

Safe Cities The India Story



What is safe city

Introduction

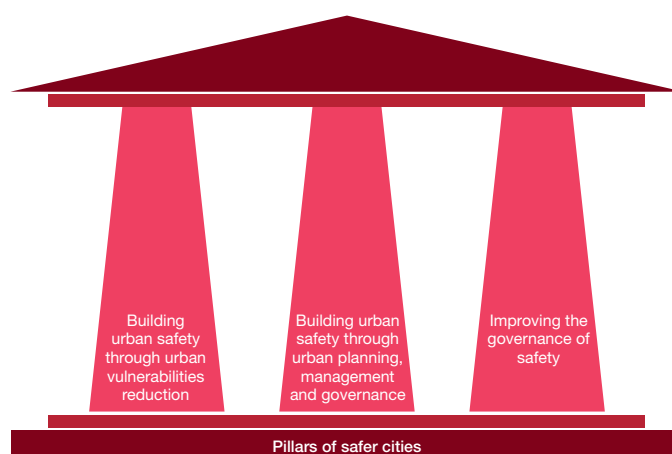
Safe city: A perspective

Public safety has emerged as an important function for governments across the world. It refers to the duty and function of the state to ensure the safety of its citizens, organisations and institutions against threats to their well-being as well as the traditional functions of law and order. With more than half the global population today living in urban areas, safe city is increasingly being considered essential in ensuring secure living and prosperity.

Crime, violence and fear in cities pose significant challenges. The basic principles of good governance must find a direct application in any urban safety strategy, aimed at reducing and preventing common problems of crime and insecurity.

The United Nations, through its Habitat Agenda on Human Settlements (Habitat II, 1996), which was adopted at the Istanbul Conference, initiated a series of approaches and strategies to effectively reduce and eradicate violence and crime within the cities. The aim of the UN-Habitat Safer Cities programme is to reinforce personal safety and reduce fear by improving safety services and accountability to the community. The Safer Cities programme has the following building blocks[1]:

- **Building urban safety through urban vulnerabilities reduction:** The UN Safer Cities programme defines vulnerability as the probability of an individual, a household or a community falling below a minimum level of welfare (e.g. poverty line) or the probability of suffering physical and socio-economic consequences (homeless or physical injury) as a result of risky events and processes (as forced eviction, crime or flood). Paying special attention to urban vulnerabilities and violence shall reduce the probability of crime and ensure a secure and safe city environment.
- **Building urban safety through urban planning, management and governance:** Sustainable urbanisation by emphasising inclusive and participatory urban planning, and local development practices, incorporates policy-making and strategy development. This in turn promotes institutional and organisational development, resource planning and management in order to enhance efficiency in governance.
- **Improving the governance of safety:** Enhancing urban safety and social cohesion are issues of good urban governance. They intend to create a city where safety is improved for its citizens and neighbourhoods, where there is fearless interaction among people and groups. These are prudent aspects of good governance which create an enabling environment for the inhabitants of the city, allowing improved quality of life and fostering economic development.



Safe city –India perspective

The Constitution of India enjoins the Union to protect every state against external hostility and internal disorder in order to ensure that the governance of every state is carried out in accordance with the provisions of the Constitution. In pursuance of these obligations, the Ministry of Home Affairs (MHA) continuously assesses and monitors the internal security situation, issues appropriate advisories, shares intelligence inputs, extends manpower and financial support, offers guidance and expertise to the state governments for maintenance of security.

As per the Seventh Schedule to the Constitution of India, 'police' and 'public order' are state subjects and, therefore, the state governments are primarily responsible for the prevention, registration, detection and investigation of crime and prosecution of the perpetrators of crime within their jurisdiction.

However, the MHA supplements the efforts of the state governments by providing them financial assistance for the modernisation of the state police forces in terms of weaponry, communication, equipment, mobility, training and other infrastructure. The MHA from time to time introduces key initiatives to ensure that the states and the state security agencies are equipped with the latest technologies and systems to ward off any security threat to its citizens.

Modernisation of state police force (MPF)

The MHA is assisting the state governments for modernising its state police forces. Under this scheme, assistance is being provided for the procurement of state-of-the-art equipment such as CCTV cameras for surveillance, radio tetra sets for communication, forensic laboratories, weaponry, vehicles, computerisation and training infrastructure. Under the MPF scheme, all the north eastern states are eligible to receive 100% central assistance of their approved annual plan for modernising the state police force.

Megacity policing plan

The megacity policing plan was introduced by the government under the MPF scheme in 2005 with an allocation of 57 million USD[2]. By 2010, it had achieved considerable maturity as the system was used for ensuring the successful and event-free Commonwealth Games in Delhi. The MHA has provided further impetus to the megacity policing programme by allocating 72 million USD[2] for the period 2013-17.

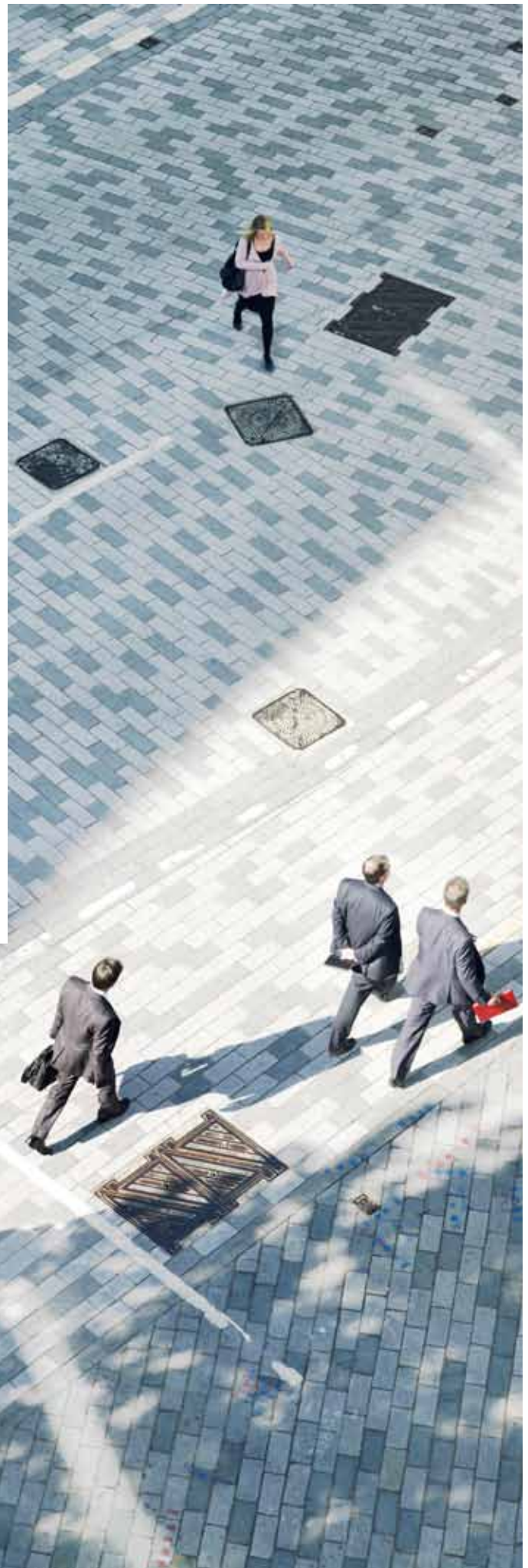
The state governments are the primary drivers for city surveillance initiatives. They are also responsible for overall funding. However, they can request funds from the MHA as needed. The state government funds can be pooled in from city municipalities, state governments and MP/MLA funds.

The funds will be used to procure modern equipments:

- CCTV systems, perimeter security systems, network equipment
- Data servers for central command control centres, video management system and DVRs
- Cyber patrol and communication monitoring system
- Integrated GIS-based automated vehicle tracking and management system

Other state initiatives

In line with Schedule 7 of the Constitution of India, individual states have also initiated similar programmes for procurement. Several states have made it mandatory to secure cities by deploying video surveillance systems to protect its citizens against crimes and terrorist attacks.

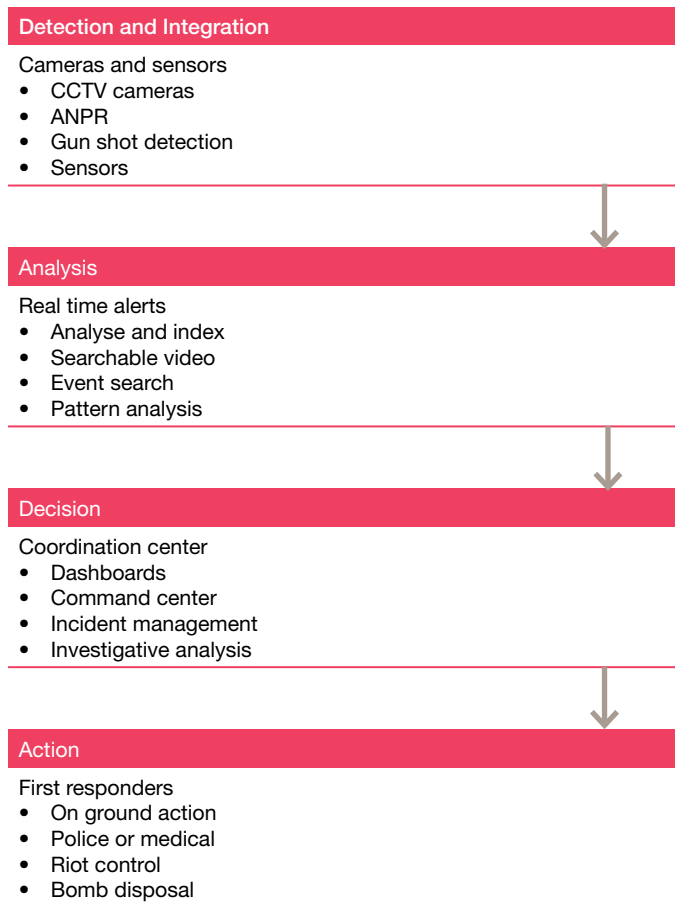


Elements of safe city

Integrated city surveillance

India's vibrant democracy and healthy amalgamation of the socio-economic and cultural diversity is reflected in its cities. An integrated surveillance system provides a safe and secure environment for the development and growth of these aspects. Schools, colleges, educational institutions, technical and infrastructural resources such as the airports, railway stations, power plants, refineries (including heritage and cultural buildings), and most importantly, its citizens are the source of a city's energy.

There is a growing recognition of the interconnectedness and the interaction between factors that spark and drive crises and the ecosystem of security management that handles these factors. Furthermore, there is greater focus on the high economic and social costs because of the lack of a robust security management methodology. There are four entities that collectively form a part for a smart public safety and security work flow as defined below:



Workflow for a smart public safety and security

Detection and integration: Capturing and collating data in real time is the lifeline of a safe city project, especially if the data pertains to an incident leading to a security threat. The idea is to collect data from a wide range of different sources in digital formats so that it can be efficiently processed and used in real time. The detection system may be driven electronically using high definition CCTV cameras, infrared radars (IRs), lasers, handheld devices or simply an incident reported by a vigilant citizen through a mobile or social media. It is imperative that the relevant data is obtained for recording and analysis. This information will then be integrated from disparate sources and systems to create a dependable information base.

Analysis: It is crucial that the integrated information is available to the security agencies in usable formats, the analytics tools should assist the agencies in the analysis and retrieval of crucial information from the captured data for pattern analysis, event search, and video retrievals. Information once retrieved in the desired format shall help in proactive planning and decision making. Dashboard reporting will allow agencies to use the available information better. Improve the strategic and tactical decision-making including anticipation, prevention, and resource deployment. Openly share information that can benefit the public, such as crime maps and effectiveness assessments. Incident management SOPs can be defined, refined and redesigned for operations during critical event response

Decision: Establishing state-of-the-art command, control and coordination centres, equipped to accommodate decision makers and facilitate decision making, dashboard reporting, incident management and investigative analysis of the data collected using the real time information. The infrastructure established enables effective and efficient decision making, with easy access to information.

Action: A team that will act as 'first responders' to an emergency, for disaster management should be established. This unified threat assessment and response team will have ready access to the information base which will prepare them to handle incidents and emergencies better. The team will be equipped respond to on ground action like riot control, bomb disposal and any other police and medical emergency.

Components of safe city

Safe city solutions incorporate a wide array of technology driven sub systems. Integration and interoperability of these sub-systems is fundamental in obtaining better intelligence from various sources and sensors. From CCTVs to crisis management centers, technology will enable law enforcement, emergency services and local decision makers. This will help optimise their response to the expected as well as unexpected.

The following are the components that form the basis of the safe city architecture:



Surveillance system and equipments

The goal of any safe city programme is to provide officers and first responders with a shared security presence and an enhanced awareness through a system equipped with video surveillance cameras. The network of cameras collects data in the form of images or videos that are required to detect risks and respond to emergency situation. The CCTV camera technology has evolved over time, starting out as 100% analog systems, they gradually started becoming digitised. Network cameras and PC servers are now used for video recording in a fully digitised system.

IP cameras

An IP camera combines a camera and image processing in one unit that includes the digitisation and compression of the video, as well as a network connector. The video is transported over an IP-based network via switches, and recorded to a standard digital storage system with video management software. Some typical cameras used in surveillance systems are fixed cameras, fixed dome, PTZ, IR and thermal imaging cameras.

Video analytics (VA)

The video analytics capability of a surveillance system determines its effectiveness and efficiency. VA, also called intelligent video surveillance, is a technology that uses software to automatically identify specific objects, behaviours or attitudes in video footage (for example, from CCTV systems). There are extensive powerful video analysis methods and tools that are deployed in a number of application domains, including

surveillance and security applications. VA like motion detection, trip wires, object removal or abandonment, facial recognition, licence plate recognition, etc enables video surveillance to become a proactive monitoring tool that signals the need for immediate intervention by guards, police, or other security personnel. A video surveillance based safe city shall include the above mentioned video analytics tools along with other equipments to support detection of gun shots, fire alerts, unclaimed object alert and crowding alert.

Network connectivity

Network connectivity is one of the most important components of a safe city project and needs careful attention in assessment, planning and implementation. This is the backbone of the system in which data travels from the surveillance systems to the data centres and control viewing centres. It is important to ensure that the provisioned connectivity is reliable and secure and not plagued with latency, jitter, packet loss and performance. A combination of network technologies including leased lines, OFC network, terrestrial networks, wireless broadband, VSat and mobile network is expected to be used to provide seamless connectivity for all surveillance. The provisioning of the network backbone should also ensure connectivity to the data centres and control rooms with scalable capacities to allow for expansion in the future.

Data centre

Data centres are the heart of the surveillance based safe city projects. The data centre acts as a warehouse for the data collected from the surveillance sensors. The data centre is also responsible for providing continuous, real-time data to the command viewing centres for seamless, efficient and effective operations. Generally, a primary and a secondary data centre are established to ensure that the operations remain uninterrupted even if one is down. This centre hosts all the applications that are required by the agencies to operate systems like the video management software and the analytics application (VMS, VA), the automatic number plate recognition application (ANPR), the automatic vehicle classification. Appropriate space is provided for storage as well as retrieval of the digital information captured by the system. The design of a data centre for a safe city primarily depends on the type of operations that are envisaged by the security agency in a safe city project and the type of processing required on these feeds: indexing, matching in DB, pattern analysis, GIS mapping, video analytics, facial recognition, etc.

Command viewing centres

A command viewing centre (CVC) is an infrastructure that accesses the integrated information available at the data centre such as incident video feeds. CVC allows the collation of information, thus helping in the analysis of data for quicker decision making. CVCs will be equipped with an intelligent operations capability to ensure integrated data visualisation, real-time collaboration and deep analytics that can help the agencies prepare for problems, coordinate and manage response efforts, and enhance the ongoing efficiency of city operations.

The GUI available at the CVC will equip users to take decisions by using the real-time and unified view of operations. Cities can rapidly share information across agency lines to accelerate problem response and improve project coordination.

A CVC assists in leveraging information available with all the city agencies, thus allowing the management to make efficient and informed decisions. Furthermore, the centre helps in anticipating the challenges and minimising the impact of disruptions.

A CVC will provide a city wide GUI for visually depicting the video feeds and other sensor data. The GUI will also provide an overall status of the various city operations and its functions. The drill down capability of such a dashboard will allow the operational users and decision makers to explore the underlying detailed status information to a depth relevant to their role.

The viewing centre will have a GIS map of the city giving the status of the area of interest to the agency. Multiple map layers may depict equipment or other assets, events, weather, positions of resources available to the city operations or boundaries of designated areas. Cross agency collaboration supports messaging between operators at the control centre, response units at the incident sites and other agencies, with the aim of reducing the response time, sharing information effectively and enabling collaborative decision making in a controlled and assured environment. It will comprise of a set of tools like emergency call response systems and call dispatch systems to support immediate communication between all users and supporting agencies.

Incident management capability is achieved through tools that assist in detection and management of incidents. The toolset enables the commanders as well as the executive staff to actively manage all the security aspects of the city since these tools provide real time information of incident detection, incident correlation and incident response. All of the capabilities of the CVC put together (the user interface, the GIS maps, the integration of application data, advanced analytics and incident management) provide the shared situational awareness required to enable the city operations staff and supporting agencies to synchronise and prioritise. The operator will be trained and provided with the standard operating procedures for responses to such incidents and emergency situations for effective crisis management.

The control centre will be designed to enable all back office operations which will be closely integrated with the command and control centre operations.

Collaborative monitoring

A key enabler for safe city is the aspect of collaborative monitoring. In Indian cities where every establishment, government or private, has realised the necessity to secure its infrastructure and establish surveillance, monitoring and incident response systems, it is important that the data gathered by these agencies is shared among them. Government agencies like the aviation and transport department are already deploying onboard surveillance systems by provisioning CCTV based surveillance on public buses and bus stands, metros, railway stations and airports. These systems under collaborative

monitoring can conveniently share their data in real time with the security agencies of the city. Similarly, live feeds from CCTV systems deployed by private establishments like malls, business parks and entertainment houses can be provided to the CVC of the city where the security agency can make effective use of the information. Many cities across the world have surveillance systems deployed by multiple public and private establishments. These cities are using the collaborative framework to receive video feeds from these systems to ensure real time responses.

Change management and capacity building

It is crucial that change management and capacity building programmes form an integral part of the safe city project. These initiatives will acquaint the stakeholders to the proposed system and its associated processes. Furthermore, it will motivate, train and empower the security agency officials to adopt revised methods of working and appreciate the resultant benefits.

Change management will keep every stakeholder informed about the changes in the process flow and information management systems. It will empower the officials with the necessary skill and attitude in order to facilitate them in performing their duties in a more effective manner.

Capacity building

It is prudent to build the capacities of the departmental officials who are involved in the operations and decision making, by disseminating the necessary knowledge and skills for smooth implementation of the envisaged processes. It is equally important to generate an attitude that is receptive to a technology based delivery of services. Merely developing, redefining processes and implementing technology will deliver the quality of services envisaged. The concerned officials have to learn to operate the redesigned services, and efficiently deliver the desired outputs.

Requirements	Outcomes
Train the users to operate the re-designed systems	Efficient delivery
Requirements	Outcomes
Enhance their knowledge and skills	Managerial and Technological challenges met
Requirements	Outcomes
Train them to obtain standardisation, direction and consistency	Enhancement in organisational capability

Design considerations

While designing a video surveillance based safe city project, all important aspects need to be considered so that the desired outcomes can be achieved.. A robust system design ensures that the system has been based on identified needs and planned outcomes.

A well- planned system design will determine the areas to be covered and the type of incident alerts such as real-time, reactive and proactive alerts. The type of camera, the video analytics and sensors should be identified based on the camera specifications, the connectivity backbone and its availability by the user. The user should have identified the type of architecture, data centre design and capacity building requirements that will support the system in achieving the required functionalities. It is imperative that due emphasis is given to whether any existing legacy CCTV based camera systems need to be integrated or whether the CCTV systems available with other agencies are to be integrated.

The following illustration depicts design considerations which need to be explored before embarking on a roadmap for safe city:

Type of alerts: real time or reactive or pro active	Type of cameras and sensors to be installed	Standardized systems for future integration and compatibility	Overall connectivity:dedicated or MPLS or multicast etc
Design considerations for safe city	Integration with different agencies for inputs and consultation	Architecture to be adopted: centralized or decentralized or hybrid	Areas to be covered and hot spot identification
	Integration of existing surveillance systems	Establishment of a command and Control center	Reactive Analysis: Video forensics for legal evidence verification etc
			Data center establishment and capacity Building

Ecosystem of video surveillance system

Regulatory authorities				
Network and Telecom Service Providers				
Technology providers	OEMs	Channels	Users	O&M players
Software and Analytics	Camera and peripheral manufacturers	System Integrators	Government	System Integrators
Semiconductor manufacturers		Distributors	Industrial	OEMs
Network Equipment Manufacturers	<i>Produce video surveillance hardware</i>	Security dealers	Commercial	
Storage providers		<i>Responsible for integration and deployment of the surveillance system</i>	Residential	<i>Provide operations and maintenance support</i>
			<i>End user of the video surveillance product</i>	

Regulatory authorities: The regulatory authorities like the state police are responsible for defining the policies and regulations governing the aspects of a surveillance system (quality, data security, environmental protection, etc).

Network or telecom service providers: These agencies provide the backbone for the data connectivity. The network service providers can be private or public entities, with an established infrastructure to support the heavy bandwidth requirements of the system via GSM, VSAT, RF, WiMax, copper and fibre optic channels.

Technology providers: Technology providers develop the underlying technology to support the surveillance system. These include the software or technology for video surveillance, network communication equipments and the data storage system. These entities typically provision the video analytics like ANPR, facial recognition, intrusion detection, video management software, switches, routers, NAS, SAN, SATA etc.

Original equipment manufacturers (OEM): These agencies produce video surveillance hardware like the IP cameras: fixed, PTZ, thermal imaging, mega pixel, camera lenses, and other accessories.

Channels: These agencies procure the surveillance applications and hardware from the technology providers and OEMs respectively to supply, install, commission and maintain the surveillance system.

Users: Government bodies, industries, commercial and residential entities primarily drive the demand for the surveillance systems. They determine the expectations from a system by laying down the functional and technical requirements.

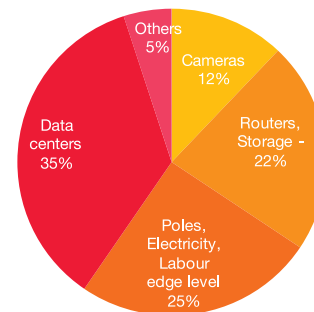
Operation and maintenance players: These are typically the system integrators and OEMs who provide the operations and maintenance support for the deployed system.

Relative cost analysis of a video surveillance project

Capital expenditure

The IP camera equipments, typically the fixed and PTZ cameras including the network peripherals like routers, switches and storage contribute to approximately 40 to 50% of the cost, the next capital intensive deployment is the data centres including the control centres, which is around 30 to 40%. The expenditure incurred on the labour for installation and commissioning of civil infrastructure consumes another 20 to 30% of the total capital project cost.

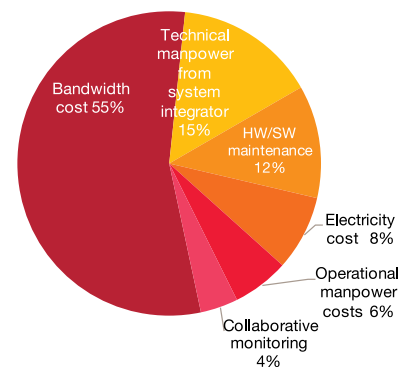
CAPEX – Relative cost of surveillance systems components for cameras [2]



Operating expenses

The bandwidth charges constitute the majority of the cost which is around 50% to 60% of the operating expenses budgeted for surveillance project, with hardware, software maintenance and provisioning technical manpower costs around 10 to 15% each.

OPEX - Relative cost of surveillance systems components for cameras [2]



Safe city drivers in India

Drivers for adoption

Although the safe city concept has been implemented around the world, it has recently been introduced in India. In order to address the complex challenge of security and develop a decision making approach that is data driven, we aim to provide an illustrative framework for the evaluation of some factors that steer the need for adoption of a safe city project and offer a detailed logic model for implementing the activities that will lead to the intended outcomes of reduced crime and faster response.

State agencies can however evaluate their need of implementation of safe city projects on the basis of many other parameters. There can be many factors like the prevailing crime rates, the extent of urbanisation, threats from terrorism and disasters, the socio-economic importance of an area, literacy rate, political importance of a particular place etc that can accentuate the need for adopting a safe city project. However, factors like internet penetration, network infrastructure, the extent of industrialisation etc aid in the successful implementation of such initiatives.

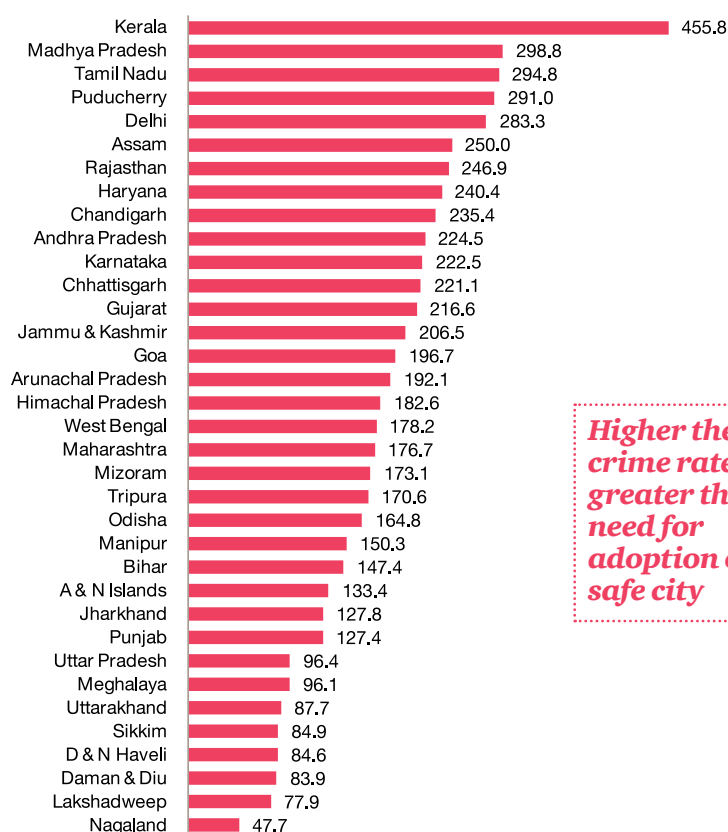
Crime rate

The main purpose of implementing safe city is to reduce crime and induce a feeling of safety among the citizens. It also aims to deter by creating a fear of consequence in the criminals. Hence, while considering the probability of implementing a safe city project, the most important element is the crime rate which is the number of crimes committed per person. A comparison of the different crime rates of the various states and UTs in India has been provided below.

The NCRB data reflects a high rate of crime throughout the country. Safe city, through surveillance networks, can improve the situation. This is evinced by the safe city implementations that have led to significant reductions in crime rates across the world:

- A dramatic reduction of 12.5% and 33% in burglaries and vandalism respectively in Moscow within first six months of the operation
- 12.5% decrease in major criminal activities in Mexico

Rate of cognisable crimes (IPC) per lakh population in 2012



Source: Crime in India 2011, 2012 – National Crime Records Bureau [3]

2.4% increase in the rate of cognisable crimes under IPC from 2012 to 2013

Highest rate of cognizable crimes in Kerala despite 11.6% reduction in crime rate in the state over 2011

Higher the crime rate greater the need for adoption of safe city

More than 10% YOY growth in crime rates in Tamil Nadu, Bihar, Odisha, Lakshadweep, West Bengal, Arunachal Pradesh, Assam, Jharkhand, Manipur

Significant reduction in crime rates recorded in A & N Islands, Chandigarh, D & N Haveli, Puducherry, Goa, Sikkim and Nagaland

Lowest rate of cognisable crimes in Nagaland

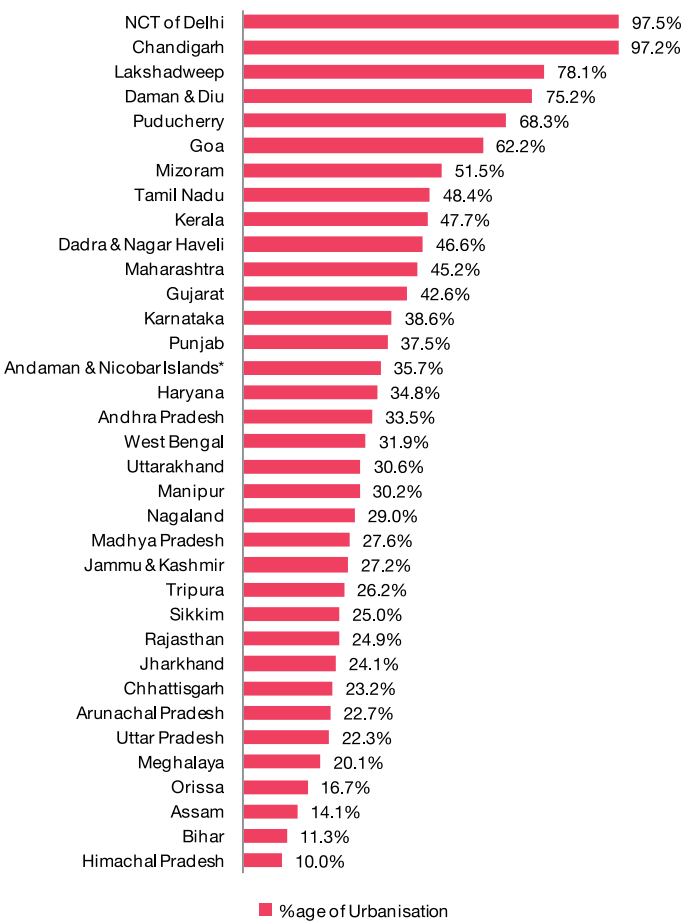
Highest growth in rate of cognisable crimes in Coimbatore, followed by Kolkata

Urbanisation

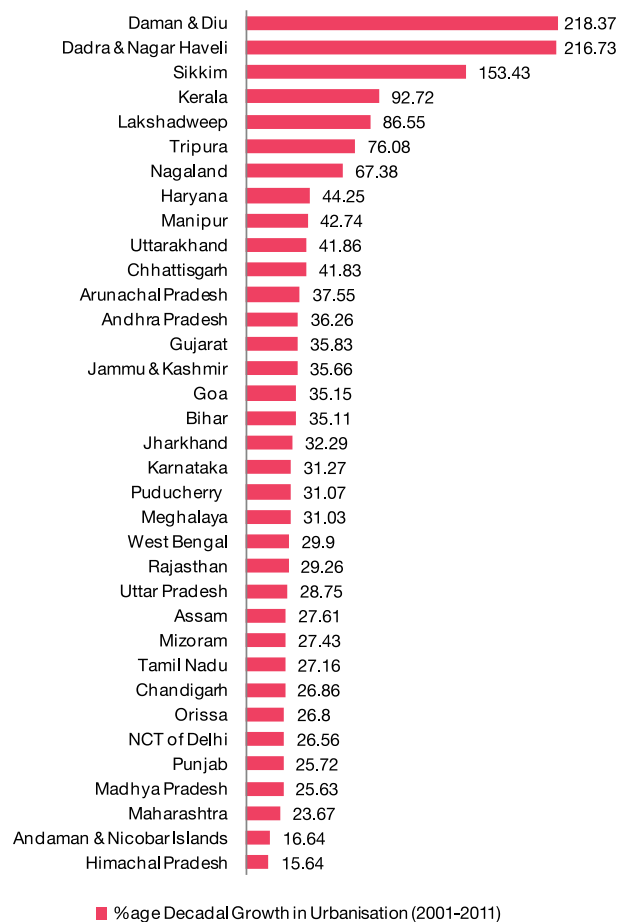
Over the years the urban population in India has been expanding. This fast paced urbanisation is pressurising the existing civic infrastructure leading to a competition over scarce resources in the cities. This has a direct correlation with the number of crime cases and thus accentuates the need for implementing a safe city project. The rate and extent of urbanisation in India has been provided below.

We can see two categories; one that already has a high density of urban population like Delhi, Chandigarh etc and another that is witnessing a rapid growth in terms of urbanisation. The regions that already have a high percentage are the ones that need immediate measures for transformation and those that are rapidly growing can have a well planned safe city project implemented at the initial stages of their development itself in order to sustain their long term security needs.

Percentage urbanisation



Percentage decadal growth in urbanisation



Source: Rural-Urban Distribution, Provisional Population Totals – Census of India 2011[4]

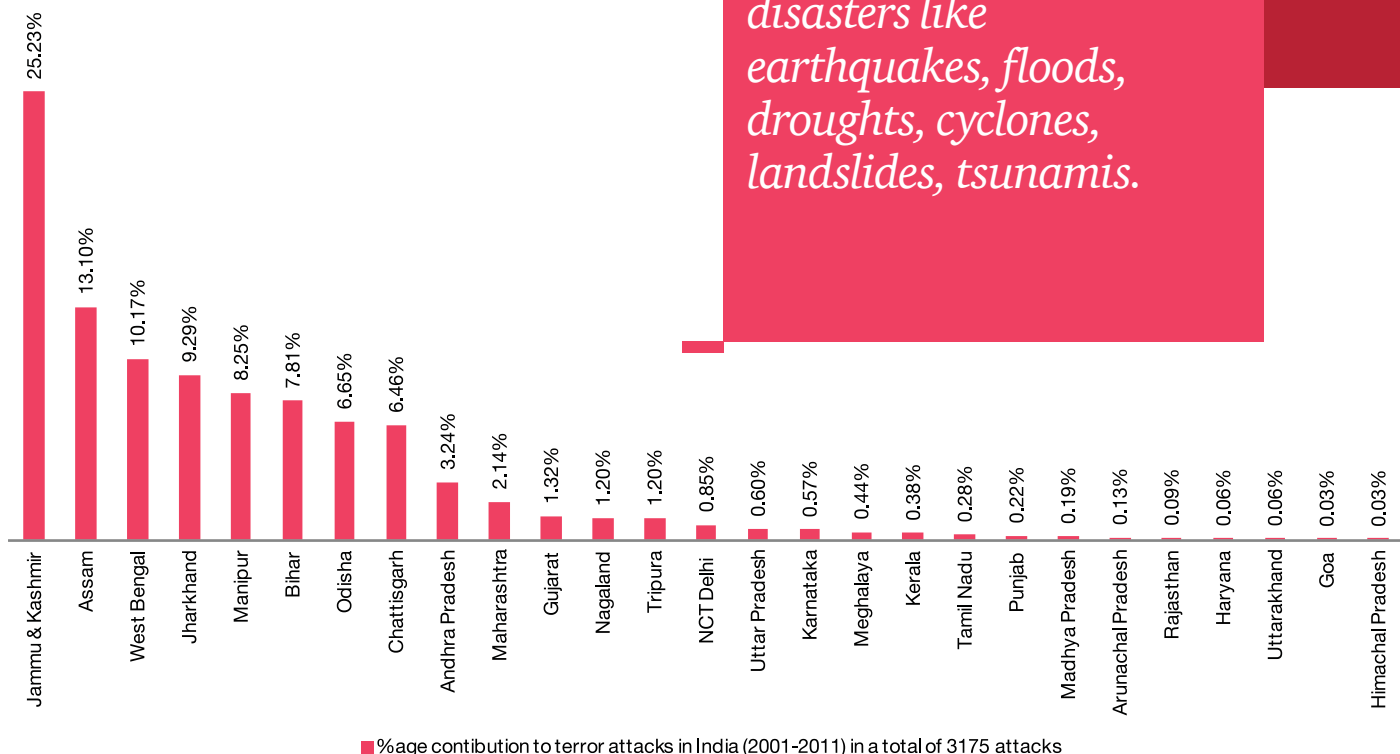
Disaster and terrorism threats

Natural disasters and terrorism (including the anti-national activism of groups like the naxals, ULFA, Bodo etc) pose major threats to both life and property. In most cases, the response of the concerned authorities to natural disasters and terrorist activities is more reactive than proactive. While a lot has been done in terms of post-event mitigation mechanism, preventive measures still have some ground to cover. Implementation of a safe city programme (integrated with emergency response and disaster management facilities) will help deploy advanced information and communication systems. These can significantly reduce the number of casualties as well as economic loss.

The internal and external anti-national threats that a region faces are an important concern. Areas like Jammu and Kashmir, Assam, West Bengal etc, that have a high occurrence of such activities should consider implementing a safe city project.

Similarly, the recent events like the flash floods in Uttarakhand, the earthquakes in Assam, Gujarat, Maharashtra, floods in Bihar, etc necessitate the provision of robust emergency response systems and advanced security provisions to limit the extent of damage and to aid in a more rapid recovery.

Efforts are being made by the state and central governments to improve the emergency response mechanism in India.



Source: Global Terrorism Database 2011[5]

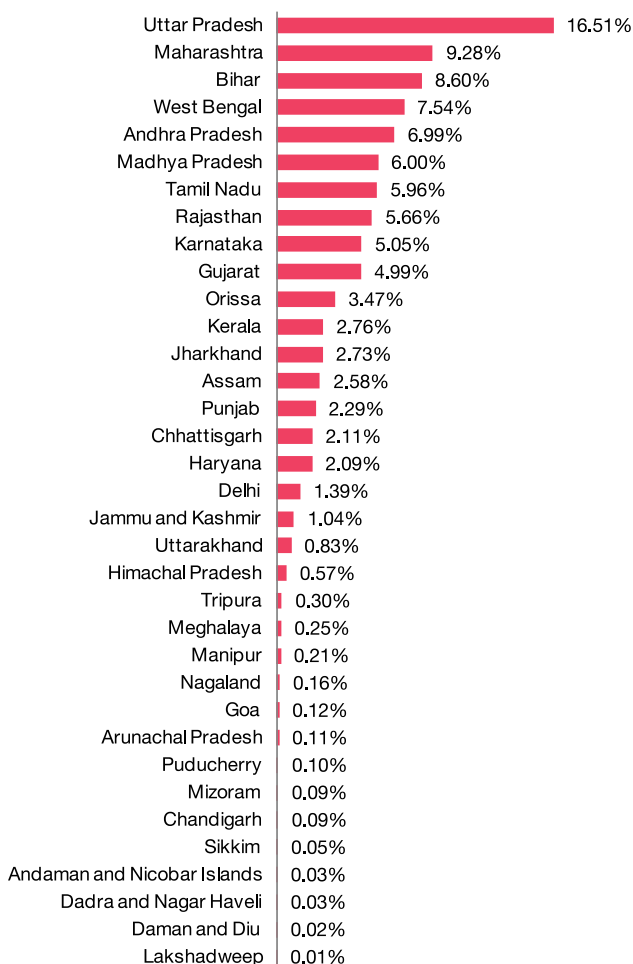
According to United Nations environment programme report (2011) India is ranked second in the number of deaths due to natural disasters after China

India's topography is vulnerable to natural hazards. Out of 35 states and UTs, 27 of them are prone to disasters like earthquakes, floods, droughts, cyclones, landslides, tsunamis.

Socio-economic importance

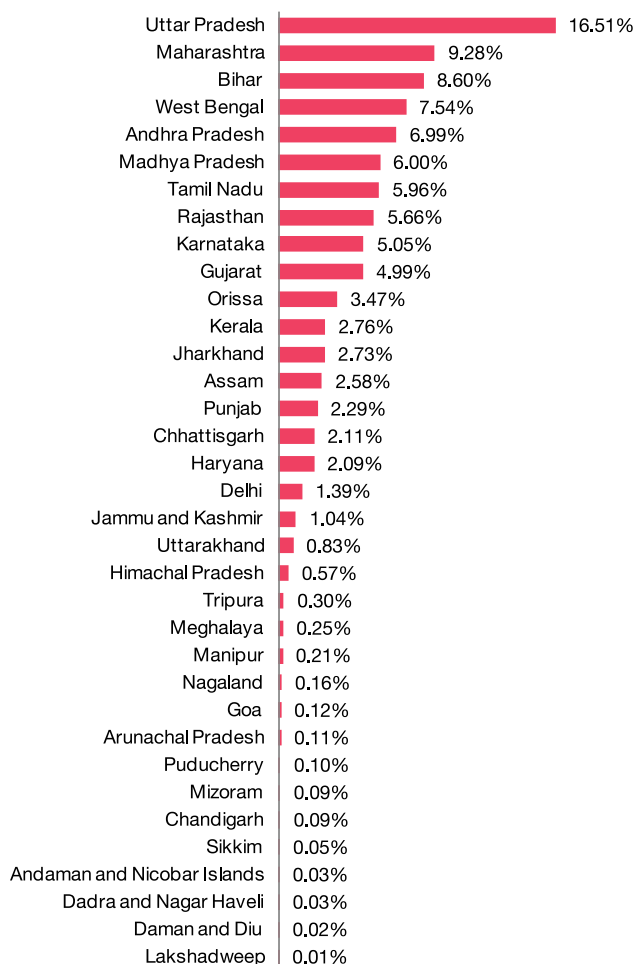
Social, financial and the political importance of regions is also one of the most critical elements while considering the implementation of safe city projects. There is a need for the enforcement agencies to bring the security mechanisms of significant places that are noteworthy contributors to political, cultural and commercial mosaic of the nation, up to international standards. With this view, it is imperative that measures are taken to improve the safety mechanism for areas like Delhi, Uttar Pradesh (maximum number of Lok Sabha seats) that are political hubs; Mumbai, Bangalore, Gurgaon, Hyderabad that form the backbone of financial and economical stability; and Allahabad, Nashik, Uttarakhand, Goa, Rajasthan, Gujarat etc that have both historical and social importance.

State wise percentage contribution to total population [4]



■ %age Contribution to Total Population

State wise percentage contribution to National GDP [9]



■ %age Contribution to Total Population

Source: Rural-Urban Distribution, Provisional Population Totals – Census of India 2011[4]

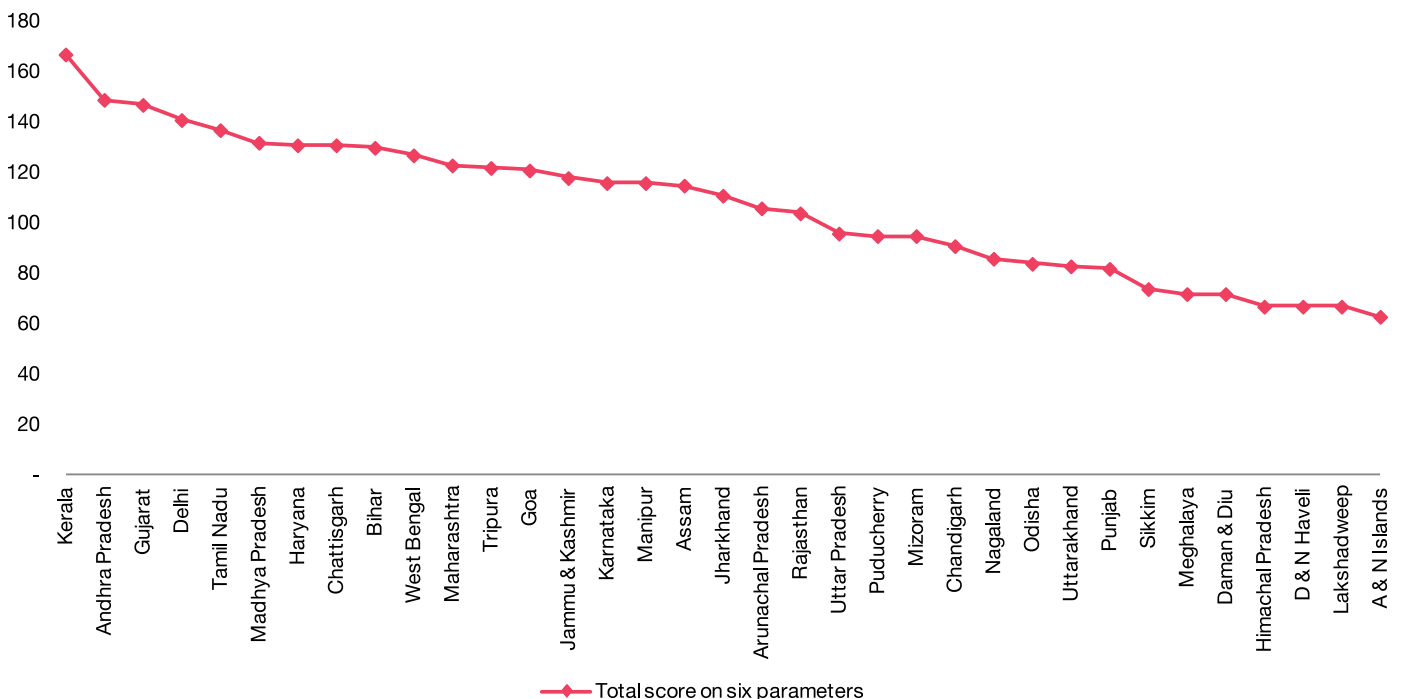
Adoption framework

In order to analyse the propensity of a state to adopt a safe city project, we have scored states as well as UTs on a linear scale of 1 to 35 (with 35 being the score given to the state or the UT that indicates the maximum requirement of a security measure, while one being given to the state that fairs well on all the requisite parameters). Consequently a cumulative score for each state has been derived, after ranking them on parameters such as crime rate, percentage of urbanisation, rate of urbanisation, terror rate, population and GDP growth.

Apart from these parameters, many other factors also exist that may have a negative or a positive correlation with the implementation requirement. Thus, it is important for stakeholders to perform a deep-dive analysis on the factors that may change the scope or timeline of their requirements, and ensure that such a project is implemented where it is actually required and benefits the public at large. There may also be a need to carry out a similar such analysis at the city level within a state, in order to prioritise the project scope.

Thus, evaluation of these factors within each state can help enforcement agencies identify the focus area of the safe city project, examine the nature of existing crime problems so as to adopt specific solutions and refine the crime prevention measures.

Propensity to adopt safe city program based on illustrated parameters



Speed breakers

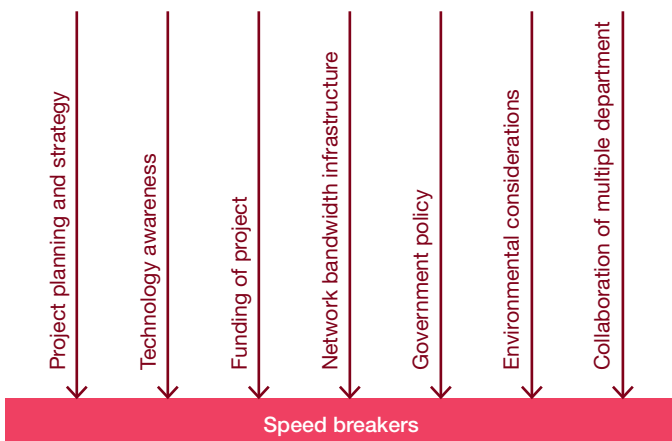
The concept of a safe city is built on understanding its benefits and overcoming its challenges. The market for such a concept is newly emerging, and in order to ensure its faster, countrywide acceptance as well as application, it is important to understand the concept behind making cities safer in all its attributes. Both policymakers as well as solution providers are aggressively trying to obtain a better understanding of the obstacles that may hinder its quick adoption, and the capacity of the initiative to counter threatening situations (such as crime, terrorism, etc.) while contributing to better city traffic management in an ever evolving scenario, where predictable or unpredictable events affect the lives of the people.

Project planning and strategy

Conceptualising the project with all its attributes, keeping in mind factors such as the rule of the land as well as the governing policies, and ensuring that the designed system produces the desired results, has always played a critical role in any project life cycle. Planning and strategising a safe city project is no different. Some of the typical challenges that originate during this stage are as follows:

- Lack of understanding of safe city projects and its benefits after implementation
- Identification of the functional expectations from the system
- Lack of a consolidated roadmap for planning and executing the project
- Lack of a synergised approach due to limited coordination among policymakers while adopting a countrywide approach towards the safe city concept
- Limited involvement of all agencies responsible for maintenance of law, infrastructure creation as well as governance, i.e. state police, state municipal corporations, public works department, etc.

These challenges can be overcome by establishing a dedicated team so as to address the project requirements at various stages of the project. This team shall comprise of all key stakeholders involved in the area of governance. For easier adoption and acceptance, the team needs to be an integral part of the project in order to ensure coordination between the user and the executing agency, and facilitate prompt decisions for the benefit of the project. This team shall define the needs of the project, intended outcomes, functional as well as technical requirements of the system.



Technology awareness

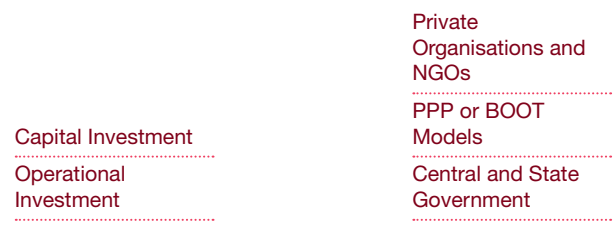
Limited awareness as well as understanding of technologies underlying a safe city projects leads to unrealistic expectations from the system. This in turn leads to scenarios such as lack of adoption, improper implementation or shelving of such initiatives.

Technical workshops that help create awareness on technologies as well as the best practices prevalent in the global market can help stakeholders understand which technology is appropriate in a given situation, thus helping them avoid unrealistic expectations from projects.

Funding of project

- All safe city projects are high-value projects, with 40 to 50% being the initial capital investment, and the remaining investment being operational expenses. Appropriate funding at every stage of the project is critical in order to ensure the sustainability of the project.
- Project funding for such capital-intensive initiatives needs to be jointly planned by all agencies so as to ensure effective utilisation. The following measures may be considered for managing fund requirements:
- Funding by the central and local governments
- Funding from private organisations, NGOs, etc.
- Improving the effectiveness and utilisation of funds in selected schemes
- Promoting the public private partnership (PPP) or build own operate transfer (BOOT) for upcoming projects

Project funding



Network bandwidth infrastructure

Network bandwidth infrastructure requirement is an important dimension to be considered while conceptualising a safe city project. IP cameras in particular require high bandwidth for recording, monitoring and control function purposes. Furthermore, it is imperative to make available the requisite network infrastructure in order to ensure connectivity of the field at all times. Thus, governments need to look at initiatives that assist network service providers in enhancing their reach and availability, as well as make investments to promote bandwidth consumption research. During the design phase, due consideration needs to be given to assessing the required bandwidth consumption, based on parameters such as video quality, compression rate, etc. suiting to meet the expectations from the system.

Government policy

The government, both at the central as well as the state level, faces many challenges at the department level while implementing the safe city project. Some of the policy challenges that come up during the implementation phase of the project, and which need immediate attention are as follows:

High value of tax duties on importing security equipments initiative

Fund requirements by the state as well as the central government for investing in safe city s

Shortage of trained manpower within the state police force

Measures such as reduction in tax duties on importing security equipments, additional recruitments to cover the manpower gap, encouragement of the PPP or BOOT model of funding for upcoming projects are required in order to overcome the foreseeable challenges at the inception stage.

Policymakers as well as other stakeholders must work towards raising the level of awareness amongst citizens towards such safe city projects.

Operating environmental factors

The safe city project involves the deployment of field infrastructure such as outdoor cameras, network devices, poles. These field devices are exposed to the open environment, and in order to ensure their seamless functioning, it is imperative that they have access to regular power supply and protection against instances such as theft and vandalism. Longer functioning, protection and security of the field infrastructure maybe achieved through the following measures:

Sensitising and involving citizens in the safe city project

Exploring different methods of power supply such as solar power

Use of technology for tracking and detecting instances of theft and vandalism of field equipments

Better protection and casing of equipments

Government to take initiatives to improve network penetration

Government to promote bandwidth consumption research

Design considerations for bandwidth consumption optimisation

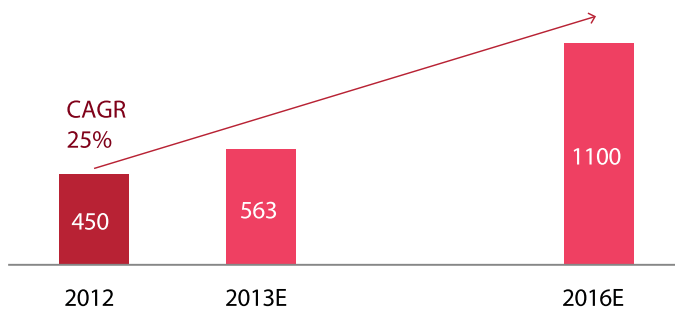
Collaboration of multiple departments

Integration of multiple private or government-owned CCTV infrastructure into the safe city project is a critical task. It is also important to have in place, an exchange of data among various agencies. However, the main impediment to such an integration of data from various agencies is the existing legacy systems, deployed with the respective agencies. Another such challenge is the non-existence of a security system at certain locations. These challenges however, can be overcome by encouraging the deployment of standardised and scalable security solutions at different locations. State governments need to also build models for collaborative monitoring.

Sector analysis

For the past few years, India's electronic security as well as surveillance market has been experiencing significant growth, amidst the backdrop of rising concerns for safety and security. According to an ASSOCHAM study, the total electronics security market in India can be pegged at 3,250 crore INR (2012), with an estimated compounded annual growth rate of 25% during 2013-16.

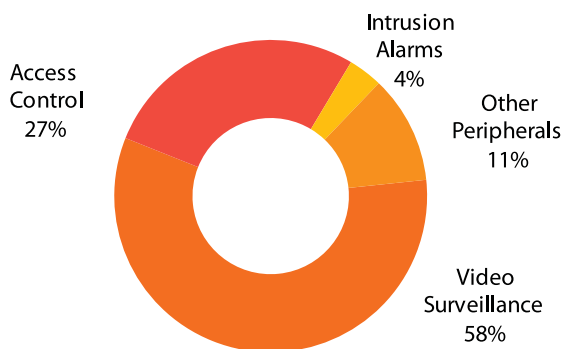
The electronic security market in India[2]



The security and surveillance market in India can primarily be sub-categorised into four sub-sectors such as the following:

- Video surveillance and CCTV
- Access control
- Alarm systems
- Other peripherals (detectors, scanners, etc.)

Indian electronic security market breakdown: 2013 [2]



The video surveillance and CCTV market, which comprises a major portion of the total security and surveillance market in India, is growing at a compounded annual growth rate (CAGR) of about 30%[12]. Factors such as the threat of terrorism and a regular increase in the incidence of criminal as well as illegal activities has led to an increased sensitivity towards the security compliance requirements at hotels, railway stations, airports, hospitals, etc. which in turn, has proven to be a growth driver for the market in India. Although, the government sector is the biggest segment in terms of volume and demand, the private sector is also increasing its expenditure on security surveillance, due to increasing concern on the safety of life and property. The access control market is also reporting a promising growth, and is poised to grow at a higher pace owing to the increased security concerns and inflating security budgets of both Government departments and private agencies. The Indian access control market is still in its development stage, with information technology (IT) and banking financial services and insurance (BFSI) segments being the early adopters. However, an increase in the market share of access control technology can be observed through segments such as integrated solutions, which includes electronic security and alarm systems.

Market trends



Today, the security segment is a largely fragmented industry. Till now, the organized sector, that accounts for almost 50% of the total market[8], has been flourishing within the security domain, due to their low-priced security products. However, established brands will gradually dominate the market with consumers now becoming conscious on aspects such as quality and the features of the product they are buying.

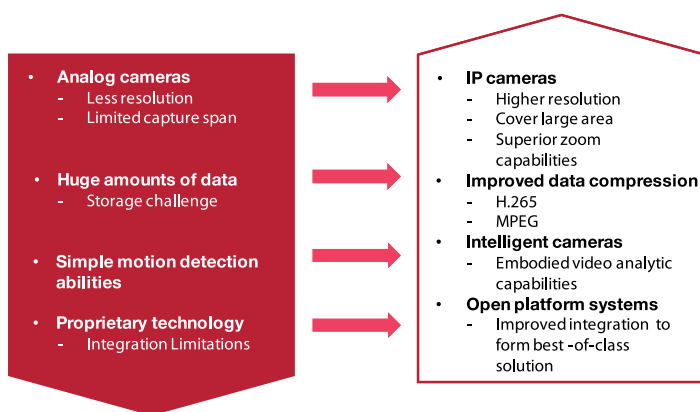
The segment is also characterised by a lack of standardisation and an absence of a regulatory framework to oversee the quality of products being offered in the market. Lack of a common standard and the presence of varied products as well as technologies, are proving to be barriers in the integration, collaboration as well as the communication of various solutions.

Other trends witnessed within the security and surveillance industry are customers' preference for integrated solutions that not only include setting up security infrastructure, but also involve back-end analytics and maintenance of infrastructure. This in turn, is leading to a change in the business model of various vendors who provide security as a service, wherein customers will now no longer need to buy equipments or worry about maintaining them. Rather they will just need to pay a monthly rent to the vendor for the maintenance of their entire security framework.

There has also been a significant transformation in the technology adopted by products within the security industry, with an increased preference among customers for products that

are hassle-free, easy to install, come with remote accessibility and at the same time, offer improved quality feed and have high resolution. Analog cameras are now being overtaken by IP cameras whose growth has traditionally been slow owing to the limited storage and network infrastructure, which is no longer a concern with the advent of various advanced bandwidth and compression technologies.

Evolution in technology



A move from analog CCTV to IP video surveillance technology is already in full swing. Although analog CCTVs still make up the majority of camera installations, while IP cameras are gaining traction within the industry, on account of performance and cost-saving advantages such as scalability and installation flexibility, remote control, etc. One of the factors that is leading to a shift from analog cameras is the span and resolution capability of IP cameras. IP network cameras provide up to 16 times the resolution of traditional analog cameras, and can often take the place of two to three analog cameras. This reduces the total cost of ownership, monitoring as well as maintenance [7]. Cameras are also getting a lot smarter than simple motion detection, the reason being, video analytics that enables them to be programmed in such a way so as to identify and track events as well as objects, and subsequently also raise alarms. This helps in reducing the total number of manpower being used for monitoring purposes. People, who traditionally were employed to keep vigilance on video monitors for hours, can now be used to be on the floor, ready to respond, while cameras will perform the function of vigilance.

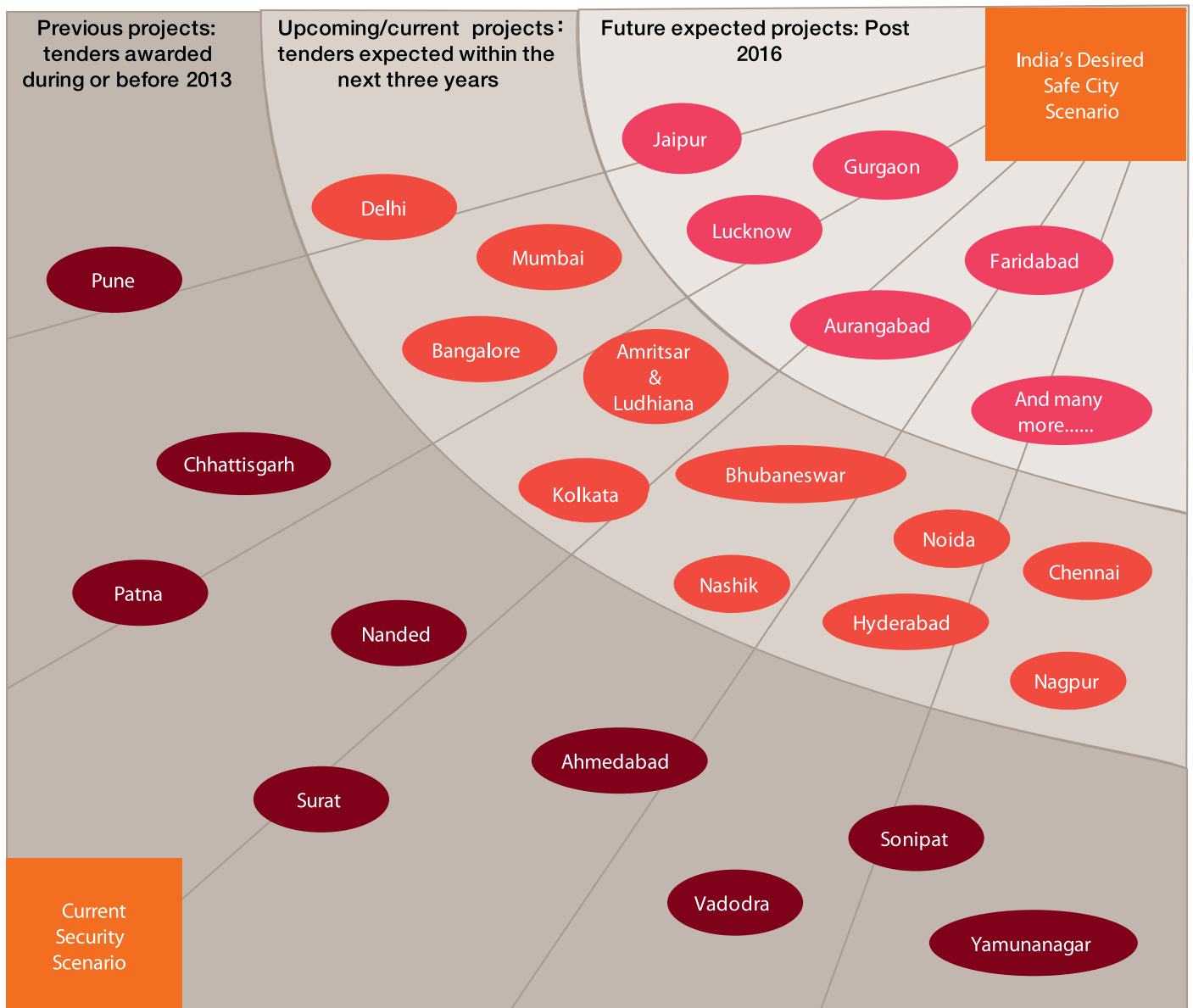
Cameras continue to offer greater details, thereby leading to the need for better video codecs for improved data compression as well as storage abilities. Technologies such as H.265, MPEG and other upcoming codecs encode a data stream for transmission or storage, and decode it for viewing and editing, which results in reduced bandwidth and storage requirements.

Another key technological transformation has been the open platform system that decouples the software from the hardware so that disparate systems such as surveillance cameras, analytics software, and access control systems from a mix of vendors can be integrated into one efficient and effective solution with no limitations of proprietary technology.



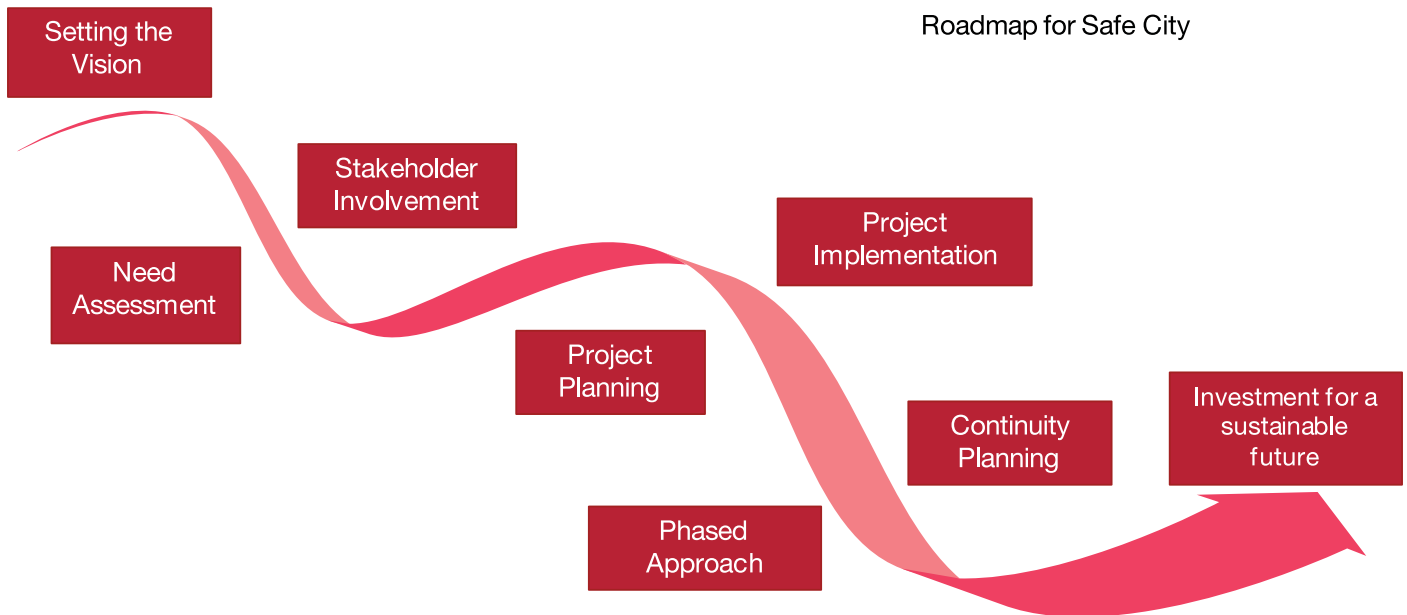
Opportunities for system integrators

Central as well as state governments are now working with state police agencies towards creating high security standards by undertaking security projects that include deployment of modern security infrastructure such as CCTVs, gun shot detectors, Video analytics, data mining solutions, etc. There has been an increased focus of the state and the central government on Security and Surveillance projects which may result in bigger safe city project opportunities for system integrators and technology partners.



Roadmap

Implementation of a safe city project is an inclusive and collaborative process that involves aspects such as governance, planning, technology, resources and awareness. It requires participation, inputs as well as ideas from a wide range of stakeholders. Considering this, we have cited a potential roadmap that provides insights that will help states as well as cities in launching an initiative aimed at fundamentally transforming their security



Critical steps within the roadmap

Setting the vision: It is important to have in place a clear vision of the end result that is to be achieved, even before an approach of transformation is framed. A clear picture of the desired security scenario needs to be in place in order to take appropriate measures to reach to the desired goal.

Analysis-based need assessment: An effective assessment of the current scenario is one of the most important activities to be undertaken for such a project. A survey of various parameters affecting crime incidence, and the mapping of geographic areas with high perceptions of crime instances provide critical snapshots and help prioritise focus issues as well as resources.

Encourage stakeholder involvement: Different government agencies as well as working groups often operate in near isolation from one another, which results in a major barrier of facilitating various tasks and activities. It is imperative that the implementing authority engages with other stakeholders, since they can provide valuable insights into the most effective ways to improve security measures. Also, the earlier we get all the stakeholders involved, the better.

Address challenges: During the course of implementation complex problems such as policy, funding gaps, technology adoption and awareness issues are bound to occur. However, it is important to view a particular hurdle well in advance and come up with a coordinated set of solutions. It may also be advisable to seek professional help in order to leverage best practices being implemented in other avenues.

Project planning: Thoughtful planning of technology and its use is critical while implementing such an initiative. While

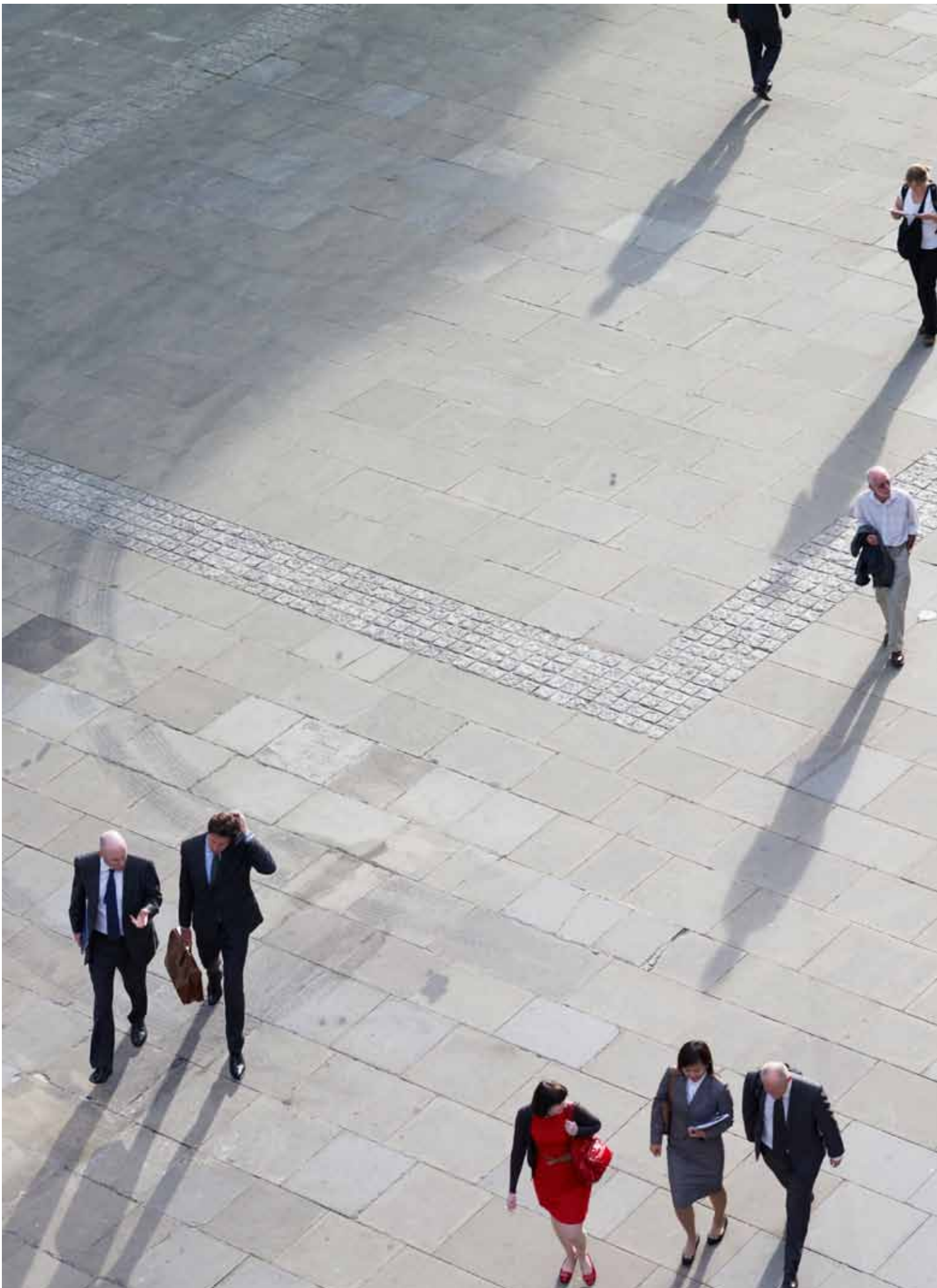
there are plenty of differences between geographies, they still have a lot in common[11]. We need to look for global safe city implementations, and try to adopt those solutions which have already been successfully implemented for similar problems.

Phased approach to start small and scale big: The secret of rolling-out an initiative is breaking complex, overwhelming tasks into small manageable tasks, and then taking up the first task. Segment the project goals and activities into immediate, short-term and long-term based timelines. For instance, immediate measures can involve setting up of required surveillance infrastructure, Short-term measures can include use of analytics, while long-term measures can include collaboration with other agencies or establishments and sharing of data.

Long-term sustainability: It is critical that sustainability plans for the project are well-laid out. Future plans for the continuity of the project need to be defined from the outset, and issues such as budget for maintenance, appropriate staffing, provisions for technology upgrades, etc. need to be deliberated well in advance.

Invest for the future: It is important that the concerned authorities as well as leaders understand that the security initiatives they are investing in will take some time to deliver its desired results, and they must be prepared to invest upfront for long-term benefits. Such programmes take time to change the people's perception about the security scenario, and will lead to a significant reduction in crime rates in the due course of time.

India must look at rolling-out a proactive approach so as to provide a safe and secure environment, coupled with an enhanced approach towards robust response mechanisms in case of incidents of terrorism, crime or a natural calamities.





Credits

1. UN Pillars of Safer Cities: www.unhabitat.org/content.asp
2. PwC research
3. National Crime Records Bureau, 2013, Crime in India 2012 Statistics
4. Census of India, 2011, Provisional Population Totals – Rural Urban Distribution, Paper 2, Volume 1
5. Global Terrorism Database, University of Maryland, Available at <http://www.start.umd.edu/>
6. Safer Cities : A plethora of opportunities for Technology Providers, March 2012, Frost & Sullivan
7. Fullerton Eric and Blem John, Megatrends in Video Surveillance : A guide to today's leading trends in video surveillance technology and practice, Milestone Systems
8. Richa Chakravarty, September 2013, Challenges faced by CCTV camera players hindering growth of market, Available at electronicsb2b.com
9. Directorate of Economics & Statistics of respective State Governments and for All-India – CSO; Data from 2004-05 Series based on base year 2004-05. Databook for DCH; 18th October, 2013
10. Census India 2011 survey: www.census2011.co.in/states
11. How to Transform a City – IBM Smarter Cities White Paper, March 2012, IBM Corporation – USA
12. Richa Chakravarty, July 2011, CCTV camera market in India will see significant growth in 2013-2014, Available at electronicsb2b.com

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ASSOCHAM derives its strength from its promoter chambers and other industry/regional chambers/associations spread all over the country.

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AK 120 - November2013 Safe cities.indd

Designed by: PwC Brand and Communications, India