Kingdom of the Netherlands

– White Paper 2018

Water-Energy-Food Nexus:

Mastering a 21st Century Tightrope

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This White Paper is based on a Roundtable discussion on the Water-Energy-Food Nexus, hosted by the Embassy of the Kingdom of the Netherlands at WFES, Abu Dhabi, UAE in January 2018.

A perfect storm is brewing. The world's water-energy-food nexus faces intensifying pressure amid rising populations and climate change. Strategies to underpin positive change in the Middle East and beyond are urgently needed. Anthropologist Margaret Mead said it best: "We will not have a society if we destroy the environment."

SOLUTIONS TO IMPROVE THE NEXUS that lies at the heart of our very existence are deeply complex – there is no silver bullet. A basket of interlinked solutions – one that rejects siloed approaches while tackling the multifaceted challenge – is essential to sustainable change. Strategies that only focus on parts of the problem often incur high costs and poor sustainability. An integrated nexus benefits each valuable resource and creates a stronger bridge of economic and environmental security into the 21st century. Clear communication and collaboration between key entities – government, industry, academia, society – form the bedrock of this positive evolution. Unified efforts are critical.

TICK-TOCK

Time is short. The option of having the three-plus decades that was spent debating how to best mitigate climate change, culminating in the Paris Agreement in late-2015, is not on the table. In this case, the importance of relieving the strain on the nexus is too great and the negative consequences of sluggish progress too severe.

A smattering of facts highlights the magnitude of the challenge. Over the next two decades, the world will need up to 40% more water to meet rising demand and, without significant changes to how we produce and consume water, agricultural production will have to increase by about 70% by 2050. Around 50% more primary energy must be made available worldwide by 2035. The World Bank points to the Middle East and North Africa (MENA) as a global hotspot of unsustainable water use, especially in terms of groundwater. In some countries, more than half of current water withdrawals exceed what is naturally available. Such stress on natural resources is exacerbated by what BP Outlook expects to be a 54% growth in the Middle East's energy consumption alone up to 2040.

What is the water-energy-food nexus?

The nexus means that the three sectors – water security, energy security and food security – are inextricably linked. Actions, both positive and negative, in one area more often than not impacts one or both of the others.

Source: Food and Agriculture Organization of the UN

Red flags

Signs of strain are clearer than ever. Germany's Max Planck Institute for Chemistry and the Cyprus Institute in Nicosia warned that high temperatures could make some areas in MENA uninhabitable from mid-century onwards. Higher temperatures linked to climate change have caused acute food shortages for millions of people in East Africa. Around two-thirds of the globe's population will face water shortages by 2025 – a very short seven years away – and Cape Town's water crisis has escalated. Helen Zille, head of the provincial government, said if the taps run dry it will be "the disaster above all disasters". What has become known as Day Zero is anticipated in April, but it could be avoided if all residents use less than 50 liters of water per day. "No-one should be showering more than twice a week at this stage. You need to save water as if your life depends on it, because it does," Zille stressed. Global Risk Insights offers another example of the negative consequences of climate change; drought conditions in China in 2006 threatened 182 million hectares of farmland, 8.7 million livestock and 95 million people. To gauge the magnitude of this crisis, consider that the number of people facing hardship during this event alone equates to ten times the population of the UAE and five times that of the Netherlands today.

We are many

7.6bn
The size of today's global population, which is expected to rise by nearly a third to 9.7 billion by 2050

9.4m
The size of the UAE's population in 2017, which is expected to climb by 39% to 13.1 million in 2050. Dubai's population alone is expected to nearly double to 5 million by 2030

17m
The size of the Netherlands population in 2017, climbing just 3% to 17.5 million by 2050

1.44bn
China and India will be the world's most populous nations by 2024, with 1.44 billion people each. India is likely to take the lead to 1.66 billion by 2050 – nearly 20% of the global population

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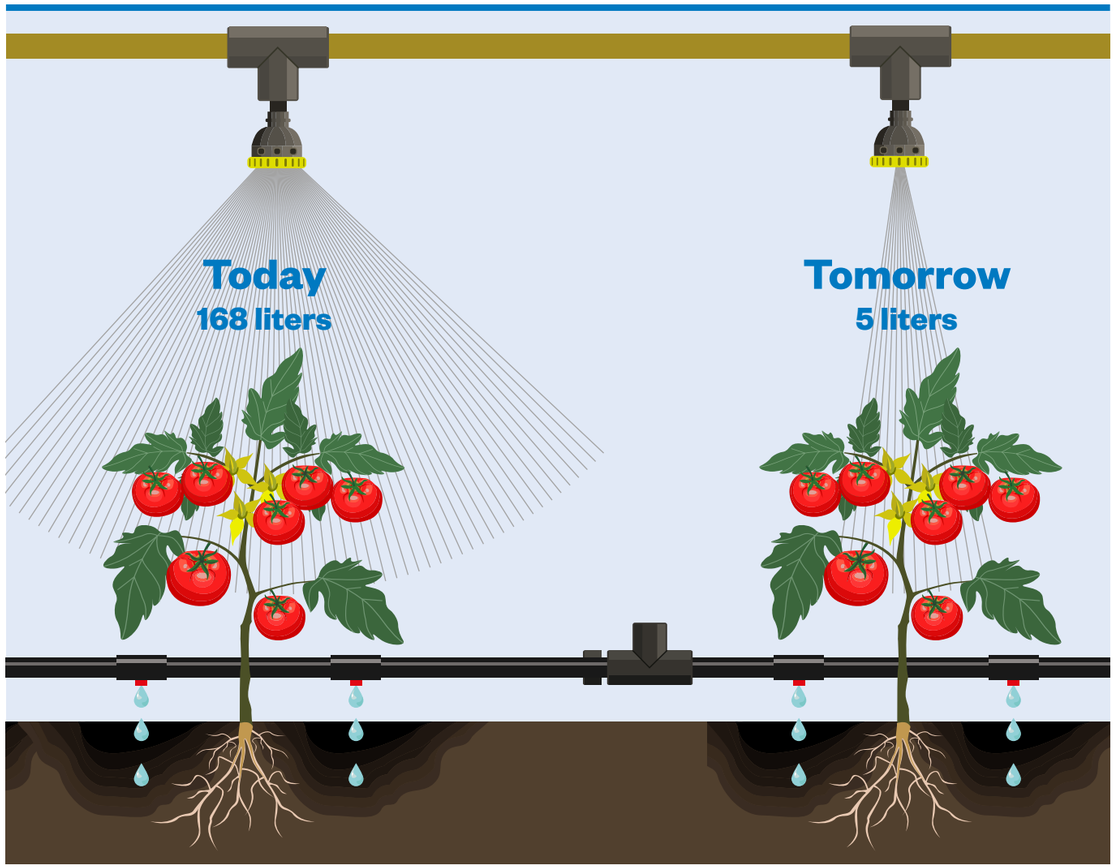

"Born in 1766, Englishman Thomas Robert Malthus was one of the key figures in history to argue that growing populations would eventually diminish the ability of the world to feed itself, as the rising number of people overtake the development of sufficient land for crops (see page 2: We are many). *With similar ideas persisting 184 years after his death, the world clearly needs to pursue unprecedented resource management strategies."*

KNOWLEDGE PARTNERSHIPS

Amid such pressures, knowledge sharing with nations that face similar challenges helps accelerate progress; therein lies the value of partnerships between the Netherlands and the UAE. The Netherlands has had decades of practice and many successes in this area. Home to 17 million people, 40% of the country lies below sea level. More than half of the Netherlands would be under water all or part of the time without dams and dikes. Yet, it is the second largest global exporter of food in terms of dollar value after the US. The country is the world's top exporter of potatoes and onions and the second largest exporter of vegetables

The Tomato

The first experiments in the new research center for protected horticulture in Riyadh, Saudi Arabia, developed with support from the Netherlands' Wageningen University & Research experts, show that water savings of over 90% can be achieved in local tomato growing. It currently takes around 168 liters of water to grow 1kg of tomatoes. It can be done with as little as 5 liters of water.

overall in terms of value. Plus, around 6% of the Netherland's energy supply was generated by renewable sources in 2016, compared to the International Energy Agency's (IEA) global average of 10%. Looking ahead, the Dutch government aims to achieve 16% renewable energy by 2023, with the ultimate goal of 100% by 2050.

The UAE is also an ambitious voice – both from sharing knowledge with others, such as the Netherlands, and leveraging its entrepreneurial spirit to forge home-grown solutions. Renewable energy and sustainable agriculture are high on the agenda of the UAE Vision 2021 and the country's 2050 Energy Plan aims to supply 50% of its power needs from renewables and cut CO_2 emissions by 70%. The UAE was also the first country in MENA to ratify the Paris Agreement and a new Minister of State for Food Security, Mariam Al Mehairi, was appointed last year.

"Our goal is to establish the UAE as a successful global model combining economic growth, energy sustainability and a clean-safe environment," said His Highness Sheikh Mohammed bin Rashid Al Maktoum, UAE Vice President and Prime Minister and Ruler of Dubai. Both the Netherlands and the UAE have impressive rankings in the Global Innovation Index 2017, taking the 3rd and 35th spot, respectively. The countries' joint zest for lateral thinking provides a robust springboard for reshaping the status quo when it comes to the production, consumption and reuse of water, energy and food.

STRATEGIC RETHINK

Rethinking how we use, manage and preserve water, energy and food will mean overhauling how we think and problem solve. This transition also supports the UAE's transformation into a competitive knowledge-based economy, rather than an oil export-centric one, thus enabling the country to 'export' its understanding of key issues to others in need.

"No matter how innovative, technologies in the water-energy-food nexus cannot be propped up by subsidies or other unsustainable support networks. Regardless of country and climate, systems benefit most from being built upon a robust business case."

Combining the knowledge and efforts of the UAE and Netherlands to spur a paradigm shift will in part mean leveraging the networking environment that already exists among specialists and interested parties in both countries. Many have long informally shared ideas and advice. Shrugging off organizational boundaries and hierarchies can sometimes accelerate progress.

Collaboration, transparency and innovation must be the unwavering themes propelling the Netherlands and UAE's partnership. It is key to take stock of what has already been achieved. Next, key challenges across the nexus should be pinned down and prioritized, for every issue cannot be tackled simultaneously. Thirdly, all the information already available on the topic needs to be collected and categorized. This includes establishing systems to improve data harvesting and analysis. Fourthly, all this information can be used to make an educated guess as to what the world's water-energy-food nexus will look like in the 2020s, 2030, 2040s and beyond. This must include detailed goals and forecasts for each country, ensuring all have clear game plans. Strategies to improve the nexus in the Netherlands and the UAE cannot be grouped together with other countries in Europe and MENA; each country has vastly different goals and capabilities. Generalities will no longer suffice – they are breeding grounds for confusion. Specifics are a must.

Stepping Stones to Success

Government: Clear leadership
To provide a clear game plan for positive change in business, industry, academia and wider society. To promote cross-border relationships and knowledge-sharing, both in the Middle East and beyond.

Digital Era: A new tool box
To leverage existing technologies to identify innovative solutions across the nexus. To leverage investors' confidence in such technologies, thus bolstering their willingness to financially back much-needed R&D.

Talent: People matter
To leverage human capital in the workplace, support budding talent in higher education and teach younger generations – the budding professionals of the late-2020s onwards – the importance of the nexus. To help create a thirst for innovation by rewarding and supporting 'out of the box' thinking.

Finance: Money talks
To consider lateral forms of financial support for R&D projects, SMEs and entrepreneurs and to support both traditional and innovative strategies. To help educate and simplify the process for funding, especially amongst SMEs and entrepreneurs, and encourage public-private partnerships.

Pressure Points

40%
Over the next two decades, the world will need up to 40% more water to meet rising demand

2050
Without significant changes to how we produce and consume water, agricultural production will have to increase by about 70% by 2050

50%
Around 50% more primary energy must be made available worldwide by 2035

90%
The UAE imports nearly all its food, with the strain likely to intensify as the size of the population climbs steeply

2021
Renewable energy and sustainable agriculture are high on the agenda of the UAE Vision 2021. The country's 2050 Energy Plan also aims to supply 50% of its power needs from renewables and cutting CO_2 emissions by 70%

10%
Around 6% of the Netherland's energy supply was generated by renewable sources in 2016, compared to the IEA's average of 10%

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THE BIGGER PICTURE MATTERS

Improvements to today's nexus must fit into the wider system of the world, such as social and economic outlooks. For example, efforts to strengthen the nexus could incorporate the role of human capital and skill-building to help inspire a more resource-efficient world. Water quality technicians, urban food growers, low-carbon car engineers, recyclers, green builders, wave and wind energy producers and solar cell technicians are some of the 'jobs of the future' that have been identified by the National Geographic.

How can 21st century career channels that help develop the intellectual tools to support the nexus be nurtured, while also reducing unemployment levels?

The same ethos applies to small and medium-sized enterprises (SME). The SME sector in the Gulf Cooperation Council (GCC) – comprising of Saudi Arabia, Kuwait, the UAE, Qatar, Bahrain, Oman – presents a potential of $920 billion, with 156% growth in the next five years, employing 22 million people, according to MENA Research Partners. In the UAE, Gulf Capital estimates that SMEs make up 95% of all enterprises, employ 42% of the workforce and contribute over 60% to the country's GDP. How can SMEs be incentivized to invest their time and effort into solving the challenges associated with water, energy and food? What are the best 'carrots' to encourage progress?

Ensuring a reliable flow of finance will make a considerable difference. For example, Expo Live has an an innovation and partnership program launched by Expo 2020 Dubai with an allocation of $100m to fund, accelerate and promote creative solutions that improve lives while preserving the environment. Innovative efforts must not only focus on theory, but also pin down tangible solutions. A combination of academic and creative solutions that are affordable and easily applicable will mark the sweet spot in vital R&D.

"How to encourage societies in the UAE, Netherlands and beyond to consider the water footprint of their lunchtime meal? Or the amount of ground that has been farmed and fuel used to transport goods to make sure the shelves in local food shops are stocked on a 24/7 basis?"

DIGITAL TOOLS: NEW OPPORTUNITIES?

Digital tools will also be a valuable ally in the effort to create a streamlined nexus. The collection and harvesting of big data – large data sets that are analyzed by computers to determine trends – can help pin down areas where resources are being wasted or not appropriately reused, for example. The same applies to other technologies under the umbrella of the 4th Industrial Revolution: predictive analytics, automation, internet of things (IoT) and advanced robotics, to name a few. It is equally vital that such data is easily accessible and not gathering dust on digital shelves.

The proper utilization of technologies will lead to multifaceted applications. Can technologies be used to encourage individual tracking devices to monitor water consumption and help reshape consumption habits? Can sensors in agriculture that help small-scale farmers monitor progress be adapted to ensure the upmost durability for every climate and socio-economic demographic? Wageningen Environmental Research (WENR) and Rabobank in the Netherlands have joined forces to develop a digital tool to monitor smallholders' crops. The information it

"Each country must have detailed goals and forecasts to ensure all have clear game plans. Generalities will no longer suffice – they are breeding grounds for confusion. Specifics are a must."

provides helps to lower farmers' risk profiles so that they can gain access to credit. The team is now developing a tool it calls the Climate Smart Digital Farm Finance (CSDFF) Solution, which supplies reliable information about farms from different data sources. How can efforts by the aforementioned key stakeholders – government, industry, academia and society – help leverage ideas in the UAE, as the country looks to broaden its farming industry? Such technologies also offer a particularly crucial bridge of support from developed to developing nations, as less-fortunate communities face the greatest risks associated with resource shortages.

In the Middle East alone, a diversified portfolio of technologies is required to suit the region's varying climates and landscapes; from the Iraqi mountains, to Oman's southern green hills and the Empty Quarter that accounts for more than a quarter of Saudi Arabia's lands. One size will not fit all. Solutions must be delivered smartly and quickly. Careless and rushed efforts will just add to what is already a tight timetable.

ECONOMIC LOGIC

Above all, efforts must be driven by sound economic arguments. Greater efficiency in the water-energy-food nexus cannot be propped up by subsidies or other unsustainable support networks. MENA is home to 5.5% of the world's population and 3.3% of its GDP, yet it accounts for a staggering 48% of its energy subsidies, the World Bank detailed in its 2014 report, titled 'MENA economic monitor: Corrosive subsidies.' Now, major improvements are underway. For example, the UAE's petroleum subsidies totaled $7 billion a year and were only part of wider energy subsidies that totaled $29 billion a year – 6.6% of GDP – before the country stopped fuel subsidies from 1 August 2015. Similar cuts have been made – and more are planned – across the region. This marks a major step in encouraging society to think about energy efficiency, for subsidies of fossil fuels have been part of the national workings in the region.

Other environmental factors, such as carbon emissions, must also be factored into economic equations to ensure that countries sustain their commitment to the Paris Agreement. Worldwide cohesion is required to make the Agreement's goal of keeping the increase in the global average temperature to well below 2°C above pre-industrial levels a reality. One small but interesting example in stabilizing the 'food' component of the nexus in a low-carbon world has been illustrated in the Dutch province of Limburg, where a chicken farm has produced the world's first CO_2 neutral egg. In the national spirit of reinvention, 'small' steps such as CO_2-free eggs are all part of the Netherlands' wider goal to achieve a 100% circular economy by 2050.

Leveraging historic ties

The UAE Minister of Economy, Sultan bin Saeed Al Mansouri, and the former Dutch Minister of Economy, Henk Kamp, signed a memorandum of understanding (MoU) on Innovation Cooperation during Al Mansoori's visit to the Netherlands last year. The MoU defines cooperation on five identified themes:water-energy-food nexus, aerospace and aviation, energy, life sciences and health and smart cities. The MoU will be supported by the Dutch participation in Expo2020, under the theme of the water-energy-food nexus. Expo2020 is an important tool to strengthen the Netherlands' relationship with Emirati friends, explained Frank J.M. Mollen, Ambassador of the Kingdom of the Netherlands, to the UAE. The UAE ranks as one of the 25 most important export markets for the Netherlands and is one of the country's most important trading partners in MENA. Around 250 Dutch companies are based in the UAE and multinationals such as Shell, Unilever, BAM, Philips, AkzoNobel, FrieslandCampina, Van Oord, Boskalis, Vopak, Royal Haskoning DHV, ING and ABN AMRO have investments locally. Companies like Royal Dutch Shell and Friesland Campina have been present in Abu Dhabi for 60 years or more, long before formal relations were established in 1972.

Source: Menafn

Drier Lands

1st

The GCC is rated as the world's most water-stressed region, with the least available water per capita. Growing scarcity of groundwater has resulted in water extraction exceeding the availability of natural renewable water resources

6x

Saudi Arabia and the UAE consume 91% and 83% more water than the global average, respectively, on a per capita basis. This amounts to around six times more than the water consumed in the UK

30%

The UAE expects its water demand to increase by nearly a third over the coming decade

2030

The GCC could reduce water withdrawals for power generation by 20% by 2030 if it deploys a sustainable renewables plan, according to IRENA. By comparison, the UK, US and India could achieve a 50%, 25% and 10% decline, respectively

PROGRESS ACROSS THE NEXUS: HOLISTIC STEPS

Water security is step one: without it we will perish. It is also a key ingredient to global energy and food production, yet it remains a trouble spot for the UAE and wider region. Total water productivity in MENA is only about half the world's average. Roundtable participants estimated Abu Dhabi's per capita consumption a day at 1,700 liters, while Statistics Netherlands' 2015 data said it is 119 liters in the Netherlands. Opportunities for improvements abound.

The first experiments in the new research center for protected horticulture in Riyadh, Saudi Arabia, developed with support from the Netherlands' Wageningen University & Research experts, show that water savings of over 90% can be achieved in local tomato growing. In the UAE capital, groundwater and desalinated water account for 60% and 35% respectively of water use. The recycled water contribution is just 5%, according to the Abu Dhabi State of Environment Report 2017. And, despite its water scarcity, MENA has the world's lowest water tariffs and the highest proportion of GDP (2%) spent on public water subsidies.

The GCC could reduce water withdrawals for power generation by 20% by 2030 if it deploys a sustainable renewables plan, according to Abu Dhabi-based International Renewable Energy Agency (IRENA). By comparison, the UK, US and India could achieve a 50%, 25% and 10% decline, respectively. This is especially timely for the GCC considering Saudi Arabia-based Apicorp estimated last April that meeting the rising power demand in MENA means increasing capacity by an annual average of 7.4% between 2017 and 2021.

If such stark illustrations of resource inefficiency are not enough to excite regional efforts, then the fact that MENA has the greatest expected economic losses from climate-related water scarcity at up to 14% of GDP by 2050 might. It is time for the UAE to exercise its historic knack for sustainability. "Since the Bronze Age, our ancestors have used our scarce water resources wisely, and developed a well management system called Tawi, as well as a traditional water irrigation system known as Falaj," said His Excellency Dr. Thani bin Ahmed Al Zeyoudi, UAE Minister of Climate Change and Environment. "The Falaj system played an important role in supporting date farms that formed the basis of the traditional UAE economy, along with grazing, fishing and pearling." How can the strong ties between the Netherlands and UAE today help support the next step of 21st century water innovations?

There is great potential for cross-border collaboration in the Middle East, as 60% of surface water resources in MENA are transboundary and all countries share at least one aquifer. The Netherlands can help provide a template that enables input and collaboration from multiple parties, as is seen through the use of several parties in the initiative of the Dutch Deltares. Another program, based in the Netherlands and called Water Nexus, combines research institutes, large and small companies

Regional progress

The Middle East's current successes must also be supported and seen as a positive catalyst for greater change in the region. The World Bank details how Morocco's nation-wide efforts on groundwater management are advancing, as are Jordan's plans to harness private sector innovation, finance recycling wastewater and enhance supply through desalination. Saudi Arabia is pursuing reforms to reduce untargeted subsidies and boost the role of private operations in support of public interest outcomes, while Egypt has a renewed focus on strengthening local accountability for water supply and sanitation services, especially in under-served rural areas.

"There is already great potential for cross-border collaboration in the Middle East, as 60% of surface water resources in MENA are transboundary and all countries share at least one aquifer."

and has the support of the country's Ministry of Economic Affairs, reflecting the Dutch Triple Helix approach of university-industry-government relations.

TACKLING water scarcity would also benefit from the establishment of regional and international agreements that actively measure water footprints of countries, individuals, companies and so on. The UAE's reputation for pushing regional and global boundaries means it could be the best advocate of this initiative in the Middle East.

Another area that would benefit from more R&D to identify cost-effective and widely applicable solutions is that of recycled water. Successful strategies can be explored in the UAE to reduce wastage in many industries. This can include energy-producing processes, such as oil, gas and mining. In 2020, the planet's oil wells will produce a staggering 12.7 billion gallons a day of water, estimates Total. An average of three to five barrels of water is produced with one barrel of oil. How to re-use or minimize this water useage is playing a major role in the new water strategies of the UAE and other Gulf energy producers, all of whom operate the beating heart of the global oil industry. Water that is contaminated during the exploration and production of oil, gas and other commodities can be treated and turned into produced water. Depending on the treatment, the produced water can then be re-used for future operations, for crops, for arable supplies and so on. There are significant and untouched opportunities; 82% of wastewater in MENA is not recycled.

Desalination will also become increasingly valuable in meeting MENA's water shortage; the Middle East is already home to around 70% of the world's desalination plants. Abu Dhabi plans to build the world's largest desalination facility by 2021, with the $544 million (Dhs2 billion) Taweela Reverse Osmosis (RO) Independent Water Project including two desalination plants. Also in Abu Dhabi, Masdar launched the Renewable Energy Water Desalination Programme in January 2013. This forward-thinking initiative aims to develop and demonstrate advanced and innovative technologies in desalination. A large majority (83%) of desalination in the UAE is produced at thermal plants, which consume around 3.5 times more energy for each unit of produced water than modern RO plants. One the oldest forms of water treatment worldwide, RO technology tends to be cheaper and use less energy than other water purification methods. But it cannot be the sole method. Diversified yet united solutions are the best route to water-energy-food security.

FOOD: TRADITIONAL METHODS EVOLVE

Strengthening food security is also a priority in the UAE; a topic that the Netherlands can share its experiences. The Netherlands has again claimed its place as the worlds' second largest agricultural exporter. The national statistics office CBS reported a total of $113.5 billion dollars in agricultural exports for 2017 – up 7% on 2016. The UAE, which imports up to 90% of its food, aims to produce 60% more food by 2051. Efforts to increase environmental efficiency and sustainability include Abu Dhabi Farmers Service Centre's (ADFSC) agreements with 25 farms in Abu Dhabi to convert them from traditional to organic agriculture.

"The ADFSC's interest in encouraging the shift from traditional to organic agriculture is consistent with sustainability, environmental protection, conservation of soil and water natural resources, as well as the production of clean and chemical-free food," said Nasser Mohammed Al-Junaibi, Acting CEO of the ADFSC. The center seeks to convert approximately 100 farms for organic agriculture over the next four years. Established in 2009, ADFSC aims to implement reforms in farming practices, improve productivity, modernize agricultural systems, innovate agricultural marketing programs, promote food security and strengthen the competitiveness of local products. Another innovative project involves growing Dutch lettuce in the desert near the UAE's city of Al Ain in specially designed greenhouses. Five Dutch companies are involved (Delphy, Grow Group, Levarht, Rijk Zwaan and Philips Lighting) in the 'desert farm', which will produce 4,000 tons of herbs and vegetables a year at its peak. When it comes to farming, the Netherlands has proven beyond doubt that high volume agriculture is viable in an efficient and affordable way, in large part due to specifically conditioned environments, such as greenhouses.

The same applies to hydroponic agriculture, a high-tech method that enables the growth of vegetables without soil, and vertical farming. The latter involves growing fruit and vegetables in tall buildings without daylight. This year, the Dutch town Dronten will be home to the first commercial European vertical farm. Staay Food Group is building a nine-story-building, in which their company Fresh Care Convenience, will cultivate various types of lettuce. Each floor in the flat will have specially designed climate chambers with LED lighting, which will produce 30,000 crops of rucola, lollo bionda, lollo rosso and curly endive a week. That's twice as many crops as can be grown in traditional farms in a week, according to the Netherlands Enterprise Agency.

NOVEL thinking can also be used to increase efficiency in farming practices in the form of small-scale irrigation technologies. This would be especially beneficial in urban farming –

Next best steps?

A compilation of ideas and suggestions gathered during the roundtable

- ✓ Broaden the use of hydroponic and urban agriculture
- ✓ Identify strategies to leverage local human capital to support nexus
- ✓ Strengthen synergies between government, industry, academia and society
- ✓ Establish clear regulations for the reuse of wastewater in industry, especially oil and gas
- ✓ Address the demand-side of the nexus i.e. reduce detrimental consumption habits
- ✓ Establish a coordinated platform to explore the most applicable technologies
- ✓ Examine how best to gather and harvest the vast amount of relevant data to identify trends
- ✓ Establish an institute to build local capacity and develop home-grown technologies

**Not in order of importance.*

Inspiring local innovations

Part of the UAE's national effort to use water more efficiently is the first edition of the Mohammad Bin Rashid Al Maktoum Global Water Award, launched last year. In a bid to inspire an innovative spirit, $1 million will be distributed to three ideas that offer novel and affordable solutions to countering water shortages worldwide. The Award has three categories: Innovative Projects Award, Innovative Research and Development Award, and Innovative Youth Award. The first edition received 138 applications from 43 countries, from research centers, institutions and individuals. The next edition will introduce a new criterion to attract sustainable projects and technologies to produce clean drinking water.

Plus, under the umbrella of the Mohammed bin Rashid Al Maktoum Global Initiatives (MBRGI), the UAE Water Aid Foundation (Suqia) undertook pioneering development projects in 21 countries around the world. More than half a million people (553,370) benefitted from 85 development projects. More ideas lending themselves to application worldwide are integral to resigning the UN's shocking statistic that 844 million people do not have access to safe water to the history books.

Hydroponic agriculture is very common in the Netherlands and involved growing plants without soil in nutrient-rich solutions. This cuts the volume of runoff, which helps save water and bank balances.

perhaps ideal for the UAE's bustling cities? – and developing countries where larger projects have historically been hampered by daunting bills, a lack of infrastructure and poor access routes.

With just a handful of cities accounting for most of the population living within the UAE's borders – home to 84 thousand square kilometers of land – surely such infrastructure can benefit local farmers?

Utilizing the benefits of the 4th Industrial Revolution to increase the number of sensors and data collection technologies on farms – big and small – will help the UAE identify the best areas and crop types to broaden its farming industry. Regulators can help set clear guidelines for the collection and use of such data to give investors and the public – including budding farmers – a confidence boost in the country's seriousness about improving food security. In turn, this will spur further R&D into much-needed innovative technologies and policies to redefine the boundaries of traditional farming practices that have been practiced in the Middle East for millennia.

The UAE already benefits from high quality research-driven institutions; Masdar Institute, Petroleum Institute and the Khalifa University of Science, Technology and Research, now all under the umbrella of the newly-established Khalifa University of Science and Technology. Such establishments have enabled the UAE to climb the global ranks to place 22nd in terms of human capital and research, according to the Global Innovation Index 2017. This is particularly impressive considering the country only gained independence 46 years ago. Looking ahead, the UAE would benefit from a university with a core mission to build local capacity and drive homegrown technology. Both would help accelerate R&D efforts and support the country's wider goal of transitioning into a knowledge-based economy.

ONWARDS AND UPWARDS

Urgent calls to strengthen what is a vulnerable water-energy-food nexus cannot be lost amid the noise of a world that is busy troubleshooting on many fronts. Lessons shared between the Netherlands and the UAE, both open-minded partners hungry to redefine the status quo, can be leveraged far beyond their borders. The robustness of this nexus links directly to our security as a global population in the 21st century. Extraordinary times call for extraordinary measures.

Participating organizations at the roundtable:

Abu Dhabi Farming Service Center
ADWEC
ARCADIS – UAE Projecten
BlueValue
Deltares
Environment Agency Abu Dhabi
Embassy of the Netherlands, UAE
Ernst & Young MENA
EXPO2020
International Center for Biosaline Agriculture (ICBA)
IRENA
Masdar
Masdar Institute, Khalifa University of Science & Technology, UAE
Ministry of Energy & Industry, UAE
Ministry of Climate Change & Environment, UAE
Ministry of Agriculture, Nature & Food Quality, NL
Ministry of Foreign Affairs, NL
Pure harvest
WasteTransformers
Water Alliance

**Sources: Wageningen Environmental Research (WENR), ADSFC, Khaleej Times*

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