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Transforming central business districts
Taking the smart route

pwc

Message

Alok B Shriram

President

PHD Chamber of Commerce and Industry

It is estimated that by the year 2050, the number of people living in Indian cities will touch 843 million. To accommodate this massive urbanisation, India needs to ¬find smarter ways to manage complexities, reduce expenses, increase ef¬ficiency and improve the quality of life. Huge investments will be required over the next 20 years across areas like housing, transportation, sewage and solid waste management, water management, energy, information technology and public security to build smart cities in India.

Prime Minister Narendra Modi, on 25 June 2015, unveiled three flagship government schemes that aim to spruce up urban India at an expenditure of close to 4 lakh crore INR. Under the first one, the Smart Cities Mission, 100 smart cities will be built to promote adoption of smart solutions for efficient use of available assets and enhance the quality of urban life. The other two schemes are the Atal Mission for Rejuvenation and Urban Transformation (AMRUT), and the Housing for All (Urban). The smart cities will be selected through a competition among a number of eligible cities, while 500 cities are being identified under AMRUT.

For the first time in the country, a challenge has been floated under which citizens of urban India can contribute to the formulation of the development visions of their cities. This competitive mechanism will end the top-down approach and lead to people-centric urban development through a bottom-up approach. A total of 100 smart cities will come up by transforming present cities, having satellite towns around some of them, and, at places, by combining two cities into one and building a new one in between. In addition, the government is also looking closely at laying down new bylaws and floor area ratio (FAR) norms to find a way to optimally utilise existing land in the country for the investment.

Against this backdrop, PHD Chamber of Commerce and Industry is organising a conference on '**Smart Cities and Urban Transformation**' on 11 August 2015, to highlight the opportunities, issues and solutions for sustainable urban development in the country.

PHD Chamber, in association with PwC, is bringing out this report on '**Transforming central business districts: Taking the smart route**'. I sincerely hope that this report will benefit all the stakeholders concerned with smart cities and sustainable urban development.

I wish the conference all the success.

- Alok B Shriram
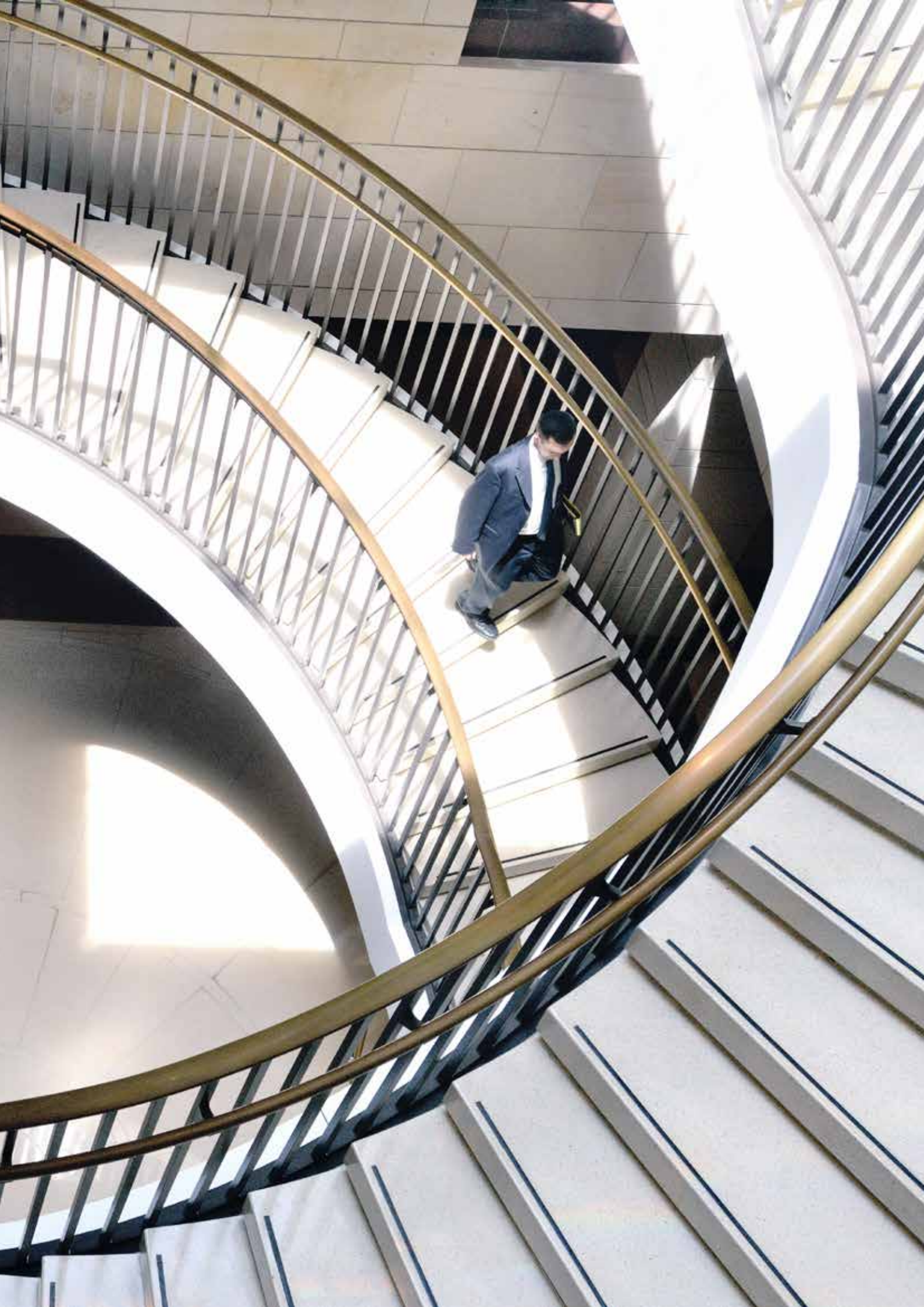
Message

Rajeev Talwar

Chairman

Housing and Urban Development Committee

PHD Chamber of Commerce and Industry

The working population in India will constitute about 69% of the total populace by 2035. To accommodate a corresponding rise in the number of city dwellers, India's urban areas, which will be critical to the economic growth of the nation, require a massive overhaul to brace for such a future. Cities, therefore, need to plan and provide a suitable environment for future investments, create new jobs and livelihoods, build reliable public infrastructure, provide social services with ample access to affordable housing and, most importantly, support efficient use of resources for a sustainable quality of life.

This dramatic growth also provides impetus for the creation of smart cities which leverage information and communications technology (ICT) to greatly improve the productivity, lifestyle and prosperity of our people. Additionally, green growth strategies can build environmentally sustainable cities.

In light of this exciting future, PHD Chamber, in association with PwC, is bringing out this report focused on '**Transforming central business districts: Taking the smart route**'. I sincerely hope that it will benefit all the stakeholders concerned.

I wish the conference immense success, and welcome all the distinguished speakers and delegates.

- Rajeev Talwar

Foreword

Neel Ratan
Leader
Government and
Public Sector
PwC India

Upgraded **central business districts** *can act as* **lighthouse projects** *that drive city* **transformation.**

Cities are playing an important role in driving the Indian economy, as citizens, particularly the youth, aspire to contribute to the upsurge in India with their talent and skills. The urban population in India is currently around 31% of the total population and contributes over 60% of the country's gross domestic product (GDP). This contribution is only likely to increase over time as India rides high on the economic growth wave. The Japan Bank for International Cooperation (JBIC) has ranked India as the topmost destination for future investments, followed by Indonesia and China.[1]

Urban agglomerations, with the presence of central business districts (CBDs), office complexes and business hubs, are emerging as pivots for jobs and business opportunities. CBDs are now being realised as areas with high economic activity and they provide an appropriate ecosystem and infrastructure to support the livelihood of city dwellers. The concept of CBDs is not a new one as a similar concept existed in the empires of rulers such as Ashoka, Akbar and Shah Jahan.

The CBDs in Mumbai, Delhi, Bengaluru, Chennai, Kolkata, Hyderabad and Pune have been playing an important role in driving the economic growth of these cities and attracting people from rural areas seeking job and entrepreneurial opportunities. As land parcels in prime locations in India become more expensive, it is imperative that the existing CBDs reinvent themselves in order to keep up with the increasing demands of businesses and evolving aspirations of citizens. However, of late, CBDs have been affected by several challenges, among which core physical infrastructure is a major concern. Some of the other key challenges plaguing CBDs include safety and security, parking, traffic congestion and weak public transport networks. Given these challenges, Indian CBDs cannot ignore the technology resources available and the potential that information and communications technology (ICT) holds to enable them to leapfrog to the next stage of development.

The Government of India, through its 'Smart City Mission' launched in May 2015, has announced two distinct development strategies for city development: pan-city initiatives and area-based development.[2] Under pan-city development, cities will identify one initiative which can be taken up for the benefit of residents spread across them. Area-based development, on the other hand, takes the form of redevelopment, retrofitting or greenfield development adjoining the city boundary. Among the area-based development strategies, retrofitting is best suited for the rejuvenation of CBDs, as they impact the lives and livelihoods of a significant number of people directly or indirectly.

Within retrofitting, the government further recommends the adoption of 'smart applications' or 'smart solutions' in day-to-day operations and the provision of city services. The adoption of technology needs to be encouraged within Indian CBDs in order to enhance the physical and economic ecosystems they offer to investors and businesses. Improved technology adoption and the creation of an environment conducive to economic growth will enhance the 'ease of doing business' in India and attract more capital. This in turn will improve both the physical and economic environment, thereby creating a virtuous development cycle.

The objective of this knowledge paper is to highlight the importance of CBDs, their issues and best practices from across the globe. Also, the report presents technology initiatives that can be taken up within CBDs and lays out an action plan which will support administrators in embracing those initiatives for the improvement of CBDs. The knowledge paper has been prepared for a conference organised by the PHD Chamber of Commerce and Industry (PHDCCI) on 'Smart Cities and Urban Transformation', to be held in New Delhi on 11 August this year. It is hoped that the paper will stimulate discussion on the possible avenues for leveraging smart solutions to enhance CBDs and citizens' quality of life. Finally, the knowledge paper will enable decision makers to take cognisance of the existing situation, consider the way forward and explore technology interventions for improving CBDs.

1. Central business districts (CBDs)

1.1 Why CBDs matter

The present age has been called the age of the Anthropocene, an epoch that is supposed to have begun when human activities started having a significant impact on earth's ecosystem. Rapid urbanisation over the last hundred years has greatly contributed to this impact. We are at a stage where the global urban population has risen to over 50% of the total population for the first time in the history of mankind. This figure is set to rise to over 80% by 2050. The accelerating growth of cities and their disproportionate consumption of physical and social resources have been assessed by the United Nations (UN) to be two of the greatest challenges to mankind. As emerging economies continue their rapid growth, it is anticipated that the rate of increase of the urban population will outpace that of the overall population due to factors such as migration from rural areas.

Many of India's growing cities are suffering from years of inadequate investment in basic infrastructure, especially technology infrastructure. These gaps, due in part to budgetary pressure but also to the regular turnover of leadership, have kept cities, their leaders and citizens from realising their full potential. This in turn has led to slow economic development and constrained the ability of city officials and governments to make informed, data-driven decisions.

While the urban population in India is currently around 31% of the total population, it contributes over 60% of the country's gross domestic product (GDP). It is for this reason that cities are referred to as the 'engines of economic growth', and ensuring that they function efficiently is critical to India's economic development. The global experience is that a country's urbanisation up to a 30% level is relatively slow. Thereafter, the pace of urbanisation speeds up, till it reaches about 60–65%. With an urban population of 31%, India is at a point of transition where the pace of urbanisation will accelerate. India currently has over 360 million people living in cities. By 2030, this number is estimated to grow to 590 million (almost twice the population of present-day United States). Therefore, we need to plan our urban areas well without further delay. Considering that India is at the brink of transition we can plan our urbanisation strategy in the right direction by taking advantage of the latest developments in technology.

With the GDP contribution of urban India set to rise from the present level of 63% to 70–75% in 2020,[3] CBDs will play an important role in fuelling India's economic growth. A CBD is dense area within a city which is characterised by high economic activity and is provisioned with adequate infrastructure and utilities to sustain this activity. The economic character of a city is dominated by its CBDs. The CBDs in metros play a key role in driving the economic growth of these cities and attract large segments of populations from rural and non-metro cities. To keep pace with exponentially increasing urbanisation, rising business aspirations and high land rates, it is crucial for CBDs to get a facelift and cater to the evolving citizen and city requirements.

Stores, hotels, government administrative offices, theatres and recreational facilities are located on the fringes of the core business area of a CBD. A CBD is often valued as prime real estate for the following unique characteristics:

Which stems from the metro rail, light rail and roads that converge at the CBD from distant locations within the city

Which is a result of improved planning and development of a public realm across the streets

Accessibility

Improved appearance

Compactness
Which comes from the increased floor area ratio (FAR) that is available for the development of buildings within the CBD—usually leading to the development of a centralised transportation facility and facilitating the interchange of goods, services and ideas across the area

Quality infrastructure

Proximity to established businesses

Which is usually provided in order to create an environment that is conducive to economic growth

Which arises due to the network effect of a large business community in a relatively small geographic area
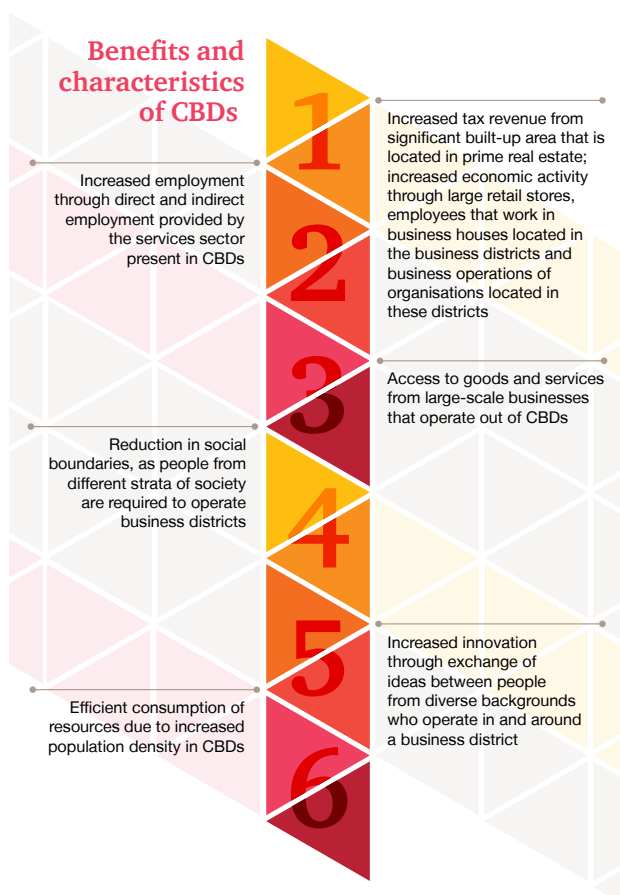
Cities attach significant importance to these characteristics, which are laid out in the goals they formulate for CBDs. Following are a few examples:[4]

- **San Francisco:** *The city wants a downtown area that works well and looks well, is conveniently arranged and easy to get to.*

- **Detroit:** *The goal is to make the Detroit CBD both 'attractive and efficient, and economically competitive with new planned commercial centres such as Northland Shopping Centre'.*

- **Minneapolis:** *There is no alternative to the goal of accessibility for central Minneapolis. It must be possible for persons who desire to work or obtain services or merchandise in the area to get to it conveniently, quickly, and economically.*

1.2 How CBDs are helpful

While CBDs are instrumental in shaping a city's skyline and economic character, they also provide benefits to the local governments and citizens. These benefits include the following:

Benefits and characteristics of CBDs

1 Increased employment through direct and indirect employment provided by the services sector present in CBDs

2 Increased tax revenue from significant built-up area that is located in prime real estate; increased economic activity through large retail stores, employees that work in business houses located in the business districts and business operations of organisations located in these districts

3 Access to goods and services from large-scale businesses that operate out of CBDs

4 Reduction in social boundaries, as people from different strata of society are required to operate business districts

5 Increased innovation through exchange of ideas between people from diverse backgrounds who operate in and around a business district

6 Efficient consumption of resources due to increased population density in CBDs

1.3 Role of infrastructure in CBDs

In order for the benefits to sustain and grow over a period of time, the infrastructural assets that are created in a CBD should meet the needs of the stakeholders who construct, operate and derive their livelihood from the businesses that operate in the CBD. Such stakeholders include the following:

CBD stakeholders

Anchor companies
The essential characteristics of a CBD tend to be dominated by the dominant industry. For example, Bandra Kurla Complex (BKC) is dominated by the banking and financial services industry. Such anchor companies play a crucial role as they create job opportunities, attract more investments and help in creating a business hub.

Developers of the built environment
Developers are the entities who develop the ecosystem of the CBD by building infrastructure which is business friendly and sustainable. Business-friendly infrastructure implies high saleability and meeting the needs of the developers.

Direct employees who keep the CBD operational
Employees who travel in and out of CBDs on a daily basis require easy access to the CBDs, better public services and an optimum quality of life.

Mayors and local governments
They are responsible for encouraging businesses in the city to promote economic development. Their role is to plan infrastructure in a manner that attracts businesses, promotes investment and provides the city with livelihoods.

Indirect employees who keep the CBD operational
While employees engaged by firms in a CBD actually drive the CBD, every CBD also requires operational support in terms of people who actually tend to various aspects such as roads, utilities, repair and maintenance, etc.

The infrastructure assets responsible for creating an environment conducive to growth are as follows:

- Economic assets are the firms, institutions and organisations that drive, cultivate or support an innovation-rich environment.

- Physical assets are the buildings, transportation facilities such as roads and metros, and utilities such as water, sewerage, power, solid waste and connectivity.

- Social assets include open spaces, recreational facilities and street facade, which create the public realm and support the exchange of ideas.

Business districts can reach their full potential when all three assets are combined with the spirit and risk-taking ability of the business community and a synergistic relationship is created among them.

1.4 CBDs in India

Having stressed the importance of CBDs, it is essential to point out that their characteristics differ from region to region depending on the nature of economic activities prevalent and the kind of business which a city tends to attract primarily.

Officially, CBD development in India started quite recently, when the city administration focussed on the development of specific areas—CBDs—in order to promote economic growth. Historically, the first CBD was Nariman Point, which was developed in the early 1900s by reclaiming land and filling the coastal regions of Churchgate with debris. Today, Nariman Point houses the headquarters of top investment banks and consulting firms of the world and is also known as the Manhattan of Mumbai.

Over the past few years, the importance of CBDs has grown and a more focussed approach towards their development is visible across several cities in India. While this approach has been planned to some extent, most CBDs have a long way to go before they achieve the level of smartness that is expected of business hubs from an infrastructure and ICT perspective. Today, more than 15 CBDs are present across prominent cities such as Mumbai, Delhi and Kolkata.

Let's take a quick glimpse at the top CBDs across the country and their significance.

i. BKC, Mumbai

With most of the commercial activities of Mumbai concentrated in south Mumbai, particularly Nariman Point, there was a serious need to decongest this part of the city. This was one of the primary reasons behind the development of BKC as a CBD. BKC is developed by the Mumbai Metropolitan Region Development Authority (MMRDA).

BKC houses some of the top business entities today and roughly six lakh people currently work in the area. Several office and residential buildings have been constructed and several others are nearing completion. One of the factors that work well for BKC is its proximity to the international and domestic airports of Mumbai and its central location in the city when compared to CBDs in south Mumbai. This makes it a preferred choice for office space.

ii. CBD, Bengaluru

The CBD of Bengaluru sprawls across a 10-km radius around the Vidhan Soudha and is a hotspot for business activity. Home to many corporate offices and small and large businesses, this CBD is located in the heart of the city and is easily accessible.

The CBD also covers Brigade Road, which is Asia's third most expensive street and MG Road, which is the thirteenth most expensive in Asia.

iii. Gujarat International Finance Tec-City (GIFT), Gandhinagar

Although under construction, GIFT is a good example of how a CBD should develop and the kind of provisions that are required to build a city which is conducive to business growth and sustainable in nature.

GIFT provides high-quality infrastructure, utility provisions and state-of-the-art ICT infrastructure. GIFT is being developed by the Gujarat International Finance Tec-City Company Limited (GIFTCL). The vision for GIFT is to set a new benchmark for greenfield CBD development and to achieve an optimum quality of life which supports economic development, sustainable growth, frugal consumption of resources and utilisation of the best and latest technology.

Although GIFT has a long way to go, it seems well poised to achieve the image of a CBD which is a global benchmark.

iv. Connaught Place, New Delhi

Connaught Place is one of the most popular business centres of Delhi and is generally bustling with commercial and economic activity. It is supposed to be the fifth highest priced market as per the 2013 Forbes list. While the centre was developed in the early 1900s, the redevelopment plan for Connaught Place started only in 2000. Upgrading of existing infrastructure, revamping of the utility network and improved parking management were identified as some of the areas requiring attention.

2. Upgrading CBDs in India

Of late, CBDs have been playing a critical role in catering to the workspace requirements of businesses and have doubled up as leisure and entertainment spots for citizens. India has a mix of CBDs, some were planned at the beginning of 20th century and are now considered heritage sites (Fort, Mumbai) and newer ones emerged towards the end of millennium (BKC or CBDs in the NCR). As land parcels are scarce, it is imperative that existing business districts are revamped in order to meet the needs of aspirational Indian businesses. While the core physical infrastructure is still a challenge, Indian CBDs cannot ignore the technology resources available today and the potential ICT exhibits to leapfrog to the next stage of development.

While CBDs are developing across various parts of the country, their growth is hampered due to certain challenges:

- **Retrofitting**
  While retrofitting is a common approach adopted for densely congested cities such as Mumbai and Delhi, replanning existing infrastructure, road networks and utility provisions are some major challenges, and hence CBDs tend to continue to develop in a haphazard manner. Converting existing buildings into smart structures, establishing open spaces, common utility ducting, etc., are some initiatives that should ideally be part of a CBD, but retrofitting these into the existing CBD is an ambitious endeavour.

- **Overcrowding**
  Overcrowding in CBDs is a common phenomenon as businesses try and move closer together to increase throughput. However, this often leads to overcrowding on roads, buildings and public transport. Social facilities such as recreation centres get overburdened which in turn impacts the cleanliness and structure of CBDs in the long run.

- **Transportation**
  Availability of adequate transportation in CBDs is a major challenge. Road networks often get blocked due to overcrowding and public transport networks get choked due to heavy influx of people. In the absence of incentives to keep the road and transport networks decongested, transportation in-and-out of CBDs becomes difficult.

- **Sustainable consumption**
  Sustainable consumption becomes difficult when overcrowding occurs because every entity in a CBD is there to run a profitable business or to lead a high quality life and leads to heavy consumption of energy, water, electricity, fuel and land. Considering that the concepts of smart utility and smart consumption are just emerging in India, CBDs are currently facing the most challenging problem of incorporating sustainable consumption patterns.

A drill down of key issues plaguing CBDs in India is required to adapt the solutions which have been deployed globally. To gauge the pulse of citizens regarding their concerns with CBDs as well as areas of improvement, we conducted an internal survey where 40 people responded with their suggestions and improvement areas. Most of the respondents are in the age group of 24-35. The survey questions were based on four aspects: physical, social and economic infrastructure and ICT ecosystem.

2.1 Physical infrastructure is top priority

In the physical infrastructure space, transport ecosystem, parking and safety are the most critical aspects for citizens. We asked people about the public transport ecosystem in and around CBDs, parking arrangements as well as last-mile connectivity. We also sought feedback on water and power supply and rainwater drainage and sewerage networks. In addition to this, we obtained their opinion regarding Wi-Fi connectivity, safety and security, and readiness to deal with health emergencies and disaster incidents.

Majority of the respondents believe that the availability of public transport in and around CBDs is a cause of concern and needs improvement. With adequate availability of public transport and proper last-mile connectivity, the dependency on private transport will eventually reduce and minimise traffic congestion on roads, particularly during peak hours.
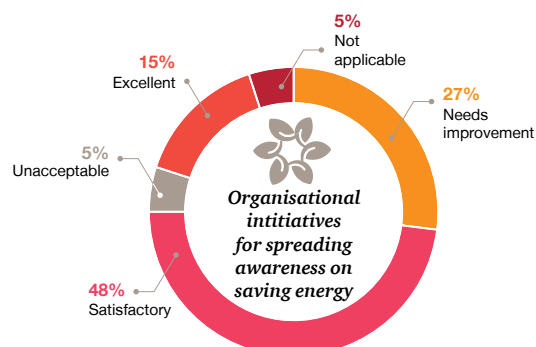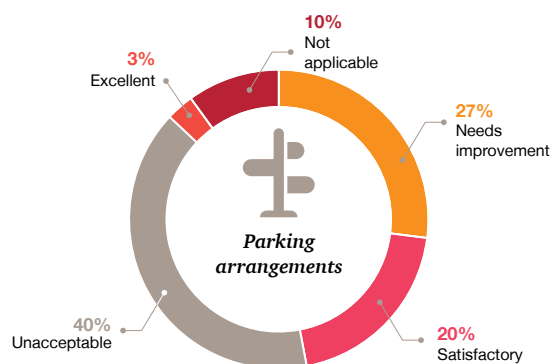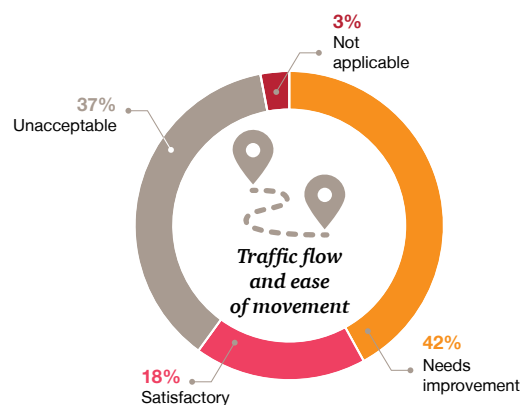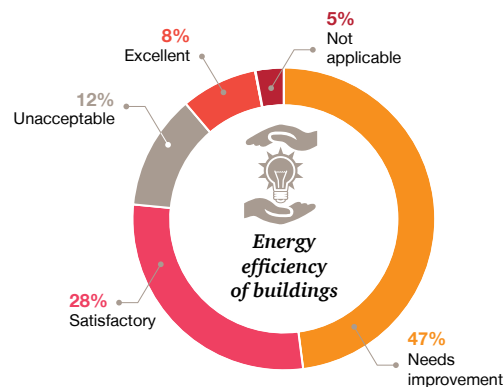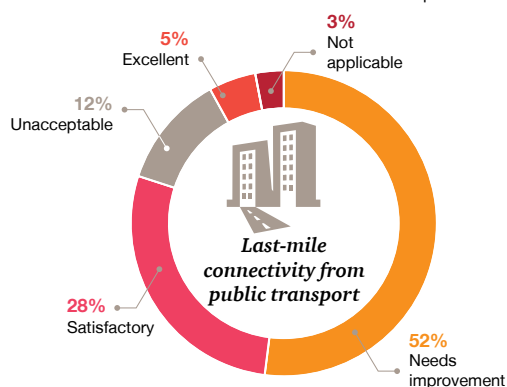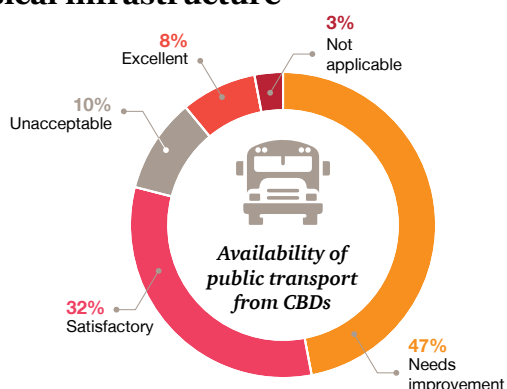
In our survey, more than half of the respondents said that last-mile connectivity in and around CBDs need considerable improvement. Many felt that parking arrangements in these areas are not up to the mark and can be worked on. In the absence of a robust public transport network, many rely on their own vehicles to commute to CBDs. However, traffic congestion, particularly during peak hours, is a pain point and inadequate parking space further adds to the woes. With inadequate authorised parking spaces, parking mafias thrive. People have no option but to rely on them and spend money, which is unaccounted for, and not

added to the revenue of the government. Moreover, traffic flow and ease of movement are causes of concern and needs further development.
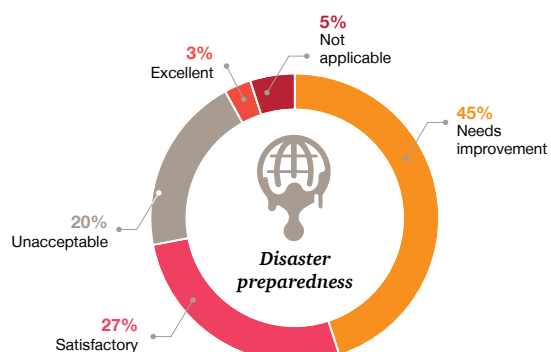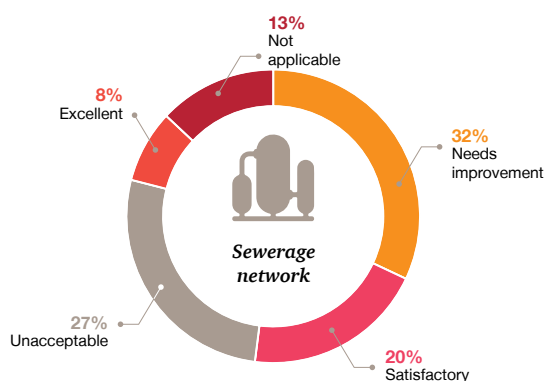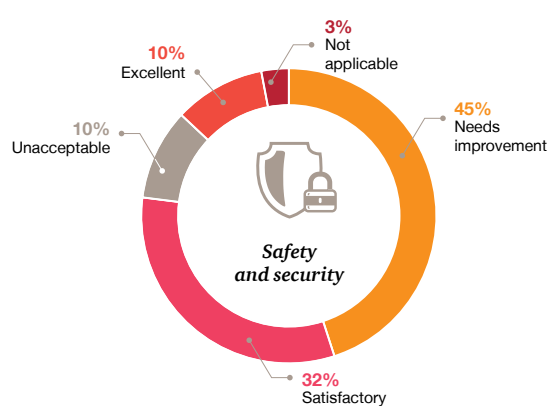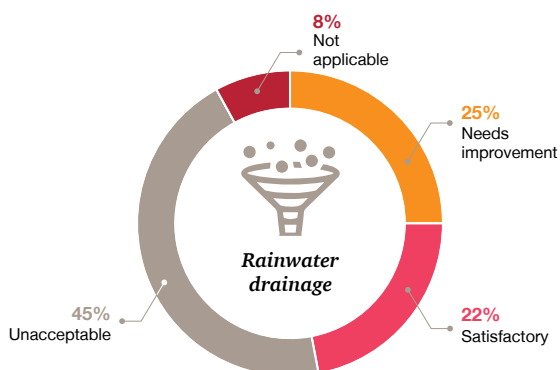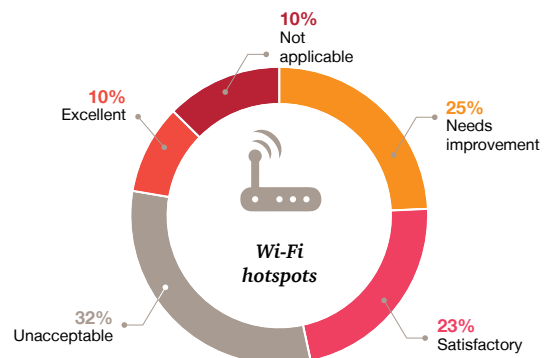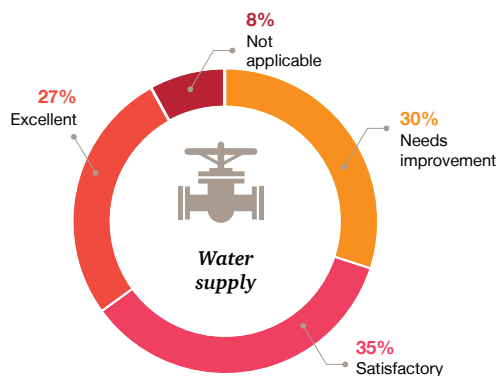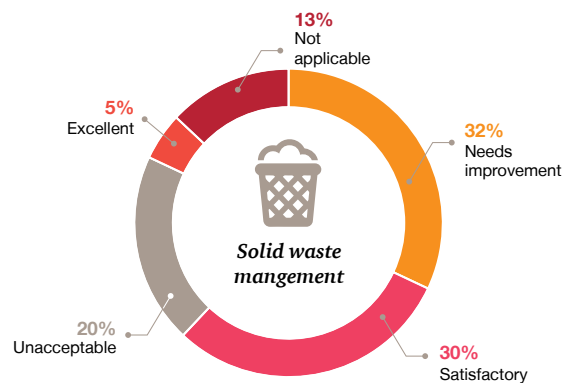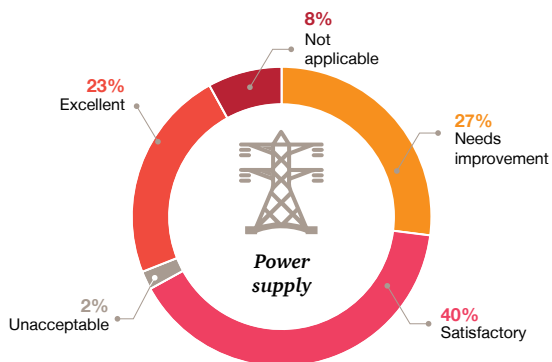
With increased focus on sustainability and rising concerns of global warming, several buildings across the globe and in India are becoming energy efficient. However, the respondents feel that the energy efficiency of buildings in CBDs needs vast improvement. Given the high energy consumption of offices in CBDs, it is vital to make CBDs more energy efficient to minimise their carbon footprint and leverage technology for reducing greenhouse gas emissions. In terms of power and water supply, respondents feel that CBDs score well. However, there is scope to improve rainwater drainage in and around CBDs as ponds with rainwater are a common sight here during the monsoon. Moreover, sewerage and solid waste management are areas for CBDs to improve on.
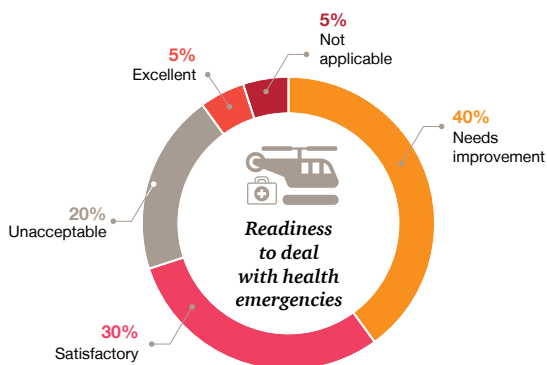
In this era of instant connectivity, it is imperative that CBDs provide Wi-Fi hotspots for people in the area. However, many CBDs are lagging behind with no area-wide Wi-Fi hotspots and poor data/network connectivity though many offices and restaurants provide hotspots for people entering their network boundaries. Safety and security as well as disaster preparedness are vulnerable areas for CBDs as per our survey. Furthermore, CBDs seem to be ill-equipped to deal with health-related emergencies.
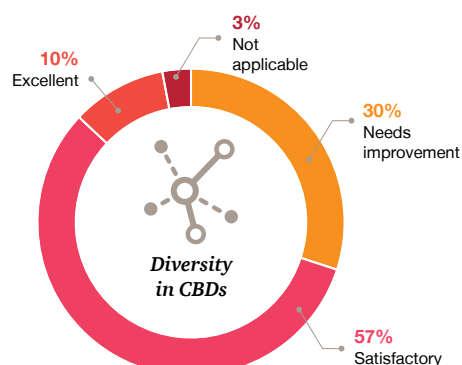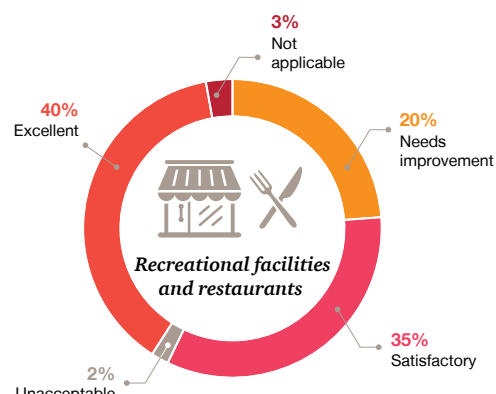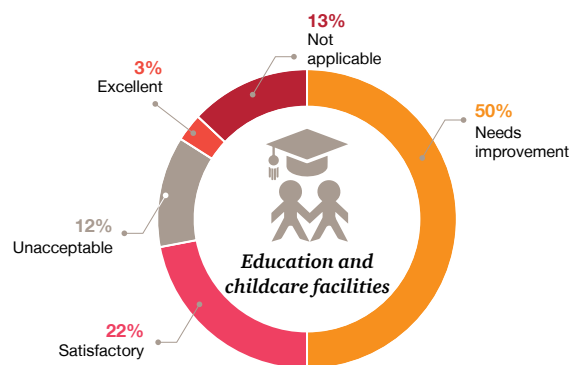
Physical infrastructure

Energy efficiency of buildings
- 5% Not applicable
- 8% Excellent
- 12% Unacceptable
- 28% Satisfactory
- 47% Needs improvement

Traffic flow and ease of movement
- 3% Not applicable
- 37% Unacceptable
- 42% Needs improvement
- 18% Satisfactory

Availability of public transport from CBDs
- 3% Not applicable
- 8% Excellent
- 10% Unacceptable
- 32% Satisfactory
- 47% Needs improvement

Parking arrangements
- 10% Not applicable
- 3% Excellent
- 27% Needs improvement
- 40% Unacceptable
- 20% Satisfactory

Last-mile connectivity from public transport
- 3% Not applicable
- 5% Excellent
- 12% Unacceptable
- 28% Satisfactory
- 52% Needs improvement

Organisational intitiatives for spreading awareness on saving energy
- 5% Not applicable
- 15% Excellent
- 5% Unacceptable
- 48% Satisfactory
- 27% Needs improvement

Power supply

- 8% Not applicable
- 27% Needs improvement
- 40% Satisfactory
- 2% Unacceptable
- 23% Excellent

Solid waste mangement

- 13% Not applicable
- 32% Needs improvement
- 30% Satisfactory
- 20% Unacceptable
- 5% Excellent

Water supply

- 8% Not applicable
- 30% Needs improvement
- 35% Satisfactory
- 27% Excellent

Wi-Fi hotspots

- 10% Not applicable
- 25% Needs improvement
- 23% Satisfactory
- 32% Unacceptable
- 10% Excellent

Rainwater drainage

- 8% Not applicable
- 25% Needs improvement
- 22% Satisfactory
- 45% Unacceptable

Safety and security

- 3% Not applicable
- 45% Needs improvement
- 32% Satisfactory
- 10% Unacceptable
- 10% Excellent

Sewerage network

- 13% Not applicable
- 32% Needs improvement
- 20% Satisfactory
- 27% Unacceptable
- 8% Excellent

Disaster preparedness

- 5% Not applicable
- 45% Needs improvement
- 27% Satisfactory
- 20% Unacceptable
- 3% Excellent

Readiness to deal with health emergencies

- 5% Not applicable
- 5% Excellent
- 40% Needs improvement
- 20% Unacceptable
- 30% Satisfactory

Healthcare facilities

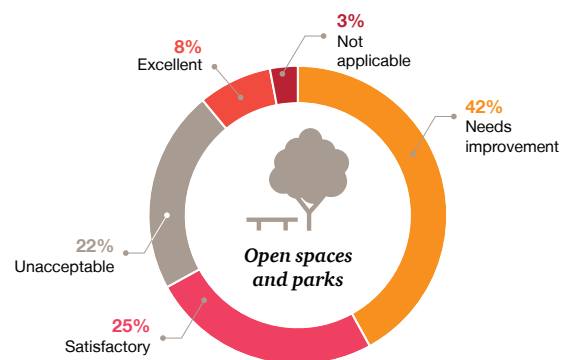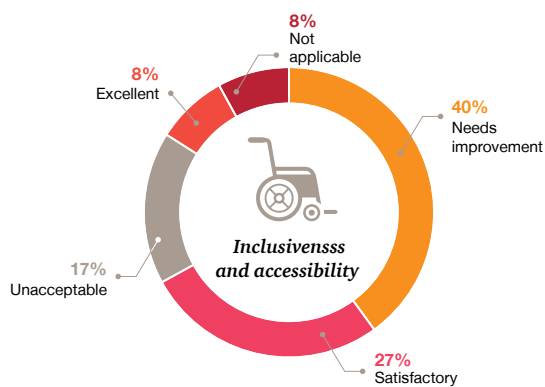- 5% Not applicable
- 10% Excellent
- 33% Needs improvement
- 17% Unacceptable
- 35% Satisfactory
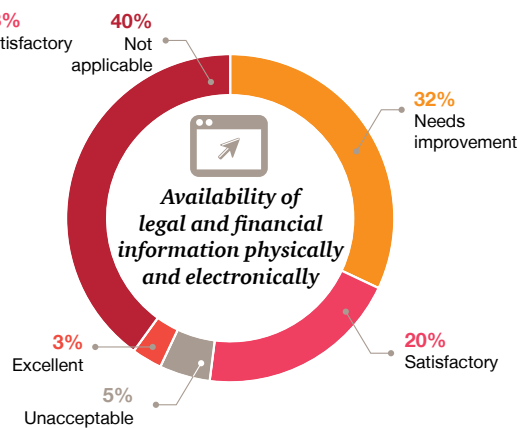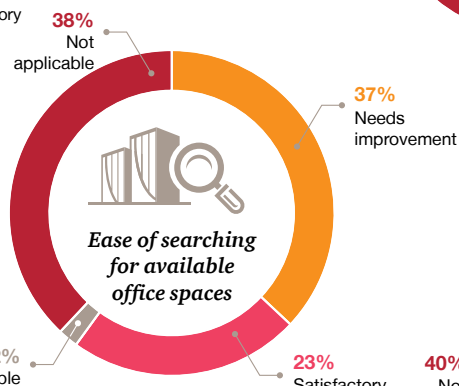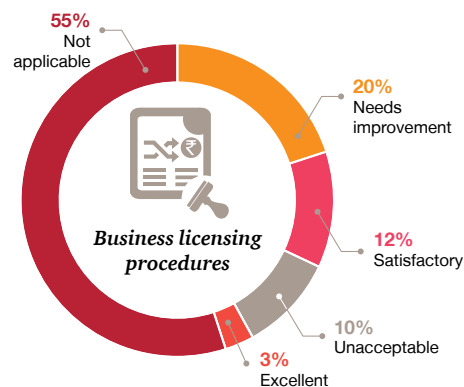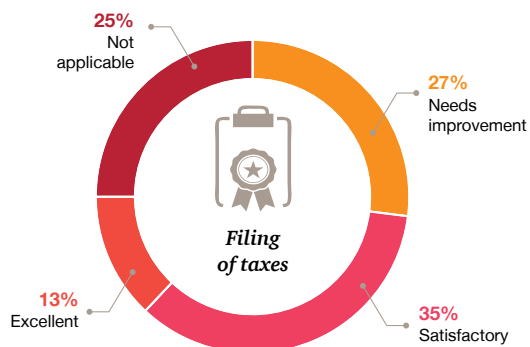
2.2 Deep dive: Other crucial issues

With regard to social infrastructure, many respondents were satisfied with the availability of healthcare facilities in and around CBDs. However, the presence of educational and childcare facilities requires improvement. Respondents are satisfied with the presence of recreation facilities as well as the rate of social diversity in and around CBDs. However, CBDs are behind in terms of inclusiveness and ease of accessibility for differently-abled people. Also, CBDs need to expand the presence of open spaces and parks in and around their areas. Majority of the respondents feel at home in and around CBDs and experience a feeling of belongingness.

In terms of economic infrastructure, majority of the respondents were satisfied with the ecosystem of filling taxes in CBDs. The availability of office spaces in CBDs needs to be worked on. Also, the availability of legal and financial information and the support system for such information in these areas needs to be upgraded.
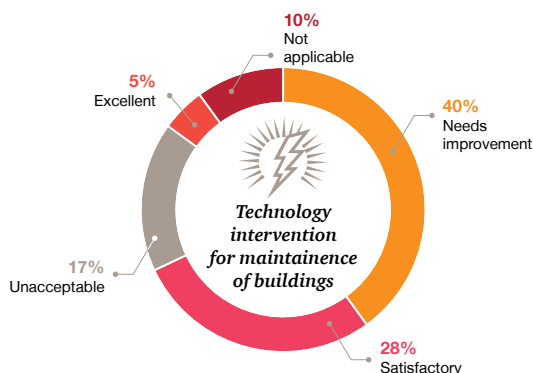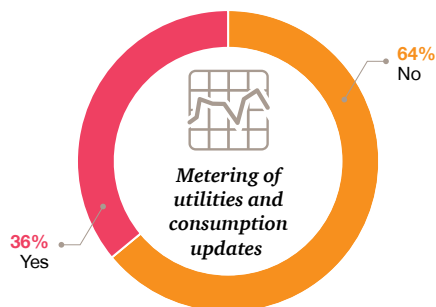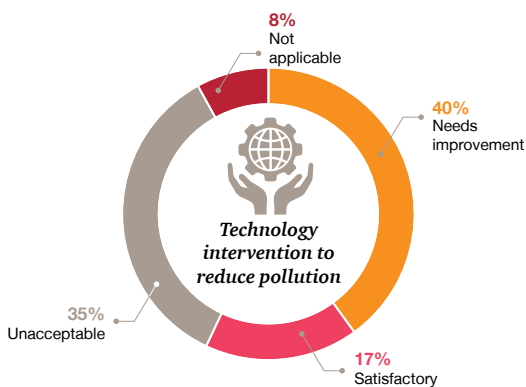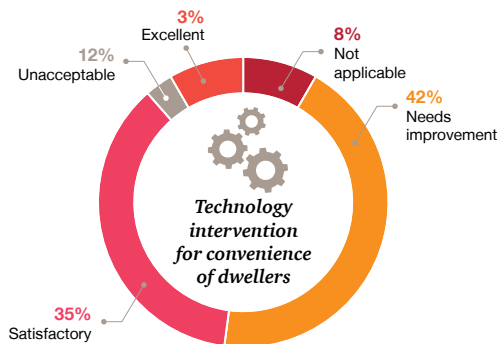
In terms of the ICT ecosystem, majority of the respondents feel that there is further scope for technological advancements for the convenience of dwellers in CBDs. Moreover, there is scope for enhancing technology intervention to reduce pollution in CBDs. In addition, technology intervention for maintenance of buildings in CBDs requires improvement. Furthermore, there is scope for leveraging technology to disseminate utility consumption and billing reminders in CBDs.

Education and childcare facilities

- 13% Not applicable
- 3% Excellent
- 50% Needs improvement
- 12% Unacceptable
- 22% Satisfactory

Recreational facilities and restaurants

- 3% Not applicable
- 40% Excellent
- 20% Needs improvement
- 35% Satisfactory
- 2% Unacceptable

Diversity in CBDs

- 3% Not applicable
- 10% Excellent
- 30% Needs improvement
- 57% Satisfactory

Inclusivensss and accessibility

- 8% Not applicable
- 40% Needs improvement
- 27% Satisfactory
- 17% Unacceptable
- 8% Excellent

Open spaces and parks

- 3% Not applicable
- 42% Needs improvement
- 25% Satisfactory
- 22% Unacceptable
- 8% Excellent

Economic infrastructure

Filing of taxes

- 25% Not applicable
- 27% Needs improvement
- 35% Satisfactory
- 13% Excellent

Business licensing procedures

- 55% Not applicable
- 20% Needs improvement
- 12% Satisfactory
- 10% Unacceptable
- 3% Excellent

Ease of searching for available office spaces

- 38% Not applicable
- 37% Needs improvement
- 23% Satisfactory
- 2% Unacceptable

Ease of submission of space rentals and keeping track of submission status

- 53% Not applicable
- 15% Needs improvement
- 27% Satisfactory
- 5% Unacceptable

Availability of legal and financial information physically and electronically

- 40% Not applicable
- 32% Needs improvement
- 20% Satisfactory
- 5% Unacceptable
- 3% Excellent

ICT infrastructure

Technology intervention for convenience of dwellers

- 3% Excellent
- 12% Unacceptable
- 8% Not applicable
- 42% Needs improvement
- 35% Satisfactory

Technology intervention to reduce pollution

- 8% Not applicable
- 40% Needs improvement
- 35% Unacceptable
- 17% Satisfactory

Metering of utilities and consumption updates

- 64% No
- 36% Yes

Technology intervention for maintainence of buildings

- 10% Not applicable
- 5% Excellent
- 40% Needs improvement
- 17% Unacceptable
- 28% Satisfactory

Responses

" Decongestion, more breathing space, right of way for pedestrians and cyclists, minimal use of private vehicles, metro connectivity and feeder connectivity via smaller vehicles instead of regular sized buses. "

" Systematic transportation with a benchmarked fare model from Gurgaon Cyber City will help get rid of the auto monopoly here. Bad roads and infrastructure only increases the travel duration and makes it worse due to the long traffic jams. "

" CBDs house some of the old buildings of the city, which are not suited for present day living, and are mostly non-compliant with building regulations. This situation can be improved with better enforcement of regulations. "

" Given the high energy consumption in offices and the environmental impacts associated with such office clusters, steps to address at least a part of the impact must be initiated. "

" Integrated planning which treats public transport and the surrounding dwellings (including residential/ commercial) as part of one ecosystem is required. In places like Singapore or Hong Kong, the public transport infrastructure is seamlessly merged with housing and commercial estates. "

" Power supply lines pass through the CBD in a haphazard manner. These power lines have to be properly laid. The power distribution network in CBD needs a complete overhaul. "

" We need rainwater harvesting systems to deal with water shortage and enhanced use of solar panels or other non-conventional sources for generating energy. "

" The drainage system needs to be revisited and requires an efficient channelised system which does not get easily blocked due to the solid waste flowing with the rainwater. Rainwater harvesting has to be done otherwise CBDs will become uninhabitable in the near future. "

" Lack of planning and maintenance leads to waterlogging every monsoon and the first few showers completely cripples the city. "

" Nature gives one a sense of engagement and belongingness and in Gurgaon we do not do not have access to any greenery. "

" In Singapore, a business license is issued in just 27 minutes and in India it can take up to 27 days which can be reduced. "

3. Smart retrofitting

3.1 Why retrofitting?

Since the land parcels for development of new offices in prime locations are scarce, the options available for rejuvenating CBDs are retrofitting and redevelopment. Redevelopment entails high capital expenditure and a high payback period, however retrofitting comparatively takes less time, and has lower capital investment and payback period. Developers and real estate owners will need to invest in developing building facades, common areas within the building premises and in making the buildings energy efficient. The agencies responsible for the CBD (government agencies such as urban local body (ULB)/parastatal or private entities) will need to invest in both physical and technology infrastructures in order to adopt smart solutions across the CBDs.

Retrofitting using smart components will improve the quality of life and delivery of services for the CBD residents which will further unlock the inherent land value of the CBD. Smart components are envisioned to make services available to citizens at the touch of their fingertips and will also make enough information available to citizens to help them customise their lifestyle and improve their standard of living with sustainable consumption. Moreover, smart solutions will also bring down the overall operational expense of maintaining an office within the CBD thereby making commercial establishments in CBDs further attractive. The occupants' benefits through retrofitting include the following:
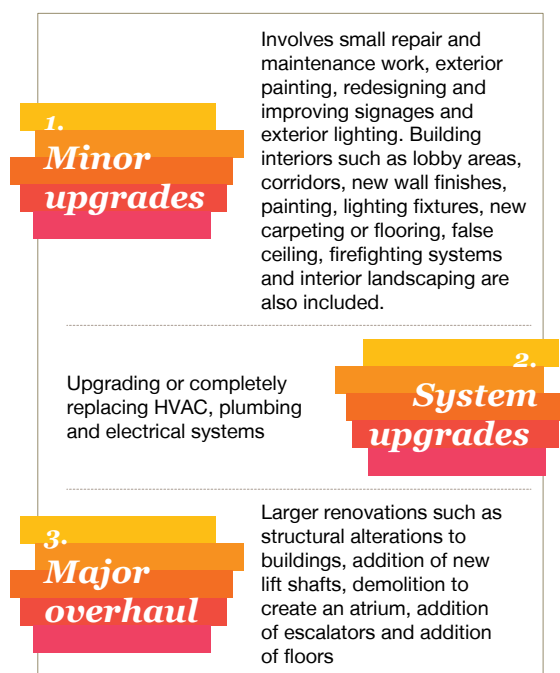
Amongst the area based development strategies, retrofitting is best suited for the rejuvenation of CBDs. The retrofitting strategy aims *to introduce planning in an existing built-up area to achieve smart city objectives in an area consisting of more than 500 acres identified by the city in consultation with the citizens.* The Government of India's mission guidelines further state that *since existing structures are largely to remain intact in this model, it is expected that more intensive infrastructure service levels and a large number of smart applications will be packed into the retrofitted smart city. This strategy may also be completed in a shorter time frame, leading to its replication in another part of the city.*

3.2 Retrofitting approaches

Retrofitting carried out by real estate developers will involve changes in the structure and façade of the building or the services offered within the building premises,[5] whereas retrofitting offered by the CBD operator will be through the adoption of smart components such as smart mobility, utility, communication, and smart surveillance solutions.

The capital expense and time required in retrofitting a building premise within a CBD will depend on the level of retrofitting[6] and such levels of retrofitting can be broadly classified as the following:

01 Increased property value

02 Increased occupancy levels

Occupants' benefits through retrofitting

03 Increased desirability of location

04 Lower recurring maintenance costs

1. Minor upgrades — Involves small repair and maintenance work, exterior painting, redesigning and improving signages and exterior lighting. Building interiors such as lobby areas, corridors, new wall finishes, painting, lighting fixtures, new carpeting or flooring, false ceiling, firefighting systems and interior landscaping are also included.

2. System upgrades — Upgrading or completely replacing HVAC, plumbing and electrical systems

3. Major overhaul — Larger renovations such as structural alterations to buildings, addition of new lift shafts, demolition to create an atrium, addition of escalators and addition of floors

While undertaking such a retrofitting exercise, it is imperative to take a planned approach to determine the options available for a specific building based on the layout, occupancy pattern and need for revitalisation. Following this, the best option must be selected, considering the financial implications which will include the capital cost, market demand, operational expenses, and potential envisaged after retrofitting the property. Adequate risk mitigation needs to be done for operational issues arising during the retrofitting; additional permissions that need to be sought from the government agency, and any environmental impact that an initiative may have.

3.3 Retrofitting smart technology

The Government of India, through it 'Smart City Mission' launched in June 2015, announced two distinct development strategies for city development—pan city initiatives and area based development.[7] Under the pan city development, the cities will identify one initiative which can be taken up to benefit residents across the city, however, area based development takes the form of either redevelopment, retrofitting or greenfield development adjoining the city boundary.

A CBD that is centrally located and responsible for giving the city its economic character is best suited for retrofitting. Moreover, a significant percentage of the city's population is directly or indirectly employed in the businesses operating out of the CBD, making it even more attractive for rejuvenation. Within such retrofitted areas, the government further recommends adoption of *smart applications* or *smart solutions* thus implying that technology will be infused in day-to-day operations and provisioning of city services. Such adoption of technology needs to be encouraged within Indian CBDs to improve the physical and economic ecosystems that they offer to investors and businesses. Improved technology adoption to create an environment conducive to economic growth will help enhance *ease of doing business* in India and further attract capital which improves both physical and economic environments thereby creating a virtuous development cycle.

3.3.1 Smart mobility

While CBDs continue to attract residents from other areas of the city to carry out business operations and leverage retail establishments, they add immense pressure on the transportation infrastructure of the city. The public transport and last-mile connectivity offered by road networks are often strained during the peak working hours. While augmentation in terms of capacity will help in easing the woes of commuters; technology solutions can be useful in utilising the existing capacities to the maximum extent possible. Such technological solutions will be less capital intensive than capacity augmentation and may also have a shorter development turnaround time leading to quick wins and tangible outputs. Such 'smart mobility' solutions have been adopted by various cities and can be effectively leveraged by CBDs to reduce the inadequate infrastructure during peak hours.

- **Carpooling services:** The capacity of the road infrastructure is inadequate during peak hours. However, there is spare capacity available in vehicles on the road which often goes unutilised. Carpooling originated in the wake of the oil crises in 1970 and has since then lost its popularity. In the wake of mobile-based real time data sharing, carpooling has received a push with France's BlaBlaCar and Germany's Carpooling.com. Another form of sharing has been created by the availability of 'grab and go' cars such as Zipcar. These cars offer an alternate mode of last-mile commute for the CBD visitors and promote the use public transport to enter and exit the CBD, thereby reducing overall congestion. Similar initiatives also exist in India such as Easy2Commute, Pool My Car or Car Cab Pool which provides a platform for people to pool vehicles. An incentive mechanism can be created to encourage people to pool their vehicles.

- **Smart parking:** Indian CBDs are often plagued with illegal kerbside parking due to inadequate parking lots or due to lack of real-time information of available parking slots in the vicinity. Smart parking solutions that enable commuters to access real-time information on available parking spots using map services on smartphones can go a long way in reducing parking troubles. Additionally, such smart parking systems also reduce the turnaround time for parking by eliminating manual payments at parking lots. The availability of parking data will also support local authorities with regard to the planning and pricing in accordance with the traffic and congestion patterns within the CBD.

- **Real-time journey planner:** A real-time journey planner for commuters entering and exiting the CBD will enable them to make smart choices like timing their commute to avoid major traffic snarls. Appropriate visualisation of the data gathered from the real-time journey planner can help in influencing user behaviour and in planning future capacity augmentation. Such real-time journey planners are often created in the form of mobile applications and build on the sensors deployed on the road network and the social data available from commuters. Mobile applications such as Citymapper and Waze offer similar services and CBDs can either develop or leverage the existing apps in order to enable commuters to make their way to and from the CBD. In a realistic scenario, a CBD will be characterised by many entry and exit points. A traveller passing through a CBD may wish to cut across the area in the most optimum manner to cross the CBD or to arrive at a spot within the CBD. A real-time journey planner can integrate real-time traffic details with optimum route data and provide the best possible option to travellers in and around CBDs.

- **Bike sharing services:** In developed countries, alternate transport is emerging as a choice of transport due to the health and sustainability benefits it offers. Paris' self-service Vélib' cycle sharing platform has aggregated over 18,000 cycles in 8 years and has an average daily ridership of over 85,000. Indian CBDs can promote cycles as the last-mile transit route in cities with favourable weather and infrastructure.

- **Digital signboards:** Signboards alongside the road can go a long way in managing the expectations of commuters and in notifying them in case of logjams. Such signboards offering variable messaging services can also be an integral part of the information shared with commuters through CBD's integrated mobile application. Such signboards can further enhance CBDs capacity to manage traffic through congestion zones and also help in driving commuter behaviour. For example, in a city like Mumbai, logjams during the monsoon or traffic during peak hours are a common occurrence. Digital signboards can provide easy detours to commuters without them having to access their mobile devices. It can also be used as a public broadcast system and integrated with disaster management functions of the city to keep citizens updated.

- **Intelligent transport systems (ITS):** Components of ITS such as adaptive traffic management based on ambient usage patterns, incident detection systems on highways, automatic number plate recognition (ANPR) using CCTV surveillance mechanism can help in easing traffic and in enforcing traffic regulations. The data captured by components of the ITS system can help in planning congestion pricing (in case it is adopted) on the road network within the CBD.

3.3.2 Smart buildings

Overcrowding is one of the biggest challenges CBDs face today which leads to immense pressure on physical infrastructure in terms of resource consumption. With number of offices, residents and visitors to CBD on the rise, the stress on buildings with regard to water, electricity, security and energy consumption has become a challenge. Until recent times, buildings were just about the office/residential space required for habitation but now, the purpose of a building has grown beyond the four walls of a room to aspects such as the impact of the building on the environment, purpose of the organisation or entity using the building and the quality of life that the building can offer its inhabitants. This led to the concept of a smart building which integrates various aspects of building operations that earlier worked in silos and provides an optimum quality of life while respecting the need to reduce the environmental impact on the outside world. Smart building solutions are a pressing need especially in high consumption areas such as CBDs because of the impact that a heavily populated building ecosystem can have on the surroundings. Some prevalent smart building technologies that have been used are listed below:

- **Centralised building management system:** A centralised building management system will help to connect various aspects of building operations such as surveillance, water connection and supply, electricity meters and lift and parking. In most buildings today, these operations are controlled separately and the coordination required between the different verticals of operations is also managed manually. A centralised building management system will be able to integrate these operations and bring the best of services to inhabitants of the building. For e.g. the surveillance system can be used to detect the presence or absence of people in public areas to reduce air conditioning or to switch off the lights automatically. Free exchange of information between these verticals will ensure optimum comfort, lower cost of operations and efficient utilisation of resources by the building.

- **Smart electricity meters**: The electricity consumption pattern of different households or offices in a smart building can be captured over a period of time. Such information from different buildings can be aggregated over time by a smart grid which supplies power to these buildings to devise incentive packages for different buildings in order to encourage reduction in consumption. Users can study their own consumption patterns and consciously try to make effective use of electricity. In an advanced scenario, smart buildings may actually be able to generate revenue by selling the unutilised load back to the grid.

- **Building surveillance system**: While the primary function of a building surveillance system is security, it can also play a major role in regulating the building management system. The surveillance system can be used to detect the presence of people in public areas to regulate temperature and electricity usage and to optimise energy consumption. For e.g. in an IT park, the surveillance system may be linked to ICT tools which switch off all computers in the absence of any employees, which may lead to considerable reduction in energy consumption. Internal surveillance system can also be leveraged and connected to external public networks in case of security threats within the building. This can be crucial as CBDs are often under threat due to the scope of impact possible.

- **Utility management system**: In a smart building, each office or house will be characterised by utility appliances and electronic devices. A utility management system can play the role of a universal system within each home or office to manage all appliances and electronic devices and to monitor their energy consumption. The system can be used to remotely turn off or put devices into sleep mode when not required or during peak load hours to save costs. The utility management system can be provided to consumers on their mobile devices so that they can remotely manage their homes or offices through their mobile devices.

3.3.3 Smart energy

In recent years, the battle for energy has become more intense across the world. In an effort to grow faster, most regions have blindly relied on consumption of non-renewable sources of energy. But with their supply dwindling and the competition becoming more intense, the focus on smart consumption has increased.

A rise in unchecked consumption is also leading to higher carbon emissions, which can be alleviated by taking ownership of one's consumption and adopting practices which reduce usage and offer a good quality of life.

The concept of smart energy has gained popularity owing to a growing tendency of unchecked energy consumption, which is a result of overcrowding, and CBDs, as such, will be the ideal target for incorporating smart energy components. Some popular ICT smart energy components which can be used are as follows:

- **Smart grid:** One of the problems with electricity consumption is the need for a mechanism to measure and regulate it dynamically. A smart grid will help overcome this. It integrates an electrical grid with ICT tools that can be used to communicate with local substations, monitor demand, regulate supply, adapt to changes in consumption and keep track of it on a real-time basis. A smart grid is the first step towards establishing an energy-efficient CBD, because it provides a platform on which supply manipulations can be effected to save costs and optimise energy consumption. A smart grid is several steps ahead of a simple electric grid and can manage load effectively by reducing supply to non-critical substations during peak load hours (demand-side management).

- **Demand-based pricing:** Currently, consumers have little idea about their consumption patterns and daily usage levels, other than the unit-wise consumption details available at the end of the month. With the help of smart grid and smart metering systems, customers can get real-time information about electricity consumption. This will help them become conscious of their consumption levels, leading to reduction in overall use. Further, smart pricing techniques can be devised wherein the tariff is changed according to individual consumption patterns, and the price of utility is increased during peak load hours or decreased during low load hours. This gives an incentive to consumers to keep a check on their consumption habits.

- **Alternative energy sources:** While smart buildings can utilise their own solar panels to meet their energy requirements, a solar plant at the CBD level will help achieve economies of scale which cannot be done through distributed power plants. CBDs need to start making an effort towards matching their consumption with an equal produce of energy. Individual units of the CBD can contribute towards this solar plant and receive incentives based on their contributions. This will help to drastically reduce carbon emissions throughout the CBD. District

heating can also be explored as an alternative source of energy by connecting power stations and heat-generating entities in the CBD to heat distribution networks. The heat generated can be used to directly heat offices and homes. In the near future, the heat generated can also be used to create electricity through thermoelectric generators. The feasibility of such a concept may have to be studied.

3.3.4 Smart utilities

In a CBD which is characterised by office spaces, small industrial units or residential spaces, the pressure on utilities such as water, electricity, drainage or gas can be huge. In the current scenario, utility management is a cost burden both because the manpower or support required to manage it is high and because there is no way to measure the usage and accordingly take steps to optimise operations. Smart utilities cover a wide range of solutions ranging from water supply and sanitation to ICT infrastructure such as public Wi-Fi or command and operate centres.

Smart utilities are crucial in a CBD as they can enable communication and integration between various utility operations which will improve overall efficiency of operations. The following are some of the pressing smart utility requirements in Indian CBDs:

- **Smart meters:** Smart meters help in solving the first problem of data capturing. Smart electricity meters or water meters help in capturing real-time usage data and enable two-way communication between the end application and the supply. Once the usage data at an office or residence level is captured and available, a plethora of opportunities are opened to apply smart concepts at a CBD level such as demand management, predictive analysis, utility pricing and load balancing at a grid level. Capturing leakage points in the distribution network also becomes easy with the availability of two-way communication as reconciliation becomes simple. This is important as pilferage of electricity or water supply is a common occurrence in the Indian urban scenario.

- **Environment sensors:** Use of environment sensors in CBDs is of paramount importance because in CBDs, which are characterised by industrial establishments, the level of emissions can be quite high and the pollution levels may also be beyond permissible levels. Emissions from automobiles on heavily congested roads are major contributors to pollution in CBDs and the sensors will keep track

of it. Similarly, weather monitors can be used to capture the current weather conditions and accordingly regulate temperature within buildings which can help reduce energy consumption in offices and homes. Water-level sensors can keep track of waterlogging in cities such as Mumbai where heavy rains can disrupt activities in the CBD.

- **Supervisory control and data automation (SCADA):** A SCADA system for all distribution networks such as electricity, water and drainage will be a crucial requirement for sound operations within a CBD. Capturing data will require sensor networks to be set up which can be used to monitor and control utility networks throughout the CBD. It will help optimise costs of operations in the CBD by integrating all utility distribution networks into a single package. A SCADA system at the CBD level can be used to regulate water supply, electricity supply and drainage flow from a single location, streamlining operations. Further, centralised control ensures better coordination between different aspects of the CBD such as when storm water drainage flow can be enhanced to accommodate heavy rainfall, which can be predicted through weather sensors.

- **Network simulation:** It's expected that the CBD will be characterised by a vast drainage, sewerage and water distribution network. These distribution networks can be mapped on to a simulation system to study the effect of change in parameters on the functioning of the network. For example, in the case of a choked drain, simulation may help in understanding the impact of the blockage. Based on the results of the simulation, the SCADA system can be used to change the flow patterns of the network to account for the blockage. Network simulation can also help in planning for capacity enhancement measures as various input levels can be used to study the behaviour of the network.

- **Smart street lighting:** CBDs are some of the well-lit areas of any city. The congestion during evening peak hours especially requires sufficient street lighting. To conserve energy, intelligent street lights can be deployed which can adapt to the presence or absence of activity and accordingly adjust their brightness. Street lights form the biggest chunk of a city's electricity consumption and intelligent street lights can change this. Also, conventional street lights can be replaced with LED lights to save energy. The street light may also be integrated with SCADA system for centralised control and management.

3.3.5 Smart communication

One of the primary deficiencies in effective urban administration is the lack of communication between different aspects of the city. Effective communication can enable better integration between the city verticals and ensure its better operation as a whole, as it may form the backbone of the SCADA system or the sensor network in the CBD. Sound communication technology in a CBD can have far-reaching impacts. The better the communication network, the faster is information available–be it communication of data captured by sensors or information downloaded by users from the internet. In a way, use of smart communication can boost activity in a CBD. Some of the smart communication interventions which will be useful for CBDs are as follows:

- **Public Wi-Fi:** Public internet accessible as core ICT infrastructure is a must for CBDs today. Considering that CBDs are economic hotspots, a lot depends on how quickly and easily information is made available to people. Wi-Fi hotspots at regular intervals can be installed to give seamless connectivity to those on the move. This network can also be leveraged in controlling utility distribution networks, transmission of meter readings, push-based location-specific services to mobiles, managing sensor networks, etc.

- **Command and control centre:** Considering that a CBD will use modern utility system and infrastructure management systems, a centralised control and command centre is a must to manage all CBD operations. The command and operations centre will ideally consist of operations ranging from traffic, medical services, police and safety to building and utility management, and will be used to monitor the state of all utilities, sensor networks, incidents, building systems, disasters and surveillance systems. This will form the horizontal backbone to various district verticals and integrate overall district operations.

- **Health monitors:** Effective healthcare is a challenge due to the low patient-to-healthcare staff ratio. To provide for better healthcare services, smart health monitors can be used wherein a patient's vital statistics are monitored through body sensors and communicated to a base station through Bluetooth or infrared technology. The base stations will have a database of various patients and their ailments, which will be pre-configured to trigger alarms in case any vital statistics are beyond acceptable norms. In

fact, this concept can also be applied to patients who are on the move but need their vital statistics to be monitored. The monitoring device can leverage the wireless network available in the CBD to connect to the base station.

- **Utility-level communication:** In an ideal scenario, the various utility systems will need to communicate with each other and operate together. For example, light sensors can help reduce brightness of street lights or lamps at home whenever the reading on the sensor network is above the set threshold. Data from light sensors can also be leveraged by smart grids to predict electricity consumption patterns. Similarly, surveillance networks can be used to find the most optimum routes for people to get to their destinations by considering factors such as time of day, and this information can be pushed to mobile devices through public wireless networks.

- **Video telephony:** In the digital age, all offices and homes should be provided with video telephony to encourage meetings to be held over the web rather than in person, as the latter involves travelling which implies road congestion and fuel expenditure. Video telephony can be enabled through a strong fibre optic network connection.

3.3.6 Smart surveillance

Surveillance systems are fast becoming pressing needs of most major cities. While the primary purpose of surveillance is safety, the availability of new smart components ensures that they can be used for much more than just safety. Traditionally, a surveillance system was just about cameras installed to manually monitor activities remotely and react to incidents. Smart surveillance systems today can actually form the front end of the command and control centre in a CBD, as they can provide valuable feed which can be analysed to detect suspicious activities or manage incidents. This data can also be fed into facial recognition or pattern recognition software to derive meaningful results. The following are some areas in which CBDs can use smart surveillance:

- **Automatic number plate recognition (ANPR):** Manual monitoring of vehicles breaking traffic rules requires traffic police to be deployed and vigilant. Besides, most offenders are able to get away because the number of vehicles is huge. Instead, automatic number plate recognition software can be used in conjunction with the surveillance system to capture images of number plates and identify the owner through government databases. Once the vehicle is identified, an e-challan can be generated and sent to the offender via email. This also ensures that traffic is not held up every time a challan is generated on the spot. The hit rate this way is much higher and revenue loss due to lack of enough police officials can be reduced. ANPR can also be used to trace lost or stolen cars and to send alerts to owners and local police about the coordinates of the vehicle.

- **Garbage collection monitoring:** Quite often, garbage collection is a nuisance, with workers not completing their tasks diligently, leading to waste lining the streets and piling up near dumping points. The surveillance system can be used to keep tabs on whether workers are actually visiting all the garbage collection points. Also, sensors can be installed in the waste bin and linked to the surveillance system. When the waste goes beyond a certain level and requires collection, the surveillance system can be triggered to detect collection activity. This can improve cleanliness in CBDs.

- **Route detection:** The surveillance cameras, connected to one another, can be used for determining effective routes through CBDs. Surveillance systems can identify congested areas and automatically provide updates to travellers to switch to de-congested routes. Similarly, surveillance systems can also be used to relay those routes where some activity from vehicles and crowd has been detected to help assess their safety for women.

- **Facial recognition and pattern recognition:** Facial recognition is essential for controlling crime and ensuring safety in CBDs. It can be used as an access-granting mechanism in various areas of the CBD and help track suspicious activities and identities of people involved in such activities. Similarly, certain pre-defined movements or patterns of movements can be fed into the surveillance system to sound an alert whenever the pattern is repeated. This can help in identifying suspicious movements across the CBD.

4. Way forward

Once the challenges in the CBD and indicative solutions to address them have been identified, each of the city administrators will have to tread a unique path and develop solutions that are relevant to the specific needs of tenants, employees and visitors of the CBD. Administrators can help identify the enablers for implementation and suggest a high-level action plan to ensure that the planned benefits are provided to the stakeholders.

4.1 Enablers for action

- **Partnerships:** City administrators will have to forge strong partnerships with private organisations, non-governmental organisations, universities, funding agencies and entrepreneurs in order to derive an operating model that could work for CBDs. Each stakeholder within the partnership network will contribute with special resources in the way of technical expertise, managerial skills and finance. The global best practices can also be imbibed by forging the right set of partnerships with private players and universities.

- **Citizen participation:** In case of CBDs, citizen participation will come through engagement with the businesses and their employees. The success of initiatives adopted will depend on the acceptance from stakeholders and it will be important for CBDs to involve citizens during the planning process by ensuring that initiatives go through a citizen audit during the evaluation phase.

- **Leadership commitment:** Successful execution of an urban development initiative will depend on committed leadership from the civic body's elected representatives and administrative staff. In carrying out complex interfaces and development strategies across various urban domains, the leadership requires multiple skills and new types of managers. It relies less on individuals and more on their capacity to connect and distribute power to other stakeholders, within and outside the public administration.[8]

- **Smart finance:** The city administrations in India have been facing budget constraints and are tasked with doing more with less. In such a scenario, it is essential to find new ways to pool up financial resources and develop new legal and institutional frameworks that facilitate access to finance and make projects within CBD attractive to investors.

- **Pilots and agile delivery:** Pilots allow for early visualisation of solutions and to see what works and what does not. Moreover, they support the formation of coalitions of stakeholders and can pave the ground for legitimising both transformational and transitional initiatives that challenge the status quo.[6]

4.2 Action plan

The administrators will need to take up a concentrated effort if Indian CBDs are to compete at the global level and attract investors. We conclude by recommending steps to be taken up by the administrators from ULBs/parastatal/private entities to retrofit and develop a sustainable and economically attractive CBD.

Stakeholders:
Administrators, NGOs, private organisations, universities, citizens

▲

2 — Develop a vision for the CBD including key performance indicators

Stakeholders:
Administrators, NGOs, private organisations, universities, citizens

▲

4 — Identify potential leaders outside the administrative capacity who can support in executing the projects and liaise with other leaders

Stakeholders:
Administrators, NGOs, private organisations, universities

▲

6 — Look for smart financial solutions to make it all happen

Stakeholders:
NGOs, universities, citizens

▲

8 — Perform social audits to determine effectiveness of the pilot projects and make mid-course corrections

Stakeholders:
Administrators

▲

10 — Communicate project necessity and benefits to all stakeholders

1 — Assess the ambient situation in the CBD and identify the problems that need to be addressed

▼

Stakeholders:
Administrators, NGOs, private organisations, universities, citizens

3 — Identify internal capacities to execute projects to achieve the CBD vision

▼

Stakeholders:
Administrators

5 — Identify spatial boundaries within which the projects will be executed and prioritise multi-domain projects over siloed initiatives

▼

Stakeholders:
Administrators, NGOs, private organisations, universities, citizens

7 — Look for agile ways of implementation, including pilots to show benefits, and obtain advocacy from stakeholders

▼

Stakeholders:
Administrators, NGOs, private organisations, universities

9 — Finally, determine the projects that need to be executed throughout the geographical area chosen for implementation within the CBD

▼

Stakeholders:
Administrators, citizens

5. Case studies

Urban lab at Barcelona

The city of Barcelona has gained global reputation as a torchbearer in adopting smart solutions for its citizens. The 22@Barcelona project transforms an industrial land into an innovative district.

One of the innovative ideas which Barcelona has planned is an underground service gallery that interconnects blocks in a manner that excavation is not required during repairs of utility ducts such as telecommunication networks, electricity networks, district heating and pneumatic waste collection systems.

The Integral Solution for Urban Infrastructures (or SIIUR) project aims to create an urban lab through deployment of sensor networks. The lamp posts on the streets are equipped with LED lights and sensors that process environmental information and detect presence, temperature, humidity, noise and pollution. These lights are connected to a street lighting cabinet that centralises all communications and services and sends the information to a central control centre.

Moreover, the city itself was being sought to be offered up as an urban lab for testing and simulating applications developed by innovative start-up companies. Barcelona is creating an efficient and smart service delivery platform for citizens and municipal workers. This platform has a common data warehouse where the different sensor systems store their information. This system has been built on a public-private partnership (PPP) basis, a normalised model based on well-known standards.

Public data owned by the city council is made accessible to the public in standard digital formats in an easy and clear structure. The portal includes more than 300 categories of data in five basic areas, namely, territory, population, urban services, economy and administration. The initiative aims to increase the transparency of the city council, identify information of common interest, support private initiatives that develop public services of interest and support the openness of public data.

Lessons from Melbourne

Decentralisation of offices to suburban business areas led to Melbourne's CBD losing its sheen. During the slump in Melbourne's CBD and the national recession, the permanent resident population reduced to 700 and the number of open-air restaurants dwindled to just two. The local and state governments appreciated the challenge at hand and initiated policy reforms that rejuvenated the CBD.

A number of projects were initiated since 1980, which led to this transformation. Notable projects included 'Postcode 3000', which stimulated development of permanent residential units, leading the permanent population to surge over 36,000. Significant efforts were made to reinvigorate the transportation system wherein the emphasis was on development of multiple modes of transport. This focus on mobility led to the development of bicycle lanes on key routes, accessible platforms at tram stops, dedicated bus lanes on key bus routes, and redevelopment of five railway stations in the CBD's vicinity. The city administrator's view that pedestrians fuel the CBD economy allowed planners to focus on creating an attractive, stimulating environment to prolong interest and encourage spending.

Visitors to the CBD have increased in number, which is up to 8,00,000 now, while the average car travel time has remained stable as a result of investment in public transport. The number of dining places in the business district has grown to 600, giving the city its unique flavour of cafes and restaurants along its laneways.

Cape Town Central City

Cape Town's CBD was distressed with a high level of crime during the 1990s. The Central City Improvement District (CCID) was then formed by property owners in the area. It provides an additional security service in Cape Town alongside the South African Police Service. The CCID was launched in November 2000 to address the increasingly negative perception of the city. It is a collaboration between public- and private-sector stakeholders working together to develop, promote and manage Cape Town's central city. Its vision is to provide an inclusive, vibrant and sustainable city centre. Driven by the Central City Development Strategy, the PPP has specialised yet integrated focus areas including safety and security, quality urban management and social development.

The CCID has been able to significantly reduce crime in the Cape Town Central City over the past decade, and through the combined efforts of the government and private stakeholders, it is now positively perceived as a vibrant tourist attraction. The CCID has also made a valuable contribution to safety and security, demonstrated not only in improved resident satisfaction but also during the hosting of mega events. Improved safety has been closely associated with the improved brand of the city, enhancing conditions for future economic growth. A clear demonstration of the project's impact is that Cape Town's reputation as the cleanest and safest CBD in the country continues to set the standard for other CBDs in South Africa.

CCID became an internationally acclaimed model of urban security partnership supported by the city council. Through the efforts of the CCID, Cape Town's CBD has enjoyed rapid regeneration over the last decade. The CCID's managing agent is the Cape Town Partnership, a collaboration of the public and private sectors working together to develop and promote Cape Town central city. The focus of the partnership is still on security and surveillance (50% of the budget) and cleansing (21%).

BKC, Mumbai

BKC was developed by the MMRDA as a financial and business hub. The business district was established in central Mumbai with a view to decongest south Mumbai's business district of Nariman Point. Its current occupants include leading banks and financial institutions. BKC aspires to become a tenant-friendly CBD that is efficient and leverages ICT for improved experiences of tenants, employees and visitors. BKC is in the process of implementing smart initiatives in a phased approach. The first phase includes the following:

- **Wi-Fi:** In order to provide seamless connectivity to visitors and employees, BKC plans to offer public Wi-Fi across key locations to address the communication needs of the mobile workforce.

- **Smart parking:** Commuters spend a significant amount of time in locating a parking spot which results in increased carbon emission and loss of productive time. The smart parking solution which enables commuters to locate empty parking slots using a mobile device will help reduce unauthorised parking, emissions and time required for parking.

- **Smart street lights:** Energy-efficient lights are envisaged to be adopted across the CBD to reduce power consumption and operational expenses of managing the street lights.

- **Surveillance:** The CBD plans to install cameras across key locations to reduce thefts and improve emergency response within the CBD limits.

- **Citizen application:** It intends to have a centralised mobile application system to disseminate information and provide a unified communications interface while raising grievances or requesting for any service while on the go.

Among Indian CBDs, BKC has become a torchbearer for the smart city paradigm, the results of which will be keenly observed by other CBDs while devising their technology adoption strategies.
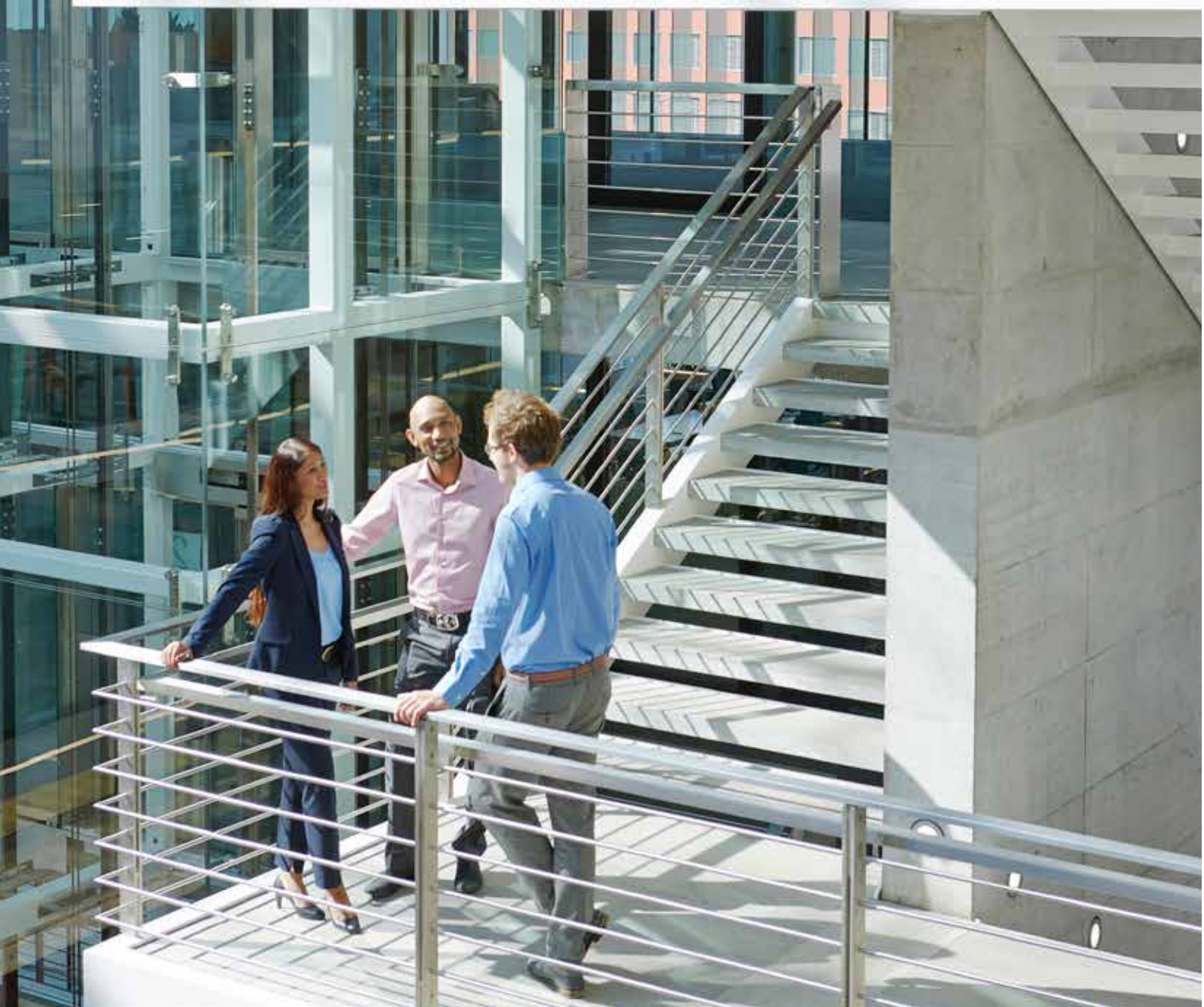
Endnotes

[1] *FY 2014 JBIC Survey Report on Overseas business operations of Japanese manufacturing companies*

[2] *GoI Smart City Mission document*

[3] *http://www.business-standard.com/article/news-cm/urban-population-to-contribute-70-75-of-india-s-gdp-by-2020-barclays-114032000273_1.html*

[4] *https://www.planning.org/pas/at60/report125.htm*

[5] *JLL, Retrofitting India's central business district*

[6] *Ibid*

[7] *GoI Smart City Mission document*

[8] *Euricur, PwC & IHS. (April 2014). iUrban (inspire, innovate, implement)*

About PHDCCI

The PHD Chamber of Commerce and Industry (PHDCCI), a leading industry chamber of India, ever since its inception in 1905, has been an active participant in the India growth story through its advocacy role for the policymakers and regulators of the country. Regular interactions, seminars, conference and conclaves allow healthy and constructive discussions between the government, industry and international agencies bringing out the vitals for growth. As a true representative of the industry with a large membership base of 48,000 direct and indirect members, PHDCCI has forged ahead leveraging its legacy with the industry knowledge across sectors (58 industry verticals being covered through expert committees), a deep understanding of the economy at large and the populace at the micro level.

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It is more than just an organisation of the business community, as it lives by the chosen motto 'In Community's Life & Part of It' and contributes significantly to socio-economic development and capacity building in several fields. Industrial development, health, education and skill development, housing, infrastructure, agriculture and agribusiness and Digital India are the seven key thrust areas of the chamber.

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