

FLASHES

A MONTHLY MAGAZINE ON KNOWLEDGE AND DEVELOPMENT BY THE
MOHAMMED BIN RASHID AL MAKTOUM KNOWLEDGE FOUNDATION

AUGUST 2017
ISSUE 32

#YearOfGiving

The iPhone Turns 10

How it changed the world forever



TALENT AND INNOVATION

FUNDAMENTAL FOR SUSTAINABLE DEVELOPMENT

WASTE TO ENERGY

TURNING GARBAGE INTO PROFIT

MICHAEL DELL

THE FOURTH INDUSTRIAL REVOLUTION



EISENBERG

PARIS

THE IDEAL CARE TO SOOTHE MEN



ESSENTIAL SOOTHING MOISTURISER

HIGH-TECH SKIN CARE INSPIRED BY SCIENCE AND NATURE
THE ANTI-AGE EXPERT - TRIO-MOLECULAR® FORMULA

Exclusively at

Paris Gallery



باريس غاليري

800-744

www.parisgallery.com
www.luxuryclub.com

CONTENTS

AUGUST 2017
ISSUE 32



REGULARS

06: NEWS

Talent and creativity are key for innovation

14: DIGITAL WINNING STREAK

The UAE has been ranked as one of the top countries for its digital economy and it is challenging larger countries

34: WASTE TO ENERGY

Transforming waste management to create energy is a perfect win-win scenario

54: THE FIRST INDUSTRIAL REVOLUTION

The world is currently undergoing the Fourth Industrial Revolution, characterised by massive technological disruption

EXPLORE

LIBRARIES OF PEACE

After the end of a 50-year civil war, the Colombian government is using mobile libraries as part of its reconciliation programme /12

HOW THE iPhone CHANGED THE WORLD

The first iPhone was launched a decade ago to immediate acclaim and it transformed the world /16

KEEPING DOOMSDAY AT BAY

In the face of astonishing losses in crop diversity over the last century, more than 1,700 seed banks have been established /20

NINE SPECIES ON THE BRINK

Global warming and associated weather changes are affecting some species more than others /24

A FRONT ROW SEAT

Michael Dell and the recently formed Dell Technologies are ready for the Fourth Industrial Revolution /30

THE HUMAN CELL ATLAS

Scientists are collaborating to create a comprehensive map of all the cells in the human body /38

THE GREAT ELECTRIC ACCELERATION

With the Tesla 3 rolling off production lines, the future looks uncertain for traditional car manufacturers /42

WORLD'S FIRST FLOATING WIND FARM TO SET SAIL SOON

The £200 million Hywind Scotland Project is opening a new frontier in sustainable energy /46

THE CUBESAT REVOLUTION

Cube satellites or cubesats are being used in everything from disaster response to climate monitoring /50

خشب العود

KHASHAB AL-LOUD

HERITAGE



عبد الصمد القرشي | سادة العطر الملكي



عبد الصمد القرشي
ABDUL SAMAD AL QURASHI



قنديل | Qindeel

للطباعة والنشر والتوزيع

Printing, Publishing & Distribution

Member of MBRF Holding

CHAIRMAN

HE Jamal Bin Huwareb

EDITORIAL BOARD

Saif Al Mansoori

Khalid Wazani

Lina Al Anani

Eyad Al Jurdy

Mohammed Bin Rashid
Al Maktoum Knowledge
Foundation
T: +971 4 423 3444
F: +971 4 368 7777
PO Box 214444, Dubai
United Arab Emirates
www.mbrf.ae
flashes@mbrf.ae



A Motivate Connect Publication

Media One Tower,
Dubai Media City
PO Box 2331, Dubai, UAE
T: +971 4 427 3000
F: +971 4 428 02261
motivatepublishing.com
connect@motivate.ae

PUBLISHER

Chris Capstick
chris@motivate.ae

GROUP EDITOR - CONNECT

Guido Duken

PROJECTS MANAGER

Ingrid Valles

SENIOR ART DIRECTOR

Tarak Parekh

DESIGNER

Sanil Kumar

CONTRIBUTOR

Robert Anderson

GENERAL MANAGER - PRODUCTION

Sunil Kumar



FOREWORD

Dear readers,

The fourth Knowledge Summit, which is organised by the Mohammed Bin Rashid Al Maktoum Knowledge Foundation, is entitled "Knowledge and the Fourth Industrial Revolution". There is no single definition of this term, but the Fourth Industrial Revolution generally refers to the current and developing environment in which disruptive technologies and trends such as the Internet of Things (IoT), robotics, and artificial intelligence (AI) are changing the way we live and work.

The Fourth Industrial Revolution is growing out of the third (the Digital Revolution) but it is considered a new era rather than a continuation due to the extremely rapid advance of its development and the disruptiveness of its technologies. According to Professor Klaus Schwab, Founder and Executive Chairman of the World Economic Forum at Davos and author of *The Fourth Industrial Revolution*, this new era is differentiated by the speed of technological breakthroughs, the pervasiveness of scope and the tremendous impact of new systems.

This effect was highlighted recently in a *Harvard Business Review* article that stated that digital flows are now responsible for more GDP growth globally than trade in traditional goods. This means the digital competitiveness of countries is central to economic growth

and proves the importance of knowledge-based economies.

That the UAE is a leader in this regard was made clear by The Digital Evolution Index 2017, which measures how competitiveness and trust in digital economies vary across the world. The UAE was placed 22nd out of 60 countries analysed, but it was one of three "Stand Out" countries according to its relative digital momentum. As the Index made clear, the new digital world is allowing smaller, nimbler countries such as the UAE to seriously challenge the big players.

Businessman Michael Dell, who was at the vanguard of the digital revolution, says the technology industry is characterised by a "constant creative destruction" which yields evolutionary and revolutionary ideas. One need not look further than the impact of the iPhone, which was launched 10 years ago, to see the truth of Dell's statement. Even the giant car companies are not immune as the impact of Tesla's electric vehicles is proving.

Looking at all these factors it is clear that the theme of this year's Knowledge Summit (November 21-22) is particularly pertinent.

Jamal Bin Huwareb

CEO of Mohammed bin Rashid
Al Maktoum Knowledge Foundation



The Importance of Nurturing Talent and Innovation

His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, affirmed the importance of nurturing talent and innovation as they are the fundamental pillars of sustainable development. His Highness made the remarks during a visit to the Dubai Design District (d3). Sheikh Mohammed called on all stakeholders to continue enhancing the environment to foster creativity and encourage young talent to chart innovative paths for developments that contribute to the achievement of Dubai's strategic objectives.

Sheikh Mohammed highlighted the role of the design industry in shaping the future. His Highness said: "The economic sectors that depend on innovation and creativity are the actual movers of the economy. We must focus on encouraging talent and help them to blossom and become an active part of our economy and community."

His Highness added: "The UAE has become a global hub for diverse knowledge-based sectors. Our aim is to consolidate our status in the design sector, in which we have tremendous potential for growth, and make our country a preferred destination for global companies. We also aim

to position the UAE as an incubator for creative ideas and professionals."

HH Sheikh Mohammed toured different areas of the Dubai Design District, and visited many businesses there. He was also briefed on the second phase of the district's development, which features a Creative Community spread over one million square feet, a thriving centre that seeks to attract designers as well as visitors and tourists.

During the visit, His Highness also met with local and regional designers and entrepreneurs, and reiterated the importance of the design industry in fostering creativity and innovation and building the economy of the future.

The Creative Community will also be home to the Dubai Institute of Design and Innovation (DIDI), the region's first design university, offering a curriculum that has been structured in cooperation with the world's leading design institutions – the Massachusetts Institute of Technology (MIT) and New York's Parsons School of Design. The Creative Community will also see the establishment of a state-of-the-art lab "Fablab", equipped with prototyping and production facilities. †

Application Deadline for Mohammed Bin Rashid Knowledge Award 2017 Extended

The Mohammed Bin Rashid Al Maktoum Knowledge Foundation (MBRF) is extending the application deadline for the Mohammed Bin Rashid Knowledge Award 2017 (MBRKA) until the end of August.

Held under the patronage of MBRF Chairman His Highness Sheikh Ahmed bin Mohammed bin Rashid Al Maktoum, the Award seeks to honour individuals and institutions who have made significant contributions to the knowledge sector and to science-based sustainable economies.

The decision to extend the submission deadline came in response to demand from knowledge experts and professionals – individuals and organisations – from all around the world. The Foundation – a member of the Mohammed Bin Rashid Al Maktoum Global Initiatives – will continue to accept entries submitted through the website www.knowledgeaward.com in an effort to increase competition and allow the largest number of qualified contestants to apply for the Award.

“We were delighted with the extensive and positive interaction exhibited by the global knowledge community during the application period,” said MBRF’s CEO His Excellency Jamal bin Huwareb. “Applicants are reaching out to us from far beyond our borders and our region, which reaffirms that the UAE has become an influential player in the global knowledge sector, a beacon of science and thought, and a magnet for intellectuals and innovators.”

The Mohammed Bin Rashid Knowledge Award honours success in several knowledge-related categories, including development, innovation, leadership and creativity, the development of educational institutions, scientific research,

communication technology, literature, publishing and printing, paper and electronic documentation, and many other sectors identified by the MBRKA Board of Trustees. This year, candidates can be individuals, Emirati or foreign, from any nationality, gender, race or religion, as well as local, regional or international organisations, such as academic institutions, government entities, corporations or NGOs.

To be eligible for nomination for the MBRKA, applicants must have made outstanding contributions towards producing and distributing knowledge. In addition, the application must be accompanied by the candidate’s CV (not exceeding 1,000 words), as well as letters of reference from legal persons with relations to the category said candidate is applying for.

Candidates can also include any supporting documents pertaining to their achievement or contribution, the impact of that contribution and their reasons for entering the contest. Candidates may be nominated for more than one category of the Award, but may not be nominated by the same nominator for more than one idea in any field. Applications can be submitted in Arabic or English, and candidates may nominate themselves or be nominated by others – posthumous nominations, however, are not permitted.

Applications that do not meet all the requirements will not be accepted, and MBRKA’s Board of Trustees is entitled to withdraw the Award from any party in the event of breach of the conditions, or of scientific research standards, ethics, scientific integrity, intellectual property, or any other breach the Board deems substantial and significant. Applications should be submitted through the Award’s website www.knowledgeaward.com





MBRF Meeting In Preparation for Global Knowledge Index

The Mohammed bin Rashid Al Maktoum Knowledge Foundation (MBRF) convened with a group of experts associated with the Arab Knowledge Project in the Library of Alexandria, Egypt, for their third meeting. It was held to prepare for the upcoming inaugural edition of the Global Knowledge Index, following the directives of HH Sheikh Ahmed bin Mohammed bin Rashid Al Maktoum, Chairman of MBRF.

Experts from MBRF – along with the Arab Knowledge Project team – went into the details of the Index's updated version, as well as the progress made with regards to the upcoming launch of its global version in November, during the annual Knowledge Summit in Dubai.

The one-of-a-kind Global Knowledge Index covers 140 countries and is put together by top-tier Arab and international experts and consultants using accurate and objective data. It is the fruit of a partnership between MBRF and the Regional Bureau for Arab States at the United Nations Development Program (UNDP).

His Excellency Jamal bin Huwaireb, CEO of MBRF, said: "Our partnership with the Global Management Challenge complements our mission to spread knowledge and facilitate

learning across various disciplines through innovative and effective means. The Challenge trains and empowers a generation of young leaders, capable of making the right decisions and efficiently managing business. This, in turn, stands to improve corporate performance and achieve greater global competitiveness."

"The fact that today's meeting is held at the Library of Alexandria, a global knowledge and culture icon, makes it all the more distinguished," said Dr Hany Torky, Director of the Arab Knowledge Project. "The meeting today holds a symbolic significance of the important role played by knowledge in achieving sustainable human development."

The Index seeks to evaluate knowledge, regarding it as a catalyst for comprehensive and sustainable human development. It covers six main sectors: pre-university education, technical education and vocational training, higher education, economics, information and communication technology (ICT), research & development (R&D) and innovation, as well as knowledge-enabling environments.

The Arab Knowledge Project had organised two previous expert meetings, the first took place in Beirut in May 2017, and the second in Dubai in June 2017. †

MBRF Concludes Second Translation Workshop

The Mohammed bin Rashid Al Maktoum Knowledge Foundation (MBRF) wrapped up the second translation workshop – part of the Dubai International Writing Program – which took place on July 2-6, 2017.

The workshop enlisted experts in book translation from around the world to train a generation of regional young professionals in the field, and to eventually trigger and support a large-scale translation movement in the wider Arab world. Seven trainees attended the workshop, where translator and mentor Kamel Yousef Hussein conducted an intensive programme, touching upon the basics of literary translation and adaptation, covering novels, stories, articles, poetry, theatre, biography, and travel literature.

"Falling under the umbrella of the Dubai International Writing Program, these workshops seek to hone participants' translation and adaptation skills across many disciplines," noted MBRF's CEO His Excellency Jamal bin Huwaireb. "These skills have become increasingly pressing and indispensable tools to inspire cultural content creation and develop knowledge in the Arab world, in addition to promoting creativity and encouraging writing across various sectors."

The Foundation organises five-month intensive translation workshops, where participants are selected based on their previous experience in the field. The workshops focus on translating literary works, as well as business and



management books, among others. At the conclusion of the workshop, the Foundation issues a collection of books translated by the participants.

This most recent workshop adds to the series of sessions and activities the Foundation offers under the aegis of the Dubai

International Writing Program, which seek to benefit the largest possible number of trainees in different creative fields. These activities were instrumental in discovering many promising writers who have gone on to make their mark, in addition to producing dozens of prominent and influential books. †

First Twitter ‘Youth Circle’ on Promoting Arabic Language Held

The Mohammed bin Rashid Al Maktoum Knowledge Foundation (MBRF) joined hands with the Emirates Youth Council to hold the first Youth Circle on Twitter on July 19.

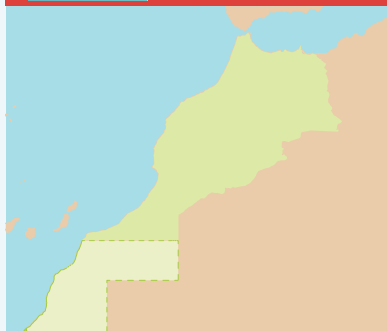
It was titled “How to Make Arabic the Language of Science and Knowledge?” The real-time discussion took place on Twitter via the hashtags #Youth_Circle and #Bil_Arabi, allowing participants around the world to voice their opinions and share their thoughts. A video documenting the session was published on the Ministry’s social networking accounts.

Interactive discussions throughout the Youth Circle are set to tackle various topics such as the host of activities organised to support the Arabic language as part of the Year of Giving 2017. The debate, furthermore, will explore how present and future generations can benefit from using Arabic in science, given the language’s flexibility and capacity to transfer knowledge to Arab societies everywhere, in addition to the role of both traditional and social media in promoting the use of Arabic as the main language of online dialogue in the Arab world.

Her Excellency Shamma bint Suhail Faris Al Mazrui, Minister of State for Youth Affairs and Chair of the Emirates Youth Council, participated in the Youth Circle, along with HE Jamal bin Huwaireb, CEO of MBRF; Aisha bin Bayat Al Falasi, Head of the Government Communication Unit at Dubai Educational Zone; Heba Al Samt, Director of Digital Media for TV and Radio at Dubai Media Incorporated (DMI); and Rafed Al-Harthi, Journalist at Abu Dhabi Media; along with a number of respected media professionals. The Circle was moderated by Al-Arabiya TV’s Mohamed Al-Tamehi.

MBRF hopes the Circle will produce bold new ideas, initiatives, proposals and programmes that bolster and promote the Arabic language across all platforms. The Foundation had previously launched the Bil Arabi initiative – on UN Arabic Language Day – for the specific purpose of promoting the use of Arabic in cultural discourse and knowledge-related projects, and exporting the rich Arab culture, which was a historical hotbed for science and civilisation. †





Reading Rank Overall: 3rd
Total Reading Time Per Year: 57 hours
2016 Sample Size: 1,121
Number of Arab Countries Sampled: 22

The Arab Reading Index (ARI) was first released in 2016 and aims to provide an objective assessment of the state of reading in the Arab region

under the wider vision of the Arab Knowledge Index. As reading is the basic tool in knowledge acquisition, exchange, and dissemination this assessment is of primary importance. The Arab Reading Index focuses mainly on reading within the more general knowledge development concept, emphasising the role of reading as a tool for enlightenment and empowerment.



92%

EXTENT OF
READING



85%

ACCESS AND
AVAILABILITY



57

AVERAGE TOTAL
READING HOURS
(ANNUAL)



84%

PERSONAL
ATTRIBUTES



27

AVERAGE
NUMBER OF
BOOKS READ

Reading matter
sourced from

Made up of



57 hrs

Average of total
reading (annual)



91%

Family



32 hrs

Electronic
documents



72%

Skills and abilities



94%

School



27 hrs

Printed documents



89%

Motivation



71%

Society



29 hrs

Work related



92 %

Attitudes



30 hrs

Not work related

ابت

19

In Arabic

أ

10

In foreign languages



12

Work related



16

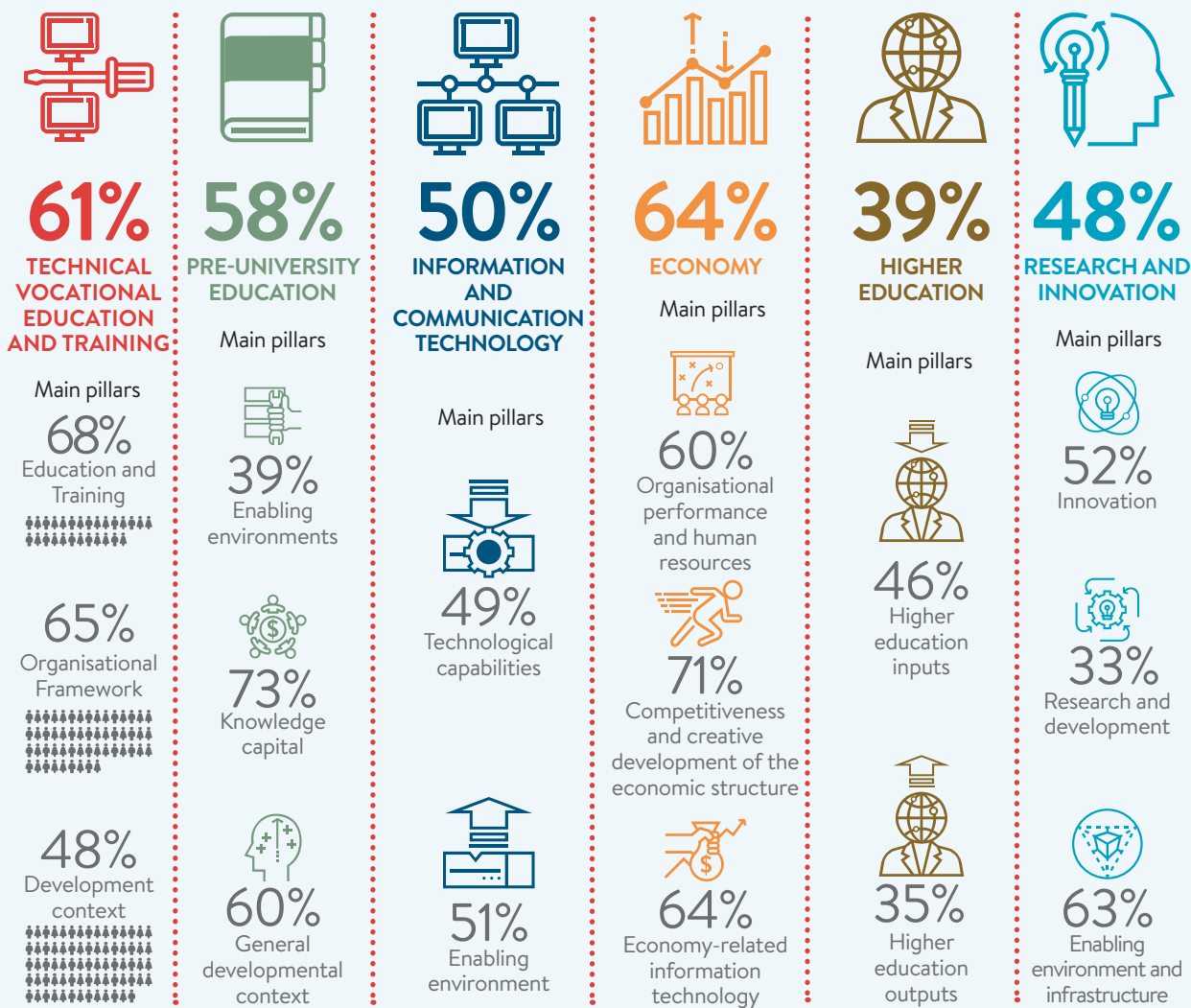
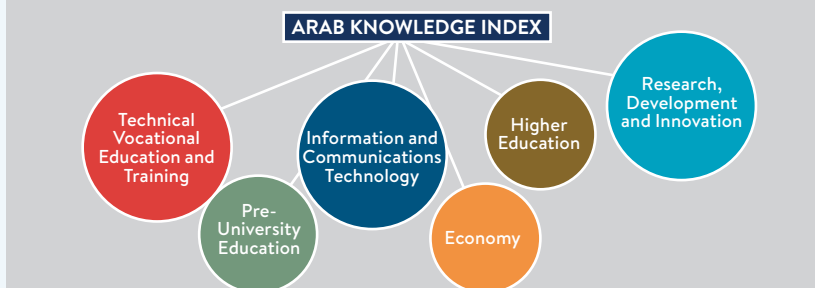
Not work related

The Arab Reading Index is done in partnership by the Mohammed bin Rashid Al Maktoum Knowledge Foundation (MBRF) and the United Nations Development Programme (UNDP).

Number of Arab Countries
Sampled: 22

The Index, which was initially launched at 2015's Knowledge Summit, monitors the status of knowledge in 22 Arab countries to help decision makers, experts and researchers to implement development policies and identify knowledge gaps.

THE SIX MAIN SECTORAL INDICES OF THE ARAB KNOWLEDGE INDEX



The Arab Knowledge Index is a joint initiative between the Mohammed bin Rashid Al Maktoum Knowledge Foundation (MBRF) and the United Nations Development Programme (UNDP).

Source: www.knowledge4all.com



LIBRARIES OF PEACE

After the end of a 50-year civil war, Colombia's government is using mobile libraries as part of its reconciliation programme.

In a world where the threat of large-scale war seems to increase by the day, peace treaties are rare and precious accomplishments. One of the most significant in recent history was concluded just last year, when Colombian President Juan Manuel Santos brokered an agreement between the Colombian government and the guerrillas of the Revolutionary Armed Forces of Colombia (FARC). That deal, which the Colombian government ratified last December, formally ended a 50-year civil war that claimed the lives of more than 220,000 people.

Santos was awarded the 2016 Nobel Peace Prize for his efforts. But his visionary leadership does not stop at his ability to broker and conclude an accord. As part of the Colombian government's reconciliation programme, the National Library of Colombia has made it a priority to install mobile public libraries on the outskirts of FARC demobilization zones – the areas where former guerrillas can surrender their weapons

and begin to reintegrate into society.

These mobile public libraries are providing communities that have been devastated by decades of conflict with education and access to information. The parts of Colombia that were once controlled by the FARC are among the most remote and isolated in the country. Many of these communities do not have basic sanitation, power, health care, or access to education.

Low literacy rates in Colombia's rural areas have exacerbated inequality throughout the country. Fortunately, Santos understands that education and literacy are prerequisites for upward economic mobility. His commitment to making more resources available in demobilization zones is thus a way of leveling the playing field.

However, Santos's historic project aspires to be much more than a fillip to economic growth. By promoting such quintessentially free and open institutions as public libraries, Santos is also opening a

Above:
Colombia's mobile libraries are enablers for democratic dialogue, education and collective action.

space for citizens to engage in democratic dialogue. Libraries encourage empathy and tolerance, and they can foster productive interactions between local populations and ex-combatants who are returning to the fold of Colombian civil society.

Moreover, libraries enable collective action, by providing people with the resources and information they need to take control of their own circumstances and strengthen the social ties that bind their communities. Libraries are hubs where local organisations and individual community members can meet to discuss the issues of the day, and formulate peaceful and collaborative responses to shared problems.

As hubs, libraries also create a sense of collective purpose and belonging. In some of Colombia's demobilization areas, mobile public libraries were among the first state-run institutions to open after the signing of the peace agreement. By including libraries in the government's initial efforts to re-engage with these areas, Santos clearly recognises the role these institutions play in reducing tension and promoting peace. Together, the libraries will form a national network that brings previously isolated regions together.

The National Library of Colombia is implementing its mobile library programme in partnership with the non-governmental organisation Libraries Without Borders, the creator of the Ideas Box: a cutting-edge pop-up library and learning tool that provides educational and cultural resources to communities in need.

The Ideas Box is both portable and durable, and it gives communities direct access to multimedia devices

such as tablets and computers, thousands of e-books, and web-based content. The Ideas Box is being used to help disadvantaged and displaced people around the world; but it has been especially valuable for responding to Colombia's educational and cultural crisis.

In a tribute to public libraries recently published in *The New York Times*, the critically acclaimed author Mahesh Rao recalls journalist Sophie Mayer's definition of a library as, "the ideal model of society, the best possible shared space." For Mayer, a library is a place "where each person is pursuing their own aim (education, entertainment, affect, rest) with respect to others, through the best possible medium of the transmission of ideas, feelings, and knowledge – the book."

With the help of Libraries Without Borders, Santos has taken Mayer's moving description to heart. By making libraries available to everyone, he is aiming to increase literacy, promote culture, and unite the people of Colombia.

One hopes that other world leaders will follow in his footsteps, and that they, too, will recognise the role that libraries can play in ensuring lasting peace. 📖

Alex Soros is the founder of the Alexander Soros Foundation, which recognises environmental defenders with an annual prize. Patrick Weil, Chairman of Libraries Without Borders, is Senior Research Fellow at the National Center for Scientific Research and a visiting professor at Yale Law School. Copyright: Project Syndicate, 2017.

Below: In Colombia even a bus stop doubles as a library.



DIGITAL

WINNING STREAK

The UAE has been ranked as one of the top countries for its digital economy and it is seriously challenging larger countries.

Digital flows are now responsible for more GDP growth globally than trade in traditional goods. Automation, AI, the internet of things (IoT) or business models such as the 'sharing economy' is changing how we conduct business and our lives. This means the digital competitiveness of countries is central to economic growth and shows the importance of knowledge-based economies.

So it was good news for the UAE this year when the country leapt six spots to number 35 on the rankings of the Global Innovation Index, putting it at par with the best globally. In the 2017 Change Readiness Index (CRI) released by KPMG International in July, the UAE ranks third – behind Switzerland and Sweden – for its ability to respond and adapt to any significant change.

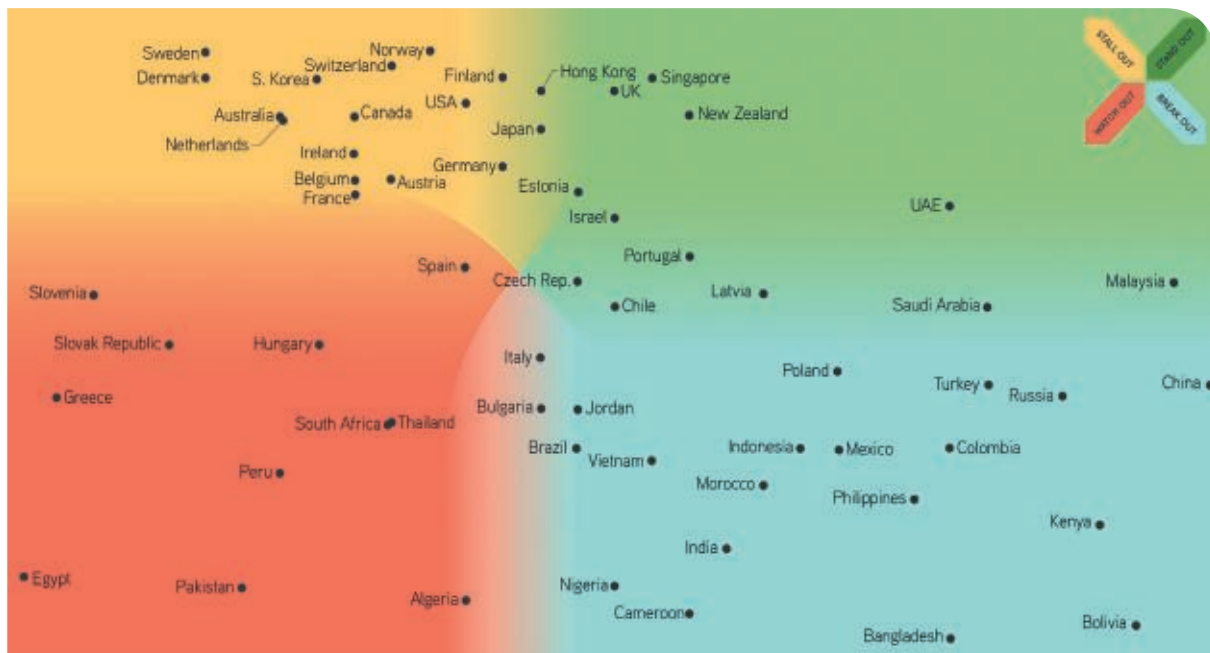
In a further boost The Digital Evolution Index 2017, released by Digital Planet 2017, revealed that the UAE is among the top nations when it comes to the digital economy. The survey by the Fletcher School at Tufts University ranks the UAE 22nd globally, making it the highest-ranking Arab nation and first in the Middle East and North Africa.

The Digital Evolution Index 2017 measures how competitiveness and trust in digital economies vary across the world. With nearly half of the world's population online, the research maps 60 countries' development, demonstrating their competitiveness and market potential for further digital economic growth.

The index measures four key drivers and 170 unique indicators to chart each country's respective course:

- Supply (or internet access and infrastructure)
- Consumer demand for digital technologies
- Institutional environment (government policies/laws and resources)





- Innovation (investments into R&D and digital start-ups etc.)

The research mapped the countries dividing them into stand out, stall out, break out and watch out segments.

“Three countries are notable as standouts even within the Stand Out segment: Singapore, New Zealand, and the UAE. Each has a unique policy-led digital strategy and a narrative that may be considered by other nations as worthy of emulation or adoption,” the report stated.

It’s no surprise that the UAE is a stand out country as it has been at the forefront of spurring innovation in every possible channel, with numerous programmes and initiatives being rolled out to stress the importance of keeping pace – and even keeping ahead – with today’s technology-driven world.

Another important fact highlighted by the research was that the top 10 countries on the list – Norway, Sweden, Switzerland, Denmark, Finland, Singapore, South Korea, the UK, Hong Kong and the US – clearly show a trend: economies that are larger could be in danger of losing the digital race to smaller countries.

Several nimble nations are ahead of the US and the UK on the list – and Japan is on the outside looking in at 15th, while Germany is at 17th and China is further down at 36th.

If you factor in countries’ relative digital momentum, the ‘real stars’ – as termed by Bloomberg – are Singapore, New Zealand and the UAE.

With the digital economy now firmly in the driver’s seat of globalisation, the notion of “digital competitiveness” has become front and centre for countries, their policymakers, businesses, and indeed their citizens – to whom digital platforms are a ticket to inclusion into the global marketplace.

Another important finding is that some countries and corporations are embracing digitalization and upending traditional sources of competitive advantage. In some instances, even small

countries discovered that their digital prowess gives them an ability to punch above their weight in having an impact, often leapfrogging more established countries in finding creative solutions around constraints; this would not have been possible in the traditional, physical economy.

So what makes the UAE a member of the Stand Out segment?

One factor is that the UAE is using public policy as a key to the success of the digital economy. A prime example is the proliferation of government smart services in the UAE that make queuing at tellers a thing of the past. For example, Dubai Economy has launched an “instant licence” initiative to allow investors and entrepreneurs to get commercial licences within five minutes. By making use of such online services, the user is showing his trust and as uptake increases countries become more digitally evolved.

The UAE is also taking great care to identify and amplify the drivers of digital momentum. Digital momentum, the report says, is powered by different drivers depending on a country’s level of digital evolution and economic advancement, and priorities for institutions and innovation are key. In the UAE, there are several incubators and entities, such as Dubai Future Accelerators and GITEX Startup, which support SMEs and startups to reach the next level of business.

In short, the UAE is focused on reinventing itself through innovation, which is aided by it having a superb digital infrastructure with an extremely high internet penetration.

According to Vivek Bapat, senior vice-president and global head of marketing strategy and thought leadership at SAP, “Digital transformation is no longer a choice, it’s an essential driver of revenue, profit and growth.” That is a fact the UAE has taken to heart, and it will continue to give other countries a run for their digital money. †



HOW THE iPhone CHANGED THE WORLD

The first iPhone was launched a decade ago to immediate acclaim and it transformed the mobile phone business, the internet economy and, in many ways, society as a whole.

It's been a mere 10 years since the iPhone took over our lives. Its sleek exterior, fluid motion and crisp user interface were an instant hit and transformed the way people viewed and used mobile technology. Although the iPhone ushered in a mobile revolution, technically it wasn't the most innovative device to hit the market.

Touch screens had made their debut on earlier phone models and tablets, and erstwhile mobile technology leader Nokia had already launched phones with more memory, better cameras and faster mobile connectivity. In contrast, Apple's iPhone was a build on the iPod's software and interface but with a twist: its creators did not design it as a telephone with extra features. Rather the iPhone was launched as a full-fledged handheld computer that could also make calls and surf the internet. This seemingly simple shift in concept is what made the iPhone such a transformative piece of technology.

The iPhone's launch changed almost every

facet of our life – the way we live, interact with others and even how we do our jobs. While the smart phone boom had just begun, the iPhone propelled it to new heights by creating a portable personal technology infrastructure that was almost infinitely expandable.

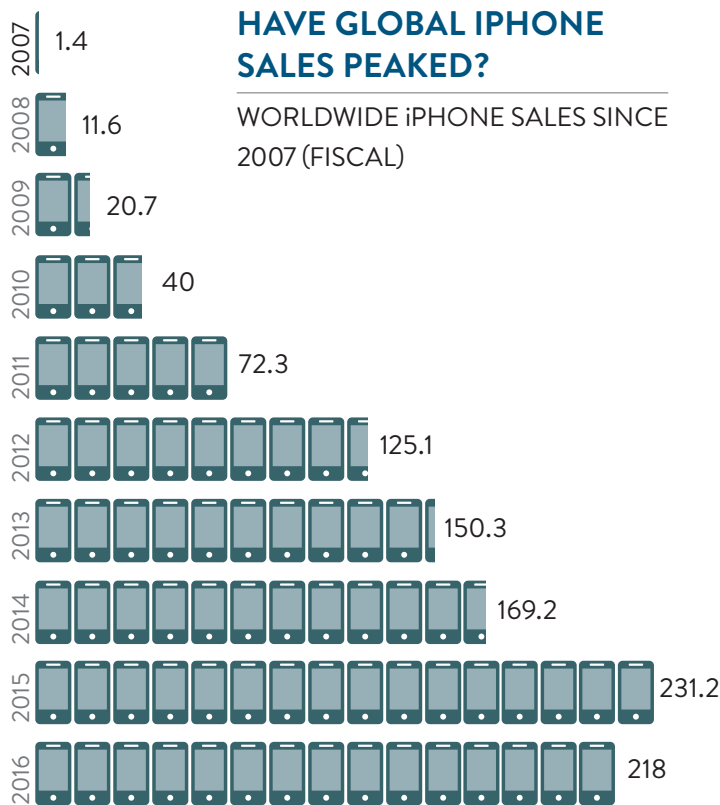
HANDHELD COMPUTER OR SMART PHONE?

While we can credit the iPhone's initial technology and cool looks for its runaway success, it is actually the imagination behind what the device should do that changed the game.

The iPhone's designers faced an interesting dilemma at the conceptual stage – did they want to make a handheld computer or a cutting-edge phone? If they went with the former, the iPhone, with its ability to play music, would also mean the demise of the iPod – Apple's main revenue driver since its launch in 2001. Finally, Apple's designers decided to take a leap of faith and installed a fully capable computer operating system on the iPhone. They also included a few application programs that allowed the user to make and receive calls, a new display system for voicemail, an email app, a web browser and, of course, the iPod's music-playing features.

While the initial apps were limited and almost primitive in nature, skilled computer engineers and hackers identified the potential for greater functionalities. The iPhone inspired a flurry of activity, spurring them to write their own software and running it on their own devices. This marked the beginning of the app age. Apple launched its App Store in 2008 – a year after





the iPhone's launch — with 500 apps. Now there are 2.1 million on the App Store and 3.4 million on its Android competitor Google Play, according to app measurement company App Annie.

In the first quarter of 2017, the combined publisher revenue for downloads and in-app purchases in the App Store and Google Play grew to \$10.5 billion — not including revenue from in-app advertising or commerce, such as Amazon purchases or Uber rides.

BEYOND GOOD LOOKS

The iPhone forced people to change the way they thought about mobile phones. Software became much more important than hardware for mobile users. When the iPhone debuted, Nokia had over 200 different styles of phones out in the market — some flipped open, some slid open, large keyboards, small keyboards, cameras with higher pixels — but none mattered to the user now. What apps the phone could run and how quickly became the deciding factors while purchasing a mobile device.

This had a huge impact. The iPhone led to the Android ecosystem, boosting companies like Samsung — and ruining BlackBerry and Nokia.

As a result iPhones have a lot of cheaper competition and sales have shrunk. In 2018, Apple is expected to sell 241 million phones, compared with Samsung's

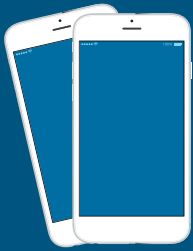


404 million, according to data from research firm Canaccord Genuity.

The shift in focus from hardware to software changed the mobile industry's business model. Profits were now not just limited to selling devices and services, but extended to marketing and selling apps. This was followed by revenues from in-app advertisements. Companies that controlled any smart phone's operating systems gained unprecedented earning power as app developers had to share their revenues with them. Thanks to this, Apple may only hold 15 per cent of the mobile phone market, yet it reaps 80 per cent of global smart phone profits.

The impact of the iPhone on Apple's fortunes is easy to see. In its 2006 fiscal year, Apple generated \$1.9 billion of profit on \$19.3 billion of revenue — mostly from the iPod and Mac. Its business grew 10 times over the next decade. Last year, it generated \$45.6 billion of profit on \$215.6 billion of revenue. The iPhone drove 63 per cent of its sales last year — and likely even more of its profit.

While no one can predict what the next technology game changer will be, it will most likely be connected to smart phones and their related infrastructure. As devices and apps continue to develop, most of them will hark back to the iPhone as their conceptual ancestor and inspiration. 



IPHONE DESIGN REVOLUTIONS

In 2007, Apple founder and CEO Steve Jobs made us rethink mobile phone functionality and forced manufacturers to change the way they designed and built cell phones. Here are some of the iPhone's most revolutionary concepts:



MULTI-TOUCH SCREENS

The iPhone showed us that physical keyboards were dispensable. Prior to 2007 there were touch screen phones, but most required a stylus to operate them and weren't convenient for typing. The iPhone's 3.5 inch LCD screen and multi-touch technology were 'finger friendly' and made the stylus redundant. With the keyboard gone, the screen could now cover the entire face of the phone, opening doors to many of the device's other innovations.



GOOGLE MAPS

Developed specifically for Apple, Google Maps became hugely popular thanks to the iPhone, which was the first smart phone to bring mapping technology to mobile devices. iPhone's later models featured GPS allowing Google to add the turn-by-turn satellite navigation capability that is now standard in smart phones.



THE APP STORE

With only a screen to interact with, the iPhone suddenly made developing good software an imperative. Initially, Apple engineers took care of this but it went on to give birth to a multi-billion dollar app and gaming industry. Companies like Uber, Snap and Tinder owe their very existence to the iPhone's app revolution.



FINGERPRINT SCANNERS

Although Apple wasn't the first to integrate a finger print scanner in its devices, it was instrumental in making the technology popular, cost effective and reliable through its Touch ID feature in the iPhone 5S.



GORILLA GLASS

With the screen becoming an integral and prominent aspect of the phone, Apple had to ensure that it was supremely resistant to scratches and smashes. Leading American glass and ceramic company Corning came to Apple's rescue with its Gorilla Glass – a thin, toughened glass for the iPhone screen. The crack- and scratch-resistant glass is now the gold standard for all mobile devices.



MOBILE INTERNET

Prior to the iPhone, the mobile internet experience was very limited. The iPhone's Mobile Safari brought the full experience of the internet to a comparatively large screen. The introduction of web-enabled third-party apps in later iPhone editions gave rise to the current environment of always-connected social media, news and shopping networks.



VIRTUAL ASSISTANTS

Apple's virtual assistant Siri was a revolutionary concept in mobile services. Initially, Siri did suffer from limitations such as accent recognition and what kind of commands she could understand, but these were soon smoothed out. Once again Apple pushed its competitors to up their services game.



ALL-IN-ONE DEVICE

The iPhone's variety of uses made it a device for everyone. Users no longer had to make a choice between a phone for business, pictures or music. With its all-in-one capability, the iPhone switched seamlessly between roles. This year, 1.2 trillion digital photos will be taken worldwide, and most of those – 85 per cent – will be taken on phones, according to market research firm KeyPoint Intelligence.



ACCELEROMETER

The iPhone's accelerometer made it truly smart, enabling the phone to know when it was turned sideways so that it could automatically rotate the screen. The sensor soon became a must have for all smart phones, spurring a host of innovative new uses for the technology. From digital spirit levels to mobile racing games that use the phone as a steering wheel, hundreds of apps now take advantage of the accelerometer.

KEEPING DOOMSDAY AT BAY

In the face of astonishing losses in crop diversity over the last century, more than 1,700 seed banks have been established around the world.



Since agriculture began over 12,000 years ago, it has been feeding the world. Everything we eat depends upon it. Agriculture produces our fruits, vegetables and cereals and also feeds the animals we eat. Walk into any bustling marketplace in the developing world, or any brightly-lit supermarket in the developed world, and it's easy to see how the wide availability of food can mean it is often taken for granted. But belying the piles of produce and the multi-coloured blare of food packaging is the sobering fact that a crash in biodiversity forces agriculture into very real danger.

According to *National Geographic*, over 90 per cent of historic fruit and vegetable varieties in the United States have disappeared. More than 60 per cent of the world's calories now come from three crops – wheat, rice and maize – and just 64 crops account for 80 per cent of all human consumption.

In the last 100 years, with the advent of industrial-scale agriculture and giant biotech companies intent on profit above all else, many thousands of non-commercial agricultural seeds have been lost – their valuable genetic diversity gone for good.

Biodiversity is essential for nutrition and global food security and the homogenisation of the food industry effectively sets up a house of cards. As history has shown with the Irish Potato Famine of 1845, heavy reliance on reduced genetic varieties can have catastrophic consequences.

Agriculture feeds seven billion people and that figure is set to rise to at least 10 billion in the next 50 years. With the demand for food set to increase dramatically our agricultural systems need to evolve without sacrificing the biodiversity we depend on.

Award-winning filmmakers Taggart Siegel and Jon Betz of Collective Eye Films honed in on the pressing issue of seed diversity in the already acclaimed 2016 feature documentary, *SEED: The Untold Story*. In a joint interview with *Flashes*, Co-Director and Producer Siegel says, "Our latest film began with an article in *National Geographic*, which reported that up to 96 per cent of the vegetable seeds available in 1903 have disappeared. Within moments we knew that was our next film. The speed and scope of this loss is staggering and its implications for our future are stark".

Elaborating on the scale of the problem Siegel explains, "Our once abundant seed diversity, painstakingly created by ancient farmers and gardeners over countless millennia, has been drastically winnowed down to a handful of mass-produced varieties. Under the spell of industrial 'progress' and a lust for profit, our quaint family farmsteads have given way to mechanised agribusinesses sowing genetically identical crops on a monstrous scale".

Siegel continues, "Recent news headlines suggest that Irish history may already be repeating in our



globalised food system. Articles in the *New York Times* and other mainstream sources report the impending collapse of the world's supplies of bananas, oranges, coffee and coconuts – all due to a short-sighted over-reliance on a single, fragile variety. Without seed diversity, crop diseases rise and empires fall".

The seed banks that are being established around the world by governments and non-profit organisations supported by their communities are vital to forestall the disturbing loss of seed diversity. Seeds are living creatures and embody the means to support life itself, and these biorepositories for preserving genetic seed materials are essential for keeping seed diversity viable over the long term.

THE GLOBAL SEED VAULT

Piercing the icy ground with a concrete shard entrance and burrowing 150 metres into the depths of a mountain halfway between mainland Norway and the North Pole lies the world's most important seed bank – the Svalbard Global Seed Vault. Whilst it may evoke the lair of a James Bond villain harbouring malignant plans for world ruin, the "Doomsday Vault" is in fact a beacon of hope as its contents vouchsafe the survival of the planet and those who live on it.

Entombed in this safe-haven on the frozen Norwegian island of Spitsbergen in the Svalbard archipelago, seed samples from the world's crop collections are protected and preserved. Built to withstand

Above: The seeds in the Svalbard Global Seed Vault are protected by permafrost.

Below: Different varieties of maize, none of which are commercially grown.





Top: Local communities use their own seeds, safeguarding crop diversity.

Above: Entrance to the Svalbard Global Seed Vault.

epidemic diseases, natural and man-made disasters as well as World or Nuclear War, it is located above the worst-case scenario global flood levels and the permafrost maintains the vault temperature below the freezing point of water. Additionally, the seeds are protected by one-metre thick walls of steel-reinforced concrete, two blast-proof doors and two air-locks.

SAFEGUARDING BIODIVERSITY

The vault accepted the first seeds on 26 February 2008 and it currently stores 933,304 samples originating from almost every country in the world. Unique varieties of major African and Asian food staples such as maize, rice, wheat, cowpea, and sorghum sit alongside the more exotic and unusual cheesytote, zombie pea and pigeonwing seeds and the more common European and South American varieties of lettuce, barley and potato. It is the most diverse collection of food crop seeds in the world and it has the capacity for more – the vault can store 4.5 million varieties of crops, with each variety containing around 500 seeds – equating to 2.5 billion seeds.

Whilst the Global Seed Vault doesn't own or govern the seeds within it – seeds are owned by those who donated them and only they can access the seeds or allow others to borrow them – The Crop Trust, formerly known as the Global Crop Diversity Trust – is the sole organisation entrusted with the operations of the vault.

Explaining how crucial the vault is for food security, Cierra Martin, Partnerships and Communications Fellow of The Crop Trust, says, "We need it to ensure that food will be available at stable and affordable prices, without expanding agriculture's footprint. We need crop diversity both in farmer's fields and stored in gene banks. We need it available to all, forever, through an efficient global system."



Safeguarding biodiversity in and around agriculture is a prerequisite for food security. The Crop Trust was established in 2004 to do just that.”

Established by Bioversity International on behalf of CGIAR (formerly the Consultative Group for International Agricultural Research) and the UN Food and Agriculture Organisation, The Crop Trust supports a global system for food security in a sustainable way, uniting and securing the global gene banks that are tasked by the international community with conserving this legacy of diversity for all of humanity.

Martin describes the Svalbard Global Seed Vault as, “The ultimate insurance policy for the world’s food supply, offering options for future generations to overcome the challenges of climate change and population growth. It will secure, for centuries, millions of seeds representing every important crop variety available in the world today. It is the final back up.”

In an era where the Earth’s environment is under constant and unmitigated pressure from rampant industrial exploitation, the long-term conservation and use of crop diversity for food security worldwide is more important than ever before.

NOT A COMPLETE SOLUTION

However, the Doomsday vault is not a fix-all solution. Jon Betz, Co-Director and Producer of *SEED: The Untold Story*, explains, “Seeds are living embryos, they have a lifespan. They can’t be frozen forever, they



need to be grown out. The vulnerability of Svalbard is that they do not grow the seeds out. Increasingly, other seed banks are losing their budgets to grow out their full collections as well, and this puts us at great risk.”

According to a 2014 United Nations Food & Agriculture Organisation report, the key to feeding the world lies with small farmers. Betz concurs and believes that the future of agriculture is not with the industrialised model of chemical pesticide dependent farming, but rather with a regionalised, localised system. “Not agriculture that lines the pockets of an increasingly small number of multinational biotech companies who patent and control our seed supply,” he says, adding, “As Will Bonsall says in the film, ‘If you’re relying on someone else for your seed then it’s like you’re relying on someone else on your soul.’”

For over 12,000 years, seeds have been saved by nearly every farmer in the world and shared freely as part of what Thomas Jefferson called “the common heritage of humanity”. But we have arrived at a position where a handful of biotech chemical companies, whose primary market is producing pesticides, own the majority of the world’s seed market.

Yet there is always a glimmer of light and with infectious and inspiring optimism Betz concludes, “The most essential thing we can do now is to support bioregional seed saving initiatives. Local seed savers, gardeners and seed saving efforts by farmers and communities in our own backyards. The solution is to have locally supported enterprises in every community. Governments and the food industry also need to support traditional seed breeders who are breeding seeds that are open pollinated and not controlled, patented and held under intellectual property rights.” †

Above: Taggart Siegel and Jon Betz made the documentary *SEED: The Untold Story*.

Above left: The Svalbard Global Seed Vault can store 4.5 million varieties of crops.

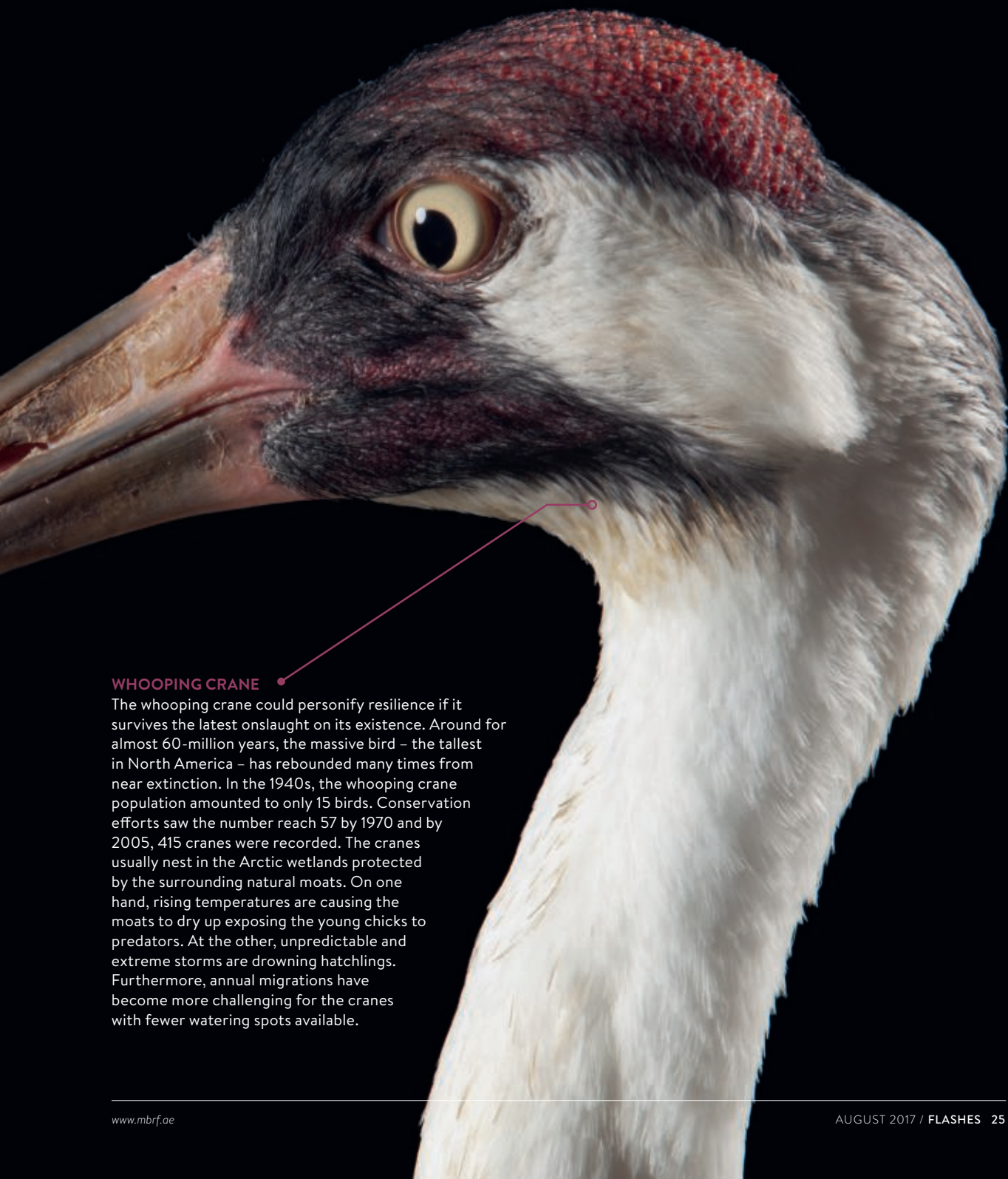
NINE SPECIES ON THE BRINK

Global warming and associated weather changes are affecting some animals more than others. Particularly affected are those animals that have unique food requirements, susceptibility to diseases and those that live within specialised environments.

Every time we speak of climate change affecting the animal kingdom, polar bears, penguins, sea turtles and corals take up the prime spots on the discussion. New research claims that the impact of climate change on wildlife is greatly underreported. The latest statistics show that almost 700 species of mammals and birds on the International Union for the Conservation of Nature's (IUCN) red list of threatened species are victims of climate change.

Here we list some lesser-known species struggling to survive in increasingly hostile environments. [↑](#)





WHOOPING CRANE

The whooping crane could personify resilience if it survives the latest onslaught on its existence. Around for almost 60-million years, the massive bird – the tallest in North America – has rebounded many times from near extinction. In the 1940s, the whooping crane population amounted to only 15 birds. Conservation efforts saw the number reach 57 by 1970 and by 2005, 415 cranes were recorded. The cranes usually nest in the Arctic wetlands protected by the surrounding natural moats. On one hand, rising temperatures are causing the moats to dry up exposing the young chicks to predators. At the other, unpredictable and extreme storms are drowning hatchlings. Furthermore, annual migrations have become more challenging for the cranes with fewer watering spots available.

A giant panda is shown clinging to a thick, brown tree branch. The panda's black and white fur is clearly visible, and it has a focused expression. A red line with a dot at the end points from the text block to the panda's head.

GIANT PANDA

The giant panda has become synonymous with wildlife conservation efforts – so much so that the World Wildlife Fund has made it its symbol. While the species has just come off the endangered list and is now categorised as ‘vulnerable’, short breeding seasons, low birth rates and limited food supplies continue to threaten its existence. It is predicted that climate change will wipe out more than one-third of the panda’s bamboo habitat in the next 80 years. The problem is further escalated by increasing human development that is fast taking over the panda’s bamboo-rich forests. Pandas are highly sensitive to temperature changes and start to overheat at temperatures of just 25°C. Without help, the giant panda seems doomed to a hot and hungry future.

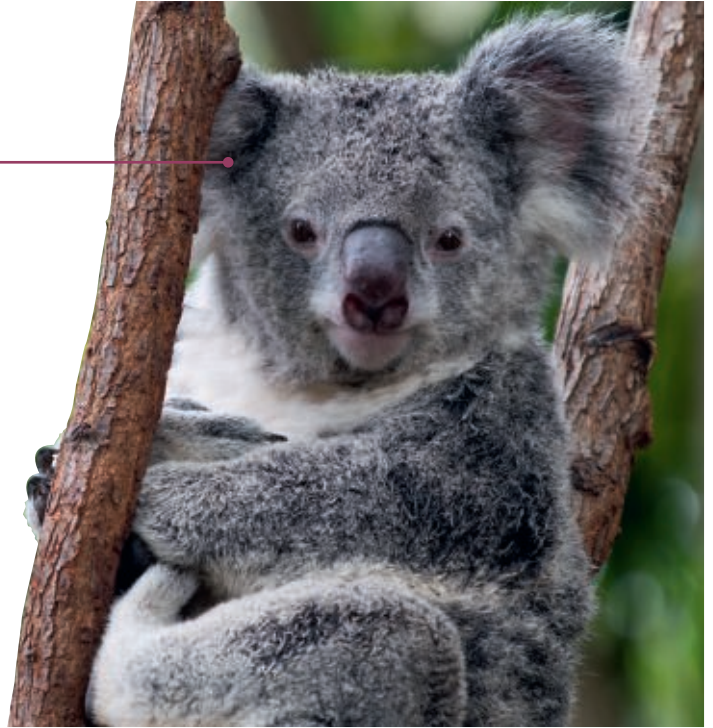
A snow leopard cub is shown looking over a snowy ridge. The cub's spotted fur is visible, and it has a pink tongue sticking out. A red line with a dot at the end points from the text block to the cub's head.

SNOW LEOPARD

Although this majestic cat lives in some of the harshest conditions on Earth, it hasn’t been able to adapt to the devastating effects of climate change. Since 1972, the snow leopard has been listed as an endangered species. Found between altitudes of 3,000 to 5,500 metres across the frigid and rocky Tibetan Plateau, snow leopards are succumbing to rising temperatures. Forced to move higher up the mountains where vegetation is limited, they are starved of their herbivorous prey. With humans scaling the mountain sides to graze their herds, the leopards are hunted down to protect the goats and sheep.

KOALAS

It would be hard to imagine Australia without its cuddly koalas but the marsupials are under serious threat. Koalas rely solely on eucalyptus trees for food, shelter and even water but an increase in atmospheric carbon dioxide is now making these life-giving trees less nutritious and even poisonous for the koalas. Rampant droughts across the island continent are further drying out the foliage meaning less water for the koalas. In parched areas, the creatures are dying of kidney failure brought on by dehydration.



HARLEQUIN FROG

The forests of Central and South America once boasted over 110 species of the harlequin frog. However, between the 1980s and 1990s, two-thirds of the species were wiped out due to climate change. The El Nino effect has cooled the Andes encouraging the growth of the chytridiomycosis fungus that causes disease and ultimately the death of harlequin frogs. In other regions, extreme heat is also wiping out the sensitive amphibians. Since amphibians rely on two habitats for survival, scientists believe they are the hardest hit of all vertebrate species.



ADELIE PENGUIN

Adelie penguins build their nests on the frozen, rocky plains of the West Antarctic Peninsula. However rising temperatures are killing off the hatchlings in a two-pronged process. Puddles formed by the melting ice either freeze the eggs before they even get a chance to hatch or prove to be fatal to the chicks that are yet to develop waterproof feathers.



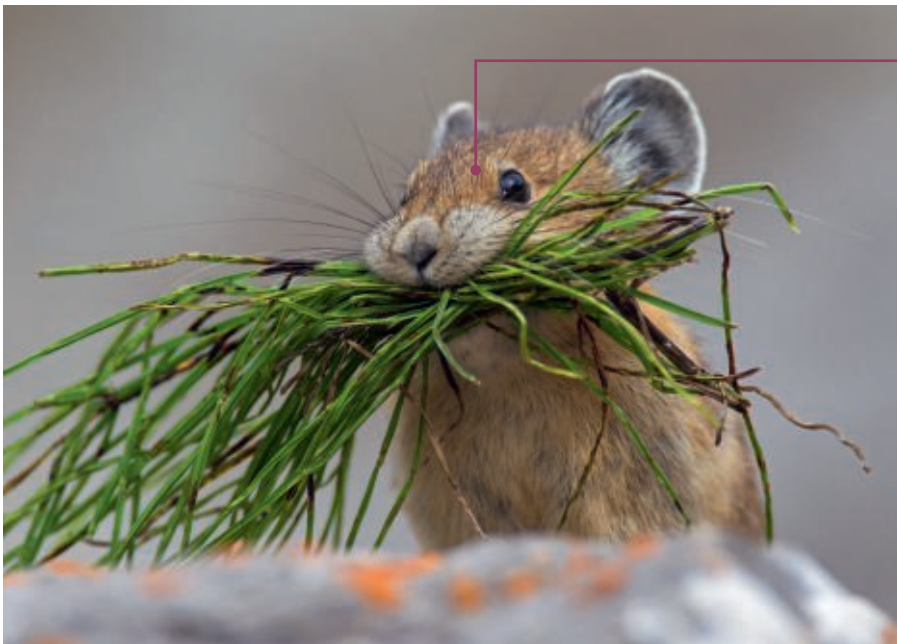
CHEVRON BUTTERFLYFISH

Ironically, it is the butterfly fish's strong dietary preference that is killing it off as the picky eater feeds only on tabular and staghorn corals. Rising ocean temperatures are causing massive coral bleaching events leaving the fish without any food. Although scientists have tried feeding the fish other types of diets in controlled trials, the chevron butterfly fish chooses to starve rather than try a mixed or varied diet.



WOODLAND CARIBOU

For hundreds of years, the woodland caribou has called North America's snow covered forests its home. The cold kept out predators and competitors. However, rising temperatures are now making the forests more welcoming for other deer, which carry the meningeal brain worm, which is fatal to caribou. If spared by disease, the wolves following the deer decimate the caribou population. Another factor is the vicious water cycle that occurs when the sea ice lining their habitat melts. Upon evaporation it enters the upper atmosphere as moisture and turns into a frigid rain that traps the plants the caribou eat under a layer of ice. This phenomenon starves to death tens of thousands of creatures at a time.



AMERICAN PIKA

The American pika is found in the mountains of western North America, from central British Columbia and Alberta in Canada right down to the US states of California and New Mexico. The US Wildlife Service, due to climate change's impact on its population, is already considering this cousin of the rabbit for protection under the Endangered Species Act. Rising global temperatures are pushing pikas out of the habitats they historically have called home, leading to a crisis for the species. When exposed to high heat, pikas, which have adapted to cold alpine temperatures, can die from overheating within six hours. Many experts say it could possibly be the first animal to go extinct due to climate shifts.



A FRONT ROW SEAT

Michael Dell was at the forefront of the personal computer explosion 30 years ago and now he's getting the recently formed Dell Technologies ready for the fourth industrial revolution.

The previous time we spoke to Michael Dell was in October 2015 when the world's 39th richest person and CEO of Dell was in the process of acquiring the storage company EMC for \$67 billion. At that point he described the "fun" he was having orchestrating what was billed as the world's biggest technology merger.

That merger happened in September 2016 creating an IT giant with business units spanning from PCs to cloud computing, storage and cyber security. It is now some 10 months later when *Flashes* catches up again with the CEO of the newly named Dell Technologies and it is clear he is relishing the challenges and opportunities the combination is bringing.

"I would say it's actually gone better than planned," a jubilant Dell explains. "We had theorised and dreamed and had ideas about how the combination would be – about creating Dell Technologies with Dell and EMC and VMware, Pivotal, SecureWorks, Boomi and RSA. The reaction from customers and partners has been overwhelmingly positive."

Under a comprehensive two-year strategy, Dell Technologies aims to become a clear leader in IT infrastructure and client solutions, be recognised as an expert in

digital transformation, provide the strongest multi-cloud portfolio on the market and produce business-driven security products and services all under a comprehensive array of solutions and consumption models.

In April this year, Dell was in Dubai to meet existing and new customers. "What I saw when I was there was somewhat similar to the reaction across the world – a full embrace," Dell says of the visit. "I saw people from government and academia and business all throughout the region that were engaging with us in a new way because of the combined capabilities that we have."

Dell is a driven visionary as is clear from his past. He was born in 1965 in Houston, Texas, and in his teens he became intrigued by the expanding world of computers and gadgetry. At 15, he purchased an early Apple computer for the strict purpose of taking it apart to see how it worked. He was at university when he realized that no company had tried selling personal computers (PCs) directly to customers. Dell figured he could make money bypassing the middleman and the markups, so he took \$1,000 out of his savings and started selling PCs to other students.



Top: The Michael & Susan Dell Foundation supports projects aimed at children in India, South Africa and the U.SE.

Above: The creation of Dell Technologies positions the company to take advantage of the Fourth Industrial Revolution.

The business grew, and Dell naturally became distracted from his studies. “What do you want to do with your life?” his dad asked him at that point. “I want to compete with IBM,” the freshman replied and promptly dropped out to focus all his efforts on his business. It was a profitable decision. In 1984, Dell’s first full year in business, he had \$6 million in sales. By 2000, Dell was a billionaire and his company had offices in 34 countries and on employee count of more than 35,000. The following year, Dell Computer surpassed Compaq Computer as the world’s largest PC maker.

In 2004 Dell stepped down as CEO of the company, but he remained chairman of the board. He

served on the Foundation Board of the World Economic Forum and the executive committee of the International Business Council. He also was on the US President’s Council of Advisors on Science and Technology and sat on the governing board of the Indian School of Business in Hyderabad.

However, things started going awry at Dell when badly built computers resulted in the company taking a \$300 million charge to fix the faulty machines. This was a huge issue that resulted in Dell losing its top perch atop the industry. In an effort to correct things, Dell returned in 2007 as CEO, and in 2013 he announced he would be taking the company private again. Together with Silver Lake Partners, a private equity firm that specializes in technology, and computer software giant Microsoft, he launched a buyout of all outstanding shares of Dell. This deal has been valued between \$23 billion to more than \$24 billion.

Lately, things have been looking up again for Dell Technologies’ PC unit. Although PC sales have continued to decline in recent years – with research firm IDC saying in January that global shipments for 2016 were down 5.7 per cent year-over-year to 260 million units – Dell Technologies was among the few vendors to increase its market share last year with a 4.3 per cent increase in shipments to 40.7 million. This placed it third with 14 per cent market share globally, compared to 21 per cent for HP Inc and 21.3 per cent for China’s Lenovo.

So does he see any hope for the PC market? “I think there is too often a tendency to say everything is going this way or that way like the death of the PC for example,” Dell replies with a smile. “I think four billion PCs have been sold since the PC died so that’s been pretty good for the PC.”

Although PCs were the foundation of his success, Dell is not sentimental. “Our industry is characterised by a constant creative destruction where there are new firms being created, new ideas being thrown up, and some of them really work out well and some don’t. That creative destruction that occurs is an important part of the evolution and revolution that occurs within our industry,” he explains.

One area that Dell Technologies is keen to stake a claim on is the digital transformation as companies and governments across the world seek to incorporate new digital technologies into their products and business activities to improve performance and efficiency. This is particularly pertinent in the Middle East, with audit and consultancy firm PwC forecasting that Middle East industries are set to invest \$42 billion each year in digital technologies by 2021. Dell believes the excitement surrounding digital transformation is real and means big things for technology players the world over.



“I think there is too often a tendency to say everything is going this way or that way like the death of the PC for example”

“There is always some element of overhype but once you get past that there is a reality there,” he says citing exploding data demand, the growth in the internet of things (IoT), the generating of huge amounts of information, and artificial intelligence engines being developed to analyse it.

“We think of it as the Fourth Industrial Revolution – it’s an explosion in new opportunities and it will take a different form in each organisation, based on what their industry looks like and what their competitive field looks like. We’re seeing all of our customers needing to reimagine their companies in some way in the context of this new digital age.”

Dell doesn’t only apply his entrepreneurial savvy to business. In 1999, Dell and his wife created the Michael & Susan Dell Foundation with a focus on education and health for underprivileged children. “When you become a parent, you are suddenly aware of how important good health and quality education are for the well-being and success of children,” says Dell.

As goal-directed achievers, the Dells bring valuable skills to assisting children in the United States, India and South Africa. They provide microfinance and scholarships, combat child abuse, and support medical research, health insurance, physical fitness, child care and education initiatives.

Dell, who openly admits to being an impatient

person in business, takes a different stance when it comes to the foundation. “Focus is very important,” he explains. “Patience is also important because measuring progress takes time – sometimes years – to show the full results and impact. We are trying to drive systemic change in areas where there are big problems with big challenges.”

Just as he does with his company, Dell endorses “data driven analytical decision-making and measurable results” and he and his wife approve every grant by their foundation. “You think about all the potential and all the problems that could benefit from some kind of help,” Dell says, “and it’s a pretty massive list. So you’ve got to narrow it down.”

This year, the Michael & Susan Dell Foundation announced a \$1 billion endowment for social entrepreneurship. So does that mean the 51-year-old Dell might be preparing for life after work? “Why would I leave now? We’re getting to the fun part here,” he replies. “Our company is a third of a year old now and what’s happened in the last three decades in terms of IT, I think, will be seen as child’s play compared to what happens in the next three decades,” he says.

“In the last 30 years there has been a lot of progress in the world; you read about a lot about bad things, but there has actually been a tremendous amount of progress. And to me it mirrors the rise of the micro-processor. Now somebody in Africa for \$30 can hold a device in their hands and have more information than the President of the United States had 25 years ago – and it is amazing.

“The availability of information and how that changes the world, to me, is exciting. So I get to have a front row seat in that and get involved. It is a lot of fun.”

Above: Michael Dell in his dorm room at the University of Texas where he assembled his first computers in 1984.



WASTE TO ENERGY

Transforming waste management to create energy is a perfect win-win scenario – sprawling tonnes of refuse can be efficiently converted into energy with significantly reduced emissions. The Waste-to-Energy renewable energy source promises change for a sustainable future.

“He who does not think of energy is not thinking about the future,” were the wise words spoken in January 2017 by the Vice President and Prime Minister of the UAE and Ruler of Dubai, His Highness Sheikh Mohammed bin Rashid Al Maktoum, when he launched the United Arab Emirates energy strategy for the next 30 years.

“Where there’s muck there’s brass”, is a timeworn expression originating in Yorkshire, England, where brass is used as a slang term for money. It resonates with a similar wisdom and essentially means that work with dirty elements can often be profitable – it’s an idiom that is enduringly true, perhaps now more than ever, as humans are creating unprecedented amounts of waste globally.

The colossal scale of waste provides the basis for unprecedented energy and revenue generation with the effective deployment of clean and alternative energy systems. Waste-to-Energy (WTE) is a growing renewable source of energy which processes municipal solid waste (MSW) – the wide variety of everyday rubbish discarded by the public – and converts it into energy in the form of electricity and/or heat. MSW can be recycled, composted, disposed of and incinerated in the case of WTE.

As global populations increase the sheer amount of waste generated on Earth is staggering. In the last century, many forms of waste were disposed of irresponsibly, with complete disregard for the health of waste plant workers, citizens and the denigration enacted on the environment. But with the advent of new technologies, a greater sense of stewardship for the planet, and the prospect of massive revenue generation, waste management is entering a positive new phase, with WTE being steadily recognised as a vital and efficient source of energy for countries all around the world.

According to the World Energy Council, the market size of the WTE industry was \$25.32 billion in 2013, a figure which has been growing at over five per cent year on year. WTE technologies based on thermal energy conversion lead the global market and continued growth is expected to 2023, with value forecasts at around \$40 billion.

Global waste generation is not going to slow down any time soon. Conservative estimates reported by the World Energy Council and peer organisations predict that it will double by 2025 to over 6 million tonnes of waste per day. While countries in the Organisation for Economic Co-operation and Development (OECD) will reach ‘peak waste’ by 2050, and East Asia and Pacific countries by 2075, waste will continue to grow in Sub-Saharan Africa. By the end of this century, global waste generation could hit a mammoth 11 million tonnes per day.

If there is a positive to be drawn from such towering mountains of trash it’s that highly unproductive, damaging and unsustainable practices such as landfilling are becoming untenable. Increased environmental consciousness plus the rise of renewable energies will also help to propel WTE market development.

With the right systems in place waste can be transformed from being an undesired by-product of society into a valuable energy resource, thereby killing two birds with one stone: treating non-recyclable and non-reusable amounts of waste and generating a significant amount of energy, which can be included in the energy production mix in order to satisfy the consumer demand.

The UAE Energy Plan for 2050 targets an energy mix that combines renewable, nuclear and clean energy sources to meet the UAE’s economic requirements and environmental goals. One of the principal aims is to increase the contribution of clean energy in the total energy mix to 50 per cent, with an estimated saving of AED 700 billion by 2050. If the plan proves effective, individuals and corporations will also improve consumption efficiency by up to 40 per cent.



WASTED OPPORTUNITY NO MORE

CHANGING DYNAMICS OF GCC WASTE MANAGEMENT MARKET

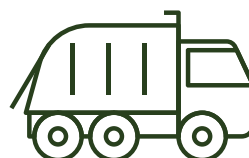
MARKET POTENTIAL FOR WASTE TO INCREASE BY 1.5X IN THE NEXT 5 YEARS

PER CAPTA WASTE GENERATION

GULF COOPERATION COUNCIL	2 KG
CHINA	1 KG
INDIA	.5 KG



TOTAL WASTE GENERATION



2015

95

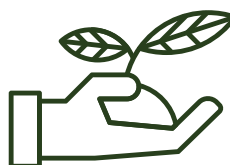
Mn MT

2050

120

Mn MT

MARKET GROWTH (REVENUE)



	2015	2020
UAE	829	1250
KSA	2200	3570
OMAN	26	66
KUWAIT	1560	2770
BAHARAIN	84	115



Above: The UAE is already using advanced technology to separate recyclables from municipal waste.

Above right: Dubai processes about 4,000 tons of recyclable waste daily.

Opposite page: Garbage is taken to a waste-to-energy incinerator at a plant in Spain.



Dhabi National Energy Company, TAQA. The company is wise to the opportunities renewables present and the firm's website says succinctly – "Turning rubbish into energy is big business".

The \$850 million project is hoped to cut CO₂ emissions by over one million tonnes per year, "taking into account the emissions that would be released if the waste was buried in a landfill site, transportation to the dumps and the size of the plant if it was powered by fossil fuels," explained Dr Saif Al Sayari, Executive Officer and Head of TAQA's Energy Solutions.

Spanning over 100,000 square metres, the alternative power project will help Abu Dhabi to shrink its carbon footprint. "This offers us one of the most efficient ways to treat municipal solid waste," said Dr Al Sayari, adding, "The problems with landfill sites are that they emit methane, a greenhouse gas that is 18 times more harmful than CO₂, and is already the second-biggest contributor to climate change. Plants such as the one we are planning will help us deal with that challenge".

Commenting on the global outlook for WTE, Ed Atkinson, Head of Waste to Energy at TAQA said, "In Saudi Arabia the government has announced \$130 billion for renewables, so there is huge potential within the region. There will [also] be huge growth potential in countries such as India and China. The Chinese government has earmarked a \$50 billion budget for waste-to-energy projects. China is looking to ramp it up and there is a massive opportunity there for energy companies".

Europe is the largest and most sophisticated market for WTE technologies. This premier position is thanks to trailblazing initiatives such as the Metamorphosis

The UAE will invest AED 600 billion over the next three decades in order to deliver the constant energy demands and vouchsafe the sustainable growth of the nation's economy. Sheikh Mohammed stated, "The new strategy takes into consideration an expected annual growth of six per cent, and will work on increasing the contribution of clean energy in the energy mix from 25 per cent to 50 per cent by 2050, while slashing the carbon footprint during power generation by 70 per cent over the next three decades. Ensuring the sustainability of energy resources is a guarantee of sustainability of growth in our country. The government has made an achievement by drafting the first unified energy strategy in the country based on supply and demand".

The Dubai Municipality is investing \$545 million into a new facility to convert solid waste into energy. The plant will be one of the largest in the Middle East and it's expected to be operational by 2020. The first phase will receive 2,000 metric tonnes of MSW per day to produce 60 megawatts of power and it's a significant step towards the emirate's goal of reducing landfill waste by 75 per cent over the next five years.

Abu Dhabi is also constructing one of the biggest WTE plants in the world. The 100-megawatt plant will be located on the outskirts of the UAE capital near the Mussafah Sea Port. The plant is being built by the Abu



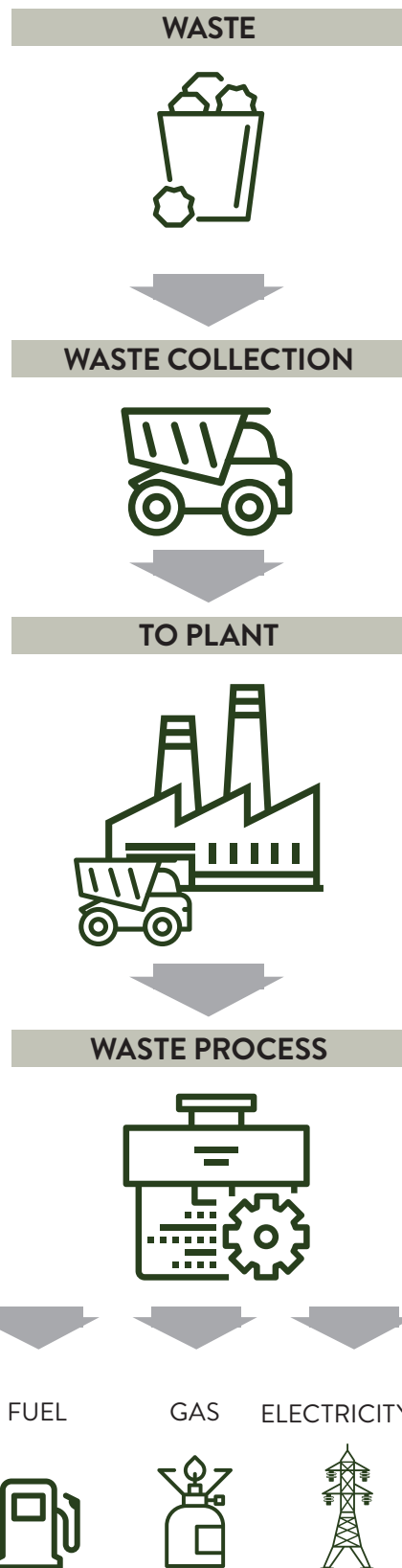
Project, led by FCC Environment – one of Europe's leading waste and resource management companies, in partnership with the Metropolitan Area of Barcelona, Gas Natural Fenosa, the Catalan Energy Institute and SEAT.

The Metamorphosis project has developed an innovative process to increase the production of biofuel from municipal waste and agro-industrial waste. It represents a breakthrough in energy recovery from waste treatment to a fuel producer with the capacity to feed The FCC Group's vehicles and distribution network.

In an interview during the World Waste To Energy Summit in London on May 23-24, Antonio Alfonso Avello, Managing Director at FCC Environment International said, "Methamorphosis is a project fully aligned with our closed-loop approach to waste management. It represents the kind of bold ambition we all need to have to properly transition to a circular economy. At FCC, we have a fleet of 15,000 vehicles and manage 24 million tonnes of waste per year in our treatment plants. With 1,800 of these vehicles using CNG [Compressed natural gas] power, electric or hybrid technologies we are proud to have one of the most advanced fleets in the sector. By proving the feasibility of the technology used in Methamorphosis we hope to improve our fleet further – reducing energy use in water and waste treatment and converting that waste into a valuable renewable fuel resource".

The obvious benefits of projects such as this are the reduction in greenhouse gas emissions from fleets of vehicles and in the automotive sector at large. Avello added, "This project will show how renewable fuel can be generated at a local level, with the potential for improving the environment in urban areas. Importantly, this project will also help the EU take a significant step forward in an area where its development and penetration is still in its early stages".

With the giant WTE plants being constructed in Abu Dhabi and Dubai, and the innovative and progressive strategies set forth in the UAE Government's Vision 2021 and The Energy Plan 2050, the Middle East is also setting a strong example in support of renewable energy sources. As Highness Sheikh Mohammed stated in January, "The Gulf countries are similar in their economic structure and we hope that we will one day have a unified GCC energy strategy in order to ensure sustainable growth for our people and global influence for our economies".



THE HUMAN CELL ATLAS

Scientists all over the world are collaborating to create a comprehensive map of all the cells in the human body. As a resource for studies of health and disease, the Human Cell Atlas may transform the fundamental understanding of human development and help to cure, prevent or manage all diseases by the end of the century.

In the 17th century, the English natural philosopher, scientist and polymath Robert Hooke coined the term 'cell' – inspired by the sleeping quarters of monks – after discovering the core unit of human beings, and indeed every living organism on Earth, while studying cork tissue. However, it took biologists a couple of hundred years to appreciate the crucial importance of cells in the study of all life forms.

In the modern age, with advanced technology and collaborative science across nations and disciplines, timeframes for fully comprehending and implementing discoveries have contracted, but we still don't have anything close to a panoptic understanding of all the cells in the human body and how they function together.

For over 150 years the scientific community has worked through speculation and experimentation with cells to arrive at the first stages of something truly extraordinary – the Human Cell Atlas. An initiative that will accurately chart the entire human body's composition.

Cartography has been an integral part of human history for millennia, but imagine a map not of the land and oceans, but of the vast internal expanse that is the human body.

In October, 2016, a cooperative community of world-leading scientists met in London, UK, to discuss and ultimately launch this trailblazing new project. The mission statement for the Human Cell Atlas is: "To create comprehensive reference maps of all human cells – the fundamental units of life – as a basis for both understanding human health and diagnosing, monitoring, and treating disease".

This collection of maps will identify, describe and define the cellular basis of health and disease. All the different cell types and where they are located in the body will be aligned with their functions and the biological networks that direct their activities.

According to humancellatlas.org, "The Human Cell Atlas would give us a unique ID card for each cell type, a three-dimensional map of how cell types work together to form tissues, knowledge of how all body systems are connected, and insights into how changes in the map underlie health and disease. It would allow us to identify which genes associated with disease are active in our bodies and where, and analyse the regulatory mechanisms that govern the production of different cell types".

A COLOSSAL UNDERTAKING

There are trillions of cells in the human body and so the project is widely recognised as a colossal undertaking, but the initiative is also imbued with a positive sense of plausibility and right-timing. Advances in similarly enormous projects like the Human Genome Project and new gains in single-cell genomics have put it within reach. It is an ambitious but achievable goal, requiring cooperation between biologists, clinicians, technologists, physicists, computational scientists, software engineers, and mathematicians from all over the world.

The Human Cell Project is led by a broad consortium of organisations including Wellcome; a politically and financially independent global charitable foundation, the Wellcome Trust Sanger Institute; one of the leading centres of genomic





discovery and understanding in the world, and the Broad Institute of MIT and Harvard.

Dr. Aviv Regev, Chair of the Faculty at the Broad Institute, a Professor of Biology at MIT and co-chair of the organising committee for the Human Cell Atlas says, “Imagine if, like me, you had somewhat impaired vision and you spent your life seeing things in a blur. Then one day, someone gives you glasses and you are suddenly able to see the world in its detailed beauty: letters on street signs, leaves on the trees. The Human Cell Atlas is like that pair of glasses. It will allow scientists to see biology much more clearly, in high resolution. Until we can see the processes that drive health and disease with that level of clarity, we won’t ever fully understand them. And we need to understand them in order to develop medicines that act on them effectively”.

In a report for the medical publication *STAT*, Dr Regev and Dr Sarah Teichmann – Head of Cellular Genetics at the Wellcome Trust Sanger Institute, Director of Research in the Cavendish Laboratory at the University of Cambridge, UK, and a visiting research group leader at the European Bioinformatics Institute, added, “New techniques for profiling individual cells have emerged in the last few years, but they haven’t yet been applied in a comprehensive and high-throughput fashion. As a result, we have barely begun to identify all the different kinds of cells in the human body – and there may be hundreds we have yet to describe”.

The report goes on to emphasise the vital importance of the collaborative effort required to make the Human Cell Atlas a reality, stating, “This isn’t just a problem that matters to biologists. It should matter to everyone. Without a deep understanding of what our cells are and how they organise



themselves to keep us healthy, we can’t understand how they go awry in disease. No wonder two out of three drugs fail when tested in humans – we don’t understand the cells the drugs are acting on.”

COLLABORATION REQUIRED

The collaboration from hundreds, possibly thousands of eminent scientists located all over the world, will mean a huge amount of data and necessitate the very best systems for big data crunching. Who better to step in with a helping hand than Silicon Valley’s most notable figure, Mark Zuckerberg, together with his wife Priscilla Chan.

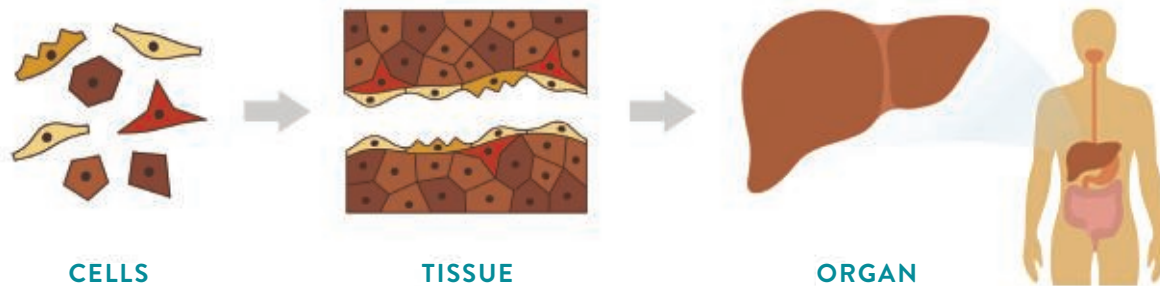
On June 1st 2017, the Chan Zuckerberg Initiative (CZI) announced that it will provide \$3 billion in financial and engineering support long-term to The European Bioinformatics Institute (EMBL-EBI) – a global leader in the storage, analysis and dissemination of large biological datasets, the Broad Institute and the UCSC Genomics Institute, to build an open Data Coordination Platform for the Human Cell Atlas.

Cori Bargmann, a neuroscientist and President

Above: The Chan Zuckerberg Initiative (CZI) announced that it will provide \$3 billion in financial and engineering support long-term to The European Bioinformatics Institute

Top: More than 500 scientists from 20 countries are already contributing to the Human Cell Atlas.

THE CELL IS FUDAMENTAL UNIT OF LIFE



of Science at CZI said, “We are thrilled to bring together three of the world’s leading institutions in genomics, informatics and data sharing to build this important new resource. It’s a great example of how we can help accelerate science by supporting collaborations across institutions and by bringing scientists and engineers together in new ways”.

In an interview with NPR (National Public Radio – an American privately and publicly funded non-profit membership media organisation) Bargmann explained, “As a neuroscientist, I see tremendous unmet needs in neurodegenerative diseases like Alzheimer’s disease and Parkinson’s disease and ALS. And diseases that affect young adults like schizophrenia, and learning disorders and autism that affect children. So, I can look across the whole field and think of ways that we would like to be able to address these problems”.

A SHORT TIMEFRAME

Despite the scale and ambition of the Human Cell Atlas, the timeframe for achieving the goal is notably short. On the projected schedule Bargmann says, “If the Chan Zuckerberg Initiative were doing this alone, it might take a very long time to make a human cell atlas. But fortunately, there’s

momentum around this idea in the world. With that, I think we might realistically accomplish it within 10 years. We’ll then have that framework for everyone to build on, just like everyone now builds on the Human Genome Project”.

A decade may seem optimistic but consider the progress made with less sophisticated technologies available. Just over 80 years ago the first antibiotic was developed and prior to that the four major killers in the world were infectious diseases – now these four don’t even figure in the top ten. Whether it happens in 10 years or more, those involved with the Human Cell Atlas seem assured that science will be able to cure, prevent or manage all disease in the next century.

With a concerted global effort, an exemplar of which is the Human Genome Project – which sparked an ongoing period of effective collaboration in biology – the consensus amongst those involved is positive and they are ready and willing to work together to accomplish their goals. Approximately 500 scientists from over 20 countries are already contributing to the Human Cell Atlas project, participating in meetings, online discussions, and joint project planning.

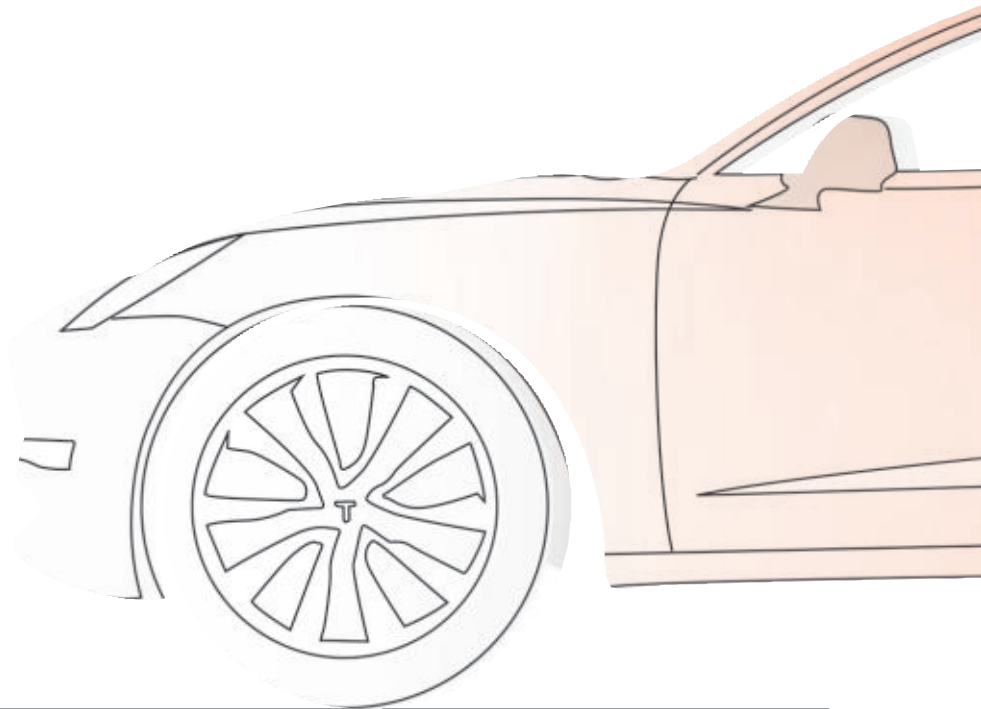
In the official paper *The Human Cell Atlas*, authored by numerous scientists, including Dr Regev and Dr Teichmann, the promising conclusion says, “The past quarter-century has shown again and again the value of the scientific community joining together in collaborative efforts to generate and make freely available systematic information resources to accelerate scientific and medical progress in tens of thousands of laboratories around the world. *The Human Cell Atlas* builds on this rich tradition, extending it to the fundamental unit of biological organisation: the cell. Many challenges will arise along the way, but we are confident that they can be met through scientific creativity and collaboration. It is time to begin.”

Left-right: Dr Teichman and Dr Regev are part of the organizing committee for the Human Cell Atlas.



THE GREAT **ELECTRIC** ACCELERATION

With the Tesla 3 rolling off production lines, the future looks uncertain for both the internal combustion engine and traditional car manufacturers.



When electric car maker Tesla Inc. briefly overtook General Motors Inc. and Ford Inc. in April to emerge as the United States most valuable car company, it marked a watershed in the history of car manufacturing.

Upstart Tesla produced a mere 76,230 cars last year, compared to the 6.7 million that rolled off Ford plants and 10 million cars produced by GM during the same period, yet investor faith in the electric car maker pushed its market cap above the established players, in a sign that the future may not belong to the incumbents.

Elon Musk, the maverick CEO of Tesla, has turned the auto industry on its head by commercialising cars that run on lithium-ion batteries rather than traditional fuel sources such as diesel, petrol or natural gas. The technology, which to date remains costlier than the standard internal combustion engine technology, has allowed Tesla to disrupt the business model of the capital-intensive auto manufacturing business.

While the concept of electric cars has been around for some time, Musk's push over the past few years has coincided with a concerted move by global decision makers to reduce the global carbon footprint that's harmful to the world's climate.

According to the United Nations Framework Convention on Climate Change, transportation contributes

around a quarter (23%) of the current global energy-related greenhouse gas (GHG) emissions and is growing faster than any other energy end-use sector.

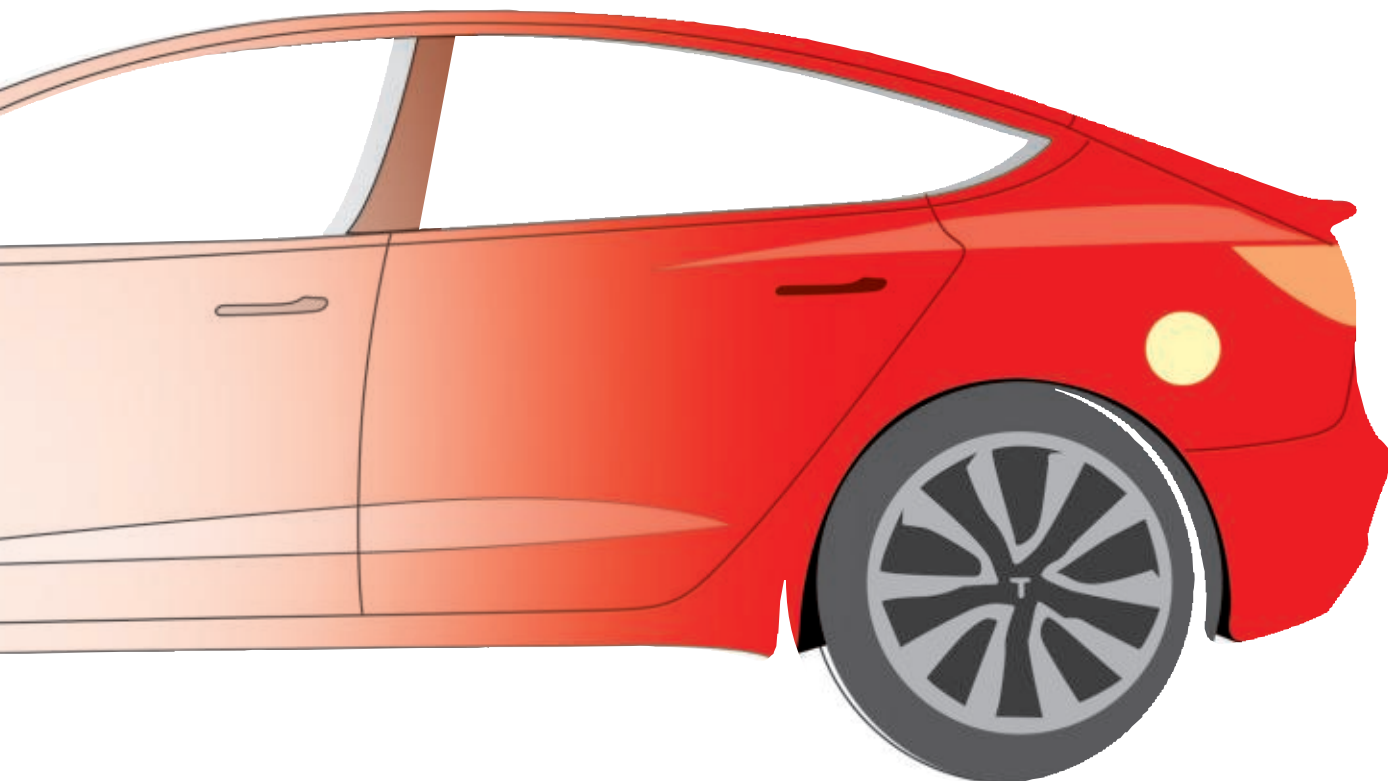
"GHG emissions from transport are anticipated to rise from today's levels by nearly 20 per cent by 2030 and close to 50 per cent by year 2050 unless major action is undertaken," the UNFCCC said.

Making a dent in the fumes generated by the transportation sector would go a long way in helping mitigate the impact of climate change and limiting global temperature increase to below 2 degrees Celsius as pledged by more than 190 countries at the Paris Climate Change Agreement accord in 2016.

But the UNFCCC notes that it would require changing the transport emissions trajectory, development of an integrated electro-mobility ecosystem and widespread production of low-carbon production of electricity and hydrogen.

FOOLED BY CHEAT DEVICES

Conscientious car owners had already been ahead of the curve by purchasing diesel cars which emit less carbon dioxide and are more efficient than their petrol-fuelled counterparts. But it turned out that diesel car owners were misled by car makers. Volkswagen, the venerable German auto giant which was a leader in diesel cars, was heavily fined by regulators for cheating on diesel-emission tests.





Above: Elon Musk, the maverick CEO of Tesla, is challenging the traditional auto industry.

Above centre: Transportation currently contributes around 23 per cent of greenhouse gas emissions.

The US Environmental Protection Agency believes the company used “defeat devices” to artificially reduce the emissions generated from 10.5 million diesel cars VW sold worldwide. Over the past year, the US Department of Justice has slapped a \$4.3 billion criminal and civil penalty on VW executives, apart from a \$14.7 billion lawsuit – the highest ever paid by a company for violating the Clean Air Act.

Other companies have also come under increasing scrutiny, as the diesel-emission crackdown intensified. Earlier this year, the US EPA accused Fiat Chrysler of using cheat devices on more than 100,000 vehicles built from 2013 to 2016. Chrysler denies the allegation.

Nissan was also accused by South Korean regulators of manipulating emissions data last year, which the Japanese car maker disagrees with.

A report by the International Council of Clean Transportation last year underscored that the issue of emission manipulation is widespread across the industry and the current set of regulations were inadequate to address the challenge.

As customers become disenchanted by diesel cars, major cities are also falling out of love with the diesel engine.

“Soot from diesel vehicles is among the big contributors to ill health and global warming,” said Helena Molin Valdés, head of the United Nations’ climate and clean air coalition at a C40 Conference of Mayors in December.

Indeed mayors of Paris, Madrid, Athens and



Mexico City have pledged to ban diesel cars on their roads by 2025.

CHARGED UP

Riding the wave of dissatisfaction around diesel cars, the electric car no longer appears to be a fad, with registrations of electric cars hitting a new record in 2016, with over 750,000 sales worldwide, according to the International Energy Agency.

Over the next 10 to 20 years the electric car market will likely transition from early deployment to mass market adoption, with electric car stock ranging between 9 million and 20 million by 2020 and between 40 million and 70 million by 2025, the IEA estimates.

In addition, electric cars are also catching up to their internal fuel combustion counterparts in terms of costs.

Tesla’s Model 3 is set to start at a more affordable \$35,000 (apart from \$7,500 tax credit) and travel around 215 miles on a single charge.

Swiss investment bank UBS AG estimates that a Chevrolet Bolt will cost \$28,700 in Europe, similar to fuel-sourced brands, and will have a low maintenance cost of \$255 per year, compared to \$610 for a VW Golf.

“People focus on the sticker price, but they underestimate the difference in the cost of running the vehicle,” said Patrick Hummel, UBS automotive analyst who raised his expectation of global electric vehicles by 50 per cent. “There is likely more demand than we thought previously.”

While Tesla has the lead for now, a number of other



companies are keen to secure market share in the promising new industry, especially as businesses and customers eye driverless technology.

Between 2015 and early 2017, nine global OEMs publicly announced their willingness to create or significantly widen their electric model offer over the next five to ten years, according to IEA estimates.

Apart from traditional players, a number of Silicon Valley technology companies such as Google, Amazon, Apple and Uber are eager to leverage their spending power and innovation to capture a piece of the car market.

Uber and Volvo recently established a \$300-million venture to develop driverless cars, while GM announced its \$500 million investment in Uber rival Lyft in January to build a network of on-demand, electric, driverless cars.

Eager to turn the page on its diesel scandal, Volkswagen has unveiled plans to produce electric powertrains with no less than 30 electric models to enter the market by 2025.

Apple has also long been rumoured to be working on an electric, driverless car, while Amazon's interest in developing a fleet of fuel-efficient logistics network as an extension of its retail empire is well-documented.

Wall Street investment bank Morgan Stanley believes automakers are on a rocky road over the next few years as they balance the need to keep up with new technologies while at the same time investing in traditional engines.

"We believe that the technology disruption risk to the global automotive sector is real and significant," says Adam Jonas, head of Morgan Stanley's global auto research. "The full shape of the battery electric vehicle market remains to be discovered. While we think there will be strong growth for a long period, the profitability of that growth cannot yet be ascertained."

Above: Electric car prices are starting to come down and could soon rival traditional fuel-driven models.

VOLKSWAGEN SCANDAL

11M vehicles affected worldwide



10.3M Volkswagen global sales In 2016



Diesel cars recalled:

In US: **482,000** including VW Jetta, Beetle, Golf, Passat and Audi A3
In S Korea: **5,000**



WORLD'S FIRST FLOATING WIND FARM TO SET SAIL SOON

The £200 million Hywind Scotland Project is ready to be towed out to sea. The floating wind farm, the first of its kind in the world, is the result of a collaboration between international energy company Statoil and UAE's renewable energy company Masdar.

Norway's Statoil is on the brink of unlocking expanses of the ocean to generate renewable power with the world's first off shore wind farm ready to set sail soon. Featuring pioneering technology, the Hywind Project uses a 78-metre tall underwater ballast and three mooring lines attached to the seabed to keep its turbines upright.

EXTRAORDINARY ENGINEERING

Last month, Hywind's five turbines, each with a capacity of six megawatts, were mated onto a floating substructure, ready to be towed into position 25 kilometres off the coast of Scotland. The sheer dimensions of the turbines make their installation onto the floating platforms a staggering feat of engineering. Each turbine tower weighs 12,000 tonnes and has rotor blades measuring 154 metres in diameter – that's twice the wingspan of an Airbus A380. The turbines themselves measure a soaring 253 metres of which 78 metres (that is nearly three-quarters the height of the Eiffel Tower) are below the water surface.

Hywind is being set up in the North Sea where it will take advantage of the area's wind speeds of 10 metres per second but the structure is being built to withstand wind speeds exceeding 40 metres per second and

waves at least 20 metres high. Undoubtedly, the first step of mounting the turbines on the platforms marks an exciting milestone in the development of the world's first commercial scale floating wind farm.

When Hywind reaches completion later this year, the 30 megawatt farm will become a source of renewable electricity for 22,000 homes in the United Kingdom.

Hywind's novel technology is being hailed for its global potential as it demonstrates cost efficient and low risk solutions for commercial scale parks. According to Statoil, Hywind has the potential to open new markets for renewable energy production worldwide. Irene Rummelhoff, head of the oil firm's low-carbon division, said the technology opened up an enormous new resource of wind power. "It's almost unlimited. Currently we are saying floating wind farms will work in water depths of between 100 and 700 metres, but I think we can go deeper than that. It opens up ocean that was unavailable before," she said.

Over the deep seas off Japan, for instance, there's enough potential wind power to meet the country's electricity needs many times over, and two pilot floating turbines have been operating there since 2013.





Above: Fixed bottom wind farms are limited to shallow water where steel poles can be driven into the sea bed.

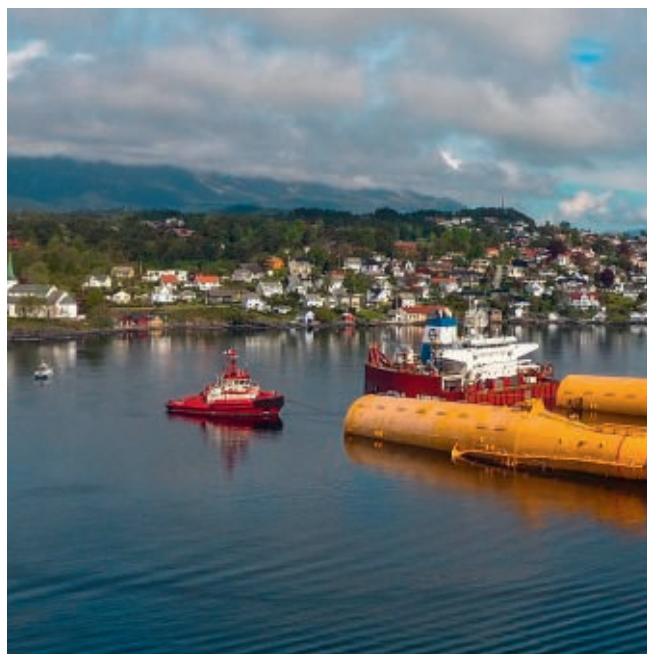
Above centre: The enormous floating substructures of the Hywind project before being mated with the turbine tower.

THE FUTURE OF FLOATING WIND FARMS

The North Sea's shallow waters are becoming a popular spot for offshore wind farms. They conveniently allow turbines to be mounted on to steel poles driven into the sea bed. Researchers are also looking towards the Atlantic and Mediterranean to place floating wind farms, which could soon phase out fixed bottom wind farms. "Looking to the next decades, there might be a point where floating is bigger than fixed based," said Stephan Barth of IEA Wind, an intergovernmental wind power body covering 21 countries.

At the moment there are more than 40 floating wind farm projects, using multiple design concepts, under way worldwide and they are expected to boom by 2035. Commercialisation of the technology means new countries have the chance to emerge as renewable energy leaders. For example, French company Ideol is looking to build floating farms in Japan and France. Currently, the United Kingdom has the most offshore wind capacity in the world, followed by Germany.

The big obstacle, naturally, is cost: floating turbines cost more to build than onshore wind farms, not to mention conventional power plants. A 2014 study in the journal *Renewable Energy* found that the cost of energy from a hypothetical floating wind farm would be between \$93 and \$268 per megawatt-hour – in the



range of conventional offshore turbines but far more, for instance, than electricity from natural gas plants.

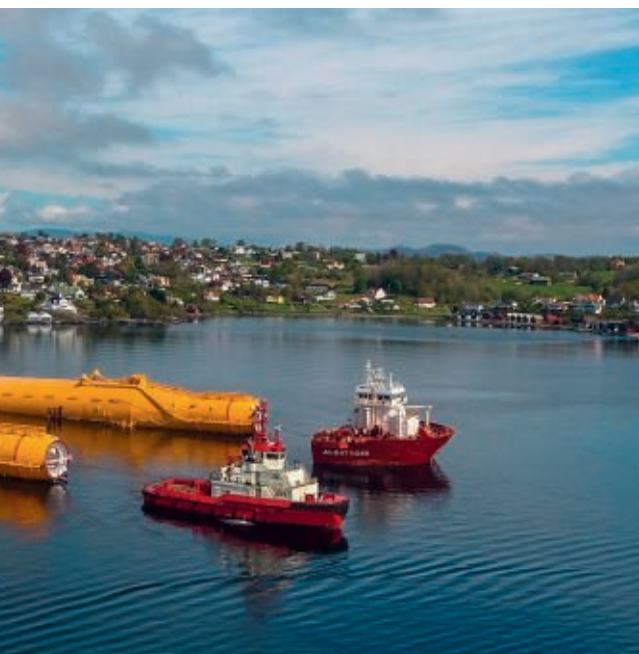
A more recent study from the organisation Carbon Trust found that the cost of energy from floating turbines could actually be lower than fixed installations – but that they would cost much more up front to build (around \$4.7 million per megawatt of capacity for floating, compared to \$3.9 million per megawatt for fixed).

The hope is that technology improvements, mass production, and the use of less costly materials could bring down the costs. A group of researchers in Portugal, for instance, has designed a floating turbine with a base made of concrete rather than steel, which they say could reduce the cost of the structure by 60 per cent.

If the costs can be reduced, the potential is high. According to the National Renewable Energy Laboratory 60 per cent of the technically available offshore wind resource off US shores lies in water more than 60 metres deep, too deep to access with conventional fixed turbines. That would be more than 1,000 gigawatts of clean power – about equal to total US electricity generation capacity today.

PARTNERING FOR POWER

Apart from being the world's first floating wind farm, Hywind's most notable feature is that its primary developer, Statoil, has traditionally been involved in the production of carbon based fuels. Statoil is actively seeking to diversify away from non renewable fuels and has partnered with UAE's Masdar to bring Hywind to life. The Abu Dhabi based renewable



energy company acquired a 25 per cent stake in the project during the Abu Dhabi Sustainability Week earlier in January this year.

“Hywind Scotland represents the next stage in the evolution of the offshore wind industry, combining the project management experience and technical expertise of one of the world’s largest offshore energy players – and our own capabilities in renewable energy development acquired over the last decade in the UK and international markets,” Chief Executive Officer at Masdar, Mohamed Jameel Al Ramahi, said at the time. “The deployment of commercially viable wind energy in deep water marks a new era of growth for wind power, allowing countries to further diversify their energy mix. We are proud to extend Masdar’s renewable energy portfolio in the United Kingdom and to build on our close partnership with Statoil,” he added.

With investments spanning across the globe, Masdar is not new to wind energy projects. In fact, Hywind is its second partnership with Statoil, the first being the 420 megawatt Dudgeon wind farm scheduled to come on-stream by the end of this year. Masdar also funds London Array, the largest offshore wind farm in the world. Together these three projects bring Masdar’s gross renewable energy generating capacity in the United Kingdom to 1.06 gigawatts, which is enough to displace 63,000 metric tonnes of carbon dioxide each year. As Hywind and Dudgeon move towards completion, Masdar and Statoil are seeking to bring clean energy technologies to other global markets.

It is clear the offshore wind farm market is poised for growth. Scotland granted planning permission



for as much as 92 megawatts of floating offshore wind capacity, including two separate projects, at the beginning of this year. In Ireland, the developer Gaelic Holdings Plc and Ideol SAS, a French floating wind company, agreed in March to develop floating wind projects in Irish waters, starting with a 30-megawatt array.

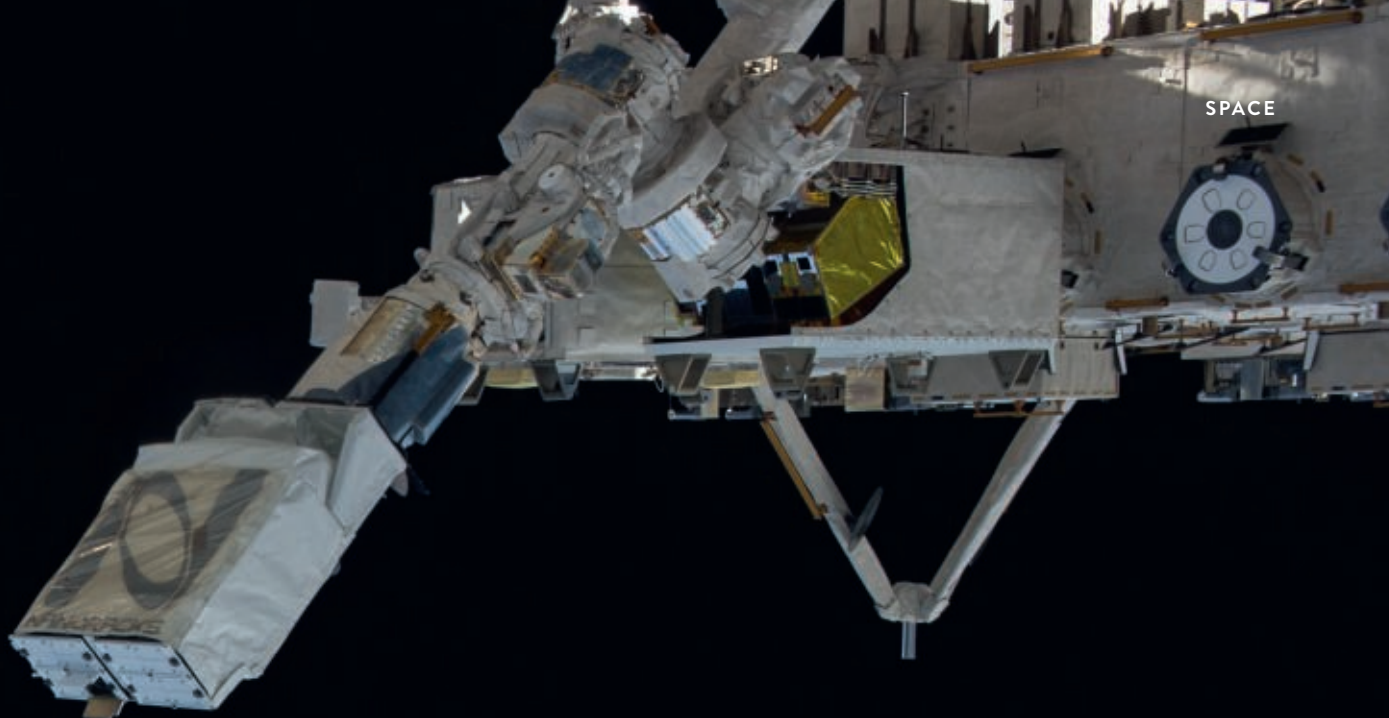
The deals bring to about 237 megawatts the capacity of floating offshore wind projects that will be installed worldwide by 2020, according to Bloomberg New Energy Finance. That’s just a fraction of the 38,000 megawatts of turbines due to be fixed to the seabed by the end of this decade. ↗

Top: Different models of floating platforms are currently being tested.

Above: Seventy-eight metres of the 253-metre-tall Hywind towers are below water.

THE CUBESAT REVOLUTION

Cube satellites or cubesats are being used in everything from disaster response to climate monitoring. Now scientists plan to revolutionize the way we face the final frontier by using the miniature satellites for space



In June this year, the D-Sat cubesat hitched a ride on India's PSLV rocket into space. When it comes back later this summer, the mini satellite developed by Milan-based startup D-Orbit will have created history.

The D-Sat is on a mission to mitigate Earth's growing space junk problem. Its D-Orbit Decommissioning Device (D3) – an independent thruster system – will guide the D-Sat to a controlled destruction in Earth's atmosphere when its mission comes to an end in July or August. This will be the first-ever such manoeuvre for such a small spacecraft.

"We have developed a decommissioning system for satellites," D-Orbit CEO and co-founder Luca Rossetini says. "It's an intelligent motor that you install on satellites before launch and it enables the satellite to be removed at the end of life in a very quick and controlled way." While the operation sounds straightforward and simple, the decommissioning involves a series of complex operations, each representing a single milestone in space, that have to be completed in a precise sequence.

According to the European Space Agency (ESA), D-Sat can play an important role in the future of space

flight if it succeeds in its mission. Space junk has long threatened Earth's space exploration missions and D-Sat could be a solution that is viable both technologically and economically.

Lowering the orbit of the satellite is one of the most important measures to control space junk. This is a complex manoeuvre, which can be performed only after the satellite has completed its mission. By this time, it has also lost most of its technical reliability making the manoeuvre difficult to carry out. ESA data shows that most satellites do not implement the manoeuvre at all or it is insufficiently carried out. The D3 technology shows potential to overcome this issue as it can deorbit the satellite even if the rest of the spacecraft is completely unresponsive.



SATELLITE COMPARISON

NANOSATELLITE

1-10 kg

Prospektor-X



Compare size to Toster



MICROSATELLITE

10-100 kg

Prospektor-1



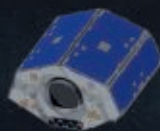
Compare size to Beachball



SMALL SATELLITE

100-500 kg

Nigerisat-2



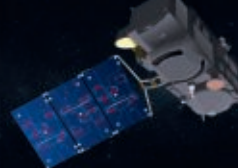
Compare size to Fridge



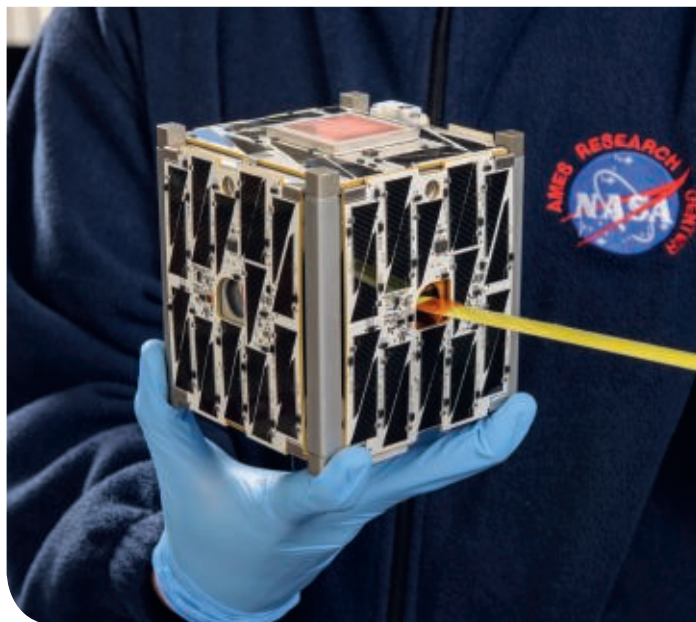
STANDARD SATELLITE

>500 kg

ESA Sentinel-3



Compare size to SUV



Above: NASA has been developing cubesats for all four its science divisions since 2013.

Several major satellite manufacturers and operators are eagerly awaiting the result of D-Sat's mission. If it is successful, it will inspire commercial satellite manufacturers and operators to consider the D-Sat for their future missions.

While this is the first time a cubesat has been launched into space with the mission to destroy itself, the miniature satellites are commonly used in low Earth orbit for remote sensing and communications.

Cubesats were first designed in the late 1990s to help university students gain engineering experience in satellites. Measuring only 10 centimetres cubed with

a mass of less than 1.33 kilograms they are much less expensive (typically no more than \$10 million for an interplanetary mission) to build than traditional satellites. Cubesats are designed in such a way that two or more can be joined together for more complicated missions. An entire constellation of cubesats, flying and working together could make powerful observations from the nature of Earth's polar regions to the extremely low-frequency energy of far-away galactic nuclei and black holes.

For the first decade after their invention, most cubesats were limited to university or research applications. However, they came into the limelight when in 2013 there was a sudden spurt in the launch of commercial satellites, roughly dozens annually. Prior to this only a handful of satellites were launched each year. Manufacturers quickly realised the benefits of the mini satellites and began using them for missions ranging from disaster response to monitoring climate change.

Already circling the Earth are the "Doves", cubesats built by San Francisco-based startup Planet Labs (which includes several key PhoneSat players among its founders). Doves capture imagery with a resolution of 3 to 5 metres from Earth orbit, Planet Labs representatives say.

The company launched its first two Doves in April 2013 and has since lofted 71 more, with the stated aim of making information about our planet much more accessible to a variety of customers.

Cubesats are winning the space research community's vote on two counts. Since they are light weight, they don't need a lot of fuel to propel them into space and can even share a rocket with larger satellites. Both factors bring down the cost of launching a cubesat



CUBESAT MISSIONS TO WATCH OUT FOR

Launching in May 2018, Mars Cube One (MarCO) will be launched along with NASA's InSight lander. The two cubesats will ride into space and then separate from the booster to make an independent trip to Mars. One of the spacecraft will send data back to Earth as InSight lands on Mars, while the other will act as a backup. The InSight probe mission will cost around \$675 million, while the two MarCOs cost a mere \$13 million.

In 2018 NASA will test the rocket expected to carry humans out of low Earth orbit for the first time since the 1960s. The initial launch will be unmanned and will include 13 microsatellites. Of these, the Lunar Flashlight cubesat will be used to reflect sunlight to peer into permanently shadowed craters on the moon, and NEA Scout, will fly to near-Earth asteroid 1991VG using a solar sail.

A mission to Jupiter's icy moon Europa in the next decade will include cubesats, which will carry out a variety of functions including reconnaissance for future landing sites, gravity fields, magnetic fields, atmospheric and plume science, and radiation measurements.

The ESA and NASA are considering a joint mission to investigate the asteroid 65803 Didymos and try to move its moon via an impactor. ESA plans to send along two cubesats to do supplemental observations.

significantly. However, cubesats still suffer from some design challenges. Their electronic components are smaller making them more sensitive to radiation and can last only a few months or years before falling back into the atmosphere.

However, this is changing. NASA has developed a miniature radio-communication system capable of talking directly to Earth from Mars and beyond. Meanwhile, firms in Europe are developing high-efficiency ion engines.

As a result, cubesats are an exciting new tool that "will enable some new kinds of measurements to be made and, in some cases, whole new missions to be done," says Robert Staehle of NASA's Jet Propulsion Laboratory (JPL) in Pasadena, California, who led a 2013 study investigating the feasibility and potential of interplanetary cubesats.

One project that will help pave the way is the Interplanetary NanoSpacecraft Pathfinder In Relevant Environment (INSPIRE) mission, which will launch two identical 3U cubesats on an Earth-escape trajectory. Plans call for the spacecraft to get about 1.5

million kilometres from Earth during the course of the three-month mission.

Cubesats are redefining space research. With the nano-satellites at the forefront, space research and technology developments are open to everyone from students and technology pioneers to crowdsourced initiatives. NASA is envisioning launching swarms of cubesats, each carrying a single instrument or performing a single task. Each low-cost, highly-specialised probe could also be used for sacrificial missions to destructive places such as the surface of Venus, the plumes of Europa or inside the volcanoes of Io.

Small, modular and inexpensive to build and launch, they are breaking the high cost barriers of traditional space research and opening up space exploration like never before. In fact, their only limiting factor appears to be that they need to hitch a ride into space. To cope with the large number of CubeSat proposals, NASA wants to see more low-cost commercial launchers developed, to carry tens to hundreds of kilograms of payload, in contrast to the five tonnes typical of launchers designed for communications satellites. †

THE FIRST INDUSTRIAL REVOLUTION

The world is currently undergoing the Fourth Industrial Revolution, but it is the massive changes of the First Industrial Revolution that set the scene for the three that followed.

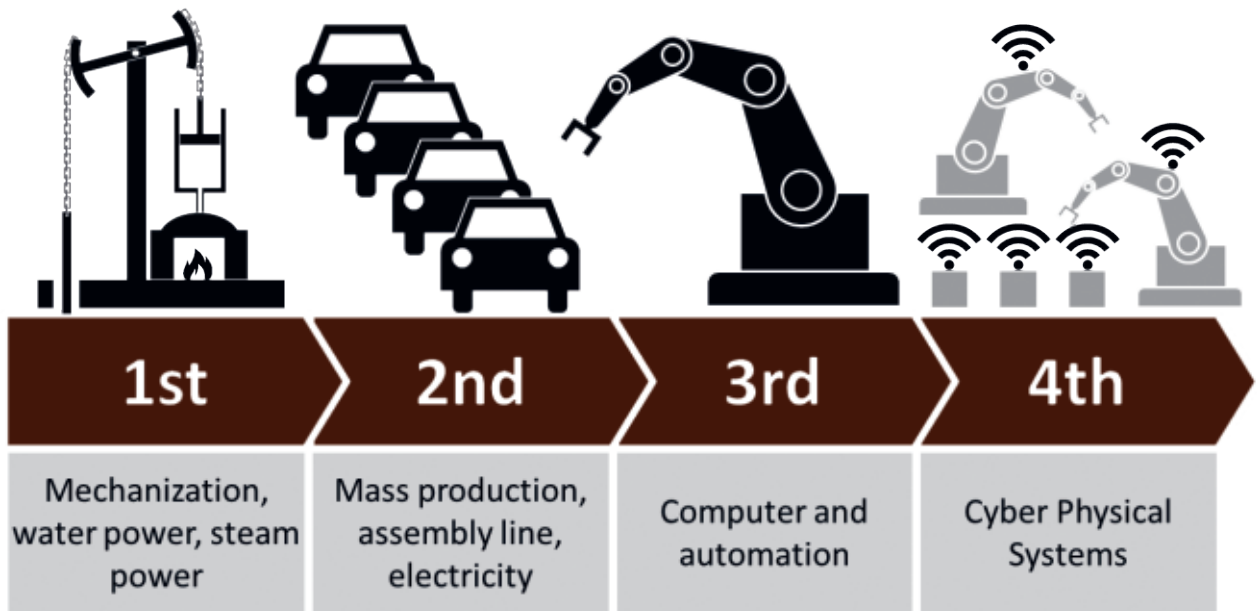
The First Industrial Revolution was one of the most pivotal economic and social moments in history, and also one of the most debated. Why did it occur and what was the reason it was centred in Britain from 1760 to 1840? Did it really do irreparable damage to humanity, creating a culture of greed and a disregard for the livelihood of the poor?

Any answer to the latter is as relevant today as it was in the 19th century, with both the digital and knowledge economies changing the world and how we live.

What is certain is that the First Industrial Revolution changed British – and later European and North American – society forever, heralding the rapid transformation from an agrarian economy to one







Above: Each of the four Industrial Revolutions is characterised by new technological developments in unique fields.

Below: George Stephenson invented the steam locomotive.



dominated by machine manufacturing. It was a revolution fed by population growth, increased foreign trade, and greater demand for manufactured goods, and had far-reaching economic and social consequences, not only for Britain, but for the rest of the world.

It effectively changed the face of the country, transforming a nation of farmers and rural craftsmen into a country of factory hands, with new machines revolutionising the wool and cotton industries and leading to rapid urbanisation.

“Economically, one of the earliest and most dramatic effects of the industrial revolution was the cheap production of certain consumer goods like textiles,” says Joshua Ehrlich, a PhD candidate in history at Harvard University. “But over time, the industrial revolution has been responsible, directly or indirectly, for practically all of the technologies that have shaped the ‘modern’ economy. Socially, early effects included rapid urbanisation, displacement of traditional sources of wealth and labour, and the problems associated with mining and factories.”

James Hargreaves’ spinning jenny, invented in 1764, is widely acknowledged as a starting point of this revolution, kickstarting a period of rapid innovation and mechanical ingenuity. It was followed by Richard Arkwright’s spinning throstle and carding engine, Samuel Crompton’s spinning mule, Edmund Cartwright’s power loom, and James Watt’s steam engine, which was developed between 1763 and 1775. All led to what German writer and philosopher Friedrich Engels described as “the victory of machinework over handwork”.

“This invention made it possible to deliver more yarn than heretofore,” wrote Engels of the spinning jenny in *The Condition of the Working Classes in*

England, which was published in 1845. “Whereas, though one weaver had employed three spinners, there had never been enough yarn, and the weaver had often been obliged to wait for it, there was now more yarn to be had than could be woven by the available workers... Now that the weaver could earn more at his loom, he gradually abandoned his farming, and gave his whole time to weaving... By degrees the class of farming weavers wholly disappeared, and was merged in the newly arising class of weavers who lived wholly upon wages, had no property whatever ... and so became working men, proletarians.”

The Industrial Revolution helped Britain become the wealthiest nation on Earth, with unprecedented progress in manufacturing not only astonishing the watching world, but the British themselves. Textile manufacturing allowed Britain to undercut handloom textiles on the global market, while trains and steamships, which together transformed global communications, allowed the country to consolidate its pre-eminent global economic and political position throughout the course of the 19th century.

The impact on every aspect of British life was huge. The landscape was transformed, new towns built, and industrial centres expanded thanks to the proliferation of factories and warehouses. Railways, largely pioneered by George Stephenson in the early 1800s, furthered transportation and increased accessibility; canals connected industrial centres with ports, coalfields and trading centres; and a new class of urban worker emerged as a growing number of people moved to towns and cities in search of employment.

But why Britain? And why the late 18th century? These are questions that have been fiercely



Above: 'The Rocket', Stephenson's first locomotive, heralded the arrival of trains and mass transportation.

debated, admits Ehrlich, with any possible answer multifaceted.

"A comprehensive explanation would probably have to consider: first, environmental factors such as the convenient availability of coal and, it has been argued, a shortage of timber spurring a search for underground fuel sources; second, social and economic factors involving the 'Industrious Revolution' – the growth of consumer demand and industrious behaviour leading up to the industrial revolution; and third, political, legal, and intellectual conditions that encouraged trade, entrepreneurship, and technological innovation," says Ehrlich.

There were other factors, too, including Britain's distinctive wage and price environment (wages were high and energy cheap), but also the country's success in the international economy, which set in motion

economic developments that presented inventors with unique and highly remunerative possibilities.

"Underlying the technological breakthroughs of the industrial revolution was Britain's commercial and imperial expansion of the 17th and 18th centuries, which was the cause of the peculiar wage and price pattern," wrote Robert C. Allen, now global distinguished Professor of Economic History at New York University Abu Dhabi. "The state policies that mattered most were mercantilism and imperialism."

For social reformer and economist Alfred Toynbee, the period 1760 to 1840 marked a fundamental transformation of the British economy and ushered in unprecedented changes in population, agriculture and the lives of the poor.

He, like others, was concerned with the welfare and living conditions of the working classes and the

KNOWLEDGE AND THE FOURTH INDUSTRIAL REVOLUTION

The fourth annual Knowledge Summit is scheduled to take place from November 21-23, 2017 in Dubai. The Mohammed Bin Rashid Al Maktoum Knowledge Foundation (MBRF) organises this annual event and this year's edition is entitled "Knowledge and the Fourth Industrial Revolution".

The Fourth Industrial Revolution is defined as a range of new technologies that are fusing the physical, digital and biological worlds, and impacting all disciplines, economies and industries.

The Fourth Industrial Revolution follows on from the Third Industrial Revolution, or the Digital Revolution,

which refers to the advancement of technology from analogue electronic and mechanical devices to the digital technology available today. The era started during the 1980s and advancements include the personal computer, the internet, and information and communications technology (ICT)



Above: The First Industrial Revolution's mechanical breakthroughs greatly increased the production of goods

Above right: Factory work damaged the family unit, with many children forced to labour in unsafe conditions.



injustices of early industrial capitalism. In contrast to the emergence of a class of prosperous industrialists and merchants, the majority of workers lived and laboured in squalid and overcrowded conditions. Children were exploited and ill-treated, women toiled at the expense of family, and men were left with little or no bargaining power against their employers. Most worked 10 to 14 hours a day, six days a week, with no paid holidays and – as the first generation of industrial workers – were left to the mercy of free-market capitalism with no constraints.

“Mining and factory labour were brutal, poorly-paid, and dangerous for many people employed in them,” says Ehrlich. “They were also economically disruptive in Britain (think the Luddites) and on a global level (think Indian textile weavers). Mines and factories were also environmentally destructive, polluting air, water, and other essential resources.”

The Luddites were early protestors in an era that came to be defined by political unrest as industrialisation and urbanisation created a need for both social and political change. These textile workers and weavers destroyed machinery in the early part of the 19th century as a form of protest, believing innovation threatened their jobs, although they were not opposed to technology per se.

Political and social unrest continued throughout the early 19th century, with social reformers seeking improved social welfare, education, labour rights, political rights and equality.

“The process of industrialisation is necessarily painful,” wrote E.P. Thompson in *The Making of the English Working Class*. “It must involve the erosion of traditional patterns of life. But it was carried through

with exceptional violence in Britain. It was unrelieved by any sense of national participation in communal effort, such as is found in countries undergoing a national revolution. Its ideology was that of the masters alone. Its messianic prophet was Dr Andrew Ure, who saw the factory system as ‘the great minister of civilisation to the terraqueous globe’, diffusing ‘the life-blood of science and religion to myriads... still lying ‘in the region and shadow of death’.

“But those who served it did not feel this to be so, any more than those ‘myriads’ who were served. The experience of immiseration came upon them in a hundred different forms; for the field labourer, the loss of his common rights and the vestiges of village democracy; for the artisan, the loss of his craftsman’s status; for the weaver, the loss of livelihood and of independence; for the child, the loss of work and play in the home; for many groups of workers whose real earnings improved, the loss of security, leisure and the deterioration of the urban environment.”

The Industrial Revolution resulted in arguably the most profound and far-reaching changes in human history, with scientific innovation and technological improvements contributing to the advancement of agriculture, industry, shipping and trade, just as the lives of the poor were changed forever and their life expectancy diminished.

For better or for worse, it also made Britain, and later Europe, richer than ever before imagined, and continues to impact the world today.

“The Industrial Revolution is one of the most celebrated watersheds in human history,” wrote Allen. “It is no longer regarded as the abrupt discontinuity that its name suggests, for it was the result of an economic expansion that started in the 16th century. Nevertheless, the 18th century does represent a decisive break in the history of technology and the economy. The famous inventions – the spinning jenny, the steam engine, coke smelting, and so forth – deserve their renown, for they mark the start of a process that has carried the West, at least, to the mass prosperity of the 21st century.”†

damas



Natural beauty, is the nature of beauty.

DAMAS CLASSICS

A unique collection of classic jewellery with the beauty and brilliance of Forevermark Diamonds. Less than one percent of the world's diamonds are worthy of the Forevermark inscription – our promise of beauty, rarity and responsible sourcing.



FOREVERMARK



A DIAMOND IS FOREVER

Forevermark is part of The De Beers Group of Companies. Forevermark.com



مبادرات محمد بن راشد آل مكتوم العالمية
Mohammed Bin Rashid
Al Maktoum Global Initiatives



مؤسسة محمد بن راشد آل مكتوم للمعرفة
MOHAMMED BIN RASHID AL MAKTOUM
KNOWLEDGE FOUNDATION

جائزة محمد بن راشد آل مكتوم للمعرفة

MOHAMMED BIN RASHID AL MAKTOUM
KNOWLEDGE AWARD

تعلن جائزة محمد بن راشد آل مكتوم للمعرفة
عن فتح باب الترشيح لأهم الأفراد والمؤسسات للفوز بالجائزة عبر الموقع الإلكتروني.

The Knowledge Award announces opening of nominations
to individuals and organizations through the website

www.knowledgeaward.com



تكريماً للإنجازات العالمية في مجال المعرفة والابتكار
Honoring International Achievements in Knowledge & Innovation

الموعد النهائي لاستلام الطلبات : 31 أغسطس 2017
Submission Deadline : 31st August 2017