



UNITED ARAB EMIRATES  
MINISTRY OF CLIMATE CHANGE  
& ENVIRONMENT



# UAE Circular Economy Landscape Report

2023

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# **UAE Circular Economy Landscape Report**

## 2023

Joint Report by the Global Green Growth Institute  
and UAE Ministry of Climate Change and Environment

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## LIST OF ACROYMS

ACOP 28	28th Conference of the Parties	DFA	Dubai Future Accelerators
4IR	Fourth Industrial Revolution	DFF	Dubai Future Foundation
ACTVET	Abu Dhabi Centre for Technical and Vocational Education & Training	DPM	Department of Urban Planning and Municipalities
ADDC	Abu Dhabi Distribution Company	EAD	Environment Agency Abu Dhabi
ADDED	Abu Dhabi Department of Economic Development	EESA	Environmental Excellence School Award
ADGM	Abu Dhabi Global Market	EGA	Emirates Global Aluminium
ADIO	Abu Dhabi Investment Office	EnMS	Energy management systems
ADNOC	Abu Dhabi National Oil Company	EN-WWF	Emirates Nature-Worldwide Fund for Nature
AEC	Architecture, construction, and engineering	EPR	Extended Producer Responsibility
AI	Artificial Intelligence	ESCO	Energy service companies
AMBER Lab	Advanced Materials and Building Efficiency Research Laboratory	ESG	Environmental, Social and governance
AR	Augmented Reality	EV	Electric Vehicles
ARDECO	Arab Development Establishment	FBMG	Food and Beverage Manufacturing Business Group
ASR	Aquifer Storage and Recovery	FCA	Fujairah Centre for Adventures
ASTR	Aquifer Storage Transfer and Recovery	FEED	Front-end engineering design
AWG	Atmospheric water generation	GCC	Gulf Cooperation Council
AWS	Amazon Web Services	GCRE	Green Coast Real Estate
B2B	Business-to-Business	GDP	Gross Domestic Product
BIM	Building information modelling	GGBS	Ground Granulated Blast-furnace Slag
BOOT	Build Own Operate Transfer	GGGI	Global Green Growth Institute
CaaS	Cooling as a Service	GHG	Greenhouse gas
CDW	Construction and Demolition Waste	GIM	Graphene Innovations Manchester
CEA	Controlled-environment agriculture	GRI	Global Reporting Initiative
CEA	Controlled environment agriculture	GW	Gigawatts
CIP	cold in place	HAC	High Ambition Coalition
CPA	Circular Packaging Association	ICBA	International Center for Biosaline Agriculture
CSP	Concentrated Solar Power	IEMS	Institute of Environmental Management and Sustainability
CSP	Cloud service providers	IOT	The Internet of Things

IPP	Independent Power Project
ITTI	Industrial Technology Transformation Index
IUCN	International Union for Conservation of Nature's
KEZAD	Khalifa Economic Zones Abu Dhabi
LCA	Life cycle assessment
LEC	Lafarge Emirates Cement
LOC	Leaders of Change
MAR	Managed Aquifer Recharge
Masdar	Abu Dhabi Future Energy Company
MBRGI	Mohammed Bin Rashid Al Maktoum Global Initiatives
MENA	Middle East and North Africa
MIGD	Million imperial gallons per day
ML	Machine Learning
MOCCA	Ministry of Climate Change and Environment
MOEI	Ministry of Energy and Infrastructure
MOIAT	Ministry of Industry and Advanced Technology
MOU	Memorandum of Understanding
MRV	Measuring, Reporting and Verification
MW	Megawatt
NAP	National Adaptation Plan
NFT	Non-fungible tokens
OBTI	One Billion Trees Initiative
OEM	Original Equipment Manufacturer
P&G	Procter & Gamble
P2P	Peer to Peer
PCR	Post-consumer Recyclates
PET	Polyethylene terephthalate
PPP	Public-private partnership
PtL	Plastics-to-Liquid
R&D	Research and Development
RAKEZ	Ras Al Khaimah Economic Zone's
RDF	Refuse Derived Fuel

RDI	Responsive Drip Irrigation
RDNB	Raw Design and Build
rPET	recycled polyethylene terephthalate
RTA	Roads and Transport Authority
RVM	Reverse vending machines
SaaS	Software-as-a-Service
SAF	Sustainable Aviation Fuels
SAT	Soil Aquifer Treatment
SBN	Sustainability Business Network
SCA	Securities and Commodities Authority
SDAL	Sharjah Department of Agriculture and Livestock
SDG	Sustainable Development Goal
SFDR	Sustainable Finance Disclosure Regulation
SMEs	Small and medium enterprises
SRF	Solid Recovered Fuel
SRTIP	Sharjah Research Technology and Innovation Park
STFT	Sustainable and Transition Finance Team
STP	Sewage treatment plant
Tadweer	Abu Dhabi Waste Management Center
TSE	Treated Sewage Effluent
TSG	The Storey Group
UAE	United Arab Emirates
UBC	Used beverage cartons
UNEP	United Nations Environment Programme
UPM	Union Paper Mills
VR	Virtual Reality
VUCA	Volatile, Uncertain, Complex, Ambiguous
WEEE	Waste Electrical and Electronic Equipment
WFH	Work from home
WHR	Waste heat recovery
WtE	Waste-to-Energy

As we navigate the path toward a sustainable and prosperous future, let us remember that the circular economy is not just a concept, but a commitment to harmonizing human progress with the well-being of our planet. Together, we have the power to transform, and through innovation and collaboration we shall pave the way for a more resilient future where economic growth and environmental stewardship go hand in hand.

**HH Sheikha Shamma Sheikha  
Shamma bint Sultan bin  
Khalifa Al Nahyan**

President & CEO of UAE  
Independent Climate Change  
Accelerators, UICCA



It is with great pleasure that I introduce this report, which highlights the remarkable efforts and actions undertaken by stakeholders across the United Arab Emirates in support of the country's transition towards a Circular Economy. As we navigate the path towards a more sustainable future, it is imperative to recognize and celebrate the initiatives that propel us closer to achieving our collective goals.

The Circular Economy represents a transformative paradigm shift, one that challenges the linear "take-make-dispose" model and embraces a regenerative approach to resource management. In the UAE, we have recognized the urgent need to shift from traditional practices to innovative and sustainable solutions that optimize resource utilization and minimize waste generation.

Within these pages, you will discover a tapestry of stories that reflect the commitment and determination of our stakeholders, both from the public and private sectors, large and small. From government agencies and municipalities to businesses, entrepreneurs, and communities, the UAE's circular journey is marked by their visionary actions.

The report showcases a diverse array of initiatives and projects, each demonstrating how stakeholders have risen to the challenge and made significant strides in their respective fields. Through collaboration, innovation, and a shared commitment to sustainability, these stakeholders have paved the way for a more circular and resilient UAE.

From circular design and eco-friendly manufacturing practices to waste management innovations and the promotion of sustainable consumption, this report showcases the breadth and depth of actions that have been undertaken. It exemplifies the spirit of innovation, determination, and forward-thinking that characterizes the UAE's transition towards a Circular Economy.

While this report provides a snapshot of the progress made, it is by no means an exhaustive account. It is a testament to the fact that across the nation, stakeholders are actively embracing the Circular Economy principles and driving change. It is a call to inspire and motivate others to join the movement, realizing that through collective action, we can accelerate the transition towards a more sustainable and prosperous future.

I extend my gratitude to all the stakeholders featured in this report for their commitment and dedication. Their actions serve as beacons of hope and inspiration, illuminating a path towards a Circular Economy that benefits not only our environment but also our economy and society at large.

I encourage policymakers, businesses, communities, and individuals alike to immerse themselves in the stories and insights shared within this report. Let us be inspired, let us collaborate, and let us take further bold steps towards embracing the Circular Economy in the UAE.

Together, we can continue to transform challenges into opportunities, crafting a future where sustainability is woven into the fabric of our nation.

**Mariam bint Mohammed Almheiri**

Minister of Climate Change and Environment and Chairperson of the UAE Circular Economy Council



It is my pleasure to present this report, which details the UAE's latest developments and achievements in its transition to a circular economic model.

The rapid pace of progress witnessed by our country over the last few decades has led to an increase in the population and as a result, the UAE population growth averaged nearly 10% annually in the first decade of this century. These changes amplified the impact on available resources including energy, food, and water, highlighting the need to transition to a circular economy, to continue to drive sustainable, inclusive economic development.

Waste is too often thought of simply as something to be disposed of as cheaply and easily as possible, often overlooked as a source of valuable materials. A change in the production and consumption patterns of economic agents and, more generally, the attitudes and habits of society is imperative to effectively optimize the value of products and materials throughout their life cycle and alleviate the impact of economic growth on the environment.

To achieve these goals, the UAE government established the Circular Economy Council and the Circular Economy Policy in early 2021, setting our path to circularity and maximizing the use of our precious resources to create a healthier, more sustainable economy. The policy calls for community collaboration, engaging all segments of society—the government, businesses, and individuals—with the support of a wide array of partners, stakeholders, and experts in the field.

Today, the stories and insights shared within this report show how far we have traveled down this path, moving closer to the realization of our circular economy vision. For instance, the Aluminum Recycling Coalition, an alliance brought together by EGA, promotes a culture of aluminum recycling in the UAE. Its pilot plant that converts bauxite residue into green soil products is thought to be the first of its kind in the world. Moreover, several eco-friendly alternatives to plastic mentioned in the report support the UAE's contributions as a member of the High Ambition Coalition (HAC) to End Plastic Pollution that aims to eliminate plastic pollution by 2040.

Private sector companies, both large and small, continue to showcase their innovation potential in this regard as well, and this report sheds light on solutions

they have launched to promote recycling, regeneration, sharing, optimization, virtualization, and exchange. These achievements are indeed a source of pride for us and show how stakeholders are embracing the circular economy principles to serve as agents of change.

Accelerating the UAE's transition to a green and circular economy remains one of the top priorities of the Ministry of Economy while we actively build that future we envision, rather than passively awaiting it. I conclude by reiterating our unwavering commitment to intensifying collective efforts and initiatives aimed at accelerating the UAE economy's shift to a circular model, ensuring a better, brighter future for all.

**Abdulla bin Touq Al Marri**

Minister of Economy and Chairperson  
of the Policy Committee of the UAE  
Circular Economy Council



Circular economy is a key pillar in our efforts to reduce the environmental footprint of the energy, infrastructure, and transport sectors. Therefore, the Ministry of Energy and Infrastructure has made sure the principles of circular economy are deeply integrated in its projects and strategies, such as the UAE Energy Strategy 2050 and UAE Water Security Strategy 2036.

We believe that circularity helps us rebuild our relationship with the environment as it allows our natural systems to regenerate. In addition, it contributes significantly to improved energy and water security and environmental sustainability, as well as cost savings as a result of keeping resources in use for a long time and extending the life cycle of products.

Through the UAE Circular Economy Policy, we have embarked on an ambitious and important mission to transition from a linear model to a circular economy approach that enables a long-term environmental, economic, and social prosperity for our nation.

Many key stakeholders in the UAE have already embraced circular economy principles, after recognizing that they are not only good for the environment but also make sound business sense. This report sheds light on successful examples and provides valuable insights for our sectors to help them embed circularity in their core operations and accelerate the transition to a circular economy in the UAE.

**Suhail bin Mohammed Al Mazrouei**

Minister of Energy and Infrastructure





**H.E. Dawoud Al Hajri**

Director General of Dubai Municipality

“The UAE is making significant strides in efforts to promote the transformation towards a circular economy and sustainable environment in line with comprehensive strategies and plans designed to achieve both short and long-term goals. The move aligns with the vision of wise leadership to position the UAE as one of the most sustainable countries in the world and as an innovative country that encompasses all elements to ensure sustainability, prosperity, and high quality of life for all society members. Furthermore, these efforts highlight the UAE’s keenness

to support international cooperations and activities to achieve sustainability goals and reduce environmental challenges to provide a better future for the coming generations.

Currently, Dubai Municipality is concentrating on enhancing the fields of environment, public health, construction, infrastructure, and public facilities, in order to support the efforts of the UAE and Dubai to become a circular economy, transitioning from a linear economic model. As part of these efforts, the Emirate introduced a waste management strategy and

highlighted the importance of waste recycling, in line with these efforts. The Municipality has been achieving its goals through several qualitative and globally accepted policies, strategies, projects, and initiatives by collaborating with private sector companies and supporting this movement. In line with this, several recycling companies, either focusing on municipal waste or construction waste, have moved to Dubai and established their headquarters in the Emirates.

The Municipality also introduced several initiatives and policies, like the strategy for managing and treating electronic waste, conditions for the use of recycled materials, and a guide for the use of packaging materials to support the efforts to attain sustainability. At Dubai Municipality, we have also developed a set of guidelines for green buildings, a strategy to ensure better air quality, and recommendations for dealing with sludge. Furthermore, we have established sustainable oases in several areas of Dubai to promote the separation of waste from the source, smart buildings policy, conditions

for using 3D printing and the use of local materials as the first city in the region, and many other policies and strategies.

These projects, policies, and strategies are a testament to the steadfast commitment of the Emirate to promote the concepts of circular economy and renewable energy as well as the strategic plan to encourage sustainable practices across various vital sectors. The move coincides with the declaration of the year 2023 as the ‘Year of Sustainability,’ under the slogan ‘Today for Tomorrow’, by His Highness Sheikh Mohammed bin Zayed Al Nahyan, President of the UAE.

The year of sustainability signifies the UAE’s approach, goals, and vision linked to sustainability and its commitment to addressing environmental and climate challenges, in light of the UAE’s hosting of the Conference of the Parties (COP28) on climate change this year. Furthermore, these policies are in line with the UAE Vision 2030, the UAE Green Agenda 2030, and the UAE Centennial 2071 Plan, and support the objectives of the circular economy policy 2021-2031.”



**Khaled Al Huraimel**  
Beeah's CEO

At BEEAH, our zero-waste strategy helps shape the circular economy and reduce emissions in line with the national vision and global targets.

Driven by zero-waste, we have established several recycling facilities, exponentially increased landfill waste diversion and begun collaborations for recycling innovation. Integrated with technology, robotics and platforms, our end-to-end waste management chain continues to enhance material recovery, reduce the need for the

manufacture of virgin material and enable the movement of recovered material in the circular economy.

We see zero-waste to landfill and net-zero emissions as fundamentally linked. By going beyond waste management and exploring waste-to-energy innovations, BEEAH is proud to continue working towards making more zero-waste, net-zero initiatives a reality in the UAE and share examples on the global stage



**Ali Al Dhaheri**  
MD and CEO of Tadweer

Our nation stands as a beacon of sustainability, where visionary leadership, innovative practices, and a united commitment drive us towards a greener future. Through strategic collaborations, effective policies, and cutting-edge technologies, we can harness the power of circularity to optimize resource utilization, minimize waste generation, and foster economic

growth. The UAE's circular economy landscape serves as a testament to our collective determination to build a resilient and sustainable society for generations to come. Let us continue our journey, forging new pathways, and inspiring global change, as we realize the full potential of a circular economy and create a world that thrives on sustainability.



**Dr. Frank Rijsberman**

Director-General of the  
Global Green Growth  
Institute

It is with great pleasure and deep appreciation that I introduce this publication, which highlights the significant strides taken by the United Arab Emirates (UAE) in support of the transition to a Circular Economy. The Global Green Growth Institute (GGGI) is committed to advancing green growth globally, and we are delighted to witness the dedication and progress made by the UAE in embracing and promoting circular

economy principles.

The concept of the Circular Economy is increasingly recognized as a powerful framework for addressing the global challenges of resource scarcity, environmental degradation, and the pressing need for sustainable development. A Circular Economy promotes a regenerative and restorative approach to economic growth, which ensures that we use resources efficiently, minimize waste,

and reduce our ecological footprint while creating economic and social value.

In this publication, you will find a comprehensive overview of the transformative actions taken by the UAE in pursuit of a circular economy. The UAE, a nation known for its visionary leadership, has embarked on a remarkable journey to transition its economy into one that is more sustainable, resilient, and environmentally responsible. Through a series of ambitious initiatives, visionary policy frameworks, and innovative partnerships, the UAE has set itself as a model for circular economy development in the region and beyond.

The UAE's journey towards a circular economy is a testament to the nation's unwavering commitment to sustainability, and it serves as an inspiration for other countries. This publication encapsulates the various initiatives, strategies, and success stories that reflect the UAE's dedication to building a circular

economy that not only preserves its natural resources but also contributes to economic growth and job creation.

We, at GGGI, have been honoured to collaborate with the Ministry of Climate Change and the Environment (MOCCAEE) to not only help develop this publication but also provide technical expertise, policy support, and knowledge sharing. We applaud the UAE's leadership for their vision and resolute efforts, which are instrumental in forging a sustainable future for their nation and the world.

As we look to the future, it is our hope that the achievements and lessons learned from the UAE's journey to a Circular Economy, as documented in this publication, will inspire other nations and stakeholders to take bold actions and embrace circular economy principles as a cornerstone of sustainable development.

Together, we can drive the global transition to a Circular Economy, and in doing so, create a more prosperous and sustainable world for all.



**Mrs. Laila Abdullatif**

Director General at Emirates  
Nature- WWF

The circular economy is one of the cornerstones of a sustainable future, with a focus on minimizing waste and negative impacts on the environment. Nature-based Solutions are instrumental

to this endeavor, inspiring us to restore and sustainably manage natural ecosystems in order to preserve our natural capital for generations to come.



**Fernando J. Gómez**

Head of Resource Systems  
and Resilience at the Center for  
Nature and Climate and Member  
of the Executive Committee,  
World Economic Forum

The UAE's role in promoting innovation for the circular economy has been pivotal, and our collaboration on Scale360° is an illustration. It was one of the first programs that recognized the value of accelerating circularity by uncovering and connecting local innovators with a global community.

Through the program, we supported grassroots innovation in 29 national and local hubs all over the world. We are proud to say that Scale360° empowered innovators to drive the circular economy as well as showcased the acceleration that can happen through public-private partnerships.

# EXECUTIVE SUMMARY

The Circular Economy Landscape Report (Report) provides an overview of the initiatives that the Ministry of Climate Change and Environment (MOCCA), and their public and private partners, who are members of the Circular Economy Council and other key United Arab Emirates (UAE) stakeholders, have taken to date in furthering the UAE's transition towards a Circular Economy.

The objectives of this Report are to:

- take stock of the progress that both public and private stakeholders in the UAE have made, and highlight the actions/ steps that they continue to take as part of their collective Circular Economy Agendas
- celebrate the recent initiatives and achievements of key partners; and
- act as a **call to action** to accelerate collective efforts geared towards enabling the transition to a Circular Economy

The report was written jointly by the MOCCA and the Global Green Growth Institute (GGGI), an international, inter-governmental organisation that aims to support and promote inclusive green growth around the world. In compiling this Report, GGGI and MOCCA conducted desk-based research and invited key UAE

stakeholders to provide contributions and examples of the progress being made in the delivery of solutions that will support the transition to a Circular Economy.

The report categorises the actions taken within the UAE into the six different types of actions set out in the ReSOLVE framework developed by the McKinsey Center for Business and Environment and the Ellen MacArthur Foundation in their joint 2015 report, "Growth within: A circular economy vision for a competitive Europe"<sup>1</sup>. These six actions include:



### Regenerate

Shift to renewable energy and materials; reclaim, retain, and regenerate health of ecosystems and return recovered biological resources to the biosphere.



### Share

Maximize utilization of products through peer-to-peer sharing of privately owned products or public sharing of pools of products; reuse them throughout their technical life spans; and prolong those life spans through maintenance, repair, and design for durability.



### Optimise

Improve the performance and efficiency of products; remove waste from their supply chains; and leverage big data, automation, and remote sensing. None of these actions requires changing products or technologies.



### Loop

Keep components and materials in closed loops and prioritize the inner ones. For finite materials, this means remanufacturing products or components and (as a last resort) recycling materials. For renewable materials, it involves anaerobic digestion and the extraction of biochemicals from organic waste



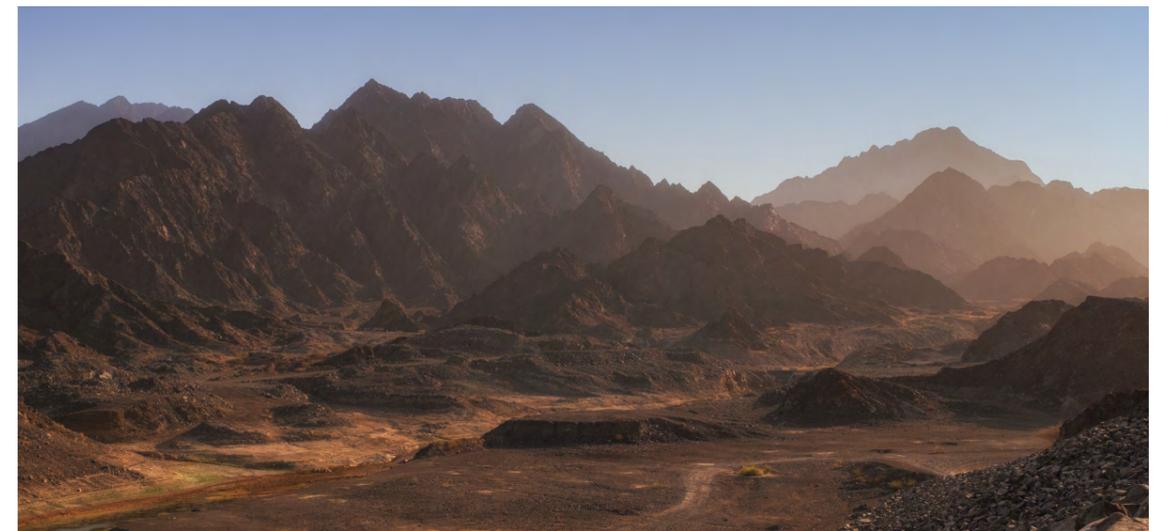
### Exchange

Replace old materials with advanced renewable ones; apply new technologies, such as 3-D printing and electric engines.



### Virtualise

Deliver utility virtually—books or music, online shopping, fleets of autonomous vehicles, and virtual offices



<sup>1</sup> [Benefits of adopting a circular economy for Europe | Report \(ellenmacarthurfoundation.org\)](https://ellenmacarthurfoundation.org/Report)

A summary of the actions taken by UAE stakeholders under these six types of action are set out below.

### 1. Action taken to Regenerate

With respect to **shifting to renewable energy and materials**, the actions undertaken by UAE stakeholders have included:

- Developing renewable solar energy capacity
- Redeveloping a landfill site into a solar farm
- Deploying solar power at a regional Distribution Centre
- Developing green hydrogen projects
- Developing local alternatives to plastic straws using renewable (date palm) materials
- Developing alternatives to single use plastic using renewable starch based materials

With respect to **Reclaiming, Retaining and Regenerating Health of Ecosystems**, the actions undertaken by UAE stakeholders have included:

- Recharging Aquifers
- Capturing and permanently storing carbon
- Identifying threatened ecosystems to inform urban planning, land use and infrastructure projects
- Restoring coral, mangrove and seagrass to strengthen marine ecosystems
- Saving the Arabian Oryx from

- extinction and restoring it to the wild
- Creating Coral Nurseries and Artificial Reefs
- Rehabilitating wild habitats
- Planting mangroves
- Planting Ghaf and Sidr Trees
- Planting 1 billion trees globally
- Creating positive environmental impacts while team building
- Developing and deploying nature based solutions
- Piloting regenerative farming techniques
- Increasing local sourcing of produce
- Supporting animal pollinators
- Using a Circular Approach to develop Nature Based Solution Projects
- Introducing blockchain to identify how food was produced
- Developing plans for a floating living lab for marine restoration
- Conserving and protecting the natural desert landscape and its inhabitants

With respect to **returning biological resources to the biosphere**, the actions undertaken by UAE stakeholders have included:

- Composting food waste to enrich local soil
- Converting Bauxite Waste into soil

### 2. Action taken to Share

With respect to **sharing models that support access over ownership**, the actions undertaken by UAE stakeholders have included:

- Providing cooling as a service
- Providing building energy optimisation as a service
- Providing access to use a car as a service (pay per use)
- Providing access to peer-to-peer car sharing
- Providing access to toys and books (Toy Rental)
- Providing access to furniture and electrical appliances (Furniture rental)
- Providing access to towels and linens (Rental)

With respect to **prolonging the life-span of products**, the actions undertaken by UAE stakeholders have included:

- Providing market-places to buy and sell pre-owned products
- Providing reverse logistics to enable buying and selling of pre-owned, returned and overstocked products

### 3. Action taken to Optimise Resources

With respect to **optimising resources**, the actions undertaken by UAE stakeholders have included:

- Identifying and adopting more resource efficient ways to build roads
- Using smart technologies to monitor and manage energy use
- Using nature inspired AI and a global digital platform to promote industrial symbiosis
- Using AI to reduce food waste
- Improving the life-cycle management of fresh food products to reduce food

- waste
- Using technology to optimise food supply chains and minimise food waste
- Introducing a BIO store to the UAE
- Designing for deconstruction to eliminate construction waste
- Implementing measures to extend the useful life of buildings
- Developing and producing more environmentally friendly building materials and products
- Designing, developing and selling green premium products and services
- Growing plants using a new plant responsive water and nutrient delivery system
- Growing food with less water and chemicals 12 hours a day
- Growing food in efficient, smart greenhouses
- Growing food using advanced vertical farming technology
- Growing food inside supermarkets
- Implementing the ε-R Pathway to Circularity – Redesign, Reduce, Reuse, Recycle
- Retrofitting buildings to improve energy and water efficiency
- Using Smart Building management tools to improve the efficient use of energy and water
- Improving Facility Management
- Developing guidelines to encourage more efficient irrigation

#### 4. Action taken to Loop

With respect to **upcycling**, the actions undertaken by UAE stakeholders have included:

- Upcycling waste to make furniture
- Upcycling local waste into sustainable materials – vegan leather, concrete and solid surfaces.
- Upcycling Construction and Demolition Waste into construction materials
- Upcycling palm leaves to grow mushrooms
- Upcycling waste to make Michelin Star Food
- Upcycling clothes

With respect to **repurposing waste**, the actions undertaken by UAE stakeholders have included:

- Repurposing waste heat to generate electricity
- Converting waste oil into biodiesel
- Repurposing by-products from aluminium production
- Repurposing wastewater sludge for use in other sectors
- Using the by-product from desalination to make cement
- Rescuing “Ugly” food
- Using a web-based platform to redirect food waste.

With respect **remanufacturing**, the actions undertaken by UAE stakeholders have included:

- Remanufacturing car parts
- Establishing a laptop

remanufacturing plant

- Establishing an automotive remanufacturing plant
- Introducing an electronic device subscription service that ensures after first life, devices are repaired, refurbished or recycled.

With respect to **facilitating recycling and the secondary materials market**, the actions undertaken by UAE stakeholders have included:

- Developing a Recycling Plant for (PET) plastic materials used in food packaging
- Developing a Plastic to Liquid Processing Plant that will convert non-recyclable plastics into recyclable feedstock.
- Developing Refuse Derived Fuel (RDF) Plant that will convert municipal waste into alternative fuel for cement plants.
- Developing a Solid Recovered Fuel Facility to transform waste into alternative green fuel
- Developing an E-waste recycling facility.
- Increasing capacity to manufacture recycled paper.
- Upgrading capabilities to recycled used beverage cartons.
- Developing an advanced water treatment plant to increase the supply of recycled water.
- Expanding recycled water distribution infrastructure
- Developing a virtual global marketplace for recycled plastic

- Developing a local virtual business to business marketplace for recyclables
- Using smart bins to reward people who recycle
- Scaling up a startup initiative offering cash for trash
- Introducing Reverse Vending Machines and Smart Bins
- Using digital technology to facilitate the collection of recyclable waste
- Developing and commercialising Recyclable Packaging and Packing made from Recyclates
- Developing a range of recyclable materials for the food packaging industry

With respect to **recycling and using recycled materials**, the actions undertaken by UAE stakeholders have included:

- Collecting and recycling milk cans
- Making clothes from recycled fabric
- Recycling water
- Developing a waste to Hydrogen Plant
- Developing a Waste to energy power plant.
- Using recycled feedstock (oil from waste tires) rather than fossil feedstock

#### 5. Action taken to Virtualise

With respect to virtualising, the actions undertaken by UAE stakeholders have included:

- Going paperless
- Introducing new digital payment

options

- Migrating to cloud computing
- Setting up data centres to support cloud computing
- Adopting remote and hybrid working
- Holding virtual conferences and events

#### 6. Action taken to Exchange

With respect to Exchange, the actions undertaken by stakeholders have included:

- Using 3D printing to construct buildings
- Adopting and deploying building information modelling (BIM)
- Implementing Modular construction
- Using life cycle assessment tools and implementing strategies to reduce environmental impacts
- Converting classic cars into electric vehicles
- Introducing Electric Trucks
- Operating 100% Electric Waste Trucks
- Launching an autonomous electric Abra
- Constructing a rail network
- Installing water fountains instead of using plastic bottles
- Making drinking water form air
- Manufacturing plant based dairy alternatives.

In addition, to these six actions, this report also showcases the supportive actions that have been undertaken by various different public and private stakeholders to create an appropriate enabling

environment to support the transition to a Circular Economy. These support actions fall into the following three categories:

- Develop and Implement Policies and Regulations to support the Circular Economy
- Finance and Incentivise the Circular Economy
- Develop necessary Skills and Knowledge and raise awareness and understanding about the Circular Economy

A summary of the actions taken by UAE stakeholders to create an appropriate enabling environment are set out below.

### 7. Action taken to develop and implement supportive policies and regulations

Many UAE stakeholders have taken action to develop and implement policies and regulations that are supportive to the transition to Circular Economy. This has included:

- Development and approval of policies to accelerate the transition to a Circular economy
- Development of a Regulatory Framework to support the Circular Economy
- Introduction of a Recycled water policy
- Introduction of National Water and Energy Demand Side Management Programme
- Introduction of National Green Buildings Regulations
- Development of an Electric Vehicle

Roadmap

- Introduction of Federal Energy Management Regulations for Industrial Facilities
- Introduction of a Green Procurement Policy
- Ministerial Decision on regulating trade of recycled plastic water bottles
- Launch of UAE Digital Economy Strategy
- Introduction of a Virtual Asset Regulator and law regulating virtual assets
- Introduction of Metaverse strategy
- Introduction of an AI Strategy
- Launch of Index to measure sustainability of factories
- Introduction of mandatory sustainability reporting
- Abu Dhabi Sustainable Finance Declaration
- Introduction of regulations governing Green Bonds and Sukuks
- Exempting corporates who issue Green Bonds and Sukuks from paying fees

### 8. Action taken to Finance and incentivise the Transition to a Circular Economy

Actions that UAE stakeholders have taken action to finance and incentivise the transition to Circular Economy include:

- The creation of debt and equity instruments related to the Circular Economy
- The launch of a Circular Economy Investment Fund

- The provision of Green Mortgages
- The launch of a prize challenge to “Rethink Brine”
- The awarding of cash prizes to support FoodTech
- The running of student competitions.

### 9. Action taken to develop Circular Economy Skills and Knowledge and Raise Awareness and Understanding about the Circular Economy

With respect to **developing Circular Economy Skills and Knowledge**, the actions undertaken by stakeholders have included:

- Enhancing the Circular Economy skills of federal government officials
- Developing the skillset for Circular Manufacturing
- Increasing technical skills to upcycle clothes
- Establishment of an R&D Facility to study ecological engineering and circular economy principles and practices Promoting cooperation and exchange of knowledge to design and produce environmental friendly resources
- Developing high tech skills and technology to produce food
- Piloting the infrastructure for Digital Product Passports

With respect to **raising awareness and understanding about the Circular Economy**, the actions undertaken by stakeholders have included:

- Raising awareness about the Circular Economy in priority sectors

- Supporting bottom-up innovation and entrepreneurship through the Scale 360 initiative
- Increasing public awareness about food waste and changing behaviours
- Raising awareness and providing guidance on reducing food waste
- Raising awareness about how to reduce food loss and waste across the food supply chain
- Highlighting and promoting the deployment of new and emerging green technologies
- Measuring the sustainability of factories
- Raising awareness and knowledge about the Circular Built Environment
- Increasing facility managers capabilities to operate and maintain more sustainable facilities
- Improving societies awareness and knowledge about conservation
- Promoting and supporting Environmental Education and Corporate Social Responsibility
- Mobilising civil society to build transformative action at scale
- Raising awareness about recycling
- Educating pupils and the public about the importance of recycling
- Raising awareness about e-waste and waste segregation
- Encouraging the proper disposal of used batteries
- Raising awareness among consumers about circular packaging
- Raising awareness about aluminium recycling.

## A. BACKGROUND

The Circular Economy Landscape Report (Report) provides an overview of the initiatives that the Ministry of Climate Change and Environment (MOCCA), and their public and private partners, who are members of the Circular Economy Council and other key United Arab Emirates (UAE) stakeholders, have taken to date in furthering the UAE's transition towards a Circular Economy.

The objectives of this Report are to:

- take stock of the progress that both public and private stakeholders in the UAE have made, and highlight the actions/ steps that they continue to take as part of their collective Circular Economy Agendas;
- celebrate the recent initiatives and achievements of key partners; and
- act as a **call to action** to accelerate collective efforts geared towards enabling the transition to a Circular Economy

The report was written jointly by the MOCCA and the Global Green Growth Institute (GGGI), an international, inter-governmental organisation that aims to support and promote inclusive green growth around the world. Established in 2012 at the Rio+20 United Nations Conference on Sustainable Development, the UAE is a founding member and donor of the organisation and has hosted its regional office in Abu Dhabi since 2011. Over the last decade, GGGI has supported the UAE, and specifically MOCCA, in

undertaking research, writing reports, and in developing policies and institutional frameworks that promote green growth in the UAE. This has included working in close collaboration with MOCCA on the development of the UAE's Circular Economy Policy and on various initiatives to enhance knowledge and understanding about the Circular Economy in the UAE.<sup>2</sup>

A Circular Economy is one where, by design, waste and pollution are eliminated, resource use is optimised and where nature regenerates. The current economic system, in contrast, is linear. In a Linear Economy resources and materials are extracted from the earth, made into products and services (often in ways which generate negative social and environmental impacts) which are then used or consumed and then eventually discarded as waste back into the environment.

This current take-make-throw system is an underlying cause for many of the local and global socio-economic challenges that governments, businesses and societies around the world are currently and will increasingly face. The twin catastrophic issues of climate change and biodiversity loss and their associated problems, for example, can be attributed, in a large part, to the linear economic system currently prevalent throughout the world. Indeed, 70% of all global greenhouse gas (GHG) emissions are related to material handling and use<sup>3</sup>, and more than 90% of

<sup>2</sup> See Annex A for further information about the Global Green Growth Institute

<sup>3</sup> CGR 2022 ([circularity-gap.world](#))

biodiversity loss is due to the extraction and processing of natural resources.<sup>4</sup>

Therefore, to effectively and successfully tackle these and other issues, the underlying linear system which supports and enables such issues to arise and thrive, needs to be transformed. Seeking to address issues such as climate change within the current linear economic system, fails to fully acknowledge the scope of the global challenge and ultimately will only address the symptoms, not one of the major causes of the problem.

Transforming an economic system is not easy and will involve considerable disruption. However, whether the economic system is changed or not, considerable disruption is still expected in the future driven by:

- exponential growth of technologies such as Artificial Intelligence (AI) and the co-called Fourth Industrial Revolution (4IR);
- globalisation;
- environmental factors such as climate change and biodiversity loss; and
- population growth and movements.

To thrive in the face of such massive disruptions, governments, businesses and wider society need to embrace change and the increasingly Volatile, Uncertain, Complex, Ambiguous (VUCA) nature of the world. This is because those who

embrace change and recognise the VUCA nature of the world, are best prepared to not only survive the disruption but to thrive by seizing upon the associated opportunities.

Indeed, the growing global interest in environmental, social and governance (ESG) issues associated with business operations is partly driven by the recognition that all types of businesses in all sectors and industries are embedded in interconnected (complex) environmental, social and governance systems that are changing rapidly (adding to volatility), in ways that are unpredictable (increasing uncertainty) and ambiguous.

Nonetheless, although increasingly popular, the ESG concept is not prescriptive when it comes to developing action items<sup>5</sup> and thus currently offers little guidance for a company to improve their operations.

The Circular Economy, on the other hand, does provide a powerful framework and set of principles that governments, businesses and society can use to inform their long-term strategies, priorities, values and decision-making. The Ellen MacArthur Foundation, a leading advocate of the Circular Economy, identifies that the Circular Economy is based on the following three principles, all of which are driven by design:<sup>6</sup>

- **Eliminate waste and pollution** – treat waste and pollution as design

<sup>4</sup> How the circular economy can tackle biodiversity loss ([ellenmacarthurfoundation.org](#))

<sup>5</sup> Circular Economy Alliance "Strategic Forecast Board Report – Volume 1" Circular Economy Alliance | Leading the change by being the change: "We educate the pioneers of the green transition"

<sup>6</sup> What is a circular economy? | Ellen MacArthur Foundation

- flaws, setting specification for any design to be that materials re-enter the economy at the end of their use.
- **Circulate products and materials at their highest value** – keep materials in use, either as a product or when that can no longer be used, as components or raw materials. Thus, biodegradable materials should be returned to nature (through composting and anaerobic digestion) to regenerate the land, while non-biodegradable, technical products and materials should be reused, repaired, remanufactured, and recycled.
  - **Regenerate Nature** -shift the focus from extraction to regeneration, where instead of degrading nature, natural capital is built.

Adopting these three Circular Economy principles is expected to help companies and countries alike to:

- generate new sources of revenue and value added through new circular products and business models.
- increase their competitiveness through reducing costs and developing new innovative products, services and business models;
- de-risk their investments and operations through securing material supplies and resources and decentralising production;
- stimulate innovation and increase their stock of “knowledge capital” through the re-designing of products, processes and business models;

- improve their reputation and “brand capital” through providing better solutions to the problems facing society;
- leverage new technologies (such as AI, big data, blockchain, internet of things, machine learning and vision, robotics, digital twins and cryptographic anchors) to reshape companies and economies into ones that are regenerative, resilient and sustainable;
- become more collaborative through working with suppliers and partners from across sectors to develop circular solutions;
- become more transparent and knowledgeable about their value chains and associated risks; and
- create local jobs and business opportunities through the processes and business models that keep products and materials in the loop.

Moreover, by making companies and countries more resilient, innovative, adaptable, flexible, responsive and agile, adopting circular economy principles will also help companies and countries to thrive in an increasingly Volatile, Uncertain, Complex, Ambiguous (VUCA) world.

The evidence to support these expected impacts is also growing. For example, a study by McKinsey & Co and the Ellen MacArthur foundation<sup>7</sup> estimated that adopting circular economy principles in just the mobility, built environment and

<sup>7</sup>Benefits of adopting a circular economy for Europe | Report ([ellenmacarthurfoundation.org](https://ellenmacarthurfoundation.org))

food sectors in Europe, could unlock €1.8 trillion of benefits annually. Similarly, a recent (2021) joint study by the Ellen MacArthur Foundation, Bocconi University and Intesa Sanpaolo found that circular economy strategies can de-risk investments and offer better risk-adjusted returns.<sup>8</sup>

Recognising the invaluable benefits and indeed the necessity for long-term prosperity of transforming into a Circular Economy, the UAE Government developed, and approved in January 2021, a Circular Economy Policy for the UAE, the first in the region to do so.

This report aims to highlight the need to transform into a Circular Economy through the wide scale adoption and implementation of the three Circular Economy principles across the UAE’s public and private sectors.

The multiple crises we face today encourages us to accelerate and strengthen our efforts to transition to a more Circular Economy where waste and pollution are designed out, resource use is optimised and where nature is regenerated. We call on governments, companies and society at large to continue our collective efforts to support the transition to a Circular Economy.

In compiling this report, GGGI and MOCCAIE conducted desk based research and invited members of the UAE Circular Economy Council (Annex A to this Report) and other key UAE stakeholders

<sup>8</sup>Circular economy: a de-risking strategy an driver of superior risk-adjusted returns | Shared by Finance Programme ([thirdlight.com](https://thirdlight.com))

to provide contributions and examples of the progress being made in the delivery of solutions that will support the transition to a Circular Economy. The Report outlines the ongoing and collective commitment to a Circular Economy and illustrates the continued importance of driving this momentum forward.



## B. THE PURSUIT OF A CIRCULAR ECONOMY IN THE UAE

Determined to tackle unsustainable patterns of consumption and production and reduce the UAE's vulnerability, the UAE Government developed the region's first Circular Economy Policy. Approved by the UAE cabinet in January 2021, the policy identifies four priority sectors for transformation:

- Sustainable Manufacturing;
- Green Infrastructure;
- Sustainable Transportation; and
- Sustainable Food Production and Consumption

For each of the four priority areas, the policy sets out some potential actions and initiatives that key stakeholders from both the public and private sector, could adopt to become more circular and support the UAE's transition to a Circular Economy. These actions are grouped into six different types of action. Those relating to:

- vision, strategy, sharing information and raising awareness;
- building capacity and supporting businesses;
- research and development and collaboration;
- public procurement and investing in

infrastructure;

- the development of a supportive legal and regulatory Framework; and
- providing economic incentives.

In addition, the policy identifies eight common core areas where the government can take a more active role to stimulate the transition to a circular economy, namely through:

- Incorporating Circular Economy principles and strategies into sector strategies, plans and policies;
- Collecting, sharing, monitoring and analysing Circular Economy data and information;
- Conducting circular research and development (R&D) into technologies, methodologies and business models that support the Circular Economy and leverage new technologies to maximise overall benefits;
- Increasing awareness and building capacity (including retraining) among key stakeholders on technologies, methodologies and business models that support the circular economy. Raise awareness and understanding on the concept and principles with public officials, business leaders and the public;

- Creating partnerships & collaboration platforms to bring groups together to identify circular economy opportunities, address barriers and learn from each other;
- Ensuring access to sustainable finance and helping remove barriers to finance;
- Developing and implementing circular public procurement policies and using the Government's purchasing power to create and grow markets for circular goods and service; and
- Improving waste management and viewing waste as a source of valuable materials and products, not a hazard.

The UAE's Circular Economy Policy is fully aligned and contributes meeting many of the UAE's international commitments, including the 2030 United Nations' Agenda for Sustainable Development and in particular, Sustainable Development Goal (SDG) 12 on Sustainable Consumption and Production. This goal recognises that to achieve sustainable development, we need to radically transform the way we use materials to satisfy our needs and wants. Specifically, this SDG seeks by 2030 to<sup>9</sup>:

- achieve the sustainable management

- and efficient use of natural resources;
- halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses;
- achieve environmental sound management of chemicals and all wastes throughout their life cycle<sup>10</sup>, and significantly reduce their release to air, water and soil in order to minimise their adverse impacts on human health and the environment;
- substantially reduce waste generation through prevention, reduction, recycling and reuse
- Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle;
- Promote public procurement practices that are sustainable, in accordance with national policies and priorities; and
- ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature.

<sup>9</sup> Goal 12 | Department of Economic and Social Affairs (un.org)

<sup>10</sup> in accordance with agreed international frameworks

## Working Collaboratively

Neither MOCCAЕ nor the UAE Government alone can transform the UAE economy into a Circular Economy. Transformation will require concerted collective action from stakeholders across the public sector, the private sector, academia and civil society. Importantly, it will also require inter-disciplinary collaboration across multiple sectors and industries to unlock many of the Circular Economy opportunities and to deliver many of the considerable economic, social and environmental benefits.

In recognition of the need to work collaboratively, the UAE Government developed its Circular Economy Policy by working with, and engaging with, a broad array of public and private sector stakeholders from across sectors and industries and subsequently the UAE cabinet approved the establishment of a UAE Circular Economy Council at the same time that it approved the Circular Economy Policy (January 2021). The Council, which is chaired by MOCCAЕ aims to<sup>11</sup>:

- oversee the drafting of a mechanism to implement the strategy in coordination with relevant authorities
- approve performance indicators related to the strategy’s adoption
- harmonise federal and local strategies within the policy’s requirements
- suggest the general foundations of sectoral plans and project
- encourage the participation of the private sector in projects and initiatives related to the circular economy
- promote partnership between the public and private sectors, and advance scientific research in related areas.

Council members include representatives from federal and local authorities and the private sector. Annex A contains a list of the UAE Circular Economy Council members.



<sup>11</sup> [Circular economy - The Official Portal of the UAE Government](#)

## C. OVERVIEW OF ACTION in furthering progress towards a Circular Economy in the UAE

In their pioneering joint 2015 report, “Growth within: A circular economy vision for a competitive Europe”<sup>12</sup>, the McKinsey Center for Business and Environment and the Ellen MacArthur Foundation identified

six actions that economies and companies could undertake to transition from the current linear economy to a circular one. They named this, the ReSOLVE framework and the six action are:



### Regenerate

Shift to renewable energy and materials; reclaim, retain, and regenerate health of ecosystems and return recovered biological resources to the biosphere.



### Share

Maximize utilization of products through peer-to-peer sharing of privately owned products or public sharing of pools of products; reuse them throughout their technical life spans; and prolong those life spans through maintenance, repair, and design for durability.



### Optimise

Improve the performance and efficiency of products; remove waste from their supply chains; and leverage big data, automation, and remote sensing. None of these actions requires changing products or technologies.



### Loop

Keep components and materials in closed loops and prioritize the inner ones. For finite materials, this means remanufacturing products or components and (as a last resort) recycling materials. For renewable materials, it involves anaerobic digestion and the extraction of biochemicals from organic waste



### Virtualise

Deliver utility virtually—books or music, online shopping, fleets of autonomous vehicles, and virtual offices



### Exchange

Replace old materials with advanced renewable ones; apply new technologies, such as 3-D printing and electric engines.

<sup>12</sup> [Benefits of adopting a circular economy for Europe | Report \(ellenmacarthurfoundation.org\)](#)

All these actions, in different ways, increase the utilisation of physical assets, prolong their life spans, and shift the use of resources from finite to renewable ones. Moreover, each action reinforces and accelerates the performance of the others and thus separately and together could have significant impact on transforming the economy and protecting the environment.

Transitioning to a circular economy requires complex efforts at the local, national, regional, and global levels and by both the public and private sectors. Many key stakeholders in the UAE have already started to undertake many of these actions and therefore have been playing a key role in supporting the country's first steps on its path to a more Circular Economy. This section highlights and celebrates the impressive and inspiring actions that numerous different public and private sector stakeholders, both large and small, in the UAE have taken to regenerate, share, optimise, loop, virtualise and exchange.

In addition, to these six actions, this report also showcases the supportive actions that have been undertaken by various different public and private stakeholders to support the transition to a Circular Economy. These support actions fall into the following four categories:

- Develop and Implement Policies and Regulations to support the Circular Economy
- Finance and Incentivise the Circular

Economy

- Develop Skills and Knowledge for the Circular Economy
- Raise awareness, knowledge and understanding about the Circular Economy.

### C1. Action taken to Regenerate

As one of the three core principles of the Circular Economy, «Regenerate» is an important approach that encompasses three practices:

1. promoting the use of regenerative materials as production inputs to replace non-renewable materials, such as bioplastics and renewable energy;
2. restoring or enhancing natural capital to sustain the provision of natural resources, for example, planting trees and reclaiming mangroves;
3. converting economic byproducts into valuable regeneratives for the biosphere, such as bio-soil.

Many UAE stakeholders have taken action to regenerate nature. Some of these stakeholders and their actions are described in the subsection that follow<sup>13</sup>.

With respect to **shifting to renewable energy and materials**, the actions undertaken by UAE stakeholders have included:

- Developing renewable solar energy capacity
- Redeveloping a landfill site into a solar farm
- Developing green hydrogen projects
- Developing local alternatives to plastic straws using renewable (date palm) materials
- Developing alternatives to single use plastic using renewable starch based materials

With respect to **Reclaiming, Retaining and Regenerating Health of Ecosystems**, the actions undertaken by UAE stakeholders have included:

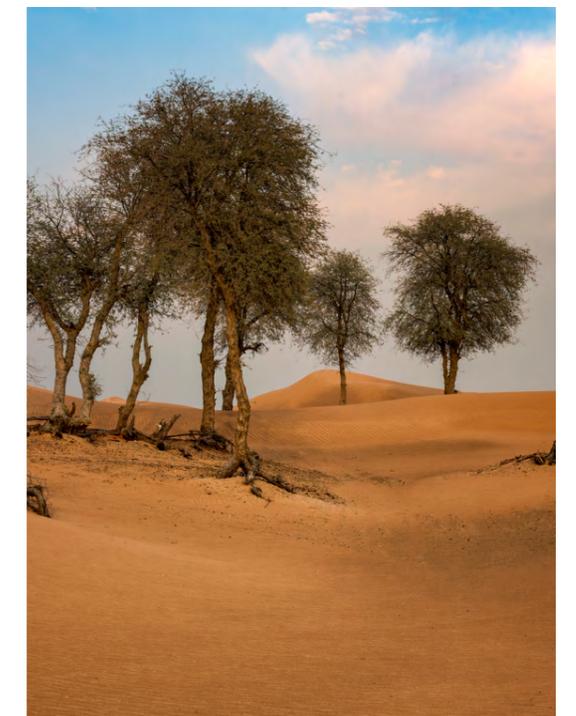
- Recharging Aquifers
- Capturing and permanently storing carbon
- Identifying threatened ecosystems to inform urban planning, land use and infrastructure projects
- Restoring coral, mangrove and seagrass to strengthen marine ecosystems
- Saving the Arabian Oryx from extinction and restoring it to the wild
- Creating Coral Nurseries and Artificial Reefs
- Rehabilitating wild habitats
- Planting mangroves
- Planting Ghaf and Sidr Trees
- Planting 1 billion trees globally
- Creating positive environmental impacts while team building
- Developing and deploying nature

based solutions

- Using regenerative farming techniques
- Supporting animal pollinators
- Introducing blockchain to identify how food was produced
- Developing plans for a floating living lab for marine restoration
- Conserving and protecting the natural desert landscape and its inhabitants

With respect to **returning biological resources to the biosphere**, the actions undertaken by UAE stakeholders have included:

- Composting food waste to enrich local soil
- Converting Bauxite Waste into soil



<sup>13</sup>This is not a definitive nor exhaustive list

## C1.1 Shift to renewable energy and materials

### Developing Renewable Solar Energy Capacity

The UAE has launched ambitious initiatives to increase its solar energy utilisation, continuing to build renewable and clean energy projects<sup>14</sup>. The most prominent of these projects is Shams Solar Power Station (the Abu Dhabi Solar Project) and the Mohammed bin Rashid Al Maktoum Solar Park in Dubai.

The UAE is also building the world's largest independent solar power plant, the Al Dhafra Solar PV facility, which will have a capacity of up to 2 gigawatts (GW) of electricity. The plant aims to reduce the emirate's carbon emissions by more than 2.4 million metric tonnes annually, equivalent to removing some 470,000 cars from the road and providing electricity to over 160,000 homes in the UAE. The UAE is also building the world's largest Concentrated Solar Power Plant (CSP) plant located in one area.



The UAE is also constructing the first hydroelectric power station that utilises stored water technology in the Hatta region of Dubai, the first of its kind in the Gulf Cooperation Council (GCC) countries, with a production capacity of 250 MW and a storage capacity of 1,500 MW-hours. The expected lifespan of the station is up to 80 years, with an investment of AED1.421 billion. The project is expected to be completed in the fourth quarter of 2024.

The UAE plans to harness renewable resources to meet some 50 percent of its energy needs by 2050.

### Redeveloping a landfill site into Solar Farm

In January 2021, it was announced that Emirates Waste to Energy Company — a joint venture between environmental management company Bee'ah and renewable energy company Masdar — will undertake a pioneering project to redevelop Bee'ah's landfill into a solar farm<sup>15</sup>.

The project, a first of its kind in the UAE, will help ensure productive use for a closed landfill, which is a global industry issue due to stringent environmental monitoring and remediation requirements that can take up to 30 years. Thus, as well as producing up to 120 megawatts (MW) of clean renewable solar power, the project will also help keep a brownfield site in productive use and reduce demand for developing solar PV on greenfield sites.

### Deploying Solar Power at a Regional Distribution Centre

In April 2019, Carrefour UAE unveiled new solar panels installed on their Carrefour Regional Distribution Centre in JAFZA, Dubai. The building's rooftop is covered with an area of almost 12,000 m<sup>2</sup> of solar panels, the largest on a facility of its kind in the GCC region. Using the latest technology, these solar PV panels generate around 30% of the electricity the state-of-the-art warehouse requires and offsets around 1,870 metric tonnes of CO<sub>2</sub> a year — the equivalent of removing roughly 400 passenger cars from the road annually.

### Developing Green Hydrogen Projects

Masdar has publicly announced several green hydrogen project agreements including:

- a demonstration project for the production of green hydrogen and sustainable aviation fuels (SAF) in partnership with Siemens Energy, TotalEnergies, Marubeni Corporation, Department of Energy in Abu Dhabi,

Ethad Airways, Lufthansa Group and Khalifa University

- an agreement with BP, ADNOC, Etihad and Tadweer to explore the production of sustainable aviation fuels in the UAE using solar-to-green hydrogen and waste gasification.
- Acquiring a stake in BP's proposed green hydrogen project, HyGreen Teesside, which is to produce 60 megawatts (MW) electrical input of hydrogen at start-up in 2025, increasing to up to 500 MWe by 2030.
- a US\$5 billion strategic alliance with ENGIE to help drive UAE's green hydrogen economy, which includes development of a 200 MW green hydrogen plant in the UAE with Masdar, Engie, and Fertigllobe.
- the development of 4-gigawatt (GW) capacity green hydrogen plants in Egypt, which includes development of a 2 GW green hydrogen project in the Suez Canal Economic Zone (in partnership with Hassan Allam Utilities, Infinity Power, General Authority for Suez Canal Economic Zone, the New and Renewable Energy Authority, the Egyptian Electricity Transmission Company, and The Sovereign Fund of Egypt)
- a 2,000 MW capacity integrated offshore wind and green hydrogen project in Azerbaijan, as part of a 4,000 MW project agreement between Masdar and the Ministry of Energy of the Republic of Azerbaijan.

<sup>14</sup> <https://www.wam.ae/en/details/1395303156558>

<sup>15</sup> [UAE to get first-ever solar landfill - News | Khaleej Times](#)

**Developing Local Alternative to Plastic Straws using renewable (date palm) materials**

Researchers from United Arab Emirates (UAE) University have developed a cost-effective and environmentally friendly alternative to plastic straws using date palm leaves<sup>16</sup>. Straws made from date palm leaves can help reduce plastic pollution and create a value-added product from an agro-waste material.

Every year, million of tonnes of waste are generated from pruning and harvesting date palm and so the researchers sought to create a product that would address this waste problem and provide a sustainable alternative to plastic straws.

They developed a novel method for synthesising the straws from date palm leaves which is cost-effective, non-toxic and eliminates all impurities, ensuring that the straws are 100% natural and chemical-free.

The straw synthesis method opens up a low-cost, non-toxic technique to make straws on an industrial scale, which can be manufactured in different customised sizes, replacing not only normal lengthy straws, but also the smaller straws that are mostly used in the beverage industry.

Another benefit of the straws is that they are 100% biodegradable, making them environmentally friendly and a safer alternative to plastic straws.

The team comprising Dr Pranay Ranjan, Md Zishan Akhter and Jeyaganesh Devaraj

has received a patent (US 11,559,157) for their invention, which they hope will encourage more companies to adopt their technology and help reduce the amount of plastic waste that ends up in the oceans.

**Developing alternatives to single use plastic using renewable starch-based materials**

In 2020, UAE-based MyEarth launched a line-up of starch-based organic alternative products that are soluble in water that it developed to replace single-use plastic. They developed the eco-friendly alternative that helps reduce all plastic waste even from the production process.

The starch-based product line, including shopping bags, garbage bags, landscaping sheets, straws, boxes among others, looks and feels the same as plastic but the change is on the environmental impact. The material is biodegradable and compostable. Further, since it is soluble in water, it won't cause choking of water streams or present any hazard to the marine life.

With production costs being just slightly above single-use plastics, it's the most affordable option out of all other plastic alternatives

**C1.2 Reclaim, Retain and Regenerate Health of Ecosystems**

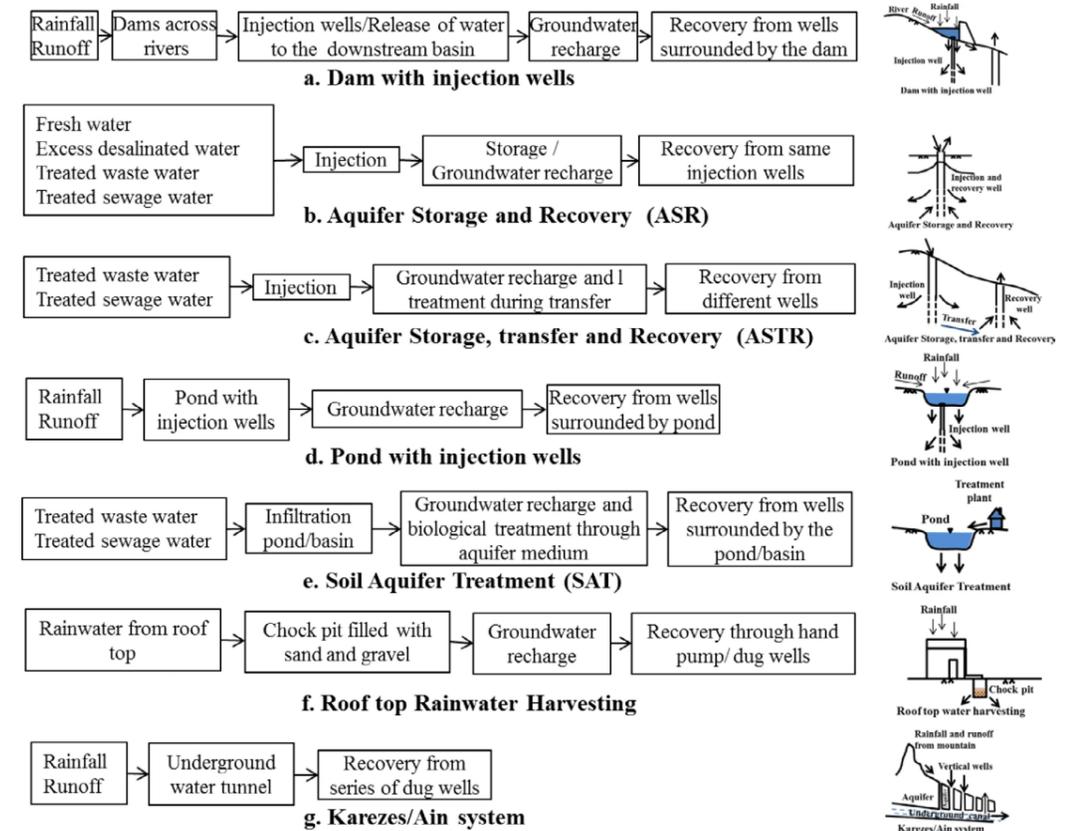
**Recharging Aquifers**

Gulf Cooperation Council (GCC) Countries, including UAE, have adopted various techniques of Managed Aquifer Recharge (MAR).

Water consisting of varying quantity and quality (derived from various sources) are used via MAR techniques to increase the groundwater storage and, if possible to enhance its quality, respectively<sup>17</sup>.

Generally, seven MAR techniques are utilized in GCC countries including dams, aquifer storage and recovery (ASR) technique, aquifer storage transfer and recovery (ASTR) technique, ponds, soil aquifer treatment (SAT) technique, rooftop rainwater harvesting, and Karez/ Ain system.

Results indicated that ASR using excess desalinated water or treated sewage effluent (TSE) is the most used MAR technique in GCC countries, followed by the use of ASTR, dams, and ponds.



<sup>16</sup> <https://www.universityworldnews.com/post.php?story=20230331081347765>

<sup>17</sup> <https://link.springer.com/article/10.1007/s13369-020-05060-x>

**Capturing and Permanently Storing Carbon**

In January 2023, the Abu Dhabi National Oil company, ADNOC, started a pilot project with British-Omani sustainability company 44.01 to permanently convert carbon dioxide from the air into a mineral within rock formations in Fujairah.

In June 2023, ADNOC successfully installed solar panels from Abu Dhabi Future Energy Company (Masdar) that will provide the energy required to capture carbon dioxide from the air, mix it with sea water and inject it underground, where it is expected to mineralize within peridotite rock formations. A backup generator powered by biodiesel made from used cooking oil by WAKUD will be used when the sun isn't shining<sup>18</sup>.

ADNOC are the first energy company in the region to run a carbon-negative project of this kind and the pilot marks the latest step in their \$15 billion investment into projects that will reduce their carbon footprint and help them to achieve their Net Zero by 2050 ambition<sup>19</sup>.

The pilot is being undertaken in partnership with Fujairah Natural Resources Corporation.



**Identifying threatened Ecosystems to inform urban planning, land use and infrastructure projects**

In May 2023, the Environment Agency Abu Dhabi (EAD) successfully concluded an assessment of Abu Dhabi's terrestrial and marine ecosystems<sup>20</sup>. A total of 16 terrestrial and marine ecosystems underwent assessment and were classified according to the International Union for Conservation of Nature's (IUCN) standards. As a result, 12 ecosystems were classified as 'Threatened,' with two as 'Critically Endangered,' five as 'Endangered,' and five as 'Vulnerable'. No collapsed ecosystems were identified within the emirate.

Mountains and wadis, coastal plains, mangrove forests, saltmarshes, and coral reef ecosystems were identified as some of the most threatened in Abu Dhabi. Recognising their importance, many of these ecosystems are already included in the network of protected areas managed by EAD.

Following the assessment, the Abu Dhabi Red List of Ecosystems will be published as an official IUCN document, reaching a global audience and showcasing Abu Dhabi's commitment to implementing internationally-recognised processes at the local level to protect biodiversity.

The publication of the Abu Dhabi Red List of Ecosystems will play a pivotal role in the development of Abu Dhabi as it will inform urban planning, land use, and infrastructure projects and

<sup>18</sup> [https://es.linkedin.com/posts/adnocgroup\\_turning-co2-into-rock-in-fujairah-activity-7074296053004419072-2zs3](https://es.linkedin.com/posts/adnocgroup_turning-co2-into-rock-in-fujairah-activity-7074296053004419072-2zs3)  
<sup>19</sup> <https://www.thenationalnews.com/business/energy/2023/01/17/adnoc-to-pilot-project-that-converts-carbon-dioxide-into-rocks/>  
<sup>20</sup> <https://www.zawya.com/en/world/middle-east/abu-dhabi-first-city-in-region-to-complete-assessment-of-ecosystems-wulidsn9>

therefore enable Abu Dhabi to grow while concurrently safeguarding its environment and preserving its ecosystems.

The Abu Dhabi Red List of Ecosystems will enhance understanding of the risks each ecosystem faces, enabling the Agency to establish a representative network of protected areas effectively.

This list stands as the first of its kind in the region, encompassing desert ecosystems and employing assessment criteria for human-made ecosystems.

Together with the Abu Dhabi Red List of Species, the Abu Dhabi Red List of Ecosystems provides valuable insights into the status of species and ecosystems and underscores the need for conservation interventions.



**Restoring coral, mangrove and seagrass to strengthen marine ecosystems**

The Environment Agency in Abu Dhabi have been undertaking a project to restore coral, mangrove and seagrass in Abu Dhabi to creating a refuge for the world's second-largest dugong population, a marine mammal threatened with extinction, and for many other marine plants and animals, including four species of turtle, three kinds of dolphin and 500 species of fish.

The project has been recognised by the United Nations as one of 10 pioneering efforts to revive the natural world. Some 7,500 hectares of coastal areas have already been restored with another 4,500 hectares under restoration for 2030<sup>21</sup>.



<sup>21</sup> <https://www.unep.org/news-and-stories/press-release/un-recognizes-10-pioneering-initiatives-are-restoring-natural-world>

### **Saving the Arabian Oryx from extinction and restoring it to its natural habitat**

The Abu Dhabi Government has taken numerous steps aimed at restoring the Arabian Oryx to its natural habitat.

In particular, Abu Dhabi has undertaken extensive breeding and reintroduction programmes, and so far, more than 1,000 Arabian Oryx have been released across the UAE, Oman and Jordan.

Today, the Arabian Oryx Conservation Programme is considered as one of the world's most successful conservation programmes, which has helped increase the number of Arabian Oryx in the UAE to 10,000 which is considered the largest group of Arabian Oryx in the world.

Such initiatives boosted the efforts to protect the Arabian Oryx and increase its numbers in the wild, as well as changing the Arabian Oryx's status in the International Union for Conservation of Nature's (IUCN) Red List from "threatened" to "vulnerable" in 2011, a move considered one of the most significant achievements in the field of species reintroduction at the global level<sup>22</sup>.



<sup>22</sup> <https://www.wam.ae/en/details/1395303025079>

<sup>23</sup> <https://www.ead.gov.ae/en/Media-Centre/News/Seed-planting>

### **Creating Coral Nurseries and Artificial Reefs**

In April 2019, the UAE Ministry of Climate Change and Environment (MOCCAE) announced plans to create the world's largest artificial reef off the east coast of Fujairah. The plan proposes about 300,000 mature adult colonies — about the size of three football pitches — in a single location.

In June 2018, MOCCAE signed an agreement with Fujairah Centre for Adventures (FCA) to build the reef. By June 2020, over 9,000 corals were planted in over 600 square metres of the UAE's waters with MOCCAE supplying the mother corals.

### **Rehabilitating wild habitats**

The Environment Agency Abu Dhabi (EAD) produces 300,000 shrubs a year at the Baynounah Nursery in Al Dhafra region for use in the agency's various projects to rehabilitate wild habitats in reserves such as Al Houbara Protected Area<sup>23</sup>.

There are stores of seeds for approximately 58 species of local wild plants and the agency is working on establishing a central nursery with a production capacity of up to one million shrubs annually, as well as establishing a centre for the genetic resources of local plant species.

In February 2020, the EAD announced that they will be scattering more than one million seeds of native wild plant species in four different locations across the emirate

of Abu Dhabi with the aim of rehabilitating natural habitats, supporting seed stock in different types of soils and enhancing plant cover of selected wild plant species in their natural habitat.

The project is expected to improve Abu Dhabi's natural habitats, supporting biodiversity by providing shelter and food to vertebrates, birds, small mammals, reptiles and other creatures. It will also increase the stock of seeds in the soil, continuing to improve the vegetation cover for years to come.

### **Planting Mangroves**

In March 2023, the Municipality and Planning Department in Ajman launched the Mangrove Cultivation Initiative in Al Zorah Reserve, coinciding with the National Carbon Sequestration Project



<sup>24</sup> <https://www.am.gov.ae/ajman-municipality-department-launches-the-mangrove-cultivation-initiative-in-al-zorah-natural-reserve/>

<sup>25</sup> [https://www.majidalfuttaim.com/docs/default-source/reports/nature-based-solutions-whitepaper.pdf?sfvrsn=c1216844\\_2](https://www.majidalfuttaim.com/docs/default-source/reports/nature-based-solutions-whitepaper.pdf?sfvrsn=c1216844_2)

<sup>26</sup> <https://www.thebrandberries.com/2023/03/15/pg-strengthens-forest-for-good-initiative-with-tree-planting-campaign-in-the-uae/>

initiative, which was announced during the COP26 Conference in Glasgow, in which the UAE participation in planting 100 million mangrove trees by 2030 was announced<sup>24</sup>.

It was able to plant 31 thousand mangrove seedlings in Q1 2023 in Al Zorah Reserve in Ajman, as part of an educational program that includes monitoring birds and explaining the importance of mangrove trees in cooperation with partners, school students, society and employees.

Similarly in 2021, Carrefour UAE partnered with Procter & Gamble (P&G) to launch the Forests for Good initiative, with the aim to plant 26 mangrove forests in the UAE within one year<sup>25</sup>.

By 2023, P&G had planted 34 forestation programs across the UAE, with more planned in future and across the region<sup>26</sup>.

**Planting Ghaf and Sidr Trees**

In 2022, Majid Al Futtaim’s Mall of the Emirates, Emirates Environmental Group and Fujairah Municipality planted 1,250 indigenous Ghaf and Sidr sapling trees in Fujairah<sup>27</sup> and another 1,250 trees in Hatta region, adding up to 2,500 trees.

This partnership sets a great example of public-private partnerships and how the community can work together to reduce its negative impact on the environment. Upon maturity, the 1,250 trees will mitigate and offset 7.37 metric tons of CO2 emissions. The trees will also serve to enhance the biodiversity of the UAE by creating new habitats, food and shelter sources for the native species.



<sup>27</sup> <https://www.zawya.com/en/press-release/mall-of-the-emirates-partners-with-fujairah-municipality-and-emirates-environmental-group-to-plant-1-250-trees-gqs0h75h>

<sup>28</sup> <https://www.arabnews.com/node/1798991/corporate-news>

**Planting 1 billion Trees Globally**

In January 2021, the UAE’s The Storey Group (TSG) launched an ambitious initiative to encourage Emirati residents and corporates to come together to help plant 1 billion trees globally by 2026 in a transformational project designed to help offset the country’s carbon emissions<sup>28</sup>.

TSG has teamed up with EcoMatcher, a certified social enterprise and the world’s first blockchain-enabled digital tree-planting platform, to launch the One Billion Trees Initiative (OBTI), which is aimed at capturing 250 billion kgs of carbon within a decade of planting the full tree complement.

OBTI enables people to buy or gift trees, with each tree delivering an annual carbon sequestration of 25 kgs, or plant and name a forest of 1,000 trees or more. Trees will be planted around the world with locations in nine countries — Guatemala, Peru, Uganda, the UAE, India, Nepal, Thailand, Indonesia and the Philippines.

Via the EcoMatcher app, tree “owners” can track every tree’s performance from their phones through ID geolocation, learn each tree’s story — its species, plant date, farmer and more, and even engage with each tree while tracking its carbon impact with easy-to-use dashboards.

**Creating positive Environmental Impact while Team Building**

UAE-based company, “Companies for Good” offer and help organise team

building activities that make a positive social impact. They offer numerous outdoor team building activities that positively impact the environment and raise awareness about environmental issues. This includes:

- Desert adventure and clean up

- Ghaff Tree Planting
- Beach Clean up
- Mangrove planting and Kayaking
- Cooking a sustainable lunch and then planting native trees
- Kayaking through the forest and cleaning the forest



**Developing and Deploying Nature Based Solutions**

In 2021, Emirates Nature-WWF, MOCCA, the Environment Agency Abu Dhabi, the Government of Umm Al Quwain, the international Center for Biosaline Agriculture (ICBA) and HSBC MENAT joined forces, as part of the Climate Solutions Partnership, to run a 4-year project (2021-2024) called “Nature Based Solutions for Climate, Biodiversity and People” to protect, restore and sustainably manage at least one priority coastal ecosystem in the UAE, including mangroves, to mitigate climate change and drive socio-economic benefits such as eco-tourism and food security.

The project also aims to explore technical, policy and financial considerations that are important for public and private sector decision-making that supports the scaling up of Nature-based Solutions for climate action at the emirate and national levels. This work includes:

- Collection of on-the ground information to demonstrate the links of coastal ecosystem services, climate mitigation and socio-economic co-benefits;
- Restoration and community consultations activities in high-value areas;
- Creation of a portfolio of bankable projects in collaboration with innovative small-scale sustainable businesses;

- Enhancement of climate-nature policy links;
- Redirection of financial flows towards nature conservation;
- Showcase of Sustainable Blue Economy benefits.

**Piloting Regenerative Farming Techniques**

Sharjah’s first gated mixed used community developed by Majid Al Futtaim and the Sharjah Government, Al Zahia, piloted regenerative farming techniques to promote soil health and improve carbon sequestration from the atmosphere. The farm demonstrated circular economy principles by sourcing organic waste from the local community<sup>29</sup>. The community is now working on a “food to compost” initiative to treat the organic waste from the residential households.

**Increasing local sourcing of produce**

In June 2023 Majid Al Futtaim’s Carrefour signed a cooperation agreement with the Sharjah Department of Agriculture and Livestock (SDAL) to establish a partnership supporting local agricultural and animal products<sup>30</sup>.

The signed MoU includes sharing expertise and resources to drive innovation, promote local produce, and ensure a sustainable future for the UAE.

The cooperation agreement will help to ensure that there are more locally produced

<sup>29</sup> [https://www.majidalfuttaim.com/docs/default-source/reports/nature-based-solutions-whitepaper.pdf?sfvrsn=c1216844\\_2](https://www.majidalfuttaim.com/docs/default-source/reports/nature-based-solutions-whitepaper.pdf?sfvrsn=c1216844_2)  
<sup>30</sup> <https://www.zawya.com/en/business/retail-and-consumer/sharjah-agriculture-and-livestock-unit-signs-coop-deal-with-carrefour-do09g6yy>

products in Carrefour stores. Majid Al Futtaim Retail has a target to double the volumes of locally sourced fruits and vegetables by 2030, as compared to the 2019 baseline, in the GCC.

Sourcing food that is grown regeneratively and locally, where appropriate, will play an important role in reducing carbon emissions and biodiversity loss and in transitioning to a Circular Economy for Food.

**Supporting Animal Pollinators**

Majid Al Futtaim are piloting 10 beehives across both the Tilal Al Ghaf community and at their Head Quarters (Tower 1) to

share the many advantages that these animals provide. Aside from being prolific pollinators, honeybees also aid in the preservation of wild plant biodiversity<sup>31</sup>.

The installation of beehives at Tilal Al Ghaf community was a success and consequently the number of beehives will be doubled in Q3 2023.

Additionally, Tilal Al Ghaf community boulevard is being lined with Ziziphus spina-christi trees. Ziziphus trees are known for their potential in contributing to a large yield of honey due to their high potential of nectar secretion as well as their extended flowering patterns.



<sup>31</sup> [https://www.majidalfuttaim.com/docs/default-source/reports/nature-based-solutions-whitepaper.pdf?sfvrsn=c1216844\\_2](https://www.majidalfuttaim.com/docs/default-source/reports/nature-based-solutions-whitepaper.pdf?sfvrsn=c1216844_2)

**Using a Circular Approach to develop Nature Based Solution projects**

The Environmental Charity, Emirates Nature-WWF (EN-WWF) is working closely with local communities to develop sustainable and commercially viable projects that integrate traditional culture with biodiversity stewardship to develop thriving and resilient rural communities using a circular approach to nature-based solutions.

In particular, they:

- encourage regenerative and nature positive farming using the principles of agroecology and circular farming that includes planting water-wise novel crops, reducing agrochemical use, composting and mulching, and ethical animal husbandry;
- promote modern irrigation techniques and the use of treated waste water to improve water use efficiency
- are helping to restore culturally significant falaj systems and develop nature, heritage and hiking trails, and other attractions to boost ecotourism.
- Encouraging the improved storage, distribution, and marketing of produce and products.
- Planting native trees using arid land techniques such as water cocoons, micro catchments, and grazing protection to promote biodiversity

and encourage bees for pollination and honey production

- use volunteers from the local and wider community to affect transformative change.

**Using Blockchain for Food Traceability**

Majid Al Futtaim, which holds the Carrefour franchise for the Middle East, Asia and Africa, will leverage IBM Food Trust, a blockchain-enabled platform for the food industry run on IBM Cloud<sup>32</sup>.

IBM Food Trust uses decentralised ledgers to record transactions. Through a collaborative blockchain network, critical information such as product origin, transportation, and ingredients, can be logged and accessed quickly by permissioned participants across the value chain and ultimately customers. Launched in 2020, the initiative started with two initial products categories, Carrefour’s fresh chicken brand and microgreens harvested from select in-store hydroponic farms, before expanding into around 150 product lines from different categories including CRF Fresh Milk, CRF Grapes from different origins, CRF Salad leaves and CRF UHT Milk. Customers will be able to get immediate access to food supply chain data, from farm to store shelf by scanning a QR code on participating products. The history of the product, including production process, halal and food safety certifications, and other relevant data, will be immediately available once uploaded

<sup>32</sup> <https://gulfbusiness.com/majid-al-futtaim-taps-ibm-blockchain-for-food-traceability-at-carrefour-stores/>

onto the blockchain.

Majid Al Futtaim is engaging with its supplier partners to enable broader participation in this initiative in the UAE, before introducing it to other Carrefour markets operated by the company in the Middle East, Africa and Asia.



**Developing plans a floating living lab for marine restoration**

In May 2023, URB, a Dubai-based developer of sustainable cities, announced plans to develop Dubai Reef – a floating living lab for marine restoration and ecotourism.

Dubai Reefs consists of a sustainable floating community for marine research, regeneration and ecotourism. The project includes residential, hospitality, retail, educational and research facilities.

The marine institute will be the heart of the project, working towards greater protection of the marine and coastal environment of Dubai. It aims to accelerate the marine science and conservation capacity of Dubai, whilst building the most diverse artificial reef, covering 200

square kilometres. It also aims to create a home to more than 1 billion corals & more than 100 million mangrove trees.

The project aims to enhance the coastal ecosystems of Dubai as a mitigation strategy. Coastal ecosystems are the unique habitats formed by plants and other organisms that can thrive at the borders between ocean and land. They are full of plants that help to regulate the earth’s temperature. These are forests of the sea. They keep carbon out of our atmosphere by pulling it from the air, and storing it in their tissue, roots, and soil.

Whilst Dubai’s coast has been greatly impacted by oil-digging, dredging and reclamation projects in the past decades. Dubai Reefs project will regenerate the coastal ecosystem of Dubai. It aims to provide protection from storms, whilst also providing habitat for wildlife and fish.

The 200 square kilometer artificial reef will provide invaluable ecological and economic richness, nurturing marine species and providing a natural defense against coastal erosion.

Dubai Reefs will also promote coral ecosystems, which provide numerous benefits that are important for climate change adaptation. These include coastal protection and food security. Coastal ecosystems such as mangroves, tidal marshes and seagrass meadows sequester and store more carbon per unit area than terrestrial forests.

Regenerative Ocean Farming is another

key feature of the project, which is a climate friendly food production technique.

### Conserving and protecting the natural desert landscape and its inhabitants

In 2002, the Dubai Desert Conservation reserve was established. It has been very

successful in growing the population of sand gazelles, Arabian gazelles and the Arabian onyx, from 230 initially to over 1,300 today. A further 171 Arabian Oryx have been relocated to other protected areas in the UAE. Another achievement of the reserve has been the re-introduction of 2,800 Houbara, or Macqueen's Bustard<sup>33</sup>.



<sup>33</sup> <https://www.khaleejtimes.com/uae/emirates-dubai-municipality-renew-agreement-to-protect-dubai-desert-conservation-reserve>

## C1.3 Returning Recovered Biological Resources to the Biosphere

### Composting Food Waste to enrich local soil

In 2020, two women based in Dubai created a completely nature-based composting start-up called "The Waste lab" that redirects food scraps from landfill to enrich soil. They launched their paid services in December 2021<sup>34</sup>.

The Dubai-based company has built pioneering partnerships with well-known brands such as The Hilton group, Pullman Dubai Creek City Centre, Vox Cinemas, Coffee Planet, and won a grant from Visa's She's Next program. Their pilot urban composting site at The Sustainable City became a community centre and permanent fixture.

They have diverted 112 tons of food waste from landfills, which is equivalent to 129 tons of CO2 emissions, thanks to acquisition of farmland in 2022 allowing for larger-scale operations.

For the co-founders, this is just the beginning. They now lead a team of 12 and plan to expand their service to other emirates. They want to work with local farmers, grow their own food using compost and encourage others to join them in understanding the cycle of life and building a sustainable future.

<sup>34</sup> <https://gulfnews.com/uae/from-grit-to-glory-the-waste-labs-journey-to-triumph-against-the-odds-1.1686818622094>

<sup>35</sup> <https://wam.ae/en/details/1395303019626>

### Converting Bauxite Waste into Soil

In February 2022, Emirates Global Aluminium (EGA) announced that it was going to build a pilot plant to convert bauxite residue, a by-product from alumina refining, into greenery soil products<sup>35</sup>.

The pilot plant is thought to be the first of its kind in the world and follows a global R&D breakthrough after five years of research and development by EGA and The University of Queensland's School of Agriculture and Food Sciences.

EGA's game-changing process converts bauxite residue in its entirety in hours into environmentally-benign, plant-friendly soil. Trials have shown that EGA's manufactured soil, which the company calls Turba (the Arabic word for soil), enhances plant growth while using less water and fertiliser than local sandy alternatives.

The UAE has insufficient naturally-occurring soil, due to the arid climate. Soil is a complex of minerals and organic matter and is considered a non-renewable resource. In even the most favourable climates, it takes nature centuries or longer to add even a centimetre of soil to the surface. The country currently imports large quantities of soil products each year for greening and agricultural purposes from as far afield as Europe. Bulk transportation of soil products generates greenhouse gas emissions.

EGA's pilot plant, in Al Taweelah in Abu Dhabi, is expected to be operational in 2023.

## C2. Action taken to Share

Sharing plays a pivotal role in supporting the transition to a Circular Economy. By facilitating the sharing of resources, products and services, sharing-based models contribute to maximising resource utilisation, reducing waste and promoting sustainable consumption patterns.

Platforms and systems that facilitate sharing enable under-utilised assets or products to be accessed and utilised by multiple users, maximising the use of a product or asset reducing the need for new production or resource extraction, which in turn reduces the overall demand for resources and minimises waste generation.

Sharing models also promote the idea of access over ownership which in turn can help extend the lifespan of products. By allowing individuals or businesses to share or rent products such as tools, equipment or vehicles, responsibility for the maintenance and repair of products can also be shared with a collective incentive to keep the product in good condition. By prioritising regular maintenance and prompt repairs, the longevity and functionality of a shared item can increase, compared to an individually owned item which is used infrequently. This proactive approach to maintenance helps extend the products lifespan and reduces the frequency of premature disposal.

Moreover, sharing models often prioritise

high-quality and durable products. Since the shared items are expected to serve multiple users over an extended period, they are typically designed and manufactured to withstand frequent use and potential wear and tear. This focus on durability helps ensure that the products can endure a longer lifespan, reducing the need for replacements.

Sharing also involves reusing products throughout their technical lifetime (second-hand) and prolonging their life through maintenance, repair and design for durability. By giving used products a second life, the second hand market extends the lifespan of goods, so that instead of being discarded or sent to landfill, these products continue to be used and valued by new owners. Extending the lifespan of products in this way reduces the need for new production, conserves resources and reduces waste.

Many UAE stakeholders have taken action to share. Some of these stakeholders and their actions are described in the subsection that follow<sup>36</sup>.

With respect to **sharing models that support access over ownership**, the actions undertaken by UAE stakeholders have included:

- Providing cooling as a service
- Providing building energy optimisation as a service
- Providing access to use a car as a

<sup>36</sup> This is not a definitive nor exhaustive list

- service (pay per use)
- Providing access to peer-to-peer car sharing
- Providing access to toys and books (Toy Rental)
- Providing access to furniture and electrical appliances (Furniture rental)
- Providing access to towels and linens (Rental)

With respect to **prolonging the life-span of products**, the actions undertaken by UAE stakeholders have included:

- Providing market-places to buy and sell pre-owned products
- Providing reverse logistics to enable buying and selling of pre-owned, returned and overstocked products

### C2.1 Sharing Models that support access over ownership

#### Providing Cooling as a Service

In January 2023, UAE-based energy services company Taka Solutions launched their pay-per-use Cooling-as-a-Service (CaaS), which aims to decrease energy consumption and associated costs at chiller plants across the UAE<sup>37</sup>.

Under CaaS, customers can eliminate upfront investment and operational expenditure and instead pay per unit of cooling consumed wherein Taka will install

and maintain the chiller plant in return for a pre-agreed charge for the actual supply and consumption of cooling.

Taka also announced that it signed its first CaaS project with Green Coast Real Estate (GCRE) for their 11-storey residential Port Saeed building, located in Deira. As part of the project, Taka Solutions will be financing the replacement of the chiller plant with no capital expenditure to GCRE. The plant will also be fully operated and maintained by Taka Solutions for the contractual duration of 15 years, after which the plant will be handed back to GCRE at no further cost.

In addition to avoiding the cost of installing a new chiller plant by GCRE, the new equipment will generate an overall savings of more than 2 million UAE dirhams (\$544,510) in utility costs, reducing the total energy expenditure and carbon footprint over the contract period.

CaaS scope includes combinations of total chiller and auxiliary equipment replacement with state-of-the-art equipment and technology, retrofit, upgrade, refurbishment and full recommissioning of existing equipment, redesign of pump and pipework layout and other energy saving opportunities. Additionally, customers can offload all liabilities and risks associated with their chiller plant, including equipment breakdowns and maintenance.

<sup>37</sup> <https://www.zawya.com/en/projects/utilities/uaes-taka-solutions-launches-cooling-as-a-service-rvrrb6hd>

### Providing Building Energy Optimisation as a service

Stout Energy provides **Building Energy Optimization as a service**. They help their clients maintain their built environments at maximum efficiency, letting them count the savings while reducing emissions<sup>38</sup>.

HVAC accounts for roughly 70% of building energy consumption in the UAE. Stout Energy's HVAC optimization services for buildings subscription plan can save up to 50% of HVAC energy consumption without any upfront costs. Their service can drastically decrease energy consumption of their clients' HVAC systems through implementing a range of energy efficiency measures such as BMS software optimization, integration of IoT sensors, peak shaving, and control strategy optimization. Stout Energy do not charge their clients any upfront fees but instead charge a monthly nominal fee out of the savings they provide, ensuring that their clients get a risk-free energy efficiency solution for their building.

Clients can also upgrade to their all-inclusive **Cooling as a Service (CaaS)** plan in which Stout Energy take responsibility for their client's HVAC system entirely, ensuring maximum efficiency and long life of their systems.

Under a CaaS scheme, Stout Energy take ownership of their clients' HVAC system purchasing equipment such as chillers or roof top units without charging their

clients anything upfront. Stout Energy maintain the system 24/7 and pays the electric bills. They repair and replace parts keeping the system running at optimum condition. This creates an incentive for Stout Energy to maintain maximum efficiency and only charging clients a monthly fee for the "cooling" they use. This monthly fee is inclusive of all maintenance, electricity, and water charges as well.

The solution is priced cheaper than existing passive maintenance contracts because Stout Energy make money out of the energy savings produced by virtue of ultra-efficient maintenance.

The lifetime costs of systems under CaaS are also lower because proper maintenance increases the life of the equipment.

Stout Energy are also able to use advanced artificial intelligence and mixed reality technologies to pre-emptively fix issues, ensuring most problems are fixed even before the customer can notice.

The constant monitoring and maintenance of optimum temperatures and conditions also increases client comfort and frees the customer from performance risks and electric costs of the system and enables them to focus on growing their own business.

<sup>38</sup> <https://www.stoutenergy.me/>

### Providing access to use a car as a service (pay per use)

Udrive is the first car-sharing provider in the Middle East that provides car rental by the minute<sup>39</sup>. The app-based service can offer "great value for money" with savings of about 25 per cent to 40 per cent, depending on the car model. A taxi from Dubai Marina to Dubai International Airport can charge Dh80 to Dh100, while that trip in a Udrive vehicle — normal traffic withstanding — costs about Dh25.

Udrive has clocked two million trips to date making them one of the largest rental booking platforms by transactions per car in the region.

Convenience is a major factor because Udrive provides all UAE riders with free fuel, RTA parking and comprehensive insurance, so customers don't need to do anything other than driving. The mobile app also reduces the booking process time compared with traditional car rental companies.



<sup>39</sup> <https://www.thenationalnews.com/business/money/2022/03/17/how-uae-residents-are-saving-money-in-the-sharing-economy/>

<sup>40</sup> <https://friendlycar.com/>

### Providing access to Peer to Peer car sharing

FriendlyCar is a Peer to Peer (P2P) online marketplace for borrowing and lending cars in the Middle East<sup>40</sup>. The average utilization of a private car is only 5%, which is not efficient. Car sharing could greatly reduce the number of cars on the road.

One car share can actually take six cars out of the road, making for less pollution, and reduce the investment on infrastructure and parking, and ultimately, a better economy- a win-win for everyone.

People start by listing their cars on the platform's database. It then verifies and screens car owners, renters, as well as the cars themselves, and ensures insurance is covered as well for these vehicles.

### Providing access to Toys and Books (Toy Rental)

ToyShare is a UAE online off-center educational and recreational toys and books rental platform<sup>41</sup>.

Their purpose is sharing economy to save toys from landfills and oceans and contribute towards rescuing the planet. Toyshare will save space of outgrown toys at homes and money on buying toys which are entertaining and useful for short period only.

The aim is for kids to learn while playing with their organized toys and books library, and participate in the sharing culture of Toyshare. Once the books and toys are retired from our library they are donated to the less fortunate kids.

They have set up a cleaning line with firm procedures to clean and disinfect all toys and books. They use child and environment friendly products and UV treatment which insures all their toys and books are clear of germs and bacteria.

### Providing access to Furniture and electrical Appliances (Furniture Rental)

Eze Lease is a lifestyle rental platform for furniture and electrical appliances<sup>42</sup>. Launched in November 2022 and currently operating in pilot mode with multi-unit landlords, the company will soon service individual homeowners and tenants. It brings home the sharing and circular economy by leasing items such as sofas through to fridges.

This product is perfect for a market such as the UAE, where 90 per cent of the population is expatriate, transient and, out of that, 85 per cent live in rentals.

### Providing access to Towels and Linens (Rental)

UAE start-ups, Rent-a-Towel and Dr Linen, currently rents towels and bed linen to 20 Dubai hotels<sup>43</sup>.

Rent-a-Towel services properties with 100 to 200 rooms and provides about 20,000 towels and linen items daily, shifting the workload from hotel housekeeping and reducing operating costs, which can ultimately influence rates paid by guests. It removes the need for in-house laundry infrastructure.

While some properties already outsource laundering directly to Dubai's large commercial laundries, Rent-a-Towel and Dr Linen took this further by also owning the linen, thereby removing a capital cost from properties. Its model can save housekeeping 10 per cent to 12 per cent.

## C.2.2 Prolonging the Lifespan of Products

### Providing Marketplaces to buy and sell pre-owned products

There are a range of marketplaces in the UAE where pre-owned products can be bought and sold. This includes<sup>44</sup>:

- The Facebook groups e.g. "Buy It, Sell It, Swap It Dubai for all types of products
- Depop for pre-loved clothes
- Dubizzle for all types of products
- Garderobe for designer clothing, bags or shoes
- RETOLD for pre-loved couture
- The luxury Closet for pre-loved designer items
- Think Upcycle for buying and selling secondhand furniture goods
- Thrift for good – charity shop for clothes, books and accessories

### Providing reverse logistics to enable buying and selling of pre-owned, returned and overstocked products

Cartlow is a UAE-based technology company that offers software-as-a-service (SaaS) solutions to major companies in the reverse logistics ecosystem. Reverse logistics in the circular economy is the process of collecting and aggregating products, components or materials at the end-of-life for reuse, recycling and returns.

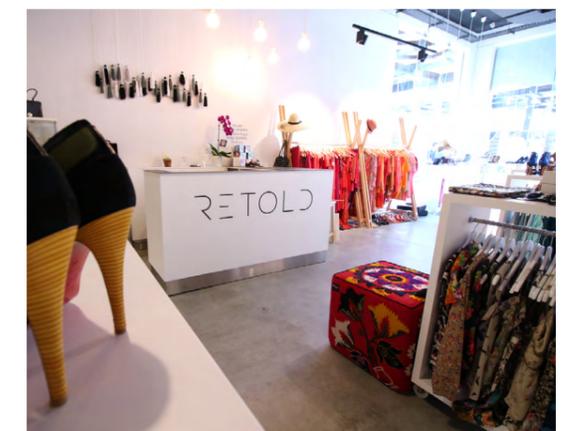
Cartlow began as a re-commerce platform that had partnered with UAE top retailers to help them sell returned, overstocked and certified pre-owned products they can't sell because they lack the processing capabilities. Consequently, the platform helps prevent millions of returned and overstocked products that are fully functional from being discarded

as waste. Cartlow has managed over two million products since its inception, saving over six million kilogrammes of e-waste and 36 million kilogrammes of carbon emissions<sup>45</sup>.

Cartlow's platform offers about half a million products across 30 categories including electronics such as mobiles, tablets, laptops, LCD TVs, appliances, and watches. All the products sold on Cartlow's platform go through intensive quality checks and Cartlow provides up to 12 months warranty for the products.

In June 2022, the company raised \$18 million in a growth financing round to expand its operations and further mature its business ecosystem in the region by combining return management, recycling and re-commerce through technology<sup>46</sup>.

In August 2022, Cartlow acquired second-hand goods marketplace Melltoo<sup>47</sup>. Melltoo customers will be enabled with a wide range of products and a more convenient way to shop and sell preloved products.



<sup>41</sup> <https://toyshare.ae/>

<sup>42</sup> <https://www.thenationalnews.com/business/money/2022/03/17/how-uae-residents-are-saving-money-in-the-sharing-economy/>

<sup>43</sup> <https://www.thenationalnews.com/business/money/2022/03/17/how-uae-residents-are-saving-money-in-the-sharing-economy/>

<sup>44</sup> Time Out Dubai

<sup>45</sup> Gulf Business

<sup>46</sup> Gulf Business

<sup>47</sup> Logistics Middle East

### C3. Action taken to Optimise Resources

Optimisation plays a crucial role in supporting the transition to a Circular Economy. Optimisation involves maximizing the use and minimizing wastage of resources, such as raw materials, energy and water. This can be done through the design of processes, systems and products that are energy and water efficient and that minimize raw material consumption.

Optimisation involves continuously identifying inefficiencies and waste and removing them. Production processes therefore should be made as efficient as possible taking into account the full life cycle of products.

New technologies such as artificial intelligence, machine learning, the internet of things, big data analytics, automation, digital twins, cloud computing and blockchain technology can all help optimise resource use. See Annex B for how these new technologies can help optimise resource use.

Another powerful way to optimise resource use is through industrial symbiosis. Industrial symbiosis is a concept that promotes the collaboration and exchange of resources, materials, energy and expertise between different industries or organisations. It aims to optimise resource use by creating mutually beneficial relationships where one entity's waste or by-product becomes

another entity's input or raw material. In an industrial symbiosis network, organisation work together to identify opportunities for resource sharing, waste exchange, and collaborative initiatives. By leveraging the strengths and capabilities of each participant, industrial symbiosis aims to optimise resource utilisation, minimise waste generation and promote sustainable practices.

Many UAE stakeholders have taken action to optimise. Some of these stakeholders and their actions are described in the subsection that follow<sup>48</sup> and include:

- Identifying and adopting more resource efficient ways to build roads
- Using smart technologies to monitor and manage energy use
- Using nature inspired AI and a global digital platform to promote industrial symbiosis
- Using AI to reduce food waste
- Designing for deconstruction to eliminate construction waste
- Implementing measures to extend the useful life of buildings
- Developing and producing more environmentally friendly building materials and products
- Designing, developing and selling green premium products and services
- Growing plants using a new plant responsive water and nutrient

<sup>48</sup>This is not a definitive nor exhaustive list

- delivery system
- Growing food with less water and chemicals 24 hours a day
- Growing food in efficient, smart greenhouses
- Growing food using advanced vertical farming technology
- Implementing the 4-R Pathway to Circularity – Redesign, Reduce, Reuse, Recycle
- Retrofitting buildings to improve energy and water efficiency
- Using Smart Building management tools to improve the efficient use of energy and water
- Improving Facility Management
- Developing guidelines to encourage more efficient irrigation

#### Identifying and adopting more resource efficient ways to build roads

Having undertaken pilot projects and analysis to study the effectiveness, sustainability and implementation readiness of different methods and materials that could be used to construct roads in Abu Dhabi that use less raw materials and generate less waste, Abu Dhabi's Department of Urban Planning and Municipalities (DPM) announced in 2019 that 6 projects would use these eco-friendly methods and materials in the construction of roads in the Emirate<sup>49</sup>.

<sup>49</sup>[Construction Week Online](#)

This will include using geo-grids to reinforce asphalt pavements which will reduce the thickness of paving layers, and the amount of raw materials used in constructing roads. In turn, this would be expected to decrease construction time, lower operating costs, extend road lifespans, and reduce carbon emissions.

Similarly, it will involve adopting "cold in place" (CIR) recycling, where the top 2 to 5 inches of the existing asphalt surface are ground off, crushed and mixed with an asphalt recycling agent and placed back down with a paver. This method is expected to increase operational efficiency and promote the recycling of concrete waste.

DPM has also started to implement pavement projects that use steel slag aggregates in modified asphalt layers to enhance infrastructure sustainability. The department is also using recycled tyre crumb rubber to improve asphalt layers, which not only helps to recycle tyres but also reduces noise from road traffic.



### Using smart technologies to monitor and manage energy use

Manufacturing facilities in the UAE are ahead of average in the smart utilization, monitoring and management of energy according to a survey, conducted by Schneider Electric, of 46 manufacturing facilities in the UAE operating across sectors such as energy, metals, food and beverage, chemicals, paper and wood, and other segments<sup>50</sup>.

The assessment's findings however also indicate that there is a significant opportunity for companies to adopt more practices around waste management, such as recycling and re-using, in line with national efforts to create a circular economy.

The UAE Ministry of Industry and Advanced Technology and Ministry of Energy and Infrastructure are working in partnership with Schneider Electric to explore ways to enhance energy efficiency in the industrial sector.

Schneider Electric is also working with UAE-based Arab Development Establishment (ARDECO) to manufacture power and energy technology solutions in the nation. Schneider Electric will manufacture a range of highly advanced energy automation solutions and integrated power solutions, including production switchgear and control panel integrations, as well as energy automation design and engineering<sup>51</sup>.

<sup>50</sup> [Ministry of Industry and Advanced Technology](#)

<sup>51</sup> <https://www.utilities-me.com/news/interview-schneider-electric-enhances-smart-manufacturing-in-uae-as-it-seeks-to-support-sustainability-initiatives>

<sup>52</sup> [Gulf News](#)

### Using nature inspired AI and a global digital platform to help promote industrial symbiosis

The Surpluss is a new global platform developed in the UAE that offers a digital ecosystem where businesses can share their surplus resources to enhance sustainability and innovation, and become more competitive<sup>52</sup>. The platform aims to promote industrial symbiosis and the transition to the Circular Economy enabling a wide range of resources to be shared on the platform including surplus materials, production by-products/waste, knowledge and time.

The platform can help UAE businesses, of all sizes including small and medium enterprises (SMEs) to reduce costs, increase revenue streams and become more resilient while reducing their environmental impact. In particular, the platform can help businesses source secondary materials, share logistics and technical expertise. To ensure businesses of all sizes can access the platform, The Surpluss is based on an annual tiered membership model, whereby smaller companies, pay a lower cost, reducing the barriers to entry, particularly for SMEs.

Although initially, The Surpluss was targeting resource-intensive sectors, particularly manufacturing, it has now evolved into a sector-agnostic platform and can drive value for a wide array of industries – from healthcare to oil and gas.

The foundation of the artificial intelligence (AI) learnings used on the platform was

<sup>50</sup> [Ministry of Industry and Advanced Technology](#)

<sup>51</sup> <https://www.utilities-me.com/news/interview-schneider-electric-enhances-smart-manufacturing-in-uae-as-it-seeks-to-support-sustainability-initiatives>

<sup>52</sup> [Gulf News](#)

inspired by nature, specifically learning from slime mould and the concept of collective intelligence where an entire organisation, not only the user, can benefit from one misstep and find opportunity from learned experiences to a better suited synergy. Collective intelligence enhances a company's resilience by not making the same mistake twice and applying these learnings to the rest of the larger ecosystem.

The platform will also allow companies to take inspiration from nature: where organisms don't work together to 'diversify their assets', they work together to solve problems to thrive in volatile conditions. To do this, The Surpluss have taken a unique approach where they celebrate incompatibility. Natural symbiosis always occurs between the most unlikely partners. The Surpluss can redirect market exchanges by disrupting linear economic systems. Businesses can expect innovation to form when they are paired with unlikely partners from other industries. This is the core of The Surpluss

Its beta testing phase was completed in 2022 with 100 companies across the UAE participating.

In June 2023, The Surpluss organised the UAE's first Industrial Symbiosis Symposium to promote the idea of industrial symbiosis.

### Using AI to Reduce food waste

The Food-tech start-up Winnow helps food service and hospitality industry in the UAE cut down on food waste by making the kitchen smarter<sup>53</sup>.

<sup>53</sup> <https://www.winnowsolutions.com/company>

<sup>54</sup> [Khaleej Times](#)

Specifically, Winnow Vision, their AI-enabled tool, enables kitchens to automatically track food waste, cut costs and save time. The system takes photos of wasted food as it's thrown away and, using the images, the machine trains itself to recognise what has been thrown in the bin. This means that, over time, food will be thrown in the bin and the data will be captured automatically. This increases data accuracy and ease of use.

Simple and intuitive to use, the Winnow Waste Monitor comprises a digital scale and a connected tablet. Using any bin, team members throw food away in the usual way. The weight is recorded and then the user selects the reason and identifies the item/dish using the tablet.

Winnow thus provides hotels and restaurants with data and insights on how and where to limit waste. Clients using Winnow's food waste monitor are saving between three and eight per cent of their food purchasing cost.

Founded in 2013 in the UK, Winnow came to Dubai as a participant of the Dubai Future Accelerators (DFA) programme, an initiative by Dubai Future Foundation (DFF). When it joined DFA in Dubai, it managed to gain traction with key local private sector players, such as Majid Al-Futtaim and Emaar, who became worldwide beta testers for the upgraded technology. Thus, after the success of its pilot project in Dubai, the company decided to set up a base in the emirate, with its sights set on an expansion into the wider Middle East and North Africa (Mena) region<sup>54</sup>.

### Improving the life-cycle management of fresh food products to reduce food waste

In 2019, Majid Al Futtain's Carrefour launched an internal programme to reduce food waste called the "War on Waste".

Project involved training over 4,000 frontline employees to better manage fresh food product life-cycle. It comprises of 15 different operational measures involving:

- better demand forecasting;
- optimizing in-store processes including improving storage and display;
- repurposing fruits into juices or fruit salads; and
- reinforcing cold chain standards amongst others measures.

The project has resulted in between 8,000 to 10,000 tons of fresh food waste being diverted from landfill each year.

### Using technology to optimise food supply chains and minimise food wastage

In 2018, the UAE Food and Beverage Manufacturing Business Group (FBMG) launched the "Open Food Platform for the UAE". The platform brings together over 650 companies, investors, and thousands of traders, alongside governmental bodies, through a shared digital infrastructure. By harnessing cutting-edge technologies

like AI and Blockchain, its primary goal is to optimize Dubai's food supply chain, minimize food wastage, and enhance energy efficiency.

### Introducing a BIO Store to the UAE

In February 2022, Carrefour Launched their First BIO Store in the UAE<sup>55</sup>. Carrefour BIO offers recyclable paper bags and uses biodegradable packaging across its fresh products in line with the retailer's mission to eliminate single-use plastic from its operations by 2025.

Customers will find refilling stations for water and detergents that are quick and easy to use and help to prevent excessive plastic consumption. The store also houses an innovative hydroponic farm to offset Carrefour's carbon footprint and bolster food security in the UAE.

The advanced store concept implements eco-friendly equipment to reduce energy consumption by as much as 15 per cent, plus digital price tags connected through WiFi offer a sustainable substitute to printed paper labels. What's more, all the tables and shelves have been made using recycled pallets, and a pick by weight sections seeks to reduce waste by allowing customers to bring home their desired quantities of nuts, spices, and dried fruits in recyclable paper bags.

<sup>55</sup> <https://www.majidalfuttain.com/en/media-centre/press-releases/detail/2022/02/carrefour-launches-the-first-bio-store-in-the-uae>

### Designing for Deconstruction to eliminate construction waste

The Netherlands pavilion at Expo 2020 Dubai was designed and built according to circular principles<sup>56</sup>.

The pavilion used as many reusable, recyclable and compostable materials as possible and for constructing the pavilion, a radical construction method was applied by renting materials available in Dubai such as sheet piles and tubes.

**Biobased materials** were also integrated into the design. For example, floor and wall finishes were made from mycelium and a curtain and canopy was made from cornstarch that was later converted into biopolymer textile fibers when the pavilion was deconstructed. Biobased materials offer an alternative to current finishing materials in the building industry that are often polluting and not recyclable. By showing concrete applications that are both technically and aesthetically integrated into the design, the Netherlands pavilion, designed by V8 Architects, inspires the building industry and showed how architecture can be a stage for innovations.

The entire pavilion was technically designed to be easily **disassembled into usable elements** that can easily be reused in the local civil and construction industry. The sheet piles and steel tubes of over 18 meters, play the leading role in this. Smaller finishing materials such as the mushroom farm silos were reused other projects. The floors were built up

<sup>56</sup> <https://v8architects.nl/en/deconstruction-of-netherlands-pavilion-at-expo-2020-dubai-to-start/>

with sand, gravel and stabilization mats that were easily removed to serve as a new surface elsewhere in Dubai. The excavated sand from the plot was used to insulate the walls of the pavilion and to level the floors.

All installations, lighting and even the elevator were **leased and were reused**. The lighting fixtures and furniture were donated to a charity organisation in Dubai to be used efficiently for the rest of their lifespan. Even the foundation of the pavilion was designed to be removed again. By basing the entire pavilion on steel plates instead of concrete, nothing was left behind after the pavilion was dismantled. Only the desert sand that was already there when the plot was received in 2018.

Even, the production of mushrooms and mycelium products will continue as a local entrepreneur has taken over the "mushroom nursery".





### Implementing measures to Extend the useful Life of Buildings

Sharjah City Municipality have started implementing several measures aimed extending the useful life of buildings in its emirate<sup>57</sup>.

The civic authorities have been hard at work to carry out periodic maintenance for each building within their jurisdiction and proper implementation of all rules and regulations. Several measures have been undertaken to upgrade the sustainability of the buildings including those that enjoy heritage status.

To ensure the efficiency of buildings, the municipality has signed a memorandum of understanding (MoU) with the American Concrete Institute to enhance cooperation between the two parties in matters related to their longevity and safety.

Key to expanding their lifespan is periodic maintenance of buildings, waterproofing and thermal insulation.

### Developing and Producing more Environmentally Friendly building materials and products

In April 2023, Dubai-based Quazar Investment Company signed a Memorandum of Understanding with UK-based Graphene Innovations Manchester (GIM) to create a new company in the UAE that will develop and produce environmentally - friendly products using advanced 2D materials, including breakthrough graphene - enhanced concrete that does not need cement or water and can be made using recycled materials<sup>58</sup>.

This new company will invest over \$1 billion to develop and mass manufacture a range of graphene-based products. These include:

- GIM Concrete - A breakthrough construction material that dramatically reduces CO2 by eliminating cement. GIM Concrete also uses no water, it cures quickly and can be made using recycled materials. GIM Concrete will eventually become carbon negative.
- GIM Hydrogen (Type IV & V) - A graphene-enhanced storage tank and pipe made using advanced proprietary AI-based robots with substantially improved H2 barrier properties and leak prevention.
- GIM Smart Clothing - A protective clothing with PPE technologies that actively cool workwear and improve comfort for people in extremely hot environments.

<sup>57</sup> [Khaleej Times](#)

<sup>58</sup> <https://www.graphene-info.com/graphene-innovations-manchester-signs-1-billion-deal-tackle-global>

### Designing, Developing and selling Green Premium Products and Services

Schneider Electric is targeting for 80% of its product revenues to come from "Green Premium" products, services and solutions by 2025.

**Green Premium Products** provide detailed information on their regulatory compliance, material content, environmental impact and circularity attributes. They deliver market-driven value propositions through third-party labels and product certifications that support their customers' sustainability ambitions.

**Green Premium Services** implement circular economy principles such as durability, upgradeability and recyclability to move beyond the 'take, make, and dispose' industrial model. In utilising these services, their customers reduce their environmental impact and optimise the total cost of ownership of their assets

**Green Premium Solutions** utilise IoT-enabled offers and digital tools to efficiently use energy and other natural resources. They enable their customers to reduce their environmental impact and minimise their CO2 footprint.

### Growing plants using a new plant responsive water and nutrient delivery system

In October 2020, Responsive Drip Irrigation (RDI) established its new regional hub for R&D and production in Abu Dhabi.

RDI GrowStream™ is a disruptive plant-responsive irrigation technology that diverges from the standard systems that have failed to keep up with growing population demands and that have continued with practices that are depleting and degrading the planet's natural resources.

RDI GrowStream™ responds to plant root signals, delivering water and nutrients on-demand to each and every plant. This incredible new system has even more benefits for hyper-arid climates like Abu Dhabi (sandy soil + extreme heat = some the toughest environments to efficiently grow crops). Water is easily and quickly lost either to percolation (through the sandy soil) or evaporation (from the high temps). By delivering water only when the plant calls for it and directly to the roots, RDI GrowStream™ provides water-efficiency that no other technology can match.

Over the last 2.5 years RDI Growstream has been used to grow a wide variety of fruit trees such as date palms, pomegranate, citrus, mangoes, berries, coconut, figs, and banana intercropped with herbs and plants such as moringa, rosemary, oregano, hibiscus, aloe vera and more at RDI's trial at Taweelah orchard.

Thanks to RDI's system, all varieties of the trees and plants have had significantly increased fruiting compared to previous years when another form of irrigation was used. RDI's system caused a 30% increase in date palm fruit, all while using 30% less

water than previous irrigation systems and 50% less fertilizer. RDI has helped increase biodiversity both in terms of the variety of plants growing and number of pollinators visiting the area<sup>59</sup>.

In late 2019 and early 2020, comparative vegetable trials in Pakistan, revealed yield increases of more than 300% obtained using GrowStream™ versus standard drip irrigation.

Globally, RDI is demonstrating another major benefit: crop diversity. Any farmer can now easily grow a variety of diverse crops because of GrowStream's™ nature-driven water delivery system. Expert knowledge of flow rates and crop water requirements are no longer needed to grow high-quality, commercial-grade produce. This crop diversity builds resilience for growers and gives the ability to meet shifting market demands.

RDI's new R&D center will focus on studying regional crop varieties, as well as, new crops not typically grown locally, establishing best practices for RDI GrowStream™ in hyperarid climates.

RDI's technology promotes regenerative agriculture – a holistic approach to farming that seeks to build healthy soil, increase biodiversity, and ensure the land can be farmed by future generations. RDI GrowStream™ works in the rhizosphere and can uniquely deliver a new breed of organic, natural soil amendments and enhancements. With many regional initiatives to convert desert landscapes

into green cities, RDI will help drive the sustainable development of these cities and their green living spaces, in addition to improving soil health to develop new areas suitable for crop production.

To help achieve Abu Dhabi's vision for 2030, Responsive Drip Irrigation also plans to build the RDI Abu Dhabi Center for Global Sustainability. Set to launch in 2021, this new state-of-the-art center will not only showcase RDI's plant responsive system, but will serve as an exhibition center for AgTech innovations and will provide educational programs and seminars on the latest methods and best practices for implementing plant-responsive technology, regenerative farming, utilization of reclaimed water, sustainable building materials, energy conservation, carbon sequestering, and factors to address climate change.

Ongoing plant and crop studies and research programs will be performed, which will be open to the general public for touring and presentations. The RDI Abu Dhabi Center for Global Sustainability will provide information and demonstrate the broad impact on water conservation, soil regeneration, and climate change that RDI's plant responsive technology will have across various sectors from crop production to landscape management, and even to eco-friendly buildings... all contributing to the global effort to create a future that is livable for generations to come.

<sup>59</sup> Instagram - RDI

**Growing fresh Food with less water and chemicals 24 hours a day**

Dubai-based Badia farms use the latest hydroponics technology to grow delicious, nutritious micro-greens and herbs without sunlight, soil, or pesticides.

Their revolutionary farming methods use up to 80 percent less water, are energy-efficient and sustainable. They specialise in growing micro-greens and herbs that are popular with gourmet chefs who require top quality taste, aroma and appearance and who otherwise would import products from on average 3,000km away, with associated impact on freshness, taste, aroma, appearance and embedded carbon.

Badia Farms grow fresh culinary produce 24 hours a day, 365 days a year and is free from harmful chemical pesticides, insecticides and herbicides because it's grown naturally in a sterile, soil-free growing environment.

Their hydroponic methods use 80 percent less water than open field growing, and because they recirculate their water there's no wastage. Similarly, their vertical farm uses less land space to deliver a higher yield and their soil-free growing methods are helping to protect precious soil resources.

**Growing food in efficient, Smart Greenhouses**

Pure Harvest Smart Farms a pioneering, technology - enabled agribusiness

headquartered in the United Arab Emirates, focused on sustainable year-round production of premium-quality fresh fruits and vegetables.

They are committed to delivering on their mission of farming extraordinarily flavourful, affordable, and locally grown fresh produce, by innovating across the full value chain of controlled-environment agriculture (CEA), including technology design, procurement, construction, and farm operations, and then marketing and selling products through their global consumer brand.

Pure Harvest are 7 times more efficient than typical desert greenhouse farms, 30 times more efficient than traditional field farming, can grow 365 days a year and very water efficient with 85% of the water used being leaving the farm in the food.



### Growing food using advanced vertical farming technology

In July 2022, Crop One Holdings and Emirates Flight Catering announced the opening of the “world’s largest vertical farm. The over 330,000-square-foot facility is located in Dubai and has the capacity to produce over 1million kilograms of leafy greens annually<sup>60</sup> using a data-driven approach.

Dubbed ECO 1, the farm uses 95% less water than field-grown produce as the farm operates on a closed-loop water recycling system where the incoming water source is treated on-site through a multi-step water purification process and redistributed throughout the farm.

The farms also require a fraction of the land than conventional growth while yielding more fresh produce. Specifically, they grow 100x more produce than conventional farming per square foot. Their farming techniques also do not require the use of harsh chemicals, pesticides, herbicides, or fungicides, natural or synthetic, that other types of farming use.

Similarly, crops grown in Crop One farms lead to leafy greens with significantly enhanced shelf life, staying fresh several weeks after purchase in the refrigerator. A longer shelf-life means less food waste in the supply chain, thus limiting carbon emissions.

Likewise, there is no waste from spoilage or uncertainties in weather unlike crop

production via conventional agriculture where approximately 30% of all crops are lost due to this.

The farm guaranteed an output of 3,000kgs per day and currently grows spinach, kale, arugula and four varieties of lettuce, namely Romaine, Ruby Sky, Laliq and Batavia.



### Growing food inside supermarkets

In April 2020, Majid Al Futtaim launched Dubai’s first in-store hydroponic farm which spans 24 square metres and can accommodate up to 16 varieties of leafy greens, including lettuce, arugula, and kale, and herbs such as basil, dill, and sorrel<sup>61</sup>.

Opened in Carrefour market Al Wasl, this was the company’s third in-store hydroponics farm, following two others in Carrefour locations at Yas Mall and My City Centre Masdar. Since this launch in 2020, a further three hydroponic farms

were developed in Dubai (Dubai Festival City Mall, Mirdif Mall and Ibn Batuta Mall) bringing the total number of in-store farms in the UAE to 6.

The farms are part of an agreement signed by Majid Al Futtaim with the UAE’s Ministry of Climate Change and Environment to promote sustainable locally-grown produce.

### Implementing the 4-R Pathway to Circularity – Redesigning, Reducing, Reusing and Recycling

The global manufacturer, distributor and retailer Al Bayader International is implementing the **4-R Pathway to Circularity**, which focuses on ‘Redesigning, Reducing, Reusing, and Recycling.’

This approach prevents plastic packaging ending up in nature by improving reuse and recycling methods, as well as reduces the carbon footprint of packaging through eco-design to ensure circularity in every step. It also optimises resource-use to promote energy efficiency.

### Retrofitting buildings to improve energy and water efficiency

One of the main projects that the UAE Ministry of Energy and Infrastructure (MOEI) is handling is a Building Retrofit programme which aims to reduce energy and water consumption in government buildings by rehabilitating 422 of the federal government buildings that

consume the most energy and water.

The programme is implemented through a shared savings mechanism operated through a public-private partnership where qualified private sector energy service companies (ESCOs) finance, rehabilitate, install, test and operate products, technologies and system that will reduce energy and water consumption by at least 20% compared to the average consumption over the previous three years.

As well as improving the energy and water efficiency of the government’s building stock, the Retrofit programme has also helped to regulate the ESCO market in the UAE, to the benefit of any person or organisation in the UAE seeking trusted companies that can deliver improved energy and water efficiencies.

### Using Smart Building management tools to improve the efficient use of energy and water

The UAE Ministry of Energy and Infrastructure (MOEI) has developed and uses two advanced electronic platforms to improve the efficient use of energy and water in the government building sector.

One platform monitors the energy and water savings achieved from the retrofitting of government buildings. The platform enables real time data to be used to monitor the consumption of energy and water and assess the overall performance of buildings as well

<sup>60</sup> <https://cropone.ag/news/2022/9/13/watch-sheikh-mohammed-visits-worlds-largest-vertical-farm-in-dubai>

<sup>61</sup> [Majid Al Futtaim launches Dubai’s ‘first’ in-store hydroponic farm \(gulfbusiness.com\)](https://www.gulfbusiness.com/news/majid-al-futtaim-launches-dubai-s-first-in-store-hydroponic-farm)

as calculate emission and cost savings . These highly efficient systems in the buildings help to reduce consumption, as well as the lifespan and sustainability of the building.

The other platform monitors installed solar energy systems and helps track the daily energy savings, emission reduction and cost savings through various diagrams. It also helps to check the performance ratio of the installed solar systems base don the weather or the possibility to identify if malfunction occurred.

**Improving Facility Management**

As part of the UAE’s National Energy and Water Demand Side Management Programme 2050, the Ministry of Energy and Infrastructure (MOEI) introduced a Facility Management Programme which is developing an energy efficient facility operations and maintenance framework that:

- Certifies energy efficient operations;
- Promotes/incentivises efficiency practices;

- Develops capabilities through training and certification;
- Takes a holistic approach to building rating schemes and retrofit programmes; and
- Measures performance via the National Energy and Water Intensity database.

**Developing guidelines to encourage more efficient irrigation**

As part of the UAE’s National Energy and Water Demand Side Management Programme 2050, the Ministry of Energy and Infrastructure (MOEI) developed National Guidelines for Efficient Irrigation to support water conservation and improved water use efficiency in the Agricultural Sector and the Built environment sector – the two sectors consuming the greatest amount of water.

The guidelines provide technical support to farmers on the latest agricultural methods and technologies that can increase productivity of inputs and reduce water demand.



**C4. Action taken to Loop**

The second principle of the Circular economy is to circulate products and materials at their highest value in continuous loops of use and re-use. This means keeping materials in use, either as a product or, when that can no longer be used, as components or raw materials such that nothings becomes waste and the intrinsic value of the products and materials are retained

For biodegradable products and materials, they are kept in the loop by being returned to the earth through processes like composting and anaerobic digestion – the earth’s processes will naturally keep them in the loop.

Non-biodegradable, “technical” products and materials, on the other hand, are kept in the loop through reuse, upcycling, repurposing, repair, remanufacturing, upcycling and as a last resort, recycling.

Upcycling is a process of transforming discarded or waste materials into products of higher value, quality, or utility. It involves repurposing and creatively reusing materials that would otherwise be discarded as waste. Unlike recycling, which often involves breaking down materials to create new products, upcycling focuses on retaining the original material’s integrity and enhancing its value through innovative design and craftsmanship.

Repurposing involves finding new uses or

applications for waste materials without significant processing or transformation. It focuses on utilizing materials in their existing form or with minimal modifications to serve a different purpose. Repurposing often involves creativity and innovation to reimagine the potential of waste resources.

Remanufacturing is a process of restoring used or end-of-life products to their original specifications or performance level. It involves disassembling, cleaning, repairing, and reassembling the product using a combination of reused, repaired, and new parts. Remanufacturing differs from conventional repair or refurbishment as it aims to bring the product back to its original condition, ensuring it meets the same quality and performance standards as a new product.

The practice of keeping products, materials and resources in a continuous loop of use and re-use helps to extend products’ lifespans which in turn reduces the demand for virgin materials which puts less stress on the earth’s ecosystems, minimises waste generation and maximises resource efficiency.

Many UAE stakeholders have taken action to circulate products and materials. Some of these stakeholders and their actions are described in the subsection that follow<sup>62</sup>.

With respect to **upcycling**, the actions undertaken by UAE stakeholders have

<sup>62</sup> This is not a definitive nor exhaustive list

included:

- Upcycling waste to make furniture
- Upcycling local waste into sustainable materials – vegan leather, concrete and solid surfaces.
- Upcycling Construction and Demolition Waste into construction materials
- Upcycling palm leaves to grow mushrooms
- Upcycling waste to make Michelin Star Food
- Upcycling clothes

With respect to **repurposing waste**, the actions undertaken by UAE stakeholders have included:

- Repurposing waste heat to generate electricity
- Converting waste oil into biodiesel
- Repurposing by-products from aluminium production
- Repurposing wastewater sludge for use in other sectors
- Using the by-product from desalination to make cement
- Rescuing “Ugly” food
- Using a web-based platform to redirect food waste.

With respect **remanufacturing**, the actions undertaken by UAE stakeholders have included:

- Remanufacturing car parts
- Establishing a laptop remanufacturing plant

- Establishing an automotive remanufacturing plant
- Introducing an electronic device subscription service that ensures after first life, devices are repaired, refurbished or recycled.

With respect to **facilitating recycling and the secondary materials market**, the actions undertaken by UAE stakeholders have included:

- Developing a Recycling Plant for (PET) plastic materials used in food packaging
- Developing a Plastic to Liquid Processing Plant that will convert non-recyclable plastics into recyclable feedstock
- Developing Refuse Derived Fuel (RDF) Plant that will convert municipal waste into alternative fuel for cement plants
- Developing a Solid Recovered Fuel Facility to transform waste into alternative green fuel
- Developing an E-waste recycling facility
- Increasing capacity to manufacture recycled paper
- Upgrading capabilities to recycled used beverage cartons.
- Developing an advanced water treatment plant to increase the supply of recycled water
- Expanding recycled water distribution infrastructure

- Developing a virtual global marketplace for recycled plastic
- Developing a local virtual business to business marketplace for recyclables
- Using smart bins to reward people who recycle
- Scaling up a startup initiative offering cash for trash
- Using digital technology to facilitate the collection of recyclable waste

With respect to **recycling and using recycled materials**, the actions undertaken by UAE stakeholders have included:

- Collecting and recycling milk cans
- Making clothes from recycled fabric
- Developing a waste to Hydrogen Plant
- Developing a Waste to energy power plant
- Using recycled feedstock (oil from waste tires) rather than fossil feedstock

## C4.1 Upcycling

### Upcycling Waste to make Furniture

There are a number of furniture designers and manufacturers in the UAE that upcycle waste to make furniture. This includes:

- **Tribe Dubai**, an eco-friendly home décor studio in Al Quoz who designed and created a collection of furniture from salvaged wood in the UAE<sup>63</sup>. The aged wood comes from UAE junkyards they tied up with. The wood is restored with a natural finish that reveals the original wood’s grains and markings,

reflecting its story.

- **Raw Design and Build (RDNB)** who create sustainable and aesthetically pleasing furniture that’s handmade for most part, with production split between Amman, Dubai and Italy<sup>64</sup>. The design firm was established to see if furniture design in the region could focus on three aspects of sustainability – functional, social and environmental. The germ of the idea sprouted into a full-blown concept of repurposing reclaimed wood to create furniture when Amman-based architect Mohammed created side tables for a client out of wooden pallets. They produce a range of furniture that uses natural and recycled materials. Alongside wood, they also use steel, glass and natural stone and they ensure that any new materials that they use is accredited as environmentally safe. The reclaimed and abandoned materials for their products are recovered from construction sites, industrial areas, warehouses, art galleries and a few shops.
- Abu Dhabi-based **Driftwood Factory**. They breathe new life into dead driftwood by converting them into pieces of furniture. The factory and workshop recycled all kinds of abandoned and used wood into dining tables, consoles and more. They source wood from construction sites and use pallets, scaffolding, planks as well as metal from junkyards to reduce wood usage and give an industrial feel

<sup>63</sup> Gulf News

<sup>64</sup> Gulf News

to the products. They also do regular scavenging hunts for abandoned wood and recently salvaged a tree trunk from the industrial area in Musaffah. Everything is also made in the UAE – with winning designs involving a lot of trial and error.

### Upcycling Local Waste into sustainable materials

In 2022, the Dubai-based startup ARDH Collective launched three new flagship materials that repurposes waste resources native to the UAE and MENA region to create more sustainable material resources<sup>65</sup>. These materials are:

- **DATEFORM which diverts date seeds** from landfills and converts it into DATEFORM's flagship material "It's Roasted" which is composed of roasted and pulverised date seeds. The solid surface materials can be used to create countertops, flooring/tiling systems, wall cladding, shelving units, furniture and more. Every year over 108 million kilograms of date seeds are discarded in the UAE.
- **RAMEL, a concrete composite** that replaces traditional riverbed sand with locally sourced desert sand and partially replaces cement with similar binders resulting in a more environmentally friendly material. The concrete industry is responsible for 8% of the world's carbon emissions due to the process involved in cement production. Furthermore, riverbed sand, one of concrete's main components, is a

diminishing resource and its extraction is damaging to local ecosystems. Being an alternative mix to traditional concrete, RAMEL can be easily used for a range of different applications. RAMEL Blocks are the world's first desert sand-based blocks that have the equal structural integrity to traditional concrete. The size and shape follow industry standards, however, with less than half of the environmental impact.

- **NEAR leather is a vegan and ethical leather** made from plant based fibers native to the UAE. Animal skin leathers contribute greatly to global carbon emissions and are highly toxic. Tanneries use a range of chemicals to treat the animal skin to create all the characteristics of the leather as we know it. Faux leather and other plastic based leather imitation materials can also be toxic and cause harm to the environment during their production and use. In the UAE alone, over 400 million kilograms of plant fiber is discarded every year. NEAR leather can transform this farming waste by-product into a more sustainable and ethical choice.



<sup>65</sup> <https://www.zawya.com/en/uae>

### Upcycling Construction & Demolition Waste into construction materials

Sharjah-based BEEAH group have developed a state-of-the-art Construction and Demolition Waste (CDW) Recycling Facility that has revolutionized the management of construction waste in the UAE by diverting substantial amounts away from landfills.

With a capacity to treat and process approximately 500,000 tonnes of heavily contaminated construction and demolition waste each year, the facility uses innovative processes to transform CDW into industry-certified recyclable products, including curb stones, interlock materials, and recycled aggregate.

These recycled products serve as essential resources for road construction and other building applications, further contributing to sustainable development practices.

### Upcycling palm leaves to grow mushrooms

Abu Dhabi-based Below Farm grows mushrooms all year round using vertical farming techniques and by upcycling palm leaves from local date farms in the UAE and converting them into nutritious food.

Their end-to-end data monitoring system uses machine learning algorithms to optimize the perfect growth conditions for each variety of specialty mushrooms, so they grow in prime conditions for the best flavor & quality.

The farm, which was had its first harvest in May 2021, requires little water and no

<sup>66</sup> [Khaleej Times](https://www.khaleejtimes.com)

<sup>67</sup> <https://aeworld.com/fashion/upcycled-by-miu-miu-comes-to-dubai/>

arable land. They currently grow Oyster, King Oyster, Shiitake and Lion's Mane and so unlike button mushrooms that grow on manure, these are known as "primary decomposers" that eat through wood so it is a cleaner process which does not use pesticides or fertilisers.

An automated system controls temperature and humidity to allow Below Farm to currently grow 120 tonnes of mushrooms a year. Mycelium, or mushroom starter culture, can be used to make plant-based packaging, coffee, mushroom leather, and even a type of vegan meat.

### Upcycling waste food to make Michelin Star Food

Dubai-based Green Michelin starred restaurant, Lowe has come up with a menu that creatively reuses waste. One of their most popular dishes is the burnt toast ice cream – where they came up with a way to turn burn toast into ice-cream. By focusing on finding ways to use waste products, they have learnt to create amazing new dishes and have curated a "Waste Not" menu- an 8-10 course meal made exclusively from waste products in the restaurant and that barely creates any waste<sup>66</sup>.

### Upcycling Clothes

In February 2021, the international fashion designer, Miu Miu launched a special collection of vintage dressed reworked and transformed by Miu Miu, while the memory of the originals is preserved in cloth. Seven exclusive dress were available in the Dubai Mall<sup>67</sup>.

Strictly limited to a selection of just 80 one-off pieces and numbered designs, Upcycled by Miu Miu is built around precious, anonymous finds, dating from the 1930s to 1980s, carefully sourced from vintage clothing stores and markets worldwide. Once restored the pieces are re-fashioned and finished with signature Miu Miu embroideries and embellishments. Each piece is entirely unique and all are completely by hand.

## C4.2 Repurposing Waste

### Repurposing waste heat to generate electricity

In 2022, Lafarge Emirates Cement (LEC), part of the Holcim Group, a leading Swiss industrial company signed a 10-year BOOT (Build Own Operate Transfer) contract with ENGIE Solutions, an international leader in sustainable energy solutions to design, finance, construct and manage operations of a 10MW waste heat recovery (WHR) plant at its Fujairah cement plant.

In May 2023, ENGIE announced it has begun construction and is expected to generate its first Kilowatt-hour commissioned by year-end 2023. The WHR plant will help LEC avoid 29 kilotonnes per year of CO<sub>2</sub> emissions from the grid – representing a reduction of 28% in power-related emissions.

ENGIE Solutions will implement the ORC technology in an “energy as-a-service” model in the cement industry for the first time in the region. ENGIE’s energy-as-a-

service model means guaranteed energy savings, higher reliability, and resiliency, with no capital outlay and no need for additional staff.

Converting waste heat into energy brings LEC cost savings, greater efficiency, and closer alignment with their commitment to sustainability goals.

Abu Dhabi National Oil Company (ADNOC) Refining is also planning to utilise its waste heat to generate power. By the end of 2023, it expects to complete phase 1 and 2 of its \$600m waste-heat recovery project which will increase power production and thermal efficiency at the Ruwais gas-fired plant by about 30%, with no additional carbon dioxide emissions<sup>68</sup>.

The waste-heat recovery project will capture exhaust heat from the gas-powered turbines at the Ruwais plant – which is currently vented into the atmosphere – to produce steam that is subsequently used for power production.

The project will recycle waste heat to produce up to an additional 230 megawatts of electricity a day and 62,400 cubic metres of distilled water a day for use in the plant.



<sup>68</sup> [www.adnoc.ae](http://www.adnoc.ae)

### Converting Waste Oil into Biodiesel

In 2022, Lootah Biofuels opened their new factory in Dubai Industrial City. The factory collects used cooking oil treats it, and converts it into biodiesel using the latest international technologies at a competitive price compared to regular diesel.

The launch of the new plant and the consequent increase in biodiesel production capacity by 100 tonnes per day will help the UAE achieve its goal of obtaining five percent of transportation fuel from food waste and renewable resources.



### Repurposing by-products from aluminium production

In 2022, Emirates Global Aluminium supplied 203 thousand tonnes of waste to other industries as feedstock. The amount was almost double the volume EGA generated during 2022, reducing stockpiles from previous years, and a 40 per cent increase on 2021 as industries recovered from COVID-19<sup>69</sup>.

EGA has worked for more than a decade with other industries in the UAE to find

<sup>69</sup> <https://www.zawya.com/en/uae>

<sup>70</sup> <https://www.qatra.ae/bio-products/>

productive uses for by-products from aluminium production. Re-use diverts waste from landfill and reduces the need to exploit new natural resources, contributing to the development of a circular economy.

EGA is a global leader in the re-use of spent pot lining, the largest single by-product stream from aluminium smelting. Use of EGA’s spent pot lining as alternative raw material helps reduce greenhouse gases and nitrogen oxides from the cement sector.

Other major by-product streams for which EGA has found re-uses with other industries include carbon dust, dross, and potline process waste.

### Repurposing wastewater sludge for use in other industries

In early 2019, Sharjah based Qatra Water Solutions constructed solar drying beds to remove up to 80% of the water in sludge, the main by-product (“dirt”) of wastewater treatment<sup>70</sup>.

The water in sludge makes it voluminous and heavy –Qatra’s Al Saja’a Bio Refinery generates around 45 tons of this wet sludge every day. Like many wastewater treatment plants, prior to 2019, Qatra was landfilling this sludge but by using the solar drying beds which leverages the sun’s heat to remove up to 80% of water, Qatra has reduced the quantity produced to less than 10 tons per day.

This dry sludge is not only a great fertilizer

thanks to its nutrient content, but also carries a high caloric value of more than 14 MJ/Kg, making it perfect for Cement Factories as a subsite of Charcoal. In 2019, Sharjah Cement Factories and Qatra signed a Reuse Agreement so the Factory reuses Qatra Dry Slud.

### Using Desalination by-product, Brine, to make cement

A Dubai-based architect duo at waiwai, Wael Al Awar and Kenichi Teramoto, are investigating developing cement made using brine generated by the UAE's desalination plants, which remove salt from seawater<sup>71</sup>.

They were inspired by the UAE's mineral-rich sabkha – salt flats that are part of the country's wetlands and centuries ago were used in architecture. blocks were hewn from salt flats and used to build Siwa, a medieval town in Egypt close to the Libyan border. However, rather than mining the delicate sabkha ecosystem, they are looking to use waste brine, which contains many of the same minerals.

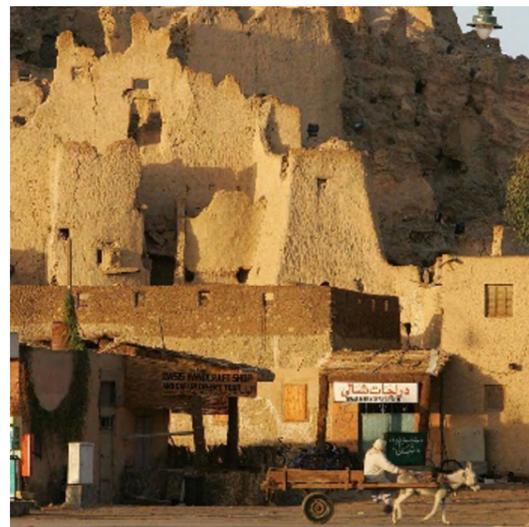
With one of the largest desalination operations in the world, the UAE produces roughly one fifth of the world's brine as by-product – approximately 28 million cubic metres a day according to a 2019 UN-backed report.

Brine contains magnesium minerals that can be extracted and used to make cement. Al Awar claims their Magnesium-based cement can “perform to the equivalent of Portland cement,” which uses calcium

carbonate as a raw ingredient and is the most commonly used cement in concrete manufacture. However, the magnesium cement has its limitations. As a salt-based product, it is liable to corrode steel reinforcement although it is possible to use other materials to reinforce.

Professor Kemal Celik, Director of the Advanced Materials and Building Efficiency Research Laboratory (AMBER Lab) developed a method of using brine, a water desalination byproduct, to make cement in a process that requires significantly lower resources and energy than the conventional cement production process, while producing a similar quality product<sup>72</sup>.

Using Celik's method, the amount of magnesium-based cement that could be produced by the waste brine corresponds to approximately 23 percent of the cement production in the UAE and KSA.



<sup>71</sup> <https://edition.cnn.com/style/article/uae-pavilion-biennale-sabkha-cement-spc/index.html>

<sup>72</sup> <https://nyuad.nyu.edu/en/>

### Rescuing “ugly” food

A Dubai-based startup established in 2021, HeroGo, is the UAE's first ‘ugly food’ delivery service. It uses artificial intelligence (AI) technology to reclaim misshapen fruits and vegetables discarded by producers and delivers them to customers at a discount.

By partnering with growers and importers, HeroGo rescue ‘oddly’ shaped, sized, or coloured produce, items close to sell-by dates, or in excess supply at risk of waste, delivering quality groceries to their customers. With customers savings of up to 40% on current bills, they are also proving that sustainability doesn't have to be costly.

### Using a web-based platform to redirect food waste

Replate is a tech-enabled non-profit that works directly with businesses in the UAE to learn and understand waste management habits, set sustainability goals, develop and implement onsite food recovery programs, and coordinate donations with local charities<sup>73</sup>.

Their web-based platform offers tools for businesses with food surplus to donate meals to non-profits serving communities who are experiencing food insecurity and also offers business solutions designed for food waste prevention through source reduction. Their platform thus enables businesses to track total food donations, measure the social and environmental impact of those contributions, and utilize source reduction tools to make informed

<sup>73</sup> <https://www.re-plate.org/uae>

<sup>74</sup> <https://www.zawya.com/en/uae>

decisions that prevent waste in the future.

Their mission is to reduce food waste, and mitigate the impacts of climate change across the globe.

In December 2022, Majid Al Futtaim's Mall of the Emirates launched their first rescue food programme “Feed the Future”. The initiative focuses on recovering leftover and edible food from restaurants, cafés, the Food Court, and workforce catering in Mall of the Emirates. The program repurposes this food to the benefit of the community<sup>74</sup>.

To facilitate this effort, Mall of the Emirates has partnered with the technology platform, Replate. Vendors at mall can now schedule and manage their donations, and coordinate pickups with the UAE Food Bank, which then distributes those contributions to charitable organisations and groups, including workers in communal housing and families.

To participate in the program, F&B outlets in the mall simply need to register as a vendor at replate.org. They can then nominate a sustainability hero to represent the company and the schedule picks up using Replate's platform. Replate keeps a record of the donations by date to track the amount donated, as well as specific quantities of each food item. This tracking helps F&B outlets in the mall reduce and prevent waste in the future.

Additionally, the platform measures the environmental and social impact of the donations, such as water saved, CO2 diverted, and the number of meals served.

### C4.3 Remanufacturing Products

#### Remanufacturing car parts

GM in the UAE offers their customers the opportunity to trade-in old GM parts for new or remanufactured parts as part of their "Remanufacturing Program"<sup>75</sup>.

The GM Remanufacturing Program is a parts exchange program where the customer trades-in the damaged part in return for a remanufactured one at a discounted rate.

Remanufacturing is a comprehensive and intensive industrial process by a GM-certified remanufacturer, and/or the Original Equipment Manufacturer (OEM), which a previously sold worn-out, or non-functional product or component is returned to an upgraded condition and warranted in performance level and quality.

#### Establishing a Laptop Remanufacturing Plant

Circular Computing, a UK remanufacturer of used laptops, opened their purpose-built laptop remanufacturing factory in Ras Al Khaimah Economic Zone's (RAKEZ) in 2017<sup>76</sup>.

Their unique Circular Computing™ remanufacturing process re-uses 99% of the original materials to remanufacture a laptop and the last 1% goes into recycling, where it is transformed into pallets. Nothing is thrown away and they have a collection of more than 180,000

spare parts.

The remanufacturing process directly avoids the depletion of many of the Earth's limited resources that are part of the original manufacture of every new laptop, such as water, precious metals and minerals and the emissions of CO2 greenhouse gases. The process also means e-waste is not increased from the unnecessary disposal of a working laptop.

Circular Computing recently became the world's first company to receive a BSI Kitemark Certification for its circular production process, in which pre-used laptops are remanufactured to be "equal to or better than new" in terms of appearance and function. BSI Kitemark Certification is a prestigious UK product and service quality certification mark, which demonstrates that a product or service has gone beyond the normal requirements to achieve the highest standards.

The company's products are 100% carbon neutral and a certified Carbon Neutral Plus Product and are audited annually by Carbon Footprint. Their carbon footprint has been assessed following ISO 14064-1 and the GHG Protocol. Any residual GreenHouse Gas emissions are offset using verified projects to achieve carbon neutrality.

In November 2021, their state-of-the-art production facility was extended with the expectation that by the end of 2023, they will have a production rate of 50,000 rebuilt laptops per month<sup>77</sup>.

#### Establishing an Automotive Remanufacturing plant

The global automotive service provider, OWS is ready to launch the GCC region's largest automotive remanufacturing plant in Ajman in 2023.

OWS is an established key player in the US automotive remanufacturing segment. During vehicle remanufacturing, an older vehicle is brought back to life. This key offering is a first of its kind, not only in the UAE, but in the MENA region and West Africa.

During the process of remanufacturing or rebuilding a car, they replace the essential components, or they rebuild the central components, for example, the engine, transmission, and transfer kit, which are essentially the guts of the car. Once these pivotal components are changed, the vehicle owner will get a higher quality vehicle and one with an additional 5 to 10 years to the life. They provide a warranty 10 times longer than other automotive dealers.

Since OWS is cost-effective, sustainable and environmentally friendly most government fleets in the UAE work with OWS. School buses are a perfect example of remanufacturing as the external body is not required to be shiny or perfect, but more importantly, should function with the maximum level of safety.

The new plant will also provide the electrification of vehicles so they take gasoline vehicles and completely convert

them into electric vehicles (EV) which will also convert the lifeline of the vehicle.

#### Introducing a Device Subscription Service that ensures after first life devices are repaired, refurbished or recycled

In June 2023, a sustainable device subscription programmes was launched in the UAE by the multi-brand electronics retail group, E-City in partnership with the Reverse logistics platform Cartlow<sup>78</sup>.

The initiative simplifies the process of keeping up with the latest technology by eliminating the need to sell or trade-in the current device and provides customers with affordable and convenient options to prolong the life cycle of their devices and reduce electronic waste.

Customers will constantly have the latest device in the device subscription programme by securing its exchange value for future use.

All old devices collected through the programme undergo data sanitisation following international standards for IT asset disposal services. The programme adheres to circular economy principles, meaning that collected devices are either repaired, refurbished, or recycled to minimise waste and promote sustainability.

<sup>75</sup> <https://www.chevroletarabia.com/ae-en/complete-care/remanufacturing>

<sup>76</sup> <https://circularcomputing.com/remanufacturing-process/>

<sup>77</sup> [http://tradedarabia.com/news/IND\\_389632.html](http://tradedarabia.com/news/IND_389632.html)

<sup>78</sup> <https://gulfbusiness.com/cartlow-e-city-launch-device-subscription-program/>

## C4.4 Action to Facilitate Recycling

### Developing a Plastics to Liquid Processing Plant that will convert non-recyclable plastics into valuable feedstock

In August 2022, DUBAL Holding, Quantafuel and BASF signed a front-end engineering design (FEED) agreement for developing a 80,000 tons per year Plastics-to-Liquid (PtL) processing plant in Dubai. The PtL project will convert low-quality, non-recyclable plastics into valuable products which BASF will use to create new products from the recycled feedstock.

### Developing a Solid Recovered Fuel Facility to transform waste into alternative green fuel

In August 2022, Beeah Recycling, a waste processing and material recovery business under Beeah Group, added a new Solid Recovered Fuel (SRF) facility to its state-of-the-art, integrated waste management complex in Al Saj'ah, Sharjah.

The SRF facility will transform commercial residue waste into an alternative green fuel that is high-value, low moisture and low in chlorine content, which is a more sustainable and lower emissions alternative to coal that is typically used in cement production. The SRF facility currently has a production capacity of 85,000 tonnes of alternative green fuel every year, which amounts to 250 tonnes per day.

Sharjah Cement, which is located close to Beeah Recycling's Waste Management Complex, has entered an agreement to receive 73,000 tonnes of alternative green fuel from the SRF facility every year<sup>79</sup>.

### Developing a Recycling Plant for (PET) plastic materials used in food packaging

In January 2023, Repeat, BEEAH Group, and Agthia signed a Memorandum of Understanding (MoU) to study the feasibility of establishing a 12,000 tonnes per annum polyethylene terephthalate (PET) recycling plant.

PET is a plastic material used in food packaging such as plastic water bottles and so the project could help facilitate the manufacturing of water bottles using recycled plastic. In the frame of the project under study, Repeat would operate the recycling plant, while BEEAH Group would supply a seven-year feedstock of plastics. Meanwhile, Agthia would provide a seven-year offtake for products. The feedstock will be post-consumed PET bottle bales while the offtakes will be food-grade recycled PET resin.



<sup>79</sup> UAE: New recycling facility producing alternative green fuel from waste opens in Sharjah - News | Khaleej Times

### Developing an E-Waste Recycling Facility that will process Waste Electrical and Electronic Equipment (WEEE)

In 2019, Dubai e-waste specialist Enviroserve, opened the world's largest e-waste recycling facility, the Recycling Hub, in Dubai<sup>80</sup>. The 280,000 square-foot e-waste recycling plant will process WEEE (Waste Electrical and Electronic Equipment), IT asset disposition (ITAD), refrigerant gas and specialised waste.

The Recycling Hub has a processing capacity of 100,000 tonnes of total integrated waste per year, of which 39,000 tonnes is e-waste. The facility uses state of the art reclamation technology, which surpasses EU standards for e-waste and can process the entire range of WEEE from consumer and industrial to commercial and military. These include air conditioners, batteries, computers, household appliances, mobile phones, and even military avionics.

The integrated facility will also recycle specialised waste material such as aerosol cans, light bulbs and FMCG products and is currently the only dedicated refrigerant gas reclaim facility in the UAE.

The Dh120 million project is backed by the Swiss Government Export Finance Agency and represents one of the largest foreign direct investments in the field of environmental management to date in the UAE.

Enviroserve's green recycling facility will service international e-waste recycling

<sup>80</sup> World's largest e-waste recycling facility opens in Dubai | Uae - Gulf News

efforts across Africa, Middle East and Caucasus.

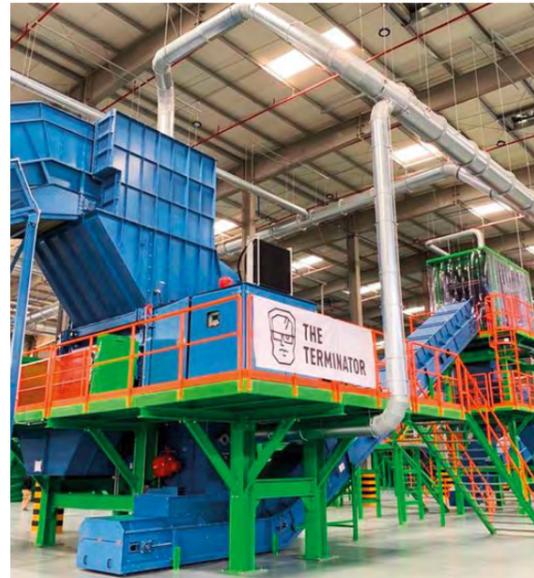
### Developing a Refuse Derived Fuel (RDF) Plant that will convert municipal waste into alternative fuel for cement plants

In 2023 commercial operations in the first Refuse-Derived Fuel (RDF) plant in the Emirate of Umm Al Quwain started. Daily, 1,000 tonnes of municipal solid waste from the emirates of Ajman and Umm Al Quwain's 550,000 inhabitants are converted into 700-800 tonnes of RDF. This RDF is then used by the region's cement plants, partially replacing gas and coal use in these plants.

The facility started its commercial operation in 2023 and receives a daily quantity of 1000 tons of municipal solid waste and produces 700-800 tons of RDF daily.

The RDF facility was built and is managed by a public-private partnership (PPP) between the UAE's Ministry of Climate Change and Environment (MOCCA) and the Emirates RDF Company, a joint venture of BESIX, the Ajman-based Tech Group Eco Single Owner holding company, and Finland-based Griffin Refineries.





**Increasing capacity to manufacture recycled paper**

In December 2022, Industrial hub Khalifa Economic Zones Abu Dhabi (KEZAD) Group signed a 50-year land lease agreement with speciality tissue manufacturer Star Paper Mill for the establishment of a new facility.

Under the agreement, Star Paper Mill, in collaboration with RC Paper Machines, will expand its existing capacities with an investment of Dh200 million in a 59,000 sqm site in KEZAD to **manufacture recycled kraft paper** jumbo reels to be used to manufacture corrugated cartons and 100 per cent eco-friendly biodegradable bag papers out of recycled raw materials.

The project will apply the latest innovation in processing waste generated from the facility, using an effluent treatment plant

<sup>81</sup> <https://www.zawya.com/en/uae>

to recycle water and reuse it. The raw materials used, including OCC, NCC, NDLC, and sack kraft waste, will be sourced locally in the UAE to reduce transport-related emissions.

**Upgrading Capabilities to Recycle used beverage cartons**

In November 2022, Union Paper Mills (UPM), the UAE’s leading paper recycler, signed a Memorandum of Understanding (MOU) with Tetra Pak, the world’s leading food processing and packaging company with the objective to increase the overall collection and recycling of used beverage cartons (UBC)<sup>81</sup>.

Within the terms of this MOU, Tetra Pak will support UPM with UBC recycling capabilities including the necessary technology to adapt a pulping line that will be installed and operated at UPM premises located in Dubai.

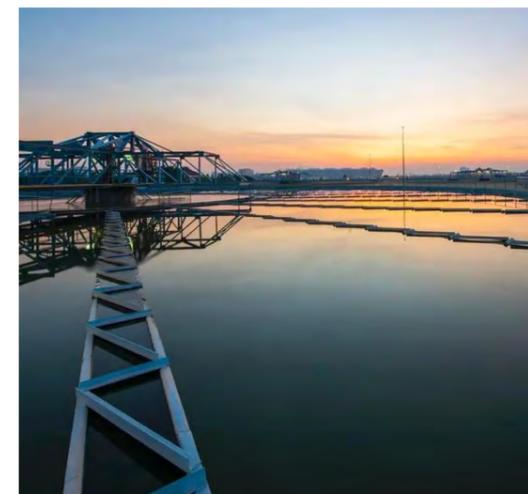
Tetra Pak will also lend its support on the technical know-how for the recycling line as well as facilitate engagements between waste management companies and UPM. This will further increase the capacity and overall efficiency of UBC collection, transportation, treatment, and recycling system.

As part of the MoU, UPM will procure and process UBC to extract and recycle fibers, which will then be utilized to produce recycled paperboard for packaging applications.

**Developing an Advanced Water Treatment Plant to increase the supply of recycled water**

In May 2023, Khalifa Economic Zones Abu Dhabi – KEZAD Group and Sustainable Water Solutions Holding Company (SWS) signed a framework agreement under which they will cooperate on the development and operation of a pilot polished water plant, as well as polished water distribution to industries in KEZAD Musaffah<sup>82</sup>.

The state-of-the-art Polishing plant, capable of treating a 20,000 m3 influent daily, will filter and treat Treated Sewerage Effluent (TSE), removing additional impurities and contaminants, generating non-potable water suitable for industrial use, offering industries cost-effective access to premium recycled water, reducing reliance on potable water sources. It will help lower the carbon footprint of many industrial sectors and will preserve potable water.



<sup>82</sup> <https://www.zawya.com/en/uae>

<sup>83</sup> <https://www.thenationalnews.com>

**Expanding Recycled Water Distribution Infrastructure**

In July 2020, Abu Dhabi Distribution Company (ADDC), a subsidiary of Abu Dhabi National Energy Company, also known as Taqa, awarded Dh900 million worth of projects to expand the company’s recycled water distribution programme<sup>83</sup>.

The two projects will have a combined capacity to transmit around 85 million imperial gallons per day (MIGD) of recycled water, sufficient to irrigate more than 3.5 million palm trees. The expansion will increase the use of recycled water beyond municipal landscaping to include commercial and agricultural sectors. The move will also allow nearly 4,000 farms to benefit from the supply of recycled water.

The new transmission infrastructure will help the company reach clients from the commercial and agriculture sectors located on the outskirts of Abu Dhabi. The expansion will include laying out approximately 150 kilometres of pipelines.

In January 2020, ADDC began transmitting 4.4 MIGD of recycled water on Saadiyat Island through an existing network on Yas Island.

**Developing a virtual global marketplace for Recycled Plastic**

In September 2022, the UAE launched the **“Rebound Plastic Exchange”** – the first global trading platform for recycled materials.

The exchange provides a marketplace

that enables buyers and sellers of plastics from around the world to connect and efficiently trade recycled plastic with confidence, bringing increased opportunity for recycled content for the world's products and packaging.

Their mission is to provide a marketplace for recycled plastic, facilitating the movement of quality assured feedstock across borders in a regulatory compliant way that will help increase the efficiency of recycling plastic at scale. By 2025, the recycled materials market is expected to exceed \$46 billion<sup>84</sup>.

### Developing a local virtual Business to Business marketplace for Recyclables

In 2021, a Sharjah-based Business-to-Business (B2B) platform, Re.life Market, which sells recyclables through an open bidding process was launched. In 2022, the B2B portal enabled 150,000 tonnes of recyclable material worth Dh100 million to be traded in the UAE<sup>85</sup>.

The platform connects buyers and sellers of recyclables in a virtual B2B marketplace, with several trade options through a transparent bidding process. Trades are possible across categories of recyclables, including ferrous and non-ferrous metals, plastic, paper, wood, e-waste, glass, and rubber. The platform also verifies the quality of recyclables being traded on the platform and provides guarantee of payment to sellers when a trade is completed.

By removing the middleman from supply

chains, re.life market eliminates many of the pain points that buyers and sellers are facing in the current recyclables trading journey - not only does re.life market speed up the process, it also adds a new layer of transparency and promotes more sustainability-centric thinking.

### Using Smart Bins to reward people who recycle

In January 2020, a Smart Bin that can identify the rubbish thrown into it and the person using it was trialled across the UAE as part of efforts to increase recycling<sup>86</sup>.

The smart bin created by an Abu Dhabi start-up called Cycled melds cutting-edge artificial intelligence with mobile technology to promote recycling.

Inspired by reverse-vending machines, which pay out a deposit in exchange for the return of a plastic bottle, the Smart Bin uses rewards to encourage more people to recycle. Users drop in plastic, metal or glass. The bin then weighs and identifies the material and sends the user a message telling them, based on the weight, the carbon emissions that they have saved by diverting their waste from landfill. Users can translate their points to shopping vouchers or Netflix gift cards, which can be used to pay for a Netflix subscription.

Since the plastic ban came into play in June 2022, usage of the Cycled SmartBins have increased by 190% with each location collection an average of 1500 plastic bottles a day<sup>87</sup>.

<sup>84</sup> [UAE enters billion-dollar recycling market with launch of plastic exchange \(thenationalnews.com\)](https://www.thenationalnews.com/uae/2023/07/13/abu-dhabi-aims-to-recycle-20-million-single-use-plastic-water-bottles-this-year/)

<sup>85</sup> [UAE B2B platform re.life market hits Dh100m trade in recovered commodities for 2022 | Retail – Gulf News](https://www.thenationalnews.com/uae/2023/07/13/abu-dhabi-aims-to-recycle-20-million-single-use-plastic-water-bottles-this-year/)

<sup>86</sup> <https://www.thenationalnews.com/uae/environment/abu-dhabi-s-smart-bin-offers-rewards-to-people-who-recycle-1.969604>

<sup>87</sup> [Facilitating a green shift in the United Arab Emirates \(cycled.no\)](https://www.thenationalnews.com/uae/environment/abu-dhabi-s-smart-bin-offers-rewards-to-people-who-recycle-1.969604)

### Scaling up a startup initiative offering Cash for Trash

In 2020 a social enterprise called Nadeera that leverages technology to promote waste sorting at source, established the first trash-for-cash system in the Middle East and North Africa (MENA) region called "Yalla Return". The initiative gives customers cash rewards based on the quantity of recyclables they turn in and the concept provides resident-centric, technology-enabled waste management solutions for municipalities and waste management authorities.

In 2022, as part of PepsiCo's Greenhouse Accelerator Programme, Nadeera won a \$100,000 grant, alongside package of mentorship to help them scale up the initiative.



### Introducing Reverse Vending Machines and Smart Bins

In July 2023, the Environment Agency Abu Dhabi (EAD) announced that up to 70 reverse vending machines (RVM) and 26 smart bins will be placed across Abu Dhabi to encourage recycling of plastic

bottles and aluminium cans.

The RVMs will be located in high footfall areas such as the Corniche, Abu Dhabi International Airport, sports venues, malls and schools<sup>88</sup>. Several of the agency's key stakeholders and partners taking part in the initiative, including Lulu, Aldar and Carrefour. Carrefour, for example, has committed to install 18 Reverse Vending Machines (RVMs) and to offer Smart Bins across Carrefour stores in Abu Dhabi and Al Ain.

In June 2023, the new recycling bins were introduced at Adnoc petrol stations across the emirate.

EAD hope the initiative will result in 20 million plastic bottles being recycled every year.

### Using digital technology to facilitate the collection of recyclable waste

In November 2020, Veolia Near & Middle East launched RECAPP, the first recycling app in the UAE, collecting plastic bottles and aluminium cans from the doorsteps of households free-of-charge.

In November 2022, RECAPP launched the first B2B digital recycling platform in the UAE. GoRECAPP.com will enable UAE businesses to deploy recycling boxes on their premises and provide adapted digital solutions for retail stores, offices, schools, sport facilities, hotels, restaurants and any other types of organisations.

Businesses can place an order on GoRECAPP.com for a one-time recycling

<sup>88</sup> <https://www.thenationalnews.com/uae/2023/07/13/abu-dhabi-aims-to-recycle-20-million-single-use-plastic-water-bottles-this-year/>

box or subscribe for a weekly collection. A number of options are available for the recycling boxes, targeting small waste streams usually not well recovered, including plastic bottles, cans, paper, coffee capsules, e-waste, batteries, and lightbulbs. RECAPP also now offers a brand program for companies to deploy recycling boxes in their own stores or in their retail partners' stores to collect end-of-life products brought back by customers.

Thus, RECAPP had been transformed into a holistic digital recycling solution for both individuals and businesses, with third-party carriers and collecting several categories of small waste streams that are often poorly managed.

During its first two years (November 2020-2022), RECAPP built a community of over 40,000 registered users and collected 500 tonnes of recyclables and over 25 million bottles and cans.

#### Developing and commercialising Recyclable Packaging and packaging made from recyclates

The UAE Petrochemical company, Borouge has been undertaking technical development, evaluation and screening of recycled plastics from recycling partners in its Packaging Centre of Excellence established by Borouge's Innovation Centre.

The Borouge team collaborates with its value chain partners to develop and commercialise mono-material laminates

and sustainable packaging applications that are suitable for everyday use. They have developed various proof of concept for Post-consumer Recyclates (PCR) containing packaging solutions, as well as fully recyclable mono-material solutions based on Borouge products. This included a mono-material flexible packaging solutions for toothpaste tubes which enables them to be recycled rather than ending up as plastic waste. The advancement of mono-material packaging with quality performance and functionality is a major breakthrough for advancing circularity.

Moreover, in 2021 Borouge officially added recyclates to its portfolio after entering into an agreement with a Singapore-based recycling company, Plaspulp Union to commercialise mechanically recycled polyolefins. Thus, they now offer recyclates along with virgin polyolefin solutions.

#### Developing a range of recyclable Materials for the food packaging industry

The global manufacturer, distributor and retailer Al Bayader International, has partnered with Sulapac, a Finnish company pioneering the advent of sustainable materials. The two entities will **develop a wide range of sustainable materials** for the food packaging industry, focusing on using locally available feedstocks, and to **develop a mechanical and chemical recycling infrastructure** in the UAE for these materials<sup>89</sup>.

<sup>89</sup> [Al Bayader International partners with global entities to empower the GCC's circular economy \(zawya.com\)](https://www.zawya.com/en/news/2023/01/10/al-bayader-international-partners-with-global-entities-to-empower-the-gccs-circular-economy)

## C4.5 Recycling and using recycled Materials

### Collecting and Recycling Milk Cans

In 2023, FrieslandCampina, one of the world's largest dairy cooperatives and the owner of Rainbow Brand in the Middle East, is collaborating with Recapp, a Veolia digital recycling solution, to **collect two million milk cans**, weighing 100 tons. The initiative is an extension of a successful pilot program undertaken in May 2022 which engaged with teashops and households to collect and recycle six tons of Rainbow milk cans.

### Making clothes from recycled fabric

UAE fashion start-up, Nomad, only use recycled and natural fabrics and are building an ethical and sustainable supply chain that creates high-quality, minimal impact, long-lasting items. They carefully select their materials and collaborate with their production partners to reduce waste, chemicals and plastics that endanger the people and ecosystem of the plant, or have negative impact on local communities<sup>90</sup>.

### Recycling Water

In line with their sustainability commitments to protect and restore water resources, Majid Al Futtaim's 2 residential communities (Tilal Al Ghaf and Al Zahia) use 100% recycled water to provide irrigation for the community's landscaping.

In Tilal Al Ghaf, they use treated sewage effluent (TSE) from a nearby Municipal water recycling treatment plant.

<sup>90</sup> <https://www.fromnomad.com/pages/about-us>

In Al Zahia community in Sharjah, however, they use TSE from their own sewage treatment plant (STP) which treats onsite the grey water collected from all the community's homes (showers, tap water/laundry drainage).

### Developing a Waste to Energy Power Plant

In May 2023, Abu Dhabi Waste Management Center (Tadweer) and the Emirates Water and Electricity Company (EWEC) received 2 proposals for the development of a greenfield Abu Dhabi **Waste-to-Energy (WtE) Independent Power Project (IPP)**.

Set to be one of the region's largest WtE facilities, the project will have an expected annual processing capacity of 900,000 tonnes of waste, enabling an expected carbon emissions reduction of 1.1 million tonnes per year. The WtE project is also expected to generate enough electricity to power up to 52,500 households.

Following their submission, the proposals will undergo a detailed technical and commercial evaluation. The awarding announcement and the execution of the Concession Agreement are expected to take place in Q3, 2023. The WtE project has a target commercial operation date of Q4, 2026.



### Developing a Waste to Hydrogen Plant

In March 2022, Sharjah-based Beeah Energy, a subsidiary of the Beeah Group, signed an official agreement with UK-based Chinook Science to commence the development of the region's first waste-to-hydrogen plant to produce combined low-cost ground-breaking green hydrogen and high-quality activated carbon<sup>91</sup>.

Non-recyclable waste wood and plastic will be processed using Chinook RODECS gasification and pyrolysis technology, which will produce up to 18,000kg of green hydrogen a day at full operational capacity. The production of green hydrogen is expected to be significantly cheaper than that of fossil fuels.

The plant will host a hydrogen fuelling station equipped to provide enough fuel cell grade hydrogen for several large trucks and buses every day.

### Using recycled feedstock (oil from waste tires) rather than fossil feedstock

BASF recently invested €16 million into Pyrum Innovations AG, a technology company specialized in the pyrolysis of waste tires. BASF will uptake most of the pyrolysis oil and process it into new chemical products by using a mass balance approach as part of its ChemCycling™ project.

The Pyrolysis oil will partly replace fossil feedstock and be used for demanding plastic applications. The resulting products will mainly be for customers from the plastics industry who are looking

for high-quality and functional plastics based on recycled materials.

Replacing fossil feedstock through recycled feedstock at the beginning of the chemical value chain will help BASF lead the transition of the plastics industry to a circular economy. The investment helps BASF take a significant step towards establishing a broad supply base for pyrolysis oil and towards offering their customers products based on chemically recycled plastic waste on a commercial scale.

Products made from pyrolysis oil by using a mass balance approach have the exact same properties as products manufactured with primary fossil resources. In addition, they have a lower carbon footprint than conventional products.

BASF and Pyrum anticipate that production capacities of up to 100,000 tons of pyrolysis oil derived from waste tires could be built up within the next years together with additional partners.



## C5. Action taken to Virtualise

Taking action to virtualise and dematerialise processes helps in the transition to a circular economy as it reduces the consumption of physical resources which in turn reduces waste and the disposal of physical materials. It can also help with more efficient resource allocation, for example teleconferencing and remote work reduce the need for physical travel and the associated carbon emissions.

Similarly, digital document management can also enable better organization and retrieval of information, minimizing duplication and optimizing resource utilisation. Adopting digital solutions and embracing virtualisation can also help to extend the life-cycle of products or services since digital alternatives to single-use physical items can be reused, updated or shared repeatedly, promoting longevity and reducing the need for continue production.

Virtualisation and dematerialisation also helps enable the adoption of circular business models. For example, the shift towards digital products and services, such as e-books or software subscriptions, can facilitate the transition from ownership to access models, promoting the sharing and reuse of digital assets.

Finally, virtualisation can help companies to meet increasing demands without the constraints of physical resources

since digital products and services can be easily replicated, customised and distributed, allowing companies to adapt to changing market needs and reduce the environmental impacts associated with traditional manufacturing and distribution.

Many UAE stakeholders have taken action to virtualise. Some of these stakeholders and their actions are described in the subsections that follows and includes:

- Going paperless
- Introducing new digital payment options
- Migrating to cloud computing
- Setting up data centres to support cloud computing
- Adopting remote and hybrid working
- Holding virtual conferences and events

### Going Paperless

In December 2021, Dubai Government became the first Government in the world to go paperless with all 45 government entities in the emirate being paperless and providing more than 1,800 digital services covering 10,500 key transactions.

The Dubai Paperless Strategy was launched in 2018 and has eliminated more than 1 billion pieces of paper used for government transactions every year<sup>92</sup>.

<sup>91</sup> [Beeah Energy And Chinook Sciences Commence The Development Of Region's First Waste-to-Hydrogen Plant \(fuelcellworks.com\)](https://www.fuelcellworks.com/news/2022/03/01/beeah-energy-and-chinook-sciences-commence-the-development-of-region-s-first-waste-to-hydrogen-plant/)

<sup>92</sup> <https://www.digitaldubai.ae/initiatives/paperless>

### Introducing new Digital Payment options

In October 2022, the Abu Dhabi Government Unified Services Ecosystem, TAMM launched new digital payment solutions and options through Abu Dhabi Pay, a unified digital payment platform that enables customers to digitally transact with Abu Dhabi government services<sup>93</sup>.

It introduces Abu Dhabi Pay Digital Wallet as the new payment channel for all Abu Dhabi Government entities and includes Apple Pay, Samsung Pay, Payit, PayBy, Google Pay, direct debit and credit cards, and prepaid cards.

It complements Abu Dhabi Government's vision to build a cashless society and expand the modes of payment in the emirate.

### Migrating to Cloud Computing

In 2021, almost 43 per cent of organisations in the UAE region adopted cloud computing<sup>94</sup>.

Cloud computing enables organisations to utilize shared infrastructure and virtualized resources. Instead of each organization maintaining its own physical servers and data centers, cloud service providers consolidate resources, leading to better utilization and reduced waste. Similarly, cloud computing enables organisations to scale their computing resources up or down based on demand which helps prevent overprovisioning

and eliminates waste associated with underutilised infrastructure.

Moreover, since cloud service providers typically operate large scale data centres that are designed for energy efficiency with advanced cooling systems and other technology to minimise energy consumption, migrating to the cloud can reduce carbon footprints.

Finally, cloud computing can reduce e-waste created through obsolete hardware.

### Setting up Datacentres to support Cloud Computing

A number of major cloud service providers (CSP) have invested in setting up data centres in the UAE<sup>95</sup>. This includes:

- cloud computing wing of Chinese e-commerce giant Alibaba who set up a data centre in 2015
- enterprise and business applications giant SAP who set up a data centre in 2018
- software company Microsoft who launched two data centres in Dubai and Abu Dhabi for Azure and 360 data in 2019
- the world's biggest cloud storage service provider Amazon Web Services (AWS) who launched a data centre in Abu Dhabi in 2022
- IBM who launched two data centres in 2022

<sup>93</sup> <https://www.zawya.com>

<sup>94</sup> <https://www.thenationalnews.com>

<sup>95</sup> <https://www.thenationalnews.com>

- Software and application development giant Oracle who launched a data centre in Dubai in 2020 and in 2021 announced new cloud region in Abu Dhabi.

In 2022, to support the global demand for infrastructure to support cloud computing and digital transformation, the UAE's biggest telecom operator e& and artificial intelligence provider G42 merged their data centre services under Khazna Data Centres.

### Adopting remote and hybrid Working

The Covid19 pandemic forced many people globally to work from home (WFM). However, even after the easing of restrictions, remote working and hybrid working remained in place for many organisations in the UAE.

Remoting working can support the transition to a Circular Economy in several ways for example:

- It reduces the need for physical office spaces which can reduce the demand for office buildings and associated infrastructure leading to reduced construction, lower resource consumption and more efficient use of existing office space.
- It can eliminate or reduce commuting, resulting in fewer vehicles on the road and decreased transport related emissions.

### Holding Virtual Conferences and Events

Due to the Covid19 pandemic a number of conferences in the UAE were held virtually. This included:

- The Dubai Innovation Summit in 2021
- Dubai Future Talks
- World Government Summit in 2021
- The UAE Government Summit in 2021
- Dubai Future Blockchain Summit in 2021
- The Sharjah International book fare in 2020
- Sustainability Business Network (SBN) Annual Conference in 2021
- The UAE Industrial Symbiosis Symposium in 2023

Moreover, many physical summits which were held in the UAE incorporated virtual elements, allowing participants to join remotely.

Virtual conferences can support the transition to a circular economy in a number of ways, for example:

- They eliminate the need for physical travel, reducing carbon emissions associated with transportation.
- They reduce the consumption of physical resources – they don't need large-scale event venues, printed materials or disposable items typically associated with in-person conferences.

## C6. Action taken to Exchange

Exchange entails the substitution of outdated, inefficient, and non-renewable products with renewable and efficiency-enhanced alternatives. An example of this, is the replacement of internal combustion engines with electric motors. It also involves exchanging ways of doing things, for example using public transport or car sharing rather than private vehicles.

Many UAE stakeholders have taken action to exchange. Some of these stakeholders and their actions are described in the subsections that follows and include:

- Using 3D printing to construct buildings
- Adopting and deploying building information modelling (BIM)
- Implementing Modular construction
- Using life cycle assessment tools and implementing strategies to reduce environmental impacts
- Converting classic cars into electric vehicles
- Introducing Electric Trucks
- Operating 100% Electric Waste Trucks
- Launching an autonomous electric Abra
- Constructing a rail network
- Installing water fountains instead of using plastic bottles
- Making drinking water form air

- Manufacturing plant based dairy alternatives.

### Using 3D printing to Construct Buildings

The UAE has constructed a number of number of building using 3D printers including:

- Dubai Future Foundation building in 2016
- A villa in Sharjah using eco-friendly cement in 2019
- Bus stop in Ajman
- Dubai Municipality Building in 2019

Using 3D printers to construct buildings has the potential to reduce waste during construction by 60 per cent<sup>96</sup> and can also reduce the carbon footprint as there is less need for the transportation of heavy materials to the construction site and construction is done with precision and accuracy, ensuring that structures are built to exact specifications and reducing the need for repairs or renovations.

This technology also has the potential to save construction costs by 50 to 70 per cent and labour costs by 50 to 80 per cent and can ensure building are completed in a fraction of the time and less labour than it would take traditional methods.

In August 2021, Dubai announced a target that 25% of buildings will be 3D printed by 2030.

<sup>96</sup> <https://gulfbusiness.com>

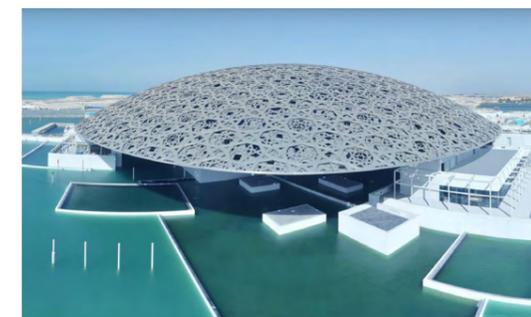
## Adopting and Deploying Building Information Modelling (BIM)

The construction sector in the Middle East has been widely implementing Building Information Modelling (BIM) to maximise efficiency and reduce wastage in the sector<sup>97</sup>. BIM is the process of digitally generating and managing building data during the design, construction, and life cycle of a project.

Currently Dubai mandates the use of BIM with Dubai Municipality decreeing that it must be used in “architectural and mechanical works” on buildings that have more than 20 floors or have areas larger than 200,000 square feet in addition to other conditions.

Although Dubai is the only emirate mandating its use, prominent projects such as the Abu Dhabi Midfield Terminal Building and the Louvre have used BIM.

Given its advantages to maximise efficiency and reduce cost and waste, BIM is being widely adopted across AEC (architecture, construction, and engineering) industry with its market size expected to rise to \$15.06bn by 2027, according to a Allied Market Research report.



<sup>97</sup> <https://gulfbusiness.com>

<sup>98</sup> <https://gulfbusiness.com>

<sup>99</sup> <https://www.oneclicklca.com>

## Implementing Modular Construction

Modular construction or pre-assembled buildings are gaining popularity across the region<sup>98</sup>.

Modular construction potentially reduces material waste by up to 30 per cent and improves work safety by up to 70 per cent, as compared to traditional construction. They also have reduced material requirement and so may help the industry cope with rising price of steel, aluminium and other construction material.

### Using Life Cycle Assessment Tools and implementing strategies to reduce environmental impacts

In developing their carbon neutral building, the SEE Institute, a hub for sustainability education, research and business incubation located in Dubai conducted a life cycle assessment (LCA) of the building using One Click LCA and implemented various strategies to reduce its environmental impact<sup>99</sup>. This included:

- Optimising the design of the building to use fewer materials where possible
- Using prefabricated elements for all major structural elements, such as beams and slabs to eliminate waste and make the construction process more efficient
- Locally sourced all construction materials to minimise transportation emissions
- Selected concrete based on its embodied carbon which contained up to 60% of Ground Granulated Blast-

furnace Slag (GGBS) that has the same properties as cement yet causes much lower embodied emissions, doesn't require the quarrying of virgin materials, diverts waste from landfill and is less energy-intensive.

- Sourced steel from a local plant that has 97% recycled content.
- Selecting the best performing building structure in terms of embodied carbon, insulation and acoustics – a light-weight façade was the best performing of six options
- Using construction materials that have Environmental Product Declarations which means their embodied carbon arising from manufacturing was carefully calculated and externally verified.

**Converting Classic Cars into Electric Vehicles**

A Dubai-based garage, Fuse EV, converts classic cars into electric vehicles (EV)<sup>100</sup>.

Founded in late 2022, the company not only does the necessary mechanical and electric work to convert the cars into EV, but can also totally revamp a car – changing the interior and fabric cloth and exterior paint job.

They are currently focused on converting classic cars because it was easier to register in the UAE after they were converted.

The cost of converting depends on how extensive the modifications are and as each car is different there is a lot of

customisation but prices start at about AED 40,000-50,000 for a small car without much milage.

Converting a classic car into EV gives it a new lease of life and makes it easier for classic car enthusiasts to maintain, as they spend a lot of time looking for spare parts and getting them shipped over by which time the driving season is over. Thus converting the cars makes the lives of the owners so much easier and eliminates the really bad fumes associated with such cars.

**Introducing Electric Trucks**

In June 2023, DHL announced that it will be the first logistics company to introduce the UAE's first electric Mercedes-Benz truck. The fully electric 40-ton eActros 300 Tractor is particularly suitable for heavy-duty distribution transport and compatible with all common semitrailers.



<sup>100</sup> <https://www.khaleejtimes.com>

**Operating 100% Electric Waste Trucks**

In June 2023 Abu Dhabi Waste Management Company (Tadweer), Renault Trucks, Al Masood and Averda formed a partnership to start operating 100% Electric Waste Trucks that will collect household waste from across Abu Dhabi.

**Launching an autonomous Electric Abra**

In May 2023, Dubai's Roads and Transport Authority (RTA) announced that it had begun trial operations of the 'First Autonomous Electric Abra'. The aim to launch the electric abra is to 'convert 25 per cent of the total mobility journeys in Dubai into self-driving journeys by 2030'. The electric abra will have reduced noise, zero carbon emissions and will be able to operate and run fully 'autonomous procedures independent of the captain'<sup>101</sup>.



**Constructing a rail network**

In February 2023, construction of the UAE's 1,200km long Etihad Rail network was completed and commercial freight operations had begun<sup>102</sup>.

In the future, the network is expected to be extended into the rest of the GCC and

<sup>101</sup> <https://whatson.ae/2023/05/public-transportation-systems-coming-to-the-uae/>

<sup>102</sup> <https://whatson.ae/2023/05/public-transportation-systems-coming-to-the-uae/>

<sup>103</sup> <https://www.utilities-me.com>

that passenger as well as cargo trains will be introduced.



**Installing Water Fountains instead of using plastic bottles**

The Dubai Government has installed over 50 water fountains in strategic places across the city, including public parks, beaches, and popular tourist destinations, with the help of its partners and sponsors as part of its Dubai Can initiative.

Their installation has successfully reduced the use of an equivalent of more than 7 million 500 ml single-use plastic water bottles in its first year (2022-2023).

They have also inspired many private companies in Dubai to install water fountains in their offices, reducing single-use plastic in the workplace.

**Making Drinking Water from Air**

In May 2023, UAE's Khalifa University in partnership with UAE-based company Eshara Water, Swedish firm Azelio AB, and Masdar City, launched the world's first atmospheric water generation (AWG) system that can produce drinking water straight from the air that is powered entirely by solar and electrical thermal energy storage<sup>103</sup>.

Currently it can supply up to 1,000 liters per day per unit but has plans to increase capacity to 7,500 liters in the near future.

It is expected to benefit distant or isolated off-grid regions that would otherwise have to depend on non-ecofriendly energy sources for their daily electricity and water requirements.

Eshara Water, based at Khalifa Industrial Zone Abu Dhabi, are the first company in the UAE to manufacture a type of generator that can produce 'pure drinking water' from air<sup>104</sup>. Their generators only require an electrical supply to work.

The machine monitors and judges the relative humidity within the air and judges the temperature of the air. Then, it calculates how much it needs to change the temperature of that air in order for it to reach its dew point, i.e., the moment when the air is about to release all of its water. The air passes through a filtration system to remove dust and particulates, it is then condensed into water before being passed through a mineralisation chamber. Finally,

the water is treated with ultraviolet light to ensure its purity. And when the water reaches premium quality, it is chilled and ready for consumption.

The innovation also helps to avoid the use of single-use plastics. By the end of 2022, it was estimated that the machines saved more than 166 million plastic bottles and 17 million tonnes of CO2. The machine produces a litre of water for about 25 fils – around six times cheaper than bottled water.

Currently Eshara manufacture three machines: A five-litre water generator for households and hotel rooms, 30-litre and 1,000-litre.

Majid Al Futtaim have installed some of these machines in construction sites and their office and metro stations. They are also exploring an air-to-water pilot with **hydro-panel technology** and solar power to generate clean drinking water from the air<sup>105</sup>. Each photovoltaic panel produces an average of 3 litres of water per day.



<sup>104</sup> <https://www.khaleejtimes.com>

<sup>105</sup> <https://www.majidalfuttaim.com>

### Manufacturing Plant-Based Dairy Alternatives

In October 2022, UAE-based Nitre Food signed an agreement with Swedish giant Tetra Pak, the world's leading food processing and packaging solutions company, to establish a specialized plant-based manufacturing facility in the UAE to provide a comprehensive end-to-end packaging and processing solutions delivery<sup>106</sup>.

Located in Dubai Industrial City, the factory is scheduled to commence operation in the first quarter of 2024 with an initial capacity of 8,000 l/h, focusing on producing almond and oat milk products as well as a range of innovative plant-based beverages.

A large body of research suggests a more plant-based diet, including a switch to plant-based alternatives to dairy, is needed for lowering human-induced climate change as well as land and water use. One study<sup>107</sup> found examples of plant-based beverages that had a between 21% and 67% of greenhouse gas emissions from milk and that with only a few exceptions, plant based alternatives to dairy have a smaller negative impact on the environment compared to dairy products.

<sup>106</sup> <https://meprinter.com>

<sup>107</sup> <https://www.mdpi.com/2071-1050/13/22/12599>

## C7. Action taken to develop and implement supportive Policies and Regulations

The legal and regulatory framework plays a crucial role in supporting the transition to a Circular Economy by providing the necessary structure, incentives, and guidelines for businesses, organizations, and individuals to adopt circular practices.

Many UAE stakeholders have taken action to develop and implement policies and regulations that are supportive to the transition to Circular Economy. Some of these stakeholders and their actions are described in the subsections that follows and include:

- Development and approval of policies to accelerate the transition to a Circular economy
- Development of a Regulatory Framework to support the Circular Economy
- Introduction of a Recycled water policy
- Introduction of National Water and Energy Demand Side Management Programme
- Introduction of National Green Buildings Regulations
- Development of an Electric Vehicle Roadmap
- Introduction of Federal Energy Management Regulations for Industrial Facilities
- Introduction of a Green Procurement Policy
- Ministerial Decision on regulating trade

- of recycled plastic water bottles
- Launch of UAE Digital Economy Strategy
- Introduction of a Virtual Asset Regulator and law regulating virtual assets
- Introduction of Metaverse strategy
- Introduction of an AI Strategy
- Launch of Index to measure sustainability of factories
- Introduction of mandatory sustainability reporting
- Abu Dhabi Sustainable Finance Declaration
- Introduction of regulations governing Green Bonds and Sukuks
- Exempting corporates who issue Green Bonds and Sukuks from paying fees

**Development and Approval of Polices to accelerate transition to Circular Economy**

In July 2022, the UAE Government approved 22 policies aimed at accelerating the country’s transition to a

Circular Economy. The policies focus on the UAE’s four Circular Economy priority sectors: Manufacturing, Infrastructure, Transport and Food.

**Development of a Regulatory Framework to support the Circular Economy**

In June 2022, Abu Dhabi announced that it would be developing a new **Circular Economy regulatory framework** alongside new green policies and incentives.

The plans to develop the regulatory framework are part of Abu Dhabi new industrial strategy which aims to double the size of Abu Dhabi’s manufacturing sector by 2031 and support Abu Dhabi’s transition towards a smart, circular economy, powered by an industrial sector that champions responsible production and consumption across waste management, parts supply, and manufacturing.



Development of a Regulatory Framework to support the Circular Economy

**Introduction of a Recycled Water Policy**

In June 2019, Abu Dhabi launched their Recycled Water Policy. The Abu Dhabi policy aims to ensure optimal use of recycled water in the Emirate by supporting efforts to preserve Abu Dhabi’s water resources, including drinking and groundwater in order to meet the future needs of all sectors<sup>108</sup>.

As well as promoting the use of recycled water for its economic, social and environmental benefits, the policy aims to also look at the future and exploring new markets for reclaimed water and wastewater treatment by-products.

**Introduction of National Water and Energy Demand Side Management Programme**

In March 2021, the Ministry of Energy and Infrastructure launched the UAE National Energy and Water Demand Side Management Programme 2050.

Rolled out in cooperation with strategic partners and stakeholders of the federal and local governments and the private sector, the programme aims by 2050 to<sup>109</sup>:

- reduce energy demand by 40%
- reduce water demand by 50%
- ensure security of supply in the energy sector
- invest in the best available technologies
- achieve operational excellence in the management of energy and water systems

<sup>108</sup> <https://www.aquatechtrade.com>

<sup>109</sup> <https://www.wam.ae/en/details/1395302957699>

- support carbon reduction initiatives
- ensure efficient use of energy resources

The National DSM program contains four main pillars, chosen because they have the highest potential for impact, namely:

1. Agriculture which aims to achieve a paradigm shift from unsustainable abstraction of groundwater to sustainable management of groundwater, by balancing water and food security requirements, promoting efficient irrigation, and using alternative water resources.
2. Built Environment which aims to optimise energy and water efficiency within the urban environment through increased phasing in of green building, retrofitting exiting building stock, replacing fixtures and equipment and improving public and private irrigation practices.
3. Transport which aims to reduce energy demand in transport across the Emirates through the avoid, shift, and improve framework through smart city planning, pubic transport and green technology.
4. Industry which aims to foster responsibility and accountability within industry through regulatory and transparency requirements to encourage efficiency, sustainability and implementation of best practice to drive energy efficiency.

The National Conservation Campaign which is a main part of the National DSM Program targeted to enhance people awareness and behavior in energy and water consumption in order to have daily sustainable and responsible individual behavior.

**Introduction of National Green Buildings Regulations**

As part of the UAE’s National Energy and Water Demand Side Management Programme 2050, the Ministry of Energy and Infrastructure (MOEI) introduced a National Green Building Regulation to help reduce energy and water consumption. The Regulations set out mandatory, minimum energy and water standards for new buildings in the UAE and other minimum sustainability measures to reduce resource use and the negative environmental impacts often associated with the built environment.

The Regulations also incorporate circular economy principles into construction design methodologies and approaches used by public sector entities.

**Development of an Electric Vehicle (EV) Roadmap**

As part of the UAE’s National Energy and Water Demand Side Management Programme 2050, the Ministry of Energy and Infrastructure (MOEI) developed an Electric Vehicle National Roadmap.

It sets out a comprehensive national plan and action programme that includes developing ambitious strategies involving both federal and local government entities and the private sector across the energy

and infrastructure sectors.

The programme has achieved the following:

- National guideline for EV infrastructure
- National policy for EV
- National Platform for EV chargers
- National mobile app.

**Introduction of Federal Energy Management Regulation for Industrial Facilities**

As part of the UAE’s National Energy and Water Demand Side Management Programme 2050, the Ministry of Energy and Infrastructure (MOEI) introduced Federal Energy Management Regulation for Industrial Facilities. This sets out minimum energy efficiency (performance) standards that industries operating in the UAE should meet.

MOEI aims to measure and monitor the status of energy consumption in the industrial sector and will support the 50 largest industrial energy consumers in the UAE that do not currently have energy management systems (EnMS) to meet these minimum efficiency standards. Industrial facilities with the highest energy consumption rates will be required to submit a plan to reduce their energy demand and CO2 emissions. To ensure their energy demand falls and their sustainability increases, they will be required to provide audited reports on their energy consumption.

**Introduction of a Green Procurement Policy**

In March 2023, the Dubai Executive Council **approved a new Green Procurement policy** which aims to support the circular economy and stimulate the local supply chain to adopt more sustainable practices, green technologies, products and services, and broaden the use of sustainable materials. The policy is expected to help drive green innovation, enhance competitiveness and financial efficiency while also reducing Dubai’s environmental footprint and increasing Dubai’s reputation as a city that uses its resources sustainably.

Prior to its approval, it was piloted with several government entities to assess its practicality. The Policy includes the development of measurable environmental and technical standards for procuring green products. During its first phase of implementation, the policy focuses on the following four categories:

- construction materials,
- information technology devices,
- lighting materials, and
- the waste management sector.

**Ministerial Decision on regulating Trade of Recycled plastic water bottles**

In January 2023, the UAE Ministry of Industry and Advanced Technology (MoIAT) issued a **ministerial decision on regulating the trade of recycled plastic water bottles** in line with top public health and food safety standards.

The decision allows the use of recycled polyethylene terephthalate (rPET) produced at MoIAT-approved recycling facilities that have obtained a certificate of conformity as per the UAE Regulation for Control on Food Contact Material.

The decision also stipulates that the recycling facility must provide documents proving its adoption of an effective quality system and good manufacturing practices for materials that contact food. These include a report from an accredited lab in the UAE testifying that the recycled product has passed the safety test, a report indicating the compliance of the bottled water with health and safety requirements, including migration tests for packaging materials in accordance with the applicable technical regulations and regulations, and a risk assessment report for the quality and safety of recycled raw materials intended for use in bottling drinking water.



### Launch of UAE Digital Economy Strategy

In April 2022, the UAE launched the “UAE Digital Economy Strategy” which aims to double the contribution of the digital economy to the UAE’s gross domestic product (GDP) from 9.7 per cent as of April 2022 to 19.4 per cent within 10 years. It also seeks to enhance the position of the UAE as a hub for digital economy in the region and globally.

Digitalisation can help reduce the consumption of physical resources which in turn reduces waste and the disposal of physical materials.

### Introduction of a Virtual Asset Regulator and law regulating virtual assets

In March 2022, Dubai adopted a law that regulates virtual assets. The Dubai Virtual Asset Regulation Law is aimed at creating an advanced legal framework to protect investors and provide international standards for virtual asset industry governance that will promote responsible business growth in the emirate<sup>110</sup>.

They have also established an independent authority to oversee the development of the best business environment in the world for the virtual assets in terms of regulation, licensing, governance and in line with local and global financial system.

Virtual assets include cryptocurrencies such as Bitcoin and non-fungible tokens (NFTs).

<sup>110</sup> <https://www.thenationalnews.com>

<sup>111</sup> <https://www.thenationalnews.com>

<sup>112</sup> <https://u.ae>

### Introduction of a Metaverse Strategy

In July 2022, Dubai launched a Metaverse Strategy which aims to create 40,000 virtual jobs and add \$4bn to the emirate’s economy over the next five years<sup>111</sup>.

The metaverse is a three-dimensional, hyper-realistic, virtual-reality space where users interact with other users in computer-generated environments such as shops, learning environments, and meeting rooms, among others. It combines elements of social media, augmented reality, virtual reality, video games, and other advanced technologies.

The Dubai Metaverse Strategy aims to turn Dubai into one of the world’s top 10 metaverse economies as well as a global hub for the metaverse community. The strategy aims to build on Dubai’s achievement of attracting more than 1,000 companies in the fields of blockchain and metaverse. It also promotes Dubai’s ambitions to support more than 40,000 virtual jobs by 2030<sup>112</sup>.

### Introduction of an AI Strategy

In October 2017, the UAE launched its UAE Strategy for Artificial Intelligence (AI) with the aim to become one of the world leaders in AI by 2031. The AI strategy identifies priority sectors that will be the initial focus of activities. These include:

- Resources and Energy – from existing technology in the extraction industry to renewable energy and innovation in utilities
- Logistics and Transport – longstanding

air and sea hub in the UAE make it a valuable location for piloting new systems in the sector

- Tourism and hospitality – opportunity for becoming globally the first in customer-support AI, creating integrated and personalised services for tourist in the UAE

### Launch of Index to measure sustainability of factories

In February 2023, the UAE’s Ministry of Industry and Advanced Technology (MoIAT) and the Abu Dhabi Department of Economic Development (ADDED) launched the Industrial Technology Transformation Index (ITTI), a comprehensive framework to measure the digital maturity and sustainability of factories<sup>113</sup>.

The ITTI was developed with leading industry players, consultancy firms, technology providers and subject-matter experts. It will help manufacturers to make data-driven decisions to allocate resources more effectively and unlock financial incentives.

The index will promote the integration of 4IR applications and sustainability best practices and raise awareness about the benefits of advanced technology. The ITTI is the first of its kind to integrate 4IR fundamentals with sustainability in one comprehensive framework.

The index’s categories are aligned with the manufacturing value chain, and are comprised of 20 dimensions out of which 4 are sustainability related.

<sup>113</sup> <https://wam.ae/en/details/1395303129350>

In order to validate the accuracy and effectiveness of the tool, the Ministry piloted the ITTI with 75 manufacturing plants in 8 priority sectors, around 60 of which are Small and Medium Enterprises (SMEs). During the pilot phase, ITTI inspired many to take the next step in their digitalisation journey, and most participants indicated that they highly recommend the assessment to industrial peers.

To properly activate and scale the ITTI, a certification programme has been developed to qualify third party assessors to conduct 1-day assessments based on the ITTI framework. The tool enables certified assessors to evaluate current technology and processes of manufacturing plants across the manufacturing value chain. Based on the findings of the assessment, assessors develop a detailed report, providing recommendations on prioritised actions to help manufacturers identify business areas where improvements will generate the highest business impact.

### Introduction of Mandatory Sustainability Reporting

In 2020, the Securities and Commodities Authority (SCA) of UAE mandated that all public joint stock companies listed in the UAE have to disclose sustainability reports. In 2021, it was clarified that the sustainability reports have to cover the full ESG spectrum—namely, environmental, social, and governance topics.

For each topic, the government of the UAE

issued general definitions to simplify the process:

- Environment: How has your company minimized its environmental impacts?
- Social: How have you addressed social issues (e.g., human rights, health and safety)?
- Governance: How have you maintained ethical business practices?

To be compliant, it needs to adhere to the Global Reporting Initiative (GRI) standards. The GRI is an international non-profit organization that develops sustainability reporting standards.

As part of this reporting, UAE listed companies have to report on GHG emissions, energy and water use but not on virgin/recycled material usage nor waste generated.

**The Abu Dhabi Sustainable Finance Declaration**

In 2019, the Abu Dhabi Global Market (ADGM) under the auspices of the Ministry of Climate Change and Environment, the Central Bank and the Securities and Commodities Authority (SCA) launched the Abu Dhabi Sustainable Finance Declaration: a voluntary membership-based initiative that seeks to increase the quality and depth of green financial products in Abu Dhabi and create a thriving sustainable finance industry to support the Emirate of Abu Dhabi and the UAE in meeting the United Nations Sustainable Development Goals (SDGs)<sup>114</sup>.

The signatories of the Abu Dhabi Sustainable Finance Declaration agree to:

- Collaborate to create a framework for fostering and integrating green and sustainable investments in the Emirate of Abu Dhabi, the UAE and the wider region;
- Facilitate a constructive dialogue on sustainable finance between all stakeholders, including the financial community, business and the public sector;
- Identify new and innovative measures, products and services to initiate positive economic, social and environmental development in Abu Dhabi and beyond;
- Encourage educational opportunities for greater environmental protection and sustainability;
- Raise awareness among, and encourage cooperation with, relevant stakeholders in the implementation of the provisions of this declaration at the Emirate and Federal level;
- Meet regularly to assess progress on implementing the provisions of this Declaration.



<sup>114</sup> [The Abu Dhabi Sustainable Finance Declaration \(adgm.com\)](https://adgm.com)

**Introduction of Regulations governing Green Bonds and Sukuks**

In May 2023, the UAE Securities & Commodities Authority (SCA) issued a Resolution relating to the regulation of green and sustainability linked bonds and sukuk.

The Resolution aligns SCA’s regulation of Green Bonds and Sukuk (“GBS”) and Sustainability-Linked Green Bonds and Sukuk (“SLGBS”) with capital market international practice with its content based on the Green Bond or Sustainability Linked-Bond Principles (“ICMA Principles”) of the International Capital Market Association (“ICMA”)<sup>115</sup>.

Chapters 1 and 2 of the Resolution prescribe requirements that issuers and obligors of GBS and SLGBS must abide by in order to fulfil the ICMA Principles.

**Exempting Corporates who issue Green Bonds from paying fees**

In June 2023, the UAE Securities & Commodities Authority (SCA) announced that companies would be exempt from registration fees on the local market 2023 for green or sustainability-linked bonds or sukuk<sup>116</sup>.

It supports the SCA efforts to encourage companies to move towards issuing green and sustainability-related bonds and sukuk to finance sustainable projects related to the environment and climate, and encourages investors and companies to adopt environmentally friendly investment opportunities.

<sup>115</sup> [SCA Issues Regulatory Framework for Green and Sustainability-Linked Bonds and Sukuk - Al Tamimi & Company](#)

<sup>116</sup> [Registration fee waiver for firms listing green bond: SCA \(gulfbusiness.com\)](#)



## C8. Action to Finance and Incentivise the Transition to a Circular Economy

Transition from a linear to a Circular Economy will require considerable investment in infrastructure, research and development and in supporting and scaling up new circular business initiatives and startups. Thus, financing and financial incentives will play a crucial role in supporting the transition to a Circular Economy.

Many UAE stakeholders have taken action to finance and incentivise the transition to Circular Economy. Some of these stakeholders and their actions are described in the subsections that follows and include:

- The creation of debt and equity instruments related to the Circular Economy
- The launch of a Circular Economy Investment Fund
- The provision of Green Mortgages
- The launch of a prize challenge to “Rethink Brine”
- The awarding of cash prizes to support FoodTech
- The running of student competitions.

### The creation of Debt and Equity Instruments related to the Circular Economy

The past two years have seen a steep increase globally in the creation of debt

and equity instruments related to the circular economy. For example, by the end of June 2021 there were 13 public equity funds focused on the circular economy, with a combined USD 8 billion assets under management, and since 2019, over 35 corporate and sovereign bonds have been issued to help finance circular economy activity including Black Rock’s circular economy public equity fund which was launched in 2019 and by July 2021 had more than USD 2 billion assets under management.

New evidence has found that the circular economy can be used as an investment portfolio de-risking strategy by investors and financial institutions, and as a way to drive better risk-adjusted performance<sup>117</sup>.

### The launch of a Circular Economy Investment Fund

In September 2022, HSBC Asset Management launched the HSBC GIF Global Equity Circular Economy fund<sup>118</sup>. The fund will invest in around 60 companies that are enabling the transition to a circular global economy, by designing out waste and pollution, keeping products and materials in use and regenerating natural systems. It will be benchmark agnostic and take a bottom up, high conviction stock selection approach. There will be no fixed allocations across

<sup>117</sup> <https://ellenmacarthurfoundation.org>

<sup>118</sup> <https://no.assetmanagement.hsbc.com>

geographies, sub-subsectors or company stages.

The fund will be classified as Article 9 under the EU’s Sustainable Finance Disclosure Regulation (SFDR) and aims to deliver against all 17 of the UN Sustainable Development Goals.

The fund will target both wholesale and institutional investors with a particular focus on high-net-worth individuals, family offices and private banks.

### The Provision of Green Mortgages

In 2021, HSBC issued the first green mortgages in the UAE. The three loans were approved for HSBC customers purchasing houses in The Sustainable City community in Dubai.

HSBC UAE’s green home loans offer an interest rate discount of 0.25 per cent for properties that meet certain sustainable criteria, and a 50 per cent discount on applicable arrangement fees.

Not only a first for the UAE, the green mortgages are also the first issued by HSBC globally, demonstrating the importance of the UAE to HSBC’s global strategy and underlining the bank’s commitment to environmental, social, and governance issues in the Emirates.

In January 2021, HSBC formed a dedicated Sustainable and Transition Finance Team (STFT) in the Middle East to help institutions, corporates and individuals transition to a more sustainable economy.

<sup>119</sup> <https://www.ewec.ae>

HSBC’s green mortgage product is applicable for properties that are either LEED- certified or if they meet similar requirements, and HSBC’s STFT reviews properties to validate eligibility on a case-by-case basis.

### The launch of a Prize Challenge to “Rethink Brine”

In March 2020, Sandoq Al Watan, the national initiative launched by prominent Emirati businessmen to support research projects for the post-oil era, launched the Centurium Prize Challenge named “ReThink Brine” to protect the Arabian Gulf ecosystem and marine life, enable an eco-friendly construction and real estate sector, address the UAE’s water scarcity challenges, and support the UAE’s Water Security Strategy 2036<sup>119</sup>. In August 2020, the scope of the Challenge was expanded to include innovative medical solutions to COVID-19 such as disinfectants to aid in the fight against the pandemic.

The Challenge is sponsored by the Environmental Agency – Abu Dhabi (EAD) and Aldar Properties, in partnership with EWEC. A grand prize of AED 2.5 million will be awarded to the team that develops over the course of three years (March 2020 to May 2024) commercially viable construction material or medical product from brine discharge. The winner is expected to be announced in May 2024.

### Awarding Cash Prizes to support FoodTech

The UAE's Global FoodTech Challenge<sup>120</sup> seeks to find the next wave of technology innovations on the cusp of transforming traditional agriculture practices, efficiently and sustainably.

In 2022, there was a \$2 million award pool consisting of a cash prize, startup incentives, acceleration services, innovation grants, localization support, mentorship programs and more that early-stage agri food tech start-ups within Food Production and Food Loss and Waste could win.

The four winners in 2022 were:

- Aquagrain from the UK - A cleantech soil improver produced from food waste that delivers more crops with less water
- Sustainable Planet from the UK – who Grow plant-based protein (water lentils) on non-arable land and creating a protein isolate from the fastest growing plant on our planet
- Revoltech from the UAE – who have a unique patent-pending freezing technology that keeps cells alive
- Orbisk from the Netherlands -who use AI image recognition technology leveraging automation to quantify food waste in professional kitchens seamlessly, reducing food waste and improving sustainability and profitability



### The running of Student Competitions

Schneider Electric recently launched NextGen Go Green – a global student competition seeking disruptive ideas to make cities more sustainable and community-oriented. It is open to students across the globe who are passionate about sustainable innovation and want to demonstrate bold new skills in energy, technology, and sustainability. Students will have the opportunity to gain valuable professional mentorship and receive international recognition for their work. Winners will also be considered for new job opportunities within our company.

Schneider also have a Sustainability School – an online knowledge sharing program that includes courses around sustainability and decarbonisation as well as circularity. It is open for their employees and partners to create the awareness around the topic. [www.se.com](http://www.se.com)

<sup>120</sup> <https://www.foodtechchallenge.com/>

### C9. Action to develop Circular Economy Skills and Knowledge and raise awareness and understanding about the Circular Econom

Since transitioning to the Circular Economy requires a shift in mindset, business practices and the adoption of new approaches, individuals and organisation will need to acquire specific skills and knowledge to effectively participate in and drive the circular transition.

Important skills and knowledge that will support the transition to a Circular Economy include systems thinking and an understanding of the interconnectedness of different systems and how they influence each other. Systems thinking helps identify the potential impacts and opportunities across the entire lifecycle of products and services, enabling holistic and integrated decision making.

Design thinking and skills in circular design will be important in reimagining how existing products, services and systems could be redesigned to maximise resource efficiency and eliminate waste and pollution while also helping to regenerate nature.

Likewise, skills in supply chain optimisation and management will also be invaluable for identifying opportunities to reduce waste, optimise resource use and create closed-loop supply chains. This involves understanding material flows, reverse logistics, remanufacturing

<sup>121</sup> This is not a definitive nor exhaustive list

and implementing circular procurement practices.

Of course, skills relating to waste management and recycling technologies will also be important as will skills relating to circular business models and entrepreneurship and the ability to collaborate and engage with stakeholders from across diverse sectors.

Moreover, given that the Circular Economy requires a change of mindset and behaviours, it also requires a general increase in awareness knowledge and understanding about the Circular Economy and its three principles among all sectors of society.

Many UAE stakeholders have taken action to develop skills and knowledge and to raise awareness about the Circular Economy. Some of these stakeholders and their actions are described in the subsection that follow<sup>121</sup>.

- With respect to developing skills and knowledge, the actions undertaken by stakeholders have included: Enhancing the Circular Economy skills of federal government officials
- Developing the skillset for Circular Manufacturing
- Increasing technical skills to upcycle clothes
- Establishment of an R&D Facility to study ecological engineering and circular economy principles and practices Promoting cooperation and exchange of knowledge to design

and produce environmental friendly resources

- Developing high tech skills and technology to produce food
- Piloting the infrastructure for Digital Product Passports

With respect to helping **raise knowledge, awareness and understanding** about the Circular Economy, the actions undertaken by stakeholders have included:

- Raising awareness about the Circular Economy in priority sectors
- Supporting bottom-up innovation and entrepreneurship through the Scale 360 initiative
- Increasing public awareness about food waste and changing behaviours
- Raising awareness and providing guidance on reducing food waste
- Raising awareness about how to reduce food loss and waste across the food supply chain
- Highlighting and promoting the deployment of new and emerging green technologies
- Measuring the sustainability of factories
- Raising awareness and knowledge about the Circular Built Environment
- Increasing facility managers capabilities to operate and maintain more sustainable facilities
- Improving societies awareness and knowledge about conservation

- Promoting and supporting Environmental Education and Corporate Social Responsibility
- Mobilising civil society to build transformative action at scale
- Raising awareness about recycling
- Educating pupils and the public about the importance of recycling
- Raising awareness about e-waste and waste segregation
- Encouraging the proper disposal of used batteries
- Raising awareness among consumers about circular packaging
- Raising awareness about aluminium recycling.

## C9.1 Developing necessary Skills and Knowledge for the Circular Economy

### Enhancing the Circular Economy skills of Federal Government Officials

In November 2022, The UAE government launched "Jahiz", an upskilling initiative for the future of government talents. It aims to enhance UAE Government readiness through upskilling all government talent with 20 major future skills within one year, through an interactive digital platform developed in partnership with 15 leading government entities and global companies.

The initiative is one of the government's

transformational projects led by FAHR focused on empowering government talents, providing them with the know-how, and enhancing their ability to innovate and employ modern technologies to promote the performance and competitiveness of the UAE government.

Jahiz covers four main skill groups, and 20 sub-skills, through more than 90 modules. The Circular Economy is one of the 20 sub-skills under the New Economy skill group.

### Developing the Skillset for Circular Manufacturing

In July 2022 it was announced that the Abu Dhabi Department of Economic Development (ADDED) and GE Digital will collaborate to adopt circular economy strategies to drive a more productive, competitive, advanced, and innovative manufacturing sector while reducing greenhouse gas emissions and other pollutants.

As part of the collaboration, GE Digital will provide its expertise to accelerate the pace of technological transformation in the industrial sector and share best practices for designing and launching incentive packages to advance the shift towards applications of the Industry 4.0, support the UAE Sustainability and circular economy initiatives.

GE Digital will also work closely together with ADDED to provide skillset development programmes to increase

diversified technical knowledge in the manufacturing community, aligned with Abu Dhabi Government's vision to upskill human capital and enable a future-ready workforce.

Such initiatives by ADDED and GE Digital serve to expedite the adoption of circular manufacturing operations and implement the efficiencies of technology offered by Industry 4.0 advancements.

### Increasing Technical Skills to Upcycle Clothes

Students at the Dubai Institute of Design and Innovation are exploring issues related to the durability of materials and what happens to the items once they have been used<sup>122</sup>.

They learn about this through project work where they create designs for new items out of used clothes. While students are aware of the importance of sustainability, they need to develop the technical skills to upcycle for example adding a print to material, over dyeing, gathering the material in some way or cutting it up and knitting it into a new item.

Having to use old garment to make new ones, rather than being a constraint, can actually free students from the existing fashion system and enables them to create silhouettes and prototypes that are very fresh and new and not dictated to by existing trends.

<sup>122</sup> <https://www.thenationalnews.com/uae/2021/07/05/upcycling-is-the-answer-to-polluting-fast-fashion-says-dubai-designer/>



### Piloting the infrastructure for Digital Product Passports

Al Bayader International, the global manufacturer, distributor and retailer of creative solutions in sustainable food packaging, healthy food and personal and home care products, announced a partnership with German sustainability leader Reifenhäuser to develop **R-cycle pilot projects** in GCC that will contribute to a stronger circular economy<sup>125</sup>.

Spearheaded by the company, the R-Cycle initiative provides the **infrastructure for a digital product passport** that holds all relevant data about a product's materials and preferred end-of-life options. All products will be tagged with a marker, such as a QR code or a digital watermark, which can be scanned at the time of waste disposal or in recycling plants to place the product in the best end of life area. This ensures higher efficiency of recycling and higher quality of sorting.

The pilot projects will consist of using R-Cycle to illustrate the use of recycled

content in packaging. From then on, the projects will focus on using R-Cycle to promote the right segregation at source, contributing to more recycled plastics of high quality with lower contamination.

### Developing high tech skills and technology to produce food

In February 2023, the world's largest indoor vertical farm of its kind for research and development, AeroFarms AgX opened in Abu Dhabi.

AeroFarms AgX is advancing sustainable controlled environment agriculture (CEA) and indoor vertical farming to help address broader global agriculture supply chain challenges. The farm and research centre will employ over 60 highly skilled engineers, horticulturists, and scientists for its high-tech laboratories conducting organoleptic research and precision phenotyping, phytochemical analysis, as well as research on next-generation machine vision, machine learning, robotics, and automation.



<sup>125</sup> [Al Bayader International partners with global entities to empower the GCC's circular economy \(zawya.com\)](https://www.zawya.com/en/news/2023/02/23/al-bayader-international-partners-with-global-entities-to-empower-the-gcc-s-circular-economy)

## C9.2 Raising Awareness and Understanding about the Circular Economy

### Raising awareness about the Circular Economy in Priority Sectors

In May 2022, the Ministry of Climate Change and Environment (MOCCAE) started its "Dynamics of Circularity" series of periodic stakeholder assemblies aimed at sharing knowledge, building capacities and exploring opportunities to implement circular economy practices in priority sectors.

The first session, held at the end of May 2022, focused on "Rethinking circularity in Chemical Manufacturing" and involved representatives from Unilever, BASF and DOW sharing information about how these companies are embracing and enabling the Circular Economy.

The second event in August 2022 focused on the Food and Beverage sector and was organized in partnership with the UAE Food & Beverage Business Group (FBMG), an industry association, at the headquarters of Dubai Chambers. The event aimed to develop a shared understanding of the circular economy concept in relation to the F&B industry, discuss ongoing and potential initiatives and projects in this space, and review the challenges and requirements pertaining to the sector's transition to a circular economy.

The third session of the series took place

in cooperation with the United Nations Environment Programme (UNEP) West Asia Office in November 2022 and with the participation of the Coalition of Innovation in Recycling towards a Closed Loop Economy (Coalition CIRCLE). Themed 'Towards a Circular Plastics', this instalment of the series sought to promote sectoral adoption of circular economy principles through highlighting existing and potential initiatives and projects in this space and exploring the challenges and requirements of implementing circularity on a wider scope.

The fourth session, held in March 2023, focused on Extended Producer Responsibility (EPR). During this event PepsiCo, Tetra Pak and Ronald Berger all shared their experiences and views on EPR.

### Supporting bottom-up innovation and entrepreneurship through the Scale 360 initiative

The UAE is a signatory to the World Economic Forum's Scale 360 initiative, a global public-private partnership that aims to accelerate the transition towards a Circular Economy by supporting bottom-up innovation and entrepreneurship.

Its mission is to mobilize action among innovators, governments and private-sector stakeholders to develop an environment that supports circular innovation. Taking a multistakeholder approach that includes government, business, civil society and entrepreneurs, the Scale360° initiative

targets specific marketplace challenges in each local economy to stimulate targeted circular economy solutions.

Scale360° has created a community to share knowledge and collaborate in developing solutions that will help drive the transition towards a circular economy in a manner that empowers local champions.

Scale360° provides innovators with the tools necessary to incorporate circularity at each stage of their projects, from the initiation phase through to realizing the full potential of their ambitions. The programme positions innovators centrally within the circular economy environment, connects them with other change-makers and amplifies their achievements.

The Scale360° Circular Innovation Playbook provides an actionable methodology, grounded in design thinking, and targeted interventions to ignite circular innovation. It includes a scoping procedure, workshops and analysis, leading to a tangible intervention recommendation tool.



<sup>126</sup> <https://www.thenationalnews.com>

### Increasing public awareness about Food Waste and Changing Behaviours

In March 2022, the UAE launched a nationwide campaign to reduce food waste<sup>126</sup>.

The food loss and waste initiative, called Ne'ma — Arabic for blessing — encourages public and private sector entities to collectively address food waste and improve responsible consumption. It is focused on increasing public awareness on food waste and changing current behaviors while measuring and capturing impact, to meet sustainable development goals.

Ne'ma will co-ordinate government agencies, the private sector, NGOs and society to reduce food loss and waste across the food supply chain. This spans from the production process to consumption, and includes farms, companies, distributors, retailers and the general public.

One of the key objectives of Ne'ma is to address the root causes behind behaviour that leads to food loss, with the aim of

reducing waste in the medium and long term. They will conduct a specialised study to assess the current level of food waste and will also develop legislation and encourage innovative and technical solutions.

Successful solutions will be supported through a platform that will spread awareness about the importance of reducing food waste and the Ne'ma initiative will hold consultations with private sector institutions, government and community agencies, hotels and restaurants, as well as retailers, universities and schools.

### Raising awareness and providing guidance on reducing food waste

In March 2023, MOCCAE launched their guide for food waste reduction. The Guide entitled "How to Reduce Food Waste Using Three Low-Cost Nudges – A Practical Guide for Canteens and Buffet Restaurants" seeks to engage with business sectors and individuals to meet the 2030 goal to reduce food loss and waste by 50%<sup>127</sup>.

The Guide focuses on three areas, referred to as nudges, that the hospitality sector can implement to educate the public on food loss and waste efforts, and foster positive behavioural changes. These are:

1. food loss and waste messaging, designed with the help of behavioural scientists to motivate diners to reduce their plated waste;

<sup>127</sup> <https://www.zawya.com>

2. visual portion displays for diners, to show how much food they are ordering, and help them make more sustainable food decisions; and
3. the introduction of a transparent bin and tracker, to serve as a visual reminder of the everyday impact of food waste.

The nudges are based on consumer insights including results of a successful pilot between ne'ma and Accuro with the support of behavioural science experts from the Behavioural Insights Team testing multiple nudging interventions.

Ne'ma encouraged hospitality and business to join the movement and scale up such nudges to support the UAE in achieving its reduction targets and their sustainability goals as organisations.

A number of UAE industry partners have signed an MOU with Mohammed Bin Rashid Al Maktoum Global Initiatives (MBRGI) and Winnow agreeing that they would work collectively to test, adopt, and scale practices and guidelines stipulated in Guide. MBRGI will be promoting awareness about food waste by partnering with supermarkets, retail chains, hotels, and restaurants to repurpose food items and rescue excess food left over from buffets at hotels and prevent it from going to landfill by redirecting, rescuing, and redistributing food to vulnerable communities across the Middle East, Africa, Asia, Europe, and South America.

The guide can be accessed here:  
<https://www.nema.ae/top-tips.html>

### **Raising Awareness about how to reduce food loss and waste across the food supply chain**

In 2023 Dubai Municipality launched its 3-year Food Waste and Loss Reduction Awareness Project aimed at reducing food loss and waste in the Emirate of Dubai by implementing measures that address food waste at every stage of its circulation.

The project seeks to spread the culture of reducing food waste and places paramount importance on engaging the community in the fight against food waste. Through extensive awareness campaigns and educational initiatives, every member of society is encouraged to play an active role in reducing food waste at home, in restaurants, and across various settings

It also seeks to train food handlers, supervisors and managers in all food establishments on how to efficiently and safely transport, store and manage food stocks to minimise food loss and ensure food safety.

Similarly, the programme will also educate food traders and food importers on how they can reduce food losses and spoilage along the food supply chain and promote sustainable and secure transportation of food while simultaneously maintaining the highest standards of food safety.

<sup>111</sup> <https://www.thenationalnews.com>

<sup>112</sup> <https://www.zawya.com>

### **Highlighting and promoting the deployment of new and emerging green technologies**

In February 2023, the UAE Ministry of Industry and Advanced Technology (MOIAT) announced the formation of an Industrial Sustainability Alliance that will seek to:

1. highlight and promote the deployment of new and emerging green technologies;
2. showcase best practices and flagships in industrial sustainability in the UAE's industrial sector; and
3. provide a platform for dialogue and exchange among policymakers, global technology experts and industry.

The UAE's Industrial Sustainability Alliance will host exhibits showcasing Greentech to increase awareness on the benefits of deploying these technologies in industrial operations and will run sustainability training for the industrial workforce to instil the concepts of efficiency, waste management and circularity in production processes. Similarly, the Alliance will also support policy dialogues and knowledge exchanges on industrial sustainability and will provide technical support in formulating sustainability roadmaps through the Industrial Technology Transformation Index (ITTI).

This will build on the work previously undertaken by MOIAT to contribute to the UAE's climate neutrality efforts and the work they did to help develop

sustainability roadmaps for the UAE's largest 50 factories.

### **Measuring the Sustainability of Factories**

In February 2023, the UAE's Ministry of Industry and Advanced Technology (MOIAT) and the Abu Dhabi Department of Economic Development (ADDED) launched the Industrial Technology Transformation Index (ITTI), a comprehensive framework to measure the digital maturity and sustainability of factories<sup>128</sup>.

The ITTI was developed with leading industry players, consultancy firms, technology providers and subject-matter experts. It will help manufacturers to make data-driven decisions to allocate resources more effectively and unlock financial incentives.

The index will promote the integration of 4th Industrial Revolution (4IR) applications and sustainability best practices and raise awareness about the benefits of advanced technology. The ITTI is the first of its kind to integrate 4IR fundamentals with sustainability in one comprehensive framework.

The index's categories are aligned with the manufacturing value chain, and are comprised of 20 dimensions out of which 4 are sustainability related.

In order to validate the accuracy and effectiveness of the tool, the Ministry piloted the ITTI with 75 manufacturing plants in 8 priority sectors, around 60 of

<sup>128</sup> <https://wam.ae/en/details/1395303129350>

<sup>129</sup> <https://www.zawya.com/en/business/energy/worldgbc-launches-guide-to-accelerate-regenerative-built-environments-x6mlzq3a>

which are Small and Medium Enterprises (SMEs). During the pilot phase, ITTI inspired many to take the next step in their digitalisation journey, and most participants indicated that they highly recommend the assessment to industrial peers.

To properly activate and scale the ITTI, a certification programme has been developed to qualify third party assessors to conduct 1-day assessments based on the ITTI framework. The tool enables certified assessors to evaluate current technology and processes of manufacturing plants across the manufacturing value chain. Based on the findings of the assessment, assessors develop a detailed report, providing recommendations on prioritised actions to help manufacturers identify business areas where improvements will generate the highest business impact.

### **Raising awareness and knowledge about the Circular Built Environment**

In May 2023, the World Green Building Council (WorldGBC) and its network of over 75 green building councils, which includes the Emirates Green Building Council, launched the Circular Built Environment Playbook - a critical guide for the building and construction sector around the world to accelerate the adoption of circular economy and resource efficiency principles<sup>129</sup>.

The Playbook was developed with the support of WorldGBC's global programme

partners - Brightworks Sustainability, Foster + Partners, Vinzero and Kingspan - as well as technical partners, WSP, CBRE.

Through the playbook the WorldGBC hope to make the complex principles of the circular economy easy to understand for every actor in the built environment. It maps out more than 20 strategies of implementing circular design, construction and operation for the built environment, illustrated with best practice case studies from all over the world.

The playbook can be accessed here: <https://worldgbc.org/article/circular-built-environment-playbook/>



**Increasing facility managers capabilities to operate and maintain more sustainable facilities**

As part of the UAE’s National Energy and Water Demand Side Management Programme 2050 and its Facility Management Programme, the Ministry of Energy and Infrastructure (MOEI)

launched a training programme to enhance the abilities of facility managers to efficiently and effectively operate and maintain energy efficient facilities.

20 engineers from different entities participated in the first training program.

**Improving societies awareness and knowledge about conservation**

As part of the UAE’s National Energy and Water Demand Side Management Programme 2050, the Ministry of Energy and Infrastructure (MOEI) launched a National Conservation Campaign, “Save to Sustain”.

Working in collaboration with numerous partners, the Ministry is working to improve society members’ intellectual maturity regarding conservation in general and in energy in particular. The campaign aims to educate the public about energy sector issues and how to deal with these issues on an individual level in order to improve consumer behaviour.

As part of the awareness campaign, the Ministry launched an online platform that allows society members to support institutional efforts to implement the National Conservation campaign by presenting creative ideas that support the conservation of electricity and water consumption in the UAE, as well as opening the field for volunteering in various activities and events of the UAE’s energy sector.

**Promoting and supporting Environmental Education and Corporate Social Responsibility**

In January 2023, the BEEAH Group launched BEEAH Education to promote and support environmental education and corporate social responsibility initiatives in schools, universities, communities and corporate entities<sup>130</sup>.

BEEAH Education will lead several environmental awareness, education and awarding programmes for the group including:

- 1. The Academy of Sustainability** (formerly the Bee’ah School of Environment) which engages more than 700 schools, hundreds of teachers and thousands of students every year to incorporate environmental education into school curricula and hold competitions to drive sustainable action among the youth and their communities.
- 2. The Future Pioneers Awards by BEEAH** (formerly the Environmental

Excellence School Award (EESA)) which has awarded several schools, students, and teachers over the years. It is now expanding its scope to highlight the accomplishments of professionals and companies. The goal of the award is to widen the understanding of how ground-breaking solutions can help achieve a sustainable future for all.

BEEAH Education will also lead the Institute of Environmental Management and Sustainability (IEMS) Academy, a training and certification institution for professional and vocational courses that prepare individuals for careers in sustainability. The IEMS Academy has trained and certified hundreds of individuals for fulfilling careers in sustainability.

BEEAH Education’s ecosystem of programmes will help address the need for awareness and knowledge in the area of sustainability from homes to communities and classrooms to workplaces.



<sup>130</sup> <https://www.zawya.com/en/business/education/beeah-group-launches-beeah-education-to-drive-sustainable-action-kc4avtzj>

**Mobilising civil society to build transformative action at scale**

In 2021, the Environmental Charity, Emirates Nature-WWF created a new initiative designed to build transformative action at scale through a mass civil society mobilization programme, called ‘Leaders of Change (LOC).’

The LoC initiative is an innovative new approach to environmental conservation, mobilizing people, businesses and government entities across the UAE via training, ideating, and hands on field experience that allows participants to learn and contribute to active conservation projects.

Activities undertaken that support the transition to a circular economy include:

- planting and monitoring mangroves in Umm al Quwain to improve carbon storage for the NbS project (summarized elsewhere in this document) and the “Priceless Planet Mangrove” project, which is a joint endeavour between MasterCard and EN-WWF;
- cleaning up waste while renovating an ancient falaj system in Fujairah;
- using local experts to provide 3 days of training on the Circular Economy;
- training youth and the private sector on a climate simulator to achieve 1.5 degrees;
- recording data in support of EAD’s

single-use plastic monitoring efforts, and

- teaching about how individual choices can support or hinder food systems transformation.

**Raising awareness about recycling**

FrieslandCampina has launched the ‘Recycle to Green’ sustainability education campaign, which aims to educate UAE residents on the benefits of recycling and the environmental impact of these materials when they end up in landfills. The ultimate goal is to create a movement to inspire a shift in the mindset of the UAE residents towards recycling.

**Educating pupils and the public about the importance of recycling**

Abu Dhabi Waste Management Company’s (Tadweer’s) Community Outreach and Awareness Program has educated 104 schools, 53,000 students, on the importance of recycling.

Similarly, Tadweer has attended 15 events and festivals, reaching another 10,000 members of public.

**Raising awareness about E-waste and waste segregation**

Schneider Electric launched an **e-waste collection campaign** for employees in Oct-Dec 2022 to dispose electronic waste safely and sustainably, such as old mobile phones. The CO2 emissions

savings estimated by the waste disposal agency was 69.04 KG. They also installed 15 waste segregation bins across their offices.

**Encouraging the proper disposal of used batteries**

In 2023, Sharjah-based BEEAH Education’s Academy of Sustainability will partner with global battery company Duracell, to host the 4th Edition of The Great Battery Challenge<sup>131</sup>. The Challenge engages schools and students in collecting used batteries and inculcates the habit of properly disposing of batteries.

The schools that collect the most used batteries receive an award, and last year’s (2022) competition saw the collection of 2,000 kilogrammes of used batteries.



**Raising awareness among consumers about circular packaging**

In March 2023, the Circular Packaging Association (CPA), a public-private partnership across the packaging value chain, officially launched in the UAE.

The Association aims to integrate the principles of a circular and green economy into the packaging value chain in the UAE, transforming the current linear system, which is based on the concept of buying, using, and disposing of products, into one that considers post-consumption packaging waste as a valuable resource that can be reused.

The Association aspires to raise awareness among consumers and provide recommendations on legislation and policies related to circular packaging, through a data-driven and multi-stakeholder approach.

The Circular Packaging Association is the result of work initiated in 2019 by founding members of the CIRCLE Coalition for innovation in recycling towards a circular economy. CIRCLE was formalized under the sponsorship of the Ministry of Climate Change and Environment via the signing of a Memorandum of Understanding establishing a circular economy for packaging across the GCC. In 2019, the members of CIRCLE funded a study to investigate the barriers and enablers of a circular economy for post-consumer packaging in the UAE.

<sup>131</sup> <https://www.zawya.com/en/business/education/beeah-group-launches-beeah-education-to-drive-sustainable-action-kc4avtzj>

### Raising awareness about Aluminium Recycling

In January 2023, Emirates Global Aluminium and other beverage producers, can manufacturers and waste management firms founded the Aluminium Recycling Coalition to help promote aluminium recycling in the UAE, with a focus on beverage cans.

The Coalition plans to support the UAE government in creating aluminium recycling regulations and policies, as well as work to develop aluminium recycling infrastructure. As part of its first project, the coalition will support a

study by the International Aluminium Institute on aluminium recycling rates and behaviours in the UAE. The study aims to fully understand the scale of aluminium recycling in the country and identify potential solutions for it.

Members of the coalition include EGA, Abu Dhabi Waste Management Company (Tadweer), Aujan Coca-Cola Beverages Company, Coca-Cola Al Ahlia Beverages Company, BEEAH Tandeef, Pepsi-bottler Dubai Refreshment, CANPACK, Crown Bevcan EMEA, DULSCO Group and Veolia.



## D. OUR CALL TO ACTION

1. As the world recovers from the COVID-19 pandemic and seeks to restore global prosperity while also seeking to mitigate against, and adapt to the impacts of climate change and biodiversity loss in a world that is Volatile, Uncertain, Complex and Ambiguous (VUCA), we must all collectively focus on addressing the underlying and systemic factors driving many of these issues, namely our linear economic system of take-make-throw away. If we do not transform our businesses and economic system into more circular ones reminiscent of natural systems where there is no waste and nature is given the opportunity to be regenerative, our problems and their negative impacts will only intensify.
2. Transforming an economic system is a herculean task which by definition will be disruptive, creating some winners and some losers, but maintaining the status quo will undeniably be ultimately far more disruptive, creating many more losers than transforming to a circular economy will. Adopting circular economy principles will make UAE businesses and the country overall more resilient, innovative and adaptive, traits necessary to thrive in a VUCA world.
3. The remarkable transformation the UAE has already achieved over the last half century, shows, without doubt, the

government, businesses and people of the UAE are more than capable of rising to achieve this transformation challenge. And as with the transformation already achieved, this new transformation to a Circular Economy will require everyone to play a role and collaborate with each other to find and together travel down the optimal transformational path for the UAE.

4. We therefore call on governments, companies and the public at large to continue our collective efforts to support the transition to a Circular Economy through the following actions:

-  Advocating for, celebrating and raising awareness, knowledge and understanding about the Circular Economy in the UAE
-  Creating an enabling environment for the Circular Economy in the UAE
-  Providing sufficient resources to enable the transition to a Circular Economy
-  Leveraging technology and innovation to support and enable the transition to a Circular Economy
-  Increasing the quality and depth of the Circular Economy in the UAE

## ANNEX A GGGI in the UAE

### WHO WE ARE

The Global Green Growth Institute (GGGI) is a treaty-based international, intergovernmental organisation dedicated to supporting and promoting strong, inclusive and sustainable economic growth in developing countries and emerging economies.

Established in 2012 at the Rio+20 United Nations Conference on Sustainable Development, GGGI's vision is a low-

carbon resilient world of strong, inclusive, and sustainable growth. GGGI supports its Member States in transitioning their economies towards green growth model that simultaneously achieve poverty reduction, social inclusion, environmental sustainability, and economic growth. GGGI's work contributes to its Members' efforts to deliver on the Sustainable Development Goals and the Nationally Determined Contributions to the Paris Agreement.



## GGGI IN THE UAE

The United Arab Emirates (UAE) were a founding member of the GGGI, signing a Memorandum of Understanding with the organisation in March 2011. In that same year (2011), GGGI's Regional Office was opened in Masdar City in Abu Dhabi, prior to the formal establishment of the organisation in 2012.

For more than a decade GGGI has been working in close collaboration with the UAE's Ministry of Climate Change and Environment (MOCCAE) and more recently with the Environment Agency Abu Dhabi (EAD) in several pivotal green growth areas, including on developing:

- A National Green Growth Strategy- the UAE's Green Agenda 2030
- A National Climate Change Plan
- Climate change risk assessments
- A Climate Change Adaptation Programme and a National Adaptation Plan (NAP)
- Air pollution emissions inventories, an air pollution monitoring programme

and a National Air Quality strategy

- A National and an Emirate level System for Measuring, Reporting and Verification (MRV) of Greenhouse Gas (GHG) Emissions
- An analysis of the Green Bonds and Sukuk market in the UAE
- A Green Business Toolkit for the UAE
- An understanding of the Environmental Goods and Services (EGS) Sector in the UAE
- A Circular Economy Policy
- Pathways to a Circular Economy
- A composite indicator to monitor and evaluate the UAE's transition to a Circular Economy
- Workshops to increase knowledge and understanding about the Circular Economy in the UAE
- An Ecosystem to support Green Innovation and Investment
- Reports on the state of the Green Economy in the UAE

### GGGI in UAE

Office No. 202 A. Level 2 Incubator Building  
Masdar City PO Box 135075  
Abu Dhabi, United Arab Emirates  
Tel + 971 2 556 8160

### GGGI Headquarters

19F Jeongdong Building  
21-15 Jeongdong-gil Jung- gu, 04518  
Seoul, Republic of Korea  
Tel +82 70 7117 9942

## ANNEX B

### UAE Circular Economy Council Members

**H.E. Mariam bint Mohammed Almheiri**  
Minister of Climate Change & Environment

**H.E. Abdulla Bin Touq Al Marri**  
Minister of Economy

**H.E. Dr. Thani Bin Ahmed Al Zeyoudi**  
Minister of State for Foreign Trade - MOE

**Eng. Ali Al Dhaheri**  
Acting General Manager - Abu Dhabi Waste Management Center - Tadweer

**H.E. Abdulrahman Al Nuaimi**  
Director General - Municipality and Planning Department in Ajman

**H.E. Khaled Al Huraimel**  
Chief Executive Officer - Beeah

**H.E. Eng. Ahmed AlKaabi**  
Assistant Undersecretary - Ministry of Energy and Infrastructure

**Eng. Othaibah AlQaydi**  
Acting, Assistant Undersecretary of Sustainable Communities Sector, Ministry of Climate Change & Environment

**Anis Nassar**  
Lead, Resource Circularity - World Economic Forum

**Eng. Aisha Al Abdooli**  
Director, Green Development & Environment Affairs Department, Ministry of Climate Change and Environment

**H.H Sheikha Shamma Bint Sultan Bin Khalifa Al Nahyan**  
President & CEO of UAE Independent Climate Change Accelerators, UICCA

**H.E. Omar Bin Sultan Al Olama**  
Minister of State for Artificial Intelligence

**H.E. Razan Khalifa Al Mubarak**  
Managing Director - Environment Agency Abu Dhabi

**H.E. Eng. Dawood Abdul Rahman Al-Hajri**  
Director General - Dubai Municipality

**H.E. Laila Mostafa Abdullatif**  
Director General - Emirates Nature – WWF

**H.E. Omar Ahmed Suwaina Al Suwaidi**  
Undersecretary - MoIAT

**H.E. Nawal Al Hosany**  
Acting Assistant Undersecretary of the green development and climate change sector – Ministry of Climate Change and Environment

**Mrs. Samar Elmnhrawy**  
SVP HC and Sustainability Services (HO) - Corporate H.O.– Majid Al Futtaim Group

**Mr. Patrick Chalhoub**  
Executive Director - Chalhoub Group

## ANNEX C

### New Technologies that can support Optimisation of Resources

**Artificial intelligence (AI) and Machine Learning (ML)** can analyse vast amounts of data, identify patterns and make predictions to optimise complex processes. These technologies can be applied to supply chain management, demand forecasting, resource allocation, scheduling and decision making, enabling more efficient and data-drive optimisations.

**The Internet of Things (IOT)** devices equipped with sensors and connected to a network can collect real time data on various parameters, such as temperature, pressure, movement and performance. This data can be used to monitor and optimise processes, equipment performance, energy usage and supply chain logistics.

**Big Data analytics** enables large and diverse datasets to be analysed using advanced analytical techniques that can enable organisations to gain valuable insights, identify inefficiencies, and make data-driven decisions. It can support optimisation efforts in the areas such as demand forecasting, inventory management, route optimisation, customer segmentation and resource allocation.

**A digital twin** is a virtual replica or simulation of a physical system, process or product. It enables organisations to model and optimize various scenarios, test different strategies and predict outcomes before implementing changes in the real world. Digital twins can be used to optimize manufacturing processes, facility layouts and supply chain operations.

**Robotic Process Automation (RPA)** involves the use of robots to automate repetitive and rule based tasks. By automating manual processes, organisations can improve efficiency, accuracy and speed while reducing errors and costs. RPA can optimize tasks such as data entry, order processing, inventory management and quality control.

As seen the sharing section, **cloud computing** provides scalable and on-demand access to computing resources enabling organisations to optimize their infrastructure and storage needs. It allows for flexible resource allocation, data sharing, collaboration, and real-time analytics. Cloud-based solutions can support optimization efforts in various areas, including data analysis, supply chain management and business process optimization.

**Blockchain technologies** offer decentralized and transparent record keeping, enabling secure and traceable transactions. It can be used to optimize supply chain operations, track and authenticate products, streamline financial transactions and reduce fraud or counterfeiting.

Augmented Reality (AR) and Virtual Reality (VR) technologies can optimize training, maintenance and design processes. By providing immersive and interactive experiences, organisations can improve employee training, equipment, maintenance, and design iterations, leading to more efficient and optimized workflows.



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For further information or feedback:

**Ministry of Climate Change & Environment**

PO Box 1509, Dubai, United Arab Emirates

Email: [info@moccae.gov.ae](mailto:info@moccae.gov.ae)

[www.moccae.gov.ae](http://www.moccae.gov.ae)

