ICCC
Maturity Assessment Framework (IMAF) 2.0
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Message from Mission Director

Kunal Kumar

Joint Secretary & Mission Director (Smart Cities Mission), MoHUA

Smart Cities across India have leveraged the immense potential of Integrated Command and Control Centers (ICCCs) for effective urban governance. ICCCs have enabled cities to develop better situational awareness as compared to traditional, inefficient silo-ed departmental approaches. ICCCs have also been able to reduce the complexity of dealing with multiple technology systems/applications by integrating them into a common platform. Therefore, smart cities are able to do more with less leading to real-time data-driven decision/policy making.

It is important that we continuously assess the maturity and effectiveness of ICCCs in solving real issues faced by the city. ICCC Maturity Assessment Framework (IMAF) was introduced with an aim to provide cities with a self-assessment toolkit with indicators divided into functional, technological, operational and engagement pillars to help understand gaps in deployment and make necessary mid-course corrections.

While the earlier version of IMAF was focused on assessing ICCCs on four key parameters it is now required to evaluate the ICCCs on a broader spectrum of capabilities and therefore, IMAF 2.0 is being introduced which expands the assessment parameters to ten pillars and assess the on-ground impact of use cases in cities. The ten pillars encompass various dimensions such as use cases, governance, cybersecurity, interdepartmental coordination, adoption of innovation, etc. which are critical to the success of ICCCs in Smart Cities.

The ten pillars and impacts of use cases in IMAF 2.0 will be individually rated out of five stars which shall enable cities to gauge their strengths and weaknesses under individual pillars. City officials are encouraged to gain meaningful insights, identify gaps, and implement targeted measures to enhance their ICCCs' performance.

I look forward to all the Smart Cities making the best out of IMAF 2.0 to assess their ICCCs, identify improvement areas and make necessary amends. Let's all continue to harness technology effectively to serve our citizens better.

01
Introduction

1.1
Overview

Smart Cities Mission is a flagship initiative under the Ministry of Housing and Urban Affairs (MoHUA), Government of India, with a purpose to drive economic growth and improve quality of life of people by enabling local area development and harnessing technology, especially Smart solutions that leads to Smart outcomes. In order to integrate all the Smart solutions and to have centralized monitoring and decision-making capabilities, Integrated Command and Control Centers (ICCCs) have been set up in 100 Smart Cities.

In the last few years, ICCCs have emerged as nerve centers helping cities in better monitoring and management of various city infrastructure/utilities *like water, streetlights, solid waste management, roads development, etc.* They are helping cities in continuous analysis of data, preparation of dashboards for effective decision making by city leadership and increasing the situational awareness within city which is leading to faster response to the incidents and emergency situations. ICCCs have improved interdepartmental coordination across multiple departments within urban local bodies and other government bodies and further enhanced communication across different stakeholders in the city, including citizens, in day-to-day operations and helping cities in real-time urban planning.

Integrated Command & Control Centre, Varanasi

In January 2021 when around 50% of ICCCs were operational in the country, MoHUA realised the need to guide the existing ICCCs to improve the service delivery and set a benchmark for upcoming ICCCs by releasing ICCC Maturity Assessment Framework (IMAF). IMAF acted as a guiding toolkit for cities to self-assess the maturity of ICCCs, identify the gaps under functional, technological, operational and engagement aspects and make any mid-course corrections for enhanced effectiveness.

With ICCCs now operational in all 100 cities, it is important to revisit the existing framework and modify the same to assess cities on upcoming priorities such as compliance on cybersecurity, creation of a business plan for the sustenance of ICCC beyond the mission period, adoption of innovation to address complex urban challenges, execution of standard operating procedures to achieve operational excellence, creating value for line departments, and most importantly assess the on-ground impact of use cases.

The first version of IMAF was focused on assessing ICCCs on four key parameters: Technological, Functional, Operational and Citizen engagement. With IMAF 2.0, it has expanded to ten pillars taking into consideration ICCCs rapidly advancing and adapting to the ever-evolving technological landscape and the contextual needs of cities. The ten pillars encompass the various dimensions critical to the success of ICCCs in Smart Cities. These pillars will now serve as the foundation for the rating-based mechanism through which the self-assessment will be conducted by the city followed by the on-ground assessment from the third party.

The key objective of IMAF 2.0 is to assess city ICCCs and individually rate them on each of the ten pillars and use cases enabling them to identify gaps and work towards their resolution. The assessment will also help cities to understand the potential areas of growth across each pillar and making cities realize the full potential of the deployed infrastructure in ICCC. IMAF 2.0 seeks to foster a culture of innovation and excellence in Smart City governance, paving the way for sustainable urban development in India.

1.2

Key learnings from IMAF

The first cycle of IMAF broadly explained about the role of technology in Smart Cities through the design principles and technology stack used across Smart Cities which has been explained in Annexure I. It also details the key objectives for which the ICCCs were established along with the functional modules, design considerations made for ICCC platform and use cases across key sectors for operations of ICCC. Please refer Annexure II to explore the details on ICCC and its usage across cities.

The first cycle of IMAF also helped cities in understanding the maturity across four pillars of ICCCs namely Technological Capability, Operational Capability, Functional Capability and Engagement Capability. Some of the key learning across the four pillars are as follows:

Functional

The Functional pillar assessed ICCCs on their basic capabilities on data acquisition, data analytics, command & control and communication ability of ICCC. However, with the advancement of ICCC, it is now required to assess them on the rate of field device deployment and its functionality on-ground. The ICCCs are now supposed to have a detailed SOP for each functional use case and their approach to identify new use cases.

Technological

The Technological pillar assessed ICCCs on their capabilities on product maturity including data acquisition & visualization configuration capabilities. However, considering the technological advancements, it is now required to assess ICCCs on how cities are using generated data in ICCCs to take decisions and necessary actions, how cities are able to secure ICCCs with the latest cyberattacks, are cities ready to manage the technology advancements and the technology infrastructure within the ICCC, etc.

Operational

The Operational pillar assessed ICCCs on their capabilities on availability of frameworks for governance, team management, knowledge management, etc. However, ICCCs are now required to be more agile to handle day to day operations specially in case of emergency and disaster management like COVID, flood, earthquake, etc. Therefore, ICCC must now be assessed on the actual implementation of governance framework through action taken reports, review meetings, manpower retention practices, ability to quickly respond in emergency through effectiveness of interdepartmental coordination and the approach to create a practical and sustainable Business plan for the ICCC with an intent to optimize cost and generate revenue streams.

Engagement

The Engagement pillar assessed ICCCs on their capabilities of engaging with citizens, employees and ability to perform the sentiment analysis. However, with the advancement of new approaches for engagement and communication, ICCCs must now be assessed on the innovative ways to engage citizens, create alliances, onboard new technology partners for development of new use cases, etc.

Drawing the insights from existing IMAF, it is now required to create an improved framework for assessing the maturity of ICCC in cities.

02
IMAF 2.0 Approach

IMAF 2.0 assessment framework takes a systematic and comprehensive approach to assess maturity and effectiveness of ICCCs in Smart Cities. It is designed to assess ICCCs on various aspects which can help cities constantly improve their ICCCs in providing better services to the citizens.

Part A of the assessment delves into the key pillars, rating mechanism, and assessment methodology employed within the IMAF 2.0 framework. By leveraging these elements, cities can gain valuable insights into their ICCC's performance and progress, enabling them to make informed decisions and drive continuous improvement.

However, the *Part B* is focused on the impact created by the ICCC.

Integrated Command & Control Centre, Chandigarh

In order to better understand the IMAF 2.0 approach, let us take an analogy if a hospital were to use it. *Part A* shall be helpful to assess the hospital on the availability of basic infrastructure and facilities such as advanced machines, laboratory, operation theatres, various medical departments, availability of good doctors & staff, the number of services offered to the patients, the process of maintaining the medical history and connecting it with the patient ID, generating the possible analytics on the health of the patient basis the family medical history (if available), availability of relevant information across the departments, governance structure of the hospital, and the plans made by the hospital in terms of revenue generation.

Whereas the *Part B* shall assess the hospital on the quality of treatment given to patients, patients recovery rate, satisfaction index of the patient, the ease in the registration process for patient & attendants, etc.

No matter how well the hospital does in Part A of the assessment, it will be ranked as a good healthcare facility only if it does well on Part B. Therefore having a good part A is a necessary but not sufficient condition for the hospital's effectiveness in meeting its end goal. Now, let us explore the core components of the IMAF 2.0 approach in detail.
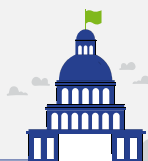

Integrated Command & Control Centre, Bhopal

01 Infrastructure

02 Use Cases

03 Cybersecurity

04 Data Lifecycle Management

05 Governance

06 Team Management

07 Business Plan

08 Interdepartmental Coordination

09 Stakeholder Engagement

10 Adoption of Innovation

2.1
Key Pillars

The foundation of the Part A of the IMAF 2.0 framework lies in its ten key pillars, which provide a comprehensive view of ICCCs' functioning and impact. These pillars have been carefully identified to encompass the essential aspects that contribute to the success and effectiveness of ICCCs in Smart Cities. Each pillar represents a critical area that requires evaluation, allowing cities to gain a holistic understanding of their ICCCs' maturity and identify areas for improvement. The ten pillars serve as the backbone of the IMAF 2.0 framework, guiding the assessment process and enabling cities to benchmark their performance against other cities and best practices. The below table provide details of each assessment pillar:

01 INFRASTRUCTURE
This pillar assesses the ICCC on the physical Infrastructure of ICCC assessing building management system, fire and other emergency systems, 24 X 7 power availability, network, etc. and the deployed field devices within the city assessing their deployment and functional rate in line with their contract, availability of real-time data feed, geotagging, etc.

02 USE CASES
This pillar assesses the ICCCs on the Standard Operating Procedure's (SOP's) availability, periodic review, and automation of SOPs across all the functional use cases. It also evaluates the ICCC on the implementation of new use cases in ICCC.

03 CYBERSECURITY
This pillar assesses the ICCCs on their compliance to cybersecurity practices such as policy to manage, protect and monitor various assets, system applications and networks including ICCC infrastructure itself.

04 DATA LIFECYCLE MANAGEMENT

This pillar assesses the ICCC on the effectiveness of managing data lifecycle such as ability to perform data analytics, data quality control, data archival, data classification and data exchange for their day-to-day operations.

05 GOVERNANCE

This pillar assesses the ICCCs on the presence and use of governance policies, guidelines for ICCC manpower, SLA Metrics, Approvals Metrics, involvement and review by the board and city leadership.

06 TEAM MANAGEMENT

This pillar assesses the ICCCs on the availability & deployment of the sufficient team to manage ICCC, resourcing / hiring / HR policy, employee retention practices and capacity building of the team.

07 BUSINESS PLAN

This pillar assesses the ICCCs on the financial sustenance plan beyond the mission period including the creation of a practical business plan, strategies on cost optimization and revenue generation for ICCC.

08 INTERDEPARTMENTAL COORDINATION

This pillar assesses the ICCC on the effectiveness of Interdepartmental Coordination with multiple departments of the city and how they come together to deliver better services to the citizens.

09 STAKEHOLDER ENGAGEMENT

This pillar assesses the ICCC on the effectiveness of stakeholder engagement including citizen engagement and how it engages external ecosystem through partnerships for delivering better services to the citizens.

10 ADOPTION OF INNOVATION

This pillar assesses the ICCC on the level of innovative practices being adopted by ICCC for onboarding new cases, to create alliances, through the usage of smart procure guidelines and how are they together creating value for the city and other stakeholders.

2.2
Rating Methodology

IMAF 2.0 incorporates a rating mechanism on a scale of five stars to promote transparency and facilitate effective benchmarking among Smart Cities, fostering healthy competition to drive continuous improvement. The Part A of IMAF 2.0 shall assess ICCCs on a 5-star rating-based mechanism to evaluate the maturity and progress of ICCCs across the ten identified pillars. This mechanism provides a structured framework for cities to assess their ICCCs' performance on each pillar and assign ratings based on predefined criteria. The Part B of IMAF 2.0 shall assess ICCCs on the impact created by each of the operational use case on a scale of 5-stars. The five-star rating system shall enable cities to identify the gaps in their existing use case and work towards closing the same. The rating system allows for a standardized and comparative analysis, enabling cities to gauge their strengths and weaknesses accurately. The approach to rating has been explained below:

01 Each of the ten pillars in IMAF 2.0 along with impacts of use cases will be rated out of 5 stars where *1 being the lowest* and *5 being the highest.*

★ ★ ★ ★ ★   ★ ★ ★ ★ ★

02 The maximum marks for each pillar and impact of one-use case is 100. Therefore, every star will account for 20 marks and every half star will account for 10 marks. *For Example: a city with 70 marks in one pillar will be given three and half stars for that pillar.*

★ = 20 marks   ★ = 10 marks

03 In order to give the star rating the scores will be rounded off to the nearest 10.
For example,
Case A: if the marks are between 81 to 85, it shall be rounded off to 80 for calculating the stars, i.e., four stars.
Case B: if the marks are between 86 to 89, it shall be rounded off to 90 for calculating the stars, i.e., four and half star.

04 Within each pillar, every indicator has been given certain marks as per the weightage of the indicator. *For Example: a pillar with 7 indicators will have total 100 marks wherein certain indicators will be given more marks as per the weightage of that indicator.*

05 Part A: Cumulative rating will be calculated by applying the pillar weightage as per the below table:

Part A - Management			
Pillar No.	Pillar Name	Indicators	Weightage
I	ICCC Infrastructure	5	10%
II	Use Cases Composition	5	15%
III	Cybersecurity	8	15%
IV	Data Lifecycle Management	6	10%
V	Governance	7	10%
VI	Team Management	6	10%
VII	Business Plan	3	5%
VIII	Interdepartmental Coordination	4	15%
IX	Stakeholder Engagement	3	5%
X	Adoption of Innovation	3	5%
	Total	**50**	**100%**

For Example — if the city has scored the following scores across the pillars, then the overall score shall be calculated as below:

Part A — Management (Illustrative)					
Pillar No.	Pillar Name	City Score	Rating	Weightage	Adjusted Score
I	ICCC Infrastructure	70	3.5	10%	7.0
II	Use Cases Composition	55	2.5	15%	8.3
III	Cybersecurity	30	1.5	15%	4.5
IV	Data Lifecycle Management	53	2.5	10%	5.3
V	Governance	72	3.5	10%	7.2
VI	Team Management	59	3	10%	5.9
VII	Business Plan	67	3.5	5%	3.4
VIII	Interdepartmental Coordination	69	3.5	15%	10.4
IX	Stakeholder Engagement	76	4	5%	3.8
X	Adoption of Innovation	83	4	5%	4.2
	Total	**634**		**100%**	**59.8**

The cumulative score comes out to be approx. 60 (rounding off 59.8) which is equivalent to 3 stars for Part A

06 Part B: Cumulative rating will be calculated by applying the following weightage as per the below table. *Note - In case less than 5 use cases are evaluated, city will not be given any marks under "Impact of Use Cases"*

Part B - Impact			
S. No.	Pillar Name	Indicators	Weightage
I	Operational Use Cases in ICCC	1	50%
II	Impact of Use Cases (Minimum 5)	9	50%
	Total	**10**	**100%**

For Example — if the city has scored the following scores across the various components of Part B, then the overall score shall be calculated as below:

Part B — Impact (Illustrative)					
Pillar No.	Pillar Name	City Score	Rating	Weightage	Adjusted Score
I	*Operational Use Cases in ICCC*	*80*	4	50%	40
II	*Impact of Use Cases (Minimum 5)*	*63.4*	3	50%	31.7
1	Use Case 1	67 / 100	3.5		
2	Use Case 2	74 / 100	3.5		
3	Use Case 3	35 / 100	1.5		
4	Use Case 4	59 / 100	3		
5	Use Case 5	82 / 100	4		
	Total of 5 Use Cases	317 / 500	3		
	Total			**100%**	**71.7**

The cumulative score comes out to be approx. 70 (rounding off 71.7) which is equivalent to 3.5 stars for Part B

An illustrative report card has been shared below for reference.

ICCC Maturity Assessment framework IMAF 2.0 City Report Card (Part A)			
City Name:			
S. No.	Pillar Name	Rating	Remarks
I	ICCC Infrastructure	★ ★ ★ ½	
II	Use Cases Composition	★ ★ ½	
III	Cybersecurity	★ ½	
IV	Data Lifecycle Management	★ ★ ½	
V	Governance	★ ★ ★ ½	
VI	Team Management	★ ★ ★	
VII	Business Plan	★ ★ ★ ½	
VIII	Interdepartmental Coordination	★ ★ ★ ½	
IX	Stakeholder Engagement	★ ★ ★ ★	
X	Adoption of Innovation	★ ★ ★ ★	
Overall Rating for Part A		★ ★ ★	

| ICCC Maturity Assessment framework IMAF 2.0 City Report Card (Part B)			
City Name:			
I	**Operational Use Cases**	**Rating**	**Remarks**
1	Number of operational Use Cases in ICCC	★ ★ ★ ★	
II	**Impact of Use Cases**	**Rating**	**Remarks**
1	Monitoring of Door to Door Collection	★ ★ ★ ★	
2	Enhancing Safety & Security using Emergency Call Box	★ ★ ★ ★	
3	Traffic enforcement using Intelligent Traffic Management System	★ ★	
4	Monitoring of Urban Flood using Flood Sensors	★ ★ ★	
5	Monitoring of energy consumption using Smart Streetlights	★ ★ ★ ★	
Aggegate Rating of all use cases		★ ★ ★	
Overall Rating for Part B (Operational Use Cases + Impact of Use Cases)		★ ★ ★ ★	

Scoring for Part A

A total of 100 marks has been allocated to each pillar under Part A. The distribution of marks across each indicator is given below:

Infrastructure

I	ICCC Infrastructure	Total Marks
1	Is the city tracking the upkeep of ICCC infrastructure / hardware and software elements on a daily basis?	30
2	What is the frequency of conducting the preventive maintenance exercise for field devices?	10
3	What is the percentage of field devices deployed vs procured field devices?	20
4	What is the percentage of operational field devices vs deployed field devices?	20
5	How many sensors/devices deployed on the field are geo-referenced?	20
	Total Marks	**100**
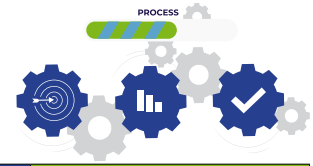
Use Cases

| II	Use Cases	Total Marks
1	What is the percentage of operational use cases for which SOP is drafted, approved and included in the Operations Manual?	25
2	What percentage of operational use cases are being categorised as per the defined three levels?	15
3	How frequently the SOPs are being reviewed / modified in the Operations Manual?	20
4	What percentage of use case SOPs are automated?	20
5	How many new use cases have been implemented by the city in last 6 months?	20
	Total Marks	100

Cybersecurity

III	Cybersecurity	Total Marks
1	Has the city conducted the cybersecurity audit of the ICCC in the last 1 year?	10
2	What is the status of the compliance percentage against the non-conformance (if any) identified during the audit?	20
3	Has the city received the cybersecurity compliance certificate from STQC empanelled agency in the recent audit?	15
4	Does the city have a Cybersecurity Operations Team?	15
5	Are regular training programs being conducted for creating awareness about cybersecurity amongst stakeholders managing ICCC?	10
6	Does the city have a cybersecurity SOP?	10
7	Does the city have a cybersecurity policy?	10
8	Has the city mapped IoT devices with the manufacturing location?	10
	Total Marks	100

Data Lifecycle Management

IV	Data Lifecycle Management	Total Marks
1	How many types of data analytics are being practiced in the ICCC?	20
2	Is the data classification and data categorisation being practiced in ICCC?	15
3	Is the city archiving the data based on multilevel classification (real time, near real time and offline)?	20
4	What practices are being followed by the city for quality control of data?	20
5	For how many domains the datasets have been listed on India Urban Data Exchange (IUDX) Platform?	15
6	Is the information on the ICCC Microsite updated?	10
	Total Marks	100
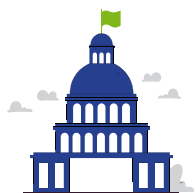
Governance

V	Governance	Total Marks
1	Is there a fortnightly review at the level of Commissioner / CEO?	20
2	Is there a quarterly review at the level of board?	15
3	Does the city have an automated mechanism available for tracking of all contracts/licenses?	15
4	Does the city have an approval matrix in place?	15
5	Does the city have a comprehensive risk management plan?	15
6	Is the Operations Manual approved by the board?	10
7	Is the Business Plan approved by the board?	10
	Total Marks	100

Team Management

VI	Team Management	Total Marks
1	Does the city have a dedicated person heading the ICCC operations?	20
2	Does the ICCC have a technical team to run its daily operations?	25
3	Has the MSI deployed the number of resources in ICCC as per the contract ?	25
4	Is the ICCC resourcing / hiring policy duly approved by the board?	10
5	What is the attrition rate of ICCC staff hired by SPV?	10
6	Are regular training programs being conducted for ICCC staff?	10
	Total Marks	100

Business Plan

VII	Business Plan	Total Marks
1	What percentage of operational expense is being met by the revenue generated by the ICCC?	40
2	In how many areas has the city started generating revenue through ICCC?	30
3	Is the ICCC being treated as a separate entity in the books of account?	30
	Total Marks	100

Interdepartmental Coordination

VIII	Interdepartmental Coordination	Total Marks
1	With how many departments has the ICCC been integrated?	25
2	What percentage of line departments / agencies are operating out of ICCC premises?	25
3	For what percentage of the use cases is the analysis being shared with the relevant department for taking necessary action? *Note - It must be answered against all use cases where other departments are involved.*	25
4	Are all the relevant departments involved during the review of SOPs?	25
	Total Marks	100

Stakeholder Engagement

IX	Stakeholder Engagement	Total Marks
1	What percentage of complaints / grievances received from citizens are being resolved as per defined TAT (Turn Around Time)?	40
2	How many partnerships/alliances have been created for operationalisation of the use cases?	30
3	Is there a dedicated helpline to address and resolve concerns of the citizens?	30
	Total Marks	100

Adoption of Innovation

X	Adoption of Innovation	Total Marks
1	Has the Internal Innovation Committee (IIC) been formed in the city to assist with ICCC innovation?	30
2	How many work orders have been issued by the city to start-ups?	40
3	Has the ICCC partnered with any incubator to support innovation activities under SmartProcure Guidelines?	30
	Total Marks	100

Scoring for Part B

A total of 100 marks has been allocated to each pillar "Operational Use Cases" and "Impact of Use Cases". The distribution of marks across each indicator is given below:

I	Operational Use Cases in ICCC	Total Marks
1A	What is the number of operational use cases in the ICCC?	75
1B	In how many sectors the use cases are operational?	25
	Total Marks	100
II	Impact of Use Cases (Minimum 5 use cases shall be evaluated)	Total marks
1	Please describe the identified use case for the ICCC	NA
2	How many planned KPIs have been achieved by the implementation of the use case?	10
3	Has the city identified potential KPIs across the three defined levels and shared it with the concerned department?	10
4	How many insights have been shared with the parent department in the last 6 months?	10
5	What percentage of complaints / grievances received from citizens are being resolved as per defined TAT (Turn Around Time)?	15
6	What is the estimated percentage of citizens that are directly benefiting from this use case?	10
7	What are the major impacts of this use case?	20
8	Has the city defined detailed SOP for the use case?	10
9	How many mock drills have been conducted in the last 1 year?	15
	Total Marks	100

2.3
Assessment Methodology

The assessment methodology of IMAF 2.0 follows a comprehensive approach to collect and analyse data across the ten pillars. As each pillar represents a different aspect of ICCCs' maturity, the data collection process accounts for the varying nature of indicators. The data collected for the various pillars across the framework will be obtained in varied units. Some indicators will require an elementary response of Yes or No, while others will require quantitative responses in the form of percentages or multiple-choice options. Additionally, subjective evaluation may be necessary for certain indicators in Part B.

The goal of the assessment methodology is to provide cities with pillar-wise insights and identify specific gaps within their ICCCs. By evaluating the maturity of ICCCs against each pillar, cities can pinpoint areas requiring improvement and develop targeted strategies to enhance their maturity in relation to the respective pillars. The expected outcome of the assessment methodology is to furnish cities with a clear understanding of their ICCCs' strengths and weaknesses, enabling them to embark on a focused journey toward bolstering their Smart City initiatives.

By employing a robust assessment methodology that accommodates diverse data formats and evaluation techniques, IMAF 2.0 ensures a thorough evaluation of ICCCs' maturity. This approach allows cities to gain meaningful insights, identify gaps, and implement targeted measures to enhance their ICCCs' performance, ultimately contributing to the overall development and effectiveness of Smart Cities in India.

The assessment shall be conducted in the following two ways:

Self-assessment by cities:
The cities shall self-assess themselves every quarter. (www.iccc.smartcities.gov.in)

On-ground assessment by third party:
A third-party team shall also visit the city and perform an independent assessment of IMAF 2.0 and submit report to MoHUA

03

IMAF 2.0 – Framework
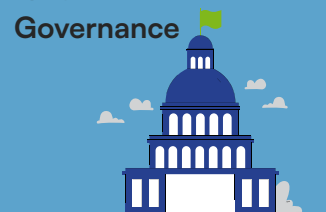
IMAF 2.0 Framework comprises of following two sections:

Part A: Management (or Systemic Readiness)
Part B: Impact (or Functional Capability)

Part A: ICCC Management

01 **Infrastructure**

02 **Use Cases**

03 **Cybersecurity**

04 **Data Lifecycle Management**

05 **Governance**

06 Team Management

07 Business Plan

08 Interdepartmental Coordination

09 Stakeholder Engagement

10 Adoption of Innovation

01 Operational Use Cases in ICCC

02 Impact of Use Cases

Part B: ICCC Impact

The table below provides the summary of IMAF 2.0, and the details are followed in subsequent sections:

#	ICCC SNAPSHOT	Response
1	Basic Details	
2	Details of Field Devices Installed	
3	List of operational services / use cases at ICCC	

A	MANAGEMENT	Indicators
I	ICCC Infrastructure	5
II	Use Cases	5
III	Cybersecurity	8
IV	Data Lifecycle Management	6
V	Governance	7
VI	Team Management	6
VII	Business Plan	3
VIII	Interdepartmental Coordination	4
IX	Stakeholder engagement	3
X	Adoption of Innovation	3
	Total Indicators	50

B	IMPACT	Indicators
I	Operational Use Cases in ICCC	1
II	Impact of Use Cases (minimum 5 use cases)	9
	Total Indicators	10

Health ATMs, Lucknow

3.1
ICCC Snapshot

ICCC snapshots are basically the set of basic details on, ICCC, field devices, and use cases to understand the overall snapshot of ICCC within a city. The components of ICCC snapshot, given in the below table, aims to capture city's readiness for the maturity assessment:

A	ICCC SNAPSHOT	Response	Remarks
1	ICCC Go Live Date		
2	Project Cost (Breakup of Capital and O&M Cost)		
3	Name of the Master System Integrator (MSI)		
4	O&M contract of MSI up to		
5	Complete address of ICCC Facility with geo coordinates		
6	ICCC Nodal Officer (Name, Designation, email ID and Contact)		
A.1	**Details of Field Devices Installed**	**Count**	**Remarks**
1	CCTV Surveillance Cameras (Fixed, PTZ and others)		
2	Adaptive Traffic Control System (ATCS) Junctions		
3	Red Light Violation Detection (RLVD) Junctions		
4	Automatic Number Plate Recognition (ANPR) Cameras		
5	Over Speed Detection System (OSDS) Locations		
6	Emergency call box		
7	Public Address System (PAS)		
8	Variable Message Displays (VMDs)		
9	Smart Streetlights (Include CCMS as well)		
10	GPS enabled SWM Vehicles		
11	GPS enabled Public / Intermediate Public Transport		
12	Environmental / Air Quality Monitoring Sensors		
13	Flood Monitoring Sensors		
14	Smart Poles		
15	Bin Overflow Monitoring Sensors		
16	No. of STP's monitored through ICCC		
17	Smart Water Meters		
18	No. of Water Treatment Plant monitored through ICCC		
19	Smart Classrooms / Digital Libraries		

20	City Wi-Fi Locations		
21	Health ATMs		
22	Body Worn Cameras		
23	SCADA System (Water/Electric)		
24	Others		
A.2	**Operational Use Cases at ICCC**	**Sector**	**Remarks**
1	Name of Use Case	Name of Sector / domains	
2			
3			
n			

Note - The city may select one of the below sectors / domains to maintain consistency

- Solid Waste Management
- Water & Wastewater Management (drainage, septic tank, wastewater, water supply)
- Emergency and Disaster Management
- eGov / Citizen Service Delivery
- Mobility (transit / transport / traffic) Management
- Energy management
- Environmental Management
- Safety & Security
- Healthcare
- Education
- Municipal Finance
- Citizen Engagement / Public Awareness & Communication
- Others

Integrated Command & Control Centre, Namchi

3.2
Part A: ICCC Management

The below table details the 50 indicators across the ten pillars of ICCC Assessment. The table also provides description of each indicator along with the desired supporting documents and scoring criteria:

Infrastructure

I	ICCC Infrastructure	Response	Description	Supporting Documents	Scoring Criteria
1	Is the city tracking the upkeep of ICCC infrastructure / hardware and software elements daily?	Yes / No	The city must track the functioning (uptime) of ICCC Infrastructure/ hardware and software elements on a daily basis which includes: 1. IT and Non IT Infra - Video Wall, Network Switches, Routers, Optic Fibre Cable (OFC) and connectors, Servers, Security Components, Cloud, Software Applications / upgrades, Laptops, Desktops, UPS, Battery, Precision AC, etc. 2. Power - The city must ensure that ICCC is equipped with 24 X 7 power availability with sufficient power backup system, UPS system (standalone or parallel) The SLA compliance will be calculated based on overall defaults (downtime) in the last 90 days for all IT and non IT infrastructure elements *Note - The scope of infrastructure includes ICCC facility, data center, data recovery center, or any other viewing center. It does not include field devices.*	1. Uptime SLA and calculation methodology agreed with MSI 2. SLA Compliance Report for 90 days stating the number and details of defaults 3. Last 90 Days Element Management System (EMS), Network Management System (NMS) and Building Management System (BMS) Report for tracking of IT Infra, Non IT Infra and Power. 4. Copy of Bill of Materials finalized with the vendors. 5. Go Live Certification	Above 95% SLA compliance - 100% Marks 85% to 95% SLA compliance - 75% Marks 70% to 84% SLA compliance - 50% Marks Below 70% SLA compliance - 0% Marks
2	What is the frequency of conducting the preventive maintenance exercise for field devices?	1. Quarterly 2. Half Yearly 3. Annually 4. No Periodic schedule	The city must ensure a periodical preventive maintenance for all field devices with respect to inspecting voltage, loose cables, locks, device mounting, undressed cables, gaps, loose screws, etc. The city must ensure that one round of inspection for all field devices must be completed within a quarter. In case all the field devices are not inspected within a quarter then the city may choose the respective time period (half yearly or yearly) as the completion of one exercise for all field devices.	1. Preventive Maintenance agreement / contract with SI / 3rd party agency 2. Preventive Maintenance report for last 1 year signed by CEO / Commissioner	Quarterly coverage of all devices - 100% Marks Half-yearly coverage of all devices - 50% Marks Annually coverage of all devices - 25% Marks No periodic coverage - 0% Marks

I	ICCC Infrastructure	Response	Description	Supporting Documents	Scoring Criteria
3	What is the percentage of field devices deployed vs procured field devices?	1. Above 90% 2. 76% to 90% 3. 60% to 75% 4. Below 60%	The city must provide the details of field devices which are deployed on the field vs the devices which were to be deployed basis the RFP/contract agreement as on date of assessment. It must be shared in the form of a table with following columns: • Type of device • Deployed (Count) • Devices as per contract agreement (Count) The percentage shall be calculated as the ratio of total deployed devices (across all use cases) vs the count of total devices procured (across all use cases) as per the contract agreement.	1. Contract Document / BoQ Document 2. Go Live Certification / Report as per given format (in description column) 3. Last 90 Days Element Management System (EMS) and Network Management System (NMS) Device Status Report	Above 90% - 100% Marks 76% to 90% - 75% Marks 60% to 75% - 50% Marks Below 60% - 0% Marks
4	What is the percentage of operational field devices vs deployed field devices?	1. Above 90% 2. 76% to 90% 3. 60% to 75% 4. Below 60%	The city must ensure that the sensors deployed in the field locations should be operational and is able to provide real-time data such as asset ID, last reported time, device status (on/off) etc. The city must report the operational devices in the city vs the deployed field devices for the last 90 days in a form of a table with following columns: • Type of device • Operational (Count) • Deployed (Count) The percentage shall be calculated as the ratio of total operational devices (across all use cases) vs the count of total deployed devices (across all use cases).	1. Last 90 Days Element Management System (EMS) and Network Management System (NMS) Report 2. Any other system generated report functional vs non-functional field devices 3. Report as per given format (in description column)	Above 90% - 100% Marks 76% to 90% - 75% Marks 60% to 75% - 50% Marks Below 60% - 0% Marks
5	How many sensors/devices deployed on the field are geo-referenced? *Note - The list to be validated across all the operational sensors/devices*	1. Above 90% 2. 76% to 90% 3. 60% to 75% 4. Below 60%	The city must ensure that all the sensors/devices be geo-referenced and should be mapped with respective latitude/longitude address. The percentage shall be calculated as the ratio of total devices providing real time data vs the total operational devices.	1. The screenshot of GIS map with geo-referenced attributes for all types of fixed devices 2. System generated reports displaying the coordinates of field devices	Above 90% - 100% Marks 76% to 90% - 75% Marks 60% to 75% - 50% Marks Below 60% - 0% Marks

Integrated Command, Control & Comunication Centre (IC4), Kochi

Use Cases

II	Use Cases	Response	Description	Supporting Documents	Scoring Criteria
1	What is the percentage of operational use cases for which SOP is drafted, approved, and included in the Operations Manual?	1. Above 90% 2. 76% to 90% 3. 60% to 75% 4. Below 60%	The city must clearly define SOPs for managing various parameters including Subject Area, Business Need, Possible Triggers, Business Actor(s), System Actor(s), Scenario Overview, Responding to Event or Situation, Analysis, Scenario Supporting Information, and Scenario Outcome The percentage shall be calculated as the ratio of the no. of use cases for which the SOP is drafted and approved vs. the no. of operational use cases Refer the SOP format as per the Operations Manual.	1. List of Operational Use Cases 2. SOPs of all use cases as per the Operations Manual 3. Alerts Dump	Above 90% - 100% Marks 76% to 90% - 75% Marks 60% to 75% - 50% Marks Below 60% - 0% Marks

II	Use Cases	Response	Description	Supporting Documents	Scoring Criteria
2	What percentage of operational use cases are being categorised as per the defined three levels?	1. Above 90% 2. 76% to 90% 3. 60% to 75% 4. Below 60%	The cities must make a matrix of use cases as per the below three levels - Level 1 - Situational awareness *For Example- Monitoring of Crime through CCTV, Water logging, etc.* Level 2 - ICCC enabled execution of SOPs and interdepartmental coordination *For Example- Service interruption, road digging / works, etc.* Level 3 - Decision support enabled by Data Analytics *For Example- analysis of road accidents, pattern of crime incidents, etc.*	1. Matrix details for all operational use cases	Above 90% - 100% Marks 76% to 90% - 75% Marks 60% to 75% - 50% Marks Below 60% - 0% Marks
3	How frequently the SOPs are being reviewed / modified in the Operations Manual?	1. Quarterly 2. Half Yearly 3. Annually 4. No Periodic schedule	The city must ensure that SOPs are kept relevant and therefore SOPs need to be reviewed and updated periodically. The review must be conducted periodically for all use cases and recorded for necessary changes and actions. *For Example - The SOPs must be modified in case of any changes in the data collection format, data collection source, change in POCs, modification in SLA, modification in the response process, etc.*	1. Old SOP 2. Modified SOP with dates (if modified) 3. Minutes of Meeting / Board Meeting / Relevant Documents	Quarterly - 100% Marks Half-yearly - 50% Marks Annually - 25% Marks No periodic review - 0% Marks
4	What percentage of use case SOPs are automated?	1. Above 90% 2. 76% to 90% 3. 60% to 75% 4. Below 60%	The city must ensure that SOPs are system driven and their logs are being maintained in the system. Every SOP must be automated in aspects such as trigger mechanisms, system recorded action taken, log maintenance, SLA compliance, etc. The percentage is calculated as the ratio of no. of use cases for which the SOPs are automated vs the total no. of operational use cases.	1. System Generated reports for System Driven SOPs 2. Reports for Manual SOPs	Above 90% - 100% Marks 76% to 90% - 75% Marks 60% to 75% - 50% Marks Below 60% - 0% Marks
5	How many new use cases have been implemented by the city in last 6 months?	1. 3 or more use cases implemented 2. 1 - 2 use case implemented 3. No use cases implemented	The city must continuously work to develop use cases through defined SOPs. They can initiate the identification of new use cases through Consultations/Workshops, Crowdsourcing, leveraging existing repositories, etc. Refer Operations Manual for further details.	1. Steps to Identify New Use Case as per Operations Manual 2. System generated report for new use cases	3 or more use case implemented - 100% Marks 1 -2 Use Case implemented - 60% Marks No Use Case implemented - 0%

Cybersecurity

III	Cybersecurity	Response	Description	Supporting Documents	Scoring Criteria
1	Has the city conducted the cyber audit of the ICCC in the last 1 year?	Yes / No	The city must conduct an external audit from STQC empanelled agency.	1. Assessment Report	Yes - 100% Marks No - 0% Marks
2	What is the status of the compliance percentage against the non-conformance (if any) identified during the audit?	1. Above 90% 2. 76% to 90% 3. 60% to 75% 4. Below 60%	The recommendations & gaps identified by the third party auditor must be addressed and closed by the city. The compliance of the same shall be calculated as the ratio of the no. of recommendations addressed vs the total no. of recommendations given by the third party.	1. Action Taken Report 2. Approval on the given recommendations from the third party 3. Compliance Certificate for respective non conformance	Above 90% - 100% Marks 76% to 90% - 75% Marks 60% to 75% - 50% Marks Below 60% - 0% Marks
3	Has the city received the cybersecurity compliance certificate from STQC empanelled agency in the recent audit?	Yes / No	The city must obtain a certificate from STQC empanelled agency. The audit must be conducted within 1 year.	1. Cybersecurity Compliance Certificate from the third party 2. Assessment Report showing compliance	Yes - 100% Marks No - 0% Marks
4	Does the city have a Cybersecurity Operations Team?	Yes / No	The city must deploy a team of qualified and experienced cyber security and privacy professionals which shall include security governance expert, vulnerability assessment and penetration tester, security network architecture expert, security risk and compliance manager to detect, and protect the ICCC and associated infrastructure, applications as well as network from cyber-attacks. Kindly refer Chapter 9 - Cybersecurity from Model RFP (Section I - Volume II) for further details.	1. Details of Cybersecurity Operations Team 2. Report of vulnerability / threats identified in last 3 months by the team	Yes the team has been deployed — 100% Marks Yes the team has been deployed but sufficient team is not available - 50% Marks No team deployed — 0% Marks

III	Cybersecurity	Response	Description	Supporting Documents	Scoring Criteria
5	Are regular training programs being conducted for creating awareness about cybersecurity amongst stakeholders managing ICCC?	Yes / No	The city must design and conduct regular training programs quarterly for creating awareness about cybersecurity with the stakeholders involved in managing ICCC. The city must ensure that minimum one person is a certified cybersecurity professional in the team.	1. Training calendar 2. Attendance sheet with feedback form 3. Technical Modules 4. Cybersecurity Professional Certification for minimum one person	Cybersecurity professional certificate available with one person from the cybersecurity team - 40% Marks 2 Awareness training conducted in last 6 months - 60% Marks *Note - In case only 1 Awareness Training is conducted in last 6 months - 30% Marks*
6	Does the city have a cybersecurity SOP?	Yes / No	The city must have their cyber security SOP to manage, protect and monitor various assets, system applications, network including ICCC infrastructure.	1. Cybersecurity SOP 2. Copy of city cyber security policy duly approved by the department / committee (if any) 3. RACI chart available for all ICCC members 4. Incident Response Plans 5. Minutes of Meetings in last 6 months	Yes - 100% Marks No - 0% Marks
7	Does the city have a cyber security policy?	Yes / No	The city must have their cybersecurity policy to ensure network security, data privacy, IoT device security, risk management, backup etc.	1. Risk Assessment 2. Back Up Plan	Yes - 100% Marks No - 0% Marks
8	Has the city mapped IoT devices with the manufacturing location?	Yes / No	The city must have details of IoT devices mapped with the manufacturing location, certification, etc. The city must identify the products from border sharing countries.	1. List of devices mapped with the country of manufacturing	Yes - 100% Marks No - 0% Marks

Data Lifecycle Management

IV	Data Lifecycle Management	Response	Description	Supporting Documents	Scoring Criteria
1	How many types of data analytics are being practiced in the ICCC?	Multiple Choice 1. Descriptive Analytics 2. Diagnostic Analytics 3. Predictive Analytics 4. Prescriptive Analytics 5. None	The city needs to choose from the following broad categories of analytics and provide the details of the specific analytics implemented, their total no. and the outcome of using those analytics 1. Descriptive Analytics - Ability to view insights from historical data for a given data set. 2. Diagnostic Analytics - Ability to undertake root cause analysis using data slicing, data aggregation, data mining, data discovery and correlation techniques using ICCC platform 3. Predictive Analytics - Ability to make predictions about future events using past data 4. Prescriptive Analytics - Ability to propose best course of action for any given situation/scenario based on analytics.	1. Details of analytics conducted at the ICCC - mapped to the use case, details of analytics and the outcomes. One analytics may be undertaken in multiple use cases, in this case details of all may be given. 2. Screenshots showcasing the analysis 3. System generated Report for the said analytics	4 analytics - 100% Marks 2 - 3 analytics - 50% Marks Less than 2 analytics - 0% Marks
2	Is the data classification and data categorisation being practiced in ICCC?	1. Data Classification only 2. Data Categorization only 3. Both 4. None	Data categorization: Different types of datasets generated by different Departments etc. can be categorised into shareable data and non-shareable data basis personal or non-personal. This applies to data generated both in geospatial and non-spatial forms. Data classification: Data classification is the process of organising data into categories for its most effective and efficient use. Further to data categorization, there is a need to classify the data basis its intended usage and stakeholders. There may be some data which can be open to the public, while some other may be confidential and restricted. Such distinctions need to be appropriately defined to prevent misuse and maintain confidentiality. The City Data Policy classifies data as:-	1. SOP for data classification and categorisation 2. List of actual data with details of classification & categorisation in last 3 months	Both — 100% Marks Only Data Classification — 50% Marks Only Data Categorization — 50% Marks None — 0% Marks

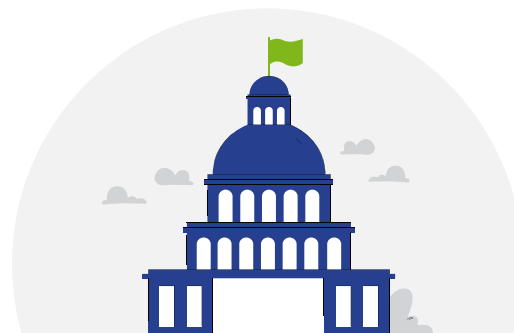| IV	Data Lifecycle Management	Response	Description	Supporting Documents	Scoring Criteria
			Level 1 Public / Shareable Data: Those data not covered under the scope of negative list and non-sensitive in nature. This data is available for public consumption and use. Level 2 Negative List: Non-shareable data as declared by the departments / organisations. Level 3 Restricted Data: Data which are accessible only through a prescribed process of registration and authorization by respective departments / organisations. Level 4 Sensitive data: Sensitive data as defined in various Acts and rules of the Government of India. *Note - The Data Classification & Categorisation must apply to ICCC wide data collection.*		
3	Is the city archiving the data based on multilevel classification (real time, near real time and offline)?	Multiple Choice Yes - Standard Data as per SLA Yes - Flagged Data as per SLA Yes - System Data as per SLA Not archived	In case the city has not clearly defined the SLAs, the city may adhere to the following guidelines for archiving data - Standard Data Upto 30 Days - Real time 31 - 90 Days - Near Real Time Above 90 Days - Archived Data offline/cloud system (or as per requirement) Flagged Data Upto 90 Days - Real time Above 90 Days - Archived Data offline/cloud system (or as per requirement) System Database/Analysed Data / Insights /Logs - for the duration of the contract period In case the city has not clearly defined the SLAs, the city may adhere to the following guidelines for archiving data - Standard Data Upto 30 Days - Real time 30 - 90 Days - Near Real Time Above 90 Days - Archived Data offline/cloud system (or as per requirement) Flagged Data Upto 90 Days - Real time Above 90 Days - Archived Data offline/cloud system (or as per requirement)	1. The supporting document must have the following details in a tabular format. a. Type of data archived (Standard / Flagged / System) b. Name & Sector of the archived data c. SLA defined for data archival d. Frequency of archival e. Process of archiving along with set duration 2. Datasets sample across standard, flagged and system data across video/ non-video data. 3. SOPs for archiving data	Standard Data — 40% Marks Flagged Data - 40% Marks System Data & logs - 20% Marks Not Archived — 0% Marks

IV	Data Lifecycle Management	Response	Description	Supporting Documents	Scoring Criteria
			System Database/Analysed Data / Insights /Logs - for the duration of the contract period Data archived by the city can be largely of the following types 1. Video data such as analytics, violation footage, any statutory data which can be used for the court of law, other normal footage (Mention the type) 2. Non-Video data such as messages, grievances, other data (Mention the type) *Note — Please mention if the city has any other type except the above-mentioned list. The data backup/ archival must be done on a separate system / machine.* *All the data dump must be available for 3 years.*		
4	What practices are being followed by the city for quality control of data?	Multiple Choice 1. Data Cleansing 2. Data Profiling: Systematic 3. Data Traceability 4. Data Compliance: 5. Data Monitoring 6. None	The city can follow the below practices for the Data quality assessment - 1. Data Cleansing: Maintenance of data to fit defined Smart City Data Standard for enhanced interoperability and decision making. 2. Data Profiling: Systematic analysis of data to gather actionable and measurable information about its quality. 3. Data Traceability: Tracking of the lifecycle of data to determine and demonstrate all changes and access to the data. 4. Data Compliance: Ongoing processes to ensure adherence of data to both enterprise business rules, and, especially, to legal and regulatory requirements. 5. Data Monitoring: Routine checking and validation of data against quality control rules to ensure quality and format consistency. *Note - City must segregate the data accordingly and make it available for usage.*	The city needs to submit a document stating the process of its data quality assessment mentioned in the description. *Note - Please provide an additional supporting document if the city has an automated system of data quality assessment stating the procedure of the same.*	Each of the five component to get 20% weightage No — 0% Marks

IV	Data Lifecycle Management	Response	Description	Supporting Documents	Scoring Criteria
5	For how many domains the datasets has been listed on India Urban Data Exchange (IUDX) Platform?	1. 6 or more domains 2. 3 - 5 domains 3. 1 - 2 domains 4. No datasets on IUDX	The city must list the datasets across all domains on the IUDX platform and start working with the IUDX team to create city specific use cases.	Report from IUDX Platform	6 or more domains - 100% Marks 3 - 5 domains - 75% Marks 1 - 2 domains - 50% Marks No datasets on IUDX - 0% Marks
6	Is the information on the ICCC Microsite updated?	Yes / No	The city must update all information related to ICCC on the microsite (www.iccc.smartcities.gov.in). The login details are already provided to the city. In case of any issues, they may connect with MoHUA.	The on-ground information such as operational use cases, outcomes, city detail, etc must match with the information on the microsite.	Yes — 100% Marks Partial - 50% Marks No — 0% Marks

Integrated Command & Control Centre, Agra

Governance

V	Governance	Response	Description	Supporting Documents	Scoring Criteria
1	Is there a fortnightly review at the level of Commissioner / CEO?	Yes / No	The Smart City CEO / Additional CEO / Commissioner must review the progress and action tracker of ICCC on fortnightly basis as per the template. The review meeting must have a planned agenda, a set day / time and tracking of specific action items emerging from the meeting for closure in a time bound manner.	1. Reports from last 3 meetings with action taken report, minutes and agenda 2. Fortnightly checklist / template signed by CEO.	Regular meeting in last 3 months - 100% Marks Irregular meetings in last 3 months - 50% Marks No Meetings in last 3 months - 0% Marks
2	Is there a quarterly review at the level of board?	Yes / No	The Smart City Board must review the progress and action tracker of ICCC on quarterly basis. The review meeting must have a planned agenda, a set day / time and tracking of specific action items emerging from the meeting for closure in a time bound manner.	1. Reports from last 1 year with action taken report, minutes and agenda	Yes - Four meeting in last 1 year - 100% Marks Yes - Two meetings in last 1 year - 50% Marks Yes - One meetings in last 1 year - 25% Marks No Meetings in last 1 year- 0% Marks
3	Does the city have an automated mechanism available for tracking of all contracts/ licenses?	Yes / No	The city ICCC must have engaged with several agencies for setting up the ICCC to ensure smooth operations. The city must ensure that the following is being done through the automated mechanism: 1. All contracts required for continuous operations of ICCC are active. 2. Renewal process has been initiated for contracts prior to 3 months of expiry, in case required. 3. The contracts which are completing their tenure, adequate transition and knowledge transfer activities are undertaken, including handover of the documentation, licenses (tech and non tech) etc.	1. Contract Management section as per Operations Manual Document 2. System generated reports	Yes — 100% Marks Partial - 50% Marks No — 0% Marks

V	Governance	Response	Description	Supporting Documents	Scoring Criteria
4	Does the city have an approval matrix in place?	Yes / No	The city ICCC must have approval matrix / framework which should be used for timely approvals across various functions of ICCC operations. Such approvals shall follow a stepwise process and for exigencies hindering ICCC operations, exceptional approval shall be sought from CEO/MC *Note - City to define its own approval matrix based on State/UT/city guidelines. Refer Operations Manual for further queries.*	Approval Matrix section as per Operations Manual Document	Yes — 100% Marks No — 0% Marks
5	Does the city have a comprehensive risk management plan?	Yes / No	The city must periodically review the potential risks to the ICCC operations and the respective plan for risk mitigation. The risk may be assessed based on the key areas such as functional *(For Example- service delivery to citizen through each use case), Technology (cybersecurity risk, technology obsolete, etc.) Operations (business continuity, sustained operations of ICCC, availability of skilled manpower, etc) and Engagement (citizen, interdepartmental, partnerships, etc).*	The city must share the following details in a tabular format under the four identified areas / sub areas- a. Risk Identified b. Risk Mitigation Plan c. Remarks	15 or more risk areas/sub-areas: 100% Marks 10-14 risk areas/sub-areas - 60% Marks 4-9 risk areas/sub-areas - 40% Marks Less than 4 risk areas/sub-areas - 0% Marks
6	Is the Operations Manual approved by the board?	Yes / No	The city must ensure that the operations manual must be drafted by the city duly approved by the board.	Board Approval	Yes — 100% Marks No — 0% Marks
7	Is the Business Plan approved by the board?	Yes / No	The city must ensure that the business plan must be drafted by the city duly approved by the board.	Board Approval	Yes — 100% Marks No — 0% Marks

Integrated Command & Control Centre, Bilaspur

Team Management

VI	Team Management	Response	Description	Supporting Documents	Scoring Criteria
1	Does the city have a dedicated person heading the ICCC operations?	Yes / No	The city must have an operations head (full-time) for managing day to day operations of ICCC. The person must not be below the rank of General Manager / Chief Technology Officer / Chief Engineer or equivalent.	1. Details of Head, Operations ICCC 2. Biometrics Attendance Report / Report approved by the CEO / Commissioner	Yes — 100% Marks No — 0% Marks
2	Does the ICCC have a technical team to run its daily operations?	Yes / No	ICCC technical staff (IT / Subject Matter Experts) - The ICCC team must include the key resource as follows: 1. Chief Technical Officer 2. Solution Architect 3. Cybersecurity expert 4. Business Analyst / Use-case / SoP expert / Data Management expert 5. GIS expert 6. Server/ Storage & Database Expert *Note - Minimum 50% staff to be direct hire under SPV.*	Word document with template providing: 1. Details of ICCC Staff hired through SPV 2. Roles and Responsibilities of the team as a part of the SOP 3. Biometrics Attendance Report / Report approved by the CEO / Commissioner 4. Team Organogram 5. Certified list of on roll employees from competent authority	3 or more technical resource hired by SPV - 100% Marks 1 or 2 technical resource hired by SPV - 50% Marks No technical resource hired by SPV - 0% Marks *Note - In case the city does not have the identified six resources deployed in ICCC through SPV/MSI/PMC, it will attract the penalty for deduction of 40% Marks from the total marks scored.*
3	Has the MSI deployed the number of resources in ICCC as per the contract?	Availability of 1. More than 90% Staff 2. 71 - 90 % Staff 3. 50 - 70 % Staff 4. Less than 50 % staff	The MSI must deploy full team in the ICCC as per the contract. The percentage shall be calculated as the ratio of the no. of MSI staff deployed vs the no. of MSI staff to be deployed as per the contract.	1. Details of Staff 2. MSI attendance report for last 3 months 3. MSI Resourcing Policy / Contract with ICCC	More than 90% Staff availability - 100% Marks 71 - 90 % Staff availability - 80% Marks 50 - 70 % Staff availability - 60% Marks Less than 50 % staff availability - 0% Marks

VI	Team Management	Response	Description	Supporting Documents	Scoring Criteria
4	Is the ICCC resourcing / hiring policy duly approved by the board?	Yes / No	The city must have appropriate ICCC resourcing / hiring policy. The attrition should be managed with robust internal business processes, in conjunction with City HR Policy Guidelines. *For Example - Key technical personnel are identified and retained for a period of minimum 2 years.* *Note - The city must detail the list of all people hired in ICCC*	1. ICCC resourcing policy duly approved by the board 2. Details of ICCC Staff present since the Go Live of ICCC.	Yes — 100% Marks No — 0% Marks
5	What is the attrition rate of ICCC staff hired by SPV?	1. 0% 2. 1 - 30% 3. 31-60% 4. Above 60%	The city must list down the various measures being taken by the city to retain the ICCC resources and talent. The following options may be part of the measures: 1. Regular catch ups with the staff to understand any gaps 2. Salaries to staff are as per industry standards 3. Appropriate performance appraisal processes have been conducted 4. Others The percentage shall be calculated as the ratio of no. of people left in last 1 year on the payroll of SPV vs the total no. of people on the payroll of SPV.	1. Attrition Rate in the last 1 year with details of staff left 2. Document stating steps taken to retain talent by the city	0% - 100 % Marks 1 - 30% - 70% Marks 31-60% - 50% Marks Above 60% - 0% Marks

Electric City Buses, Dehradun

VI	Team Management	Response	Description	Supporting Documents	Scoring Criteria
6	Are regular training programs being conducted for ICCC staff?	Yes / No	The city must allocate budget, design and conduct regular training programs quarterly for their staff on various aspects such as ICCC Operations, Infrastructure management, managing use cases, SOPs, etc.	1. Images with details of Training (virtual or physical) and Capacity building workshops conducted in last 1 year 2. Details of trainings conducted, certifications and attendees in last 1 year 3. Budget allocated for capacity building and training in the recent ICCC budget 4. Training modules 5. Training recordings if available 6. Attendance list 7. Training SOPs	Quarterly Trainings - 100% Marks Half-yearly Trainings - 50% Marks Annual Trainings - 25% Marks No Trainings - 0% Marks

Business Plan

VII	Business Plan	Response	Description	Supporting Documents	Scoring Criteria
1	What percentage of operational expense is being met by the revenue generated by the ICCC?	1. Above 15% expense 2. 6-15% of expense 3. 1-5% of expense 4. No expense being met	The city must explore different ways of generating revenue and must be able to meet the operational expense from the revenue generated. The revenue must also be utilised for purposes like technology refresh, operations of ICCC, salary of manpower, etc. The percentage shall be calculated as the ratio of the total revenue generated for a particular year vs the total operational expense for a particular year	1. Copy of business plan certified from CEO 2. The details in the format which must include - a. Revenue generated till date (year & area wise) b. Total operations expense incurred (year wise) c. Areas highlighting the usage of revenue	Above 15% expense - 100% Marks 6-15% of expense - 60% Marks 1-5% of expense - 25% Marks No expense being met - 0% Marks

VII	Business Plan	Response	Description	Supporting Documents	Scoring Criteria
2	In how many areas has the city started generating revenue through ICCC?	1. More than 4 2. 3-4 3. 1-2 4. No	The city must identify and explore new and other potential areas of generating revenue through the usage of its ICCC assets, products & services to attain the financial sustainability.	1. The format must include a. Revenue generation areas b. Process of revenue generation c. Start Date d. Revenue generated per area till date (year wise) e. Buyers f. Scale up plan	More than 4 - 100% Marks 3-4 - 80% Marks 1-2 - 40% Marks No - 0% Marks
3	Is the ICCC being treated as a separate entity in the books of account?	Yes / No	The city must identify as a separate entity and create a separate profit & loss statement in the books of account. This shall enable city to effectively manage the expense, revenues and profits for the ICCC.	1. The copy for books of account which shows ICCC as a separate entity certified by CEO / Competent Authority	Yes — 100% Marks No — 0% Marks

Interdepartmental Coordination

VIII	Interdepartmental Coordination	Response	Description	Supporting Documents	Scoring Criteria
1	With how many departments has the ICCC been integrated?	1. More than 4 2. 3-4 3. 1-2 4. No Integration	The ICCC must be integrated with department such as Police, Traffic, Health, Fire, Disaster, SWM, Water, and other line departments / agencies for effective coordination and better service delivery to citizens / end users. It is suggested that the concerned departments must regularly sit inside the ICCC premises for monitoring and taking necessary action.	1. Document with following details: a. Name of department b. Mode of integration (manual (ex. excel) / auto (ex API) c. Number of department representative sitting in ICCC 2. Proofs for Mode of Integration (ex APIs, analysis shared) for last 3 months 3. SOPs for Interdepartmental Coordination	More than 4 - 100% Marks 3-4 - 80% Marks 1-2 - 40% Marks No integration - 0% Marks

VIII	Interdepartmental Coordination	Response	Description	Supporting Documents	Scoring Criteria
2	What percentage of line departments / agencies are operating out of ICCC premises?	1. Above 90% 2. 76% to 90% 3. 60% to 75% 4. Below 60%	The identified line departments / agencies must operate out of ICCC premises to enhance the interdepartmental coordination. The representatives sitting inside the ICCC premises enables the quick exchange of relevant information between the line department and ICCC which leads to efficient service delivery to citizens.	1. Document with following details - a. Department Name b. Representative(s) Name sitting inside ICCC c. Start Date 2. Biometric attendance of representatives	Above 90% - 100% Marks 76% to 90% - 75% Marks 60% to 75% - 50% Marks Below 60% - 0% Marks
3	For what percentage of the use cases is the analysis being shared with the relevant department for taking necessary action? *Note - It must be answered against all use cases where other departments are involved.*	1. Above 90% 2. 76% to 90% 3. 60% to 75% 4. Below 60%	The city must ensure that there must be a proper feedback channel between the departments. The analysis and insights for respective use cases must be regularly shared with relevant departments / government agency for on-ground action. The percentage shall be calculated as the ratio of the no. of use cases for which the analysis is being shared with the relevant department vs the total no. of applicable use cases where other departments are involved.	Document mentioning the details for each use case along with insights shared with the department in the last 3 months.	Above 90% - 100% Marks 76% to 90% - 75% Marks 60% to 75% - 50% Marks Below 60% - 0% Marks
4	Are all the relevant departments involved during the review of SOPs?	Yes / No	The city must ensure that all the concerned departments are involved and consulted during the SOP review. This exercise needs to be performed across all the applicable use cases where external departments are involved. The percentage of applicable use cases shall be calculated as the ratio of the number of use case where departments are involved & consulted in the review of SOP vs the total number of use cases where other departments are involved	1. Minutes of Meeting in presence of concerned departments 2. List of use cases where external departments are involved with details of external department	Above 90% of the applicable departments - 100% Marks 76% to 90% of the applicable departments - 75% Marks 60% to 75% of the applicable departments - 50% Marks Below 60% of the applicable departments - 0% Marks

Stakeholder Engagement

IX	Stakeholder Engagement	Response	Description	Supporting Documents	Scoring Criteria
1	What percentage of complaints / grievances received from citizens are being resolved as per defined TAT (Turn Around Time)?	1. Above 90% 2. 76% to 90% 3. 60% to 75% 4. Below 60%	The city must resolve all the complaints received from the citizens as per the TAT. The percentage shall be calculated as the ratio of the no. of complaints resolved as per Turn Around Time vs the no. of complaints received from the citizens. In case the complaints were reopened then the marks will be reduced by the percentage of reopened complaints. The percentage of reopened complaints shall be calculated as the ratio of total no. of reopened complaints vs the total no. of resolved complaints. *For Example - if a city scores 10 marks without incorporating the calculation of reopened complaints and 20% of the complaints were reopened then the final marks will be calculated as 10 Marks - 20% of 10 Marks = 10 - 2 = 8 Marks*	1. Past 3 months consolidated report supported by individual system report 2. The city needs to provide the following details in a tabular format. a. The no. of complaints/ cases lodged by the citizens through ICCC's complaint/ case redressal mechanism. b. No. of cases resolved by the city per TAT	Above 90% - 100% Marks 76% to 90% - 75% Marks 60% to 75% - 50% Marks Below 60% - 0% Marks
2	How many partnerships / alliances have been created for operationalisation of the use cases?	1. More than 4 2. 2-4 3. Less than 2 alliances	The city must create valuable partnerships/alliances for effective implementation / operationalisation of use cases. These alliances can be with any line department and/ or outside government sector including industry, academics etc. for the purpose of service delivery/data or resource sharing/other reasons. The alliance must be created at least three months before the final date of submission of nomination and should be active currently.	1. Agreement of the alliances 2. Details as per the tabular format a. Name of the stakeholder with whom the alliance has been made b. Purpose of the alliance c. Achievement by the alliance	More than 4 - 100% Marks 2-4 - 70% Marks Less than 2 alliance - 0% Marks

IX	Stakeholder Engagement	Response	Description	Supporting Documents	Scoring Criteria
3	Is there a dedicated helpline to address and resolve concerns of the citizens?	Yes / No	The city must have a dedicated helpline / call centre to address queries of citizens. The helpdesk must be available 24 X 7 to address and provide necessary support during the emergency situations. ICCC must be integrated with the helpline in case the helpline is stationed at some other department.	1. Helpline / Call Centre number 2. Details as per the tabular format a. Number of calls received in last 3 months b. Categorization of calls as per complaints, information, etc.	Yes — 100% Marks No — 0% Marks

Integrated Command & Control Centre, Ahmedabad

Adoption of Innovation

X	Adoption of Innovation	Response	Description	Supporting Documents	Scoring Criteria
1	Has the Internal Innovation Committee (IIC) been formed in the city to assist with ICCC innovation?	Yes / No	The internal innovation committee is a body that is to be formed in the city for anchoring the innovation activities in the city. The IIC is to propose the problem statements for which innovative solutions are to be sought. The IIC can help the city create problem statements for innovation in the ICCC. The model composition of IIC is given in para 3.2 of the SmartProcure Guidelines. The IIC should have the city CEO, HoD, start-up incubation expert, and a Domain/Industry Expert. The guidelines are available at https://smartnet.niua.org/3-00864448-78b3-473d-b59f-3851d58f9d5c	IIC Formation Office Order	Yes — 100% Marks No — 0% Marks
2	How many work orders have been issued by the city to start-ups?	1. 4 or more 2. 3 3. 2 4. 1 5. None	After recommendation by the IIC, the city needs to issue work orders for piloting or procuring the solutions.	Copy of work order and pilot completion report	4 or more - 80% Marks 3 - 60% Marks 2 - 40% Marks 1 - 20% Marks None - 0% Marks *Note - In case a city gives a scale-up order to any pilot through Direct Procurement or Bid Challenge Process under the SmartProcure Guidelines, the city will be awarded with 20 % additional marks per pilot, with a cap of 100 % Marks.*
3	Has the ICCC partnered with any incubator to support innovation activities under SmartProcure Guidelines?	Yes / No	The city may partner with incubators to execute pilots as per the SmartProcure Guidelines.	Engagement letter/MoU indicating partnership with incubator.	Yes — 100% Marks No — 0% Marks

3.2.1
CEO's Fortnightly Review Checklist

The CEO's may refer the below indicative checklist to take fortnightly review for ICCCs

S.No.	Category	Checklist	Action taken (for non-Compliance)
1	Use Cases	☐ Are the use cases catering to city's need? ☐ Are all use cases working as per defined SOPs?	
2	Field Devices	☐ Are all the field components (IoT devices, sensors, cameras, WiFi, etc) functional?	
3	ICCC Facility	☐ Is the ICCC infrastructure (IT / Non-IT/ Power) functioning as per defined SLAs?	
4	Cybersecurity	☐ Has the city conducted cybersecurity audit in the last 6 months from the STQC empanelled agency?	
5	ICCC Team	☐ Does the ICCC have sufficient management / technical / operational / staff to run the daily operations? ☐ Is there a training scheduled in next 3 months to enhance the capacity of ICCC Team and spread cybersecurity awareness as per the year-long training calendar?	
6	Inter-departmental Coordination	☐ Are all the relevant departments being involved and consulted in the operations of use cases? ☐ Is there a regular sharing of insights / analysis with all such departments?	
7	Financials	☐ Does the ICCC have sufficient yearly budget for ICCC operation (O&M, human resources, etc) Has the city identified new revenue streams for sustainability of ICCC?	
8	Innovation	☐ Is the Internal Innovation Committee set-up and assisting the ICCC in new use case / application development?	
9	IMAF	☐ Is the city doing self-assessment of IMAF every 3 months? ☐ Are measures being taken to improve the maturity of ICCC as per IMAF scores?	
10	Governance	☐ Are there any approvals / escalations pending at any level? ☐ Is there any pending submission such as RTI response, documents required by GoI, state, other departments, etc.? ☐ Has the city identified the potential risk areas in the operations of ICCC?	

3.3
Part B: ICCC Impact

The Part B assess the actual impact of ICCC on ground created by the use cases. This section will further have two parts as detailed below:

3.3.1
Operational Use Cases in ICCC

This section will assess and rate the ICCC basis the number of operational use cases in the city. The rating shall be calculated as per the section 2.2 Rating Methodology. The indicators are as follows:

#	Operational Use Cases in ICCC	Response	Description	Supporting Documents	Scoring Criteria
1a	What is the number of operational use cases in the ICCC?	1. Above 40 2. 31 to 40 3. 21 to 30 4. 11 to 20 5. 1 to 10	The city must leverage ICCC and operationalise a greater number of use cases to serve the citizens. The city must clearly define SOPs for managing various parameters including Subject Area, Business Need, Possible Triggers, Business Actor(s), System Actor(s), Scenario Overview, Responding to Event or Situation, Analysis, Scenario Supporting Information, and Scenario Outcome Refer the SOP format as per the Operations Manual.	1. List of Operational Use Cases 2. SOPs of all use cases as per the Operations Manual 3. "Overview of Use Case" as per Operations Manual along with Sector name	Above 40 - 75 Marks 31 to 40 - 60 Marks 21 to 30 - 40 Marks 11 to 20 - 25Marks 1 to 10 - 10 Marks No Use case - 0 Marks
1b	In how many sectors the use cases are operational?	1. 10 and above 2. 7 to 9 3. 4 to 6 4. 1 to 3	Same as above	Same as above	1. 10 and above — 25 Marks 2. 7 to 9 - 20 Marks 3. 4 to 6 — 10 Marks 4. 1 to 3 — 5 Marks

3.3.2
Impact of Use Cases

This section will assess the on-ground impact of the use case on various indicators, and it shall require cities to provide minimum five use cases as selected by the assessment agency / MoHUA. However, during the self-assessment cities may randomly select any number of use cases as per their choice. Each use case shall be evaluated on the below indicators.

S.No.	Question	Description	Supporting Document	Scoring Criteria	Total Marks
1	Please describe the identified use case for the ICCC	Description of the use case, major features, stakeholders etc. as per the 'Overview of Use Case' section of the Operations Manual	1. "Overview of Use Case" as per Operations Manual along with Sector name	Nil	NA
2	How many planned KPIs have been achieved by the implementation of the use case?	The city must enlist their planned KPIs. The KPIs must focus on impact and sustainability of the use case. Enlist your planned KPIs and mention which of those have been achieved. Example of KPIs can be as follows: 1. Reduction in citizen grievances 2. Reduction in operational costs through efficient fleet utilization 3. Increase in average traffic speed 4. Reduction of road accidents due to traffic management 5. Reduction in time taken for movement of emergency vehicles 6. Reduction in crime rate 7. Increased green cover in the city 8. Decrease in pollution in the city	1. List of identified KPIs mapped to their achieved value approved by the CEO of Smart City 2. Last 3 months generated reports	7 or more KPIs: 10 Marks 4-6 KPIs: 7 Marks 1-3 KPIs: 5 Marks Less than 1 KPIs: 0 Marks	10
3	Has the city identified potential KPIs across the three defined levels and shared it with the concerned department?	The city must prepare a three-level matrix for the identified use case. *For Example- the use case can be related to water, waste water, SWM, street lights, traffic management, revenue collection, fire and emergency response, security & safety, public transport management, etc.* Please refer the indicative list of KPIs across various sector at Section 3.3.3 — KPIs across key sectors.	1. List of identified KPIs mapped across the three defined levels 2. KPIs shared with the concerned department accompanied by the communication sent to the department	KPIs identified across the three levels - 5 Marks KPIs shared with the concerned department - 5 Marks	10
4	How many insights have been shared with the parent department in the last 6 months?	The city must share the relevant insights with the parent department to take necessary action. *For Example - a repeat accident happening at one junction needs to be informed so that parent department can identify the root cause and take necessary action, a repeat snatching / criminal activity happening at one particular street needs to be informed to the parent department so that requisite security measures can be taken place such as patrolling.*	1. Insights shared with the concerned department accompanied by the communication sent to the department	Above 5 Insights - 10 Marks 3-5 Insight - 7 Marks 1-2 Insight - 5 Marks No insight shared - 0 Marks	10

S.No.	Question	Description	Supporting Document	Scoring Criteria	Total Marks
5	What percentage of complaints / grievances received from citizens are being resolved as per defined TAT (Turn Around Time)?	The city must resolve all the complaints received from the citizens for the said use case. The percentage shall be calculated as the ratio of the no. of complaints resolved as per Turn Around Time vs the no. of complaints received from the citizens. In case the complaints were reopened then the marks will be reduced by the percentage of reopened complaints. The percentage of reopened complaints shall be calculated as the ratio of total no. of reopened complaints vs the total no. of resolved complaints. *For Example - if a city scores 10 marks without incorporating the calculation of reopened complaints and 20% of the complaints were reopened then the final marks will be calculated as 10 Marks - 20% of 10 Marks = 10 - 2 = 8 Marks*	1. Past 3 months consolidated report supported by individual system report 2. The city needs to provide the following details in a tabular format. a. The no. of complaints/ cases lodged by the citizens through ICCC's complaint/ case redressal mechanism. b. No. of cases resolved by the city per TAT c. No. of complaints reopened	Above 90% - 15 Marks 76% to 90% - 10 Marks 60% to 75% - 5 Marks Below 60% - 0 Marks	15
6	What is the estimated percentage of citizens that are directly benefiting from this use case?	The city must list down the number of people getting benefitted from this use case.	1. System generated reports showing the benefits to the citizens 2. Justification for the benefitted population	<5% = 0 Marks 5 - 15% population= 2 Marks 16 - 25% population = 4 Marks 26 -35% population = 6 Marks 36 - 45% = 8 Marks >45% = 10 Marks	10
7	What are the major impacts of this use case?	The city should quantify the impact created on the following aspects- 1. Cost optimisation in any aspect by the implementation of use case (Pre and post scenario to be added) 2. Revenue generated by the ICCC by this use case (if any) 3. Other city wide impact created by this use case. *For Example- x no. of households getting clean water supply, y no. of lives saved because of better accessibility to ambulance, etc.*	1. Details of cost saved 2. Details of revenue generated 3. Other impacts The above details to be approved by the CEO	Cost saving - 6 Marks Revenue generation - 7 Marks Other Impact - 7 Marks	20

S.No.	Question	Description	Supporting Document	Scoring Criteria	Total Marks
8	Has the city defined detailed SOP for the use case?	City should have clearly defined SOPs for managing below Components covering Subject Area, Business Need, Possible Triggers, Business Actor(s), System Actor(s), Scenario Overview, Responding to Event, Analysis, Scenario Supporting Information, and Scenario Outcome	SOP as per the Operations Manual	Subject Area - 1 Marks Business Need - 1 Marks Possible Triggers - 1 Marks Business Actor(s) - 1 Marks System Actor(s) - 1 Marks Scenario Overview - 1 Marks Responding to Event - 1 Marks Analysis - 1 Marks Scenario Supporting Information - 1 Marks Scenario Outcome - 1 Marks	10
9	How many mock drills have been conducted in the last 1 year?	The city must conduct regular mock drills for strengthening the use case. It shall enable city to regularly identify gaps and improve them during the drills. The drills will also effectively involve all the stakeholders in the SOP improvement process. Mock drill is a complete demonstration of how to react whenever a disaster / event occurs. Benefits of mock drill as follows: 1. It helps us identify potential errors and risks. 2. It improves coordination between different departments to effectively manage the real even / disaster happens. 3. It shows how to save property / lives, helps us to improve the SOP and prepares it well for the actual scenario	1. Mock Drill Report	Quarterly Mock drills - 15 Marks Half-yearly Mock drills - 10 Marks Annual Mock drills - 5 Marks No Mock drills - 0 Marks	15

3.3.3
KPIs across key sectors

This section mentions the indicative list of KPIs which are supposed to be tracked by the respective line department across the three levels for effectively leveraging ICCC in cities. The city must prepare a three-level matrix for each of the operational use case. *For Example, the use case can be related to any of the sectors / domains such as solid waste, water, wastewater, disaster, energy, security & safety, mobility, etc.*

The three levels are as follows:

Level 1 - Monitoring / Situational Awareness:
These KPIs will be monitored by the line department to increase the on-ground situational awareness for taking necessary action.

Level 2 - ICCC enabled execution of SOPs and interdepartmental coordination:
These KPIs will be needed for execution of the SOP such as any alerts, notification, etc. and will be required to track the interdepartmental coordination for providing quick and efficient solution to the citizens/end user.

Level 3 - Decision support enabled by Data Analytics:
These KPIs will be required to bring out the insights / intelligence from the ICCC. These KPI can help line department to take data driven decision backed by evidence and trend. The KPIs may be examined against the following dimensions:

A) **Time: Change in trends over time, patterns, etc.** *For Example - How has performance changed over time? Are there particular patterns based on season / month / day of week / time of day?*

B) **Space: Geographic jurisdictions, land use, urban form, density, etc.** *For Example- How does the performance vary across different spatial blocks (use GIS data)?*

C) **Demography: Population; gender, age, income, etc.** Does KPI vary across areas with different income profile? or how is performance per capita female?

D) **Cross-functional / Dept: Cross-functional analysis against other department data - How has KPI changed with change in KPI of another dept. that has bearing on this KPI?** *For Example- Has emergency response time improved with increase in average traffic speed?*

The indicative list of KPIs for various sectors / domains are given below:

Solid Waste Management

Level 1 - Monitoring / Situational Awareness

- Percentage of Waste Collection (Dry Waste / Wet Waste / Medical Waste / E-Waste / Hazardous Waste / Construction & demolition Waste)
- Door to Door Waste Collection (Wet / Dry)
- Vehicle Deployed for Waste Collection (Dry Waste / Commercial D2D Waste Collection)
- Segregation of waste at source
- Vehicle Tracking and Monitoring (Route, breakdown, coverage, km travelled, speed of travel, etc.)
- Fuel Monitoring (Running KM, Engine Running Hrs, Engine Idle Hrs, Fuel Refill, Fuel Drain, Fuel Consumption)
- Manpower Tracking and Monitoring (attendance, ward wise allocation, etc.)
- Road Cleaning / Street Sweeping
- Bin overflow / clearance / littering / dump yard garbage / debris / C&D
- Monitoring MRF / Bio CNG / Bio Methanation / Bio Mining

Level 2 - ICCC enabled execution of SOPs and interdepartmental coordination

- Vehicle breakdown repairing / replacement of vehicle
- Manpower availability on ground
- Operational issues like network failure, service interruption, asset maintenance, etc.
- GPS enabled vehicle tracking

Level 3 - Decision support enabled by Data Analytics

- Identification of blind spots (places where no coverage of waste is being done)
- Vehicle breakdown details (breakdown area, any specific vehicle getting breakdown, any specific vendor leading to noncompliance in vehicle)
- Coverage of door-to-door waste collected in the city

- Attendance analysis
- Revenue generated per ton (through waste processing)
- Segregation percentage (Zone wise, ward wise)
- Landfill utilisation
- Household coverage (ward wise)
- Waste recycling rate
- Waste transported per vehicle
- Manure Sales & Production
- Household level coverage of municipal solid waste collection
- Efficiency of collection of municipal solid waste
- Extent of municipal solid waste recovered through reuse

Smart Semi-Underground Dustbins, Visakhapatnam
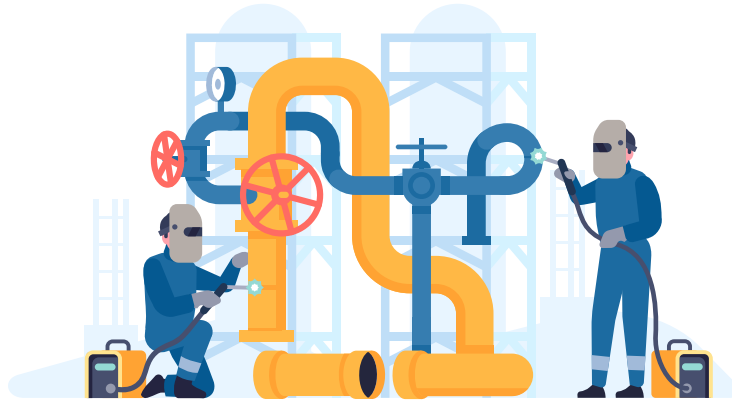
Water & Wastewater Management

Level 1 - Monitoring / Situational Awareness

- Real-time flow monitoring of water sources
- Detection of leakage/damage in the real-time pipeline of the water supply facility
- Pump failures (days/pump/year)
- Main Pipeline failures (No./100 km/year)
- Pressure of water flowing from the water storage tank
- Acidity level or basicity level observed in the water source.
- Flow or current of water flowing at different locations in the piped network
- Current water level in the water storage tanks
- Raw water storage capacity (days)
- Transmission and distribution storage capacity (days)
- Total number of functional metered water connections / total number of water supply connections (including public stand post connections)
- Monitoring of suspended / settleable solids, total / volatile solids, COD, BOD5, pH, oil, sludge, and grease concentration
- Quality of water supplied
- Level of Non-Revenue Water (NRW)
- Monitoring water pressure / water flow / water leakage / water quality monitoring

Level 2 - ICCC enabled execution of SOPs and interdepartmental coordination

- Complaints: Number of complaints made by consumers that have been redressed by the ULB, as per service charter standards. *For Example- Pressure complaints, Continuity complaints, Water quality complaints, Interruption complaints*

Level 3 - Decision support enabled by Data Analytics

- Non-Revenue Water (NRW)
- Water consumption not billed
- Illegal water connections, water theft and metering inaccuracies.
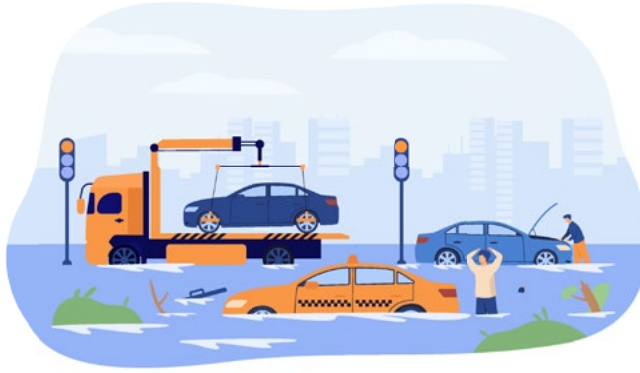
Disaster Management

Level 1 - Monitoring / Situational Awareness

- **Fire:** Weather conditions, such as temperature, humidity, and wind speed, that may impact fire risk
- **Flood:** Rainfall intensity and duration
- **Flood risk index:** An index that combines various monitoring data to provide an overall assessment of flood risk in different areas of city
- **Flood:** Capacity of the city's drainage systems to handle excess water and identify potential bottlenecks.
- **Flood:** Rainfall forecasting / Early Warning system
- **Flood:** Live stream of vulnerable points like subway, canal and river mouth
- **Cyclone:** Wind speed & Intensity
- **Health:** Capacity of healthcare facilities to handle potential health emergencies, including bed availability, medical supplies, and personnel.
- **Health:** Population health indicators, such as vaccination rates, disease prevalence, and hospitalization rates, to detect changes that may indicate emerging health threats.
- **Health:** Epidemic curve to visualize the progression of the disease outbreak and identify trends or changes.

Climate Disasters monitoring through ICCC, Surat
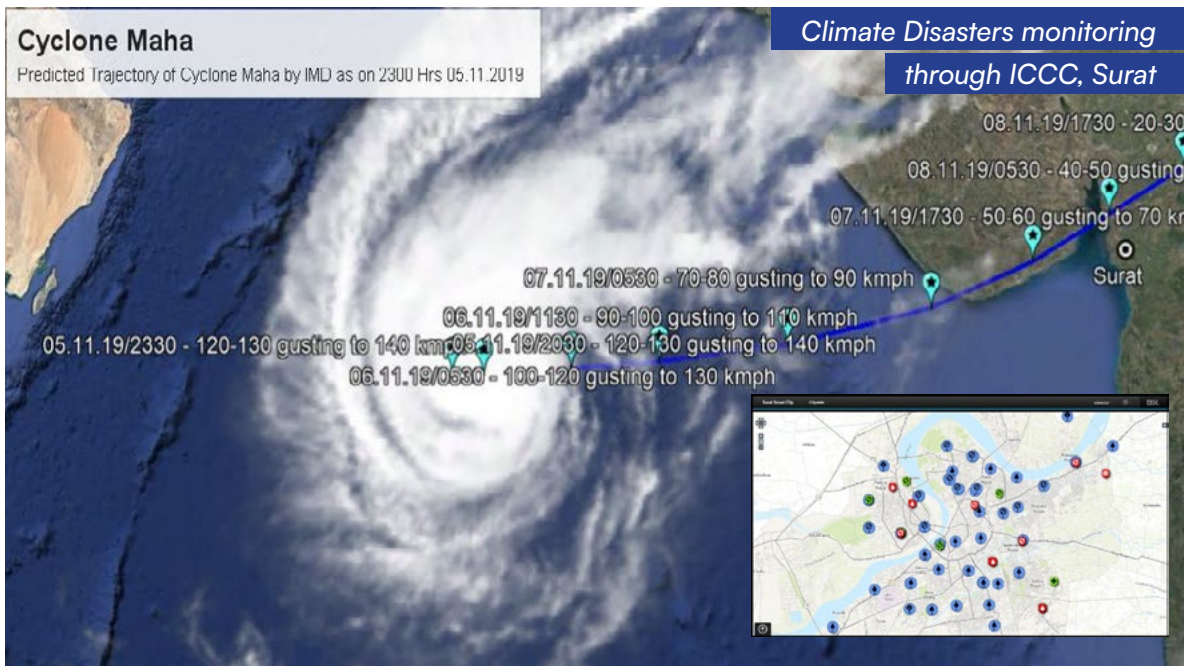
Level 2 - ICCC enabled execution of SOPs and interdepartmental coordination

- Sensor maintenance and calibration
- **Flood:** Time to issue flood warnings
- **Flood:** Accessibility of flood-related data to relevant stakeholders, including emergency responders, city officials, and the public.
- **Health:** Integration and sharing of health data among different agencies and stakeholders to ensure a coordinated response.
- **Health:** Timely reporting of health emergencies to regional or national health authorities for a coordinated response.

Level 3 - Decision support enabled by Data Analytics

- **Fire:** Analyse fire behaviour modelling data to better understand how fires spread and develop appropriate response strategies.
- **Fire:** Categorize fire incidents based on their severity *(For Example- minor, moderate, major)* to understand the impact and resource requirements for each category.
- **Fire:** Categorize the causes of fire incidents *(For Example- electrical, cooking, arson) to focus on specific prevention strategies.*
- Effectiveness of communication channels used to relay critical information among response teams, agencies, and the public during incidents.
- Evaluate how information is gathered, processed, and disseminated among different agencies and stakeholders for response to victims
- Effectiveness of data analytics in optimizing response times by analysing historical response data and traffic patterns.
- **Flood:** Frequency and accuracy of early warning system to determine their reliability in anticipating flood events
- **Flood:** Resilience of critical infrastructure, such as roads, bridges, and drainage systems, to withstand and recover from flood impacts.
- **Flood:** No of flood warning issued in last 3 months
- **Flood:** Advance prediction of flood inundation scenarios and increase in time available to prepare for managing the upcoming flood
- **Flood:** The reduction in loss of lives during any disaster
- **Flood:** Identification of natural rainwater flow blockages
- **Flood:** Planned evacuation system
- **Health:** Evaluate the time taken for relevant authorities to be notified about unusual health events or suspected cases.
- **Health:** Geospatial analysis to identify clusters and hotspots of health emergencies for targeted response measures.
- **Health:** Analyse the distribution of cases among different age groups and demographic characteristics to identify vulnerable populations.
- **Health:** Number of in-patient hospital beds per 10,000 population
- **Health:** Healthcare professionals per 10,000 population
- **Health:** Average response time in case of health emergencies
- **Health:** Period prevalence of water borne diseases
- **Health:** Period prevalence of vector borne diseases

Mobility Management

Level 1 - Monitoring / Situational Awareness

- Red Light Violation Detection
- Speed Violation Detection
- Free Left Blocking Violation Detection
- Real-time parking availability information
- Geographical coverage of public transport
- Availability of public transport on important routes
- Availability of Passenger Information System
- Enable dynamic parking tariff to be implemented to facilitate demand management
- Dynamic bus scheduling
- Way given to ambulance / emergency vehicles
- Monitoring of general offence *(For Example- improper number plate, illegal parking, stopped vehicle crossing signal lines, etc.)*
- Monitoring of entry of vehicles to restricted Zones
- Efficient management and monitoring of potholes

Intelligent Traffic Management System, Kalyan-Dombivali

Level 2 - ICCC enabled execution of SOPs and interdepartmental coordination

- Emergency vehicle dispatches facilitated by ICCC or Dial 100 or Dial 108
- Enable enforcement of penalties on parking violations and collection of penalties via Enforcement mobile application
- Viewing, analysing the CCTV feed and monitoring and managing of crowd movement, Parking conditions
- Vehicle breakdown repairing
- Traffic diversions based on traffic in identified roads
- Operational issues like network failure, service interruption, asset maintenance, etc.

Level 3 - Decision support enabled by Data Analytics

- Reduction in stoppage time
- Increased Travel Speed
- Change in number of all reported accidents per vehicle km
- Traffic-related fatality per lakh population
- Improvement in Traffic Related Emergency Notification and Personal Security
- Extent of signal synchronization
- Optimized cycle times of intersection to regulate and maintain free flow of traffic to enhance the efficiency of the road and transport infrastructure.
- Percentage of urban intersections providing safety enhancements for pedestrians and disabled or other vulnerable road users
- Change in crime reports relating to illegal parking
- Reduction in operational costs through efficient fleet utilization
- Increased convenience to commuters and reduction in traffic congestion
- Effective management of City Bus Operations
- Reduction in time taken for movement of emergency vehicles
- Percentage improvement in parking revenue through utilization of digital payment methods for paying parking charges
- Public Transport journey time reliability — deviation from scheduled timetable
- Geographical coverage of public transport
- Availability of public transport
- Mode share of public transport
- Percentage of road network with dedicated bicycle tracks
- Percentage of interchanges with bicycle parking facilities
- Mode share of non-motorized transport
- Availability of Passenger Information System
- Availability of paid parking spaces
- Percentage coverage of footpaths — wider than 1.2 m
- Percentage of traffic intersections with pedestrian crossing facilities
- Extent to which universal accessibility is incorporated in public right-of-way
- Percentage coverage of footpaths
- Percentage coverage of bicycle paths
- Percentage of interchanges with bicycle parking facilities

Energy Management

Level 1 - Monitoring / Situational Awareness

- No. of streetlights on/off (hourly basis, night, day)
- Non-functional lights
- Luminosity as per ground situation
- GIS based mapping of the Smart Lighting System in a city
- No. of controller to remotely on/off the streetlights
- Energy Parameters such as voltage, current, voltage fluctuation, power consumption for each individual light as well as a group of lights
- No. of streetlights stolen / missing
- No. of complaints received / resolved
- Solar Rooftop: Installed and Energy Monitoring
- No. of solar roof tops installed, and monitoring of energy generated

Level 2 - ICCC enabled execution of SOPs and interdepartmental coordination

- SLA management for repair
- Maintenance of Street lights: Detect failures of lights and other circuitry and generate alarms for maintenance automatically
- Complaint management for addressing streetlight grievances

Level 3 - Decision support enabled by Data Analytics

- Learning occupancy pattern on roads and predict occupancy state of roads for future planning.
- Analyse if any Light has fused before time i.e. before burn hours as specified in the supplier's document
- Data analytics on routes where lights can be alternate lit during low traffic density
- Time-based scheduling with intelligent weather adaptive lighting control.
- Analysis on power consumption used in street lighting during different time of the day
- Analysis of potential power saving if the source of power is changed to solar power in future.
- Analysis on power consumption used in street lighting with the base power calculated

- Percentage of households with authorized electrical supply
- Percentage of electrical connections covered through smart meters
- Average number of electrical interruptions per year
- Average length of electrical interruptions per year
- Percentage of total energy derived from renewable sources
- Energy consumption per unit - water supply and sewerage
- Energy consumption per unit - street lighting
- Percentage of new and redeveloped buildings following green building norms
- Total energy consumption per capita

Floating Solar Power Plant, Tirupati

Environment Management

Level 1 - Monitoring / Situational Awareness

- Temperature, Humidity
- Ambient Light
- Gases - CO, NO2, O3, SO2, CO2
- Air Pressure
- UV Radiation
- PM2.5
- PM10
- Noise Pollution
- Air Quality Index
- Quality of water in public surface water bodies

Level 2 - ICCC enabled execution of SOPs and interdepartmental coordination

- Notification to concern authority on breaching the defined threshold levels
- Displays of air quality status on VMDs
- Communication & Coordination with concerned departments such as municipal, traffic, pollution control board, NGOs etc. for necessary actions.

Level 3 - Decision support enabled by Data Analytics

- Trend analysis of pollution in different times of the day
- Trend analysis of pollution at busy junctions of the city
- Improved management of pandemic situations in the city
- coordination of data feed with Traffic Police and Environment Department.
- pollution control plan for the areas having higher AQI index
- traffic movement to lower the AQI and provide data to coordinate with key NGOs and environment activist group for evidence-based planning
- Increased green cover in the city

Safety & Security

Level 1 - Monitoring / Situational Awareness

- Monitoring calls from Emergency Call Boxes
- Abandoned baggage detection
- Crowd monitoring
- 24x7 CCTV Surveillance
- Continuous footpaths and walkways
- Well-lit streets at dark hours
- Universally accessible pedestrian pathways
- No potholes or open manholes on road
- Speed limit enforcement
- Broken tree / water logging on roads / Encroachments
- Wrong way detection / one way entry
- No Helmet Detection
- Triple Ride Detection
- No Seatbelt Detection
- Driver Talking on Phone while Driving

Level 2 - ICCC enabled execution of SOPs and interdepartmental coordination

- Emergency vehicle dispatches facilitated by ICCC or Dial 100 or Dial 108
- ECB connected with line departments, Police, Fire, Hospitals, etc.
- Emergency notifications displayed in VMDs which are installed on roads/signals.
- Faster & integrated emergency response Safety for Women, Child & Senior Citizens

Level 3 - Decision support enabled by Data Analytics

- Reduction in crime; monthly, quarterly, annually
- Percentage of Cases solved: Kidnapping, Chain snatching, Theft, etc.
- Change in number of all reported accidents per vehicle km
- Traffic-related fatality per lakh population

- Improvement in Traffic Related Emergency Notification and Personal Security
- Analysis of most crime prone top 5 areas
- Analysis of reduction on field deployment staff of police
- Analysis of traffic black spots, where there is history of fatal accidents
- Analysis of Non-Motorised Transport and pedestrian safety in the city based on accidental data
- Number of CCTV cameras installed in the city per unit of road length
- Number of recorded crimes per lakh population
- Extent of crimes recorded against women, children, and elderly per year
- Reduction in the no. of dark spots in the city
- Safety score mapping from third party sources

Crowd monitoring through ICCC, Prayagraj
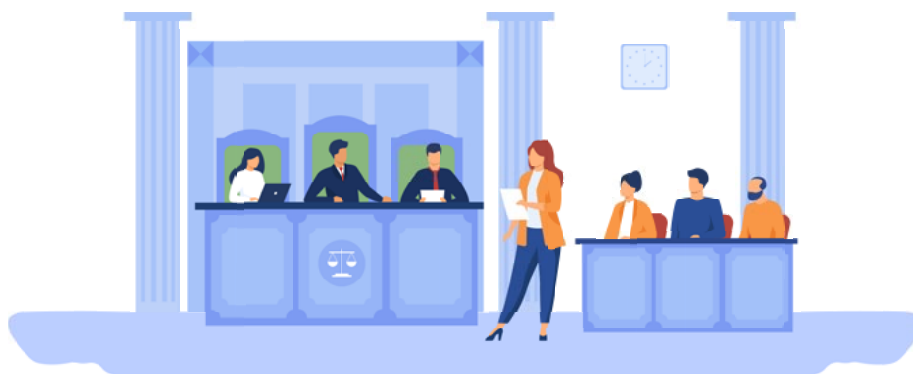
Public Grievance

Level 1 - Monitoring / Situational Awareness

- Overall Complaints Received, Resolved and pending
- Department wise complaints Received, Resolved and pending
- Category wise complaints Received, Resolved and pending
- Official's wise complaints Received, Resolved and pending
- Source wise complaints Received, Resolved and pending (like call Center, Social medias, Online portal, petitions, post, etc.,)
- Escalated complaints (like, AE, EE, CE, DC and Commissioner)
- GIS based mapping of complaints

Level 2 - ICCC enabled execution of SOPs and interdepartmental coordination

- Initial response and acknowledgment from respective department
- SLA management for complaint redressals
- Grievance Escalation and Routing
- Regular Updates about grievances
- Resolution Communication
- Feedback Collection from department and Analysis
- Data Management and Reporting
- Operational issues like Call centre, network failure, service interruption, etc.

Level 3 - Decision support enabled by Data Analytics

- Data analytics on routes where/category more complaints are registered
- Data analytics on hotspots of grievance
- Data analytics on specific department/official where grievances are more prevalent
- Predictive analytics to anticipate potential grievances or employee dissatisfaction
- Average delay in grievance redressal
- Identify the key areas that are most relevant to predicting grievances
- Sentiment analysis techniques to assess the overall sentiment of public discussions and end user feedback about the grievances closed.

04
Annexures

Intelligent Traffic Management System (ITMS), Agra

4.1
Annexure I: Technology In Smart Cities

4.1.1
Role of Technology

Cities in India are growing at a rapid pace and so are challenges faced by them, which have multiplied since their limited resources are under tremendous stress. They are trying to meet citizens' aspirations and expectations with available resources, assets, finances, and manpower. They are leveraging technologies to do more with less and to address challenges in service delivery, civic operations, and deal with complex situations in real-time.

Today we are witnessing a technology revolution commonly referred to as the fourth Industrial revolution which is driven by emerging technologies like AI, ML, Blockchain, Drones, Cloud, Data Analytics. These technologies are disruptive in nature and will have a significant impact on the way we live, way we move and way we operate our businesses. These emerging technologies are helping cities in managing complex situation by collecting, processing, analyzing data at breakneck speed in real-time which was not possible earlier. Due to recent advancement in computing and storage capabilities these technologies and solutions are affordable and accessible. Next generation of urban enterprises will have significant dependence on digital technologies, data sciences and will adopt new ways of managing resources and doing business.

The same also gets reflected when one analyses the technology infusion being undertaken in various cities as part of the Smart Cities Mission. 100 Smart Cities in India have taken a quantum leap to embrace, adopt & adapt technology to reimagine the way cities deliver citizen services, manage their infrastructure and core civic operations with the objective to deliver quality of life to its citizens and local businesses. These cities have started embracing technology solutions in a planned and structured manner. Connectivity infrastructure is being enhanced by various Smart Cities to cater to future bandwidth requirements.

Technology has been leveraged by cities quite well in handling Covid-19 crises. ICCCs were converted into Covid-19 War Rooms, supported by many solutions developed in an agile manner. Industry too has been supportive in such a compelling time towards such efforts.

Like clean drinking water and healthcare, we must ensure that technology is perceived and leveraged as a public good in Smart Cities. Technology is to be treated as the means to achieve the end outcomes i.e., quality of life, economic ability, and sustainability. We must also ensure public participation during design and implementation of technology projects in Smart Cities. Thus, there is a greater need today to discuss, debate and deliberate on how cities should conceptualize, design and implement our technology projects.

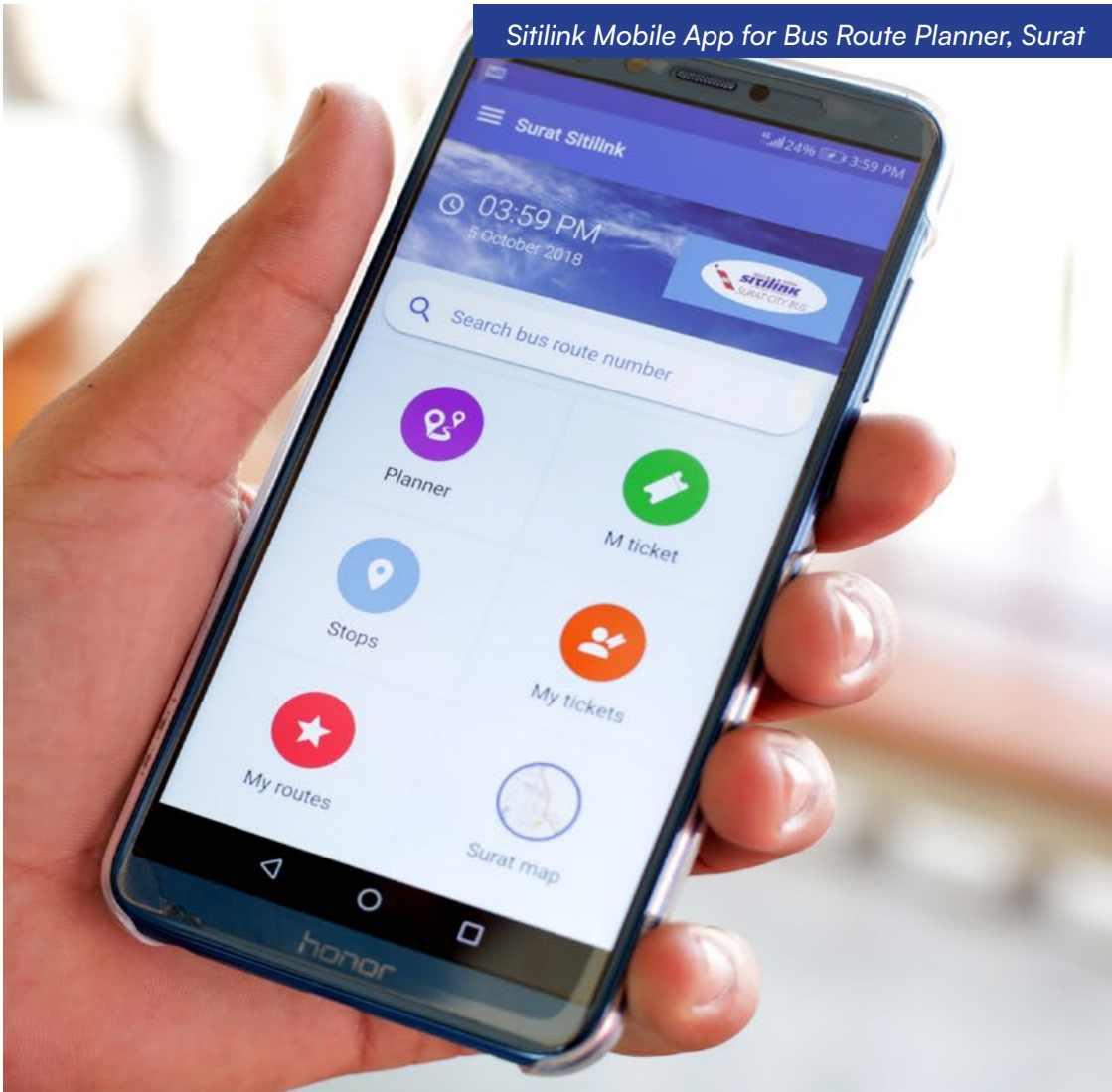|		
Improved access to information	**Making Cities Safer**	**Improved traffic management**
Improved energy efficiency	**Encouraging greater collaboration**	**Improved disorder resilience**
Efficient resource management	**Efficient citizen service delivery**	**Efficient project management**

Sitilink Mobile App for Bus Route Planner, Surat

4.1.2

Technology Stack for Smart Cities

While different cities have implemented/implementing various solutions, the central theme being adopted is to create Data Driven Governance. A typical technology stack to drive this Data Driven Governance involves following 3 layers:

Decision Support Layer

- Data Correlation, Integration, Dashboard

- Alerts and Notifications, Standard Operating Procedures (SoPs)

- AI/Data Analytics, GIS based Visualization, Predictive Modeling

Domain/Business Applications and Services Layer

- Applications managing various sensors (like Video Management System, Parking Management System, VMD Management System, ITMS, etc.)

- Applications catering to Civic Services to Citizens/Businesses like Building Permission Management System, Birth/Death Record Management System, License Management System, Property Tax System, Water Billing System, etc.

- Applications for various city infrastructure monitoring/management like Hospital Management, School Education Management, Theatre/Open Space Management, City Bus Management, Street Light Management, etc.

- Applications for effective management of internal functions like Human Resource Management System, Asset Management System, Legal Case Management System, Finance, Project Systems, Software developed for Covid-19 Management, etc.

Core Data Infrastructure Layer

- Master Data of Assets/Systems, GIS Data, User Registry

- Data from different sensors like CCTV cameras, Drones, Parking Sensors, Water/Pollution sensors, VMDs, GPS devices, etc.

The 3 technology layers mentioned above are required to be supported by fusion/ integration of multiple initiatives to deliver effective outcomes to all the stakeholders. Integration with all the relevant external systems is key to bringing convergence and avoidance of duplicity. What is also equally important is the IT Security provisions at all levels.

Technology ecosystem is constantly evolving & Smart Cities have been experimenting / implementing cutting edge initiatives.

Following is the list of few of such cutting-edge initiatives already undertaken/being undertaken by various Smart Cities in India:

AI, ML	Video Analytics	Blockchain
Digital Twin	**Virtual Reality**	**Drones**
Software as a Service (SaaS)	**Infrastructure as a Service (IaaS) such as DC on Cloud**	

Integrated Command & Control Centre, Surat
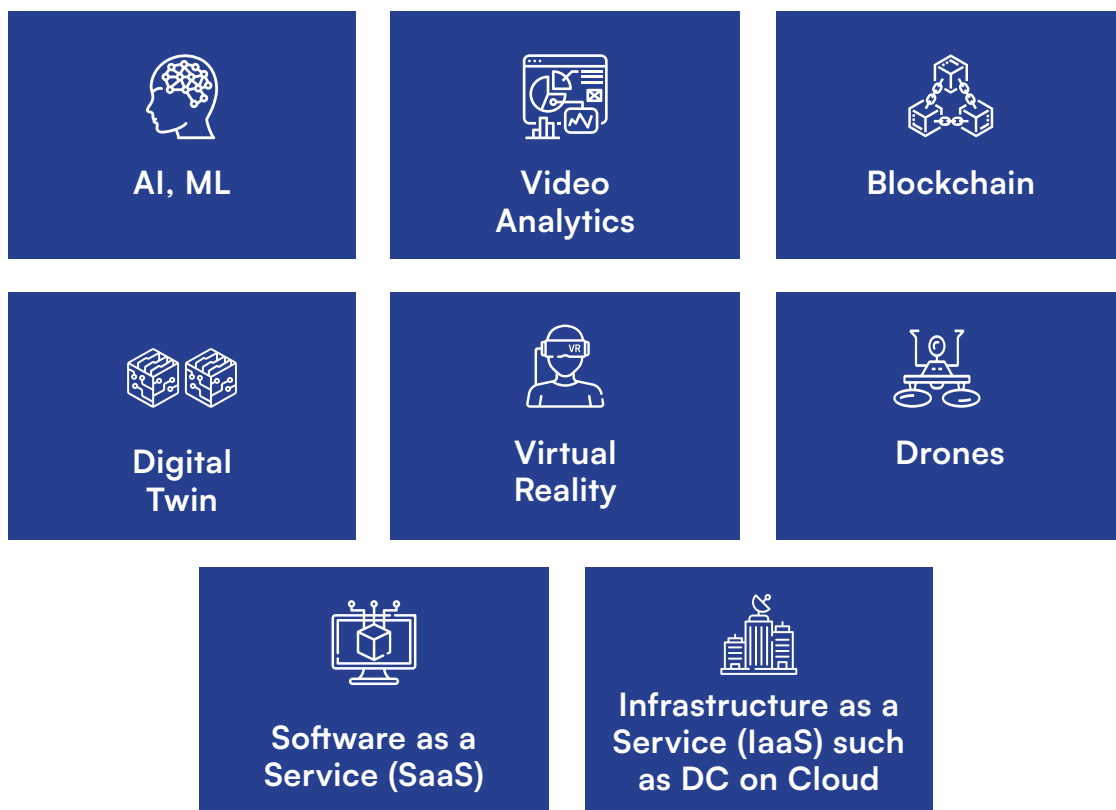
A model blueprint for the complete technology ecosystem in Smart Cities is given below, which can be used by cities as a reference functional architecture.
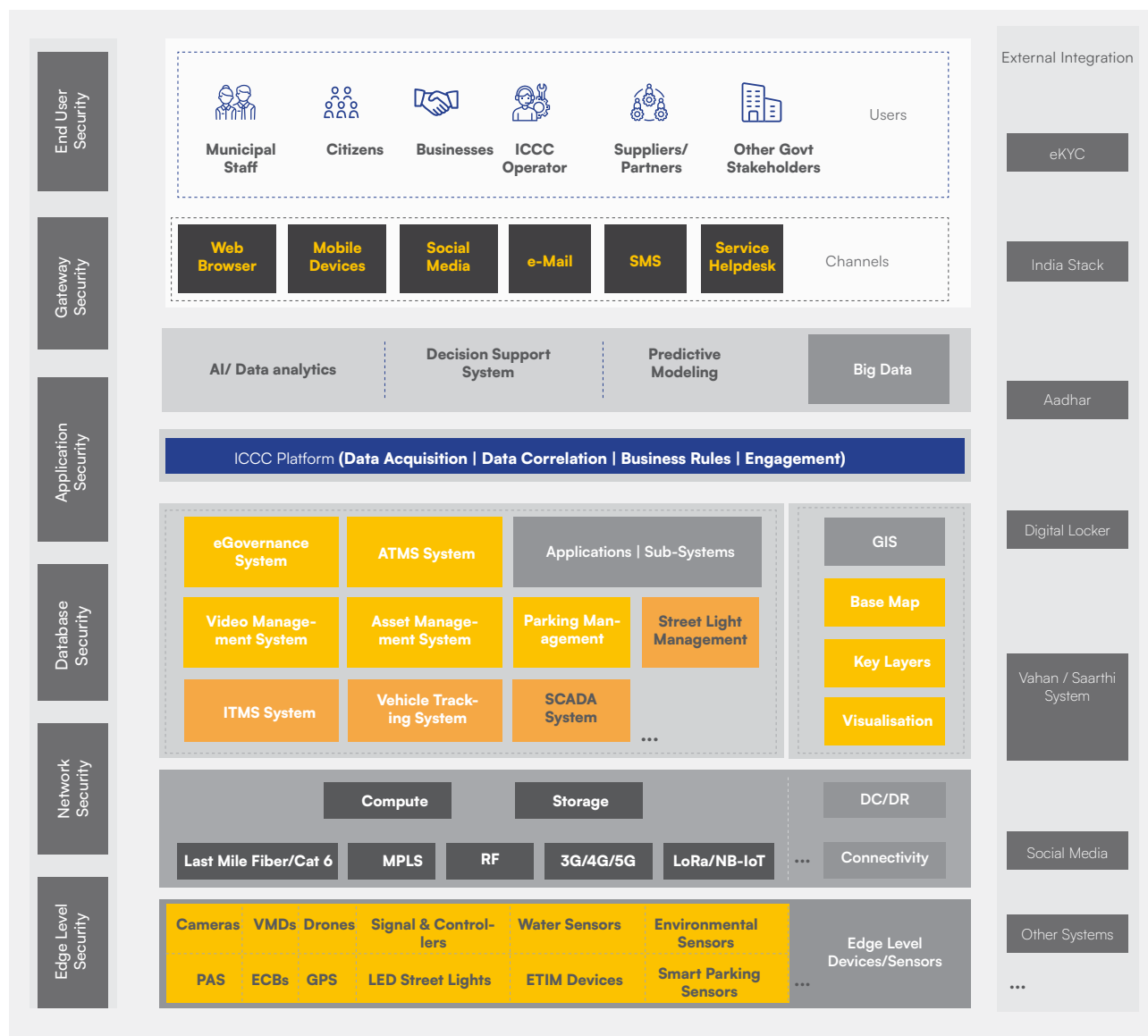
Figure 1: A model blueprint for technology ecosystem in Smart Cities

Smart Cities technology blueprint is an indicative blueprint which provides 360-degree perspective to Smart Cities stakeholders. It will guide decision makers at the city level to plan and formulate their enterprise level digital strategy, policies, processes, project budgets and resourcing.

4.2
Annexure II: ICCCs at Smart Cities in India

4.2.1.1

About Integrated Command & Control Centres (ICCCs)

India 's Smart Cities have increasingly become spaces for social and cultural evolution, apart from becoming key avenues for economic development. These multitudes of aspirations put tremendous pressure on the nature and degree of evolution in a city, which requires a steady stream of support in day-to-day civic operations and early warning systems to ensure that the city is inclusive and sustainable in serving the aspirations of its residents.

A giant leap to effectively tap the enormous data available to city administrations & create actionable intelligence has been the deployment of state-of-the-art Integrated Command and Control Centres (ICCCs). Experiences from the Covid-19 pandemic and other efficiencies unlocked through ICCCs, have shown us how effective a tool well-developed ICCC system can be in the hands of city administrators.

Similarly, the city can utilize the ICCCs to effectively monitor various operations of city administration and use its advanced analytical capabilities to plan for any future challenges. ICCCs are a great opportunity for cities to leverage technology and drive inclusion, efficiency and innovation. These ICCCs shall become strategic assets for cities and are envisaged to be the brain for city operations, handling day-to-day operations as well as exceptional scenarios and disaster/crisis management. The sensors and edge devices will capture and generate real-time data from various utilities such as water, waste management, energy, mobility, built environment, education, healthcare and safety. ICCC as a platform through its different layers and components will act as a Decision Support System (DSS) for city administration to respond to real-time events by consuming data feeds from different data sources and by processing information out of data sets.

Integrated Command & Control Centre, Bhubaneshwar

Indicative municipal and non-municipal services which can be supported well by ICCCs as depicted below:

City Infrastructure Management

| Dasboards for project monitoring and analysis | Drone based monitoring of construction activity or infrastructure maintenance checks | Fleet Management (SWM, Fire Dept, Ambulance) | CCTV Monitoring for Critical Infrastructure, etc. | Management of Street Lights | Water Supply & Sewage management (SCADA system) |

Civic Services Monitoring

| Property Tax collection monitoring | Grievance Redressal monitoring | Real-time collaboration with Ward Offices | Environmental & Water Quality Monitoring | Dynamic Messaging & Advertising | CCTV Monitoring for Garbage |

Traffic & Transport Management

| Signal Management | Traffic Enforcement | Parking Monitoring / Management | City Transport Management |

Safety & Surveillance

| CCTV or drone based surveillance for law & order | PA System for Centralized Crowd Management | Emergency Call Boxes for enhanced safety of women, elderly & children | Predictive Policing |

Disaster Risk Simulation and Prediction

| Covid-19 Management | Flood Management | Fire Incidences | Any other Man-made/ Natural crisis | Predictive Disaster Forecasting |

4.2.1.2

Key objectives of ICCC

ICCC are intended to be brain and nervous system of the city for monitoring & managing various key functions. Core objectives to be attained through a well- designed ICCC are listed below:

- Monitoring and management of various city infrastructure/utilities like water, streetlights, solid waste management, roads development, etc.
- Continuous analysis of data, preparation of dashboards for effective decision making by department heads, city leadership, creating simulations
- Increasing the situational awareness within city by providing insights using data across urban functions
- Faster response to the incidents, crisis situations; creating disaster resilience
- Enhancing collaboration across multiple departments within and outside urban local bodies and other government bodies
- Enhanced communication across different stakeholders in the city, including citizens, in day-to-day matters as well as during crisis situations
- Real-time Urban Planning
- Please refer to subsequent section for an indicative list of use cases

4.2.1.3

ICCC Platform: Four key layers

While ICCC is a functional unit, for its effective operationalization, a software platform (or set of applications) is needed to acquire data from various sub-systems, which can orchestrate a coordinated response and create a decision support system. Hence, the ICCC platform can aptly be called as a system of systems. The ICCC Platform plays a key role in delivering the core purpose of the overall ICCC facility. The core 4 functionalities required in a standard ICCC Platform are explained below:

A. **Data acquisition engine:** to ingest data from different edge devices (sensors, devices, actuators), various sub- systems, open APIs and systems

B. **Data correlation & analytics engine:** to analyze the multidimensional data and create patterns, trends, correlation and forecasting for decision making purposes in real-time. The engine also facilitates the analysis in different visual formats

C. **Business rules engine:** to configure or automate processes to handle events in different scenarios.

D. **Communication engine:** to connect with edge devices, mobile assets and resources to enable the communication or facilitate the management of different systems.

The ICCC Platform plays a key role in delivering the core purpose of the overall ICCC facility. ICCC is a general terminology and can be referred to as Command and Control Centers or Smart City Center. The 4 core functionalities required in a standard ICCC Platform are explained below:

A. Data Acquisition Engine

The data acquisition engine aggregates static and real-time data feeds from different sensors/ IoT devices like cameras, metering devices, telematics devices, applications, departmental databases, etc. This includes, *For Example, data on air and water quality, ambient luminosity, disasters, traffic, solid waste, etc.* This enables other functional layers of ICCC to aggregate, process and consume the data for deriving information.

Surveillance

Camera Feed
- Fixed camera
- PTZ Camera
- Perimeter Fencing
- Private Camera Feeds

Safety & Security
- Emergency Kiosk
- Panic Button
- Data Feed from Social Media

Transit
- GPS Tracking
- RFID Tags Readers
- Sensors (induction loops, microwave, radars, laser, detection, etc.)
- Variable Messaging display
- Ticketing Data
- Automated Fare Collection System

Traffic
- Traffic Camera Feed
- Speed Detection Camera
- ANPR
- Red Light Violation Detection
- Parking Violation Detection
- Toll Management
- Congestion Detection
- Road Accident

Emergency

- Road Accident
- Fire Sensors
- Flood Sensors
- Flow Detection
- Leakage Detection: Water/Gas
- Air Quality Detection
- Hospitals in-patient data feed
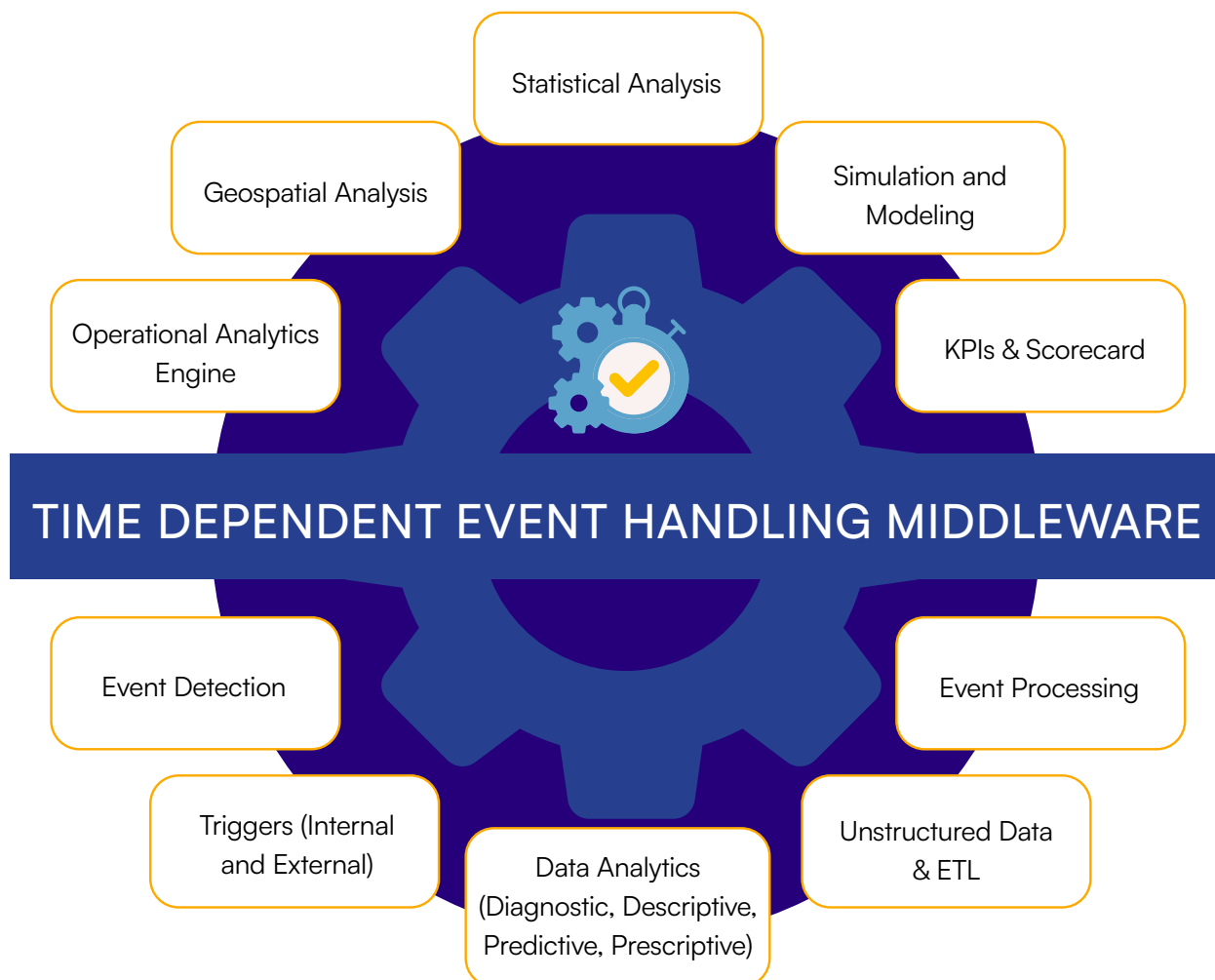
Others

Data Feed:
- Disaster Response Cell
- Solid Waste Department
- Health
- Street Light
- Hospitals, Labs
- Weather Department
- Property Tax

B. Data Correlation & Analytics Engine

The data correlation and analytics engine analyzes information to show trends, patterns and insights, in visualized forms that guide towards prompt decisions. It comprises components for extraction and transformation of data from different systems, data sources and data formats. *For Example- health records are captured from Integrated Hospital Management System, traffic inform ambulance can be tracked using Vehicle Tracking System in different formats.* ICCC Data Aggregation and Analysis Engine can process the information to allow users to use information from different systems as per requirements.

Statistical Analysis
Geospatial Analysis
Simulation and Modeling
Operational Analytics Engine
KPIs & Scorecard

TIME DEPENDENT EVENT HANDLING MIDDLEWARE

Event Detection
Event Processing
Triggers (Internal and External)
Data Analytics (Diagnostic, Descriptive, Predictive, Prescriptive)
Unstructured Data & ETL

This engine has data aggregation, normalization and data models with the following capabilities:

- Collect and integrate sensor/IoT devices data from multiple sources
- Normalize the aggregated data to a common data model to make comparisons more meaningful so that city administration can construct working digital models of their communities
- Expose APIs through which application developers and vendors can plug in to the city management infrastructure and provide public service capabilities.

The application developers/vendors can use the platform APIs and build applications on top of platform consuming the data model exposed as part of these APIs.

Data Analytics components are used to perform data churning to derive intelligence from different datasets across the domain. This intelligence can then be used for exception handling and visualization in different scenarios through various analysis using ICCC components or third-party tools/applications, such as:

a) Predictive Analytics   d) Sentiment Analytics
b) Diagnostic Analytics   e) Video Analytics
c) Prescriptive Analytics

This engine enables ICCC to derive intelligence from the information collected from Data Acquisition and Visualization Engine.

C. Business Rules Engine

The Business Rules Engine helps correlate the information, configure Standard Operating Procedures (SOPs), manage external and internal triggers, policy implementation, and handling of complex events. This engine enables ICCC to handle the events to make real-time decisions as per the configured protocol.

| Operational Logic: Rule Engine | Access Rule Base & Engine | Configuration Management | Policy Management | Complex Event Processing |

It helps in configuring or automating the operations in different scenarios, *For Example:*

a. Defining and configuring an event
b. Defining and configuring external/internal trigger
c. Defining and configuring event response
d. Defining and configuring responsibility matrix
e. Defining and configuring incidents and change requests
f. Defining and configuring user access and authorization
g. Defining and configuring access policy of field assets

This engine at ICCC allows to communicate with different systems. Few examples are mentioned below:

i) Configuring Events and Responses for Water Supply operations:
a. Configuring alerts and notifications using smart metering for water usage/consumption
b. Configuring events and triggers over data emanating through SCADA system for managing water operations
c. Configuring response protocols in case of leakage detection
d. Configuring response protocols in case of effluent detection etc.

ii) Event and Response Management for waste-water Treatment
a. Configuring alerts and notification using SCADA for waste-water treatment systems for its on-field employees
b. Configuring alerts and notification using for level detections at treatment plant
c. Configuring events and trigger for managing energy consumptions of pumping control systems for storm water management

D. Communication Engine

The Communication Engine will house the action-oriented SOPs, incident response dispatches and management systems (rules engines, diagnostics systems, control systems, messaging system, events handling system), and reporting/dashboard system to provide actionable information to city administrators and citizens. While this engine will exist in most ICCCs from inception, it will be flexible to accept inputs from various downstream applications and sensors as and when they get introduced in the city.

It will be responsible for managing:
a. Communication with Stakeholders
b. Device Control (asset, access and authorization)
c. User Interface and Visualization
d. Complex Real-time Event Handling
e. Service Management

User Interface & Visualization

- Reports
- Dashboard
- Scorecard
- Simulation

Device Control & Monitoring

- Remote configuration & control
- Event Processing
- Device Diagnosis

Data Management

- Data Transformation
- Data Metering
- Data Visualization
- Data Control

Service Management

- Control Bus
- API Management
- Services Management
- Policy Management

User Management

- User Life Cycle Management
- Access Management
- Authorization Management

4.2.1.4

ICCC Platform: Design Considerations

Cities should keep in mind the following design considerations during the implementation and enhancement stage of ICCC platform.

- **ICCC to be designed as a system-of-systems:** Various sub-systems should talk to the ICCC, thereby providing common operating picture on city operations to ICCC supervisors and Smart City/ULB leadership - in normal circumstances as well as during emergency or crisis

- **Focus to be on outcomes:** ICCC implementation to be driven by use cases to deliver specific outcomes for various departments and stakeholders of the city. Refer to subsequent section for indicative use cases that can be implemented through the ICCC

- **Adhere to open standards & IndEA Framework** ICCC platform should follow open standards, and should not be developed using proprietary algorithms, to avoid vendor-lock-ins. Also adhere to the IndEA framework released by MeitY, Govt of India

- **Scalable and Interoperable:** Architecture IT usage within cities is going to increase in years to come and thus productive use of ICCC is expected to improve only with the passage of time. Scalable architecture can support integration of additional sub-systems in future, without additional/substantial investment of time & money.

- **Robust IT Security Systems & Policies:** ICCC is expected to become the brain and nervous system for city operations, with access to a lot of valuable data & systems. It is thus, essential that a robust IT Security system be designed & implemented to safeguard the data & systems from internal/external threats

- **Address data privacy concerns:** ICCC shall have access to various data sets - video, audio & text data, both through field level systems like CCTV cameras or through social media or grievances received. It's essential to have right access controls and usage guidelines to address privacy concerns.

- **Compliance with PPP-MII provisions:** DPIIT has notified orders to promote manufacturing and procurement of locally manufactured products and services under the Make in India initiative. Smart City SPVs are required to comply with the same

4.2.1.5
ICCC Use Cases in Cities

4.2.1.5.1
Indicative Scenarios for ICCC Operations

This section outlines three indicative scenarios to explain how ICCC can assist and empower city administration and various stakeholders in effective city management.

Scenario 1: How ICCC can aid disaster management in a flood-prone city?

Context Setting: The city is subjected to water logging (even flooding in some areas) during heavy rains in the monsoon season, leading to safety concerns in certain pockets in the city, traffic congestion, disturbances to utility, etc. Moreover, water logging gives rise to many water and mosquito borne diseases. The city thus grapples with a range of issues from disaster response/management to resource mobilization, spanning across sectors like transportation and mobility, healthcare and emergency services.

The inability to harvest relevant data, gather detailed insights and predict the incidence and frequency of a disaster further impede timely and efficient decision making and response.

Solution: A city with authorities connected through ICCC can salvage valuable time in a flood crisis to proactively & efficiently manage typical threats due to heavy rains in the following

manner:

- Informed decision making with multiple authorities coordinating on a single digital source of truth for entire city
- GIS analysis can help identify functionaries best suited to respond to emergency for faster response
- Integration with city app and mobile services can provide reliable and critical communication to affected citizens

Table 1: Functions that can be performed by an ICCC in this scenario

ICCC Layers	Key functions to be performed at ICCC
Data Acquisition: To collect contextual data	- Locate all CCTV cameras, schools, hospitals, police stations, etc. on the city GIS - Sentiment/incident tracking from the internet, mobile app and social media - Online viewing of CCTV footages, video analytics on water logging - Data from water sensors across the city - Deluge maps of flood prone areas on the city map based on past incidences and patterns of water-logging - Data from meteorological department on rain forecast; Data on high tides (in case of cities with coastline)
Data Correlation and Analytics Engine: To allow better situational analysis	- Dynamic GIS maps of the city to continuously show possible affected areas in the city in the next 24 — 72 hours - Identification of public spaces (like schools) for the movement of citizens to safer locations - Location wise analysis of the impact on possible transport congestion, mosquito breeding hotspots - Identification of volunteers for possible support during an emergency
Business Rules Engine: For effective response	- Dynamic monitoring of the situation & effective decision making from ICCC - Plan traffic diversions, put in place safe zones & crowd management - Use drones for remote monitoring - Trigger SOPs for co-ordinated response involving municipal staff, rapid action force, volunteers
Communication Engine: For timely communication with all the stakeholders	- Public Address System to disseminate warnings, build awareness - Two-way communication for effective deployment of emergency response services, citizen volunteers, NGOs and private sector - Coordination with dam authorities (if applicable) for water release in most optimum way - Constant communication on social media & mass communication on mobile phones

Scenario 2: How can ICCC support management and improvement of public transit in cities?

Context Setting: Citizens use public transport system for their daily commute, switching between multiple modes of public transport - bus, train and NMT to reach their destination. They have no easy method to view availability and timings across different modes of transport to plan their journey. As a result, they often encounter delays or taking a less comfortable journey than expected, incurring undue hardship and leading to low usage of public transport. Further, on routes having inadequate lighting there are incidents reported of harassment from passers-by and co-passengers on public transport in certain sections of the city after dark.

Solution: ICCC mediated seamless connectivity can help citizens identify the best time-efficient route prior to the journey. Integration with a digital women's safety platform can help them access real-time safety information on routes, provide feedback and quickly access help in times of distress.

- The city mobile application integrated with the ICCC can help citizens get real-time information on the arrival and departure of various modes of public transport.
- The app can highlight the next available mode of transport based on the latest schedules and timetable, helping them plan the commute and reducing waiting time.
- Throughout the commute, access to public Wi-Fi at public hotspots and public transport can be made available, which are continuously monitored through ICCC for uptime & usage hygiene
- To improve safety, ICCC analyzes hotspots where transport users report harassment in the city mobility app - to visualise responses in terms of transport operations, transit station design and urban land- use
- The app sends live updates to users and has an inbuilt panic button that helps them access relevant public authorities and emergency contacts at the earliest.

Table 2: Functions that can be performed by an ICCC in this scenario

ICCC Layers	Key functions to be performed at ICCC
Data Acquisition: To collect contextual data	- Aggregate mobility-based data from all nodal points like bus transport, metro, taxi, rail, etc. on real-time basis - Parking availability data from Parking Lots across the city - Dynamic data on traffic situations across the city from Google maps (or any other system) - Dynamic data on traffic signaling system at various traffic signals - Data from police on the possible movement of VIPs
Data Correlation and Analytics Engine: To allow better situational analysis	- Analyze the data from different sensors, GPS devices and cameras; visualise the flow of transport/transit - Integrate all mobility related sub-systems with the mobility platform - Carry out predictive analysis for peak time analysis across the city hot-spots

ICCC Layers	Key functions to be performed at ICCC
Business Rules Engine: For effective response	• Create green corridors through the adaptive signaling system • Dynamic decision making by bus/metro railways to cater to surge/slump in the demand • E-challans to traffic rule violators, monitoring collection of the same • Real-time monitoring of footpaths & cycle tracks to identify violators, through CCTV cameras, social media, volunteers • Deploy additional security personnel in areas where safety scores fall • Regular inputs to the city planners for improving the mobility within the city
Communication Engine: For timely communication with all the stakeholders	• Regular updates to registered citizens on the city traffic situation • Dynamic reporting on traffic diversions • Timely communication with traffic police for effective management of traffic in the city

Scenario 3: How ICCC can help save energy, yet improve lighting conditions and improve sense of security within a city?

Context Setting: Every city aspires to have the best lighting conditions at public places. However, it is often faced with citizen grievances around quality & availability of street lighting. This is despite significant amount of expenditure and investments into LED street-lighting across the city

Solution: ICCC provides an excellent opportunity to effectively plan, monitor & manage streetlights in a city.

• Scientific identification of hot spots requiring street light/higher illumination requirements in the city
• Real-time monitoring of the street light functioning
• Remote management of illumination, switching ON/OFF of the street lights, thereby having substantial savings of energy bills

Table 3: Functions that can be performed by an ICCC in this scenario

ICCC Layers	Key functions to be performed at ICCC
Data Acquisition: To collect contextual data	• GIS mapping of LED streetlights • Integration of grievances from grievance redressal system & social media • Data on day-night timings, for aligning ON/OFF of streetlights with setting sun or the rising sun • Data on crime-hot spots, requirements coming from various citizen forums

ICCC Layers	Key functions to be performed at ICCC
Data Correlation and Analytics Engine: To allow better situational analysis	• Mapping of crime hot-spots on the GIS map & its correlation with lighting availability within the city • Correlation with some historic significance at certain places within the city • Correlation with Incidents (like accidents, fire, mob gathering, etc.) or crisis
Business Rules Engine: For effective response	• Effective planning for future expansion, illumination levels • Timely resolution of grievances related to faults, illumination levels • Near real-time decisions on increase of illumination in areas experiencing certain incidents, crisis situation • Daily monitoring of energy usage, identification of patterns for improved decision making
Communication Engine: For timely communication with all the stakeholders	• Real-time communication to field engineers to rectify faults • Daily dashboard to head of department, with specific suggestions on improvements

4.2.1.5.2

Other use cases across sectors

Cities are advised to give utmost attention to identify an exhaustive list of Use Cases and gauge their details to derive the best/maximum outcomes from the ICCCs. The following table provides an indicative list of Use Cases, which are detailed in the sequent sub-sections.

Use Cases across Key Sectors
A. Solid Waste Management
1. How to improve cleanliness at public places
2. How to improve public toilet facility monitoring and servicing
3. How to manage on demand Waste Collection in City
4. How to manage Solid Waste Management Operations effectively
B. Water / Wastewater Management
5. How to ensure reliable and quality water supply in city
6. Reduction of potable water wastage in the city
7. How to control affluent disposal into city river water?
8. How to ensure the storm water network readiness before rains?

C. Emergency and Disaster Management	
	9. How to reduce the damage to property/life in case of fire event in a busy area of city
	10. How to reduce the damage to property/life in case of Disaster/Emergency event in a busy area of city

D. e-Governance / Service Delivery	
	11. How to monitor and manage civic complaints effectively
	12. How to gauge Citizen Satisfaction to citizens to improve service delivery
	13. How to reduce victim transit time from accident location to Hospital?

E. Mobility Management	
	14. How to effectively manage City Bus Operations
	15. How to do City Traffic Planning using Data Analytics
	16. How to reduce parking of vehicles in non-parking zones?
	17. How to monitor entry of vehicles to restricted Zones
	18. How to reduce citizen inconvenience during road maintenance
	19. How to effectively tackle potholes problems in City

F. Energy Management	
	20. How to effectively monitor streetlight functioning and keep the city illuminated?

G. Environment Management	
	21. How to address air and noise pollution in city using environmental Sensors?
	22. How to increase the green cover of the city?

H. Safety and Security	
	23. Make citizens feel safe in the city
	24. How to ensure safety of citizens during emergency/ disaster situations
	25. How to predict crime in a city using Data Analytics, Artificial intelligence

I. Health Management	
	26. How to effectively tackle mosquito borne diseases in city
	27. How to strengthen Civic Health Care delivery in the city using Data Analytics
	28. How to predict Stray Dog menace in the city

The detailed explanation for each use case has been provided in the sequent sub-sections:

A. SOLID WASTE MANAGEMENT

The details of few use cases across Solid Waste Management are as follows:

Use Case 1:
How to improve cleanliness at public places?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Data Feeds from IoT sensors including bin level sensors, CCTV cameras, etc. • Grievances received from City Help Line Number, City Mobile App, Web Portal and Social Media • GPS location feeds from SWM Vehicle • Schedules of Sanitation workers • CCTV feeds from areas and places with high foot falls, hawker zones, areas having pan shops and food stalls, etc.	• Data Correlation across feeds from various aggregation sources such as bin level sensors, CCTV cameras, GPS location of vehicles, QR Code scans etc. • Designing shortest route for garbage collection vehicle to aggregation point • Route optimization, traffic simulation and congestion management for allocating appropriate vehicle	• Trigger SOPs for grievances received, track the action taken through CCTV System & other field level interventions • Proper routing of vehicles in real times and assistance during vehicle breakdown • Vehicle & workers tracking in real time • Daily checks with Sanitary Inspectors on the cleanliness of city • Monitoring of CCTV Cameras at dumping ground	• Automated messaging to citizens for regular updates through Social Media/WhatsApp/ SMS • Communication over VMD, PAS and Social Media for educating citizens • Two-way communication with field force: Sanitation Inspectors, Health Department Officers, and Vehicle drivers • Bulk SMS/ Notifications to the citizen in locality

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
	• Areas (Zone/Ward) wise analysis of waste or garbage on timelinesSentiment Analytics and response with respect to event • Sanitation worker attendance analysis	• Implement mechanism to carry out effective monitoring & management of Dry & Wet waste segregation (at source as well as at disposal sites)	• City Cleanliness dashboard to be presented to Commissioner & Mayor on daily basis

Use Case 2: How to improve Public Toilet facility?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Data Feeds from QR Codes, IoT based Toilet monitoring sensors, Toilet Feedback System devices, feedback photographs etc. • Grievances received from City Help Line Number, City Mobile App, Web Portal, Social Media, etc. • View all public toilets on city map along with meta data (toilet type, water supply, cleanliness etc.) • View the cleanliness schedule of public toilets with meta data (contractor details, time etc.)	• Data Correlation across feeds from various aggregation sources such as IoT based Toilet monitoring sensors, Toilet Feedback System devices, GPS location of Mobile toilets, QR Code scans etc. • Resource assignment and work allocation to contractors pertaining to public toilets cleaning • View the trend of public toilets usage • Track the area-wise issues pattern (Water leakage, unclean toilets etc.) with respect to public toilets. • Conduct usage/revenue analysis (if chargeable) of public toilets	• Trigger the SOP, staring with Instantaneous event reporting to respective authorities • Communicate complaints and feedback with contractors, area officer and department heads responsible for maintenance of public toilet. • Escalation and SLAs monitoring • Use VMDs to update citizens about public toilets in given locality and its rating • Send complaint status to citizens with respect to public toilets	• Send alert on receiving poor feedback or complaint w.r.t to public toilets. • Provide information to citizens about public toilets & their cleanliness through Mobile App/SMS/WhatsApp/Social Media • Two-way communication with field force: Sanitation Inspectors, Health Department Officers, and Vehicle drivers. • Awareness campaigns by authorities with citizens at large

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• GPS location of Mobile Public Toilets • SLA benchmarks of Toilet Cleaning contractors	• Sentiment Analytics and response with respect to event • Sanitation worker attendance analysis	• Monitoring of Heath status of assets • Vehicle & workers tracking in real time	• Cleanliness dashboard to be presented to concerned officials on daily basis

Use Case 3:
How to manage on-demand waste collection in the city?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Data Feeds from IoT sensors including bin level sensors, AI based Video Analytics etc. • Inputs from Grievances Redressal Systems including Smart City Help Line Number, MC Helpline, City Mobile Apps, Web portal and Social Media • GPS location feeds from Vehicle Tracking Systems installed in Municipal Vehicles • View the garbage pick-up vehicle schedule and transfer station real time feeds • View and track the sanitation officer's attendance and movement	• Data Correlation across feeds from various aggregation sources such as bin level sensors, AI based Video Analytics, GPS location of vehicles etc. • Designing shortest route for garbage collection vehicle to aggregation point • Route optimization, traffic simulation and congestion management for allocating appropriate vehicle • Areas (Zone/Ward) wise analysis of on-demand waste or garbage collection • Resource assignment analysis and optimization • Sentiment Analytics and response with respect to event • Sanitation worker attendance analysis • Advance analytics on aggregated datasets	• Trigger the SOP, starting with instantaneous event reporting to respective authorities • Asset and Resource mobilization and allocation in real time • PTZ Camera Control at select places for validation • Proper routing of vehicles in real times and assistance during vehicle breakdown • Vehicle & workers tracking in real time • Informed and data driven decision making • Visuals and Dashboard	• Automated messaging to citizens for regular updates through Social Media/WhatsApp/SMS • Communication over VMDs, PAS and Social Media for educating citizens • Two-way communication with field force: Sanitation Inspectors, Health Department Officers, and Vehicle drivers. • Awareness campaigns by authorities with citizens at large • Event Summary report for future trend analysis

Use Case 4:
How to carry out Solid Waste Management Operations effectively?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Ability to receive the complaint of on demand garbage collection through various channels and quantity of waste collected at processing plant/ landfill site • Ability to schedule the waste collection as per waste type (medical Waste, Hazardous Waste or e-Waste) • View area wise request and pick up schedule • View the request allocation to specific officer and vehicle as per request.	• View the shortest route to respond the on-demand request • Ability to predict the waste complaints based on past trends of on demand waste collection requests • Ability to predict the cost and effort to calculate the cost with respect to size of request as per business rules. • Ability to predict ETA etc. • Resource assignment analysis and optimization • Sanitation worker attendance analysis • Advance analytics on aggregated datasets	• Trigger the SOP, starting with instantaneous event reporting to respective authorities • Asset and Resource mobilization and allocation in real time • CCTV Camera Control at select places for validation • Proper routing of vehicles in real times and assistance during vehicle breakdown • Vehicle & workers tracking in real time • Informed and data driven decision making • Visuals and Dashboard • Ability to communicate with on field staff/ contractor/vehicle driver and citizen • View and update the status of on demand request through call, SMS and WhatsApp • Ability to communicate the real time status of vehicle to gauge the ETA etc.	• Automated messaging to citizens for regular updates through Social Media/ WhatsApp/SMS • Communication over VMDs, PAS and Social Media for educating citizens • Two-way communication with field force: Sanitation Inspectors, Health Department Officers, and Vehicle drivers. • Awareness campaigns by authorities with citizens at large • Event Summary report for future trend analysis • Ability to allocate the request to an officer/ contractor/processing plant etc. • View the SLA compliance and levy penalty on contractor etc.

B. WATER MANAGEMENT

The details of few use cases across Water/wastewater Management are as follows

Use Case 5 :
How to ensure reliable and quality water supply in the city?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Input from Project Management System on the maintenance work being undertaken • Real time Inputs on water quality parameters (Turbidity, Chlorine levels etc.) from water treatment plants, ESR/GSR, pumping stations • Grievances received from citizens (through Social Media, Mobile App, Portal, CFCs, etc.)	• Correlation and analysis of water quality parameters data received from water treatment plan, ESR/GSR, pumping stations • Analysing water quality parameters from source to destination • Validation of grievances by the ICCC Operator from ICCC based on water quality parameters data received.	• Visualisation/ Dashboard of water quality parameters from water treatment plants and reservoirs • Alerts in case of breach in water quality paraments • Close monitoring of Social Media & Grievance redressal system • Identifying maintenance requirement between Source to destination of water supply channels	• To water department officers, treatment plan, reservoirs vendors/officers • Communicate with citizens of specific area about contamination of water • Alert and alert the concerned personnel in case of threshold breach (water surpasses the threshold.) • Identify the city areas on GIS map that would require planning of sewer lines and the pumping station

Use Case 6:
How to reduce potable water wastage in the city?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Input from Project Management System on the maintenance work being undertaken	• Correlation and analysis of water pressure level data received from water treatment plant, ESR/GSR, pumping stations	• Visualisation/ Dashboard of water quality parameters from water treatment plants and reservoirs	• To water department officers, treatment plan, reservoirs vendors/officers

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Real time water pressure levels from water treatment plants, ESR/GSR, pumping stations • Grievances received from citizens (through Social Media, Mobile App, Portal, CFCs, etc.) • Data from water distribution network • Ability to record and view the water quality reports	• Analyse amount of water collected from source to destination • Analyse water consumption patterns based on historical data • Analysis of water consumption patterns throughout the day and rationing of quantum based on that • Analysis of water quality at source	• Alerts in case of breach in water pressure levels • Close monitoring of Social Media & Grievance redressal system • Identifying maintenance requirement between Source to destination of water supply channels	• Communication to maintenance team • Controlling and monitoring of supply from pumping stations in case of wastage • Alerts in case of water theft through pipeline and change in pressure

Use Case 7:
How to control affluent disposal into city river water?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Feed from relevant CCTV camerasData from sensors put on sewerage Lines • SCADA System at Sewerage Treatment Plants/Sewerage Lines • Complaints and grievances from the citizen from the city's grievance redressal platform or One City One App or Social Media on disposal of sewerage into the city river/sea • Levels of pH and other chemical composition of water at spots where nalla water connects with the river/sea • Data on diseases due to water contamination	• Co-relate the data on sewerage created v/s sewerage treated v/s sewerage disposed off • Check the quality of water at the disposal spots • Analyse the diseases reported due to water contamination	• Create hot spots of water contamination areas • Control parameters and set thresholds for alerts at various location across the river • Alert and shoot message to the concerned personnel in case of threshold breach (water surpasses the threshold.)	• Automated messaging to citizens for regular updates through Social Media/WhatsApp/SMS • Issue warnings to industries/commercials establishments restaurants/housing societies who are releasing untreated sewerage into nalas/river • Publish weekly dashboard to Commissioner & Mayor on the disposal of Sewerage/Affluent waste into Nallas/City River/Sea

Use Case 8:
How to ensure the storm water network readiness before rains?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Feed from relevant CCTV cameras • Data from sensors put on storm water drainage • Complaints and grievances from the citizen from the city's grievance redressal platform or One City One App or Social Media on non-cleaning of storm water network • Storm water network cleanliness schedule and progress of cleanliness plan along with details of concerned officers and contractors • View the area wise budgetary provision of each area for cleanliness of storm water	• Create simulation of water flow in different scenarios across storm water network • Use Predictive analytics based on complaints and cleanliness schedule • Create dashboard on the storm water network clean-up work, especially for 2 months prior to monsoon season • Create history patterns on the past flooding due to overflowing of storm water network	• Monitor the SLA compliance of contractor and officers wrt of maintenance of storm water network • Raise triggers to City Commissioner if the work on Storm Water cleaning is not as per the schedule • Create dashboard on the Citizen grievances related to storm water cleaning	• Communicate with Storm Water department officers and contractors if the progress is not as per plan • Communication to citizens through website, mobile app, SMS, WhatsApp to update them about maintenance drive • Educate citizens on importance of keeping Storm Water Nallas/Drains clean through multiple channels

C. EMERGENCY & DISASTER MANAGEMENT

The detailed explanation for each use case has been provided in the sequent sub-sections:

Use Case 9:
How to reduce the damage to property/life in case of fire event in a busy area of city?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Feed from various CCTV cameras of the city including feed from private camera feeds of (societies, large establishments, shops, etc.) • Data from state emergency and disaster management systems • Data from fire sensors in the city • Live traffic data from ATCS and other traffic cameras of the city • Navigation map of the city with all the layers (police stations, fire stations, emergency forces, water reservoirs, important warehouse etc.) • Data/feed from Social Media, mobile apps and other city level systems *(For Example- Emergency call boxes)*	• Historical, analysis of various incidents and predicting events for future considering parameters like Festival times, Sporting events, Rainy seasons, Density of population, etc. • Correlate data of seismic sensors to identify possibility of fire in congested areas • Identify and tabulate all the vulnerable property/area details area wise considering possibility of fire incidents • Identify and highlight the potential aftereffects of previous fire incident by analysing the previous incidents	• Access to CCTV Network across the city providing regular video feeds and provide real-time updates to the concerned stakeholders during a fire incident. • Trigger the SOP, staring with Instantaneous event reporting to respective authorities *(For Example- Police. City administration)* • Route traffic analysis and provide the shortest route available to the emergency vehicles to reach to the incident location. • Co-ordination and communication with multiple stake holders of various emergency services they all reach on time (like ambulance, fire tenders. etc) • Identify and plan the relief materials required on the ground and ensure that it reaches in the shortest possible time • Do traffic analysis and plan Creation of Green/ Emergency corridors by traffic signal management for quick response and better location management	• Automated messaging to citizens for regular updates through Social Media/ WhatsApp/SMS • Automated Messaging to the all the concerned departments (fire department, health department, hospitals) with real time update. • Awareness campaigns by authorities with citizens at large • Use VMDs, PA systems to update people • Communicate with various NGO's to come and help for any incident (like food donation, volunteering, etc.)

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Electrical and circuit diagrams of major establishments, offices of the city • Hospital details with their specialty and bed status • Data on the Wind Flow in the affected area	• Correlate the nearest water sources for the fire tenderers, in case they need to quickly refill.	• Drones for better situational awareness • Use of Field level warning systems *(For Example- Sirens, Public address systems, VMDs, etc)* to dispatch the information to the citizens	• Communicate the property details to the fire department and to the respective property owners reminding them to get the fire safety survey completed

Use Case 10:
How to reduce the damage to property/life in case of Disaster/ Emergency event in a busy area of the city?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Feed from various CCTV cameras of the city including feed from private camera feeds of (societies, offices etc.) • Data from state emergency and disaster management systems • Data from sensors like seismic, flood, fire, smoke, water, environmental sensors • Flooding, fire, seismic hotspots of the city on map. • Live traffic data from ATCS and other traffic cameras of the city. • Topographical maps of the city mentioning along with maps for the underground utilities • Navigation map of the city with all the layers (police stations, fire stations, emergency forces, water reservoirs, important warehouse etc)	• Historical, analysis of various incidents and predicting events for future considering following parameters 1) Festival times 2) Sporting events 3) Rainy seasons 4) Density of population etc. • Correlate data of seismic sensors with water level sensors to identify possibility of flooding because of earthquake • Identify and tabulate all the area wise vulnerable property details for multiple incidents types like flood, fire, earthquake etc	• Access to CCTV Network across the city providing regular video feeds and provide real-time updates to the concerned stakeholders for various incident types • Trigger the SOPs, staring with Instantaneous event reporting to respective authorities *(For Example- Police, hospital, City administration)* • Route traffic analysis and provide the shortest route available to the emergency vehicles to reach to the incident location. • Co-ordination and communication with multiple stake holders of various emergency services they all reach on time. • Identify and plan the relief materials required on the ground and ensure that it reaches in the shortest possible time.	• Automated messaging to citizens for regular updates through Social Media/ WhatsApp/SMS • Automated Messaging to the all the concerned stakeholders and respective departments with real time update. • Training & Awareness campaigns by authorities involving citizens at large • Use VMDs, PA System to update people and avoid any scenarios of rumours.

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Data/feed from Social Media, mobile apps and other city level systems *(For Example- Emergency call boxes)* • Electrical and circuit diagrams of major establishments, offices of the city • Details of all the properties like schools, which are earmarked for people evacuation/ temporary shelters • Realtime traffic information from the ITMS system • Hospital details with their specialty and bed status.	• Identify and highlight the potential aftereffects of any incident by analysing the previous incidents	• Do traffic analysis and plan Creation of Green/ Emergency corridors by traffic signal management for quicker response • Drones for better situational awareness • Use of Field level warning systems *(For Example- Sirens, PAS, VMDs, etc)* to dispatch the information to the citizens • Dashboards, heat maps, graphs for various sensor and other data sets for analysis.	• Communicate with various NGO's to come and help for any incident (like food donation, volunteering) • Communicate the property details to the departments and to the other emergency services for providing help.

D. E-GOVERNANCE / SERVICE DELIVERY

The detailed explanation for each use case has been provided in the sequent sub-sections:

Use Case 11:
How to monitor and manage civic complaints effectively?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Grievances receivedW from citizens (through Social Media, Mobile App, Portal, CFCs, etc.) • Inputs from Live feeds of CCTV cameras across City to register complaints	• Classification of grievances across the different domains (Road, Water, SWM, Sewerage etc.) • Analysis of grievances/feedback received from Social Media, Mobile App, Portal, CFCs, etc.	• Visualisation/ Dashboard on the GIS Map • Dispatch of the information to relevant stakeholders (Respective Departments, Contractors etc.)	• To Internal stakeholders (Respective Departments, Zonal Offices, etc.) • Alerts to department officers if higher number of complaints are logged or with lesser satisfaction score in given time interval

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Inputs from Asset Management System for various infrastructure — Roads, Community Halls, Street Lights, etc. • Inputs from Project Management System for various citywide projects • Affiliated Street Infrastructure as well as other Assets details on GIS Map along with their maintenance schedule	• View the SLA compliance status of complaints : Department wise, Officer Wise, Location Wise (Ageing Report) • Co-relation of Complaints on GIS MAP along with affiliated attributes — nearby manholes, Vehicle Depots (JCB, Pumping /Hydraulic machine etc.) • Root cause analysis of complaints, identify top complaints area wise, department wise etc.	• Live monitoring of the work through CCTV Cameras • Close monitoring of Social Media & Grievance redressal system while work is going on • Post Complaint redressal, feedback from Complainant • Publish the Satisfactory Index on Internal Portal — Department /Zone/ Domain wise	• To Contractors • To Complainant on status of complaint • To affected Citizens through VMDs, PAS, Social Media, Mobile Apps, Portal, etc. • In case there are any major service disruptions (like water/gas pipeline damage, etc.) timely communication to the respective authority & to the affected citizens

Use Case 12:
How to gauge Citizen Satisfaction to citizens to improve service delivery?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Grievances received from citizens (through Social Media, Mobile App, Portal, CFCs, etc.) • Inputs from Live feeds of CCTV cameras across City to register complaints • Inputs from Citizen Feedback System for the handling of the entire Compliant Management Lifecycle	• Classification of Major no of Complaints/grievances across the different domains (Road, Water, SWM, Sewerage etc.) • Analysis of grievances/ feedback received from Social Media, Mobile App, Portal, CFCs, etc. • City wide and domain wise Analysis of repetitive complaints/grievances • SLA compliance status of complaints : Department wise, Officer Wise, Location Wise (Ageing Report)	• Visualisation/ Dashboard on the GIS Map • Dispatch of the information to relevant stakeholders (Respective Departments, Contractors etc.) • Close monitoring of Social Media & Grievance redressal system while work is going on • Post Complaint redressal, feedback from Complainant	• To Internal stakeholders (Respective Departments, Zonal Offices, Municipal Commissioner etc.) • Alerts to department officers if higher number of complaints are logged or with lesser satisfaction score in given time interval • To Complainant on status of complaint

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
	• Analysis on customer satisfaction on different dimensions of Complaint Management Lifecycle	• Publish the Satisfactory Index on Internal Portal — Department /Zone/ Domain wise	• To Citizens through, WhatsApp, Social Media, Mobile Apps, Portal, etc. • Top Achiever — Zone/Department with higher level of Satisfactory Index

Use Case 13:
How to reduce victim transit time from accident location to Hospital?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Information from Police/ Other sources on accidents • Feed from various CCTV cameras of the city including feeds from private camera feeds of (societies, offices etc.) which can be used to monitor the incident spot • Live traffic data from ATCS and other traffic cameras of the city • Ambulance availability data • Hospital details with their specialty and bed status • Data on the specialist doctors, if need arises for critical care • Data from Blood Banks within the city	• Qualification of the incidence as mild/ moderate/ severe • Analyse the traffic impact • Identify the nearest Ambulance(s) • Analyse the hospital bed availability	• Trigger the appropriate SOP based upon the incidence severity • Co-ordinate with Ambulances, Traffic Police, Hospitals for quick action on ground • Co-ordinate with blood Banks for the requirements • Continuously monitor the spot from CCTV cameras • Manage traffic movement through ITMS • Coordinate with traffic police for continuous traffic regulation • Use of drones as per severity & feasibility	• Automated messaging to citizens for regular updates through social media/ WhatsApp/SMS • Automated Messaging to the all the concerned stakeholders and respective departments with real time update • Use VMDs, PA systems to update people • Regular updates to all the stakeholders (Disaster Management Cell, Traffic Police, Hospital, etc.) • Regular updates to the City Leadership

E. MOBILITY MANAGEMENT

The detailed explanation for each use case has been provided in the sequent sub-sections:

Use Case 14:
How to manage the City Bus Operations effectively?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Inputs from Automatic Vehicle Location System (AVLS) • Inputs from Incident Management System • Inputs from Bus Scheduling and Depot Management System • Information from AFCS/ Bus ticketing System • Grievances received from citizens (through Social Media, Mobile App, Portal, CFCs, etc.) • Input from Project Management System on the maintenance work being undertaken • Schedule from Roads Dept on Roads Maintenance on GIS • Information about events happening across the city which will have impact on traffic movement & cause crowd gathering	• Route wise Bus Operation Performance Index— Ridership, Violations, Trips etc. • Routes and bus wise Alerts - Breakdown etc. • Ability to correlate the Bus routes with the road Maintenance/ construction work for route diversion. • Ability to correlate of Incidents on GIS MAP along with affiliated attributes — nearby Depots, Ambulance, Fire Vehicles etc. • Traffic impact analysis for diverted routes • Analysis of grievances/feedback received from Social Media, Mobile App, Portal, CFCs, etc.	• Visualisation/ Dashboard on the GIS Map • Live Monitoring of the Bus through AVLS and Incident Management System • Dispatch of the information to relevant stakeholders in case of alerts/ incidents (traffic police, Fire, Transport SPV, Ambulance, Bus operators etc.) • Close monitoring of Social Media & Grievance redressal system	• To internal concerned stakeholders (Road Department, Transport SPV, Fire etc.) • To Depot Managers for various Violations, breakdown etc • To Traffic Police • To Bus Operators • To Citizens through PIS, PAS, Social Media, Mobile Apps, Portal, etc. for route diversions & Revised Schedules

Use Case 15:
How to do City Traffic Planning using Data Analytics?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Inputs from Adaptive Traffic Control System (ATCS) — Vehicle Density • Inputs from Sensors for Vehicle Classification • Inputs from Live feeds of CCTV/PTZ cameras • Information on Total Road Accidents, violations etc. • Grievances received from citizens (through Social Media, Mobile App, Portal, CFCs, etc.) • Input from Project Management System on Road Network and the maintenance work being undertaken • Total station Survey on GIS including road geometry • Schedule from Roads Dept on Roads Maintenance on GIS • Information about events happening across the city which will have impact on traffic movement & cause crowd gathering	• Analysis of the traffic volume and peak time data to identify the Crossroads /Junctions for zero tolerance for traffic violations, Infrastructure health (Roads, Traffic signal etc.) • Ability to correlate the road geometry with the traffic impact analysis/ road accidents/violations • Ability to correlate the Existing Signal Cycle at Hot-spot Junctions • Traffic analysis on city map for different time zones of the day • Traffic impact analysis on the affiliated roads for maintenance/ construction • Analysis of grievances/ feedback received from Social Media, Mobile App, Portal, CFCs, etc. • Mapping of the city traffic, footfall with parking data for future planning	• Visualisation/ Dashboard on the GIS Map • Live Monitoring of the Bus through AVLS and Incident Management System • Dispatch of the information to relevant stakeholders for effective Traffic Operations (traffic police, ATCS Nodal Person, Road Department etc.) • Close monitoring of Social Media & Grievance redressal system	• To internal concerned stakeholders (Traffic Department, Road Department etc.) • To ATCS System (Cycle Timing) • To Traffic Police • Real Time Traffic Congestion information/ Route diversion To Citizens through VMD, PAS, Social Media, Mobile Apps, Portal, etc

Use Case 16:
How to reduce parking of vehicles in non-parking zones?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Inputs from Live feeds of CCTV/PTZ/ ANPR cameras	• Suspect person/Vehicles/ Proclaimed offenders/ absconders (Offender's Pattern Matching - real time)	• Visualisation/ Dashboard on the GIS Map	• To Police for Hot listed/watch listed vehicle list

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Hot listed/watch listed vehicle list • Restricted Area with geofence on GIS • Grievances received from citizens (through Social Media, Mobile App, Portal, CFCs, etc.)	• Analysis of grievances/ feedback received from Social Media, Mobile App, Portal, CFCs, etc. • Validation of grievances by the ICCC Operator from ICCC (CCTV Cameras, or any other mechanism	• Planning/ forecasting manpower required for surveillance in high risk area • Dispatch of information to various stakeholders (Police, Towing department etc.)	• To Towing Van for unauthorized vehicles at restricted area • Sharing info on parking lots with citizens through multiple channels

Use Case 17:
How to monitor entry of vehicles to restricted Zones?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Inputs from Live feeds of CCTV/PTZ/ ANPR cameras • Hot listed/watch listed vehicle list • Restricted Area with geofence on GIS • Grievances received from citizens (through Social Media, Mobile App, Portal, CFCs, etc.)	• Suspect person/Vehicles/ Proclaimed offenders/ absconders (Offender's Pattern Matching - real time) • Analysis of grievances/ feedback received from Social Media, Mobile App, Portal, CFCs, etc. • Validation of grievances by the ICCC Operator from ICCC (CCTV Cameras, or any other mechanism	• Visualisation/ Dashboard on the GIS Map • Planning/forecasting manpower required for surveillance in high risk area • Dispatch of information to various stakeholders (Police, Towing department etc.)	• To Police for Hot listed/watch listed vehicle list • To Towing Van for unauthorized vehicles at restricted area • To Complainant

Use Case 18:
How to reduce citizen inconvenience during road digging/maintenance?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Input from Project Management System on the maintenance work being undertaken • Schedule from Roads Dept on Roads Maintenance on GIS	• Ward/Zone wise requirements for Road Digging/ Maintenance • Co-relation of multiple requests for digging/maintenance of same road stretch	• Visualisation/Dashboard on the GIS Map • Identification of exception situation if the digging/ maintenance requirements are getting scheduled at different point of time within the 3 months (or whatever time period defined by the city).	• To Internal stakeholders (Roads Dept, Traffic Dept, Sewerage Dept, Water Supply, etc.) • To Traffic Police

Data Acquisition	Data Correlation and Analysis	Command and Contro	Communication
• Permissions given to other agencies (telecom/utility firms) & tentative schedule for their work • View the underground utility network on the map • Grievances received from citizens (through Social Media, Mobile App, Portal, CFCs, etc.) • Information about events happening across the city which will have impact on traffic movement & cause crowd gathering • Affiliated road network on GIS Map	• Analysis of grievances/feedback received from Social Media, Mobile App, Portal, CFCs, etc. • Validation of grievances by the ICCC Operator from ICCC (CCTV Cameras, or any other mechanism) • Traffic impact analysis on the affiliated roads • Ability to correlate the potholes complaints with road maintenance schedule and defect liability period	• Planning of the road digging/maintenance work and dispatch of the information to relevant stakeholders (traffic police, Roads Dept, Contractors) • Live monitoring of the work through CCTV Cameras • Close monitoring of Social Media & Grievance redressal system while work is going on. • Traffic Management through ATCS during work execution.	• To Contractors • To People through VMDs, PAS, Social Media, Mobile Apps, Portal, etc. for route diversions • In case there are any major service disruptions (like water/ gas pipeline damage, etc.) timely communication to the respective authority & to the affected citizens

Use Case 19:
How to effectively tackle potholes problems in City?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Grievances received from citizens (through Social Media, Mobile App, Portal, CFCs, etc.) • Input from Live feeds of CCTV cameras across the road Network (Pre-Monsoon & Post — Monsoon Survey) • Schedule from Roads Dept on Roads Maintenance on GIS	• Ward/Zone wise requirements for Potholes Maintenance • City wide Hot-Spot Analysis based on potholes • Ability to correlate the potholes complaints with road maintenance schedule and defect liability period • Analysis of grievances/ feedback received from Social Media, Mobile App, Portal, CFCs, etc.	• Visualisation/Dashboard on the GIS Map • Identification of exception situation if the maintenance requirements are getting scheduled at different point of time within the 3 months (or whatever time period defined by the city). • Planning of the road maintenance work and dispatch of the information to relevant stakeholders (traffic police, Roads Dept, Contractors)	• To Internal stakeholders (Roads Dept., Zonal Offices etc.) • To Traffic Police • To Contractors • To People through VMDs, PAS, Social Media, Mobile Apps, Portal, etc. for route diversions

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Permissions given to other agencies (telecom/utility firms/ Implementation Agencies) & tentative schedule for their work • Input from Project Management System on the field work being undertaken for digging activities	• Validation of grievances by the ICCC Operator from ICCC (CCTV Cameras, or any other mechanism) • Aging Report of potholes and road construction and maintenance	• Live monitoring of the work through CCTV Cameras • Close monitoring of Social Media & Grievance redressal system while work is going on. • Traffic Management through ATCS during work execution, if any	• In case there are any major service disruptions (like water/ gas pipeline damage, etc.) timely communication to the respective authority & to the affected citizens

F. ENERGY MANAGEMENT

The details of few use cases across Energy Management are as follows:

Use Case 20:
How to effectively monitor streetlight functioning and keep the city illuminated?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Data feeds for the street light monitoring and control from 1) controllers, 2) any other intermediary software, 3) Data from feeder panel • Feeds from various CCTV cameras of the city including feed from private camera feeds of (societies, offices etc.) • Location of streetlights marked on GIS map	• Classification of Crimes/ accidents as per their types for the areas where the streetlights were off • No of times when feeder panel did not had electricity when streetlights were not functioning	• Burning ratio of the streetlights (what % of total streetlights were lit up and for how much time they were lit up) • Amount of electrify consumed month on month and identify potential gaps and leakages/pilferages if sudden surge in consumption is found in a particular area and overall. • Streetlights burning during the daytime and close them • Preventive checks on availability of power on feeder panels, functioning of controllers	• Automated messaging to citizens for regular updates through Social Media/ WhatsApp/SMS • Automated Messaging to the Rapid Action teams/Field teams with the location of pole and problem description to help them solve the issue faster and take other necessary actions as per SOPs

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Realtime locations of the Street light monitoring/beat Marshals and Rapid action teams on city map • Complaints and grievances from the citizen from the city's grievance redressal platform or one city one app. • Data/feed from social media, mobile apps and other city level systems *(For Example- Emergency call boxes)*	• Citizen sentiment analysis on social media for the non-functioning/non availability of lights • Identify new areas to install streetlights analyzing the crime hotspots in the city.	• Trigger the SOPs, when a streetlight is off or not sending data at desired frequency. • Control of streetlights illumination- Try and identify the areas and time to decrease illumination and save energy and cost. • Check and track if all the grievances and complaints are completed within defined timelines. • Dashboards, heat maps, graphs for various sensor and other data sets for analysis.	• Inform city administration, city police and citizens about non-functioning of streetlights, preventive maintenance so that they take necessary actions to provide any untoward incidences

G. ENVIRONMENT MANAGEMENT

The details of few use cases across Environment Management are as follows:

Use Case 21:
How to address air and noise pollution in city using environmental Sensors?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Feed from various CCTV cameras of the city including feed from private camera feeds of (societies, offices etc.) • Data from environment, seismic, flood, fire, smoke, water etc. sensors	• Regularly monitor and correlate the environment data with the state and national pollution benchmarks and highlight exceptions	• Analyse frequently high polluted routes/areas and try to divert the traffic to alternate routes to decongest them • Identify the types of industries in highly polluted areas and identify the opportunities to relocate them with the authorities	• Automated messaging to citizens for regular updates through Social Media/WhatsApp/SMS • Awareness campaigns by authorities with citizens at large *(For Example to reduce honking or to use more greener fuels or to plant trees)*

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Complaints and grievances from the citizen from the city's grievance redressal platform or One City One App • Live feeds of traffic cameras, ITMS, ATCS systems providing the traffic density, volume of the traffic and peak hours • Navigation maps of the city • Data/feed from social media, mobile apps and other city level systems *(For Example- Emergency call boxes)*	• Correlate and identify routes with high traffic, peak hours and their corresponding noise levels • Correlate the solid waste dump yard data or pending collection data and corresponding impact on NOX, SO_2, CO_2, O_3, PM_{10}, $PM_{2.5}$ and AQI levels in the respective areas	• Identify any unauthorized industries in the city and attempt to regularize them • Constantly monitor the NO_X, SO_2, CO_2, O_3, PM_{10}, $PM_{2.5}$ and overall AQI levels in the city and compare with the benchmarks to identify the aberrations and area wise trends • Doing historical analysis create a pollution profile in the city for various weather and even types and plan their mitigation actions accordingly	• Use VMDs, PA System to update people about route diversions, reducing noise levels etc. • Communication to various authorities (police, traffic department for route diversions and other maintenance activities • Issue warnings to industries/restaurants/ other commercial establishments which are contributing to more than usual pollution

Use Case 22: How to increase the green cover of the City?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Feed from various CCTV cameras of the city including feed from private camera feeds of (societies, offices etc.) • GIS maps highlighting green cover of the city, industrial hotspots of the city, densely, sparsely populated areas of the city • Complaints and grievances from the citizen from the city's grievance redressal platform or one city one app. • Navigation maps of the city • Data/feed from Social Media, mobile apps and other city level systems *(For Example- Emergency call boxes)* • Nation or state benchmarking data of green spaces/trees per million	• Regularly monitor and correlate the green space data with national and station level benchmarks for number of trees per million. • Correlate the high polluted areas and their corresponding green cover and identify areas lacking green cover. • Correlate the number of trees which shall be cut for all the construction projects and plan afforestation initiatives	• Analyse frequently high polluted routes/areas and try to divert the traffic to alternate routes to decongest them by looking at the cameras and sensor readings. • Determine the need for green spaces (number of trees) for every area considering the air pollution levels in the area. • Keep a check on the growth of newly planted trees.	• Automated messaging to citizens for regular updates through Social Media/ WhatsApp/SMS • Awareness campaigns by authorities with citizens at large (to plant trees) • Communication to various authorities (department of parks and gardens for plantations and maintenance of trees.

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Details of various construction projects in the city • Census data for the city • Data from environment, seismic, flood, fire, smoke, water etc. sensors • GIS maps showing green cover of the city		• Identify areas on roadside or on dividers or any stretch of land where in green spaces can be created • Identify areas were the green cover is not managed properly	• Issue warnings to respective commercial spaces on depleting green spaces

H. SAFETY AND SECURITY

The details of few use cases across Energy Management are as follows:

Use Case 23:
How to make city a safer place to live?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Feed from CCTV cameras (installed by city administration, Police), Streetlight system • Video feeds from private CCTV camera networks in the city *(For Example- collaboration with schools, commercial establishments, housing societies etc)* • Location of the Beat Marshals and Rapid action teams on city map • Marking pre-identified areas as 'Critical' and collection of crime related data for the same	• Classification of Crimes/accidents as per their types • Extent of crimes recorded against women, children and elderly per year • Location wise analysis of crimes. • Correlating multiple datasets from various sub-systems • Sentiment analysis by analysing citizens feedback regarding safety issues in the city (ensuring anonymity of the contributor)	• Access to CCTV Network across the city providing regular video feeds • Trigger the SOP, staring with Instantaneous event reporting to respective authorities *(For Example- Police. City administration)* • Control of streetlights illumination • Use of Field level warning systems *(For Example- Sirens, Public address systems, VMD, etc)* to discourage defaulter	• Automated messaging to citizens for regular updates through Social Media/ WhatsApp/SMS • Automated Messaging to the Rapid Action Teams and other action taking team as per SOP • Awareness campaigns by authorities with citizens at large

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Data/feed from Social Media, mobile apps and other city level systems *(For Example- Emergency call boxes)* • Details of relevant incidences *(For Example- accident, theft etc)* • Grievances logged by citizens	• Integration of GPS for optimized route tracking for Emergency Response • Integration of face detection with CCTNS system.	• Creation of Green/ Emergency corridors by traffic signal management for quick response and better location management • Drones for better situational awareness and triggering appropriate action.	

Use Case 24:
How to ensure safety of citizens during emergency/disaster situations?

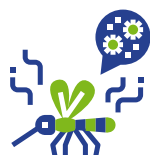| Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Location of all CCTV cameras, emergency call box, Public Address System, police stations, Beat Marshals and Rapid action teams visible on the city map with feeds from CCTV • Data inputs from Dial 100/Dial 112, Smart City Helpline etc. • Data inputs from weather department, emergency fire services, hospitals, other related government agencies • Marking few areas as 'Critical' for safety • Monitor the entire city by collaboration with private establishments to gather video feeds from private CCTV camera networks • View the heat maps of fire/ flood prone areas on the city map based on past incidences and patterns • Data/feed from Social Media, Mobile Apps and other city level systems	• Location wise analysis of crimes/fires/riots/ epidemics in the city • Crowd detections using analytics on CCTV Cameras • Analyse citizen feedback about various safety issues in the city • Integration of GPS for optimized route tracking with Emergency Response teams • Integration of face detection with CCTNS system • Sentiment analysis by analysing citizens feedback regarding safety issues in the city	• Trigger SOPs, starting with instantaneous event reporting to respective authorities • Asset and Resource mobilization and allocation in real time • GIS plot with Safe zones indicators • Signal Management for Traffic diversions • Crowd management and Security Breach handling • Control of streetlights illumination • Use of Field level warning systems *(For Example- Sirens, Public address systems, VMD, etc)* to discourage defaulter • Creation of Green/ Emergency corridors by traffic signal management for quick response and better location management • Use of drones for for better situational awareness	• Two-way Communication with Ambulance services/Fire Dept vehicles for effective deployment • Automated messaging to citizens for regular updates through Social Media/ WhatsApp/SMS • Automated Messaging to the Rapid Action Teams, Women Protection Teams • Use of Public Address System, VMDs to effective communication on the ground

Use Case 25:
How to predict crime in a City using Data Analytics and AI?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• View designated unsafe streets on city map (Marked by police/city administration/citizens) • View Real time video streaming of camera feed and video analytics • View heat-map based on street light complaints from different areas • Citizen feedback along with photographs and coordinates • Specific gestures include Distress, violation of traffic rules, detection of crowd gathering • View objects for tracking and monitoring: Missing Car, Missing Person, etc • Inputs from CCTNS system on crime hot-spots in the city, info in recent trends • Input from ITMS on signal violation & patterns • Location of all CCTV cameras, emergency call box, Public Address System, police stations, Beat Marshals and Rapid action teams visible on the city map with feeds from CCTV • Data inputs from Dial 112, Smart City Helpline etc.	• Generate Heat-map of crimes • Apply Predictive Analytics over crime date over different dimensions. • Map High potential areas of crime: Crime Type, Crime Severity, Crime Location • Analyze Social Media to get further insights on crime in the city • Location wise analysis of crimes/fires/riots in the city • Co-relate info on crowd detection, crime hotspots, speedy vehicles, Gunshot detection, etc. • Integration of GPS for optimized route tracking with Emergency Response teams	• Notifications to the citizens about crime in sensitive areas • Deployment of Protection and Surveillance team in sensitive areas • Send alerts to Police on likely incidences; Invoke concerned SOPs • Traffic diversions using ITMS • Asset and Resource mobilization and allocation in real time • Crowd management and Security Breach and crowd movement and crowd behaviour handling • Access to CCTV Network across the city providing regular video feeds • Control of streetlights illumination at places of incidences • Use of Field level warning systems *(For Example- Sirens, Public address systems, VMD, etc)* to discourage defaulter(s)	• Two-way communication with field response team to assist them in rescue or mitigation operation • Use of Public Address System, VMDs to communicate messages on real-time basis • Feedback/awareness - Civic Services • Two-way Communication with Ambulatory services for effective deployment • Information to Women safety, Patrol Services for quick response • Automated messaging to citizens for regular updates through Social Media/WhatsApp/SMS

I. HEALTH MANAGEMENT

The details of few use cases across Energy Management are as follows:

Use Case 26:
How to effectively tackle mosquito borne diseases in city?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Input from civic health department for locating water logging/ potential mosquito breeding areas across cities • Grievances received from citizens (through Social Media, Mobile App, Portal, etc.) • fumigation plan from civic health department • Real time Bed/ medicine/staff availability details from Hospital Management System	• Heat maps creation with Ward/Zone wise Hot-Spot Analysis. • Trend analysis of patient footfalls with timelines. • Co-relation of data from mosquito breading season, fumigation schedule and impact on mosquito bone disease	• Visualisation/Dashboard on the GIS Map • Predictive Alert in case of available bed is lesser than daily patient count • Planning and monitoring of resources (Medicines/staff/ bed etc.) • Triggering SOPs in case of emergency alerts • Close monitoring of Social Media & Grievance redressal system • Bulk SMS to citizen in locality to educate on mosquito borne diseases.	• Communication over VMDs, PAS and Social Media for regular updates and advisory through city health department • Communication with Hospitals, City Health and Sanitation officers based on alerts generated by the system

Use Case 27:
How to strengthen Civic Health Care delivery in the City using Data Analytics?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Ward /Zone wise data of Vaccination drive carried across the city • Data from health care surveys • Real time Bed/medicine/ staff availability details from HMS	• Correlation of water quality, air quality on diseases reported at primary, secondary and tertiary care. • Ward/Zone wise heat-map generation of different diseases across city	• Planning and monitoring of resources (Medicines/ staff/bed etc.) • Triggering SOPs in case of emergency alerts	• Communicate with patients/ Hospitals/Citizens/ Labs • Communicate with sanitization/ heath department during alerts

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Patient data from primary, secondary and tertiary care. OPDs (Indicating major and minor treatments) • Grievances received from citizens related to healthcare delivery in the city (through Social Media, Mobile App, Portal, etc.)	• Identify common diseases based on patient data etc. on daily, weekly and monthly basis to gauge the impact of preventive care program • Predictive analysis of historical data to identify outbreak of disease.		• Awareness drive for citizens in targeted areas through email, SMS, WhatsApp, PAS

Use Case 28:
How to predict Stray Dog menace in the City?

Data Acquisition	Data Correlation and Analysis	Command and Control	Communication
• Dog bite/menace grievances received from citizens (through Social Media, Mobile App, Portal, etc.) • Ward/Zone wise sterilization drive data conducted by municipal department • Monitoring of stray dogs on cameras through video analytics	• Ward/Zone wise heat maps creation of grievances with Hot-Spot Analysis	• Review the thresholds of dog bites incidents every monthly against reported cases • Monitoring grievance redressal system	• To hospitals, concerned departments • Increase awareness among citizens about dog bites and its treatment using SMS, WhatsApp, Website and mobile app etc.

Integrated Command and Control Centre, Indore