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Insights

Urban future with a purpose

12 trends shaping human living

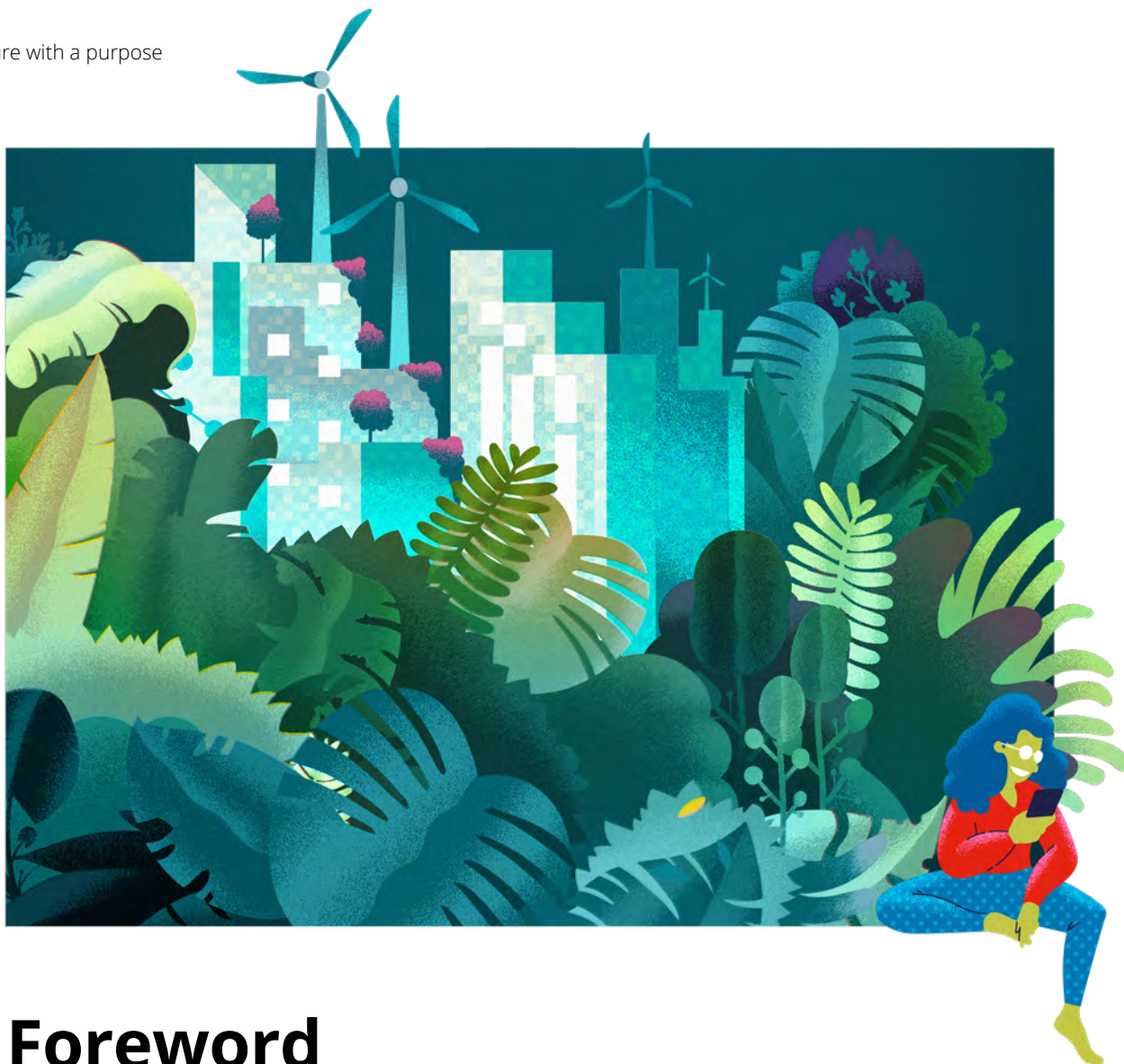## ABOUT DELOITTE'S SMART CITY SOLUTIONS CENTER

Cities must become more resilient, digital and sustainable. We stand with mayors, urban planners and community innovators in envisioning, designing, implementing and operating the foundations of urban living.

Deloitte's Smart City Solutions Center is a Center of Competences for both **Smart Cities** and **Future of Mobility** solutions, which leverages technology assets and human expertise to add value for public and private clients.

A core team of more than 20 of skilled specialists invests heavily in developing products to increase operational efficiency, and in research and methodologies to design and advise the future of cities. Plus, 45 Analytics and Cognitive consultants provide support to Smart City Solutions Center's projects. Read more on Deloitte.com.

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Foreword

2020 was a critical year for cities and communities. The pandemic affected the core of our urban living, and local governments needed to react quickly to protect people's lives and simultaneously look for the best approaches to handle the long-term effects of COVID-19.

AT THE INTERSECTION of both these challenges, one topic stands out: the importance of making cities more human and nurturing a strong sense of connection, shedding light on what cities should care about the most – people.

This is the motto of this study and the underlying idea in the 12 trends we present. Committed to helping cities drive change, we have listened to prominent actors in order to understand what we might expect to happen next. Researchers, practitioners, policymakers and city leaders are just some of the people we interviewed, and their insights helped identify 12 trends that cities, leveraging technology and data, can follow on the road to becoming smarter, more sustainable and resilient.

The 12 trends are not equally applicable or desirable for all cities. They cover most of the domains of a city and touch on the main changes emerging from the pandemic. However, we do not suggest that all these trends form a recipe for every city – after all, there is no one-size-fits-all approach to city development.

These are the 12 trends we have identified:

GREEN PLANNING OF PUBLIC SPACES:
Cities are being planned and designed for people, with 'green' streets, new corridors and public spaces as centres of social life.

SMART HEALTH COMMUNITIES:
Cities develop health care ecosystems that are focused not only on diagnosing and treating sickness, but also on supporting well-being through early intervention and prevention, while leveraging digital technologies.

15-MINUTE CITY: Cities are being designed in a way that amenities and most services are within a 15-minute walking or cycling distance, creating a new neighbourhood approach.

MOBILITY: INTELLIGENT, SUSTAINABLE AND AS-A-SERVICE: Cities work towards offering digital, clean, intelligent, autonomous and intermodal mobility, with more walking and cycling spaces, where transport is commonly provided as a service.

INCLUSIVE SERVICES AND PLANNING:
Cities evolve to have inclusive services and approaches, fighting inequalities by providing access to housing and infrastructure, equal rights and participation, as well as jobs and opportunities.

DIGITAL INNOVATION ECOSYSTEM: Cities attract talent, enable creativity and encourage disruptive thinking, developing themselves through an innovation model approach and a combination of physical and digital elements.

CIRCULAR ECONOMY AND PRODUCING LOCALLY: Cities adopt circular models based on a healthy circulation of resources, and on principles of sharing, reusing and restoration, with an emphasis on limiting municipal waste volumes and on producing locally – for instance, by urban farming.

SMART AND SUSTAINABLE BUILDINGS AND INFRASTRUCTURE: Cities aim to have regenerated buildings; they leverage data to optimise energy consumption and the use and management of resources in buildings and utilities: waste, water and energy.

MASS PARTICIPATION: Cities evolve to be human-centred and designed by and for their citizens, promoting mass participation by the ecosystem in a collaborative process and following open government policies.

CITY OPERATIONS THROUGH AI: Cities adopt automated processes and operations (orchestrated by a city platform) and are following data-driven planning approaches.

CYBERSECURITY AND PRIVACY AWARENESS: Cities strive to promote awareness of the importance of data privacy and preparedness for the impact of cyberattacks since data will be an important city commodity.

SURVEILLANCE AND PREDICTIVE POLICING THROUGH AI: Cities are leveraging artificial intelligence (AI) to ensure safety and security for their citizens while safeguarding the privacy and fundamental human rights.

I send my profound appreciation to all who have contributed to this analysis. I now expect these trends to enlighten cities in their path from urban living to more human living. It is part of what we picture as an "urban future with a purpose".

Miguel Eiras Antunes
Global Smart City, Smart Nation and
Local Government Leader
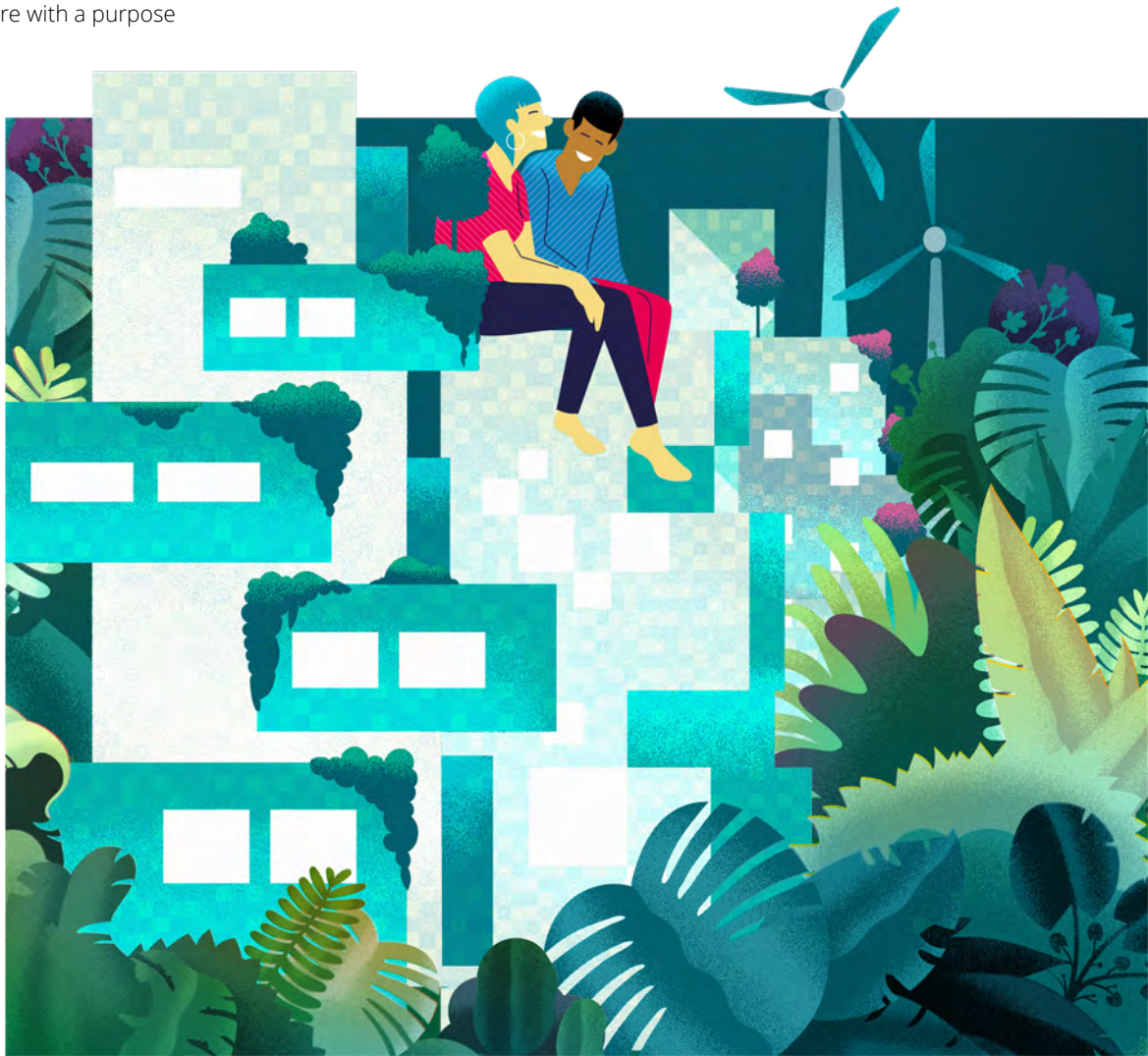
Trend 1: Green planning of public spaces

Cities need to be planned and designed for people, with 'green' streets, new corridors and public spaces as centres of social life.

URBAN AREAS ARE traditionally characterised by high population density and heavy construction to support modern amenities, such as transport and commercial buildings. They now face increasing pressure from expanding populations, limited resources and the growing impact of climate change. One of the indicators for measuring SDG 11 is the area of public and green space in a city, as the lack of natural space creates an unhealthy urban living environment.[1]

Cities should be driving a decarbonisation agenda. Becoming low carbon is the first step towards mitigating carbon emissions and achieving ecosystem resilience. At the same time, cities should ensure that urban planning is capable of dealing with the pressures of climate change in the adaptation agenda.

Green public spaces entail:

- a large number of trees in cities (Singapore ranks first in the Green View Index from MIT's Senseable City Lab, which measures the canopy cover in cities)2

- creation of more and larger public parks and nature-based solutions in the urban environment, fostering a closer connection to nature even in cities with high population density

- more walking and cycling facilities instead of car-centric designs and parking areas, with space for children and adults to enjoy outdoor activities, and fostering a sense of security and safety. (According to a study by C40, investing in a shift to mass transit and developing walking and cycling corridors can reduce carbon emissions in cities by 5-15 per cent.)3

Cities around the world are recognising the benefits of a green approach to urban planning, as it has the potential to lower urban temperatures, mitigate air pollution and build natural environmental resilience. World Economic Forum's Global Agenda Council on the Future of Cities has included increasing green canopy cover in its top ten list of urban planning initiatives.4

How to ensure successful implementation

- Understand sustainability drivers and societal targets.

- Promote equal, fair and integrated urban planning.

- Do not underestimate the power of community engagement.

- Ensure funding and financing.

"Green infrastructure creates a more liveable city. Our city has suffered from floods, loss of biodiversity, poor air quality. Trees will really restore that."
Yvonne Aki-Sawyerr, Mayor of Freetown

Who is implementing it?

FREETOWN, SIERRA LEONE

Freetown is one of the most crowded cities in the world, characterised by rapid but uneven growth. For instance, 38 per cent of the city's expansion had been in either medium- or high-risk areas. Adding to the challenge, the mandate for urban planning does not belong to the city.

In January 2019, Mayor Yvonne Aki-Sawyerr launched the 'Transform Freetown' plan, a three-year vision for developing the city, to address its socio-economic challenges and environmental vulnerabilities. The plan encompasses four clusters and 11 priority sectors. One of the initiatives is a #FreetownTheTreeTown campaign. The aim is to reduce erosion and run off, and increase vegetation cover in the city 50 per cent by 2022, by planting one million trees. This is seen by the mayor as a way to combat the rise in air temperature associated with deforestation and to strengthen the resilience of the city.

As of 2020, the city has planted 245,000 seedlings and nursed 15 different species of trees across sites. Followed by a machine learning assessment of tree canopy, the growth of the trees will be tracked through a locally developed application called Treetracker.

This way, the city can leverage community stewards to help ensure the survival of the trees and issue impact tokens as a reward for good care. The initiative has created 553 green jobs among tree planting communities to ensure long-term sustainability of the strategy. The objective is to ensure equitable distribution of vegetation cover across the city and to include the entire community in the process so that Freetown becomes more resilient to future challenges.[5]

DO YOU WANT TO FIND OUT MORE? PLEASE **CLICK HERE** TO:

- check the extended case study and interview with Mayor Aki-Sawyerr

- find additional case studies (Lisbon, Portugal and Shiraz, Iran)

- read a detailed explanation of the trend "Green planning of public spaces", with insights from policymakers, researchers and city planners we spoke to.

Trend 2: Smart health communities in the cities

Cities are developing health care ecosystems that are not only focused on diagnosing and treating sickness but also on supporting well-being through early intervention and prevention, leveraging digital technologies.

THE HEALTH CRISIS during the pandemic made the case clear: There is a community role in creating a better health environment, and cities need to pay more attention to the well-being of their citizens. Globally, five of the top ten causes of death are related to unhealthy behaviour.[6] This brings into the spotlight the need for preventive medicine. The factors that affect a person's health and behaviour are complex; therefore communities (physical and virtual) must play a part.

Cities will develop health care ecosystems that move away from a focus purely on diagnosing and treating sickness and injuries to one that is equally focused on supporting well-being through early intervention and prevention. Instead of being designed and funded to treat individual patients one by one, they will have a greater appreciation of the interconnectedness of communities. The social determinants of health will be better understood, and government and the private sector will collaborate to address some of these challenges.

As care moves outside of the hospital walls new community players and disruptors will become critical in forming the new ecosystem. Scientific advancements and the affordability of personalised health care (genomics, micromics, metabolism and behavioural economics) will ensure that care is tailored for individuals and their families. The citizens' health journey will be underpinned by interoperable data and analytics guiding them through positive health choices and behaviours.

Cities have a responsibility to create a healthy environment. Smart Health Communities (SHCs) engage patients, companies and public entities to deliver digital health services, in order to develop and shape communities, reducing costs dramatically, improving wellness and longevity, and promoting economic growth. Governments act as enablers of change by promoting this interconnected health care ecosystem. A city, as a geographical SHC, can drive a shift towards preventive and curative therapies, as well as provide solutions that foster collective and cooperative healthy behaviour, and generate and analyse interoperable data to predict risks and evaluate impact. While privacy is a concern, investment in smart public health initiatives generates substantial return on investment for cities while improving public health and well-being.[7]

How to ensure successful implementation

- Work to generate trust.

- Invest in a data privacy and security infrastructure.

- Establish partnerships between public and private stakeholders, namely government agencies, technology companies, health care and life sciences players, the media, NPOs/NGOs, social care entities and citizens.

- Collaborate with technology companies to launch awareness-creation programmes and knowledge-sharing platforms.

- Establish community-driven funding hubs to strengthen the reach and support capabilities and operational efficiency of SHCs.

- Restructure policies and consider incentivising SHC development plans.

"The pandemic quickly catalysed the awareness of the relationship between public health and community-based health and, in many cases, highly localised insights into neighborhood-based health. Public health goals are only relevant to the degree to which they can be implemented at the local scale of the community or the urban neighborhood."

Uwe Brandes, Faculty Director, Georgetown University Global Cities Initiative

Who is implementing it?

CHICAGO, USA

Chicago is prioritising the establishment of a highly interconnected health and wellness ecosystem. To do so, the city launched Healthy Chicago 2.0 in 2016 and Healthy Chicago 2025 (a cross-sector collaboration) in 2020. It is the city's multi-stakeholder plan to maximise health equality and well-being for its citizens.

The focus is on reducing health inequality by developing partnerships and community engagement, addressing the root causes of poor health, increasing access to health care and human services, improving health outcomes and utilising data to optimise research.

The Healthy Chicago 2.0 initiatives were directed towards changing people's living conditions. As cited in a report by the Chicago city government: "During Healthy Chicago 2.0, instead of just treating diabetes or counseling people on what to eat, we also worked on strategies to increase access to healthy foods and create more walkable neighborhoods."

As a part of the Healthy Chicago 2025[8] plan, the aim is to close the racial life expectancy gap and to continue prioritising other issues, such as ending the HIV epidemic, improving mental health and creating a drug-free society. The city conducts knowledge-sharing and awareness events to communicate with residents about health care essentials and educate them about public health issues. Technology is used extensively to power innovative tracking and delivery models.

DO YOU WANT TO FIND OUT MORE? PLEASE **CLICK HERE** TO:

- check the extended case study

- discover additional cities that are following the trend (Cascais, Portugal; Nice, France; and Louisville, USA)

- read a detailed explanation of the trend "Smart Health Communities", with insights from policy-makers, researchers and city planners we spoke to.
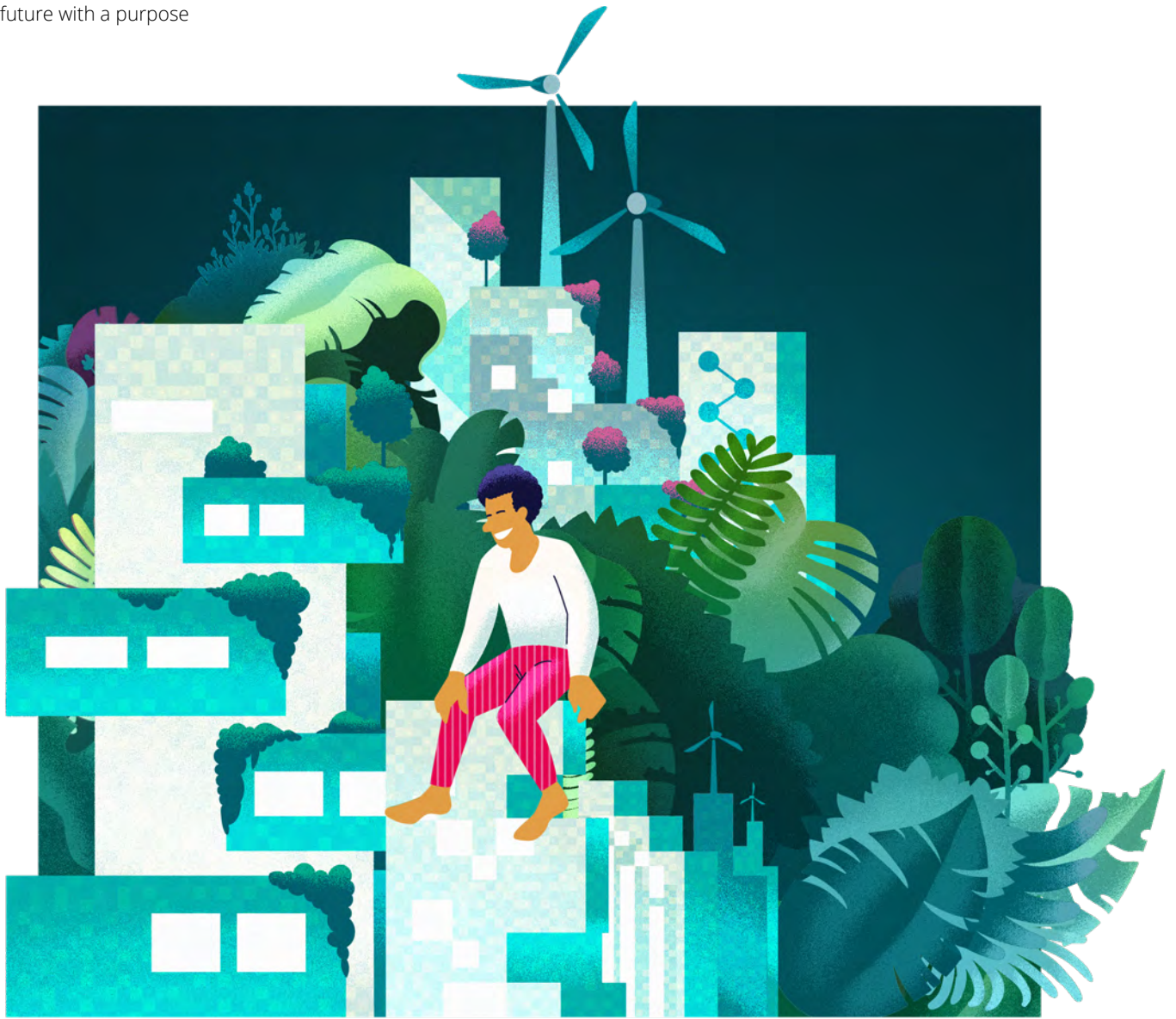
Trend 3: The 15-minute city

Cities need to be designed so that amenities and most services are within a 15-minute walking or cycling distance, creating a new neighbourhood approach.

THE '15-MINUTE' CITY concept – primarily developed to reduce carbon emissions by reducing the use of cars and motorised commuting time – is a decentralised urban planning model, in which each local neighbourhood contains all the basic social functions for living and working. Many people argue that the concept of creating localised neighbourhoods in which residents can get everything they require within 15 minutes by walking, cycling or on public transport will ultimately improve the quality of life. Such spaces entail multi-purpose neighbourhoods instead of separate zones for working, living and entertainment, which reduces the need for unnecessary travel, strengthens a sense of community and improves sustainability and liveability.

Today most cities have 'operation-based' neighbourhoods, with separate areas used predominantly for business or entertainment. Fragmented urban planning results in a sprawl, with people having to travel long distances across the city to get to their destination. In contrast, compact cities of the future, or 'hyperlocalisation', prioritise strategies for urban infrastructure that aim to bring all the elements for living and working into local neighbourhood communities.

The '15-minute' city is an iteration of the idea of 'neighborhood units' developed by American planner Clarence Perry during the 1920s. The theory of 'new urbanism', an urban planning and design concept promoting walkable cities, subsequently gained popularity in the US in the 1980s. Similar versions of 'urban cells' or 30- and 20-minute neighbourhoods have also emerged across the globe in the past decade.

The rezoning model will gain further traction in the future, boosted during the COVID-19 disruption, by new ways of working that require less transport. With climate change as a major global concern, C40 in its "C40 Mayors' Agenda for a Green and Just Recovery"[9] has recommended this model for cities worldwide, arguing that its pedestrianisation approach contributes to a reduction in greenhouse gas emissions and supports environmental sustainability.

While this approach may not be entirely applicable to every city – for example, it is probably more suitable for a big metropolis than for smaller cities – remote working and the digitalisation of services have increased the impetus to apply the principle of neighbourhood planning regardless of city size.

How to ensure successful implementation

- Correlate sustainability goals and urban planning initiatives.

- Ensure community endorsement.

- Decentralise core services.

- Launch schemes to promote affordable housing in every neighbourhood.

- Allow flexible use of urban spaces and properties across neighbourhoods.

"I would like to live in a self-sustainable city. As an urban planner, I focus on the importance of neighbourhood planning and the 15-minute city offers you that self-sustainability."

Maimunah Mohd Sharif, Executive Director of UN-Habitat

Who is implementing it?

PARIS, FRANCE

The mayor of Paris, Anne Hidalgo, aims to decarbonise the city's economy and make Paris a healthier place for its citizens through her programme, *La ville du quart d'heure* (the quarter-hour city). The initiative focuses on reducing carbon emissions, prioritising pedestrians and cyclists, and 'decentralising' the city. The priority areas include easy access to workplaces, stores, schools, clinics and cultural activities. The concept for this ecological transformation is based on four pillars, namely: proximity, diversity, density and ubiquity – aiming to fulfil the basic social functions of living, working, supplying, caring, learning and enjoying.

The city has adopted an approach of 'hyper-proximity' and 'multipurpose localities', which seeks to reduce drastically the number of car lanes to free up road space for pedestrians and cycles, and to utilise public spaces for varied purposes such as daytime schools, serving as sports facilities and places for night-time leisure activities. Plans also include the creation of 'children streets' near schools.

As a part of transport planning, the mayor has announced €350 million of funding for pedestrianisation, which will focus on creating a cycle lane in every street in the region by 2024 and removing 60,000 parking spaces for private cars. The impact is already being felt: there is a new public garden replacing a parking lot in the Minimes barracks. As a part of the same initiative, the surrounding buildings have been renovated into 70 public housing apartments at a cost of €12.3 million. The Place de la Bastille has also been transformed as a part of the city's €30 million plan to increase green cover and pedestrian areas and cycle lanes.[10]

DO YOU WANT TO FIND OUT MORE? PLEASE **CLICK HERE** TO:

- check the extended case study

- discover additional case studies (Portland, USA; Stockholm, Sweden; and Melbourne, Australia)

- read a detailed explanation of the "15-minute city", with insights from policymakers, researchers and city planners we spoke to.

Trend 4: Mobility: Intelligent, sustainable and as-a-service

Cities are working towards offering digital, clean, intelligent, autonomous and intermodal mobility, with more walking and cycling spaces, where transport is commonly provided as a service.

THIS IS ONE area where cities should expect huge disruption. Some major changes in how people move around in cities are already under way, but the trend will accelerate further in the next decade, with electrification, autonomous driving, smart and connected infrastructure, modal diversity, and mobility that is integrated, resilient, shared and sustainable – powered by disruptive business models. In answers to an ESI ThoughtLab survey question, 54 per cent of city leaders admitted they will rethink mobility and transportation in the aftermath of the COVID-19 pandemic.[11]

Less need to travel. It is expected that in general people will travel less than they have in the past. With new urban planning concepts such as the '15-minute city' promoting compact environments, 'connected corridors' and changes in the way that people work, movements within urban areas will decrease substantially and bicycles, scooters and even walking will increasingly be the preferred options in community neighbourhoods.

Electrification. It is estimated that in 2030, electric vehicles (EVs) will have around 32 per cent of the total market share for new car sales globally,[12] although there will be differences between regions.

Connectivity and automation. Recent Deloitte research in the United States estimates that by 2040, up to 80 per cent of passenger miles travelled in urban areas could be in shared autonomous vehicles.[13] This development will be led by major technology-based corporations or the automotive and transport sector and by technology-based start-ups. Solutions such as passenger drones by EHang and drone delivery by Amazon are making rapid advances. Logistics companies look increasingly to autonomous technology to meet the rising demand for goods.

Sharing. Cities will also benefit from an increase in on-demand multimodal mobility and Mobility-as-a-Service (MaaS) platforms, such as in Helsinki. For instance, residents will be able to plan and book door-to-door trips digitally, use the same fare card for all transport modes, access automated last-mile cargo shipment services, and have end-to-end real-time visibility of freight in transit – and with seamless payment models.[14]

Intelligent mobility. With data playing a central role in some of these shifts, customised travel is something that cities will start to deliver, segmenting their customers (citizens) in a mobility context and implementing strategies for each market segment. The value of 'intelligent' mobility is forecast to grow to €850 billion by 2025, representing more than 1 per cent of global GDP.[15]

How to ensure successful implementation

- Embrace a holistic approach (and consider the total mobility mix), and start with a minimal viable ecosystem for 'smart mobility', adding features over time in an agile way.

- Invest in infrastructure – physical, energy, digital and telecoms – that supports effective transformation.

- Be aware that a new generation of vehicles is needed, and there should be a resurgence in the use of some existing types of vehicles, such as motorbikes and bicycles, with a strong focus on micromobility.

- Make mobility management a priority, both management of assets (infrastructure and vehicles) and management of clients (people).

- Make sure regulation adapts to the new circumstances, covering vehicle security and liability in cases of accidents, data management and privacy, interoperability, connectivity, risk and responsibility, and cybersecurity.

"I am completely bored with Smart City IoT systems that try to optimise the flow of traffic so you get more throughput of cars. I am more interested in getting rid of cars in cities."
Kent Larson, Director of City Science group at MIT Media Lab

Who is implementing it?

LOS ANGELES, USA

Los Angeles is working towards implementing sustainable and smart mobility solutions. The city aims to reduce air pollution by accelerating the electrification of transport.

According to a recent study, LA accounts for about half of electric vehicles in the United States and has committed to having 5 million electric vehicles by 2030.[16] LA's urban mobility plan has a focus on improving the accessibility and environmental friendliness of its public transport system. LA has launched multiple compressed natural gas (CNG) buses and deployed the first of 40 zero-emission electric buses on its Orange Rapid line in July 2020.[17] The entire LA Metropolitan Transportation Authority (Metro) bus fleet is expected to be electric by 2030.[18]

With a target to improve the air quality further, LA launched its Zero Emission 2028 Road Map 2.0 in 2019. The initiative involves advisory partners BMW, Tesla, Greenlabs, CSUN, Itron, PCS Energy and others.

In December 2020, the city launched an urban air mobility programme to analyse the issues identified by diverse stakeholders in the public airspace and property rights. The programme is likely to support the development of solutions to build and integrate a community-centred aerial mobility technology with its other multimodal platforms.[19]

DO YOU WANT TO FIND OUT MORE? PLEASE **CLICK HERE** TO:

- check the extended case study

- discover additional case studies (Shenzhen, China and Copenhagen, Denmark)

- read a detailed explanation of the trend "Mobility: Intelligent, sustainable and as-a-service", with insights from policymakers, researchers and city planners we spoke to

- explore the interview with Kok Yam Tan, Deputy Secretary of Smart Nation and Digital Government Office, Singapore.

Trend 5: Inclusive services and planning

Cities are evolving to have inclusive services and approaches, fighting inequalities by providing access to housing and infrastructure, equal rights and participation, and jobs and opportunities.

CITIES ARE NOT only centres of economic development; they symbolise equality, healthy communal coexistence and prosperity for all. Social inclusion should be a key pillar of urban growth and development for the cities of the future, bearing in mind the three building blocks identified by World Bank: spatial inclusion (providing affordable housing, water and sanitation), social inclusion (expanding equal rights and participation) and economic inclusion (creating jobs and offering citizens opportunities for economic development).

Cities should be planned and designed to generate social and economic outcomes for everyone, avoiding the costs that occur when people are excluded. Although the poor are usually the most affected, cities will also remove the barriers caused by differences in gender, race, nationality, disability or religion. Inclusive design could mean building gender-inclusive urban centres to provide safe and secure spaces for carers and installing wheelchair-accessible features for those with mobility difficulties. Inclusive design may

mean building greener and safer neighbourhoods for all citizens and investing to create secure and joyful spaces for children to play and accessible places for the elderly, making cities pleasurable for the silver generation. An inclusive social care system will embrace migrants and offer them tailored services that address their particular needs and circumstances, just as for everyone else.

There are already some signs of cities prioritising inclusion. A survey of 167 cities worldwide found that 40-47 per cent use metrics to track progress towards inclusion goals, although the majority are in advanced economies.[20]

Digitalisation enables governments to facilitate access to a range of services, accelerate business opportunities, analyse societal gaps, educate mass audiences, collect real-time data, boost data-driven decision-making, facilitate predictive and proactive governance, and engage larger audiences in social activity. It also frees up government capacity to re-direct finite administrative and case management resources to those who need it most.

Although a fundamental requirement for social inclusion, technology may also create disparities. City planners should remain aware of the large numbers of 'digitally invisible' citizens, to avoid skewing the results of city analysis that would compromise urban planning efforts and even contribute to widening the inequality gap.

How to ensure successful implementation

- Implement proactive multisector solutions, both preventive and curative.

- Promote an integrated planning approach instead of a fragmented one.

- Follow an equity-centred by design approach.

- Improve the adoption of technology solutions and digital skills, supported by adjusted regulation.

- Pursue data equity.

- Establish inclusive living labs.

- Use agile methods to respond rapidly and anticipate citizens' needs.

"Inclusion is not a feel-good thing. Obviously it is about equity, it is the right thing to do, but it is fundamental also for the economic survival of cities."

Sameh Wahba, Global Director of Urban, Disaster Risk Management, Resilience and Land Global Practice at World Bank

Who is implementing it?

MEDELLÍN, COLOMBIA

Two decades ago, the city of Medellín was infamous for its high homicide rates, economic inequality and social exclusion. However, the city started to transform into an urban inclusive community through an integrated planning approach to improving connectivity, education and public facilities, with a special focus on the poor.

The initial stages of transformation began in the 1990s, when the focus was on restructuring public spaces and the landscape through targeted territorial regeneration initiatives that involved connectivity enhancement and community participation.[21] Initiatives such as Medellín Metrocable, the world's first cable car system for public transport, connected the city's poor neighbourhoods with the city centre, and San Javier outdoor escalators (2011), public outdoor escalators connecting one of the poorest and most violent neighbourhoods (Comuna 13) on steep hills to the city centre, are examples that have contributed to the development of an inclusive city.

An important focus of the strategy was on education. The local government created public facilities, including libraries and schools across all neighbourhoods, and invested in a "Medellín, the most educated" programme – especially for early childhood and primary education – as a powerful way of reducing poverty and improving society.

More recently, the adoption of open government policies (accessibility of data and public information), investments in ICT (free internet access zones),[22] social co-creation practices (such as Mi-Medellín for mass participation)[23] and other programmes are contributing to the creation of a smart Medellín.

DO YOU WANT TO FIND OUT MORE? PLEASE **CLICK HERE** TO:

- check the extended case study

- discover additional case studies (Quito, Ecuador and Nagareyama, Japan)

- read a detailed explanation of the trend "Inclusive Services and Planning", with insights from policymakers, researchers and city planners we spoke to

- explore the interview with Sameh Wahba, Global Director for World Bank's Urban, Disaster Risk Management, Resilience and Land Global Practice.
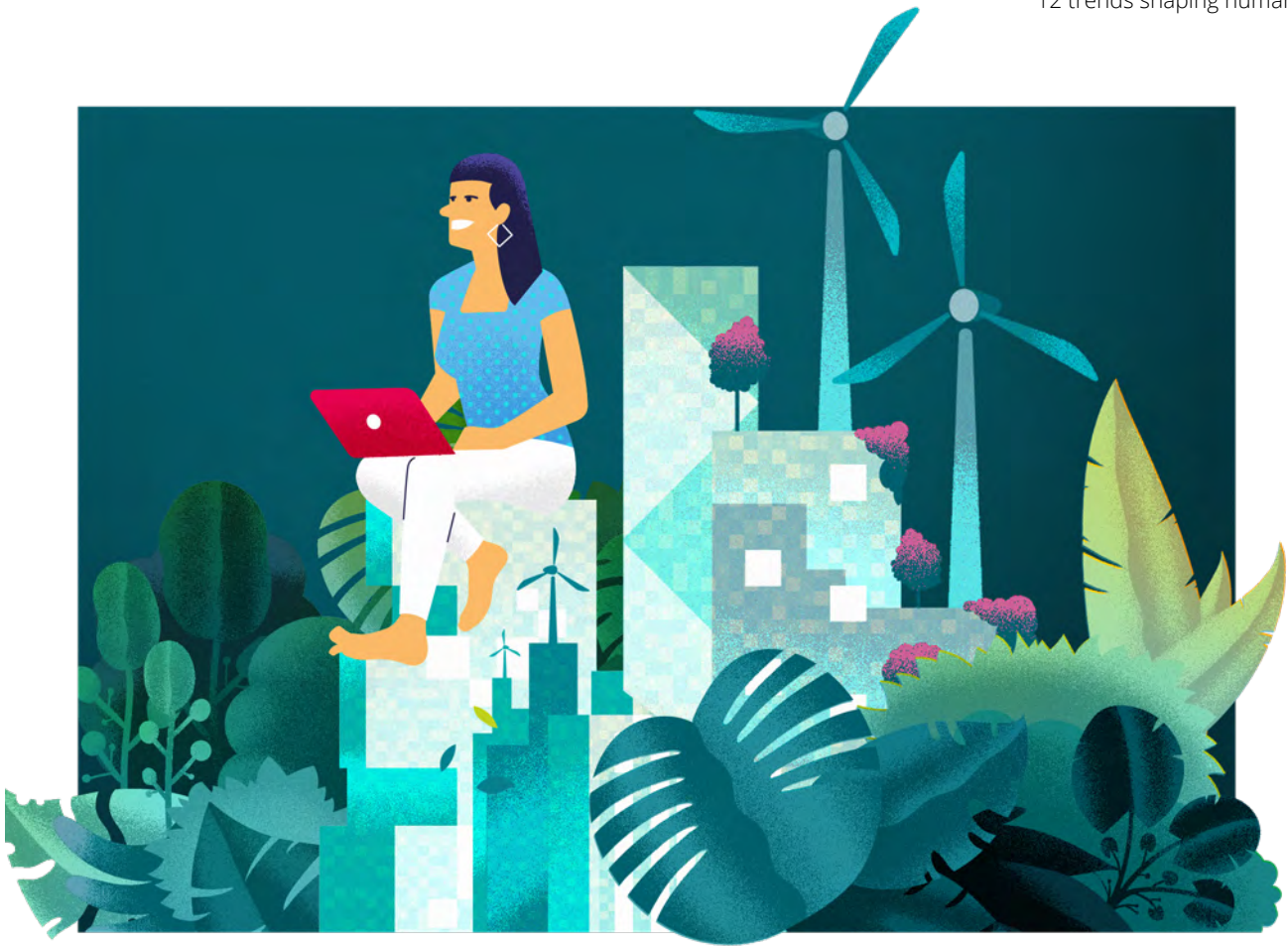
Trend 6: The city as a digital innovation ecosystem

Cities strive to attract talent, enable creativity and encourage disruptive thinking; developing themselves through an innovation model approach and a combination of physical and digital elements.

WHILE TRADITIONALLY COMPANIES and industrial parks have been concentrated in suburbs of the city, start-ups and digital nomads are bringing innovation and ideas to the city centres. As population numbers increase in urban areas, cities compete for investment, skilled workers (talent) and cultural prominence, and this is turning urban regions into innovation hubs, leveraging data.

In some cities with an innovation or technology department, individuals try to innovate from a silo. This is not what we mean. Cities will adopt a multidimensional approach to innovation, the so-called quintuple innovation helix framework (of interactions between university, industry, government, public and environment),[24] and city governments will act as platforms enabling the right connections, policies, places and infrastructure to make the ecosystem flourish; solving the town's most prominent challenges and bringing positive change to the city and its industries.

Cities will be Living Labs for digital transformation and centres of experimentation, using data to develop pilots that can be scaled up. By putting talent attraction at the centre of its strategy, a city can develop with the goal of being the most attractive host (of people, companies and research centres), in order to facilitate ecosystem development. The City Hall has to develop the right skills, and data collection and usage, and modernise its governance model to foster collaboration and encourage open innovation. Increasing the level of adoption of digital innovation in high-priority economic sectors generates a positive impact on local competitiveness, by opening up new sources of employment and economic growth.[25] It also supports the uptake of disruptive and promising digital technologies.

Remote working has lengthened the list of cities that can adopt this strategic approach. In line with the 'rise of the rest' theory put forward by Richard Florida in 2019,[26] the shift from enterprise attraction to talent attraction makes it possible for smaller cities to thrive in a post-pandemic world, using data as a source of competitiveness in the digital innovation environment. It is a time for small remote hubs.

How to ensure successful implementation

- Create capacity to attract talent, expertise and open talent networks.

- Foster agile processes and avoid a risk-aversion culture.

- Add the required skill sets and gain an awareness of the opportunities that new technologies offer.

- Ensure data mastery and interoperability standards.

- Embrace a new way of management and leadership.

"I hope that Leuven can be some kind of open source city, where we share the things that we do here that might work on a different scale in different places. I don't want to be protectionist."

Mohamed Ridouani, Mayor of Leuven

Who is implementing it?

ESPOO, FINLAND

Espoo is among the European forerunners in innovation and sustainable smart city development. Home to the leading innovation and technology hub in the Nordic countries, strong research institutes, SMEs and global company headquarters alike, Espoo is an innovation ecosystem in Finland. It hosts an active start-up hub and some of the most valuable Finnish companies, and also Aalto University and VTT Technical Research Centre of Finland – two important players in the innovation scene.

Espoo is also home to the highest density of international talent and the highest education level among Finnish cities, with 52 per cent[27] of residents over 24 years old holding a university degree. "The point is not to be the most sustainable city or to be the most intelligent city; the point is to be the most sustainable or most intelligent community", said Mayor Jukka Mäkelä. The development of a digital economy in Espoo has increased the wealth-generation capacity of the city. This in turn has led to the creation of improved public services for the city's residents. In 2020, Espoo was awarded the title of Finnish Capital of Innovation[28] and was in the top six in the European Capital of Innovation (iCapital)[29] Awards of the European Commission.

Espoo's services are built on a mixture of experimentation and co-creation, through a 'City-as-a-Service' approach.[30] The city seeks to position itself as a place where development is driven first and foremost by the best interests of its residents.[31] As the mayor has stated, "Our first value is customer and resident orientation. Collaboration is key to having this kind of innovation ecosystem or start-up ecosystem."

DO YOU WANT TO FIND OUT MORE? PLEASE **CLICK HERE** TO:

- check the extended case study and comments from Mayor Jukka Mäkelä

- discover additional case studies (New York City, USA and Porto, Portugal)

- read a detailed explanation of the trend "Digital Innovation Ecosystems", with insights from policymakers, researchers and city planners we spoke to.

Trend 7: Circular economy and local production in the city

Cities are adopting circular models based on a healthy circulation of resources; principles of sharing, reusing and restoring; and with emphasis on limiting municipal waste volumes and on producing locally – for instance, urban farming.

D O YOU KNOW that on average a car is parked more than 90 per cent of the time? Or that the average office is used only 35-50 per cent of the time?[32] That 30 per cent of food is wasted? That half of the waste is produced in cities?

Increasingly, cities are developing aspects of a circular economy, which entails decoupling economic activity from the consumption of finite resources and designing waste out of the system.

What does it mean to live in a city
with a circular economy?

- it is a city that promotes a better use of
  resources through procurement policies;

- that consumes less, and reuses and recycles
  water, energy, products and materials

- that recycles and manages waste according
  to regulations

- that stimulates an economy of repair,
  borrowing and second-hand commerce

- that nurtures a sharing mindset
  (e.g., car trips, spaces and materials)

- that fosters better use of resources in construc-
  tion (e.g., 10-15 per cent of building materials
  are wasted during construction)

- that stimulates an innovative approach to how
  the city and its citizens consume, store and
  use resources.

A circular economic model is one of the pillars
of the European Union's European Green
Deal strategy,[33] and there are already some
examples of its application, as well as policies
and mechanisms to fund the transition.

Cities will also increasingly encourage a 'produce
local' approach to food and energy. Urban
and small-scale farming is gaining traction in
some urban centres as a way to deliver fresh
and healthy food, establish direct contact with
food producers and reduce carbon emissions,
while strengthening the local economy. Inno-
vative approaches make better use of space and
light, such as vertical farming, hydroponics,
LED indoor farming and rooftop farming.

Simultaneously, the energy revolution is
contributing to the circular economy through
decentralisation of energy production, mainly
through renewable sources (biogas, wind, solar,
wood biomass, waste, etc.), and off-grid and
microgenerators, paving the way for self-suffi-
ciency whereby cities generate as much energy as
they consume, creating communities of energy
and offering further economic opportunities.

How to ensure successful implementation

- Secure funding for the transition.

- Establish flexible and simple regulatory
  structures and smart procurement.

- Create or rethink metrics to measure circularity.

- Leverage national or regional policies and
  invest in awareness campaigns.

"It requires vision and engagement from local administrators and the private sector. A circular economy can change the face of our cities and, at the same time, be the engine of our recovery."
Ursula von der Leyen, President of the European Commission

Who is implementing it?

SEOUL, SOUTH KOREA

The Seoul Metropolitan Government launched the Sharing City Seoul programme in 2013, an initiative that uses technology to support businesses with a sharing concept to reduce waste and underutilised capacity, cut municipal costs and boost new business opportunities. The initiative aims to encourage collaboration and sharing of public and private resources to tackle city challenges, promote participation by citizens and facilitate the growth of local businesses. Through the initiative, the city government has also launched several 'sharing projects' to promote the adoption of the sharing principle to deal with social and environmental issues.

The Seoul Sharing Promotion Committee established a 'Seoul Sharing Hub' to showcase a pool of online platforms created by various organisations for sharing in order to enhance the convenience for citizens in accessing data.

Additionally, the goal of the Seoul Sharing Hub is to produce, store, and deliver such data, and also to network with pertinent domestic and overseas organisations, enterprises, the media and other entities from different areas and fields.

The city government has supported new start-up businesses and larger corporate companies in providing sharing services, including municipality-owned co-working spaces.[34]

DO YOU WANT TO FIND OUT MORE? PLEASE **CLICK HERE** TO:

- check the extended case study

- discover additional case studies (Glasgow, Scotland; Cape Town, South Africa; Lappeenranta, Finland; and Hong Kong)

- read a detailed explanation of the trend "Circular economy and producing locally", with insights from policymakers, researchers and city planners we spoke to.
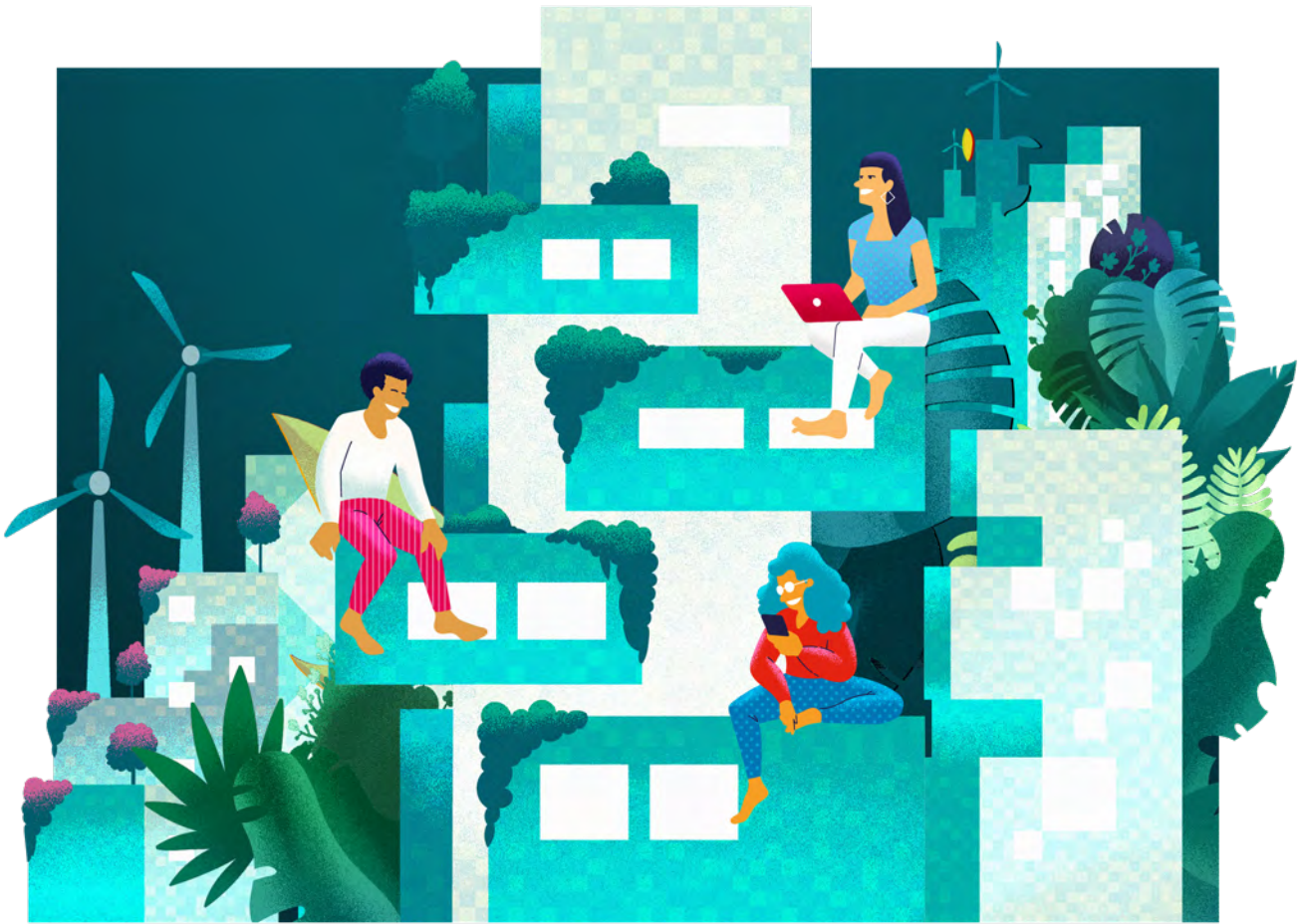
Trend 8: Smart and sustainable buildings and infrastructures

Cities aim to have regenerated buildings and to leverage data to optimise energy consumption and the use and management of resources in buildings and utilities: waste, water and energy.

N 2019, THE Coalition for Urban Transitions estimated that it should be possible to cut emissions from cities by about 90 per cent by 2050 (15.5 GtCO2e by 2050) using proven technologies and practices, in particular for buildings and infrastructure. Estimated cuts include 36.5 per cent from residential buildings and 21.2 per cent from commercial buildings.[35] Buildings are currently responsible for 30-40 per cent of total city emissions. To achieve the COP21 target by 2050, emissions from buildings must be 80-90 per cent lower than they are today.[36]

Many buildings are energy inefficient and contribute heavily to carbon emissions. In the EU, as of February 2020, roughly 75 per cent of building stock was energy inefficient.[37] So there is some way to go. A 2019 Navigant report stated that only 5 per cent of the smart city projects that it tracked had a focus primarily on building innovation, and just 13 per cent had 'some level' of focus on buildings.[38]

World Green Building Council defines a green building as one that, "in its design, construction or operation, reduces or eliminates negative impacts, and can create positive impacts, on our climate and natural environment; preserve precious natural resources and improve our quality of life".[39] Given the pressure on cities to act on climate change, green buildings are going to invade our urban centres. Besides being built with sustainable and ethical materials, they will be energy, water and resources-efficient; environment-friendly by design – powered by renewables (such as solar) and capable of producing their own energy (electricity prosumers); covered by vertical and/or rooftop gardens; and able to provide a better indoor environment for those who live in them or use them.

On top of that, they will leverage data and digital technology to enable components of infrastructure to become more efficient and better adapted to the stakeholders' usage. Business models provided by flexible office operators will foster an Office-as-a-Service or even Real Estate-as-a-Service approach.

Gartner predicts that by 2028 there will be more than 4 billion connected IoT devices in commercial smart buildings.[40] They will be powered by telecommunications infrastructures, with 5G and High Efficiency Wi-Fi (6 or 6E) at the forefront, and smart utilities such as power, waste and water.

As of May 2020, 28 major cities have signed up for World Green Building Council's Net Zero Carbon Buildings Commitment,[41] which calls for cities to reach net-zero carbon operations by 2030 for all assets under their direct control, and to advocate for all buildings to become net-zero carbon in operations by 2050.

How to ensure successful implementation

- Define a vision and technological guidelines, and develop a roadmap.

- Stimulate and prioritise sustainability-targeted renovation, construction and restoration projects.

- Launch incentive plans to promote alternate materials and build a strong engagement ecosystem.

- Beyond investing in buzzwords like 5G or sensory-tech solutions, extract value from data.

- Promote data-sharing standards and policy.

"**The question now is whether we are able to look at smartness at a district level. This is what we are doing to a certain extent in Punggol – using the different characteristics of different buildings to manage energy better in a way that the heat generated by one building can be used for another building for example, and that is possible through digitalisation. The smart building space is moving into a smart district place.**"

Kok Yam Tan, Deputy Secretary of Smart Nation and Digital Government Office, Singapore

Who is implementing it?

SINGAPORE

Singapore has been an early adopter of green architecture and sustainable urban planning initiatives. In 2005, it introduced the Green Mark certification scheme, an initiative to drive Singapore's construction industry towards more environment-friendly buildings. The goal now is for "at least 80 per cent of the buildings in Singapore to be green by 2030."[42]

According to the Ministry of National Development, "As of January 2018, about 3,200 building projects in Singapore have met the BCA Green Mark standards. These cover more than 94 million square metres, which is around one-third of the total gross floor area of Singapore's building stock."[43]

As part of the strategy to 'green' the city landscape and improve environmental sustainability, the city has a Housing and Development Board (Singapore's public housing authority) Green Towns Programme, which is a ten-year plan to make HDB towns more sustainable and liveable by 2030. Two projects stand out:

- *Punggol.* Smart and Sustainable Punggol is one of the milestones of the Strategic National Programs of Smart Nation Singapore. This is a plan to develop Punggol as Singapore's first eco-town since 2010.[44]

- *Tengah.* This eco-smart city of 42,000 homes aims to be a clean state, cooler by design.[45] Some of its features are smart energy management, using artificial intelligence; automated waste collection, a system that uses high-speed air to transport household waste; and smart-enabled homes, each equipped with smart-switched socket outlets and a smart distribution board.[46]

DO YOU WANT TO FIND OUT MORE? PLEASE **CLICK HERE** TO:

- check the extended case study

- discover additional case studies (Adelaide, Australia and Fukuoka, Japan)

- read a detailed explanation of "Smart and sustainable buildings and infrastructure", with insights from policymakers, researchers and city planners we spoke to.

Trend 9: Mass participation in city building and development

Cities are evolving to be human-centred and designed by and for their citizens, promoting mass participation by the ecosystem in a collaborative process and following open government policies.

WHAT DOES AN ideal experience in our city look like? How can our city contribute to a brighter global future? How would we like our children to grow up in the city? What would we like our city to be known for around the world?

These are some of the questions you will be asked in cities where there is open government and mass participation. These are places where citizens, social innovators, civil society organisations, businesses and academia are part of the process of building their cities (in a quintuple helix model[47]), closing the gaps between local government and the ecosystem.

Through mass participation, supported by open data and technology, and with local government acting as a platform, cities can use citizens as a 'sensor' and benefit from greater innovation, better utilisation of resources and an increased sense of ownership. Co-creation through mass participation is a bi- or multidirectional human-centred approach, rather than just a bottom-up or traditional top-down approach.

Cities are increasingly innovative in the way they promote participation, and technology plays a key role in enabling innovation – for instance, mobile applications and reporting websites overcome the need for groups to meet in person to discuss new ideas and collaborate; and digital currency opens the door to gamification strategies. But to ensure the three principles of open government are met (participation, collaboration and transparency), it is necessary to have open data platforms and other initiatives. Participatory budgets are a good starting point. Some cities go a step further and provide citizens and the ecosystem with real-time access to information, to keep them informed about changes that affect where they live. Ultimately, cities will progress towards having true platforms for collaboration, fostering co-creation and leading to new governance models (co-governance), where responsibility is shared among the participants and is not just a burden on the local government. From this perspective, a new culture is created, and citizen engagement emerges as critical for ensuring the long-term sustainability of policy initiatives.

How to ensure successful implementation

- Engage the city population at scale and combine physical and virtual interactions whenever possible.

- Follow the digital imperative, but create a smart population for smart cities.

- Ensure accessibility and inclusiveness for all citizens.

- Establish clear governance processes and transparency to boost trust – an enabler of open governments and collaboration.

- Align objectives and expectations, and make clear connections between participation and decisions taken.

"You can think of the city as-a-service, as we do in Espoo…. It is easy to use digitalisation and ask your residents and customers about services provided. If you have that customer orientation, you are going to the right way and it is quite easy to improve your services."

Jukka Mäkelä, Mayor of Espoo, Finland

Who is implementing it?

LEUVEN, BELGIUM

In 2020, the European Commission awarded the city of Leuven the title of European Capital of Innovation to commemorate its innovative ideas and frameworks for implementing them. The city's citizens are participants in testing these ideas, in a truly co-creation approach. The award was the culmination of the city's work in putting its citizens at the core of municipal decision-making, through cooperation, co-creation and celebrating diversity.

One such initiative was 'Leuven, Maak het Mee' or 'Leuven, Co-Create',[48] a project which called for citizens to submit their ideas on how to improve city liveability. By the end of 2019, more than 3,000 people had registered to submit proposals, and a total of more than 2,231[49] ideas were proposed, with over 1,000[50] making it into the city's plans.

Co-creation is also seen in Leuven as a pillar for the development of its sustainability strategy, utilising collaboration to devise the roadmap for its flagship project Leuven 2030.[51] This is a mission-driven NGO that was founded to establish Leuven's climate transition strategy, aiming to transform it into a carbon-neutral, resilient city, with a goal to cut carbon emissions by 65 per cent by the end of the decade.[52] The roadmap for Leuven 2030 was co-created with 70 experts laying out a path to carbon neutrality and including 13 programmes.

"It is a governance model, it's not just a network", where every layer of society has an equal stake.[53] Government, the city's citizens, companies and knowledge institutions, and semi-public institutions such as public transport companies all have 20 per cent of the voting.

Leuven stands out as a city where the mayor's vision is fully committed to inclusion and participation, seeking to make co-creation the defining ethos of the city's development, and entrusting the city to its residents through collaborative practices.

DO YOU WANT TO FIND OUT MORE? PLEASE **CLICK HERE** TO:

- check the extended case study with comments by Mayor Mohamed Ridouani

- listen to a podcast with Mayor Mohamed Ridouani

- discover additional case studies (Mexico City, Mexico and San Diego, USA)

- read a detailed explanation of the trend "Mass participation", with insights from policymakers, researchers and city planners we spoke to

- explore the interview with Maimunah Mohd Sharif, Executive Director of the United Nations Human Settlements Programme (UN-Habitat).

Trend 10: City operations through AI

Cities are adopting automated processes and operations (orchestrated by a city platform) and following data-driven planning approaches.

MACHINES RUN 24/7, and there are operations and tasks that cities perform that will become increasingly smart and powered by artificial intelligence (AI). AI will contribute to the optimisation of operational efficiencies, benefiting city managers, and ultimately citizens, through reshaped service delivery. In an ESI ThoughtLab study, 66 per cent of 167 cities surveyed are investing heavily in AI, and 80 per cent will do so over the next three years.[54]

While chat assistants are currently among the most common solutions powered by AI, cities will evolve to have digital platforms as 'city brains', where all urban activity is orchestrated and operated, providing a holistic view of the city, allowing for events correlation, fast and assertive root-cause analysis, predictive analysis (through machine learning) and incident management; and providing operational insights through visualisation.

If the behaviour of almost every citizen is registered through anonymised data, and 5G technology enables cities to become huge connected eco-systems, it will be of paramount importance to maximise data value and improve planning and decision-making using AI and data analytics, on the way to a cognitive city. Gartner predicted in 2019 that a city platform will be a mature smart city solution in five to ten years' time, when it is expected that 1-5 per cent of cities will be using a city platform to manage their operations.[55]

But cities can go even further. We see cities like Dublin and Singapore, among others, creating a Digital Twin – a dynamic digital replica of their physical assets and environments and their interdependencies – for urban planning purposes and using machine learning to predict future events and trends. Digital Twins will become increasingly powerful in enabling data-driven decisions and will have a high adoption rate among city governments, with the promise of making cities more resilient.[56] ABI research has predicted that by 2025 the number of urban Digital Twins will exceed 500.[57]

How to ensure successful implementation

- Start with data strategy and governance.

- Be aware of privacy issues, and stimulate a culture of trust.

- Ensure data standards and interoperability.

- Avoid algorithmic bias.

- Develop the right skill sets among the city workforce.

- Follow a citizen-focused approach to operations.

"Citizens don't want a city that reacts to what is happening; they are asking for cities that will anticipate the future, and that is what AI and all the knowledge that we are collecting here are for."

Miguel Pinto-Luz, Deputy Mayor of Cascais

Who is implementing it?

CASCAIS, PORTUGAL

Cascais is a coastal resort town with a population of 211,000 that attracts more than 1.2 million tourists a year and aims to be "the best to live in for a day or a lifetime". To drive efficiencies in infrastructure, transport, public safety and other services, the city has a mission to "test innovative solutions capable of being scaled." It developed a large portfolio of technology-based services ranging from energy-efficient buildings to remote payments for parking, but it lacked a unified vision across the municipal domains.

In 2018, Cascais developed a managed services digital command centre, C2, to give it a holistic and integrated approach to the management of city operations in a multidisciplinary room. The solution was powered by Deloitte's smart place operating system, CitySynergy. Integration increased the quality of services to citizens and achieved savings based on higher effectiveness and efficiency.

The city platform now provides 15 smart initiatives (including citizen connection websites and a citizen engagement app) with integrated maps of assets and dependencies, online dashboards, customised reports and a Digital Twin.

It supports management of an ecosystem of more than 30 service partners, enables predictive management through event correlation and data analytics, and facilitates decision-making and urban planning. C2 has helped improve operations, increase efficiencies and cut costs. For example, by integrating real-time traffic and road condition data, the system not only optimises routes for the collection and disposal of waste, but also identifies the best times for garbage collection, potentially reducing operating costs by up to 40 per cent and boosting energy savings by up to 20 per cent.

DO YOU WANT TO FIND OUT MORE? PLEASE **CLICK HERE** TO:

- check the extended case study with comments by Deputy Mayor Miguel Pinto-Luz

- listen to a Podcast with Deputy Mayor Miguel Pinto-Luz

- discover additional case studies (Vienna, Austria; Calgary, Canada; and Hong Kong)

- read a detailed explanation of the trend "City operations through AI", with insights from policymakers, researchers and city planners we spoke to.

Trend 11: Cybersecurity and privacy awareness in the city

Cities strive to promote awareness of the importance of data privacy and to get prepared for the impact of cyberattacks, since data will be an important city commodity.

AS SERVICES ARE becoming highly integrated and interconnected, and vulnerabilities created during data exchanges are more common, data security is vitally important. In 2018, the total cost of losses from cyberattacks for cities in a survey averaged €2.8 million.[58]

Cybersecurity is now a key consideration for developers and planners of smart cities, and attention is turning to the risks inherent in such a highly interconnected environment. However, while the cybersecurity industry has developed a mature understanding of how to measure and mitigate the impact of cyberattacks on infrastructure in 'non-smart' cities, there is limited knowledge of the potential impact of attacks on smart cities.

An attack on smart city infrastructure may create effects that cascade – or 'ripple' – outwards and affect other parts of the city or country, or beyond. Resilience is *the* essential concept that must be considered when creating these complex and highly interconnected environments. It is essential to use resilience as a cornerstone of city building, and to do so in a way that can be scaled up and remain flexible for future upgrades and enhancements.

As the complexity of technologies, operational interdependencies, and systems management increases, so does the interest of hackers in profiting from this environment. Developing smart city initiatives without considering cybersecurity and privacy can result in a highly vulnerable environment that poses security risks to critical infrastructure and data, and in some cases may even create safety risks for citizens.

Advance planning is essential. By one estimate, 95 per cent of Cities 4.0 (as labelled by ESI ThoughtLab, referring to hyper-connected cities that use technology, data, and citizen engagement in pursuit of the SDGs) ensure that cybersecurity is considered early in the process, compared with only 51 per cent of other cities.[59]

However, many cities are not ready for the challenges. Besides lagging far behind in the digital revolution, with outdated technologies running critical infrastructure, they lack the human resource expertise to be capable of addressing the challenges.[60] Creating ecosystems of innovation – as Tel Aviv has done – could be one approach to improving security. Another approach is to invest in models of public/private cooperation and coordination. Efforts must be backed by city executives and not left to external entities or departments alone.

How to ensure successful implementation

- Ensure three major goals:

    – Govern like a nation

    – Treat smart cities as a defensive ecosystem

    – Reboot with resilience.

- Synchronize the city with cyber strategy, and allow for flexibility.

- Have a clear cyber and data governance in place, with accountability.

- Leverage the ecosystem and build strategic partnerships to grow cyber capabilities.

- Align regulation policies.

- Adopt a specific tool to manage the cybersecurity landscape of a smart city.

- Invest in awareness campaigns on privacy.

"It has been an interesting evolution over the last decade or two in terms of cybersecurity protections. Initially cities very much felt that they needed to create a fortress; then they started to realise that using the cloud was going to be more secure because many cloud service providers have 24/7 security experts with greater capacity to monitor, detect and prevent attacks."

Jeff Merritt, Head of IoT and Urban Transformation at World Economic Forum

Who is implementing it?

TEL AVIV, ISRAEL

In 2010, faced with the prospect of an ever-increasing number of cyberattacks, Israel's prime minister consulted with its National Cyber Initiative, which recommended that instead of creating a government-led cybersecurity programme, it should create a cybersecurity ecosystem that could identify and respond to the threats by itself. A constantly evolving framework for this ecosystem was then built, in collaboration between the government and the military, knowledge institutions and the business sector.[61]

With the government acting as a catalyst, Israel's cybersecurity industry accounts for 31 per cent of global investments in this sector, ranking second after the USA in 2021.[62] It is an economic growth engine, with Tel Aviv at its centre. Companies such as Snyk, SentinelOne, Cato Networks, Forter and BigID achieved unicorn status in 2020.[63] Tel Aviv is also home to the Municipal Innovation Center, which showcases demonstrations of smart city solutions and digital innovation for city leaders and administrators in a non-biased environment, to help local governments implement secure smart systems. Tel Aviv also hosts an important annual global conference, called Muni World and Expo, as well as other international cyber events.

Tel Aviv leverages its innovation and start-up environment to strengthen its ecosystem. The involvement of and close connection to the military is a key element in this. In 2020, Tel Aviv University launched a free online cybersecurity course covering topics such as cryptography, security of identification systems, attack and defence strategies, and viruses and other malware, with participation by students from more than 150 countries. In just six months, it became the number one security course in the world, out-competing 1,750 other courses.[64]

DO YOU WANT TO FIND OUT MORE? PLEASE **CLICK HERE** TO:

- discover additional case studies (Tokyo, Japan and Toronto, Canada)

- read a detailed explanation of the trend "Cyber security and privacy awareness", with insights from policymakers, researchers and city planners we spoke to

- explore the interview with Jeff Merritt, Head of IoT and Urban Transformation at World Economic Forum.

Trend 12: Surveillance and predictive policing through AI

Cities are leveraging artificial intelligence (AI) to ensure safety and security for their citizens while safeguarding privacy and fundamental human rights.

SURVEILLANCE AND PREDICTIVE policing through AI is the most controversial trend in this report, but one that has important implications for the future of cities and societies.

Technology is frequently used as a synonym for evolution, but the ethics of its use may need to be questioned. An underlying question is what society we are aiming to build. There are doubts and uncertainties about the impact of AI on communities and cities: the most fundamental concern is privacy, but there are frequent debates about AI from other perspectives, such as its impact on jobs, the economy and the future of work. Therefore, one cannot disconnect the discussion about surveillance and predictive policing from recent debates about the societal, ethical and even geopolitical dimensions.

The pace of adoption of AI for security purposes has increased in recent years. AI has recently helped create and deliver innovative police services, connect police forces to citizens, build trust and strengthen associations with communities. There is growing use of smart solutions such as biometrics, facial recognition, smart cameras and video surveillance systems.

A recent study found that smart technologies such as AI could help cities reduce crime by 30 to 40 per cent and reduce response times for emergency services by 20 to 35 per cent.[65] The same study found that cities have started to invest in real-time crime mapping, crowd management and gunshot detection. Cities are making use of facial recognition and biometrics (84 per cent), in-car and body cameras for police (55 per cent), drones and aerial surveillance (46 per cent), and crowdsourcing crime reporting and emergency apps (39 per cent) to ensure public safety. However, only 8 per cent use data-driven policing.[66] The International Data Corporation (IDC) has predicted that by 2022, 40 per cent of police agencies will use digital tools, such as live video streaming and shared workflows, to support community safety and an alternative response framework.[67]

Surveillance is not new, but cities are exploring the capabilities of predicting crime by analysing surveillance data, in order to improve security. Cities already capture images for surveillance purposes, but by using AI, images can now be analysed and acted on much more quickly.[68] Machine learning and big data analysis make it possible to navigate through huge amounts of data on crime and terrorism, to identify patterns, correlations and trends. When the right relationships are in place, technology is the layer that supports law enforcement agencies to better deliver their job and trigger behaviour change. The ultimate goal is to create agile security systems that can detect crime, terrorism networks and suspicious activity, and even contribute to the effectiveness of justice systems.

How to achieve these goals while respecting privacy and liberties remains a crucial question.

Experts say it is almost impossible to design broadly adopted ethical AI systems, because of the enormous complexity of the diverse contexts they need to encompass. Any advances in AI for surveillance and predictive policing need to be accompanied by discussions about ethical and regulatory issues. Even though the value proposition of these technologies might seem attractive from a use case perspective, liberties and civil rights need to be protected by proper privacy and human rights regulations.

In summary, cities need to consider if using technology for surveillance and policing implies making concessions to convenience at the expense of freedom.

How to ensure a successful implementation?

- Balance security interests with the protection of civil liberties, including privacy and freedom.

- Experiment responsibly, and regulate first.

- Establish institutional review boards that include experts from multiple disciplines.

- Create mechanisms for monitoring and reviewing algorithms.

- Privilege the usage of environmental data instead of personal data.

- Promote strong collaboration and trust between law enforcement systems and citizens.

- Accompany digitalisation with a change in culture.

"Technology is not good or bad, the question is how are we using it. Technology doesn't build relationships, it doesn't build trust: people do. You can only add the technology once you have the trusted relationship in place."

Jeff Merritt, Head of IoT and Urban Transformation at World Economic Forum

Who is implementing it?

KANAGAWA, JAPAN

In preparation for the Tokyo Olympics, the Japanese police force launched AI-enabled predictive policing.

The AI systems are capable of determining whether multiple crimes are committed by the same person, by comparing data relating to each crime. Using this information, AI can predict the criminal's next move.

The AI system has a 'deep learning' algorithm for teaching the computer systems in real time as it collects more data. The process enables the system to have full access to police force statistics, while also providing access to other details of the crime, such as time, place, weather and geographical conditions.

There is also a plan to permit AI access to social media in order to identify the specific areas or people who may be involved in a crime. The Kanagawa police began studying the feasibility of this in 2018 and carried out joint research with the private sector before putting a system in place.

The National Police Agency has also set up a panel to advise on how the police should make use of AI.[69]

DO YOU WANT TO FIND OUT MORE? PLEASE **CLICK HERE** TO:

- discover additional case studies (Singapore; Rio de Janeiro, Brazil)

- read a detailed explanation of the trend "Surveillance and predictive policing through AI", with insights from policymakers, researchers and city planners we spoke to.

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