ITS APPLICATIONS IN SMART CITIES
Surat's Perspective

IRF-India Chapter

7th Webinar: Intelligent Transport Systems (ITS) for Road Safety

Surat City Profile

8th Largest in India as per population

Fastest growing city globally as per Oxford Economic's Global Cities 2030 Report

Termed as **Economic Capital** of Gujarat

9/10 Diamonds in the world are cut and polished here

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

- Area: 474.52 sq.km
- Population: 44.6 Lakh (Census 2011)
- Density : 138 Persons/ Ha (Census 2011)
- Population Growth Rate : 59% increase in a decade (2001-2011)
- Admin Zones : 9

- 2nd largest in Gujarat and 8th largest In India
- Fastest growing city in India
- Large number of migrant populations in the city from various parts of India due to economy generating textile and diamond industries

About Smart City Mission and Surat Smart City

PAN City

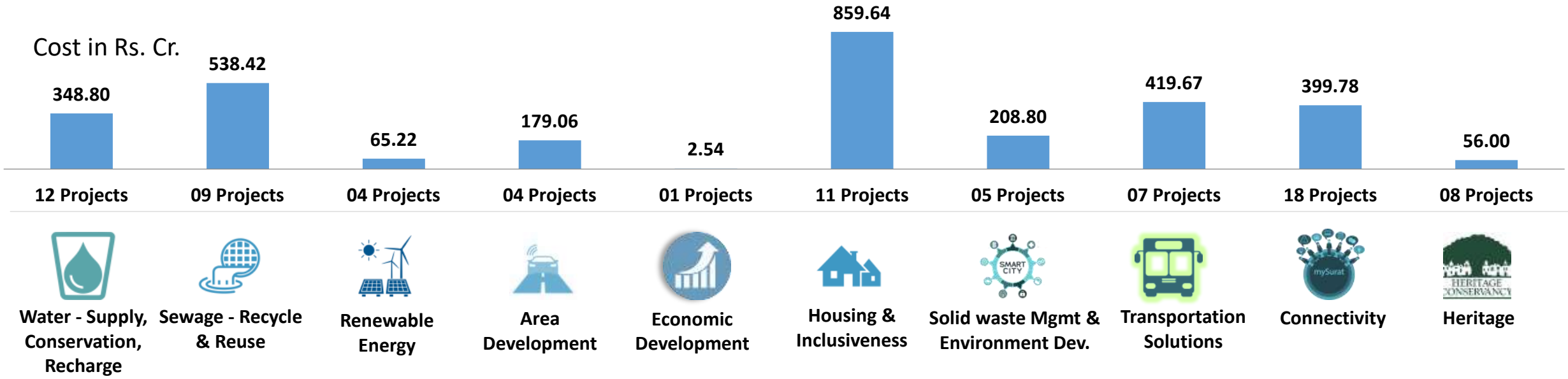
- For the whole city
- Focuses on Transport - Mobility -Connectivity
- **Pan City Proposal Rs. 884.33 Cr.**

ABD

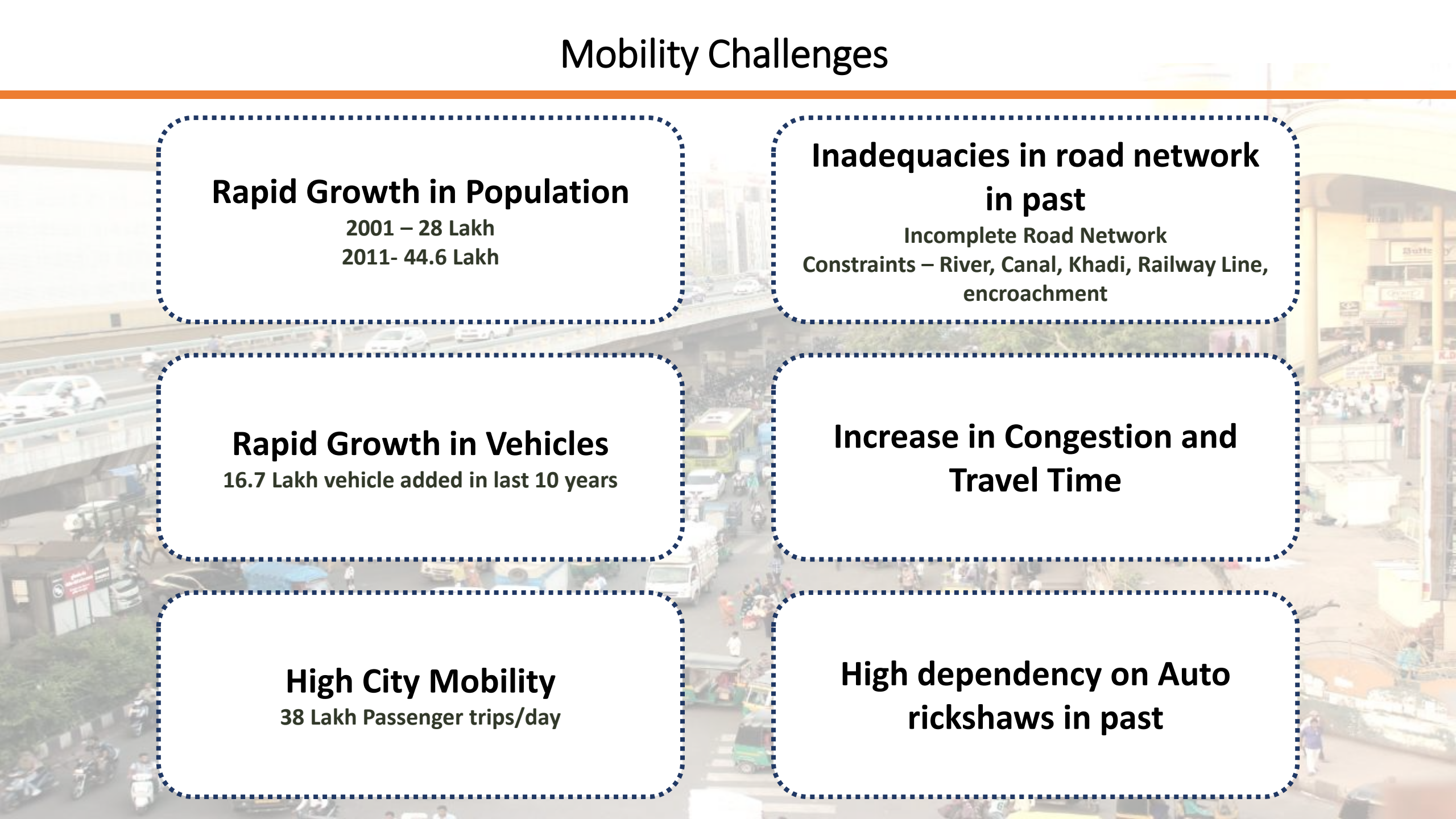
- Covers 8.77 sq.km area out of 326.52 sq.km
- 7 TP Schemes
- **Retrofitting proposal Rs. 2104.26 Cr.**

Highlight of ABD Area

Cost in Rs. Cr.



Mobility Challenges



Rapid Growth in Population

2001 – 28 Lakh

2011- 44.6 Lakh

Inadequacies in road network in past

Incomplete Road Network

Constraints – River, Canal, Khadi, Railway Line, encroachment

Rapid Growth in Vehicles

16.7 Lakh vehicle added in last 10 years

Increase in Congestion and Travel Time

High City Mobility

38 Lakh Passenger trips/day

High dependency on Auto rickshaws in past

Vision, Strategic Goals and Policy Directions

The vision SARAL in Indian languages means "Simple" which also implies mobility being Easy, Convenient and Accessible aimed towards a healthy living environment.

सरल परिवहन, समृद्ध जनजीवन !

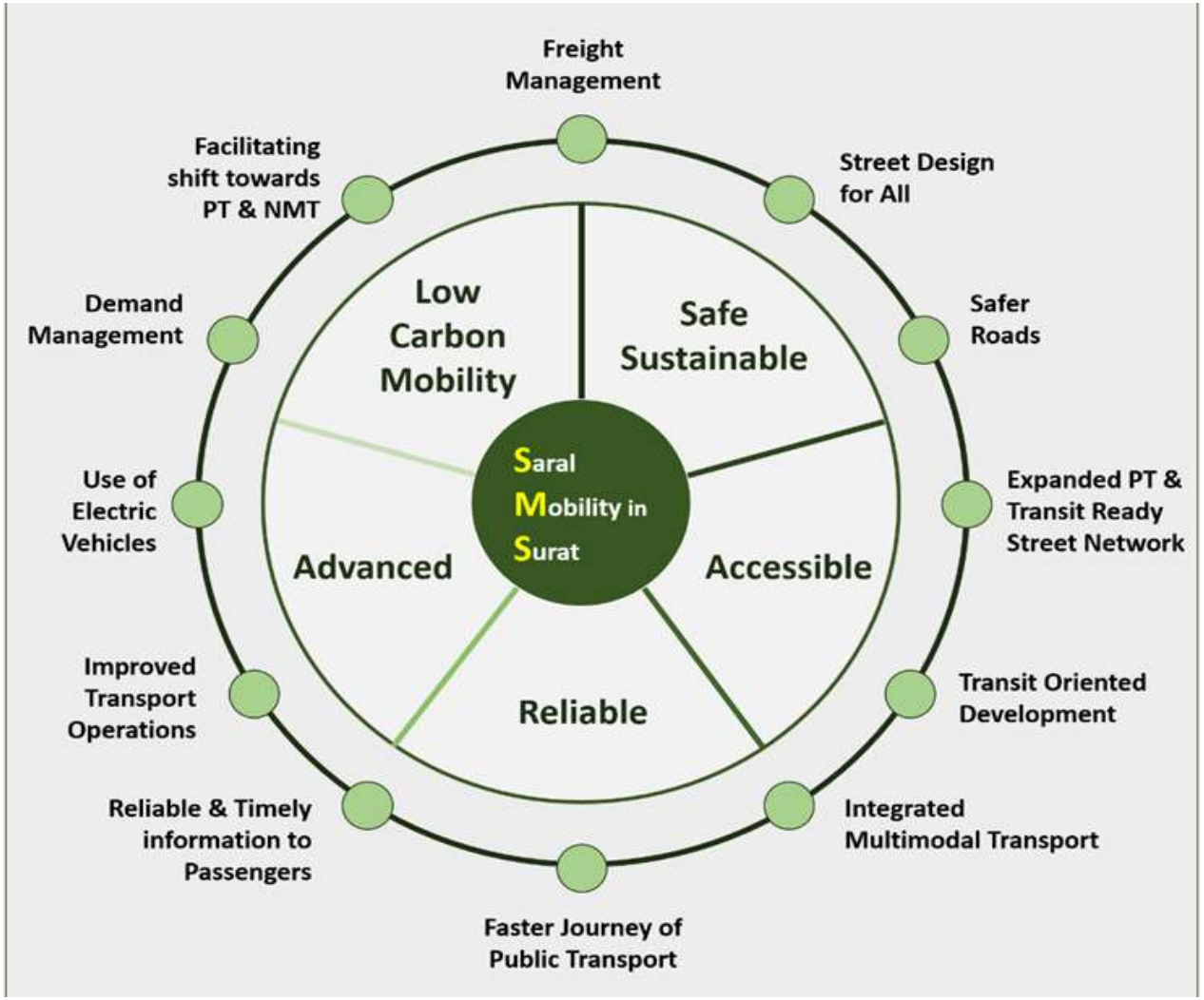
S : SAFE

A : ACCESSIBLE

R : RELIABLE

A : ADVANCE

L : LOW-CARBON



BRTS & City Bus Services

#	Particulars	BRTS	City Bus
1	Network Length	110 km	404 km (SUDA: 67 km)
2	Total Routes	12 (1 express)	45
3	Total Stations/Stops	169	774
4	Operational Timings	6:00 am to 09:00 pm	6:00 am to 09:00 pm (3 routes – 4:00 am to 11:30 pm)
5	Depots	4	4
6	Operators	3	3
7	Total Buses	157	575

- **Largest BRT Network in India**
- Entire BRTS and City Bus operations are monitored from SMAC Center utilizing
  - **Integrated Transit Management System**
  - **Automatic Fare Collection System**
- **300 electric bus to be inducted of which 37 are on road and 113 will be plied in short time**
- Public Bicycle Sharing system in place

Intelligent Transit Management System

166 BRTS Buses

575 City Buses

163 BRTS Stations

Ridership: >2.6 Lac/day

Smart Components

- GPS Based Automated Vehicle Location System
- Real-time information and monitoring of BRTS/City buses
- Passenger Information System
- Depot Management, Vehicle Scheduling & Dispatch System
- Management of critical parameters like:
  - Bunching
  - Headway
  - Route violation
  - Schedule violation
  - Non-stoppage violation
- Real-time information to citizens of ETA

Automatic Fare Collection System

Features

- Single ticketing for integrated journey covering BRTS & City Bus
- Turnstile type automatic gates with ticket validators
- Mobile App and Web Portal for ticketing and journey planning
- QR Code based Paper & Mobile Ticketing for easy ticket issuance and validation
- Integration with Surat Money Card for Tap & Go

Surat Money Card

PPP Model

53,000 Card

- Open Loop Smart RuPay Card – enables usage in SMC as well as retail environment
- One Card Many Services – access to not only transit but also non-transit based services.
- Hassel free journey – Just “Tap-In” and “Tap-Out”, paperless ticket.

Integrated Traffic Control System & Area Surveillance Network

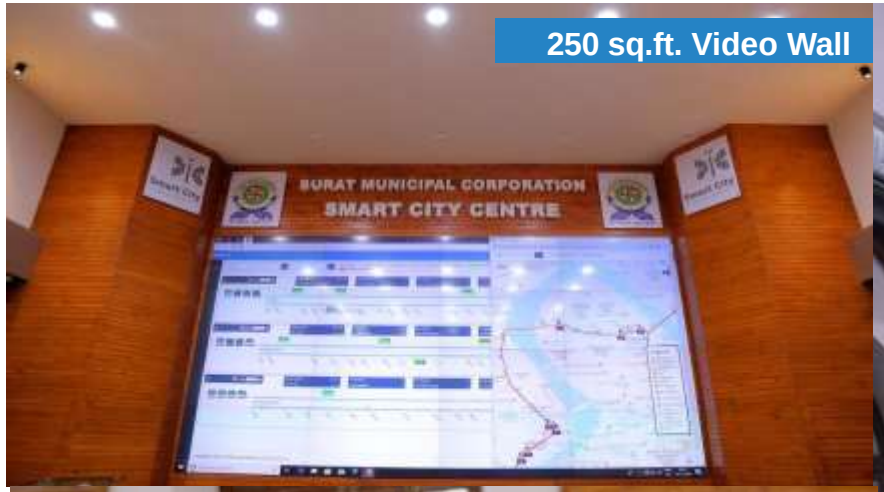
Project is Under Implementation

Key Objectives

- Improve Journey Time Reliability
- Safety Improvement
- Accident Reduction
- Increase Operational Efficiency
- Traffic Enforcement
- Reduction in Traffic Congestion
- Real time Information
- Public Awareness
- Pollution Control
- Increased Traffic Signal Efficiency

Integrated Traffic Control System (ITCS)	267 Junctions
Red Light Violation Detection (RLVD) Systems	25 Locations
Automatic Number Plate Recognition(ANPR) Cameras	17 Locations
Speed Violation Detection System	15 Locations
Traffic Violation Cameras	31 locations
Traffic Surveillance Cameras	55 Locations
Emergency Call Box (ECB) System	20 Locations
Variable Message Signboards	20 Locations
Traffic Command Center	1
Zebra and stop line marking	267
E-Challan Hand Held Device	215

LIVE Monitoring of BRTS / City Buses from Command and Control Center



250 sq.ft. Video Wall

30 Operators Capacity

2100 sq.ft. Area

IT-MAC
(Integrated Transport-Mobility Administration Centre)

- Integrated Command & Control Center for Surat
- Two discrete video walls for monitoring transport & mobility services and other municipal services
- Total 100 operator seating capacity
- Disaster Recovery Center/War Room

IT Systems to be used

- ITMS & AFCS
- Smart SWM System
- ITCS
- Intelligent Parking System
- Street Light CCMS
- ERP & Analytics
- IT Service Mgmt. Tools
- Call Center

Project is Under Implementation

Services to be Monitored

- Monitoring & Management of
  - City Bus & BRTS Buses
  - Emergency vehicles - Fire & Ambulance
  - SWM Vehicles
  - Other Vehicles like dumper placer, tanker, etc.
- 267 Traffic Junctions
- CCTV Feed
  - Suman Eye Project – 2700 Camera
  - ITCS – 1000+ Camera
  - Safe City Fed – 650+ Camera
- IT Infrastructure
  - OFC & Leased Line (850+ locations)
  - DC & DR
  - Transit components like PIS, ETM, POS, Turnstiles, etc.
- Smart Street Light
- Smart Parking
- Environment Sensors
- Variable Messaging System & PIS
- Water Supply & Drainage SCADA
- Revenue Collection
- Complaint Redressal
- Other Civic Services

India Urban Data Exchange (IUDX)

- Ministry of Housing and Urban Affairs **(MoHUA)** has developed a secured, open source data sharing and exchange platform **"India Urban Data Exchange (IUDX)"**.
- The platform allows sharing of data between **multiple public and private stakeholders** aimed at development of **citizen and business centric solutions**.
- Surat, being a Smart City with strong emphasis on data driven governance, has been selected as one of the five smart cities for IUDX deployment.

Key Benefits

1. Operational Efficiency by leveraging Data
2. Strengthening ICCC
3. Driving City Planning & Prioritization
4. Driving Sustainability through Data Monetization
5. Brings Innovative solution for City issues

India Urban Data Exchange (IUDX)

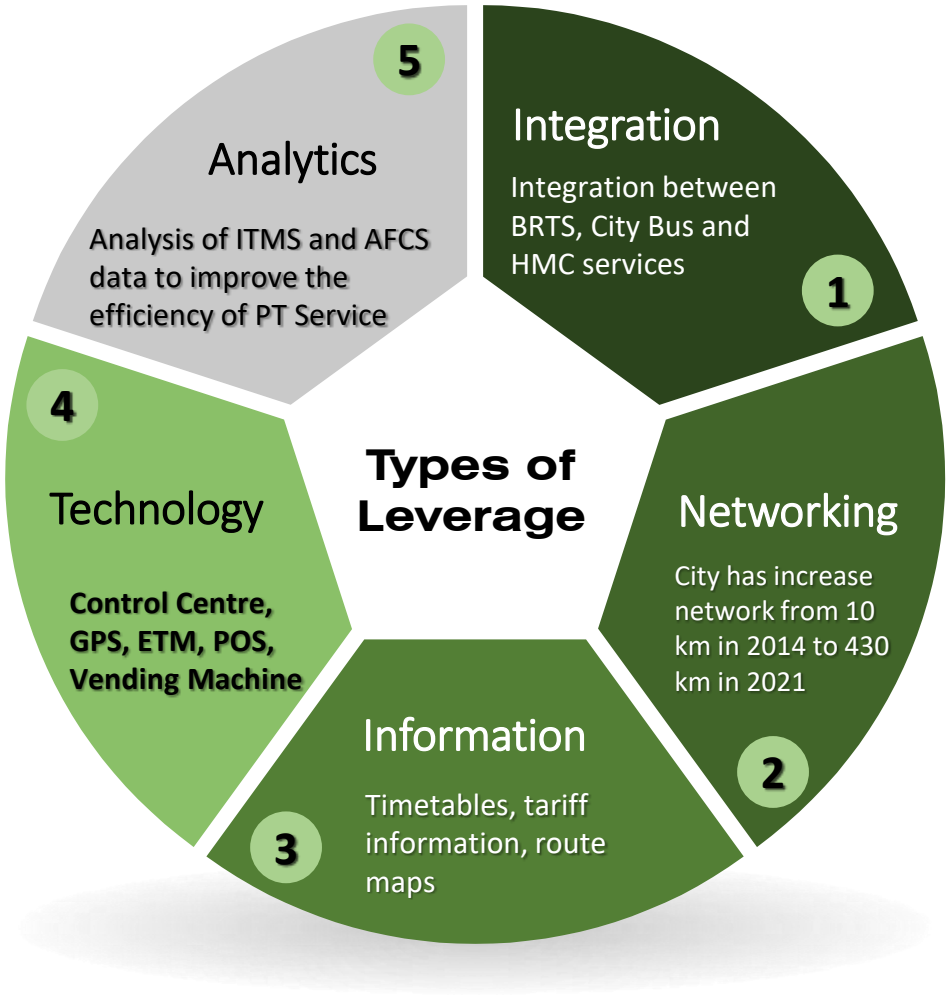
Surat IUDX platform has gone live on 19th October 2020. Following data sets are on-boarded:

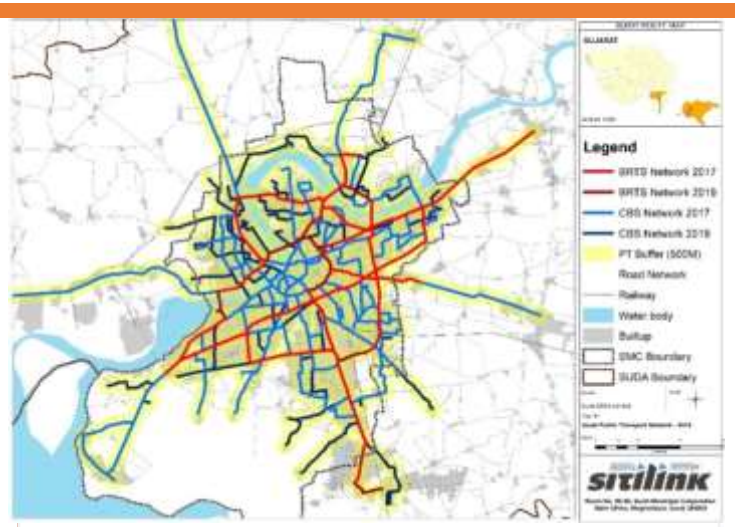
- Data sets of e-Bicycle/e-Bike is also onboarded and private radio cabs(OLA/Uber) are in progress.

- Through IUDX platform, city has partnered with various private stakeholders for valuable and innovative solution to City Admin and citizen.

Partner Name	Proposed Solution	Solution Description	Status
NEC	Bus Occupancy Details for the Commuters	The existing Sitilink APP will now display the bus occupancy details which will help the commuters plan their journey more efficiently	APP Deployed for Android & IOS Sitilink users
ARST&TT	Bus Occupancy Details for the Commuters	The Station PIS will display the bus occupancy along with the ETA details	WIP
Citility	Multimodal APP	This APP will facilitate the citizens to plan their journey with different options which are safer, greener and cost effective using multimodal transit options – walk, buses, e-bike, private cab etc.	WIP
Safetipin	Mobile App for Safer City	To develop the map-based mobile APP & technology platform that works to make communities and cities safer by collecting and providing safety-related data on a large scale. The data will be made available to all APP users as well as for use for the city administration for analysis & Decision making	WIP

Leveraging in Transportation



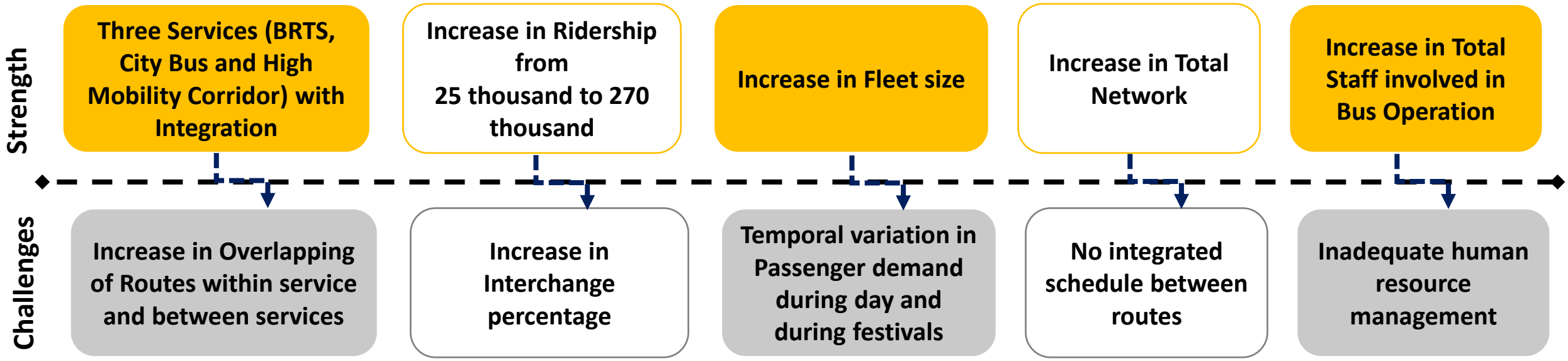


Transit Performance Indicator

- Ridership – Passenger/Bus
- Revenue – Revenue/Bus
- Vehicle Utilisation
- Earning Per Kilometer
- Cost per Kilometer
- Accident Rate
- Load Factor
- Occupancy Ratio

Problem Statement

Vehicle Planning and Scheduling aims for **“Maximum Mobility with Minimum Resources.”**



HOW to overcome the above Challenges?

Possible Outputs:

1) Analyze all routes and schedules – Corrective measures

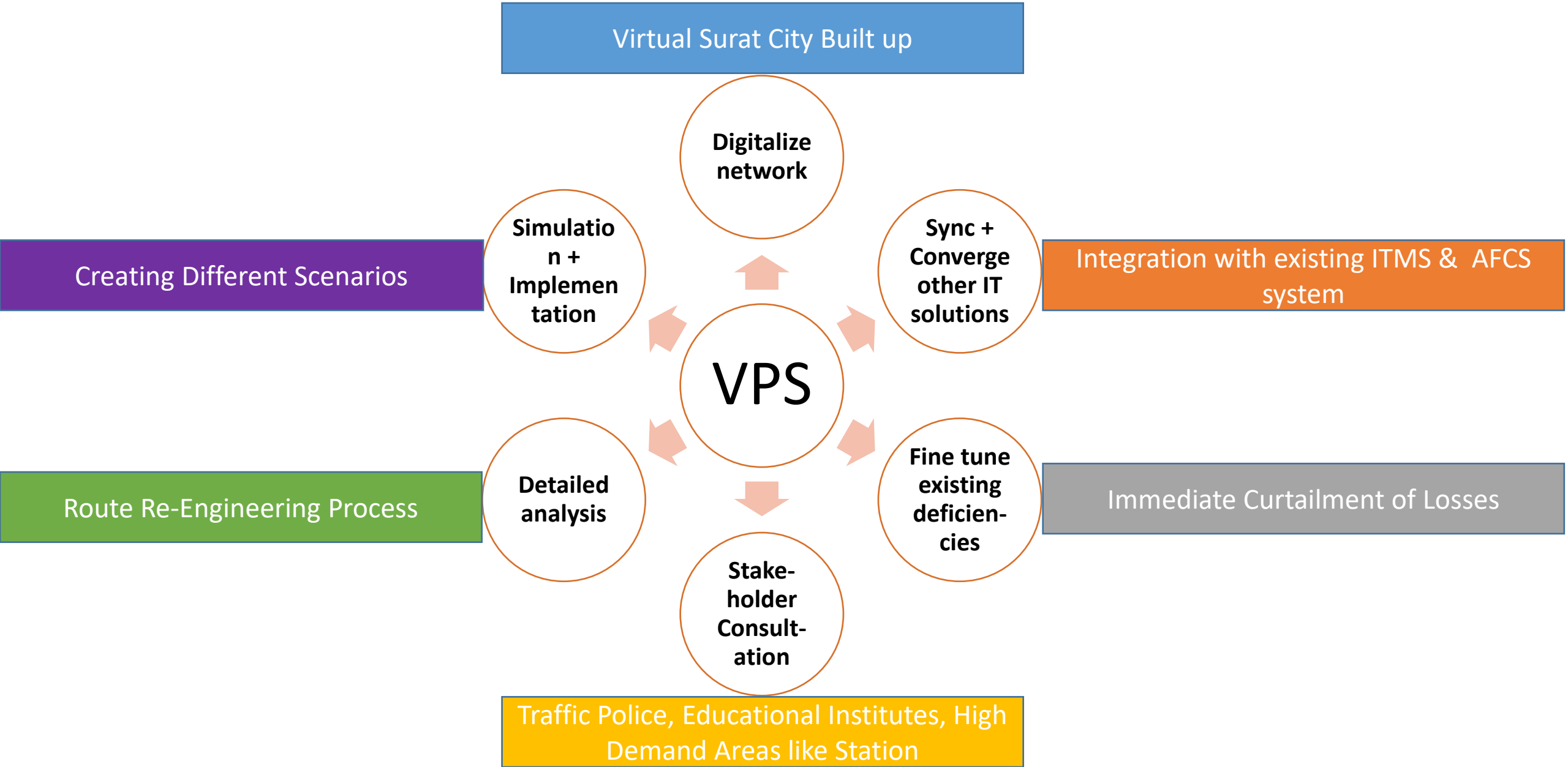
2) Classify the routes in line with their potential.

3) Serving the public demand i.e. headway as per the passenger load at different timings of the day route wise

4) Maximizing the percentage share of revenue km.

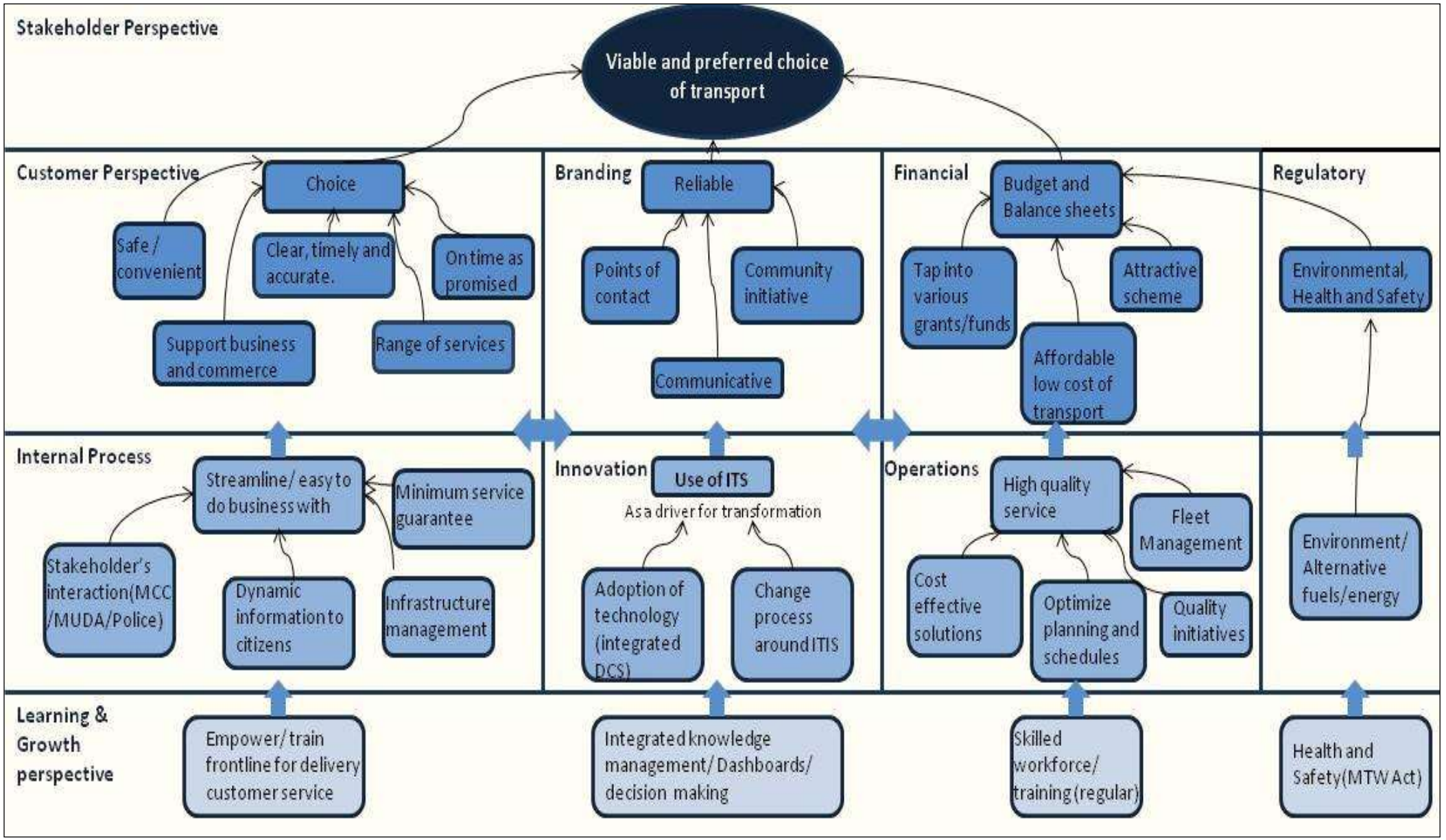
5) Achieving Optimum vehicle utilization.

Process


Virtual Surat City Built up
Digitalize network
Simulation + Implementation
Sync + Converge other IT solutions
Creating Different Scenarios
Integration with existing ITMS & AFCS system
VPS
Detailed analysis
Fine tune existing deficien-cies
Route Re-Engineering Process
Immediate Curtailment of Losses
Stake-holder Consult-ation
Traffic Police, Educational Institutes, High Demand Areas like Station

Solution Matrix

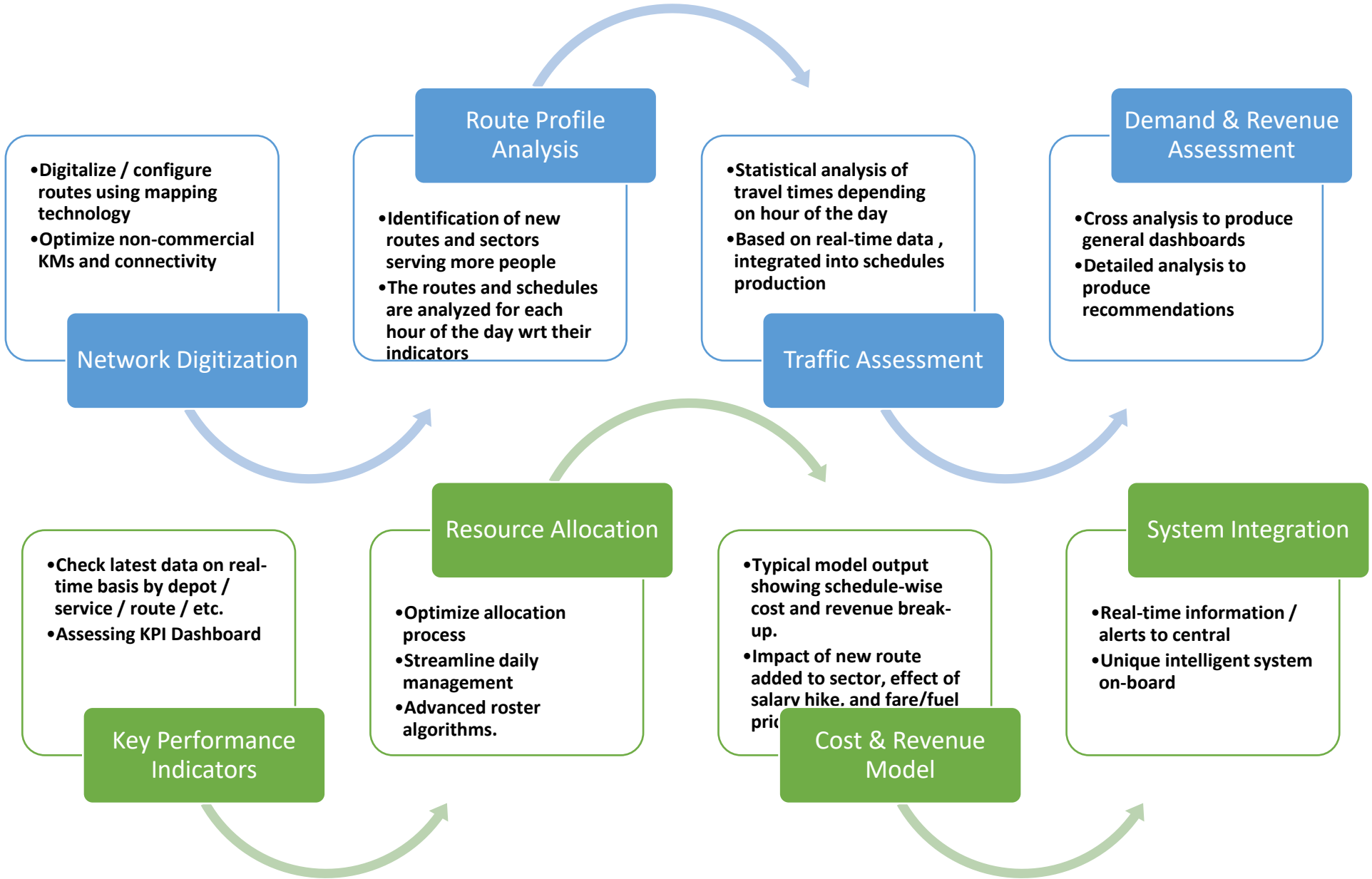
A win-win situation for the whole system



Solution: Vehicle Planning & Scheduling

- **Improving the level of service offered** to passengers
- Scheduling process with **designing of a timetable of trips** to be served by buses.
- The **transit scheduling process** comprising of timetables, trips & driver duties.
- Minimizing waiting times **improve customer satisfaction,** which in turn leads to **increases in ridership and revenues.**
- **Maintaining schedule adherence** in traffic stretches.

Key Outcomes



System Outcomes

- Decrease in non revenue bus km and optimizing depot allocation resulted into a huge **saving of Rs. 1.29 Crores** within a year.
- Savings in lakhs of non-revenue km led to savings of **28% of GHG emissions.**
- With new demand areas through VPS, the transportation **coverage of city increased to 98%.**
- Increase in Public Transport **User Satisfaction level** from 8.1 in 2019 to 9.3 in 2020

Application of Vehicle, Planning & Scheduling

MODULE		USES
Bus Station analysis	→	Peak - off Peak Load
OD Analysis	→	Passenger Transfer Analysis
Route wise and Bus wise Conductor analysis	→	Improve the revenue collection
Driver Analysis	→	Improve the reliability
Schedule Optimization	→	Route direction wise and peak hour wise
Trip and Schedule Adherence Analysis	→	Route and Operator wise
Schedule Arrival/Departure and Actual Arrival Departure	→	To improve adherences
Route Performance Analysis	→	For KPI's estimation
Interchange Station & Infrastructure requirement	→	ETM, Turnstile, Staff, etc. requirement

Replicability

VPS tool can be used for different Public Transport bodies in other cities by increasing the scale to integrate it with other existing IT solutions available like ITMS, AFCS and ITCS to have one Single Integrated ITS System

- Setting up the Origin - Destination Data & Forecasting Demand
- All routes and stops screening for route re-engineering
- Crowd peak locations and its planning
- Depot allocation
- City traffic analysis and projections
- Transit Oriented Development for upcoming new areas
- Connecting other IT solutions to value added environment

Sustainability

Measureable Outcomes

Commuter related

1. More service with existing resources.
2. Buses available as per commuter demand and need.
3. Reduction in travel time.
4. Schedule adherence efficiency increased.

Route/Schedule related

1. Route Optimization with existing resources.
2. New Route alignment coverage and connectivity.
3. Increased Route/Schedule revenue with immediate results
4. Minimised operating costs.

Division/Depot related

1. Organised operational structure
2. Vehicle utilisation enhanced.
3. Crew utilisation enhanced.
4. Over time minimised.
5. Diesel consumption reduced.

Finances related

1. Avg revenue increased.
2. EPkm Increased
3. Revenue to Cost Ratio Increased
4. Operational Ratio Increased
5. Increase in revenue kilometres
6. Financial Optimization Increased

Vehicle Planning and Scheduling tool has improved the schedule preparation process which in turn has improved the reliability and efficiency of bus operations.

THANK YOU

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www.suratmunicipal.gov.in