

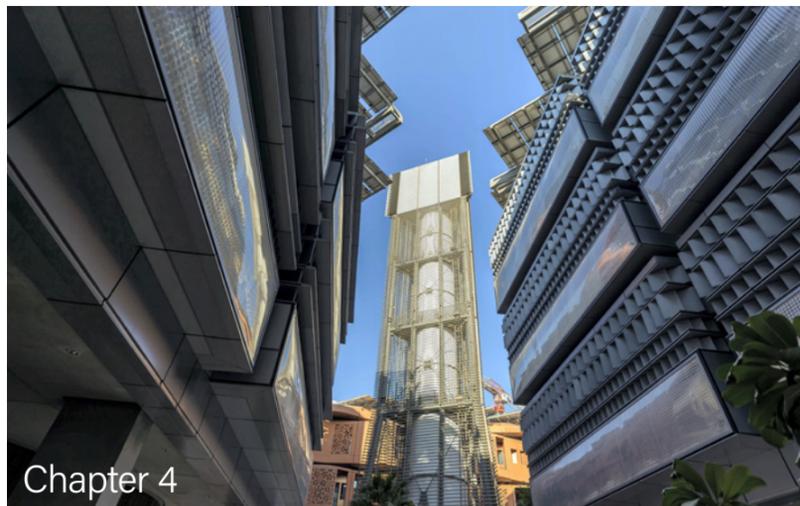
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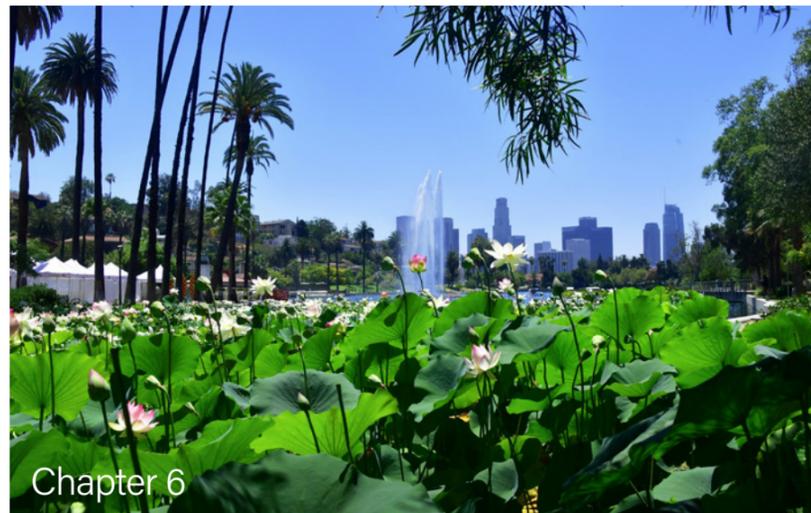
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FOREWORD

ACCORDING TO THE UNITED NATIONS, 68 per cent of the world's population will live in urban areas by 2050, adding approximately 2.5 billion people to our towns and cities.

Inevitably, the impact of urbanisation will be most acute in those regions experiencing the fastest population growth, such as Africa, Asia and parts of the Middle East. However, city planners everywhere are confronting the dilemma of accommodating more and more residents while offering a public realm that improves quality of life, health and well-being.

In the past, cities were built with a focus on economic development and defence as opposed to the environment or the happiness of their inhabitants. To bring about "people-centric" cities that meet the needs of those who live in them, it is essential to prioritise the development of the public realm. Research shows that doing so yields tangible commercial benefits, besides improved health and well-being, with successful businesses and the highly skilled attracted to communities that are well integrated with their outdoor environment.

Knowing that our cities must adapt, Masdar City in Abu Dhabi provides a road map for sustainable urban development based on the principles of economic, social, cultural and environmental sustainability.

The city's masterplan prioritises pedestrians and the clever use of public space, thanks to both traditional methods and the latest technologies. Streets and walkways are orientated to channel cooling breezes while maximising shading. Driverless shuttles and electric passenger cars operating on-demand within the city's boundaries reduce the inflow of outside traffic, further improving pedestrian access and allowing for more parks and community spaces.

Stimulating the mind as much as they do the body, open spaces complement Masdar City's positioning as a hub for innovation. By improving data collection and analysis, artificial intelligence and smart city technologies have the potential to benefit the city's public realm strategy,

making the design process more responsive to the needs of residents, tenants and visitors. Masdar City's growing community will receive a further boost this year with the opening of the Mohamed bin Zayed University of Artificial Intelligence and Masdar Central Park, which embodies the city's sustainability principles.

The importance of public space for both mental and physical well-being is a recurring refrain of this report. It examines the experiences of other world cities integrating effective public realm strategies, while reflecting on Masdar City's own plans and achievements, from opening new public parks to adopting sustainable farming practices.

Since breaking ground in 2008, Masdar City has embraced the commitment of the UAE to prioritise the happiness and well-being of its people.

Urban communities developed around walkable spaces and amenities which foster health and well-being can be ideal environments for happy and productive people, even in climates as hot as the UAE's.

I hope this report, published in partnership with *The National* and the World Future Energy Summit to mark Abu Dhabi Sustainability Week, provides both insight and encouragement to all stakeholders involved in the sustainable development of our towns and cities.

With only a decade remaining to deliver on the UN Sustainable Development Goals, all of us have a shared obligation to promote a wider understanding of the role of civic spaces in cultivating innovation, sustainability, and the health and well-being of our urban communities.



Mohamed Jameel Al Ramahi
Masdar chief executive

EXECUTIVE SUMMARY

ONE OF THE WORLD'S major challenges over the next decade, as urban populations grow dramatically, will be how to ensure life in our cities is a happy, healthy reality.

Around half of the world's inhabitants currently live in cities, 548 of which have populations of at least one million. By 2030, that number is expected to grow past 700.

There is ongoing debate among experts about which aspects of urban development most affect health and well-being.

These include street design and connectivity, public transport, green spaces and parks, water, waste and sanitation, pollutants affecting air quality and noise, building materials and design.

The growing view of experts is that no price can be put on the importance of health and well-being in our cities.

The starting point is the World Happiness Report, conducted annually by the UN Development Solutions Network. In 2019, for the second consecutive year, Finland emerged as the happiest country in the world, and the report sees why.

The Finnish capital, Helsinki, best explains what makes Finns so happy. Helsinki has made sure its sustainable solutions are not just environmentally friendly and energy-efficient, but equally effective in terms of citizen well-being, equality and functional everyday life.

It is a city uncovering the link between happiness and urban development, and the crucial importance of making the most of civic spaces.

The Royal Institution of Chartered Surveyors says there is growing evidence that the physical urban environment has a positive and negative impact on health and well-being.

Far from being a decorative ornament or urban planning afterthought, high-quality public spaces play a critical and under-appreciated role in promoting the health and well-being of communities, in mind as well as body.

There is also a genuine commercial dimension to quality civic spaces, with successful businesses and the highly skilled attracted to communities well-integrated with the outdoor environment.

Covering the widest range of amenities imaginable, from parks to town squares to community art installations, public spaces make up 12 per cent of the land area of the average European city, the UN says. However, the figure for Middle Eastern cities is as low as two per cent, with the region's challenging climate a contributing factor.

In cities, people demand these amenities now. Once basic services such as reliable power, clean water and high-speed internet are in place, the trend moves to improving the quality of that liveability. This includes the conversion of city areas into functional public space, narrowing roads and adding cycle paths. The thinking has now shifted to the question of how to design to cater to the necessary functionality of cities, like streets for cars to drive through, but also to provide amenities.

"This is something we are always trying to do at Masdar," says Lukas Sokol, Masdar's head of city design and sustainable planning. "If you want to compete internationally on that stage and attract the right kind of minds and investments, you have to create a public realm that people want to live in."

PUBLIC OPINION IN THE UAE

This report, titled *People and spaces: the role of urban green spaces in cultivating innovation, sustainability and health and well-being in Arab cities*, sheds new light on why public spaces must have their proper place in the urban planning process if the transformation of Arab towns and cities is to achieve lasting benefits for the mind, body and planet.

The results of an online survey, appointed by Masdar and conducted by *The National*, shows that people are well aware that access to public green space in the city in which they live helps make them happy. More such spaces are desired and the majority of respondents indicated they would make regular use of them.

More than a third of respondents cited mental health benefits as the main role of green public space in a city.

"Universally speaking, we respond well to being in comfortable environments, we do want to engage with the outside and are a social species. We do want to see other people and see the city. The place where that is demonstrated is the public forum, the public realm where the public comes and meets and engages with one another," Sokol says.

He adds that the survey results demonstrate "a maturing society that is looking at these kinds of facilities as integral to their lifestyles and quality of life"

While the majority of respondents say existing green public space in their city added to their personal happiness by a large extent, the survey points to a need for more information telling the public where to find the nearest public space.

"The study uncovers some really interesting opportunities for the public and the private sector. It is affirming and expanding on the importance of public realm and the work that is already being done [in the UAE]. With some of the government initiatives, they are looking at enhancing the public realms and providing not only access to more parks but also more natural areas," Sokol says.

Today's master developers, architects and city planners are focused on cultivating innovation, sustainability, public health and well-being in our future cities.

A digital revolution over the next ten years will transform the way cities are designed, with a clear role for artificial intelligence and Big Data to support an understanding of what residents want and need.

Outdated design principles do present an obstacle to progress, however, and lessons must be learnt from mistakes of the past.

The UAE Government's initiatives in recent years, part of efforts to make the country one of the best in the world by 2021, are powerful real-life examples of how to turn the concept of happiness into reality.

The UAE has embraced strategies to make the world a better place with its support for the United Nations Sustainable Development Goals, in particular the drive to make cities inclusive, safe, resilient and sustainable.

This includes the world's most sustainable community that has been created at Masdar City, and its potential to influence sustainable urban development around the world to accommodate population growth.

A number of master planners, developers, architects and designers worldwide turn to Masdar City where so many of the most difficult questions on sustainable urban development have already been answered.

MASDAR CITY SHOWS THE WAY

Masdar is a city where traditional architecture blends effortlessly with state-of-the-art modern technology; where buildings are designed to cut energy and water consumption by 40 per cent; a city inspiring others to think smarter, leaner and greener; a high-tech, low carbon, sustainable city years ahead of its time.

It is a city binding commercial and residential areas together with clusters of parks, other green spaces and a wide range of facilities and services contributing positively to public health and well-being.

One of the biggest problems to be faced over the next ten years, as the world's cities become more heavily populated, is how to ensure a consistent and sufficient distribution of food. A pilot scheme at Masdar City could see urban communities grow their own food in an allotment, solving a regional food production crisis.

As urban populations grow worldwide, a number of major cities are finding ways to cope. After years of research, Los Angeles, a city like many others in the US afflicted by disturbing urban issues, devised a far-sighted plan to become a more prosperous, liveable and sustainable city over the next 20 years.

Its key elements include parks and open space, seen as being essential for quality of life, as well as public facilities and community assets. Getting creative, LA plans to grow its open space network by using underutilised roads or golf courses. Almost 13,000 kilometres away in Melbourne, Australia, increased demand on open spaces is intensified by the fact that population growth is already occurring in areas with little or no open space.

Melbourne has responded with a strategy to direct the open space planning until 2027. One of its main aims is to create a network of open spaces within easy walking distance for the community. Melbourne's plans are built on the philosophy that open space boosts physical and mental health and well-being, while making its people feel closer to each other and more connected.

In Vancouver, widely recognised as one of the top five cities worldwide for liveability and quality of life, a new road map to a brighter, healthier future for its population came out of two years of consultations with 35,000 people. One of the main aims is to put Vancouver in even closer touch with its natural surroundings, supporting the World Health Organisation philosophy that green spaces can reduce health inequalities, improve well-being and aid in treatment of mental illness.

RETHINKING CITIES FOR THE PEOPLE WHO LIVE IN THEM

The International Resource Panel, part of the United Nations Environment Programme, says it is vital to re-think cities so that they are able to face the challenge brought by increasing urbanisation.

Among its main recommendations are that cityscapes need to be designed for people not cars, and must allow the poor in particular to access the opportunities of the city.

Award-winning Canadian writer, urbanist and design consultant Charles Montgomery points to a powerful, unbreakable link between environmental sustainability and social sustainability in cities. He has said that the responsibility to shape our urban future must be shared not just by governments, architects and designers, but also by all individuals living in cities.

Montgomery advocates the retrofitting of cities for happiness through designing streets, parks, housing development and shopping malls to make people feel and behave better, happier and be kinder to each other.

Elizabeth Monoian, founding co-director of the Land Art Generator Initiative, says the move to clean energy will

"Universally speaking, we respond well to being in comfortable environments, we do want to engage with the outside and are a social species. We do want to see other people and see the city."

Lukas Sokol
Masdar's head of city design and sustainable planning

SMART CITIES

The Austrian Institute of Technology says cities of the future must not only be equipped with smart technologies, but also be planned digitally. A new interactive planning and analysis platform, supported by AI, has recently been used to supervise the smart revitalisation of three Uzbekistan cities.

Franco Atassi, head of smart infrastructure for Siemens in the Middle East, sees digitalisation as a key factor in developing the world's future sustainable cities, revolutionising design and construction, creating buildings which learn from the people occupying them, and act on their behalf.

Atassi says the next ten years will see the digital revolution begin to have real impact on our cities. As ever-more devices are connected to the Internet of Things, buildings will play a larger, more flexible and integrated role in city ecosystems, increasingly reacting to their surroundings.

Duncan Denley, managing director of landscape architecture company Desert INK, believes obsolete design principles held on to by decision makers pose the biggest threat to the reality of future cities being shaped by smart technology to the benefit of growing urban populations.

He says this mentality needs to be reconfigured and updated for truly sustainable urban development to be achieved.

Denley identifies Oslo, Copenhagen and Melbourne as among the world's most enlightened cities, but worries that most cities continue with a business as usual model of ever-expanding urban sprawl and car dominance.

have a major influence on the way of life for growing populations in the world's cities.

She says the energy transition will not only create a liveable climate for future generations, but it will also increase the quality of life for everyone.

A digital revolution will have a major effect on the way future cities are designed to make life inside them safer, more comfortable and sustainable.

Danish architect and urban design consultant Jan Gehl has said that learning from past mistakes is also an essential factor.

Gehl has studied for more than 40 years how people make use of the spaces where they live and work, and in designing cities, planners have ignored the people who live in them.

He says caring for people in the city is central to making cities lively, safe, sustainable and healthy. Cities such as Copenhagen, Melbourne, Sydney, New York and Vancouver set an example through policies encouraging people to walk and cycle as much as possible.

Gehl's vision of a happy city is one featuring clusters of shopping streets, with a shop every five metres to coincide with the stimuli humans need every five seconds,

The struggle to make future cities better places to live for millions of additional residents, inevitably, includes a major role for new digital technology, and in particular, artificial intelligence.

INTRODUCTION AND METHODOLOGY

THIS REPORT, PEOPLE AND SPACES: *the role of urban green spaces in cultivating innovation, sustainability and health and well-being in Arab cities*, has been produced to shed new light on why public spaces must have their proper place in the urban planning process if the transformation of Arab towns and cities is to achieve lasting benefits for the mind, body and planet. The report also highlights the link between access to such spaces and the personal happiness of residents and the broader well-being of a population.

The study has been produced as part of a partnership between Abu Dhabi clean energy company Masdar and *The National* newspaper to help the discussion around this topic at Abu Dhabi Sustainability Week in January 2020.

It is hoped that this research can support urban planners and developers in their efforts to create sustainable and prosperous cities.

To provide insights from the UAE, an online survey, *Urban Green Spaces Survey: the role of civic spaces in cultivating innovation, sustainability and health and well-being in our cities*, as described in chapter 3, was conducted to assess how residents feel about public green space in their cities. It was run via *The National's* website.

The survey was designed to identify sentiment in the UAE towards public green spaces, and how they affect respondents' everyday lives.

It asked readers how frequently they visit public green spaces in the city where they live and what are the main reasons they go there.

Those who do not make regular visits were asked to give their reasons also.

The survey asked respondents to say what kind of facilities they would like to see added to public green spaces, and to identify their main role in a city.

It also asked readers to what extent does the existing green public space in their city add to their personal happiness, and invited them to name their favourite outdoor location in the UAE.

Respondents who took part are UAE nationals or residents living in Abu Dhabi, Dubai, Sharjah, Fujairah, Ajman, Umm Al Quwain, Ras Al Khaimah, with some from outside the UAE.

The male and female participants were from the following age groups: below 18, 18-21, 22-25, 26-35, 36-45, 46-55, 56-65, over 65.

The survey produced a mix of more than 500 qualitative and quantitative responses, revealing a range of strong opinions on the benefits, strengths and weaknesses of public green spaces in the Emirates.

Beyond the survey, the report also explores the UAE's commitment to happiness and meeting the UN Sustainable Development Goals in chapter 2.

In chapter 4, Masdar City's evolving public realm is included as a case study, highlighting ongoing and future projects, such as Masdar Central Park, and looking to the future of the city. The study highlights how Masdar City's example is inspiring the incorporation of green spaces in urban planning beyond Abu Dhabi in chapter 5.

Case studies from cities around the world and how green spaces are viewed and used by planners and authorities are also included in chapter 6. In chapter 7, the views of global leaders in this field are explored. Chapter 8 addresses the impact of the digital revolution on the way cities can be built as well as how listening to what people want will more greatly shape planners' visions in the future.

Throughout the report, insights from interviews with experts, on the subject of urban green spaces and their importance, are included to augment the argument that urban green spaces add to people's overall well-being.



CHAPTER 1

DEVELOPING

HAPPY CITIES

What we know about the link
between happiness and access
to green public spaces

FEW EYEBROWS WERE RAISED when Finland emerged as the happiest country in the world for 2019. It was, after all, the second year in a row that Finland had topped the standings in the World Happiness Report, which ranked 156 countries by how happy their citizens perceive themselves to be.

The global survey is conducted annually by the United Nations' Development Solutions Network, which is tasked with implementing the UN Sustainable Development Goals to build a better and more sustainable future for all.

The report concluded that Finland, like each of the other top-ranked countries, has high values for the six key variables which are seen to support well-being, namely income, healthy life expectancy, social support, freedom, trust and generosity.

What is it, however, more than anything, that makes Finns such a happy crowd?

To find the answer, look no further than the country's capital, Helsinki, and its status as a European pioneer in sustainable urban development.

The key to the Finnish capital's achievement is that it has taken important steps to ensure its sustainable solutions are not merely environmentally friendly and energy-efficient, but equally effective in terms of citizen well-being, equality and functional everyday life.

HELSINKI'S 'OPEN INVITATION'

Putting things to the test, Helsinki sends out an open invitation to: "Jump on a bike from the city's bicycle-sharing system and enjoy a ride to a resident-organised block party in one of the city's dynamic neighbourhoods, breathing clean air as you pedal. Monitor your home's energy consumption on your smartphone.

"Take your children to the local day care centre by foot. Ride the Metro to a free-of-charge workspace provided by the City. Relax after work by weeding the urban garden of your housing company, or by bathing with friends in one of Helsinki's many public saunas."

In a nutshell, Helsinki has uncovered the link between happiness and urban development and the crucial importance of making the most of civic spaces.



It is a city recognising that the world's major problems of the future can, and must, be solved within cities – one which promotes itself as a prime example of the problem solving capabilities of cities, confronting challenges by boldly testing novel approaches with its people.

Adding weight to its status as the world's happiest country, therefore, Finland has a capital city which sets an example as one living up to its promise to deliver sustainable urban development solutions that are environmentally friendly, energy-efficient and socially sustainable.

In this city, green is an emphatic symbol of how to go for results when it comes to creating a population of happy people, using its civic spaces to cultivate innovation, sustainability and health and well-being

THE UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

Helsinki has become the driving force to make this process work, being fully devoted to voluntary local review and reporting to the UN on its implementation of the Sustainable Development Goals, as defined in the 2030 Agenda for Sustainable Development.

Among other things, Finns pride themselves on their reputation for keeping promises, and work is already well under way in Helsinki to make the city carbon neutral by 2035.

Not all cities have Helsinki's natural assets, but equally, few have maximised them as efficiently. Every one of the Finnish capital's near 1.3 million population lives less than 10km from its 130km seashore which opens up to around 300 islands.

The Helsinki happiness factor is enhanced by a strategy to develop the city's maritime recreational opportunities and tourist services, easing access to seaside destinations, improving services on the islands and developing sea-themed events, while in recent years also opening new islands for the public.



In this city, green is an emphatic symbol of how to go for results when it comes to creating a population of happy people, using its civic spaces to cultivate innovation, sustainability and health and well-being.

One of the world's greenest metropolises, Helsinki boasts green and recreational areas which are equal to 45 per cent of the city's land mass. It has 216km of trails and sports tracks and 1,200km of cycling routes.

It is a city which brings nature close to all who inhabit there, and everyone who visits. An example of loyal support for the philosophy that, at a time when around half of the world's 7.4 billion population lives in cities – with 2.4 billion more to be added over the next 35 years – achieving greater public well-being is an even larger responsibility of today's master developers, architects and city planners.

Aimed at providing universal access to safe, inclusive and accessible green and public spaces, in particular, for women and children, the elderly and people with disabilities by 2030, UN Sustainable Development Goal 11 needs unprecedented collaboration and investment to achieve that goal.

Currently, 548 cities around the world have at least one million residents. That number may well exceed 700 by 2030. In the midst of such enormous urban dependence, the emphasis on building happier cities to make people happier is at a premium; the need to create safe, healthy, sustainable infrastructures that are economically viable for everyone, essential.

The Royal Institution of Chartered Surveyors says the urban environment has long been recognised as an important element of health and well-being

MEASURING HAPPINESS

Over the past decade, the influence of happiness metrics in policy-making has grown significantly, underlining the reality that happier people bring enormous social and economic benefits to society. Fostering greater trust of one another, and longer, healthier, more productive lives shape an abundance of social connections, and make richer contributions to the vitality of our communities and day-to-day living.

The Royal Institution of Chartered Surveyors says the urban environment has long been recognised as an important element of health and well-being. While this historically centred on pollution, disease and overcrowding, there is now growing evidence that the physical urban environment has a positive and negative effect on health and well-being.

The UK-based RICS maintains that built environment professionals can use this factor to integrate health-promoting policies and design into new developments and regeneration projects of all sizes.

With chronic health conditions rising globally, bringing heavy costs, it says many of these conditions are preventable and strongly influenced by the built environment, with planners and designers capable of encouraging physical activity as the most effective means of reducing chronic disease and obesity.

Recognising the level of ill health caused or aggravated by air pollution, strategies to cut exposure within buildings and improve urban air quality are also effective, while measures to increase, and give easy access to green spaces, leisure facilities and affordable healthy food can be injected into development to improve health and well-being.

As the world's population increases, the need for solutions to the major problems this creates becomes critical. It is a challenge to accommodate the huge numbers of people drawn into our cities in a way that guarantees their long-term health and well-being.

According to RICS, a leading professional body for qualifications and standards in land, property, infrastructure and construction, many of the world's fastest growing cities are today working to cope with the kind of health problems encountered in the 19th century in developed countries. Meanwhile, cities in developed countries are being confronted with new illnesses and weaknesses partly brought about by the organisation of urban infrastructure, the methods of transport used and modern lifestyles.

While there is growing commitment to use land more intensively, property to be employed more efficiently and construction carried out more affordably, it will all be in vain should actions fail to deliver places where people can live healthier and happier lives.

There is ongoing debate among experts about which aspects of urban development most affect health and well-being. These include street design and connectivity, public transport, green spaces and parks, water, waste and sanitation, pollutants affecting air quality and noise, building materials and design.

So what is the first step to creating civic spaces which, while cultivating innovation and sustainability, lead to health and well-being in our cities? Is it about the level and quality of service the citizens experience; is it about stimulating aesthetics; or is it ease of movement by car or on foot?

Among the strongest and innovative voices on this subject is the award winning Canadian writer, urbanist, and design consultant Charles Montgomery who has advised and lectured planners, students, and decision-makers across the US, Canada, the UK, the Middle East and Mexico.

More than a decade of extensive team research has led him to the conclusion that the first step, crucially, is one that can elude urban planners and designers, and has nothing to do with design, with buildings, roads, trees or cycle paths.

The priority, he maintains, is to first agree on what matters for well-being, what needs to be achieved, and how design and systems affect human emotions, behaviour and health.

FINANCING THE GROWTH OF HAPPINESS

This has led to an evidence-based urban happiness model built around three overlapping conditions: subjective well-being, which is basically how people assess their own state of happiness; psychological well-being, which looks at how far people go in life towards reaching their full potential, and is associated with good health and productivity; and healthy life expectancy, which is seen as a powerful predictor of happiness across the world.

If such a model is to prove effective, it will require help from those holding the purse strings. As normal, during periods of economic downturn, there are concerns as to whether the costs involved in bringing happiness on such a vast scale globally are practical without proof of return on investment.

There is a growing view, however, that no price can be put on the importance of health and well-being in our cities, which is a critical matter beyond the perceived restrictions of public or private finance.

What this all indicates is a movement towards solutions in urban development, erasing the fears of how master developers, architects and city planners can overcome the problems brought by around half of the world's population now living in cities.

Happy, healthy, thriving people, living in cities becoming more crowded but built to embrace the population growth through the use of civic spaces to nurture innovation, sustainability and health and well-being of their citizens. Not easy to achieve, but not difficult to imagine.



CHAPTER 2

LEADING THE WAY

The UAE's commitment to happiness is highlighted by its embrace of the UN Sustainable Development Goals



WHEN THE UAE GOVERNMENT set out to make the country one of the best in the world by 2021, happiness was always high on the agenda.

This has been underlined by a succession of initiatives which show the UAE as a country prepared to take the necessary steps and actions – many of them unique – to put happiness at the heart of policymaking.

On a broader basis, the UAE has become a standard bearer for strategies designed to make the world a better place, in particular with its recognition and support for the United Nations Sustainable Development Goals.

Adopted by all member states in 2015, these 17 global goals represent the UN's blueprint for a more sustainable future for all – a universal call to action to end poverty, protect the planet and improve the lives and prospects of everyone, everywhere.

Their adoption has turned an international spotlight on environmental degradation, sustainability, climate change, and water security, and launched a serious race against time to achieve the UN's SDG objectives.

The SDGs aim to ensure that no one is left behind, and are central to the vision for a thriving economy that works for people and planet, as laid out by the 2030 Agenda for Sustainable Development, the UN's "plan of action for people, planet and prosperity".



HIGH LEVEL OF RESOLVE

Embracing the initiative with a high level of resolve, the UAE identifies particularly with SDG11, whose objective is to “make cities inclusive, safe, resilient and sustainable”.

This can only be done through a co-ordinated series of measures that create career and business opportunities, safe and affordable housing and build resilient societies and economies. The process requires substantial investment in public transport, a full commitment to develop green public spaces and a determined and effective plan to improve urban planning and management in participatory and inclusive ways. The vital importance of SDG11 is underlined by the fact that more than 50 per cent of our global population now live in cities, which are also responsible for around 70 per cent of worldwide energy-related emissions.

Placed firmly on the frontline of both climate impacts and the transition to a sustainable future for all, our cities are changing, as reflected by the dramatic transformation in recent years of the UAE capital, Abu Dhabi, and Dubai.

Cities such as these, brimming with new business parks and free zones, flush with new housing developments in the affordable bracket, abounding with vibrant communities decorated with lush greenery, connected by modern, efficient public transport, are pointing the way towards a sustainable economy.

In the UAE, there is overwhelming evidence of a government committed to driving the policy framework, built environments and municipal services, which are all key elements in the foundations of a country and its cities.

Reem Island, a modern residential and commercial destination off the main Abu Dhabi island's coast, houses the first international campus opened by the prestigious Sorbonne University in Paris.

Students in Abu Dhabi, as well as resident families and business executives, now enjoy the freedom and mobility provided by a 93,000 square metre recreational space, Reem Central Park.

Boasting sports facilities, a skating arena, playground, community lawn, canal walk and city beach, the park is also home to a fountain designed to stage daily laser light shows, illuminating Reem Island nights.

In another sign of the UAE's open space philosophy, the rebranded Sheikh Fatima Park has been undergoing a major redevelopment to turn it into a community hub for leisure and wellness.

The new, 46,000-square-metre space features an adventure zone, zoo, a designated area for women and children, an interactive educational area, as well as numerous restaurants and shops.

Its developer Imkan is committed to promoting an active lifestyle, stimulating wellness and uniting the community, to establish “a tranquil urban oasis in one of the city's bustling neighbourhoods”.

The emphasis is to encourage people to enjoy outdoor settings, the plans inspired by a World Health Organisation study into the benefits of urban green spaces, which “showed that parks not only had a positive effect on mental health, but also reduced levels of cardiovascular diseases, and obesity”.

The city's changing face is also seen in the development of the 80,000-square-metre beachfront community, Al Bahar, which brings a wealth of sports, health and fitness facilities to the Abu Dhabi Corniche, including basketball and beach volleyball courts, football pitches, an outdoor gym and a yoga studio.

With a multitude of dining, retail and leisure outlets along the beachfront, the community also features an inflatable waterpark concept as well as public spaces for year-round concerts and community events.

VIBRANT COMMUNITIES WITH SUSTAINABLE LANDSCAPES

In order for this process to succeed, as the UAE has recognised, it was important to place a high priority on Gross National Happiness (GNH). The concept originated in Bhutan, the Buddhist kingdom on the eastern perimeter of the Himalayas, as an alternative to Gross National Product (GNP), the total value of products turned out by a country's residents.

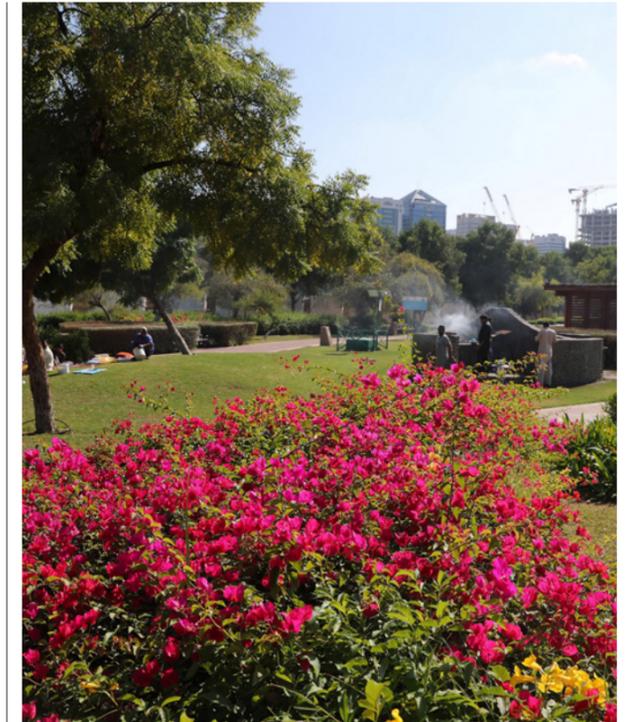
GNH, a philosophy that has guided Bhutan's government since being instituted in the constitution in 2008, includes an index used to measure the collective happiness and well-being of the population.

In recognition of its importance, the UN General Assembly in 2011 passed Resolution “Happiness: towards a holistic approach to development”, asking member nations to follow Bhutan's example and measure happiness and well-being, labelling happiness a “fundamental human goal”.

Since then, many nations and cities have begun creating happiness indices, while the UAE has gone further by regulating policy and development through harnessing these indicators to improve happiness.

The UAE timeline for this process, in fact, started ahead of the UN resolution, when in 2010, the government launched the UAE Vision 2021, laying out the key themes for the country's social and economic development; its objectives geared towards the country's 50th anniversary in 2021.

Many nations and cities have begun creating happiness indices, while the UAE has gone further by regulating policy and development through harnessing these indicators to improve happiness



The initiative was devised to inspire people, the government and the broader community in the UAE to cultivate well-being as a way of life, and enrich the greater happiness of the nation.

Such an undertaking required a highly strategic and practical approach, and in 2014, in order to translate Vision 2021 into reality, UAE Vice President and Ruler of Dubai, Sheikh Mohammed bin Rashid, launched the seven-year National Agenda 2021.

Developed by more than 300 officials from 90 federal and local government entities, the included a set of national indicators in the sectors of education, health care, economy, police and security, justice, society, housing, infrastructure and government services.

National Agenda executive teams were appointed, their main task being to develop and implement comprehensive and integrated action plans based around short, medium and long term initiatives.

Updated annually, the strategic plans identify responsibilities, as well as laying down priorities and execution timelines. All activities are co-ordinated with the relevant federal, local and international stakeholders, and closely monitored, to ensure targets are achieved.

ANOTHER SIGNIFICANT STEP

In February 2016, the UAE Government took another significant step towards its happiness goals by creating the post of Minister of State for Happiness, and appointing Her Excellency Ohoud Al Roumi (pictured right).

Initially, the minister's main responsibility was to harmonise all government plans, programmes and policies to achieve a happier society, and a year later her portfolio was extended to Minister of State for Happiness and Well-being.

One month after the minister's appointment, Sheikh Mohammed approved her proposal for a National Programme for Happiness. This unique and innovative initiative to establish a National Charter for Happiness was backed by a series of measures taken to create a happy and productive work environment at federal government offices.

These included the appointment of chief executives for happiness and positivity at all government bodies, setting up of councils for happiness and positivity at federal entities, and scheduling time for government happiness-related programmes and activities.

Within two months, Her Excellency was unveiling another initiative, the Customer Happiness Formula, designed as an effective tool for government employees to achieve the happiness goals under the National Programme for Happiness and Positivity.

This showed the UAE as one of the first countries in the world to launch specific initiatives aimed at pleasing customers, transforming the working environment at all government ministries and institutions and turning them into happiness destinations



This showed the UAE as one of the first countries in the world to launch specific initiatives aimed at pleasing customers, transforming the working environment at all government ministries and institutions and turning them into happiness destinations.

The programme is based on three themes: happiness and positivity in government work; happiness and positivity in lifestyle; and measuring happiness and positivity, further reinforcing the government's commitment to provide broader community happiness.

But what is happiness? And how can it be transmitted? The UAE Government addressed these questions when, in July 2016, it confirmed that 60 Chief Happiness and Positivity Officers from federal and local government entities were to undergo training to understand the 'science of happiness' and implement it.

The first of its kind training programme was built on five pillars: the science of happiness and positivity; mindfulness; leading a happy team; happiness and policies in government work; and measuring happiness.

It includes lectures, seminars, educational benchmarking visits to see the best global practices and experiences in the field and a set of applications and workshops.

In March 2017, the UAE University joined with the National Programme for Happiness and Positivity to establish the Emirates Centre for Happiness Research, a first of its kind in the UAE and the Middle East.

Carrying out scientific studies related to the science of happiness, and measuring and assessing happiness indices, the centre also set out to boost the UAE's contribution to elevating the scientific content of happiness worldwide.

A month later the programme launched the Friends of Happiness platform, an electronic portal designed to draw the public to its initiatives and rally support for the government's efforts to promote happiness and positivity.

Conceived to spread awareness about the importance of happiness and positivity, it set out to establish partnerships between the government and the community, individuals and organisations that endorse happiness as a practise in all sectors, also providing backing for the government's projects during the 'Year of Giving' in 2017.

Before the year ended, the UAE was ranked first in the Arab world and 21st overall – up eight places from 2016 - in the UN World Happiness report.

AT THE FOREFRONT IN THE ARAB WORLD

A year later, the UAE again topped the Arab world standings and climbed to 20th among 156 countries, placing 21st in 2019 to cement its position among the world's happiest countries.

Within the country, the initiatives on happiness have been warmly welcomed and supported across the public and private sectors, and in all areas of the community.

Happiness starts at the top. In the UAE, strong, bold, innovative leadership ensures that it flows.





CHAPTER 3
**MORE PARK
LIFE PLEASE**

Public green space makes us happy,
say UAE residents

UAE RESIDENTS SAY existing public green space in the cities where they live make a major contribution to their personal happiness, but more is needed closer to home and with better facilities.

In an online readers' survey appointed by Masdar and conducted in partnership with *The National* newspaper and the World Future Energy Summit, more than a third of respondents – of a sample of more than 500 people who live across the Emirates – cite mental health benefits as the main role of green public space in a city.

The results from this study of public sentiment about urban green spaces tie in with the more practical evidence referenced in previous chapters linking well-being to access to such spaces for a city's population. Just as importantly, the survey results show that the experience in other cities around the world, such as Helsinki, is as relevant in the UAE as anywhere else. People in the Emirates have overwhelmingly positive feelings about the public spaces close to them and want to be able to have greater and easier access to them.

Overall, in the poll, 87.4 per cent say they regularly visit public green spaces in the UAE, ranging from daily to once a month, with only 12.6 per cent saying they never visit them.

This indicates that residents will make use of such places that are located relatively close to them. Even in a country with extreme weather in the summer time, the survey respondents still indicated a high interest in parks and outdoor locations.

Of those surveyed, 36.6 per cent said they visit public green spaces near where they live at least once a month, 27 per cent at least once a week, 13.8 per cent several times weekly and 9.8 per cent almost every day.



However, for those who visit infrequently, about half say the reasons are that there is a lack of green spaces and those that do exist are too far away. More than 27 per cent of people who visit green spaces infrequently say that the main factor for this is the poor quality of facilities that they find when they do visit. Only 2.8 per cent say they are generally not interested in visiting public green spaces in their city.

The survey points to a need for more information telling the public where to find their nearest public space, which is identified as any open piece of land that is undeveloped, accessible to the public and partly or completely covered with grass, trees, shrubs, or other vegetation.

This largely includes parks and community gardens, but 10.6 per cent of those surveyed said the reason why they do not visit public green spaces regularly is a lack of information on where to find them.

The overall sentiment shown in the results from the poll is that people would spend more time in public green spaces if there were more of them and also if it is easier to know where they are located and how to access them.

MENTAL HEALTH BENEFITS

The majority of respondents (65.7 per cent) said existing green public space in their city added to their personal happiness by a large extent, with another 27.4 per cent saying this was to a small extent.

Mental health benefits were seen by 38.8 per cent as the main role of green public space in a city, with 30.1 per cent nominating environmental benefits such as reduction of air pollution and 24.2 per cent believing leisure is their key function.

That more than a third of people say that mental well-being is affected by visiting parks and other such places shows that many are conscious of the benefits linked to personal happiness. This can also inform policy making and decisions around development. Put simply, more parks and the like included in a masterplan, the more likely that residents, investors and visitors will view a development with a more positive frame of mind, as indicated by this polling.

The survey also shows that 33.2 per cent want ecological facilities to be added to their public green spaces, with 27.7 per cent asking for more sports facilities, 21.1 per cent calling for children-focused amenities and 11.5 per cent wanting food and beverage outlets.

Notably, the survey showed that parks are more popular than beaches. A question was asked to discover what outdoor spaces people liked in general, not just confined to urban green areas and Umm Al Emarat Park in Abu Dhabi emerged as the most popular outdoor location in the UAE. Abu Dhabi Corniche, home to several parks, is in second place. The beach was the third most popular choice, according to respondents.



Outdoor locations mentioned most frequently as favourites in survey (alphabetical order):

- Abu Dhabi Corniche
- Al Ain Oasis
- Al Dhafra desert
- Al Hudariyat island
- Al Mamzar Beach Park
- Al Seef
- Beach
- Creek Park
- Delma Park
- Desert
- Dubai Miracle Garden
- Formal Park
- Jabal Hafeet
- JBR
- JLT Park
- Khalifa Park
- Kite Beach
- Lake Park
- Liwa desert
- Mangroves
- Marjan Island Boulevard
- Masdar Park
- Outdoor restaurants and events
- Outside Louvre Abu Dhabi
- Parks
- Ras Al Khaimah Corniche
- Reem Central Park
- Saadiyat Beach
- Safa Park
- Sharjah Corniche
- Sharjah University City
- Sulaimi park (Al Ain)
- The lake area in The Greens and The Views
- The running track along Jumeirah Beach
- Umm Al Emarat Park
- Wadi Shawka (Ras Al Khaimah)
- Yas Links
- Yas Park
- Zabeel Park
- Zayed Sports City

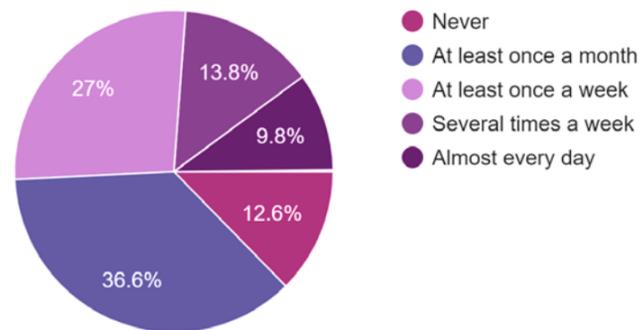
Other outdoor locations nominated beyond the parks and beaches – perhaps not surprisingly bearing in mind the UAE’s many natural assets and the cultural affinity to them – were the desert, oases including Al Ain Oasis, Wadi Shawka in Ras Al Khaimah and Al Qudra lakes in Dubai.

The comments submitted by respondents to the survey show how the subject of urban green spaces is emotive and time spent close to nature can mean a great deal to the quality of people’s lives. There is a strong sentiment around the importance of such places for residents of cities across the country.

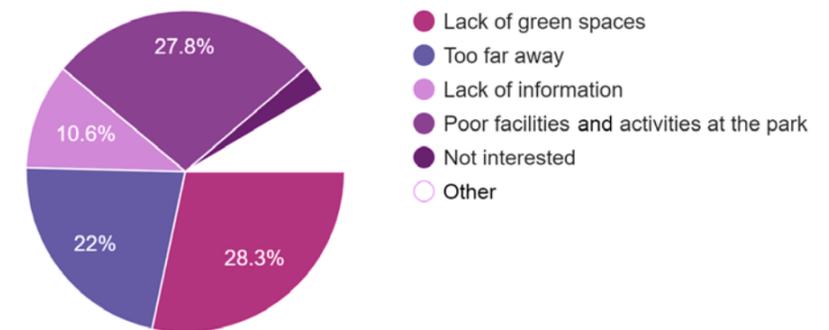
“Reem Central Park [is my favourite outdoor location], but also the little parks that dot the city, these are priceless,” said one Abu Dhabi resident, within the 36-45 age bracket, whose main reason for going to urban green spaces almost daily is for the benefits they can bring to his mental health.



How frequently do you visit public green spaces in the city you live in?



If you infrequently visit a green public space in your city, what is the typical reason for that?



SAFE ENVIRONMENTS FOR RELAXATION

"The large parks are nice, but in an ideal community there would be a little park within 5-10 minutes' walk from every home," adds the resident.

An Abu Dhabi Emirati, aged 26-35, says her favourite outdoor locations are "Lake Park, Formal Park, Mussafah Park, and Baynunah Public Park" which she calls safe environments for relaxation, spending time with friends and family and allowing children to play. She visits them at least once a month and believes their main function is to benefit the environment.

"Safe and free green spaces play a huge role in all aspects of our well-being. From mental well-being to physical, it is imperative to have them. Especially in cities, and in a country like the UAE where concrete is [in] excess."

A Dubai resident



A Dubai resident, 26-35 years old, who visits urban green spaces mainly for leisure purposes several times weekly, says they add a great deal to his personal happiness, although he regrets a lack of suitable locations for his favourite past time, that don't charge.

"Currently, [for me] the only 'accessible' green space is Zabeel Park – of which I visit 4 times a week," he says. "I play a lot of Ultimate Frisbee there with my friends since its one of the few places that have a large enough open grass space without an expensive paygate."

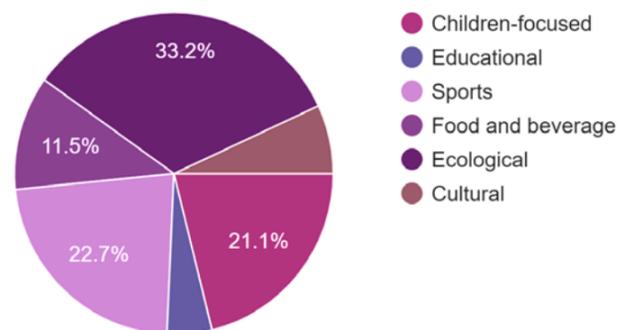
An Abu Dhabi resident, aged 26-35, who visits parks at least once a week, says: "I like going to areas where nature and culture is the scenery. I'm not really into modernised background like skyscrapers, and the like."

She finds that parks augment her personal happiness a great deal and would like to see more ecological features added to the capital's urban green spaces.

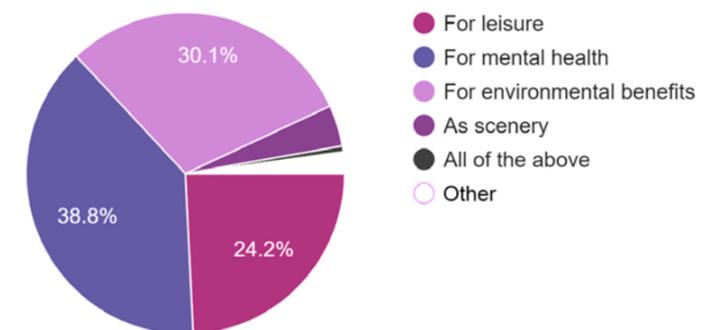
In Dubai, a female resident, aged between 25 and 36 years, visits green spaces in the city once a month and goes to "any place where I find greenery. The lack of such spaces is affecting my health".



What kind of facilities would you like to see added to public green spaces?



In your opinion, what is the main role of green public space in a city?



However, she wants a bigger offering of parks and such areas and adds: "Safe and free green spaces play a huge role in all aspects of our well-being. From mental well-being to physical, it is imperative to have them. Especially in cities, and in a country like the UAE where concrete is [in] excess."

She appreciates urban green spaces for helping people to relax, activities on offer for children and time spent with family and friends. They also allow for the enjoyment of nature, as well as for exercise, she says.

One Abu Dhabi resident, 36-45 years old, who visits public green spaces several times weekly, says their main function is to enhance the environment, for instance by improving air quality in cities.

"I am a nature lover so I like parks and seaside walks," she says, and wants to see more cultural attractions in urban green spaces.

MORE CHILD-FOCUSED FACILITIES

Another Abu Dhabi resident, aged 56-65, visits outdoor locations in Ruwais several times weekly to exercise and play sports and says that urban green spaces should mainly be for leisure purposes.

He says there is a "lack of information on nearby green spaces" and they should offer more child-focused facilities.

Among those expressing dissatisfaction with the current offering of public green space in UAE cities was a 36-45 female Abu Dhabi resident who said: "Umm Al Emarat is the only proper park. All other parks and green spaces are misused and turned into barbecue areas."

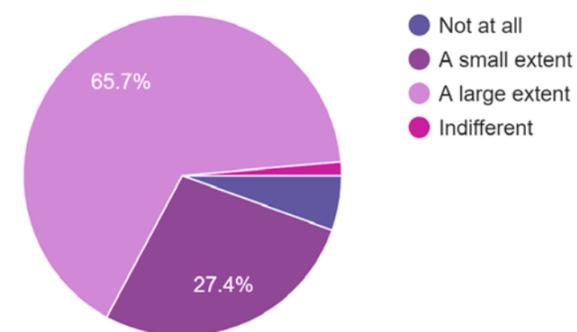
There is some sentiment shown in the survey related to how residents should use public green spaces. Keeping these areas clean and refreshing is as important as the facilities available according to the respondents.



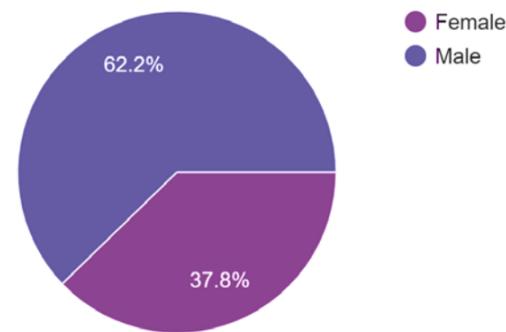
"Umm Al Emarat is the only proper park. All other parks and green spaces are misused and turned into barbecue areas."

An Abu Dhabi resident

To what extent does the existing green public space in your city add to your personal happiness?



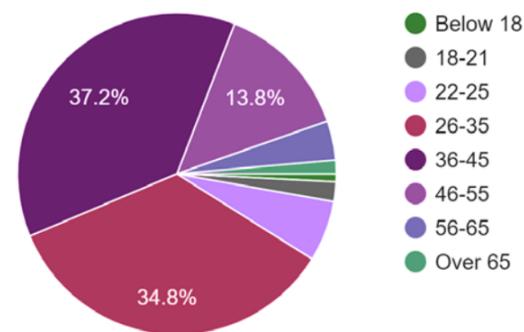
Gender of respondents



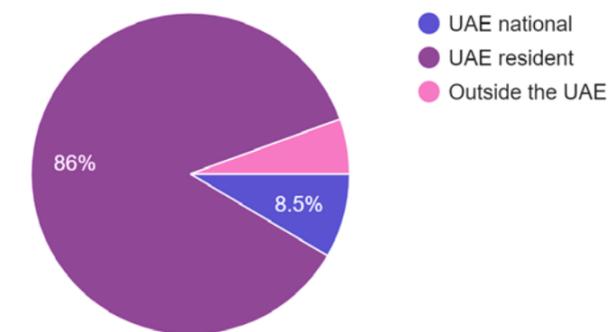
Another female Abu Dhabi resident, aged 36-45, was firm about her favourite location, and what she does not like about current public green space. "The desert [is my favourite]," she said. "The only green space is far away, and it seems the grass is treated with chemicals which doesn't make it suitable for children to play on [because of their] allergies."

The response to the online survey indicates that the topic of public green spaces in cities is important to residents in the UAE and would benefit from further study beyond an indication of sentiment. Overall, it is clear that there is a lot of feeling and emotion involved and these are obviously powerful factors to be considered, and more importantly not ignored, when planning and designing cities in the future. Incorporating this sentiment into this thinking has the potential to bring equally powerful benefits to communities at large.

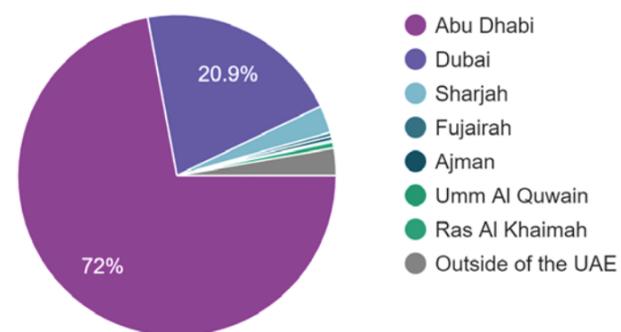
Age of respondents



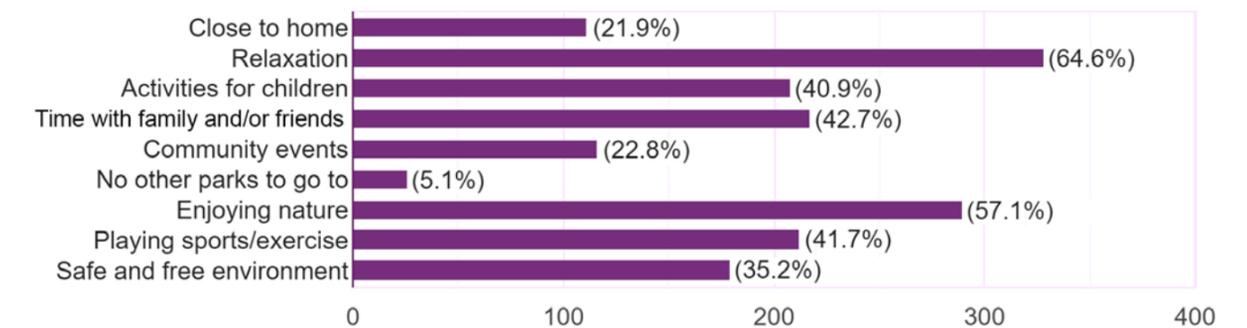
Are you a:



Where do you live?



What is your main purpose for visiting a green public space?



CHAPTER 4

GLOBAL INFLUENCER

How Masdar City's success
has set the standards for
sustainable development



THE WORLD'S MOST SUSTAINABLE urban community is entering another important phase of growth in 2020, when Masdar City's population will increase following the addition of 150,000-square-metres of mainly residential space.

Keeping pace with the arrival of the new residents, an abundance of leisure and recreational facilities are being delivered to ensure all those living at Masdar City enjoy a lifestyle consistent with a destination setting the highest standards in innovation and sustainability.

The delivery of Masdar Central Park at the start of this year adds an extensive range of new leisure and recreation facilities while the bike-share system is being extended and more open spaces are in the pipeline.

The longer-established Masdar Park already features a children's playground, a music wall and art installations themed on sustainability. A 5.6 kilometre running and cycling track, Al Mamsha trail, starts at this park. Parks

were always at the heart of the original masterplan laid out by Sir Norman Foster, the renowned architect.

When complete, more than 90,000 people will live and work in Masdar City, which, as a pioneer in sustainable design and renewable energy, will influence the way cities around the world are shaped over the next decade to accommodate population growth.

By 2030, five billion people – more than 60 per cent of the world's population – will inhabit cities. In order to cope, while conserving natural resources, cities must adapt to support sustainable living, creating, inventing new and innovative solutions to increasing demand for energy and water, and growing waste production.



UTILISING CLEAN ENERGY

These are problems that master planners, developers, architects and designers the world over are committed to solving, growing numbers of them turning to Masdar City where so many of the most difficult questions on sustainable urban development have already been answered.

An ecosystem built on knowledge, research and development, Masdar City has delivered R&D and pilot facilities giving rise to solar energy, energy storage, green building and urban sustainability projects.

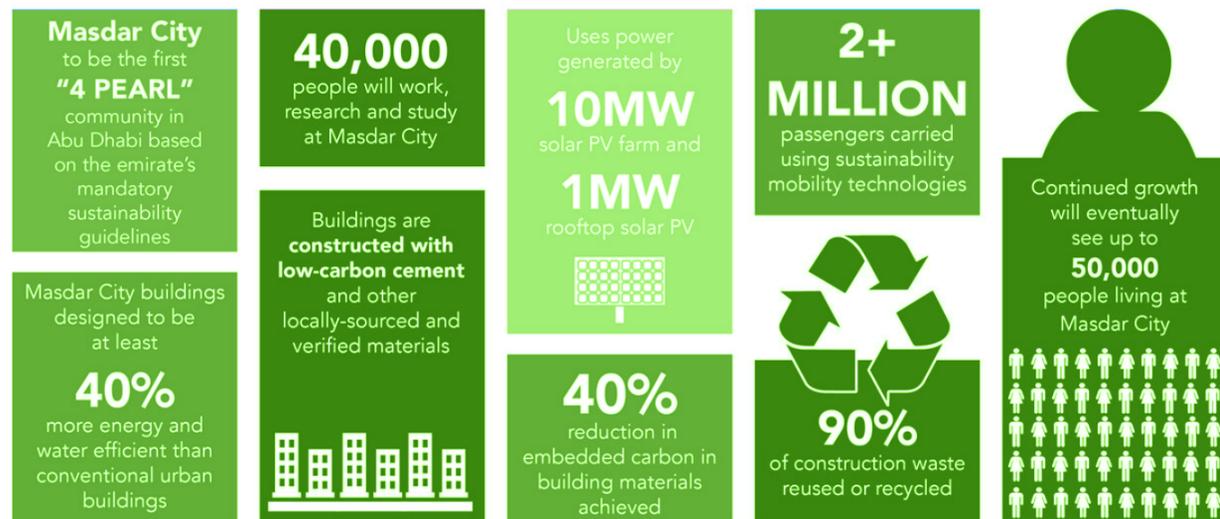
Breaking through many boundaries of sustainable design and technology, it is a technology cluster and a business and investment free zone, and much more.

By showing a clear emphasis on innovation and sustainability, it has become increasingly attractive to businesses, educational institutions and residents.

Masdar City's broader appeal is that of a unique cultural destination in its own right, receiving thousands of visitors each week.

In essence, Masdar City has created a template for sustainable urban development, and one which is expanding as its business and residential communities grow together. The importance of what is happening 30km from the heart of Abu Dhabi is already highly significant.

Masdar City is a place where the past, the present and the future come together now, where traditional architecture blends effortlessly with state of the art modern technology to maximise energy efficiency and give residents a lifestyle today that for many, hopefully, lies ahead.



INSPIRING A FUTURE VISION

It is a city asking and inspiring other cities to think smarter, leaner and greener; a high-tech, low carbon, sustainable city that is years ahead of its time.

It is a city characterised by narrow walkways that channel the wind, offering shade that makes the perceived temperature lower than other parts of Abu Dhabi. A city where everything needed is within walking distance, meaning natural exercise and a healthy lifestyle comes easier.

Designed to reduce energy and water consumption by 40 per cent, Masdar City's buildings are constructed with the use of green building materials - low-carbon cement and 90 per cent recycled aluminium, in addition to other locally sourced and verified materials.

Buildings are powered by clean energy delivered by a 10MW solar farm, which annually produces around 17,500 megawatt-hours of clean electricity, while offsetting 15,000 tonnes of carbon emissions. Standards are as high as expectations at Masdar City. Buildings must meet a minimum Estidama Pearl Building Rating System certification of three pearls, which is equivalent to LEED Gold.

Such benchmarks have proved highly effective in attracting a wealth of powerful corporate brands, and the growing assembly of businesses now includes more than 700 global and local companies, as well as a rising selection of restaurants and cafes.

To its residents and those employed within Masdar City, it is an attractive community in which to live, work, learn and play.

Forward-thinking attention to detail in the design of the modern work-life space that helps define Masdar City has created a kind of 'greenprint' for cities in many other parts of the world that will be designed to accommodate the growing urban population of the next ten years.

Based on the four pillars of economic, social, cultural and environmental sustainability, Masdar's philosophy is the inspiration for cities in many other parts of the world which will also be developed one neighbourhood at a time, the community growing with the arrival of new homes, offices and business centres, retail and restaurants, hospitals, schools and nurseries.

Binding the commercial and residential areas together will be clusters of parks, other green spaces and a wide range of facilities and services to make life in the city complete, contributing positively to public health and well-being.

PEDESTRIAN-FRIENDLY NEIGHBOURHOODS

In another trend being set in Masdar City and sure to be replicated in many other future cities, residents and visitors alike feel comfortable to leave their cars behind, given freedom to roam the spacious, pedestrian-friendly neighbourhoods.

When transportation is needed, it is ever present in the form of smart systems that include an inviting fleet of electric vehicles and driverless cars, providing easy links to all areas of the expanding city, enhancing the experience of livability.

Giving the city a significant extra dimension have been innovative pilot projects such as the Seawater Energy and Agriculture System, the Eco-Villas and the Masdar Solar Hub for testing and R&D of photovoltaic and solar thermal technologies. Dedicated to discovering cutting edge solutions in the fields of energy and sustainability, the institute has housed highly skilled graduates who come together in an innovative environment to test and develop new technologies.

It also offers partnerships to companies to expand a culture of innovation and entrepreneurship, drive economic growth, and accelerate the commercialisation of breakthrough technologies for global markets.

Inevitably, a concept as innovative and forward thinking as Masdar City is now taking on a key role this year in the UAE's commitment to build a workforce able to ensure the country keeps pace with the spiraling influence of artificial intelligence.

With worldwide economies being dramatically influenced by the rapid advancement of AI technology, the Emirates has established the Mohamed bin Zayed University of Artificial Intelligence.

Located within Masdar City, the new graduate-level AI research institution began accepting applications for its first masters and PhD programmes at the end of 2019, and classes are scheduled to begin in September 2020. The opening of the university represents a global challenge taken up by the UAE to harness the full potential of AI. Underlining the significance of this development, all students enrolling are offered full scholarships, monthly stipends, health insurance and accommodation.



"At Masdar we see the public realm as a place to create chance encounters, and interactions...The idea is to combine academia, the public sector and private sector, and for each to play a role to spur innovation."

Lukas Sokol
Masdar's head of city design and sustainable planning

Forward-thinking attention to detail in the design of the modern work-life space that helps define Masdar City has created a kind of 'greenprint' for cities in many other parts of the world that will be designed to accommodate the growing urban population of the next ten years

"We are very excited about the arrival of the university, because it reinforces our research and development components, but more than that, it is an important part of our thinking on the public realm," says Lukas Sokol, Masdar's head of city design and sustainable planning.

"Einstein said that play is the highest form of research, and at Masdar we see the public realm as a place to create chance encounters, and interactions, between the various sectors. The idea is to combine academia, the public sector and private sector, and for each to play a role to spur innovation.

"The key is to bring individuals working in those related sectors as close as possible, so we are directly integrating the public realm and facilities, and are now looking at expanding sports centres, to allow people to have not only productive lifestyles in terms of work, but also healthy lifestyles in terms of movement.

"These principles go back to the ancient Greeks, who had gymnasiums which were there not only for exercise but were also places of study, where people would go to know their own mind and body. If you get your blood circulating and oxygenate the brain, you become more creative and productive. So we are trying to integrate all these facilities and all these sectors together into an ecosystem that will inspire people to create the next great ideas and to grow the next big company."

There is a major emphasis at Masdar City on creating a sustainable community which becomes a catalyst for similar developments around the world, to ensure cities of the future cope with urban population growth.

"Masdar City has a very strong international presence, and has become a beacon of sustainability," explains Sokol. "We host more than 350 official delegations a year who come to experience what is being done and to see if any of these lessons can be transferred into developments internationally. We have received heads of state and politicians like Angela Merkel, Hillary Clinton and Boris Johnson. They all come to see for themselves this initiative and what we have been able to do so far."



DELIVER HUMAN PROGRESS

Masdar's opportunity to further increase its global influence arrives in January when it hosts Abu Dhabi Sustainability Week, now a well-established global platform aimed at accelerating the world's sustainable development. More than 150 policymakers, industry specialists, technology pioneers and sustainability leaders come together to share knowledge and map out strategies to deliver human progress.

"This gives us a perfect opportunity to share ideas between decision makers and leaders in the field, and also to showcase technologies and offerings that companies have already been able to innovate," says Sokol.

New ideas abound at Masdar City, and they have been combined with older concepts as well as a practical

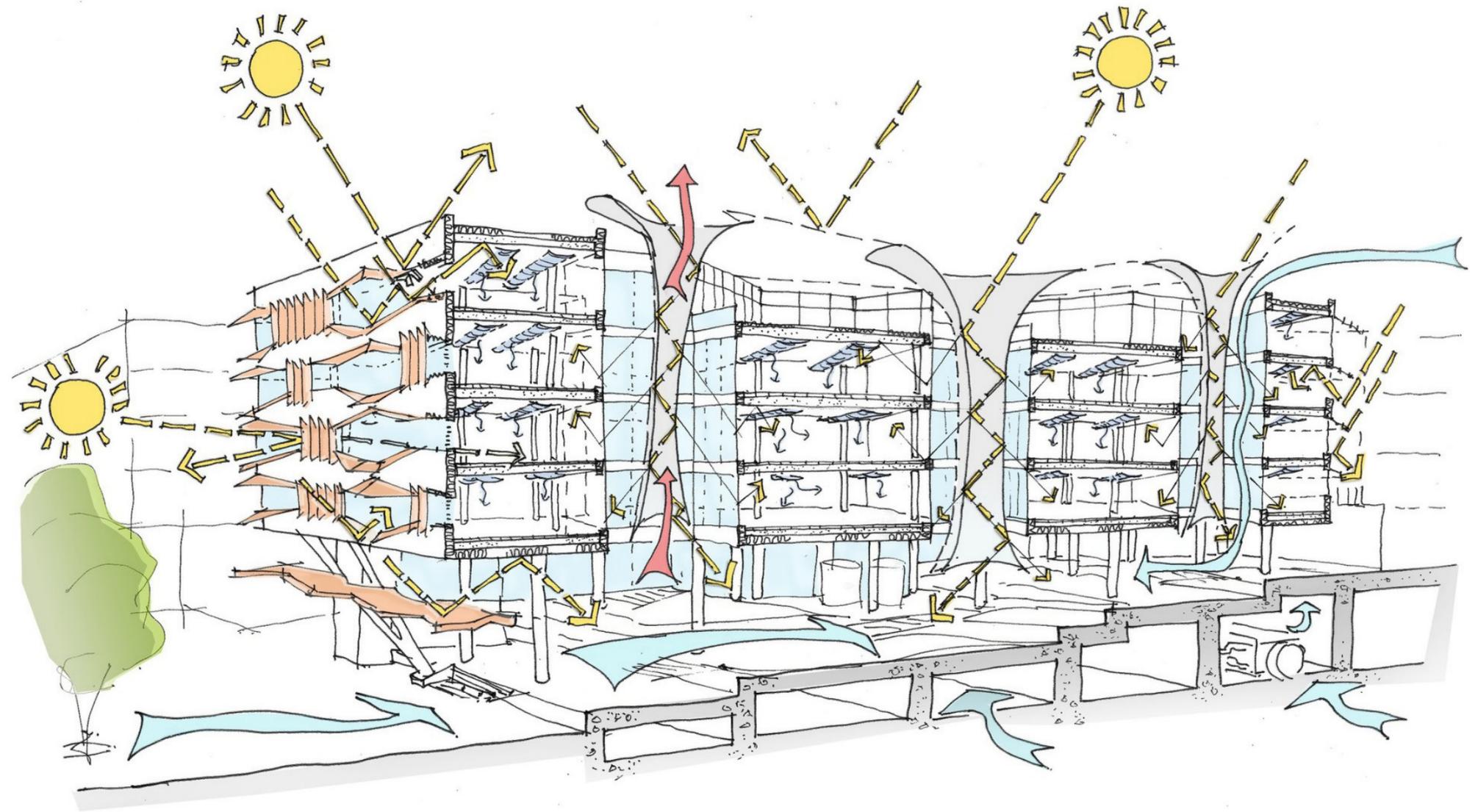


interpretation of what works best. During the initial planning stages, much thought was given to the most practical orientation of the buildings from a solar and wind point of view. The result is that the entire city has a north-westerly orientation, based on the fact the wind in the area generally flows from that direction. Knowing how to use the wind to cool temperatures in a hot climate is embedded in Arabic architecture and culture, and at Masdar City a giant wind tower allows people to congregate outside during the blazing summer months.

German conglomerate Siemens has its regional headquarters at Masdar City. The building (main picture) has earned a series of international awards for architectural design and sustainability.

"The building is an excellent example of what can be achieved by combining smart architecture and digital technology. Outside, aluminium panels reduce the need for cooling by providing full shade to 95 per cent of the building's glass surfaces. The building's orientation was also carefully considered to take advantage of prevailing winds, using the Venturi effect to direct wind underneath and up through Arabic-style wind towers, assisting with natural cooling," says Franco Atassi, head of smart infrastructure for Siemens in the Middle East (above).

"The intention with our Masdar HQ was to 'walk the talk' for innovation in sustainability. We wanted to show



that even in hot and humid conditions, we could use technology and intelligent design to dramatically reduce the environmental footprint of an office building."

According to the architects Sheppard Robson, the 22,800-square-metre structure, which floats above a new public plaza, is the result of a stringent brief to create a building that is "truly optimised for its purpose, delivering the most sustainable building possible for the same cost per square metre as a typical headquarters in the UAE."

Atassi adds: "Our building management system, constantly monitors and optimises resource efficiency, and the data shows that we reliably achieve an average of 55 per cent savings in energy and 47 per cent savings in water usage over a similarly-sized office building in the UAE."

"From a technology perspective there are multiple digital systems at work, each contributing to sustainability, safety and security. To keep our employees safe, a central security system controls more than 50 doors and turnstiles, 50 cameras and monitors 100 additional doors throughout the building. We have also integrated fire alarm, gas suppression and lighting control systems into the building's digital ecosystem."

SOLUTIONS FOR FOOD SECURITY

One of the biggest problems to be faced over the next ten years as the world's cities become more heavily populated is how to ensure a consistent and sufficient distribution of food.

A project now being conducted at Masdar City could see urban communities grow their own food in an allotment, an old idea with a modern variation. The city is piloting a future farming facility built from recycled shipping containers, with the initial aim to provide regional solutions for any food production crisis.

Less than one per cent of the region is arable and permanent crop land, and more than 40 per cent of the UAE's food is imported at a cost which will rise to more than US\$100 billion by 2030.

The pilot scheme at Masdar City develops vertical farming inside shipping containers equipped with hydroponic systems that can operate using minimal water. This is another key factor in a country where more than 40 per cent of natural water sources have been lost in the past 20 years through overuse and despite water scarcity, 84 per cent of water is used for agriculture and irrigation, which contributes less than one per cent to GDP.

With conventional farming no longer sustainable in the UAE, the development of alternative models is essential, and the kind of innovation being shown in this area at Masdar City is vitally important.



"With the world's population expected to exceed nine billion by 2050, efficient and sustainable production and distribution of food is becoming increasingly important," says Yousef Baselaib (pictured above), executive director of sustainable real estate at Masdar. "This is particularly true for countries with arid climates and harsh environmental conditions like ours."

The retrofitted 12-metre shipping containers in use at Masdar City grow four tonnes of leafy greens per year, using less than 40 litres of water a day. The crops are constantly monitored by the latest technology within a sealed environment, shortening the growing cycle. Temperature and carbon dioxide levels can be regulated via a mobile phone app, with an automated nutrient delivery system to produce the best possible results. These systems can be applied to urban areas to encourage people to eat home grown produce.



ABU DHABI SUSTAINABILITY WEEK

Masdar has joined forces with the UAE's Food Security Office to address the most important environmental issues likely to impact the nation. During Abu Dhabi Sustainability Week, Masdar will turn the spotlight on other projects focused on vegetable and livestock farming, water harvesting and recycling, waste recycling and how to use energy for cooking.

At the end of the week, more cities will think this way, and Lukas Sokol believes many of the biggest challenges successfully negotiated at Masdar City can result in lessons being learnt far and wide.

"Of course, our focus has been on some of the more local challenges, primarily dealing with our hot and humid climate in the UAE," he says. "When the Masdar initiative was started we identified that there was a gap in both the research and the experimentation of identifying how cities in the region can be more sustainable.

"Our focus had been to develop solutions, and technologies and strategies for this particular climate. However, through that, the lessons learnt have been that many of the solutions are very universal."



CHAPTER 5

SPACE EXPLORATION

Masdar City's
example is shaping
ideas for urban
development

AS CITIES AROUND THE WORLD are shaped over the next ten years to cope with growing urbanisation, it is inevitable that progress made and lessons learnt at Masdar City will prove invaluable.

But what aspects of Masdar City's design and development are most important in terms of helping to spark ideas for the wider world beyond Abu Dhabi?

Certainly Masdar City's example has helped bring to life the principles that drive economically, environmentally, culturally and socially relevant sustainable development in the emirate itself. The city has always been envisaged as a centre for the advancement of new ideas, not just for energy production, but broader innovation, as it attracts world-class expertise.

According to the original architects – Sir Norman Foster's Foster + Partners – “the city is designed to encourage walking, while its shaded streets and courtyards offer an attractive pedestrian environment, sheltered from climatic extremes”. This was achieved by combining state-of-the-art technologies with traditional Arab planning principles. Yet how can these ideas be smoothly transferred to the thinking behind development in other places? How can the ingredients behind the success of Masdar City be best understood and used as a template for sustainable building around the world?

Offering insights in response to these questions, experts with a deep knowledge and understanding of the project are convinced that Masdar City points the correct way ahead for future sustainable urban development, particularly in terms of incorporating green spaces and the benefits they bring.

They include Duncan Denley, managing director at Desert INK, a forward-looking landscape architecture company working on high profile projects in the UAE including the Sustainability Pavilion at Expo 2020 Dubai and Masdar City Square.

“For me, the most important aspect that underpins Masdar City as the world's most sustainable community is the fact that it is driven by core sustainability principles from macro to micro scale,” says Denley.

“Unlike most developments where sustainability is an afterthought, 'clipped-on' to a largely standard building or district, everything about Masdar is considered from a sustainable perspective.



FUNDAMENTAL SUSTAINABLE PLANNING

"Sustainability is considered when locating buildings, defining their function and even orienting them for beneficial microclimatic effect and encouraging walkability. Most other developments are developed on a plot-by-plot basis and so inevitably the potential sustainability benefits are then limited to decisions like materials and finishes rather than the fundamental sustainable planning principles which is where the big wins are found."

Elizabeth Monoian and Robert Ferry (pictured far right) are founding co-directors of the Land Art Generator Initiative, which brings together artists, architects, landscape architects and other creatives working with engineers and scientists to find solutions for sustainable energy infrastructures. Their international design competition has become one of the world's most followed sustainable design events.

"The design of Masdar City demonstrates that life in a decarbonised world does not need to involve sacrifices to our lifestyles," says Monoian.

"Rather, we can smartly employ technology to improve our quality of life in a city of innovation and experimentation, education and experiences - teeming with art and culture. It's a city that also happens to be vastly more in harmony with the environment than the cities that we constructed in the 20th century."

While the growth of urban populations over the next decade has become an issue of global concern, experts are convinced that developers and planners of sustainable cities in other parts of the world can take important lessons from the concept, design and development of Masdar City.



"Dense urban areas are predominantly self-shading. Dense urban planning increases the viability of mass public transport. They are vibrant and bustling, which makes people feel good and part of a community"

Duncan Denley (above)
Managing director at Desert INK



PREDOMINANTLY SELF-SHADING

"If there is one key lesson or rule to be learnt from Masdar, then it is urban density is a great thing," declares Duncan Denley. "Dense urban areas are predominantly self-shading. Dense urban planning increases the viability of mass public transport. They are vibrant and bustling, which makes people feel good and part of a community."

"The facilities constructed are more intensively used, retail and dining outlets are more successful. I always equate great urban design to a good party. Anyone who has been to a party where lots of people are crammed into a

relatively small space will recognise that there is a certain buzz to being among people.

"You meet the other partygoers, you interact as you negotiate your way around the space. Contrast this to a party in a massive house or hall, where the same number of guests fails to achieve that buzz as people drift off to corners and other rooms and hence don't interact."

Robert Ferry at LAGI is firm in his belief that Masdar City's success underlines that it is possible for old methods, and habits, to be refreshed or replaced.



“One of the lessons for developers and planners is that truly sustainable architecture requires a fundamental redesign of the means and methods of construction. The building industry is notoriously reticent to change, but with buildings accounting for 40 per cent of global carbon emissions, it is absolutely critical that over the decade of the 2020s we re-think entirely the ways that we design and build our cities.”

Ferry is equally resolute in affirming that Masdar City offers powerful evidence of the importance of the public realm in truly sustainable urban development, particularly in view of the expected population growth in our cities over the next decade.

“Healthy and thriving cities require parks and open spaces for a variety of reasons, from improved public health, both mental and physical, to the ecosystem

services, such as storm water management, they provide,” says Ferry.

“Shared open spaces allow planners to increase overall density and maximise energy efficiency. In the context of low carbon energy strategies, these spaces, when thoughtfully designed, can double as distributed renewable energy generation landscapes.

“The beautiful outcomes of our 2019 design competition for Masdar City demonstrate the usefulness of this approach by bringing renewable energy infrastructure to life in ways that engage people in public spaces.”

The competition invited creatives to design a work of art for a landmark site within Masdar City, using renewable energy technology as a medium of creative expression to provide on-site energy production.

A NEW WAY AHEAD FOR DESIGN

It was run in partnership with the 24th World Energy Congress staged in Abu Dhabi in September, when an exhibition showcased 28 shortlisted projects designed for Masdar City.

During Abu Dhabi Sustainability Week, the spotlight falls on the winning entry, Starlit Stratus (above), as LAGI proceeds to assemble a team of international experts to develop a feasibility study and prototype.

Starlit Stratus was described as “a perfect example of the new way of approaching the design of our cities...creating a dynamic public space filled with shade and mist”

Duncan Denley, meanwhile, maintains that practicality is vital to the success of the public realm. “Good quality

The competition invited creatives to design a work of art for a landmark site within Masdar City, using renewable energy technology as a medium of creative expression

public realm is not about 'window dressing,'" he says. "It is not beautification of the spaces left over between buildings. The space configuration and content of the spaces between buildings are far more important to humans than the facades or external appearance of the buildings themselves.

"It's important that the spaces we create are hard-working and useful, not just attractive. Urban spaces are attractive when they are filled with people, so let us ensure that there is shade in hot climates, somewhere comfortable to sit, some interesting activities and the ability to programme the space according to seasons or time of day.

"When we create such spaces, people inhabiting these dense urban areas are happy and use the spaces more, which in turn attracts other people to sit, walk and populate the urban areas.

"Cities cannot just be tolerable, but desirable places to live. Look at cities like Vancouver, Melbourne and Copenhagen where people actively choose city over suburb due in most part to the successful public realm which brings huge health, social and cultural benefits."

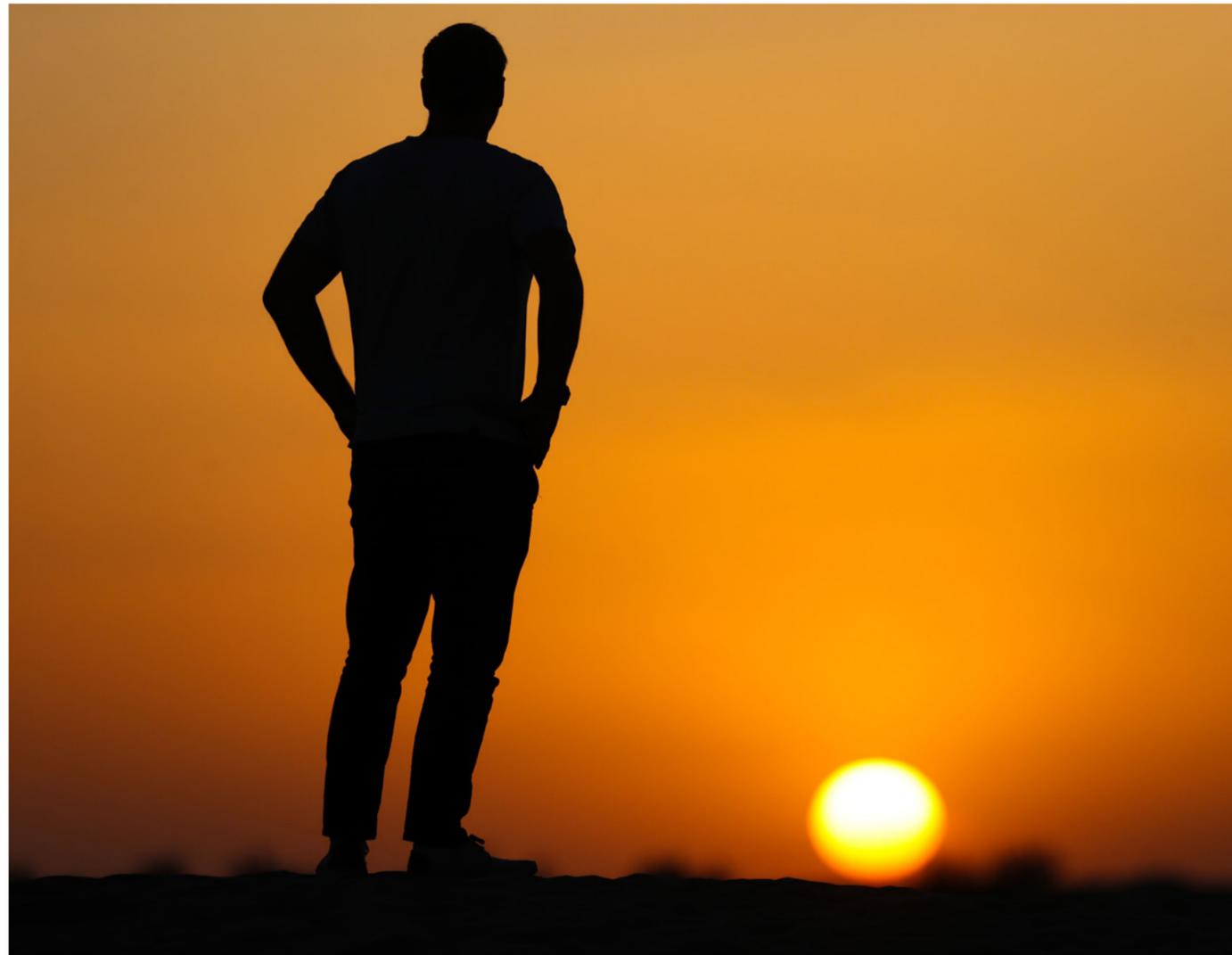
Adds Denley: "Anyone who still remains unconvinced that quality public realm design is of critical importance in our rapidly urbanising planet should read the work of a visionary Danish urban designer, Jan Gehl, who has learnt to 'read' cities.

"The funny thing about Gehl's work is that anyone can understand the principles which he highlights to us, since we have all experienced the elements that make public realm successful. He identifies simple principles which we all know instinctively. People are more likely to walk if the points of attraction are close by.

"When people walk, they see and meet each other, which makes them feel good. If we design more roads, there will be more cars. If we increase the number of parking bays, more cars will park there. If we don't provide safe cycle routes, no one will cycle. These principles are not rocket science, yet they are so powerful when you join the dots and integrate this thinking."

Denley has strong beliefs about the most important effects that living and working in Masdar City have on residents and members of its business community in terms of health, well-being, and that these can help to spread the word.

"Residents, whether daytime workers or those living in the community at Masdar will benefit from several



aspects," he says. "Notably the ability to walk between buildings, shops and restaurants. It is a simple pleasure, but one which unfortunately is quite rare in our region, yet fosters casual exercise, chance meetings with others in your community, casual networking and creates that all-important vibrancy critical for an urban centre.

"It is my hope that those who work and live in the district will become advocates for this way of life and will be critical in spreading the sustainable message of Masdar beyond the community."

Similarly, Elizabeth Monoian at LAGI sees Masdar City's contribution to the health and well-being of its residents and workforce as vitally important to urban development.

"When we live and exercise in a city free of the air pollutants from vehicle exhaust, diesel generators, and gas combustion, we will see immense benefits over time to our health and well-being," she says.

LESSONS OF NATURE

"This will be enhanced by an environment that is designed with the lessons of nature in mind – biophilic spaces resplendent with plant life and a variety of spaces for collective and private enjoyment – open spaces that, much like a mature forest, make the most efficient use of every photon of sunlight rather than reflecting them back into space with concrete parking lots and empty rooftops.

"The designs submitted to the 2019 design competition for Masdar City, such as Starlit Stratus, Nest and The Oasis at Masdar City, demonstrate how sunlight and heat energy can be harnessed to naturally create microclimates of lush and verdant forests within desert cities without the need for external water or energy.

"By creatively harnessing the resource that the UAE is most rich in – the power of the sun – we can contribute positively to health and well-being, for a city that feeds the cognitive function of its entrepreneurs, educators, artists, and scientists, and leads us to a better future without sacrificing the natural world that makes it all possible."

CHAPTER 6

THE URBAN SPRAWL

Cities across the world
make well-being of the
population a priority



THINKING OF LOS ANGELES, invariably and inevitably, provokes images of Hollywood, celebrated centre of the entertainment industry, its name spelt out in famous white letters fixed on the Santa Monica Mountains.

LA is known everywhere as the home of Tinseltown, the glittering hub of the film world, renowned for its celebrities, its Walk of Fame, Universal Studios, Sunset Strip and Hollywood Boulevard.

In much broader terms, Los Angeles is a city like many others in the United States, afflicted by disturbing issues developed out of its vast urban mass, from air pollution, soaring rates of diabetes, asthma and other preventable diseases, to shattered sidewalks, shut down playgrounds, and a cavernous rift in health levels between its rich and poorest communities.

Los Angeles is, however, taking back control, given new impetus towards changing its uglier sides by a growing trend for city leaders to have an influence on health and well-being through policies driven by various local authority departments.

This sprawling metropolis in Southern California, the second most populous city in the United States after New York City, has been working hard in recent years to rid itself of the ailments hanging over it like a dark cloud. Los Angeles is a city getting in touch with its problems, in an age when heart disease, stroke, diabetes, cancer, and other chronic diseases are the leading causes of premature death and disability in society.

FAR-SIGHTED POLICIES

This has led to thorough examination of the connections between social and environmental conditions of communities and the health of residents, building appreciation of the impact of land use on the health and well-being of communities.

Years of research and consultancy with all the city's stakeholders led to the emergence of 'OurLA2040', a comprehensive update to the City's General Plan, laying down far-sighted policies to help create a more prosperous, liveable and sustainable Los Angeles over the next 20 years.

In preparing the plan, LA confronted issues such as parts of the city having less than half an acre of park space for every 1,000 people, with only 30 per cent of residents living within walking distance of a park.

These were worrying figures in the face of studies showing that access to public parks and recreational facilities have not only helped reduce neighborhood crime, but were effective in promoting physical activity and enhancing mental health.

The city's new roadmap is geared towards an economically prosperous and sustainable Los Angeles, whose population is scheduled to grow from more than four million people today to 4.6 million by 2040.

It sets out to shape a city that will noticeably improve the quality of life for all residents, delivering reliable and high quality basic services and amenities.

Plotting the direction for the way the city will grow and change, its key elements include parks and open space, public facilities and community assets, land use and economic development, water and energy conservation, air quality, historic preservation.



LISTENING CLOSELY TO RESIDENTS

In the ongoing process to build an effective plan, Los Angeles city planners have been listening closely to residents, staging regular meetings billed as Community Conversations to hear their concerns and identify themes, issues and opportunities for the city's future open space.

Among the main messages and conclusions to date have been that open space is essential for quality of life because it provides social, health, environmental, aesthetic and educational benefits to the community, and that the allocation of open space must take in essential factors such as population density, income distribution and proximity to schools.

This putting together of heads has identified a number of creative ways to expand the city's open space network, including using underutilised roads or golf courses, as well as city-owned land parcels and roof gardens on public buildings.

Almost 13,000km away across the Pacific Ocean, the city of Melbourne has something in common with Los Angeles, apart from its position as the country's second most populous city, but nevertheless associated with that fact.

Melbourne's population, currently at more than 4.8 million, is not just growing, but growing faster than the amount of green space and outdoor recreation space is increasing.

As the capital of Australia's southeastern state of Victoria, Melbourne lives under a banner declaring that, as everyone needs a happy space, space to catch their breath and breathe, this is "the perfect place".

To keep it that way, Melbourne's challenge is to meet the needs of the growing and changing residential and worker population, and ensure the health and well-being of all its people in a city which manages 48 sites spread across more than 500 hectares of open space, representing 15 per cent of its total area.

This putting together of heads has identified a number of creative ways to expand the city's open space network, including using underutilised roads or golf courses



Many of the major open spaces were created towards the end of the 19th century as part of a vision for a green belt of parks encircling the city, and are synonymous with the character of Melbourne and its reputation as one of the world's most liveable cities.

Preserving the city's character is a major undertaking for planners who know that population growth will result in more people living and working in higher density neighbourhoods, meaning more people needing to use open space for the benefit of their physical and mental health and well-being.

A NETWORK OF OPEN SPACES

The increased demand on open spaces is intensified by the fact that population growth is already occurring in areas with little or no open space.

Melbourne has responded by developing its first Open Space Strategy to direct the open space planning until 2027. One of its main aims is create a network of open spaces within easy walking distance for the community, particularly in areas where the heaviest population growth is forecast.

In a household survey undertaken during the research phase of the strategy, many people emphasised that they chose to live in the city because of the open space.

City planners say that "green areas perform important environmental functions in cities including improving the urban climate, capturing atmospheric pollutants and improving quality of life by providing recreation space."

Famed for its historical parks, gardens and boulevards, which are integral to its social and cultural life and

development, Melbourne's plans are built on the philosophy that open space boosts physical and mental health and well-being, while making its people feel closer to each other, and more connected.

The city has set out to create a system of major new open spaces to cope with the population growth, catering to the demand for outdoor sport, recreation and leisure opportunities, while also hosting festivals and events. They will be linked by a system of existing and new on and off-street trails ideal for cycling and walking

A key part of Melbourne's open space future is effective water cycle management, in order to maintain the quality of public open spaces in a city dissected by three major waterways: the Yarra River, Maribyrnong River and Moonee Ponds Creek.

These combine not only to make this a beautiful city by giving life to parks and gardens, but also deliver recreational, economic and tourism benefits, in essence creating a liveable city.

While the Yarra River was one of the main factors giving rise to Melbourne, for many years the city turned its back on the waterways. But this changed in the 1980s when moves began to establish open spaces along their banks.

The waterways are now used for recreational boating and rowing, and their open spaces lure residents outdoors for jogging, cycling, walking and other activities promoting social connectedness and community health and well-being.

In order to monitor its progress and compare performance with that of other cities, Melbourne uses a range of health, well-being, participation and connection indicators

To keep this trend flowing, Melbourne is heavily focused on effective urban water management, a key part of which is the intercepting of stormwater before it goes down the drain, so that it can be used to keep the city green and cool.

In order to monitor its progress and compare performance with that of other cities, Melbourne uses a range of health, well-being, participation and connection indicators.

These measure key elements such as the level of personal well-being, standard of living, satisfaction with health and what residents are achieving in life, as well as the feeling of personal safety, and of belonging in a community.

Measurement of urban development's effect on well-being is not easy, particularly in view of the time needed to devise and implement strategies capable of making a difference.

In 2009, Vancouver announced boldly that it was challenging itself to become the greenest city on Earth by 2020, effectively launching a global competition with the likes of London, Sydney, Copenhagen, New York, Portland, Seattle, San Francisco, Chicago, Toronto, Berlin, Paris, Stockholm and many more.

This was Vancouver, widely recognised as one of the top five cities worldwide for livability and quality of life, recognising the desire of its residents to protect their right to live in a city that is vibrant, affordable and sustainable, given its majestic setting, lapped by the Pacific Ocean, with a spectacular mountain backdrop.

It was also Vancouver embracing the movement towards more green urban areas as a means of making the world's cities better adjusted to their responsibility towards well-being in the face of rising urban populations.



ROAD MAP TO A BRIGHTER, HEALTHIER FUTURE

The World Health Organisation says having access to green spaces can reduce health inequalities, improve well-being, and aid in treatment of mental illness. It also points to analysis suggesting that physical activity in a natural environment can help remedy mild depression and reduce physiological stress indicators.

'Vancouver 2020: A Bright Green Future' became the city's road map to a brighter, healthier future for its population, following two years of consultations with 35,000 people, including 9,500 city employees, members of advisory committees, and participants in a variety of workshops and other events.

Among the plan's main objectives were the resolve to put the city in even closer touch with its natural surroundings, seen as a crucial step to make Vancouver a better place to live for its residents, their children, and grandchildren.

Acknowledging that its long term objectives could take up to 30 years to achieve, the city identified ambitious but achievable targets for 2020.

These included ensuring that every person lives within a five-minute walk of a park, beach, greenway, or other natural space, while planting an additional 150,000 additional trees. There was also a commitment to making mobility much more relaxing and stress free, by ensuring that more than 50 per cent of the trips residents make are on foot, bicycle, and public transit.

So how far has Vancouver gone to becoming the world's greenest city, and a city where modern urban development translates into public well-being? Asked the question on the eve of 2020, Doug Smith, the city's director of sustainability, said: "We're not there yet. But I would say it's been wildly successful so far. We've hit two-thirds of our targets. And we've moved the conversation in the right direction."

It is a question that many more cities must also find a way to answer in the affirmative.



CHAPTER 7
**THE WAY
FORWARD**

Rethinking the path towards
sustainable future cities

WHAT WILL BE THE MOST IMPORTANT elements in creating cities for the future which achieve the objectives for public health and well-being in practical terms?

It is a question that will be answered in many ways over the next decade as the concepts of master planners, architects and designers transfer from the digital drawing boards to reality.

The International Resource Panel, part of the United Nations Environment Programme, says it is vital to re-think cities so that they are able to face the challenge brought by increasing urbanisation.

In its report *The Weight of Cities, Resource Requirements of Future Urbanisation*, the scientific panel of experts points to an "once-in-a-lifetime opportunity" to shift the dramatic growth in city populations on to a more environmentally sustainable and socially just path.

The report says that decisions made today on urbanisation and land-use models, as well as on critical infrastructure, will determine whether our investments are future-proof, or whether they lock us on to an unsustainable path.

Calling for a new strategy for 21st century urbanisation, it says city stakeholders from academia, policymakers, community leaders, designers and the business community need to reconnect and rethink the relationship between cities and the natural environment.





A RADICAL CHANGE

Among its main recommendations are that cityscapes need to be designed for people not cars, and must allow the poor in particular to access the opportunities of the city.

The report proposes “a radical change” in default approaches to urban planning to prevent uncontrolled sprawl and promote high-density, mixed-use communities with safe and inviting streetscapes, connected by efficient and affordable mass transit systems.

It advocates liveable, functionally and socially mixed neighbourhoods, resource-efficient smart buildings and urban energy, waste and water systems, all supported and reinforced by changing values and behaviour to make it all work.

Urban infrastructure and land-use policy must be strategically linked to achieve sustainability goals, highlighting the potential of transit-oriented development to significantly change the way people and goods move through the city, reducing dependence on fossil fuels and potentially improving quality of life for inhabitants.

The report recommends development of attractive mixed-use and socially mixed inner-city neighbourhoods, housing the top schools, cultural amenities, sporting and recreation facilities, and pavements that are safe and clean.

EMOTIONAL EFFECTS OF SPACES AND SYSTEMS

Charles Montgomery, the award-winning Canadian writer, urbanist and design consultant, is a strong voice behind the move to drive fundamental changes in the way our cities are conceived, with a new emphasis on understanding how they affect the people who live there.

Montgomery points to a powerful, unbreakable link between environmental sustainability and social sustainability in cities, and says the responsibility to shape our urban future must be shared not just by governments, architects and designers, but also by all individuals living in cities.

“If we give a damn about human well-being in cities, we need to study the emotional effects of spaces and systems,” says Montgomery. “We need to use evidence to help fix the horrific mistakes we’ve made over the last century.”

Passers by are four times more likely to help lost tourists on busy streets packed with small shops, rather than in characterless neighbourhoods where people move around more quickly

In his book *Happy City*, also the name of his design consultancy, Montgomery advocates the retrofitting of cities for happiness, through designing streets, parks, housing developments and shopping malls to make people feel and behave better, happier and be kinder to each other.

Extensive studies of psychology, neuroscience, public health and behavioural economics by Montgomery's team have shown that patients able to see trees from their hospital bedside windows recover faster than those who may gaze out on to brick walls.

Underlining research results which showed that the most important ingredient for human happiness is social connection, an experiment conducted in Seattle found that passers by are four times more likely to help lost tourists on busy streets packed with small shops, rather than in characterless neighbourhoods where people move around more quickly.

"We think the kindness effect was a result of velocity," says Montgomery. "People are nicer to each other when they move more slowly and have time to make eye contact."

Montgomery, who works with entities around the world to build "places that are happier, healthier and more inclusive," says that for many years policymakers have used GDP or economic growth as the measure of success in creating well-being.

He describes this as a "perverse" system which fails to measure the things that really matter in our cities, such as social inclusion – who's involved in the success of a city – people's health and social connections, sense of meaning and belonging in our cities and the resilience of communities.

All these things, he maintains, work together to produce happier, healthier more successful societies, but there are other key elements which have to be carried forward in the design of future cities.

"By understanding the link between human well-being and the way we design and live in cities we can all be part of that process of shaping our future in cities."

Charles Montgomery
Award-winning Canadian writer



HIGHER LEVELS OF TRUST

"There's a powerful relationship between environmental sustainability and social sustainability in cities," says Montgomery. "You can't have one without the other. Of course, we need to reduce our impact on the environment. We need to bring down greenhouse gas emissions. But at the same time we need to pay attention to the social element in cities, and have our cities really working for people."

"The good news is that we can accomplish both at the very same time. So measures we take to improve well-being in cities can also reduce our impact."

"Just take a look at some of the most wonderful and happy

urban places. These are walkable, connected places that make it easy for everybody to get around. People who live in those kind of places are reporting having higher levels of trust in strangers, better relationships with their families, and a greater sense of neighbourliness. They perform better on economic measures, and people are healthier in those places.

"So we really can have it all – the happy city, the green city, the low carbon city – these really are the same place."

Montgomery firmly believes that those who will live in the cities of the future, share responsibility with those who design and build them to ensure they work.

“By understanding the link between human well-being and the way we design and live in cities we can all be part of that process of shaping our future in cities,” he says. “Yes governments can take action to enable new ways of moving in cities, healthier ways of moving. We can build places that are more connected, more open.”

“But at the same time individuals can make a difference as well, by choosing to move differently, by taking control of their own neighbourhoods, for example transforming public space into social space, rather than car space. This is a challenge for all of us and we really all can shape our urban future.”

Elizabeth Monoian, founding co-director of the Land Art Generator Initiative, believes the move to clean energy will have a major influence on the way of life for growing populations in the world's cities.

“The energy transition will not only create a livable climate for future generations, but it will also increase the quality of life for everyone,” she says. “We will have far fewer air pollutants, which will result in fewer cases of asthma and other respiratory ailments, possibly reduce autism rates, and generally extend human life expectancy.”

“We will have a more benevolent impact on wildlife and natural habitats, allowing them to flourish in greater proximity to cities. We will consume less energy because electrification will allow for more efficient use (electric motors are twice as efficient compared to internal combustion engines).”

“This will allow us to put more energy into human culture, education, and other endeavors of human thriving. If managed smartly, the energy transition will provide new opportunities for social mobility by empowering people everywhere to become prosumers, not merely consumers, distributing investment in wealth generation through new means of energy production.”

Adds Monoian: “A world in carbon balance will provide a mix of centralised utility-scale renewable energy landscapes (large solar arrays and wind farms that require transmission infrastructure) and decentralised local installations (rooftop solar and community energy) that will create greater resilience and ease the burden (and cost) of transmission.”

“In both centralised and decentralised clean energy systems there is an opportunity to think creatively about how the public engages with them, and how the infrastructure responds in its design to environment and culture.”



THE CHALLENGE IS MASSIVE

“Technologies such as solar panel laminations (for colourful and artistic PV panels) can allow energy systems to weave themselves into cherished and historic public spaces. Especially in the case of urban clean energy installations we can create new forms of art like Land Art Generator Initiative Solar Mural installations to make our cities more beautiful and inspiring as they become more sustainable.”

The way ahead towards sustainable future cities impacting positively on public well-being is clearly lit, and visibly dotted with obstacles and challenges.

Maarten Hajer, distinguished professor of urban futures at Utrecht University, Netherlands, was co-author of the International Resource Panel's report *The Weight of Cities*.

He says unequivocally: “We must rethink the way in which we urbanise. City networks constitute a great opportunity for city governments to collaborate and learn from each other. Our report shows we can achieve an urban form that is both socially and ecologically sustainable. Yet the challenge is massive.”

A woman with long, wavy, light blue hair is wearing a black leather jacket and a VR headset. She is holding two VR controllers, one in each hand. The background is dark with some blurred lights.

CHAPTER 8 **A DIGITAL REVOLUTION**

Technology will shape
future cities but
planners must listen to
what people want and
outdated ideas will go

NOTHING IN THE WORLD is more certain over the next decade than dramatic urban population growth. By 2030, the number of cities on Earth with at least one million residents could jump from 548 to more than 700.

The challenges are enormous, and universal. The solutions are available and evolving but also embedded in years of failure.

Ahead lies a digital revolution which will have a major impact on the way future cities are designed to make life inside them safer, more comfortable and sustainable, before the first resident moves in.



The Austrian Institute of Technology says the cities of the future must not only be equipped with smart technologies, but also be planned digitally

MASSIVE DIGITAL TRANSFORMATION

The struggle to make future cities better places to live for millions of additional residents, inevitably, includes a major role for new digital technology, and in particular, artificial intelligence.

The Austrian Institute of Technology notes that cities and regions are undergoing a massive digital transformation, bringing enormous challenges in terms of climate-intelligent spatial planning, sustainable energy supply and mobility.

The Institute says the cities of the future must not only be equipped with smart technologies, but also be planned digitally, from the quarter to the building.

At the Smart City Expo World Congress in Barcelona in November, 2019, the Institute unveiled an interactive planning and analysis platform, supported by AI, as a model laboratory for the urban planning practice of the future.

The lab has recently been used to supervise the smart revitalisation of three Uzbekistan cities, and can use AI for rapid prototyping, allowing complex development scenarios for cities or new districts to be developed, implemented and integrated into existing concepts.

Franco Atassi, head of smart infrastructure for Siemens in the Middle East, says digitalisation will be a key factor in developing the world's future sustainable cities, revolutionising design and construction, creating buildings which learn from the people occupying them, and act on their behalf.

"We spend 90 per cent of our lives in buildings, and they are currently responsible for consuming around 40 per cent of the world's energy," says Atassi. "It's imperative that we view any building – regardless of its use – as an opportunity to improve sustainability and usability.

"Globally, our technology digitalises buildings across almost every sector. In the UAE there are airports, mosques, shopping malls, hotel complexes, hospitals, concert spaces and theme parks which all have our digital technology running behind the scenes.



SMART BUILDING TECHNOLOGY

"Dubai Airport, the Atlantis Hotel, Dubai Opera and the Sheikh Zayed Grand Mosque are all digitalised by Siemens building technology. The positive impact of digitalisation is clearly seen at Dubai Airport, where we were able to reduce the annual energy bill by 20 per cent and save 25,000 tonnes of CO2.

Added Atassi: "All sectors have much to gain from embracing digitalisation in buildings. A smart hospital, for example, can use IoT technologies to track patients, medication and assets. Intelligent buildings in universities could use dynamic lighting to create an optimum environment for students to study.

"Intelligent devices and smart building technology are crucial in reducing our environmental footprint and creating sustainable spaces, and our aim is to use digitalisation to make cities of the future better places to live, work, heal and learn."

On the question of what further advancements in smart building technology can be expected to shape future cities, Atassi declares: "The next ten years will see the digital revolution begin to have real impact on our cities. For example, digital twins will be used extensively in the design and construction of buildings and city infrastructure.

"The ability to construct a perfect digital representation of future buildings means they can be smart from day one; optimised for sustainability, comfort and safety in the virtual world before the first brick is laid.

"We are already demonstrating the potential of connecting a city's infrastructure to the Internet of Things with our work at Expo 2020 Dubai. As more and more devices are connected to the Internet of Things, buildings will play a larger, more flexible and integrated role in city ecosystems. They will, for example, become a more active part of the energy value chain as both consumers and producers.

Atassi continues: "Buildings will increasingly react to their surroundings. The trend of interaction between buildings and people continues to gain traction as we strive to create environments that respond, learn and adapt to the needs of those using them.



UNCONSCIOUS INTERACTION

"Previously, much of this interaction was achieved manually, and we're now starting to see a transition toward smart buildings making greater use of automation and data analytics.

"Eventually we will achieve unconscious interaction, where occupants have no direct interface with the digital building. At this point sensors, data analysis and actuators are doing all the work in the background, and the building is constantly learning from – and acting on behalf of – its occupants."

So what can hold back progress?

Learning from past mistakes remains an essential factor,

and one which renowned Danish architect and urban design consultant Jan Gehl puts vividly into perspective.

In his book *Cities for People*, he observes that, in recent years, the way cities have been planned and developed has dramatically changed, much for the worse.

Gehl, who for more than 40 years has studied how people make use of the spaces where they live and work, says that for at least that long, those responsible for delivering the cities ignored the people who would live in them.

He cites Brasilia, the capital of Brazil, as a perfect example of this, and of the fundamental change in city planning and design that is needed to make future cities better, happier places in which to live.

"From the air it's very interesting," he says, lamenting the habit of planners who 'took off in planes so they could organise the new optics of the big city.' It's interesting for a bird or eagle. From the helicopter view, it has got wonderful districts with sharp and precise government buildings and residential buildings.

"However, nobody spent three minutes to think about what Brasilia would look like at the eye level. That was typical – planners were to look after the plan, the architects were to look after the buildings.

"With modernism, they were free of the context of the city. They placed it on open lands surrounded by grass. Nobody was responsible for looking after the people who were to move in these new structures."

Gehl maintains that caring for people in the city is central to achieving "lively, safe, sustainable and healthy cities."

"It is my very firm point of view that if we take a more systematic approach and take these 'cities for people' more seriously, we will find that the cities would be considerably more friendly, livable, and lively because people will be in these cities more," he says.

QUALITY PUBLIC TRANSPORTATION SYSTEM

"We will find that the cities will become more attractive because the scale will be smaller and the pace and noise is lowered. The cities would be dominated by other people, which is the most interesting thing in our lives," says Gehl.

"They would be safer because if people are using a city it will be safer. They would be more sustainable because suddenly it'd be much easier to make cities where we can have a good quality public transportation system, where we can walk in style and dignity to and from the station day and night in safety, and have a good time doing it.

"A good public transportation and a good public rail, they're brothers and sisters. Finally, and this may be the most important thing, we would have natural activity built into the day."

In emphasising this last point, Gehl lays blame at the feet of the modern system in which people "don't have to move at all," compared with previous generations. This is particularly the case in an increasingly digitalised world.

"Now the great majority in the western world is sitting throughout the day, sitting in the morning, sitting on the transport, sitting during work, sitting on the transport and sitting in the evening, tired and looking at television. In this way there is no natural activity built into the day.

"You have to set aside special fitness time. Some do but most don't. That is why cities like Copenhagen, Melbourne, Sydney, New York and Vancouver now have a specific policy. These cities will do whatever they can to invite people to walk and bicycle as much as possible in the course of their daily activities.

"Only one hour of moderate exercise like walking for half an hour to work and half an hour back, or bicycling, can give you an extra seven years of life. If people will please start to move around themselves again, it will also give a much lower health bill to society."

To make this happen in future cities, Gehl identifies some simple options. "We can simply make sure that car parking lots are far away from where you have to go and there are many stairs in front of you instead of many escalators," he says. "There's a number of things we can do to make a bicycle system really efficient – like in Copenhagen – so we hardly consider taking the car."

Gehl's vision of a happy city is one featuring clusters of shopping streets, with a shop every five metres "to



"Only one hour of moderate exercise like walking for half an hour to work and half an hour back, or bicycling, can give you an extra seven years of life."

Jan Gehl
Danish architect

coincide with the stimuli humans need every five seconds. If you walk at normal speed, and there is a new door and a new exhibition every four, five, six metres, that will be just the ideal stimulation for your senses."

In another nudge to future city planes, he declares: "Communities need to offer little gardens, groceries and children playing. The battle for quality is won in the small scale."

Duncan Denley, managing director of landscape architecture firm Desert INK, says obsolete design principles held on to by decision makers pose the biggest threat to the reality of future cities being shaped by smart technology to the benefit of growing urban populations.

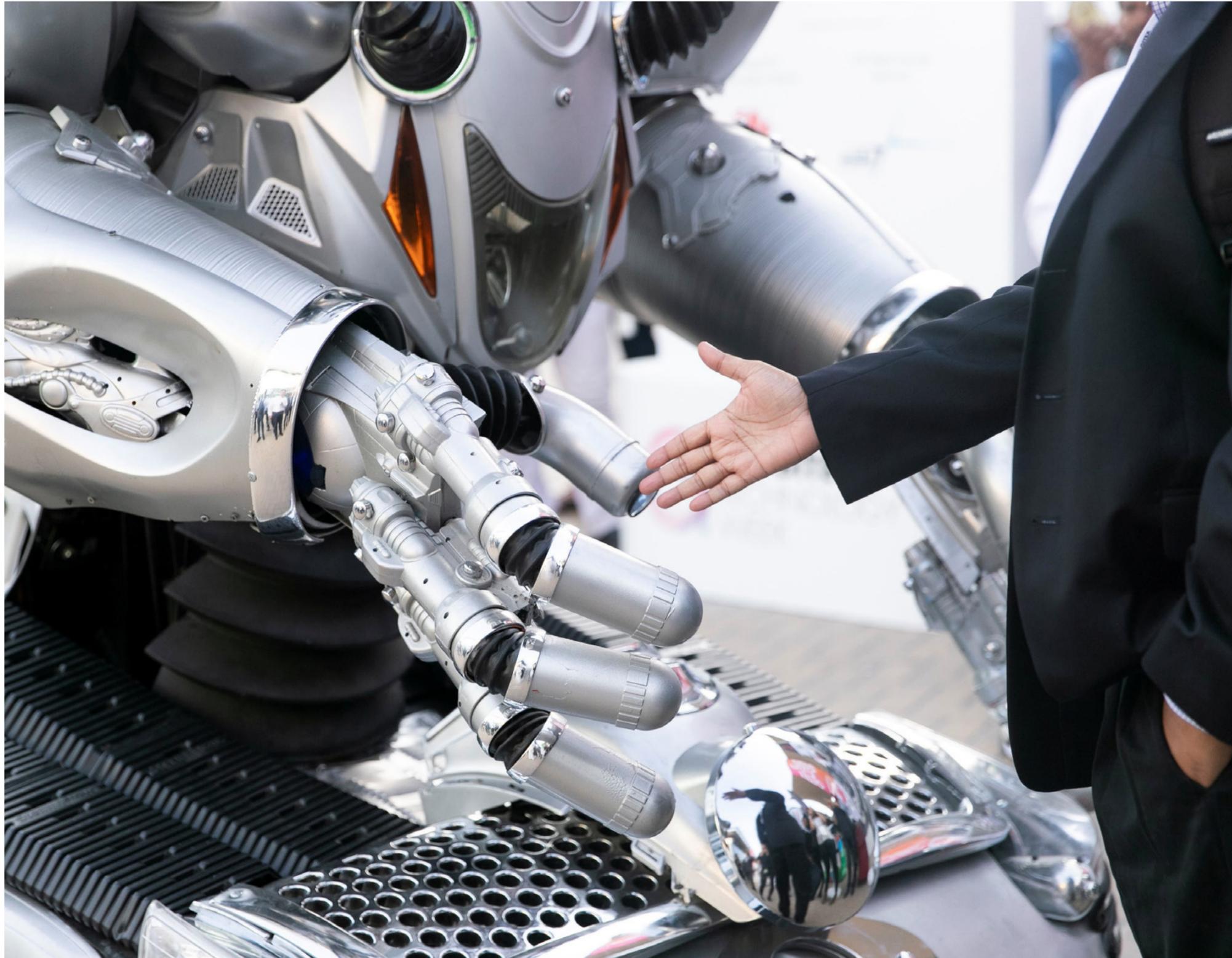
"There is only one obstacle to sustainable urban development and it is people; in particular there is resistance amongst decision makers to embrace change and new ideas," says Denley. "We frequently experience this. Many decision makers follow a 'rule book' which is completely outdated and largely structured around providing priority to buildings over public realm and cars over people.

"Any design which deviates from these rules is automatically dismissed. Landscape and spaces for people are typically defined by whatever is left from the plot and budget once the buildings, roads, car parking and services have been fully accommodated.

"This mentality needs to be reconfigured and updated if we are to generate truly sustainable urban development. It will also need to be top down, since naturally, individuals will revert to familiar old approaches if left to their own devices.

Adds Denley: "Many clients and architects prioritise the superficial aspects of development, allocating huge budgets to building facade beautification, shiny exotic materials and architectural gimmicks.

"These things rarely improve the human experience of an urban area, yet consume vast resources which could be put to better use and deliver tangible benefits to those occupying the spaces, buildings and districts.



POCKETS OF APPRECIATION

"Fortunately, there are some enlightened developments and cities like Masdar City which are proving that the new model works, so there is tremendous hope for the future."

Ultimately, is there sufficient appreciation of the problems presented by major urban population growth on a worldwide basis, and sufficient commitment, vision and resources, to bring an effective solution globally?

"There seems to be a growing recognition that far from being a problem, cities may actually present a positive solution to the climate crisis which we face presently," declares Denley. "This is only true if those cities are appropriately designed and executed however."

"There are pockets of appreciation for these new models among the most enlightened and leading cities in the world such as Oslo, Copenhagen and Melbourne, yet worryingly most cities continue with a 'business as usual' model of ever-expanding urban sprawl and car dominance."

"The resources, experience and case studies are all there. Whether global leaders will adopt these principles soon enough is the ultimate question."

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