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EU Tech Chamber

White Paper on Smart Cities Council

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EXECUTIVE SUMMARY

The 2030 Agenda for Sustainable Development, with its 17 Sustainable Development Goals (SDGs), provides an ambitious and broad framework that unlocks new perspectives for policymaking and international cooperation in smart cities.

There is a significant progress in implementation, but current efforts fall considerably short in terms of the scale needed to deliver the SDGs within the coming 9 years.

As a response to the COVID-19 pandemic, ambitious actions have become even more important. In this light, implementation of the aforementioned SDGs is vital for a recovery that leads to greener, more inclusive economies and stronger, more resilient countries and cities.

A cities-based approach to sustainable development requires working in a relational manner within an entire network of cities, where each municipality plays an integral part in transitioning towards sustainability.

We believe that creating industry-wide standardization across Europe for smart cities is essential to achieve carbon neutrality by 2050.

European Commission programs and projects have proved that innovative technologies are readily available for use, and efficient implementations of renewable energies can be integrated into the urban environment with no fundamental obstacles.

We envision a stronger collaboration within European cities at all levels which will not only improve our lives but also our districts and entire cities.

Moreover, we believe it is time to consolidate the trend of smart cities around people to ensure that innovative technologies serve cities' dwellers and continue making real changes in our everyday life.

European Technology Chamber

With great technology comes great responsibility.

Technology Obliges!

The European Technology Chamber is a registered NGO that enables European businesses to use their technologies for the benefit of Europe and mankind. The EUTEC Chamber has three major goals, and it believes that technology is the answer to reach those goals.

Competitiveness

Strengthen Europe's competitiveness and transformation capabilities in its global positioning

Sustainability

Leverage innovation, key technologies and business opportunities to achieve the 17 UNSDGs

Growth

Build bridges to international markets and establish partnerships to facilitate inclusive growth

About Smart Cities Council

Designed to build the cities of the future

The Smart Cities Council is an initiative of the EU Tech Chamber that aims to fulfill the growing need for urbanization and connectivity. As an increasing number of people are residing in cities, the cities of tomorrow must become 'smart'. The purpose of this council is to connect the relevant innovators and stakeholders, share concepts and collaborate.

Connect
Connect European technology solutions with cities, districts and buildings.

Increase
Increase the efficiency, technological advancement and sustainability of European Cities.

Promote
Promote European best practices of Smart Cities in Europe and global markets.

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METHODOLOGY

EU Tech Chamber White Paper

A EUTEC White Paper serves as an informational document to share knowledge, foster exchange and collaboration and create value for our advocates and the larger EUTEC community, from society to businesses and industry professionals to technological innovators.

The sharing of technology-driven solutions and methods can help solve some of our most challenging questions on how we can improve our lives based on insights from engineers, experts and researchers.

A White Paper is carefully curated in collaboration with EUTEC advocates, supporters and contributors who share EUTEC's vision and values and is published by ETUEC Sections for education and knowledge-sharing purposes.

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10 RECOMMENDATIONS FOR SMART CITY DECISION MAKERS

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10 RECOMMENDATIONS FOR SMART CITY DECISION MAKERS

1. Green Spaces: Due to rapid urbanization, 65% of the population is expected to reside in cities by 2050. Therefore, it is essential to include adequate green spaces for people and animals to coexist within cities, as well as to promote mental and physical health and facilitate stress alleviation.

2. Cleantech Development: Due to rapid urbanization, challenges such as the Built Environments (BE) energy consumption will remain high, with an estimated 38% of emissions originating from the BE. Cleantech development will be essential for achieving carbon neutrality by 2050.

3. Cybersecurity Through Improved Software and Hardware Integration: Digitalization creates business opportunities and has the potential to improve the sustainability performance of the building and construction sector. However, it will be critical to improve the existing levels of cybersecurity, especially to protect the data of people, companies and governments.

4. Creating a Free, Open-Source Platform: The creation of a citizen-centred design approach based on an open-source platform can allow for the democratization of smart building design, where information can be shared freely.

5. The Internet of Things-IoT: The IoT has quickly become a huge part of how people live, communicate and do business. In this light, the development of software that is better calibrated to be more compatible with other software would be beneficial. For example, software that facilitates the seamless use of connected appliances, smart home security systems and ultra high-speed wireless Internet will help streamline connectivity.

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10 RECOMMENDATIONS FOR SMART CITY DECISION MAKERS

6. Technological Adoption: Technology can help industries to become more sustainable by reducing wastage, time required, and cost throughout the construction process. This is especially true when using smarter building materials, artificial intelligence, robotics, three-dimensional (3D) printing, and BIM Management.

7. Creating Sustainable Best Practices for Smart Cities: Creating incentives that other municipalities, companies and people can adopt is essential to achieve carbon neutrality by 2050, thus leading to industry-wide standardization across Europe.

8. Mobility and Electrification: Due to the electrification of transportation, it will be critical to improve the existing infrastructure to accommodate electric vehicles, bikes and other modes of transport for shaping future cityscapes.

9. Circular Economic Models: The reuse of building materials and recycling of infrastructure can enhance value circulation and promote effective resource usage, which would help lower the industry's virgin resource consumption.

10. Evolution of Office Spaces in Cities: Due to the growth of digitalization, more people have been able to relocate from major cities to more rural communities. Therefore, rethinking the ways in which commercial buildings are designed to accommodate more shared, coworking spaces will be beneficial for catering to future working conditions.

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1. Green Spaces

Due to rapid urbanization, 65% of the population is expected to reside in cities by 2050. Therefore, it is essential to include adequate green spaces for people and animals to coexist within cities, as well as to promote mental and physical health and facilitate stress alleviation.

Green infrastructure is usually associated with parks, green spaces and river corridors in cities, but nowadays, buildings with vegetation have emerged as an increasingly important element within planning. Green zones in cities are unique environmental areas that can stimulate novel thinking and increase our knowledge on eco-friendly construction and provision of services. Green areas in urban environments not only promote wellbeing but also help to increase biodiversity and provide other important ecosystem-related services. Therefore, cities must plan and create more green areas to lower the temperature, reduce the risk of flooding, mitigate noise and reduce pollution.

Moreover, public urban green spaces promote outdoor activities and social interaction, which significantly contribute to the health and well-being of the residents, especially people who have limited contact with nature. Adding a simple green square in a crowded complex of apartments can be considered a social improvement through design because it can reduce crime and provide a space for children to play, thereby helping them avoid the otherwise dangerous inner-city environment.

Passive buildings with vegetation and smart solutions that facilitate a sustainable lifestyle are other important factors. Modern buildings should provide passive solar designs, fresh air systems, cultivation balconies, a shared roof garden with greenhouses, green roofs, solar cells, a cargo bike pool, simple solutions for waste management and separate metering and billing for hot water and electricity.

Greener, healthier and more attractive cities can be developed through many innovative methods and sustainable makeovers, such as the use of green roofs, walls and facades; mobile vegetation systems and urban habitats; and increasing biodiversity.

Digital technology can play an important role in the greening of cities. Satellite surveys and machine learning can help urban planners to build a picture of the green spaces in their cities, while drones and RFID tags can simplify the process of maintaining and protecting plant life easier, even if it is halfway up a skyscraper. Infrared satellite imagery combined with data from Google Earth can help to identify urban areas in which the amount of greenery can be increased. Innovative technologies not only can help plant life to thrive in an urban environment but also maximise its beneficial impact on the humans who live in the environment.

We advise that monitoring and mapping of the existing green infrastructure on buildings should be a part of the Smart City agenda. Additionally, mapping areas with deficiency in and potential for green buildings will help planners, facility managers, estate managers and the entire construction industry to converge for increasing the proportion of urban green spaces.

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2. Cleantech Development

Due to rapid urbanization, challenges such as the Built Environments (BE) energy consumption will remain high, with an estimated 38% of emissions originating from the BE. Cleantech development will be essential for achieving carbon neutrality by 2050.

According to research by Saint-Gobain, globally, the built environment accounts for 33% of energy consumption, 30% of greenhouse gas emissions, 40% of solid waste streams (in developed countries) and 40% of raw material consumption. By swapping out traditional building materials with more sustainable materials that support interior drywall construction, expenses will barely increase, building time will be reduced and, most importantly, the end-users will benefit. To reduce environmental damage, we recommend the development and widespread use of cleantech to benefit the society. Through the adoption of technologies that reduce energy, water and resource usage, societies can increase their productivity, global competitiveness and drive local economic development and employment.

Moreover, the involvement of businesses with cleantech is crucial to drive benefits both for the companies themselves and the entire world. Rising to the challenge of developing cleaner products and manufacturing systems allows companies to become more flexible, more innovative and, finally, more sustainable. In sum, engagement with the cleantech sector is the perfect opportunity for companies to generate long-term profits. A holistic approach to sustainability should be adopted with a mission to develop systems in which buildings work together to create a waste-free environment and minimize adverse effects on the environment. Various forms of cleantech solutions can be applied, such as green roofs, reusable and recyclable materials, filters for purifying indoor air, biomaterials, water systems, innovative lighting, heating and ventilation and passive air-cooling methods for reducing energy consumption. Moreover, analytics and automation technologies are poised to transform energy management in buildings. From reducing energy consumption and carbon footprint, to promoting health, wellness and productivity, these technologies promise to deliver a wide variety of benefits to building owners, occupants and the environment. Considering the importance of and value offer by new cleantech solutions, smart cities should consider reducing the use of materials and energy in the public sector throughout product and service lifecycles, with a focus on waste management, transport, energy generation and energy efficiency.

The developers of BEs should focus on two primary areas, namely increasing renewable energy usage and simultaneously decreasing and repurposing waste.

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3. Cyber Security Improved software and hardware Integration

Digitalization creates business opportunities and has the potential to improve the sustainability performance of the building and construction sector. However, it will be critical to improve the existing levels of cybersecurity, especially to protect the data of people, companies and governments. Smart infrastructure enabled by new technologies such as artificial intelligence, advanced analytics, and the Internet of Things (IoT) offers numerous of advantages that lead to considerable cost savings and efficiencies but also expose cities, companies and their customers to new types of cyber risks.

Urban data platforms can truly help smart cities to become smarter when the correct security measures are implemented. Data security will always be a hot topic so long as governments have vast stores of public data. Hardware and software integration should always be accompanied by a robust cybersecurity policy for safeguarding systems against attacks that could disrupt cities or harm people. Because we depend on information and information technology (IT) to great extents nowadays to make our everyday life easier and more convenient, especially in smart cities, cybersecurity is vital to protecting all of these functions.

Cyberspace is vulnerable to a broad spectrum of hackers, criminals, terrorists and state actors. Working in cyberspace, malevolent actors can steal money, intellectual property or classified information; impersonate law-abiding parties for their own purposes; damage important data or deny the availability of normally accessible services.

Increasing threats due to cyber-attacks are driving the development of solutions for mitigating cyber risks at many levels because data, infrastructure, applications and people are exposed to different types and levels of threats.

An effective security solution must start with the embedded hardware platform. Strong hardware authentication features and features supporting secure boot, software measurement and encryption provide the foundation for minimizing attack risks. A focus on the implementation of superior cybersecurity solutions will help keep systems safe and secure and protect the data of people, companies, cities and governments.

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4. Creating a free, open-source platform

The creation of a citizen-centred design approach based on an open-source platform can allow for the democratization of smart building design, where information can be shared freely.

The European Innovation Partnership on Smart Cities and Communities (EIP-SCC) is working towards the ambitious goal "to speed the adoption, at scale, of common open urban data platforms, and ensure that 300 million European citizens are served by cities with competent urban data platforms, by 2025".

A study commissioned by the European Commission found that 70% of the surveyed cities that had adopted urban data platforms were using open standards to further develop their platforms and build a higher level of trust between the private and public sectors and between governments and their citizens.

Open-source platforms are the future of smart buildings because they not only offer the possibilities of accelerating both innovation and co-creation activities in cities and buildings but also provide many benefits to building owners, property managers and residents.

Similarly, open-source software development is an efficient route to the creation of new services. Co-creation improves the commitment of different stakeholders and ensures that the created solutions are based on real needs.

The sharing of open data in an effective and transparent manner increases the possibility that different stakeholders innovate together to achieve shared goals. Moreover, the use of open data creates opportunities for improved services like better planning and predictive analysis, more efficient construction and better asset management in smart cities, improved citizen engagement and revelation of hidden and important relationships in data.

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5. The Internet of Things - IoT

The IoT has quickly become a huge part of how people live, communicate and do business. In this light, the development of software that is better calibrated to be more compatible with other software would be beneficial. For example, software that facilitates the seamless use of connected appliances, smart home security systems and ultra high-speed wireless Internet will help streamline connectivity.

McKinsey Global Institute predicts massive value growth for the IOT ($11.1 trillion annually by 2025). Smart homes—fully connected household environments that provide residents with an unprecedented level of control and comfort—will account for a major part of this increase.

Solutions based on the IoT are becoming increasingly common nowadays. Automated real-time data collection is helping to optimise energy consumption in thousands of buildings and facilities in cities.

The IoT can be used in combination with big data to monitor and rapidly evaluate infrastructure or building performance. Companies can lower overall costs, as well as track and monitor utilization, energy efficiencies and maintenance needs, by using IoT sensors and communication technologies. In residential buildings, PropTech solutions such as applications for buildings that use automation and wireless communication are examples of this trend. For infrastructure management, IoT systems use cloud computing, virtualization and automation.

PropTech and Smart Building are important segments within the Smart City ecosystem, and in these segments, IoT solutions can be used to address challenges such as the need for separate infrastructure to maintain facilities, lack of integration between different systems and lack of control over energy wastage in massive residential buildings.

Further development of IoT and the integration of AI technologies with connected systems is recommended to create the concept of a new household—an intelligent space that predicts residents' needs and provides them with a truly seamless user experience.

The application of the IoT in home automation benefits everyone—from homeowners to the city and even the entire planet. By optimizing resource usage, we decrease our spending and reduce our carbon footprint.

IoT connected technology allows everyone to be eco-friendly, reduce carbon emissions and cut down pollution.

6. Technological Adoption

Technology can help industries to become more sustainable by reducing wastage, time required, and cost throughout the construction process. This is especially true when using smarter building materials, artificial intelligence (AI), robotics, three-dimensional (3D) printing, and BIM Management.

According to a report by McKinsey & Company, the productivity gaps in construction cost the global economy $1.6 trillion annually. Technology adoption will help to reduce the lack of productivity which affects almost all construction companies. Moreover, the use of advanced analytics to monitor efficiency and fault detection at multiple sites simultaneously helps to rank site productivity and improve workers performance while keeping costs low.

EUTECH recommends accelerated adoption of Building Information Modelling (BIM) in BEs as an enabler of innovation and as the foundation of AI usage to enhance the current design, construction, portfolio and project management and real estate and facility management capabilities. AI helps to redefine and extend the role of BIM which will become the norm in the development of new buildings and many other facilities in the smart cities.

AI is driving smart, efficient buildings from design through construction into operation and usage. These buildings offer real-time control over the internal space. Successful smart buildings add value by improving comfort through adjustments based on personal preferences and by making a direct, positive impact on individual productivity and well being.

The use of 3D/four-dimensional (4D) printers in construction can provide solutions for the rapid construction of low-cost housing. Thanks to 3D/4D printers, we can print many materials, including concrete, glass, ceramics and many types of plastics and metals. Moreover, infrastructure elements are damaged, 3D/4D printing can facilitate the rapid completion of maintenance before the occurrence of larger and more expensive issues. Smart factory technologies and robotics can accelerate innovation and design development, reduce electricity and labour costs and result in the introduction of more successful new product projects.

The effective adoption of smart city technologies also requires a transition to smart construction materials that can respond in a useful and controlled manner to any changes in their conditions or to the environment in which they are used.

7. Creating Sustainable Best Practices for Smart Cities

Creating incentives that other municipalities, companies and people can adopt is essential to achieve carbon neutrality by 2050, thus leading to industry-wide standardization across Europe.

Adopting consensus-based standards in smart cities is recommended to achieve the interoperability required for building a smart city and ensuring that the city functions in a better and more effective manner. A few products and services are not easily replicable and rather complicated to scale from one city to another. Therefore, by selecting solutions based on best practices, cities can deploy them in a cheaper and more reliable manner because the selected products, services and processes have been already tested in many other cities under various circumstances.

According to The United Nations Economic Commission for Europe (UNECE), many challenges and issues for smart cities are externalised to broader territories and require multi-level and horizontal coordination, as well as international cooperation. This involves coordination across municipal and national borders; international transboundary cooperation among cities and urban agglomerations; information-exchange and learning and interoperability of standards and protocols. Innovative cities develop knowledge and exchange good practices and experiences related to other contexts, including the knowledge and exchange of international standards.

City-focused international cooperation to learn good practices can lead to both successes and failures. There are alliances and networks of cities that are working across borders to achieve sustainability, exchange experiences along their digitization journey and align urban data platforms, common standards and application programming interfaces to create a larger and more coherent ecosystem.
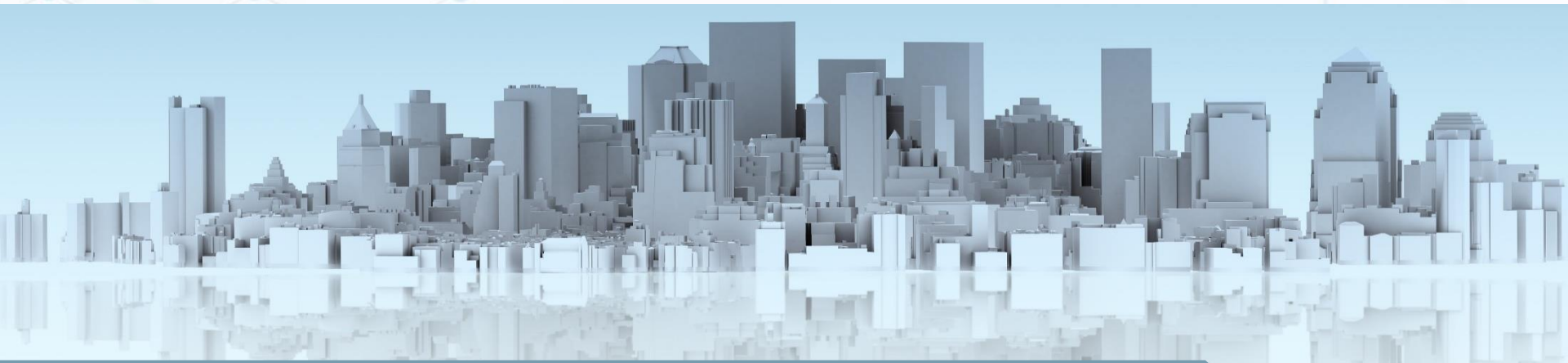
8. Mobility & Electrification

Due to the electrification of transportation, it will be critical to improve the existing infrastructure to accommodate electric vehicles, bikes and other modes of transport for shaping future cityscapes.

The transportation sector, especially private mobility, is one of the main causes of polluting emissions. Globally, road transportation is responsible for 30% of NO2 emissions, 10% of total particulate matter and 54% of CO. Urban mobility accounts for 40% of all CO2 emissions due to road transportation and up to 70% of the emissions of other pollutants due to transportation.

To reduce polluting emissions on the road, electric mobility is strongly encouraged by municipal administrations to accelerate the transition to mobility models that ensure environmental sustainability, increase system efficiency and cost-effectiveness for citizens and drive modernization and technological development in the industry.

Sustainable modes of travel can reduce environmental, social and economic impacts such as atmospheric and acoustic pollution, road congestion, accidents and degradation of urban areas due to the space occupied by private vehicles at the expense of pedestrians.

The promotion of electric vehicles, bikes, scooter and car sharing services, self-service bikes, walking, public transport and carpooling networks, as well the provision of charging stations, must be a priority to provide urban residents with true sustainable alternatives to the single-occupant fossil-fuelled car.

We recommend the promotion of innovative solutions in smart cities such as car and bike fleets, city district design for sustainable transport and intelligent traffic safety systems. It is certainly important that this transition in mobility is accompanied by a change in mentality that makes room for new forms of economy, including the sharing economy.

9. Circular economic models

The reuse of building materials and recycling of infrastructure can enhance value circulation and promote effective resource usage, which would help lower the industry's virgin resource consumption.

Circular economy is a novel economic framework that is restorative and regenerative by design. Business models need to change to suit a circular economy, where everything is a resource for something else, and waste does not exist. Sustainable resource management policies for smart cities should promote resource optimization to foster the transition towards the circular economy. Resource usage and emissions can be limited through material recovery, which can generate additional economic growth because it stimulates technological innovation.

In the construction sector, which is responsible for 40% of global waste production and 50% of resource consumption, the transition to the circular economy will lead to profound renewal at different levels of the value chain: production processes, product formulation, product end-of-life management, recycling, reuse and development of the economy of functionality.

Profitable business models in smart cities should be combined with social and environmental responsibility through the use of prefabrication processes and development of lightweight construction solutions, reuse of building materials, increased recycling of infrastructure and improved product design from the outset to provide a response to the challenge of resources usage reduction.

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10. Evolution of Office Space in Cities

Due to the growth of digitalization, more people have been able to relocate from major cities to more rural communities. Therefore, rethinking the ways in which commercial buildings are designed to accommodate more shared, coworking spaces will be beneficial for catering to future working conditions.

Smart cities transform the ways in which office spaces are used for meetings, IT processes, facilitation and service delivery. The current shift towards a more flexible and hybrid work approach and the expectations of millennials have driven businesses to use space on demand with requirements such as different spaces for different use cases throughout the week. Recent trends are forcing the development of new office models---modern, dynamic workspaces with collaboration zones that house many whiteboards to facilitate the exchange of ideas as opposed to the traditional desk-and-chair layout.

Smart cities improve office dynamics in multiple ways. From security and energy management to process automation, smart cities reshape and refine almost everything for the corporate sector. Corporate offices, managements and businesspersons can leverage the high-tech resources in smart cities to communicate with employers and employees and share information effectively.

Design and green zones included in office spaces contribute to social sustainability and help people thrive at work, which is linked to better job performance, creativity, well being and more positive interactions among people. The number of sick-leave days availed by employees working in offices with design and green zones is among the lowest across employees working in similar facilities due to the healthy work environment, good indoor air quality and use of closed systems for chemicals. Modern, intelligent buildings may provide users with the ability to act as a "virtual super secretary" for the entire building, tracking the whereabouts of users inside and outside a building and providing suggestions for meetings inside the building by considering possible external obstacles.

Startups and large enterprises prefer to work in shared office spaces because it is a less expensive, flexible and highly productive option. Moreover, the choice of an environment-friendly building could be a part of their corporate social responsibility program.

Ultimately, by using smart building structures, we make our cities more liveable, workable and sustainable. Moreover, we increase the attractiveness of certain neighbourhoods to businesses that offer complementary services. In doing so, we can achieve the target of net zero emissions.

CONCLUSION

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In this paper, we examined several domains associated with the smart cities concept and evaluated each of them briefly with a focus on the BE.

Today, smart cities are the driving force in economic, social and cultural life, in addition to leading environmental transformation. By utilizing the true value and massive innovative potential of cites, coupled with deep involvement at the municipal level, we can have a major impact on achieving the United Nations SDGs.

We strongly believe that all efforts undertaken in cities will position humans and liveability at the centre of the urban perspective and sustainability. Modern technologies, new approaches and solutions and smart services powered by data will help to rebuild cities in a manner that creates value for all citizens and improves our wellbeing and quality of life.

Finally, by accelerating the adoption of new ways of thinking; considering recent trends, expectations of young generations and humans in general and using modern technology as a critically important aspect, we will be able support the people-oriented approach in smart cities.

CONTRIBUTED BY

Mohammad Abdullah Sajid
Graphic Designer

Nadine Böhnke
Marketing Manager

Sammi Fu Bo
Advocacy Manager

Anna Rabiej
Smart Cities Council

Nedzad Piric
Director Smart Cities Council

Sharon Shang
Landing Coordinator

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