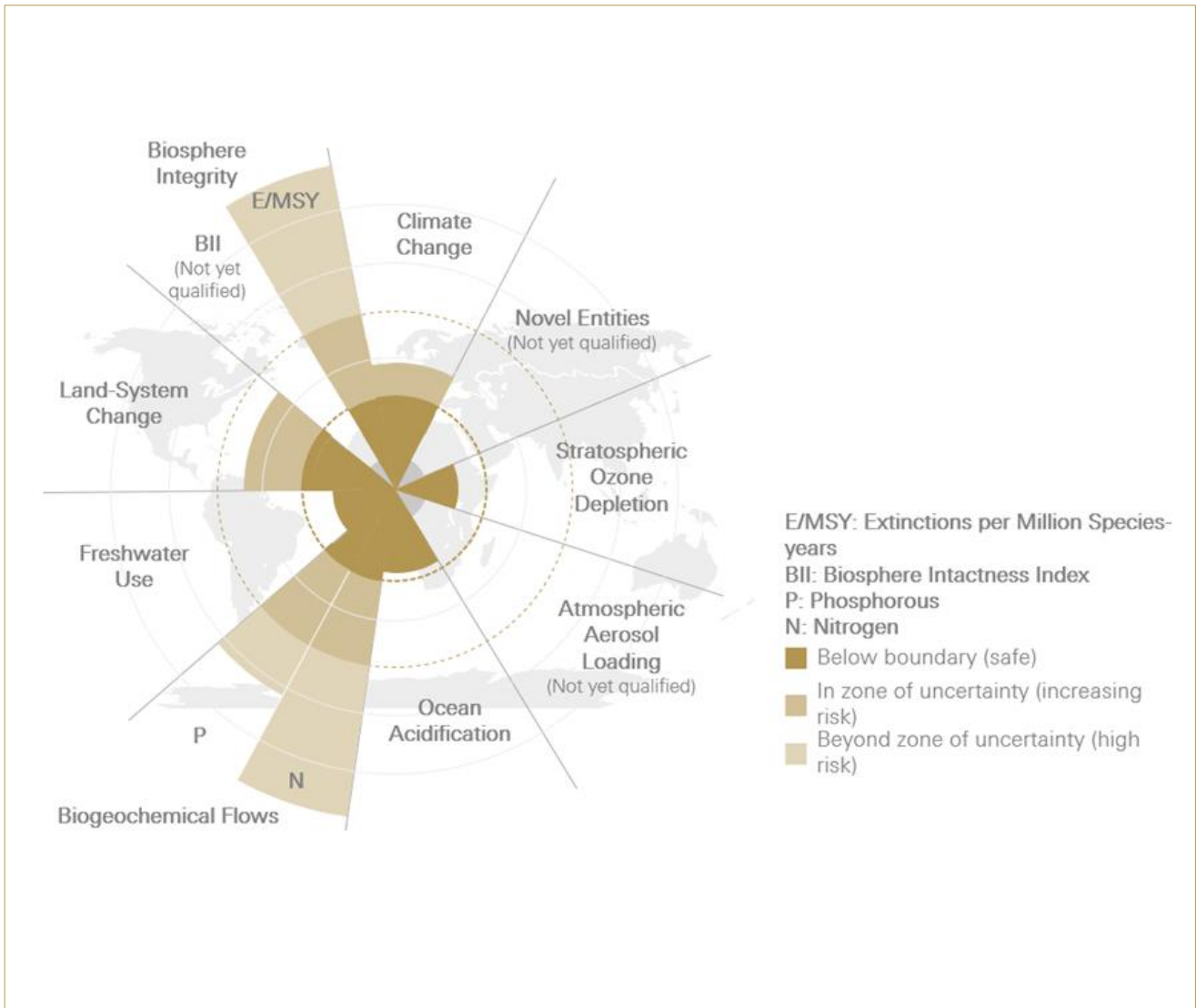


Figure 7: Planetary boundaries and their status (Stockholm Resilience Centre)

Global GHG emissions have continuously increased in the past decades. In 2019 global GHG emissions reached an unprecedented value of approximately 59 ± 6.6 GtCO₂e, which is about 12% higher than in 2010 and 54%

higher than in 1990. The largest share and growth in global GHG emissions occurred in CO₂ emissions from fossil fuel combustion and industrial processes, followed by CH₄ emissions.⁴⁷

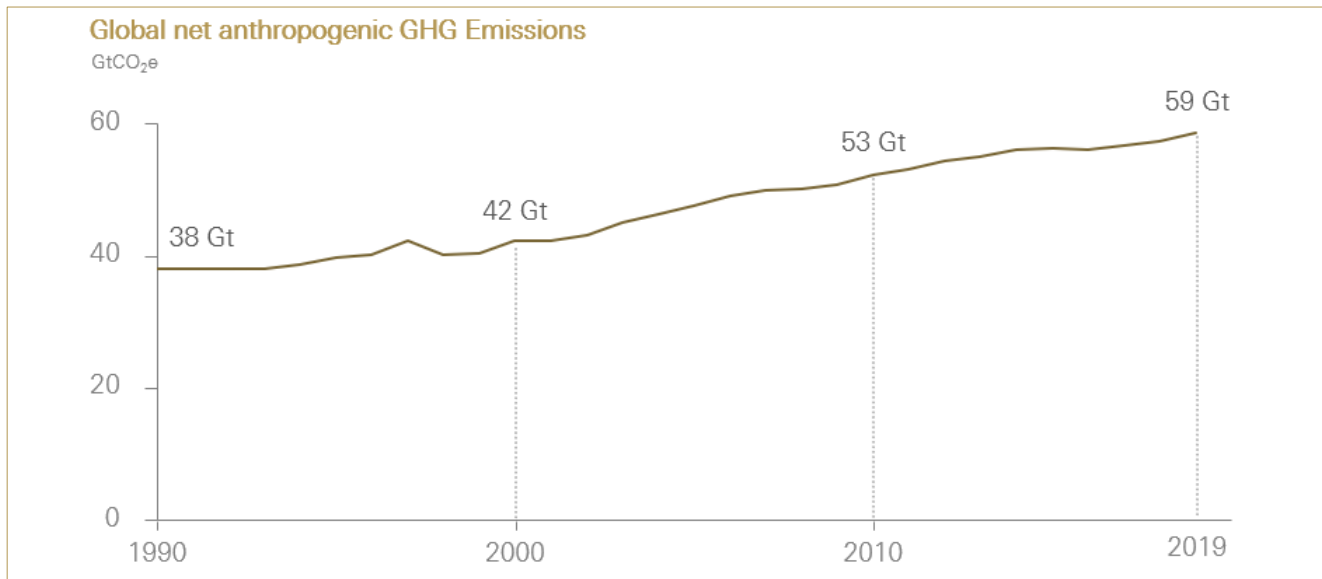


Figure 8: Evolution of GHG emissions (IPCC, AR6)

To comply with the Paris Agreement and stabilise global warming to 1.5 °C, global GHG emissions must peak before 2025 and fall by 43% by 2030, compared to 2019 levels.⁴⁸ 1.5 °C also requires reaching zero CO₂ emissions globally around 2050, as well as deeply reducing emissions of non-CO₂ gases, particularly CH₄.⁴⁹ Any residual emissions must then be removed from the atmosphere, either by nature-based solutions, such as forests or mangroves, or using engineering-based technical solutions, such as direct air capture (DAC) or bioenergy with carbon capture and storage (BECCS).⁵⁰

In early 2020, the remaining carbon budget that allowed for a 50% chance of stabilising global warming to 1.5 °C was around 500 GtCO₂e. This means that mankind can emit only up to 500 Gt more of CO₂ until 2050 if it wants to limit long-term

temperature increases to 1.5 °C. Emissions levels above this threshold mean greater warming will occur, with every 0.1 °C of additional warming resulting in further damage. If 2020, 2021, and 2022 emissions are considered, the carbon budget decreases to 380 GtCO₂ at the start of 2023. At the current pace of emissions, humanity has nine more years before its CO₂ budget runs out; and several studies show this timeframe may be even shorter.^{51, 52}

In reaction, the UN has included planet protection (with emphasis on climate and sustainability) as a key priority of “Our Common Agenda” (the preamble for a new post-SDG global development framework after 2030).⁵³ The agenda facilitates a global dialogue for renewed solidarity between peoples and future generations to deliver equitable development and sustainably for all.

Also, at the COP21 in Paris, governments agreed that mobilising stronger and more ambitious climate action was urgently required to achieve the goals of the Paris Agreement. These targets can only be achieved with

⁴⁷ IPCC, AR6

⁴⁸ Most scenarios for stabilising global warming to 1.5°C imply a potentially limited overshoot with temperatures rising above 1.5 °C for several decades before stabilising and falling again to stay within 1.5 °C.

⁴⁹ IPCC, SP 1.5, Chapter 2

⁵⁰ UN, Paris Agreement

⁵¹ IPCC, AR6

⁵² Global Carbon Project

⁵³ UN

holistic action from governments, corporates, and households — connecting the work of government with voluntary and collaborative actions from non-state actors.⁵⁴

Governments must act by announcing net zero targets and increasing the ambition of 2030 targets through their NDCs. This is especially critical for high-emitting countries. As of 2018, 15 countries accounted for approximately 80% of the world’s GHG emissions, with China, the United States of America, the European Union, and India representing more than 50%.

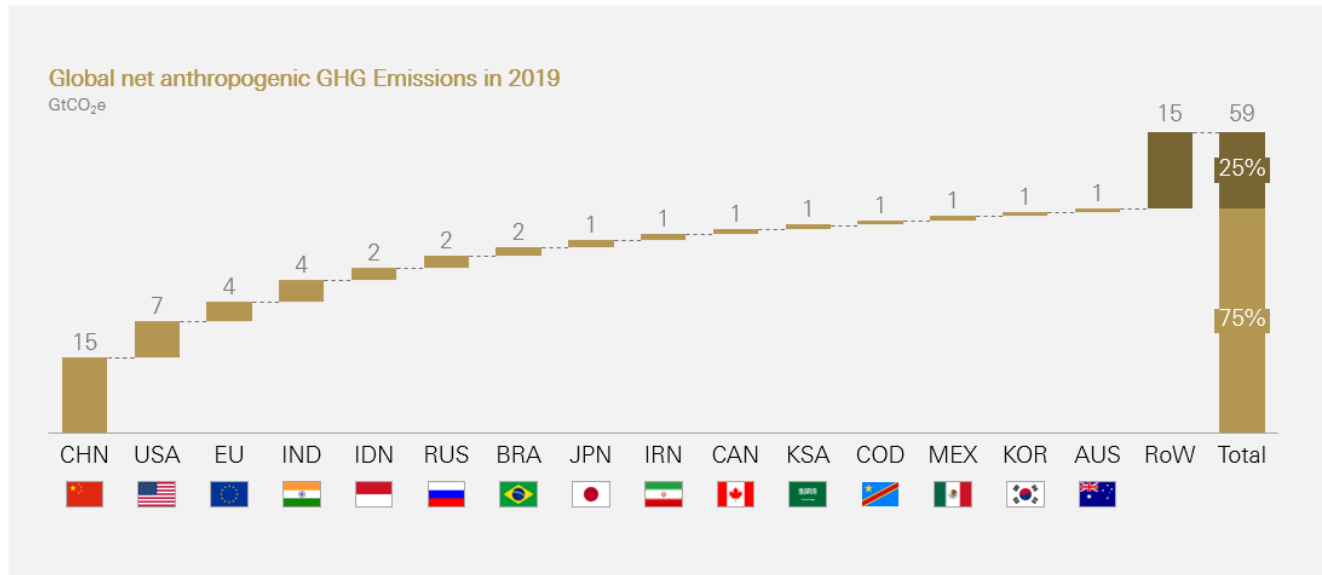


Figure 9: GHG emissions per country (Climate Watch, IPCC)⁵⁵

Recognising this, governments have started to act. As of November 2022, around 140 countries had announced or were considering net zero targets, covering close to 90% of global emissions. However, as of today, commitments are insufficient to reach global goals and shorter-term action is not happening at a level compatible with these goals. Unconditional and conditional NDCs are estimated to reduce global emissions in 2030 by 5 and 10% respectively, while the 1.5 °C pathway requires a 43% cut in emissions.⁵⁶

Corporates also need to introduce pledges to reduce emissions. These pledges may overlap with targets announced by governments and are thus not necessarily additional to government action. Corporate pledges can, however, be a catalyst to accelerate climate action. This is already underway, as of February 2023, 41% of the world’s largest publicly traded companies by revenue had net zero targets,⁵⁷ up from just one-fifth in December 2020. Overall, corporate commitments have been growing exponentially. The volume of companies with pledged science-based targets grew 65% each year between 2015 and 2021.⁵⁸ Growth in corporate net zero targets is nevertheless associated with benchmarks and criteria which lack consistent robustness, ultimately leading to misinformation.⁵⁹ Despite all the announcements, corporate climate action is still insufficient, as most companies (63% across sectors during the 2018–2020 period) disclose their emissions only partially or do not disclose them at all. Only 8% of companies fully disclose their current emissions, reduction targets, and effective emissions reductions.⁶⁰

⁵⁴ UNFCCC, High-level Champions

⁵⁵ Data on country proportions from Climate Watch Historical GHG Emissions database rescaled to IPCC’s AR6 estimation of 59 GtCO₂e.

⁵⁶ UNEP, Emissions Gap Report

⁵⁷ 1,996 largest publicly traded companies in the world by revenue, as stated by the Net Zero Tracker.

⁵⁸ Climate Action Tracker, Net Zero Tracker

⁵⁹ United Nations

⁶⁰ Climate Action Tracker, CDP, Refinitiv

Households also must play their part. They can influence the course of emissions, mainly by reducing and optimizing consumption patterns. For example, reducing consumption of animal protein and avoiding food waste and overconsumption could slash GHG emissions by 40% to 70% by 2050.^{61, 62}

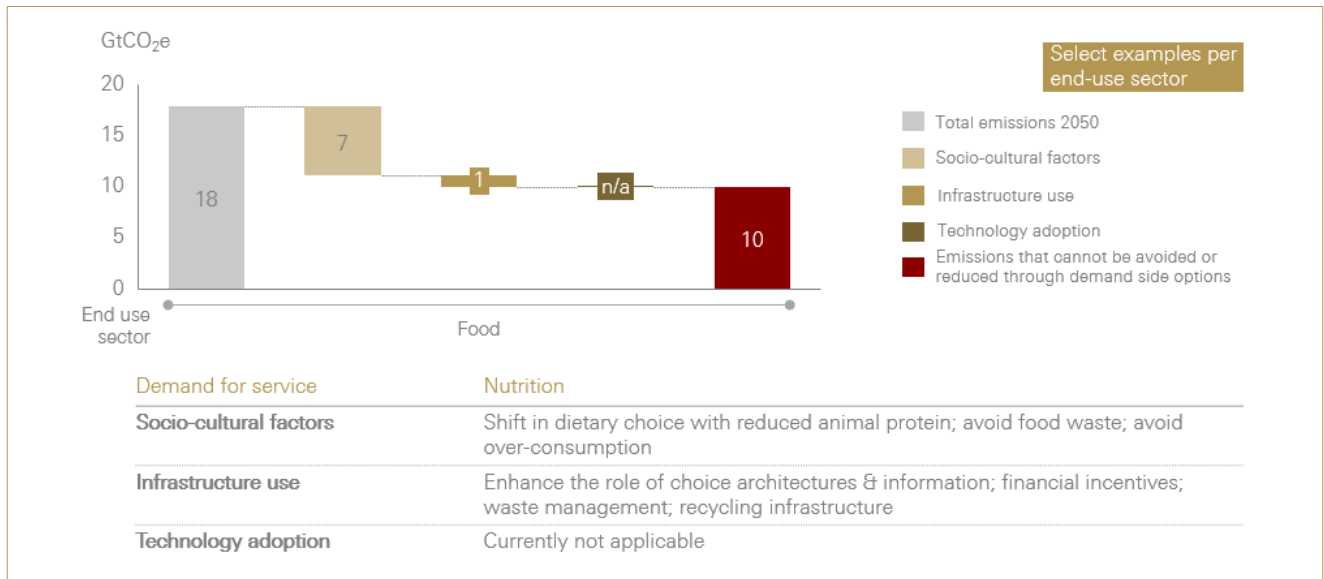


Figure 10: Impacts of changing habits in emissions: Food end use sector (IPCC AR6, World Resources Institute)

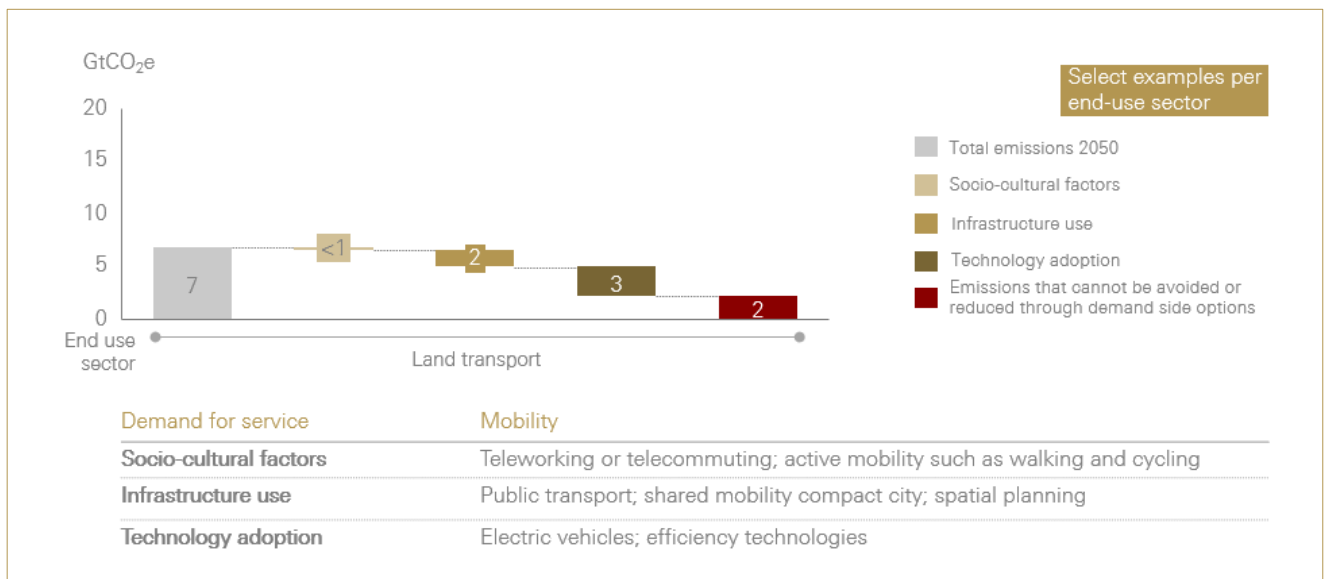


Figure 11: Impacts of changing habits in emissions: Land transport end use sector (IPCC AR6, World Resources Institute)

To address existing gaps, governments must urgently raise their ambitions as required under the Paris Agreement. The private sector must also improve targets and take actions to deliver on them.

⁶¹ IPCC, AR6
⁶² World Resources Institute



6 The UAE's Case for Climate Change Action

6.1 A Need and an Opportunity for the UAE

The need for climate change action in the UAE becomes clear when considering future and already visible consequences in the region⁶³. Global GHG emissions are still rising, decreasing the world's — and UAE's — carbon budget and fuelling further global average temperature increases.

Global Climate Circumstances

The Parties agreed in Paris to limit global warming to below 2.0 °C while pursuing all measures to limit it to well below 1.5 °C by end of this century. Achieving the 1.5 °C target without an overshoot will require cutting emissions by 43% by 2030 from 2019 levels and reach net zero worldwide around mid-century.

Achieving net zero means all GHG emissions released by human activities are counterbalanced with GHG removal from the atmosphere. This requires following two steps:

1. Reduce human-caused emissions as much as possible.
2. Remove any remaining excess GHGs from the atmosphere by using natural carbon sinks (e.g., restoring forests) and negative emission technologies (e.g., direct air capture).⁶⁴

As a party to the Paris Agreement, the UAE has committed to playing its full part in the global effort

to tackle climate change. As such it recognised the need to peak its GHG emissions before 2025. The UAE Net Zero by 2050 Strategic Initiative, announced in 2021, is a tool the nation has developed to align its actions with its commitments under the Paris Agreement, avoid the worst impacts of climate change, and contribute to worldwide efforts on climate action.

Local Climate Circumstances

Locally, the Arabian Peninsula is considered one of the most climate-vulnerable regions in the Middle East and Southwest Asia due to its extreme temperatures, scarce and intermittent precipitation, high aerosol load, and aridity.⁶⁵ As a core part of the Arabian Peninsula, the UAE faces the same perils. Warming in the UAE has so far reached 1.8 °C versus pre-industrial levels (versus around 1.1°C on average for the rest of the world), and impacts are already emerging.⁶⁶

This will affect human life (due to sustained temperature increases, higher pollution, and risks from vector-borne diseases), ecosystems (through depletion of groundwater resources, erratic rainfall, land degradation, and higher food security risk), and the economy (rising sea levels have the potential to affect critical infrastructure such as cities, harbours, roads, and desalination and power plants).⁶⁷ Given that 85% of the UAE's population and more than 90% of its infrastructure are located in coastal areas, rising sea levels are a critical concern. Likewise, rising water temperatures and salinity may also permanently damage crucial ecosystems such as corals and wetlands that serve as carbon sinks, further exacerbating climate change.^{68, 69}

⁶³ Explored in depth in chapter 2.1, 'Climate change action – a need and an opportunity for the UAE.'

⁶⁴ World Resources Institute

⁶⁵ Cambridge University Press and Assessment, COP26, Futures We Want – Regional Profile for the Arabian Peninsula Based on Kingdom of Saudi Arabia (KSA) and United Arab Emirates (UAE).

⁶⁶ Carbon Brief: How every part of the world has warmed – and could continue to warm. Based on land and ocean observations obtained from the Berkeley Earth Surface Temperature Project.

⁶⁷ Nature

⁶⁸ Nature

⁶⁹ WRI

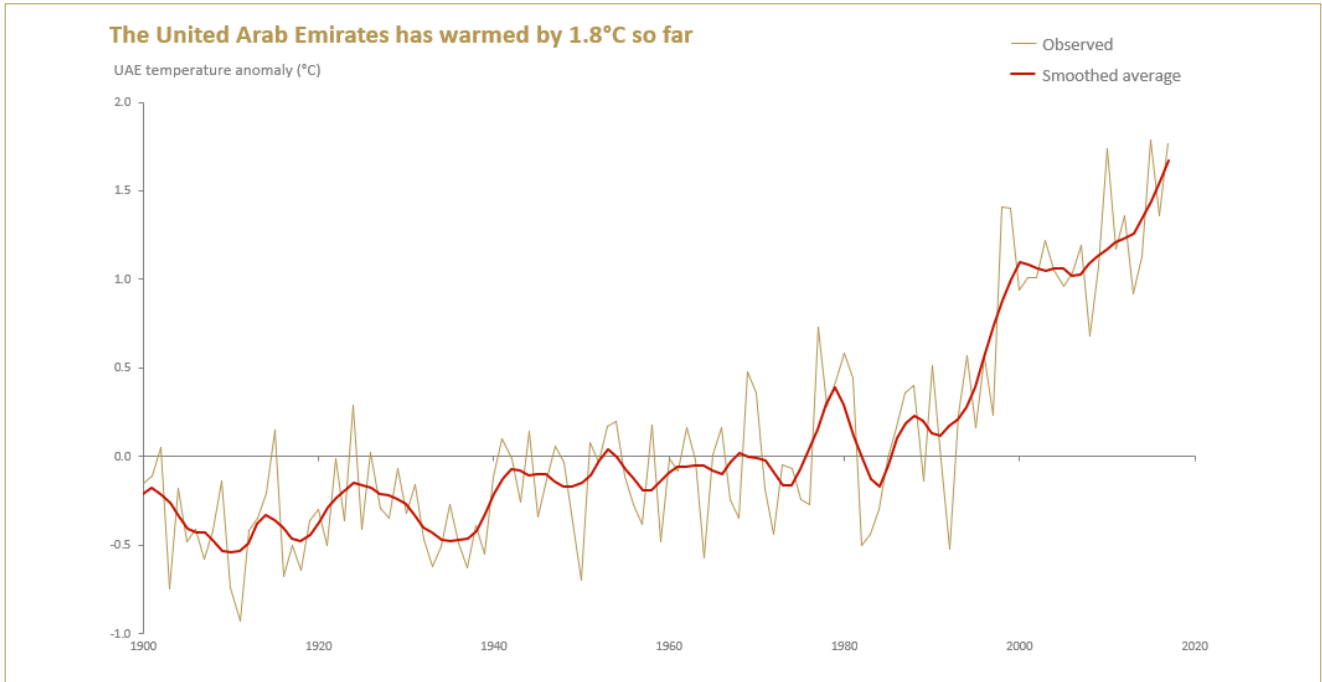


Figure 12: Temperature anomalies in the UAE relative to 1951-1980 baseline period. (Carbon Brief: How every part of the world has warmed – and could continue to warm. Based on land and ocean observations obtained from the Berkeley Earth Surface Temperature Project)

The region and the UAE face a concerning future, as the climate development scenarios paint a disturbing picture. By 2040, countries on the Arabian Peninsula are forecasted to be the most water-stressed countries in the world. By 2050, temperatures may rise to 2.4 °C,⁷⁰ and extreme rainfall may increase by 200%, causing flooding, such as that witnessed in Fujairah in July 2022. Tropical cyclones may become more likely, potentially leading to sudden sea level rise of up to 4 meters. By 2100, extreme weather scenarios include over 5 °C of average warming, with ultra-extreme heatwaves reaching temperatures of 56 °C and above, lasting for several weeks. Sea level rise can reach 1 to 2 meters, and up to 7 meters during cyclone storms, which under current conditions would flood all the region’s major cities, including Dubai and Abu Dhabi. All of this will disrupt multiple economic sectors, potentially leading to losses of billions of dollars and making some areas uninhabitable.⁷¹ This LTS reaffirms the climate-security nexus as was recently highlighted by the UAE at the UN Security Council Meeting.⁷²

Sustainable Opportunities

For all these reasons — and like the rest of the world — the UAE must address climate change. This will require significant investment to introduce new technologies. As such, acting on climate change is also an economic opportunity for the UAE. A recent study conducted by the World Bank predicts that a green growth transition would enable the UAE’s economy to grow at 7% percent annually, in line with the key indicator of the ‘We the UAE 2031’ plan to double the GDP to AED 3 trillion.⁷³ The UAE’s energy transition is thus a genuine growth accelerator for the nation’s economy.

Similarly, implementing the UAE Net Zero by 2050 Strategic Initiative is not only a way to mitigate damages; it can unlock multiple benefits for the UAE. For example, energy transition, particularly scaling renewables, presents significant investment opportunities. Next, by seeking net zero, the UAE can future proof and diversify its economy, build new sources of knowledge, and strengthen exports.⁷⁴ Industries will be able to meet rising demands for low-emissions products (both existing products

⁷⁰ Carbon Brief; versus 1951-1980 period; under 2°C global average warming scenario
⁷¹ COP26, Futures We Want
⁷² Permanent Mission of the United Arab Emirates to the United Nations

⁷³ Green Growth Opportunities in the GCC. World Bank presentation made at Abu Dhabi Economic Department.
⁷⁴ Further detailed in 2.3 ‘UAE’s need for Net Zero.’

such as oil, steel and aluminium and new ones such as synthetic fuels and direct air capture), without sacrificing competitiveness. Manufacturing cost increases are typically compensated by an additional premium, since consumers are willing to pay more for greener, more sustainable products.

Finally, the UAE can also become a role model for decarbonisation by transparently sharing the details of its UAE Net Zero by 2050 Strategic Initiative. Additionally, Net Zero allows the UAE to provide its citizens with a better living environment. The air quality in cities will be improved due to reduced pollution by the industrial, power and transport sectors; noise levels and congestion will be mitigated due to the circulation of more electric vehicles; and citizens will enjoy more comfort within their homes thanks to improved building efficiency.

6.2 UAE's Position to Act on Climate Change

The UAE is a young and progressive nation in the Arabian Peninsula, bordering Saudi Arabia and Oman. It is largely an arid land with vast sand desert, sand dunes, oases, mountains, valleys, marshes and mangroves, and salt plains.⁷⁵ It was founded in 1971 and since then has flourished, becoming one of the leading economies in the MENA region.⁷⁶

Population

With a population of over 9.5 million inhabitants,⁷⁷ the UAE is culturally and socially diverse. As a nation with a young population,⁷⁸ the UAE actively involves its youth in climate action through initiatives such as its low-carbon class activity programmes,⁷⁹ a dedicated sustainability platform for youth.⁸⁰ The UAE also integrates gender inclusivity into its climate-related activities with, for example, strong representation by women in the UAE climate and energy community, including in the UAE Office of Special Envoy of Climate Change, and through a dedicated platform for Women in Sustainability, Environment, and Renewable Energy (WiSER).^{81,82}

Economy

The UAE is prosperous, with expected population and economic growth of roughly 20% and 90%,⁸³ respectively, by 2050, compared to 2022 values. At the beginning of the region's development, the UAE's economy was driven mostly by nomadic farming, date palm cultivation, fishing, pearl diving, and shipping and navigation. Since the discovery of oil in the 1950s, the UAE's economy has been powered mainly by the extraction of crude oil and natural gas, wholesale and retail trade, repair services, real estate, business services, construction, and manufacturing.⁸⁴ Metals, petrochemicals, and activities in high emissions industries (e.g., steel and iron, aluminium) are also key.⁸⁵ The UAE also focused on developing its physical infrastructure including roads, electricity and water generation, ports, and social infrastructure, such as schools and medical facilities. The rapid growth of the construction sector to meet infrastructure demand attracted many expatriates, resulting in a population boom. The expanding population in turn led to additional demand for new buildings and infrastructure. The UAE is still developing parts of its infrastructure, such as its public transportation network, with the development of passenger and freight rail networks connecting all emirates under way. The nation is also expecting significant economic and population growth beyond 2030.⁸⁶

Despite this growth, the UAE is committed to an absolute GHG emissions reduction target. Peaking emissions is a critical first step to be able to deliver net zero by 2050. The nation's efforts to reduce emissions have accelerated, and this LTS outlines plans for further initiatives. Additionally, it is very likely that the UAE's emissions already peaked between 2019 and 2022, with further reductions targeted towards 2030 and beyond. Implementation of the policies presented in the UAE's first LTS, as well as its Third Update of Second NDC, will lead to emissions declining from now on to meet a target

⁷⁵ UAE Government Portal

⁷⁶ World Bank

⁷⁷ As of 2019, Oxford Economics

⁷⁸ Compared with average OECD young population share.

⁷⁹ IRENA

⁸⁰ Masdar

⁸¹ Masdar, WiSER – Women in Sustainability, Environment and Renewable Energy

⁸² Further details on inclusivity are provided in chapter 9.6, 'Raising inclusion in Net Zero – Women, Youth, People of Determination.'

⁸³ Expected population growth and real GDP growth from 2022 to 2050. Based on projections from Oxford Economics.

⁸⁴ UAE Government Portal

⁸⁵ UAE Government Portal

⁸⁶ Based on projections on population growth and real GDP growth from 2022 to 2050. Oxford Economics.

emissions reduction of 19% in absolute terms by 2030 compared to the 2019 level.⁸⁷

Moreover, the UAE has already made significant progress in diversifying its economy: The share of its non-oil sector increased from roughly 30–40% in the 1970s to currently about 70% of total GDP.⁸⁸ This demonstrates the striking economic changes the UAE already implemented. The UAE also has a strong industrial sector with emissions heavy segments (including cement, steel, aluminium, and petrochemicals), which, together with other manufacturing industries, contributed to around 8% of its GDP in 2017.⁸⁹ The transition to a low-carbon economy is a chance to further diversify by growing a competitive, innovation-driven economy and becoming an export hub for low-emissions technologies and fuels.⁹⁰

In July 2023 the UAE has launched the National Hydrogen Strategy, as hydrogen has recently emerged as one of the most important types of clean energy. The strategy aims to promote the UAE's position as a producer and supplier of low-emission hydrogen by 2031 through the development of supply chains, the establishment of hydrogen oases and a dedicated national research and development centre.

The National Hydrogen Strategy is a crucial tool to meet the country's commitment to Net Zero by 2050, in line with the objectives of the Paris Agreement. It aims to turn the UAE into a leading and reliable producer and supplier of low-carbon hydrogen by 2031, driving the country's investments in clean energy and its contribution to the global efforts towards environmental sustainability.

The strategy will help accelerate the global hydrogen economy and scale up local hydrogen production to 1.4 million tons per annum (1 MTPA Green and 0.4 MTPA Blue Hydrogen) by 2031, 7.5 MTPA by 2040, and 15 MTPA by 2050. Following a thorough study of hydrogen demand, the National Hydrogen Strategy forecasts local demand of low-carbon hydrogen to reach 2.7 MTPA by 2031.

An overview of the targets and predictions for hydrogen production was considered while

preparing short-, medium-, and long-term scenarios (2031, 2040, and 2050) for the future production of blue, green, and pink hydrogen, along with exploring other alternatives and derivatives

To enhance the UAE's position as a supplier of low-emission hydrogen and achieve the country's objectives, 10 enablers have been identified. These include global collaboration; resources and assets; climate, safety and social drivers; enabling infrastructure; research and development; policy, regulation and standards; finance and investments; industry development and demand activation; sustainable commercial and economic models; and skills and education.

The strategy sets the main measures that the UAE will take to expedite the growth of the hydrogen economy and become amongst the world's top producers of low-emission hydrogen. It will also help reduce emissions in hard-to-abate sectors, such as land, sea, and air transport, chemicals and fertilizers, and metals, including aluminum, iron, and steel, by 25% by 2031 and 100% by 2050.

The National Hydrogen Strategy involves tangible steps to establish two hydrogen oases by 2031 and increase their number to five by 2050. The strategy contributes to fostering the domestic market, developing a regulatory framework and policies that support hydrogen as a sustainable fuel for the future, strengthening regional collaboration to establish a regional hydrogen market, and bolstering investments in research and development to improve cost effectiveness of hydrogen production, transport, and utilization.

It enhances the investor confidence and helps companies develop robust supply chains. It supports the country's approach to fully utilize its abundant solar energy, natural gas resources, ability to capture and store carbon, and strategic location to unlock local hydrogen production capabilities and accelerate the global hydrogen economy.

To advance related technologies, the country will establish a hydrogen centre for research and development in 2031, which will be developed into

⁸⁷ Further details on UAE's targets are included in Chapter 3 'The Role of Climate Change Mitigation in the UAE.'

⁸⁸ UAE Ministry of Finance

⁸⁹ At real prices of 2010. Assumes mentioned industries are classified under Transformative Industries in UAE Governmental Portal. UAE Government Portal

⁹⁰ MOIAT, Operation 300 billion



a recognised innovation centre globally for hydrogen by 2050.

The strategy was developed in collaboration with stakeholders using bottom-up approach to make sure it is ambitious and viable, as well as supports the objectives of the 'We the UAE 2031' Vision, the Circular Economy Policy 2031, the National Strategy for Wellbeing 2031, and the UAE Net Zero by 2050 Strategic Initiative, in line with the UAE Centennial Plan 2071.

While this transition is underway and must accelerate, the UAE is aware of its responsibility as a reliable, low-emissions energy provider and guarantor of global energy security, particularly amidst the current energy crisis. The UAE is driving this transition in three ways:

1. Implementing policy measures to reduce its own oil and gas demand, for example through increasing energy efficiency across economic sectors, or through electrification in industry and transport.⁹¹
2. Continuing production of Murban crude oil, which already has a comparatively low carbon intensity as a product of its advantageous geology, decades of advanced reservoir management practices, and continued investments in the decarbonisation of its operations and portfolio.⁹²
3. Heavily investing in renewable energy overseas. The nation has invested more than \$50 billion in renewable energy projects across 70 countries, including 27 island nations, and plans to invest an additional \$50 billion over the next decade.

Government

The UAE is a federation of seven emirates, and as such, climate policies are developed by involving a wide range of entities in line with the legal and executive jurisdictions and roles laid down in the constitution. The UAE Council on Climate Action,⁹³ an inter-ministerial, inter-emirate governance body established in 2022, ensures alignment across federal- and emirate-level policies and interventions.⁹⁴

Climate

The UAE lies in a region known for its climate vulnerability, yet, it has nevertheless prospered remarkably. However, future climate change is likely to increase pressures on the nation's environment, economy, and society. Given the impact of climate change and of the cost of inaction, the UAE is committed to reducing its GHG emissions and enhancing its climate resilience.⁹⁵

⁹¹ Further detailed in this report under chapter 4, 'Sectoral roads towards decarbonisation.'

⁹² ADNOC

⁹³ Previously part of the UAE Council on Climate Change and Environment, established in 2016.

⁹⁴ Further details on decarbonisation policies and on the UAE's governmental structure, are included in chapters 4 and 9 (respectively).

⁹⁵ Further details can be found in chapter 2.1. 'Climate Change Action — a Need and an Opportunity for the UAE.'

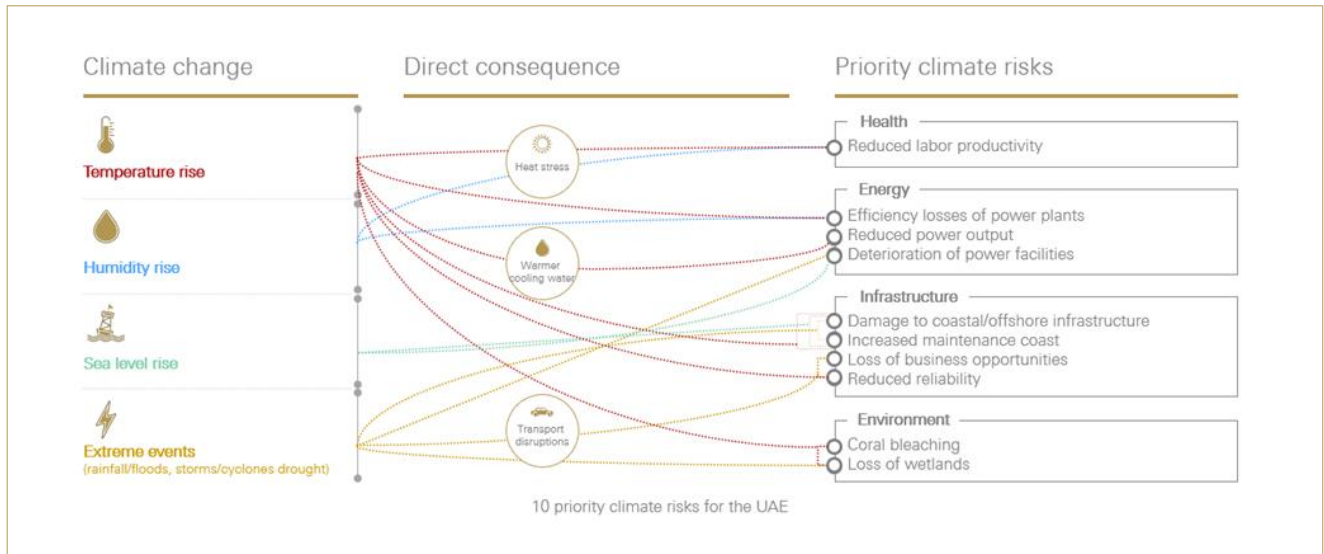


Figure 13: Climate change impacts in the UAE (UAE Climate Risk Assessment).

In summary, the UAE is exposed to climate change but also well positioned to act on it. The already visible impacts of climate change on the nation’s fragile climate, combined with a mindset of continuously seeking a better future, can galvanise its young and well-prepared population to work together to decarbonise its economy. Acting on climate change is an opportunity for the UAE to tackle one of humanity’s most urgent modern challenges, while inspiring other countries in the process.

6.3 The UAE’s Climate Ambition and Climate Actions

The UAE is aware that the perils associated with climate change leave no place untouched. In recent years — even before introducing the UAE Net Zero by 2050 Strategic Initiative — the nation has already taken decisive action to mitigate climate change and adapt to its impacts, acting both within and across borders.⁹⁶

National Climate Change Action

The UAE was the first nation among GCC countries to ratify the Paris Agreement. It was also the first to commit to an economy-wide reduction in emissions.

In 2017, the UAE developed the National Climate Change Plan 2017-2050, laying out a framework to manage GHG emissions, adapt to climate change

and stimulate private sector driven, innovative economic diversification. Other notable efforts include the UAE Environmental policy,⁹⁷ work on national-level GHG inventory, and the advancement of international commitments, such as the NDCs. The UAE stepped up its commitments in 2021 when it became the first nation in the region to announce a net zero strategic initiative. This is a crucial step in the nation’s efforts, which goes well beyond its stated goal of decarbonisation. It is a vehicle for economic growth, job creation, and industrial expansion that closely aligns with the UAE’s long-term development ambitions.

The UAE kicked-off renewable energy investment more than 15 years ago, even though the economic case for renewables was not straightforward at the time, and the nation now leads the region’s efforts. This puts the UAE on the map as a major player in regional clean energy. Its efforts span from renewables to nuclear. Solar energy is the core of the UAE’s renewable energy efforts, and projects already include the Noor Solar Plant (1.2 GW of capacity), Al Dhafra Project (2 GW of capacity), and the Mohammed Bin Rashid Solar Park (2 GW of capacity, with a total of 5 GW planned by 2030),⁹⁸ which has its own innovation centre.⁹⁹ The Barakah nuclear power plant with 5.6 GW of nameplate capacity, the first in the Middle East, came online in 2020. By Q3 2023, Barakah nuclear power plants is supplying 4.2 GW of clean dispatchable base load

⁹⁶ Extensive details of the UAE’s current climate action initiatives are provided in its latest submitted NDC (UAE’s Third Update of Second NDC). This section provides an overview and key examples that summarize the nation’s endeavours.

⁹⁷ Ministry of Climate Change and Environment

⁹⁸ DEWA

⁹⁹ Mohammed bin Rashid Al Maktoum Solar Park, Innovation Centre

to the UAE electricity grid.¹⁰⁰ Clean/low-carbon¹⁰¹ hydrogen investments are also accelerating, guided by the UAE's National Hydrogen Strategy.¹⁰²

In parallel with clean energy developments, the UAE is advancing technologies to capture carbon from the industrial processes and/or remove it from the atmosphere. This involves using nature-based (e.g., mangroves) and engineering-based technical solutions. The UAE built the region's first industrial-scale carbon capture, utilisation, and storage (CCUS) facility in 2016, and since then has developed multiple projects in the area.

Efforts have accumulated over the course of years to a point where decarbonisation is embedded in all of UAE's main economic sectors and through multiple federal- and emirate-level strategies, policies, and targets. Currently, the UAE Net Zero by 2050 Strategic Initiative builds on more than 30 existing strategies across all sectors. Additional policies, such as the Clean Energy Strategic Target 2035 in Abu Dhabi and the UAE National Hydrogen Strategy, were updated during the development of the net zero pathway.¹⁰³

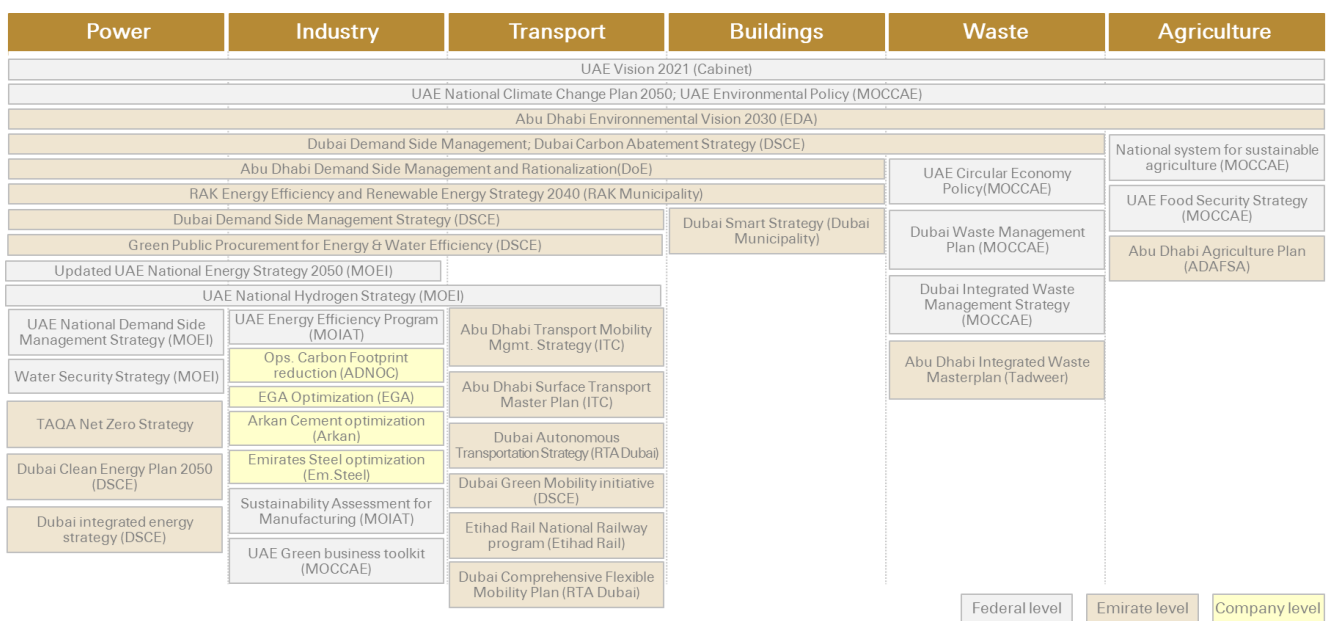


Figure 14: Existing strategies considered in the UAE Net Zero by 2050 Strategic Initiative (UAE Net Zero by 2050 Strategic Initiative)

¹⁰⁰ ENEC; the first unit of Barakah nuclear power plant came online in 2020.
¹⁰¹ Specific type of hydrogen is under discussion depending on international markets' demand.
¹⁰² Ministry of Energy and Infrastructure

¹⁰³ Further details are provided in the UAE's most recently submitted NDC (the UAE's Third Update of Second NDC), as well as in this document, under chapter 3, 'The role of climate change mitigation in the UAE' and chapter 4, 'Sectoral roads towards decarbonisation.'

Climate Change Action Abroad

The UAE also supports other nations' climate efforts. It has invested more than \$50 billion in renewable energy projects across 70 countries, including 27 island nations, and plans to invest an additional \$50 billion over the next decade. The UAE has also provided over \$400 million in aid and soft loans for clean energy deployment and contributed to 11 GW of invested capacity in 30 notable renewable energy projects. In 2022, the UAE also announced the Partnership for Accelerating Clean Energy (PACE) with the United States to accelerate the transition to clean energy. PACE aims to catalyse \$100 billion in financing, investment, or other support to deploy 100 GW of clean energy by 2035. The first wave of investments under PACE allocates \$20 billion to fund 15 GW of new clean and renewable energy projects in the US before 2035. It will be financed through \$7 billion in cash equity from the private sector that will drive a further \$13 billion through US debt financing and other instruments. Other high-profile efforts include the UAE-Pacific Partnership Fund, the launch of the Energy Accelerator Financing Platform with

IRENA,¹⁰⁴ and the Agriculture Innovation Mission for Climate, a UAE-US founded partnership — supported by more than 30 countries — to increase Research & Development (R&D) in agriculture and food security.¹⁰⁵

The UAE's national companies are also developing multiple partnerships abroad and leveraging opportunities to share and acquire knowledge. Abu Dhabi National Oil Company (ADNOC), Mubadala, and the Abu Dhabi National Energy Company (TAQA) invested in Abu Dhabi Future Energy Company (Masdar). Masdar is now one of the largest developers of renewable energy projects in the world and operates in more than 40 countries including Uzbekistan, Azerbaijan, Egypt, Jordan, Kyrgyzstan, Turkmenistan and Tanzania. Masdar currently has a portfolio of renewable energy projects with total capacity of over 20 GW operational or under development, and it aims to increase its renewable energy portfolio to 100 GW by 2030.¹⁰⁶ Beyond its initial goals, the company aspires to develop in excess of 200 GW of renewable energy, reinforcing its position as a world leader in the renewable energy sector.



Figure 15: Overview of Masdar investments (Masdar)

¹⁰⁴ UAE Embassy; IRENA is an international intergovernmental organization hosted in Abu Dhabi and is playing a vital role in the energy transition in UAE

¹⁰⁵ AIM for Climate
¹⁰⁶ Masdar

Even considering the national and international initiatives already under way, the UAE still has room to increase its climate action efforts. Its new targets, detailed in its most recently submitted NDC, commit to a 19% decrease in emissions by 2030, compared to 2019 levels.¹⁰⁷ Yet, these targets can only be achieved if the UAE increases its ambitions. This becomes increasingly relevant as the UAE embraces its role as the host of COP28, the world's most important and anticipated yearly climate conference. The UAE's Net Zero by 2050 Strategic Initiative is crucial because it can address requirements to showcase progress ahead of COP28, including stronger commitments, more transparent and ambitious roadmaps, tougher policy frameworks, and executed on-the-ground actions.

Link to Sustainable Development Goals (SDGs)

Net Zero is also a way to strengthen the UAE's contribution to the UN SDGs, which were developed as a 'universal call to action to eradicate poverty, protect the planet, and ensure global prosperity.'¹⁰⁸ The UAE conducted its first Voluntary National Review in 2018, expressing its commitment to pursue the 2030 Agenda. Since then, it has deployed several mechanisms and initiatives to advance the SDGs. For example, from the climate and sustainability vantage point, the UAE is taking urgent actions, including the rollout of strategies, policy directives, and incentives to reduce emissions and accelerate decarbonisation (SDG 11, 13), and promote biodiversity protection (SDG 14, 15). Moreover, in 2017, the UAE formed its National Committee on SDGs, which comprises 15 federal-level government organizations responsible for the national implementation of the SDGs, monitoring, and reporting of progress towards targets, and stakeholder engagement.¹⁰⁹

Furthermore, the UAE aligns its National Agenda with the SDGs; in a recently conducted exercise, all 17 SDGs were mapped to a National Agenda pillar. This allows the UAE to prioritise targets in a given time frame and manage the scope of SDG implementation by considering the capacities and constraints of a particular year. Additionally, the UAE recently ran an exercise to coordinate

government entities' SDG efforts, highlighting success stories and drawing upon lessons that can be beneficial to other government entities and the world. As a result, progress in realising the SDGs is now included in entities' strategic plans and overall government performance. The UAE also implemented the Government Accelerators (GA) initiative run by His Highness Sheikh Mohammed bin Rashid Al Maktoum. This is a platform for federal and local government entities to address challenges and achieve ambitious goals in short periods of time, and it has already generated significant outcomes, including the announcement of the UAE Net Zero by 2050 Strategic Initiative. To ensure these and other initiatives keep driving progress on the SDGs, the UAE promotes comprehensive stakeholder engagement and the use of enabling mechanisms, the latest details of which are included in the UAE's most recent Voluntary National Review.¹¹⁰

6.4 The UAE's Way to Net Zero

Countries worldwide increasingly recognise that isolated decarbonisation targets and initiatives no longer suffice to meet the challenges of climate change. Net zero thus emerges as a guiding principle for the UAE's decarbonisation efforts; it is an all-of-society approach that encompasses every economic sector (industry, transport, buildings, agriculture, waste) and extends beyond national borders to inspire people worldwide¹¹¹.

The profound transformation net zero will bring to the UAE will be unlocked by a series of decarbonisation measures. Together, these measures form the tool kit that drives net zero across economic sectors.

Energy Efficiency and Demand-Side Management

Energy efficiency will drive key improvements in the industry, transport, and buildings¹¹² sectors. On the latter, building codes will be updated in 2024 to ensure adherence to best practices for the mitigation of both embodied and operational emissions. They will also ensure building will become better adapted and resilient to harsher temperatures. In parallel, demand-side management will be crucial to improve energy use.

¹⁰⁷ Further detailed in chapter 3.1 'The role of climate change mitigation in the UAE'

¹⁰⁸ UN 2030 Sustainable Development Agenda: Sustainable Development Goals

¹⁰⁹ UAE and the 2030 Agenda for Sustainable Development – Voluntary National Review 2022, National Committee on Sustainable Development Goals

¹¹⁰ National Committee on Sustainable Development Goals

¹¹¹ Further detailed in 3.1 'UAE Net Zero target – scope and coverage'

¹¹² Including cooling systems

Across sectors, this will require initiatives to not only decrease but also shift periods of peak power use by the government, companies, and households.

Clean Power

Utilities and independent producers will need to invest significantly to deploy renewables, storage, and nuclear. Photovoltaic panels (PV) will be the key source of power generation under Net Zero pathway. In the build-up to 2050, solar technologies, accompanied by peaceful nuclear energy, reverse osmosis, batteries, and other forms of energy storage, will progressively minimize gas as the main source of power generation and potentially enable it to be replaced with hydrogen or other alternatives. This will be a fundamental piece of Net Zero, given it will not only drive decarbonisation of the power and water sector, but also support emissions reductions in other sectors.

Modal Shift

Under net zero, public transport use — metro, tram, public buses, and rail — will increase over private vehicles. People will also walk and bicycle more (i.e., increase of active mobility). Supporting this will require enhancing public transportation networks and developing foundations for more pedestrian and cyclist-friendly cities.

Fuel Substitution, Electrification, and Industrial Process Updates

Internal combustion engine (ICE) vehicles, which are powered by fossil fuels, will gradually be replaced by battery-electric vehicles (BEVs) and hydrogen-fuelled vehicles (FCEV).¹¹³ Supporting infrastructure (e.g., electric vehicle chargers) must be enhanced to enable this transformation. Domestic shipping will resort to ammonia or methanol, domestic aviation to sustainable aviation fuels (SAFs) and low carbon aviation fuel (LCAF) and rail will be electrified, ensuring decarbonisation across these sub-sectors.

Fuel transition will also take place in industry, mainly industrial heating. Fossil fuels will be gradually phased out by solar thermal, low-carbon hydrogen, biomass/waste and electric power, or natural gas combined with CCS. Existing processes will also

have to be updated. This will require using lower emissions materials and capturing leaking and flared¹¹⁴ natural gas.

Carbon Capture and Storage

CCS will be instrumental in reducing emissions, especially for industries that are considered heavy emitting sectors (HES) (i.e., industries where it is harder to decrease emissions because they result from natural reactions in manufacturing processes). This technology involves the capture of CO₂, either directly from the atmosphere or from large sources, including industrial facilities that use fossil fuels. Captured CO₂ can then be compressed, transported, and injected underground to be permanently stored.^{115,116}

Waste Management

In addition to increasing recycling and reuse, households and corporates will also need to decrease their waste production per capita to reduce the amount of waste that ends up in landfills. Eventually, waste to energy facilities will be equipped with CCS, and landfills with gas capture equipment, to mitigate emissions from the waste that is not sorted or recycled.¹¹⁷ Moreover, through improved management of secondary scrap or demolition waste, the UAE will avoid emissions in heavy emitting industries.

6.5 Vision of UAE's Net Zero Future: A Typical Day of a UAE Citizen in 2050

Reem is a 45-year-old Emirati living in a net zero UAE. Born and raised in Dubai, she grew up with the city and witnessed the ongoing evolution net zero spurred in the UAE. She has long been aware of climate change's hurdles and rejoices when recognizing that the UAE has successfully averted climate change's worst consequences by acting swiftly.

Reem lives in a modern neighbourhood within a mixed-use development where multi-use facilities are combined into single buildings. There, she enjoys being able to access all essential services by

¹¹³ Fuel Cell Electric Vehicles

¹¹⁴ Natural gas that is burned in the process of oil extraction.

¹¹⁵ International Energy Agency (IEA)

¹¹⁶ Once scaled up, use cases for CO₂ use (e.g., sustainable aviation fuel, building materials) might be superior to storage due to decreasing overall lifecycle emissions.

¹¹⁷ Further details on all decarbonisation measures that must be implemented across sectors are available under section 4, 'Sectoral Roads Towards Decarbonisation.'



foot. She can walk to the grocery store, pharmacy, local medical centres, and leisure areas. Reem has developed the habit of commuting by foot and appreciates that shaded sidewalks have been expanded across the city over the years.

Reem usually starts her day by walking to the park across from her building. The greenery that was added throughout the years to urban centres in Dubai helps to provide shade that cools down the city, increasing the appeal of walking. Right now, it is winter, and she has decided to bicycle to work. She picks up a bike from a public bike share programme, which has grown in popularity as cycling lanes have been expanded across town. As Reem cycles to work, she notices that the air feels fresher and cleaner than it used to. This could be attributed to the various initiatives that have been taken to enhance air quality in Dubai, such as promoting the use of public transportation, increasing the number of green spaces, and implementing regulations to reduce air pollution from factories and vehicles. Reem takes a deep breath and feels grateful for the improved air quality that makes cycling to work a more enjoyable and sustainable option.

She then meets fellow co-workers and gets ready to start her day. She works in a corporate position at a major aluminium manufacturer. Today, employees analyse a presentation on the company's decarbonisation journey, and they study how it implemented aluminium anodic protection and CCS to decrease its emissions. Over the last decades, the UAE's industrial sector underwent a deep transformation that established its position as a leader in industrial decarbonisation. Now, Reem's employer is the world's leading green aluminium manufacturer and employees recognise past efforts and discuss potential ways to drive them further in the future.

After the presentation, Reem enjoys a break in one of the office's vertical garden areas. Thanks to net zero, the UAE's buildings maximise energy efficiency through the use of improved materials, deployment of solar thermal, and updated cooling regulation. Likewise, new developments and renovations started to include the build-out of green areas, among other innovations. For several decades now, all new building developments in the UAE have been net zero.

Over lunch, Reem hears about the agritech business owned by her colleague's partner. She learns that by controlling the amount of applied fertiliser and

using more efficient formulas, farmers in the UAE managed not only to decrease emissions but also to improve their yields, reduce costs, and support food security. Local produce is now widely marketed and trusted by consumers.

As lunch wraps up, Reem throws out her almost non-existent waste wrappers and packaging. The amount of waste from individuals has decreased significantly, due to technological advancement and an increase in awareness. For the waste that remains, Reem knows it will be automatically sorted and that most of it will be recycled, thanks to extensive developments in the waste and recycling infrastructure.

When she finishes work, Reem walks to the gym. On her way, she notices the extensive PVs that grace all the rooftops of nearby buildings, as well as the EV chargers in the parking lots. She is reminded of her weekend trips across the nation and of driving through extensive fields of PV and restored natural areas, where mangroves are the highlight of the UAE's coastal extensions.

Reem ponders the changes the UAE has undergone in recent years and how they yielded such significant results in a relatively short period of time. While the nation previously relied on carbon-intensive fuels, the UAE now has one of the world's cleanest power grids, powering cars, buildings, and industry. Its core industries, which at first glance seemed hard to decarbonise, are now providers of zero carbon materials for customers around the world, made possible by fuel switching, CCS, and the updating of processes and raw materials. Citizens who used to commute almost exclusively by car have now switched to alternatives, prompted by the development of walking and cycling lanes and public transport, coupled with last-mile solutions, such as on-demand electric buses, to carry them from neighbourhoods to nearby metro stations. They now enjoy the extra time for reading and exercising that this provides. This increasingly educated, well-equipped, and climate-conscious society keeps pushing for further decarbonisation efforts.

A sudden, yet recurring thought comes to her mind — she is truly privileged to live in a nation that spearheaded change and inspired climate action across other countries. While she enjoys the benefits — such as improved air quality, reduced commutes, closely available services — Reem looks forward to continuing to be a part of this change.

Section 2: How Do We Get to Net Zero?



Section 2: How Do We Get to Net Zero?

7 The Role of Climate Change Mitigation in the UAE

Responding to climate change requires both mitigation and adaptation. Mitigation refers to avoiding and reducing GHG emissions. Adaptation refers to adjusting systems and societies to withstand the impacts of climate change. Net Zero is a mitigation target to reduce the nation's emissions to net zero, backed-up by science as the only means to limit global temperature rise.¹¹⁸ Net zero emissions are achieved when 'net anthropogenic GHG emissions are balanced by anthropogenic removals.'¹¹⁹

To achieve this, the UAE built a decarbonisation pathway to mid-century (i.e., towards 2050). This pathway includes interim emissions targets for 2030, 2040 and 2050, which were approved by UAE Cabinet resolution in October 2022.¹²⁰ The 2030 target guides near-term action and is outlined in the UAE's Third Update of Second NDC.¹²¹ The 2040 targets establish mid-term goals, and the 2050 targets embody the final objective to cut greenhouse gases to as close to zero as possible, with any remaining emissions absorbed by natural sinks or negative emissions technologies.¹²² Natural sinks are elements that absorb more atmospheric carbon than they release. Negative emissions technologies remove carbon dioxide from the atmosphere by mechanical means such as with DAC.

7.1 UAE Net Zero Target — Scope and Coverage

The UAE is committed to reducing economy-wide GHG emissions to as close to zero as possible by 2050, with any remaining emissions re-absorbed from the atmosphere.¹²³ Thus, total net GHG emissions in 2050 will be net zero, after accounting for the removal of CO₂ from the atmosphere with nature-based solutions (e.g., planting mangroves) or using engineering-based technical solutions (e.g., DAC technology).

To define interim emissions reduction targets, the UAE set 2019 as the base year. Inventory for the base year was developed through a detailed analysis, in line with best practices, which concluded that the UAE emitted a total of 225 MtCO₂e GHG in 2019.¹²⁴ Compared to this base year, the UAE plans to reduce economy-wide GHG emissions by 62% by 2040 (absolute target of limiting net emissions to at most 86 MtCO₂e)¹²⁵ and 77% by 2045 (absolute target of limiting net emissions to at most 51 MtCO₂e) before reaching net zero in 2050. The overall 'net zero pathway' that introduces a new set of measures, interventions and initiatives is depicted in Figure 17. For comparison the 'business-as-usual scenario' assumes economic growth without decarbonisation efforts, and the 'current policies pathway' estimates emissions development reflecting the already committed decarbonisation initiatives and programs.

¹¹⁸ Climate NASA

¹¹⁹ IPCC Special Report, Global Warming of 1.5 °C, Glossary

¹²⁰ Further details can be found under chapter 6., 'The UAE's Commitment to Ambitious Climate Targets.'

¹²¹ A deep-dive describing the link between the LTS and NDC is provided in Chapter 6.3, 'The need for LTS-NDC alignment.'

¹²² United Nations

¹²³ Excluding international shipping and aviation and F-gases.

¹²⁴ Details on methodology and assumptions followed to compute the emissions inventory are included in UAE's Third Update of Second NDC ICTU table.

¹²⁵ Sectoral targets and pathways are detailed in depth in Chapter 4. 'Sectoral Roads Towards Decarbonisation.'

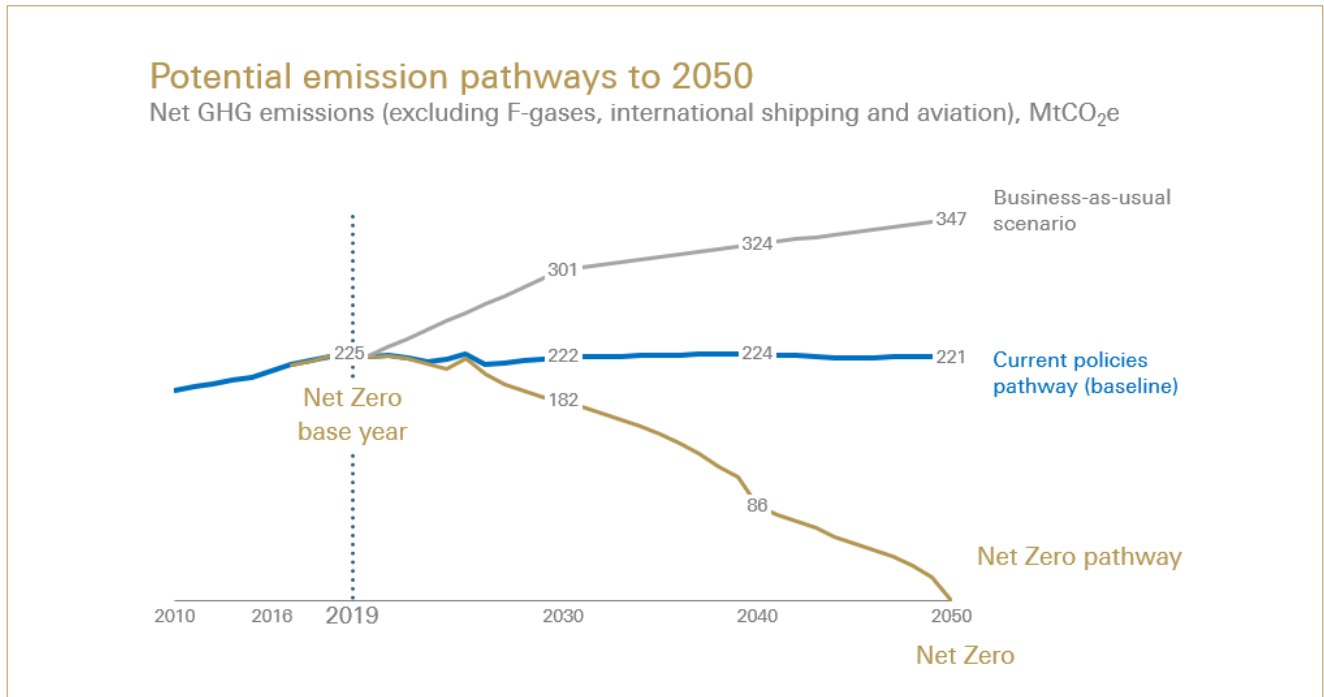


Figure 16: UAE’s potential emission pathways to 2050 (UAE Net Zero by 2050 Strategic Initiative)

These new targets reflect increased ambitions compared to previous UAE announcements. Firstly, they represent the first time the UAE has introduced long-term targets (beyond 2030). Secondly, the new 2030 targets reflect an improvement over the previously announced 2030 targets under the Updated Second NDC¹²⁶ by using an enhanced target-setting methodology and by increasing the level of ambition:

- **Target scope:** All key economic sectors are covered inclusive of industry, transport, buildings, waste, agriculture, power/water, and negative emissions. The results cover key GHG emissions which include Carbon Dioxide (CO₂), Methane (CH₄) and Nitrous Oxide (N₂O). However, the targets do not cover emissions from fluorinated gases or negative emissions due to land use types. On a conservative level, this ensures 95% coverage of total national GHGs.

As per Food and Agriculture Organization of the United Nations, UAE is estimated to have 382,000 Ha of agricultural area and 320,000 Ha of forest area, in addition to the mangrove forests dotting the countries coastline. These land use types can result in up to 8 MtCO₂ of negative emissions, as

per the most recent greenhouse gas inventory. Currently, the biodiversity division at Ministry of Climate Change and Environment of UAE is studying and validating the various land use types in the UAE. Hence, while these land use types have not been considered in the UAE Net Zero analysis, they shall be reflected in the subsequent update of the UAE Long Term Strategy.

- **Enhanced target-setting methodology:** Despite being a developing country with sustained population and economic growth, the UAE is now committing to absolute emissions reduction targets (so called fixed-level and base year targets) to ensure maximum transparency and measurability. Thus, the nation is improving on the previous common practice of anchoring emissions reductions to future business-as-usual development, often criticised by its lack of transparency and certainty.¹²⁷
- **Increased level of ambition:** The new fixed-level target of 182 MtCO₂e is significantly lower than the previous business-as-usual-based target, which in absolute terms equates to 208 MtCO₂e. Compared to the prior 31% reduction versus business-as-usual, this new absolute target of

¹²⁶ The UAE’s Updated 2nd NDC was the latest published NDC from UAE prior to the drafting of this LTS report.

¹²⁷ OECD, Climate Change Expert Group, Accounting for baseline targets in NDCs: Issues and options for guidance



182 MtCO₂e is a significant improvement, since it would correspond to a 40% reduction compared to business-as-usual. This is illustrated below.¹²⁸

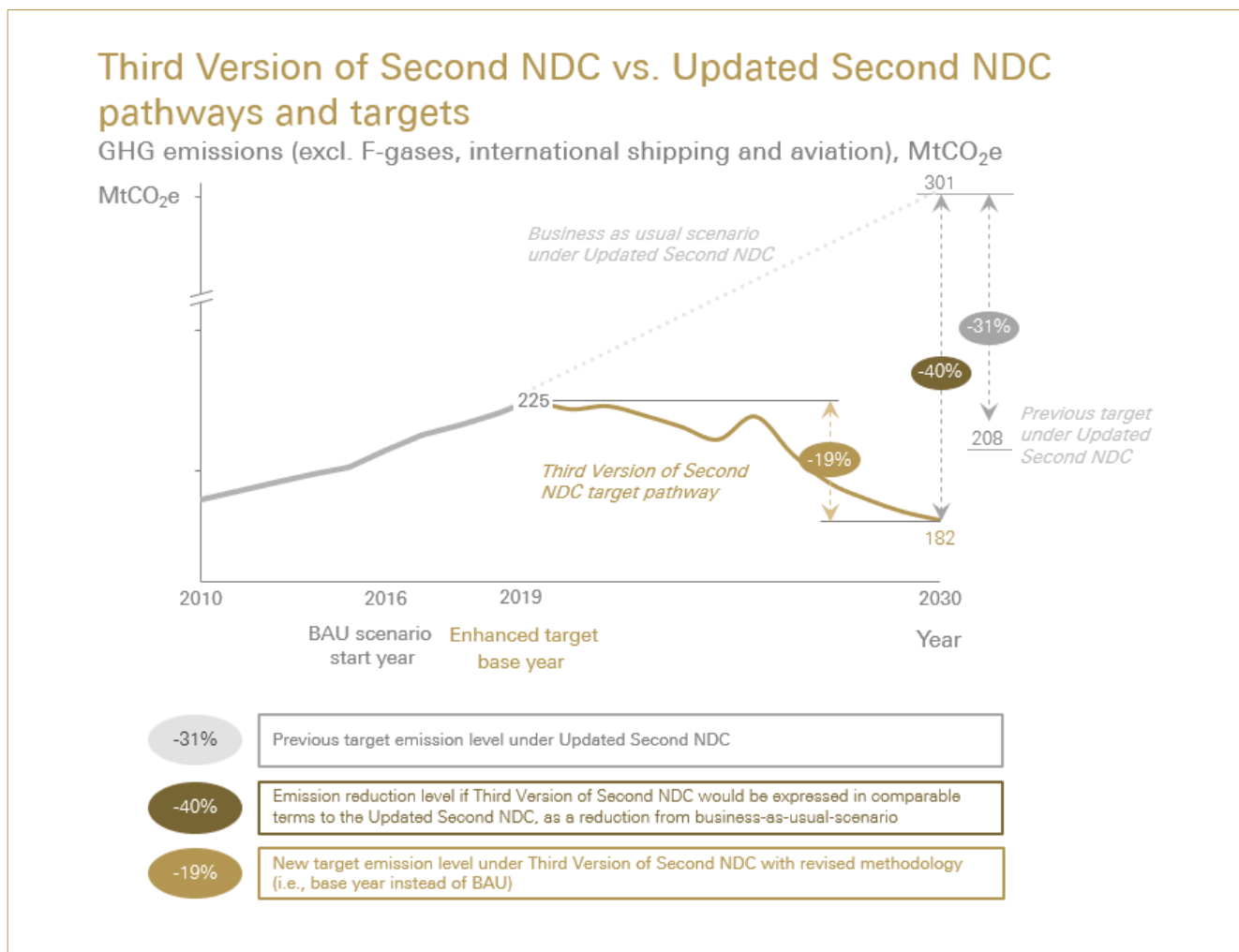


Figure 17: Third Update of Second NDC versus Updated Second NDC targets

Besides increasing its ambitions, the UAE’s decarbonisation targets cover all domestic sectors — power and water generation, heavy industry, transport, buildings, agriculture, and waste — including land use, land-use changes, and forestry (LULUCF). Emissions-wise, targets cover all national GHG emissions, including CO₂, CH₄, and N₂O.

Targets exclude emissions from F-gases, which are typically part of cooling applications, since a comprehensive and robust study on these is still under way.¹²⁹ Targets and measures will be defined once this study is completed. Also, UAE developed

the National Efficient Cooling Plan in line with international best practices to address both mitigation and adaptation aspects. In this regard, the UAE Efficient Cooling Plan was developed under National Demand Side Management program to increase cooling efficiency by implementing cooling operations and technology improvements and increasing penetration of District/Efficient Cooling (DEC) for new developments as well as retrofitting existing building to DC.

Future targets, specifically ones advanced by future NDCs for international aviation and shipping, are also not considered as these are managed by other

¹²⁸ UAE, Updated Second Nationally Determined Contribution of the United Arab Emirates

¹²⁹ Fluorinated gases refer to hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF₆), and nitrogen trifluoride (NF₃).

treaties and international organisations such as the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO). The UAE is supporting decarbonisation targets set by the ICAO and the IMO and relevant local entities in the UAE are working on initiatives to advance in this area. A joint feasibility study by UAE entities explores the production of SAFs and other products using municipal solid waste (MSW) and renewable hydrogen.¹³⁰ With regards to shipping, the UAE is exploring green shipping corridors, which are maritime routes to test and showcase feasibility of low emissions shipping fuels and technologies. Also, MOEI has established a research and development centre to accelerate the transition and transformation of the maritime industry towards the net-zero future.

7.2 Net Zero Pathways to Reduce Emissions

In the base year (2019), the UAE emitted 225 MtCO₂e of GHGs. An overview of 2019 emissions per sector is provided in the table below.¹³¹ The sector split is in line with the UAE Net Zero by 2050 Strategic Initiative. All emissions from the burning of fossil fuels to generate power and water are shown in the power and water generation sector. All power and water emissions are then distributed to the consuming sectors (without double-counting) to drive energy efficiency and informed fuel switch decisions in these sectors (e.g., emissions in the industrial, transport, waste, buildings, and agriculture sectors include indirect emissions from power and co-generation plants). Emissions related to the production of oil and gas are accounted for in the industrial sector. This split is chosen to facilitate implementation, as entities who are typically focused on one sector can be held accountable and progress can be measured easily.

Table 2: Sectoral base year emissions (UAE Net Zero by 2050 Strategic Initiative)¹³²

Sector	2019 base year
Power grid emission coefficient ¹³³	0.55 tCO ₂ e/MWh
Industry emissions	103 MtCO ₂ e
Transport emissions	42 MtCO ₂ e
Buildings emissions	62 MtCO ₂ e
Waste emissions	13 MtCO ₂ e
Agriculture emissions	6 MtCO ₂ e
Negative emissions	-1 MtCO ₂ e
<i>Note: Individual sector emissions include indirect emissions from power and water usage.</i>	

The UAE conducted a thorough process to develop its net zero pathway, which tackles these emissions and resulted in the above-mentioned decarbonisation targets. In summary, this process involved:

1. Identifying and quantifying emissions for all UAE's sectors in recent years, following a bottom-up approach.
2. Assessing existing committed programmes related to emissions to understand how the nation's emissions would evolve once these are deployed. Over 30 national-, emirate- and company-level programmes were considered in this analysis, as illustrated in Figure 15. This analysis concluded current strategies are not enough to reach net zero emissions in 2050.
3. Building on existing programmes to close the gap to reach net zero. This was done by identifying optimal emissions reduction measures for each source of emissions and planning their uptake based on their business case, emissions reduction potential, and other benefits to the society. The analysis made it

¹³⁰ Masdar News, Masdar, ADNOC, bp, Tadweer and Etihad Airways explore production in the UAE of sustainable aviation fuel from municipal solid waste and renewable hydrogen.
https://moei.gov.ae/assets/download/9b4bf8a9/UAE_National_SAF_Roadmap.pdf
https://www3.weforum.org/docs/WEF_UAE_Power_to_Liquid_Roadmap_2022.pdf

¹³¹ Table excludes own emissions (scope 1) from power and water generation and negative emissions. If those are considered, total GHG emissions were **225 MtCO₂e in 2019**.

¹³² For 2030 sectoral targets, please refer to published UAE Third Update of Second NDC.

¹³³ Definition of power grid coefficient: total emissions for power production divided by gross generated power.

possible to define the UAE's net zero pathway for each sector and included details such as the pace and volume with which measures should be deployed, their decarbonisation impact and associated business case, job creation, and further opportunities for the sector.

There are several ways — associated with different decarbonisation speeds, targets, and transformation paces — to reach net zero in 2050. When detailing the UAE Net Zero by 2050 Strategic Initiative, the UAE assessed a range of different options, which were distilled into three distinct scenarios to achieve this goal. In coordination with all relevant stakeholders, the nation then selected the most suitable scenario given its economic conditions and objectives.

The UAE Net Zero by 2050 Strategic Initiative pursues near-term economic diversification opportunities while providing time for businesses to adjust and deploy decarbonisation measures as technology matures and becomes available at scale. The strategy future-proofs existing export industries through more rapid emissions reductions, thereby seizing emerging opportunities arising from an increased demand for 'green' products (e.g., green

steel and green aluminium) due to increasing international standards. It further creates new export industries through the development of maturing technologies such as low-carbon hydrogen, synthetic fuels, CCS, and Direct Air Capture.

In doing so, the net zero pathway elevates the UAE's ambitions and aligns with the nation's goals of driving innovation and technological enhancement and exploring new revenue streams. Simultaneously, it allows the nation to diversify its economy and venture into new areas that are set to become increasingly relevant in the future.

8 Sectoral Roads Towards Decarbonisation

The UAE's Net Zero by 2050 Strategic Initiative covers all domestic economic sectors. Respective sector targets implied by the net zero pathway are displayed below. Emissions per sector account for emissions from power and water generation.

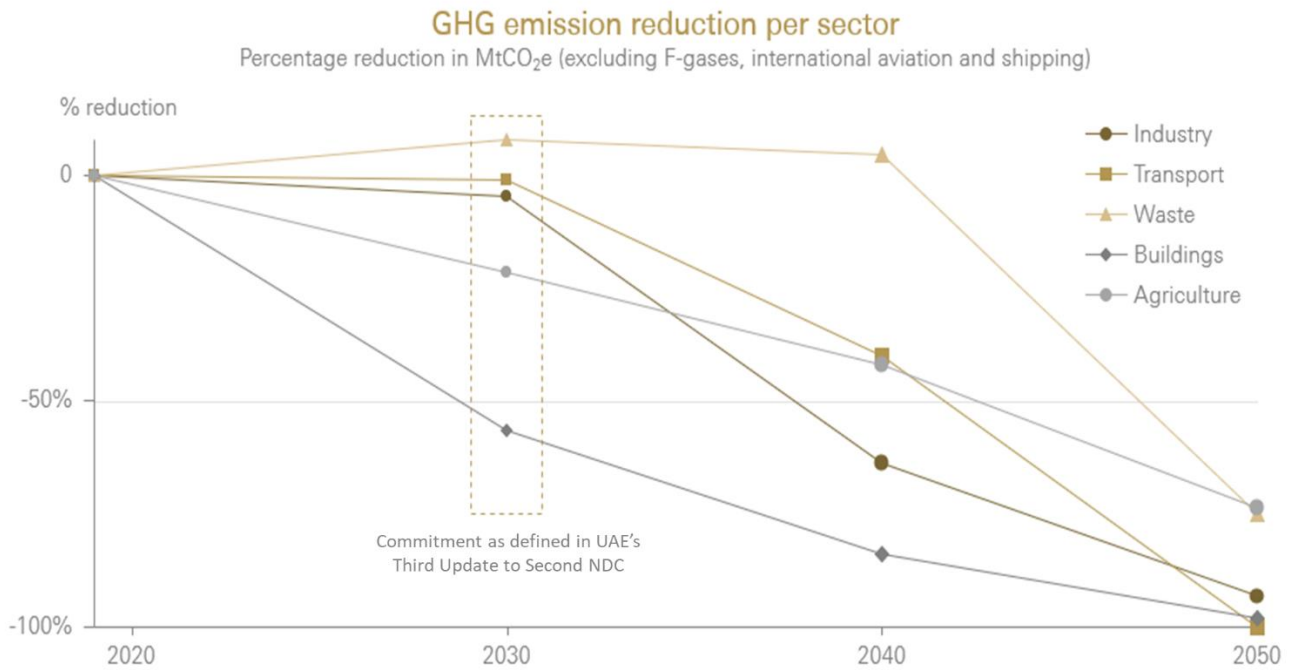


Figure 18: The UAE's sectoral net zero targets (UAE Net Zero by 2050 Strategic Initiative)

Table 3: Overview of Sectoral Targets (UAE Net Zero by 2050 Strategic Initiative).

Sector	2019 base year	2030 targets (% reduction)	2040 targets (% reduction)	2050 targets (% reduction)
Total Emissions	225 MtCO ₂ e	182 MtCO ₂ e (-19%)	86 MtCO ₂ e (-62%)	0 MtCO ₂ e (-100%)
Industry emissions	103 MtCO ₂ e	98 MtCO ₂ e (-5%)	37 MtCO ₂ e (-64%)	7 MtCO ₂ e (-93%)
Transport emissions	42 MtCO ₂ e	42 MtCO ₂ e (-1%)	25 MtCO ₂ e (-40%)	0 MtCO ₂ e (-100%)
Waste emissions	13 MtCO ₂ e	14 MtCO ₂ e (+8%)	14 MtCO ₂ e (+5%)	3 MtCO ₂ e (-75%)
Buildings emissions	62 MtCO ₂ e	27 MtCO ₂ e (-56%)	10 MtCO ₂ e (-84%)	1 MtCO ₂ e (-98%)
Agriculture emissions	6 MtCO ₂ e	4 MtCO ₂ e (-22%)	3 MtCO ₂ e (-42%)	1 MtCO ₂ e (-74%)
Negative emissions	-1 MtCO ₂ e	-3 MtCO ₂ e	-4 MtCO ₂ e	-13 MtCO ₂ e
Power Grid Emission Coefficient	0.55 tCO ₂ e/MWh	0.27 tCO ₂ e/MWh (-51%)	0.08 tCO ₂ e/MWh (-85%)	0 tCO ₂ e/MWh (-100%)

Note: Individual sector emissions include indirect emissions from power and water usage.

8.1 Decarbonisation of Power and Water Generation

Current Landscape

Decarbonising power and water generation is key to reaching net zero because it is one of the highest-emitting sectors in the UAE. In 2019, grid connected power and water generation plants emitted 76 MtCO₂e of GHGs (including gas-fired power plants, gas-fired power and water co-generation plants, waste-to-energy power plants, but excluding captive, non-grid-connected industrial power plants).

Reaching net zero in the power and water sector requires moving away from carbon intensive sources of energy¹³⁴ and relying on 'clean' sources of energy instead. The underlying condition is that the expected growing demand for power and water is always satisfied (in terms of both quality and quantity). This can be achieved with existing technologies, principally by shifting to renewable energy sources. Renewable energy is generated from natural energy sources that are replenished at a higher rate than they are consumed. Common renewable energy sources are solar energy, wind energy, geothermal energy, hydropower, ocean energy, and bioenergy.¹³⁵ These renewable resources are key for clean power production because they generate lower emissions than burning fossil fuels does, or no emissions at all. The UAE has an advantageous position since a key

resource enabling sector decarbonisation — sunlight — is abundant in the region. The nation has already invested heavily in solar PV power plants and has an installed solar capacity of around 5 GW, with several other developments planned in the near-term. The nation also has one of the world's lowest levelised costs of electricity produced by PVs.

Nevertheless, decarbonising the power grid will be a significant undertaking, given the substantial increase in power demand. The power generated is expected to increase to 211 TWh by 2030, due to connection of captive demand, expansion of economic activity, increasing demand for cooling, and higher electrification, especially in the transport sector. While the power generated shall increase further in 2040 and 2050, the final generation mix will be announced by Ministry of Energy and Infrastructure in consultation with the utilities which are currently analysing various decarbonization scenarios. In addition to transitioning to low-to-no carbon energy sources, energy efficiency and demand-side measures will be important to ensure that affordable, reliable, and sustainable electricity can be provided to customers in UAE.

¹³⁴ IPCC

¹³⁵ UN

Power generated, 'Diversify Net Zero' pathway TWh

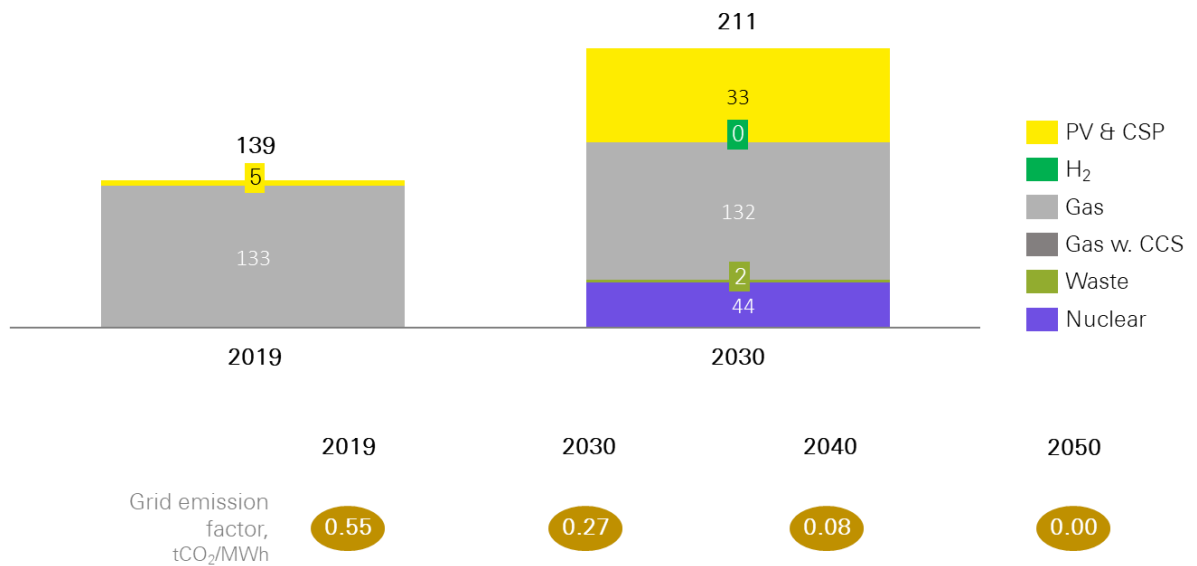


Figure 19: The UAE’s power generated per type (UAE Net Zero by 2050 Strategic Initiative)

The UAE is also decarbonising its energy-intensive desalination sector by using low-carbon reverse osmosis (RO) technologies to produce potable water. Abu Dhabi will be home to one of the world’s largest reverse osmosis plants, sufficient to meet the water demand of around 350,000 households. The first of two phases started operating in 2022 and reached 50% production capacity. The RO plant is expected to provide an annualized emissions reduction of 4 million tonnes of CO₂e after full completion in 2027.¹³⁶ Another three desalination projects with capacities of 120 MIGD,¹³⁷ 70 MIGD,¹³⁸ and 100 MIGD¹³⁹ are expected to become operational between 2025 and 2026. Moreover, Dubai aims to produce 100% of desalinated water capacity using clean energy or waste heat by 2030.¹⁴⁰

Decarbonising the UAE’s power and water generation sector is crucial and entails several challenges. The nation has already started to act,

showcased by multiple initiatives from players in the sector, but reaching net zero by mid-century will require further climate action from stakeholders across areas.

Key Climate Actions to Reach Net Zero in the Power and Water Generation Sector

Due to fast improving economics and the response to the climate crisis, renewable energy is rapidly becoming a preferred energy source globally, and the recent energy crisis has further built momentum for renewables which can also improve energy security. Renewable energy is estimated to account for over 90% of global electricity expansion from 2022 to 2027.¹⁴¹ In line with these global trends, the UAE will focus in deploying technology to enable clean power and water generation. This will be the main component of UAE’s net zero toolkit for this sector.

Table 4: The power and water generation net zero toolkit (UAE Net Zero by 2050 Strategic Initiative)

#1 Clean Power and Water Generation

Solar power will be the prime tool to decarbonise power and water generation in the UAE. The UAE Updated National Energy Strategy aims for tripling the share of renewable capacity, and increasing the installed clean

¹³⁶ Abu Dhabi DoE
¹³⁷ Mirfa RO desalination project
¹³⁸ Shuweihat RO desalination project

¹³⁹ Abu Dhabi Islands RO desalination project
¹⁴⁰ DSCE
¹⁴¹ IEA, Renewables 2020



energy capacity from 14.2 GW to 19.8 GW in 2030, to ensure the country is on track to achieve its climate change mitigation goals.

This significant increase in solar energy production must be accompanied by enhanced storage options to solve the intermittency of solar energy (i.e., the sun doesn't shine consistently all the time). Technologies used to enable energy storage will be selected based on system needs and economics to enhance the UAE energy infrastructure and to ensure that the sustainability targets are achieved. Under the current technological and economic feasibility, batteries and low-carbon hydrogen (green, blue, and pink types, along with exploring other alternatives and derivatives) would be used for this purpose, battery storage would be introduced post-2030 for day to night load shifting, and a large-scale low-carbon hydrogen roll-out for long-term storage would be required post-2040.

Nuclear energy, led and provided by the Emirates Nuclear Energy Company's (ENEC)¹⁴², will be important as a baseload power source, because it can produce electric power at a constant rate even during periods of low solar radiation, such as during cloudy days or at night.

The UAE Energy Strategy 2050 published in 2017 aimed at achieving 50% clean, 12% clean coal and 38% gas capacity mix by 2050 and reduction of energy demand by 40%, achieved by promoting energy efficiency measures. The updated energy strategy 2050 launched in 2023 reflects greater climate ambitions by ramping up clean energy adaptation to 30% by 2030 of the total installed capacity and will achieve Net Zero by 2050. There will be no coal capacity in the capacity mix. Coal capacity that was projected post 2022 till 2050 in the Energy Strategy 2050 published in 2017 has been removed from the plan and is substituted by clean energy sources. The existing 1.2 GW of constructed capacity (as on 2022) has been converted to low emission gas-based generation.

With regards to water production, the UAE will expand several ongoing low-carbon reverse-osmosis projects.¹⁴³ This will bring the water production carbon intensity down by an order of magnitude in comparison to the currently prevalent multi-stage flash desalination.

Collectively, measures to decarbonise power and water generation in the UAE will lead to GHG grid emission coefficient reductions in the sector of 54% by 2030, 84% by 2040, and 100% by 2050 in comparison to the baseline year of 2019 (i.e., 0.55 tCO₂e/MWh).

¹⁴² ENEC

¹⁴³ E.g., Mirfa RO, Shuweihat, Abu Dhabi Islands

Climate Policies to Reach Net Zero in the Power and Water Generation Sector

An enabling regulatory environment is required to successfully deploy the proposed measures to reach net zero. The UAE has already introduced several policies in recent years (see 'Existing Policies That Support Decarbonisation'). However, new policies, programmes, and other government interventions are critical to close the gap to net zero. These are detailed under 'New Policies to Reach Net Zero.' The UAE already approved several policy packages to address this, and they are currently being detailed for implementation. The UAE expects to implement power and water generation sector policies in 2024.

Existing Decarbonisation in the Power and Water Generation Sector

The UAE is already pursuing a clean power generation mix, demand side management (DSM) policies and improvements in energy efficiency to decarbonise its power and water sector.

At the federal level, the most relevant long-term strategies are the UAE Energy Strategy 2050 and the UAE National Water and Energy Demand Side Management Programme 2050 (UAE DSM Programme). The DSM aims for a 40% reduction in energy consumption and a 51% reduction in water consumption by 2050, compared to business-as-usual.

The 2023 UAE Energy Strategy Update aims to promote the deployment of renewable and nuclear energies, enhance energy efficiency, drive R&D and innovation in renewables technologies, increase local clean energy capacity, and encourage investments in the country's renewable and clean energy sector.

The Updated UAE Energy Strategy 2050 will position the UAE at the forefront of the global energy transition and support the target of achieving a grid emission factor of 0.27 kg CO₂/kWh by 2030, which is lower than the global average. It enhances international partnerships to support sustainability objectives in the energy sector.

The updated strategy outlines a national program to balance and meet the rising energy demand and

sustaining variable renewable resources. In the first phase of the energy strategy, which will run till 2030, the strategy aims to support the target of reaching Net Zero by 2050 in power and water sector by establishing the required policy, regulatory and technological backbone in the power and water sector to ensure a smooth transition to a very high percentage of variable renewables, ensuring the country's leadership and achieving climate neutrality goals of achieving Net Zero by 2050. With changing technological scenarios/assumptions, MOEI will be updating these national strategies to reflect the new Net Zero targets periodically in consultation with key utilities operating in the country.

At the emirate level, the nation has initiatives such as the Abu Dhabi Climate Change Strategy, Clean Energy Strategic Target 2035 for Electricity Production in Abu Dhabi (legally binding), Dubai's Clean Energy Strategy 2050, Dubai's Carbon Abatement Strategy 2030, and Ras Al Khaimah's Energy Efficiency and Renewable Energy Strategy 2040. The recent Abu Dhabi Climate Change Strategy will deliver a 22% reduction in carbon emissions in the emirate by 2027 (through implementation of 81 projects) – equivalent to sequestration by 500 million trees over 10 years¹⁴⁴.

Several of these introduce demand side management policies, energy efficiency, and emissions reduction goals. To deliver on the energy transition initiatives efficiently, for example, Emirates Water and Electricity Company (EWEC) follows the model of an independent system operator with additional responsibilities¹⁴⁵ (ISO+), which allows it to utilise operational and planning synergies. With significant deployment of renewables and nuclear capacity already, EWEC aims to surpass national power and water emission targets. Abu Dhabi Department of Energy (DOE) and EWEC have already initiated a detailed project to accurately model and plan out a net zero emission power sector for 2050.

Furthermore, DOE has issued a Regulatory Policy for Clean Energy Certificates (CEC) or Energy Attributes Certificates (EACs) to drive the transition to a sustainable decarbonised energy sector. The program enables parties to claim the non-energy

¹⁴⁴ <https://www.abudhabi.gov.ae/en/programmes/abu-dhabi-climate-change>

¹⁴⁵ These include scheduling, dispatching, forecasting, planning, procuring, trading, and bulk supplying.



attributes of clean energy to support their decarbonisation goals, while providing additional value to the clean energy sources and fostering their growth.¹⁴⁶ As per DOE policy, EWEC is already running a successful CEC/EAC auction scheme, which is the first of its kind in the region and allows grid-connected parties to obtain these certificates.

New Policies to Reach Net Zero in the Power and Water Generation Sector

Policies to Scale Renewables in the Utility Mix

The UAE will continue to rely on the single buyer model wherein the energy mix is centrally determined and Power Purchase Agreements (PPAs) are established for the private market to invest in the sector. This includes agreements for renewable capacity, storage, and other required technologies.

1. Strengthened National Coordination

Emirates will continue and enhance their coordination to be able to support each other in reaching the power sector's ambitious targets. This includes coordinating on topics such as land allocation and siting for renewable energy projects to overcome key barriers to scaling renewables fast (e.g., land availability and grid interconnection).¹⁴⁷

2. CO₂e Emissions Targets/Caps

The UAE will deploy a national policy with a CO₂e emissions targets for the power and water sector. These targets will be cascaded to the emirate-level regulators and system operators across the power and water sector to plan and deploy a capacity mix that delivers on these targets. At emirate-level, regulators will approve binding targets across the power and water sector to deliver on the national targets.

Policies to Increase Distributed Generation

3. Incentivise Distributed Generation for Industrials, Corporates, and Households

To accelerate the deployment of renewable energy, the nation will enable and accelerate the deployment of distributed renewables. This will be achieved by deploying four different policies.

Firstly, all utilities shall ensure that industrial players and corporates will be allowed to deploy distributed generation for own consumption as well as export to the grid under appropriate regulations.

Secondly, the UAE will also mandate solar PV during retrofits of old government buildings or development of new government buildings. Additionally, all municipalities shall incentivise solar PV for new buildings through appropriate mechanisms. This will be complemented by a third policy that will reform net/gross metering policies for households, expand existing policies beyond Dubai and Abu Dhabi, and review tariffs for industrial distributed renewable feed into the power grid.

These efforts will be enabled by a fourth policy to expand current smart meter coverage. Smart meters measure and record how much electricity is used during each hour of the day and are essential for differentiated tariff schemes and gross/net metering. All policies assume transparency of electricity consumption data to relevant entities.

Policies to Optimise Load Balancing

4. Optimised Load Balancing

Load balancing will be supported through two main policies. Under the first policy, the UAE will introduce variable tariff structures to better reflect generation costs for both households and corporate entities. This will provide an incentive for households and businesses to save energy and contribute to the UAE's DSM programme. It will encourage consumers to shift power demand towards periods when renewable energy is abundant by, for example, turning on the washing machine during the day instead of in the evening. Besides changing consumer behaviour, the UAE will implement a policy for cooling storage in district cooling to ensure load shifting while reducing operating costs of district cooling plants.

Under the second policy, the UAE plans to introduce a voluntary load shifting programme so power consumers can coordinate with utility providers to reduce demand at certain times to support

¹⁴⁶ In addition to value derived from EWEC's development of the assets from a least-cost supply perspective

¹⁴⁷ With further benefits of scale potentially achievable in closer international cooperation

balancing of the power grid and optimize use of power generation assets.

Smart meter deployment will also be important to support these two policies.

Lighthouse Initiatives in the Power and Water Generation Sector

Under existing policies, the UAE already has examples of initiatives that specifically target clean energy deployment. A selection of key initiatives in the power and water generation sector are presented below.

UAE Civil Nuclear Energy program

Barakah nuclear power plant is located in Al Dhafra region and hosts 4 units of APR1400 with the capacity of producing 5.6 GW (40 Terawatt per annum) of clean baseload energy, which constitutes of 46% of the updated UAE 2030 Nationally Determined Contribution (NDCs). Currently, the 3 online units are key contributors to decarbonization of the hard-to-abate sectors in UAE by supplying clean baseload power to heavy industries.

Mohammed bin Rashid Al Maktoum Solar Park¹⁴⁸

DEWA's Mohammed bin Rashid Al Maktoum Solar Park is planned to become the largest single-site solar parks in the world with a production capacity of 5 GW by 2030. When completed, it is expected to save over 6.5 million tonnes of CO₂e emissions annually.

The solar park has a current production capacity of 2 GW with an extension already under construction. The construction is over 90% complete and includes a 700 MW CSP plant with molten salt technology. Using this technology, solar radiation heats liquid salts which are then stored until needed. Electricity is generated using the stored heat to produce steam that drives a steam turbine. The CSP plant has one of the world's largest energy storage capacities (15 hours), which allows for energy availability around the clock.¹⁴⁹



Abu Dhabi's Department of Energy (DOE) Battery Storage Plant

In 2019, Abu Dhabi launched the world's largest virtual battery plant with a capacity of 108 MW using sodium sulphur battery cells. The battery plant can provide backup power for 6 hours.

The batteries are distributed over 10 sites across the emirate, and are connected and controlled as one plant, essentially acting as a virtual battery.¹⁵⁰



DEWA's Hatta Hydropower Storage Plant

Dubai is currently constructing a 250 MW hydropower storage plant, the first of its kind in the region, in Hatta. Construction is approaching the 60% completion mark, and the plant is expected to be commissioned by the end of 2024. The hydropower storage plant uses clean energy to pump water from the Hatta dam to an upper reservoir. At times of high energy demand, the stored water is released to drive turbines, generating electricity.¹⁵¹



¹⁴⁸ DSCE

¹⁴⁹ DEWA, Press release, 4th phase of the Mohammed bin Rashid Al Maktoum Solar Park will have the largest energy storage capacity in the world.

¹⁵⁰ Department of Energy, Press release, Abu Dhabi launches world's largest virtual battery plant.

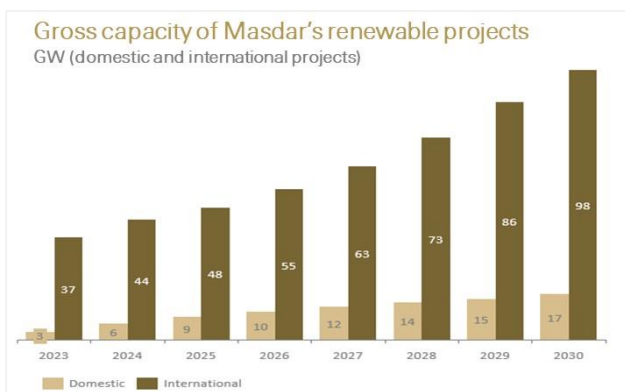
¹⁵¹ DEWA, Hydroelectric power plant in Hatta

Masdar's Planned Renewable Energy Projects

Masdar contributes significantly to the UAE's solar scale-up and plans to invest \$8 billion by 2030 in domestic renewable energy projects, primarily as part of the Abu Dhabi solar programme.

Masdar is also active in over 40 countries and currently has a portfolio of renewable energy projects with total capacity over 20 GW operational or under development and total capital requirements of \$30 billion, including secured or committed investments.

Masdar aims to achieve a portfolio capacity of 100 GW by 2030, including domestic and international renewable energy projects, with ambitions to double this capacity in subsequent years.¹⁵² By 2030, Masdar's renewable energy projects (secured or committed) are expected to displace CO₂e emissions by 95 million tonnes per year globally.



Besides these, other UAE efforts include Barakah nuclear power plant (5.6GW), Noor Solar PV Power Plant (1 GW AC), Al Dhafra Solar PV Plant (1.5 GW AC), upcoming Al Ajban Solar PV Plant (1.5 GW AC), and Taweelah Reverse Osmosis water desalination plant (with annualized emissions reduction of 4 million tonnes of CO₂e). The UAE also announces the Emirates Energy Award, a prize awarded every two years to organisations and individuals which highlights best practices in energy efficiency, sustainability, and environmental protection.¹⁵³

In 2023 Masdar launched the UAE Wind Program which builds on the UAE leadership's efforts to develop alternative energy sources, which began with the establishment of the region's first wind power station on Sir Bani Yas Island in 2004. The new 103.5-megawatt (MW) landmark project, developed by Masdar, will introduce cost-effective, large-scale, utility wind power to the UAE's electricity grid, further diversifying the country's energy mix and advancing its energy transition. The project leverages advances in technology, material

science and aerodynamics to capture low wind speeds at utility scale, paving the way for further projects.

This local wind project comes on top of Masdar's ongoing international wind projects which include the London Array and the Dudgeon Offshore Wind Farm in the United Kingdom. Masdar is also a partner in the world's first floating offshore wind farm, Hywind Scotland, which became operational in October 2017. Other projects include the first large-scale renewable energy project in the Seychelles, the 6MW Port Victoria Wind Farm; the first commercial utility-scale wind power project in the Middle East, the 117MW Tafilah Wind Farm in Jordan; the largest utility-scale commercial wind project in Serbia and the Western Balkans, the 158MW Cibuk 1 Wind Farm; and the first large-scale wind farm in the Gulf Cooperation Council (GCC) region, the 50MW Dhofar Wind Project in Oman.

Masdar also sees geothermal energy as potentially playing a significant role in the clean energy transition and is helping nations with a high concentration of geothermal activity to reduce carbon emissions. In 2023, Masdar signed a Memorandum of Understanding with ADNOC Drilling to explore collaboration around development, investment, and operations of geothermal plants within and outside UAE.

¹⁵² Masdar

¹⁵³ Government of Dubai, Emirates Energy Award

8.2 Decarbonisation of Industry

Current Landscape

Heavy industry was the sector with highest GHG emissions in the UAE in 2019, with a total of 103 MtCO₂e.¹⁵⁴ Most emissions result from operations in oil and gas, refineries, petrochemicals, cement, iron and steel, and aluminium. Emissions are driven by manufacturing processes which use gas, liquefied petroleum gas (LPG) and other conventional fuels, and by the use of power and water. The latter includes use of power and water from the grid as well as off-grid generation by oil and gas and aluminium producers for their own energy consumption.

Reaching net zero in the UAE industrial sector means overcoming three key barriers:

1. Industrial production output is expected to grow until 2050. Decreasing emissions in the same period will thus require innovative solutions to reduce GHG emissions while growing production.
2. Around 30% of the UAE's GDP is still associated with oil and gas production¹⁵⁵ and its supply is expected to increase to satisfy the global energy demand in mid-term. However, thanks to the advantageous geology, smart reservoir management practices, and investments in the decarbonisation of operations, its emissions intensity rate is already less than half the global industrial average. Moreover, ADNOC, the major player in the sector, aims to achieve net zero emissions by 2045¹⁵⁶.)
3. Manufacturing industries account for 8% of the UAE's GDP.¹⁵⁷ Some of the most important

products for the UAE are in heavy emitting sectors, primarily aluminium, steel, and cement production. Heavy emitting sectors are particularly challenging to decarbonise because the cost of abating a tonne of carbon is high when compared to the margins of the product. According to a recent international study led by Masdar, less than a third of executives operating in heavy emitting sectors worldwide say their budget will be adequate to meet their decarbonisation needs.¹⁵⁸

The UAE has already started to act. Existing initiatives and plans are critical and demonstrate the nation's commitment for reaching net zero by mid-century with further efforts.

Key Climate Actions to Reach Net Zero in the Industrial Sector

Nations worldwide are decarbonising their heavy industries through carbon pricing (70 mechanisms implemented worldwide),¹⁵⁹ fuel switching (with solar thermal industry expected to grow to \$ 36 billion globally by 2026),¹⁶⁰ CCS (around 300 CCUS projects are in various deployment stages globally),¹⁶¹ and other interventions. The key areas for industrial sector decarbonisation in the UAE are power grid connection, fuel substitution for industrial heating, process switches across sectors, and CCS.

¹⁵⁴ Including emissions from power & water usage

¹⁵⁵ GlobalData – Macroeconomic Outlook Report: UAE (2023)

¹⁵⁶ ADNOC

¹⁵⁷ UAE Government Portal, Economy in the past and present. Refers to GDP for 2017 and real prices of 2010.

¹⁵⁸ Masdar, Hard to Abate, Ready to Start, What do heavy emitters have to do to decarbonize?

¹⁵⁹ World Bank, Carbon Pricing Dashboard, as of March 2023.

¹⁶⁰ Climate-KIC, Solar thermal energy: An industry with untapped potential

¹⁶¹ IEA, Carbon capture, utilisation, and storage



GHG reductions by measure in industry sector

GHG emissions, MtCO₂e

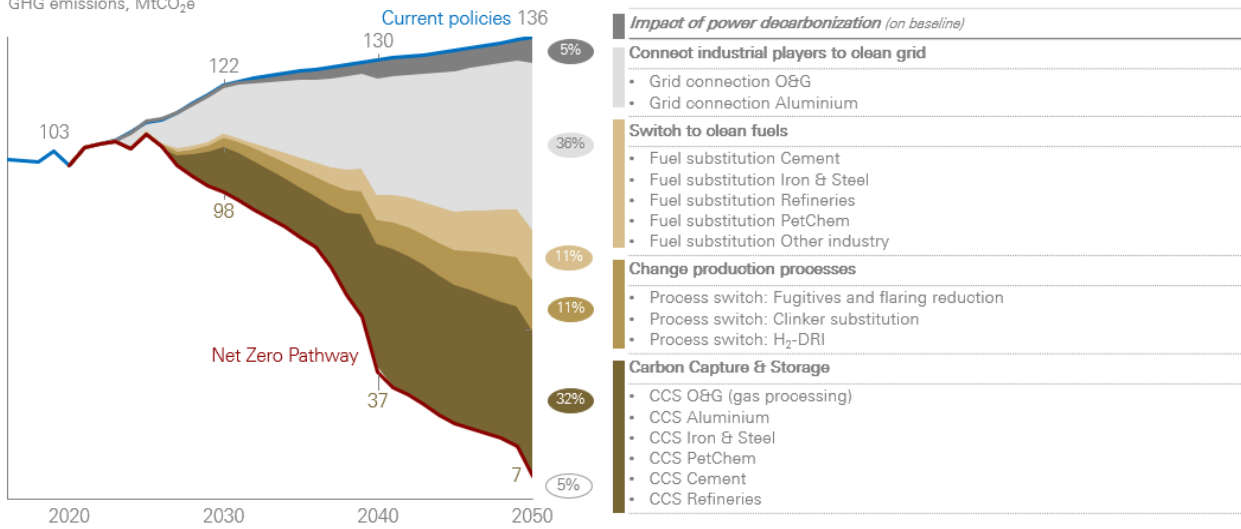


Figure 20: Industry net zero pathway (UAE Net Zero by 2050 Strategic Initiative)

#1 Connect Industrial Players to the Clean Grid	
<p>National players in the oil and gas and aluminium industries currently generate their own power using gas turbines. Connecting them to the power grid will enable these companies to reduce emissions by procuring more renewables from the grid and reducing their emissions, while also improving grid efficiency through additional load balancing and efficient power plant fleet utilization. Grid connection (together with emissions reduction in the power grid) will be responsible for 36% of the GHG emissions reductions in this sector by 2050.</p> <p>Deploying industrial decarbonisation measures can lead to benefits broader than emissions reduction. For example, higher electrification in industrial facilities also improves air quality.¹⁶²</p>	
#2 Switch to Clean Fuels	The Low-Carbon Hydrogen Opportunity
<p>Fossil fuels used for industrial heating are expected to be replaced by alternatives such as solar thermal, low-carbon hydrogen (green, blue, pink, along with exploring other alternatives and derivatives), biomass/waste and electric power, or natural gas with CCS. Solar thermal will be used for lower temperatures (below 100 °C for most industries, 400 °C for steel), and other fuels for higher temperatures (100 °C and above). This will be critical to decarbonise cement, iron and steel, petrochemicals, refineries, and other industries. The selection of the specific fuel to use will depend on each industry’s set-up, which influences economics. Among the several options, low-carbon hydrogen stands out in the UAE.</p> <p>Fuel switching measures will enable 11% GHG emissions reductions in this sector by 2050. Similar</p>	<p>Low-carbon hydrogen, green (produced with the support of solar energy), blue (produced with the support of CCS) and pink (produced with nuclear energy), will be an essential tool for the nation to reach net zero. It will serve as an alternative fuel in the transport and industrial sectors. For the latter, hydrogen will be especially crucial for heavy emitting sectors, as it can replace natural gas used for the direct reduced iron (DRI) process for steel manufacturing, as well as fuel for industrial heating in steel and cement manufacturing. Overall, low-carbon hydrogen will support GHG emissions reductions of 11% by 2050 through fuel substitution for heating (together with other substitute fuels), and an additional 11% through process switching to H₂-DRI in steel (together with other process switching measures). Hydrogen will also support the</p>

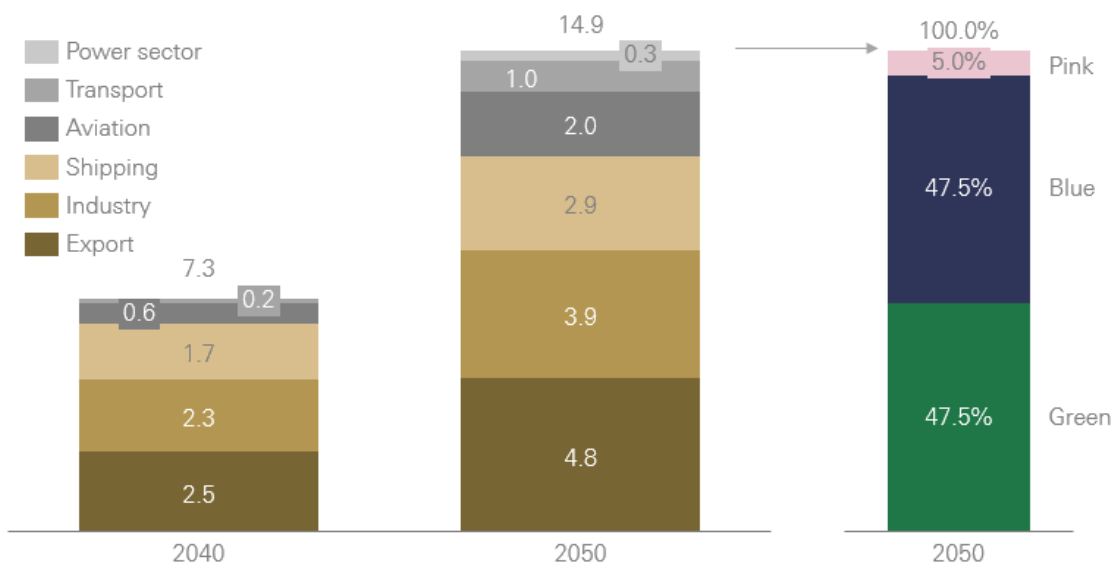
¹⁶² IPCC AR6

to electrification, fuel switching can also improve air quality in industrial facilities.¹⁶³

decarbonisation of power and water generation by being used for storage.

Besides domestic use, hydrogen unlocks international opportunities for the UAE, driven by a growing market for hydrogen and synthetic fuel exports and the need to decarbonise international aviation and shipping. Combined, domestic and international data demonstrate the opportunity for the UAE to become an international hydrogen hub due to its abundant renewable resources (solar power) and low costs (the world’s lowest levelised cost of electricity produced by photovoltaics). These put it in a privileged position to produce green hydrogen. The UAE thus aims to continue its current path to push hydrogen developments forward.

UAE hydrogen projected production volumes
Hydrogen production (Mtpa H₂), share of clean H₂ types



UAE National Hydrogen Strategy – Projection of Mix	2031	2040	2050
Pink Hydrogen	1.0%	5.0%	5.0%
Green Hydrogen	71.0%	45.0%	47.5%
Blue Hydrogen	28.0%	50.0%	47.5%

Figure 21: Estimated hydrogen production volumes (UAE National Hydrogen Strategy)

¹⁶³ IPCC AR6



#3 The Carbon Capture and Storage (CCS) opportunity

Residual carbon dioxide emissions will be captured at the source and stored in a number of geological sites including, but not limited to, hydrocarbon reservoirs and saline aquifers. Transportation and storage infrastructure must be built before the first carbon capture plant is constructed. CCS will play an especially critical role in decarbonising heavy emitting sectors by capturing residual emissions that otherwise cannot be avoided.

CCS will be implemented in multiple industries. The technology's business case is negative overall, but unit costs are declining. Given this, a significant part of the deployment will take place later, but early enough to still reach net zero by 2050.

In addition to CCS, potential use of CO₂ can be considered under specific circumstances, such as cement curing.

CCS will account for 32% of GHG emissions reductions in the industrial sector by 2050.

CCS is critical for the UAE for several reasons. Firstly, it will future-proof exports, as customers and regulations in import markets are already requesting 'green' products. It can also help the UAE to seize other international opportunities and become a CCS centre of excellence. The UAE will seek to export expertise (through development of front to end engineering design studies¹⁶⁴ and new technology), equipment (measuring, monitoring, and verification instruments, steel pipes, and industrial heat equipment), and skills (engineering and management services based on local experience). All these actions will create jobs, accelerate exports, and tackle a global addressable market estimated to have a gross value added of AED 31 billion by 2050.

#4 Change Production Processes to Address Process Emissions

Existing processes will be updated to decrease emissions, primarily through using alternative materials.

In cement, clinker will be replaced by calcined clay, reducing emissions and the energy intensity of production. The cement manufacturing process is usually divided into two main steps: clinker fabrication and mixing clinker with other materials to produce cement. During clinker fabrication, limestone and small amounts of other materials, such as clay, are heated up. During this process, called calcination, the limestone is transformed into calcium oxide, and CO₂ is released as a result, making CO₂ emissions an inherent part of the cement manufacturing process.¹⁶⁵ Clinker substitution will tackle these emissions and will be implemented before 2030. This will generate savings from cheaper raw materials and lower energy requirements.

In oil and gas, fugitive emissions and unintentional flaring will be reduced by capturing leaking and flared natural gas.¹⁶⁶

For steel, direct reduced iron (DRI) combined with low-carbon hydrogen is the future of decarbonisation. All steel plants in the UAE are already DRI¹⁶⁷ instead of the more carbon-intensive blast furnace alternatives (powered by coke, a coal-based fuel). These plants currently use natural gas but can be converted to use low-carbon hydrogen instead. As such, the UAE is already on its way to decarbonisation in steel thanks to its DRI plants. To reach net zero, the steel industry is expected to switch from the natural gas to a hydrogen based DRI process.¹⁶⁸

Process switching will enable an 11% GHG emissions reduction in this sector in 2050.

¹⁶⁴ Refers to basic engineering which is conducted after completion of conceptual design or feasibility study.

¹⁶⁵ Cembureau, Fact Sheet on the Story of Cement Manufacture

¹⁶⁶ Gas flaring is the burning of natural gas associated with oil extraction. World Bank

¹⁶⁷ Steel Making Word Press, Middle East Steel Industry

¹⁶⁸ Refers to the removal of oxygen from iron ore or other iron bearing materials in the solid state, i.e., without melting, as in the blast furnace. International Iron Metallics Association

This decarbonisation toolkit will be applied in different ways across the several sub-industries in the UAE and can lead to benefits broader than emissions reduction. For example, higher electrification and fuel switching in industrial facilities also improves air quality.

Climate Action in the Cement Industry

CO₂ emissions are inherent to the cement manufacturing process due to high temperature energy requirements¹⁶⁹ and because it is released during the chemical process of clinker fabrication,¹⁷⁰ an essential component of ordinary cement. This makes cement a heavy emitting sector, given that most CO₂ emissions are generated when it is manufactured.

It is nevertheless possible to decarbonise cement through a combination of measures. To achieve net zero in cement, the UAE will use fuel substitution, process switching with clinker substitution, and CCS to capture remaining emissions.

Switch to Clean Fuels for Industrial Heating

Cement will rely on solar thermal as an alternative fuel. Solar thermal will be used for lower temperatures (below 100 °C), and other fuels (e.g., natural gas, green hydrogen) will be required for higher temperatures (100 °C and above). Residual emissions from other fuels, such as natural gas, will later be captured with the deployment of CCS. The UAE will prioritise overcoming challenges to integrating solar thermal into existing plants, so that the switch can occur beginning in 2030. This is expected to generate a positive business case for companies.

Change Production Processes: Clinker Substitution

In cement, clinker will be substituted by calcined clay, pozzolans (available in the UAE), and ground granulated blast-furnace slag, reducing emissions and the energy intensity of cement production. Also, usage of secondary materials (e.g., from demolition waste) back to cement will be introduced. All in all, clinker substitution will generate savings from cheaper raw materials and lower energy requirements.

Capture and Store Carbon

CCS is crucial to capturing residual emissions that cannot be mitigated through fuel and clinker substitution. The cement industry is expected to start using CCS before 2040.

Climate Action in the Aluminium Industry

The production of aluminium results in high CO₂ emissions due to the intense energy requirements of the refining and smelting processes. Refining refers to the transformation of bauxite (a raw material) to alumina, and it requires a significant amount of energy for heating. Smelting, when electrolysis is used to transform alumina into aluminium, is the most energy- and carbon-intensive step in the aluminium manufacturing process. Beyond using heat, the smelting process also consumes carbon anodes at a rate of approximately 400 kg per ton of aluminium. This process also emits greenhouse gas emissions.

The most important measures for the aluminium industry are those that decarbonise its power, but new technologies that handle the anode consumption also needs to be applied. Depending on future development, other measures such as increased scrap utilisation, PFC capture, or mechanical vapor recompression might be leveraged and scaled.

Connect Industrial Players to the Clean Grid

Emirates Global Aluminium (EGA) is expected to connect to the grid as well as to electrify its alumina refinery process with electric boilers in the near future. In 2022, it has announced a strategic initiative with TAQA, Dubal Holding and EWEC to divest its natural gas-fired power assets. By doing so, it will replace gas-based power generation with long-term supply agreements on grid-power, which will be heavily decarbonised through measures in the power and water generation sector. This is a critical measure since gas-based power production in the aluminium industry emitted approximately 16

¹⁶⁹ Over 3/4 of energy for cement production is currently sourced from coal in the UAE

¹⁷⁰ Cembureau, Fact Sheet on the Story of Cement Manufacture



MtCO₂e in 2019. Apart from the aluminium production decarbonisation, it will also allow for progress on power asset and generation optimization by improving the overall power system predictability.

Novel Anode Emissions Reduction

The most commonly proposed technology to reduce emissions from anode consumption is novel anodes. This technology is still being scaled up but is one of the options to reduce this source of emissions from aluminium production.

Climate Action in the Steel Industry

Most emissions in steel manufacturing come from fossil fuels and chemical reactions. Steel production uses reduction and smelting processes. Reduction produces steel from iron ore and can be done through blast furnace or DRI methods. Both result in emissions from fossil fuels, yet the blast furnace method has higher emissions due to the use of coke, a form of coal. Smelting converts iron into steel and can also be done through different processes, also associated with emissions. Steel decarbonisation involves replacing fossil fuels for heating, process switching, and CCS.

Switch to Clean Fuels for Industrial Heating

Iron and steel will accelerate fuel substitution before 2025 as solar thermal heating is added to new steel plants built to meet forecasted demand or to replace plants at the end of their lifetimes. (Attempts to retrofit older plants may face integration challenges.) Solar thermal will be used up to 400 °C temperatures. After this threshold, green H₂ can be considered as an alternative fuel for mid to high industrial heat. CCS (coupled with natural gas) can be cheaper than H₂ under some circumstances and as such may be used instead.

Change Production Processes: H₂-DRI

The shift to hydrogen-based DRI in the UAE will start before 2030, as current natural gas DRI plants start phasing out. Additional demand after this year is expected to be met by building new hydrogen-based DRI plants.

Capture and Store Carbon

CCS will be used to capture residual emissions in steel manufacturing. The expansion of the current capacity will kick-in before 2040.

Climate Action in the Oil and Gas Industry

Emissions from the oil and gas industry are mostly associated with ADNOC's (Abu Dhabi National Oil Company) consumption of fossil fuels for energy generation in the upstream and industrial processing in the downstream. As such, decarbonisation will rely on electrification, clean power supply, CCS, fugitives and flaring reduction, and energy efficiency improvements.

Connect Industrial Players to the Clean Grid

Since January 2022, 100% of ADNOC's grid power has been supplied by nuclear and solar energy sources through procurement of clean energy certificates. To take advantage of the emission reductions planned in the power sector, most assets will be connected to the grid. ADNOC and TAQA have already announced a strategic project on offshore production decarbonisation by replacing existing offshore gas turbine generators with more sustainable power sources available on the Abu Dhabi onshore power network. The first-of-its-kind high-voltage, direct-current, subsea transmission system in MENA region is expected to cost \$3.6 billion. Furthermore, ADNOC has plans to replace gas-based electricity with clean-energy-based power across all its assets. This is expected to generate cost savings given the differential between natural gas and grid/PV power while also reducing emissions.

Capture and Store Carbon

The UAE's oil and gas industry will deploy CCS at gas processing plants, as this is one of the cheapest emissions sources to use CCS. This will be initiated before 2030 and complement ongoing actions from ADNOC. The company installed the region's first commercial-scale carbon capture utilisation and storage (CCUS) facility, Al-Reyadah with up to 800,000 tonnes per year of CO₂ capture capacity. There are plans to expand its carbon capture capacity to 5 million tonnes per year by 2030.

Change Production Processes: Reduce Fugitives and Flaring Emissions

In oil and gas, fugitive emissions and unintentional flaring will be reduced by capturing leaking and flared natural gas.¹⁷¹ National players are already acting on this, and the UAE is well advanced in reducing fugitive emissions. ADNOC already implemented a zero routine flaring policy in the early 2000s, resulting in an 89% reduction in gas flaring since the company's inception.¹⁷² Measures to minimise flaring include the installation of flare gas recovery systems, regular leak detection and repair programmes, and green completions during drilling.¹⁷³ Furthermore, ADNOC is committed to an upstream methane intensity target of 0.15% by 2025, one of the lowest targets in the Middle East.¹⁷⁴

As a result, any additional measure in this area will be expensive and are expected to be delayed to the mid-2040s. Climate action in the oil and gas industry will contribute to ADNOC's advanced goal of becoming a diversified, net zero emissions energy company by 2045 (scope 1 and scope 2 emissions), in support of UAE Net Zero by 2050 Strategic Initiative.¹⁷⁵

Climate Policies to Reach Net Zero in the Industrial Sector

Existing Policies that Support Decarbonisation in the Industrial Sector

Energy and water conservation and efficiency are core pillars to reduce emissions in the industrial sector. As such, the UAE has taken several steps at the federal and emirate level to progress in these areas. Besides this, the UAE is acting to reduce methane emissions.

In 2021, the UAE introduced an Energy and Water Demand-Side Management Programme 2050 at the federal level, which covers heavy industry as one of its pillars. It aims for energy efficiency improvements through the adoption of the best available technologies and operational excellence. These measures are expected to reduce industrial energy consumption by 33% by 2050 versus a

business-as-usual scenario. The programme has two key initiatives: the 'Top 50 Rankings' and 'Electric Motors'. The first aims to push for efficiency improvements and savings in the UAE's 50 most energy intensive companies. The second targets implementation of minimum energy performance standards for energy intensive, industrial motors and aims to keep these up to date with latest technological advancements.¹⁷⁶

Besides this, the nation will soon announce its 'Federal Energy Management Regulation in Industrial Facilities' initiative, which will pave the way for federal regulation related to sustainability and energy optimisation in industries across the emirates. This will support the Energy and Water Demand-Side Management Programme 2050 target of 33% energy savings versus a business-as-usual scenario by 2050.¹⁷⁷ The UAE also launched its Water Security Strategy 2036, which seeks to replace the use of ground and desalination water with treated sewage effluent for heavy industry and irrigation.¹⁷⁸ To incentivise industrial players to decarbonise, the nation further introduced the Industrial Technology Transformation Index (ITTI), a comprehensive framework to measure the digital maturity and sustainability of factories and formulate a roadmap for industrial transformation. This framework will allow manufacturers to improve resource allocation and unlock financial incentives through data-driven decision-making and promote integration of sustainability and advanced net zero practices.¹⁷⁹

Additionally, the UAE is acting to reduce its methane emissions. The nation joined the Global Methane Pledge in 2021, agreeing to take voluntary actions to contribute to a collective effort to reduce global methane emissions by at least 30% from 2020 levels by 2030.¹⁸⁰ The UAE also incentivises their industrial sector to develop energy-efficient and sustainable products and services through green public procurement policies such as Dubai's Sustainable Procurement Policy and Ras Al Khaimah's Green Public Procurement Guidelines. The nation also incorporates green procurement into international

¹⁷¹ Gas flaring is the burning of natural gas associated with oil extraction. World Bank

¹⁷² ADNOC, Sustainability and energy transition

¹⁷³ ADNOC, Sustainability and energy transition

¹⁷⁴ ADNOC, Press releases: ADNOC Announces New Upstream Methane Intensity Target of 0.15% by 2025 – the Lowest in the Middle East

¹⁷⁵ ADNOC, MOCCA Net Zero by 2050 Strategic Initiative

¹⁷⁶ MOEI, UAE Energy & Water Demand Side Management Programme 2050

¹⁷⁷ MOEI

¹⁷⁸ MOEI, UAE Water Security Strategy 2036

¹⁷⁹ MOIAT, News and Articles – UAE launches the Industrial Technology Transformation Index to drive digitalization and sustainability in industry.

¹⁸⁰ Global Methane Pledge, Fast action on methane to keep a 1.5°C future within reach.

trade agreements and provides a 10% price preference for domestic green suppliers and green goods of domestic origins as part of UAE's economic partnership agreement with India. Finally, the nation is developing federal energy management regulations for industrial facilities.

At the emirates level, federal programmes are complemented by DSM strategies in Dubai, Abu Dhabi, and Ras Al Khaimah.¹⁸¹ In addition to DSM initiatives, emirates are working to accelerate industrial decarbonisation. Dubai introduced a carbon abatement strategy (CAS) targeting a 9% reduction in industrial emissions by 2030 and 50% energy efficiency improvements in this sector, versus a business-as-usual scenario, by 2050.¹⁸² Dubai's net zero target by 2050 also incorporates energy efficiency, solar thermal and green hydrogen deployment, and the deployment of CCS, among other measures.¹⁸³ Abu Dhabi is developing a public policy on low-carbon hydrogen.¹⁸⁴ Abu Dhabi also launched the Abu Dhabi Industrial Strategy which aims to increase production efficiency and advance the transition to a circular economy. As part of this strategy, the emirate is currently developing a regulatory framework for the circular economy.

ADNOC has officially committed to accelerating the decarbonization of its oil and gas, petrochemical and refinery operations, aiming to achieve net zero scope 1 and scope 2 emissions by 2045. The major UAE industrial player aims to achieve a 25% emission intensity reduction and have no methane emissions from all operated oil and gas assets by 2030. The key decarbonization opportunities include energy efficiency, electrification, use of solar and nuclear power via the grid, flare reduction, CCUS and fuel change. ADNOC shall also be developing low-carbon ammonia capacity and invest in green hydrogen and renewables through its shareholding in Masdar. This paradigm shift is financed by a \$15 billion initial investment.

Emirates Steel Arkan has also implemented an initiative to achieve Net Zero emissions by 2050 (for its Scope 1 and Scope 2 emissions). This includes

implementing all internal energy optimization projects by 2026; achieving 100% clean electricity utilization before 2030; increasing scrap consumption to 2 Million Tons by 2030; and finally introducing hydrogen into the steel manufacturing process and increasing its utilization to 100% by 2050. Similarly, Emirates Steel Arkan is also aiming to achieve Net Zero emissions in its cement manufacturing process by utilization of waste heat recovery, energy efficiency, low carbon electricity, reduction of clinker, oxyfuel combustion pre-calciner, and green hydrogen.

New Policies to Reach Net Zero

The UAE expects to introduce several policies in its industrial sector before 2030. The creation of a green lead market through government procurement, the introduction of a mandatory carbon registry and trade system, and Carbon Contracts for Difference (CCfD) will be accelerated before 2025. An essential pre-requisite is a creation of an embodied emission accounting framework to distinguish green products.

Cross-Industry Policies

Carbon Registry and Trade System

The UAE plans to implement a mandatory cap and trade system, details of which are currently being defined. This mechanism will be crucial, because it incentivises companies to reduce emissions while allowing them to choose between decarbonisation measures to achieve reductions where they are most feasible and cheapest. Besides this, implementing this mechanism will smooth trade with other countries that are putting in place carbon border taxes and other adjustment mechanisms (e.g., the EU's carbon border fees¹⁸⁵).

This will support interventions across industries, including CCS, clinker substitution, switching to H₂-DRI steel, and fuel switching and grid connection. This measure will also be applied to the waste sector.¹⁸⁶

¹⁸¹ Dubai Demand Side Management Strategy, Abu Dhabi's Demand Side Management and Energy Rationalisation Strategy 2030, Ras Al Khaimah's Energy Efficiency and Renewable Energy Strategy 2040. Further details on near-term initiatives can be consulted in UAE Third Update of Second NDC

¹⁸² Versus a business-as-usual scenario

¹⁸³ DSCE

¹⁸⁴ Media Office Abu Dhabi, Abu Dhabi Department of Energy's Low-Carbon Hydrogen Policy and Regulatory Framework to Accelerate UAE's National Hydrogen Strategy

¹⁸⁵ European Commission Taxation and Customs Union, Carbon Border Adjustment Mechanism: The EU's Carbon Border Adjustment Mechanism (CBAM) is a tool to put a fair price on the carbon emitted during the production of carbon intensive goods that are entering the EU to stimulate cleaner industrial production in non-EU countries. It aims to ensure the carbon price of imports is equivalent to the carbon price of domestic production in the EU to avoid undermining its climate objectives.

¹⁸⁶ As mentioned in 4.5 'Decarbonisation of Waste'

Policies to Support CCS Deployment

To support the deployment of CCS across industries, the UAE plans to introduce CCfDs, regulated transport and storage fees, storage liability transfer, and accelerated approval processes.¹⁸⁷

Carbon Contracts for Difference (CCfDs)

CCfDs¹⁸⁸ will both support CCS deployment and avoid over-subsidisation. These will account for the difference between unit abatement costs and carbon prices to cover extra costs associated with carbon capture. CCfD will help emitters overcome cost barriers, create incentives to act (since competitiveness is protected, especially for export industries), and complement other instruments. CCfDs will be reviewed roughly every 10 years.

Regulated Transport and Storage (T&S)

The UAE will need to plan for and roll-out a CCS infrastructure network. A regulated scheme will need to be set up to remunerate the companies developing and operating it. The UAE will set regulator-determined prices¹⁸⁹ for transport and storage infrastructure, to be paid by emitters who use it. These will be regularly reviewed (around every 3-5 years), creating a sustainable and reliable business case for the transport and storage network operator and allowing for transparency and cost predictability for emitters.

Storage Liability Transfer

Carbon storage liability transfer will transfer the liability for the risk of CO₂ leakages at closed sites from the operators to the government in the long-term. This will alleviate a key barrier for private companies to provide this service as it reduces potential monetary contingencies and business case uncertainties for operators.

Certification and Approval Framework for CCS Projects

Lastly, a certification and approval framework will be developed to expedite CCS-related projects through direct involvement of the government. This will reduce the complexity of cross-sector

coordination, since all industrial, power and water generation and waste sectors are involved in CCS.

Policies to support clinker substitution in cement

Clinker substitution will be incentivised through the introduction of blended cement standards and construction quotas, updates to building codes (to enable consumption), and government offtake agreements.

Creation of a Green Lead Market

The UAE will create a green lead market through government procurement. The government will commit to procuring green cement for its projects. This supports the federal plan to make all government ministries net zero by 2050, provides demand for green cement production, and creates cross-sector benefits in the buildings sector.

Blended Cement Standards and Construction Quotas

Blended cement standards will define the permitted composition of produced cement. (Ideally, these standards will be performance-based and introduced on the federal level.) This will enable the use of low-carbon cement manufactured with calcined clay, fly ash, and silica fumes,¹⁹⁰ following the examples of the EU and US, which have already introduced similar cement and concrete standards.

The UAE will also introduce clinker reduction policies, with any new cement production plant coming online focusing on the production of less carbon-intensive blended cement types, such as LC3, instead of Ordinary Portland Cement (OPC). OPC is the current industry standard and is associated with high emissions. Besides this, blended cement quotas will define minimum amounts of blended cement for construction in the UAE. These will also positively impact the buildings sector.

Update of Building Codes¹⁹¹

Finally, building codes will also be updated to allow the use of blended cement. This will allow for a shift to performance-based regulations that leave room

¹⁸⁷ Also, establishment of CCUS Center of Excellence is currently under discussion.

¹⁸⁸ Support payments to bridge the gap between cost and carbon price. These are indexed to the price of carbon (and potentially other commodities) and fund only to the extent needed.

¹⁸⁹ RAB (Regulator Asset Base) price

¹⁹⁰ Pozzolans, which are silicate materials that produce cement-like products when they react with calcium hydroxide, are used as cement replacements to decarbonise the cement industry.

¹⁹¹ This policy is further detailed under 4.4 'Decarbonisation of buildings.'

for innovation, instead of prescribing cement composition. This measure is a critical enabler, given that it allows for consumption of the lower carbon cement. However, it is not sufficient on its own to incentivise the switch to blended cements in construction and will need to be combined with the remaining measures to enable sufficient speed and achieve decarbonisation goals.

Policies to Support the Switch to H₂-DRI Steel

Green Lead Markets

Green lead markets will follow a similar structure to those described for clinker substitution in cement. They will also stimulate the adoption of green aluminium.

Regulated Transport and Storage Fees

For H₂, these will include regulated transport and storage fees, which will work similarly to the ones for CCS.

H₂ Production Incentives

The UAE will introduce H₂ production incentives through CCfD, analogous to the ones supporting CCS, for specific sectors and usage. CCfDs will cover the difference between H₂ production costs and the cost of natural gas and will stimulate the creation of an H₂ production ecosystem, with cross-sectoral gains.¹⁹²

H₂-DRI Steel Quotas

H₂-DRI steel quotas will work similarly to the ones for blended cement and will be embedded in building codes.

Lighthouse Initiatives in the Industrial Sector

MOEI's UAE National Hydrogen Strategy

The UAE is an early mover in the production of clean/low-carbon hydrogen¹⁹³ (i.e., blue and green hydrogen) and is accelerating its international position as a hydrogen hub with multiple strategic hydrogen projects planned.¹⁹⁴

¹⁹² H₂ will also be used to decarbonise transport as detailed in Chapter 4.4, 'Decarbonisation of Transport.'

¹⁹³ The specific type of hydrogen is under discussion depending on international markets' demand.



DEWA's Green Hydrogen Pilot Plant in Dubai

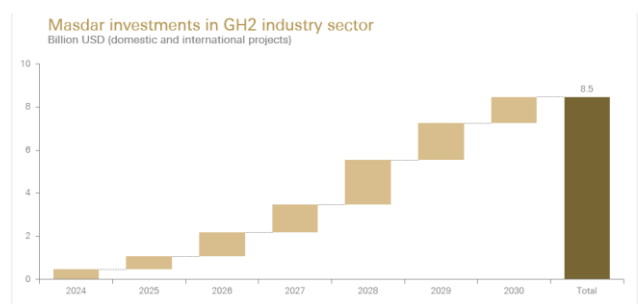
Dubai is already home to a green hydrogen pilot plant, the first of its kind in the MENA region. The green hydrogen plant is part of Dubai's large-scale Mohammed bin Rashid Solar Park and produces 20 kg/hour of hydrogen, with electricity generation capacity of 1.25 MW.

DEWA, in cooperation with ENOC, is also exploring options to develop a hydrogen fuelling station which will support the decarbonisation of Dubai's transportation sector.¹⁹⁵



Masdar's Planned Green Hydrogen Investments

Masdar is heavily developing and investing in green hydrogen projects, both within the UAE and abroad. The company aims to produce up to 1 million tonnes of green hydrogen by 2030.



¹⁹⁴ MOEI, UAE National Hydrogen Strategy

¹⁹⁵ DEWA: Press release, Green Hydrogen is one of DEWA's solutions to diversify energy sources and provide 100% of total power capacity from clean energy sources by 2050.

Carbon Capture Utilisation and Storage (CCUS)

ADNOC completed the region's first commercial-scale CCUS facility in 2016. The facility captures up to 800,000 tonnes of CO₂ per year from steel produced by Emirates Steel, the UAE's largest steel and building material manufacturer. The captured CO₂ is injected into onshore oil fields for storage, a process which also enhances oil recovery. ADNOC plans to expand their CCUS capabilities to increase CO₂ capture capacity by over six-fold by 2030. This is expected to capture approximately 5 million tonnes of CO₂ per year.¹⁹⁶



A broader range of other climate actions is ongoing. For example, Emirates Steel Arkan is already using metal scrap to decrease its emissions and it has also been replacing a significant portion of raw materials with sustainable alternatives in its Arkan Cement Factory. Furthermore, it is also working on its decarbonisation roadmap, which includes setting targets on technology introduction, use of renewables, and energy optimization.¹⁹⁷ In the oil and gas sector, ADNOC and TAQA are connecting offshore oil and gas operations to the grid by a high-voltage direct current subsea transmission system. Also, within the oil and gas sector, ENOC continuously improves its energy efficiency, while introducing more renewable energy within its operations, and it has recently signed a memorandum with DEWA to explore hydrogen usage in mobility.

8.3 Decarbonisation of Transport

Current Landscape

The transport sector emitted 42 MtCO₂e GHG in 2019.¹⁹⁸ Emissions came mostly from private passenger cars, buses, heavy-duty trucks, and mechanical vehicles such as cranes and excavators. In the UAE, nearly all of these (close to 100% in 2019¹⁹⁹) have internal combustion engines (ICE), meaning they combust fossil fuels such as gasoline and diesel to work, creating emissions in the process. Consumption of energy to power battery electric vehicles (BEV) and metro operations also contributed to GHG emissions.

To decarbonise its transport sector, the UAE will act in accordance with 'avoid-shift-improve' methodology. Consequently, it will: 1) reduce the need for travel, 2) shift as many passenger trips as possible to public transport and as many freight trips to rail transport, and 3) decarbonise existing vehicles. The UAE plans, and is already taking steps, to act accordingly.

Key Climate Actions to Reach Net Zero in the Transport Sector

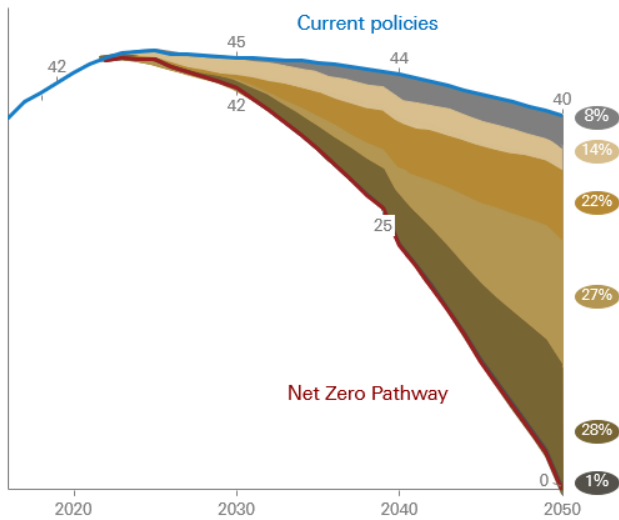
The UAE follows international best practices, such as electrification, shared mobility (e.g., car-pooling and ride sharing), public transportation, and active transportation (e.g., walking and cycling), to determine key measures to decarbonise its transport sector. The nation plans to reduce private vehicle use, electrify passenger vehicles — such as cars, taxis, buses, and motorcycles — trucks and mechanical vehicles (potentially through hydrogen), and shift freight transport to rail, while wherever possible, developing mixed use communities and clustering industries to minimise transportation needs. Domestic maritime and aviation will need to be electrified or run on low-carbon fuels to reach net zero by mid-century.

¹⁹⁶ ADNOC, Carbon Capture, Utilization and Storage (CCUS)
¹⁹⁷ Emirates Steel Arkan

¹⁹⁸ Including emissions from power & water usage
¹⁹⁹ Across private light-duty cars, taxis, motorcycles, public buses. MOCCA

GHG reductions by measure in transport sector

GHG emissions, MtCO₂e



Measures

Impact of power decarbonization (on baseline)

Conserving transportation needs

- Mixed-use development
- Increase in walking and cycling
- Increase in car-pooling
- Modal shift to metro, tram, public bus
- Modal shift to passenger rail

Decarbonising cars, taxis, buses, motorcycles and passenger rail

- Decarbonization of light-duty private cars
- Decarbonization of taxi
- Decarbonization of motorcycles
- Decarbonization of public buses
- Decarbonization of private buses
- Decarbonization of passenger rail

Decarbonise freight transport

- Modal shift to freight rail
- Decarbonization of heavy-duty trucks
- Decarbonization of freight rail

Electrify mechanical vehicles

- Decarb. of light-duty mechanical vehicles
- Decarb. of heavy-duty mechanical vehicles

Electrify domestic maritime and aviation

Sectoral Roads Towards Decarbonisation

Figure 22: Transport net zero pathway (UAE Net Zero by 2050 Strategic Initiative)

# 1 Reducing Transportation Needs	
<p>Passenger travel generated around 21 MtCO₂e GHG emissions in 2019. To tackle this, the UAE aims to reduce private vehicle use through several measures. Collectively, these will account for a 14% decrease in GHG emissions by 2050 and will also decrease air pollution which is associated with seven million premature deaths annually worldwide.²⁰⁰ The same goes for noise pollution, which can lead to mental health and cognition problems, including memory impairment and attention deficits.²⁰¹ At the same time, areas of traffic congestion — in which all the above-mentioned issues are more prominent²⁰² — will also decrease. Decarbonisation measures are detailed below.</p>	
# 1.1 Mixed-Use Development	#1.2 Rise of Walking and Cycling
<p>Mixed-use development will reduce travel distances by blending multiple-use facilities into individual buildings and neighbourhoods. This measure will not imply direct costs for the transport sector, as investments are linked to the development of buildings. Mixed-use development is already being embedded in emirates' development plans and will scale up by 2050. It should yield a yearly reduction in passenger kilometres (passenger-km) travelled by vehicle of 4% by 2040, and 7% by 2050.²⁰³</p>	<p>An increase in walking and cycling will also decrease passenger-km travelled through the years, up to a 1% reduction by 2050.²⁰⁴ This measure can also help combat obesity and physical inactivity, which are responsible for over one million deaths per year.²⁰⁵ It will generate a long-term positive business case, despite requiring initial investments in walking and cycling lanes.</p>

²⁰⁰ World Health Organisation

²⁰¹ Harvard Medical School

²⁰² Harvard School of Public Health

²⁰³ Versus a business-as-usual scenario, i.e., what would take place if net zero was not deployed.

²⁰⁴ Versus a business-as-usual scenario, i.e., what would take place if net zero was not deployed.

²⁰⁵ World Health Organisation

#1.3 Car-Pooling and Ride Sharing	#1.4 Higher Use of Public transportation
<p>Car-pooling and ride sharing in the UAE will increase the occupation levels of vehicles by 0.2% year-over-year, decreasing the number of private passenger cars on the road. This measure will require road developments, such as road painting for high-occupancy vehicle lanes.</p>	<p>The nation will build out the infrastructure and promote the use of urban public transport (including metro, trams, and public buses) over cars and taxis. This will require expanding the coverage of public transport (metro and tram) infrastructure across emirates, as well as adding new public buses, including dedicated lanes. Due to these measures, the stock of public buses will be higher in net zero versus a business-as-usual scenario, by roughly 5,000 in 2050. Deployed kilometres of metro and tram will also be higher.²⁰⁶ This measure implies significant investment and is associated with a negative business case. Even so, investments are expected to start before 2030.</p>
#1.5 Shift to Rail	
<p>A shift to rail will also play a part in reducing private vehicle usage. The UAE expects to invest in 1000 km of rail infrastructure between 2025 and 2030 to accommodate increased passenger travel. The number of passenger trains will rise from 2025 onwards, with a progressive increase in stock up to 2050 (128 in 2035, 224 in 2040, 324 in 2045, and 460 in 2050).</p>	
# 2 Decarbonising Cars, Taxis, Buses, Motorcycles, and Passenger Rail	
<p>Passenger vehicles will continue to be used, and as such must be decarbonised. This measure will also help the UAE tackle emissions from passenger travel (21 MtCO_{2e} GHG in 2019). It encompasses private light-duty cars, taxis, motorcycles, public and private buses, and passenger rail. Decarbonisation across these vehicle types will be responsible for 22% of GHG emissions reductions in this sector by 2050. Given favourable economics, these measures are expected to result in positive business cases for the UAE.</p>	
#2.1 Decarbonisation of Private Light-Duty Cars	#2.2 Decarbonisation of Taxis
<p>Private internal combustion engine (ICE) light-duty cars will be replaced by battery electric vehicles (BEVs) and fuel cell electric vehicles (FCEVs). This will accelerate since BEVs are already cost-efficient in comparison to ICE vehicles. BEVs will likely cover the vast majority, reaching 99% uptake by 2050, and FCEVs will likely reach 1%.</p>	<p>ICE taxis will also be replaced by BEVs and FCEVs, following ongoing actions. BEV taxis will reach 95% uptake by 2050, and FCEVs will account for the remaining 5%.</p>

²⁰⁶ Versus a business-as-usual scenario, i.e., what would take place if net zero was not deployed.

#2.3 Decarbonisation of Buses	#2.4 Decarbonisation of motorcycles
<p>BEV and FCEV deployment as public and private buses will ramp-up more slowly, as the economics are still not as favourable. Electrification of both private and public buses is expected to increase post 2040, when the business case of BEVs versus ICE vehicles becomes positive. The UAE will target 90% electrification for buses by 2050. FCEV buses are also expected to be introduced by 2040 to accommodate driving patterns of long-haul buses. These are expected to represent roughly 10% of total stock by 2050.</p>	<p>Adoption of BEVs will also affect motorcycles. Uptake in the UAE is expected to start before 2025, and full electrification will be reached in 2050.</p>
#2.5 Decarbonisation of Passenger Rail	
<p>Lastly, the UAE will deploy electrified passenger trains and convert diesel trains to hydrogen. Both measures are expected to start in 2025, which is the anticipated year of activation of passenger rail for high-speed routes.</p>	
# 3 Decarbonising Freight Transport	
<p>For UAE freight transport, net zero will include a shift to rail as well as decarbonisation of both heavy-duty trucks and rail. This will abate GHG emissions caused by freight travel, which were around 12 MtCO_{2e} in 2019. Measures to decarbonise freight transport will be responsible for 27% of GHG emissions reductions in the transport sector by 2050.</p>	
#3.1 Shift Freight to Rail	#3.2 Decarbonise Heavy-Duty Trucks
<p>The UAE will increase the use of rail for freight transportation over heavy-duty trucks. An increase in freight train stock is expected to enable this measure, with 25 units added by 2035, 42 by 2040, 63 by 2045, and 86 by 2050, versus a business-as-usual (non-net zero) scenario. This measure will generate savings due to the reductions in the use of heavy-duty trucks as freight is hauled via rail rather than by road.</p>	<p>Heavy-duty ICE trucks will be replaced by BEVs and FCEVs in the UAE. These will accommodate different travel needs; BEVs will be used for shorter distances and FCEVs for longer-haul trucks. BEV adoption is expected to rise before 2030, while the percentage of FCEVs on the road will grow post 2040. Eventually, post 2040, due to cost reductions of BEVs and FCEVs, they will become cheaper to own than ICE trucks.</p>
#3.3 Decarbonise Freight Rail	
<p>The progressive substitution of diesel trains with hydrogen-powered trains is projected to commence from 2025 (vs baseline with 100% diesel trains by 2050) in order to achieve Net Zero by 2050 (considering 30 years lifetime of trains). The possibility of electrification of trains has not been considered given low frequency and long distances of the trips.</p>	
#4 Decarbonising Mechanical Vehicles	
<p>Both light- and heavy-duty mechanical ICE vehicles will be replaced by BEVs and FCEVs. This will target GHG emissions that reached 9 MtCO_{2e} in 2019. These measures will enable 28% of GHG emissions reductions in this sector by 2050.</p>	

#4.1 Light-Duty Mechanical Vehicles	#4.2 Heavy-Duty Mechanical Vehicles
<p>Light-duty mechanical vehicles are expected to start shifting to BEVs and FCEVs already at or before 2025. These will progressively replace ICE vehicles, until there is no ICE stock left in 2050. BEVs are expected to have higher uptake than hydrogen due to economics, but for some use-cases FCEVs are superior.</p>	<p>Heavy-duty vehicles will be replaced by BEVs and FCEVs later than light-duty ones. BEVs usage is expected to rise in the 2030s, and FCEVs come in after 2040.</p>
#5 Electrifying Domestic Maritime and Aviation	
<p>To reach net zero in 2050, the UAE will need to decarbonise domestic shipping and aviation (inclusive of the ferries and abras). This will tackle emissions that amounted to 0.3 MtCO₂e by 2019 and account for 1% of GHG emissions reductions in the transport sector by 2050.</p>	
#5.1 Electrify Ferries and Abras	#5.2 Electrify Domestic Shipping and Aviation
<p>The UAE will introduce electric ferries and abras before 2030. This is expected to lead to full electrification by 2050 and to generate savings, given that electric ferries and abras will be more cost-efficient and have lower maintenance costs.</p>	<p>The UAE will increase the use of electric ships to decarbonise domestic coastal shipping. Electricity for coastal ships is expected to replace marine bunker fuel progressively, reaching 100% electrification in 2050, subject to global achievement of international shipping emissions reduction targets. This will entail a higher power cost compared to marine bunker fuel. Some portion of the domestic shipping may require alternative, low-carbon fuels such as green or blue ammonia.</p> <p>The UAE will also increase the use of electric planes for short-haul (domestic) flights. Electric planes are expected to bring higher power costs than jet fuel, yet nevertheless the UAE expects to reach full electrification for short-haul flights by 2050.</p>

Besides decarbonising the domestic transport sector, the UAE also aims to lead on sustainable international travel. Increasing demand for SAFs is triggered by the International Air Transport Association (IATA) and International Civil Aviation Organization (ICAO) targets and commitments of large airline companies towards mid-term decarbonisation in the lead up to 2030. The UAE plans to supply the international aviation fuel demand with e-kerosene (one type of SAF) at 1% in 2030 growing to over 50% by 2050. Similarly, the nation plans to increase production of green or blue ammonia or methanol from 1% in 2030 to 75% in 2050, a key element of decarbonising international shipping.

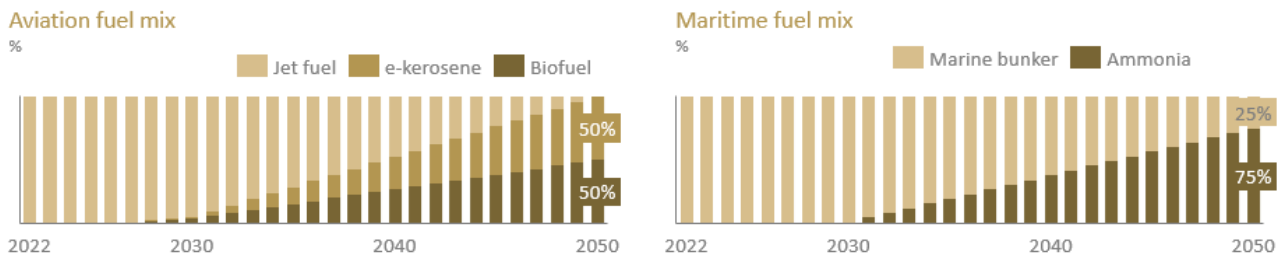


Figure 23: The UAE's planned fuel mix for aviation and shipping (UAE Net Zero by 2050 Strategic Initiative)



Climate Policies to Reach Net Zero in the Transport Sector

Existing Policies that Support Decarbonisation of the Transport Sector

The UAE has already been advancing modal shifts (e.g., switching to public transportation, increasing walking and cycling), non-ICE vehicle uptake (through BEVs and FCEVs), and development of supporting infrastructure (e.g., building more cycling tracks) to decarbonise its transport sector. This is supported by federal- and emirate-level initiatives and is in line with trends observed globally.

At the federal level, the UAE's DSM programme aims to reduce transport sector energy demand by 60% and emissions by 56% by 2050 (compared to business-as-usual) by promoting modal shifts to more sustainable transport options such as metro and rail for both passengers and freight. The DSM programme also targets an increase in uptake of hybrid vehicles and BEVs by providing financial and non-financial incentives. Moreover, this programme gradually introduces more stringent fuel standards for passenger cars, buses, and trucks, which is the largest emissions reduction driver.²⁰⁷

To support BEV uptake, the UAE is developing a national roadmap for BEVs, including federal standards for BEV charging stations and technical regulations for BEVs. The latter aims to enable the deployment of charging infrastructure, ensure network interoperability, define pricing regulation mechanisms, and improve preparation for increased BEV use.²⁰⁸

FCEV uptake is being stimulated in parallel. To this end, the UAE has completed the development of the UAE Control Scheme for Hydrogen and Fuel Cell Vehicles to define technical requirements for FCEV infrastructure.²⁰⁹

In further developments, the UAE also introduced its National Smart Mobility Strategy, which leverages artificial intelligence to develop smart transportation systems. The strategy aims to develop intermodal and well-connected mobility by adopting sustainable and autonomous mobility solutions.

At the emirate level, Dubai introduced strategies such as the Dubai Green Mobility Strategy²¹⁰ and Dubai's First and Last Mile Strategy. The latter encourages the shift to public transport by providing multiple mobility options for the first and last part of a journey leading to or from a public transport station. These options include buses on-demand, taxis, carpooling, electric scooters, and bicycles. Abu Dhabi developed a Surface Transport Masterplan with policy directions promoting multi-modal transport networks and enhanced pedestrian accessibility; while Abu Dhabi's Department of Energy issued a policy for electric vehicle charging infrastructure.²¹¹ Emirate-level governments also promote sustainable urban planning focused on mixed-use developments and active transportation (e.g., walking, cycling) as outlined strategies such as Dubai 2040 Urban Master Plan and Rafah, Ras Al Khaimah's sustainable community guideline.

New Policies to Reach Net Zero in the Transport Sector

The UAE plans to enact new policies to decarbonise the transportation sector. These have been approved and are being detailed for implementation.

Policies to Stimulate Decarbonisation of Vehicles

1. Management of New ICE Vehicles Post 2035/2040

The UAE prepares to phase down ICE vehicles. This is an effective incentive to prime consumers for the adoption of BEVs, as they become the best and cheapest alternative. This policy can only be enacted after charging infrastructure is widely available and OEMs offer electric versions of most vehicle classes.

2. Incentives for BEVs and FCEVs

The UAE plans to increase the annual registration fees for vehicles depending on their CO₂ intensity. The existing annual registration system can be leveraged for rapid implementation. This policy directly impacts consumer expenditures without interfering with free market dynamics. Tolls in the UAE will also either be decreased for BEVs and FCEVs or increased for ICE vehicles. This policy will work in a similar way to that described under 'Toll Adjustments to Benefit Group Transport.' The UAE also plans to provide incentives for BEVs and FCEVs

²⁰⁷ UAE Demand Side Management Programme

²⁰⁸ MOEI

²⁰⁹ MOIAT

²¹⁰ DSCE

²¹¹ Further details on UAE initiatives can be found in UAE's Third Update of Second NDC

such as CAPEX grants, and lower registration fees and tolls.

3. Procurement of BEVs and FCEVs as Government-Owned Vehicles

The UAE plans to introduce a policy to ensure newly purchased government vehicles after a certain date are all BEVs. This can be progressively rolled-out in line with accompanying charging infrastructure investments beginning in 2025, allows access to many vehicles, and is similar to regulations introduced internationally.²¹² The UAE expects to install 10,000 destination chargers by 2030, increasing to 30,000 destination chargers installed by 2050.

4. Provision of Road Privileges to BEVs

The UAE will grant road privileges to BEVs, such as priority lanes, dedicated parking in busy areas, and removed road circulation restrictions for low-carbon trucks.

5. Policy for Private Players to Construct a Charging Infrastructure Network

The UAE will implement a policy for private players such as utility companies and national oil companies to build a BEV infrastructure network, potentially supported by incentives to install BEV charging stations in economically unattractive locations. This policy guarantees relatively high control and central planning of charging networks for private and public vehicles and leverages private players' know-how and capabilities to deploy this infrastructure.

6. Policy for Real Estate Developers to Accommodate BEV Infrastructure

Real estate developers will follow a policy to accommodate BEV infrastructure in parking lots (at locations like shopping malls, office buildings, and residential buildings). This helps to guarantee that the foundations of charging infrastructure are built-out in the UAE.

7. National EV Charging Network

The National Electric Vehicles Policy aims to foster collaboration with federal and local partners, as well as, the private sector, in order to establish a national network of electric vehicle (EV) chargers throughout the UAE. The network will cater to the needs of

electric vehicle owners, while also regulating the electric vehicle market in the UAE.

8. Global EV Market

In May 2023, Ministry of Energy and Infrastructure launched the 'Global EV Market', a transformational project to turn the UAE into a global market for electric vehicles. The project supports the shift to green mobility and aims to increase the share of EVs to 50 per cent of total vehicles on the UAE's roads by 2050.

Policies to Stimulate Higher Usage of Public Transport

9. Government Investment for Metro, Tram, and Rail Infrastructure

The UAE will deploy a comprehensive programme to expand public transport infrastructure. This will shift some transport from roads to rails, support sector decarbonisation, and lower congestion. Passenger rail planning and finance conceptualisation is expected to be completed in 2023 with constructions starting in 2025, and construction will run into the early 2030's before finishing.

10. Provision of Road Privileges to Public Buses

The UAE will introduce road privileges (e.g., priority lanes and dedicated parking) for public buses, which will demand infrastructure adjustments while guaranteeing smooth traffic circulation. This policy will increase the level of comfort of public transport by decreasing commuting time.

11. Improvement of Public Transport 'Inter-Modality'

'Last mile' offerings, such as autonomous EV buses, 'trackless trams,' and scooters will run as shuttles to and from stations to facilitate easy access to public transport and thus enable modal shifts to rail, metro, and buses. Simultaneously, an overarching pass/app for all transport options across all emirates will support passengers.

²¹² International Energy Agency, Europe, Clean Vehicle Directive sets ZEV procurement targets for 2025, 2030; New Zealand, Public transit vehicles purchased

post-2025 must be electric; USA, 'Buy American' executive order includes plans to make government fleet electric.

12. Promotion of Public Transport through Advertising Campaigns

The UAE will run advertising campaigns to improve the image of public transport. These will be organised in conjunction with key UAE flagship events like COP28. The UAE expects to run these campaigns in parallel with the deployment of other measures to promote public transportation.

Lighthouse Initiatives

The UAE already has several initiatives that illustrate its progress in transport sector decarbonisation.

Etihad's National Rail Network

The UAE completed construction of its first national rail network in 2023. It extends across the UAE from the border of the Kingdom of Saudi Arabia to Fujairah. The 1,200 km rail network connects centres of trade and industry between Abu Dhabi, Dubai, Sharjah, Fujairah, and Ras Al Khaimah. Each train carries the freight equivalent of approximately 300 trucks, thereby leading to CO₂e reductions of 70-80% per tonne of freight.²¹³ Considering the future expansion plans, Etihad Rail would connect all emirates and all cities within the country.



RTA's Metro Network Expansion

Dubai's self-driving metro system will ultimately be expanded from the current 89 kilometres to around 379 kilometres.²¹⁴ This plan is reviewed and updated periodically considering Dubai's urban and economic development trends. Dubai is also currently investigating the feasibility of constructing a new line that will expand the network by around 30 kilometres by 2030. By 2030 metro ridership is expected to rise to around 300 million passengers compared to 225 million passengers in 2022.

²¹³ Etihad Rail, National Railway Programme

²¹⁴ When the daytime population of Dubai reaches to around 7.3 million.

Abu Dhabi is also planning to build a metro system comprised of four lines extending a total of 131 km. The construction is expected to be completed by 2030.²¹⁵ Another metro transit network is planned to connect urban hubs in the northern emirates.



RTA's 100% Taxi Electrification by 2027

RTA expects 100% of its taxis in Dubai to be 100% eco-friendly by 2027 (Dubai Taxi and franchise company taxis). The agency plans to use a mix of hybrid, electric and hydrogen-powered vehicles to reach its target.²¹⁶



Apart from these, other significant initiatives are ongoing. For example, TAQA cooperates with ADNOC on establishing a mobility joint venture "E2GO" to build and operate electric vehicle infrastructure across UAE.

²¹⁵ Plan Abu Dhabi 2030

²¹⁶ RTA, Dubai Taxi will become 100% eco-friendly by 2027.

8.4 Decarbonisation of Buildings

Current Landscape

Buildings were the third highest-emitting sector in the UAE in 2019, following the power and water generation and industrial sectors, with total emissions around 62 MtCO_{2e}.²¹⁷ Emissions were mostly driven by consumption of water and

electricity, which is closely linked to the efficiency of buildings. Buildings with lower efficiency levels require more water and electricity to meet the same activity as higher efficiency ones, leading to higher emissions. Given this, reaching net zero in buildings is mainly dependent on decarbonising power and water generation and increasing buildings' efficiency (based on the construction techniques and structures).

GHG reductions by measure in buildings sector

GHG emissions, MtCO_{2e}

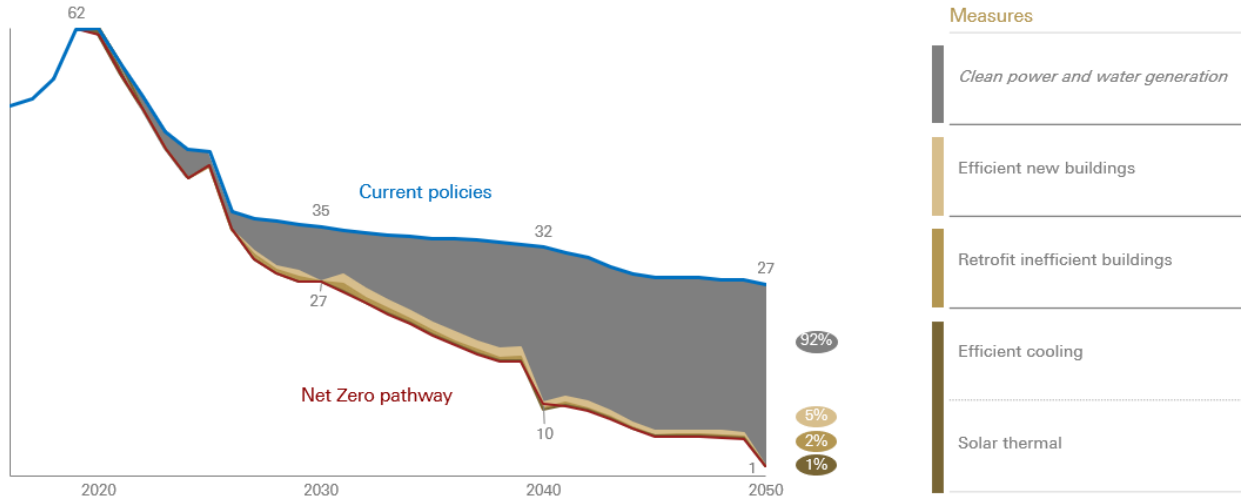


Figure 24: Buildings net zero pathway (UAE Net Zero by 2050 Strategic Initiative)

#1 Clean Power and Water Generation

Most of the decarbonisation of the buildings sector will happen indirectly, through the decarbonisation of power and water generation, which will be responsible for 92% of the GHG emissions reduction in the sector by 2050.

Sectoral Roads Towards Decarbonisation

#2 Efficient New Buildings

The UAE will guarantee buildings have the needed set-up and insulation levels to improve efficiency. This will be intrinsically linked with the roll-out of revised building codes (including passive cooling techniques), which are expected to improve buildings' energy efficiency by 35%.²¹⁸ Building codes can also be leveraged to stimulate decarbonisation of other sectors (e.g., allowing green cement usage in construction can stimulate their production in the industry sector).

This measure will account for 5% of total GHG emissions reductions in the sector by 2050. Besides this, it can contribute to improved indoor air quality, increased air tightness, reduced volatile organic compounds and decreased energy consumption — all factors which are associated with positive health and economic benefits. Energy efficient buildings, while more expensive to develop, have lower operating costs and in most cases will be cheaper than less efficient buildings throughout the lifetime.

#3 Retrofit Inefficient Buildings

²¹⁷ Including emissions from power & water usage

²¹⁸ Based on Taqati, Heriot Watt University, Masdar, Khalifa University

Existing UAE buildings also require improvements to enable water and electricity savings. This may imply different levels of retrofitting work (everything from replacing old windows to improving older standards of cooling equipment). The retrofitting of existing buildings is expected to generate incremental savings over time, especially via lower energy and water consumption. Particularly post-2030, retrofits are estimated to achieve similar energy efficiency levels as new buildings, in line with revised building codes. This measure will account for 2% of GHG emissions reductions in the sector by 2050 and enable similar benefits to the ones mentioned for efficient new buildings.

#4 Efficient Cooling

In 2019, cooling was responsible for more than 70% of power consumption in buildings.²¹⁹ It is thus crucial that efficiency of cooling systems increases, so that they require less energy to work. In the UAE, this means increasing the use of district cooling, which is used for large installations, and variable refrigerant flow (VRF), deployed for smaller scale buildings. Efficient cooling becomes increasingly critical when considering that climate change is likely to drive temperature increases in the UAE,²²⁰ accelerating cooling demand. Moreover, efficient cooling applications can generate energy savings up to 40%.²²¹

This measure is expected to ramp-up significantly post 2035. Average efficient cooling penetration across emirates is expected to be around 19% in 2035, 22% in 2040, 25% in 2045, and 28% in 2050. This will be achieved through a mix of new deployments and retrofits and, together with solar thermal, will be responsible for 1% GHG emission reductions in the sector by 2050.

#5 Solar Thermal

Solar thermal systems leverage energy from the sun to heat water for consumption within buildings. They provide an alternative green heating source for residential buildings — especially villas — that is cheaper than using electricity from the grid.

This measure is expected to ramp-up early; 80% of villas are expected to be equipped with solar thermal before 2030. This already accounts for time to draft required policies, engage with stakeholders, ensure sufficient supply, and other required processes. This threshold is then expected to remain steady up to 2030.

Together with efficient cooling, this measure is expected to account for 1% of GHG emissions reductions in the sector by 2050.

Climate Policies to Reach Net Zero in the Buildings Sector

Existing Policies that Support Decarbonisation in the Buildings Sector

The UAE has been investing significantly in energy consumption and efficiency as core levers to decarbonise the buildings sector. At the federal level, the UAE introduced a National Energy and Water Demand Side Management Programme, which requires periodic updates of building codes, retrofits of inefficient buildings, higher penetration of efficient cooling, and introduction of PV and solar

water heating. The programme targets a 51% reduction in energy consumption and a 40% reduction in water demand in this sector by 2050, versus a business-as-usual scenario, and addresses crucial demand drivers, including building codes, retrofits, efficient cooling, renewable energy, equipment standards, and efficient irrigation.²²²

MOEI's Policy for Regulating Local Energy Market provides the guidelines for the contractual framework amongst energy stakeholders and the various contracting mechanisms to consolidate the mechanisms of doing business, financing, and partnerships between the public and private sectors.

²¹⁹ UAE Net Zero by 2050 Strategic Initiative

²²⁰ COP 26, Futures We Want

²²¹ Comparison of district cooling to central air (energy use measured in kW/RT).

²²² MOEI, UAE National DSM

This will encourage energy service providers and private sector companies to invest in government projects, with the goal of reducing energy and water consumption, carbon footprint, and operational costs in buildings.

Abu Dhabi, Dubai, Sharjah and Ras Al Khaimah emirates are introducing similar strategies with the aim of decarbonisation. They have all established demand-side management or energy efficiency strategies that target improvements in building efficiency. The UAE now has Dubai's Demand Side Management Strategy, Abu Dhabi's Demand Side Management and Energy Rationalisation Strategy 2030, Sharjah's Energy Efficiency Standard for Buildings (SEEB), and Ras Al Khaimah's Energy Efficiency and Renewable Energy (EE&R) Strategy 2040.²²³ As part of the EE&R strategy, Ras Al Khaimah has already achieved 30% energy savings (in 2020 and newer buildings in comparison to pre-2019 buildings) and aims to double this figure by 2040 through regular updates and community efficiency guidelines.²²⁴

New Policies to Reach Net Zero in the Buildings Sector

The UAE will promote an enabling regulatory environment to decarbonise its buildings sector. This will be achieved through a set of policies which are being detailed for implementation, and that the UAE expects to deploy before 2025.

Cross-Sector Policies

1. Awareness Campaigns

Awareness campaigns for energy efficiency will play an important role in supporting buildings' decarbonisation measures. Campaigns aim at educating society on the optimal use of housing facilities and on the importance of energy efficiency by highlighting its positive effects on the environment and household savings. Such campaigns are easy to implement and have low costs and operational barriers. They also have the potential to reach a significant number of consumers with relatively little effort. The UAE is aware of this lever's potential and has been deploying campaigns for years, both at the national and emirate level. It therefore intends to continue these efforts from 2023 onwards to stimulate action,

as campaigns can encourage people to set higher temperatures for their cooling systems, reduce amount of waste and water usage, and turn off devices when not being used, among other actions.

The awareness campaigns shall also consider educational workshops on solar energy systems directed to school students highlighting the Energy Strategy 2050; the definition of energy and its types; the types of solar panels and how solar panels work; and the calculation of electrical energy consumption as an input in the design of the solar system; modelling solar power system; and illustrating the parts of the solar system.

2. Expansion of Green Building Labels

The UAE will deploy a policy for harmonised green building labels in line with already existing ones across emirates (especially Dubai and Abu Dhabi).

Policies to Support More Efficient New Buildings

3. Updated Building Codes

The UAE aims to accelerate its ambitions and harmonise standards across emirates. This will be driven by more stringent building codes and specifications, which will be mandatory, and combine inputs from several emirates to ensure elevation of standards.

The UAE already updates its building codes periodically. As such, this measure does not imply significant disruption to existing processes, but rather an increase of their ambition level. Updated building codes are expected to:

- 1) Ensure up to 35% more energy efficiency.
- 2) Promote green construction materials — such as blended cement and green steel and aluminium — by easing regulation on the use of these materials in construction.
- 3) Promote photovoltaic and solar thermal-ready rooftops.
- 4) Accommodate electric vehicle charging and recycling infrastructure.

While some emirates have already progressed significantly — Abu Dhabi, Dubai and Ras Al Khaimah has policies in line with 3) and 4) already in

²²³ Emirates' DSM strategies are also mentioned in the industrial sector.

²²⁴ Government of Ras Al Khaimah, Energy Efficiency and Renewables Strategy 2040



place — further increase of ambition and alignment will generate benefits across sectors, particularly in heavy industry, transport, and waste. The update of building codes in the UAE is expected to drive a positive business case starting from inception.

Policies to Support Retrofits for Existing Inefficient Buildings

4. Policies to Retrofit Villas and Government Owned Buildings

To support this measure, the UAE will introduce policies to ensure retrofitting of high consumption buildings²²⁵ (upon changes of ownership) and government-owned buildings. Similar to the goals for new buildings, these levers will aim to reach efficiency level increases of up to 35% in retrofitted units and are aligned with the goals and specifications of new building codes.

Policies to Support More Efficient Cooling

5. Specifications for Cooling Technologies and Updates to District Cooling Regulations

Cooling technologies will be promoted through updates to building codes and existing conformity programmes (when required).²²⁶ Efficiency of district cooling will be supported by a national policy which is expected to:

- 1) Regulate prices to protect end consumers. District cooling in the UAE often represents high costs for end consumers. This regulation will thus prevent price escalations, ensuring this technology is accessible to the wider population.
- 2) Develop mechanisms for increasing district cooling in areas with density above certain thresholds. District cooling makes more economic sense in high density areas. This regulation thus intends to ensure district cooling is deployed only where it can be viable, both from the societal and economic perspective.

Once appropriate measures are established for F-gasses across the various potential sources, relevant policies will also be updated to reduce

potential leakage of F-gasses from inappropriate handling of cooling fluids across the cooling sector.

Policies to Support Deployment of Solar Thermal

6. Solar Thermal Installation and Solar Thermal Ready Rooftops

The UAE's support for solar thermal deployment will include a policy to retrofit solar thermal in government buildings at the federal and emirate level and a policy for photovoltaic/solar thermal rooftop readiness for new buildings and major refurbishments in accordance with the regulations and laws of the local authorities. Both points could be part of building code updates.

Lighthouse Initiatives in the Buildings Sector

The UAE has been developing mixed-use, sustainable clusters across its emirates. The nation has flagship examples of decarbonisation initiatives in the buildings sector which also contribute to improve its citizens' quality of life and their happiness. These initiatives promote walking and cycling and associated health benefits, increase the number of green areas, which can decrease local pollution and increase well-being, and boost recreational areas that promote socialisation and related benefits.

Expo City

To get a glimpse of a future Dubai, the Expo 2020 site was transformed into a mixed-use urban community after the event. This proactive legacy plan is intended to serve as a future model for sustainable mega-events. From the outset, sustainability aspects were integrated into the urban and building-level planning: Expo City installed 5.5 MW of solar PV on buildings across the site and the energy demand of buildings was reduced by 20% compared to international standards. In total, 123 buildings also received Leadership in Energy and Environmental Design (LEED) certifications, a green building label denoting healthy, efficient, carbon- and cost-saving green buildings.²²⁷

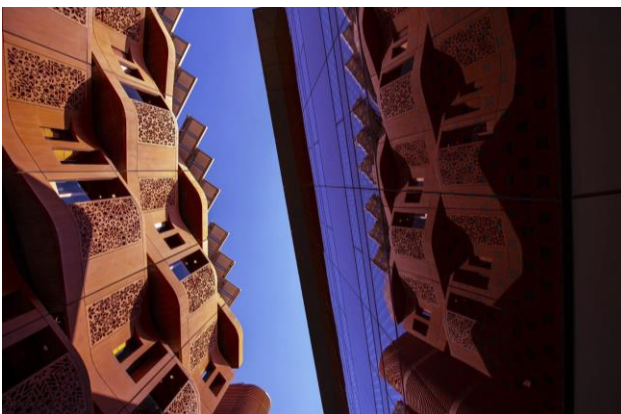
²²⁵ Alternatively, the UAE could incentivize buildings upgrades through grants, however, this would lead to increased financial burden of the government and higher risk of non-compliance with decarbonisation targets.

²²⁶ MOIAT
²²⁷ Expo City, GRI report 2021



Masdar City

Masdar City in Abu Dhabi contains one of the largest clusters of low-carbon buildings in the world. The buildings in Masdar City use 40% less energy and water compared to similar buildings and were constructed with low carbon concrete and with 90% recycled aluminium. The city implemented a transport strategy that puts pedestrians first, complemented by clean point-to-point services such as its electric and automated personal rapid transit system. As part of this strategy, neighbourhoods provide all basic services within walking distance. Masdar City is also cooperating with an autonomous vehicle producer to expand its driverless and electric vehicle network.²²⁸



Sustainable Cities

The Sustainable City Districts in Dubai and Sharjah are mixed-used and sustainable neighbourhoods. The buildings are highly efficient smart homes entirely powered by solar PV. The neighbourhoods are also pedestrian friendly and provide green

recreational areas and urban farming. The cities are also reusing 100% of wastewater for irrigation.



Several entities are advancing decarbonisation in the buildings sector. Aldar Properties is an example; the company has developed a net zero plan,²²⁹ it is the only Middle East member of the Science Based Targets Initiative (SBTi)'s expert advisory group,²³⁰ and is developing another sustainable city in the UAE, the Sustainable City at Yas Island.²³¹ Other efforts include raising awareness to the importance of decarbonising this sector. For instance, the Emirates Green Building Council (EGBC) recently launched a paper on challenges, opportunities and solutions of building decarbonisation and sustainable management of energy, water, and consumption patterns.²³² Moreover, Abu Dhabi Energy Services company drives the growth of the Abu Dhabi energy services market and helps to meet the increasing need for energy-efficient solutions in the Emirate and beyond, mainly for retrofitting government and commercial buildings.

8.5 Decarbonisation of Waste

Current Landscape

In 2019, the waste sector accounted for 13 MtCO₂e in UAE. The majority (more than 60%) of these GHG emissions comes from organic waste decomposition and landfills. Remaining 40% emissions come from the electricity used to run recycling and wastewater treatment plants.

The measures adopted by the UAE to decarbonise the waste sector address all steps conventionally associated with good waste management: reduce, reuse, recycle, and recovery. Policies include increasing landfill diversion through recycling and

²²⁸ Masdar City, Sustainability

²²⁹ Aldar, Net Zero Plan

²³⁰ WAM, Aldar joins Science Based Targets Initiative's Net Zero Expert Advisory Group

²³¹ WAM, Aldar and Diamond Developers launch The Sustainable City – Yas Island

²³² EGBC and Heriot Watt University, Building Decarbonisation and Sustainable Management of Energy, Water, and Consumption Patterns: Challenges, Opportunities and Solutions

reusing, as well as capturing landfill gas and retrofitting of existing waste-to-energy facilities. The first measures to be adopted (per the National Integrated Waste Management Agenda) will focus on landfill diversion (i.e., recycling and waste-to-energy), with the goal of reaching a recycling rate of 80% by 2031. Waste sector emissions are expected to increase by more than 8% by 2030 when compared to the 2019 base year. These measures will generate higher emissions in the short term because recycling uses more electricity and waste-to-energy processes release trapped GHGs into the atmosphere. However, waste-to-energy produces power, displacing emissions in the power sector, and emits CO₂ instead of methane (CH₄). Methane would come from landfill decomposition and has an ~85 times greater global warming potential than CO₂ on a 20-year timescale. Consequently, waste-to-energy considerably cuts long-term waste

emissions but increases emissions in the short term. Due to this, the UAE expects waste emissions to decrease 10% by 2045 and 75% by 2050, versus 2019 values.

UAE Method of Disposing and Treatment of Waste ²³³	2019	
	%	Quantity (000 Tons)
Recycling	20	6,871
Composting	1	189
Incineration with energy recovery	0	9
Incineration without energy recovery	0	53
Landfilling	80	27,903
Total	100	35,024

Key Climate Actions to Reach Net Zero in the Waste Sector

A range of measures will be adopted to reduce long-term emissions across sectors. Collectively, these changes will help drive the UAE towards net zero by 2050 (see Figure 25).

GHG reductions by measure in waste sector

GHG emissions, MtCO_{2e}

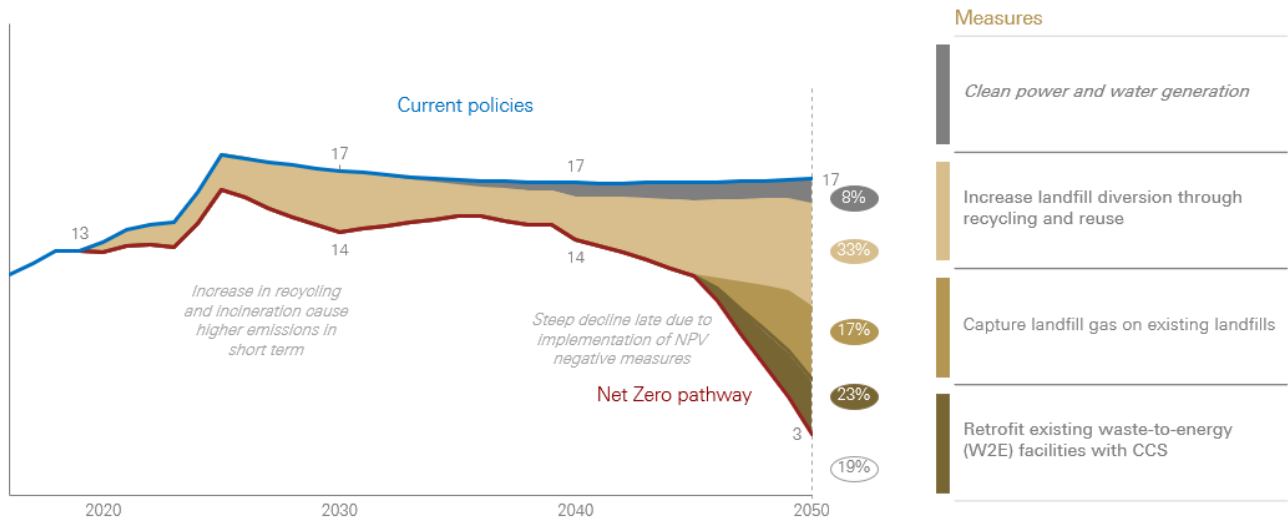


Figure 25: Waste net zero pathway (UAE Net Zero by 2050 Strategic Initiative)

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#1 Clean Power and Water Generation

The decarbonisation of the waste sector is partly dependent on climate actions in power generation due to significant energy consumption of the sector. Waste sector measures are expected to decrease the total waste emissions by 8% by 2050 due to renewable energy improvements to the grid.

#2 Increase Landfill diversion through Recycling and Reuse

Currently, most emissions in the waste sector arise from organic waste decomposition in landfills, which releases CH₄ emissions. The UAE has pledged to cut CH₄ emissions by 30% in 2030²³⁴, which will require action in the waste sector. As a result, the UAE is accelerating efforts to divert waste from landfills.²³⁵ The waste diversion target for Municipal Solid Waste (MSW), Construction & Demolition Waste (CDW) and Industrial Waste (IW) will be raised to 90% by 2035 via recycling and reuse. This will be achieved by building additional recycling and waste-to-energy plants up to 2035. Landfill diversion is expected to account for 33% of GHG emission reductions in the waste sector in 2050.

Measures in the waste sector will also generate environmental and societal benefits beyond emissions reduction. Landfills release harmful toxins into surrounding environments, and these toxins contaminate underground aquifers (and thus water supply) by leaching into the ground, with repercussions on the environment and on human health. These toxins will be decreased as a result of the measures adopted. Other societal benefits include cleaner surroundings, odour management or lower likelihood of disease outbreaks.

#3 Capture Landfill Gas at Existing Landfills

The UAE targets a waste diversion rate of 90% by 2035 through increased landfill diversion (recycling and reuse). The emissions produced by the remaining 10% will be addressed through landfill gas capture. Landfill gas capture extracts CH₄ from landfill sources which can be used to create electricity. The UAE intends to extract CH₄ to the maximum extent possible (roughly 67%) and apply landfill gas capture to all remaining landfills. This measure is expected to be implemented starting in 2030 and will continuously ramp up, eventually capturing around 3 MtCO₂e in 2050, which will account for 17% of GHG emissions reductions in this sector in 2050.

#4 Retrofit Existing Waste-to-Energy Facilities with CCS

The UAE will deploy CCS in waste-to-energy facilities to capture residual CO₂. This measure will scale up in time to reach net zero by 2050. Transportation and storage infrastructure will be built in clusters over four-year periods to ensure availability of infrastructure. The retrofitting of existing waste-to-energy facilities with CCS, and the subsequent storage of CO₂ in depleted oil fields and/or saline aquifers, will account for 23% of GHG emissions reductions in the waste sector by 2050. CCS capacity will reach a capacity of approximately 4 MtCO₂ abatement potential in 2050.

Climate Policies to Reach Net Zero in the Waste Sector

Existing Policies that Support Decarbonisation in the Waste Sector

The long-term measures detailed above will build upon a strong policy foundation that has already been put in place focused on circular economy

practices. In line with the UAE's objective to reduce waste sent to landfill, the nation implemented a wide range of policies incentivising recycling and planning for associated waste infrastructure.

The UAE has introduced the Circular Economy Policy at the federal level to transform its economy from a linear to a circular model and achieve an

²³⁴ Global Methane Pledge
²³⁵ Compared to 2020 levels

efficient use of natural resources, in full alignment with the UAE Centennial 2071.²³⁶ A circular economy helps ensure the constant flow of materials within two primary cycles:

- **Technical Cycle:** In this cycle, materials are kept in circulation via reuse, repair, remanufacturing, or recycling. When the use and lifetime of materials is maximised, it reduces GHG emissions which would otherwise be generated by producing new materials. It also prevents emissions from

waste disposal (such as CH₄ emissions from landfills).

- **Biological Cycle:** In this cycle, nutrients from biodegradable materials are put back into the soil and help regenerate nature.²³⁷

The UAE’s circular economy policy is intended to optimise resource use across four key sectors: manufacturing, infrastructure, transport, and food.²³⁸

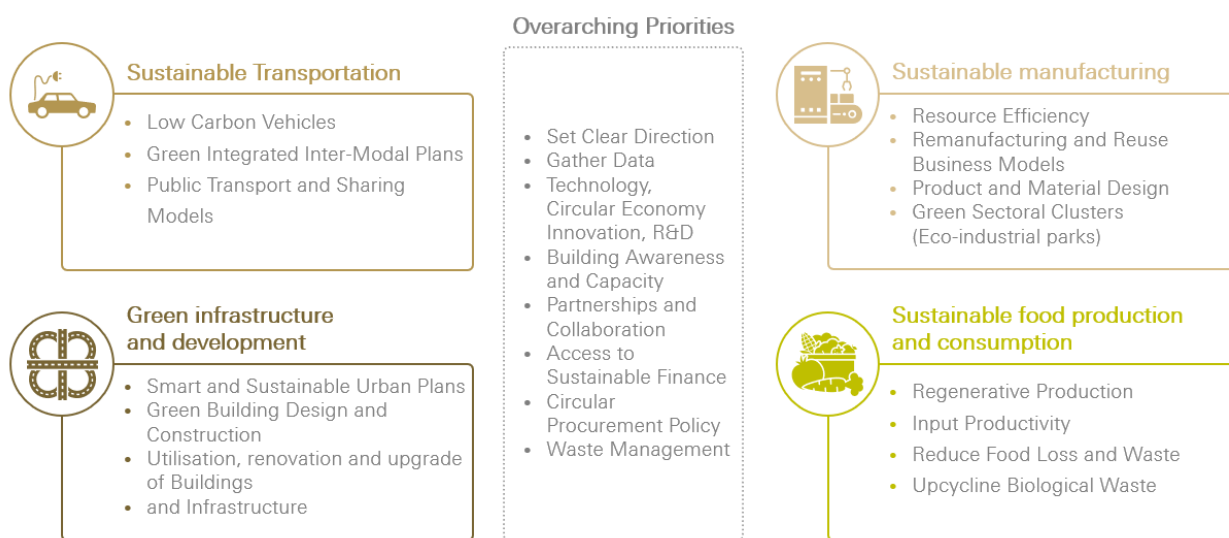


Figure 26: Priority sectors for the UAE circular economy policy (UAE circular economy policy)

In line with the UAE’s circular economy objectives, the nation plans to ban single-use plastic bags in 2024.²³⁹ In Abu Dhabi, single-use plastic bags have already been banned since 2020 and the emirate will also ban Styrofoam containers starting 2024²⁴⁰.

The UAE is also working to enact an integrated waste management plan by proposing and developing waste policies and legislation such as the National Integrated Waste Management Agenda. The nation also seeks to reduce the number

of landfills by improving waste management, with a goal of reaching 50% treatment of MSW by 2025 and 80% by 2031. The individual emirates also have several strategies in place, most notably the Dubai Integrated Waste Management Masterplan 2021-2041, the Dubai Waste Minimization Strategy 2020-2041, the Abu Dhabi Integrated Waste Management Masterplan, and Abu Dhabi’s Policy for Energy Production from Waste, to advance landfill diversion.²⁴¹

²³⁶ UAE Circular Economy Policy 2021-2031

²³⁷ Ellen MacArthur Foundation, Circular Economy

²³⁸ UAE Circular Economy Policy 2021 - 2031

²³⁹ UAE Circular Economy Policy 2021 - 2031

²⁴⁰ Environment Agency Abu Dhabi: Single Use Plastic Policy

²⁴¹ Examples of further initiatives are included in UAE Third Update of Second NDC.

New Policies to Reach Net Zero in the Waste Sector

The UAE Net Zero by 2050 Strategic Initiative builds upon existing policies while introducing new policies to close the gap towards net zero. The UAE plans to enact these new policies prior to 2025.

Policies to Increase Landfill Diversion through Recycling and Reuse

Federally coordinated awareness campaigns for household waste reduction and recycling will also be launched to educate the population on the 'why' and 'how' of household waste segregation. These policies will help the UAE to achieve a minimum recycling rate of 90% by 2035.

1. Policy for Recycled Material Use

The UAE will introduce a national policy to incentivise recycling and reuse of certain materials. This policy will first mandate reuse of construction and demolition waste (CDW) in construction projects, targeting a minimum recycling rate of 90% by 2035. Later, it will set a minimum percentage of recycled content for drinking bottles sold in the UAE, and a ban on single-use plastic across the nation. Single-use plastic is already prohibited in Abu Dhabi.

Policies to Support Capturing Landfill Gas at Existing Landfills

2. Monitoring and Enforcement of Segregation and Dumping; Higher Landfill Gate Fees

The UAE will introduce a federal policy that sets a minimum gate fee for landfills. Emirate-level regulators will continue to set the actual (potentially higher) gate fees in line with a minimum fee level. To avoid increased illegal dumping as a side-effect of higher fees, the national policy will strengthen monitoring and enforcement of segregation and dumping laws. The plan requires increasing surveillance and/or required audits of expected versus actual waste disposal.

3. Recycling Incentives

The UAE will adopt a deposit scheme on bottles and cans to increase recycling rates for MSW and divert waste from landfills. The policy will introduce a fee on drink containers that is refunded to consumers once they return the container to the store. The scheme will be implemented by the seven Emirates accordingly.

Lighthouse Initiatives in the Waste Sector

The Middle East's First Waste to Hydrogen Plant

One of the largest waste management and environmental services companies in the UAE (BEEAH Group) has partnered with innovative international companies to construct the Middle East's first waste to hydrogen plant in Sharjah. The plant will be able to transform waste wood and plastic into fuel-cell grade green hydrogen. The plant will also have an on-site green hydrogen station able to fuel multiple vehicles.²⁴²



Umm Al Quwain and Sharjah's Refuse Derived Fuel (RDF) Plant

The Umm Al Quwain RDF plant started operation in 2023 and receives 1,000 tonnes of municipal waste per day from the residents of Umm Al Quwain and Ajman. The waste is converted into RDF, effectively diverting 90% of household waste from landfills. The produced RDF is then used as fuel in cement factories, further contributing to the decarbonisation of the heavy emitting industrial sector. Sharjah also opened a solid recovered fuel facility in 2022 to transform commercial residual waste into green fuels for cement production. Cements producers in Fujairah and Sharjah are already committed to off-taker agreements for RDF fuels.

²⁴² Beeah, BEEAH Group and Chinook Sciences Partner with Japan's Air Water Inc. on First Waste to Hydrogen Plan



Waste-to-Energy Plants

The nation's first 30 MW waste-to-energy plant began operating in Sharjah in 2022, while Abu Dhabi is planning a 70 MW waste-to-energy facility.

Dubai Municipality will also soon be home to a 200 MW waste-to-energy plant developed in a partnership with a private consortium. It is expected to convert 45% of the emirate's MSW (~5,500 metric tonnes per day) into renewable energy. In its first phase, five treatment lanes will be able to process 2,000 metric tonnes a day, producing 60 MW of energy. Full operations are planned for 2024.



Material Recovery Facilities (MRF)

MRFs have been launched in Dubai, Ras Al Khaimah, Sharjah, and Ajman. The UAE's largest MRF, in Sharjah is among the largest producers of recycled plastics in the world. In 2018, it was updated to boost production and energy efficiency. A super-efficient commercial and industrial waste recycling facility, equipped with robotics and artificial intelligence, was also launched in Sharjah in 2022. The advanced technology can automatically identify and segregate various types of waste. Abu Dhabi MRF Facility is under planning phase with a proposed design capacity of 2.5 Million Tons of waste in Abu Dhabi and 750,000 Tons of waste in Al Ain.²⁴³

²⁴³ Beeah, Ultra-efficient Material Recovery Facility becomes world-leading producer of recovered plastics.



UAE Aluminium Recycling Coalition by EGA

EGA has recently established an Aluminium Recycling Coalition, which includes several industry members. The coalition has crafted a list of priority actions aimed at promoting aluminium recycling in the UAE and instilling a culture of recycling within the community. The overarching objective is to preserve this valuable resource within the country, thereby enhancing the local economy while simultaneously minimising landfill waste.

8.6 Decarbonisation of Agriculture

Current Landscape

The agricultural sector emitted 6 MtCO₂e of GHGs in 2019, when accounting for power and water used by the sector. Energy use on farms, manure management, enteric fermentation (animal digestion), and soil emissions due to fertiliser use were the primary drivers of these emissions. The UAE will need to solve for two key challenges as it pushes to decarbonise this sector in upcoming years.

- 1) Food security is a critical concern for the UAE. Consequently, the nation launched a National Food Security Strategy to increase local production of selected items²⁴⁴ by up to 15%, thereby strengthening food self-sufficiency.
- 2) Demand for agricultural products is expected to grow in line with the UAE population.

When coupled, these factors will demand use of additional agricultural land (reported at 5.5% of the UAE's total land area in 2020),²⁴⁵ potentially leading

²⁴⁴ Selected food items include fruits (apples, bananas, dates), vegetables (leafy greens, tomatoes, potatoes, cucumbers), grains and pulses (pulses, rice, wheat, sugar), oils, livestock products (beef, sheep and goat, poultry, milk, eggs), and fish.

²⁴⁵ The World Bank, Agricultural land (% of land area), United Arab Emirates (2020)

to more emissions. Despite this, the UAE expects to reduce emissions from the agriculture sector as it moves towards net zero in 2050.

Key Climate Actions to Reach Net Zero in the Agriculture Sector

Decarbonising the power grid will be the main lever to reduce emissions in the agriculture sector, since electricity and water use in farms drives most of the sector’s current emissions. Besides this, the UAE will control the use of chemical fertilisers and apply more efficient nitrogen fertilisers, actions which are identified by global research and as essential to decarbonising agriculture and increasing food security.²⁴⁶ Over the longer term, the UAE will also administer diet supplements (including potentially so-called methane pills) for livestock, to further push decarbonisation.

GHG reductions by measure in agriculture sector

GHG emissions, MtCO₂e

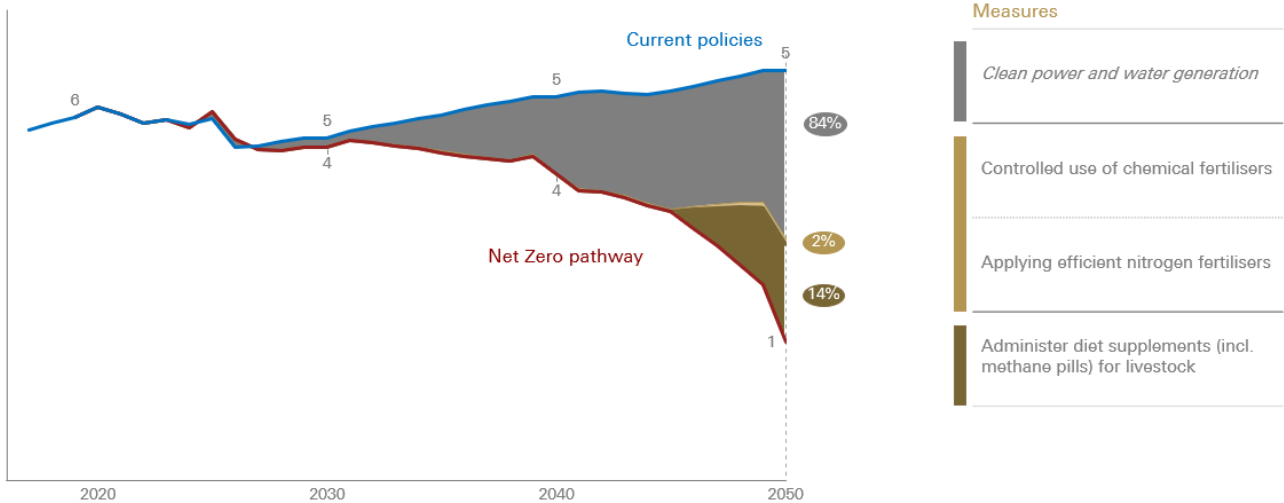


Figure 27: Agriculture net zero pathway (UAE Net Zero by 2050 Strategic Initiative)

#1 Clean Power and Water Generation

The decarbonisation of power and water generation will contribute to 82% of the GHG emissions reductions in the sector by 2050.

#2 Controlled/Efficient Use of Chemical Fertilisers

Farmers in the UAE (as in many places in the world) tend to over-apply synthetic fertilisers, creating excess emissions. Sustainable farming practices can reduce the application of synthetic fertilisers by up to 13% every year between 2030-2050. Half of the excess fertilisation is assumed to be mitigated simply by optimised timing and placement, without the need for technological interventions.

Combined with the application of efficient nitrogen fertilisers, this measure is expected to account for 2% of GHG emissions reductions in this sector by 2050. Besides this, it will help farmers to save money by reducing fertiliser use and help prevent excess nitrogen fertilisers from reaching the soil and polluting aquifers. This improves soil quality and ultimately food security.

#3 Applying Efficient Nitrogen Fertilisers

²⁴⁶ World Economic Forum, Here’s how fertiliser could be produced more sustainably

Improving the formulation of nitrogen fertilisers will reduce N₂O emissions and CO₂ emissions from synthetic (and urea-based) fertiliser application. This includes adding nitrification and urease inhibitors or slow-release coatings, which can be beneficial for reducing nitrogen losses and improving nutrient uptake efficiency.

This measure is expected to be adopted starting in the 2040s, and the share of synthetic low-emission fertilisers should reach 100% in 2050. This accounts for the time it takes for farmers to familiarise themselves with optimal fertiliser formulations and techniques. Aside from reducing emissions, this measure will prevent excess nitrogen levels.

Combined with measure-controlled use of chemical fertilisers, the application of efficient fertilisers will account for 2% of GHG emissions reductions in this sector by 2050.

#4 Administer Dietary Supplements for Livestock

Emissions from the agricultural sector include CH₄ and N₂O emissions from cattle's digestive processes. Dietary supplements can be administered to animals (including cows, goats, and sheep) to reduce these emissions. Methane pills have a CH₄ abatement potential of 45% per animal, while supplements that reduce N₂O emissions are assumed to have an abatement potential of about 25% per animal.

The UAE expects to adopt these practices in the 2040s. This also allows the time for farmers to familiarise themselves with different supplements and their application.

Diet supplements for livestock are expected to be responsible for 14% of GHG emissions reductions in the agriculture sector in 2050.

Climate Policies to Reach Net Zero in the Agriculture Sector

Existing Policies that Support Decarbonisation in the Agriculture Sector

The UAE is taking measures to decarbonise this sector by setting targets for water consumption, modernising agricultural practices, and promoting domestic food production. At the federal level, in 2020 the UAE Cabinet approved the national system for sustainable agriculture to enhance the efficiency of farms, increase self-sufficiency from targeted agricultural crops to 5% annually, and achieve a 15% annual reduction in irrigation water consumption.²⁴⁷ In parallel, the Ministry of Energy and Infrastructure has developed the National Efficient Irrigation Guidelines to improve the efficiency of irrigation systems and their maintenance. Moreover, the National Food Security Strategy 2051 aims to develop a sustainable national food production system by implementing resilient agricultural practices through the use of modern farming technologies.²⁴⁸ Besides this, the

UAE aims to ensure access to safe and nutritious food and achieve a 100,000-tonne increase in domestic production of strategic food items.²⁴⁹

Emirates are implementing similar initiatives. Abu Dhabi, for instance, launched the Agriculture and Food Safety strategic plan for 2022-2025 to increase the efficiency of its sustainable agricultural production.²⁵⁰

New Policies to Reach Net Zero in the Agriculture Sector

The UAE approved a policy package to support decarbonisation of the agriculture sector. It expects to implement initial policies in 2023 and 2024 and plans to consider further ones in the longer term.

Policies to Support Controlled Use of Chemical Fertilisers

1. Awareness Campaigns for Reduced Decarbonisation in Agriculture

The UAE will develop an awareness campaign for sustainable farming practices to reduced use of

²⁴⁷ UAE Government portal

²⁴⁸ UAE National Food Security Strategy 2051

²⁴⁹ Further detail can be found in Chapter 8 'Food systems in the UAE.'

²⁵⁰ Further detail is included in the UAE Third Update of Second NDC

excess fertiliser. The campaign will be directed towards farmers and agriculture companies to educate them about the correct and efficient use of synthetic fertilisers, including their optimal timing and placement.

For the longer-term (post 2030), the UAE expects to consider support and mandates for efficient nitrogen fertilisers and diet supplements for livestock.

Lighthouse Initiatives in the Agriculture Sector

Building Emirates' Bustanica, the World's Largest Vertical Farm

In 2018, Emirates Flight Catering (EKFC) and Crop One — an indoor vertical farming company — signed a joint venture to collaboratively build the world's largest vertical farm in Dubai. The state-of-the-art technology adopted at the vertical farm uses alternative energy sources and can produce fresh produce using 99% less water than conventional farming. The farm operates on a closed-loop water recycling system whereby the incoming water source is purified on-site and recycled throughout the farm. Vertical farming techniques also require less space than traditional farming, reducing the pressure on land use. The facility, which produces over 2,700 kg of pesticide-free leafy greens per day, has been delivering its products to customers in the UAE since 2021.



The First Hydroponic Farm in the Middle East

Abu Dhabi is also home to Gracia Farms the first hydroponic farm in the Middle East. Hydroponic farms can grow plants without soil, instead relying on a nutrient-rich water solution. The farm uses advanced agricultural practices to grow multiple types of leafy greens and is seven times more efficient than a typical UAE greenhouse farm and

over 30 times more efficient than traditional field farming.



EGA's Bauxite Residue Conversion to Soil Production

EGA is set to begin construction of a pilot plant that will refine bauxite residue — a waste product of alumina refining — into "turba" soil products, that will be used for agricultural, landscaping, gardening and other purposes. The plant will be the first of its kind globally and represents the adoption of a breakthrough technology in the UAE as well as a step forward for the agricultural sector, which struggles due to the arid climate.



8.7 Negative Emissions

The UAE can and will deliver on net zero by 2050 interim and final GHG reduction targets within its own borders. The country considers international offsets (Article 6 / ITMO) as an option of going

beyond that effort.²⁵¹ For domestic negative emissions, it plans to leverage both natural solutions (mangroves) and technology (DAC) to remove any residual emissions which cannot be abated.²⁵² Although currently not recognized, the UAE makes efforts to enhance natural capital accounting (such as blue coastal ecosystems) in GHG inventories to realize their mitigation and adaptation co-benefits at full.

Mangroves will be instrumental in the UAE's negative emissions efforts. Currently, the nation has a stock of approximately 60 million mangroves, which occupy around 18,000 hectares of land and have an annual sequestration potential of about 1 MtCO₂e. In order to protect and restore mangroves, government and private entities have been implementing various initiatives²⁵³. Domestically, the UAE aims to utilize all available land for mangrove plantation, achieving 200 million mangroves by 2050 and thereby, growing the biocapacity sink to 3.5 MtCO₂e per year. Internationally, the UAE is working to establish the Mangrove Alliance for Climate (MAC)²⁵⁴ to accelerate mangrove conservation, restoration, and resilience.²⁵⁵

To attain net zero by 2050, the UAE plans to use DAC technology to complement the mangroves. Currently, DAC is projected to provide negative emissions of 9.5 MtCO₂e per year by 2050.

Perspective: The Direct Air Capture Opportunity

DAC technologies remove CO₂ directly from the atmosphere and either permanently store it in deep geological formations or use it for other purposes (e.g., CO₂ can be combined with hydrogen to produce synthetic fuels).²⁵⁶

In the UAE, DAC technology will be used in two main ways. First, in combination with mangroves, it can address outstanding emissions after sector-level measures are deployed. Second, it offers three exceptional commercial opportunities that the UAE can seize, to:

1. Export DAC technology.
2. Produce synthetic fuels, which are a growth opportunity, since 65% of aviation fuel is projected to be Sustainable Aviation Fuel by 2050.²⁵⁷
3. Export offsets. This is subject to future re-assessment since rules and guidance in this field are still being developed.

The last option is particularly appealing, since DAC can be seen as a high-quality carbon offset. It offers a more permanent solution to store carbon when compared with nature-based solutions and is consequently perceived as more trustworthy by customers. Moreover, the demand for high quality carbon offsets is growing, and supply shortages are expected. At the same time, the UAE has the potential for a first-mover advantage on DAC, due to its cheap green energy and abundant CO₂ storage potential.²⁵⁸ This leads to a lower levelised cost of DAC that by 2030 should undercut other regions by \$10-15/tCO₂e.²⁵⁹

Combined, these advantages can make the UAE a leader in carbon offsets through DAC scaling. This would reinforce the previously mentioned benefits of economic diversification, job creation, and upskilling of the UAE's society, further realising the UAE's net zero opportunity.

8.8 Cross-Interaction Among Sectors

Reaching net zero requires considering economic sectors in isolation to understand their functioning and the associated decarbonisation measures needed to tackle emissions. At the same time, it also demands a holistic understanding of the connections between economic sectors, since actions taken in one can influence others.

When considered holistically, it is evident that net zero cannot be achieved unless decarbonisation occurs across all sectors. The most striking example of this is the decarbonisation of power and water generation. All sectors require utilities to function,

²⁵¹ Further explored under 6.1 'The UAE's Perspective on the Ambitions of the Current Target'

²⁵² Additional nature-based solutions (e.g., coastal lagoons including sea grass beds or salt marshes) to be explored in future analysis.

²⁵³ E.g., National Carbon Sequestration Project by MOCCA; Priceless Planet Coalition by Emirates Nature-WWF and Mastercard

²⁵⁴ Mangrove Alliance for Climate (MAC)

²⁵⁵ Further details on existing initiatives can be consulted in UAE Third Update of Second NDC

²⁵⁶ International Energy Agency (IEA)

²⁵⁷ IATA

²⁵⁸ Given UAE's vast saline aquifers and oil fields (where CO₂ can also be used for enhanced oil recovery), storage availability is estimated at 300+ years assuming UAE's CCS + DAC abatement capacity in 2050. Further geological research will be needed to establish feasibility and capacity in detail.

²⁵⁹ IEA WEO 2021, IEA 2022 DAC report, IATA Net Zero 2050

consequently, if power and water generation is not decarbonised, the remaining sectors likewise cannot be fully decarbonised. This is especially relevant for buildings and waste, where power accounts for a significant percentage of emissions.

Other cases can be found across sectors. For instance, updating building regulations to push for more efficient new buildings or for retrofits may impact the industrial and waste sectors if regulations include mandates for the use of green materials (green cement, for instance) and recycling building materials. Moreover, CCS deployment in waste-to-energy facilities and across other industries may support the development of synthetic fuels that require carbon as an input. This can in turn accelerate fuel substitution in the transport sector.

All in all, it is critical that net zero encompasses the whole economy. This likewise requires following a whole-of-society approach to effectively deploy the policies that will enable decarbonisation measures across sectors at speed.

9 UAE Net Zero Impacts

9.1 Net Zero Impact in UAE's Outlook

Implementing net zero will generate several positive impacts for the UAE across environmental, economic and societal dimensions:

- 1) From the environmental perspective, air quality will improve due to the cross-sector reduction in emissions. Heavy industry and transport will be leading contributors, the latter also supporting lower noise pollution levels. Better building construction and increases in retrofits will also improve indoor air quality and noise levels. Soil quality will rise, thanks to better waste management and improved fertiliser use. This will, in turn, enhance the quality of water from underground sources.
- 2) On the economic side, net zero can result in a GDP increase of 630 billion AED²⁶⁰ (1.8% additional GDP) in the 2022-2050 period. The increase in exports driven by the creation of new technologies, products, and capabilities (green cement and aluminium, hydrogen, CCS and

DAC technology and knowledge, among others) can add further 400 billion AED, leading to a total of 1.03 trillion AED in GDP growth (3% additional GDP) over the stated period. The UAE Net Zero by 2050 Strategic Initiative also aims to create an average of 160,000 jobs between 2025 and 2050 and future-proof an additional 40,000 jobs. When considering exports, this figure increases to 270,000 jobs.

- 3) On the societal level, and as has been reiterated across this document, net zero will deliver a better quality of life for everyone. It will improve citizens' health due to better air quality, reduced congestion and noise pollution, promotion of more active lifestyles (through mixed-use developments and an increase in walking and cycling), and increased food security (through deployment of measures in the agriculture sector). It will create better living conditions, through greater quality of buildings, improved city design and greater availability of green areas. Finally, it will raise the populations' skill level with the spread of knowledge from new industries and an increase in the level of awareness on climate change and its impacts.

9.2 Looking Forward: the UAE's Commitments to Just Transition

Since the industrial revolution, the use of fossil fuels globally has allowed for extraordinary growth and advancement. Yet, this progress came at the cost of increased climate impact that nations across the globe now must face. Countries need to act quickly to build a future that is liveable for all and avoid irreversible consequences of climate change. However, the transition to a net zero economy and society must happen in a just and inclusive way that considers all communities, workers, and groups.²⁶¹ Along these lines, the International Labour Organisation (ILO) defines just transition as 'greening the economy in a way that is as fair and inclusive as possible to everyone concerned, creating decent work opportunities and leaving no one behind.'

The concept of just transition emerged because the phasing-out of high-emissions industries required displaced workers to receive the tools and

²⁶⁰ Real GDP, discounted at 4%, in the 2022-2050 period. Does not consider the impact of exports.

²⁶¹ UNDP Climate Promise: What is just transition? And why is it important?



opportunities to transition to other occupations. For instance, around 6 million jobs in coal-powered electricity, petroleum extraction, and other sectors globally are estimated to disappear by 2030. Simultaneously, a low-carbon economy employs more people and is more labour-intensive than one based on high-carbon and material intensity.²⁶² Thus, advancing towards a greener economy will have an overall positive net impact on employment levels globally. Yet the net zero journey will also entail a reallocation of employment across industries,²⁶³ and many of the new sustainable jobs will require new skills. Alternative jobs will not only have to ensure acceptable living wages, but also proper workplace safety and health benefits.²⁶⁴

Just transition is also closely related to the support of developing countries. Around half of the world's oil and gas is produced by middle-income, developing countries, which are economically dependent on the prices of their exports. In addition, these countries are the ones most vulnerable to the impacts of climate change, as explained in Chapter 7.2, 'Shielding Vulnerability: Importance of Adaptation for Vulnerable Groups and Regions.'

Considering this, guaranteeing a just transition is of particular importance for emerging markets, such as the UAE, which are looking to move away from a historic reliance on fossil fuels. Just transition principles are reflected in the UAE's efforts to future-proof all sectors of its economy, particularly high-carbon ones such as steel, aluminium, and cement. The nation is already acting on this through its low-intensity hydrocarbons and investments in new technologies such as CCS and hydrogen.

The UAE is also committed to 'leaving no one behind,'²⁶⁵ even beyond its own borders. The nation is providing support and financial aid to developing nations to facilitate the adoption of emissions reduction technologies and alleviate the damage caused by climate-related natural disasters. Renewable energy projects spanning 70 countries have received over \$50 billion in investments from the UAE, and additional investments of \$50 billion are planned by 2035. In 2021 alone, UAE's Foreign

Direct Investment outflows amounted to \$23 billion, with renewable energy as one of the focus areas.²⁶⁶ The nation is also contributing to the Energy Transition Accelerator Financing (ETAF) platform collaboration with IRENA to support the green transition of developing countries.²⁶⁷ Additionally, the nation provides humanitarian aid to regions affected by natural disasters exacerbated by climate change, and it also plays an important role as a hub for United Nations humanitarian response operations based in the International Humanitarian City in Dubai.²⁶⁸

The UAE plans to continue its domestic and international efforts in the future, to accelerate just transition at global scale.

10 The UAE's Commitment to Ambitious Targets

10.1 The UAE's Perspective on the Ambitions of the Current Target

The UAE views climate action as imperative and is taking major steps to strengthen its climate actions:²⁶⁹

- 1) The nation has previously committed to decarbonise leading up to 2030 through its various NDCs (four submitted so far, with the first in 2016), which have been consistently increasing in ambition. This LTS builds upon these events and is the first time the UAE provides details on the longterm targets up to 2050.
- 2) Targets are legally binding in domestic law. The UAE's net zero pathway has been approved by the UAE Cabinet, the highest executive power in the nation. Following this, the UAE Cabinet has also approved proposed policy levers to reach net zero.
- 3) Targets separate emissions reductions and removals. As demonstrated in Chapter 4, 'Sectoral Roads Towards Decarbonisation,' the UAE will prioritize sectoral mitigation. Only

²⁶² International Labour Organization (ILO): Employment and the role of workers and employers in a green economy

²⁶³ Ibid.

²⁶⁴ UNDP Climate Promise: What is just transition? And why is it important?

²⁶⁵ Speech delivered by Sheikha Lubna bint Khalid Al Qasimi, at the time Minister of International Cooperation and Development, during her participation to the Sustainable Development Goals 2015 Summit

²⁶⁶ MOE

²⁶⁷ IRENA, ETAF

²⁶⁸ The UN RCO in the UAE

²⁶⁹ Most explored parameters aligned to international guidance on good practices for national net zero target setting. Climate Action Tracker, Evaluation methodology for national Net Zero targets

afterwards will it resort to negative emissions measures via the expansion of mangroves and deployment of DAC technology.

- 4) Targets will follow a legally binding review process at regular intervals. This was approved by the UAE Cabinet as part of the details of the UAE Net Zero by 2050 Strategic Initiative.²⁷⁰
- 5) Targets are backed-up by a comprehensive series of policies that will be implemented up to 2050, most of which will be deployed in the near term. The UAE will also work on a series of enablers to further support net zero. These include finance, technology and innovation, capability building, and public engagement.²⁷¹
- 6) Targets include transparent and scientifically robust assumptions on LULUCF and carbon removals and storage.²⁷²
- 7) The UAE is a developing country with sustained growth. It thus expects population and economic growth of 21% and 91%,²⁷³ respectively by 2050, compared to 2022 values. This includes growth in sectors considered to be heavy emitters. Despite this context, it is expected that emissions have already peaked during the period 2019 to 2022.²⁷⁴
- 8) Delivering on these targets will push the limits of technical feasibility in some sectors. For power and water generation, the UAE will deploy tens of gigawatts of PV power and scale distributed generation, while also accounting for land availability and maintaining stability of the power grid. In the transport sector, the nation plans to nearly double rail infrastructure over the next decade. Advancing technological development of CCS and low-carbon hydrogen will be critical to decarbonise heavy emitting industries. These are among the examples of boundaries that must be surpassed to materialise the UAE's net zero ambition.
- 9) The UAE can and will deliver on net zero by 2050 interim and final GHG reduction targets within its own borders. The country could consider international offsets (Article 6 / ITMO)

as an option of going beyond current effort or to achieve net zero in adverse local circumstances. Voluntary cooperation under Article 6 of the Paris Agreement is deemed beneficial, and if used, it would be additional to the domestic efforts shown and would only be undertaken in a framework that guarantees environmental integrity, shows highest possible ambition, and ensures that it does not transfer responsibility for making deep emission reductions to other countries. Also, the UAE will support national stakeholders who would pursue high integrity emission reduction/removal projects compliant with the Article 6.

10.2 The Need for LTS-NDC Alignment

Under the Paris Agreement, countries are required to communicate NDCs while being encouraged to also develop LTSs. The UAE believes that the LTS is an important means of signalling the direction and pace of decarbonisation.²⁷⁵ UAE's latest NDC and LTS documents released in 2023 are underpinned by the whole-of-government effort to develop the UAE Net Zero by 2050 Strategic Initiative. The UAE considers it to be important to communicate both the NDC and LTS in parallel to demonstrate a coherent narrative to domestic and international stakeholders, since the two documents are closely related. An LTS can inform near-term decisions by setting a long-term vision of where a nation's development trajectory should go. In turn, an NDC can help make that vision a reality by embodying a nation's short- and medium-term commitments in a way that is consistent with LTS goals. Several other benefits can come from LTS-NDC alignment.²⁷⁶

- 1) It avoids risks of considering conflicting inputs, such as by investment in technologies that may make the achievement of long-term goals more difficult. If an LTS is already developed and aligned with the NDC, countries will cut costs by avoiding near-term investments in inappropriate infrastructure that will require later phase-out.
- 2) It allows for the alignment of goals, modelling, and analysis. If the LTS and NDC are based on the same modelling used to develop

²⁷⁰ This process is currently under development. Initial details are included in Chapter 10.7, 'Evolving Net Zero – Monitoring, Reporting and Verification Mechanism.'

²⁷¹ Detailed in Chapter 10, 'Enablers to Reach Net Zero.'

²⁷² Included in the technical details provided in UAE's Third Update of Second NDC.

²⁷³ Expected population growth and real GDP growth from 2022 to 2050. Based on projections from Oxford Economics.

²⁷⁴ As detailed under 2.3 'UAE's position to act on climate change.'

²⁷⁵ World Resources Institute, Climate Action for Today and Tomorrow: The Relationship between NDCs and LTSs

²⁷⁶ World Resources Institute, Climate Action for Today and Tomorrow: The Relationship between NDCs and LTSs

decarbonisation pathways, 2050 and 2030 targets can be set using the same data and therefore, contribute to the same goals.

- 3) It facilitates prioritisation of actions to take and policies to implement. If a country already has an LTS, it likely knows the decarbonisation measures and policies to implement to reach long-term targets. It can then prioritise the most critical ones up to 2030 and focus NDC updates on those.

In fact, the UAE's Third Update of Second NDC is aligned with the present LTS. Both were developed considering the same decarbonisation pathway, and thus rely on the same data, modelling, and qualitative inputs. In this sense, targets presented in this document (from 2030 onwards) complement the ones from UAE's Third Update of Second NDC (up to 2030). This LTS thus presents broader plans and discloses the visionary angle that the UAE will adopt to achieve both its short- and long-term goals.

10.3 Managing the LTS as a Living Document

In light of the Paris Agreement, parties are invited to update their LTS regularly, as appropriate, and in line with best available science.²⁷⁷ Reviewing the LTS is important to ensure strategies consider updates to domestic policies, the changing emissions profile of the nation or of the global economy, international climate negotiations, the

latest climate science, new information and projection tools, assessments of LTS effectiveness to drive near-term action, innovation, research and demonstration updates, and evolving costs of technologies.²⁷⁸

While this LTS provides a direction and a roadmap for the UAEs climate action, the UAE also recognises that multiple assumptions behind its UAE Net Zero by 2050 Strategic Initiative may evolve with time. Examples include assumptions on the maturity, cost, and emissions intensity of technologies, UAE-specific inputs such as population and GDP growth, impact of decarbonisation measures in observed emissions, global energy prices and developments, and potential and regular increase of climate action ambition as enshrined in the Paris Agreement.

The need to update the LTS also provides an opportunity to align it with the mandatory five-year cycle review process for the NDC. Considering this, the UAE will update this LTS every five years in alignment with the NDC update process. NDCs to be submitted by the UAE on dates near to LTS submissions shall be developed considering updated LTS content.²⁷⁹ The UAE expects to update its NDC in 2025 in line with the decision taken in Glasgow on common time frames. As such, the nation may consider an LTS update by this date, and 5-year cycle updates for both documents afterwards.

²⁷⁷ Decision 1/CMA.3, paragraph 33. All States that are Parties to the Paris Agreement are represented at the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA).

²⁷⁸ World Resources Institute, Good Governance for Long-term Low-emissions Development Strategies

²⁷⁹ If the UAE decides to update NDCs outside of the mandatory five-year review cycles, those shall refer to the previously submitted LTS or increase its ambition.

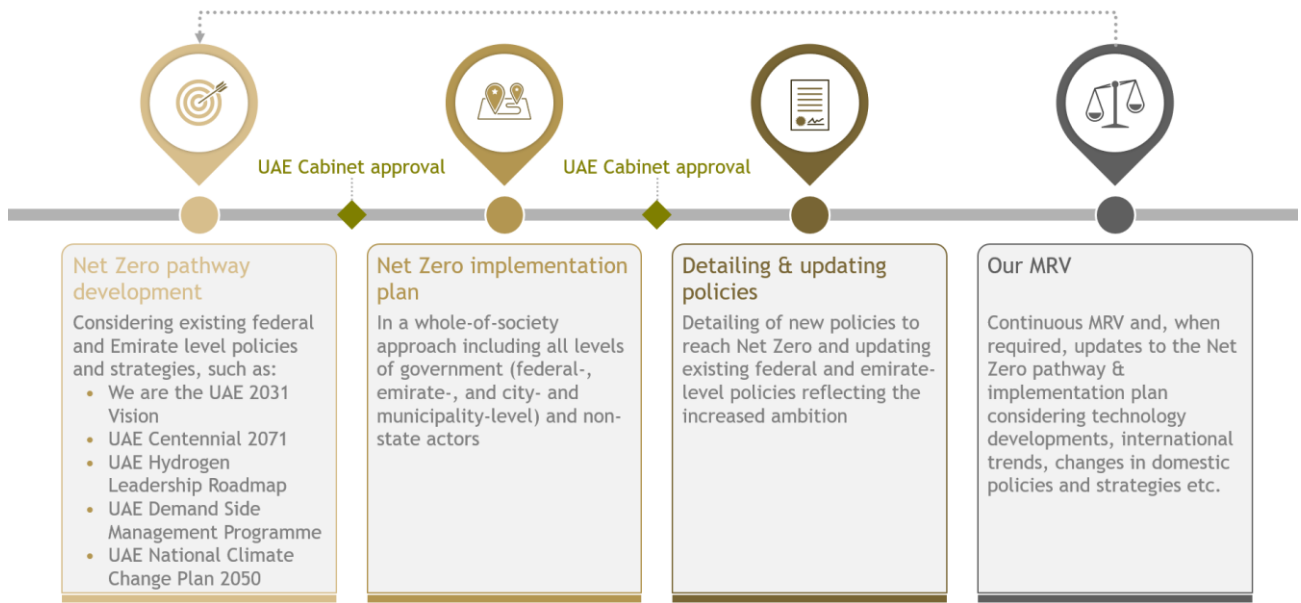
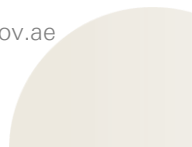



Figure 28: Net Zero development and update cycles (UAE Net Zero by 2050 Strategic Initiative)





Section 3: Why is Adaptation critical for Net Zero?

Section 3: Why is Adaptation critical for Net Zero?

11 The Role of Climate Change Adaptation in the UAE

The UAE understands climate change adaptation is a necessity and not merely a choice. The level of warming already built into the global climate system is enough to already impact the well-being of the country's population, economic growth, and environment today.²⁸⁰ Moreover, climate change impacts will fall upon the private sector just as much as the public. Climate change phenomena can disrupt supply chains and business operations, negatively impacting income and causing a loss of assets as a result. The far-reaching impacts of climate change are well-documented, including its negative effects on water scarcity, food production, human health, and the infrastructure of cities worldwide. The harsh realities of this global crisis underscore the need for swift and decisive action to safeguard the well-being and resilience of our world and its inhabitants.

Lowering emissions and removing GHGs from the atmosphere are key components of mitigating climate change. Given the current and future state of climate change, it is simultaneously necessary to adjust systems and societies to withstand the impacts of a changed climate. To accomplish this, the UAE commenced the development of its National Adaptation Plan (NAP) in 2022. The NAP process was established under the Cancun Adaptation Framework (CAF) and asks countries to formulate national adaptation plans that identify medium- and long-term adaptation needs and to implement strategies and policies to address such needs.²⁸¹ With the development of its National Adaptation Plan, the UAE is aiming to build its adaptive capacity and resilience and reduce the impact of climate change's adverse effects.

The Ministry of Climate Change and Environment of the UAE has already started working to understand the effects of climate change on the country by

conducting an evaluation of the potential climate risks that the wider Arabian Gulf region faces and the impact of those risks on infrastructure, public health, water, agriculture, and the environment.²⁸² The findings that emerged from the National Climate Change Adaptation Program are detailed in Chapter 7.3, 'The UAE's Current Commitment to Adaptation.'

11.1 The Future We Face: Global and Local Impacts of Climate Change

Global average temperatures have already risen by 1.1 °C above pre-industrial levels and are likely to exceed 1.5 °C in the near-term, making it harder to limit warming to 2.0 °C based on current mitigation commitments.²⁸³ The effects of this are already clearly visible worldwide (as described in Chapter 1.2, 'Global Impacts of Climate Change'); however, the MENA region is one of the most vulnerable to climate change impacts which are already impacting citizens, infrastructure, and the environment.²⁸⁴

Various studies have produced estimates of the average temperatures that could be reached in the UAE and the region. The exact nature of impacts will depend on global mitigation pathways. Yet, given current trajectories and stated policies, most studies envision an increase in average temperatures in the Arab region. Studies indicate that future temperatures will increase by 2-3 °C in land areas — with smaller increases in the coastal areas — by 2060–2079.²⁸⁵ With higher temperatures, higher evaporation is also expected, leading to higher humidity. Average humidity in the UAE already stands at 50-60% in coastal areas and 45% in inland ones. Humidity levels are projected to see a 10% increase over the Arabian Gulf, with more significant alterations during summer months.²⁸⁶ Humidity represents an important factor on how humans experience heat. Recent scientific investigations suggest that certain regions across the globe may have already reached the limit values of human

²⁸⁰ National Climate Change Plan of the United Arab Emirates 2017-2050

²⁸¹ UNFCCC

²⁸² The UAE State of Climate Report 2021: A Review of the Arabian Gulf Region's Changing Climate & Its Impacts

²⁸³ IPCC Sixth Assessment Report (AR6)

²⁸⁴ The UAE State of Climate Report 2021: A Review of the Arabian Gulf Region's Changing Climate & Its Impacts

²⁸⁵ Abu Dhabi Global Environmental Data Initiative (AGEDI)

²⁸⁶ AGEDI

endurance for temperature and humidity during brief periods, as measured by the wet-bulb temperature (WBT).²⁸⁷ The threshold of concern for human beings is set at a WBT of 35 °C, approximately equivalent to an air temperature of 40 °C with a relative humidity of 75%. In such conditions, a healthy person could only survive for six hours, as it would become impossible to regulate one's internal body temperature by sweating because the air is saturated with water and less evaporation can occur. Thus, the already-warm region the UAE is situated in could become even more humid, reaching conditions where human health is endangered.

With global surface temperatures increasing, most tropical regions are expected to experience higher intensity and frequency of rainfall. However, while precipitation is projected to increase in the UAE, the number of wet days is expected to decrease, implying more intense rain events but also longer dry spells.²⁸⁸

The Arabian Gulf seawater temperature is projected to rise on average from 28.5 °C (in 2015) to 30.7 °C by 2100, with maximum temperatures set to reach 31.8 °C.²⁸⁹ Higher atmospheric temperatures will likely increase salinity and pH levels due to greater evaporation and absorption of CO₂. This has a twofold effect. Firstly, warmer temperatures are going to affect oceans and the marine ecosystem, since seawater is expected to be hotter, disrupting ocean stratification (the interplay between warmer, less salty, less dense water and colder, saltier, denser water) and increasing acidification, with impacts on marine organisms, fisheries, and ecosystem services (e.g., carbon sequestration, nutrient cycling, and recreational opportunities).²⁹⁰

Additionally, thermal effects and melting glaciers are also expected to cause sea levels to rise.²⁹¹ While research focused on the Arabian region is inconclusive regarding the extent of this phenomenon in the Gulf, researchers agree that sea levels will continue to rise in the coming years and decades, with global mean sea level rise found to be 3.7 mm/year between 2006 and 2018.²⁹² This is of

particular relevance for the UAE, since around 85% of the population and more than 90% of its infrastructure are located in low-lying coastal areas, with all major cities situated along the coastline and severely exposed to such effects.

Furthermore, extreme weather events such as droughts, sandstorms, and hailstorms are expected to increase and worsen in severity and scale.

The Ministry of Climate Change and Environment identified four areas in particular — healthcare, energy, infrastructure, and the environment — as key to ensuring climate resilience in the UAE. Climate change phenomena are expected to impact these sectors in multiple ways. For example, infrastructure is likely to be affected by higher temperatures, sea level rise, and weather events reducing their reliability and causing damage. The UAE's biodiversity is likewise expected to suffer from higher temperatures causing coral bleaching and loss of wetlands, and there are also severe consequences for soil fertility, freshwater availability, and agriculture production.²⁹³

11.2 Shielding Vulnerability: Importance of Adaptation for Vulnerable Groups and Regions

The Intergovernmental Panel on Climate Change's Sixth Assessment Report made clear that climate change and its attendant phenomena impact vulnerable groups and systems the most. Vulnerability is defined by a limited capacity to avoid, resist, cope with, or recover from climate-induced harm. This vulnerability is the result of the unique interactions between individuals, households, communities, and structural and institutional characteristics and conditions specific to a country. While impacts on vulnerable communities will therefore vary greatly from country to country, as a rule, climate change exacerbates existing vulnerabilities if no proper adaptation action is implemented to protect the most exposed groups.

²⁸⁷ Measure of heat-stress condition on humans, combining dry air temperature with humidity

²⁸⁸ AGEDI

²⁸⁹ Noori et. al. (2019)

²⁹⁰ IPCC, 2019

²⁹¹ Pardaens et al. (2011)

²⁹² IPCC, Sixth Assessment Report (AR6)

²⁹³ Further detail on the projected impact of climate change phenomena on these sectors can be found in Chapter 7.3, 'The UAE's Current Commitment to Adaptation,' but also in the UAE Third Update of Second NDC as well as in the UAE Climate Risk Assessment & Adaptation Measures in Key Sectors.

Climate change impacts will also exacerbate pre-existing poverty and inequality levels, with developing nations being hit the hardest due to their geographical and climatic circumstances, heavy economic reliance on natural resources, and limited ability and resources to respond to the climate crisis.

Higher temperatures will affect the availability of freshwater resources in many water-scarce regions, negatively impacting critical key systems across health, food, energy, and industry. Poorer communities, especially those which rely heavily on agriculture, are particularly at risk of increased food insecurity and displacement in many nations. Studies in the MENA region indicate that low-income migrants and rural populations dependent on local food production and groundwater sources are more at risk of food and water insecurity.²⁹⁴ The International Organization for Migration (IOM UN Migration) found that water scarcity — in addition to riverine and coastal floods, storms, extreme humidity and temperatures, and health issues caused by climate change — will be a high vulnerability factor for the UAE by 2040.

The health impacts of climate change are a priority concern for people and decision-makers alike, as their implications are widely accepted and recognised. Air pollutants, for example, worsen respiratory problems such as asthma and bronchitis and are also linked to irregular heartbeats and even heart attacks.²⁹⁵ For this reason, the younger and the older generations are more exposed to climate risks given their higher fragility in terms of health. Additionally, it is anticipated that mental health issues in relation to the threat posed by climate change, such as stress and anxiety, will continue to rise globally, with individuals with pre-existing medical conditions being especially susceptible.

Greater exposure to the risks posed by climate change is also related to occupation. For example, temperatures and weather events disproportionately affect outdoor workers. During July 2022, flash floods in the UAE caused seven fatalities, all of them Asian migrant workers. Simultaneously, inequality in terms of income and wealth represents an important factor in occupational choice.

Considering this, the most vulnerable populations within Arab states include women, children, youth, persons with disabilities, older persons, indigenous persons, and migrants.²⁹⁶

11.3 The UAE's Current Commitment to Adaptation

In line with the nation's commitment to Article 7 of the Paris Agreement and the Global Goal on Adaptation, the UAE has instituted numerous measures for adapting to the changing climate to increase its ability to withstand its effects while also reducing the negative consequences it may have on society, the economy, and day-to-day activities. Even if the global temperature increase was kept below the 1.5 °C threshold agreed upon under the Paris Agreement, the effects of climate change are already and will continue to be felt globally.

The Cancun Adaptation Framework (CAF) established a requirement for countries to develop a National Adaptation Plan (NAP) as a means of identifying medium- and long-term adaptation needs and implementing strategies and programmes to address those needs.²⁹⁷ In alignment with the CAF, the UAE is developing its NAP to integrate climate change adaptation and resilience into sectoral development strategies. The NAP prioritises, implements, and monitors adaptation strategies across various sectors and all key actors within government and non-governmental sectors. The plans will outline specific actions, responsible leaders and supporting actors, timelines, monitoring and evaluation metrics, as well as estimated costs and impacts. The approach will also identify priority projects and action plans for financing and increase the UAE's adaptive capacity by identifying short- and long-term priority adaptation options.

Among the work and research that will feed into the NAP is the National Climate Change Adaptation Program (NCCAP), introduced by the UAE in 2019. The aim of the NCCAP was to minimise the risks related to climate change in the UAE and advance the nation's adaptive capacity, particularly among vulnerable groups (as identified in the previous chapter). The first step towards the development of

²⁹⁴ Migration, Environment & Climate Change Nexus in the United Arab Emirates

²⁹⁵ Arab Forum for Environment and Development (AFED), Impact of Climate Change on Arab Countries

²⁹⁶ UNFCCC

²⁹⁷ UNFCCC, National Adaptation Plans



the NCCAP was an assessment of the threats posed by the climate crisis to priority sectors, which include energy, infrastructure, health, and the environment. Subsequent steps included the mainstreaming of adaptation planning within development policies and the monitoring and evaluating of the implementation of adaptation measures. The NCCAP is currently being updated, most notably to include insurance as a new priority sector.

Among the risks identified by the NCCAP for these four sectors, key ones are represented by the following:

1. Energy: Efficiency loss of power facilities and desalination plants
2. Infrastructure: Damage to coastal and offshore infrastructure
3. Health: Adverse impact on human health
4. Environment: Biodiversity loss

The measures that are being adopted in the UAE to future-proof these sectors against the effects of climate change are detailed further in the following sections.

Risk #1: Efficiency Loss of Power Facilities, Desalination Plants, and Cooling

The climate crisis poses serious risks to the operations of the domestic power industry. The efficiency and output of power and district cooling plants suffer significantly from elevated temperatures and warmer water used for cooling. Moreover, land and coastal power infrastructure can be damaged by severe weather and sea level rise. Therefore, power and district cooling facilities become less reliable and maintenance costs rise.

As temperatures rise due to climate change, the increased need for cooling, such as for industrial processes or residential air conditioning, will lead to an increased demand for desalinated water, potentially putting desalination facilities in the UAE under strain. At the same time, power demand by

desalination facilities is affected by higher salinity of source water — resulting from higher evaporation due to warmer temperatures — which increases the energy requirements of these plants. When the salinity of source water is higher, desalination plants need to work harder to remove the excess salt, which requires more energy. Increased energy consumption can also lead to higher operational costs for desalination facilities, as well as require investments to upgrade the infrastructure to handle this higher demand.²⁹⁸ Additionally, desalination processes generate waste, particularly brine. Consequently, the UAE will increasingly need to research eco-friendly and cost-effective alternatives to manage brine waste, such as brine reuse²⁹⁹, or alternative disposal methods like evaporation ponds and deep-well injections³⁰⁰.

In order to prevent damage to power facilities, the UAE is carrying out routine maintenance inspections and seeking opportunities for modernisation through collaborations with leading industry experts in energy-efficient technologies. The use of environmentally friendly cooling technologies — such as heat (e.g., geothermal and waste heat), waste or recycled water, or low-GWP³⁰¹ and zero-ODP³⁰² refrigerants — is being explored. Indeed, as technology advances and environmental concerns grow, the need for refrigerants that do not harm the ozone layer and have low greenhouse potential — including hydrofluoroolefins (HFOs), hydrocarbons (HCs), and carbon dioxide itself (CO₂) — is on the rise. Geothermal heat is a promising cooling source since it uses the constant temperature of the Earth to cool buildings and represents a more sustainable alternative to traditional technologies.

Power and district cooling plants are being improved and modernised to withstand climate change's negative impacts. Power performance and plant efficiency are being upgraded with the addition of new technologies, including smart infrastructure, power system integration, automation, and AI and data analytics. For instance, Tabreed is researching nanotechnology as a tool to improve the efficiency of new and existing assets.

²⁹⁸ Energy consumption in reverse osmosis desalination: A review and future perspectives - Li, J., Liang, S., Yuan, W., & Amy, G. L. (2018)

²⁹⁹ Turning desalination waste into a useful resource – D. L. Chandler

³⁰⁰ Desalination brine disposal methods and treatment technologies – Panagopoulos A., Haralambous K., & Loizidou M. (2019)

³⁰¹ GWP (Global Warming Potential) is a measure that shows how much a given mass of GHGs contributes to global warming. CO₂ is the reference gas for the calculation,

and its GWP is 1 by default. The higher the GWP, the greater the impact on global warming.

³⁰² ODP (Ozone Depletion Potential) is an index that shows the damage that a substance may cause to the ozone layer. ODP varies from 0 to 1 and the closer to zero, the lower the impact on the ozone layer.

Risk insurance and risk management systems are being initiated to counter climate change exposure in the power sector. One example of energy companies adopting climate resilience plans is DEWA's partnership with the Institute for Risk Management (see below).

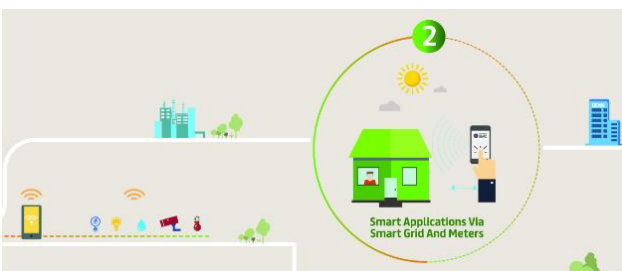
DEWA's Partnership with the Institute for Risk Management

DEWA PJSC has developed a comprehensive Climate Change Resilience Plan that is driven by a vision, guiding principles, approach, and goals to ensure the resilience of the power and water sector of Emirate of Dubai. The DEWA PJSC's Climate Change Resilience Plan identifies detailed existing mitigation measures, preventive controls and future resilience actions that address potential impacts of various climate change drivers.



DEWA's Smart Applications via Smart Meters and Grids

On top of having installed over 2 million electricity and water smart meters to cover all of Dubai, DEWA introduced Smart Applications through Smart Meters and Grids. The initiative aims to provide various benefits to users by providing automatic and detailed readings which will also contribute to creating awareness on energy and water consumption.



Risk #2: Damage to Coastal and Offshore Infrastructure

Rising sea levels pose another significant challenge to the UAE. Around 85% of the UAE's population and more than 90% of its infrastructure are located in low-lying coastal areas. Due to rising sea levels, the nation could be at risk of losing up to 6% of its populated and developed coastal areas by the end of the century. This is particularly concerning as all major cities are situated in close proximity to these areas, with extensive developments and infrastructure along the coastline.³⁰³ A long-term forecast found that environmental changes could lead to 8% of Ajman, 2% of Sharjah, up to 5.9% of Umm Al Quwain, and parts of Abu Dhabi's islands being lost to rising water by 2100.

The UAE's coastal and offshore infrastructure could face damage, strain, and increase maintenance costs due to extreme weather events, sea level rise, and changes in seawater salinity caused by rising temperatures. Climate change effects could also cause transportation disruptions and reduced building reliability, significantly harming the economy. Lower-risk consequences may include population displacement along the coastline and increased urban flooding resulting from reduced drainage capacity.

Mitigating infrastructure risk will require investment in the design and construction of climate-resilient infrastructure. To this end, the UAE is not only promoting the design and construction of green buildings and the refurbishment of existing ones but is also considering climate-resilient infrastructure in its urban plans. As part of its commitment to more resilient and sustainable urbanisation policies, the UAE signed the UN New Urban Agenda, which envisions the adoption and implementation of disaster risk reduction and management to reduce the vulnerability of cities and human settlements. Additionally, the nation is investing in R&D projects for future-proof construction materials (including pavement and cements) and is developing sea-level rise proofed infrastructure. Another step towards infrastructure climate adaptation is the nation's investment in water management infrastructure, including dams. The UAE is currently home to around 140 dams, with a total storage capacity of

³⁰³ UAE Government Portal: Climate change and the UAE's response

roughly 1.2 billion cubic meters of water.³⁰⁴ Dams control flooding by capturing excess water during heavy rain or storms but also represent a reliable source of water in times of need (e.g., during droughts).

Moreover, space-based technologies can be leveraged for disaster management, with remote detection being used to anticipate weather-related disasters and provide prompt warnings. As such, the UAE Space Agency intends to use imagery analysis to evaluate the damage caused by flooding and suggest a flood monitoring service.

The UAE is also preparing to face the impacts of the climate crisis on its infrastructure by rethinking how cities are designed, located, constructed, operated, and maintained. The Abu Dhabi 2030 Urban Structure Framework Plan, The Fujairah 2040 Plan, and Ras Al Khaimah's Sustainable Community Guidelines are clear examples of how the emirates are integrating environmental and social considerations into the principles they establish for the development of their cities. The emirates are considering the improvement of roads and the construction of water barriers, ports, and additional healthcare facilities as part of this process. Among such measures stands Dubai's deep-water drainage tunnel, which will serve an area of 490 square kilometres to help mitigate the threat of floods.

Ras Al Khaimah's Sustainable Community Guidelines and Outdoor Comfort Solutions

The Emirate of Ras Al Khaimah has recently completed a flood mitigation study to understand how to protect existing and future urban areas from the anticipated increased intensity of rainfall and frequency of adverse weather events. A total of 38 dams, 87 collection ponds, and 193 km of open drainage channels have been planned to capture and attenuate the large run-off flows generated in mountainous rural areas, while an additional network of buried pipelines will drain the run-off flows generated in the urban areas themselves. Designs have been developed and construction is already underway. The emirate is also developing strategies to face increased temperatures.

Ras Al Khaimah is also working to improve the outdoor thermal comfort of residents. The emirate

recently adopted Rafah, its first Sustainable Community Guidelines, for the construction of new infrastructure. Rafah specifies several design changes to public infrastructure aimed at improving liveability and walkability of communities while also mitigating the urban heat island effect through greenery, shaded walkways, and materials with high reflectivity. A first residential community designed following Rafah's guidelines is currently being planned. Ras Al Khaimah is also investing in research efforts to uncover new outdoor comfort solutions and technologies. An R&D centre has been established to explore transformative ways to meet the challenges of integrating outdoor comfort, and trial installations are already installed to test the performance of these solutions in the UAE's urban environments.



Early Warning System

The National Emergency Crisis and Disaster Management Authority (NCEMA) introduced the National Early Warning System to ensure the wellbeing and safety of all residents and visitors of the UAE. The system can share warning alerts with the public through mobile notifications, smart road signs, radios, televisions, and loudspeakers, with clear instructions on how to act in such scenarios.



³⁰⁴ Ministry of Climate Change and Environment

Dubai's Coastal Monitoring

The Emirate of Dubai has developed a comprehensive coastal monitoring system that is able to collect all sea state data such as wave period, height, direction, water levels, currents, and chemical quality characteristics. The system is designed to not only generate data on current natural phenomena, but also to assess and make projections on the state of the emirate's coastal and marine environment in the future.



Risk #3: Adverse Impact on Human Health

The human body is susceptible to the effects of climate change in many ways, ranging from direct harm caused by extreme weather to indirect consequences of emissions, such as respiratory issues caused by poor air quality. Higher temperatures represent a particularly serious risk for the UAE given its desert climate and the high number of outdoor and construction workers. Indeed, hotter days can lead outdoor laborers to develop medical symptoms, such as heat stroke, but also diseases and injuries.³⁰⁵ Additionally, extreme weather events have been linked to 18 casualties and eight deaths from 2014 to 2020 in the UAE.³⁰⁶ Moreover, pollution levels in the UAE have been found to be unhealthy for sensitive groups.³⁰⁷

In light of these issues, the UAE established a National Committee on Climate Change and Health to coordinate the implementation of the nation's response to the climate crisis. Policies have been implemented at both the federal and emirate level requiring outdoor workers to take a daily break during peak summer. Additionally, the nation is also acting to address environmental health determinants, including water and air quality, and food systems control. Vulnerable segments of

society are particularly relevant and healthcare workers are being provided with the necessary skills to manage the risks associated with climate change, especially for pregnant women, the elderly, and those at high risk for other reasons.

Abu Dhabi and the Partnership for Health System Sustainability and Resilience (PHSSR)

The PHSSR is a global partnership between academic, governmental, and private organizations to investigate new approaches in clinical research. The overarching objective of the collaboration between Abu Dhabi's healthcare regulator and the PHSSR is to safeguard the healthcare system from potential future crises, such as pandemics, natural disasters, and climate change.



Safety in Heat

In 2019 the Abu Dhabi Public Health Centre launched the Safety in Heat programme in response to the extreme heat stress conditions outdoor workers face during summer. The initiative set a ban on outdoor work during summer between 12:30 and 3:00 PM.³⁰⁸ Among the companies researched, results indicated a marked reduction in heat-related illnesses over a period of two years at two of these companies.³⁰⁹



³⁰⁵ Ministry of Climate Change and Environment, National Climate Change Adaptation Program: Adaptation of the UAE's Public Health to Climate Change

³⁰⁶ National Emergency Crisis and Disasters Management Authority (NCEMA)

³⁰⁷ IQ Air, Air Quality in UAE

³⁰⁸ Abu Dhabi Public Health Centre

³⁰⁹ Joubert et al.

Risk #4: Biodiversity Loss

A diverse array of marine and terrestrial ecosystems — including coral reefs, mangrove forests, Ghaf trees, and sand dunes — call the UAE home and support a variety of flora and fauna. However, with increasing temperatures, warming oceans, and extreme weather events threatening the nation's natural resources, fauna, and flora, the climate crisis is putting growing pressure on UAE's already harsh desert environment. Life underwater is equally affected, with higher ocean temperatures leading to coral bleaching episodes.

The nation's efforts to protect its biodiversity and employ nature-based climate solutions are driven by the National Biodiversity Strategy. The strategy aims to reduce pressures on the UAE's marine and terrestrial biodiversity through habitat protection and restoration of damaged ecosystems. The nation has already designated 49 protected areas, representing 15.5% of its total territory, in addition to 12% of its territorial waters as marine protected areas. Similarly, the UAE has designated several wetlands as protected areas, plus eight Wetlands of International Importance. To recognize the commitment towards conservation of birds of prey, Environment Agency of Abu Dhabi has received a CMS Champion Plus Award.

The nation is also adopting nature-based solutions which offer carbon capture and storage benefits, such as date palm trees. The 100 million date palm trees present in the Arab region are being preserved under the International Initiative to Protect the Date Palm Oases Under Climate Change Challenges, which the UAE will officially launch at COP28. Well-adapted to desert regions, Ghaf trees are also an important species for reforestation and carbon sequestration efforts in desert conditions. As such, the EN-WWF Save the Ghaf Tree campaign promoted the planting of 1,000 trees and promulgation of a law prohibiting the cutting down of Ghaf trees.

Furthermore, on the global scale, the UAE has contributed to dialogues leading to the Kunming-Montreal Global Biodiversity Framework and is also among the signatories of the UN Convention on Biological Diversity (CBD), a global agreement ratified by 196 nations and geared towards the

conservation of biological diversity and the sustainable use of its components. Last but not least, the UAE also hosts the regional office for the UN Convention on Migratory Species, in support of multilateral dialogue to protect endangered species, including falcons and dugongs.³¹⁰

The targets set in the National Biodiversity Strategy are supported by further studies and policies. Among these, the National Programme for Monitoring and Controlling Marine Water Quality continuously assesses the level of pollutants in seawater. Indeed, coral bleaching is a high-risk priority for the nation and 42% of the nation's 66 species of reef-building corals are threatened with regional extinction.³¹¹ Given coral reefs' importance as providers of goods and physical protection from storm surges, the UAE is installing rock barriers and artificial caves to recreate natural habitats. Additionally, in response to overfishing, the National Framework Statement for Sustainable Fisheries aims to achieve sustainable fishing practices. The nation's efforts in protecting underwater life are aligned with its commitment to the UN Convention on the Law of the Sea (UNCLOS), which lays down a series of policies concerning the use of oceans and their resources.

The Abu Dhabi Blue Carbon Demonstration Project

The Abu Dhabi Blue Carbon Demonstration Project was launched in 2012 to enhance knowledge of carbon sequestration and the storage capabilities of blue carbon ecosystems in the UAE. The project comprised 5 stages:

1. [The carbon baseline assessment](#) quantified the carbon stocks for coastal ecosystems and the rate of carbon sequestration in mangrove forests.
2. [A geographic assessment](#) mapped Abu Dhabi's blue carbon ecosystem.
3. [An ecosystem services assessment](#) investigated the benefits provided by blue carbon ecosystems beyond carbon sequestration.

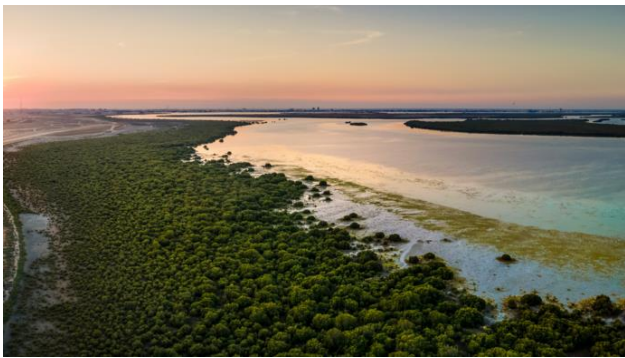
³¹⁰ The UN RCO in the UAE

³¹¹ Ministry of Climate Change and Environment, UAE National Red List of Reef-Building Corals

4. [A policy component](#) identified ways to incorporate blue carbon ecosystem services into Abu Dhabi’s policy framework.
5. [A finance feasibility assessment](#) recommended the optimal options for implementing a Blue Carbon initiative in the emirate.

Overall, blue carbon ecosystems in Abu Dhabi were found to store over 41 million tonnes of CO₂eq. The project thus improved local capacity to manage these ecosystems and represents an opportunity for regional and international replication and up-scaling.

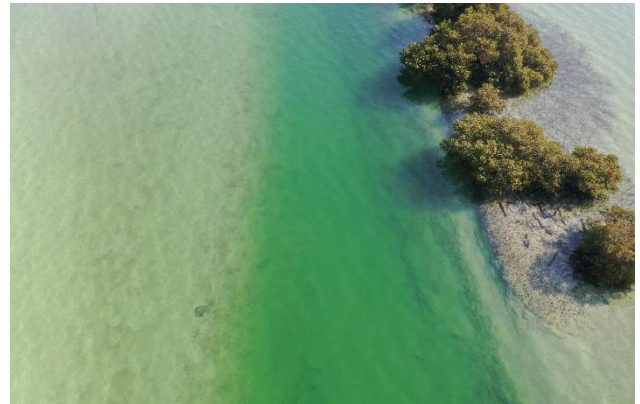
Abu Dhabi’s effort in the restoration of coral, mangroves, and seagrass, and its safeguarding of the world’s second largest dugong population were honoured as a World Restoration Flagship Initiative, led by the United Nations agencies UNEP and FAO.



Nature-based Solutions for Climate, Biodiversity & People in the UAE

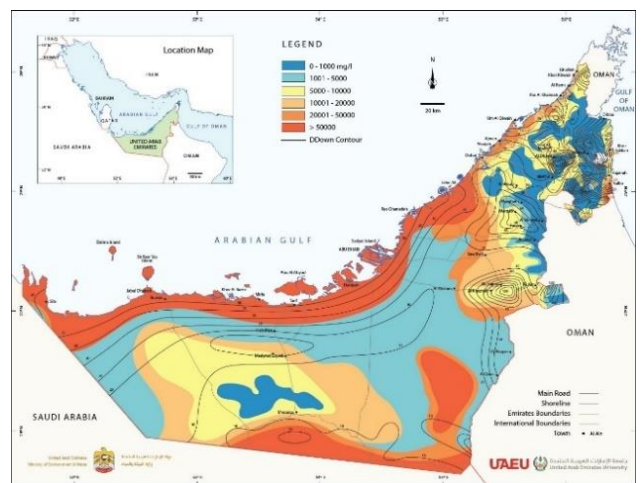
In partnership with MOCCA, Environment Agency Abu Dhabi (EAD) and the International Centre for Biosaline Agriculture (ICBA), funded by HSBC, the Emirates Nature-WWF is currently implementing a four-year project, ‘Nature-based Solutions (NbS) for Climate, Biodiversity & People in the UAE.’ The project has also secured partnership with the Ministry of Economy and the Umm Al Quwain Government as it supports the Sustainable Blue Economy Strategy for the Emirate. Through implementation of NbS in the UAE, the project integrates socio-economic, ecological, and physical scientific evidence to showcase the importance of coastal lagoons (‘khors’) as part of the UAE’s climate, national and economic diversification agenda. Project results will contribute towards a

policy framework that unlocks political support and financing for NbS in the UAE. Innovative finance models will be key to implementing credible NbS at scale in the UAE.



UAE Hydrological Map

The sustainable use of groundwater resources is a priority for the UAE to ensure an acceptable level of available water reserves. The UAE Hydrological Map was aimed at assessing the suitability of the country’s ground and surface water resources for the construction of dams and other water facilities. The collected information encompasses a range of data related to the natural environment, including groundwater, well locations, geological and topographical features, land use, and surface water sources such as ponds, dams, and springs. Additionally, plant cover and soil characteristics are included. This data is categorised to identify gaps and provide missing information. This information is then converted into digital data to prepare accurate and high-quality digital maps using Geographical Information Systems (GIS).³¹²



³¹² Abu Dhabi Media Office: The Environment Agency – Abu Dhabi Undertakes a Hydrogeological Mapping Project in the UAE to Prepare Digital Maps, Utilizing Geographical Information Systems.

11.4 Benefits and Risk Reductions from Adaptation and Mitigation Synergies

Mitigation and adaptation are often thought of and discussed as separate realms and areas of intervention. However, recognition is growing that benefits are shared between the two and that policies in some sectors work towards both objectives. Indeed, adaptation measures may simultaneously result in a reduction of GHG emissions (by encouraging low-carbon alternatives for sectors such as buildings, for example) or growth in carbon sinks. On the flip side, policies and investments impacting GHG emissions may also reduce the adverse effects of climate change.

Multiple initiatives and policies provide synergies between adaptation and mitigation. These include the UAE's ambition to expand:

1. The share of energy coming from renewable sources.
2. Energy efficiency technologies.
3. Green buildings.
4. Blue carbon ecosystems.
5. Circular Economy efforts, among other measures.

Food and agriculture policies intended to support the UAE's adaptive capacity and food self-sufficiency also lead to mitigation benefits, as explained in Chapter 8, 'Food systems in the UAE.'

Renewable Energy Generation

In July 2023, the UAE revised its 2050 National Energy Strategy, a plan first launched in 2017, which aims to diversify the energy mix and improve energy efficiency. The revised strategy reflects the more ambitious climate target of becoming a GHG-free power and water sector by 2050 which no longer includes its previous 12% "clean coal" target by 2050. The "clean energy" target was earlier 50% of installed capacity in 2050 but this has been increased to achieve Net Zero by 2050. To do this, the nation is planning for a steep ramp-up of clean energy, particularly solar PV. Increasing the level of energy coming from renewable sources not only

acts as a mitigation lever, but also reduces the adverse effects of climate change, since higher temperatures imply greater power demand for household cooling purposes.

Energy Efficiency

The UAE is targeting energy demand reduction by adopting advanced energy efficiency technologies and promoting awareness initiatives, thus working to decrease GHG emissions while simultaneously reducing the strain put on power facilities by climate change phenomena (as described in Chapter 7.3, 'The UAE's current commitment to Adaptation'). The UAE Energy Strategy 2050 targets a reduction of final energy demand by 40%, achieved by promoting energy efficiency measures. At the federal level, the UAE launched a study of the awareness and behaviour of the UAE population regarding electricity conservation.³¹³ The results coming from this study were used to plan a new national campaign on conservation consisting of awareness and educational activities and programmes tailored to the needs of different segments of society, including students, families, workers, and tourists.

Green Buildings

With the goal of increasing the climate resilience of its infrastructure, the UAE is encouraging the construction of new green buildings and the refurbishment of existing ones. As part of this effort, the UAE introduced the UAE DSM programme which, among other things, involves regular updates to building codes to improve the energy efficiency of new construction, as well as retrofitting older, inefficient buildings. Such national policies aimed at the decarbonisation of the buildings sector have clear mitigation and adaptation benefits and synergies. Indeed, green buildings can help mitigate climate change by reducing energy consumption and GHG emissions through energy-efficient design, use of renewable energy sources, and efficient heating and cooling systems. At the same time, green buildings support climate change adaptation by incorporating features that can withstand extreme weather conditions. Adaptation techniques include the use of materials that are resistant to flooding or high winds, incorporating green roofs to absorb excess rainwater, and providing natural

³¹³ Ministry of Energy and Infrastructure (MOEI)

ventilation to reduce the need for energy-intensive air conditioning.

Blue Carbon Ecosystems

Blue carbon ecosystems represent one notable example of the synergies that exist between mitigation and adaptation measures in the UAE. The nation is home to a diverse array of mangroves, salt marshes, seagrass meadows, and algal mats.

The UAE National Blue Carbon Project found that blue carbon ecosystems in the UAE hold substantial carbon stocks. For example, mangroves have a CO₂ sequestration rate of 58 tonnes per hectare per year. The UAE is home to 60 million mangroves, occupying around 18,000 hectares of land, with an annual sequestration potential of about 1 MtCO₂e. The nation has set an ambitious target to plant an additional 100 million mangroves by 2030, while ensuring that the additional plantations are not in conflict with other blue carbon habitats. Additionally, blue carbon ecosystems also act as barriers for sea level rise (by holding sediments in place and stabilising the coastline) and are breeding grounds for marine biodiversity, thus providing numerous adaptation-related benefits. The UAE's Third Update of Second NDC outlines numerous other federal- and emirate-level initiatives to protect and enhance the blue carbon ecosystems in the country.

Circular Economy

The UAE Circular Economy Policy supports sustainable production and consumption practices. A circular economy implies that resources are continuously re-used, regenerated, or restored. Circular economy practices can help to enhance adaptation and resilience to the impacts of climate change, such as extreme weather events and sea level rise. By applying circular economy principles like material reuse and recycling or resource efficiency technologies to the manufacturing sector, the policy not only seeks to reduce GHG emissions but also helps create a more productive and efficient economy. For example, the policy targets enhanced support for R&D investments in pollution-prevention technologies, as well as R&D in tools to recover value from waste more efficiently. In this way, the system is not only providing for mitigation benefits by improving the environment but also addressing adaptation concerns. As such, the policy promotes

the efficient use of natural resources across four key sectors (manufacturing, transport, infrastructure, and food production) while reducing environmental stress.

Under the UAE Circular Economy Policy, the UAE Cabinet sanctioned the establishment of the UAE Circular Economy Council, tasked with the drafting of measures to implement the strategy in coordination with relevant authorities. The Council proposed 22 policies aimed at expediting the implementation of the circular economy model and the efficient use of resources in the UAE across four key sectors: manufacturing, food, infrastructure, and transport. In sustainable transportation, the initiatives aim to foster low-carbon vehicle use, and public transport and sharing models. In relation to food production, the policies concerned regenerative production, the reduction of food loss and the upcycling of biological waste. Within green infrastructure, smart and sustainable urban plans focus on the adoption of green building design and upgrading existing infrastructure. Within manufacturing, policies concerned resource efficiency and re-manufacturing business models. Additionally, overarching priorities across sectors aim at promoting sustainable waste management practices, including waste reduction, recycling, and resource recovery, but also measures concerned with the support of circular economy start-ups, innovations, and technologies, as well as international cooperation and partnerships for circular economy initiatives. Additionally, the Council identified no less than 16 circular economy activities that representing novel business opportunities, including repurposing textile waste into new products, creating automated waste management solutions that leverage AI, and remanufacturing electronic waste.

As part of the efforts to support the implementation of strategies promoting circular economy and environmental sustainability, the Ministry of Economy has joined forces with Confindustria Cisambiente. Over 1200 Italian companies that are part of this association will work together to exchange knowledge, share experiences, collaborate with UAE counterparts inclusive of academic and research centres, and create best practices for achieving these goals.

Finally, by adopting circular economy strategies in the food sector, the UAE hopes to cut GHG



emissions while also reducing or re-using food waste. The nation has set ambitious targets for its agricultural sector and the food security of the country, both of which are addressed in depth in the next chapter, 'Food systems in the UAE.'

12 Food Systems in the UAE

Food Security is enabling the UAE's population to have access to safe, sufficient and nutritious food for an active and healthy lifestyle at affordable prices at all times, including emergencies and crises. (The Future of Food: Towards Future Food Security 2051)

Global food systems generate one-third of global GHG emissions, second only to the energy sector.³¹⁴ In 2020, the GHG emissions produced by global food systems reached 16 billion tonnes of carbon dioxide equivalent (Gt CO₂eq), which is almost 10% higher than the levels recorded in 2000. The majority of emissions (more than 70%) are related to agriculture and land use, including methane from cattle's digestive processes, CO₂ released by cutting down forests for the expansion of farmland,³¹⁵ and other emissions from manure management, rice cultivation, and the use of fuel on farms. The rest of the emissions come from industrial processes such as fertilizer production, food processing, retail, consumption, and waste management. Agriculture also requires large amounts of fresh water and occupies half of the world's habitable land.^{316, 317}

At the same time, climate change critically threatens food and water security. Ocean warming and acidification have negatively impacted food production from aquaculture and fisheries. Extreme weather events have exposed people to water scarcity and food insecurity, especially in Africa, Asia, and Central and South America. Crop yields are affected by increasing temperatures, which hinder crop quality and stability. Droughts and floods contribute to reduced food availability, threatening food security and the nutrition and survival of millions, especially among vulnerable

groups such as women, children, and low-income households.³¹⁸

The forecasted impacts on major crop yields are well documented. Higher temperatures accelerate transpiration from soil, making it harder for crops to grow due to a lack of moisture. Consequently, current crop and livestock areas will become unsuitable for food production. Agriculture is also at risk from diminishing water supplies due to more frequent droughts and increasing crop mortality, and damage caused by extreme weather events and heat stress, as well as easier spreading of pests and diseases.³¹⁹ Droughts and erratic rainfall also reduce water availability and compromise natural ecosystems. At the same time, floods can cause ground water quality concerns. Livestock farming is also being affected as animal productivity and health worsen. Climate change also affects fisheries and aquaculture in marine and freshwater environments as higher temperatures modify the physical and chemical characteristics of the aquatic environment. Global ocean animal biomass is forecasted to decrease by 5–17% between 1970 and 2100, with an average decline of 5% for every 1 °C of warming. As a result, the number of people at risk of hunger will increase, and climate change is estimated to increase the loss of years of full health by 10% in 2050.³²⁰ Once again (as highlighted in Chapter 7.2), vulnerable countries and communities, such as those in arid regions or island developing states, suffer the most from these effects.

Currently, the UAE imports around 85–90% of its food supply. Yet, despite contributing less than 0.1% of the UAE's GDP, the agricultural and forestry sector accounts for around 73% of the nation's freshwater demand,³²¹ exacerbating water scarcity in the country. The UAE's growing population, forecasted to reach 11 million inhabitants by 2050,³²² is expected to increase the strain on food availability. These factors — combined with the persistent challenges that the nation's agricultural sector faces given the particularities of the arid region and the growing pressures from climate change phenomena on the already tenuous

³¹⁴ World Bank, What You Need to Know About Food Security and Climate Change

³¹⁵ The transition to a plant-based diet would alleviate a significant share of food-related emissions, while having positive effect on biodiversity and health.

³¹⁶ Land that is ice- and desert-free.

³¹⁷ UN Food and Agriculture Organization (FAO)

³¹⁸ IPCC Sixth Assessment Report (AR6)

³¹⁹ Ibid.

³²⁰ IPCC Sixth Assessment Report (AR6)

³²¹ Food and Agriculture Organization of the United Nations (FAO)

³²² The Future of Food, Towards Future Food Security 2051

availability of food and water — make food security a pressing concern for the UAE.

For these reasons, the UAE has introduced the National Food Security Strategy 2051 with the goal of transforming the nation into a leading hub for innovation-driven food security.³²³ The strategy aims to ensure access to safe, sufficient, and nutritious food for an active and healthy lifestyle at affordable prices at all times, including during emergencies and crises. This strategy includes four areas of action:

1. Food availability, namely the availability of sufficient food quantities, either produced locally or imported.
2. Food access, namely the possibility to access to nutritious food.
3. Utilisation, namely ensuring that food provides adequate nutrition, and access to clean water is guaranteed.
4. Stability, namely always safeguarding everyone's access to adequate and secure food.

To achieve this, the UAE has set itself five objectives:

1. Facilitate global agri-business trade and diversify international food sources.
2. Enhance the sustainable technology-enabled domestic food supply across the value chain.
3. Reduce food loss and waste.
4. Sustain food safety and improve nutritional intake.
5. Enhance capacity to respond to food security risks and crises.

The achievement of the targets set in the National Food Security Strategy 2051 is also supported by other policies at the federal and local levels, as well as by public and private initiatives. The formation of the Emirates Food Security Council in 2019 represents one hallmark of the advancement of the National Food Security Strategy. The Council oversees the implementation of the strategy and its alignment with KPIs. The Council is formed by members from federal ministries, local authorities, the National Emergency Crisis and Disaster Management Authority (NCEMA), as well as a youth representative, and is supported by a committee of

representatives from public, private, and academic sectors.

Furthermore, the UAE will build human capacity for food security functions and engage the community in shifting food security notions and behaviours. The adoption of new technology will be a key focus for the nation. This includes exploring controlled-environment agriculture, sustainable aquaculture, and advanced robotics. For this reason, the Ag-tech Government Accelerators Program was established in December 2018 with the participation of federal and local entities. The programme supports the adoption of modern technologies and the development of the aquaculture sector. In just 100 days, the programme launched ten initiatives, including the first Emirates Sustainable Agriculture label, the framework for agricultural finance, and the first unified agriculture license.

The Food and Water Security Office, FAO collaborates closely with numerous UAE centres working on advanced R&D in food production. The Marine Innovation Park of the Sheikh Khalifa Marine Research Centre, for example, is a regional leading R&D centre in bio-science technology innovation and marine science. The International Centre for Biosaline Agriculture (ICBA) consists of a team of international scientists conducting applied research and development to improve agricultural productivity and sustainability in marginal and saline environments.

Spotlight Initiative: Developing Innovative Solutions for Food Production with the FoodTech Challenge

To promote the implementation of sustainable and technology-driven solutions aimed at food security and self-sufficiency in the UAE, His Highness Sheikh Mohammed bin Rashid Al Maktoum launched the FoodTech Challenge in 2019. The FoodTech Challenge is a worldwide contest designed to stimulate collaboration and creativity by bringing together the most accomplished scientists, technologists, and innovators to address the complex food-related challenges facing the UAE. The competition is centred around the critical issue of food availability and investigates cutting-edge technologies and next generation solutions for food and water security.

³²³ UAE Food & Water Security, The Future of Food: Towards Future Food Security 2051





Section 4: How Do We Accomplish the UAE's Net Zero transition?

Section 4: How Do We Accomplish the UAE's Net Zero transition?

13 The UAE's Path Forward — Net Zero Implementation

The UAE Net Zero by 2050 Strategic Initiative is currently one of the nation's main long-term plans. It will pave the way and support the delivery of other long-term initiatives, such as the UAE Centennial Plan 2071. The latter is a long-term vision that spans five decades, which presents a roadmap for government work to promote the UAE's reputation and soft power. Its prime goal is to make the UAE one of the best countries in the world by its centennial in 2071 by investing in future generations to equip them with the required skills to keep up with global progress.³²⁴ The Net Zero by 2050 Strategic Initiative is closely aligned with the UAE Centennial Plan 2071 and its pillars by promoting new technologies and capabilities, contributing to economic growth, enhancing education, and improving the well-being of the nation's citizens.³²⁵

13.1 The Role of Government in a Whole-of-Society Approach

The development of this LTS and the subsequent implementation of the measures and policies outlined in it calls for a whole-of-society approach, which involves non-state actors (particularly NGOs, academia, and corporations) besides the government entities. This is fundamental to ensure climate change action is embedded across the entire nation.³²⁶

Involving all of the UAE's government entities in the UAE Net Zero by 2050 Strategic Initiative requires two parallel actions:

- 1) All government entities contributed to detailing the Net Zero by 2050 Strategic Initiative. The UAE is a federal, independent, and sovereign state comprised of seven emirates, with government entities at both the federal and emirate levels. The nation's constitution allows emirates to exercise authority in various specific

matters and exercise all powers not otherwise assigned to the federal government under the constitution.³²⁷ Emirates were therefore extensively consulted and involved in discussions about the required changes and updates demanded by the UAE Net Zero by 2050 Strategic Initiative, particularly since they play a key role in their deployment.

- 2) Policies to implement decarbonisation measures must be approved and implemented. This is crucial to ensure concrete actions are taken and, specifically in the UAE, that emirates are aligned to a common plan that comprises both federal-level requirements and emirate-level changes. This promotes a standardised high level of ambition across the nation and a coordinated policymaking process and avoids competing or overriding policies.

The UAE already considered these two points when developing its Net Zero by 2050 Strategic Initiative. All major federal and emirate entities were actively involved in providing inputs and feedback on the initiative. Throughout this process, more than 45 stakeholders were consulted, over 60 meetings were organised, and around 800 feedback points were incorporated. This included broad discussions on which policy levers need to be implemented, both at federal and emirate level. As a result of this process of stakeholder consultation, the UAE has already approved the policy levers required for net zero prior to the publication of this LTS. This was done through a UAE Cabinet decision, which followed an initial decision approving the net zero pathway, which was announced during COP27 in October 2022. This has subsequently been supported by a formal charter, which was signed by the Governments of the seven Emirates.

Besides this, the UAE launched the UAE Council on Climate Action, an inter-ministerial, inter-emirate governance body in 2022, to ensure alignment

³²⁴ UAE Cabinet, UAE Centennial Plan 2071

³²⁵ A more detailed explanation of the link between the Net Zero by 2050 Strategic Initiative and the UAE Centennial Plan 2071 is provided in the Introduction.

³²⁶ International Institute for Environment and Development, Long-term strategies under the Paris Agreement – key principles for good governance

³²⁷ UAE Government Portal, The Constitution

across federal- and emirate-level policies and interventions.³²⁸

The development of the UAE's LTS also relied on the deep involvement of federal- and emirate-level entities. This is reflected across the document in its discussions of ongoing and planned decarbonisation efforts.³²⁹

13.2 Central Coordination for Net Zero Deployment

In addition to following a whole-of-society approach, the UAE considers establishing a dedicated Net Zero Champion to accelerate climate action. This would be a central body to coordinate and drive implementation, monitor progress, and recommend corrective actions. Countries such as the UK, Austria, Germany, Czechia, Hungary, Norway, and Ireland have dedicated climate governance bodies in place. These are often independent from executive government bodies.

Building this structure in the UAE could yield several benefits, especially to ensure alignment between the emirates and with the federal government. To achieve this, the UAE Net Zero Champion would be tasked with different responsibilities from the ones of the UAE Council on Climate Action. Those responsibilities include:

- 1) Drive planning and solve interdependencies with actions such as developing an integrated roadmap and prioritising initiatives by impact.
- 2) Champion and accelerate change by supporting and co-leading implementation of initiatives.
- 3) Log, track, and report targets and ongoing initiatives, including reporting progress to the UAE Cabinet and leading the Monitoring, Reporting and Verification (MRV) mechanism.
- 4) Provide quality and value assurance, namely by evaluating submitted data and deliverables, identifying gaps, and escalating issues.

- 5) Manage risks by identifying and evaluating risks and developing mitigation plans.
- 6) Develop and adopt methodologies and tools through an integrated data management system and assess impacts of new programmes and regulations on net zero.

The Net Zero Champion will report directly to the UAE Cabinet, and collaborate with federal and emirate entities, as well as from key UAE industries, including its major emitters. All these should have dedicated Net Zero Officers to drive climate action and liaise with the Net Zero Champion.

The Net Zero Champion's responsibility to lead the MRV mechanism will be a central part of its mandate. The MRV was first introduced in COP13, where it was stipulated that this mechanism shall apply to developing countries to help them undertake enhanced actions on the mitigation of climate change.³³⁰ The mechanism has evolved since then, and over the next few years all countries will start implementing the Enhanced Transparency Framework of the Paris Agreement, which builds on and enhances the MRV.³³¹

The UAE is developing an initiative to detail a similar mechanism for the nation.³³² Having a central entity to drive and coordinate the deployment of the UAE Net Zero by 2050 Strategic Initiative is critical to ensure progress. As a result, the UAE is working towards detailing the Net Zero Champion's mandate, organisation, and governance, and approving these via a UAE Cabinet decision. The same timeline to its reporting programme, which will include the MRV and will allow federal- and emirate-level entities to report on UAE Net Zero by 2050 Strategic Initiative targets and initiatives.

13.3 Implementation Challenges

The UAE will deploy all reasonable efforts to achieve decarbonisation targets at least equal to the ones detailed in this document. At the same time, the fact that these refer to a long-term horizon presents inherent risks. Risks can arise across three main areas — structural, organisational, and sector-specific risks — and can be tackled with several

³²⁸ Previously part of the UAE Council on Climate Change and Environment, established in 2016.

³²⁹ A detailed overview of entities that were involved in drafting this report can also be found in the 'Acknowledgements' section.

³³⁰ UNFCCC, Handbook on Measurement, Reporting and Verification for Developing Country Parties

³³¹ UNFCCC, Understanding the Enhanced Transparency Framework: New Handbook Published

³³² Further information on this topic is included under Chapter 10.7, 'Evolving Net Zero: Monitoring, Reporting and Verification Mechanism.'

mitigation actions that minimise their probability of materialising.

Structural Risks: Events Outside of the Government's Direct Control

- **Difficulties in acquiring technology know-how at the required scale.** *Mitigation:* Deploy a technology and R&D strategy³³³ outlining how key technologies will be localised and made available within the UAE at the right time and scale.
- **Insufficient funds available to finance all planned measures and policies at required time.** *Mitigation:* Deploy financing mechanisms³³⁴ to develop a structured funding approach, including mobilisation of public and private sector investors.
- **Insufficient skilled labour available to fill newly created demand.** *Mitigation:* Deploy an upskilling and capacity building plan³³⁵ to break down job creation potential into job families, identify required skills per job family on a timeline, and develop dedicated upskilling and capacity building plans to fill newly created jobs locally. This will be crucial not only to mitigate this risk, but also to consider just transition,³³⁶ a key element of the Paris Agreement's implementation.³³⁷
- **Technological cost and performance shift over time.** *Mitigation:* Monitor and evaluate the latest technology advancements and update strategy as required as part of the regular UAE Net Zero by 2050 Strategic Initiative review cycles. The UAE Net Zero by 2050 Strategic Initiative only considers mature or near-mature technologies. As such, it is necessary to monitor technology developments and update the targets and strategy on a recurring basis.

Organisational Risks: Overarching Risks Related to Strategy Execution

- **Delay in deploying the right policies.** *Mitigation:* Institute a stricter cadence of progress reporting in the early years of net zero deployment (2023 and 2024), contribute funding to drive accelerated implementation, and deploy a central entity to drive and coordinate the deployment of the UAE Net Zero by 2050 Strategic Initiative (the UAE Net Zero Office).
- **Lack of alignment across economic sectors and fragmentation of decarbonisation dialogue.** *Mitigation:* Set up an empowered governance structure (i.e., UAE Net Zero Champion) with dedicated focal points across federal- and emirate-level entities (i.e., Net Zero Officers) to ensure streamlined and efficient dialogue across the entire nation and economy.

Sector-Specific Risks: Risks on a Sector-Level

- **Limited availability of critical input factors (raw materials and/or green goods such as PV panels).** *Mitigation:* Analyse required input materials and assess mitigation actions to achieve sufficient security of supply, including localising parts of the value chain or diversifying international suppliers.
- **Carbon prices hurt industrial competitiveness.** *Mitigation:* Manage competitiveness and carbon price fluctuations through allowances and price stability mechanisms (detailed design to be conducted).
- **Distributed generation increases grid system costs, which must be socialized among all power consumers.** *Mitigation:* Design a regulatory framework to incentivise system friendly load balancing; introduce kW-based grid fees and connection fees.

³³³ Detailed in Chapter 10.2, 'Advancing Net Zero: Technology and R&D Strategy.'

³³⁴ Explored in Chapter 10.1, 'Funding Net Zero: Climate Finance Mechanisms.'

³³⁵ Included in Chapter 10.3, 'Upskilling for Net Zero: Capabilities Enhancement Plan.'

³³⁶ Further details on just transition in the UAE are provided under chapter 5.2

'Looking forward: the UAE's Commitment to Just Transition.'

³³⁷ UNFCCC, Paris Agreement

14 Enablers to Reach Net Zero

Achieving the ambitious and strategic targets set by the nation will require a series of enablers, including financing mechanisms, technology and R&D, and upskilling for climate action, with a particular focus on empowering youth, women, and people of determination. The UAE is currently planning these enablers, following a whole-of-society approach, including close collaboration with the United Nations, global private sector, NGOs, and other partners from the international community.

14.1 Funding Net Zero - Climate Finance Mechanisms

From an international perspective, climate finance is a critical decarbonisation enabler, for two main reasons:

- 1) It provides the resources and funding needed to support the transition to a low-carbon economy. This requires significant investment in renewable energy, green infrastructure, and other clean technologies.
- 2) It enables adaptation efforts to support countries (especially vulnerable ones) in preparing for and responding to the impacts of climate change, such as rising sea levels, more frequent natural disasters, and changing weather patterns.

From a domestic perspective, the UAE will require financing to attain its climate objectives and transform itself into a sustainable, low-carbon and climate-resilient economy (in line with the first point highlighted above). Financing requirements were assessed as part of the UAE Net Zero by 2050 Strategic Initiative, which included thorough and transparent financial evaluation and modelling for all decarbonisation measures and policies reported in this LTS. On a sectoral level, transport will require the most investment, followed by power and water generation and heavy industry.

The UAE has already identified potential priority mechanisms to meet these financing requirements. The nation plans to launch a programme to enable entities to finance planned measures and policies to

deploy its UAE Net Zero by 2050 Strategic Initiative. This programme outlines the development and implementation of a regularly revisable financing concept, including:

- The assessment and potential set-up of a dedicated climate fund, fed by carbon pricing, to ensure that revenues are ring-fenced and distributed to decarbonise the UAE. This follows international examples, such as the EU Green Deal Investment Plan.
- Assessment of Public-Private Partnerships (PPPs) for high cost, long-term investments, including initial engagements with private players (e.g., for public transport infrastructure).
- Studying carbon pricing, consistent climate data disclosure, public/private sector mobilisation, and stringent and transparent regulation to stimulate international investment in the UAE.

The UAE's Net Zero by 2050 Strategic Initiative will be net beneficial to the nation, with a positive business case of AED 70 billion as investments are outweighed by cost savings over time, particularly in fossil fuels.³³⁸ This expected investment reflects differently across distinct economic agents:

- Households are expected to benefit from net gains thanks to energy and transportation savings (e.g., more energy efficient buildings demand less energy consumption, which generates savings in energy costs even after considering cost reflective energy prices), leaving them with a buffer to absorb green premium price pressures.
- Corporations are expected to face additional costs, mainly due to industry investment in hydrogen, power grid connection and CCS. Without policies, there would be significant costs, however these are largely mitigated through planned support, and remaining cost can be passed on to customers through higher prices, avoiding significant impacts.³³⁹
- The UAE's government is expected to face an initial negative annual cashflow, mainly driven by investment in public transport infrastructure and support for H₂, CCS, and EVs.

³³⁸ Estimated discounted cumulative cash flow over the 2023-2080 period, computed versus a business-as-usual scenario (i.e., a scenario in which net zero would not be implemented).

³³⁹ As detailed in Chapter 4, 'Sectoral Roads towards Decarbonisation.'

The UAE plans to enable this programme before 2025.

This financing programme will build on previous steps taken by the UAE. The nation has launched multiple sustainable finance mechanisms in the past, including the Green Finance and Investment Support Scheme, which is intended to develop green finance products such as energy performance contracts (EPC), public finance initiatives (PFI), and green sukuk.^{340,341} The government also established a group of ministries, financial regulators, and stock exchanges called the UAE Sustainable Finance Working Group (SFWG) to direct financial sector capital towards sustainable projects across the country. The SFWG is working to strengthen consistent sustainability disclosures, promote sustainability-focused corporate governance, and establish a taxonomy of sustainable activities in the UAE.³⁴² In 2022, Abu Dhabi Global Market issued its regulatory framework to accelerate the growth of sustainable finance. This included the regulation of carbon offsets, enabling the establishment of the world's first regulated voluntary carbon exchange and clearing house in the jurisdiction. Abu Dhabi Global Market is also currently developing a comprehensive ESG disclosure framework and minimum standards for green funds, climate transition funds, and green bonds.

Furthermore, the nation is implementing policies to attract financing and foreign direct investments (FDI) to its climate action investment opportunities. In 2022, the UAE's Ministry of Economy (MOE) launched the NextGen FDI initiative which promotes investments in industrial process optimisation and resource and energy efficiency.³⁴³ Initiatives such as this will enable the UAE to become a more attractive target for foreign direct investment (FDI) and thus decrease its reliance on governmental and public investments. Besides this, the nation is also promoting events which discuss investment opportunities in decarbonisation, such as the 2nd edition of Investopia in Abu Dhabi.³⁴⁴

14.2 Advancing Net Zero — Technology and R&D Strategy

Science, Technology, and Innovation (STI) are key enablers for net zero. Governments have a significant responsibility in setting national STI objectives and net zero priorities and in promoting knowledge-sharing among various entities involved in the innovation system. Besides funding R&D efforts in universities, public labs, and businesses, governments must also invest in crucial enabling infrastructure and facilitate demonstration projects to support the development and deployment of innovative solutions.³⁴⁵

The UAE has emerged as a major centre for innovation and technology in the Middle East,³⁴⁶ and its commitment to climate action will likely enhance this further. The UAE Net Zero by 2050 Strategic Initiative envisions the development of a robust strategy for technology and R&D. The strategy will outline the goals and action plan to propel the launch of key net zero technologies, as well as to promote local presence of companies producing necessary equipment such as photovoltaics. The strategy prioritises areas such as CCS, hydrogen, storage for power generation, green concrete, and recycled materials, among other interventions.³⁴⁷

To elevate and accelerate innovation, the UAE developed its National Innovation Strategy (NIS). The NIS aims to promote innovation by creating an innovation-enabling environment consisting of an appropriate regulatory framework, technology infrastructure, and investments and incentive schemes. While the NIS covers innovation at large, it also targets 7 priority sectors: water, renewable energy, transportation, space, technology, health, and education.³⁴⁸ However, in addition to the outlined focus areas, the nation plans to drive the decarbonisation of its economy through accompanying investments in an ample range of technologies and sectors. Key examples are below.

³⁴⁰ Green sukuk are Shari'ah compliant investments in renewable energy and other environmental assets.

³⁴¹ Ministry of Climate Change and Environment, State of Green Finance in the UAE, The first national survey on contributions of financial institutions to Green Economy

³⁴² <https://www.adgm.com/media/announcements/the-uae-sustainable-finance-working-group-issues-second-public-statement>

³⁴³ MOE, NextGen FDI

³⁴⁴ MOEI. Decarbonisation was one of the focus areas of the 2nd edition of the event

³⁴⁵ International Energy Agency (IEA), Science, technology, and innovation policies for Net Zero

³⁴⁶ According to the Global Innovation Index 2022

³⁴⁷ Further details on these topics are included in chapter 4, 'Sectoral roads towards decarbonisation.'

³⁴⁸ National Innovation Strategy: <https://u.ae/en/about-the-uae/strategies-initiatives-and-awards/strategies-plans-and-visions/strategies-plans-and-visions-until-2021/national-innovation-strategy>

Digitalisation Initiatives

The UAE government has been at the forefront of digitalisation efforts in the MENA region, and aims to create a more efficient, transparent, and innovative public sector. Besides these advantages, digitalisation supports GHG emissions reductions.³⁴⁹

Artificial Intelligence (AI) can be used to track and predict GHG emissions. By providing insight along the entire value chain, AI can also optimize efficiency in production and transportation, thereby reducing GHG emissions and costs at the same time.³⁵⁰

Key initiatives pursued by the UAE government include:

1. The UAE Strategy for AI, aimed at positioning the country as a leader in the field. It includes initiatives to develop AI research and talent and to promote the adoption of AI in government services.³⁵¹
2. The UAE Council for Artificial Intelligence, which will be responsible for supervising the integration of AI in government agencies and the educational sector.³⁵²
3. The adoption of robots for public services. For example, in 2017, the Dubai police presented the world's first operational robot policeman, which can recognise hand signals and facial expressions, speak six languages, and respond to queries.
4. Smart Dubai, an initiative to transform the emirate into a smart city. It focuses on technology to enhance the quality of life for residents and visitors, as well as to enable a digital and lean government (e.g., through paper free and cashless initiatives).³⁵³
5. The DubaiNow app, which allows users to access over 120 government services from a single platform, and the Abu Dhabi Government Services ecosystem, which provides a range of online services to residents.

6. The Dubai Blockchain Strategy, aimed at using the technology to create a more secure, efficient, and transparent government.³⁵⁴
7. The development of Ibtokr, the first digital platform specialised in public sector innovation in the Arab world. This platform aims to establish a culture of innovation and embed it within the government's mission.³⁵⁵
8. The UAE Space Agency's Space Data Centre platform provides scientists, scholars, and public and private entities with access to space data to develop algorithms and solutions for global climate challenges.
9. The UAE Space Agency's Space Analytics and Solutions (SAS) project brings together UAE innovators from various economic sectors to facilitate UAE satellite ecosystem development around climate-change related themes such as water quality, mapping & monitoring, food security, air quality, energy, and infrastructure.
10. The UAE Space Agency has developed a constellation of advanced imaging satellites equipped with Synthetic Aperture Radar (SAR) technology. The constellation will address the critical need for better environmental and land usage monitoring, data collection and analysis to meet today's global challenges.
11. The UAE has signed the Space for Climate Observatory Charter, a global initiative that aims to bring together public and private entities involved in the Earth observation sector. Its goal is to promote the peaceful use of space technology to address climate change.
12. At the emirate level, Abu Dhabi's Integrated Energy Model (IEM) — also known as Energy Cube — aims to provide policymakers and business leaders with a comprehensive platform mapping the energy sector value chain.

³⁴⁹ Science Direct, Carbon emission reduction effects of industrial robot applications: Heterogeneity characteristics and influencing mechanisms.

³⁵⁰ BCG, Reduce Carbon and Costs with the Power of AI

³⁵¹ National Programme for Artificial Intelligence, UAE National Strategy for Artificial Intelligence 2031

³⁵² UAE Government Portal, Artificial intelligence in government policies

³⁵³ UAE Government Portal, Smart Dubai 2021 Strategy

³⁵⁴ UAE Government Portal, Blockchain in the UAE government

³⁵⁵ Ibtokr

Futuristic Transport

The UAE has made significant investments in experimental transportation technologies, including electric self-driving transport (SDT), hyperloops, electric flying taxis and others. In particular, the emirate of Dubai launched the Dubai Autonomous Transportation Strategy to assess the possibility of using these technologies, following Sheikh Mohamed bin Rashid Al Maktoum's objective of having 25% of all transport journeys in Dubai smart and driverless by 2030.³⁵⁶ This study has concluded that smart mobility solutions can cut transportation costs by 44%, reduce environmental pollution by 12%, and save 386 million hours on transportation annually in the emirate of Dubai alone.³⁵⁷

The UAE is leading the efforts in the adoption of SDT. The Dubai Metro now stands out as one of the most extensive autonomous public transit systems globally, and overall SDT provides benefits forecasted to amount to more than AED 22 billion per year, for Dubai alone.

Personal rapid transit (PRT) systems are small, automated vehicles that operate on a dedicated guideway network, providing on-demand, point-to-point transportation. The UAE has been studying the use of PRT systems in Masdar City, Abu Dhabi, which launched the first PRT system in the Middle East in 2010, providing on-demand transportation for residents and visitors.³⁵⁸ Strengthening SDT and PRT is important to decarbonise the nation, as these are alternatives to private cars that can reduce congestion, air and noise pollution, among other benefits. The UAE plans to deploy several forms of SDT and PRT, detailed below.

Autonomous Vehicles

The UAE is a region with high potential for autonomous vehicle usage, with over half its residents mentioning they would likely own a self-driving car in the next five years if the technology was available to them. The UAE is already working with various manufacturers to speed up the development of this technology.³⁵⁹ Autonomous vehicles can support decarbonisation, as a recent study pointed out that their control systems can

reduce fuel consumption by 18% and CO₂ emissions by 25%.³⁶⁰

Hyperloops

Hyperloops are high-speed transportation systems that use magnetic levitation to propel passengers in pods through vacuum-sealed tunnels. The UAE has been a major investor in this technology and already has a flagship project — Abu Dhabi Hyperloop — under development. The project aims to connect Abu Dhabi to Dubai in just 12 minutes, compared to the current travel time of about 90 minutes by car. This will likely attract UAE citizens to use public transport, further reducing demand for private cars.

Flying Taxis

The UAE has also been exploring electric flying taxis. These vehicles — also known as vertical take-off and landing (VTOL) aircraft — are designed to transport passengers through the air in urban environments, avoiding traffic on the ground. The most well-known example of this technology is the Uber Air service, which is being developed in partnership with the city of Dubai. Additionally, Dubai plans to deploy electric flying taxis (or eVTOL) beginning in 2026.³⁶¹

Smart Pods and Sky Pods

Smart pods and sky pods are autonomous solutions to move passengers across short distances to connect the city's homes and businesses with its public transport network. They will be powered by solar panels, which further increases their contribution to emissions reduction.³⁶²

SkyWay Dubai

SkyWay Dubai is being developed to carry passengers and freight on a specially designed elevated string-rail overpass between skyscrapers in Dubai. This new solution will have around 15 kilometres of length and is expected to be able to carry up to 8,400 passengers per hour in each direction. This will significantly increase Dubai's

³⁵⁶ RTA, Self-driving Transport (SDT)

³⁵⁷ US-UAE Business Council, UAE Smart Mobility

³⁵⁸ Masdar, Masdar City Mobility

³⁵⁹ US-UAE Business Council, UAE Smart Mobility

³⁶⁰ Massachusetts Institute of Technology (MIT), On the road to cleaner, greener, and faster driving

³⁶¹ Falcon Aviation, Press Release, Eve and Falcon Aviation Services Announce Partnership to Introduce eVTOL Flights in Dubai

³⁶² US-UAE Business Council, UAE Smart Mobility

passenger transport capacity and free up space in the main roads.³⁶³

Energy Sector

Exploring decarbonisation technologies in the energy sector is important to ensure that the foundations set by measures such as PV scale-up are strengthened in the long term. Solar thermal and geothermal energy are key areas the UAE is assessing.

Solar Thermal

The UAE is home to Khalifa University, a research-focused institution that has been actively involved in the development of solar thermal technologies. One notable example of the UAE's investment in this area is the Shams 1 solar power plant, which is a 100 MW concentrated solar power (CSP) plant located in the UAE's western region. The plant, which began operations in 2013, is one of the largest CSP facilities in the world and features advanced solar thermal technology.³⁶⁴

Geothermal Energy

Geothermal energy is a renewable energy source that taps into the natural heat generated within the Earth's core to provide a steady, reliable stream of power. The UAE has recently been exploring this technology. In February 2023, Masdar announced investments in Pertamina Geothermal Energy (PGE), one of the world's largest geothermal players, adding geothermal energy to its clean energy technology portfolio.³⁶⁵ Masdar is also collaborating with ADNOC drilling to invest in and develop geothermal energy projects and technologies around the world.³⁶⁶

Maritime Sector

Decarbonising the emissions intensive maritime sector is a priority for climate action in the future. Climate action in this area will drive significant demand for green fuels, which present an opportunity for the UAE to become an international maritime (and aviation) hub. To this point, the

nation's government is already promoting discussions about net zero-aligned initiatives and projects with key organisations, with a particular interest in maritime fuels and alternative energy sources.³⁶⁷ The UAE intends to develop a platform for knowledge- and idea-sharing among public and private institutions, R&D entities, and academic institutions in order to become a preferred destination for innovative maritime technologies.³⁶⁸

Peaceful Nuclear Energy

Peaceful nuclear energy will be an important contributor to greening the power grid, as it will act as baseload to produce electric power at a constant rate even during periods of low solar radiation, such as during cloudy days or at night. The UAE is investing in exploring innovative nuclear technologies, including Advanced Nuclear Reactors (Small Modular Reactors and Micro Reactors).³⁶⁹

Advanced Reactors are smaller than traditional nuclear reactors and offer several advantages and industrial applications, improved safety, and greater flexibility. In addition, these advanced nuclear technologies can support decarbonizing the hard to abate sectors by providing process heat instead of using fossil fuel. ENEC is leading the research and exploration on these topics by conducting a comprehensive review of the different technologies and assessing the market needs and potential application of the future technologies in both the power and industrial sectors. ENEC is in continuous engagement with international players to investigate the latest developments in advanced nuclear technologies and identify relevant R&D initiatives to support Human Capital development and accelerate the deployment of these technologies in the UAE.³⁷⁰

Materials

The UAE has significantly advanced in the R&D of innovative and more sustainable materials. For example, EGA has been investing in the development of new ways to produce aluminium in an environmentally friendly manner. The company

³⁶³ US-UAE Business Council, UAE Smart Mobility

³⁶⁴ Masdar, Press Release, Shams

³⁶⁵ Masdar, Press Release, Masdar Makes Strategic Investment in One of the World's Largest Geothermal Players, Growing Clean Energy Portfolio

³⁶⁶ ADNOC, Press Release, ADNOC Drilling and Masdar agree to explore geothermal energy opportunities

³⁶⁷ Public speech by Eng. Hessa Al Malek, Advisor to the Minister for Maritime Transport, Affairs, the UAE Ministry of Energy and Infrastructure

³⁶⁸ GulfToday, MOEI discusses key maritime projects proposed for COP 28

³⁶⁹ Mohamed Al Hammadi, managing director and chief executive officer of the Emirates Nuclear Energy Company (ENEC), in a speech at the World Government Summit in Dubai

³⁷⁰ ENEC, News, ENEC meets with Idaho National Laboratory experts to explore latest developments in advanced nuclear and clean energy technologies

runs a research and development centre that focuses on developing new technologies and processes to reduce emissions, conserve energy, and minimise waste. The company's efforts in researching solutions to reuse all bauxite residue — the primary by-product of alumina refineries — that is produced in the UAE is just one example. EGA also introduced a type of aluminium made with solar power. Additionally, EGA is collaborating with established academic institutions such as the Massachusetts Institute of Technology (MIT) to address solutions to improve efficiency, develop new techniques in aluminium smelting, or adopt AI robots along the chain.³⁷¹

Similarly, Emirates Steel Arkan, a leading manufacturer in building materials (mainly steel, cement, and PVCs) is continuously involved in exploring areas for improvements in production efficiency through innovative technologies. Dust reduction through the dedusting unit, slag processing to reduce by-products and produce slag aggregate, and Continuous Emission Monitoring System (CEMS) to monitor the emissions from the stacks are some of Arkan's flagship activities in adopting climate-friendly approaches.

14.3 Upskilling for Net Zero — Capabilities Enhancement Plan

It is increasingly clear that the transition to a greener economy will require transformations in the way people work and the nature of their jobs. New jobs requiring sustainability expertise will emerge, demand for certain jobs will increase (e.g., in construction with the ramp-up of complex infrastructure projects), some jobs will fundamentally change (e.g., the maintenance requirements for BEVs are different from those of ICE vehicles), and others will be downsized (e.g., coal mining jobs). Skilling, re-skilling, and upskilling the workforce is thus vital to reaching net zero targets.

The UAE is working to equip its citizens with the right capabilities to act on climate change. This is required by the UAE Net Zero by 2050 Strategic Initiative, and the nation plans to generate and future-proof an average of 160,000 and 40,000 jobs

(respectively) from 2025 to 2050. Power and water generation will drive significant demand due to the need for highly skilled individuals (e.g., engineers) for solar, batteries, and other sub-sectors. Heavy industry will also require labour upskilling, as the deployment of technologies such as CCS and hydrogen accelerates. Similar needs will emerge across the remaining sectors.

The UAE will implement a dedicated programme to address these needs and maximise net zero-driven local employment and job creation. This programme will involve:

- Equipping the UAE's workforce with the skills necessary to capitalise on emerging opportunities in the green economy, enhancing their capacity, and promoting awareness about climate change.
- Breaking down the future talent demand created by net zero into job families, split between expats and UAE nationals.
- Comparing future talent supply and demand, based on factors such as national university enrolment and expat worker movements.
- Developing an action plan to address anticipated talent shortages, including interventions such as upskilling and re-skilling programmes and international university partnerships.
- Drafting a capacity building plan for government entities to build knowledge on sustainability, regulation, and implementation.

The UAE will also consider just transition elements in its capability enhancement efforts.³⁷² This programme will add to ongoing UAE efforts, namely on capability building for the public sector. The nation sees this as a critical area, and as such the UAE Climate Change Research Network (CCRN) was established in 2021 to foster closer collaboration between the government, relevant international partners (e.g., UN) and academic institutions, to enhance knowledge-sharing, and to determine a national climate agenda based on scientific principles.³⁷³

The UAE's Ministry of Economy has launched a national strategy to attract and retain global talent

³⁷¹ EGA 2021 Sustainability Report

³⁷² As highlighted in the chapter 5.2 'Looking Forward: the UAE's Commitments to Just Transition.'

³⁷³ Ministry of Climate Change and Environment: UAE Climate Change Research Network

by positioning the UAE as one of the top countries in global talent competitiveness in strategic sectors, including energy, food and water security, advanced technology and ICT. The vision of the strategy entails the creation of an environment conducive to attracting and retaining skilled professionals through an appropriate regulatory framework and market landscape. Additionally, the UAE implemented Jahiz, an upskilling programme designed to equip state workers with critical skills such as digitalization and AI, as well as concepts related to sustainability such as net zero, climate change, and the circular economy.³⁷⁴

Similar initiatives are also being launched at the emirate level. The Environmental Sustainability Award in Ras Al Khaimah acknowledges and encourages government sectors to participate in environmental awareness initiatives and recognises their endeavours to decrease their ecological impact.³⁷⁵

Other upskilling programmes have been put in place to ensure women are heard and involved in the debate around sustainability. For example, Masdar's Women in Sustainability, Environment and Renewable Energy (WiSER) initiative aims to educate women globally on the topics of environmental sustainability and innovation to empower them in facing the challenge of the climate crisis.

14.4 Paving the Future for Net Zero - Role of Education and Culture

Education and culture are critical in the journey to net zero. The importance of education in the successful achievement of sustainability goals has been set out in the UN's 17 Sustainable Development Goals (SDGs) and UNESCO's Education for Sustainable Development (ESD) for 2030.³⁷⁶ Educational institutions play a key part in driving sustainability for four main reasons:

1. Through research, teaching, and by leveraging their outreach they can mobilise society — especially younger generations — to act.³⁷⁷

2. They can enable a better understanding of climate change and its effects by providing learning opportunities on the natural environment.
3. They allow citizens to develop the required knowledge and skills to build greener careers.
4. They introduce practices such as the circular economy, waste prevention, and resource efficiency into people's daily lives, effectively shaping culture and habits around sustainability.

The UAE and its institutions are aligned around this perspective. Examples of education's role in promoting climate action are showcased at different levels, including within educational institutions, the business sector, and the government.

On the institutional front, universities have been playing a critical role in connecting education with industry by fostering collaboration between governments, employers, and corporations.

- Recognising the crucial role of educators in shaping the future workforce, the Ministry of Education — in collaboration with UNICEF — is training around 3000 master trainers and 1500 principals across the nation for the adoption of climate education in their curricula.
- One primary example is the Dubai government's University Entrepreneurship Programme (UEP), in which the Dubai Future Foundation (DFF) partners with multiple universities to transform them into incubators for students' business ideas.³⁷⁸ This programme develops projects across sectors such as power and water generation, healthcare, and water treatment, and already involves 12 universities in the UAE.
- Dubai's Heriot-Watt University collaborates closely with the Industrial Decarbonisation Research and Innovation Centre (IDRIC), a world-renowned research and innovation facility in industrial decarbonisation.³⁷⁹
- American University of Sharjah (AUS) is developing a comprehensive Climate Action Plan to reduce its carbon emissions and align with the UAE Net Zero by 2050 Strategic Initiative.³⁸⁰

³⁷⁴ UAE Government portal, 'Jahiz' - Future government talents

³⁷⁵ Government of Ras Al Khaimah, Ras Al Khaimah Environment Sustainability Award

³⁷⁶ UNESCO, Education for Sustainable Development: A Roadmap

³⁷⁷ Times Higher Education, The Race to Net Zero: How Global Universities Are Performing

³⁷⁸ Dubai Future Foundation, University Entrepreneurship Programme (UEP)

³⁷⁹ From an interview with Professor Tadhg O'Donovan, Deputy Vice Principal and Academic Leadership at Heriot-Watt University

³⁸⁰ American University of Sharjah, Press Release, AUS Climate Action Plan to align with UAE pledge to reach Net Zero by 2050

- Umm Al Quwain University addresses both mitigation and adaptation targets with its National Landscape initiative. This first-of-its-kind landscaping project involves the use of indigenous plants as nature-based solutions to simultaneously promote native biodiversity, generate cultural benefits, and minimise cultivation costs related to irrigation, fertilization, and maintenance.³⁸¹

In this context, the UAE has firmly integrated gender equality into its response to climate change, as demonstrated by its continued dedication to promoting female education. Over 50% of the country's university graduates are women, many of them pursuing degrees in science, technology, engineering, and mathematics (STEM) and climate-related fields.

On the business side, cooperation between corporations and academic institutions has been increasing.

- The MBR Solar Park Innovation Centre collaborates with both local and international higher education institutions, as well as organisations and start-ups, to offer a platform for hosting various academic events such as conferences, seminars, and workshops.
- Masdar is at the forefront of the Youth 4 Sustainability (Y4S) initiative, which connects university students and young professionals with influential global business leaders, policymakers, and technology pioneers. The programme lasts one year and involves a series of events designed to equip participants with the latest sustainability practices, fundamental knowledge, skills training, practical work experience, and networking skills.

Lastly, on the government level, the UAE is acting to promote fundamental behavioural changes required for the climate transition. Here, the development of educational content and campaigns has been instrumental, and there are various examples at both the federal and emirate levels:

- The Save to Sustain campaign by Ministry of Energy and Infrastructure of UAE studied the level of awareness and the behaviour of citizens regarding electricity and water consumption.³⁸²

This campaign included a survey to identify the areas where society lacked knowledge regarding conservation. This study supported a plan for a national conservation campaign that would use awareness and educational activities to improve behaviours among different groups, including students, families, workers, and tourists. This plan aims to cater to the specific needs of each group, leading to more effective outcomes and a significant impact on electricity and water consumption levels.

- The Sharjah Peak Hour Campaign and Rationalisation Hour initiative has been taking place every summer for the past seven years.³⁸³
- Abu Dhabi has produced a detailed guide to efficient irrigation methods and their benefits. MOEI has also released a National Guideline for Efficient Irrigation.³⁸⁴
- Ras Al Khaimah's Energy Saving Tips campaign focuses on the importance of using efficient appliances and understanding energy and water savings.
- Dubai's My Energy, My Responsibility campaign is raising awareness on how to save electricity and water.³⁸⁵
- The Terra pavilion has been repurposed after the closure of Dubai's Expo 2020 site. This pavilion now hosts various interactive educational experiences, including themed weeks to address global challenges such as biodiversity, food, and agriculture, and other initiatives like World Majilis.³⁸⁶

All these actions are guided by UAE's Action for Climate Empowerment (ACE) framework, which the nation is developing in alignment with Article 6 of the UN Framework Convention on Climate Change and Article 12 of the Paris Agreement. The ACE is a call to action for countries to develop educational and awareness programmes, provide training to scientific, technical, and managerial personnel, promote access to information, encourage public engagement, and foster international collaboration in addressing climate change and its impacts.³⁸⁷

³⁸¹ Panorama, Solutions for a Healthy Planet, Old is Gold: Healing from within by the Indigenous Plants

³⁸² Ministry of Energy and Infrastructure (MOEI), Save to Sustain

³⁸³ Sharjah Electricity and Water Authority (SEWA), Peak Hour Campaign

³⁸⁴ MOEI, National Guideline for Efficient Irrigation

³⁸⁵ Dubai Supreme Council of Energy (DSCE): My Energy, My Responsibility

³⁸⁶ Expo 2020 Dubai Sustainability Report 2021

³⁸⁷ UNFCCC Action for Climate Empowerment

The UAE expects further examples to materialise in upcoming years as its government scales-up climate action and the nation is spotlighted with the hosting of COP28.

14.5 Joining Forces for Net Zero – Stakeholder Engagement and Mobilisation

Implementing the UAE Net Zero by 2050 Strategic Initiative will require a whole-of-society approach, demanding extensive stakeholder engagement across four main groups: government, corporations, civil society, and the international community. The nation aims to develop a tailored strategy to approach each of these groups. In addition, the UAE also plans to involve non-state actors, particularly NGOs and academia, in its climate action.

Government actions will be applied to both federal- and emirate-level entities and will put GHG emissions directly influenced by the government on a path to net zero. The UAE plans to prepare and launch these actions before 2024. In this context, the UAE expects to implement:

- A programme that engages government entities to disseminate UAE Cabinet approved CO₂ targets.
- A programme that develops emissions reduction measures that are binding for government entities.
- A programme for public procurement of green cement, steel, and aluminium.
- A national policy for net zero-compatible buildings, with energy efficiency retrofits and solar thermal or PV in government-owned buildings.
- A national policy to ensure that new government vehicles purchased after 2025 are electric.

Corporate actions will focus on engaging with and supporting preparations at corporations that are instrumental in implementing time-critical decarbonisation measures. Key examples of already ongoing actions are the UAE Alliance for Climate

Action (UACA)³⁸⁸ and UAE Climate-Responsible Companies Pledge,³⁸⁹ alliances that bring together the private sector, the government, the civil society, and NGOs to increase momentum around Paris Agreement targets and foster collaboration. The UAE expects to kick-off further engagement with the private sector in 2023. This will include liaising with:

- Key players for CCS (e.g., main emitters), to initiate the CCS network development plan.
- Cement producers regarding decarbonisation measures and their planned ramp-up.
- Key public transport players, including municipal Metro authorities and Etihad Rail, to allow smooth planning and construction of passenger rail and metro lines.
- Corporations overall, to sensitise them for the benefits of waste recycling.
- Corporate landowners, to align on the ramp-up of distributed power generation.

Households will be reached via multi-channel engagement with civil society to raise awareness and acceptance of upcoming net zero measures and government interventions. The UAE plans to commence this programme in 2023/2024. It will involve:

- Issuance of a national press release that can be complemented by a promotional campaign to inform households of the UAE's net zero targets and benefits.
- Continuous engagement with the population through social media (e.g., news and statistics being posted on Instagram).
- Continuous engagement with youth through classroom activities organised by the Ministry of Education, as well as planned activities around COP (e.g., Immersive COP and the COP Youth Competition).

Lastly, the international audience will be approached through the UAE's already released

³⁸⁸ Full list of members: HSBC, Talabat, Aldar Properties, Johnson Controls, Unilever, Siraj Power, RAK Municipality, Chalhoub Group, Apparel Group, Al Serkal Group, Farnek, Aramex, American University of Sharjah, Danone, Serco, Bureau Veritas Group, PepsiCo, Sobha Realty, Nestle

³⁸⁹ Full list of signatories: BEEAH, Emerson, Emirates Nature-WWF, Majid Al Futtaim Group, Standard Chartered Bank, HSBC, Masdar, Emirates Global Aluminium, Emirates Steel Arkan Group, Aldar Properties, Emirates Environmental Group, Strata, Al Yah Satellite Communications Company (Yahsat), Chalhoub Group, Pure Harvest, AESG, Taka Solutions, Lafarge Emirates Cement, EY, EV Lab, and TotalEnergies.

Third Update of Second NDC, and the publication of the present LTS.

The UAE expects to revise these strategies and build upon existing plans as it progresses in the deployment of its UAE Net Zero by 2050 Strategic Initiative.

14.6 Elevating Inclusion in Net Zero — Women, Youth, People of Determination

The UAE's climate agenda prioritises inclusivity and empowerment, with two main goals:

- 1) Placing a strong emphasis on safeguarding and supporting the most vulnerable segments of society, including women, youth, children, and people of determination.
- 2) Engaging and enabling these stakeholders to contribute to the nation's climate action.

The nation already has multiple initiatives aligned with this purpose.

Transversal Initiatives

In 2021, the UAE held its National Dialogue on Climate Ambition (NDCA) to encourage stakeholders to share their perspectives and ideas on how the nation can enhance climate action and increase its ambitions towards the Paris Agreement's goals.³⁹⁰ Women and youth were well-represented at this event, which highlighted their roles in climate action. The event included a dedicated session on youth and climate action and emphasized the critical role of women in driving sustainable development.

Initiatives to Promote Youth Inclusion

The UAE Ministry of Culture and Youth is responsible for creating and implementing policies in support of the development and well-being of young people in the country. The Ministry's mandate is to empower and engage youth in shaping the future of the nation by creating opportunities for them to achieve their full potential. As such, one of the key priorities for the entity is fostering a culture of innovation and creativity in

areas including education, employment, entrepreneurship, and sustainability.

To ensure young people's voices are at the heart of global climate policymaking, the COP28 Presidency has launched the International Youth Climate Delegate Programme (International YCDP), which will coach and sponsor 100 young people to attend COP28 in November. The Federal Youth Authority oversees the Youth Circles initiative which provides a platform to foster direct dialogue and interaction between youth and decision makers in both the public and the private sector. Through discussions aimed at raising awareness on topics close to the heart of UAE's younger generations, the circles aim to crowdsource ideas and solutions to tackle global challenges.³⁹¹ The Arab Youth Centre (AYC) was established with the recognition that youth are an asset in addressing climate change. In 2021, AYC took a step further by creating the Arab Youth Council for Climate Change (AYCCC), a dedicated platform empowering young Arab climate activists to participate in climate efforts. The appointment of H.E. Shamma Al Mazrui as the Youth Climate Champion in the UAE is a significant milestone in empowering young Emiratis to act on climate change. H.E. Shamma Al Mazrui leads the AYCCC Strategy, focusing on four pillars: Participation, Action, Voice, and Education (PAVE).

1. Participation: Under the Participation pillar, the UAE encourages and facilitates the active engagement of young people in climate-related initiatives and decision-making processes.
2. Action: The Action pillar emphasizes tangible steps to address climate change through practical actions.
3. Voice: The Voice pillar highlights the importance of amplifying the voices of young Emiratis in advocating for climate action.
4. Education: The Education pillar focuses on providing young Emiratis with knowledge and skills related to climate change through formal and informal education.

Local youth organized the UAE's first Local Conference of Youth in 2022 with broad support from the UN and several UAE partners. This event focused on discussions around climate change gaps

³⁹⁰ In collaboration with the United Nations Development Programme (UNDP)

³⁹¹ Federal Youth Authority

and solutions, especially as they relate to intergenerational rights and equity.³⁹²

Additionally, Mubadala leads several initiatives on youth inclusion, including its MIC Education and Outreach programmes. These programmes include interactive workshops and shows, competitions to foster interest in sustainability, renewable energy and engineering, promotion of internships, and other activities.³⁹³

The Emirates Environmental Group (EEG) has also developed multiple programmes to promote sustainability among the youth. These include an urban forestation programme, a waste management programme including actions to raise awareness on recycling, and several educational initiatives such as public speaking competitions focused on sustainability topics. Furthermore, it engages youth ambassadors through initiatives such as UACA.³⁹⁴

Youth engagement is also a topic on IRENA's agenda. Among other activities, the agency collaborates with the Global Council on Enabling Youth Action for SDG 7, a youth forum (as part of its assembly), youth talks covering multiple topics, and a Student Leaders Programme.³⁹⁵

Initiatives to Promote the Inclusion of Women

In recognition of the vital importance of integrating gender equality into its initiatives aimed at combating climate change, the UAE has made significant strides in involving women in climate-related discussions and decision-making processes. This is demonstrated by the notable representation of women in the UAE's climate and energy community, including prominent roles within the Cabinet, the Federal National Council (FNC), the Ministry of Climate Change and Environment, as well as the Special Envoy of Climate Change. The nation's efforts in gender equality are also represented by the 2026 UAE Gender Balance Strategy, which expresses the country's commitments to policies, measures, partnerships,

and international engagement on key topics, including climate and sustainability.

Mubadala is the founding partner of the Pathway20 programme, the MENA region's only career accelerator dedicated to building a pipeline of highly competent female board directors and connecting them to boards of listed and large-scale private companies. The company also promotes the Women's Network, which aims to create a safe and female-friendly environment in the workplace and to support internal plans for the advancement of women in different spheres.³⁹⁶

Likewise, IRENA promotes multiple initiatives on the inclusion of women. As part of its Gender Perspective series, IRENA developed a series of reports dedicated to this topic. It also held several events on the subject, including 'Gender in the Energy Transformation' (9th IRENA Assembly), and it produces digital content and newsletters around gender inclusion, such as its most recent report on Solar PV 'A Gender Perspective on Solar Employment'.³⁹⁷

Initiatives to Promote the Inclusion of People of Determination

The UAE pledged to 'leave no one behind' on its path towards a sustainable achievement of the 2030 Sustainable Development Agenda, in which access to clean energy and the protection of the environment are seen as key priorities.³⁹⁸ In line with this, the UAE intends to create an inclusive society for people of determination and their families through the National Policy for Empowering People of Determination. The nation supports people of determination in multiple arenas, including health, rehabilitation, education, employment, and climate action.³⁹⁹ As such, the NDCA included representatives of people of determination to ensure their participation in the development of the UAE's roadmap to net zero.

Non-state actors are also aligned with these goals. Mubadala, for instance, is engaged in a partnership with Zayed Higher Organization for People of Determination to provide jobs for people of

³⁹² UNICEF, LCOY UAE Final Report

³⁹³ Mubadala

³⁹⁴ EN-WWF

³⁹⁵ IRENA

³⁹⁶ Mubadala

³⁹⁷ IRENA (2022), 'Solar PV: A Gender Perspective', International Renewable Energy Agency, Abu Dhabi, <https://www.irena.org/publications/2022/Sep/Solar-PV-Gender-Perspective>

³⁹⁸ Speech delivered by Sheikha Lubna bint Khalid Al Qasimi, at the time Minister of International Cooperation and Development, during her participation to the Sustainable Development Goals 2015 Summit

³⁹⁹ UAE Government Portal, People of Determination

determination within Mubadala Group. This partnership — Muthabara — has so far employed 21 people of determination.⁴⁰⁰

14.7 Evolving Net Zero — Monitoring, Reporting and Verification Mechanism

Measurement, reporting, and verification (MRV) refers to the process of measuring the reduction of GHG emissions and progress on adaptation efforts — among other elements — by a specific measure or policy over a given period of time. By proving that a specific mitigation activity avoided or removed GHG emissions, MRV enhances the transparency and accountability of decarbonisation progress and helps to define areas of improvement for a country's mitigation and adaptation measures. Because it provides data required to assess the effectiveness of climate-related policies, MRV is critical for demonstrating progress on climate goals, including net zero.⁴⁰¹

The UAE will act on the requirement to report on its obligations, under the Enhanced Transparency Framework (ETF) of the Paris Agreement.⁴⁰² For the first stage of the implementation of the National MRV-Transparency System, the scope is narrowed to cover the emissions inventory elements for both GHG and AQ themes. Follow-on stages of development will include projections, policy and measure analyses, mitigation and adaptation target tracking (i.e., NDC), finance and support needed and provided, and wider impacts. By collecting emissions inventories, the MRV-Transparency System substantiates the Biennial Transparency Report (BTR) that the UAE plans to submit by December 2024 (and every two years after that). Any strong national MRV system is thus expected to support the Biennial Transparency Report as well as the National Communication (NC) or a combined NC and BTR.

To coordinate the implementation of the MRV system, the UAE is adopting a formal institutional framework that will detail the roles and responsibilities of the different emirates and build on their existing governance and capabilities. The MRV

institutional framework involves appointing a Single National Entity (SNE) responsible for:

- Overall control of the National MRV-Transparency System development and function.
- Final sign-off of the GHG and AQP inventory outputs.
- Performing several key functions such as overall control of the National System's development and functions, final approval of GHG and AQ inventory outputs, and providing institutional, legal, and contractual arrangements to ensure timely delivery of emissions estimates.
- Selecting coordinators for the MRV Technical Team and sectoral experts for the Technical Sector Expert Working Group.
- Setting up data supply agreements with technical support from the MRV Technical Team.

This framework will require support from a technical team and a National Emission Quantification tool to support GHG and AQ inventory reports. The following measures will help accomplish this:

- The MRV Technical Team, consisting of inventory coordination teams, key subject matter experts, relevant government departments, and others, will coordinate the data collection process, implement any improvements to the national inventories, and compile inventories to ensure consistency. The MRV Technical Team is also tasked with data management, including data acquisition, processing, compilation, checking and storage of data and delivery of reports and datasets to time and quality.
- Each emirate will identify a coordinating agency responsible for gathering and collating emirate-specific activity and data to be supplied to the MRV Technical Team. This coordinating agency will perform an audit of all data sources and identify key data providers and gaps.
- Data providers (both emirate-specific and at the national level) will share the data required to compile the inventories.

⁴⁰⁰ Mubadala

⁴⁰¹ The World Bank, What You Need to Know About the Measurement, Reporting, and Verification (MRV) of Carbon Credits

⁴⁰² UNFCCC, UNFCCC Process, Transparency: how reporting and review underpin global climate action and support



- The MRV support tool will collect data and manage stakeholder engagement, develop datasets and estimates, and compile an up-to-date list of GHG and AQ inventories and related outcomes. Ultimately, the MRV support tool will be critical in prioritising actions and national policy making (since GHG and air pollutant estimates are an input for estimating projections and evaluating mitigation opportunities), tracking the effectiveness of such policies, and engaging society and decision-makers in support of climate action.

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