

strategy&



# PwC Net Zero Future50

Middle East



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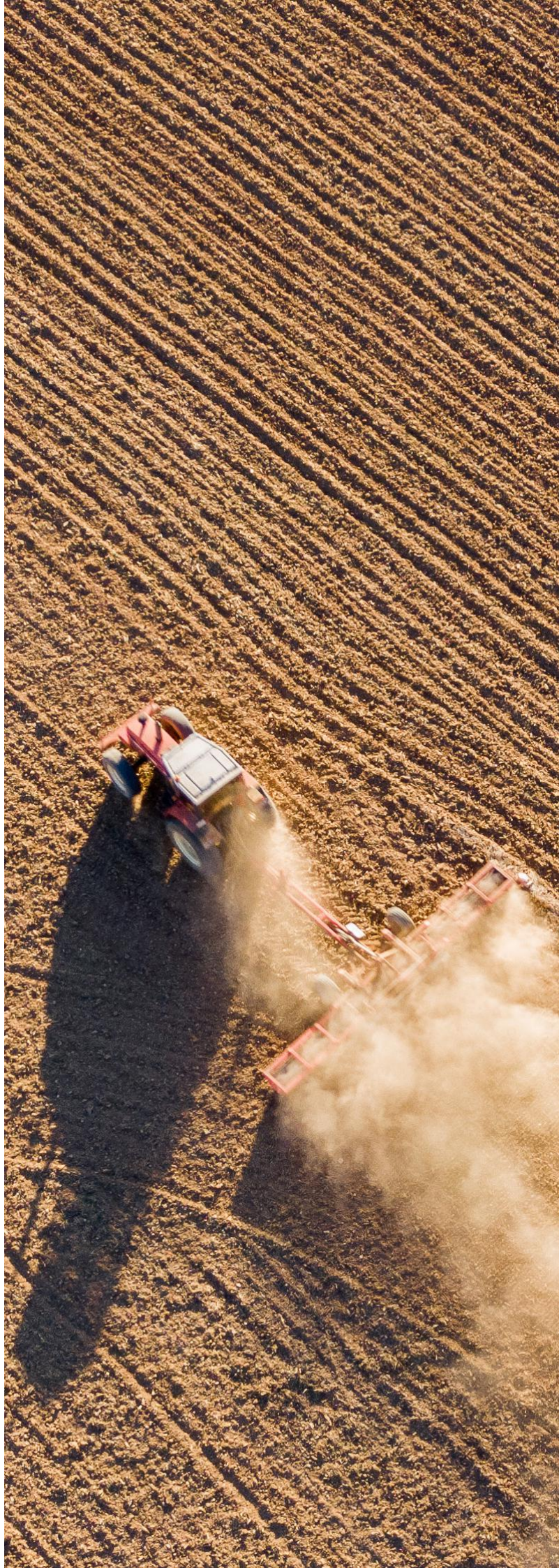
**The 2023 PwC Net Zero  
Future50 - Middle East**



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# Foreword

Climate tech innovation in the Middle East is being driven by some of the most dynamic entrepreneurs in our region, championing new technologies that are pushing the boundaries when it comes to accelerating the path to net zero.

As we stand just days away from the world's most important climate conference — COP28, taking place here in the United Arab Emirates, we are excited to shine a light on regional innovators whose organisations, we feel, are making the biggest difference in reducing emissions and accelerating decarbonisation in our region.

The PwC Net Zero Future50 - Middle East report identifies leading organisations in this space, and discusses the challenges they face in their ambition to grow and scale. Their range and diversity highlights the vibrancy of the start-up and small companies scene in the region.

Among the surprises we identified is the pioneering role of women in these businesses. More than half of the 50 climate tech companies on the list have a female founder or a mixed female-male leadership team, bucking the global trend where all-male founders dominate. We also found a large proportion of young people operating in this space - almost half of the founders of the companies in the Future50 are in the 30 to 39 year-old age category.

While it's clear that the ecosystem required to accelerate local growth in the development of climate technology has some way to go, our chosen 50 entrepreneurs represent hope and ambition when it comes to efforts to solve the climate crisis in our region. We hope they inspire you as much as they do us.

Please join us in congratulating the following companies for making the final cut. Here's to a bright and sustainable future for all.

**Dr. Yahya Anouti & Jon Blackburn**





# About

The PwC Net Zero Future50 - Middle East is a curated list of regional companies focusing on pioneering technology solutions to drive decarbonisation across all sectors. We came across more than 500 of innovators in the region making an impact on climate technology, and trimmed the number down to 50 promising breakthrough ideas with underlying technologies. The list is neither exclusive nor exhaustive. The climate investment data comes from the [‘PwC State of Climate Tech 2023, analysis of Pitchbook Data’](#).<sup>1</sup>

A thorough assessment of climate tech innovators who answered PwC Middle East’s call for pioneering technologies addressing the region’s climate challenges was carried out between November 2022 and February 2023, resulting in the final selection of the companies.<sup>2</sup> Eight climate sectors were identified in line with PwC State of Climate Tech methodology with the biggest potential for impact for decarbonisation that include Built Environment; Climate Change Management and Reporting (CCMR); Energy; Financial Services; Food, Agriculture and Land Use (FALU); GHG Carbon Capture and Storage (GHG CCS); Industry, Manufacturing and Resource Management (IMRM); and Mobility and Transport.<sup>3</sup>

PwC Middle East has not independently verified any of this company information. Where statistics or research have been discussed in the profiles of the companies, these have been sourced from the company website unless stated otherwise. Alongside the company summary and impact, PwC Middle East has provided selected highlights around the opportunity the featured technology presents, along with some of the possible strategic industry alliances for each business.

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# Executive summary

**In our analyses of the Middle East climate technology landscape, we see the founders of climate tech companies driving innovation that's helping to reduce emissions and accelerate decarbonisation.**

PwC Middle East has analysed the region's climate tech sector and identified 50 innovators who have the potential to make a significant difference in mitigating climate change.

**We found that the largest share of our Net Zero Future50 companies are working on technologies within the sectors responsible for most GHG emissions:** With Industry, Manufacturing and Resource Management contributing 29% of Middle East GHG emissions and Energy at 46%.

**From our analyses, we found that climate tech innovators cite legal and regulatory issues, funding and human capital** as among the most significant internal and external challenges they face in their quest for growth, while driving a transformative shift in addressing climate challenges.

**Across the region, female founders are breaking the global trend by dominating the climate tech landscape:** We found that, in a space that tends to be male-dominated globally, more than twenty-five percent of the companies in the Middle East Future50 (26%) have a female founder and a further 32% have a mixed team of female and male founders – meaning that a majority of the companies feature women as leaders.



## Climate technology and our region

Climate tech is defined as technologies explicitly focused on reducing greenhouse gas emissions, or addressing the impacts of global warming. The sectors of focus are based on the PwC climate tech taxonomy. Learn more at [PwC State of Climate Tech](#).

The [2023 Middle East Climate Tech report](#) identified two trends happening within climate technology in the region. First, Middle East investors are investing heavily in climate technology around the world, bucking the global investment slowdown. The report shows that the Middle East players spent about US\$5 billion on climate tech-related transactions globally in the year to end-September 2023, almost triple their estimated spending of \$1.8 billion in 2022. Secondly looking inwards, since 2018, all investors globally have spent about US\$1.85 billion on climate tech funding in the Middle East. In respect to the sectoral priorities, easily the largest share of funding has gone to companies working on technologies relating to Energy, Mobility and Transport, which are key sources of carbon emissions - showing investment is going where it's needed the most.

These sectors received about US\$1.4 billion of the US\$1.85 billion total funding since 2018. Spending on FALU accounts for most of the rest. With the help of these investments, climate tech innovators in the Middle East are helping reduce emissions and accelerate decarbonisation.

Like the climate investment sectors, companies in the Middle East's Net Zero Future50 are concentrated in a few sectors: IMRM make up about 22% of the total list, with Energy a further 20%. These are followed by the FALU sector with 18%. Companies in these three sectors, therefore, account for about two-thirds of the total. The prevalence of the FALU-focused companies signals more the need for domestic sustainability and food security for the region.

Our analysis also shows that almost half of the founders of the companies in the Future50 are between 30 and 39 years of age, and a third is in the 40 and 49 year-old age category, which bodes well for the region as, globally, the most successful exits of high venture capital-backed, hi-tech and patented start-up is around 46-years-old.<sup>4</sup>

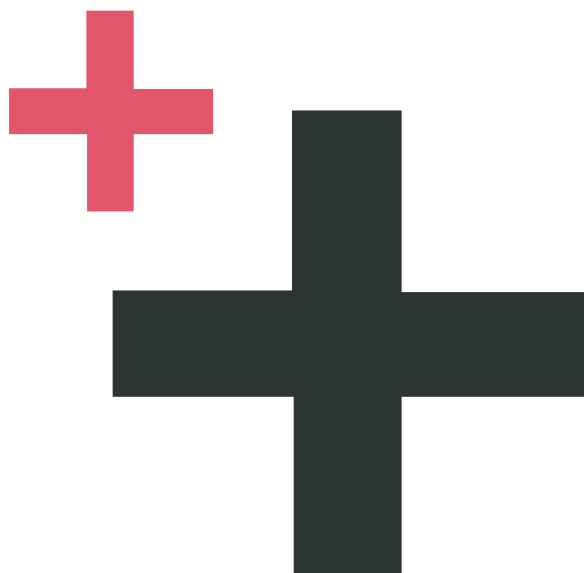
## The net zero transformation challenge

The COVID-19 pandemic led to a sharp drop in greenhouse gas emissions globally, but the fall was temporary. In 2021, the emissions were back – and moving above pre-pandemic levels – rising across all sectors.

By the end of 2022, the global economy produced 36.8 gigatonnes of carbon dioxide (Gt of CO<sub>2</sub>) – an increase of 0.9% over 2021 and 6% higher than in 2020.<sup>5</sup>

While the emissions growth continues, it has slowed down due to declining economic growth in some countries, the higher interest rates and inflation, and disruptions to traditional fuel trade flows. At the same time, there has been progress in addressing climate change, including deploying clean energy technologies, such as renewables, electric vehicles (EVs), and heat pumps. The International Energy Agency estimates that these technologies helped prevent an additional 550 metric tonnes (Mt) in CO<sub>2</sub> emissions. Yet the goal of reaching net zero emissions by 2050, as set out in the 2015 Paris Agreement, remains elusive. And for the Middle East, climate change has very tangible consequences, including increasing water shortages and drought risks.

The issues have prompted significant pledges by governments in the Middle East and North Africa region (MENA), committing to net zero emissions goals and announcing a range of other targets aimed at reducing fossil fuel dependency. This is a particularly complex topic for the region, given its role as a major producer of hydrocarbons. At the same time, the two successive COP summits taking place in the region - COP28 - in Dubai, UAE, in November 2023, a year after the summit in Sharm El-Sheikh, Egypt – highlight the central importance of the region's efforts to mitigate climate change.



# Middle East GHG emissions distribution

To help understand the potential abatement of the eight sectors we analysed the Middle East greenhouse gas (GHG) emissions to examine which industries in the region have the biggest potential for impact through decarbonising technologies. We utilised data from across multiple external climate data sources<sup>6</sup> and introduced mapping to align to the PwC State of Climate Tech taxonomy to understand their relative emissions contribution.<sup>7</sup>

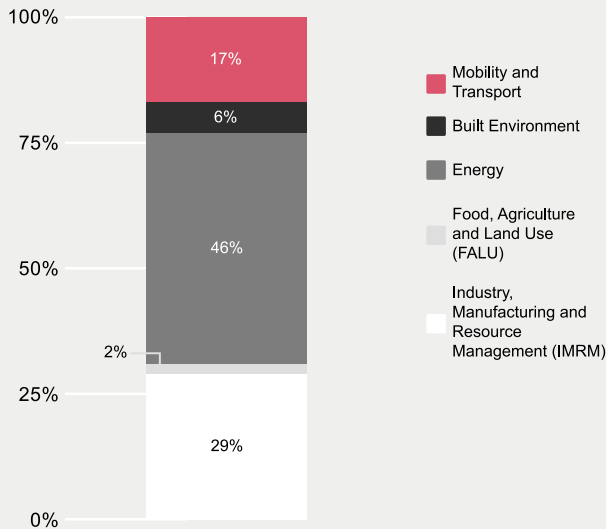
Leveraging established global methodology we assigned a potential reduction impact across the five emitting sectors: Built Environment; Energy; Food, Agriculture and Land Use (FALU); Industry, Manufacturing and Resource Management (IMRM); and Mobility and Transport. We also looked to external sources to assign ‘a potential to remove GHG emissions’ to cross-sector themes such as GHG Carbon Capture and Storage, and Climate Change Management and Reporting, which have been given a Net Zero Future50 allocation based on their potential to remove GHG emissions. We also allocated an indicative abatement potential for Financial Services.<sup>8</sup>

The approach shows that the Middle East Energy and IMRM sectors account for third quarters (75%) of GHG emissions, which is reflected in the Future50 where the same two industries lead the sectoral representation of the report, with almost half (42%) of companies featured are from these sectors (Exhibit 1).

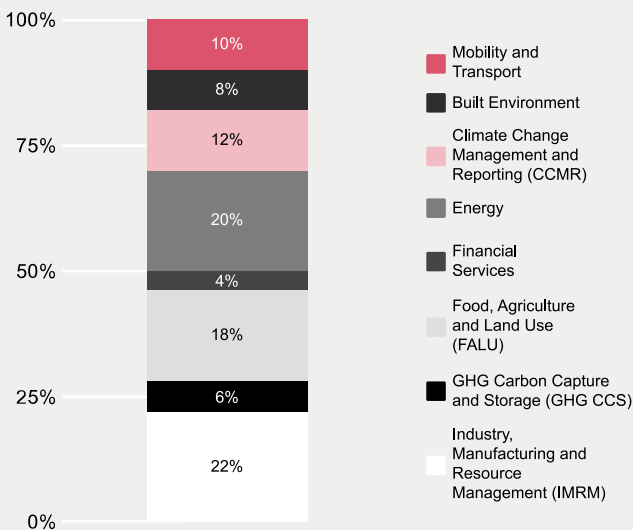
The Future50 allocation to the FALU sector is higher than estimated emissions at almost 20%, despite only contributing 2% of GHG emissions in the region. This reflects the focus on climate and sustainability challenges related directly to food security, in a region that imports more than 80% of its food and is vulnerable to supply chain disruption. Food agricultural technology can help make food supplies more reliable, stimulate innovation, cut deficits and benefit the environment at the same time.

Exhibit 1: PwC analysis of Middle East GHG emissions vs the sectoral representation of the Future50 companies.

PwC Analysis on GHG Emissions in Middle East



% Split of PwC Net Zero Future50 - Middle East per sector 2023



See appendix for PwC analysis, methodology and sources.



## Barriers for innovators on the road to decarbonisation

Here, we look at some of the main challenges identified by the climate tech innovators in their quest for growth and scale. Speaking with 96 innovators at the interview stage of the PwC Net Zero Future50 - Middle East assessment, common themes began to emerge:



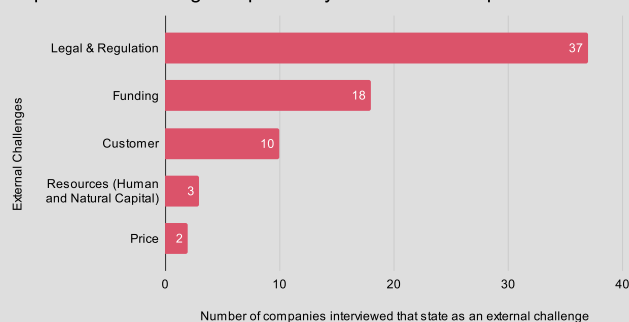
### 1. Regulatory issues, finding experienced talent and funding remain key internal issues and external challenges for entrepreneurs in the Middle East.

The entrepreneurs interviewed in the PwC Net Zero Future50 - Middle East say that regulatory and legal issues are the key obstacles they face, followed by human capital and funding.

Every start-up in the region is faced with a unique challenge. But almost all face a common challenge, namely that of funding (Exhibit 2). Compared with advanced economies, fewer investors in the Middle East make it difficult for start-ups to get the capital they need to grow. Another challenge is the limited market size in the region, with start-ups often having to compete with larger global companies, which makes it difficult to succeed.

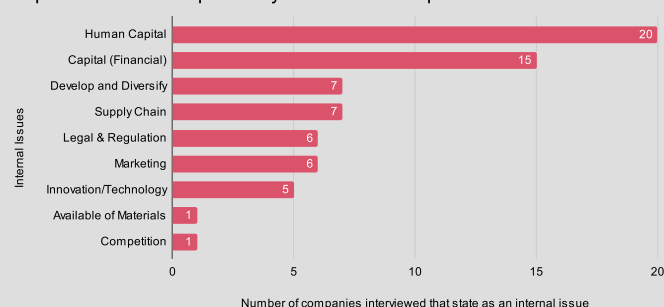
### Exhibit 2: Climate tech innovators cite legal and regulatory issues, funding and human capital as among the largest internal and external challenges they face.

Top external challenges reported by interviewed companies.\*



\*Total number of companies interviewed for Future50 selection was 96

Top internal issues reported by interviewed companies.\*



\*Total number of companies interviewed for Future50 selection was 96

In the absence of large funding bursts, start-ups need a lean build, which often means the founders have to make sacrifices in overhead investment – and end up carrying out many of the overhead functions, like accounting and marketing, themselves.



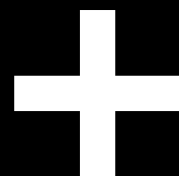
### 2. Legal requirements of various jurisdictions are also widely cited as an obstacle.

This is particularly related to scaling up in the Middle East, given that expanding into other countries in the region means having to contend with varying laws, labour requirements, and potentially, commercial restrictions, to source and develop people and build your brand. When asked in a recent interview on 'Start-up to scale-up: Can the Middle East be a global hub?', Ahmad Yousry, co-founder and CEO at Rabbit Mart, said, "We have seen significant benefits brought about by the ease of cross-border operations and uniform sets of regulations and laws around the world, especially in the EU and the US — whereas start-ups in the Middle East have to navigate a new set of challenges in pursuit of unicorn status."<sup>9</sup>

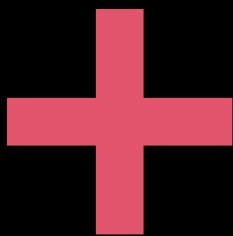


### 3. A third big challenge - widely cited by Future50 founders - is finding, attracting and retaining key talent.

Almost 35% of CEOs say there is a shortage of skilled workers – from environmental engineers to specialists in advanced technologies, such as carbon capture, not to mention intense competition for experienced hires. At the same time, the Middle East findings of our latest PwC "Hopes and Fears" survey show that more than half the individuals surveyed in the region believe their jobs will change significantly in the next five years.<sup>10</sup> Both these findings suggest that the Middle East faces a skills gap in climate technologies that the region will need to fill. In the shorter term, focus could be on intensive training programmes for some positions, and in the longer term, on the development of new curricula in higher education that seek to raise capabilities in areas relating to environmental engineering and other disciplines.



**Despite these challenges, a growing number of entrepreneurs – both worldwide and in the Middle East – are seeing new opportunities in innovative climate technologies.**

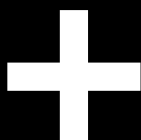


## Spotlight: Female climate tech entrepreneurs in the Middle East are playing a leading role

One of the biggest and most unexpected findings when looking at our Net Zero Future50 - Middle East is the significant proportion of women in leading roles in climate tech entrepreneurship in the region.

Our data shows that more than a quarter of the companies featured (26%) have a female founder, and 32% have mixed female-male founders. Thus, more than half of the Future50 have a female presence in leadership.

Further, by removing companies in the list that are not headquartered in the Middle East but have operations in the region, the female share rises. Based on this cut, 36% of the firms have a female founder, and an additional 30% have a mixed female-male founding team – taking the total to two-thirds.



**Exhibit 3: The gender demographic split of the final PwC Net Zero Future50 - Middle East globally with a Middle East HQ spotlight.**

The findings are counterintuitive for several reasons. First, technology globally tends to be dominated by men, and climate tech is no exception. For example, less than 100 CEOs from HolonIQ's 2022 Climate Tech 1000 are women, which means 90% of CEOs from HolonIQ's 2022 Climate Tech 1000 are men.<sup>11</sup>

Second, women have historically been under-represented in leading business roles in the Middle East region. One survey has found that the gap in ownership of established businesses between men and women in MENA is more than 40% — the largest worldwide.<sup>12</sup> Around 60% of female participants in the study said that they relied on savings as their primary or only source of capital, while 30% felt uncomfortable or unfairly criticised when approaching banks for loans.

Our latest “[Women in Work](#)” research shows that, while young women in the Middle East are highly motivated and keen to make their mark in the workplace, their experiences of employers are falling short of expectations. Too often, the assurance that they will be treated the same as their male colleagues and given equal training, development and career opportunities, is not reflected in their actual experience.<sup>13</sup>

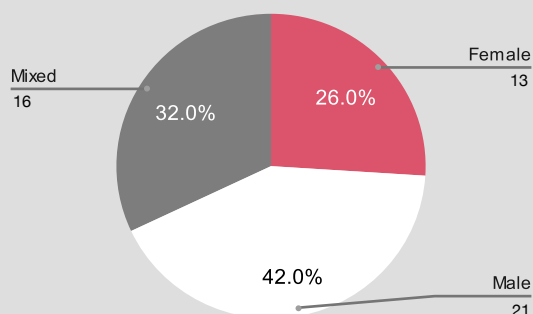
In the face of the funding gap and other factors mentioned earlier, it is remarkable that so many women in the Middle East region have taken the plunge and are playing such a prominent role in addressing climate change.

The female founders on our list come from different backgrounds - from finance and the corporate world to government and fashion. They took the leap to find their own start-ups driven by a real sense that they could significantly contribute to the efforts to address climate change.

Basima Abdulrahman, co-founder and CEO of KESK, noticed a lack of businesses focused on green buildings in Iraq and set out to fill it. “What began as a website for independent consulting surprisingly blossomed into a fully-fledged business,” she told us.

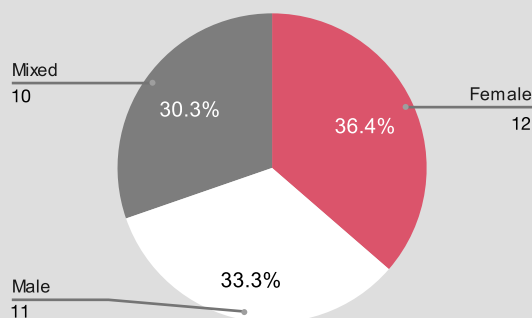
### Total Future50

Future50 gender split globally  
(Total Future50)



### Middle East HQ Spotlight

Future50 gender split of Middle East  
HQ (33 companies)



**\*33 of the Future50 are headquartered in the Middle East**

On the investors' side of the table, venture capital firms in the region have been forward-looking on launching climate funds to take action and capitalise on the opportunities in climate innovation. For Sonia Weymuller, Co-Founder and General Partner at VentureSouq, the problem was "a lack of data on how to solve regional problems" in MENA, despite it being "a region which is heating up faster than anywhere else in the world." This is what drove her to make a change.

Dina El-Shenoufy, CIO at Flat6Labs, emphasised that the region is the place to combat climate change. "I think the Middle East is already taking quite a few good strides in financial inclusion. The entire Middle East is arid land. There's a huge percentage of desert, and we are in a position where we need to be leaders thinking about irrigation and agriculture, technology, as well as solar and wind energy," Dina explains.

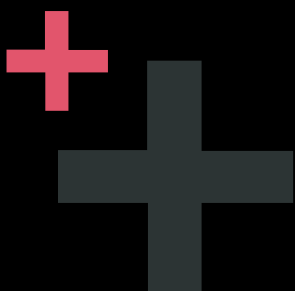
To get their start-ups off the ground, female founders faced several challenges securing funding — and came up with a variety of solutions. Leena Al Olaimy, Founder and CEO of Symbaiosys, and Rennie Popcheva-Capri, Founder and CEO of Solumar, both had trouble attracting investors. This was particularly challenging because of the large upfront R&D costs needed to develop climate technologies.

Al Olaimy told us, "So far, we have bootstrapped through awards and grants. The biggest challenge has been the difficulty in funding science and R&D. The path to building a [climate-tech] product and commercialising it is somewhat more uncertain and costly than for startups in many other sectors."

Popcheva-Capri said, "When embarking on our journey — a deep-tech start-up centred around sustainability and climate change was not the most sought-after investment opportunity in the eyes of investors. Our challenge at the very first steps was acquiring the essential capital for extensive R&D, multiple experiments, and continuous iterations."

By contrast, ValueGrid opted not to go after investors. As the Co-Founder and CEO, Nawel Mahmoudi explained, "The challenge is the limited funds, but it also helps us address [problems] in a more lean way, and adjust quickly and be agile."

Similarly, Jane Glavan, Co-Founder of Distant Imagery, took a more independent route to establishing her business. "We knew that we wanted to control and have ownership of our success, but also our failures to learn from them and keep evolving our methodologies. So we're completely project-based financing... We're a private sector company, but we operate as a not-for-profit."



While the founders pointed out that limited regional funding has been an issue for their companies, they also shed light on how the Middle East as a region has helped spur their businesses. Popcheva-Capri of Solumar said, “The Middle Eastern countries have been the first and at the forefront in welcoming our team and our technology and helping us develop it further.” Jane Glavan highlighted how Distant Imagery has benefitted from the financial environment in the UAE. “We work everywhere around the world, but we specifically chose the UAE for its ferocity for trying new things. There’s no fear of failure — and that’s amazing. I haven’t seen that anywhere else in the world. We’re very privileged to have been here for so long,” Jane says.

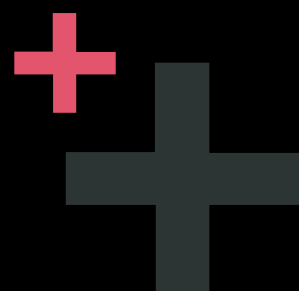
In getting their companies off the ground, female founders have learned many lessons they plan to take forward. Resilience and responsiveness were recurring themes. Al Olaimy of Symbaiosys told us that “navigating uncertainty and complexity as a start-up requires adaptive leadership; being responsive to feedback and change, iterating and remaining flexible to pivots without losing sight of the overall mission, and building organisational resilience... Also making time for personal regeneration and growth to avoid burnout. The last one is the most important and most overlooked for most founders.”

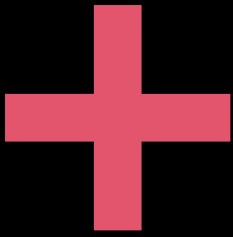
Abdulrahman of KESK had a similar takeaway. “One valuable lesson I’ve learned is the importance of agility and the ability to pivot the business in response to demand as well as local and regional dynamics. It’s crucial for every start-up to continually reassess their business plan and model, adapting to market requirements and the prevailing business and political landscape,” she advises.

Female founders emphasised the importance of collaboration and community. “There are lots of resources out there to help,” said Weymuller of VentureSouq, such as community groups and peer-to-peer learning. These communities are particularly important for entrepreneurs, as Mahmoudi of Valuegrid pointed out. “You do need a community around you, and as a woman, I think we need to step ahead and ask for help,” she explains, adding, “When needed, ask for support, advice and recommendations.” Glavan of Distant Imagery echoed the sentiment, “You have other women entrepreneurs, so seek those women out and really amplify each other’s voices and learn from them and just take every opportunity that comes. Just do it.”

Moving forward, multiple female founders echoed the findings of the overall Future50 regarding the call for legislative action (Exhibit 2) to support start-up growth in the region and to create a more robust green ecosystem for the future. To address fragmentation across the region, Weymuller of VentureSouq called for “an umbrella climate council for the GCC to ensure that a climate tech company in Jordan can scale into the UAE, to remove the hurdles.” But in attempting any significant change, El-Shenoufy of Flat6Labs pointed out that it often takes “baby steps.”

“We tend to have these grand conferences with huge promises, and I feel like there are smaller, easier, lower-hanging fruits that we can start from and then grow. Maybe that is a more sustainable path towards building our regional and national climate strategies,” she said.





## What drove you to build your start-up?



### Leena Al Olaimy

#### Founder and CEO, Symbaiosys

I was meditating at a lion conservation in South Africa, reflecting on how if nature were a tech start-up, it would be valued more than all the unicorns combined and 1.5 times global GDP, and yet paradoxically, it faces around a US\$600 billion annual investment gap.



### Rennie Popcheva-Capri

#### Founder and CEO, Solumar

We knew our technology could help solve current limitations and kept going, motivated by the huge business demand for such a solution and the positive impact that we can make for generations ahead.



### Nawel Mahmoudi

#### Co-Founder and CEO, ValueGrid

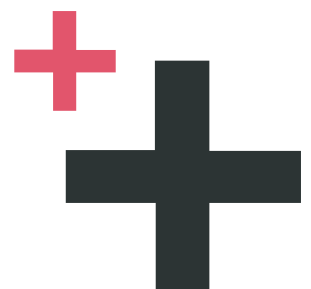
While there are thousands of initiatives and actions across institutions, organisations, and civil societies, it's very hard today to understand the link between those initiatives and the impact they have on the global net zero journey. We started to address the gap that I've seen in the industry. What could help leaders make better decisions, faster decisions and more efficient solutions overall?



### Basima Abdulrahman

#### Founder and CEO, KESK

I ventured into the realm of climate and sustainability driven by my fervour for sustainable building and mitigating climate change. The weight of these global challenges consumed my thoughts, compelling me to take action on both a global and local scale.

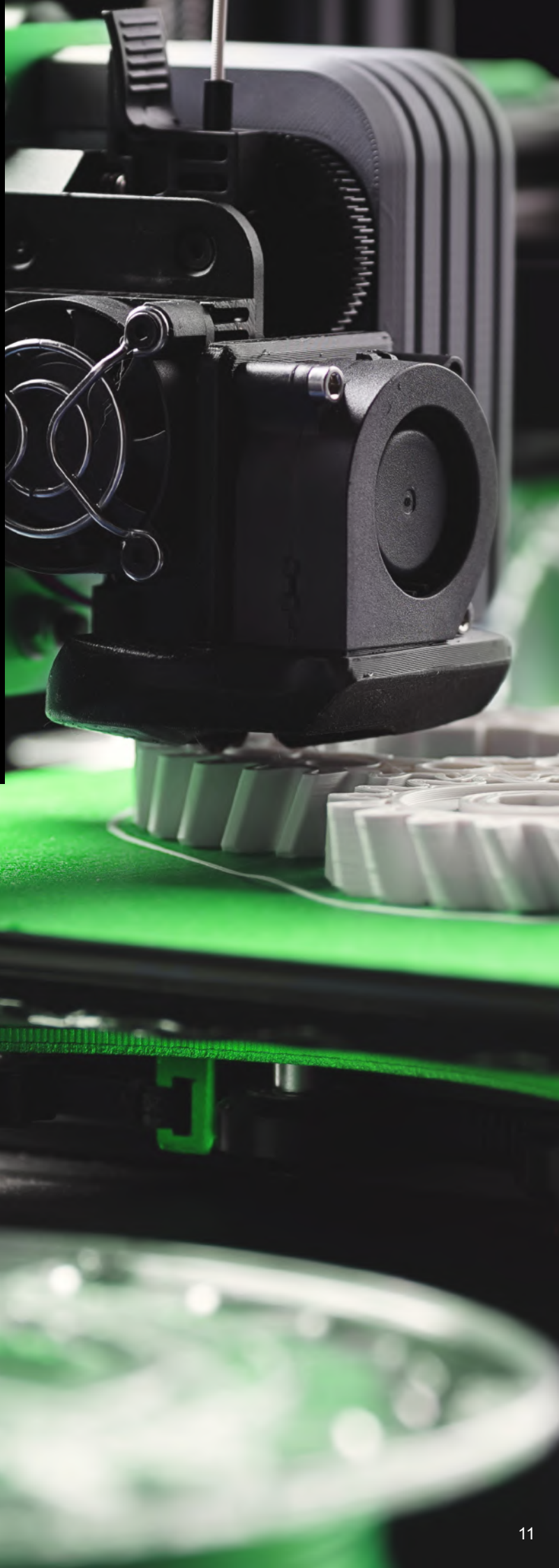


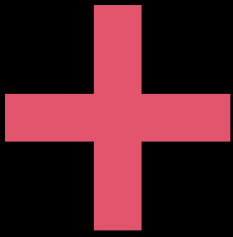


### Jane Glavan

**Co-Founder, Distant Imagery**

We personally wanted to give back not only to the country but also to our own family and our own children. This is us trying to care for them...it's about the forest itself, and whether that's providing towards climate change. That's the real impact. It's not about the numbers and the drones.





## What drove you to invest in climate tech — investors



**Dina El-Shenoufy**

**CIO, Flat6Labs**

I was looking at a screen day in, day out, with numbers going up and down, and I felt I wasn't really sure what the value was – it was fictitious gains and returns. I had no say in how I created those returns [in those] very extractive industries. They weren't industries of the future. And so when I stumbled upon the opportunity – and I quite literally stumbled upon the opportunity – to join a VC, that immediately clicked.



**Sonia Weymuller**

**Co-Founder and General Partner, VentureSouq**

I found a lot of my friends were interested in this gap where professionals were needed. Climate specifically resonated the most with me and was a huge opportunity. My personal passion is the intersection of biodiversity and technology.



**Lola Fernandez**

**Senior Investment Associate, VentureSouq**

Gen Z is the first generation that grew up with the consequences [of climate change] as their normal day-to-day, and the last generation with the time and resources to address it before we reach the 1.5 degree benchmark. That urgency has always been communicated to anyone born in the 1990s and 2000s...

I got interested in supply chain and the food chain [and what I could do to help.] as key systems to address the impacts of climate change. Both of them are so crucial to the global economy and our quality of life.



# Future50 Methodology

This report looks at examples of breakthrough ideas and their underlying technologies operating in the Middle East across the climate tech landscape; covering **Built Environment; Climate Change Management and Reporting (CCMR); Energy; Financial Services; Food, Agriculture and Land Use (FALU); GHG Carbon Capture and Storage (GHG CCS); Industry, Manufacturing and Resource Management (IMRM); and Mobility and Transport.**

We have allocated the number of companies by sector, based on their relative contribution to GHG emissions.<sup>14</sup>

We applied the PwC global Future50 selection methodology to our regional report (Figure I)

**Figure I: PwC Net Zero Future50 - Middle East selection methodology**

## 1. Scan



Scan the ecosystem **for emerging Net Zero trends and innovations**



Build a long list of 500+ ESG tech start-ups

## 2. Score



Develop an **assessment framework**



**Score the start-ups** against the assessment framework, and **refine to interview 100 finalists**

## 3. Select



Map **GHG weightings to shortlisted companies** to ensure sectoral coverage



Select a **list of 50 companies** that represent significant **emerging technologies**



## 1. Scan



Scan the ecosystem **for emerging Net Zero trends and innovations**



**Build a long list** of 500+ ESG tech start-ups

Using multiple resources, including the PwC networks and tech partner experts, we scanned the market to map the key innovators that look set to define the climate tech landscape for the next decade, identifying over 500 tech-enabled climate and sustainability focused start-ups operating in the Middle East region with the potential to deliver breakthrough solutions across the key challenge areas of decarbonisation – from micromobility to grid management.



## 2. Score



Develop an **assessment framework**



**Score the start-ups** against the assessment framework, and **refine to interview 100 finalists**

We developed an assessment framework, as illustrated in Figure II, to analyse potential innovators for inclusion within the Net Zero Future50 report. Commencing with a pool of 500 candidates from our extensive database, we curated a shortlist for in-depth interviews, culminating in the selection of a refined cohort of 100 candidates to advance to the final evaluation stage. Our analysis considered the innovation and sustainability (both environmental and commercial), unique value proposition (breakthrough potential), their solution market fit including scalability (the speed at which we think it is possible for them to accelerate) and their solution readiness; the company's maturity (where they are on the journey right now).

### 3. Select



Map **GHG weightings to shortlisted companies** to ensure sectoral coverage



Select a **list of 50 companies** that represent significant **emerging technologies**

A final group of judges across the fields of Environmental, Social, and Governance (ESG), digital innovation and transformation, energy, utilities and resources, then selected the final Net Zero Future50 based on the composite ranking of (i) innovation and sustainability (ii) unique value proposition (iii) solution market fit and (iv) solution readiness. They were supported by a team of interviewing consultants and profile writers.

This list is neither exhaustive nor exclusive but intends to show that there are decarbonisation opportunities across all sectors.

We undertook a cross review to make sure all sub-sectors have enough coverage to give readers insights into the breadth of innovation taking place, taking into consideration sectors relative to their total GHG emissions at a Global and Middle East level, but noting also an additional number of interesting companies ("Ones to Watch") within the sector.



**Figure II: PwC Net Zero Future50 - Middle East scoring and assessment framework.**



#### **i. Innovation & sustainability**

- Net Zero impact
- Broader ecological impact
- Social and societal impact
- Gender diversity weighting



#### **ii. Unique value proposition**

- Break-through potential
- Complexity of delivery
- Uniqueness of offering



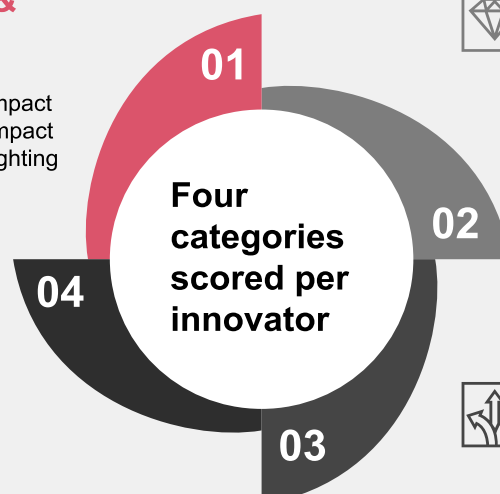
#### **iv. Solution readiness**

- How progressed is it
- Company maturity
- Technology maturity
- Capital intensity



#### **iii. Solution market fit**

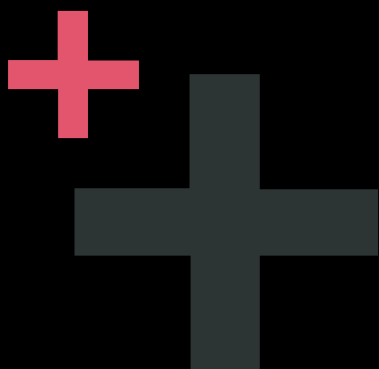
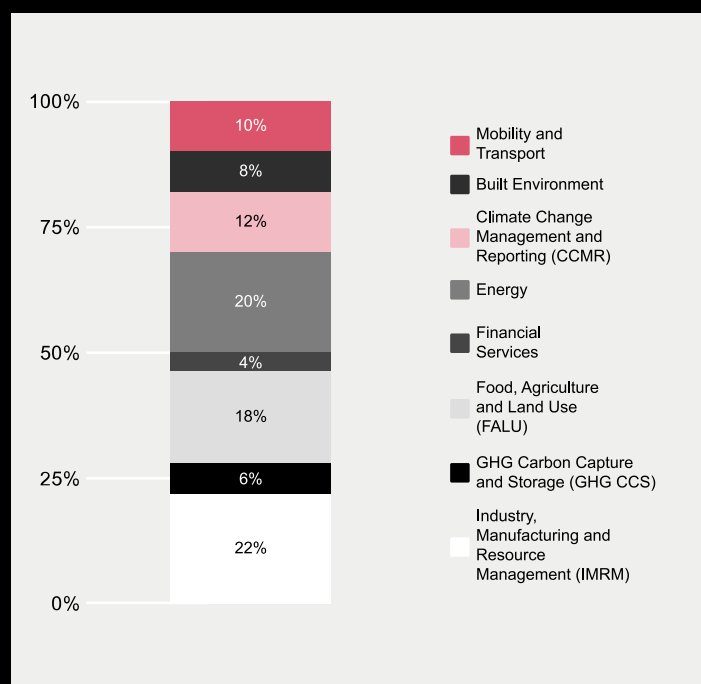
- Size of the addressable market
- Commercial viability
- Environmental attractiveness
- Potential to scale



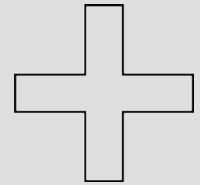
# RESULTS: 2023 PwC Net Zero Future50 - Middle East

The below shows the split of the Net Zero Future50 - Middle East companies across different sectors and cross-cutting themes, which were apportioned approximately according to their contribution to GHG emissions.<sup>15</sup>

**Figure III: PwC Net Zero Future50 - Middle East results by sector % breakdown.**



# Figure IV



## Results: 2023 PwC Net Zero Future50 - Middle East

11



Industry, Manufacturing and Resource Management (IMRM)



### Disruptors

#Biotechnology, #Blockchain, #AI, #CircularEconomy  
#MobileApps, #AdvancedRecycling, #AlternativeMaterials

10



Energy



### Disruptors

#RenewableEnergy, #Hydrogen, #SmartTechnology,  
#EnergyManagement, #PredictiveAI, #EmissionsMonitoring,  
#AlternativeMaterials

9



Food, Agriculture and Land Use (FALU)



### Disruptors

#Drones, #VerticalFarming, #Biomimicry, #WasteManagement  
#ControlledEnvironmentAgriculture, #Cloud, #Blockchain  
#UpcycledWaste, #AI, #Biotechnology

6



Climate Change Management and Reporting (CCMR)



### Disruptors

#Cloud, #Analytics, #DataVisualization, #DataMapping  
#MachineLearning, #GIS, #Blockchain, #SaaS, #AI

5



Mobility and Transport



### Disruptors

#KineticEnergySystems, #Robotics, #BatteryRecycling  
#AutonomousVehicles, #EVs, #CarbonMarkets  
#ArtificialIntelligence

4



Built Environment



### Disruptors

#Nanomaterials, #3DPrinting, #AI, #EnergyEfficientTechnology,  
#SmartDevices

3



GHG Carbon Capture and Storage (GHG CCS)



### Disruptors

#CarbonMineralization, #NatureBasedSolutions, #CarbonCapture  
#ModularTechnology

2



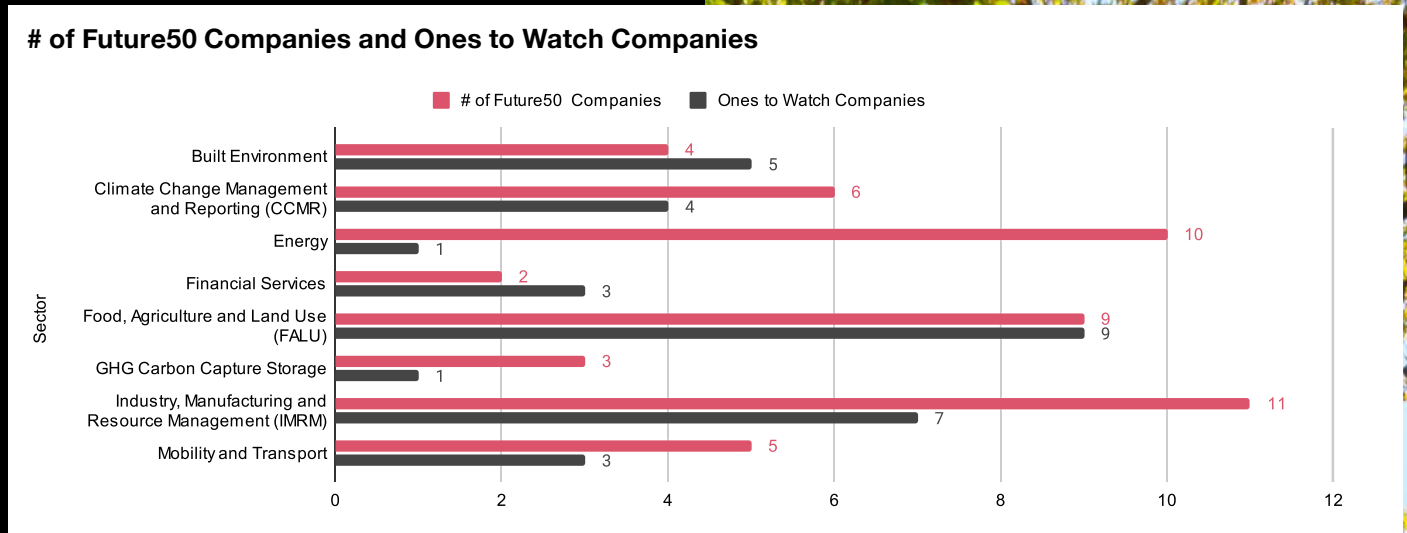
Financial Services



### Disruptors

#ImpactInvesting, #AI, #MachineLearning, #DataVisualization  
#CarbonOffsets, #NFTs, #MobileApplications

**Figure V: Consolidated breakdown of PwC Net Zero Future50 - Middle East and Ones to Watch.**



### Sector analysis: Summary of approach

In the following sectoral analyses, we have focused primarily on the three sectors that together constitute about two-thirds of the total Future50 entrepreneurs in the Middle East: **IMRM (22%)**, **Energy (20%)** and **FALU (18%)**.

The remaining technologies that make up the rest of the companies are in **Climate Change Management and Reporting (12%)**, **Mobility and Transport (10%)**, **Built Environment (8%)**, **GHG Carbon Capture and Storage (6%)** and **Financial Services (4%)**.

Across each sector, we explore the breakthrough role that our tech-enabled shortlist of companies might play, examining a sequence of questions:



#### Key facts:

- What is the sector's GHG contribution?
- What is the current VC investment on an annual basis?



#### Industry analysis:

- What are the **barriers** to decarbonisation?
- What are the **accelerators** to decarbonisation?
- What are the **emerging technological drivers** to watch?
- What are the **growth areas** where commercially viable start-ups are emerging?
- What are some **illustrative examples** of strategic alliances?

# Industry, Manufacturing and Resource Management



29%

of ME GHG emissions<sup>16</sup>



\$39m

Total VC sector investment in Middle East (Oct '17 - Aug '23)<sup>17</sup>



11

Companies in the Net Zero Future50 - Middle East

The Middle East invests about 4% of its total climate tech investments in the Industry, Manufacturing and Resource Management (IMRM) sector, which is only about a third as much as the global share allocated towards this sector. However, these limited investments are not commensurate with the level of innovation in this space. The IMRM subsector is tied with the Food, Agriculture and Land Use sector with the highest number of companies – 18 overall – on our Future50 and Ones to Watch lists. Almost half of the companies we highlight are in the waste management sub-sector, underlining that the region has room to make great strides in this area. Such waste-management companies include B2Square, which makes more sustainable “bio bitumen” from biological waste; Spootainable, which upcycles residuals, such as cocoa beans into edible plastic; and Terrax Environmental, which recycles a wide variety of substrates. Other notable IMRM sub-sectors include energy and resource-efficient manufacturing processes; transformative circularity; recycling and materials efficiency solutions; and low-GHG materials and materials recycling.

## Technology drivers:

#Biotechnology #Blockchain #AI  
#CircularEconomy #MobileApps  
#AdvancedRecycling  
#AlternativeMaterials

## Barriers:

**Access to capital:** Middle Eastern lenders are generally inclined to invest in established or state-sponsored projects, rather than in start-ups. This limits the ability of up-and-coming climate tech companies to secure adequate access to capital.

**Government support:** Only 10% of the GCC's plastic and metal waste is recycled, compared to 90% of the metal waste and 40% of the plastic waste in Germany and Japan.<sup>18</sup> This is because many Middle Eastern countries do not have policies that support circular economies. For example, due to a lack of regulation, products in the Middle East are made in material combinations that are less easy to recycle than in other regions, making establishing a circular economy that much more challenging.

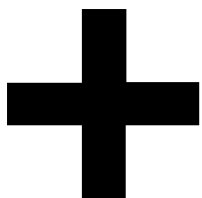
**Less mature waste-management systems:** There is a shortage of recycling and other waste-management facilities in the Middle Eastern countries. They lack systems to separate waste streams, adding excess volume to landfills. In turn, this causes companies and governments in the region to lose out on potential opportunities to recoup value through recycling and upcycling.

**Public interest:** Public awareness of and interest in recycling in the Middle East is limited compared to other regions.<sup>19</sup>

## Accelerators:

**Need for greater efficiency:** As Middle Eastern countries face water and landfill shortages, governments are being incentivised to seek more efficient solutions in managing resources and manufacturing.

**Materials and process innovations:** Following significant government push, next-generation materials and systems are expected to enter the market to create more diversified economies.



## Growth areas:

**Waste management technology:** Due in part to its rapid population growth, the Middle East has high levels of waste but insufficient systems to separate and address waste streams.<sup>20</sup> Waste is typically deposited in landfills, which is suboptimal for the environment. Moreover, this results in the loss of many potentially useful substrates, such as those used in hydrogen fuel production.<sup>21</sup> Thus, there is economic opportunity in improving waste management, not to mention the environmental benefits and the ability this could give the Middle East to manage and support population growth more effectively.

**Energy and resource-efficient manufacturing processes:** Companies can improve the sustainability of their products not only by using less emissive or more renewable materials, but by processing them with more efficient techniques with smaller carbon footprints. In the Middle East, noteworthy growth areas include water desalination, supply-chain efficiency powered by blockchain, and circular economies facilitated by easy-to-use digital platforms.

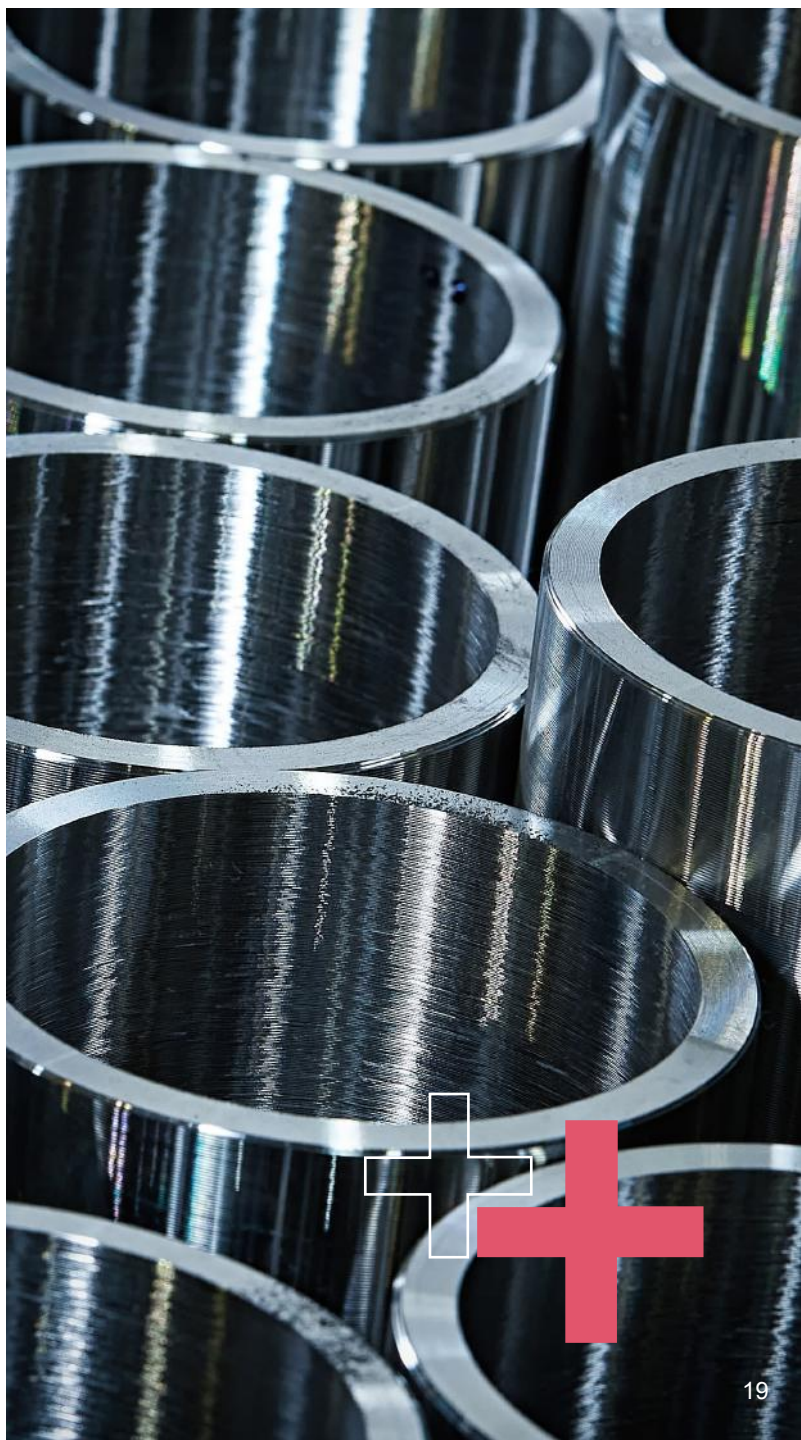
**Transformative circularity, recycling and materials efficiency solutions:** Effective recycling and circularity solutions connect across industries and create value-driving synergies. Products ranging from packaging to clothing can be made more sustainable by being made out of recycled materials.

**Biomass power, biotechnology and biopolymers:** One way to help reduce the burden on Middle Eastern landfills is by making biodegradable products, particularly plastics. In conjunction with greater recycling efforts, these could significantly reduce the overall volume of waste.

**Low-GHG plastics or plastic alternatives:** The Middle East has an advantage in producing virgin plastics due to its access to plastic feedstocks. However, globally, demand for recycled plastics is expected to outpace demand for virgin plastics. By 2030, PwC estimates a global shortfall of 25 million tons of recycled plastic, meaning the Middle East must increase its access to high-quality plastic waste and build up its recycling infrastructure.<sup>22</sup> Another potential solution is developing new types of plastic that can be made from alternative sources.

**Low-GHG materials and materials recycling:** Due to a lack of infrastructural support, Middle Eastern consumers who are looking for low-GHG materials and opportunities to recycle are often unsuccessful in their quest. Companies in this sub-sector are addressing these needs by building ways to connect producers and consumers to reduce waste and increase circularity. In this area, increasing consumer awareness of eco-friendly options will be critical.

**Low-GHG concrete and alternatives for construction:** As the Middle East continues to increase its construction, its need for concrete and building materials is skyrocketing. The region's demand for concrete is expected to grow at a CAGR of 3.2% from 2022 to 2028.<sup>23</sup> Alternatives to the highly emissive materials traditionally used in construction can reduce embodied emissions and upcycle materials, such as plastics that would otherwise go into landfills.

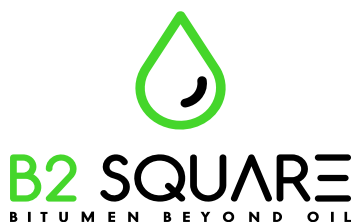




# Future50

Industry, Manufacturing  
and Resource Management

Waste Management Technology



B2 SQUARE



<https://bitumenbeyondoil.com>

#BuiltEnvironment #ClimateTech  
#GreenManufacturing

## Headquarters:

Germany

## Middle East operational countries:

Oman, Qatar, Saudi Arabia, United Arab Emirates

## Summary

B2 Square, which is meant to denote 'Bitumen beyond Oil', seeks to **re-engineer and decentralise bitumen production**. Its technology is focused on using natural and biogenic ingredients and biowaste sources to produce **instant and carbon-negative green bitumen** for supply.

## Impacts

B2 Square claims that its **100% bio-bitumen product** is **significantly more durable** than traditional bitumen and contributes well to its goal of CO2-negative road-building. Accordingly, B2 Square highlights its potential to significantly decrease GHG emissions and provide a sustainable alternative to fossil fuel dependency in the construction and road building sectors.

## Highlights

B2 Square is a subsidiary of ASC (ALBR3CHT), which won the **Germany Innovation Award 2021** in the "Materials and Surfaces" category.<sup>24</sup> B2 Square notes that, since launching in November 2021, it has installed verified interest, tests and pilot projects in Strabag,<sup>25</sup> Germany, as well as in South Africa with **Much Asphalt** and in Japan with **Nippon Road**.<sup>26</sup>

## Strategic alliances:

- Bitumen Users
- Highways (Roads)
- Construction (Roofing)
- Automotive Production Companies

## List impact technologies:

Carbon Capture Usage and Storage (CCUS)





# Future50

Industry, Manufacturing  
and Resource Management

Waste Management Technology



## CERCLE X

Cercle X



<https://cerclex.com>

#GreenManufacturing

## Headquarters and Middle East operational countries:

United Arab Emirates

## Summary

CercleX is a web3 waste management company, offering a unified, **blockchain-enabled platform that connects brands to thousands of traders, aggregators, and recyclers.**

## Impacts

CercleX seeks to help consumers, businesses, and cities manage **waste more effectively** by providing tools for waste pick-up, waste tracking and analytics, and recycling. Ultimately, with its circular economy approach, CercleX looks to reduce the amount of materials used and to **minimise the environmental impact of waste management.**

## Highlights

CercleX reports having won multiple awards for responsible waste management, including the Impactful **Cleantech Startup Award** from the Federation of Indian Chambers of Commerce and Industry (FICCI), and being a finalist in the ClimaTech Run competition at **COP27** in Egypt.

The company also mentions having partnerships with organisations, such as **Coca-Cola**,<sup>27</sup> **Mondelez**, **Dr Reddys** and **Volkswagen** and **Panasonic** focused on their waste management, and has **raised more than US\$250,000**<sup>28</sup> in equity finance.

## Strategic alliances:

- Businesses (Large Companies)
- Internet of Things (IoT)
- Artificial Intelligence
- (AI)-Based Businesses
- Plastic Manufacturers
- Battery
- Tyre
- Paper
- Metal
- E-Waste
- Plastic Recyclers

## List impact technologies:

Low-GHG Plastics, Blockchain

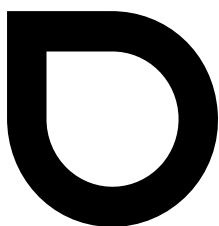




# Future50

Industry, Manufacturing  
and Resource Management

Energy/Resource Efficient Manufacturing



Desolenator



<https://www.desolenator.com/>

#GreenManufacturing

## Headquarters:

Netherlands

## Middle East operational countries:

United Arab Emirates

## Summary

Desolenator has designed a **modular solar thermal desalination solution**, which it describes as harnessing photons from the sun to transform seawater or brackish water into high-quality pure water with no harmful chemicals or harm done to the environment. Its solution promises low maintenance along with a low carbon footprint, and the company provides it both directly and as a service, with customers able to choose their desired output between **high-quality drinking water** or **ultrapure water for the production of green hydrogen**.

## Impacts

Desolenator claims to be building a **fully circular desalination system** where **waste brine is recycled into resaleable solid rock salt** with nothing returning into the environment. The company adds that its patented PVT panels harvest four times more solar energy than traditional PV panels.

## Highlights

Desolenator is part of the **Masdar Innovate** initiative,<sup>29</sup> and has won a number of awards, including the **2020 WEX Global Awards**.<sup>30</sup> The company is recognised by the **World Economic Forum** as an innovator in the field of water purification and sustainable technology.<sup>31</sup>

Desolenator reports that it has registered three international patents and is fully operational at scale. Desolenator has built and delivered a carbon-neutral water desalination plant for **Dubai Electricity and Water Authority (DEWA)** following its participation in the **Dubai Future Accelerator**.<sup>33</sup>

Desolenator has announced a project with **Silal**, as part of **ADQ**, deploying the **first solar desalination plant for agriculture** in Abu Dhabi.<sup>34</sup> The company anticipates this to be completed ahead of COP28. Desolenator's Board of Directors is chaired by Paddy Padmanathan, the CEO of ACWA Power.<sup>35</sup>

## Strategic alliances:

- Corporations
- Government
- Research Institutes
- NGOs
- Agriculture
- Development
- Islands Nations

## List impact technologies:

Green Hydrogen Production Solar Power,  
High-Efficiency Heating and Cooling,  
Desalination





## Future50

Industry, Manufacturing  
and Resource Management

Transformative Circularity, Recycling  
and Low-GHG / Efficient Materials

# DRESSARTE

Paris

*Custom-made*

DRESSARTE



<https://www.dressarteparis.com>

#GreenManufacturing

### Headquarters:

United Arab Emirates

### Middle East operational countries:

Qatar, Saudi Arabia

### Summary

Dressarte is an online service that leverages **virtual tailoring and styling to create custom-made sustainable clothing**. Its approach seeks to utilise surplus fabrics and to leverage 3D design and virtual measurements. Outfits are designed with a strong emphasis on sustainability and high-quality craftsmanship. Dressarte indicates that it reduces waste and supports local production while delivering custom clothes with just a click.

### Impacts

Dressarte emphasises that it implements sustainable practices, such as producing clothes on demand and utilising certified surplus fabrics from designer brands – **reducing waste that goes to landfills**. The company also enables customers to sell preloved custom-designed clothes online, further combating overproduction and fashion waste, which contributes to **10% of global carbon emissions**.<sup>36</sup>

### Highlights

Dressarte reports participating in the **Standard Chartered Bank Women in Tech** accelerator,<sup>37</sup> and being a finalist in two competitions: **Visa She's Next**<sup>38</sup> and **TiE Global Women MENA UAE**.<sup>39</sup>

### Strategic alliances:

- Businesses (SMEs)
- NGOs
- Fashion Houses
- Augmented Reality Developers

### List impact technologies:

AI, Extended Reality (XR)





# Future50

Industry, Manufacturing  
and Resource Management

Biomass power, Biotechnology  
and Biopolymers



**NATRIFY**  
A Sustainable Future

Natrify



<https://natrify.github.io/web>

#GreenManufacturing #ClimateTech

## Headquarters:

Egypt

## Summary

Natrify seeks to produce **bioplastics via genetically engineered microorganisms**. The bioplastic has the same features as regular plastic, while being biodegradable with zero microplastics, and is 100% non-toxic. Natrify claims that it is one of the earliest manufacturers to sell and licence the technology globally with a selling price that is equivalent to plastics.

## Impacts

Natrify states that its product, Adigide, is **designed to biodegrade naturally in any environment, including marine environments**. The company claims that the product shares the same characteristics and applications as petroleum-based plastic, yet causes zero environmental harm. Natrify's manufacturing process and the nature of its products is reported to deliver 98% zero-carbon emissions.

## Highlights

Natrify is reported to have **raised a six-figure pre-seed round** from Ambo Ventures and received a number of grants to develop its product.<sup>40</sup>

## Strategic alliances:

- Major FMCGs
- Governments
- R&D Labs
- R&D Partners within Saudi

## List impact technologies:

Low-GHG Plastics





## Future50

Industry, Manufacturing  
and Resource Management

Low-GHG Plastics, Plastic Alternatives

# PLASTUS

Plastus Biotech



<http://www.plastus.com>

#ClimateTech

## Headquarters and Middle East operational countries:

Saudi Arabia

## Summary

Plastus is a biotech company that **converts organic waste into biodegradable bioplastics** using a fermentation process. It claims to divert waste oil, returning bio-sequestered carbon to the earth and reducing organic waste stream. As a result, Plastus' patented technology addresses multiple issues, including food waste and plastic pollution.

## Impacts

Plastus notes that they provide a circular economy model that addresses challenges in decarbonisation, GHG, waste reduction, food security, and water scarcity.

The company utilises seawater to save on the purification and extraction costs, and claims that its **bioplastics have US\$0 end-of-life cost** because they degrade safely in soil or ocean, unlike most other types of bioplastics that require a special processing plant.

## Highlights

Plastus has participated in the **TAQADAM Accelerator**,<sup>41</sup> which is part of the KAUST Innovation Fund. It has reported receiving a few equity-free awards – this includes the **LEAP Award 2023 for US\$250,000** won in Riyadh in March 2023<sup>42</sup> — and registering two patents, including one for its entire lab protocol. Plastus finished as the second runners-up at the **2021 Entrepreneurship World Cup** pitch competition<sup>43</sup> and cites receiving support from Misk, Monsha'at and the Kingdom of Saudi Arabia's Ministry of Communications and Information Technology.

## Strategic alliances:

- Government
- Businesses (Large Companies)
- Universities
- Restaurants
- Catering Product Manufacturers

## List impact technologies:

Low-GHG Plastics, Food Waste Technology





## Future50

Industry, Manufacturing  
and Resource Management

Low-GHG Materials,  
Materials Recycling

# SPACECOOL

SPACECOOL



<https://www.spacecool.jp/en/>

#BuiltEnvironment #ClimateTech

### Headquarters:

Japan

### Middle East operational countries:

Egypt, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates

### Summary

SPACECOOL has developed a **radiative cooling material solution**, which, as the company notes, lowers the temperature to below that of ambient air without consuming any energy.<sup>44</sup> The company explains that this unique patented optical control technology involves optical films that block heat from the sun, suppress heat absorption and radiate heat into space.

SPACECOOL claims that when used in living and energy transportation applications, its product creates comfortable spaces by controlling internal temperatures and consequently **reducing the environmental impact of air conditioning**.

### Impacts

SPACECOOL notes that its product was shown to **reduce summer power consumption by 20%** in pilot tests, contributing to energy conservation and CO2 emissions reduction, as well as to deliver a 15-degree reduction in temperature when installed in a part of a client's building in Japan.

### Highlights

SPACECOOL claims that it has **more than 100 customers in Japan**, including major companies, such as **Honda**<sup>45</sup> and **ENEOS**.<sup>46</sup> Supported by the Japan External Trade Organisation (JETRO), the company has been venturing into the Middle East. With JETRO support, SPACECOOL exhibited at GITEX in the UAE in both 2021<sup>47</sup> and 2022,<sup>48</sup> and reports participating in Saudi Arabia's **LEAP in 2023**.<sup>49</sup>

### Strategic alliances:

- Manufacturing Companies
- Businesses (Large Companies/SMEs)
- Construction Companies
- Governments (Central Authorities)

### List impact technologies:

High-Efficiency Heating and Cooling, Smart Buildings, Food Waste Technology





## Future50

Industry, Manufacturing  
and Resource Management

Waste Management Technology

# Spoontainable

Spoontainable GmbH



<https://spoonstainable.shop/en>

#GreenManufacturing

## Headquarters:

Germany

## Middle East operational countries:

United Arab Emirates

## Summary

Spoontainable offers a sustainable solution to the plastic problem in restaurants and gastronomy sectors, as well as to industrial food waste – it **upcycles residuals, such as cocoa bean shells into fibre**, which it then **produces edible plastic alternatives**. Its products include edible spoons, stirrers, and straws, with plans to expand into full cutlery sets.

## Impacts

Spoontainable claims that by selling nine million sustainable cutlery pieces so far, it has **saved around 37 tonnes of plastic waste** and salvaged more than 10 tonnes of food waste, which in turn has **offset 145 tonnes of CO2 emissions**.<sup>50</sup> Spoontainable notes using energy-efficient processes for production, recycling its shipping materials, and working with a climate partner to offset any remaining emissions.

## Highlights

Spoontainable's accolades include being named among the top10 companies in Baden-Württemberg (Germany) 2022<sup>51</sup> and winning the AmCham Female Founders Award 2021.<sup>52</sup> Its sustainable circular approach has also been recognised with the **Green Brand seal of approval**, an **international certification for environmentally sustainable brands** in the European Union. It has also raised more than **US\$500,000 in equity**<sup>53</sup> and sought to patent its process for producing sustainable and edible cutlery alternatives.

## Strategic alliances:

- Universities
- Government
- Wholesalers and Distributors
- Bakeries

## List impact technologies:

Food Waste Technology, Sustainable Circular Economy Approach, Single-Use Plastic Reduction





## Future50

Industry, Manufacturing  
and Resource Management

Waste Management Technology

# terrax

Terrax Environmental Limited



<https://terrax.world/>

#BuiltEnvironment  
#GreenManufacturing #ClimateTech

### Highlights

Based in **Masdar City**, Terrax is an alumnus of the **PepsiCo GreenhouseAccelerator**<sup>54</sup> and the **Mohammed Bin Rashid Innovation Fund**,<sup>55</sup> and notes also participating in the **Emaar Innovation Challenge 2022** and in the **C3 Impact Accelerator**. Additionally, its stated partner product, Trident Trackway was named Sustainable Business of the Year at the **MEED Gulf Capital SME Awards 2021**<sup>56</sup> and participated in the **Start AD Academy for Women Entrepreneurs in 2021**.<sup>57</sup> Terrax adds that it is working on trials with both **Emaar** and **PepsiCo** to bolster their waste management and recycling efforts.

### Strategic alliances:

- Government
- Construction Companies
- Events Companies
- Waste Management Companies

### List impact technologies:

Low-GHG Plastics

### Headquarters and Middle East operational countries:

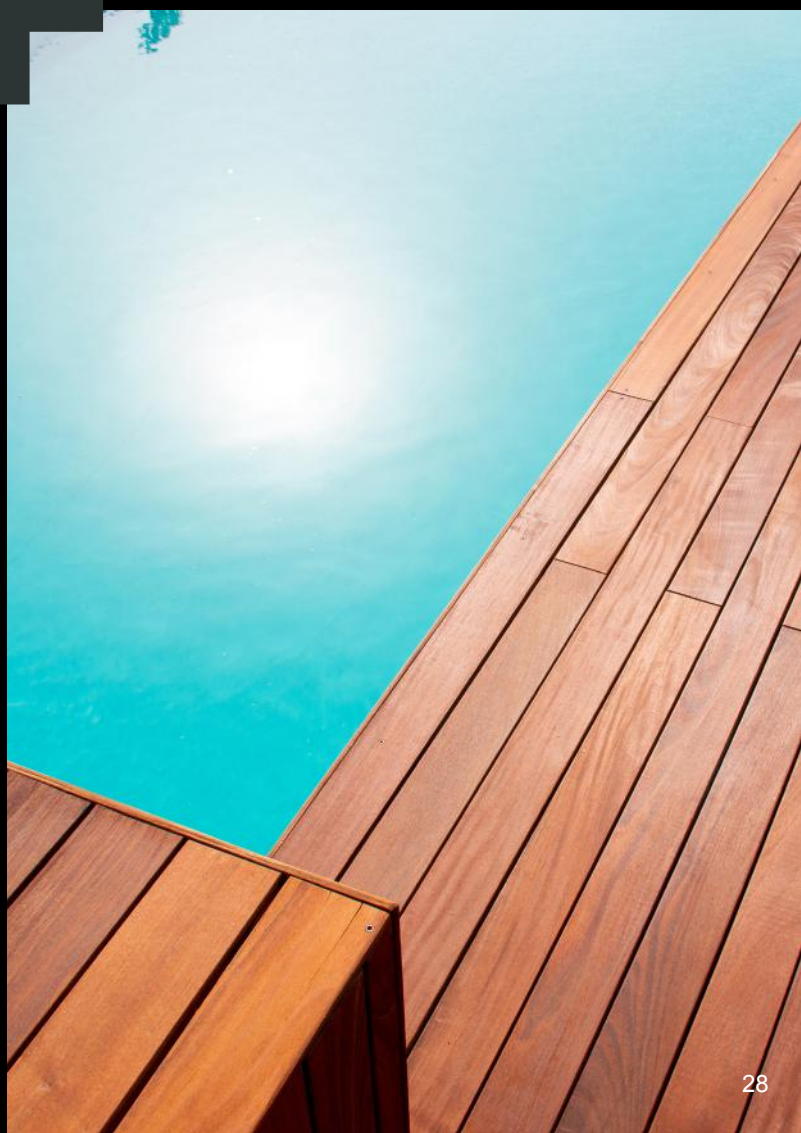
United Arab Emirates

### Summary

Terrax is a waste-processing company focused on **transforming unsegregated plastic and organic waste to replace virgin materials**, such as plywood, pallets and lumber that is used for construction, logistics and events. It suggests that the carbon footprint of its local recycled products (decking, plywood, etc.) is at least three times less than the same compounded processed wood products, notwithstanding the transport and shipping carbon footprint of the latter arising from importing.

### Impacts

Terrax notes that it is able to recycle waste that others cannot, and that it consequently helps **reduce import dependencies, waste pollution, waste sent to landfills and deforestation**. Aside from using waste to make wood replacement products, reducing carbon emissions through its low-carbon products and reducing shipping and transport through its "local waste to local market" approach, Terrax seeks to eliminate the need to segregate input waste and to help create a working environment that is less detrimental to humans working with waste.





# Future50

Industry, Manufacturing  
and Resource Management

Waste Management Technology



The Waste Lab



<https://www.thewastelab.com>

#NatureBasedSolutions

## Headquarters and Middle East operational countries:

United Arab Emirates

## Summary

The Waste Lab **salvages food and organic waste** from households and businesses that would normally end up in landfills, and creates **compost and other byproducts** from it. The company notes that it follows natural, on-farm composting on its farmland and **repurposes other rescued materials**, such as **sawdust and discarded wooden pallets** from local carpenters, **spent mushroom substrate** from mushroom growers and **discarded roots and stems** from vertical farms.

## Impacts

The Waste Lab claims to have **diverted 222 tons of waste from landfills in the first three quarters of 2023**, resulting in the **production of 67 tons of compost** and the **avoidance of 255 tons of CO2 emissions**.

Locally produced compost can **reduce the amount of compost that needs to be imported**, boosting carbon footprint reduction as well as building healthy soil for farmers requiring less irrigation. The company creates further social impact by conducting hands-on workshops to help communities practise proper organic waste-sorting at source, as well as repurposing food waste from their homes or place of work.<sup>58</sup>

## Highlights

Winner of **Visa She's Next** grant program.<sup>58</sup> The Waste Lab notes that it has secured clients such as Conrad Hotel from the **Hilton Group** and **VOX Cinemas** from **Majid Al-Futtaim Group**, as well as **BOCA Restaurant** and **Coffee Planet**.<sup>60</sup>

During Ramadan in 2023, The Waste Lab secured a **partnership with car brand Kia**<sup>61</sup> to launch a three-stage GCC operation transforming food waste into healthy compost, and raising awareness on the importance of reducing food waste at every level and of using nature-based solutions. The company is reported to have **secured more than USD 150,000**<sup>62</sup> in equity and grant finance.

## Strategic alliances:

- Business (Large Companies)
- NGOs
- Research Institutes
- Hospitality Chains
- Farms
- Food Producers

## List impact technologies:

Food Waste Technology





## Future50

Industry, Manufacturing  
and Resource Management

Low-GHG Concrete/  
Alternatives for Construction



Tile Green



<https://www.tilegreen.org/>

#LowGHGConcrete

## Headquarters and Middle East operational countries:

Egypt

### Summary

TileGreen is focused on **creating high-performing, 100% eco-friendly paving tiles** and other building materials from low-value unrecyclable plastic waste, replacing cement and other unsustainable building material. TileGreen's technology accommodates all types of plastic waste, and the company promotes its potential to create more than 45 variants of building materials.

### Impacts

TileGreen promises average-priced building material products that are **20x more weather-resistant and 2x stronger** than cement-based alternatives, while maintaining the same specifications – an overall offering that the company concludes is economic, environmentally friendly and high-performing. TileGreen indicates that its products are fully circular and that its production process is **water-negative, plastic-negative and carbon-negative**.

### Highlights

TileGreen notes participating in the **2021 AUC Venture Lab Accelerator** program,<sup>63</sup> as well as working with large partners such as **SODIC**,<sup>64</sup> which it mentions tests its products and shares feedback, and the **European Bank for Reconstruction and Development (EBRD)**.<sup>65</sup>

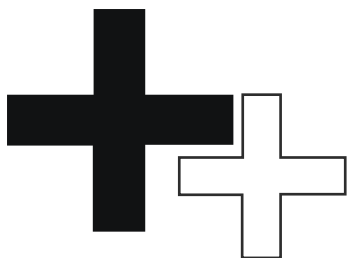
### Strategic alliances:

- Construction Developers
- Universities
- Real Estate Developers
- Government Infrastructure

### List impact technologies:

Low-GHG Concrete, Smart Buildings, Carbon-Negative Building Materials, Recycling Low-Value Plastic Waste, Recycling Construction Waste





## Ones to Watch

### Industry, Manufacturing and Resource Management

**BANTGO**

Headquarters and Middle East operational countries: United Arab Emirates

Waste Management Technology | **Green Finance**

BANTgo aims to **promote the circular economy** by rewarding users with non-fungible tokens (NFTs) for recycling waste at existing collection points. It states that its **AI-powered chatbot**, Impact2earn, guides users to recycling locations and that their actions earn tradable **NFT rewards**, which are created from photos received by the chatbot. BANTgo adds that these rewards can be exchanged for discounts on products or carbon credits.

BANTgo has been shortlisted as one of 25 startups participating in Etisalat's Hello Business Pitch 3.<sup>66</sup> BANTgo is also part of the **NVIDIA AI Inception program**.<sup>67</sup> It has participated in a number of accelerators, including the **Bedayat by SEE Institute**<sup>68</sup> and the **Global Emirates Aluminium RampUp Programme**.<sup>69</sup> The **Dubai Economic Department** selected BANTgo as one of the Dubai representatives to showcase at **VivaTech 2023 in Paris**.<sup>70</sup>

#Waste To Energy  
#Artificial Intelligence

[www.bantgo.ae](http://www.bantgo.ae)



Headquarters and Middle East operational countries: Egypt

Waste Management Technology | **Green Finance**

Bekia offers a mobile app that aims to facilitate the recycling of inorganic waste, such as paper, plastics and metals. It states that this waste is picked up by nearby collectors, with users then receiving cash in their mobile wallets or bank accounts in exchange.

Bekia notes that business and domestic users are consequently incentivised to clean and segregate their waste, adding that its solution also helps recycling plants reduce costs. The firm notes that it has **activated 22,000 mobile wallets** and collected **12 million plastic bottles**. **aiBank** is reported to have signed a partnership with Bekia to handle its paper waste with a promise to donate the funds collected to charitable interests in Egypt.<sup>71</sup>

#Waste To Energy

[www.bekia-egypt.com](http://www.bekia-egypt.com)



Headquarters: Norway

Middle East operational countries:  
Saudi Arabia, United Arab Emirates

Waste Management Technology | **Climate Tech**

Cycled Technologies has developed a proprietary Smart Recycling Station, which it describes as adapting AI technology to **automatically detect and sort recyclables within communities**. The company adds that this incentivises recycling by rewarding consumers for each returned item through its associated mobile app.

Cycled Technologies notes that in 2022, its collection points were utilised 160,000 times with over **2 million plastic bottles redirected** to recycling facilities - which it estimates is the equivalent of **60 tons of CO2 emissions**.<sup>72</sup> Cycled Technologies participated in the Middle East **PepsiCo Greenhouse Accelerator**.<sup>73</sup>

#LowGHGPlastics  
#FoodWasteTechnology

[www.cycled.no](http://www.cycled.no)



Headquarters and Middle East operational countries: United Arab Emirates

Energy/Resource - Efficient Manufacturing | **Green Finance**

Distichain has designed a **supply chain API-driven platform** using **blockchain** that it claims integrates verification, fintech, and end-to-end supply-chain solutions under a single platform, together with a legal framework umbrella. The firm seeks to enable full automation of B2B marketplaces servicing global trade.

Distichain notes that digitising and integrating supply chain processes can help achieve **energy, product and transport efficiency**, which in turn contribute to decarbonisation of the industry through optimisation as well as real-time transparency and visibility.

A **HUB71 alumnus**,<sup>74</sup> Distichain has a project underway with the **Arab Federation for Digital Economy**,<sup>75</sup> serving as the official platform to support Arab food security initiatives.

#LowGHGShipping

<https://distichain.com/>



Headquarters: Denmark  
Middle East operational countries:  
United Arab Emirates

Transformative Circularity, Recycling, Low-GHG  
Efficient Materials | **Climate Tech**

RE-ZIP has developed what it describes as **alternative packaging to single use packaging**. It aims to **reduce carbon emissions from first circulation**, and states that its cardboard foldable circular packaging is patented and supported by software with traceability for courier companies and webshops, and that it connects to drop point networks.

RE-ZIP states that it enables the typical webshop to save 100% of packaging costs as its solution sees consumers opt to bear the cost of **circular packaging** in return for further vouchers from the webshop. In Life Cycle Assessment (LCA) reports carried out on RE-ZIP products, it was found that the company's packaging has an average return rate of 80%, equivalent to approximately 4.4 circulations, which reduces CO2 emissions.<sup>76</sup>

#CircularPackaging

<https://re-zip.com/>



Headquarters: United Arab Emirates  
Middle East operational countries:  
Saudi Arabia

Low-GHG Materials, Materials Recycling | **Climate Tech**

Shift Eco seeks to be an e-commerce platform for eco-friendly products. It aims to help consumers and businesses go green by making vetted **eco-friendly products** easily accessible.

Shift Eco strives to encourage individuals and businesses to make environmentally conscious choices and contribute to the growth of a sustainable society.

The company reports that, to date, its efforts have prevented up to **21,000 equivalent units of plastic**, which typically ends up in landfills and oceans through the promotion of environmentally friendly options.

Shift Eco reports having interacted with more than 15,000 individuals who actively engage with the eco-shop and participate in its awareness sessions. Shift Eco also discloses having established over **90 partnerships with sustainability enthusiasts and organisations**.

#E-commerce

[www.shiftecoforbusiness.com](http://www.shiftecoforbusiness.com)



Headquarters and Middle East operational countries: United Arab Emirates

Energy/Resource Efficient Manufacturing | **Climate Tech**

The Surpluss describes its B2B digital app as helping companies **participate in industrial symbiosis** to reduce costs, generate new revenue streams, and reduce waste through resource sharing. The company states that its platform is **designed on the principles of circular economy** to help companies match underused resources with company requirements geographically nearby.

The Surpluss notes that this approach helps mitigate Scope 3 emissions through a localised collaborative framework and increases the standardisation and discovery of secondary materials. The Surpluss states that it has participated in the **Shell Startup Engine**,<sup>78</sup> University of Cambridge's Net Zero accelerator,<sup>79</sup> and Village Capitals' Greentech Program for Female Founders.<sup>80</sup> Furthermore, they state that they have been officially designated as an **Accelerator by the UN-backed Race to Zero**, one of only 29 global organisations around the world designated with this distinction.<sup>81</sup> It also reports having a patent pending for its intelligence matching methodology.

#ClimateTech  
#IndustryManufacturing  
AndResourceManagement

[www.thesurpluss.com](http://www.thesurpluss.com)

# Energy



46%

of ME GHG emissions<sup>82</sup>



\$752.8m

Total VC sector investment in Middle East (Oct '17 - Aug '23)<sup>83</sup>



10

Companies in the Net Zero Future50 - Middle East

The Middle East has taken a leading role in supporting energy - focused climate tech companies. In fact, 40% of Middle Eastern climate tech investment in the last 12 months has gone toward innovations in the energy sector. Renewable energy generation is a particular focus for investors: almost half — five out of 11 — of the Future50 energy companies offer innovations in renewable energy generation, such as Eden Geopower, which focuses on geothermal energy, and Hydro Wind Energy, which focuses on offshore wind power. Other innovations in grid management, energy storage and more, present additional opportunities to build a greener energy mix in the Middle East.

## Technology drivers:

#RenewableEnergy #Hydrogen  
#SmartTechnology #EnergyManagement  
#PredictiveAI #EmissionsMonitoring  
#AlternativeMaterials

## Barriers:

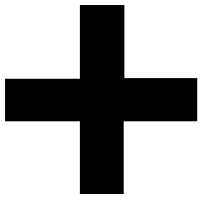
**Regulations and licensing:** Energy start-ups in the Middle East need to comply with regulations and lengthy approval processes, which can lead to delays, increased costs and uncertainty about outcomes. Regulations and licensing is cited as one of the top external challenges faced by innovators interviewed during the Future50 final assessment process (Exhibit 2).

**State-owned dominance:** State-owned energy entities often have a monopoly in the Middle Eastern markets and can limit opportunities for energy start-ups.

**Access to capital:** Traditional sources of financing may be more inclined to invest in established energy projects, leaving start-ups struggling to secure funding.

## Accelerators:

**Government support:** Saudi Arabia's Vision 2030, the UAE's Net Zero by 2050 Strategic Initiative and more, have all fostered the growth of renewable energy generation in the Middle East. These and similar plans integrate upgrades to public energy infrastructure, which provide an opportunity for new players to enter.



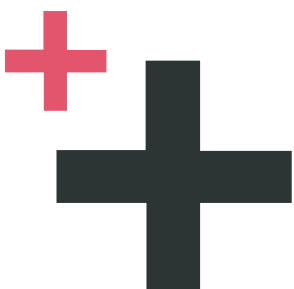
## Growth areas:

**Renewable energy generation:** Renewable energy can be generated from a number of sources, including geothermal, solar, wind and hydropower. Renewable energy in the Middle East grew by 12.8% between 2021 and 2022, but despite this growth, renewables only make up 5% of the Middle East's energy mix. Renewable energy is not only a key lever in its own right to reduce the region's emissions, but it also supports the decarbonisation of other industries.

**Grid management:** Grids in the Middle East require major improvements and upgrades to support sustainable fleets and other infrastructure. As the backbone of energy transition, they pose a significant opportunity for innovation and investment. Wireless power technology and management systems that provide energy for hard-to-reach areas could help expand the impact of renewable energy.

**Energy storage (thermal or electric):** Although they have a longer lifespan than other batteries and are widely used in EVs, lithium-ion batteries are harmful to the environment in both their production and their disposal.<sup>84</sup> The raw materials they require have damaging extraction processes, and they are often disposed of in unsafe ways. Alternative energy storage technologies, such as new forms of batteries or hydrogen, specifically liquid organic hydrogen carriers (LOHC), could reduce the need for rare-earth metals and other resource-intensive or non-biodegradable materials.

**Low-GHG extraction and maintenance:** These technologies reduce the emissions that are created when extracting materials from the ground or from maintaining energy infrastructure. Robotics, drones, automation and AI can allow companies to predict system failures and prescribe preventative solutions optimised to reduce energy use.





# Future50

Energy

Renewable Energy Generation



Eden GeoPower Inc



<https://www.edengeopower.com>

#ClimateTech

## Headquarters:

Saudi Arabia

## Middle East operational countries:

Oman, United Arab Emirates

## Summary

Eden GeoPower is on a mission to make the scalable and **sustainable extraction of earth's geothermal heat and natural resources** possible. It seeks to enable sustainable mining, carbon capture and sequestration (CCS), and carbon mineralisation.

## Impacts

Eden GeoPower suggests that it has enabled an energy development previously non-existent in the region – **geothermal power**.<sup>85</sup> It notes likewise advocating for geothermal development and carbon sequestration, and spending four years gaining traction.

The company indicates that its solution can be completely powered by renewable energy while generating **zero emissions** and has ambitions to use its technology to generate 'orange hydrogen', a cutting-edge method of producing hydrogen.

## Highlights

Eden GeoPower indicates that it holds three approved patents for "**System and Method for Pulsed Electrical Reservoir Stimulation (ERS)**",<sup>86</sup> which involves a method to increase reservoir permeability through pulsed electrical stimulation for petroleum and geothermal applications without requiring pumping of material into the subsurface. The company notes that it has also filed four additional patents for ERS technology, and that it has an additional pending patent involving **ERS for geologic hydrogen recovery**.

Eden GeoPower indicates participating in several acceleration programmes, including a few with the **Massachusetts Institute of Technology (MIT)**.<sup>87</sup> The company states that it has received US\$12 million through multiple grants and raised over US\$13 million in equity investment.<sup>88</sup>

Eden GeoPower has also signed an MoU with Oman's Ministry of Energy and Minerals (MEM) for deployment in a carbon capture and mineralisation project.<sup>89</sup>

## Strategic alliances:

- Eco-Company
- University
- Research Institutes
- Businesses

## List impact technologies:

Carbon Capture, Usage and Storage, Green Hydrogen Production, High-Efficiency Heating and Cooling, Geothermal, Orange Hydrogen





# Future50

Energy

Grid Management

# EMROD

EMROD



[www.emrod.energy](http://www.emrod.energy)

#BuiltEnvironment  
#ClimateTech

## Headquarters:

New Zealand

## Middle East operational countries:

United Arab Emirates

## Summary

EMROD is a technology company looking to transform the energy sector by introducing long-range **wireless power transmission**, which enables the safe and efficient transfer of large amounts of power wirelessly over long distances.

## Impacts

EMROD's proprietary technology uses electromagnetic energy for long-range wireless power transfer. It seeks to send power to remote areas and locations where traditional power line infrastructure is not viable, thereby providing **access to remote renewable energy sites**.<sup>90</sup> EMROD recently completed transmission tests at **Airbus Germany** to help explore how to cost-effectively deliver potential solar energy generated in space.<sup>91</sup>

## Highlights

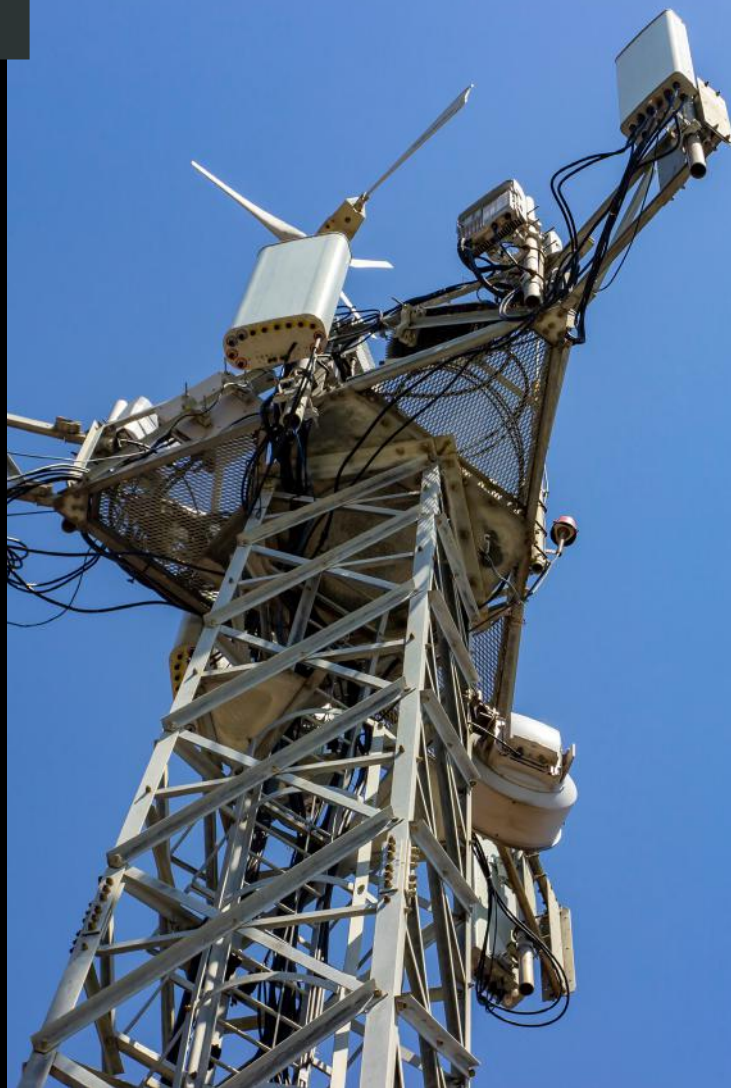
EMROD has been accepted into the **European Space Agency (ESA) Business Incubation Centers (BIC) programme**.<sup>92</sup> The company received an R&D grant from **Callaghan Innovation**,<sup>93</sup> a New Zealand government organisation, and an Ara Ake Grant from the New Zealand Energy Innovation Agency.<sup>94</sup> They were runners-up at the **Middle East Energy Startup Competition**.<sup>95</sup>

## Strategic alliances:

- Space Agency
- Government Agencies
- Energy Companies
- Telecommunications Companies

## List impact technologies:

Solar Power, Wind Power, Renewable Energy Generation, Renewable Energy Distribution





# Future50

Energy

Energy Storage (Thermal or Electricity)

## Hydrogenious<sup>LOHC</sup>

Hydrogenious LOHC Technologies GmbH



<https://hydrogenious.net/>

#ClimateTech

### Headquarters:

Germany

### Middle East operational countries:

Saudi Arabia, United Arab Emirates

### Summary

Hydrogenious is a clean tech company that provides **hydrogen storage technology** using **liquid organic hydrogen carriers (LOHC)** to store and transport hydrogen. The company's technology is designed to collect and reserve hydrogen gas that can be released and converted back to supply off-takers in the industry and mobility sector.

Hydrogenious notes that LOHC is not consumed but can be reused similar to a deposit bottle, and can be transported as easily as diesel without the need for it to be pressurised or temperature-regulated. The company states that it can **reuse existing liquid-fuel infrastructure**, bringing the safely stored hydrogen to wherever it is required for usage or export – including hard-to-reach places across the country.

### Impacts

Hydrogenious believes that hydrogen transportation will be fully decarbonised in the long-term, **bringing zero-CO2 energy** to every region in the world. Hydrogenious indicates that its offering allows for flexible hydrogen supply to consumers in industry and mobility across the globe, utilising **conventional liquid-fuel infrastructure**. The company adds that its solution infrastructure can be reused throughout the transporting cycle, resulting in an efficient circular system.

### Highlights

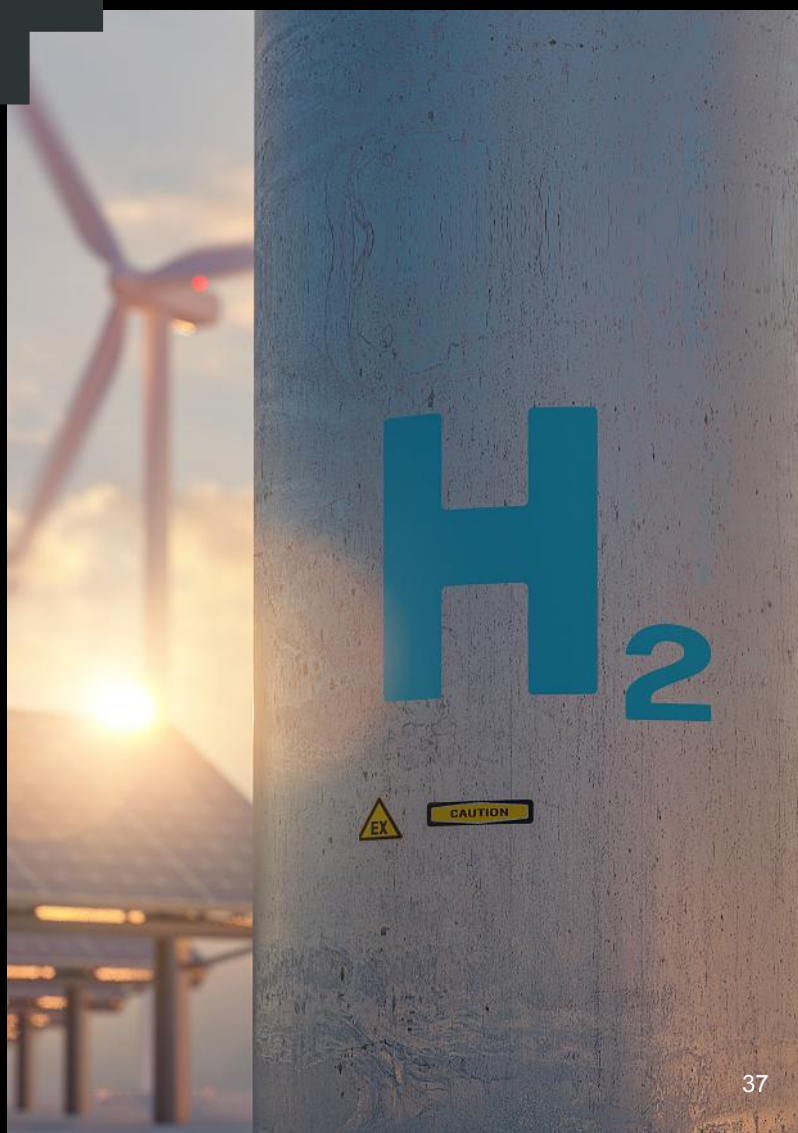
The company has reported that it has **55 patent families** around the world along with a diverse portfolio of investors, including large private corporations, such as **VOPAK**<sup>96</sup> and **Chevron**,<sup>97</sup> financial investor giants, such as **Temasek**<sup>98</sup> and **AP ventures**,<sup>99</sup> as well as public investments and grants from the EU. The company also indicates that it is partnering with major energy players in the region, such as **ADNOC**,<sup>100</sup> and Europe, such as **Uniper**<sup>101</sup> and the **Port of Amsterdam**.<sup>102</sup>

### Strategic alliances:

- Businesses (Large Companies)
- Government (Central Authorities)

### List impact technologies:

Hydrogen Transport Infrastructure





# Future50

Energy

Renewable Energy Generation



Hydro Wind Energy



<https://hw.energy/>

#ClimateTech  
#NatureBasedSolutions

## Headquarters and Middle East operational countries:

United Arab Emirates

## Summary

Hydro Wind Energy describes itself as developing a **disruptive technology** to provide **low-cost clean electricity**, **grid scale energy storage**, and seawater desalination. The company details that its **solution OceanHydro Omni** works with wind offshore in deep waters using vertical axis wind rotors and ocean-based mechanical energy storage systems.

## Impacts

Hydro Wind Energy states that its solution works towards lowering the cost of electricity, eliminating the volatility of **wind power** and **harnessing the entirety of the wind resource from 4m/s to 40 m/s**.

The company claims that its technology can therefore help increase energy generation, and helps to open up access to **offshore wind in deep waters where 80% of the world's wind resource exists**.<sup>103</sup> It notes that this contributes to lower deployment, operational and management costs.

**OceanHydro Omni** is a hybrid system that provides both grid services and on-demand energy storage capability. This helps increase grid stability that balances generation and consumption.

Hydro Wind Energy aims to reduce **CO2 emissions by 1 billion tonnes** by 2030. This is the equivalent of 2% of total carbon emissions globally.<sup>104</sup>

## Highlights

Hydro Wind Energy is part of the **Masdar Innovate Programme**<sup>105</sup> and indicates also participating in Shell StartUp Engine. To further its development, the company has sought participation in other accelerator programmes, such as Techstars Hub71 Accelerator in Abu Dhabi,<sup>106</sup> AWS Clean Energy<sup>107</sup> Accelerator Programme and the C3 HSBC Social Impact Accelerator.<sup>108</sup>

Hydro Wind Energy reports **raising more than US\$55 million** from investors, such as **Techstars**, **Hub71**, **Global Emerging Markets**, **Seedrs**, as well as private investors.<sup>109</sup>

## Strategic alliances:

- Government (Central Authorities)
- Research Institutes
- Utilities
- Multilateral Development Banks

## List impact technologies:

Offshore Wind Power, Energy Storage, Water Desalination





# Future50

Energy

Renewable Energy Generation



KESK



<https://www.keskco.com/portal>

#ClimateTech

## Headquarters and Middle East operational countries:

Iraq

## Summary

KESK aims to make smart solar energy solutions **trustable, accessible, and profitable for businesses in Iraq**. The company designs, supplies, and installs smart solar-powered air conditioning systems to be an off-the-shelf solution, which KESK believes is critically essential due to the limited electricity supply in Iraq. It further supports the system with a monitoring software that allows clients real-time data monitoring and control to optimise and offset energy costs.

## Impacts

KESK claims that its proposed solution has successfully managed to **offset 1,000 metric tons of carbon dioxide emissions per year** through implementation of its photovoltaic-powered air conditioners. Besides this, the company also provides engineering services in which it designs, supplies, and installs solar energy systems as per clients' requirements and provides software services to help it monitor and control its solar energy assets.

## Highlights

KESK claims to be Iraq's first greentech company. It has participated in the **Five One Labs** Iraq Accelerator<sup>110</sup> and has reportedly **raised an undisclosed pre-seed round of funding** with **Euphrates Iraq Fund** as lead investor.<sup>111</sup> KESK has won a number of grants and awards, most notably **US\$100,000** from the Cartier Women's Initiative Award in 2021.<sup>112</sup> Recently, KESK has been selected as one of the **Expo Live Global Innovators**,<sup>113</sup> which is part of the Expo Live Innovation Programme.

## Strategic alliances:

- Large Companies
- PV Manufacturers
- Oil and Gas Companies
- Humanitarian Organisations
- Micro-Financing Entities

## List impact technologies:

High-Efficiency Heating and Cooling, Solar Power





# Future50

Energy

Renewable Energy Generation



Maana Electric SA



<https://www.maanaelectric.com>

#GreenManufacturing  
#ClimateTech #NatureBasedSolutions

## Highlights

Maana Electric participated in the **Mohammed Bin Rashid Innovation Fund (MBRIF)** accelerator programme<sup>114</sup> and reports having **raised its first equity round** of an undisclosed amount from business angels and a family office in Luxembourg.<sup>115</sup>

## Strategic alliances:

- Research Institutes
- Governments
- Investors
- Solar Panel Manufacturers
- Large Utility Companies
- Engineering and Procurement Contractors

## List impact technologies:

Solar Power

## Headquarters:

Luxembourg

## Middle East operational countries:

United Arab Emirates

## Summary

Maana Electric develops green technologies for solar panel manufacturing. Drawing on its **space technology background**, the company applies a system engineering approach to develop more sustainable and **ESG-compliant products**, such as solar panels and cells, silicon parts and other components.

Maana Electric's premier technology is the TerraBox, which **runs on its proprietary In-Situ Resource Utilisation (ISRU) technology**. ISRU refers to the use of only locally available resources to produce goods. Likewise, the highly portable TerraBox can **produce solar panels anywhere in the world using just electricity and impure sand**.

## Impacts

Maana Electric claims that TerraBox **emits less carbon dioxide**, is less chemical-intensive and consumes two to three times less energy on a per watt basis than commonly used panels. The company adds that TerraBox delivers a per-watt **price electricity reduction of around 30% more than conventional silicon solar panels**.





# Future50

Energy

Renewable Energy Generation



Mirai Solar



<https://miraisolar.com/>

#ClimateTech

## Highlights

Mirai Solar notes that it has participated in a number of accelerators in the Kingdom of Saudi Arabia, including **TAQADAM**.<sup>116</sup> It is also an alumnus of **Wells Fargo Innovation Incubator (IN2)**<sup>117</sup> and the **LA Cleantech Accelerator (LACI)**,<sup>118</sup> and raised funding from the **KAUST Innovation Fund**.<sup>119</sup>

Mirai Solar was the regional winner of the **Cleantech Open**<sup>120</sup> and has been recognised with a number of other international awards. It claims to have been selected by the Kingdom's **Ministry of Energy** to work with a task force to commercialise the technology, and adds that it has three active pilots with commercial entities.

## Strategic alliances:

- Greenhouse Integration Partners
- Photovoltaic Device Manufacturers
- Greenhouse Companies
- Greenhouse Manufacturers

## List impact technologies:

Solar Power, High-Efficiency Heating and Cooling, Smart Buildings

## Headquarters and Middle East operational countries:

Saudi Arabia

## Summary

Mirai Solar seeks to expand the utilisation of solar energy with innovative new applications. It has developed a multifunctional shading system for building integration that is based on photovoltaic technology and **uses blocked sunlight to generate electricity**. Mirai Solar claims that the consequent power generated can provide customers with a secure return on investment and significantly lowers the carbon footprint of buildings and food production.

## Impacts

Mirai Solar states that its system is programmable and dynamic. For instance, the shading can be adjusted to satisfy different light requirements underneath the panels while continuing to allow air to flow through. Ultimately, the company aims to dramatically **improve the energy use efficiency of greenhouses and smart buildings**.





# Future50

Energy

Grid Management

## NEUROTECH

NeuroTech



<http://neurotechjo.com/>

#ClimateTech

### Highlights

NeuroTech reports that its solution has been deployed in the **Azraq refugee camp in Jordan**. The company has won the **2023 Zayed Sustainability Prize of US\$600,000**.<sup>123</sup> It also claims participating in Jordan Energy, Hackathon Energy, Digitalisation Hackathon and the Entrepreneurship World Cup.

### Strategic alliances:

- Manufacturing
- Governments
- NGOs
- Remote Building Projects

### List impact technologies:

Solar Power

### Headquarters:

Jordan

### Middle East operational countries:

United Arab Emirates

### Summary

NeuroTech is an **energy management** company dedicated to improving energy efficiency and decreasing energy consumption, and achieving net zero through the use of renewables. Besides providing energy solutions to commercial and residential companies as well as governments, NeuroTech also works to assist people in refugee camps and remote areas by integrating its solution in existing infrastructure or by building the necessary infrastructure.

### Impacts

NeuroTech focuses on **humanitarian projects**, with the aim of **extending the availability of electricity to 24/7 for refugee camps and remote areas**. This innovation aims to improve the quality of life for people living in refugee camps by powering basic services, such as lighting and medical aids. It is reported that **seven million displaced people** in camps have access to electricity for less than four hours a day<sup>121</sup> and US\$2.1 billion in total is spent each year on energy access for displaced people, the majority of which is borne by the refugees themselves.<sup>122</sup>





# Future50

Energy

Low-GHG Extraction and Maintenance

# nybl.

nybl Middle East



<https://www.nybl.ai/>

#GreenManufacturing  
#BuiltEnvironment

## Headquarters:

United Arab Emirates

## Middle East operational countries:

Bahrain, Kuwait, Lebanon, Saudi Arabia

## Summary

nybl is a deep-tech development company on a mission to develop and export innovative technology from Saudi Arabia and the UAE to the rest of the world. nybl's technology focuses on delivering **real-time failure prediction, prescription, prevention and optimisation** — increasing efficiency and reducing costs for **critical industries**. nybl offers artificial intelligence (AI) products and a codeless machine learning development platform that helps users address pressing humanitarian, energy- or sustainability-related and scientific challenges using data.

## Impacts

nybl states that its technology leverages data to drive operational efficiency in various sectors, **reducing energy intensity, total emissions and environmental risks**. nybl emphasises that it does so while monitoring, managing and mitigating emissions to contribute towards achieving net zero ambitions.

## Highlights

nybl has integrated its AI software in several partnerships, including with **Lenovo** in its **AI Innovator programme**.<sup>124</sup> nybl participated in Abu Dhabi Investment Office and Microsoft's **GrowthX** Accelerator programme 2022<sup>125</sup> and notes that it is an alumnus of **Dubai Future Foundation AREA 2071**. The company adds that it has signed contracts with **ADNOC** and **Smart Dubai**.<sup>126</sup> nybl is currently partnering the **International Humanitarian City (IHC)** with monitoring, managing and reducing its carbon emissions.<sup>127</sup>

## Strategic alliances:

- NGOs
- Governments
- Energy and Oil Companies
- Construction and Developers
- Manufacturing Companies
- UN Energy Via Energy Compact
- Healthcare Providers

## List impact technologies:

Carbon Capture and Storage, Green Hydrogen Production, Low-GHG Shipping, Precision Agriculture, Smart Buildings, Artificial Intelligence

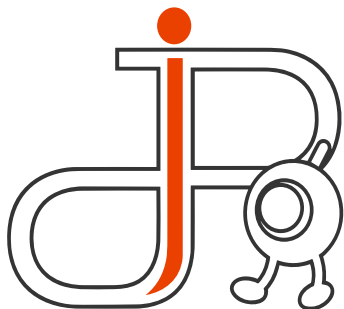




# Future50

Energy

Energy Storage (thermal or electricity)



PJP Eye LTD.



<https://pjpeye.com/>

#GreenManufacturing

## Headquarters:

Japan

## Middle East operational countries:

United Arab Emirates

## Summary

PJP Eye seeks to produce patented and rare **metal-free, plant-based carbon batteries** that are non-explosive, charge 10 times faster, and have a lifespan of more than 20 years. The batteries have potential integrations with e-bikes, e-scooters, and energy storage systems. PJP Eye has also developed technology that they claim can **convert organic industrial waste to carbon**, which is then used as a raw material for batteries.

## Impacts

PJP Eye indicates that their single carbon battery has the potential to directly and **significantly reduce CO2 emissions per 100 MW of electricity generated**. CO2 emissions during the manufacture of a typical lithium-ion battery are defined by car manufacturers, such as Mazda,<sup>128</sup> as 200 kg or less for a 1KWh battery.

The prototype dual-carbon battery is expected to have even greater CO2 reduction potential due to its further **long life and metal-free characteristics**.

## Highlights

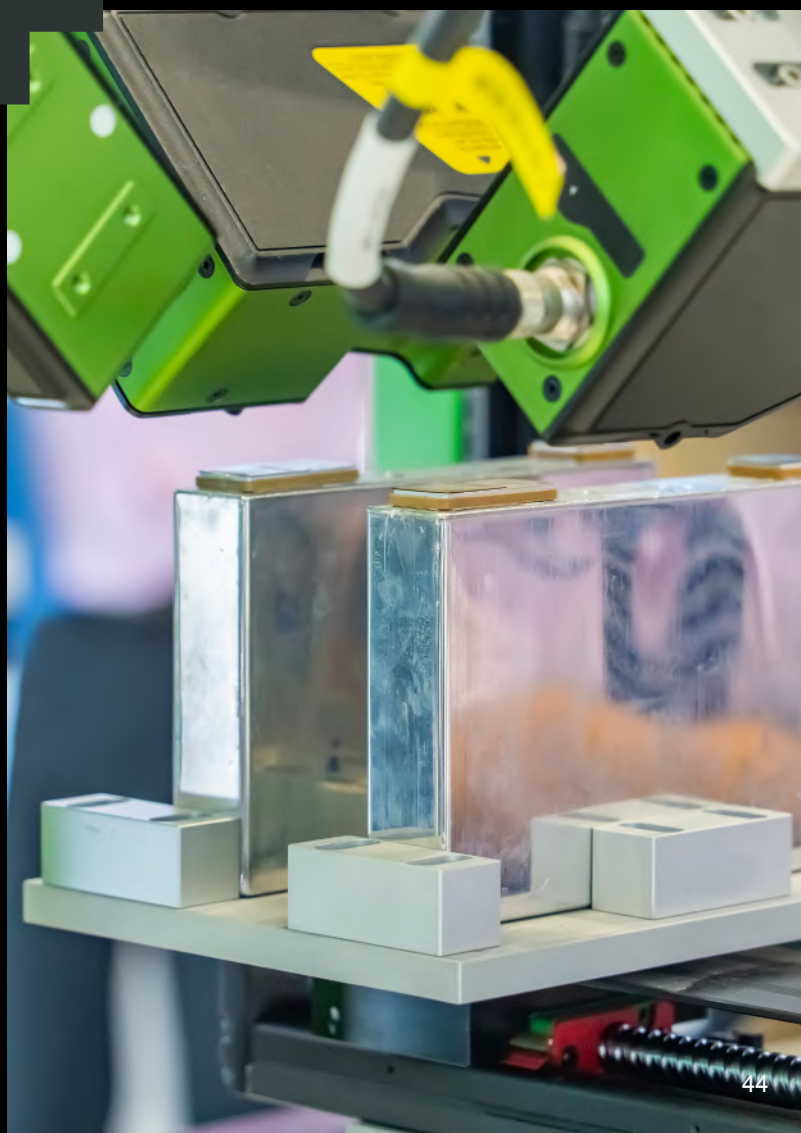
PJP Eye claims to be the first innovator to make a dual carbon battery (currently in prototype). The company won the **Most Disruptive Technology Prize**<sup>129</sup> from TechX Accelerator, a UK-based programme for innovative start-ups supporting new solutions for sustainable development and decarbonisation, through the public **funding of more than US\$100,000** to each start-up. PJP Eye also took second place in the Net Zero Technology Centre's Clean Energy Start-Up pitch battle at COP26 in 2021.<sup>130</sup>

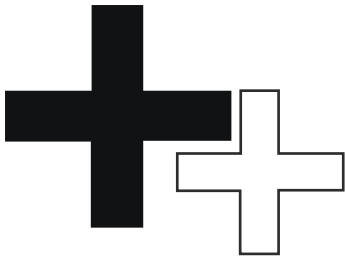
## Strategic alliances:

- Universities
- ATM Manufacturers
- Mobility Companies
- Energy Companies
- Telecommunication Data Centres

## List impact technologies

Light Duty Battery EVs, Low-GHG Air Travel, Low-GHG Heavy Duty Vehicles, Micro Mobility





## Ones to Watch

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### Energy



Headquarters: United Arab Emirates  
Middle East operational countries: Jordan, Saudi Arabia

High-Efficiency Energy Intensive Electronics and Smart  
Monitoring/Management | **Built Environment**

Amp is an energy analytics start-up that helps businesses transform their buildings by **analysing high resolution electrical data at device level** to provide insights and recommendations on energy management and optimisation.

Amp's proprietary solution combines three pillars to include; Internet of things (IoT), cloud analytics and a software as a service (SaaS)-based platform to **integrate with, or function independently** of existing legacy utility systems in buildings. Amp looks to find **inefficiencies and potential equipment failures**.

Amp was selected for the Shell Startup Engine by StartupBootcamp.<sup>131</sup>

#EnergyEfficientHeating&Cooling  
#SmartBuildings  
#DataAnalytics

<https://ampenergy.io/>



# Food, Agriculture and Land Use (FALU)



2%

of ME GHG emissions<sup>132</sup>



\$343m

Total VC sector investment in Middle East (Oct '17 - Aug '23)<sup>133</sup>



9

Companies in the Net Zero Future50 - Middle East

Making advances in agricultural technology is a major priority for Middle East countries, which depend heavily on imported food and are therefore vulnerable to supply chain disruptions. For example, in 2019, Saudi Arabia imported US\$10.5 billion of key agri-food products and exported just US\$1.7 billion — a deficit of US\$8.8 billion.<sup>134</sup> Agricultural technology can cut such deficits, make food supplies more reliable, and stimulate innovation, in addition to benefiting the environment.

Investment in Food, Agriculture and Land Use (FALU) companies was US\$265 million over the past two years. Across a broad array of domains, Future50 innovators are making needed technological advancements in agricultural technology. In fact, 18 companies in the FALU sector made our list of Future50 companies and Ones to Watch, tied with Industry, Manufacturing and Resource Management for the largest segment. FALU companies were fairly evenly divided across eight specific focus areas — from precision agriculture and robotics to earth and marine protection. Together, the variety of solutions offered by companies like Archireef, Below Farm, and Circa Biotech presents a real depth and breadth of opportunity in the Middle East.

## Technology drivers:

#Drones #VerticalFarming #Biomimicry  
#WasteManagement  
#ControlledEnvironmentAgriculture #Cloud  
#Blockchain #UpcycledWaste #AI #Biotechnology

## Barriers:

**Climate:** Land in the Middle East is not conducive to farming — with high temperatures and soil salinity and low water and animal feed availability — making large-scale farming a significant challenge.

**Supply-chain dependence:** The Middle East's dependence on imports for its food supply means that the region only has a small agricultural labour force. This has only exacerbated the region's need to increase local production.

**Research and development:** Companies in the sector say they often face significant barriers to entry due to the high cost of research and development. Moreover, investors sometimes approach FALU start-ups purely seeking a return on their investment, rather than primarily seeking to solve a problem, which can be challenging for start-ups with long-time horizons for economic impact.<sup>135</sup>

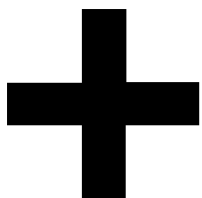
## Accelerators:

### Government initiatives for greater food security:

The appetite for greater food security is region-wide and paramount for an uncertain future. For example, in 2022, the United Arab Emirates made a US\$100 million investment in four agritech companies<sup>136</sup> and has recently pledged US\$2 billion to help India develop its agriculture to increase food security in both regions.<sup>137</sup>

**Trade incentives:** By investing in local agricultural technologies, governments can reduce reliance on both imported food and imported technologies, alleviating trade deficits.

**Labour:** Building agriculture at home will attract labour and other talent to the region, bolstering the economy.



## Growth areas:

**Precision agriculture and robotics:** Precision agriculture has the potential to increase food security, particularly for large-scale farms.<sup>138</sup> These technologies include drones to monitor and manage assets, cloud technology, AI and Internet of Things (IoT) sensors to improve tracking and provide insights and warnings to farmers.

**Vertical and urban farming and aquaponics:** Vertical farming solutions are closed systems that allow for smaller building footprints and reduced (or even recycled) water and energy use and remove the need for pesticides and herbicides. They can also lower labour costs due to automation and transportation emissions because they can be built closer to existing infrastructure than traditional farms. Controlled environment agriculture also allows food to be produced year-round, which is particularly important given the Middle East's climate.

**Earth and marine protection:** Environmental degradation has a real cost: half of humanity is directly affected by land degradation, and in addition to food and water insecurity, the UN estimates that it causes losses of US\$140 trillion in ecosystem services every year.<sup>139</sup> Coral reefs, mangroves, and forests act as carbon sinks, but they are also indicators of climate change in that they are highly sensitive and in danger of environmental degradation. To protect these vital habitats, start-ups in the FALU sector are offering innovative solutions based on biomimicry, drone technology, and more.

**Alternative foods and low-GHG proteins:** The Food and Agriculture Organisation of the United Nations (FAO) estimates that global emissions from traditional agricultural sources were 9.3 billion tonnes of CO<sub>2</sub> equivalent (CO<sub>2</sub>eq) in 2018.<sup>140</sup> As the Middle East works to decarbonise its agricultural land, it also needs to ensure food and water security, because out of the ten most water-stressed nations in the world, seven are in the Middle East and North Africa.<sup>141</sup> Alternative methods of producing food and water can save land, emissions, and water, which is particularly important for the Middle East.

### Agricultural biotech, genomics, and natural solutions:

Biotechnology involves altering living organisms to create new products or modify them, to improve plants or animals, or to use microorganisms in new ways. Genetic engineering is widely used in these fields, but other biotechnology applications involve using existing organisms to upcycle waste to create useful compounds or AI to develop new iterations of molecules. The market for biotechnology is expected to reach US\$10 trillion by 2030.<sup>142</sup>

**Land-use management:** Land is a scarce resource, particularly in the Middle East. As the regional population grows, urban land will need to increase by 50% by 2050.<sup>143</sup> However, growth will be constrained by the fact that 84% of land in the MENA region is desert. At the same time, new populations will put even further stress on agricultural systems in the region. Solutions to shrink and optimise land use in preparation for the future are paramount and can help make water and electricity delivery more efficient today.

**Value chain GHG reduction:** Consumer demand for sustainable products has increased dramatically, from 58% in 2021 to 90% in 2023.<sup>144</sup> This interest in sustainable options cuts across demographics. In agriculture, tracking and tracing the GHG emissions associated with products are key ways to meet these demands for sustainability, with AI and blockchain being important technologies in these efforts.

**Low-GHG, energy-efficient equipment and enabling software:** Software to connect producers and consumers has been making big waves. For example, many new platforms exist to sell soon-to-expire or “ugly” produce to consumers at a discount.





## Future50

Food, Agriculture and  
Land Use (FALU)

Precision Agriculture/Robotics



Aerodyne Group



<https://aerodyne.group>

#BuiltEnvironment  
#ClimateTech

## Headquarters:

Malaysia

## Middle East operational countries:

Oman, Saudi Arabia, United Arab Emirates, Jordan, Kuwait

## Summary:

Aerodyne Group was ranked the world's number-one remote sensing drone service provider for two consecutive years, in 2021 and 2022, by Drone Industry Insight.<sup>145</sup> It seeks to adopt a **holistic approach to drone tech, data tech, and digital transformation (360DT3)**, and helps organisations overcome complex industrial challenges through drone data and AI-powered analytics.

Aerodyne specialises in **managing critical assets, such as power lines, solar facilities, telecommunications infrastructure, agriculture, and oil and gas operations.** The company collaborates with organisations using a Build-Operate-Transfer (BOT) model, with the aim of empowering them to establish their own in-house drone capabilities.

## Impacts:

Aerodyne notes that its solution can enable organisations to rapidly scale, digitally transform, optimise operations, and increase productivity and improve operational efficiency.<sup>146</sup> Aerodyne's solution seeks to enable remote operations without physical presence at tower sites.<sup>147</sup> The company's ARGENTAVIS and FULCRUM drone solutions seek to develop the **sustainable logistics sector in terms of shore-to-platform and platform-to-platform operations.**<sup>148</sup> Aerodyne also provides agricultural solutions, helping farmers **increase productivity and harvest yield.**<sup>149</sup>

## Highlights:

The company is **currently raising up to US\$200 million for its Series C fundraising round.**<sup>150</sup> It indicates being operational in 45 countries. Aerodyne has reported that it is being recognised by the **Malaysian Book of Records** for being the first UAS company in Malaysia to receive a **Special UAS Project approval for its Nested Drone Project.**<sup>151</sup> Aerodyne is part of **Masdar City's INNOVATE** platform in the United Arab Emirates.<sup>152</sup>

## Strategic alliances:

- Fortune 500 Companies
- Governments (Infrastructure, Highways)
- Energy Companies
- Agriculture/Farms
- Infrastructure Maintenance Companies

## List impact technologies:

Low-GHG Air Travel, Precision Agriculture, Wind Power





## Future50

Food, Agriculture and  
Land Use (FALU)

Vertical and Urban Farming/Aquaponics



Alesca Life



<https://www.alescalife.com>

#GreenManufacturing

### Headquarters:

Singapore

### Middle East operational countries:

Saudi Arabia, United Arab Emirates

### Summary:

Alesca Life is an agritech company that seeks to maximise farm productivity and efficiency by deploying **turnkey vertical farms and precision agriculture solutions**.

The company states that it has developed patented indoor growing systems, proprietary management software, AI-enhanced IoT networks, and multispectral cameras to grow more than **100 varieties of fresh vegetables, fruit saplings, and ornamental flowers**. Alesca Life reports that it has recently inaugurated a **10,000m<sup>2</sup> manufacturing facility** in China<sup>153</sup> to significantly reduce project deployment timelines and hardware costs for customers.

### Impacts:

Alesca Life claims that its vertical farms use **90-99% less water, fertiliser, and land** compared to traditional farms and generate **less carbon emissions and food waste** as compared to imported products. It adds that its solutions offer year-round production with no chemical pesticides or GMOs. Alesca Life estimates that its global projects will collectively **save 1Tn+ litres of water by 2030**.

### Highlights:

Alesca Life is an alumnus of **Masdar Innovate**,<sup>154</sup> **Dubai Futures**,<sup>155</sup> and **Mohammed Bin Rashid Innovation Fund**.<sup>156</sup> It is also a **World Economic Forum Global Innovator**,<sup>157</sup> **Stanford StartX**,<sup>158</sup> and **Unreasonable Impact Alumni Mentor**.<sup>159</sup>

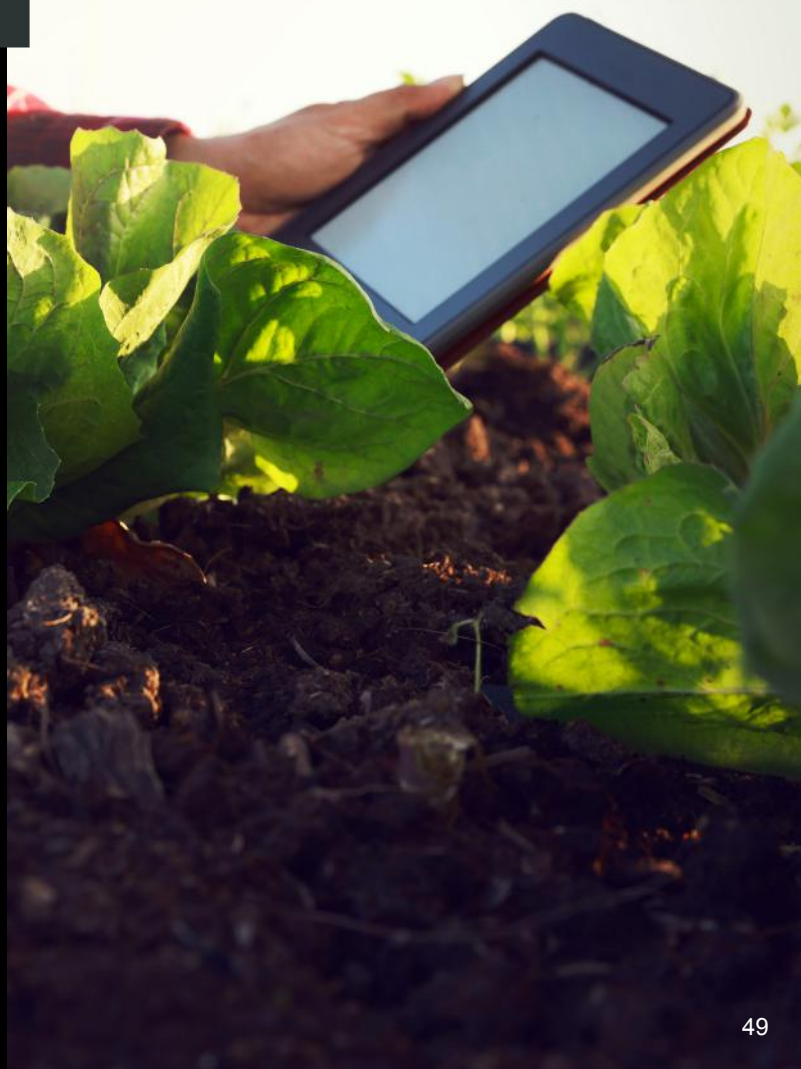
The company states that it has installed turnkey vertical farms for **Sustainable City**,<sup>160</sup> **Shangri-La Hotels**,<sup>161</sup> and **Saudi Aramco**, as well as precision agriculture solutions into greenhouses and nethouses in the UAE and Saudi Arabia to digitise and improve conventional farm operations.

### Strategic alliances:

- Real Estate Developers
- Hotel and Restaurant Groups
- Smart Sustainable Cities
- Agriculture and Farming
- Infrastructure and Construction
- Government and Public Entities
- Glasshouse and Greenhouse Operators

### List impact technologies:

Precision Agriculture, Vertical Farming, Artificial Intelligence of Things (AIoT), Digital Twin





## Future50

Food, Agriculture and  
Land Use (FALU)

Earth and Marine Protection, Deforestation  
Prevention, Reforestation and Afforestation



### Archireef

Archireef



<https://archireef.co>

#ClimateTech  
#NatureBasedSolution

### Highlights:

Archireef was founded in Hong Kong, and notes that it expanded in early 2022 to Abu Dhabi, setting up an **eco-engineering facility** at KEZAD to scale production and to improve product quality.<sup>163</sup> Archireef adds that this has allowed it to deploy ecological engineering solutions across marine ecosystems at pace, and that it has **one patent pending for its quay wall panel product**.

Archireef's local ecosystem partners include **ADQ**<sup>164</sup> and **Hub71**,<sup>165</sup> with the company also indicating that it is in talks with several governmental and non-governmental entities to deploy multiple new coral sites across the UAE and the wider GCC region.

### Strategic alliances:

- Private Sector
- Governments
- Universities
- Research Institutes
- NGOs

### List impact technologies:

Active Restoration, Nature Positive Technology

### Headquarters and Middle East operational countries:

United Arab Emirates

### Summary:

Archireef is a nature tech start-up that 3D-prints reef tiles using terracotta clay to **restore coral reef ecosystems**. It states that its proprietary reef tiles integrate **biomimicry designs** and secure a stronger foundation for corals, enhancing coral survivorship and growth.<sup>162</sup>

Archireef's **3D-printing methodology** involves an algorithm that can be dynamically adjusted to local conditions, allowing for design changes as needed and for the tiles to therefore be tailored to different environmental settings.

### Impacts:

Archireef reports a **95% coral survivorship rate** at the four sites across Abu Dhabi and Hong Kong that it has deployed its tiles on. The company notes that by rebuilding marine ecosystems, which then start performing their natural duty of keeping the oceans healthy, its solution tackles climate change. Archireef adds that its use of natural materials **prevents the leaching of toxicity into the ocean**, in contrast with other existing restoration solutions, including concrete structures.





## Future50

Food, Agriculture and  
Land Use (FALU)

Alternative Foods / Low-GHG Proteins



Below Farm



<https://www.belowfarm.ae>

#NatureBasedSolutions

## Headquarters and Middle East operational countries:

United Arab Emirates

### Summary:

Below Farm is an agritech company specialising in **end-to-end mushroom and mycelium cultivation solutions for arid climates**. It aims to harness the power of mycelium – the root system of fungi – to turn **agricultural waste into mushroom substrate**. This is used to produce fresh food and compostable materials.

Below Farm has designed what it says is a **fully automated climate control system** to optimise growth conditions for each variety of specialty mushrooms, which aims to contribute to sustainable agriculture.

### Impacts:

Below Farm has built a business model to reflect the **circular economy**. The company's localised approach aims to contribute to lower carbon emissions by avoiding food miles caused by importation. Below Farm states that its raw materials are locally sourced that helps improve local food security.

Below Farm states that its substrate, which allows mushroom mycelium to grow and establish itself, is made up of more than **70% upcycled waste biomass** from sources, such as date farms. It says its **used substrate can then be used as compost**. The company adds that its production is without pesticides or fertilisers and has a **low-water impact**. Lower water use has a positive impact due to the energy and financial cost to desalinate water, which is the primary water source for the region.<sup>166</sup>

Below Farm reports that its facility in Abu Dhabi has upcycled more than 250 tons of palm leaves, a byproduct of date farming, and converted them into an alternative source of non-animal-based protein, essential amino acids and vitamin D.

### Highlights:

Below Farm has participated in the **Circulars Accelerator**<sup>167</sup> and the **World Economic Forum programme** for circular economy start-ups.<sup>168</sup> It has also participated in the **Ma'an Social Incubator**,<sup>169</sup> a social impact incubator programme by the Abu Dhabi government.

### Strategic alliances:

- Research Institutes
- Universities
- Retailers
- Restaurants
- Food Production Companies
- Date Farms

### List impact technologies:

Alternative Foods, Low-GHG Proteins,  
Clean Tech, Sustainable Agriculture





# Future50

Food, Agriculture and  
Land Use (FALU)

Agricultural Biotech/Genomics/  
Natural Solutions



**Circa Biotech**

Circa Biotech



<https://www.circabio.tech>

#NatureBasedSolutions

## Headquarters and Middle East operational countries:

United Arab Emirates

## Summary:

Circa Biotech **upcycles food waste into protein** for animals, organic fertiliser **and biodiesel oil**, using industrial insect farming of the black soldier fly larva (BSFL). Larvae are reported to grow **500 times their initial body weight in 10 days**.<sup>170</sup>

Food waste is collected from food processing operators and fed to BSFLs, which metabolise it into proteins and oil. Circa Biotech claims that this sustainable protein production process requires low amounts of fertile land and water and produces almost no greenhouse gas emissions.

## Impacts:

Currently for every kilo of food waste, just over 2.5kg of CO<sub>2</sub> is emitted.<sup>172</sup> Circa Biotech states that its proprietary technology and processes can help **reduce this CO<sub>2</sub> contribution** by diverting food waste from landfills.

The company reports that it has a new processing facility under construction in Al Ain that they say is expected to be operational by the end of 2023. Once operational, the company suggests it will be able to **process 15 tonnes of waste each day**. Based on industry standards of CO<sub>2</sub> food waste emissions this would be equivalent to 280,000 **tons of CO<sub>2</sub> carbon offset per year**.

## Highlights:

Circa Biotech is part of **Masdar City's Catalyst accelerator**.<sup>172</sup> It was inaugurated by UAE's Minister of Climate Change and Environment, HE Mariam bint Mohammed Saeed Hareb Almheiri.

It also signed a **Memorandum of Understanding (MoU) with the Ministry of Climate Change and Environment (MOCCA)** for mutual collaboration and support in developing a circular economy and sustainable solutions for food waste management in the UAE.<sup>173</sup>

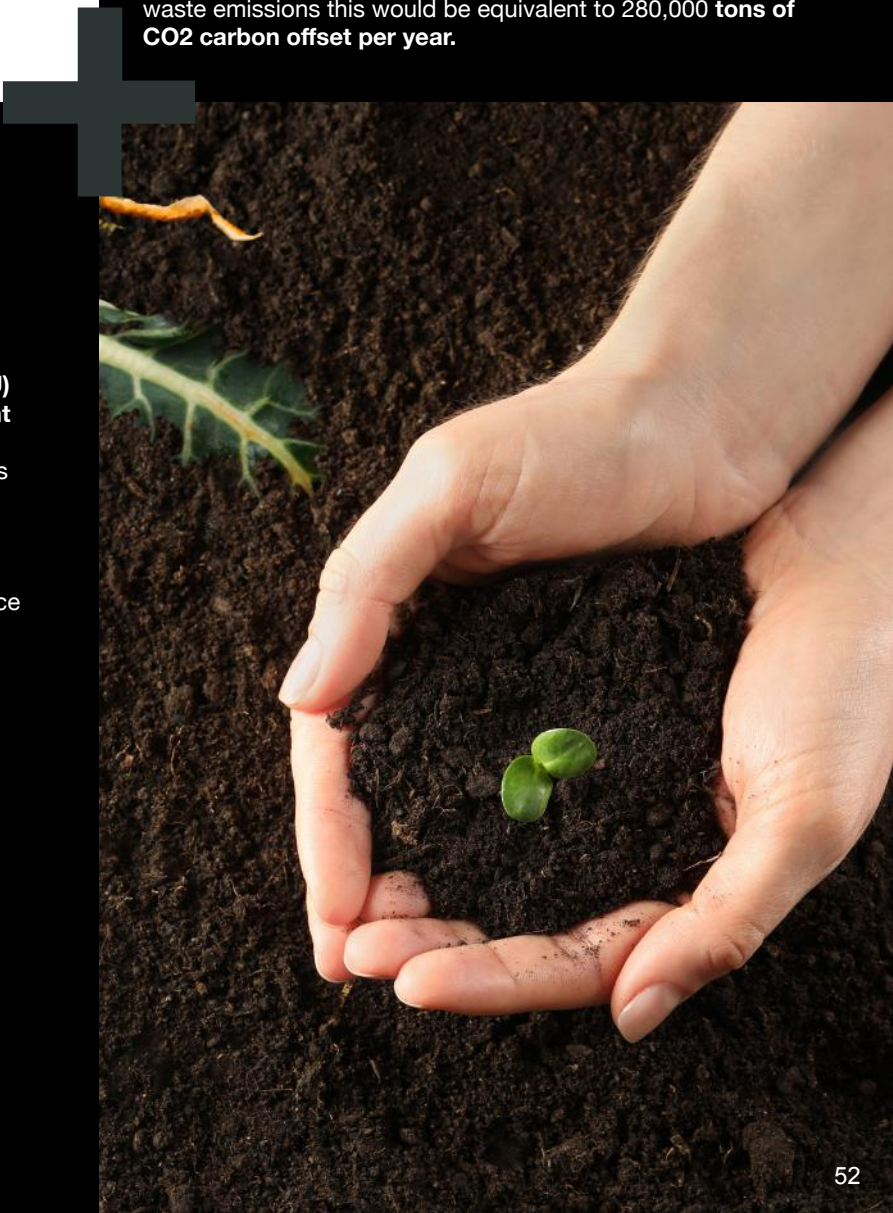
Circa Biotech has won AgriTech Innovator of the Year award at the **Sustainability Middle East Excellence Awards 2023**<sup>174</sup> and was also a finalist for the CCI France UAE Business awards for the Best ESG Impact.<sup>175</sup>

## Strategic alliances:

- Waste Management Companies
- Farms
- Agribusinesses
- Oil and Gas
- Universities

## List impact technologies:

Alternative Foods, Low-GHG Proteins,  
Food Waste Technology, Waste to Feed,  
Sustainable Lubricants





## Future50

Food, Agriculture and  
Land Use (FALU)

Earth and Marine Protection Deforestation  
Prevention, Reforestation and Afforestation



Understanding Through Imagery

Distant Imagery



<https://www.distantimagery.com>

#ClimateTech

### Headquarters:

United Arab Emirates

### Middle East operational countries:

Bahrain, Oman, Qatar, Saudi Arabia

### Summary:

Distant Imagery seeks to **restore mangroves and collect environmental data** by utilising **drone technology**. Its ecologically driven methodology is designed to **mimic nature's restoration process**, with drones used to speed up and make the process more efficient. The company claims to be the first to successfully restore mangroves through drone planting, with self-engineered and self-built drones specifically for mangrove restoration.<sup>176</sup>

### Impacts:

Distant Imagery states that it uses **imagery data for site selection** and then manually programmes the **drones, which then drop the seeds** in the soil. The company estimates that it has a **40-44% success rate**, helping plant **1.5 million mangrove seeds** in the UAE.

### Highlights:

Distant Imagery has been recognised by **World Economic Forum UpLink** as an **Oceans and Blue Carbon top innovator**.<sup>177</sup>

The company has also secured a project with the Abu Dhabi National Oil Company (ADNOC) to plant 2.5 million mangrove seedlings across Abu Dhabi.<sup>178</sup> This is part of its drone-planting technology partnership with the **Abu Dhabi Environment Agency** as part of which it has planted one million seeds.<sup>179</sup> It has planted another 500,000 seeds in partnership with **Engie Middle East**.<sup>180</sup>

### Strategic alliances:

- Businesses (Large Companies)
- Construction Companies
- Manufacturing Companies
- Energy Companies
- Government

### List impact technologies:

Precision Agriculture, Habitat Restoration Technology, Aerial Environmental Analysis





## Future50

Food, Agriculture and  
Land Use (FALU)

Alternative Foods / Low-GHG Proteins



Kumulus



<https://www.kumuluswater.com>

#ClimateTech  
#NatureBasedSolutions

### Highlights:

Kumulus has participated in a number of accelerator programmes, most notably **Flat6Labs**<sup>181</sup> and **Techstars**,<sup>182</sup> and sought to patent its technology in Tunisia and France. It has also raised more than US\$1 million in equity finance.<sup>183</sup> Kumulus was named by incubator **Station F** as **one of its most promising start-ups in 2022**<sup>184</sup> and won an award as the top start-up addressing water problems in the Eau-pération Planète pitch competition at **Vivatech 2022**.<sup>185</sup> In March 2023, Kumulus received the **Solar Impulse Foundation** label for being an efficient solution.<sup>186</sup>

### Strategic alliances:

- Business (Large Companies)
- Universities
- Governments
- Hospitality

### List impact technologies:

Solar Power

### Headquarters:

Tunisia

### Middle East operational countries:

United Arab Emirates

### Summary:

Kumulus designs machines that produce **drinking water using solar energy and air**. The company states that they do so by **reproducing the phenomena of dew** and that each machine can produce up to 30 litres of water per day, adding that several integrated systems allow for better water quality and a more accessible experience. Kumulus seeks to provide other companies with their **own source of clean and sustainable water**, and to drastically reduce the use of plastic bottles as well as the pollution and logistics associated with them.

### Impacts:

When connected to a power source, Kumulus' machine **filters, cools down, re-filters and mineralises air** to what it claims is EU standard. The company says that for **each litre of Kumulus water, 166 grams of CO2 is displaced**, which it estimates adds up to around two tons annually in addition to 250 kg of plastic. Its machines are supported by software that enable remote control and monitoring to reduce electricity usage.





# Future50

Food, Agriculture and  
Land Use (FALU)

Vertical and Urban Farming/Aquaponics



Pure Harvest Smart Farms



<https://pureharvestfarms.com>

#ClimateTech

## Headquarters:

United Arab Emirates

## Middle East operational countries:

Kuwait, Saudi Arabia

## Summary:

Pure Harvest Smart Farms is a technology-enabled agribusiness that deploys proprietary hybrid growing systems for **year-round production of fruits and vegetables through controlled-environment agriculture (CEA)**.<sup>187</sup>

The company operates across the entire value chain – from design, procurement/system integration, construction and operations – through to marketing and sales. The operations are designed to deliver **sustainably grown**, pesticide-residue free, premium quality fruits and vegetables.

## Impacts:

Pure Harvest Smart Farms **aims to contribute to net zero** through **renewable energy, decarbonisation, water conservation, and waste reduction**.<sup>188</sup> The company's CEA technology helps to overcome extreme heat, humidity, and water scarcity by **employing natural sunlight, minimal chemicals, and bees for pollination**.

Its facilities are partially powered by solar panels.<sup>189</sup> Pure Harvest Smart Farms claims that their buildings are also designed to use excess heat from nearby facilities, such as factory heat exhausts to help generate energy to power their facilities.

## Highlights:

Since its participation in the **Mohammed Bin Rashid Innovation Fund**,<sup>190</sup> the company is reported to have become the most funded start-up in the Middle East in 2022.<sup>191</sup> It has raised more than **US\$387 million in a combination of equity, debt, and other finance, including** a US\$100 million commitment for future expansion from **Wafra International**.<sup>192</sup>

The company has bought a controlling interest in a joint venture with **Al Dahra**, which operates a large-scale agriculture facility in Al Ain.<sup>193</sup> The company has signed a strategic partnership with **Saudi Arabia's National Agricultural Development Company (Nadec)**<sup>194</sup> for a large-scale food security project.

## Strategic alliances:

- Plant Farms
- Facility Designers and Builders
- Software Suppliers
- Retailers
- Distributors
- Singapore Food Agency

## List impact technologies:

Precision Agriculture, IoT, Automation, AI, Machine Learning (ML), Imaging, Climate Control Management, Solar Power, Food Waste Technology, High-Efficiency Heating and Cooling, Low-GHG Plastics





# Future50

Food, Agriculture and  
Land Use (FALU)

Agricultural Biotech/Genomics/  
Natural Solutions



# REDSEA

RedSea Farms



<https://www.redsea.ag>

#BuiltEnvironment

## Headquarters:

Saudi Arabia

## Middle East operational countries:

Egypt, United Arab Emirates

## Summary:

Red Sea Farms (RedSea) seeks to advance commercial farming in hot climates globally through the scientifically rigorous and innovative design of sustainable pioneering agriculture technologies, which span from the roots of the plants – through the rooms – and up to the roofs of greenhouses. RedSea's platform comprises proprietary **controlled environment**, agriculture technologies, plant science to cultivate crops that thrive in hot environments, and intelligent resource-saving systems.

## Impacts:

RedSea indicates that its technologies fundamentally address climate change and food security. The company notes that its hot climate agriculture platform has shown to use up to **90% less freshwater and energy** than traditional methods.<sup>195</sup> It adds that the iyris technology in its roof system, designed to absorb heat while allowing for light passage, has been shown to save up to 45% energy use in a greenhouse. RedSea has also introduced an intelligent crop monitoring platform to provide data insights and improve yield. The company claims to have produced a rootstock that is tolerant of salt, heat, and drought and produces high yields in hot and harsh climates

## Highlights:

RedSea has raised a **total US\$36.5 million**, with its most recent raise in April 2022 of US\$18.5 million in equity finance,<sup>196</sup> to support its global and regional expansion and technology development.

RedSea notes a number of high-profile partnerships, including with **Red Sea Global** to provide technologies to sustainably feed guests in **Saudi Arabia's Red Sea Project**. Another partnership is with **Silal Farms in the United Arab Emirates**, involving the installation of RedSea's technologies in Silal's contracted farms.<sup>197</sup> In March 2023, RedSea announced the commissioning of its one-hectare facility in Abu Dhabi,<sup>198</sup> set to supercharge wider adoption of technologies in the UAE to benefit local growers.

RedSea's iyris heat-blocking roof was recently awarded **The Davidson Prize**.<sup>199</sup>

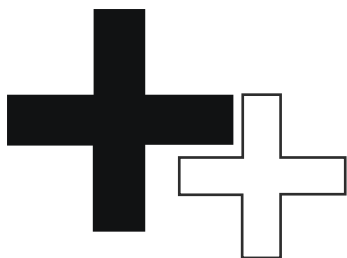
## Strategic alliances:

- Agriculture Businesses
- Universities
- Government
- Hospitality Chains
- Retail Chains
- Real Estate Development Companies

## List impact technologies:

Precision Agriculture, Sustainable Agriculture,  
High-Efficiency Heating and Cooling





Headquarters: Japan  
Middle East operational countries:  
Egypt, Oman, Saudi Arabia, United Arab Emirates

Land Use Management | **Nature-Based Solutions**

AC Biode is a circular economy technology provider. It has designed a technology called Plastalyst<sup>200</sup> that aims to help oil refinery and chemical companies **produce new second-life plastic material** from plastic waste. The company suggests that this can be achieved at temperatures below 200 celsius, and also offers catalytic pyrolysis, which converts plastics into oil.

AC Biode states that it partnered with **Sion Corp** to produce a technology called CircuLite, designed to upcycle ash or sludge into a high-value adsorbent.<sup>201</sup> The company reports that this product can be used for **carbon capture**, **water purification** and also to retain water in soil.

#Biomasspower  
#CCUS  
#LowGHGConcrete  
#LowGHGPlastics  
#WasteToEnergy

<https://www.acbiode.com/circulite.html>



## Ones to Watch

### Food, Agriculture and Land Use (FALU)



Headquarters: India  
Middle East operational countries:  
United Arab Emirates

Value Chain GHG Reduction | **Built Environment, Climate Tech**

AgNext is an agri-tech company that has designed a full-stack agri-quality assessment and fulfilment platform.

AgNext proprietary machine learning and computer vision algorithms are integrated with Hedera blockchain<sup>202</sup> to deliver deep-tech powered rapid quality assessment solutions for agri-commodities. The solution seeks to provide end-to-end traceability across the value chain along with fulfilment and digital inspection services across agri-businesses.

AgNext aims to ensure food quality, safety and traceability across the value chain. The company reports that its methods are designed to be non-obtrusive and non-destructive, which allows samples to be returned to the value chain. This helps reduce food waste and environmental impact.

AgNext has been recognised by Rabobank<sup>203</sup> as a leading agri-tech and is reported to have raised more than US\$25 million in finance,<sup>204</sup> including from notable investors, such as ADQ.<sup>205</sup>

#CCUS  
#FoodWasteTechnology  
#PrecisionAgriculture

[www.agnext.com](http://www.agnext.com)



Headquarters: India  
Middle East operational countries:  
Bahrain, Egypt, Jordan, Kuwait, Lebanon,  
Oman, Qatar, Saudi Arabia, United Arab Emirates

Precision Agriculture/Robotics | **Climate Tech**

Cropin reports that it has launched the **world's first purpose-built industry cloud for agriculture**.<sup>206</sup>

The company describes Cropin Cloud as an integrated ecosystem cloud platform that combines technologies, including **artificial intelligence, machine learning, data analytics, earth observation, and weather intelligence with agronomy sciences** to help solve complex agriculture challenges, such as food security and connectivity across the agri-value chain.<sup>207</sup> Cropin states that its platform is built on a comprehensive **crop knowledge graph** designed to analyse trillions of data points from more than 500 crops and over 10,000 crop varieties across 92 countries. The company also, according to Cropin, helps collect, aggregate, and derive real-time actionable insights throughout the farming lifecycle – from cultivation to harvesting and throughout the food supply chain. This is aimed at benefiting agribusinesses, governments and development agencies.

#PrecisionAgriculture  
#CarbonSequestration  
#SmartFarming  
#PredictiveIntelligence

[www.cropin.com](http://www.cropin.com)



Headquarters and Middle East operational countries:  
Jordan

Value Chain GHG Reduction | **Green Manufacturing**

Decapolis offers a blockchain-based solution focused on enabling end-to-end food product traceability.

The company states that farmers and producers can use it to minimise the dangers of contamination and agricultural practices. Decapolis claims that the solution can also improve **supply chain management and compliance** with international safety and quality control standards.

Decapolis has worked with the **United Nations**<sup>208</sup> to boost crop yields and revenues of farmers in Jordan, and conducted another pilot – with the University of the West of England (UWE) and the Royal Scientific Society/Water and Environment Centre of Jordan<sup>209</sup> – to **measure and verify green manufacturing processes**.

Decapolis counts **Del Monte**,<sup>210</sup> Innovative Startups and SMEs Fund (ISSF) as investors<sup>211</sup> and is currently looking to deploy its technology globally.

#Blockchain  
#ArtificialIntelligence

<https://www.decapolis.io>



Headquarters and Middle East operational countries:  
United Arab Emirates

Low-GHG/Energy-Efficient Equipment/Enabling Software | **Climate Tech**

HeroGo is a foodtech B2C platform focused on **reducing food loss and food waste**.

The company works with local farmers and food importers to **reclaim close-to-expiring or excess produce** and to sell it at up to 50% discount directly to customers and businesses to **divert food from landfills**. Its solution provides an analytics dashboard for companies to monitor emissions impact.

HeroGo has signed a partnership with **National Food Loss and Waste Initiative (ne'ma), in the UAE**.<sup>215</sup> Its approach helps create access to affordable food. HeroGo is also an alumnus of **Hub71**.<sup>216</sup>

#FoodWasteTechnology

<http://www.herogo.ae/>



Headquarters: United Arab Emirates  
Middle East operational countries:  
Bahrain, Egypt, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia

Land Use Management | **Climate Tech**

Grubtech has designed an enterprise SaaS platform solution aimed at digitising and optimising operations, and improving efficiency in the food industry.

Grubtech's solution is designed to provide data-driven insights and optimise inventory control, which it states helps restaurants **minimise waste and reduce the environmental impact of food production and transportation**.

Grubtech is an alumnus of the **HUB71 accelerator**<sup>212</sup> and of **In5 Dubai**,<sup>213</sup> and reports having raised more than **US\$18 million**<sup>214</sup> in equity financing.

#FoodWasteTechnology  
#RestaurantTechnology

[www.grubtech.com](http://www.grubtech.com)



Headquarters: Lebanon  
Middle East operational countries:  
United Arab Emirates

Precision Agriculture/Robotics | **Climate Tech, Nature-based solutions**

IOTree seeks to provide the agricultural sector with a sensing and detection solution through the use of **AI-driven IoT sensors**. IOTree describes itself as the 'internet of things for trees', noting that its solution works as an **early warning system for farmers**. The company adds that its platform provides farmers with a precision agriculture solution to **remotely track and monitor the health of date trees and other crop varieties**.<sup>217</sup> IOTree states that using data insights, users can respond in real time to climate and crop conditions, and this can potentially reduce **the use of pesticides, improve quality of harvests and preserve biodiversity** – and in turn help reduce emissions. IOTree has won a number of awards, including the **Berytech Agrytech Hackathon**.<sup>218</sup> The company also has a partnership with a **Lebanese Telecom operator, touch**,<sup>219</sup> involving installing devices through **narrowband-IoT (NB-IoT)** to connect rural areas in Lebanon.

#PrecisionAgriculture  
#ArtificialIntelligence  
#InternetOfThings

[www.iotreesolutions.com](http://www.iotreesolutions.com)



## PROTEINEA

Headquarters: United States

Middle East operational countries:

Egypt, Saudi Arabia, United Arab Emirates

Agricultural Biotech/Genomics/Natural Solutions |  
Nature-Based Solutions

Proteinea is a **biotechnology company** that uses AI-based computational engineering and synthetic biology to pioneer and accelerate the development of highly effective proteins.<sup>220</sup>

The company states that its platform has allowed it to **engineer growth factor proteins**, such as FGF2 - TGF beta to help increase functionality and reduce costs.

Proteinea adds that its technology can be applied to multiple industries – from producing cell-based meats to drug development – and that it is designed to help **contribute to a lower carbon footprint** than traditional production methods.

#AlternativeFood  
#LowGHGProteins  
#SyntheticBiology  
#Biotechnology

[www.proteinea.com](http://www.proteinea.com)



Headquarters: United Kingdom

Middle East operational countries:

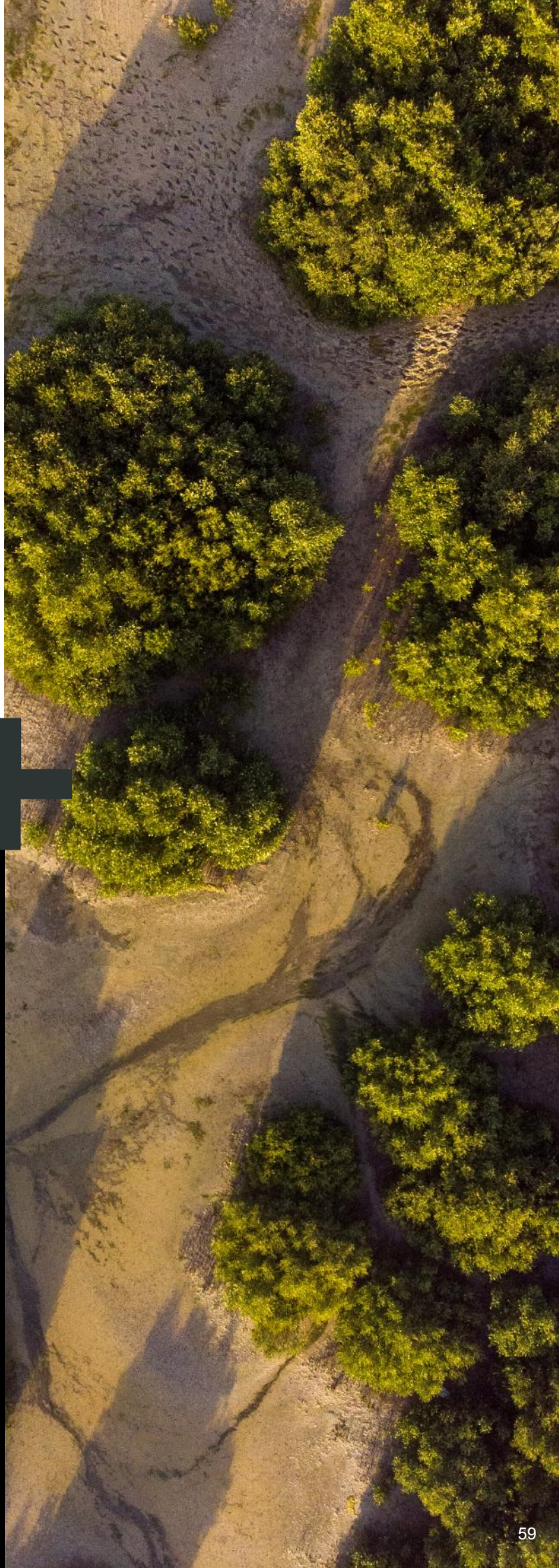
United Arab Emirates

Earth/Marine Protection/Deforestation Prevention/  
Reforest/Afforestation | **Green Finance**

Sacred Groves is a social enterprise that leverages technology to **protect existing natural habitats from destruction**. The company notes that it has partnered with NorthLadder to implement its “Junk to Jungles” circularity concept.<sup>221</sup> Sacred Groves works with the auction and repair platform to **collect and sell e-waste from companies, funnelling the proceeds into habitat protection**. The company notes that it promotes **conservation commerce**, in which companies can make nature a co-benefit in their customer value proposition. This entails linking square feet of protected forest area to companies’ revenue metrics so as to integrate conservation into their business and thus achieving their strategic ESG goals. Sacred Groves states it has guardians from more than 40 countries, has **protected three forests**,<sup>222</sup> has conducted a proof-of-concept with **Dentsu MENA**<sup>223</sup> in the UAE and have recently partnered Al Khayyat Investments (AKI) as part of an initiative to divert AKI’s depreciated devices from landfills and responsibly recycling non-working devices.<sup>224</sup>

#HabitatConservation  
#GeospatialImaging  
#Blockchain

<https://www.sacredgroves.earth/>



# Climate Change Management and Reporting (CCMR)



N/A%

of ME GHG emissions<sup>225</sup>



\$17m

Total VC sector investment in Middle East (Oct '17 - Aug '23)<sup>226</sup>



6

Companies in the Net Zero Future50 - Middle East

Early warnings for climate disasters can save lives, particularly as extreme heat increases in the Middle East.<sup>227</sup> Technologies, such as satellite imagery and AI, can provide governments and companies with warning signs and optimised plans for addressing disasters. Although Climate Change Management and Reporting (CCMR) is crucial for future disaster preparedness, investment in the sector is low. The share of Middle Eastern investment in CCMR companies is at par with the global average of about 2%.

Companies in this sector are also highly concentrated: six of the 10 companies in our Future50 and Ones to Watch lists are in the emissions monitoring, management, and reporting sub-sector. For example, ForthGrid facilitates the monitoring of ports and areas where precious metals and crude oil are extracted. Oliva Gaea, Verofax, Green Future Project, and Innovabeyond ESGeo offer solutions for companies wishing to track emissions, seek compliance with existing legislation, offer ESG and other forms of sustainability verification. Other companies on our list work to facilitate climate risk management and climate data generation, two other critical components of staying abreast of the changing climate. While these efforts are admirable, investment in the sector needs to increase.

## Barriers:

**Underutilised and missing data:** Missing data baselines are widespread and difficult to counteract. For example, although most Middle Eastern countries have air-quality monitoring systems, that data is not used effectively to craft legislation to address pollution.<sup>228</sup> Also, while there have been many studies on air pollution in the Middle East, there is a dearth of holistic, comprehensive regional studies. Countries also often lack comprehensive emissions inventories.

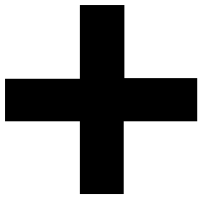
**Unenforced legislation:** Generally, Middle Eastern policies follow environmental guidelines established by international organisations such as the WHO, but they are often not effectively enforced.<sup>229</sup>

## Accelerators:

**ESG commitments:** ESG reporting is becoming a topic of increasing concern, with 64% of respondents to PwC's 2023 Middle East Report<sup>230</sup> stating that they have adopted a formal ESG strategy in the last 12 months. Regulations and international guidelines can drive further growth in this area.

## Technology drivers:

#Satellites #AI #Cloud #Analytics  
#DataVisualisation #DataMapping  
#MachineLearning #GIS #Blockchain  
#SaaS

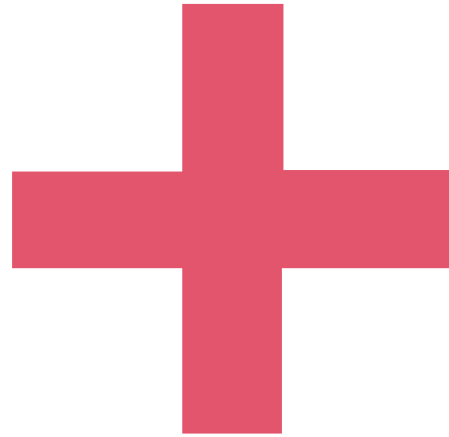


## Growth areas:

**Emissions monitoring, management and reporting:** Robust GHG monitoring and reporting systems are a crucial part of climate initiatives, including emissions reduction targets and carbon credit programmes. However, there are many gaps in GHG data giga-intelligence in the Middle East. Since they are small in scale, start-ups in this sub-sector tend to limit the scope of their focus to domains where GHG emissions are particularly salient. These include locations with heavy and extractive industries, last-mile delivery, and fluorinated gas emissions. These limited focuses form the building blocks of a more complete GHG monitoring ecosystem. SaaS platforms, AI and satellite-enabled data analytics, and blockchain technology can help collect and disseminate emissions data. Many groups stand to benefit from better emissions monitoring, including companies making forecasts and emissions reports, shoppers looking for products that are certified as sustainable, and legislators creating policies based on data.

**Climate risk management:** Climate risk management includes strategies and techniques to enhance resilience to climate challenges, whether by making choices to help climate protection efforts or by taking actions to mitigate the adverse effects of climate change. Risk assessments are key in this area, and start-ups in the Middle East are focused on bringing climate risk management to broader groups of people – from real-estate developers to individuals looking to recycle in exchange for needed goods.

**Climate data generation:** Climate data is vital for governments and organisations to make informed decisions related to climate preparedness. This data can help in tracking weather patterns and choosing optimal locations for solar and wind farms. According to the World Meteorological Organisation (WMO), extreme weather has caused two million deaths and cost US\$4 trillion in economic losses over the past 50 years.<sup>231</sup>





## Future50

Climate Change Management  
and Reporting (CCMR)

Emissions Data, Monitoring,  
Management and Reporting

# ForthGrid

ForthGrid



<https://www.forthgrid.com>

#ClimateTech  
#GreenManufacturing

## Highlights

ForthGrid, raised institutional funding from **Entrepreneur First** in 2022 after participating in its acceleration programme.<sup>232</sup>

The founding team brings experience from high-performance start-ups, such as Tesla and SpaceX.<sup>233</sup> It has reported having **more than 35 customers** leveraging its technology.

## Strategic alliances:

- Space Agencies
- International Development Agencies
- Research Institutes
- Carbon Trading and Sequestration Companies
- Sustainability Investors

## List impact technologies:

Geospatial Intelligence, Satellite Data Analytics, AI

## Headquarters:

Canada

## Middle East operational countries:

Saudi Arabia, United Arab Emirates

## Summary

ForthGrid is a **geospatial intelligence company** that leverages AI, satellite and data analytics. The company has created a SaaS cloud platform called SpaceVision, which seeks to transform satellite data into actionable insights.

ForthGrid reports that the objective of the platform is to allow authorities and financial decision-makers to monitor environmental challenges, such as water quality around ports, precious metal extraction like gold mining, monitoring crude oil stockpiles and the terminals where it is stocked.

## Impacts

ForthGrid claims that its global oil spill detection and metal extraction solution aim to mitigate impact on the ocean and land ecosystems by monitoring compliance of operators and allow authorities to take corrective action preventing unregulated deforestation.

ForthGrid indicates that its US crude oil solution monitors production of crude oil levels for upstream operators to allow them to manage production more efficiently. Forthgrid is working to develop this solution to allow downstream operators to monitor refining processes to ensure compliance to emission standards.





## Future50

Climate Change Management  
and Reporting (CCMR)

Climate Risk, Resilience  
Management

# FORTYGUARD

FortyGuard



<https://www.fortyguard.com>

#ClimateTech

## Headquarters and Middle East operational countries:

United Arab Emirates

### Summary

FortyGuard has developed a **cloud-based AI tool** that it states provides enriched **dynamic temperature insights**. Initially a material science company specialised in cooling down asphalt in hot climates, FortyGuard has since evolved into a data provider to businesses and individuals, such as architects, real estate developers and engineering consultants, typically sharing insights on excessive heat identification, passive cooling and energy optimisation.

The company highlights that its platform is designed to be a comprehensive and scalable solution utilising **AI algorithms, data processing techniques, computer vision, and multimodality** to deliver accurate insights, analytics, and predictions.

### Impacts

FortyGuard claims that its solution can provide near **surface temperature readings at up to 1m<sup>2</sup> resolution** as well as **refreshed data every few minutes at significantly lower cost** than satellite alone. It adds that its AI engine has mapped 170 cities globally to date by leveraging a variety of data sources and integrating the latest advanced technologies.

FortyGuard notes that it has created solutions around **hyperlocal mobile and static sensing** to provide detailed **heat simulations**, as well as passive cooling with heat protection, modulation and dissipation. It details that these are supported by customised **AI visuals, GIS data and net zero ESG reporting**. FortyGuard aims for its solutions to help finance energy savings calculations and monitoring, as well as material standardisation and specifications.

### Highlights

FortyGuard is part of **Masdar City's INNOVATE platform**<sup>234</sup> and is an alumnus of **HUB71**,<sup>235</sup> the **C3 accelerator**<sup>236</sup> and the **Mohammed Bin Rashid Innovation Fund**.<sup>237</sup> It states that it has partnered with companies, such as **Honeywell** and **AlfaTech** in San Jose to provide joint temperature solutions to other clients. FortyGuard also won the 2023 Etisalat Hello Pitch Competition,<sup>238</sup> the Best Pitch Award at the 2022 SHERAA Entrepreneurial Festival<sup>239</sup> and was recognised with a Ma'an Certificate for Social Enterprises.<sup>240</sup> FortyGuard counts the former CIO of City of Palo Alto, Dr. Jonathan Reichental, as one of its expert advisors, and indicates working with clients, such as **Aldar, Masdar City, Aldar Properties, NEOM, Emirates Global Aluminium and Emirates Nuclear**. It adds that it has partnered with universities, such as New York University in Abu Dhabi and The University of Wollongong in Dubai.<sup>241</sup> In September 2023, Forthgrid joined Techstars Miami's current cohort and secured US\$125k in funding as part of the program.<sup>242</sup>

### Strategic alliances:

- Universities
- Business
- Government (Central Authorities)
- Municipalities
- Insurance Companies
- Event Building Companies

### List impact technologies:

High-Efficiency Heating and Cooling, Smart Buildings,  
Environmental Data





## Future50

Climate Change Management  
and Reporting (CCMR)

Climate/Earth Data Generation



MeteoWeather



<https://meteoweather.global/>

#ClimateTech

### Headquarters:

Jordan

### Middle East operational countries:

Egypt, Iraq, Qatar, Saudi Arabia, United Arab Emirate

### Summary

MeteoWeather has developed a proprietary enterprise **climate-security and weather intelligence management and disaster monitoring intelligence system**. Its cloud-based platform and analytics tool derive images to **analyse satellite and other earth observation data** and AI to produce actionable data-driven insights, with a range of applications – from energy demand forecasts for renewable energy businesses, flight path optimisation for airline companies to science and public policy.

### Impacts

MeteoWeather's application in disaster mitigation has worked to **improve climate safety** by alerting on climate events, such as flash floods enabling authorities to take mitigating action. Renewable energy businesses can optimise locations of their wind and solar farms using MeteoWeather **custom power forecasts**. Grid operators can optimise energy demand planning with predictive weather analytics.

### Highlights

MeteoWeather is a spin out company of the **ArabiaWeather Group** that has reportedly raised **US\$7 million in equity financing**.<sup>243</sup> MeteoWeather reports that it has developed climate early warning systems for the government of the **Kingdom of Saudi Arabia** as well as **Saudi Electric Company** for power predictive modelling and **Qatar Airways** for flight predictive modelling.

### Strategic alliances:

- Governments
- Renewable Energy Firms
- Airlines
- Farming Industry
- Climate Research Organisations

### List impact technologies:

Precision Agriculture, Smart Buildings, Solar Power, Wind Power, Smart Grid, AI





## Future50

Climate Change Management  
and Reporting (CCMR)

Emissions Data, Monitoring,  
Management and Reporting



Olive Gaea



<https://www.olivegaea.com/>

#ClimateTech

### Headquarters:

United Arab Emirates

### Middle East operational countries:

Bahrain, Egypt, Kuwait, Oman, Qatar, Saudi Arabia

### Summary

Olive Gaea seeks to provide an **enterprise management tool that automates the carbon footprint management process**. It aims to provide digitised tools for AI-driven carbon emission measurement, analysis, and reporting, developing science-based decarbonisation strategies that enable organisations to forecast emission levels as well as assess mitigation and offsetting options.

### Impacts

Olive Gaea looks to help clients take measurable and effective climate action and achieve net zero targets. Olive Gaea's technology portfolio features APIs that **support e-commerce and logistics services** by measuring and offsetting on the go the footprint of last mile delivery.

### Highlights

Olive Gaea was selected for the **Emirates Global Aluminium** Ramp-Up programme.<sup>244</sup> It was also shortlisted as a finalist to the **Make it in the Emirates** Start-up Pitch competition organised by the UAE Ministry of Industry and Advanced Technology.<sup>245</sup> Olive Gaea **raised US\$1 million** in funding from Cornerstone Venture.<sup>246</sup>

### Strategic alliances:

- Businesses
- Government and Public Sector

### List impact technologies:

Automation, AI, Data Analytics





## Future50

Climate Change Management  
and Reporting (CCMR)

Climate/Earth Data Generation



ValueGrid



<https://actinsight.org/home>

#ClimateTech

## Headquarters and Middle East operational countries:

United Arab Emirates

### Summary

ValueGrid leverages **AI and ML** techniques to address complex challenges in industries, such as railway and oil and gas to improve strategic decision-making.

Its platform ActInsight aims to better integrate, analyse and visualise climate data at business, organisation, and government levels. This enables users of the technology to understand the impact of their actions or climate initiatives on net zero targets.

### Impacts

ActInsight's interactive platform enables stakeholders to interact with data in realtime to allow them to respond quicker as well as monitor and address performance gaps.

ActInsights is designed on an open platform principle, which connects their data points through APIS to other climate data organisations to enable greater collaboration between entities.

### Highlights

The ValueGrid team was a winner at both the **United Nations Global Stocktake Climate Datathon**, presenting its solution at **COP27 in Egypt**,<sup>247</sup> as well as at the **2022 Mohammed Bin Rashid Centre for Government Innovation** challenge.<sup>248</sup> The company has also been featured as a leading climate innovator by UAE's **OECD Observatory of Public Sector Innovation**.<sup>249</sup>

### Strategic alliances:

- Large Complex Data Projects
- Industry Leading Companies
- NGOs
- Consulting Firms
- Public Sector
- Government Institutions

### List impact technologies:

Carbon Management Reporting





# Future50

Climate Change Management  
and Reporting (CCMR)

Emissions Data, Monitoring,  
Management and Reporting



Verofax Limited



<https://verofax.com/sustainability/>

#GreenManufacturing

## Headquarters:

United Arab Emirates

## Middle East operational countries:

Saudi Arabia

## Summary

Verofax offers what it describes as a 'Sustainable Traceability as a Service' solution **incorporating blockchain, augmented reality and AI**. It states that this solution powers enterprises to accelerate net zero by adopting **eco-labels** and engaging end-users on responsible consumption. Verofax claims that it enables businesses to turn ESG reports into per-item **sustainable product ratings** for accessing EU markets that require interactive eco-labels. It details that these ratings are on six metrics and cover scope 1, 2 and 3 emissions, including recycled content and materials; chemical materials; water eutrophication; transport emissions; energy consumption and EOL recycling rate.

## Impacts

Verofax's solution has been designed to **nudge shoppers to purchase fractional carbon credit offsets**, which turn into free carbon credits for participating retailers. The fractional carbon offsets can be used under the **UNFCCC Clean Development Mechanism (CDM)**, which can be traded and sold to help achieve emission reduction targets. Verofax proposes its solution helps enterprises reduce business exposure to greenwashing risks as well as acquire and retain responsible consumers by turning them into advocates of its brands.

## Highlights

Verofax has raised more than **USD\$2.8 million in equity finance**,<sup>250</sup> with notable investors including **500 Global and Benson Oak Ventures**.<sup>251</sup>

Verofax won the **Artificial Intelligence Award** at the Rocketfuel pitch competition at **LEAP** in Riyadh 2023,<sup>252</sup> as well as **Bahrain Islamic Bank Innovation Challenge**.<sup>253</sup> It is part of **Masdar City's INNOVATE platform**,<sup>554</sup> alumnus of **HUB71**,<sup>255</sup> the **Mohammed Bin Rashid Innovation Fund Accelerator**<sup>256</sup> and the **Blockchain and Web3 Award at GITEX** as part of the Supernova Challenge 2023.<sup>257</sup> Verofax reports having acquired four patents on cognitive AI vision and blockchain, and being a partner with Microsoft,<sup>258</sup> which they say helps maintain their GDPR compliance.<sup>259</sup>

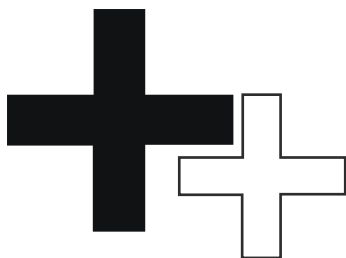
## Strategic alliances:

- Hyperscale Cloud Providers
- Industry Consultancy Firms
- Fashion and Beauty Cosmetics Manufacturers
- Oil and Gas Industries
- Food and Beverage Manufacturers

## List impact technologies:

Blockchain, Carbon Credit Tokenisation, AI, XR





## Ones to Watch

# Climate Change Management and Reporting (CCMR)



Headquarters: Italy  
Middle East operational countries:  
United Arab Emirates

Emissions Data, Monitoring, Management and Reporting |  
**Climate Tech**

Green Future Project (GFP) has designed what it describes as an automated 360-degree solution for companies to cover the end-to-end process of **measuring, tracking and offsetting companies' impact on emissions and their carbon footprint.**

The GFP enterprise SaaS solution seeks to automate the process of carbon auditing and enable ESG reporting by **auditing scope 1, 2, and 3 emissions.** GFP notes that companies can then formulate a strategy to align strategic net zero targets. GFP is part of **Hub71**<sup>260</sup> in **Abu Dhabi** and is **BCorp-certified.**<sup>261</sup>

#Environmental  
ImpactMonitoring

[www.greenfutureproject.com](http://www.greenfutureproject.com)



Headquarters: United Arab Emirates  
Middle East operational countries:  
Saudi Arabia

Emissions Data, Monitoring, Management and Reporting |  
**Climate Tech**

InnovaBeyond | ESGEO leverages ESGEO technology, which is a **GRI-certified software solution.**<sup>262</sup> The company states that it combines and converts available existing ESG standards and frameworks, as well as Social Development Goals (SDG), to collect and **process data in real-time, and to produce a combined ESG report** tailored to organisations' needs.

InnovaBeyond | ESGEO notes that it enables the disclosure of sustainability information and supports organisations' ESG governance and management. The company reports that its ESGEO software is also **SASB-certified.**<sup>263</sup>

#DataAnalysis

[innovabeyond.digital](http://innovabeyond.digital)



Headquarters: United Arab Emirates  
Middle East operational countries:  
Saudi Arabia

Emissions Data, Monitoring, Management and Reporting |  
**Climate Tech, Built Environment**

LAB Data provides an F-gas measurement and verification ecosystem that includes recommended changes to f-gas legislation to support tagging, tracking, management and end-of-life services for governments.

Carbon reductions are achieved through **collection and destruction, collection and recycling**, and monitoring recommended changes in standard f-gas practices to instil better professional standards.

Lab Data Solutions aims to **reduce emissions caused by the escape of refrigerant F-gas,**<sup>264</sup> considered a potent greenhouse gas (GHG). The company reports that its solutions are purpose-built to help reduce tens of millions of tonnes of carbon, which produces tier-one **carbon credits.**

#HighEfficiency  
Heating&Cooling

<http://www.wearelab.net/>



Headquarters and Middle East operational countries: Egypt

Climate Risk, Resilience Management | **Climate Tech**

Plstka seeks to improve waste management and has developed a **gamified reward app using AI to optimise waste recycling**. The application allows the user to swap their solid waste in return for food and medical supplies, and other life-essential services and discounts.<sup>265</sup> This has encouraged a new micro gig economy as individuals leverage Plstka technology to generate income.<sup>266</sup>

Plstka claims to have contributed to recycling **320 tons of waste** in the last two years. Plstka also reports that they have had more than **8000 downloads of their app** since launch.

#FoodWasteTechnology

<https://plstka.com/en>



# Mobility and Transport



17%

of ME GHG emissions<sup>267</sup>



\$675m

Total VC sector investment in Middle East (Oct '17 - Aug '23)<sup>268</sup>



5

Companies in the Net Zero Future50 - Middle East

The International Energy Agency estimates that to reach net zero by 2050, the global Mobility and Transport sector will need to reduce emissions by more than 3% per year until 2030.<sup>269</sup> This will require stopping and completely reversing the industry's current trajectory, which has an average growth in emissions of 1.7% per year.

On average, the share of investments the Middle East has made in Mobility and Transport related climate tech has been roughly equivalent to the global average of 48%.<sup>270</sup> However, this has fluctuated from year to year: investment in Mobility and Transport decreased from 56% of overall investment in 2022 (about US\$400 million) to just 27% in 2023 (about US\$28 million). That said, start-ups with promising decarbonisation offerings provide an opportunity for investors to increase their focus on this highly emissive sector. Two out of five of the Future50 businesses in this sector focus on low-GHG light and heavy duty EVs and high-efficiency vehicles, such as ONE MOTO, headquartered in the UAE, which designs electric vehicles (EVs) optimised for last-mile delivery.

## Technology drivers:

#KineticEnergySystems #Robotics  
#BatteryRecycling #AutonomousVehicles  
#EVs #CarbonMarkets #ArtificialIntelligence

In addition, two start-ups to watch – BaseTrack and IWROBOTX – are in the low-GHG shipping space building autonomous trucks and ships, respectively. To power this growth, innovations in battery and fuel cell technology will be key.

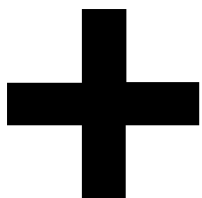
## Barriers:

**Lack of global scalability:** Shortages in the raw materials required to build EV batteries and fuel cells, high costs for synthetic fuels, and inadequate infrastructure to support low-emissions options all affect the ability of sustainable travel and transport to scale. These challenges are being exacerbated as travel and global shipping have increased post-pandemic, increasing emissions almost twice as much as average from 2021 to 2022.<sup>271</sup>

## Accelerators:

**Infrastructure development:** Governments in the Middle East are heavily investing in upgrading road infrastructure and transport systems, as well as building new systems, such as Saudi Arabia's NEOM. These upgrades give Middle Eastern countries the opportunity to craft transit systems based around more sustainable options.<sup>272</sup>

**Legislation and maturation:** Countries across the Middle East have made commitments to reduce GHG emissions and pass legislation to support decarbonisation, such as the UAE's Green Economy for Sustainable Development initiative and Egypt Vision 2030. The Middle East and North Africa nations apply more restrictive, non-tariff measures than in any other region, according to the International Monetary Fund. These almost doubled between 2000 and 2020. Business and investment barriers include cumbersome licensing processes, complex regulations, and opaque bidding and procurement procedures.<sup>273</sup>



## Growth areas:

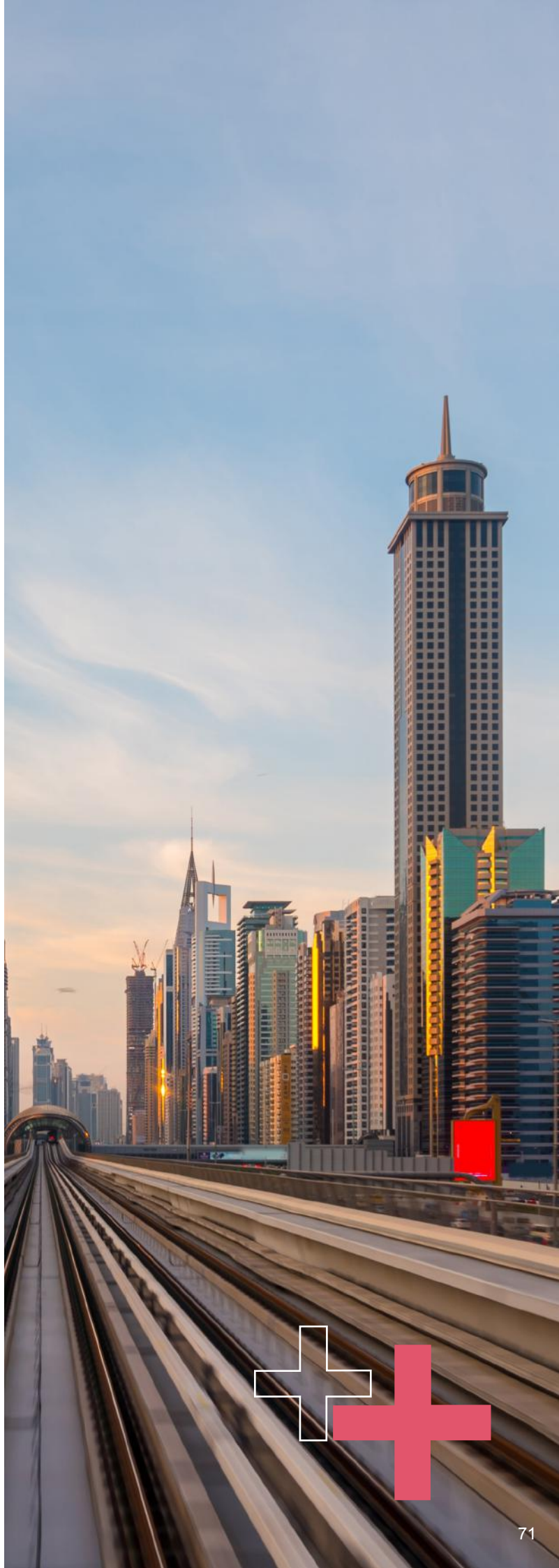
**Low-GHG light and heavy duty EVs and high-efficiency vehicles:** In the GCC, the market for EVs is growing fast, with a predicted compound annual growth rate (CAGR) of 25.16% by 2028, for an estimated total of US\$10.7 billion.<sup>274</sup> If supportive infrastructure can be built to sustain autonomous EV fleets, greater decarbonisation of public transport and last-mile logistics is possible. Other innovations, such as kinetic energy systems can help reduce emissions in harder-to-abate, non-EV vehicles.

**Micro mobility:** E-bikes and scooters have become more widespread in the Middle East, allowing commuters and residents to stay mobile with a lower-carbon profile. On the industry side, micro mobility options, including robotics, also provide an opportunity for manufacturers and distributors to reduce their emissions footprints.

**Batteries and fuel cells:** Obtaining the raw materials required for batteries and fuel cells is an ongoing challenge in the Mobility and Transport sector. In addition, battery replacement and refuelling systems will need significant development to support decarbonised EV fleets. Stakeholders in the Middle East are making investments in this area as part of its efforts to reduce emissions.

**Low-GHG air transport:** Air transport is only becoming a more significant source of emissions in the Middle East as the region rebounds from the COVID-19 pandemic. Tourism in the region alone doubled in 2022 and has grown by almost 30% in 2023.<sup>275</sup> By incentivising more eco-friendly forms of air transport — including reducing contrails, an often overlooked source of global warming — the Middle East can be at the forefront of decarbonising the skies.

**Low-GHG shipping:** Due to its location at the nexus of Africa, Asia and Europe, the Middle East has a key role to play in spearheading efforts to reduce emissions from shipping. Innovative approaches to land and sea freight can take advantage of advanced autonomous capabilities to use fuel more efficiently and proactively reduce pollution.





# Future50

Mobility and Transport

Low-GHG Light/Heavy Duty/EVs/High-Efficiency Vehicles

# ADGERO

Adgero UK Ltd.



[www.adgero.co.uk](http://www.adgero.co.uk)

#ClimateTech

## Headquarters:

United Kingdom

## Middle East operational countries:

United Arab Emirates

## Summary

Adgero develops **kinetic energy recovery systems** that can be fitted onto trucks. It details that these devices capture kinetic energy during braking and can release energy during acceleration. The company adds that this technology can **reduce fuel burn by up to 25%**, and could thus help companies save on the amount of fuel they burn while benefiting the environment.

## Impacts

Adgero claims to have been able to **reduce CO2 emissions by 25%** across the vehicles its technology has been deployed on.<sup>276</sup> The company reports that it is working with **mining companies in Australia** to deploy its solution onto load trains to provide their trucks with extra energy and **move more load per trip**, increasing trip efficiency.<sup>277</sup>

## Highlights

Adgero UK is an alumnus of Los Angeles-based accelerator **Expert DOJO**.<sup>278</sup> It reports to have been awarded R&D grants by **Innovate UK** to develop its technology, and to have raised around US\$100K in equity<sup>279</sup> from investors, such as Expert DOJO, Shackleton Ventures and TURN8, and to have development agreements with a number of vehicle brands, including **Renault**.

Adgero UK notes that it has secured a French patent for its technology related to the **integration of an electric hybrid drive system into existing heavy vehicle platforms**. The company also indicates that it has filed a new patent in North America, the EU, Australia, New Zealand, South Africa and the United Arab Emirates for the expansion of its system to include GPS-based predictive powertrain control, which allows the electric drive to adapt power delivery based on terrain and traffic.

## Strategic alliances:

- Logistics Companies
- R&D Accelerators
- Governments
- Vehicle Manufacturers

## List impact technologies:

Low GHG Heavy Duty Vehicles





# Future50

Mobility and Transport

Micro Mobility



DELIVERS.AI



<https://delivers.ai/>

#BuiltEnvironment

## Headquarters:

United Kingdom

## Middle East operational countries:

Saudi Arabia, United Arab Emirates

## Summary

DELIVERS.AI's has designed **robots** that aim to enable **automated delivery services**. Its technology seeks to help businesses offer zero-emission delivery and fixed costs. The robots are designed to be integrated into a company's existing delivery workstream and software. DELIVERS.AI has designed an end-to-end system with proprietary technologies, such as fleet management software and a tele-assistant.

## Impacts

DELIVERS.AI provides a device-agnostic technology platform through which robots run on electricity, which it believes **decreases gasoline usage**. Its robot solution could also look to help address issues, such as traffic congestion, vehicle accidents, insurance and labour costs for delivery companies.

## Highlights

DELIVERS.AI notes that they have participated in a number of notable accelerators, including **EIT Urban Mobility**<sup>280</sup> (European Institute of Technology). It also indicates having a number of global patents across its technologies. **Carrefour** is reported to have begun a pilot to autonomously deliver groceries to customers' homes in Belgium.<sup>281</sup> The company has launched a delivery service in Madrid alongside Glovo, Madrid Futuro and Goggo Network.<sup>282</sup>

## Strategic alliances:

- Universities and Research Centres
- Food Aggregators
- Airports
- Shopping Mall Operators
- E-Commerce
- Vehicle Charging Partners

## List impact technologies

Light Duty Battery EVs, Micro Mobility, Low GHG Shipping





# Future50

Mobility and Transport

Batteries/Fuel Cells



EXELx Regenerative Battery Technology



<https://www.exelx.net/>

#GreenManufacturing  
#ClimateTech

## Highlights

Exelx is part of the **Masdar Innovate** initiative.<sup>283</sup> The company reports that it has secured proof-of-concept projects with **IKEA** and **Aramex** in Jordan, and a patent in Japan for their core technology.

## Strategic alliances:

- Insurance Companies
- Warehouses
- EV Manufacturers
- EV Mobility Companies
- Heavy Industry
- Airports
- Forklift Companies

## List impact technologies

Light Duty Battery EVs, Battery Regenerate-Reuse-and-Recycle

## Headquarters:

United Arab Emirates

## Middle East operational countries:

Jordan

## Summary

EXELx is a regenerative battery technology company that claims to perform high-accuracy testing, revival and maintenance services aimed at **extending the life cycle of lithium-ion, NiMH, lead-acid and other types of batteries.**

Exelx indicates a differentiated battery manufacturing approach – taking batteries from manufacturing and consumption to repair, reuse, second application, and then recycling those that cannot be reused. Example use cases include electric vehicles and forklifts across multiple industries.

## Impacts

By extending the lifespan of batteries, Exelx seeks to **reduce the number of batteries that go to landfills** and to improve the traceability of battery cells. The company suggests that this in turn will help **reduce sourcing and mining of raw materials** to create new batteries, and indirectly reduce the carbon footprint and emissions from the manufacturing process.





# Future50

Mobility and Transport

Low GHG Light/Heavy Duty/EVs/High-Efficiency Vehicles



## ONE MOTO

ONE MOTO Technologies Ltd



<https://one-moto.com>

#GreenManufacturing

## Headquarters:

United Arab Emirates

## Middle East operational countries:

Bahrain, Iraq, Jordan, Kuwait, Oman, Qatar, Saudi Arabia

## Summary

ONE MOTO designs and builds EVs focused on the last mile delivery sector, which it seeks to decarbonise. The company's approach includes using **intelligent battery swapping technology, artificial intelligence/big data, leasing vehicles and manufacturing**. ONE MOTO seeks to create an end-to-end EV ecosystem, and offers **subscription models for fleet operators and riders** to use batteries and save money. It owns a fleet of electric delivery vehicles and provides after-care programmes.

## Impacts

ONE MOTO aims to tackle three issues – environment, profitability and welfare. The company claims that its solution will **reduce more than 260,000 tonnes of CO2 each year in the UAE** alone, increasing bottom line profits by over 74% for stakeholders, enhancing rider safety and providing governments with valuable data.

## Highlights

ONE MOTO has partnered with **Rochester Institute of Technology (RIT) Dubai** to develop three innovative electric motorcycles for last-mile transportation.<sup>284</sup> Most notably, it won the **2022 Hitachi Innovation Challenge**,<sup>285</sup> was **Scale Up of the Year**<sup>286</sup> and runner-up at the **2020 GITEX Future Stars' Supernova Challenge**<sup>287</sup> and named **UAE Sustainable Business of the Year**<sup>288</sup> at the **2020 Gulf Capital SME Awards** and **Scale Up of the Year**.<sup>289</sup>

ONE MOTO was also a finalist at the **DHL FastForward Challenge**,<sup>290</sup> mentored by corporate partners PwC Middle East, and the **C3 Accelerator programme**.<sup>291</sup>

ONE MOTO has expanded to 10 countries in two years and in July 2023, secured **US\$40 million**<sup>292</sup> in lease financing for its operations in the UAE.<sup>293</sup> The company had previously raised **US\$150 million** in asset financing<sup>294</sup> to offer finance to fleet operators to expand an electric delivery fleet throughout Europe.

## Strategic alliances:

- Universities
- Government (Central Authority)
- Distribution and Delivery Companies
- Supermarkets
- Last Mile Delivery
- Fleet Operators

## List impact technologies:

Micro Mobility, Electric Vehicles (EV), Logistics/ Last Mile, Battery Swapping, Telemetry





# Future50

Mobility and Transport

Low GHG Air Transport

## SATAVIA

MAKING AVIATION GREENER

SATAVIA



<https://satavia.com/>

#ClimateTech

### Headquarters:

United Kingdom

### Middle East operational countries:

United Arab Emirates

### Summary

SATAVIA is a climate tech software firm that provides a **market incentive for airlines** to manage the non-CO2 climate impact produced by **aircraft contrails**. SATAVIA claims to optimise flight plans for contrail prevention, quantify achieved climate benefit, and translate this into future carbon equivalent tradeable units.

### Impacts

SATAVIA notes that contrail management is emerging as one of the leading solutions for tackling the aircraft sector's neglected non-CO2 climate impact. SATAVIA claims that its software can help **eliminate 60% of the aviation industry's climate impact, or 2% of all human-induced climate change.**<sup>295 296</sup> SATAVIA is expanding this climate solution to help create a new voluntary carbon market that is expected to be worth up to US\$24 billion globally.<sup>297</sup>

### Highlights

SATAVIA has signed a multi-year production contract with **Etihad**.<sup>298</sup> It is claimed that the multi-year agreement is the world's first to incorporate contrail management into routine flight operations.

SATAVIA and Etihad have been recognised for their collaboration on contrail management by the **Air Transport World and Aviation Week**. They jointly received the prestigious 2023 **Eco-Technology Achievement Award**.<sup>299</sup>

SATAVIA is reported to have raised more than US\$2.5 million in equity finance.<sup>300</sup> In 2022, the company entered into a partnership with **AirCarbon Exchange** to create the first carbon trade arising from aviation's non-CO2 impacts.<sup>301</sup>

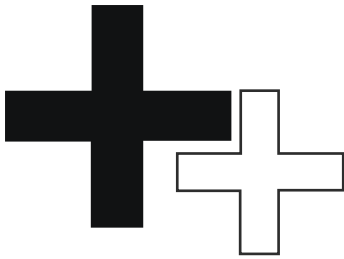
### Strategic alliances:

- Universities
- Aviation Industry
- Airlines
- Airports

### List impact technologies

Contrail Management, Flight Plan Optimisation, Radiative Forcing Management





## Ones to Watch

# Mobility and Transport



Headquarters: Kenya

Middle East operational countries: Egypt

Low GHG Light/Heavy Duty/EVs/High-Efficiency Vehicles | **Climate Tech**

ARC Ride aims to provide **clean, affordable and reliable e-mobility solutions** for rapidly developing cities by creating electric vehicle ecosystems.

ARC Ride's offering is mainly designed for FMCG delivery and taxi services. The company states that this includes EV battery swap stations that have built-in telematics and GPS functionality, along with solar panels attached to supplement grid power.

ARC Ride estimates that its solution saves an average 2 metric tons of CO<sub>2</sub> annually as compared to typical petrol motorcycles,<sup>302</sup> when calculated based on available industry research.<sup>303</sup>

ARC Ride won the **Dubai DHL Dubai FastForward Challenge 2023**<sup>304</sup> and has innovation research partnerships with Imperial College London and Strathmore University.<sup>305</sup>

#SolarPower

#LightDutyBatteryEVs

<https://arcrideglobal.com/#/home>

## BASETRACK

Headquarters: Estonia

Middle East operational countries: United Arab Emirates

Low GHG Shipping | **Climate Tech**

BaseTrack is a trucking solutions provider that has two solutions based on one technology. BaseTrack describes one as a **fully autonomous trucking service** using virtual rails technology to maximise efficiency of the trucking industry. The second, the company notes, is a **simplified semi-autonomous version** that looks to reduce fuel consumption in human-driven trucks as an **advanced driver-assistance system**.

BaseTrack suggests that its semi-autonomous solution can help human-driven trucks **save up to 20% fuel**. The company states that its autonomous trucking solution is expected to deliver commercial cargo with up to **30% less energy consumption**.

BaseTrack was a finalist at the Dubai **DHL FastForward Challenge**<sup>306</sup> and recognised as this year's **Autonomous Vehicle Solution Provider of the Year** at the AutoTech Breakthrough awards.<sup>307</sup> BaseTrack introduced the **first local autonomous truck in the UAE**, through its partnership with **ATC Allied Transport (UAE transport company)**.<sup>308</sup>

#LowGHGHeavyDutyVehicles

<https://www.basetrack.net/>



Iwrobotx

Headquarters: Turkey

Middle East operational countries: Bahrain, Egypt.

Low-GHG Shipping | **Built Environment, Climate Tech**

IWROBOTX seeks to develop advanced software, hardware and high-tech solutions for the marine industry.

The company claims to have produced a patented **autonomous electrical seabound vessel, Doris S1, which monitors and cleans marine pollution**.<sup>309</sup>

IWROBOTX claims that its product is capable of dealing with a higher volume of marine waste. The company claims that Doris S1 **cleans the sea significantly faster** as compared to other manual methods, and at a much lower cost.

IWROBOTX was a finalist at the **Global Cleantech Innovation Program**<sup>310</sup> in 2016, receiving a grant from Turkey's Scientific and Technological Research Council (TÜBİTAK).<sup>311</sup> In 2022, it was nominated for the **Future Unicorn Award**.<sup>312</sup> It participated in the **2023 Climate Finance Accelerator powered by PwC**.<sup>313</sup>

#LowGHGShipping

#MicroMobility

<https://www.iwrobotx.com/>



# Built Environment



6%

of ME GHG emissions



\$4.8m

Total VC sector investment in Middle East (Oct '17 - Aug '23)<sup>314</sup>



4

Companies in the Net Zero Future50 - Middle East

The Built Environment (residential buildings, commercial buildings and infrastructure) is one of the most significant contributors of emissions globally, accounting for around 37% of global CO<sub>2</sub> emissions in 2021. Although for now the figure is lower in the Middle East, at about 6%, based on our data.<sup>315</sup> These emissions come from both the materials used in buildings and the emissions produced during their maintenance and operation (i.e heating, cooling, lighting). Middle Eastern countries are investing in gigaprojects like NEOM and the Red Sea Project in Saudi Arabia and Expo 2020 Dubai in the United Arab Emirates to upgrade infrastructure, foster economic growth and tourism, and support a growing population. However, these investments – which we estimate will total about US\$2 trillion by 2035 – are primarily being made as government projects, and rarely include climate tech start-ups.

According to our analysis of Pitchbook data,<sup>316</sup> since 2022, there have been no deals with Built Environment climate tech start-ups in the Middle East. For comparison, globally, about 6% of total climate tech investment went towards the Built Environment sector.

## Technology drivers:

#Nanomaterials #3DPrinting  
#AI #EnergyEfficientTechnology  
#SmartDevices

Accordingly, the Middle East has room to grow in supporting start-ups in this sector. Of the companies that made our Future50 and Ones to Watch list, the largest sub-sector was low-GHG construction processes with four businesses. These include GraphenePioneer and Innotech, both of which have made innovative updates to how cement is used in construction, as well as Magway's electric-powered transport system for construction goods. Other companies offer a range of other solutions for decarbonising various aspects of the built environment. A number focus on methods to manage built environment systems more efficiently, such as Sadeem's wireless monitors for city drainage systems and Fuelin's mobile application to pay for and monitor fleetwide fuel usage.

## Barriers:

### Competition from state built-environment entities:

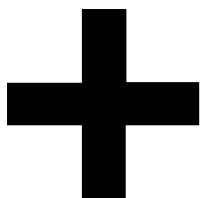
As outlined above, Middle Eastern investments are generally directed toward state-run projects, rather than climate tech start-ups. This highly centralised market is challenging for new entrants.

**Specialised labour:** The Middle East lacks the specialised labour needed to build and install complex construction solutions. Until the workforce is grown and upskilled, decarbonisation solutions that are simple to adopt will be preferable.

## Accelerators:

**Built environment growth:** As the Middle East ramps up its investments in construction, this is a key moment for start-ups looking to offer specialised or alternative solutions to more emissive traditional options. Partnerships between start-ups and state-run projects could allow resources and novel technologies to be shared for mutual benefit.

**Smart cities:** Governments in the Middle East are emphasising smart, sustainable new bids, showcasing their appetite for novel solutions. Programmes like the Smart Dubai initiative and Abu Dhabi Economic Vision 2030 emphasise incorporating novel solutions for sustainable, smart growth in Middle Eastern cities.



## Growth areas:

**Low-GHG construction processes:** Construction is a highly materials-and-emissions-intensive process, and decarbonisation efforts are not on track to meeting targets.<sup>317</sup> Emissions from construction can be alleviated by designing new builds more optimally to reduce the overall need for materials, potentially leveraging AI tools in the process. Techniques like 3D printing can be deployed to allow for less waste and reduced use of cement. Electrifying processes and vehicles in construction, which traditionally depend on fossil fuels, also open up the possibility of using renewable energy sources.

**Transformative circularity and recycling:** By applying the principles of the circular economy to the way we design buildings, infrastructure and other elements of the built environment, we can reduce global CO2 emissions from building materials by 38% by 2050. By reducing demand for steel, aluminium, cement and plastic, we can make the sector more resilient to supply chain disruptions and price volatility of raw materials.<sup>318</sup> A circular economy would also reduce the need to produce new materials as well as the amount of waste going into landfills. This last point is of particular importance in the Middle East, which requires significant upgrades to its waste-management systems. By using alternative, upcycled materials that are more durable and long-lasting than their traditional versions, it could be easier to establish circular and waste-reduction processes.

**Commercial and residential residual treatment and management:** Material residuals from commercial and residential buildings pose a problem for cities, particularly as they grow. Being able to monitor infrastructure that supports the transport of residuals, such as drainage systems, can help cities be prepared to address them in environmental-friendly ways, particularly as climate change tests the limits of these systems.

**Efficient transport systems:** With almost eight trillion metric tons of emissions in 2022, the transportation sector is the second-highest emitter of CO2 in the world, after the power industry.<sup>319</sup> Beyond deploying new kinds of vehicles, cities and companies, managing fleets can reduce emissions by making transport more efficient and monitoring fuel usage.

**Smart management of devices:** Building operations have increased in their energy demands, growing 5% from 2020 to 2022.<sup>320</sup> As operational emissions grow, the smart home market in the Middle East is projected to grow as well, at an estimated CAGR of 21.1% from 2023 to 2030.<sup>321</sup> Smart homes are equipped with smart security devices or energy, water, lighting, or climate controls, or some combination thereof. These smart devices are designed to allow homes to use energy more efficiently, which also saves money from reduced energy consumption. As demands on energy grids grow, particularly in the Middle Eastern buildings and cities that are dependent on energy-intensive heating and cooling systems, these solutions will only become more important.





# Future50

Built Environment

Low-GHG Construction Processes



GraphenePioneer



<https://www.graphenepioneer.com/>

#BuiltEnvironment  
#ClimateTech

## Highlights

GraphenePioneer has participated in the **Climate Launchpad**, one of the largest global green competitions supported by **EIT Climate-KIC** (European Institute of Innovation and Technology).<sup>323</sup>

## Strategic alliances:

- Investors
- Construction Companies
- Universities
- Government Research and Development (R&D)

## List impact technologies

Low-GHG Concrete, Smart Building, High-Efficiency Heating and Cooling

## Headquarters:

Netherlands

## Middle East operational countries:

Egypt, Iraq, Saudi Arabia, United Arab Emirates

## Summary

GraphenePioneer is a **nanotechnology company** that seeks to **create sustainable building materials** by introducing graphene into existing processes. The company states that graphene-in-concrete is possible due to its “graphene machine”, a device that can be used alongside the standard production of concrete and other composite materials.

## Impacts

Graphene-enhanced sustainable building materials aim to contribute to **decarbonisation, decrease resource consumption and CO2 emissions**,<sup>322</sup> and improve energy efficiency. GraphenePioneer notes that introducing graphene into the cement should help maintain the desired temperature in buildings, and using this technology, the construction industry can better achieve its goal to **reduce energy consumption and GHG emissions**.





# Future50

Built Environment

Low-GHG Construction Processes



Innotech



<https://www.innotech.om/>

#BuiltEnvironment  
#ClimateTech

## Highlights

Innotech indicates it has patented a 3D construction printer, which is part of its technology solution. The company participated in the **HSBC Social Impact accelerator by C3**<sup>325</sup> and was recognised with the MENA Young Innovator Award 2019.<sup>326</sup>

Innotech is reported to have **secured investment with ITHCA Group**<sup>327</sup> (formerly Oman Information and Communication Technologies Group) as part of its strategy to expand the use of the 3D-printing technology in real estate development.

## Strategic alliances:

- Construction Company
- Oil & Gas Company
- Consulting Firms

## List impact technologies

CCUS, Low-GHG Concrete, Smart Buildings

## Headquarters:

Oman

## Middle East operational countries:

Saudi Arabia

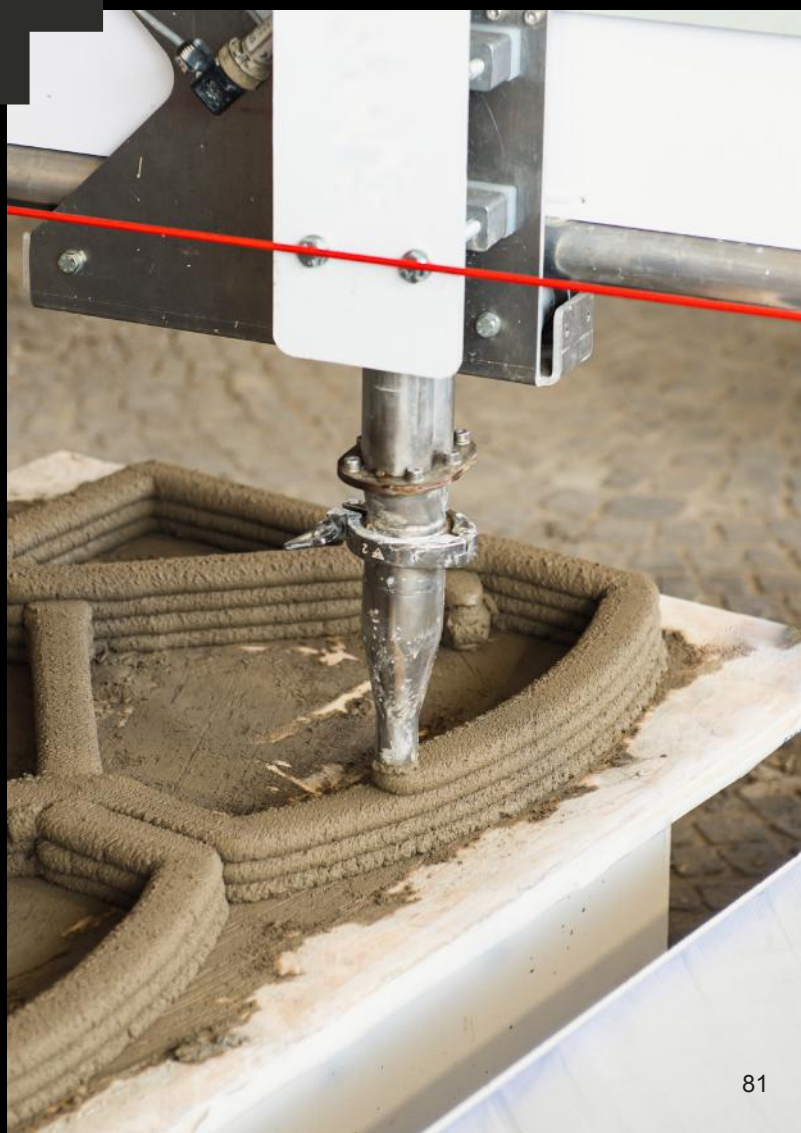
## Summary

Innotech has developed a technological solution, which includes **3D construction printing**, that aims to **reduce the amount of cement used per building by using clay and limestone**.

Innotech has applied the same approach, which they say allows them to redesign the structure of buildings to increase energy efficiency and reduce the amount of power needed for air conditioning to maintain temperatures.

## Impacts

The reduced demand of **traditional cement used in construction** in turn reduces the carbon emissions.<sup>324</sup> Innotech suggests that the 3D-printing process can also reduce the amount of timber required in the construction process.





# Future50

Built Environment

Transformative Circularity/ Recycling

## Revoltech

Revoltech



<https://www.revoltechinc.com/>

#BuiltEnvironment

**Headquarters and Middle East operational countries:**

United Arab Emirates

### Summary

Revoltech claims that its electrostatic field-based **hyper-freezing technology** is the healthiest way to **preserve food while maintaining its structure and nutrition**. The company states that its technology reduces ice crystals in frozen food, allowing for a longer shelf life and the reuse of leftover food without changes in quality, potentially reducing food waste problems.

### Impacts

Revoltech notes that its technology freezes food in less than two hours through a **combination of electrostatics<sup>328</sup> and sub-40°C freezing**. The company suggests that its technology costs are 30 times less than liquid nitrogen freezing. Revoltech adds that it has the potential to **reduce food waste in hotel kitchens and eliminate the need for preservatives in farm-to-customer transportation**, which could reduce carbon footprint, strengthen food security, and maximise natural resource usage.

### Highlights

Revoltech **won the 2023 FoodTech Challenge competition<sup>329</sup>** and has joined the community at **Hub71<sup>330</sup>** in Abu Dhabi.

### Strategic alliances:

- Hotel Equipment Manufacturers
- Hotels
- Restaurants
- Food Manufacturers
- Food Producers

### List impact technologies

Food Waste Technology





## Future50

Built Environment

Commercial/ Residential Residuals  
Treatment/ Management



Sadeem



<https://sadeemwss.com/>

#BuiltEnvironment

## Headquarters and Middle East operational countries:

Saudi Arabia

### Summary

Sadeem is a technology company that provides **wireless sensing devices to help cities monitor flood and stormwater drainage networks to reduce operational cost and minimise flood risk.**

By using **solar-powered networks, AI, IoT, and visualisation platforms**, the company claims to help reduce emissions caused by the inefficient use of maintenance vehicles in the operations of stormwater drain infrastructure in cities. It adds that the alerting system enabled by its technology also reduces flood risk.<sup>331</sup>

### Impacts

Sadeem states that it has helped **reduce the number of maintenance vehicle visits by 50% in five cities**, reducing emissions and improving infrastructure safety. It assures cities a return on their investment in less than 12 months.

### Highlights

Sadeem has **raised more than US\$2.5 million** in funding, with notable investors including **Saudi Aramco Entrepreneurship Ventures**.<sup>332</sup> The company won the award for the best IP-based technology start-up from KAUST in 2016<sup>333</sup> and the Best Global Startup Award at GITEX Future Stars 2017.<sup>334</sup> Sadeem notes that it worked closely with **Saudi Arabia's Ministry of Municipal and Rural Affairs** and the **Madinah Municipality government**, and that it is also helping the UAE's Ministry of Infrastructure Development.

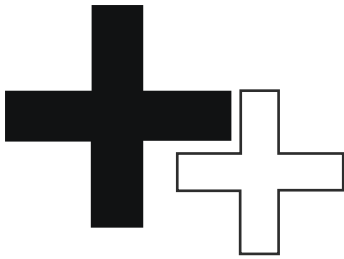
### Strategic alliances:

- Municipalities
- Government — Ministry Of Communication and Ministry of IT
- Floodwater Management Companies
- Private Contractors that Support City Management

### List impact technologies

Smart Buildings, IoT, Smart Drainage, Flood Mitigation





## Ones to Watch

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## Built Environment



Headquarters and Middle East operational countries:  
Egypt

Efficient Transport Systems | **Climate Tech**

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Fuelin is a fuel management company focused on **digitising fuel payments for commercial vehicles** whilst automating payments process giving logistics and delivery companies better visibility and monitoring of fuel consumption, which they say can help **cut unnecessary emissions**.

Fuelin's digital solution **enables paperless operations, reducing waste**. It provides customers with an NFC tag and a mobile app. This is accompanied by an enterprise dashboard for fleet managers to monitor fuel consumption to promote fuel efficiency, timing to refuel and other metrics. Fuelin participated in the **Flat6Labs** accelerator<sup>335</sup> and is reported to have partnered with **Ola Energy** to enable its solution at their filling stations in Egypt and Africa.<sup>336</sup> The company has also partnered with TAQA Arabia's Master Gas to provide e-payment services.<sup>337</sup>

#WasteToEnergy

<http://www.fuelin.net/>



Headquarters: United Kingdom  
Middle East operational countries: Saudi Arabia

**Low-GHG Construction Processes**

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Magway is developing a technology to enable zero-emissions goods movement, providing an alternative to industrial conveyors and trucks, helping to **decarbonise supply chains**.

Magway has designed an electricity-powered moving solution, which it states is adaptable to existing systems that use local renewable sources for moving bulk material of any type between points efficiently and sustainably.

Magway claims that its technology helps **reduce CO2 emissions** as it utilises **less than half the normal amount of energy**. Magway has participated in the **Tech Nation** and **PwC Climate Tech Accelerator**<sup>338</sup> and is reported to have raised more than **US\$6.5 million**<sup>339</sup> in equity financing.

#LowGHGHeavyDutyVehicles  
#LowGHGHeavyIndustry

<http://www.magway.com/>



Headquarters: Greece  
Middle East operational countries: Lebanon, United Arab Emirates

**Low-GHG Construction Processes | Built Environment, Climate Tech**

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OptiStructure notes that its service provides support to the construction industry by utilising an AI-driven optimisation framework to help minimise embodied carbon emissions from the building construction process and in turn the costs.

The company notes that this service is adaptable to any type of structure. It is compliant with regional safety regulations worldwide as well as architectural criteria.

By reducing the raw materials used in the construction of buildings, this translates to lower embodied carbon emissions.

Optistructure methodology seeks to achieve this whilst maintaining performance, quality and safety standards.

Optistructure was a finalist at the MIT Enterprise Forum Pan Arab Region 2021.<sup>340</sup>

#LowGHGConstruction  
#LowGHGConcrete  
#LowGHGIronAndSteel

[www.optistructure.eu](http://www.optistructure.eu)



Headquarters: United Arab Emirates  
Middle East operational countries: Kuwait,  
Saudi Arabia

Smart Management of Devices | **Built Environment, Climate Tech**

Vortex Biotech has sought to invent a patented system for air disinfection and sterilisation called VLED. This technology is designed to be self-powering, attachable to any existing HVAC system and to start disinfecting as soon as it is installed.

Vortex Biotech claims that as the device requires no additional power or maintenance, it significantly **reduces the need for energy**. Vortex has participated in the **Shell Startup Engine Accelerator** in Dubai.<sup>341</sup>

#HighEfficiencyHeating&Cooling  
#SmartBuildings

[www.vortexbiotech.it](http://www.vortexbiotech.it)

## wondrwall

INTELLIGENT LIVING

Headquarters: United Kingdom  
Middle East operational countries: Qatar, Saudi Arabia,  
United Arab Emirates

Smart Management of Devices | **Built Environment**

Wondrwall seeks to provide a fully integrated net zero **home energy management system** that **reduces energy demand, CO<sub>2</sub> emissions, and energy bills** as they have reported.

The company states that its smart home system uses **AI** to automate and optimise a household's heating and cooling. Wondrwall adds that it has coupled solar energy and battery storage with an intelligent household system to further optimise the solution.

Wondrwall has participated in a number of accelerator programmes, including **Tech Nation Net Zero**.<sup>342</sup> **The company** reports that it has been **granted more than US\$400,000**<sup>343</sup> as part of the UK Business Energy and Industrial Strategy on innovation.

#HighEfficiencyHeating&Cooling  
#SmartBuildings  
#SolarPower

[www.wondrwall.co.uk](http://www.wondrwall.co.uk)



# GHG Carbon Capture and Storage (GHG CCS)



N/A

of ME GHG emissions<sup>344</sup>



\$N/A m

Total VC sector investment in Middle East (Oct '17 - Aug '23)<sup>345</sup>



3

Companies in the Net Zero Future50 - Middle East

Since 2018, there has been no Middle Eastern investment in GHG Carbon Capture and Storage (GHG CCS) start-ups. However, the global share of investment in this sector is only about 2% over this period, all of which comes from European investment. Although GHG CCS technologies vary in maturity, the Middle East is poised to take advantage of these solutions. There are already two large-scale carbon capture, utilisation, and storage facilities operating in the region, including Abu Dhabi National Oil Company (ADNOC), which aims to capture five million metric tons of CO<sub>2</sub> annually from its natural gas processing plants by 2030.<sup>346</sup> Three of the four innovators on our Future50 and Ones to Watch lists are also offering disruptive solutions in the CCUS space, including Brilliant Planet using algae in open-air ponds to capture and sequester carbon, Solumar's CCUS solutions for maritime vessels, and Carbon Clean's modular offering for heavy industries with space and cost limitations.

## Technology drivers:

#CarbonMineralisation  
#NatureBasedSolutions  
#CarbonCapture  
#ModularTechnology

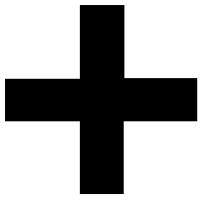
## Barriers:

**High cost of entry:** CCUS and other GHG capture solutions are capital-intensive, meaning that climate tech start-ups are mostly constrained to focus on smaller-scale solutions and innovations.

**Immature carbon pricing:** Carbon pricing is not yet globally standardised in how it is monitored or priced, making GHG capture schemes difficult to calculate or justify. Carbon prices will also need to increase in order to constitute a relevant economic metric. However, many Middle Eastern countries have made commitments to implement carbon pricing schemes, guided by the Paris Agreement and other international plans.<sup>347</sup>

## Accelerators:

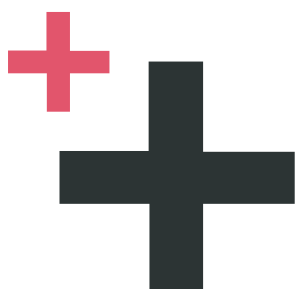
**Government commitments:** ADNOC and other government entities are making investments in the GHG CCS sector.



## Growth areas:

**Geoengineering:** Geoengineering refers to human activities that remove CO<sub>2</sub> from the atmosphere and store it underground – in ocean reservoirs or products. The Middle East has geological formations that are useful for geoengineering, making it a good region for this technology. Geoengineering opens up carbon credit opportunities, although it has been questioned in its effectiveness at limiting global emissions. It cannot be a one-stop solution, but needs to be used in conjunction with other carbon- and emissions-limiting actions.

**Carbon capture, utilisation and storage (CCUS):** CCUS is expected to be significantly deployed in the Middle East starting in 2030, under the International Energy Agency's Sustainable Development Scenario.<sup>348</sup> In the Middle East, beyond pushes for emissions reductions, the demand for CO<sub>2</sub> in enhanced oil recovery (EOR), as well as expected increase in electricity demand, are expected to drive the integration of CCUS with natural-gas production. Other solutions use algae and biological processes to sequester carbon directly from the atmosphere.





# Future50

GHG Carbon Capture and Storage (GHG CCS)

Geo-Engineering



# 44.01

44.01



<https://4401.earth/>

#ClimateTech  
#NatureBasedSolutions

## Highlights

44.01 won the **2022 Earthshot Prize 2022**<sup>352</sup> and the **Milestone Award in the 2022 XPRIZE Carbon Removal competition**.<sup>353</sup> It is also a **HUB71 alumni**<sup>354</sup> and participated in the **Unreasonable Fellowship**.<sup>355</sup>

44.01 is working with **ADNOC** on the **first peridotite mineralisation project in the UAE**,<sup>356</sup> which it claims is also the first-ever to involve injecting CO2 using seawater. In 2024, it is slated to launch the world's largest peridotite mineralisation project in the Hajar mountains in Oman.<sup>357</sup>

44.01 reports having raised US\$5 million to date, including almost US\$2 million in cash awards along with equity investment.

## Strategic alliances

- Heavy Industrial Companies
- Carbon Credit Traders
- Government
- Investors

## List impact technologies

Carbon Capture, Usage and Storage

## Headquarters:

Oman

## Middle East operational countries:

United Arab Emirates

## Summary

44.01 eliminates CO2 by turning it into rock.<sup>349</sup> The company's technology works to **accelerate the natural process of CO2 mineralisation** to remove captured CO2 permanently in less than twelve months. To do this, 44.01 injects carbonated fluid into ultramafic rock formations deep underground, where they can adjust variables like temperature and pressure.

## Impacts

Carbon removal technologies, such as **mineralisation** help decarbonise vital industries and ultimately return the atmosphere to sustainable levels of CO2.<sup>350</sup> For every tonne of CO2 removed, 44.01 creates a valuable **carbon credit that can be traded or 'retired' to abate emissions**.

44.01 notes that its technology is opening up new economic opportunities in countries like Oman and the UAE that have an abundance of appropriate rocks, and also providing new employment opportunities as the region goes through energy transition.<sup>351</sup>





## Future50

GHG Carbon Capture and Storage (GHG CCS)

Carbon Capture, Usage and Storage

# Brilliant Planet

Brilliant Planet Limited



<https://www.brilliantplanet.com/>

#ClimateTech  
#NatureBasedSolutions

## Highlights

Brilliant Planet states that it has two patents issued and five more pending for its technology.<sup>359</sup> The company secured **US\$13 million in funding** in its series A round, with notable investors including **Union Square Ventures** and **Toyota Ventures**.<sup>360</sup> Additionally, the company has mentioned that it is now selling **carbon removal credits** on marketplaces, such as Patch and Watershed, and looking to construct a 30-hectare commercial demonstration facility in partnership with **Mott MacDonald Group**<sup>361</sup> and **WSP**.<sup>362</sup>

## Strategic alliances

- Universities
- Research Institutes
- Engineering Firms
- Carbon Market Places

## List impact technologies

Carbon Capture, Usage and Storage

## Headquarters:

United Kingdom

## Middle East operational countries:

Oman

## Summary

Brilliant Planet is developing a method to **sequester carbon at a large scale using algae**. It has designed a process to allow for the growth of microalgae in open-air pond-based systems on coastal desert land, using only seawater and sunlight as inputs.

## Impacts

Microalgae remove CO<sub>2</sub> from the atmosphere by photosynthesis, in the same way as trees. However, they are much more photosynthetically efficient.<sup>358</sup> By using non-productive desert land, Brilliant Planet has the potential for large-scale carbon removal, making a meaningful impact on climate change. As a co-benefit, its system also helps to restore coastal seawater to pre-industrial acidity levels.





# Future50

GHG Carbon Capture and Storage (GHG CCS)

Carbon Capture, Usage and Storage



# Solumar

Solumar



<https://www.solumar.org/>

#ClimateTech

## Highlights

Solumar is part of the **Masdar Innovate** initiative,<sup>363</sup> and notes participating in the Emirates Global Aluminium accelerator by C3, Oslo Innovation Week, the Atlantic Smart Ports program in Portugal, the **World Economic Forum Blue Economy Challenge**, as well as in the **MENA Maritime Accelerator** and the **Mohammed Bin Rashid Innovation Fund**.<sup>364</sup>

Solumar reports receiving a number of awards, including **Women in Tech** by DIFC and Standard Chartered, and counts the **KAUST Innovation Accelerator**<sup>365</sup> and **Innovation Norway** as its initial investors to support further maritime and oil and gas technology development.

## Strategic alliances

- Maritime Industry and Shipping Companies
- Shipping Ports Operators and Shipyards
- Industrial Manufacturers
- Supply Chain Partners
- Government and Climate / Sustainability Organisations
- Universities

## List impact technologies

Carbon Capture, Usage and Storage

## Headquarters:

United Arab Emirates

## Middle East operational countries:

Saudi Arabia

## Summary

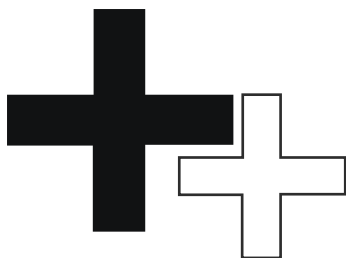
Solumar provides an **exhaust gas filtering technology** that captures pollutants like black carbon, particulate matter, volatile organic compounds (VOCs), nitrogen oxides and carbon oxides in a compact unit that can be retrofitted to vessels and other industrial, maritime and oil and gas equipment. It claims to be the only commercially available solution that can collect **black carbon, ash, sand, dust, CO<sub>2</sub>, VOC and other mechanical particles and gases simultaneously**.

The captured **black carbon is processed into carbon powder** and sold to industries, including manufacturers of plastic, rubber, tire, construction materials and carbon fibre as well as multiple other industries, enabling a **sustainable circular economy**. Solumar also states that it provides advanced air quality monitoring and management systems to keep decision-makers informed about air quality metrics.

## Impacts

Solumar claims that each unit of its product installed on a vessel can capture up to **167 million MT of black carbon** and **32 million MT of CO<sub>2</sub>**, which it estimates contributes the equivalent positive environmental impact of two million electric cars. It suggests that its solution can potentially cut 80-90% of emissions from industrial operations, ships, ports, and oil and gas operations.





## Ones to Watch

# GHG Carbon Capture and Storage (GHG CCS)



Headquarters: United Kingdom

Middle East operational countries: United Arab Emirates

### Carbon Capture, Usage and Storage

Carbon Clean is a carbon capture solutions company for hard-to-abate industries, with more than a decade of experience in designing, building, and operating industrial carbon capture technology, with technology references across 49 sites around the world.<sup>366</sup>

Its innovation, CycloneCC, is a modular, prefabricated and skid-mounted carbon capture solution. It is being developed to address two barriers to carbon capture deployment; space limitations on site, and cost concerns. Carbon Clean believes CycloneCC will improve the economics of carbon capture for heavy industries, accelerating deployment of this technology to play a role in achieving industrial decarbonisation. ADNOC is deploying CycloneCC at a nitrogen fertiliser plant with Fertiglabe<sup>367</sup> as part of its net zero 2045 plans.

#LowGHGIronandSteel  
#LowGHGShipping  
#LowGHGConcrete  
#WastetoEnergy  
#CCUS

<https://www.carbonclean.com>



# Financial Services



N/A

of ME GHG emissions<sup>368</sup>



\$21m

Total VC sector investment in Middle East (Oct '17 - Aug '23)<sup>369</sup>



2

Companies in the Net Zero Future50 - Middle East

Like the Built Environment sector, no investment deals have manifested for Middle Eastern financial services climate tech start-ups since Q1 2022. However, this is fairly in line with the global average, with a share of only about 2% of total investment across regions going towards financial services. As net zero and ESG goals gain prominence in society, innovators in the Financial Services sector are investing and creating platforms to encourage sustainability across a wide variety of industries. Roots Ventures focuses on investing in eco-friendly technologies, Outsyde focuses on small and medium-size businesses, and Dajin focuses on poultry farms. Many of these offerings attempt to make the impact of investments on carbon and the environment more tangible for investors, whether through more transparent reporting or by manifesting carbon credits as non-fungible tokens (NFTs) on the blockchain. By making systems that are easy to use and tangible, climate tech start-ups in green finance and related areas are attempting to encourage sustainable practices.

## Technology drivers:

#ImpactInvesting #AI  
#MachineLearning #DataVisualisation  
#CarbonOffsets #NFTs  
#MobileApplications

In our analysis, since 2018 there have only been three deals identified in financial services. Two pertained to Geidea, but as they were undisclosed, they are not represented in the charts (which show disclosed deal value). The third was a 2021 deal involving 5Ire for US\$21 million.<sup>370</sup>

## Barriers:

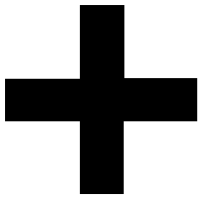
**Financing structures:** Financing in the Middle East can be more risk-averse than financing elsewhere due to its need to adhere to Shariah law. The bias towards profit-sharing agreements and joint ventures can make it challenging for newer start-ups to make a compelling case compared to established, stable entities.

**Challenges measuring impact:** It can be difficult to quantify the relative impact of financial systems on emissions. Companies in this space are attempting to make indirect impacts more tangible, but they are still tasked with justifying ESG-driven investments and prioritising different companies over one another. Reporting emissions is also not standardised, adding another level of difficulty ascertaining impact across a given portfolio.

## Accelerators:

**Sustainability targets:** Broader desire for ESG values has pushed the Financial Services sector to embrace an eco-conscious approach to investment and banking. Although the Middle East lags in this area, the desire to attract global investments has begun to "import" ESG values.

**Regional opportunities:** Because the Middle East is in the process of developing its systems outside of oil and gas, regional lenders, investors, and banks have the opportunity to foster and support local sustainable businesses following Shariah-compliant banking principles.



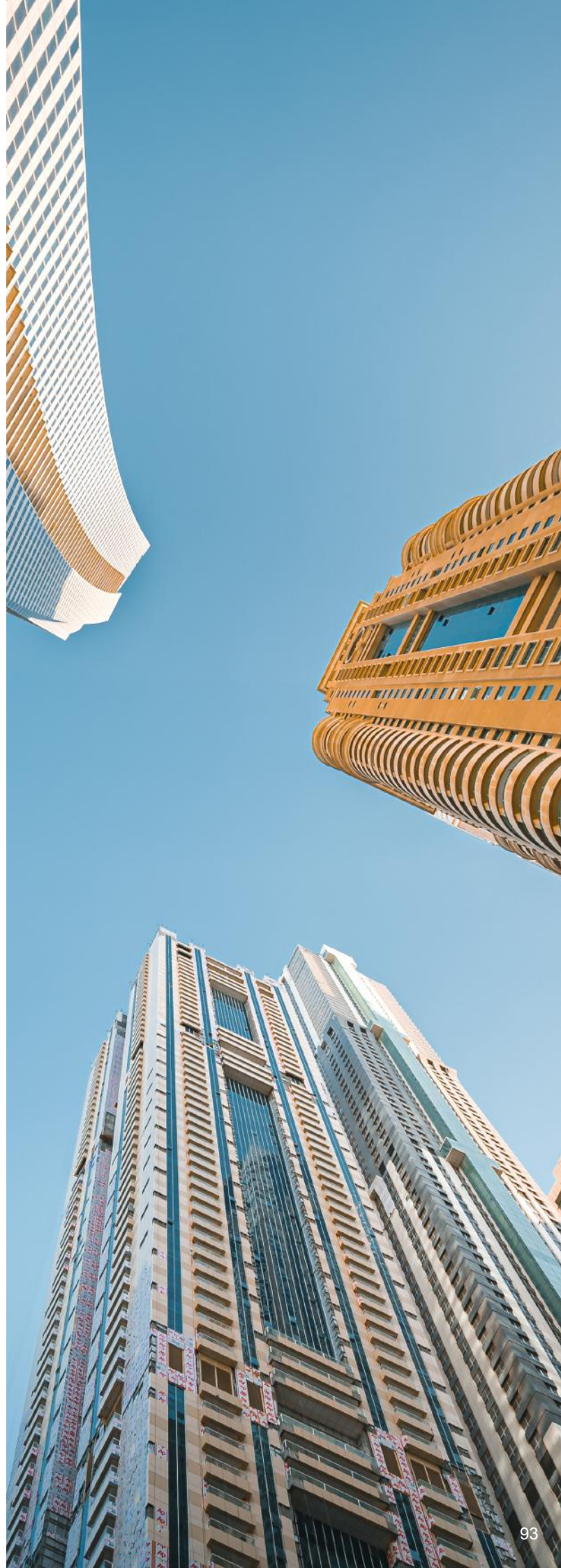
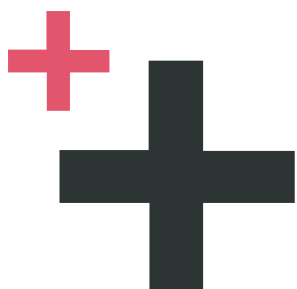
## Growth areas:

### **Funds, portfolios and investment banking:**

Connecting investors with sustainability opportunities will be crucial for building a greener Middle East, particularly as access to financing becomes democratised thanks to the internet. Start-up funds in this area offer specialised solutions, using tools like AI and analytics to make targeted impact investments for environmental causes. NFTs and blockchain technology are also helping to tokenise the effect of investments on carbon.

**Lenders:** The specifics of lending in Middle Eastern countries means that local lenders have an advantage. Climate-focused lenders can prompt growth in highly targeted areas that have heretofore been underinvested in and build a culture of decarbonisation and eco-consciousness.

**Banking (business and retail):** Banks are positioned at a critical juncture to facilitate and drive net zero goals in the operating and business models of companies they interact with. As a part of this sub-sector, payment rails and transparent middleware can make carbon impact easier to see and offer tools to both banks and consumers to make sustainability-driven decisions.





# Future50

Financial Services

Funds, Portfolios and Investment Banking



Roots Ventures



[www.roots.ventures](http://www.roots.ventures)

#GreenInvestment

## Highlights

Roots Ventures focuses on technologies that cover six major impact verticals, such as waste management, carbon capture and low-GHG construction solutions. The company states that it has strategic shareholders, such as **Saudi Aramco** and an advisory board that includes astronauts, former directors and members of the **World Economic Forum**, experts and engineers to aid its mission of scaling solutions with sustainable impact.

## Strategic alliances

- World Economic Forum UpLink
- UN Global Compact
- Investment Funds
- Technology Parks
- Global Sustainable NGOs

## List impact technologies

Biomass Power, Food Waste Technology, Low-GHG Air Travel, Low-GHG Concrete, Low-GHG Plastics, Precision Agriculture, Smart Buildings, Solar Power, Waste to Energy, Carbon Capture, Usage and Storage

## Headquarters:

Saudi Arabia

## Middle East operational countries:

Bahrain, United Arab Emirates

## Summary

Roots Ventures seeks to leverage impact investing and venture building to **scale technologies that address local sustainability challenges** while addressing global high-impact opportunities. The company aims to create business opportunities for environment-related technologies to scale up faster, starting in Saudi Arabia.

## Impacts

Roots Ventures is **committed to contributing to the green initiative target of reducing carbon emissions by 278 million tons per annum (mtpa) by 2030, and to the pledge of Saudi Arabia to go beyond net zero by 2060**. The company is actively identifying sustainability and climate challenges in the region and potential solutions to them. The company seeks to contribute towards national sustainability targets, and aims to scale solutions to resolve global climate challenges.





# Future50

Financial Services

Funds, Portfolios and Investment Banking



Symbaiosys



<https://www.symbaiosys.ai/>

#GreenFinance

## Headquarters:

Bahrain

## Middle East operational countries:

Saudi Arabia, United Arab Emirates

## Summary

Symbaiosys is an **AI-augmented data platform that aims to make it easy to invest in and to value nature**. Besides offering a global investment database meant to increase access to sustainable nature-based investing, Symbaiosys claims to provide investors with a comprehensive **collection of nature-specific capital market data**. It is also developing **AI-powered analytics** to quantify the value of investing in nature, reduce climate-related financial risks and to contribute to socio-economic development.

## Impacts

According to a report by the UN Environment and IUCN,<sup>371</sup> **nature-based solutions (NbS) could sequester 10 gigatons of carbon emissions** and help limit global warming to below a 1.5-degree celsius increase. Additionally, according to some studies, every dollar invested in nature can generate between 7 to 30 US dollars of other benefits.<sup>372</sup> Symbaiosys intends, especially through the analytics capabilities it is developing, to further facilitate this investment and to enable anyone to quantify the currently unaccounted benefits of any natural investment, along with its **direct impact on the economy, financial markets and human health**.

## Highlights

Symbaiosys has received more than US\$100,000 in grants from the Bahrain FinTech Accelerator in collaboration with the Supreme Council for Women and Bahrain FinTech Bay. It also won the top idea stage startup award in the 2021 Entrepreneurship World Cup.<sup>373</sup>

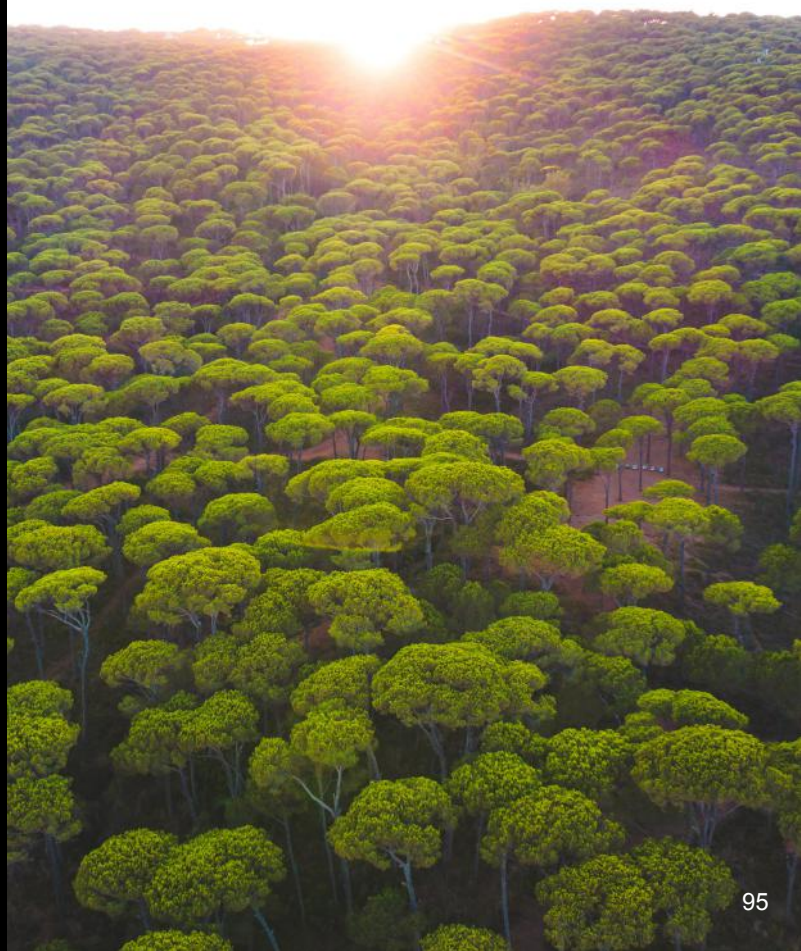
The company states that this has enabled its current phase of R&D, which involves using **Natural language processing (NLP) and ML**, with a front-end natural language interface for data exploration and visualisation, to index a corpus of more than 100,000 peer-reviewed scientific articles.

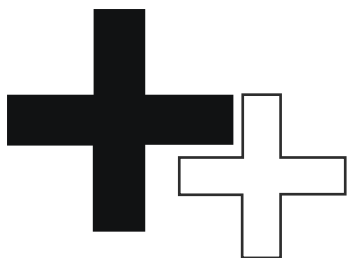
## Strategic alliances

- Governments
- Multilaterals
- Private Equity
- NGOs
- Science
- Technology

## List impact technologies

AI, ML





## Ones to Watch

### Financial Services



Headquarters: Egypt  
Middle East operational countries:  
Oman, United Arab Emirates

Lenders | **Green Finance**

Dajin describes itself as an **embedded finance platform and marketplace** making finance and markets accessible to underserved small poultry breeders. The company states that its platform, enabled through a mobile app, has an AI algorithm to assess creditworthiness to help improve financial inclusion.

Through education provided in the platform, Dajin encourages **sustainable and responsible agricultural practices**, contributing to decarbonisation and waste food reduction in the industry. Dajin claims to have been incubated by the **Ministry of Communications and Information Technology in Egypt**,<sup>374</sup> appeared on 'Shark Tank Egypt'<sup>375</sup> and was the winner of the **North Africa Startup Award**.<sup>376</sup>

#FoodWasteTechnology  
#WasteToEnergy

[www.dajin-platform.com](http://www.dajin-platform.com)



Headquarters: United Arab Emirates  
Middle East operational countries: Bahrain, Egypt, Qatar, Saudi Arabia

Banking (Business and Retail) | **Green Finance**

Fils is aiming to create a technology that serves as the **infrastructural rails for payments and financial services**.

The company suggests that its digital payment platform brings businesses in alignment with the 17 United Nations Sustainable Development Goals (UNSDGs). Fils' technology is designed to **incorporate emissions estimates and climate actions into transactions**, to help encourage sustainability across finance, hospitality, logistics, travel, and retail.

Fils notes that stakeholders in financial services, including banks, issuers, and acquirers, can potentially integrate its middleware into a variety of offerings, such as sustainable banking, impact cards, and value-added services for merchants.

Fils notes that by **making carbon impact transparent**, it can help banks offer consumer tools for eco-conscious spending.

#DigitalCarbonTracking  
#CarbonOffset&Tracking

[www.filsnow.com](http://www.filsnow.com)



OUTSYDE

HQ and Middle East operational countries:  
United Arab Emirates

Funds, Portfolios and Investment Banking | **Green Finance**

Outsyde seeks to invest with small and medium-impact investors around the world. The company looks to use several **investment strategies**, involving carbon offsets, forest protection and restoration, mitigation banks, low-impact solar, and sustainable forestry recreation to **protect lands and shift land preservation**.

Outsyde claims to be seeking to tokenise acquired assets onto the blockchain as fractional non-fungible tokens (NFTs), representing **carbon offsets to be sold as green investments**. Outsyde has partnered with Lambert and Co, a UAE business consultancy to provide services in the Emirates.<sup>377</sup>

#Blockchain

[www.getoutsyde.com](http://www.getoutsyde.com)

# Appendix

## **What counties are represented in the PwC Net Zero Future50 - Middle East?**

The selected Net Zero Future50 - Middle East featured in the report are all operational in the Middle East but are headquartered in 17 countries. This is in line with the parameters set out in the taxonomy of the Net Zero Future50 framework to consider disruptive technologies set to have an impact on challenges facing our specific region.<sup>378</sup> 518 innovations that looked to be operational in the region were identified of which 183 entered the assessment process. 100 were shortlisted of which in depth one to one 96 interviews were completed.

Countries represented with headquarters in the Middle East include Bahrain, Egypt, Iraq, Jordan, Oman, Saudi Arabia and United Arab Emirates.

Other countries represented in the report which are operational in the Middle East region include

Germany, India, Japan, Luxembourg, Malaysia, Netherlands, New Zealand, Singapore, Tunisia and United Kingdom.

## **Notes and assumptions on allocating numbers of companies across sectors:**

In order to allocate the number of innovators per sector in the Net Zero Future50 - Middle East, we evaluated Global emissions<sup>379</sup> by sector and roughly weighted the entries by sector in the Net Zero Future50 to reflect their relative emissions contribution (i.e. highest emitting sector receives the largest segment of the Net Zero Future50). This was also performed at a sub-sector level (within each sector), to ensure that key trends and emission categories were fairly represented.

The cross-sector themes of GHG Carbon Capture and Storage and Climate Change Management and Reporting have also been given a Net Zero Future50 allocation based on their potential to remove GHG emissions.

To estimate an allocation for the cross-sector themes, we calculated an indicative abatement potential, as follows:

For Financial Services, we sought to analyse Financial Services direct emissions<sup>380</sup> impact of GHG as Scope 3 and indirect emission impact is addressed through the sectors it funds.<sup>381</sup> Due to the lack of detailed information for the Middle East region, assumptions were made in the allocation. Additional input or more granular data may result in a more accurate redistribution.

We leveraged methodology followed by the PwC UK NetZero report<sup>382</sup> and used an indicative figure of 5%. This was calculated using the World Wide Fund for Nature (WWF) estimation, which conducted research on the UK market and suggests the impact of Financial Services is c.805 million tonnes.<sup>383</sup> We extrapolated this figure to calculate global emissions by applying

the weight of the UK's ratio of global financial exports (40%) against the global impact of the UK's Financial Services emissions (2%) to derive an indicative figure of 5% for global Financial Services emissions.<sup>384</sup> We have applied this 5% global abatement potential to the Middle East GHG impact, for consistency.

For Climate Change Management and Reporting, we used an indicative figure of 8%. Due to the lack of detailed information for the Middle East Region, this is based on the findings of Downar et al, who found the simultaneous association between corporate carbon emissions, carbon disclosure and organisational performance. Based on a sample of 62 UK Financial Times Stock Exchange (FTSE) 100 firms in carbon-sensitive sectors during 2010–2017, firms affected by the mandate reduced their emissions by about 8% relative to a control group of European firms.

For GHG Capture and Storage, we used an indicative figure of 6.7%. The International Energy Agency (IEA) estimates that we need to increase our GHG capture and storage rate by up to 190x (we used 100x for prudence). The current level is c.40 million tonnes which at 100x, would equate to c.4.0bn tonnes, or 6.7% allocation of the emissions opportunity.

## **Notes and assumptions on scoring:**

- Each of the four composite factors had multiple sub-criteria within them, as illustrated in methodology overview diagram (Figure II). Using the assessment framework, we scored each of the start-ups between one and five; one being the lowest and five being the highest, based on the sub-criteria within each scoring category, aggregating to an overall criteria score. In scoring solution readiness, we looked to the maturity as well as companies that have a proven technology beyond the concept stage but that also offered a solution which has significant untapped potential.

- In scoring innovation and sustainability we looked at the opportunities in terms of Net Zero impact, we also evaluated broader sustainability impacts beyond GHG. For instance, a circular model, or processes that used non-rare / hazardous materials would score better within the broader ecological benefits. We also applied a light diversity weighting for gender diverse founding teams.

- In scoring for solution market fit, businesses that had a larger addressable market, for example, those that operate in multiple countries in the region and potential to scale, scored well.

## Notes and assumptions on GHG Emission calculation for the Middle East

Calculations on the Middle East emissions were developed based on the PwC proprietary internal databases and external data sources.

The list of external data sources includes the following:

- Our world in data
- World Emissions Clock
- Climate TRACE
- EDGAR
- ClimateWatch

Given that the external data sources have different emission segments, we have introduced mapping to the SOCT taxonomy.

Finally, the following eleven countries comprise our selection for the Middle East region: Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Oman, Qatar, Saudi Arabia and United Arab Emirates.

## Interviewees and inspirers

Thank you to those members of the climate ecosystem that took the time to deep dive into the challenges in raising investment as founders and funds sharing with us their thoughts and insights:

### Investors:

- **Sonia Weymuller**, Co-Founder and General Partner, Venture Souq
- **Dina el-Shenoufy**, Chief Investment Officer, Flat6Labs

### Female founders:

- **Nawel Mahmoudi**, Co-Founder, Valuegrid
- **Jane Glavin**, Co-Founder, Distant Imagery
- **Basima Abdulrahman**, Founder, KESK
- **Rennie Popcheva**, Founder, Solumar
- **Leena Al Olaimy**, Founder, Symbaiosys

# Team overview

## Authors

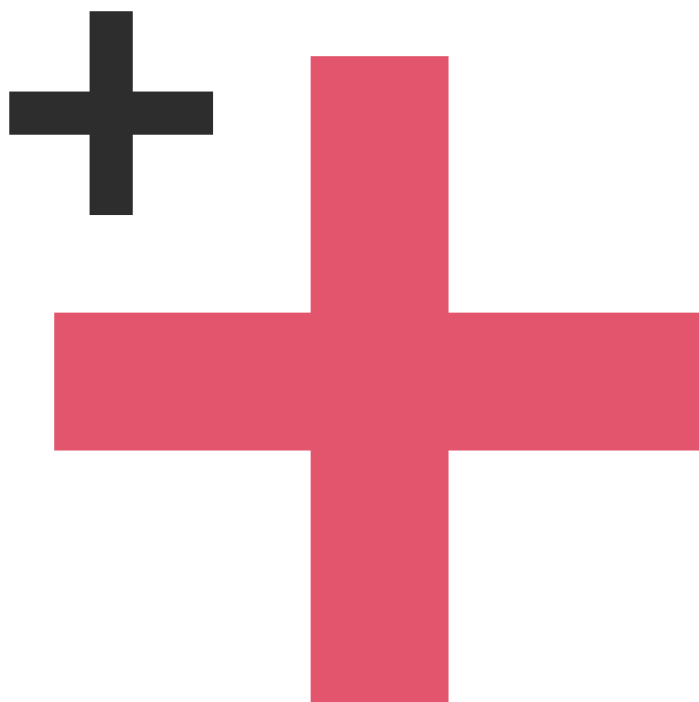
This report was written by a collaboration between Strategy& PwC Middle East. Lead authors are **Yahya Anouti, Jon Blackburn and Patricia Keating**.

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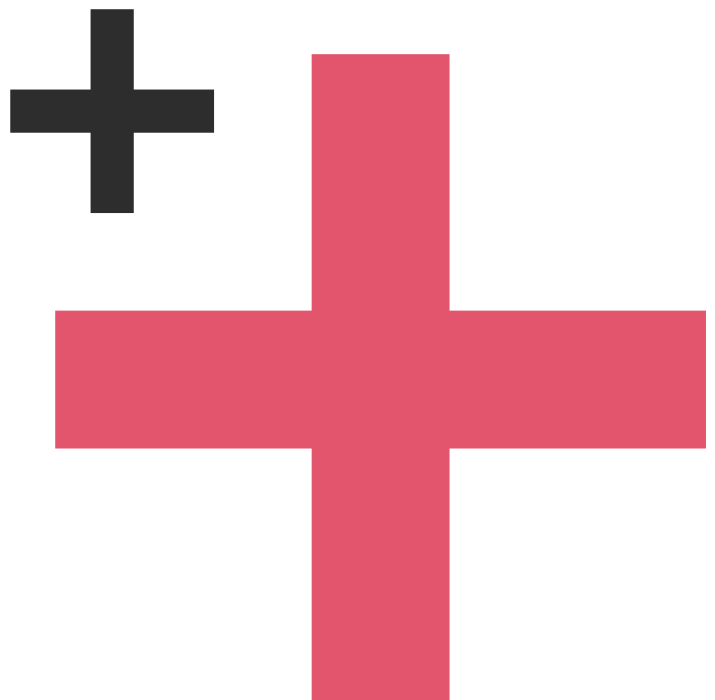
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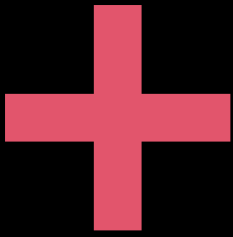
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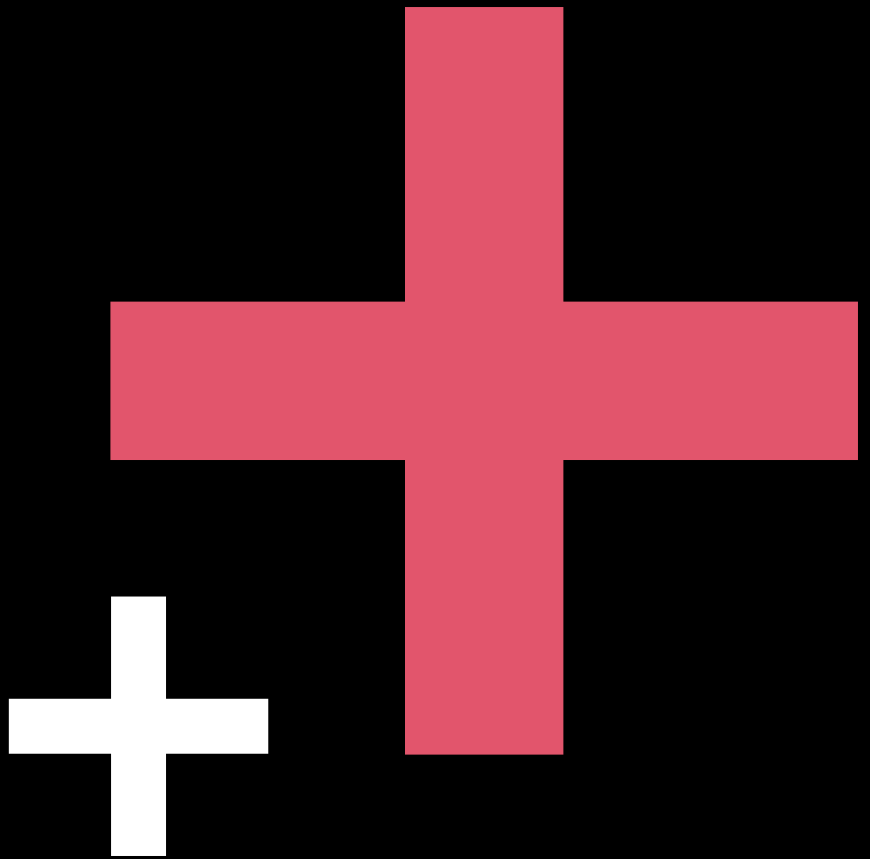
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