Disruptive Technology Enabling Smart Cities

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Director (IT)

Surat Municipal Corporation

Agenda

- About Surat
- GIS Implementation at SMC
- Use of Geo Spatial Data for Municipal Governance
  - Grievance Redressal System and Analytics
  - Property Tax Recovery Monitoring
  - Vector Borne Disease Control System
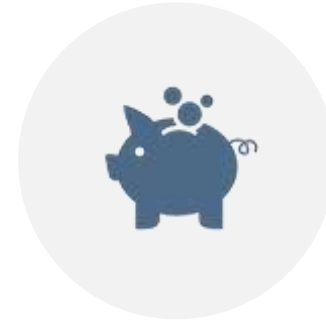 - Covid-19

Background

SURAT
8th Largest City
4.46 million
(2011 census)
6 million
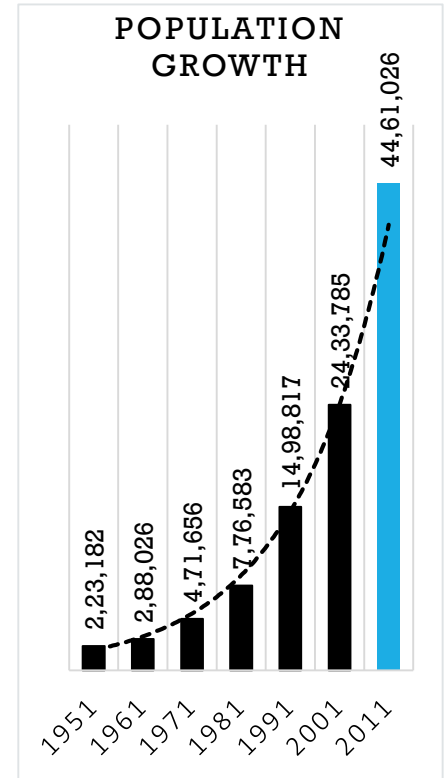(current estimates)

462.149 sq.km

Area
under
jurisdiction

**Fastest Growing
City Globally**
Oxford Economic's
Global Cities 2030 Report

**Economic Capital
of Gujarat**
Hub of Diamond &
Textile Industries

POPULATION GROWTH

- 1951: 2,23,182
- 1961: 2,88,026
- 1971: 4,71,656
- 1981: 7,76,583
- 1991: 14,98,817
- 2001: 24,33,785
- 2011: 44,61,026

60% to 80%
Decadal Growth
(since 4 decades)

- Surat dates back to 300 BC
- Municipality Established in 1852
- Municipal Corporation Formed in 1966
- Hazira Industrial Estate near the City
- An Environment with Peace, Alliance & Unity
- Admin Zones   : 9
- Election Wards   : 30

3

Surat also known as…

Diamond City — 9/10 Diamonds in the world are cut and polished in Surat

40% of nations total man-made fabric & 28% of nation's total man-made fiber production — **Textile City**

Bridge City — Over 115 bridges to ease commute

Declared as SOLAR CITY by Ministry of New & Renewable Energy — **Solar City**

Green City — Over 200 public parks & gardens along with Nature Park & upcoming Biodiversity Park

Surat – One of the Best City

Smart City
Best Performing City

Consecutive for 3rd year for showing great momentum in Implementation of Projects under Smart City Mission

SWACHH SURVEKSHAN 2021/22
2nd Cleanest City

Declared 2nd Cleanest City of India in World's largest cleanliness survey of 4242 cities

MPI 2020
2nd Best City

2nd Best City of India as per Municipal Performance Index parameters

EoL 2020
5th Best City

5th best city of India based on EoL which evaluates the quality of life

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1ST Data Maturity Assessment Framework Cycle 2 *Among 100 Smart Cities*

1ST Climate Smart Cities Assessment Framework 2 *Among 126 Cities*

1ST *Water+ City* of India

GARBAGE FREE CITY STAR RATING
One of six 5-Star Garbage Free Cities

Physical Infrastructure

Water Supply	17 WTP, 40 WDS, 3700 km. T&D network, 1285 MLD gross water supply (98.85% Coverage)
Drainage	11 STPs, 63 SPS, 3 TTP & 2022 km. gravity main network
Storm Drainage	1020 km.
Roads	**Total 3988 kms**
CC Road	86 kms
Asphalt Roads	3581 kms
Polymer Roads	202 kms
Micro Surfacing Road	90 kms
Plastic Waste Bituminous Road	28.50 kms
Bridges	**Total 115 (+7 WIP)**
River Bridge	14 (+ 2 WIP)
Creek Bridge	61
Fly over Bridge	28 (+ 1 WIP)
Railway Over Bridge & Under Bridge	12 (+ 4 WIP)
Street Lights	1,44,468

Social Infrastructure

Schools	329 (MSB) 1.6 lakh students 18 SUMAN 8300 students
Hospitals	2 [SMIMER-1520 beds with Covid Facility & Maskati-120 beds]
Health Centers & Maternity Homes	52 [7 Community Health Centers & 19 with maternity home]
Mobile Dispensaries	5
Medical College	1 [200 Undergraduate & 124 Postgraduate]
Aanganwadi	1092
Gardens	207
Swimming pools	16
Sports Facility	10
Community Halls & Party Plots	57
Library & Reading Rooms	3 Libraries & 106 Reading Rooms
Fire Stations	16

Smart and Spatially Connected Governance

Surat Municipal Corporation

Introduction

- Surat Municipal Corporation (SMC) has designed, developed and implemented a Web based GIS application along with GIS database for better governance, improving operational efficiency and ease of interaction with citizens.
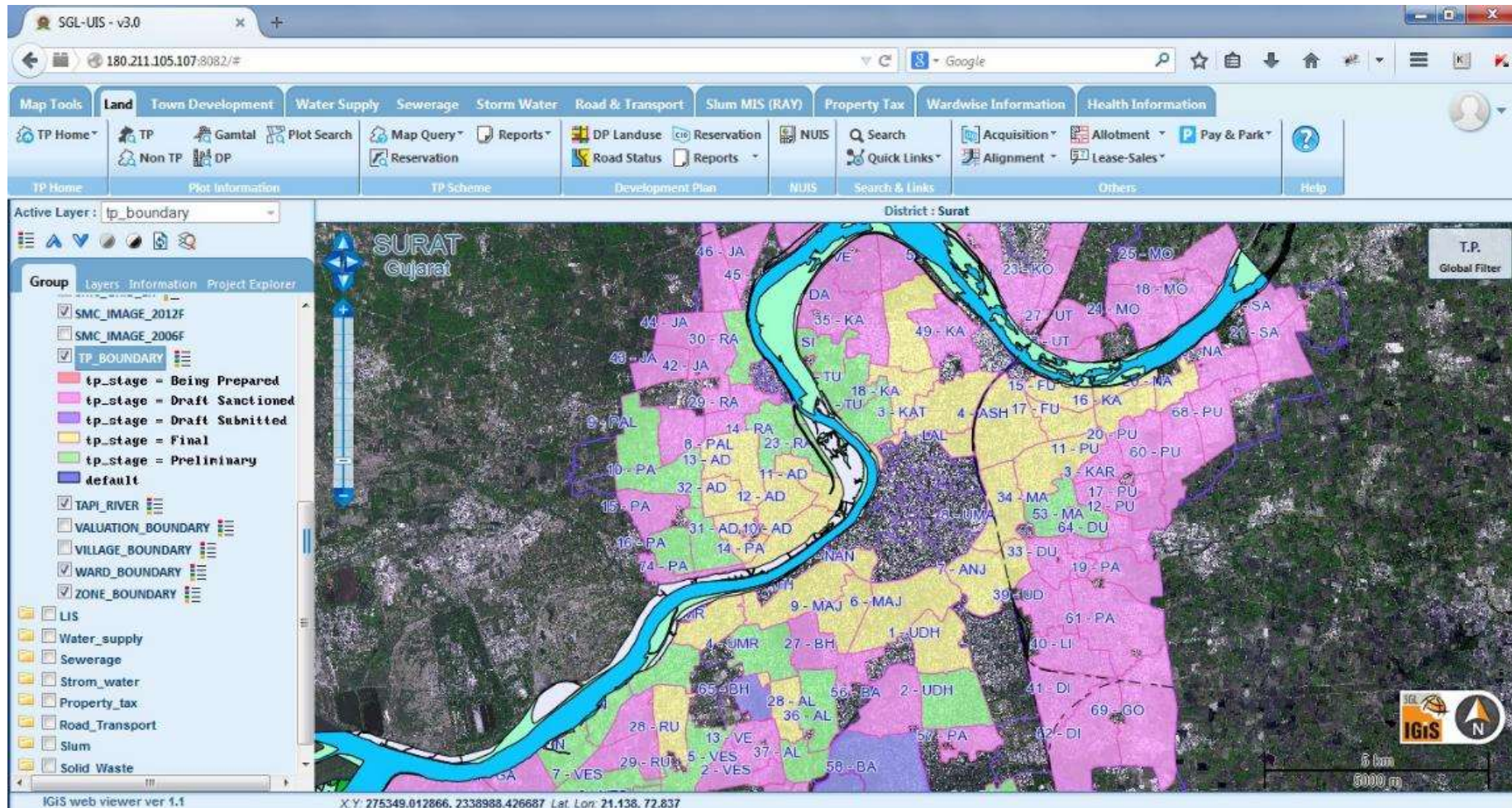
SMC Web GIS Application

- Design, develop and deploy GIS database and a customized web based GIS application

- Followed national standards and guidelines for development (NUIS, RAY, JNNURM etc.)

- Followed OGC international standards for GIS application development. (for data and web services)

- Support for Utility System like Water Supply, Sewerage System, Storm Water, Drainage System, Road Network and Solid Waste Management System. Household Level Property data Preparation.

- Customized GIS application to meet SMC's specific requirements and to make decision making processes efficient and effective.

- The system have flexibility of integrating existing as well as other third party application

- Development of user friendly and easy to use interface for Citizens and for departmental users.

Web GIS Application Interface

- The SMC Web GIS application is mainly classified in two types of interfaces.

- **A. SMC departmental users:** It consists various functionalities of different department users of SMC. Following are the list of the departments
  - Town Panning
  - Town Development
  - Building permission
  - Property tax
  - Water supply
  - Sewerage
  - Storm water
  - Road and transportation
  - Bridge
  - Affordable Housing

Web GIS Application Interface

- **B. Citizen access :** It consists limited access of the functions defined by the SMC officials. Key features of citizen interface are,

- Plot Search

- Form B/F Report

- Part-print generation

- Building permission details

- Search

Base map specification

✓Base map prepared for SMC area (326.51 sq km) using high-resolution imageries (QuickBird –Resolution 0.6m) in 1:5000 scales.

✓Slum mapping in1:500 scale using Total station survey.

▪ Layer Details

• More than 100 layers

    ✓ Town Planning Department   : 36
    ✓ Town Development   : 2
    ✓ Property Tax Department   : 5
    ✓ Road & Transport   : 19
    ✓ Hydraulic Department   : 15
    ✓ Drainage Department   : 7
    ✓ Storm Water Department   : 4
    ✓ Solid Waste Department   : 3
    ✓ Slum Department   : 2

▪ Projection Details

• Zone 43
• UTM (Universal Transverse Mercator)
• WGS84

▪ Satellite Images Details

• Quickbird Ortho Ready
    ✓ Resolution – 0.6m
    ✓ Upper-Left Lat. Long. – 21.3050 N, 72.6935 E
    ✓ Lower-Right Lat. Long. – 21.0030 N, 73.0032 E

GIS Data Specification

The GIS Data model of the application included all the relevant information of various departmental layers , type, attributes and source of the data.
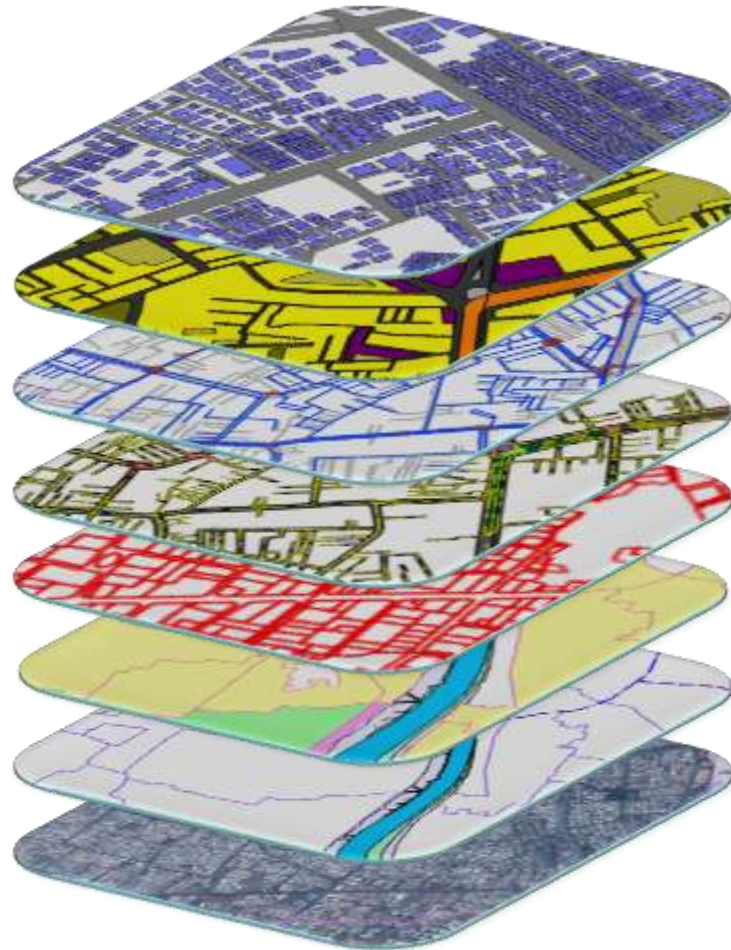
Building Footprints

Landuse / Landcover

Utilities

Road Network

Final Plot

TP Boundary

Admin Boundary

Satellite Image

Map Creation Methodology

- Base Map Preparation
- Collection of Ground control points (GCP).
- Collection of High Resolution Satellite images (Quickbird of Year 2012 and 2006).
- Mosaicking of part wise Satellite image.
- Geo-referencing and Ortho-rectification of images.
- Superimposing Administrative boundaries, TP maps, DP maps and utility layers on Satellite image and Road extraction
- Incorporation of existing departmental maps.
- Property extraction from Satellite Image (On-screen digitization).
- Land-use data extraction from satellite image (as per NUIS Level I to V)
- Creation of Topology and Edge matching of spatial database.
- Ground Truth field Verification as per the confusion matrix.
- Output Quality Check by SMC departmental officials.
- Slum Survey (As per RAY Guideline)
- Attribute attachment
- Finalization of Base Map

Base Map

- **Geo-referenced Base map contained**

- Administrative boundary

- TP scheme data

- Landuse data

- Properties

- Water Supply

- Sewerage System

- Storm Water

- Drainage System,

- Road Network

- Electric poles

SMC Web GIS Application Modules

SMC Customized Web Based GIS Application

User Rights & Management

Water Supply	Town Planning Scheme
Sewerage Network	Slum Survey
Storm Drainage Network	MIS Reports
Road Network	Customization

SMC Existing Database to be Integrated

- Property Tax System
- Building Permission
- Shops & Establishment
- Birth & Death
- Water Meter
- Hydraulic Meter
- Rent Collection Management System
- Solid Waste Management
- Disease Statistics / Reports for Hospital
- Society Registration
- TP Road work entry Module
- Street Light Entry Module

GIS Tools

Data Preparation

- Import/Export Raster, Vector, Tabular Data
- Image Registration
- Draw & Editing Tool
- Projection Transformation
- Geoprocessing
- Buffer Generation
- Legend Creator
- Annotation

Spatial/ Non spatial Query

Map Composition

- Map Layouts(plots) of various scale & size
- Print Maps

Image / Map Display

- Zoom Tools
- Swipe(Auto/ Manual Mode)
- Transparency
- Blank Selection (Auto/ manual Mode)
- Get Cursor Location
- Find by location
- Find by Annotation/ Attribute

Projection & Datum support

Database Management Tools

Output Device Interface Printer & Plotter

IGIS (GIS & IP Functionalities)	Database Server (for saving various data)	File Server (For saving raster & vector & line drawings data)

SMC Web GIS Application Modules

Land Information System (LIS)

- LIS modules includes all the functions and data related to the town planning department.

- TP and Development Plan details

- Plot level Information

- Part-print generation

- Form B/F report generation

- Reservation details

- Landuse details
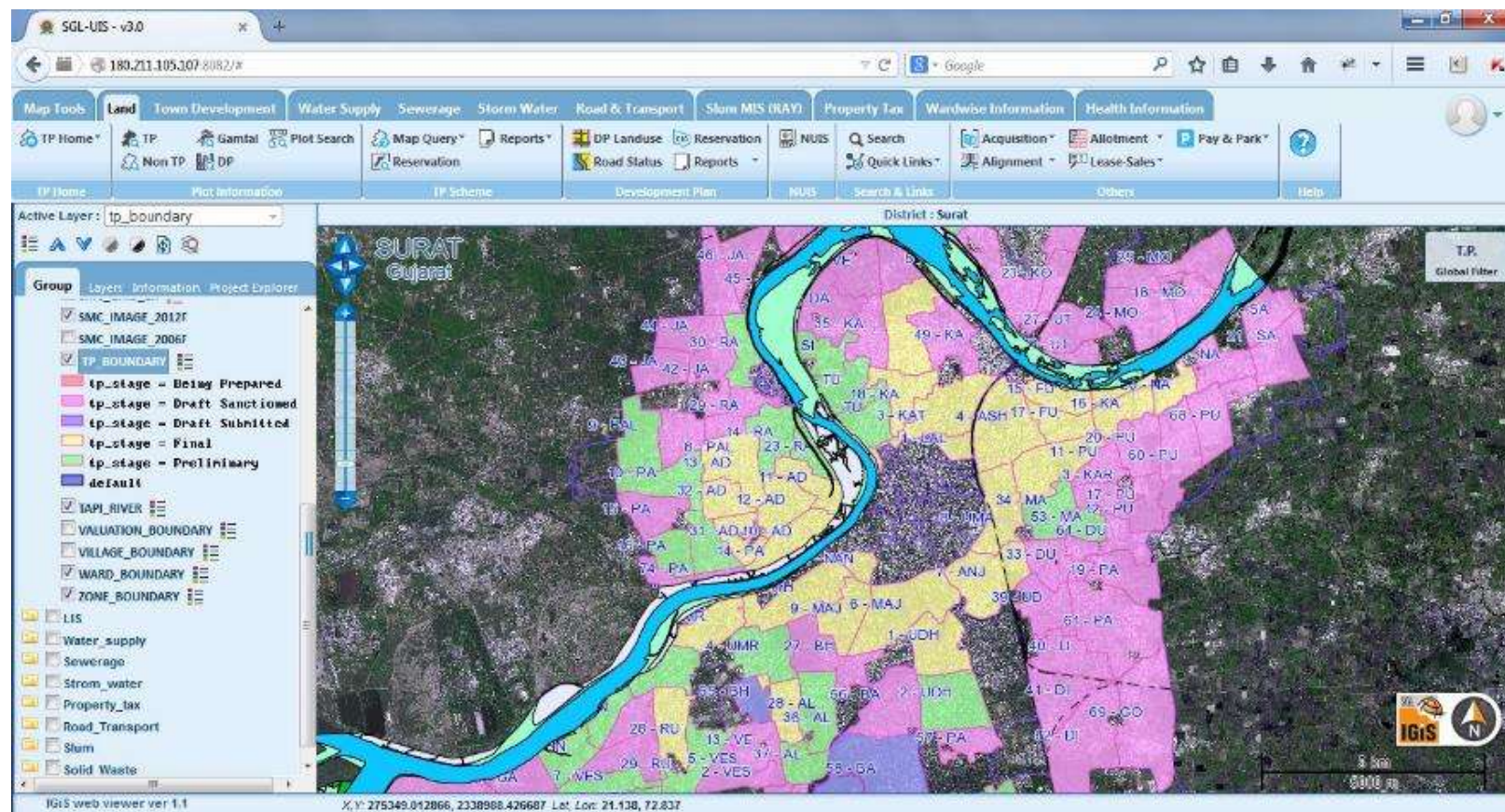
Land Information System (LIS)

Map of Development Plan
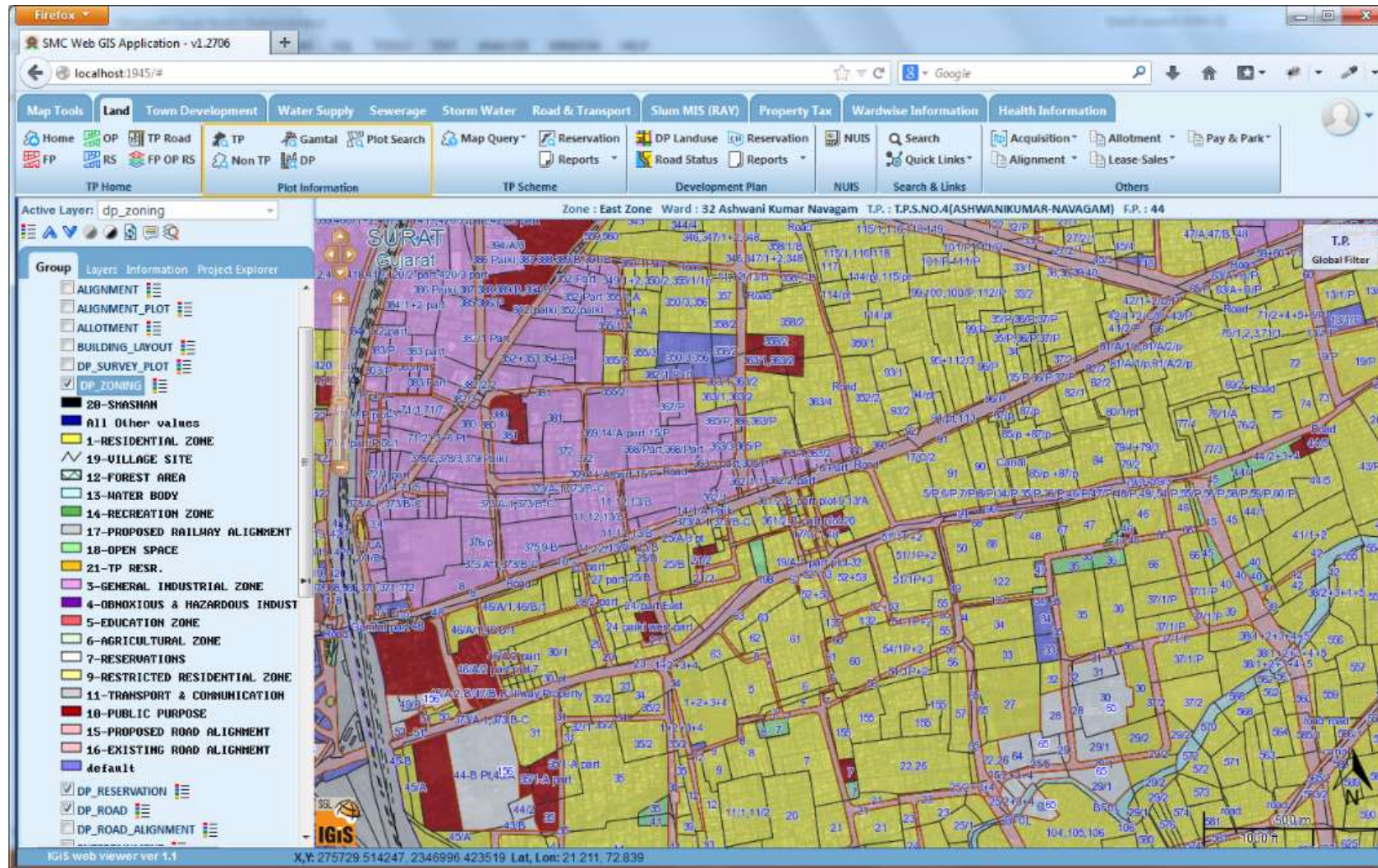
Land Information System (LIS)

Part-print report

Land Information System (LIS)

Form B/F report

FORM - F

THE GUJARAT TOWN PLANNING & URBAN DEVELOPMENT ACT , 1976

Draft Sanctioned - T.P.S.NO.49(KATARGAM)

(SEE RULE 21 & 35)

REDISTRIBUTION AND VALUATION STATEMENT

Case No.	Name of Owner	Tenure	R.S. No.	Original Plot				Final Plot						Contribution (+) Compensation (-) (Section 67) Column 9 (b) minus Column 6 (b)	Increment (Section 65) Column 10(a) minus Column 9(a)	Contribution (Section 66) Percent of Column 12	Addition to (+) OR deduction from (-) Contribution to be made under other Section	Net demand from(+) OR by (-) owner being the addition of columns 11, 13, 14	Remarks
				No.	Area in Sq.Meter	Value in Rupees		No.	Area in Sq.Meter	Value in Rupees									
						Without reference to value of Structures	Inclusive of Structures			Undeveloped		Developed							
										Without reference to value of Structures	Inclusive of Structures	Without reference to value of Structures	Inclusive of Structures						
1	2	3	3(a)	4	5	6(a)	6(b)	7	8	9(a)	9(b)	10(a)	10(b)	11	12	13	14	15	16
134	NATHUBHAI MORARJI, CHANDBEN w/o NATHUBHAI MORARBHAI, BHAGUBHAI NATHUBHAI, MANUBHAI NATHUBHAI, KISHANBHAI MANUBHAI		131	134	15397	5388950	5388950	134	15125	5293750	5293750	14746875	14746875	-95200	9453125	4726563		4631363	SHARE IN F.P. AS PER SHARE IN O.P. Reserved as per Revised D.P. SUDA-1996 (H-37)
					16397.00				15125.00										

Town Development (Building Permission)

GIS data integration with building permission details. It includes the project details, technical details, building details, B.U.C. details.

Building permission & BUC Integration

- With a view to continuously update the GIS application, The building plan approval system has been integrated with GIS application.

- Any application received for Building permission and BU Certificate are approved only after integration with SMC GIS application.

- Integration Certificate from SMC GIS team for necessary BU permission.

Building permission & BUC Integration

STEP 1   Upload Building layout plans through Online system

Surat Municipal Corporation

Offline Building Plan Approval System

Upload layout plan for development permission

Development Permission Application

Case No. of DPA : NZ/24032015/728   [Get Detail] [Clear]

Sr.No	Areatype	Scheme Name	FP No	OPNo	RSNo	RSNo	Block No	CS No
1	T	66Kosad-Variav)	231	231	476-3	476-3	772	-

File Path : D:WebApplicationsEBPASOfflineWebSite\EBPASCaseFileNZ_24032015_728NZ_24032015_728.dwg

Upload File : [Choose File] No file chosen

[Save] [Cancel]

Building permission & BUC Integration

STEP 2   GIS Integration of building layout plan through IGIS software

Building permission & BUC Integration

STEP 3   Integrated Building layout plans on GIS Base map with BUC details

Building permission & BUC Integration

STEP 4   GIS enabled Building Usage Certificate issue to respective stakeholder

Property Tax

Property Tax modules includes the Property and Owner details. It facilitated to execute Map queries and generate reports.

Key Features.

- Property Identification

- Owner details with Tax information

- Map query and Report generation through various criteria

Property Tax

Popup shows the property attributes.

Road and Transportation

Road and transportation module contains the details of road network like road, bridge, traffic island, etc.
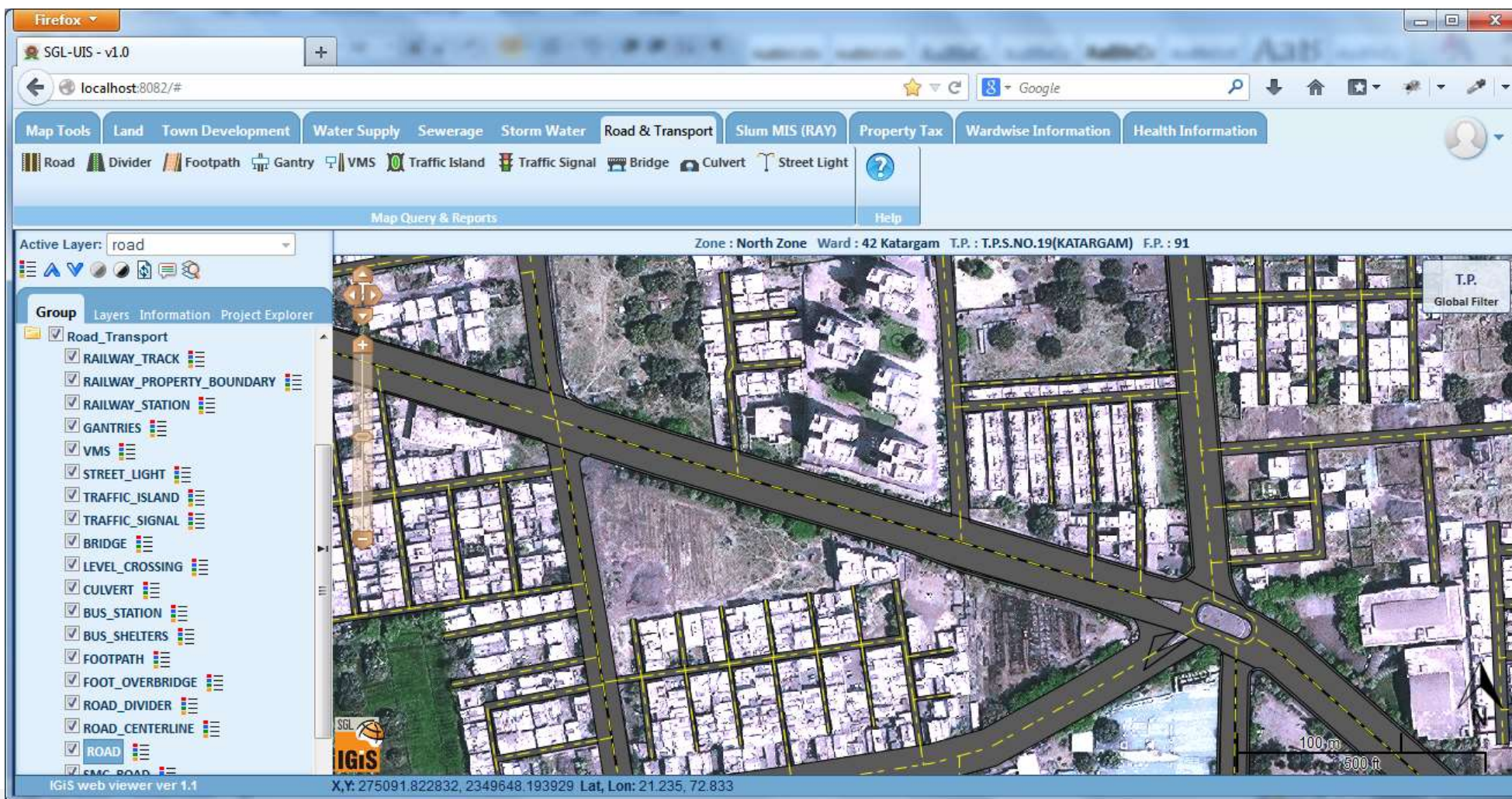
Water Supply

Water supply module contains the details of water network like water treatment plant, pipeline, valve. etc.
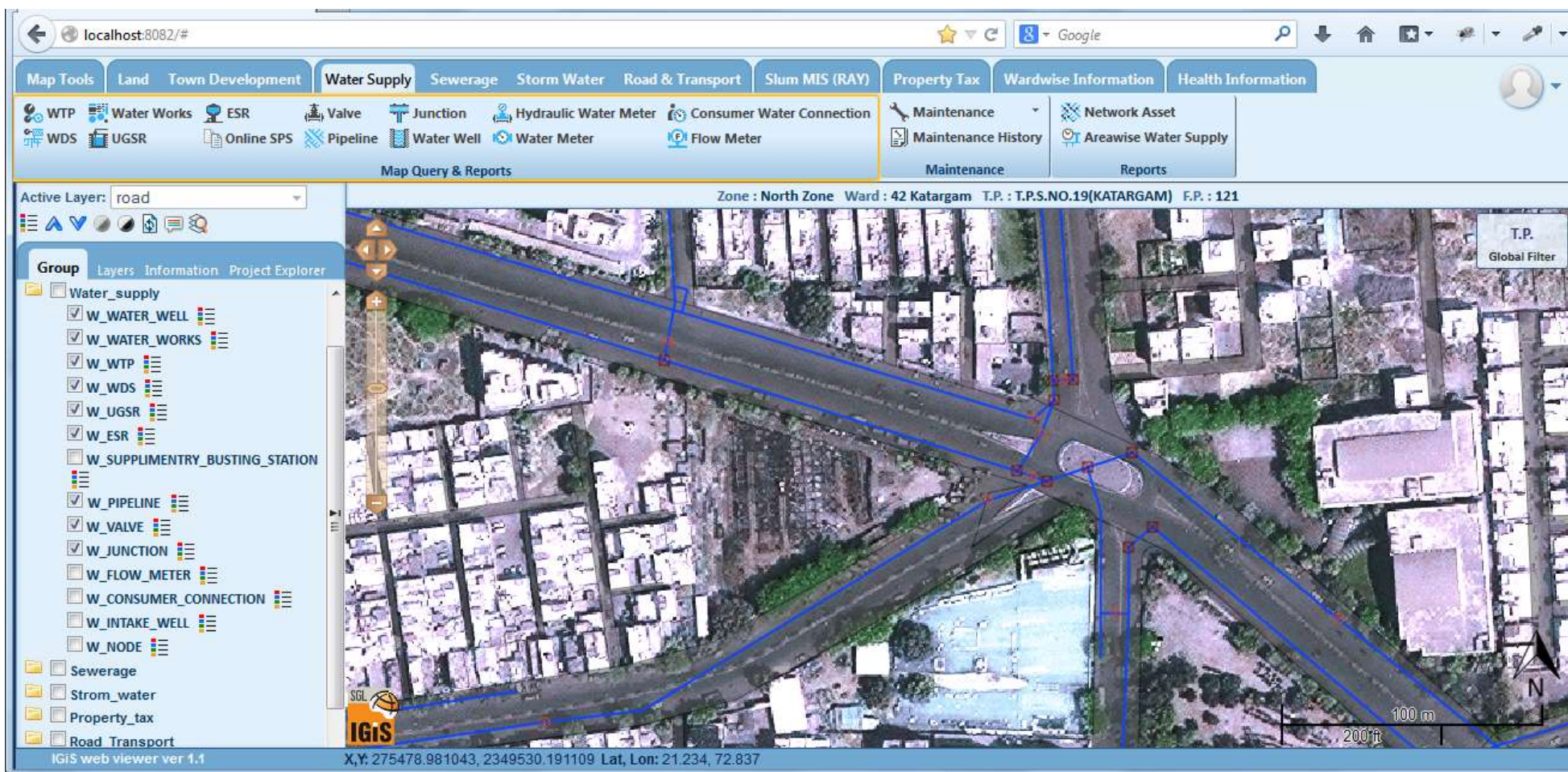
Sewerage

Sewerage module contains the details of sewerage network like sewerage pumping station, pipeline, STP, etc.

Storm Water

Storm water module contains the details of storm network like pipeline, manhole, inlet chambers etc.

Slum MIS

Slum MIS module contains the slum maps and socio-economic details. It facilitated to execute map query and generate various reports.

Citizen Interface

The citizen interface provides access to public user of some functionalities from 3rd January -2015.

Key Features

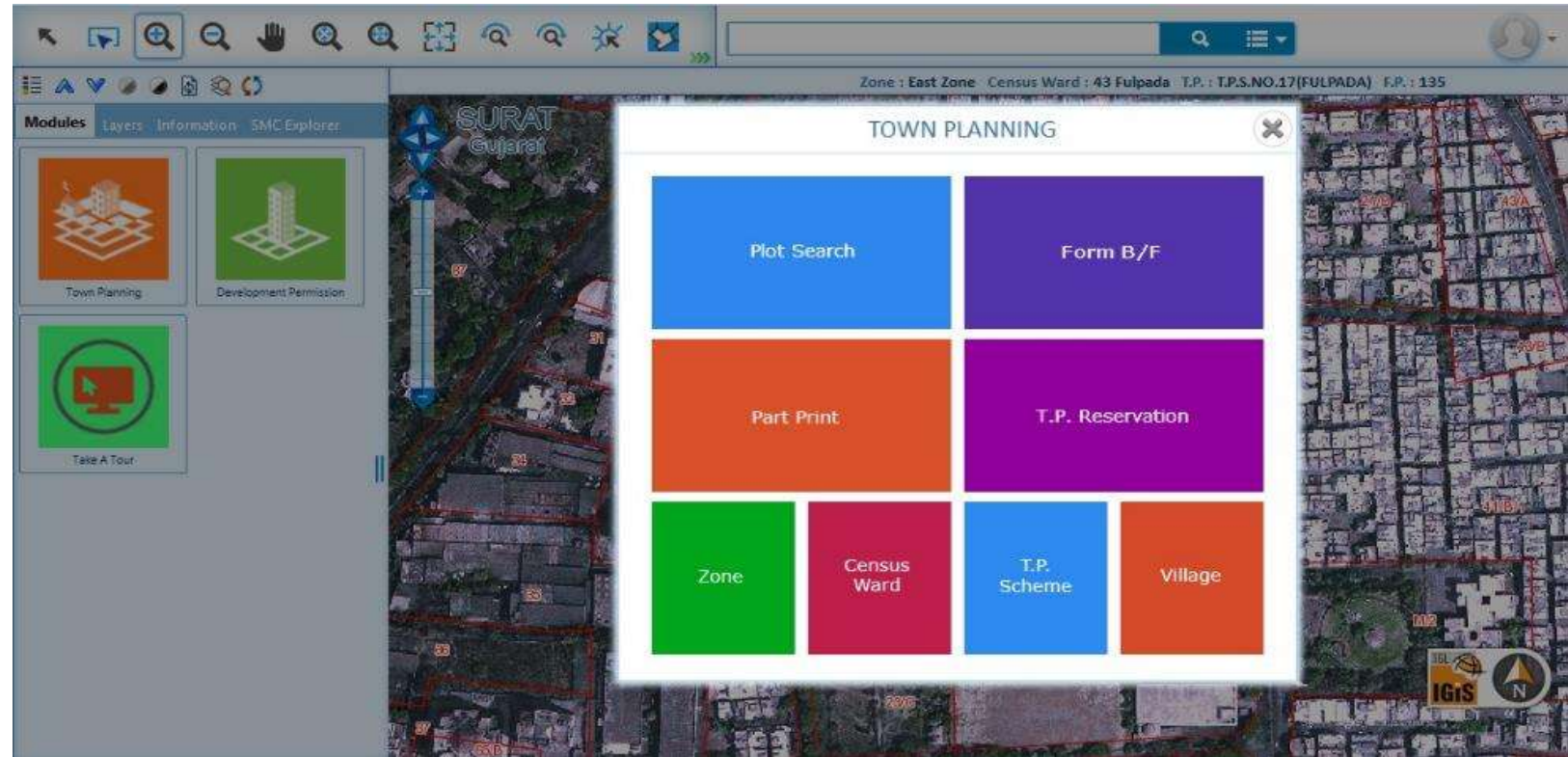Plot Search
Form B/F Report
Part-print generation
Building permission details
    Project details
    Technical details
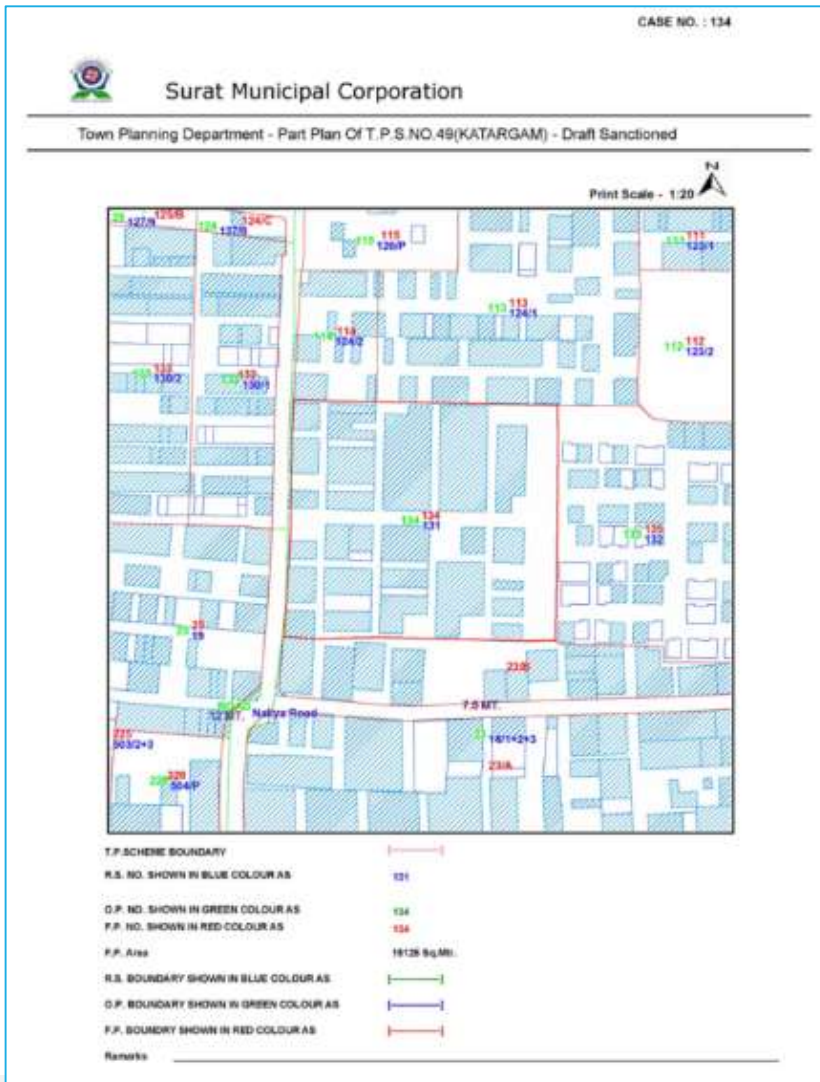   Building details
    COP and parking area
    BUC details

Citizen centric facility

SMC provides Form B/F Reports and Part-print from its Civic Center to citizen

Work in progress for Integration of other Services

- Fire NOC System

- SMC Project Monitoring System

- Hospital Registration System

- Backward integration of above services through GIS portal with Integrated Command and Control (ICCC) Solution

Use of Geo Spatial Data for Municipal Governance

Inaugurated on 29.09.2022
By Hon. Prime Minister Shri

Surat Urban Observatory & Emergency Response Center

## Services Integrated & Monitored

- Monitoring of SWM activity

- Complaint Management System

- Intelligent Transit Management System (ITMS)

- Monitoring City Operations through CCTV Network

- Integration with Geographical Information System (GIS)

- VBD Health Surveillance Application

- Monitoring of SMC Vehicles

- Property Tax Collection

- Swachh Bharat Mission Complaints & Services

Monitoring of Citizen Grievances

- SMC provides a very wide gamut of services that directly touches the citizens on a daily basis.

- On a yearly basis over 1.70 complaints are reported by citizens.

- These complaints are assigned to different departments and ground level employees for compliance.

- Considering the vast work force and quantum of complaints, it is very important to closely monitor the complaints and ensure proper compliance.
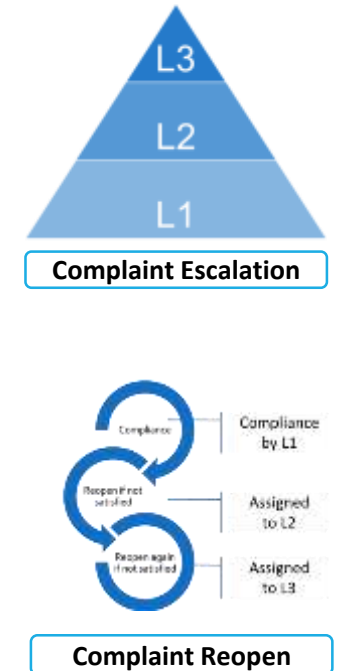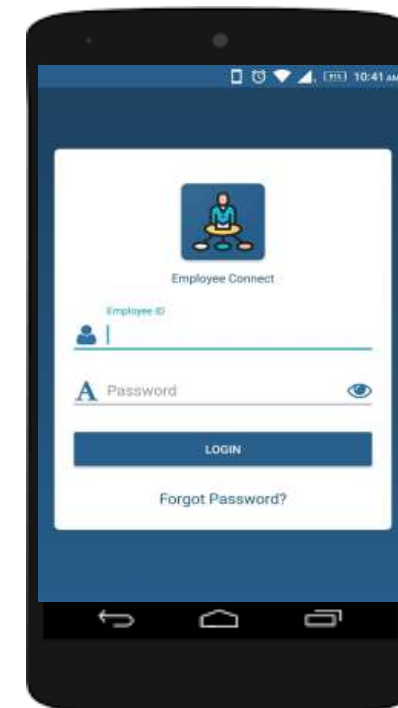
Monitoring of Citizen Grievances
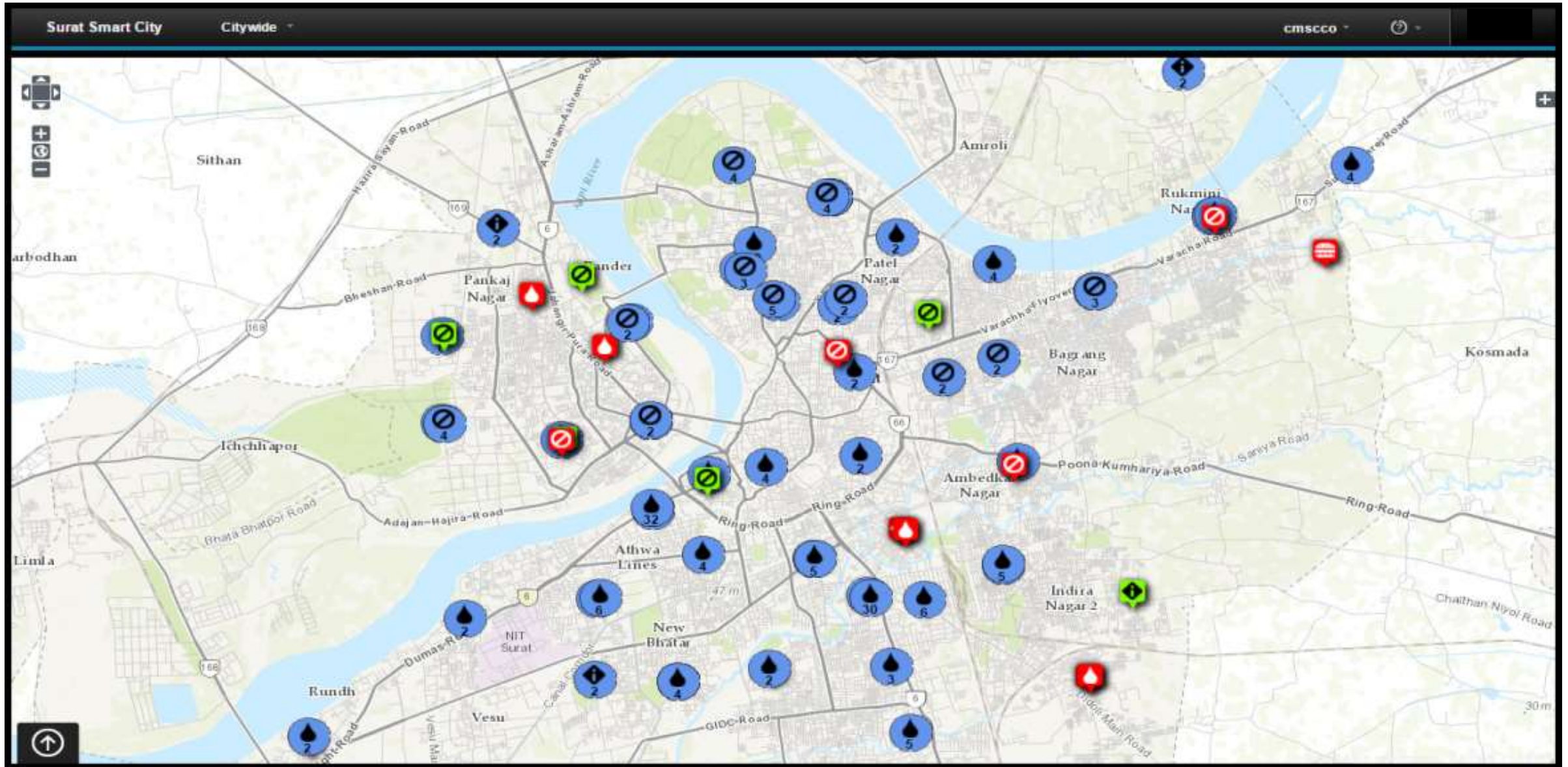
Monitoring of Citizen Grievances
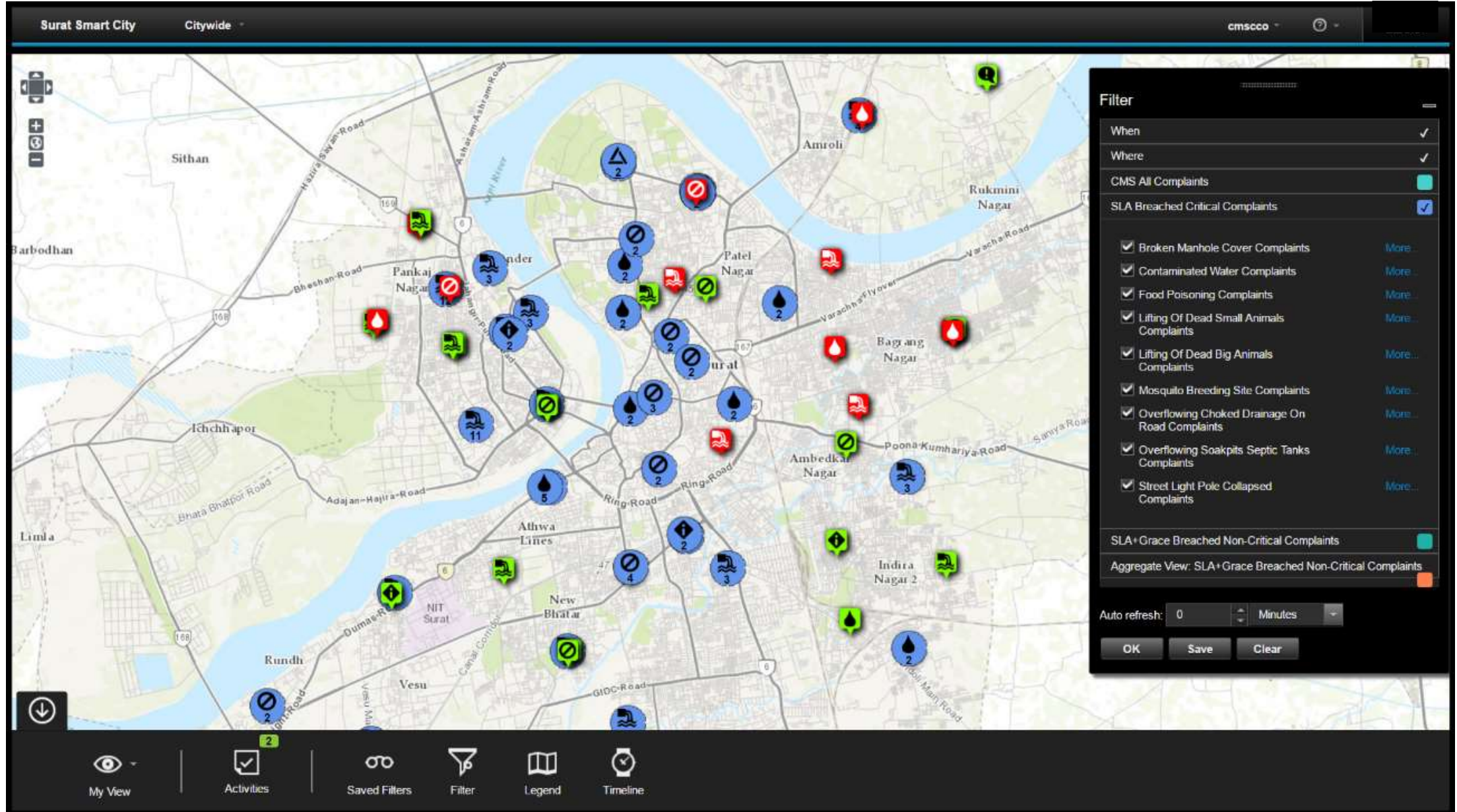
Monitoring of Citizen Grievances
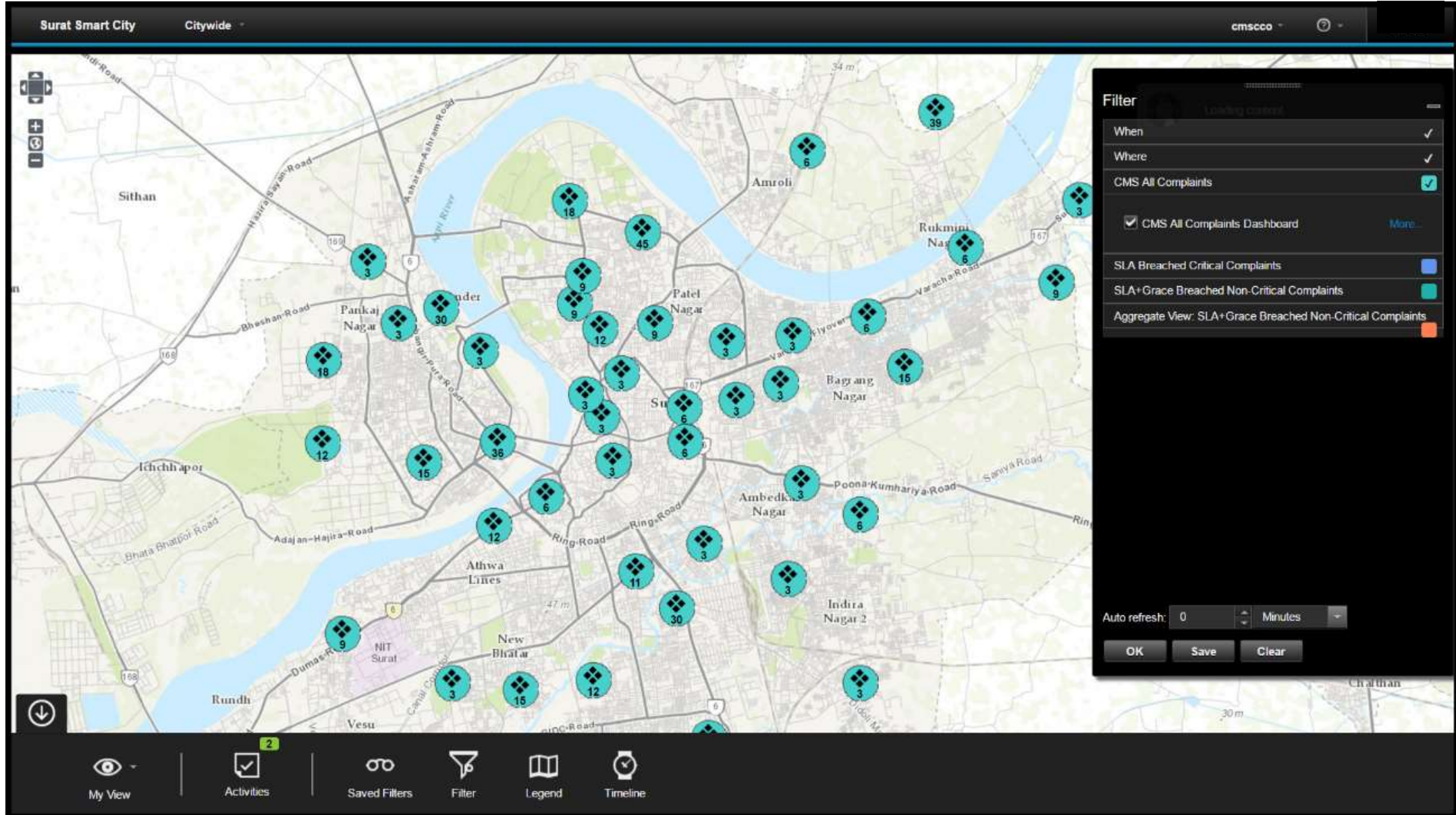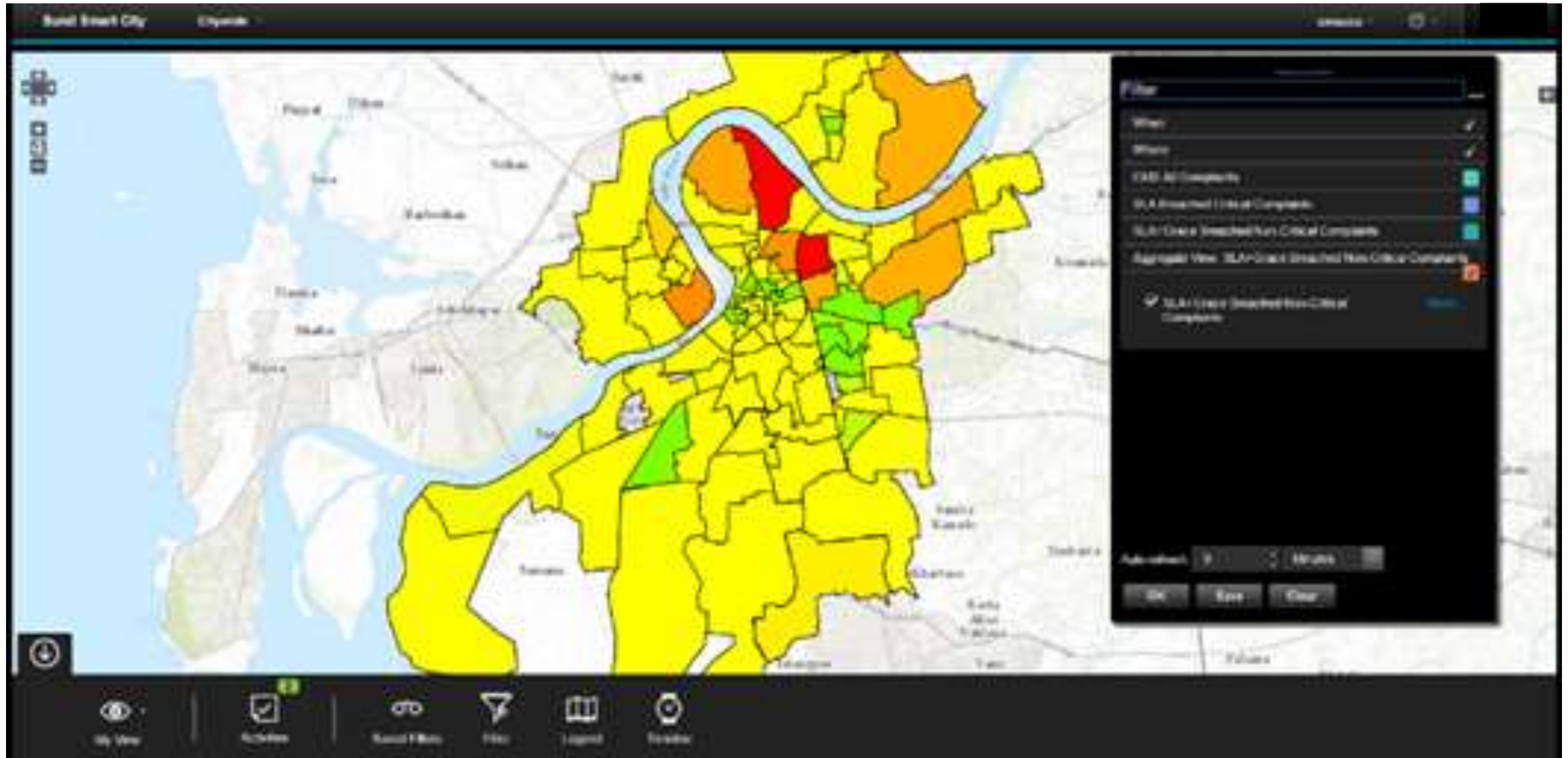
Monitoring of Citizen Grievances

Drainage & Storm Drainage Complaints Analysis

Based on number of complaints received for Drainage & Storm Drainage, considering different ranges, color code has been done for different wards.
Red Color signifies, higher number of complaints.

17-AdajanPatia
Zone: West Zone
Total Complaints: 4023
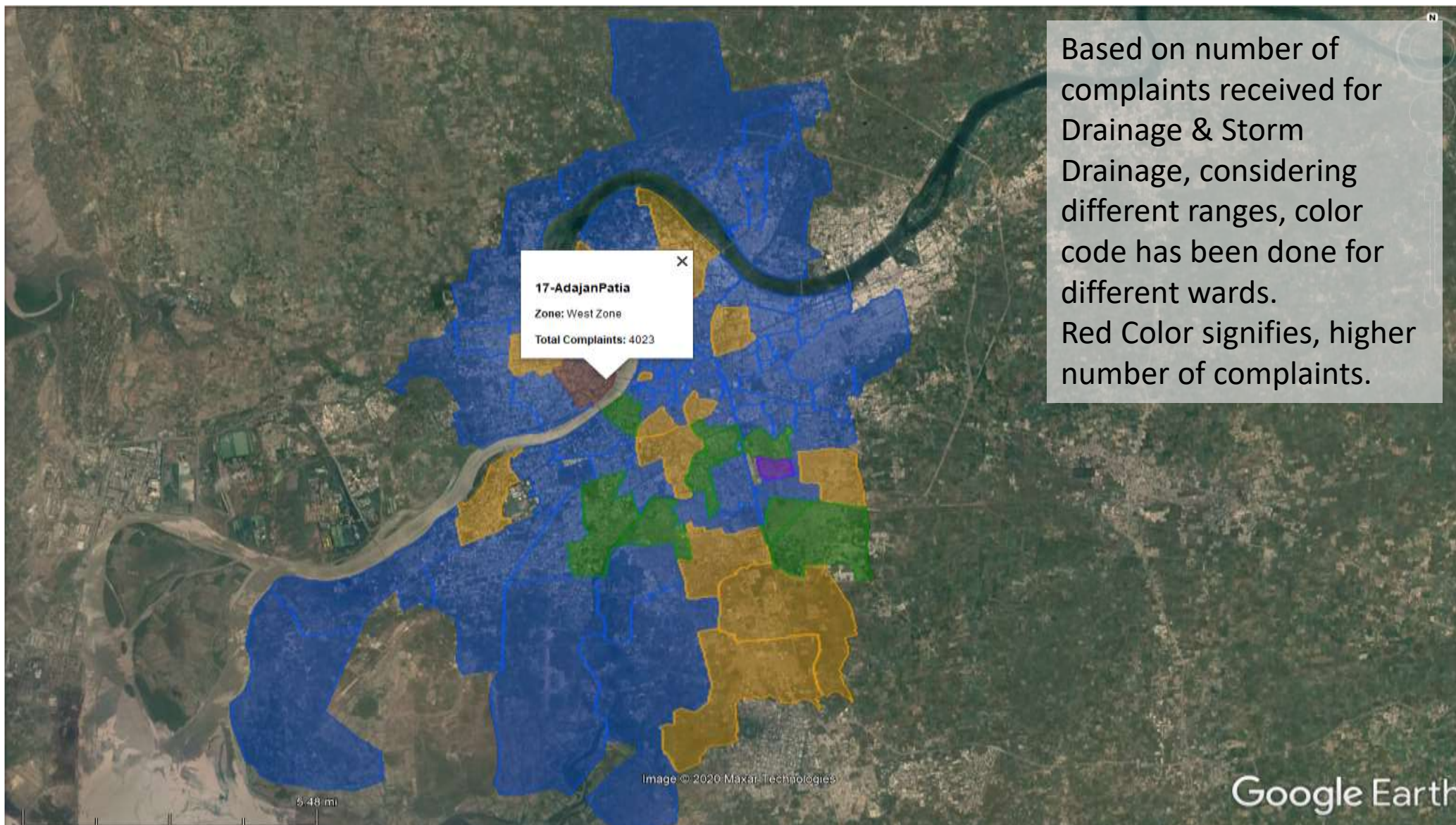
Ward wise representation based on number of complaints

Total Complaints Received
Complaint Analysis for the Year 2016

Legend

Map-based representation is created considering number of complaints received in respective wards.
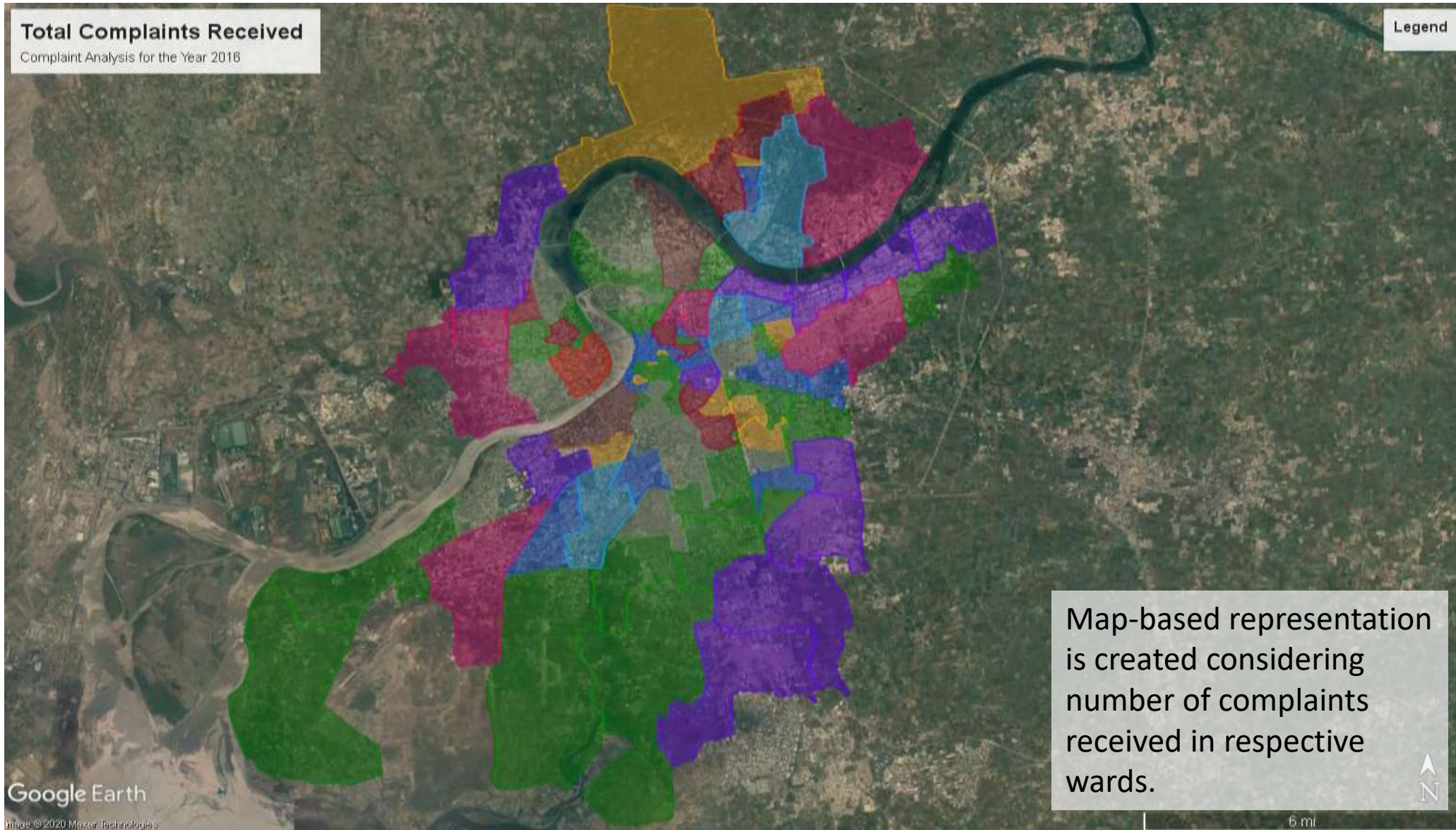
Property Tax System (Tax Recovery Monitoring)

- Zone wise/ Sub Ward wise monitoring

- Percentage of pending recovery post billing process

- Zone wise/ Sub Ward wise Defaulter count monitoring with various range of defaulter value
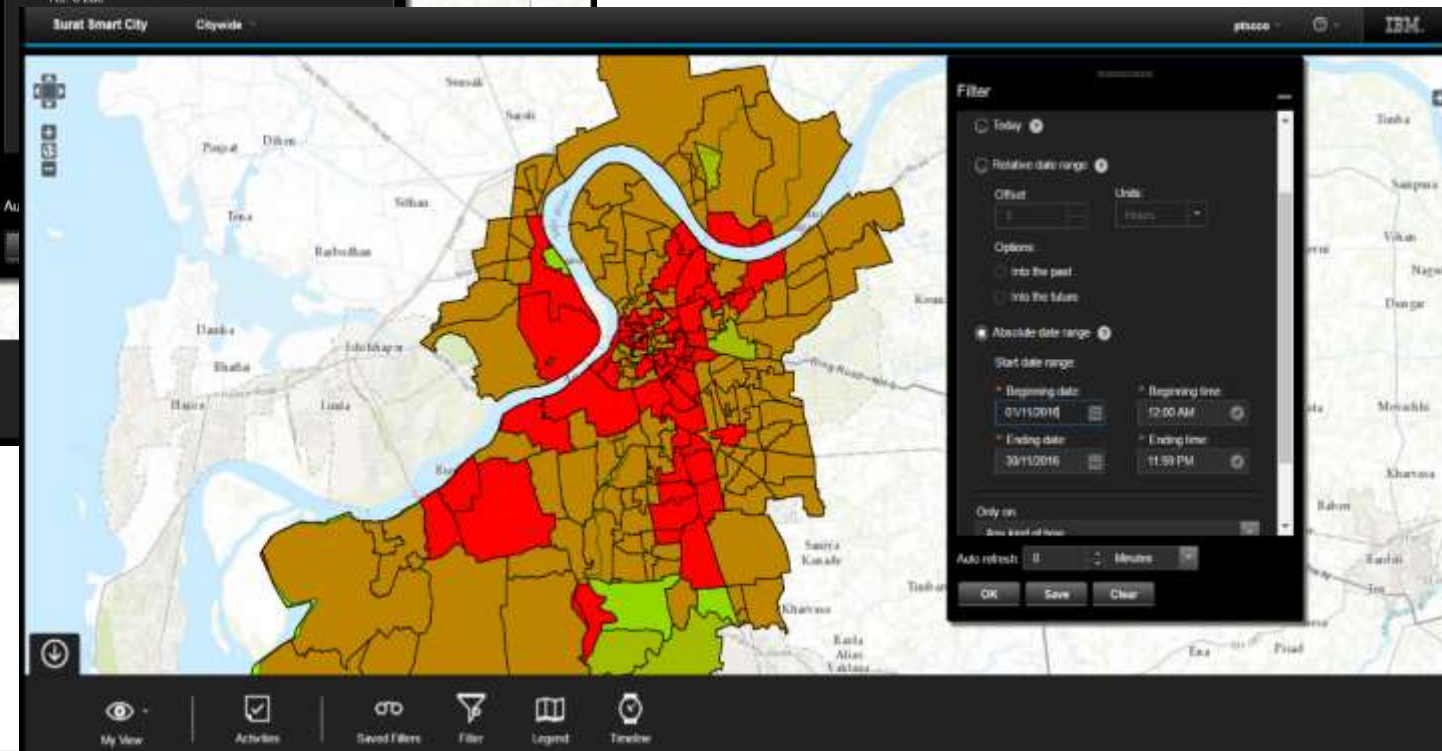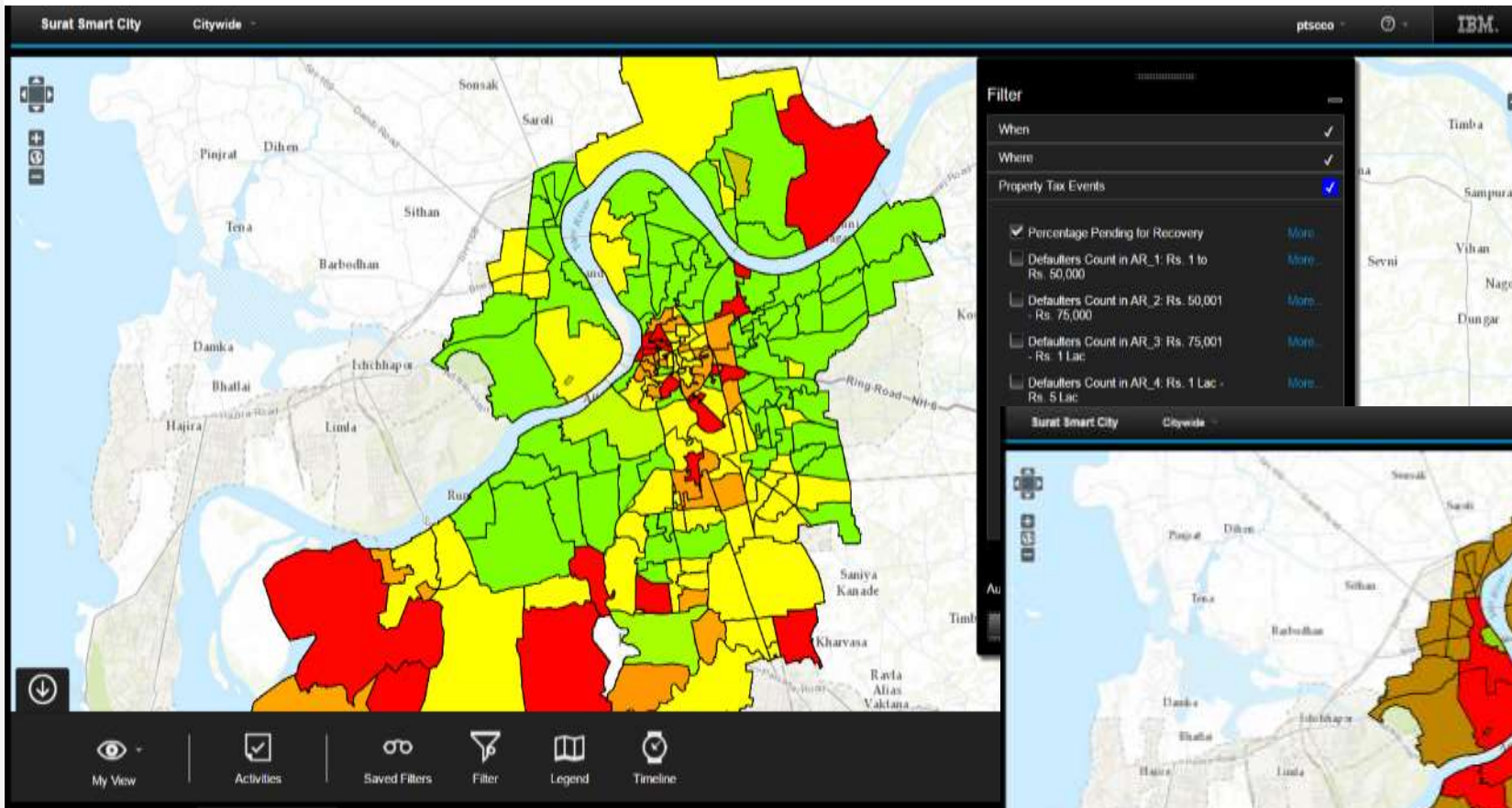
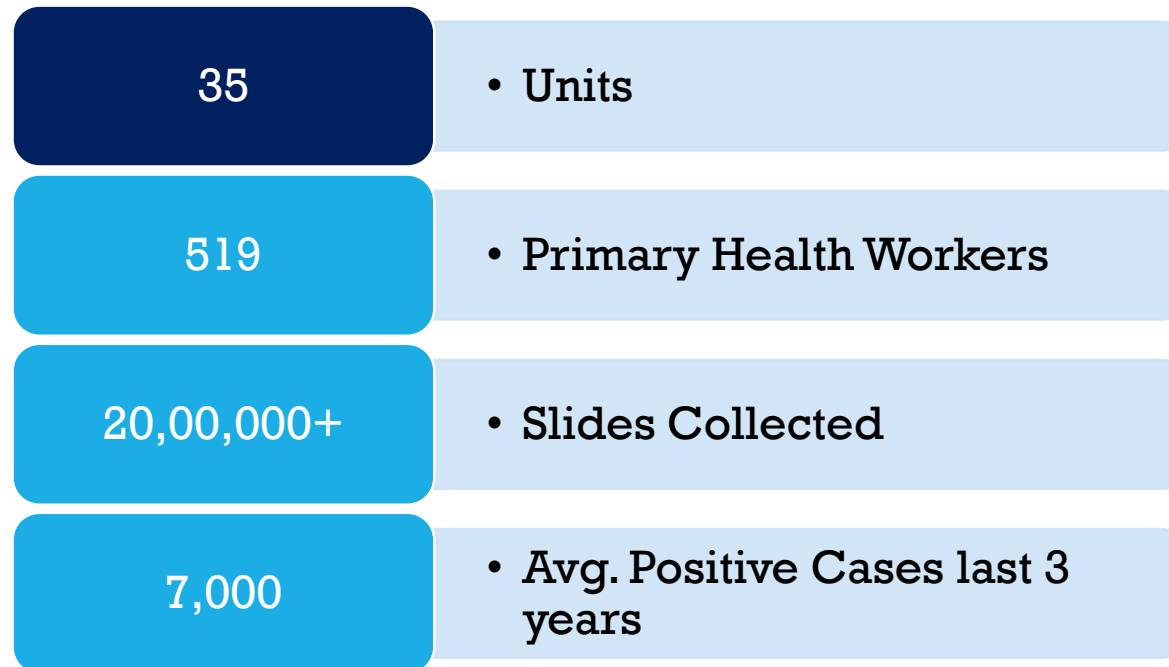# Property Tax System (Tax Recovery Monitoring)

Vector Borne Disease Control System

National strategic plan (2017-2022) has been developed by Government of India for elimination of Malaria which is based on following objectives:

- Strengthening of surveillance system to detect, notify, investigate, classify and respond to all cases and foci in all areas

- To achieve universal coverage in case detection and treatment services in endemic areas

All primary health workers perform tablet based survey which is directly monitored centrally to give the quality performance, with ultimate aim to eliminate Malaria from Surat

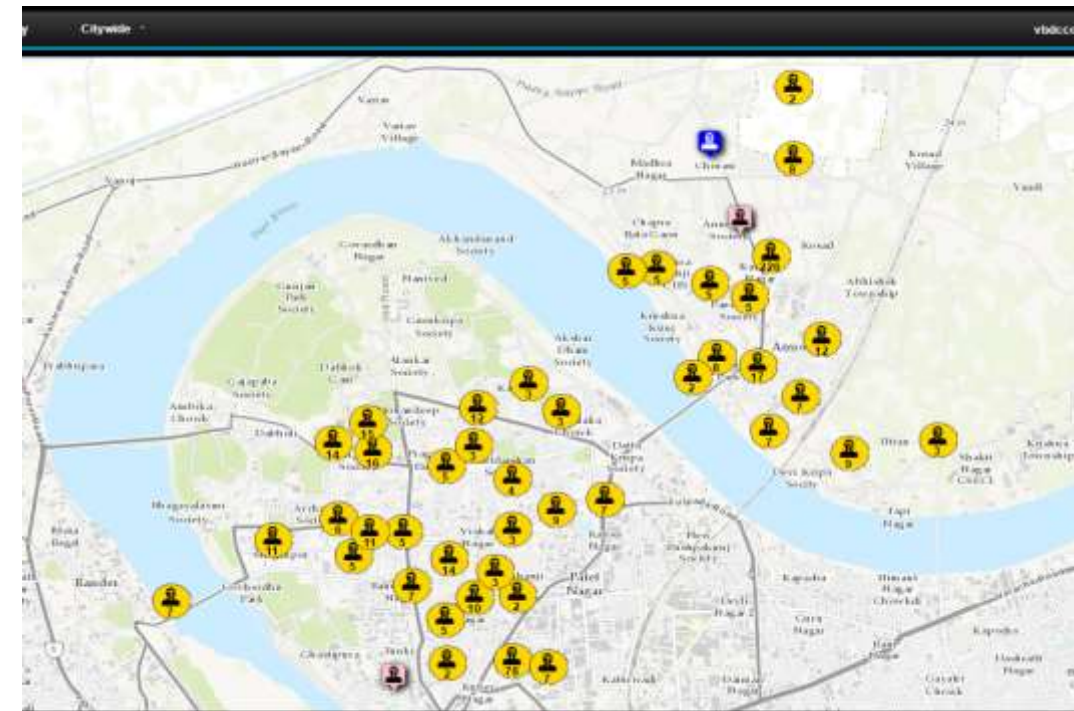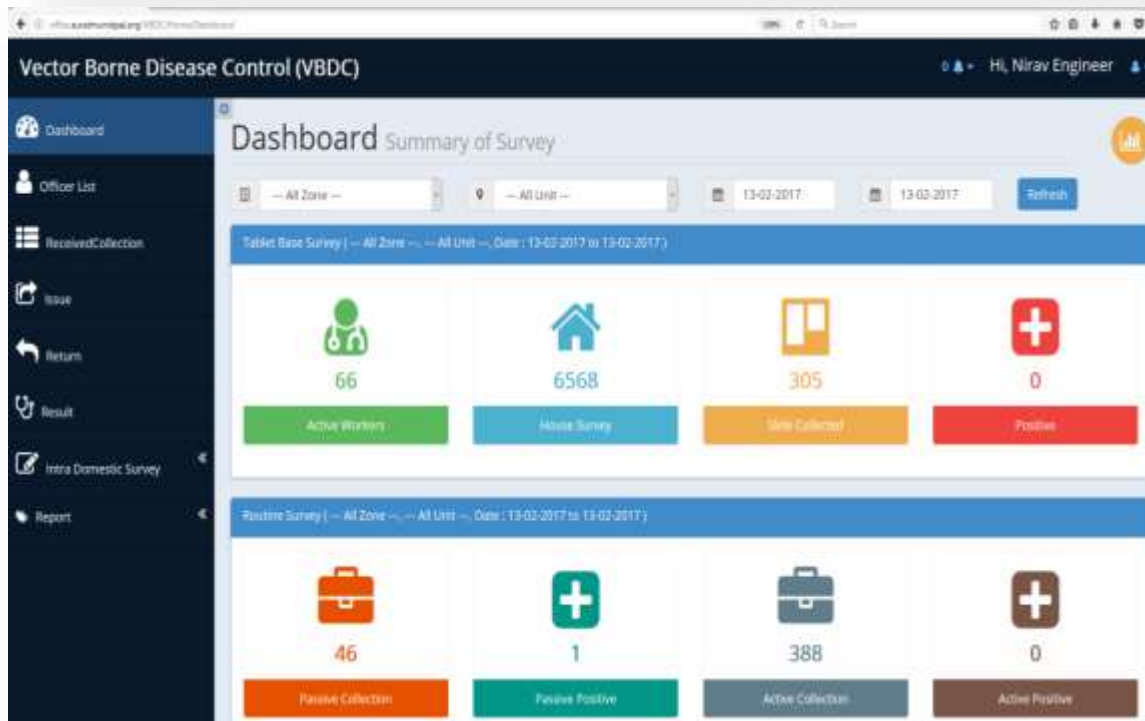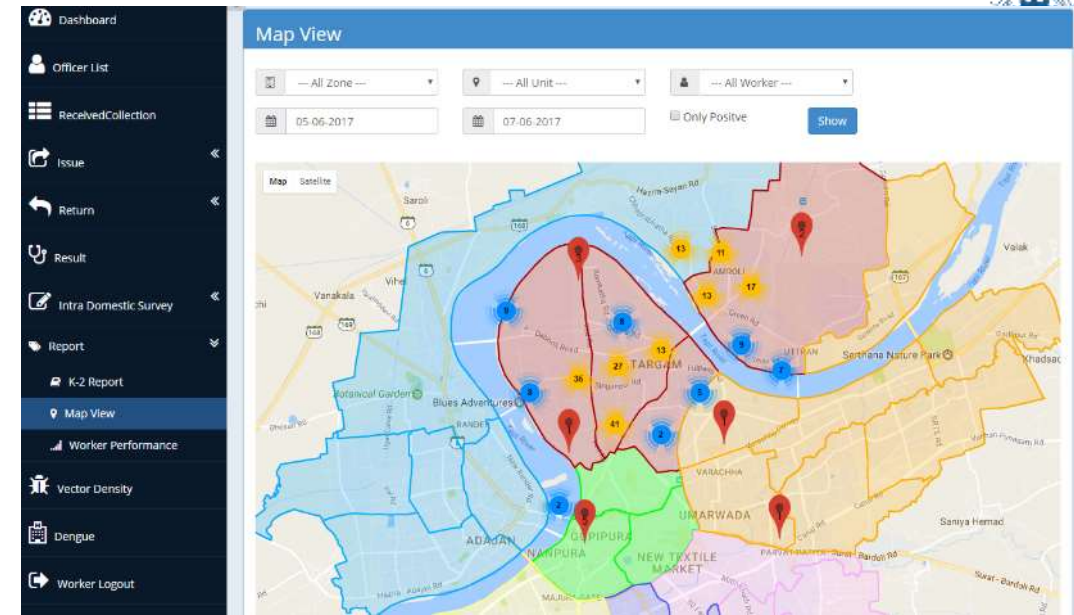| 35	• Units
519	• Primary Health Workers
20,00,000+	• Slides Collected
7,000	• Avg. Positive Cases last 3 years

Activities at SMAC Center

- Monitoring of potential Malaria Case w.r.t. cluster formation in specific area
- Monitoring of Positive Malaria Case with notification to concern field officers, nearby Urban Health Center & Deputy Medical Officer of Health
- Follow-up of Positive Case verification with field officer
- Water Logging / Mosquito breeding identification and correlation with positive malaria cases
- Early identification of outbreak
- Identification of mosquito breeding spots and follow-up with field staff for taking necessary steps to remove mosquito breeding
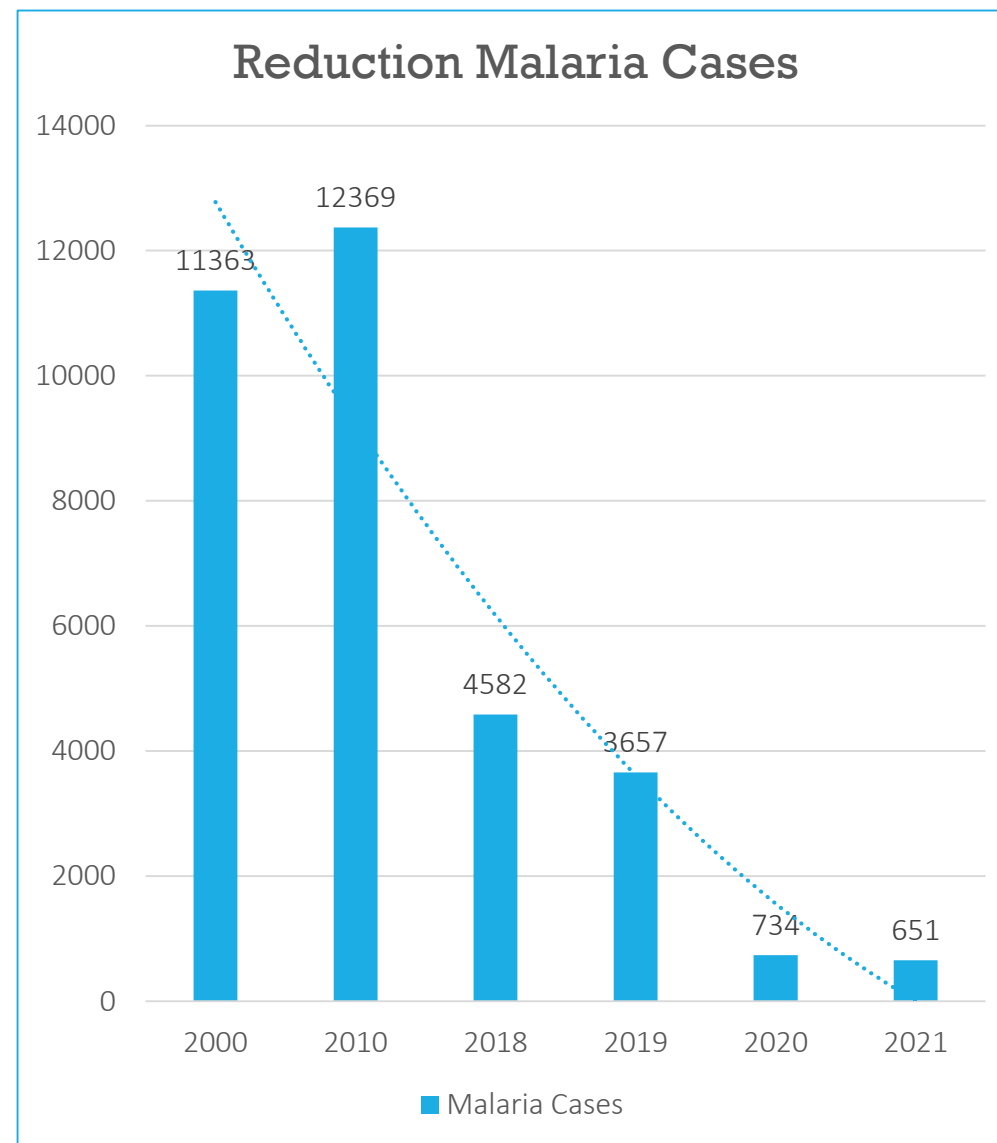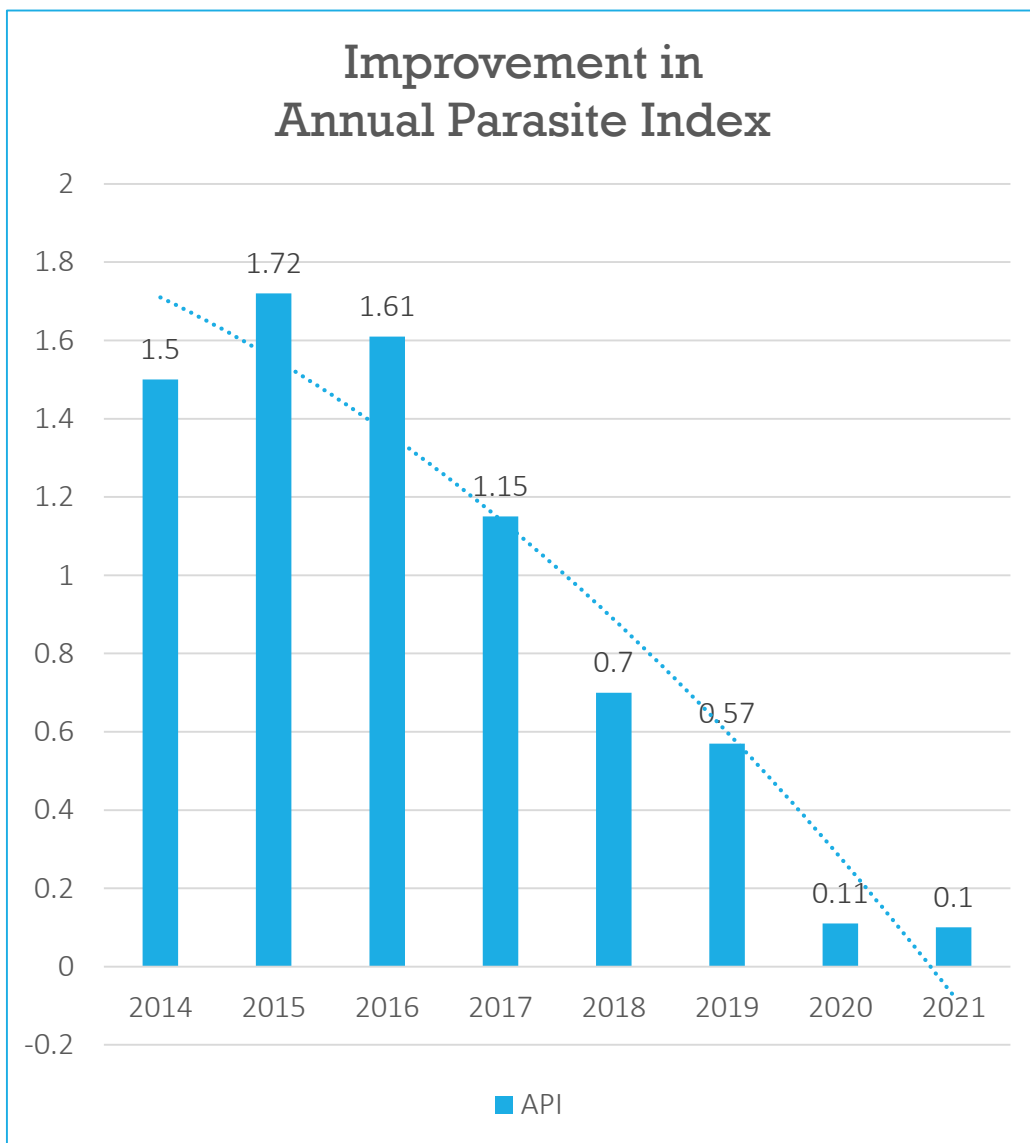- Worker field presence cross verification

VBD Health Survey Application

(Malaria survey using Tablet based devices)

- Potential Malaria Case

- Positive Malaria Case

- Follow-up of Positive Case

- Water Logging / Mosquito breeding identification

- Slide testing (Back office application)

Improvement in Annual Parasite Index

Improvement in Annual Parasite Index

Year	API
2014	1.5
2015	1.72
2016	1.61
2017	1.15
2018	0.7
2019	0.57
2020	0.11
2021	0.1

Reduction Malaria Cases

Year	Malaria Cases
2000	11363
2010	12369
2018	4582
2019	3657
2020	734
2021	651

Use of Technology
(SMC COVID-19 Tracker, Jaimini & ITIHAS + Aarogya Setu)

- To effectively fight against the novel Corona Virus, SMC adopted unidirectional approach and emphasized on use of technology

- First ULB to launch Tracking App on 20th March 2020

- SMC's solution adopted by Gujarat Government & replicated by many smart cities

- Integrated private hospitals and clinics

- Integration with ITIHAS and Aarogya Setu App

TTT-IQ
- Track
- Test
- Treat
- Isolate
- Quarantine

Use of Technology (SMC COVID-19 Tracker, Jaimini & ITIHAS + Aarogya Setu) Key functionalities of Covid-19 Application

From Virus to Vaccine: SMC COVID-19 Application incorporates various features and functionalities

COVID-19 Mgmt. Application

COVID-19 Tracker App

- Tracking and Quarantine Monitoring Module
- Positive Patient Management Module
- Testing Management Module
- Contact Tracing Module
- Indoor Patient Management
- Tele-consultation / Tele-medicine Module
- Analytics for War Room and top authorities
- City Entry Check Post screening Module
- Diamond and Textile Workers management
- Vaccination Management
- Door to Door Suveillance management for ARI cases and Comorbid citizens
- Public Website Dashboard Management
- Itihas and Aarogya Setu Analytics
- GIS Map based Analytics modules

Information Gathering & Tracking

Data Collection

- Self-Declaration Form on SMC website & SMC App
  - Notification published and those with travel history were mandated to self-declare
- Toll Free (1800-123-8000) Helpline
  - Citizen were asked to share details about travelers or suspects in their society/apartment/vicinity.
- International traveler information received from Government of India(GoI)
- Details of patients received from Private Clinics / Hospitals and Urban Health Centres
- Door to Door survey carried out and data collected through Employee Connect App

Tracking

- **SMC expeditiously developed SMC COVID-19 tracker app.**
- Tracks the people with abroad and interstate travel history.
- Tracks persons who have come in direct contact with positive COVID-19 individual.
- Tracks persons reported with ARI
- Over 12 lac persons are being tracked through this app.
- Zone level team assigned responsibility to ensure installation of app
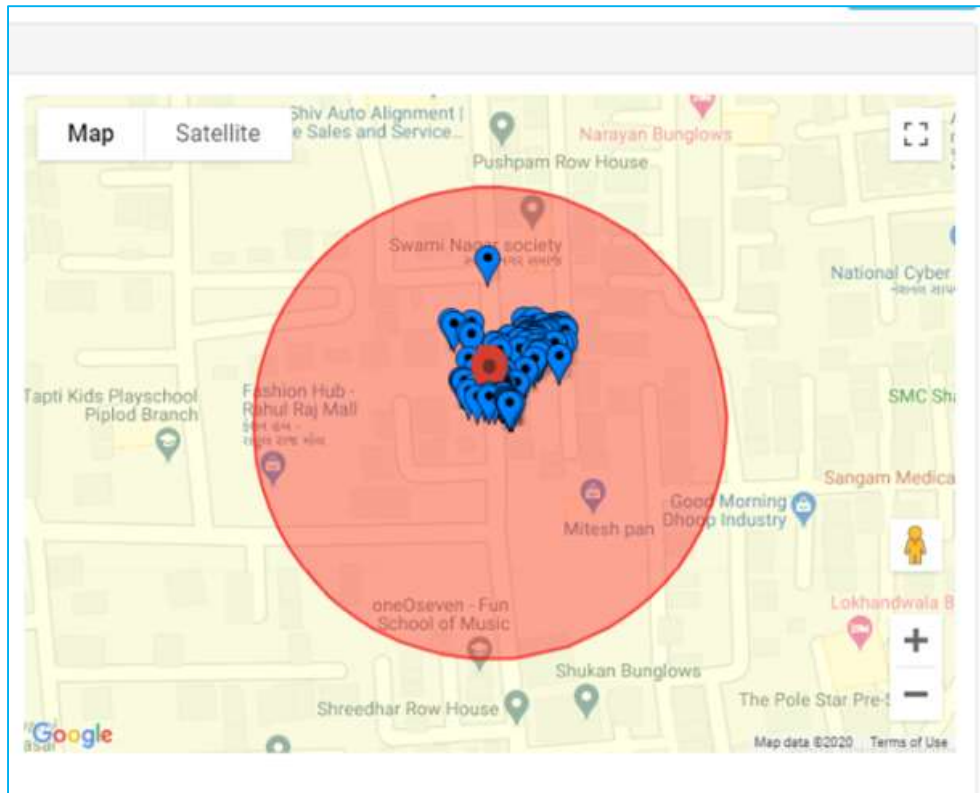
Data Collection → Tracking → Data Analysis → Action Initiation

SMC COVID-19 Application

- **Home quarantine violation** is monitored based on the hourly location obtained from suspect. Any violation is dealt with strict punitive action.

- **Health Status** reporting is done twice a day by suspects and necessary health care support is provided if the user reports any of the symptoms.
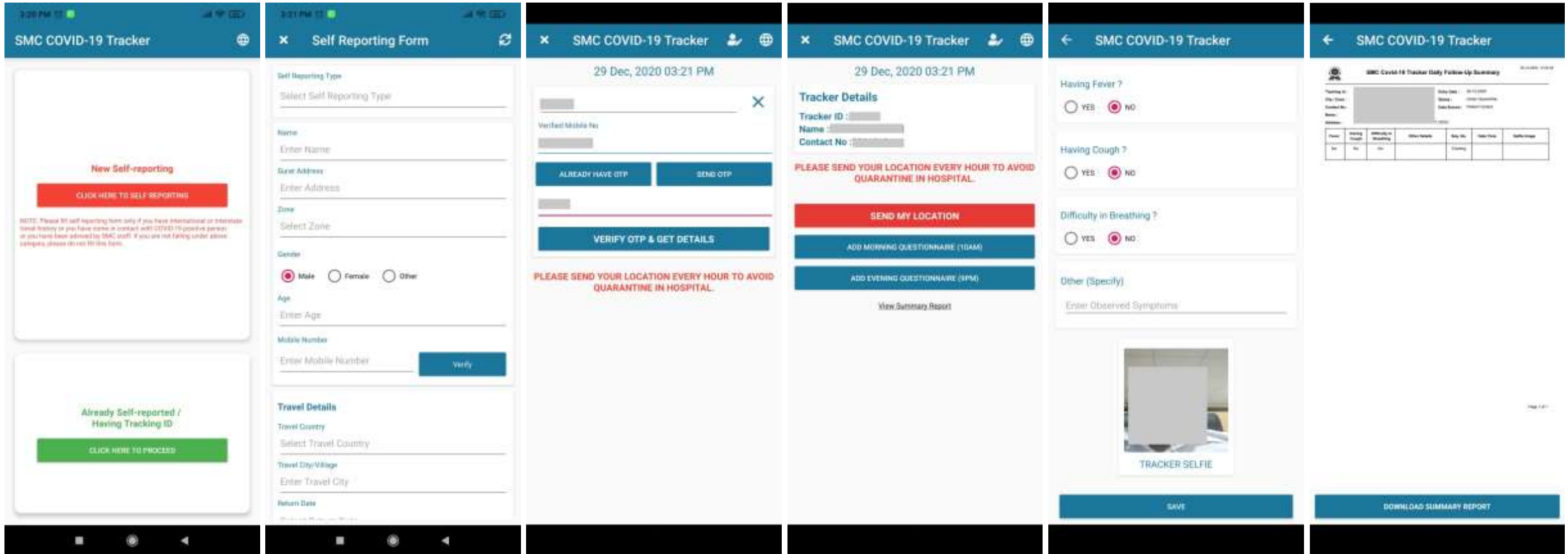

Tracking of individual in home quarantine

Health Check Questionnaire

SMC COVID-19 Tracker

SMC COVID-19 Application

- Each Covid-19 positive case is mapped on GIS.
- Data of ARI cases collected
  - through Active house-to-house Surveillance
  - from 2000 hospitals and private practicing doctors
- Heat maps generated based on various parameters like positive cases, ARI cases, density, etc.
- Containment zone and buffer zone identified and created.
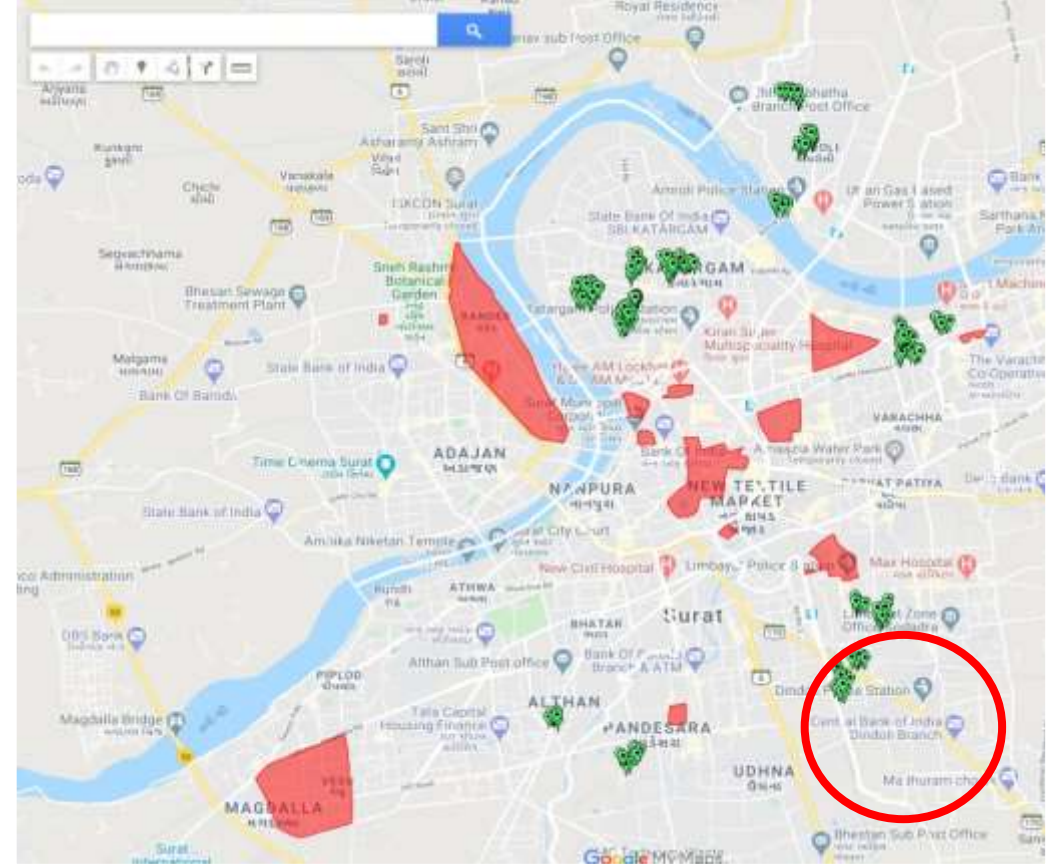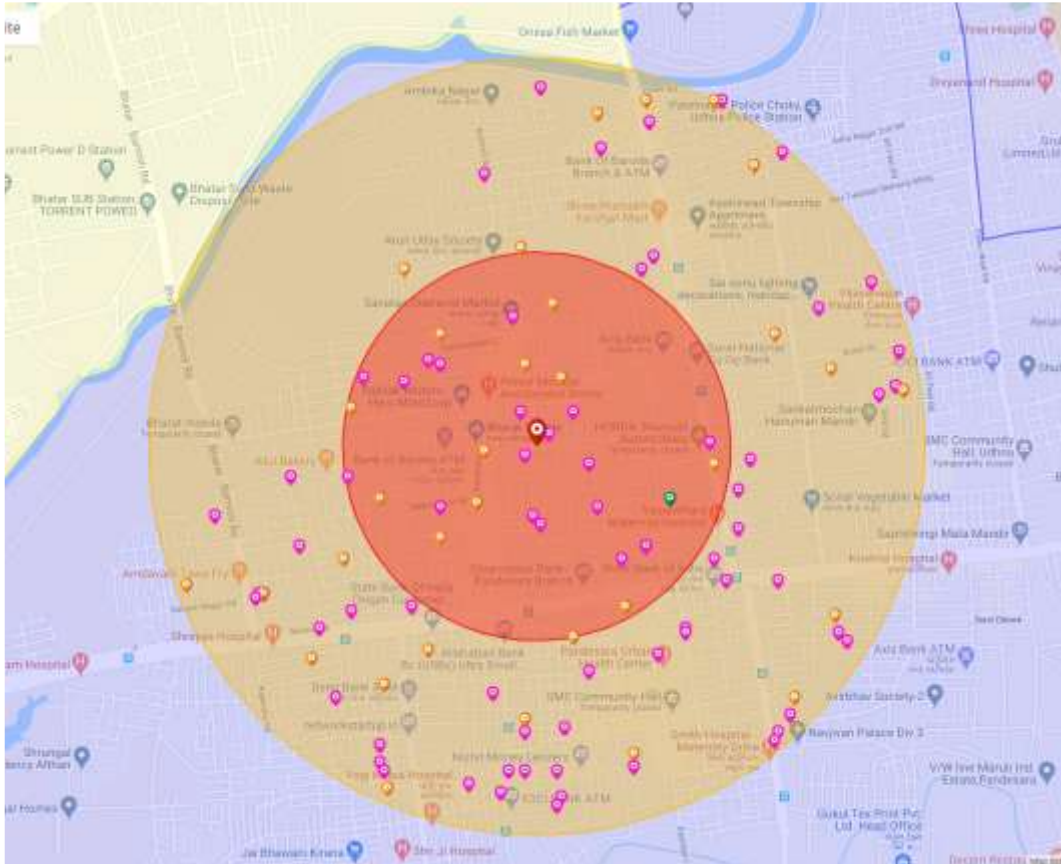

Mapping of Positive Cases
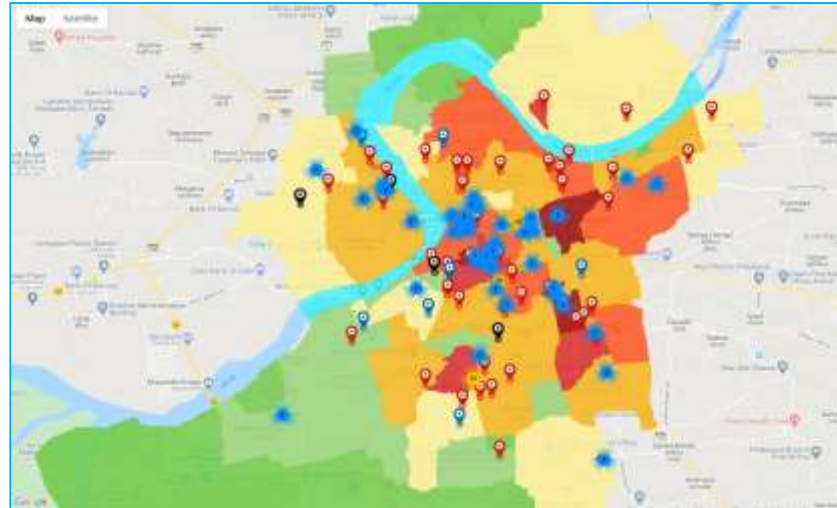
Positive Cases, Population Density & Risk Area
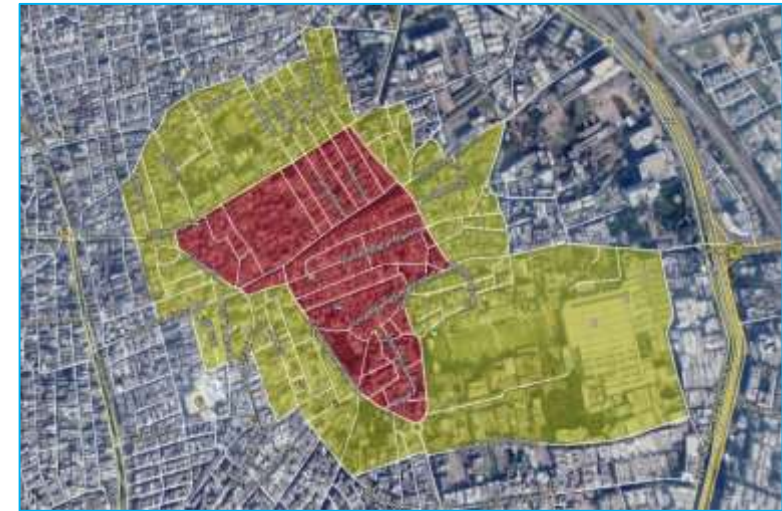
Zampa Bazar, Begampura
Red - Containment Zone |
Yellow – Buffer Zone

# Mapping of ARI cases within Red & Yellow zone of positive case

- Helps to identify potential positive cases.
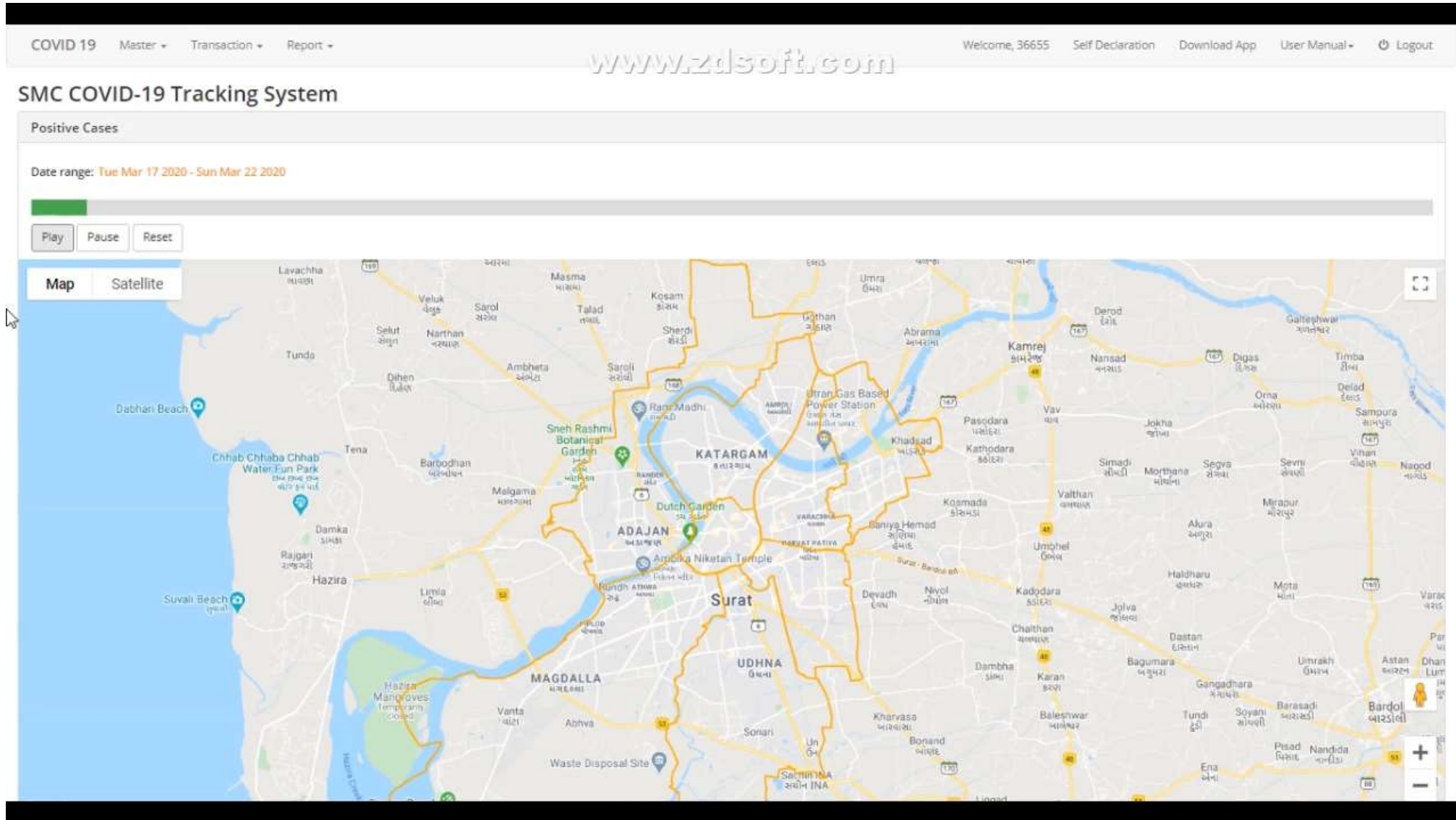- Helps to strategise testing.

Cluster Identification

- All Active and Passive ARI cases are mapped.
- Clusters are identified if more than 10 ARI cases noted within 100 meter radius.
- Helps identify potential positive cases.
- Helps to strategize testing.

# Ward wise Analysis to align field activities
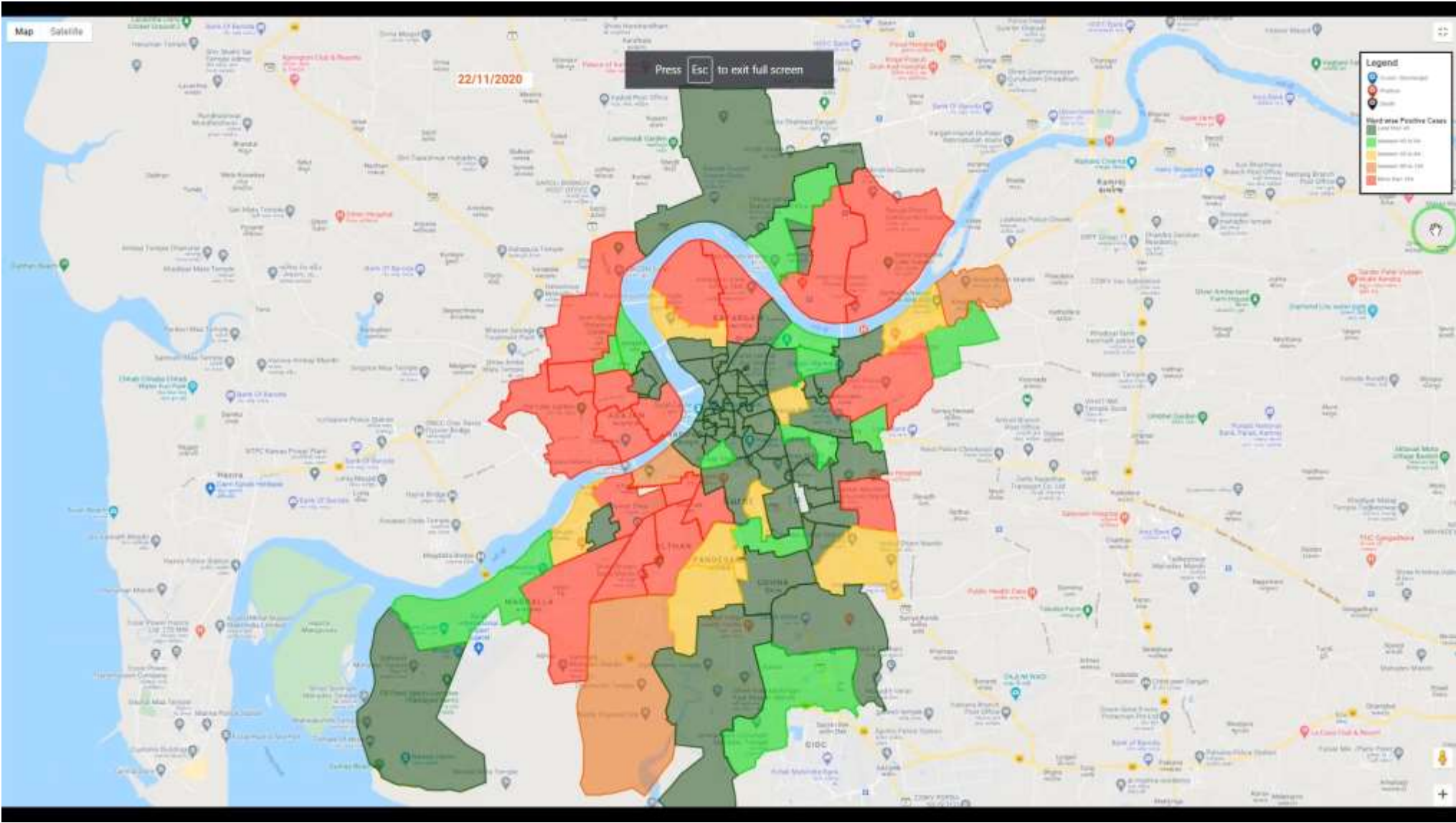
Heat Map - Positive Cases

Itihas & Aarogya Setu App utilization

- **Aarogya Setu + Itihaas based strategy adopted**
  - Aarogya Setu Positive contacts follow up through 104 + War Room
  - Intensified Surveillance & Action in Actionable Hot Spots area
  - Pink Hot Spots attended by Dhanvantari Raths
  - Emerging Hot Spots attended by Surveillance
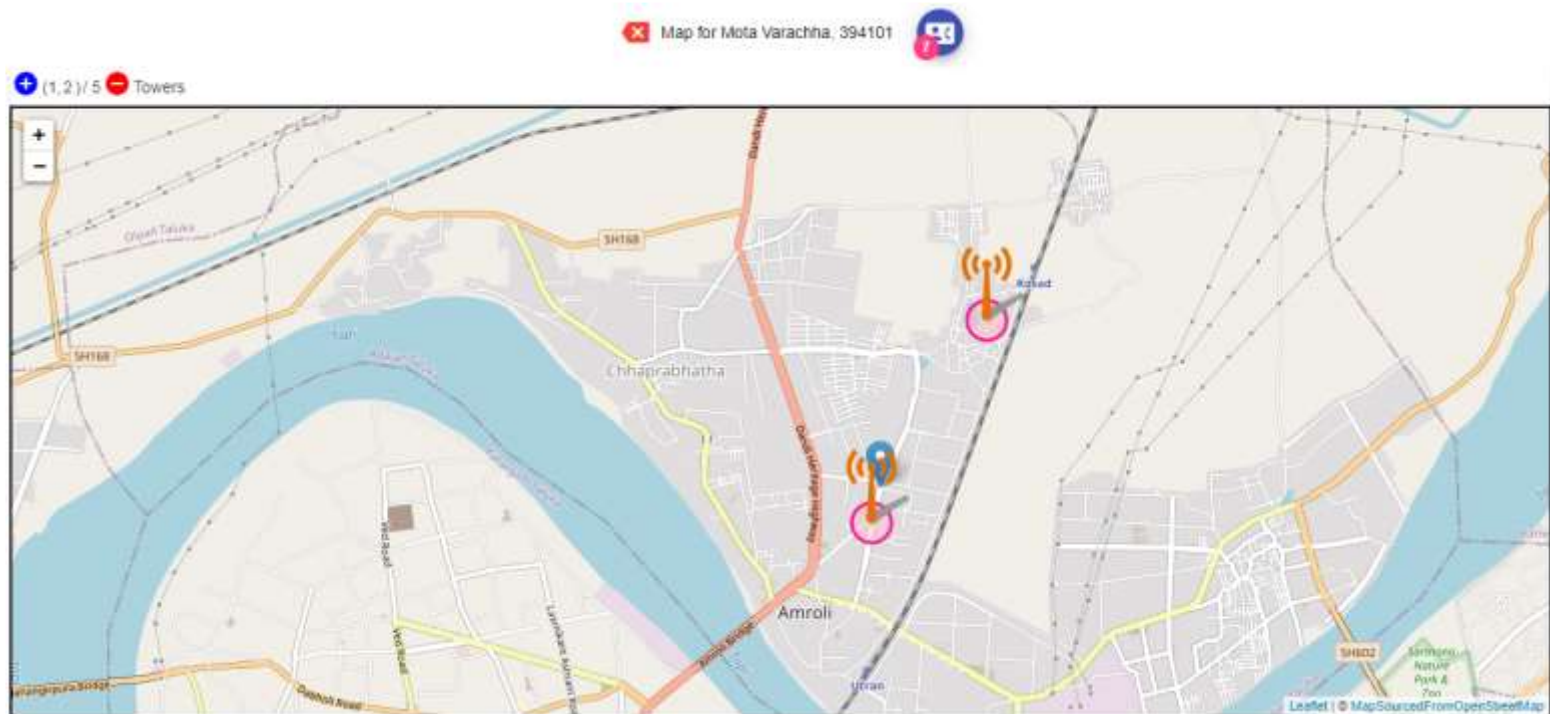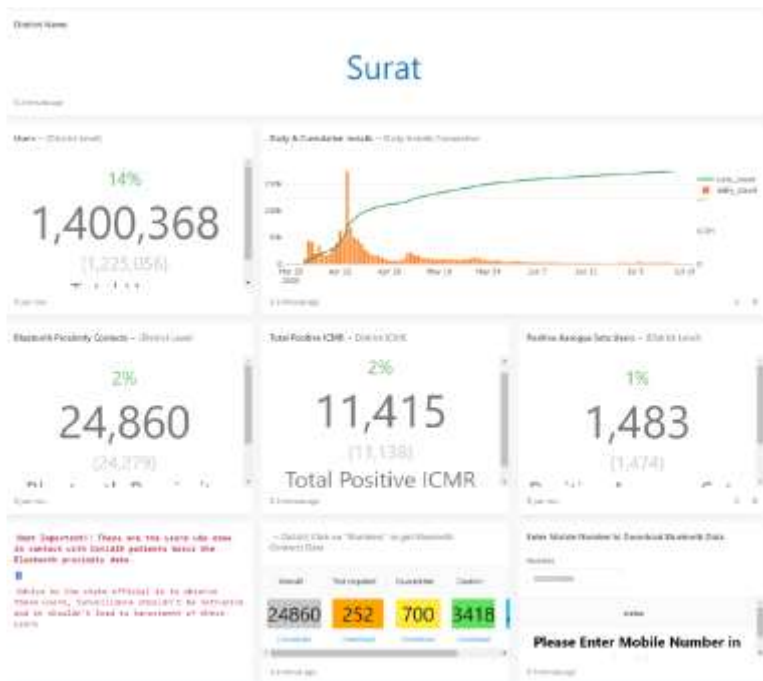
Itihas & Aarogya Setu App utilization
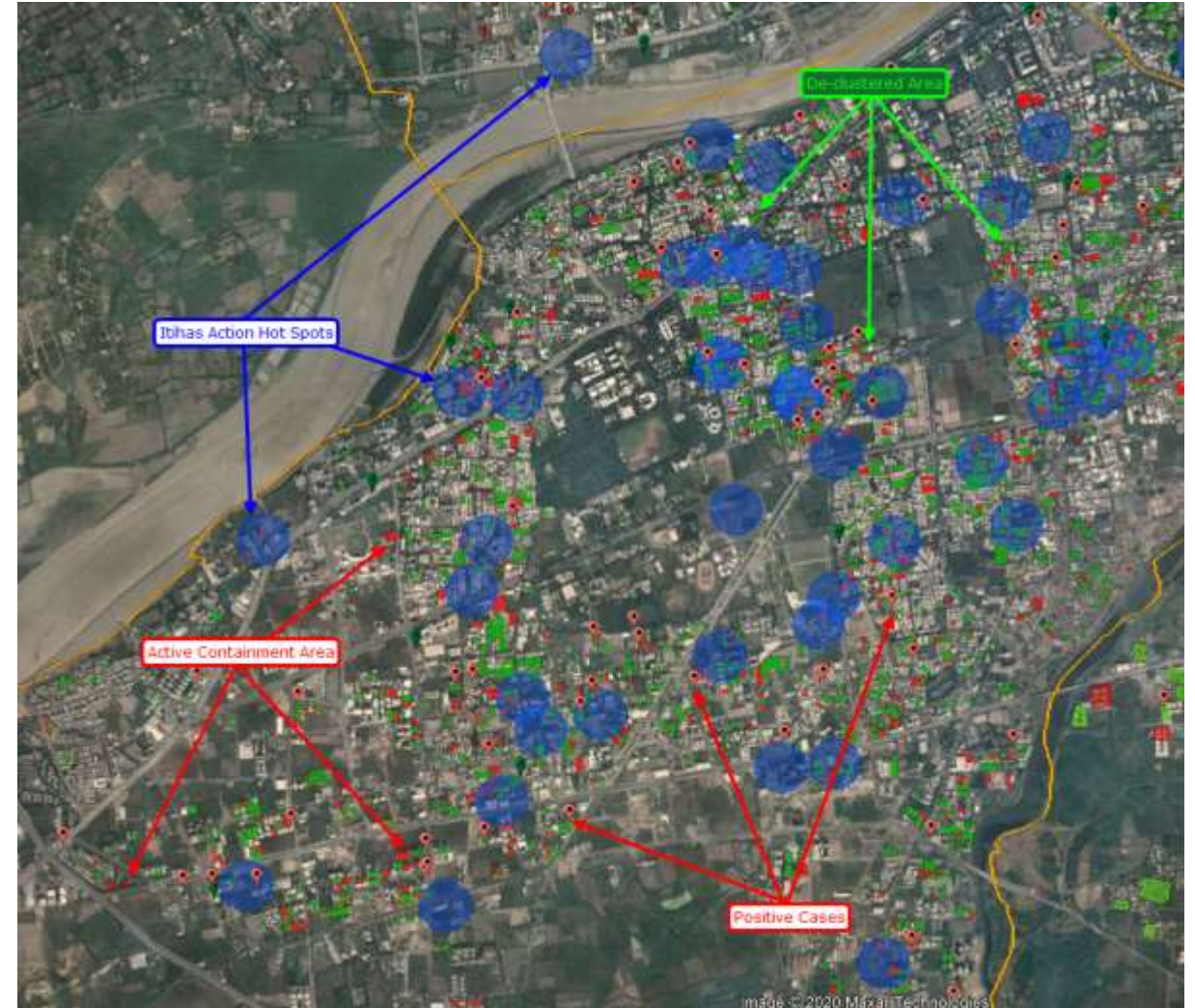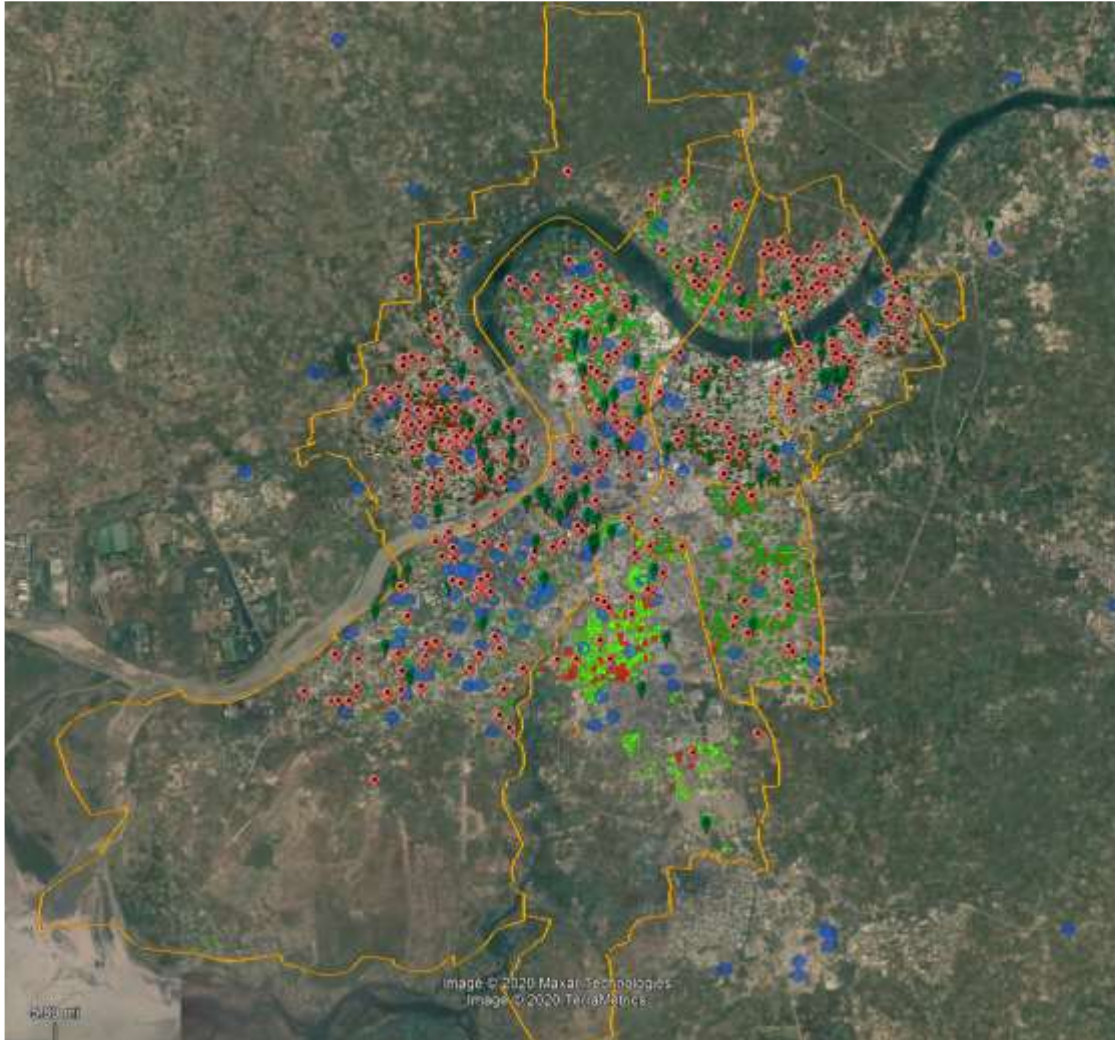
Thank You.

Surat Municipal Corporation
Surat Smart City Development Limited