Smart Cities: Building Life Safety into the Urban Landscape

Summary

Accelerated by the Internet of Things and the possibilities that connected technologies offer, the world has never been so captivated by the concept of smart cities. With development on the rise globally, the fundamental structure of cities as we know them is changing forever. When it comes to life safety, this raises some serious questions of the industry tasked with protecting lives. How will smart cities impact the life safety industry, and is it ready for smart technology?

Preface

"Globally, we're at an exciting time for urban development, with smart technology changing the way we create, live and interact in cities. In a first for the life safety industry, this new paper draws on existing case studies, technologies in practice and results from a survey of life safety installers to examine the current smart city landscape across Europe, the Middle East, Africa and India.

"Examining the value of smart technology in city planning provides a breadth of information to help explore the impact of smart cities on life safety, both in terms of the possibilities they offer and the challenges that will need to be addressed to ensure we succeed in further improving fire safety in the built environment. In doing this, we can make sure every area of the sector is equipped to face the future, laying the foundations for an even safer urban landscape that everyone can enjoy."

> Simon May, Technical Manager at Hochiki Europe

Defining a smart city

Smart cities are hailed by a growing number of experts as the future for the urban environment. By harnessing cutting-edge information and communication technologies to streamline the provision of services, such as education, transport and waste management, smart cities offer the potential to do more than boost the efficiency of public services, reduce waste and energy consumption. They offer the possibility to make cities more liveable for residents, enhancing their health and wellbeing.

Accelerated by the Internet of Things (IoT) and big data, the creation of smart cities has never been

more relevant or conceivable. But what do we mean when we talk about a smart city? How does it differ from the standard 21st century urban environment, and how do they work?

It's universally accepted that a smart city is an urban development vision to integrate multiple information and communication technology solutions in a secure fashion to manage a city's assets. However, the extent to which a city is actually considered smart is much less defined. With many aspects of what could constitute elements of a smart city already in use across the world, such as traffic management and emergency response, the term is increasingly raising more questions than answers.

A blueprint for an effective, efficient urban environment

Due to the breadth of technologies that have been proposed for use in communities planned under the smart city label, it is difficult to distil a precise definition. Deakin and Al Waer¹ list four factors that contribute to the definition of a smart city:

- 1. The application of a wide range of electronic and digital technologies to communities and cities
- 2. The use of Information and Communications Technology (ICT) to transform life and working environments within the region
- 3. The embedding of such ICTs in government systems
- 4. The territorialisation of practices that brings ICTs and people together to enhance the innovation and knowledge that they offer

Whatever the aims of urban planners, whether it's the regulation of traffic, the efficient delivery of utilities or the speedy response of emergency services, all smart cities have one key attribute in common. That is the combination of intelligent, informed town planning with the integration of advanced communications technology to achieve efficiency goals, helping to create a more sustainable community that doesn't just meet residents' needs, but helps to improve their lives. While the term 'smart cities' itself was coined some 20 years ago, the idea of using smart data to improve the efficiency of services dates back to the mid-1970s, when the city of Los Angeles, California, began the systematic collection of data to help them plan infrastructure and building projects. Now, smart cities represent the latest development in the evolution of town planning, creating highly connected, highly efficient urban environments that promote and support the wellbeing of their residents.

Big data and connectivity in Amsterdam

The Digital Agenda for Europe (2010) highlighted the importance of utilising more open data to improve public services and create smarter cities across the continent.

Amsterdam is a great example of a highly connected, collaborative city that uses open and big data to benefit its inhabitants. Through partnerships between local companies, the government and citizens, the Amsterdam Smart City Initiative² has been created to allow information about the city and the way it is used by residents to be actively shared among organisations. This data has been utilised in numerous ways to successfully streamline services and develop a more user-friendly city. For example, it has enabled the creation of an app that helps disabled people navigate the city, and even includes automated features that alert a call centre to any issues so that they can get in touch and provide immediate support.

Another development is City Alerts³, which warns the fire brigade of issues that concern privacy or safety before they attend a callout. Not only can this connected technology help people become smarter within the city, it can also improve safety.

Section 2:

Understanding the life safety industry landscape

The life safety industry view on smart cities

Discussion on smart cities is rife, from the benefits to the pitfalls, the current incarnation of smart cities is a subject of debate across the construction industry and among policy makers. However, one area where the critical spotlight is only just beginning to shine is life safety.

Protecting the residents of any building or city is vital, but with the fundamental way cities are developed and occupied changing, it raises key questions about what is required to keep people safe. Chiefly, is the life safety industry ready to respond to the demand for highly connected, responsive technologies?

A recent survey carried out by Hochiki Europe of life safety professionals from across EMEA and India suggests that there is a gap in awareness and understanding of what smart cities are and their potential impact on the industry. The survey, predominantly of life safety installers, found that over half (57 per cent) of respondents hadn't even heard of the term smart city, and only a third (33 per cent) knew what one was.

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2) https://amsterdamsmartcity.com/

3) https://www.theguardian.com/media-network/2015/oct/14/manchester-barcelona-smart-cities-open-data

Yet, despite this apparent lack of awareness surrounding smart cities, only a small proportion of respondents (14 per cent) were worried about the future of the life safety industry if all cities became smart. In fact, almost one third (30 per cent) thought it would make no difference to the industry and over two-fifths (43 per cent) were not worried at all. This could reveal a confidence among life safety professionals in the industry's ability to adapt and innovate, and is something reflected in the findings on whether they thought the industry would be able to keep people safe in a smart city. Almost half (48 per cent) of respondents were confident that this would be the case and almost a fifth (18 per cent) thought residents would actually be safer in a smart city.

However, when it came to directly stating their confidence in the industry's ability to adapt to the technological demands of smarter cities, certainty seemed to waver. Almost two-fifths (39 per cent) felt the industry is not currently equipped to adapt to smart city demands, but, the difference in those that thought the industry is equipped to adapt is minor, at just three per cent (over a third (36 per cent) were confident it is). A quarter (25 per cent) of respondents stated they didn't know if the industry is equipped to adapt.

This data highlights the gap between the confidence of life safety professionals in the future of the industry and an understanding of how the industry will adapt from this point. Life safety is a necessity to protect the lives of people in any city, which may account for the feeling of confidence in the future – essentially the industry will need to provide life safety in whatever form it is required. However, the lack of understanding around what a smart city is and, consequently, what it demands in the form of life safety technology, may be the root cause of uncertainty on whether the industry is equipped to adapt.

As an industry it is clear there needs to be more research across the board to understand what the future of life safety will look like in a smart city. Equally, as the drivers of innovation, there is a key role for manufacturers to play in educating the rest of the industry on what solutions are currently available, how they can help meet existing smart city demands, and how the industry is preparing for technology of the future. Jonathan Gilbert, General Manager – Sales & Marketing, Kentec Electronics: Smarter life safety

"Smarter cities will result in increased data availability and system integration as well as more environmentally responsible processes in urban areas. However, the impact a truly smart city could have on the life safety industry shouldn't be underestimated. The ultimate vision for operations in a smart city is a single, centralised system that controls everything a high-performing city needs to function. So, theoretically, that also means a single fire safety system – with a single manufacturer and single maintenance company.

"There would certainly be benefits for this in terms of efficiency, but it would also diminish any competition and flexibility should the system need changing. Currently the open protocol system adopted by some manufacturers allows for devices and panels to be easily replaced or swapped to different suppliers should it be required. This degree of flexibility is particularly beneficial for building owners and managers.

"The reality is we have a lot of work to do before truly smart cities are commonplace. However, intelligent life safety is, and will continue to be, increasingly widely adopted, bringing many benefits aligned with smart cities – cloud-based applications allowing for remote management, the ability to pinpoint and manage incidents, as just some examples."

Global collaboration to create smart cities

Collaboration shouldn't just be limited to cross-industry knowledge sharing, partnerships between countries also can prove beneficial in advancing smart cities. India and Germany are two nations leading the way when it comes to a collaborative approach to developing smart cities. As part of the 100 Smart Cities programme, Germany's Federal Building Ministry plans to support three Indian cities, Bhubaneswar, Kochi and Coimbatore in implementing their smart city plans.

The 100 Smart Cities Mission is an urban renewal and retrofitting programme by the Government of India with the aim of developing 100 cities across the country to make them friendly and sustainable.⁵

At a "100 Smart Cities in India" conference held on the 3rd June 2016, Federal Building Minister, Barbara Hendricks, commented: "With its 100 Smart Cities programme, the Indian government is showing its deep commitment to making cities more liveable, developing them in a sustainable and efficient way and making them cleaner and healthier. We want to support three Indian cities in this process. By doing this we are also helping German companies that want to get involved with Indian partners to assist Indian cities in implementing their concepts".

The impact of smart cities on other industries

Interestingly, almost a third (31 per cent) of respondents thought that being planned with residents' health and wellbeing in mind is the most important aspect of a smart city. This could well reflect the increasing focus across the built environment industry to developing buildings and infrastructure that promote the welfare of occupants, in terms of physical health and safety, and emotional wellbeing. The second most cited aspect was a city designed with sustainability in mind, again reflective of where the industry has placed its focus in recent years.

Facilities management stands out

Among the sectors thought likely to see the biggest impact from smart technologies, facilities management was cited most often by respondents, followed by life safety. To some extent, facilities management is already developing into a strong case study for the benefits of incorporating smart technologies and IoT devices, such as cloud-based monitoring software. Given the close synergies between life safety and facilities management, particularly when it comes to system monitoring and maintenance, it's easy to see how this kind of technology can be used to benefit life safety. The efficiencies enabled by existing advances that allow fire and emergency lighting systems to be monitored remotely already deliver time and cost benefits, as maintenance teams can identify a problem and source the correct part before visiting the site, ensuring only one visit needs to be made.

Equally, for other sectors including healthcare and education, the benefits of increased digital connectivity are clear. Not only can it help with monitoring building occupants from a safety perspective, it can also assess building usage and modify systems as required to ensure they are operating as efficiently as possible and to the maximum benefit of users. For example, smart lighting technologies already exist that are capable of automatically adjusting lighting levels in a room based on daylight levels outside to ensure optimum comfort for room users and to save energy.⁶

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⁴⁾ http://research-in-germany.org/en/research-landscape/news/2016/06/2016-06-02-germany-and-india-strengthen-cooperation-on-smart-cities.html 5) "Mission Statement and Guidelines - Smart Cities" (PDF). Ministry of Urban Development, GOI. Retrieved 1 February 2016. 6) Internet of Things: A hands-on approach, 2014, Bahga and Madisetti: https://books.google.co.uk/books?id=JPKGBAAAQBA-J&pg=PA50&redir_esc=y&hl=en#v=onepage&q&f=false

Sectors life safety installers think will be most impacted by smart technology:



Demand and collaboration

When it comes to the demand for smarter technologies, two-fifths (40 per cent) of the life safety professionals surveyed felt that this would come from their Government. There is a precedence for this, with many of the existing examples of smarter technology in practice driven by policy makers and public authorities. In Barcelona, the Municipal Government has created a network of public transport routes that avoid traffic bottlenecks and speed up services based on data analysis from the district. A smart light system has also been implemented to optimise the number of green lights on any journey and lights can even change as emergency vehicles approach for faster response?

Outside of the Government, almost a quarter (24 per cent) of respondents thought the demand for smart technology would come from manufacturers, while the same amount thought it would come directly from end-users. This split could be reflective of the uncertainty that surrounds the benefits of smart technology and its place in the industry. However, whichever end of the supply chain demand is driven from, collaboration will play a key role. Jonathan Gilbert: Demand for new technology

"As the survey findings suggest, government will be a key driver for smart technology in the life safety industry, as it will also be for smart cities more broadly. For countries and regions where the government sets and regulates legislation, the challenge to implement smart technology will be more interesting, as not all existing legislation supports the implementation of fully integrated safety solutions.

"In the UK for example, smoke detectors must be wired separately, so unless legislation changes to allow them to become part of a full system, complete integration will be impossible. It's not to say that legislation won't evolve to make smart cities a reality, but it's certainly going to be one of the greatest challenges for everyone developing technology in the industry."

One of the benefits of smart technology is the efficiency it brings to all daily activities, saving time and money. For smart technology to function optimally, however, it requires information on the full picture of its usage to be fed to all parties, from manufacturers to end-users, throughout its entire lifecycle. Understanding how and when it will be used, will help us determine what the current challenges are, how these can be overcome and even help identify other potential benefits offered by smart technology. By creating a continuous feedback loop manufacturers can create the most effective technology and endusers can better understand how to maintain and use systems so that they are always at peak performance.

Section 3:

The future of smarter cities

The impact on town planning

By harnessing big data and modern communications technology, smart cities offer a radical new approach to meet many of the goals of traditional town planning:

Traffic flow

Much more recently urban planning has focused on ways to reduce traffic congestion, particularly during rush hour. Gathering data about where people are travelling from and where they are heading to, as well as the time they are setting out at, is already helping planners to design road layouts to improve capacity and minimise the risk of delays at peak times.⁸

Smart cities take this process even further, using intelligent transport management systems to

better regulate traffic flow? Technology capable of adjusting speed limits throughout the transport network, for example, or altering the timings of traffic lights at key junctions at peak times according to need can ensure traffic keeps moving and doesn't grind to a halt.

We are already seeing such technology being employed on major roads across Europe, in the form of Active Traffic Management (ATM) on autobahns in Germany and motorways in the UK[®] Under ATM, during periods of heavy traffic, variable speed limits are used and vehicles are permitted to travel on hard shoulders – this information is conveyed to road users via computerised signs on gantries over the motorway.[®] Traffic lights are also employed on slip roads to restrict the introduction of additional vehicles until the congestion has cleared.

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8) Practical Strategies for Reducing Congestion and Increasing Mobility for Chicago, 2012, Staley and Moore: http://nacto.org/docs/usdg/practical_strategies_for_reducing_congestion_and_increasing_ mobility_chicago_staley.pdf 9) Smarter Cambridge Transport: www.smartertransport.uk/smart-traffic-management/ 10) M42 Active Traffic Management Scheme, Birmingham, United Kingdom: www.roadtraffic-technology.com/projects/m42/ 11) Active Traffic Management, AA: www.theaa.com/public_affairs/news/active-traffic-management.html



Facilities management

Within buildings, facilities managers have, for a number of years now, made use of data from inspections, as well as smart technology, to monitor the developments in their care and to ensure the effective delivery of maintenance work when necessary. It is no surprise then that nearly a quarter (24 per cent) of survey respondents felt that facilities management was the sector where smart technology would have the most impact. Such solutions are having an impact across a number of areas within the remit of facilities management, from health and safety, to maintenance, to security.

In a smart city, technology offers the potential to allow facilities managers to monitor the state of not just a single building, but an entire neighbourhood from one location, something we are already seeing in the Lusail City smart city development in Qatar¹². In doing so, the maintenance requirements from every building in a city district could be planned in advance, helping to further reduce costs and disruption to the people living or working there.

Sustainability

Smart technology is increasingly being used within buildings to minimise their environmental impact. For example, systems can automatically adjust the temperature of rooms according to the weather outside, helping to reduce energy use from heating or air conditioning systems. It is even possible to monitor room use to switch off heating systems entirely in unoccupied spaces.¹³ In smart cities, such systems can be taken one step further. Used in combination with community heating schemes, for example, they can help monitor the occupation levels of each building in the network to ensure only those buildings that are being used are heated, eading to the reduction of energy consumption. Smart technology can also be used to re-direct energy at set times to districts that need it most, helping to ensure the efficient use of energy and prevent wasted fuel consumption.¹⁴

A smart life safety vision

It is clear that intelligent infrastructure solutions have the potential to significantly improve many aspects of city living for residents, from cutting their daily commute to shrinking their carbon footprint.

Taking these opportunities into consideration, what is the potential for smart city principles to impact on the provision of life safety services?

Modern life safety systems already allow all of the fire safety and emergency lighting equipment in a building to be controlled from a centralised control panel. As a result, facilities managers can monitor the performance of their entire life safety network from a single location, helping to save significant time as they carry out the regular inspections required by law.

Moreover, innovative life safety systems, such as linear heat detection technologies, are capable of pinpointing the location of a fire. This, combined with targeted fire suppression systems like sprinklers, can not only help minimise the risk of fire spreading, it can prevent damage to intact, unharmed property elsewhere in the building, in turn reducing the overall financial cost of a fire to building owners.

There are certainly areas where smart city inspired technology can supplement these advanced life safety systems in the future to enable more effective fire safety delivery. By collecting data from regular maintenance inspections and information about past fire incidents, such as location and source, it is possible to predict the fire risk to particular developments in future. This can provide vital knowledge to facilities managers and building owners to help them identify more effective life safety technology for the needs of the premises.

Rohit Harjani, India country manager at Hochiki Europe: Smart life safety in India

"With around 815 million people expected to live in urban areas in India by 2050," city planning and development is a government priority. With this brings the challenges of creating infrastructure that reduces expenses, increases efficiency and supports residents' wellbeing.

"It's no surprise then, that smart technology and the development of digitally advanced cities, through the Smart Cities Mission, are the focus for meeting these demands. "While India is already bolstering its approach to fire safety provisions to become more in-line with other global powerhouses, densely populated cities are more complex, producing bigger buildings with a variety of uses. With effective life safety technology a fundamental element of creating high functioning, safe buildings, there's no doubt we will have to keep implementing smarter technologies to keep pace with India's smart city vision."

On a grander scale, knowledge gathered about the fire risk for each development in a neighbourhood or city, could be harnessed to plan fire and rescue service provision in the future, such as the location of fire stations or the allocation of funding.¹⁶

There are already examples of data collection being used to learn more about fire safety risk in buildings. Building Information Modelling (BIM) allows architects and building designers to feed technical information about their chosen construction materials and life safety products into 3D computer aided design (CAD) models of the development they are designing. This can help them model how a fire or smoke might move through a building, so they can identify the fastest and safest escape routes for occupants. Equally, once the building is finished, facilities managers can access the fire resistance credentials of all building materials used in the original construction phase, such as insulation and flooring, as well as replacement materials, through the BIM Library to ensure all materials continue to meet legislation.

Building Information Modelling (BIM)

BIM aims to provide a complete digital representation of a building, including all of its components and the complex information regarding their performance capabilities and maintenance requirements. The ground-breaking process is expected to completely revolutionise the way the world designs, builds, maintains and dismantles its buildings, as well as everything in them.

¹⁵⁾ World Urbanisation Prospects, 2014, United Nations: https://esa.un.org/unpd/wup/Publications/Files/WUP2014-Highlights.pdf 16) Smart Firefighting Workshop Summary Report, 2014, NIST: http:// nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1174.pdf

By allowing architects, system designers, construction workers and end-users access to accurate data regarding the location and qualities of all elements appearing in building designs, BIM significantly improves efficiency, reduces wastage and cuts costs for all parties involved.

Around the world, countries are at different stages of BIM uptake. For example, in Singapore, an estimated 96 per cent of firms are using BIM, whereas in the United States, BIM adoption is around 70 per cent.¹⁷Conversely, in the UK, The National BIM Report 2016 found that BIM adoption in the UK is at just 54 per cent. However, this up from 48 per cent last year and, fuelled by Government targets, adoption seems set to increase!⁸ BIM adoption is also on the rise in South Africa, with a growing number of studies highlighting its benefits to businesses in the country's construction sector.¹⁹

With cloud-based computing systems, it is already possible to store BIM models, and BIM-

compatible information in a centralised location that is easy to access in the field. This makes it possible for architects to refer to the BIM models for a wide range of buildings, so they can compare performance and identify where further improvements in the effectiveness of their life safety systems can be made. In the near future, architects will be able to use cloud computing to model the buildings for a development, instead of individual buildings, coordinating the designs and fire safety needs of entire neighbourhoods to deliver more efficient fire safety provision.

Equally, cloud computing will allow for centralised monitoring to be carried out remotely. The efficiencies this will bring to the industry will be most keenly felt by facilities managers and building owners, giving them the ability to assess life safety systems off site. Not only will this save time and visits, but the total cost of ownership for a fire and emergency lighting system can also be reduced.

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Conclusion

Spain, Qatar and Ghana are just some of the countries developing smart cities. London in the UK is already planning to upgrade its technological infrastructure to deliver community heating more effectively, as well as to provide 'smart parking' to help motorists find parking spaces more easily.

In Dubai, a number of new communities are in the pipeline that will incorporate many of the principles espoused by the smart cities movement, such as the Desert Rose Housing Project. These will build on many of the technologies being used in the Lusail City project in Qatar, to provide a connected community where everything, from energy provision, to public transport, is controlled and monitored to ensure they are delivered as efficiently and sustainably as possible.

For many futurologists, the smart city of the future is unlikely to look very different from a traditional city today. There will still be buildings, roads and railway lines, there will still be traffic. However, with smart technology incorporated into the city's infrastructure, all of the services the community needs to function, from transport, to utilities, to life safety, will be delivered that little more effectively and efficiently.

Smart cities present an exciting opportunity to improve the standard of living in major cities around the world, while helping to reduce their natural resources to more sustainable levels.

It is clearly time, though, that life safety provision be considered an essential part of the smart city mix, alongside sustainability and congestion. This is vital to help further improve the safety of residents, and to protect property and assets, all while helping to streamline costs and the use of resources.

While the creation of truly smart cities may still be a distant vision, and there are many elements of this we need to consider as an industry, including the impact on market competition and the potential move away from flexible, open protocol systems, there are many benefits intelligent fire safety systems can bring, now and in the future.

Governments and manufacturers both need to work together to lay the groundwork for smart, life safety focused cities. This includes looking at the regulations governing fire safety, developing the technology required to improve the connectivity of life safety systems, and implementing the infrastructure needed to centralise control of fire safety and emergency lighting equipment. This collaboration is vital to ensure we realise the vision of a smarter, safer urban future.

Key findings

A survey of life safety professionals from across EMEA and India found:

• Over half (57 per cent) of life safety installers had not heard of the term 'smart city'

The following responses were given after respondents were provided with definitions of a smart city and smart technology.

- A small amount (14 per cent) were worried about the future of the life safety industry if all cities become smart cities
- Over two-fifths (43 per cent) were not worried, and almost a third (30 per cent) did not think it would make any difference
- Over a third (36 per cent) of respondents felt the life safety industry is equipped to adapt to the technological demands of smarter cities
- In contrast, almost two-fifths (39 per cent) of respondents said the industry is not equipped to adapt and a quarter (25 per cent) were unsure
- Almost half (48 per cent) of life safety professionals were confident that the life safety industry would still be able to keep people safe in smarter cities
- Almost a fifth (18 per cent) thought people would be able even safer
- The majority (40 per cent) thought the demand for smart city technology will come from the Government
- Almost a quarter (24 per cent) thought demand would come from manufacturers and an equal amount (24 per cent) thought it would come directly from end-users
- Almost one third (31 per cent) said a city planned with residents' health and wellbeing in mind is the most important aspect of a smart city, while almost a fifth (17 per cent) said sustainability was the most important aspect
- Almost a quarter (24 per cent) felt facilities management is the sector in which smart technologies will have the most impact, this was followed by life safety at 18 per cent, healthcare at 12 per cent, education at 11 per cent and construction at 10 per cent

Case Studies: Smart cities in action

Smart cities aren't just a scientist's vision for the communities of the future, they are already here. New neighbourhoods are being built in Europe, Africa and the Middle East with smart city style technology fully integrated into their design. Existing cities across the world are even undertaking upgrades to their intelligent infrastructure to enhance connectivity and bring them a step closer to making smart cities a reality.

Here are a few examples from around the world of the smart city vision becoming a reality:

Lusail City, Qatar

Located on the coast, about 23km north of the Qatari capital of Doha, Lusail is the newest planned city in Qatar [§]. With construction already well under way, Lusail has marinas, exclusive holiday resorts on four man-made islands, commercial districts, luxury shopping and leisure facilities, and residential zones capable of catering to an expected future population of some 450,000 people.

To tie these various activity zones together, and ensure the entire settlement is sustainable and energy efficient in the hot desert environment, the architects behind it - the state-controlled developer Qatari Diar Real Estate Investment Company and Parsons Corporation - have been careful to incorporate smart technology into the fabric of its infrastructure.

This includes a comprehensive fibre optic network linking Lusail's many services systems to a central command and control centre (CCC). Not only does the CCC control the traffic management network and the municipal systems, such as water, waste and telecommunications, it provides centralised monitoring for law and order, enabling police services to be deployed quickly in the event of an incident, and sent to the location where they are needed.

The CCC is also charged with controlling the building management systems for both municipal and private buildings in the entire city, monitoring ventilation, lighting, power and security equipment in each development. This ensures the efficient distribution of limited energy and water resources, while also allowing city authorities to plan for future maintenance.

On top of all of this, Lusail's CCC has been designed to offer a number of 'value-added' services for the city. Everything, from the public transport network's smart card service and the parking management system, to debit card billing, is also controlled through the CCC, helping to make it as easy as possible for residents to move through the city and spend their money without the need for cash.





Accra, Ghana

Accra, is the capital of Ghana, and its largest city, with an estimated urban population of more than 2.27 million people. According to the International Monetary Fund, economically, Accra is one of Africa's fastest emerging cities, with a burgeoning finance sector, as well as a strong manufacturing base.

To enable the city to achieve its economic potential, and ensure it can accommodate future population growth, Accra's local authorities are currently investing in new infrastructure. The city recently partnered with technology giant, IBM[°], to identify areas where smart city systems could help it enhance efficiency and deliver better quality services for residents.

To overcome Accra's persistent problem with traffic congestion, IBM's report includes a recommendation to build an advanced mass public transit system complete with interconnected and intelligent technologies. This will ensure centralised control to help optimise capacity across the new network and minimise the risk of delays. Networked traffic lights, combined with cameras at key junctions could help monitor the road network to allow speed limits and traffic signals to be adjusted to better regulate traffic through the city to reduce the impact of traffic jams.

The IBM report also provides recommendations to optimise the energy network across Accra. Smart meters in residential and commercial buildings, for example, combined with a smart energy grid, could help monitor and manage electricity distribution across the city. Such solutions will be vital to minimise the risk of blackouts and load shedding happening in the future, helping to provide reliable power to support local businesses and manufacturers to grow in the coming years.

Barcelona, Spain

As a major economic hub, Barcelona is constantly developing its infrastructure to further improve efficiency and ensure the effective distribution of resources to residents and local businesses.

To this end, Barcelona has already implemented a number of smart city projects as part of its City OS strategy¹⁰. For example, sensor technology has been installed in the irrigation systems of parks throughout the city, which transmits real time data to gardening crews to help them monitor and manage water usage more efficiently – crucial in a city in a hot climate.

The city has also designed a new transport network based on data analysis of the most common traffic flows in the central business district. Using this information, the municipal government has created a network of vertical, horizontal and diagonal routes designed to avoid major traffic bottlenecks and to make it as easy as possible for passengers to catch connecting buses.

To further streamline traffic flow, a smart light system has been created to optimise the number of green lights on any journey. In the event of an incident requiring a response by emergency services, the vehicle's route is entered into the system controlling the traffic light network to allow traffic lights to be set to green as the vehicle approaches an interchange, helping to minimise response times.



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