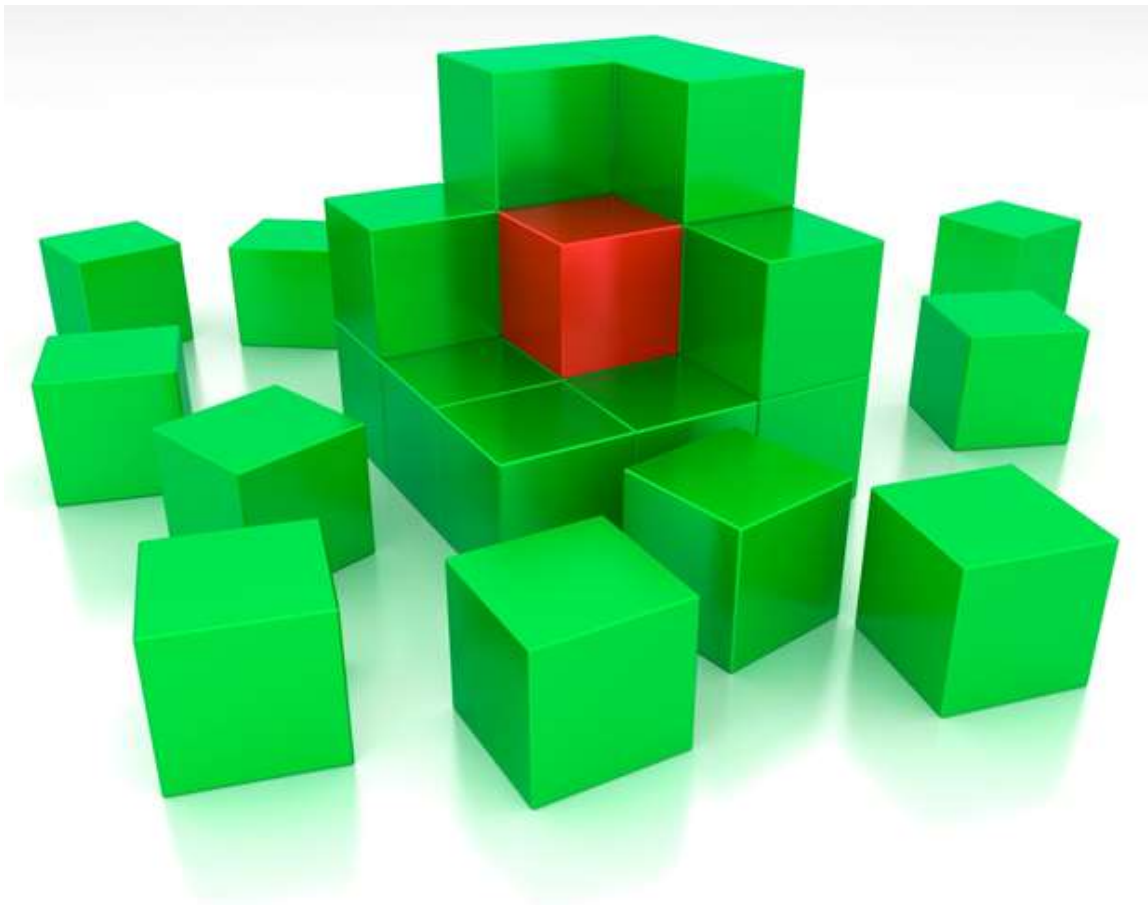




Sector Specific Inventory & Institutional Strengthening for PPP Mainstreaming

Directorate of Urban Land Transport

Pre-Feasibility Report for Implementation of Intelligent Transport System at Mangalore, Belgaum and Gulbarga on PPP basis



Submitted By
Deloitte Touche Tohmatsu India Private Limited

June 2012

ACRONYMS

BOOT	Build Own Operate Transfer
BOT	Build Operate Transfer
CTTP	Comprehensive Traffic and Transportation Plan
DBFOT	Design Build Finance Operate and Transfer
DULT	Directorate of Urban Land Transport
FDI	Foreign Direct Investment
GoI	Government of India
GoK	Government of Karnataka
IDD	Infrastructure Development Department
MIS	Management Information System
PPP	Public Private Partnership
UDD	Urban Development Department
ULB	Urban Local Body
EOI	Expression of Interest
RFQ	Request for Qualification
RFP	Request for Proposal
BRTS	Bus Rapid Transit System
ITS	Intelligent Transport System
NHAI	National Highways Authority of India
NHDP	National Highways Development Project
NEKRTC	North East Karnataka Road Transport Corporation
KSRTC	Karnataka State Road Transport Corporation
NWKRTC	North West Karnataka Road Transport Corporation
GPS	Global Positioning System
SMS	Short Message Service
GPRS	General Packet Radio Service
VMS	Variable Messaging System

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Table of Contents

1	EXECUTIVE SUMMARY	1
2	INTRODUCTION	3
2.1	PROJECT IDEA.....	3
2.2	APPROACH & METHODOLOGY, STUDIES, SURVEYS INCLUDING DATA COLLECTION, ANALYSIS.....	3
2.3	STUDY OF EARLIER REPORTS IN THIS SECTOR IN THE RELEVANT AREA.....	4
3	SECTOR PROFILE	5
3.1	SECTOR OVERVIEW.....	5
3.2	INDUSTRY OVERVIEW.....	6
3.3	REGIONAL PROFILE - MANGALORE.....	7
3.4	REGIONAL PROFILE - BELGAUM.....	9
3.5	REGIONAL PROFILE - GULBARGA.....	10
4	PROJECT	13
4.1	DESCRIPTION OF THE PROJECT.....	13
4.2	COMPONENTS OF THE PROJECT.....	13
4.3	INTERACTION WITH STAKEHOLDERS.....	15
4.4	KEY ISSUES AS IDENTIFIED IN THE CCTPS.....	16
4.5	CASE STUDIES FOR SIMILAR PROJECTS IN INDIA.....	17
4.6	DESCRIPTION OF THE SITE - MANGALORE:.....	17
4.7	DESCRIPTION OF THE SITE -GULBARGA.....	18
4.8	DESCRIPTION OF THE SITE -BELGAUM.....	18
5	BROAD PROJECT STRUCTURING PRINCIPLES	20
5.1	BACKGROUND.....	20
5.2	BENEFITS OF EXECUTING THIS PROJECT ON PPP MODE.....	20
5.3	BROAD GUIDING PRINCIPLES.....	20
6	PROJECT FINANCIALS	22
6.1	PROJECT DESIGN.....	22
6.2	COST ESTIMATION.....	23
6.3	TARIFF REVENUE STREAM.....	24
6.4	VIABILITY ASSESSMENT.....	25
6.5	SENSITIVITY ANALYSIS.....	25
7	STATUTORY & LEGAL FRAMEWORK	26
7.1	LEGAL FRAMEWORK.....	26
7.2	APPLICABLE POLICIES.....	26
8	INDICATIVE ENVIRONMENTAL & SOCIAL IMPACTS	28
8.1	ENVIRONMENTAL IMPACTS.....	28

8.2	SOCIAL IMPACTS	28
8.3	ECONOMIC IMPACT	29
9	CONCLUSIONS.....	30
9.1	PROPOSED PROJECT STRUCTURE.....	30
9.2	WAY AHEAD	31
9.3	SUPPORT REQUIRED FROM THE GOVERNMENT	31
	ANNEXURES.....	33
	ANNEXURE A: LIST OF KEY STAKEHOLDERS CONSULTED	33
	ANNEXURE B: CASE STUDIES FOR SIMILAR PROJECTS IN INDIA.....	34
	ANNEXURE C: COST ASSUMPTIONS.....	37
	ANNEXURE D: FINANCIAL SUMMARY – MANGALORE.....	39
	ANNEXURE E - SENSITIVITY ANALYSIS	48
	ANNEXURE F: TERMS OF REFERENCE FOR ENGAGING TECHNICAL CONSULTANT	51
	ANNEXURE G: TERMS OF REFERENCE FOR ENGAGING TRANSACTION ADVISOR.....	59

1 Executive Summary

- 1.1.1 Karnataka has emerged as a key State with knowledge-based industries such as IT, biotechnology and engineering. It has been termed as the science capital of India with more than 100 Research and Development (R&D) centres, and is a preferred destination for multinational corporations with more than 650 such companies¹. Such all-round developments trigger the need for well-developed social, physical and industrial infrastructure, part of which can be built through Public Private Partnership (PPP).
- 1.1.2 Since PPP concept is relatively new and the implementing officers require necessary insight, orientation and assistance, Infrastructure Development Department (IDD), Government of Karnataka is keen to strengthen the project development process in the Directorate of Urban Land Transport (DULT) for implementing infrastructure projects through PPP. IDD has therefore engaged Deloitte Touche Tohmatsu India Pvt. Ltd. (DTTIPL) to provide consultancy services in this regard.
- 1.1.3 Among the wider ambit of services, the engagement intends to arrive at sector-wise inventory, undertake pre-feasibility studies and develop a procurement plan for selection of Transaction Advisor (TA) / Technical Consultant for projects to be taken up for bidding. The information on projects that are generated out of this process shall be initially marketed through workshops before they are bid-out with the assistance of respective Transaction Advisors.
- 1.1.4 This pre-feasibility report presents a preliminary analysis on viability and project structure of implementing Intelligent Transport Systems (ITS) in Mangalore, Belgaum and Gulbarga on PPP basis.
- 1.1.5 ITS refer to the integration of information, communication and control technologies to improve the efficiencies of a transportation network. They also help to reduce the damaging effects of transport systems on the environment.
- 1.1.6 Situation Analysis - This pre-feasibility report conducts broad level technological solution demand and cost estimation for each city. It refers to various case studies and wide ranging discussions with various stakeholders to arrive at an appropriate project facilities plan for each city.
- 1.1.7 The technologies considered in this report for implementation in these cities are:
- a. Vehicle Tracking System
 - b. Passenger Information System
 - c. Variable Message Sign Boards
 - d. Traffic Regulation and Enforcement System
- All these proposed systems shall be integrated via wireless communication technology to a central control server located at the Authority's premises.

¹ <http://www.ibef.org/states/karnataka.aspx>

1.1.8 After assessing the city requirements and post interactions with stakeholders of City Corporations, City Police and Transport Corporations, the following systems have been proposed for the cities considered:

System Proposed	Gulbarga	Belgaum	Mangalore
Vehicle Tracking System	√	X	X
Passenger Information System	√	X	X
Traffic Regulation and Enforcement System	X	√	√
Variable Message Sign Boards	√	√	√

1.1.9 Important structuring parameters and alternatives affecting the implementation of this project on PPP mode have been identified in this report. Various constraints placed by existing laws, regulations and policies have also been considered to develop appropriate revenue and cost streams for the proposed systems.

1.1.10 The proposed ITS systems have been analysed based on various metrics including Project IRR, Equity IRR, and Debt Service Coverage Ratio. Since the systems are not financially viable on their own, appropriate government support required in the form of Operations and Maintenance (O&M) support has been considered. The following results were obtained in this analysis:

	Mangalore	Gulbarga	Belgaum
O&M Support (in Rs. Crore Annually)	2.68	2.06	2.49
Project IRR (Post Tax)	12.29%	12.28%	12.33%
Equity IRR	15.00%	15.00%	15.00%
Average Debt service coverage ratio	1.51	1.50	1.52
Minimum Debt service coverage ratio	1.36	1.41	1.34
Total Project Cost (in Rs. Crore)	12.59	9.15	15.34

1.1.11 For executing this project, an appropriate PPP structure has been recommended and elaborated in this report. The last section of the report highlights the way ahead for successful implementation of this project.

2 Introduction

2.1 Project Idea

- 2.1.1 The term 'Intelligent Transport System' (ITS) refers to a seamless integration of information, communication and control technologies to improve a transportation network and its operations. This involves vehicles, drivers, passengers, public transport operators, traffic controllers/managers and emergency services all interacting with each other, and linking with often complex backbone infrastructure systems. Improving the efficiency of public transport and traffic networks is a key objective of many ITS services. They also help to reduce the damaging effects of transport systems on the environment.
- 2.1.2 This report describes the systems that are proposed for the cities of Mangalore, Belgaum and Gulbarga, with emphasis on Vehicle Tracking System (VTS), Passenger Information System (PIS), Variable Message Sign Boards and Automated Traffic Enforcement. The report also analyses the broad costs and revenue streams for such a project, and recommends a suitable PPP option for implementation of ITS.

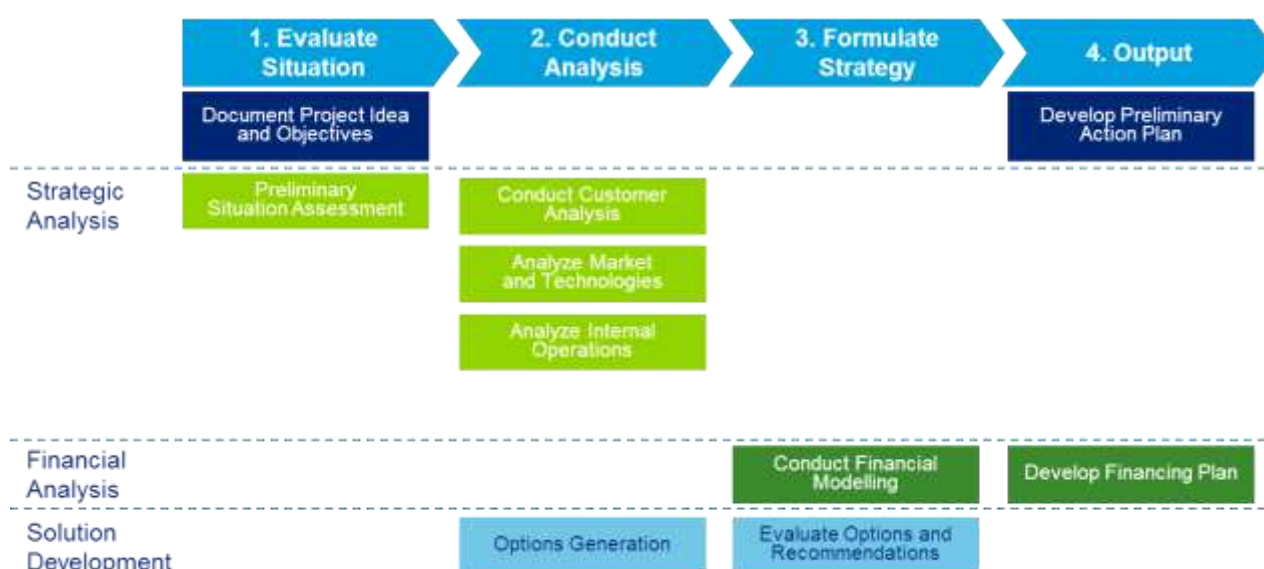
2.2 Approach & Methodology, studies, surveys including Data collection, analysis

During the course of this pre-feasibility analysis, Deloitte has undertaken the following tasks:

S. No.	Steps By Step Approach	Broad Methodology
1	Project Inception	Meetings with key officials of IDD, DULT and other stakeholders
2	Macro overview of the cities: Insights on demographic profile, traffic profile, connectivity & linkages, upcoming & planned developments.	Secondary research, review of CTTs, discussions with the ULBs
3	System identification: Identification of city characteristics, city needs, prevalent systems and suitability of proposed system to the individual city	Stakeholder interactions, review of CTTs and secondary research
4	Market Assessment Identification of target segments, identifying the revenue potential from advertisements.	Secondary research and interactions with potential private partners and other stakeholders

S. No.	Steps By Step Approach	Broad Methodology
6	Facility Planning and the Base Project Cost Estimation	Based on the market data, broad technical specifications and stakeholder inputs
7	Development of Base Financial Model : Base project cost, options for revenue generation, assumptions on financial structuring	Discussion with the Stakeholders and market insights
8	Preliminary assessment of PPP options and Final Recommendation on Project Structuring	Based on financial analysis, sectoral PPP best practices and market insights

Methodology for conducting the prefeasibility



2.3 Study of earlier reports in this sector in the relevant area

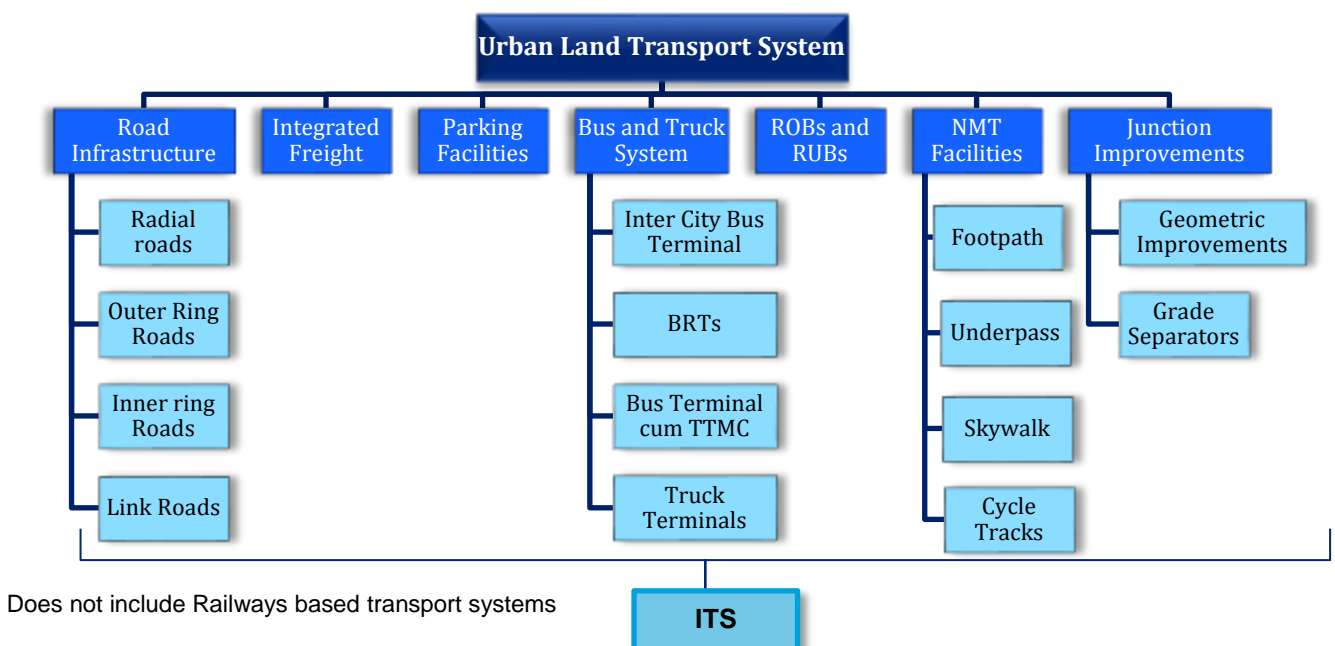
2.3.1 No earlier studies related to implementation of ITS in Mangalore, Belgaum or Gulbarga were available in the public domain. However, a Detailed Project Report for implementation of ITS in Mysore which was prepared by the World Bank has been studied. Moreover, systems implemented in Bangalore, Mumbai, Chennai etc. have also been analysed while preparing this report.

3 Sector Profile

3.1 Sector Overview

- 3.1.1 A well-developed urban transport infrastructure is essential for the movement of people and enabling trade between people. Urban Land Transport provides a comprehensive distribution and delivery network across the city and enables easier interactions outside.
- 3.1.2 The improvement of land transport in the urban sector is essential in order to enhance sustainability in urban transportation. The major reason for the deterioration of the same is due to inability to control urban sprawl. Rapid urbanization in the State of Karnataka demands a free flow of traffic in order to avoid bottlenecks to development of trade, transport and the entire urban infrastructure.
- 3.1.3 Urban transportation can be classified into the following:
 - a) **Collective Transportation (public transit):** The purpose of collective transportation is to provide publicly accessible mobility over specific parts of a city. Its efficiency is based upon transporting large numbers of people and achieving economies of scale. It includes modes such as buses, trains, metros and monorails.
 - b) **Individual Transportation:** This includes any mode where different characteristics of mobility such as speed, route, halts etc. can be modified by personal choice. Means such as automobiles, walking, cycling and motorcycles are classified under individual transportation.
 - c) **Freight Transportation:** This classification deals with movement of goods and merchandise rather than the public.

Intelligent Transport System encompasses all technologies which work towards improving the efficiencies of each category of urban transportation system.



3.2 Industry Overview

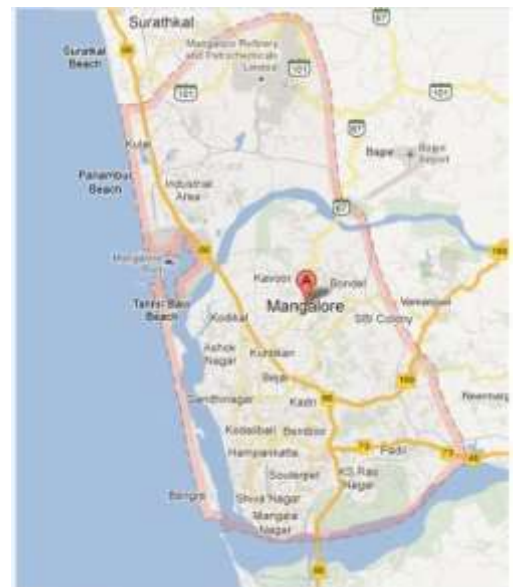
- 3.2.1 The rapid growth of vehicles on Indian roads in the past decade or so has put the existing transport infrastructure under extreme stress. While multitude efforts have been made to enhance these infrastructure facilities, these have not been able to keep pace with the growth of vehicles. This has caused increased congestion on roads and highways. This congestion increases the potential for accidents and long delays, besides increasing pollution, thereby negatively affecting quality of life.
- 3.2.2 One way of mitigating the effects of these problems is to try and increase the productivity of existing transportation infrastructure through the use of advanced technologies, including a broad range of wireless and wired communications-based information and electronics technologies. When integrated together to form an Intelligent Transport System, these technologies help reduce congestion, enhance safety and increase productivity.
- 3.2.3 **Mysore** has recently become the first Indian city to implement a city-wide integrated network of transportation technologies, including GPS and information & communication technologies. The same is being implemented by KSRTC under GEF-SUTP (Global Environment Fund - Sustainable Urban Transport Programme), an initiative by the World Bank. The project has been awarded on a procurement-cum-operations contract for three years. This includes training of KSRTC personnel to take over the system at the end of the three year period.
- 3.2.4 Also, the Central Government has approved Rs 26 crore for intelligence transport system of Indore BRTS. There are variations of such projects in the pipeline across India such as ITS implementation on Hyderabad Outer Ring Road, implementation of ITS in Pune, etc. Harnessing the benefits of ITS, including technologies such as Vehicle Tracking System, Variable Message Sign Boards (VMS) and Automated Traffic Enforcement, will help in easing the stress on Indian transportation infrastructure.
- 3.2.5 In December, 2011 the Ahmedabad BRT was judged the best in the implementation of intelligent transport system by the Union Ministry of Urban Development. The BRT systems have seen an application of ITS in the following ways:
- Operations control,
 - Automatic vehicle tracking system,
 - Electronic fare collection,
 - Real-time passenger information system and
 - Traffic management (ATCS)
- 3.2.6 The Visakhapatnam BRT is also incorporating ITS into its network. The cost estimate for developing ITS related facilities for 300 buses, 50 bus stops, 8 terminals, 3 depots and a Control Centre has been provisioned. The total cost is estimated at Rs. 6 crore. The O&M cost shall be about 15% of capital cost.
- 3.2.7 Further, an Area Traffic Control system is also being implemented in Mumbai. The Rs 72-crore project, which is being implemented at 253 traffic junctions across the city since the past two years, is a part of the World Bank-funded Mumbai Urban Transport Project.

The project has been undertaken by the Brihanmumbai Municipal Corporation (BMC) on behalf of the Mumbai Traffic Police. It centrally co-ordinates traffic signals using real time data collected through detectors. The major benefits derived from the system so far are reduction of time cycles at signals, 10 per cent increase in speed, and reduction in electricity consumption by 30% due to LED signal heads. The project is being carried out by a joint venture of an Indian software company and a Spanish transport management company.

- 3.2.8 India has a registered not-for-profit organization named Association for Intelligent Transport Systems, working towards the development and deployment of ITS in India since 2001. AITS is a forum that brings Government, Academia and Industries together to focus on visions set-up by the Government and direct Research and Development for implementing visions in the field of ITS². These endeavours promote technology driven knowledge-systems, to optimize decision-making, implementation and control.

3.3 Regional Profile - Mangalore

- 3.3.1 **Mangalore** is a port city in the state of Karnataka, located about 350 kilometres west of the capital, Bangalore. Mangalore is the administrative headquarters of the *Dakshina Kannada* district of south western Karnataka. It is located between the Arabian Sea on the west and the Western Ghat mountain ranges on the east.



- 3.3.2 Mangalore was ranked as the 8th cleanest city in the country as per a recent survey of the Urban Development Ministry. Mangalore had a population of 484,785 per the 2011 census of India. About 8.5 per cent population was under six years of age.³ The population density range varies from 25 to 75 persons per hectare. The population density in the CBD area i.e., old Corporation Area is relatively high upto 76 persons per hectare.
- 3.3.3 Mangalore city boasts of an average literacy rate of 71%, with 65.5% of the women being literate. 76.38% of the literate population lives in the surrounding villages. It has a healthy sex ratio with 1,041 females per 1,000 males.
- 3.3.4 The Mangalore City Corporation (MCC) is the municipal corporation in charge of the civic and infrastructural assets of the city. Municipal limits begin with Mukka in the north, to Netravati river bridge in the south and western sea shore to Vamanjoor in the east. The MCC council comprises 60 elected representatives, called *corporators*, one from each of the 60 wards (localities) of the city. The Mangalore municipality covers an area of 132.45 km².

² <http://www.itsindia.org>

³ Government of India Census of 2011

- 3.3.5 The Mangalore economy used to be led by port-related activities. Over the years, other industries including agricultural processing, IT etc. have emerged in and around the city. Mangalore port handles 75% of India's coffee exports and the bulk of its cashew nuts. The major industries in Mangalore are Mangalore Chemicals and Fertilizers Ltd. (MCF), Kudremukh Iron Ore Company Ltd. (KIOCL), Mangalore Refinery and Petrochemicals Ltd⁴. The Yeyyadi Industrial area also harbours several industries. In addition, Mangalore is one of the top five emerging cities of India for outsourcing. Mangalore is home to over 15,000 IT professionals and more than 55 companies. The Mangalore Airport (Bajpe Airport) is one of the fastest growing airports in India and the only airport in the state to operate two runways.
- 3.3.6 The total area occupied by transportation land use is 2269 ha in the Twin City contributing 22% of the built up area according to land Use Survey, 2000. The less percentage compared to the 1986 Land Use survey is due to consideration of general land use in which smaller roads are included in the different land uses. The Inter-City transport system in the Mangalore City is operated by private bus owners. There are about 300 buses operating in the city. Further, there are about 15,500 Auto rickshaws plying on the City Service. The City transport system is well maintained and is having more than the required transport facilities. There are more than 60 city bus schedules of which the longest route is No.54 with 32 km distance going to Thoudugoli which is close to Kerala State Boundary. It is noticed that most of the buses originate from the City Bus Stand at Nehru Maidan and State Bank of India circle. Most of these routes are of destination oriented route pattern. The substantial increase in the number of scheduled routes and buses in operation in addition to mixed flow of heavy traffic has resulted in traffic congestion mainly in the MMC area.
- 3.3.7 Mangalore's location makes it accessible via all forms of transport. Modes of transportation in Mangalore include private buses, trains, taxis and autorickshaws. There are four National Highways which pass through Mangalore. NH-17, which runs from Panvel (in Maharashtra) to Edapally Junction (near Cochin in Kerala), passes through Mangalore in a north-south direction, while NH-48 runs eastward to Bangalore. NH-13 runs north-east from Mangalore to Solapur. National Highways Authority of India (NHAI) is upgrading the national highways connecting New Mangalore Port to Surathkal on NH-17 and BC Road junction on NH-48. Under the port connectivity programme of the National Highways Development Project (NHDP), a 37.5-kilometre (23.3 mi) stretch of these highways will be upgraded from two-lane to four-lane roads. NH-234, 715-km long Highway connects Mangalore to Villupuram.⁵
- 3.3.8 Mangalore's city bus service is dominated by private operators. Two distinct sets of routes for the buses exist—city routes are covered by city buses, while intercity routes are covered by service and express buses. Karnataka State Road Transport Corporation (KSRTC) operates long distance bus services from Mangalore to other parts of the state. There are a number of private bus associations who operate services from Mangalore, including the Dakshina Kannada Bus Operators Association (DKBOA) and the Canara

⁴ <http://economictimes.indiatimes.com/features/property/mangalore-takes-over-as-the-new-sez-destination/articleshow/2788712.cms>

⁵ <http://timesofindia.indiatimes.com/business/india-business/Private-sector-candidate-wont-head-NHAI/articleshow/12362332.cms>

Bus Operators Association (CBOA). These buses usually start from the Mangalore Bus Station. Private taxis and autorickshaws operate through most of the city

- 3.3.9 However, Mangalore faces severe congestion during peak periods which result in excessive delays, low speeds and high travel times. This also leads to increased fuel consumption and air pollution. The increasing road accidents also alarm a concern about safety issues. This problem is expected to increase due to rapid urbanization, increased travel demand, exponential growth in vehicle ownership and public transport and infrastructure deficiencies. Hence, proper integration of technology and operation is required to cope with the increase in these problems.

3.4 Regional Profile - Belgaum

- 3.4.1 The city of Belgaum is located about 500 km North West of Bangalore; and is the headquarters of Belgaum District. Belgaum District is bound by Bagalkot district on the East, Dharwad & Uttar Kannada district on the South, Maharashtra & Goa states on the West and Maharashtra state on the North.



- 3.4.2 The city is located to the north –west of Karnataka and on the NH 4 connecting Bangalore to Mumbai. The city is the gateway to both Mumbai and Goa from Karnataka. Belgaum is at a distance of 520 km from Bangalore and 320 km from Pune. It's well connected by road and rail.
- 3.4.3 Belgaum District has a present population of 5.12 lakhs. The district is well known for its diverse cultural heritage, favourable agro-climatic conditions, industries, educational institutions and tourist spots. It is well connected by air, road and rail. The city of Belgaum is popularly known as the second capital of the state of Karnataka. These aspects have made Belgaum popular as industrial, education and tourist destination and have influenced the tourist inflow into the city.
- 3.4.4 Belgaum lies near the borders of Maharashtra and Goa. Due to its location, Belgaum has acquired the finer points and cultural influences from both its neighbours. Belgaum is a charming blend of the old and the new and presents a fine union of the old as well as the modern day culture and lifestyles. The city has the blend of the local Kannada culture that creates a rich heritage, which is unique in its manifestation. It is famous for its history and natural beauty and is known as Malendu or Rain Country.⁶
- 3.4.5 Belgaum district population is 4,778,439 with the area of 13415 sq. km. The National Highway 4 and NH-4A pass through Belgaum. Belgaum is on the main Indian Railways grid being part of Hubli-Division and is well connected by rail to major destinations such

⁶ Karnataka IDD website

as Bangalore (via Hubli), Mumbai, Pune/Delhi (via Miraj) and Goa. Belgaum is directly connected with Bangalore and Mumbai. The airport currently serving the city is Belgaum Airport located at Sambra (about 30 minutes' drive from the city).

- 3.4.6 Belgaum city is administered by the Belgaum Municipal Corporation. It is the fourth largest city in the state of Karnataka, after Bangalore, Mysore, and Hubli-Dharwad. INDAL (Indian Aluminium Company) is located at Belgaum. Belgaum also has a number of training centres of the Indian Armed Forces, and an air base of the Indian Air Force.
- 3.4.7 According to the land use plan of 2004, residential area constitutes 32.29% of the total developed area of 4,232.21 Hectares. The core area of Belgaum city is over-crowded and very congested as a result-new extension areas are coming up in the peripheral areas of the city. The commercial and industrial establishments occupy 1.84% and 11.89% respectively of the total developed area of the city.
- 3.4.8 The total area under roads, road-transport depots, parking areas and other transportation networks is 962.25 hectares. Vengurla - Bagalkot and Belgaum - Gokak are the important State Highways which are passing through the city.
- 3.4.9 Other wider roads within the city includes Bauxite road, College road, Club road, Hindwadi road, Hospital road, Congress Road, Market Yard roads are carrying most of the traffic in City.
- 3.4.10 The transportation system in the city is dependent on roadway system. The efficiency of road network reflects on the urban fabrics and act as major catalyst in stimulating private investment.
- 3.4.11 Belgaum is well connected with neighbouring cities by roads such as NH-4, NH-4A SH-20 and major district roads. The bypass road to NH-4 has been four laned under the Golden Quadrilateral Project by NHAI. This bypass is effective in taking out only the through traffic of NH-4. The NH-4A, which passes through the city leading to Khanapur and Londa creates traffic congestion. The State Highway SH-20, which starts at Raichur and ends at joining NH-4 in Belgaum. NWKRTC provides intercity bus services and connects the Belgaum city with major cities like Bangalore, Pune, Mumbai, Panjim, Dharwad – Hubli and Bijapur.
- 3.4.12 About 743 km. of road network connects various parts in Belgaum. The city has a road density of 7.90 km per sq. km and 1.56 km road length per 1000 persons.

3.5 Regional Profile - Gulbarga

- 3.5.1 Gulbarga city is the administrative headquarters of Gulbarga District at the North-East of Karnataka. It was formerly a part of Nizam's Hyderabad state. The city is located at about 200 km from Hyderabad and 600 km north of Bangalore. Gulbarga administration has jurisdiction over the five North-Eastern districts of the state namely Bidar, Gulbarga, Bellary, Raichur and Koppal.



- 3.5.2 It is also an important rail-head on the Madras – Bombay main line, linking the neighbouring state capitals and important cities. Further, as per the 2009 census, Gulbarga City is the 8th largest city in Karnataka state. The population growth rate has been around 2.4%. Gulbarga district which is in the centre of the peninsula is known for the Trade and Commerce of agricultural and mineral produce.
- 3.5.3 A pre-requisite for a successful and efficient trade is good provision of transport. With the development of a network of roads, railway lines and construction of bridges across the rivers the progress in trade could be achieved. The introduction of railway line connecting an important rail-head on the Chennai – Mumbai main line, links the neighbouring state capitals and important cities with Gulbarga. There is a steady and large movement of goods from neighbouring districts and states of Andhra Pradesh and Karnataka.
- 3.5.4 Recently, the increased economic activities and increased city size has increased the urban population further leading to a rapid growth in urban travel demand in Gulbarga. The increased travel demand has caused certain undesirable consequences, including a rapid growth in the number of motor vehicles.
- 3.5.5 With the number of vehicles in Gulbarga city going up three-folds within a decade, traffic jams and accidents on the main roads have become quite common. Although stretches of National Highway 218, State Highway 10 and State Highway 22 passing through the city are wide, the flow of traffic is not smooth.
- 3.5.6 Gulbarga has about 753 Kms of roads maintained by Gulbarga City Corporation and Public Works Department. Around 162 kms of the total length of roads are surfaced with Water Bound Macadam, 185 kms with Bitumen and 75 kms with Cement Concrete. Most of the roads are saturated and development is concentrated in the belt between Aland Road junction and Shahabad Road junction. Station Road is a major arterial road that is aligned in North-South direction.
- 3.5.7 Other major corridors are Market Road, Sedam Road, Humnabad Road, Aland Road, Old and New Jewargi Road and Shahabad Road. Majority of the roads in Gulbarga city have a width ranging between 5.0m to 7.0m and do not exceed 2-lanes.
- 3.5.8 A Ring Road has been constructed by the Karnataka Road Development Corporation. The Ring Road covers approximately 22.4 kms and is a 4 lane divided carriageway with service roads on both sides and a utility corridor of 3 meters between the service road and the main road.
- 3.5.9 Further, the number of vehicles in Gulbarga as of 2008 was 183,699. There is a phenomenal increase in the ownership of private vehicles over the last few years. The number of two-wheelers and cars has almost doubled. It is apparent that the increased use of private vehicles is the prime contributor to traffic congestion and higher rate of accidents and also has a severe impact on public transport patronage. However, it has brought to our notice that the city roads are missing standard traffic signage which is both mandatory and informative for safe operation of traffic on the corridors.

3.5.10 Public transport buses are an affordable means of transportation, providing a high degree of flexibility and convenience at an affordable cost. Both city and inter-city bus services in Gulbarga are currently operated by NEKRTC. The NEKRTC operates along 22 routes within Gulbarga City. The number of buses has not increased commensurate with the demand. As a result, personalized modes have been on the increase, resulting in congestion.

4 Project

4.1 Description of the Project

- 4.1.1 We understand that the Directorate of Urban Land Transport (DULT) wants to introduce intelligent solutions to the transportation issues in major cities of Karnataka. This report aims at identifying various aspects of intelligent transport systems that can be implemented in Belgaum, Mangalore and Gulbarga.
- 4.1.2 There is a wide variety of technologies which can be employed to relieve congestion, improve safety and enhance productivity. These technologies require minimal human input and can operate in variety of weather situations. When these technologies are integrated into the transportation system of a city and centrally controlled/operated, the entire system can be termed as “intelligent”.
- 4.1.3 The options of technologies vary from optimizing the public transportation planning process to tracking and penalizing the traffic offenders. Various alternate revenue streams such as advertisements, website and SMS revenue and Government support have also been proposed.

4.2 Components of the Project

- 4.2.1 Few of the systems that can be introduced under ITS along with the components of each system are listed below.

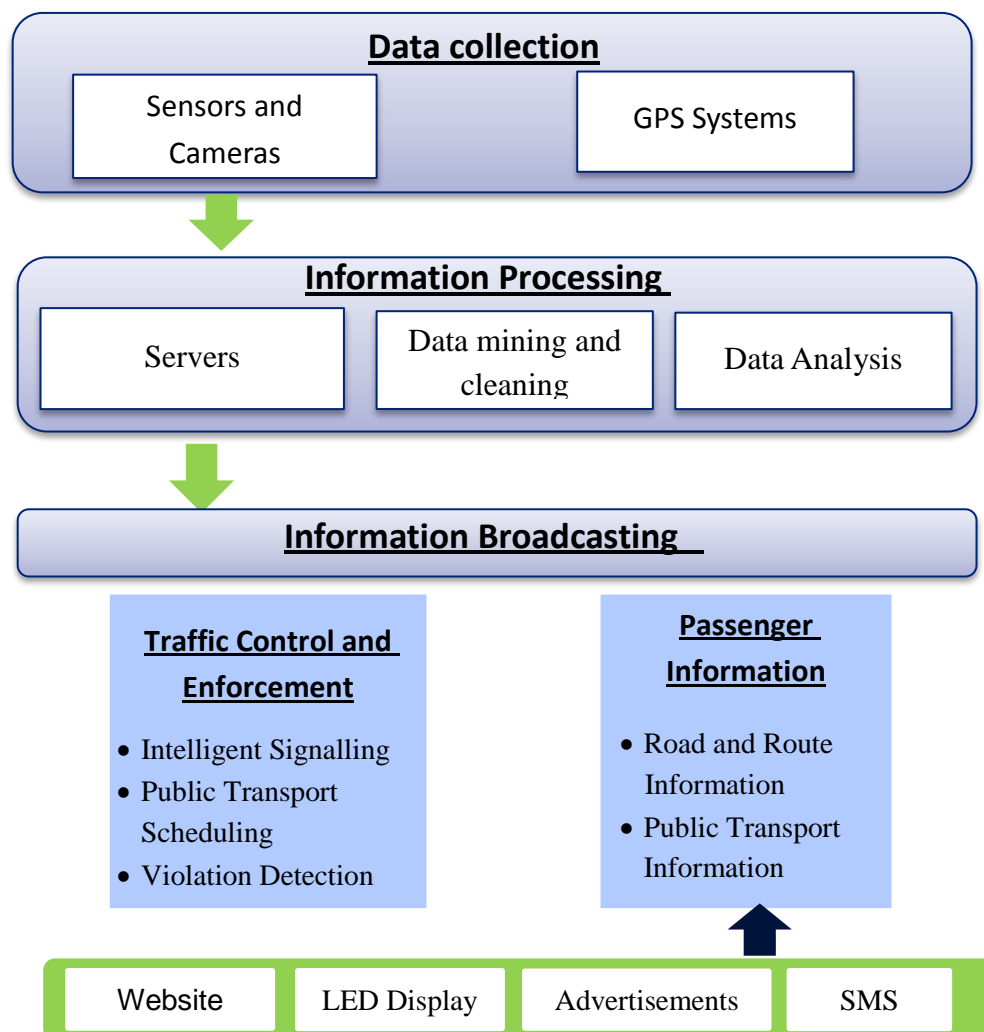
Vehicle Tracking System- An automated Vehicle Tracking System (**including incident and emergency management**) allows the transport corporation to track and monitor their vehicles real time using GPS technology. It communicates the exact location of the vehicle to a central server at pre-defined intervals. It also informs the central server whenever an exceptional incident has occurred such as accident, excessive speeding, deviation from route etc. Some constituents of a Vehicle Tracking System are:

- Vehicle Tracking Unit (VTU)
- Global Positioning System (GPS)
- Machine generating alerts for non-adherence to schedule performance.
- Two way communications between the control-room and the crew
- Map ,graph, text display and MIS reports
- Communication Headset/Speaker Mike to the driver
- Expert Systems

Passenger Information System- A real time information dissemination system allows passengers to confirm scheduling information, improve transfer coordination, and reduce wait times. Electronic information boards at bus stops help passengers plan and modify their travel routes/timings. Such a system may be used at the boarding point of public transport or remotely using a web browser or mobile device. Some constituents of a Passenger Information System are:

- LED Boards displaying real time information of arrival and departure (including incident related information such as delay)
- Short Message Service
- Internet service
- Data Center

Variable Message Sign Boards – Variable Message Sign Boards are information broadcasting tools used by different agencies to inform the passengers about various traffic related issues like accidents, diversions, speed limits, etc. These are useful for regulating incoming traffic at any area.



Traffic Regulation and Enforcement System- An advanced Traffic Regulation and Enforcement System allows automated enforcement of traffic rules at important intersections of a city. Real time traffic monitoring is accomplished through Pan – Tilt – Zoom Cameras (PTZ cameras) which are connected through local servers to the central control centre. These cameras are integrated with the traffic light control system to automatically detect traffic offenders and are equipped with Automatic Number-plate Recognition System. The information shall be relayed back to the control centre, and challans can be generated based on the information. Various other tasks such as

prediction and management of traffic flow can be performed using information gained through this system. The system would also include maintenance of an online payment portal for payment of traffic violation fines.

4.3 Interaction with Stakeholders

4.3.1 Interactions with the stakeholders formed a critical component of the site visits. During the course of this assignment, the consultants interacted with a mix of stakeholders regarding different aspects of this assignment. The list of key stakeholders consulted is presented in **Annexure A**. The interactions with these stakeholders were aimed at understanding the city characteristics, broad-level transportation related issues, probable ITS solutions required for the particular city, realistic cost & revenue assumptions and inputs on project structuring. Select inputs received are grouped and summarized below:

Gulbarga

- The system should have a forward outlook and should be designed to cater to upcoming facilities as well.
- NEKRTC communicated its interest in implementing a Vehicle Tracking System and Passenger Information System in Gulbarga.
- The city has about 25-26 vehicles under operation for intra-city services. An equal number of vehicles ply on suburban routes. Further, a study for augmentation of fleet has been approved and some amount has been ascribed by the state urban transportation fund for procurement of 40 additional vehicles.
- Further, these vehicles ply around a 20 Km periphery of the city covering 28 major bus shelters along with two Bus Terminals. Digital passenger information displays can be put up in these shelters.
- During discussions with the Police, it was concluded that the current level of traffic problems faced in the city can be alleviated through investment in physical infrastructure like street furniture etc. An ITS would not be suitable for a city of the size of Gulbarga. Similarly, discussions with the Regional Traffic Officer of Gulbarga City Corporation indicated that proposed infrastructure in the Comprehensive Traffic and Transportation Plan would be sufficient enough for foreseeable requirements of the city. An intelligent transport solution would not be required in this case.

Mangalore

- The Mangalore city bus operations are completely dominated by private bus operators. KSRTC only operates inter-city buses connecting Mangalore. Mangalore has a good and efficient system of bus transportation, and a majority of its population depends on these services for public transportation. However, no bus operator dominates the market enough to require a Vehicle Tracking System. Additionally, there is not enough coordination between the private bus operators to warrant a Passenger Information System.
- Various initiatives have already been undertaken in the city traffic police department to modernise the force. For example, a recent initiative has equipped some of the traffic police with handheld blackberry devices to book motorists for traffic offences.
- Mangalore traffic police has installed CCTV cameras at important junctions of the city to observe traffic offences. As a next step in this regard, it is proposed to automate this

entire process through intelligent Traffic Regulation and Enforcement System. Both Mangalore Traffic Police and the City Corporation also expressed interest in centralizing the information dissemination process to public. A list of places where Variable Message Sign Boards can be placed was conveyed to the consultants.

Belgaum

- Similar to Mangalore, NWKRTC (Belgaum) were of the opinion that the need of the hour is to provide basic infrastructure facilities in terms of passenger sheds, bus sheds, fleet addition etc. Once that infrastructure is in place, ITS implementation can subsequently be undertaken.
- The RTO – Belgaum felt that although the enforcement function is already undertaken by Motor Vehicle Information services (MVIs) and Senior MVIs, the traffic division is primarily looking at enforcement activities within the city. There is a requirement of a centralized control room for managing the operations, and automation of these operations can be looked at. It is proposed to automate this entire process through intelligent Traffic Regulation and Enforcement System at major intersections identified in the CTTTP.

4.4 Key Issues as Identified in the CTTTPs

Belgaum

- 4.4.1 Belgaum faces severe congestion during peak periods which results in excessive delays, low speeds and high travel times. This also leads to increased fuel consumption and air pollution. The increasing road accidents also raise a concern about safety issues.
- 4.4.2 Moreover, this problem is expected to increase due to rapid urbanization, increased travel demand, exponential growth in vehicle ownership and public transport and infrastructure deficiencies. In Belgaum, where the attempt is being made to achieve a modal split of 60% between public and individual transport by 2028, proper integration of technology and operation is required to encourage people to use Public Transport.
- 4.4.3 ITS is expected to result in improved safety to drivers, better traffic efficiency, reduced traffic congestion, improved energy efficiency and environmental quality and enhanced economic productivity.

Mangalore

- 4.4.4 While several roads radiate from the city centre, it is observed that the orbital links are few and far in between, resulting in the lack of route continuity and straining the radials. Substantial detour to traffic is observed for want of links that are missing. It is observed that a number of junctions have improper geometrics without any traffic control devices. This has resulted in traffic getting saturated at intersections resulting in delays and congestion.
- 4.4.5 Mangalore must not only meet the mobility needs of the current population but also provide for the needs of those yet to join the urban population. ITS is expected to result in improved safety to drivers, better traffic efficiency, reduced traffic congestion, improved energy efficiency and environmental quality and enhanced economic productivity.

Gulbarga

4.4.6 There is a phenomenal increase in the ownership of private vehicles over the last few years. The number of two-wheelers and cars has almost doubled. It is apparent that the increased use of private vehicles is the prime contributor to traffic congestion and higher rate of accidents and also has a severe impact on public transport patronage. Inefficient public transport will affect the competitiveness of a city's economy due to its adverse effect on availability of labour, and individual's expenditure on travel. Therefore, there is a high need to increase the efficiency of the Public Transport System through modern technological solutions including ITS.

4.5 Case Studies for similar projects in India

4.5.1 As discussed previously in section 3.2, various initiatives have been undertaken to encourage the use of intelligent transport solutions. A few examples of such initiatives are discussed in Annexure B of this report

4.6 Description of the Site - Mangalore:

4.6.1 The influx of vehicles in Mangalore has witnessed a quantum growth during the last few years. The further development of Mangalore Port, conversion of Hassan-Mangalore-B.G. Railway line, expansion of the airport at Bajpe, establishment of Oil Refinery on the north-eastern part of Local Planning Area will definitely enhance the flow of vehicles in the city. The major congestion in the city is faced at junctions/intersections of roads. The city has 24 major traffic junctions which have been identified in interactions with the stakeholders.

4.6.2 Below is the list of major intersections in the city where surveillance cameras can be installed:

S. No.	Junction	S. No.	Junction
1	A. B Shetty Road	13	K.S.R.T.C Circle
2	Rao and Rao Circle	14	Bejai Church Circle
3	Hampankatta Circle	15	Mallikatte Circle
4	Kankanady Junction	16	Nantoor Circle
5	Pump-Well (Mahavir Junction)	17	Basaveshwar Circle
6	Bendoor well Junction	18	Lady Hill Circle
7	Balmatta Junction	19	Karavali Junction
8	Jyothi Circle	20	Kottara Junction
9	Bunts Hostel	21	Hamilton Circle
10	PVS Circle	22	Clock Tower Circle
11	Navabharath Circle	23	Kavoor Junction
12	Lalbagh Circle	24	Nelikai Junction

4.7 Description of the Site -Gulbarga

4.7.1 As discussed in detail in latter sections, the system proposed for Gulbarga is a Vehicle Tracking and Passenger Information System combined with Variable Message Sign Boards. These boards would be located at 10 major intersections across the city as identified in the CTTT. The message boards for Passenger Information System shall be located at the 28 major bus shelters identified by NEKRTC and 2 bus terminals (City Bus Terminal and NEKRTC bus terminal) across the city.

Recommended Locations of Variable Message Sign Boards

S. No.	Location
1	S.V Patel circle
2	Jagat Circle
3	B. Shyam Sunder Circle
4	RTO Cross
5	Sedam Circle
6	Sat Gumbaz Circle
7	Public Park Circle
8	Dargah Cross/ Nehru Gunj
9	STBT Circle
10	Rashtrapati Circle

4.8 Description of the Site -Belgaum

4.8.1 Intersections in Belgaum are either uncontrolled or manually operated. The city has 36 major traffic junctions which have been identified in the CTTT. Traffic movements at these junctions are manually controlled by the city Traffic Police. Traffic Congestion, accidents, parking problems and traffic jams are commonly observed in these areas.

S. No.	Junction	S. No.	Junction
1	Kolhapur Cross	19	Sunman Cross
2	RTO circle	20	Vanita Vidyalaya
3	Triveni Junction	21	Sambaji Chowk
4	Ashoka Circle	22	Kirloskar Road
5	Nityanand Cross	23	Maruti Galli
6	Gandhinagar	24	Huns Talkies Road
7	Circuit House	25	Sambhadevi Galli
8	City Bus Terminal	26	Ramdev Galli
9	City Bus Stand Circle	27	Globe Cross
10	Mujavar Kot(Bhaji Mkt)	28	Govate Circle

S. No.	Junction	S. No.	Junction
11	Deshpande Petrol Pump	29	Fish market
12	Pimpal Katta	30	I Railway Gate
13	NB Chowk	31	II Railway Gate
14	Kambli Koot	32	III Railway Gate
15	Ganpati Gali	33	RPD Cross
16	Shanivar Kot	34	Goaves Circle
17	Kadha Bazar Road	35	Ravivar Pet
18	Kaktives Road	36	DCC bank

5 Broad Project Structuring Principles

5.1 Background

- 5.1.1 Project structuring and packaging involves distribution of risks and returns efficiently and reduces the total cost of financing. The art of effective project structuring requires balancing the interests of the diverse stakeholders, and optimal capital structuring. This is then converted into contracts that clearly define the roles, responsibilities, and risks allocated to each partner.

5.2 Benefits of executing this project on PPP mode

- 5.2.1 Involvement of private enterprises in execution of a project has various financial and non-financial benefits. In case of an Intelligent Transport System, the benefits extend to both the government as well as the end users.
- 5.2.2 Intelligent Transport Systems involve complex and ever evolving technologies which require technical expertise to install, test, commission, operate and maintain. Executing this project on PPP would allow an efficient mechanism for this knowledge to be implemented and adopted by the government.
- 5.2.3 Secondly, a PPP structure would allow for diversification of risks and optimal allocation of the same between all concerned stakeholders. It would also allow the private sector to bring in operational as well as managerial efficiencies in the system.
- 5.2.4 Finally, a PPP structure would also reduce or defer the financial burden of public asset development on the government.

5.3 Broad Guiding Principles

- 5.3.1 Some of the broad level project structuring principles are discussed in this section:

1. System Selection and System Architecture Designing

Option 1: Authority to select and provide detailed design to concessionaire.

Option 2: Concessionaire to select and design the system based on guidelines provided by the Authority

In order to take advantage of recent technological advances and technical competencies of the concessionaire, it is envisaged that Option 2 should be considered for project structuring.

2. Procurement and commissioning

Option 1: Authority to procure and commission the system based on above selected design.

Option 2: Concessionaire to procure and commission the system based on above selected design

Since the concessionaire shall be responsible for designing and detailing the system, it is best that Option 2 is considered. This will allow the concessionaire to select the most cost efficient system that meets the guidelines set by the Authority.

3. Coordination with different government stakeholders

Option 1: Authority to coordinate with different government departments for approvals etc.

Option 2: Concessionaire to coordinate with different government stakeholders

Implementation of the proposed systems as discussed in the previous chapter requires an enormous coordination effort. The authority being a government body is best suited for undertaking this task.

4. Operations of the system

Option 1: Authority to operate the system on its own

Option 2: Concessionaire to operate the system on its own

Option 3: Authority and Concessionaire to collaborate for System operations

Operating the proposed ITS solutions require technical expertise as well as access to the Authority's information systems. While the Concessionaire might be best suited to take care of the technical operations, it was decided after consultations with various stakeholders that tasks like issuance and collection of challans, planning and routing of buses etc. should be undertaken by the Authority only. Due to these considerations, Option 3 is recommended.

5. Demand and revenue generation risk

Option 1: Authority to market and collect revenues

Option 2: Concessionaire to market and collect revenues

Allowing the concessionaire to promote the system and collect revenues would allow it to explore alternate options of monetizing the system. These might include advertisements, branding etc. Therefore, Option 2 is best suited for maximising the system's potential. It is noted here that even after the best efforts of the concessionaire, the project might not become financially viable on its own due to its inherent nature. The Authority might need to provide financial support in form of O&M Support to the concessionaire in order for it to receive an appropriate financial return.

5.3.2 Based on these guiding principles, the project viability analysis has been performed.

6 Project Financials

6.1 Project Design

6.1.1 After assessing the city requirements and post interactions with stakeholders of City Corporations, City Police and Transport Corporations, the following systems have been proposed for the cities considered:

System Proposed	Gulbarga	Belgaum	Mangalore
Vehicle Tracking System	√	X	X
Passenger Information System	√	X	X
Traffic Regulation and Enforcement System	X	√	√
Variable Message Sign Boards	√	√	√

6.1.2 The proposed coverage of each system in consultation with suitable stakeholders is described below:

- Gulbarga:** The proposed Vehicle Tracking System will cover all 90 of the city public transport vehicles. Information to passengers shall be disseminated through customized website, display boards at bus stops/depots, and SMSes. Additionally, Variable Message Sign Boards shall be put up at places identified in the CTTTP.

System Proposed	Coverage
Vehicle Tracking System	90 vehicles as discussed with NEKRTC.
Passenger Information System	28 important bus shelters as discussed with NEKRTC and 2 bus depots as indicated in the CTTTP.
Variable Message Sign Boards	10 important junctions identified in CTTTP

- Belgaum:** The proposed Traffic Regulation and Enforcement System shall be implemented at 36 intersections throughout the city. Additionally, Variable Message Sign Boards shall be put up at these intersections.

System Proposed	Coverage
Traffic Regulation and Enforcement System	36 intersections identified in the CTTTP.
Variable Message Sign Boards	36 important junctions identified in CTTTP

- **Mangalore:** The proposed Traffic Regulation and Enforcement System shall be implemented at 24 intersections throughout the city. Additionally, Variable Message Sign Boards shall be put up at these intersections.

System Proposed	Coverage
Variable Message Sign Boards	24 important junctions identified by City Corporation.
Traffic Regulation and Enforcement System	24 intersections identified above.

6.1.3 **Concession Period:** A concession period of five years has been considered for analysis based on the standard life of electronic assets deployed in such systems and the concession period observed for similar projects like the Chennai ITMS project and Mysore ITS project.

6.2 Cost Estimation

6.2.1 The viability of any PPP project is highly dependent on the level of capital investment involved for executing the project. The cost of setting up an ITS system depends significantly on the size, scale and facilities provided. Unfortunately, Intelligent Transport Systems are a fairly new phenomenon in India and no comparative large scale system on a viable PPP mode is operational in India.

6.2.2 Each subsystem of ITS like Vehicle Tracking System, Traffic Regulation and Enforcement System etc. has multiple small hardware, software as well as network components. Details of cost assumptions of each subsystem are described in Annexure C. These costs have been taken from multiple sources including potential suppliers, secondary research, previous studies (including Mysore ITS report) and have been verified through stakeholder discussions.

6.2.3 The overall capital cost estimates* for the recommended systems in each city are as follows:

City	Mangalore	Belgaum	Gulbarga
Vehicle Tracking System	0.00	0.00	1.42
Passenger Information System	0.00	0.00	5.66
Traffic Regulation and Enforcement System	10.17	12.43	0.00
Variable Message Sign Boards	2.42	2.91	2.06
Total Project Cost (in Rs. Crore)	12.59	15.34	9.15

* The costs of Central Control Room facilities and contingency costs have been allocated to each system proportionately.

6.2.4 The concessionaire would also be required to set up and maintain an online Challan Payment Gateway for people to pay their traffic fines online. As per our discussions with key stakeholders such as ICICI Payseal representatives, it is understood that the costs for such activities are recovered through transaction charges.

6.3 Tariff Revenue Stream

6.3.1 An important source of revenue for the concessionaire in this PPP arrangement shall be advertisement revenue from Passenger Information System coupled with SMS revenue and advertisement revenue from websites.

6.3.2 The probable advertising and SMS alert rates applicable for cities of this size were discussed with various stakeholders. The probable consumption pattern for these media was also discussed with key stakeholders. Accordingly, the following assumptions have been made:

Website:

Advertisement Rate	Rs. 15 per thousand hits
Number of Hits	2,000 per day

SMS:

Price per SMS	Rs. 2
Demand	100 per day

Variable Message Sign Boards:

Revenue	1725 Rs. per day
Cost %	25%
Capacity Utilization	40%

Passenger Information Display Panels:

	on Bus Stop Panel	on Bus Terminal Panel
Revenue	1725 Rs. per day	4600 Rs. per day
Cost %	25%	25%
Capacity Utilization	40%	70%

6.4 Viability Assessment

6.4.1 The following parameters were taken for conducting the viability assessment:

- **Debt: Equity Ratio:** A Debt: Equity ratio of 70:30 has been assumed.
- **Interest on Term Loan:** Interest rate of 13% on term loan has been assumed.
- **Loan Tenure and Moratorium Period:** Loan term of 5 years with no moratorium has been assumed
- **Income Tax rate:** Income Tax of 32.445% (including education cess) has been assumed.

6.4.2 From the financial analysis, it is confirmed that implementing the proposed systems is not financially feasible in absence of government support. Certain financial assistance is required every year to make the project viable. Therefore, it is proposed to implement this project such that the Government would annually provide certain fixed assistance to the concessionaire, in the form of O&M support, in addition to the revenue he generates from the sources discussed above.

6.4.3 The amount of O&M support has been calculated in order to provide a minimum equity IRR of 15% to the concessionaire. The key financial indicators for each city in such a scenario are as follows:

	Mangalore	Gulbarga	Belgaum
O&M Support (in Rs. Crore Annually)	2.68	2.06	2.49
Project IRR (Post Tax)	12.29%	12.28%	12.33%
Equity IRR	15.00%	15.00%	15.00%
Average Debt service coverage ratio	1.51	1.50	1.52
Minimum Debt service coverage ratio	1.45	1.41	1.45

6.4.4 The detailed financial evaluation sheets for all three cities are given in Annexure D.

6.5 Sensitivity Analysis

6.5.1 Sensitivity analysis for all three cities has been performed with respect to the Capital Costs, Operation and Maintenance Costs, and the O&M support envisaged. Results for the same are presented in Annexure E.

6.5.2 It is observed from the sensitivity analysis that the project is highly sensitive to capital costs and O&M support payments as compared to O&M costs. Therefore, it is recommended that the capital costs be explored in further detail through a DPR.

7 Statutory & Legal Framework

7.1 Legal Framework

7.1.1 The Karnataka Municipal Corporation Act, 1976

The Act provides for creation of Municipal Corporation in the State of Karnataka. It confers certain powers on Mayor and the deputy Mayor. It specifies the obligatory and specific functions of the corporations. It also provides for strengthening the administrative machinery of the corporations.

The Corporation has the power to plan, design, construct, operate and maintain all public roads and related infrastructure in the city.

7.1.2 Karnataka Urban Development Authorities Act, 1981

Objective of this Act is to establish the Urban Development Authorities in the state of Karnataka for the purpose of providing planned development of major and important urban areas in the State.

Power of Authorities to take Developmental Works

Under this Section, the Authority has the power to undertake works and incur expenditure for development and in execution of that power; the Authority has the power to draw up detailed Schemes and also for the framing and execution of development schemes. The Authority may also take up any new or additional development schemes.

Power of the Authority to levy of betterment tax

Where, as a consequence of execution of any development scheme, the market value of any land in the area comprised in the scheme which is not required for the execution thereof has, in the opinion of the Authority, increased or will increase, the Authority shall be entitled to levy on the owner of the land or any person having an interest therein a betterment tax in respect of the increase in value of the land resulting from the execution of such scheme.

7.2 Applicable Policies

7.2.1 Karnataka New Infrastructure Policy, 2007

Clause 27 of this policy outline the process of procurement of public good under the ambit of the Karnataka Transparency in Public Procurement (KTPP) Act (Act 29 of 2000), or under a "Swiss Challenge" format. This act lays out the stages of procurement process, the possible award criteria as well as the process for evaluation of proposals submitted suo-moto by private parties.

7.2.2 National Urban Transport Policy, 2006

The NUTP envisions a focus on movement of people and goods as the paradigm of transport planning leading to equitable allocation of road space with priority to public transport. Under the NUTP, each city with a population of over four million will be encouraged by the central government to start planning for a mass transit system adopting a technology that would 'best suit the city requirements in the next 30 years'. As per the NUTP, "Central Government would offer support under the NURM for premium service infrastructure such as improved bus stations and terminals, improved passenger information systems, use of intelligent transport systems for monitoring and control, etc."

8 Indicative Environmental & Social Impacts

8.1 Environmental Impacts

- 8.1.1 DULT proposes to improve the management capability of the entire public transport system in major cities of Karnataka and make it more efficient, safe and commuter and environmental friendly. One way of achieving this is by introducing real time communication interlinked with buses, passengers, private vehicles, local transport corporations, city corporations and city traffic police by implementing intelligent transport systems.
- 8.1.2 As per the CTTs, all three cities under consideration face severe congestions during peak periods which result in excessive delays, low speeds and high travel times. This further leads to increased fuel consumption and air pollution. The increasing road accidents also raise a concern about safety issues. Moreover, these problems are expected to increase due to rapid urbanization, increased travel demand, exponential growth in vehicle ownership and public transport and infrastructure deficiencies. An attempt is being made to achieve and sustain a positive modal split towards public transport. Implementing ITS technologies would help make these alternate transport modes more efficient.⁷
- 8.1.3 The proposed ITS would improve traffic efficiency and reduce fuel consumption and emissions. This would enhance environmental quality and energy efficiency and would reduce transport related carbon footprint in the city.
- 8.1.4 The ITS projects proposed in the three cities do not include any major resource utilization which is harmful for the environment. The energy consumed by such systems is offset by increase in traffic efficiencies.
- 8.1.5 In view of the above, the need for undertaking detailed EIA/EMP is not foreseen for these projects.

8.2 Social Impacts

- 8.2.1 As discussed above, Intelligent Transport Systems help transport planning and management agencies to achieve operational efficiency and provide better quality of service. Thus, these systems have an overall positive impact on the society.
- 8.2.2 Further, the proposed ITS provides instant access to information related to bus schedules, expected time of arrival and departure. ITS systems provide benefits in terms of reduce waiting time and uncertainty and increase the safety of users.
- 8.2.3 Events and incidents like diversions, accidents, public works etc. require various transportation controlling authorities to coordinate and communicate with each other.

⁷ Respective CTT Reports

Centralized control of traffic related technologies makes this effort easier. The proposed Information systems allow the public to be involved and informed in such cases.

8.3 Economic Impact

- 8.3.1 Implementation of ITS technological solutions results in many tangible and intangible benefits to the economy. An ITS system allows a safeguard against the rising cost of fuel. This is because the increased efficiencies in traffic result in a reduction in fuel consumption, and improve economic productivity through fast movement of people and goods without delays in traffic bottlenecks.
- 8.3.2 An ITS system on PPP basis allows the concessionaire to generate revenue through multiple sources, including SMS revenue, Advertisements on websites, flash and ticker advertisement opportunities at LED display boards etc.
- 8.3.3 Implementation of this system would also help to generate high end employment through jobs at the control room and data centre and also software engineers to develop the system.

9 Conclusions

9.1 Proposed Project Structure

9.1.1 Based on the above discussions and financial analysis, the indicative project structure for implementing Intelligent Transport System on PPP mode is indicated below:

- The authority to award a five year concession for design, finance, procure, commission, operate, maintain and transfer the project through a transparent bidding process.
- The authority will lay down specifications for the equipment and network to be deployed. The authority will also lay down minimum performance standards in the concession agreement.
- The Concessionaire will develop and commission the system within the estimated completion period not greater than one year.
- The Concessionaire will operate and maintain the system during the concession period. All advertisement and related revenue shall accrue to the concessionaire.
- The government would provide a previously agreed O&M support amount in order to provide appropriate financial returns to the concessionaire.
- The Concessionaire will hand back the project assets to the Authority after the end of agreement period on an as- is- where- is basis.

9.1.2 The project specific risks, degree of impact, indicative mitigants for the project are presented in the Table below:

Risks	Impact	Risk Mitigants	Risk Bearer
1. Pre-completion Risk			
System Design	High	Detailed Technical Engineering	Concessionaire
Timing or Delay	Low	Fixed Cost contracts with suppliers with Performance Guarantee	Concessionaire/ Supplier
Cost Over-run	Low		
Regulatory risk (Govt coordination, Approvals)	Medium	Concession Agreement	Public Agency
2. Operating Risk – Post Completion Risk			
O&M	Low	Equipment supplier maintenance contracts	Concessionaire/ Supplier
3. Revenue Risk			
Advertisement Demand Forecast	Medium	Detailed Demand Assessment Study	Concessionaire
SMS User Charges / willingness to pay	High	Target Segment Surveys, Group Discussions	Concessionaire
Facility Augmentation	Low	Contractual Protection	Concessionaire

Risks	Impact	Risk Mitigants	Risk Bearer
Supplementary Facilities	Low/Medium	Contractual Protection	Public Agency
4. Sovereign Risk			
Macroeconomic Risks	Medium	Real price contracts	Concessionaire
Political & Legal Risks	Medium	Political Risk Insurance Concession Contract	Insurance Company State Government (Risk Sharing)
5. Financial Risk			
	Low to Medium	Loan Syndication	Financial Institutions
6. Force Majeure			
	Medium	Insurance Cover	Insurance Company/ Concessionaire / O&M Contactor

9.2 Way Ahead

- 9.2.1 The project as analysed above prima facie seems to be viable to be implemented on PPP mode with O&M support. This section recommend certain detailed studies to be undertaken before taking the project to the next stage, i.e. invitation of tenders.
- 9.2.2 The concerned agencies/authorities should freeze the project design in terms of components, its PPP structure and facilities plan for development. In this regard, a technical study should be undertaken on various specifications/variations of the technologies proposed. However, the exact specifications may depend on the budgetary support required from the government to execute this project on PPP.
- 9.2.3 A detailed demand survey and project report should be prepared to unlock the full potential of the project.
- 9.2.4 Also, a qualified transaction advisor should be engaged to further analyse and develop the project and select a suitable concessionaire. The terms of reference for engaging both are given in Annexure F and Annexure G respectively.

9.3 Support Required from the Government

- 9.3.1 The following support is required from various governmental agencies in the recommended project structure:
- In principal approval of the concept of allowing concessionaire to collect, track, integrate and analyse public transport and traffic violation information.
 - Encumbrance free sites for installation LED display boards at Bus Shelters, Bus Terminals and Variable Message Sign Boards.

- O&M support to the concessionaire.
- Lease the site for development of control centre.

9.3.2 Governmental agencies can also assist the proposed scheme by:

- Exempting excise duty on technical equipment required for this scheme
- Focusing on coordination between various governmental agencies.
- Training present staff in proposed technologies to be implemented as they would take over at the end of the concession period.

Annexures

Annexure A: List of key stakeholders consulted

Name	Designation
Mrs. Manjula V.	Commissioner, DULT
Mr. Shailender Singh	Special Officer, DULT
Mr. Praveen Madhukar Powar	Superintendent of Police, Gulbarga
Mr. Beedi Basalingappa	Divisional Traffic Officer, NEKRTC
Mr. Eshwar Awte	Regional Traffic Officer, Gulbarga City Corporation
Mr. Ganesh Rathod	Systems Manager, NWKRTC
Mr. R. S. Nayak	Executive Engineer, Belgaum City Corporation
S. H. Gangareddy	Addl. Superintendent of Police, Belgaum
Mr. Nagaraj	Supervisor, Mechanical Department, KSRTC
Mr. Balakrishna Gowda	Town Planning Officer, Mangalore City Corporation
Dr. Harishkumar K.	Commissioner, Mangalore City Corporation
Mr. Ashok Kumar	Mangalore City Corporation
Mr. Seemanth Kumar Singh	Commissioner of Police, Mangalore
Mr. Ajithkumar Hegde S.	Commissioner, Mangalore Urban Development Authority
Mr. Jayaprakash	Assistant Executive Engineer, Mangalore Urban Development Authority

Annexure B: Case Studies for similar projects in India

Some of the recent initiatives for introducing ITS technologies in India have been discussed in brief in section 3.2 of this report. Here we are discussing few examples of the same:

Traffic Regulatory Management System in Tamil Nadu:

- A fully automated **Traffic Regulatory Management System (TRMS)** has been proposed in Chennai, the capital of Tamil Nadu, This system involving usage of surveillance cameras, Automatic Number Plate Reader (ANPR) cameras and 'Pan Tilt Zoom' (PTZ) cameras to prosecute traffic offenders. A Rs. 3 Crore state funded Trial for this system was held in 2009.
- As per the system design during the trial, ANPR cameras were installed in 28 points in the city while PTZ cameras were installed at 12 locations. Now it is proposed to expand this system to cover around 100 important junctions in the city. These cameras are to be installed and connected through Wi-fi network to a central police control room. At this control room, a 10 TB storage server shall be installed to store all information relating to the TRMS. Preliminary testing of the system was conducted during this trial. Trials were conducted for more than a fortnight to ensure that there were no gaps before the TRMS is fully commissioned.
- The TRMS has been designed to detect pre-reported vehicles in its database. It has the capability to store a variety of information relating to reported vehicles in the system. In case of movement of such vehicles, the system alerts the control room. The control room shall be equipped with around 10 plasma screens to view traffic junctions online and detect any traffic violation related activities round-the-clock. In addition to the above system, traffic police personnel shall be given 70 handheld computers with built-in printers to book traffic violation cases on-the-spot.
- Complete implementation of this system in Chennai is proposed on BOT-Annuity basis. Companies to provide these services have been shortlisted and the project is currently under bidding.
- Since the e-challan system for spot fining was tested to be successful in Chennai, it is proposed to be extended to five other Commissionerates.

BMTC, Bangalore

- The Bangalore Metropolitan Transport Corporation operates a network of ordinary as well as luxury buses throughout Bangalore. The BMTC has been making a lot of efforts in order to improve the traffic and information related problems faced by their users. These include the recent introduction of various technological solutions for traffic and transport related issues.
- BMTC is currently in the process of implementing an online GPS with GPRS based VTS on build-own-operate and transfer (BOOT) basis. Currently 200 buses have been equipped with GPS devices under this effort. The cost of this project is Rs. 3.31 Crores covering around 500 BMTC buses.
- The Bangalore Transport Information System (BTIS) is an online passenger information service of BMTC that informs the passengers about which bus routes to take to reach your desired destination. This web based system offers assistance and information over other traffic-related areas such as traffic jams, parking availability, information about the

metro etc. This system can also be used to find out outstanding traffic fines for your vehicle. This system can also be used to interact and file complaints. Besides internet, this system can also be accessed through mobile phone.

- As part of a pilot project, the BMTC is introducing Real-time Multi-Lingual Passenger Information system through LED/LCD screens at a number of bus stops and major bus terminals. Another initiative in the pilot stage is a Centralized Online Fare Collection System using Smart Card based fare collection. Currently 200 such electronic ticketing machines are in operation.

Area Traffic Control project - Mumbai

Mumbai Police – Traffic Control Branch has undertaken an initiative to introduce technological solutions with an Area Traffic Control project. This project is to be implemented with financial aid from the World Bank. Tenders inviting bids for the ATC have been floated by the MCGM. The following components of the system are envisaged:

- **Speed Check Guns**

Multi Radar C is a device for measuring speed and comprises the following components:

- Smart Camera II,
- Radar sensor RRS24F-S1,
- Screen,
- Manual control unit,
- Flash generator,
- Flash light,
- Power Box,
- Tripod

- **CCTV Video Surveillance System:**

This component entails the introduction of computerized surveillance at 100 traffic junctions for surveillance and incident detection. The system shall detect the information through PTZ cameras and transmit it via a physical network to a control room. The control room shall be equipped with PCs with application software.

Variable Messaging System (VMS):

Mumbai Police - Traffic Control Branch has also started installation of Variable Messaging Sign Boards at strategic locations in the city. Information to these boards is fed through the Traffic Control Room, including information regarding bottlenecks, diversion etc.



Other initiatives by Mumbai Police Traffic Control Branch include:

- Alcohol Detector/Breath Analyser for detecting/prosecuting drunken drivers.
- Reflective Jackets and Led Battons to improve night visibility of the Traffic Police.
- Laser Speed Guns/Speed Radars for detecting/prosecuting over speeding vehicles.
- Oxygen Concentrators for Traffic Policemen working in most polluted environment for long, tiring hours.
- Use of LEDs in signal ASPECTS for better visibility and lower maintenance cost.
- Traffic Police Chowkies, Pedestals, Booths, Motor Cycles with improved visibility and better facilities for Traffic Police.
- Traffic Cones, Spring posts, Barriers as channelisers.
- Wheel Clamps for prosecuting illegally parked vehicles.

Annexure C: Cost Assumptions

Cost Head	Unit Cost (in Rs.)
Vehicle Tracking System	
Procurement Cost per GPS	14,950 per device
Installation Cost per GPS	575 per device
License for Vehicle Tracking Software Application	115,000 (for 500 vehicles per year)
Integration with GIS	1,725,000
Data communication between GPS and central Control	2,760
Voice Communication between bus and Central Control	2,070 per year per vehicle
Passenger Information System	
Bus Mounted Display Panel	57,500 per panel
Bus Stop Display Unit	230,000 per panel
Bus Terminal Display Unit	402,500 per panel
Website and SMS System Cost	500,000 for development and 5000 per year as hosting fee
GPRS data communication cost	2760 per unit per year
Variable Message Sign Boards	
Variable Message Sign Boards	402,500 per panel
GPRS data communication cost	2760 per unit per year
Data storage and Control Centre	
Server Costs	10,350,000
Software Licenses	23,000,000
Network Components and Installation	2,760,000
System Architecture Designing, installation, commissioning and testing	16,100,000
Application Software	5,750,000
Application Software for Traffic Regulatory Management	5,750,000
Access Control Facilities (2 nos)	230,000
Workstations (4 nos)	230,000
System Software for workstations	115,000
Printers	115,000

Cost Head	Unit Cost (in Rs.)
UPS	1,150,000
Air Conditioning	345,000
Other infrastructure/Misc	1,150,000
Data linking and communication at central server	3,450,000
Manpower at Central Station	2,346,000
Consumables	115,000
AMC	1,150,000
Traffic Regulation and Enforcement System	
Camera cost and installation	60,000
Data communication between each Camera and local server per camera per year	2,760
Local Servers at junction (Edge, GSM/GPRS, Application, etc.)	1,500,000
Data communication between local servers and central station per junction per year	2,760
Handheld computers-cum-printers	20,000
Data communication and printing cost per handheld device per year	5,000

Additionally, the concessionaire would be charged a lease rent of Rs. 20 per sq. ft. per month to set up the control room in the premises of the governmental agency. However, sites for setting up Passenger Information Panels and Variable Message Sign Boards would be provided by the government free of cost.

Annexure D: Financial Summary – Mangalore**Profit and Loss Account**

	Year 1	Year 2	Year 3	Year 4	Year 5
INCOME					
PIS Advertisement Revenue					
on bus stop Panel	-	-	-	-	-
on bus terminal panel	-	-	-	-	-
on VMS display	21,155,400	23,323,829	25,714,521	28,350,259	31,256,161
Website Advertisement Revenue	-	-	-	-	-
SMS Revenue	-	-	-	-	-
O&M Support	26,751,000	26,751,000	26,751,000	26,751,000	26,751,000
EXPENDITURE					
Data Communication between VMS & central control	66,240	69,552	73,030	76,681	80,515
PIS data communication	-	-	-	-	-
Data linking and communication at central server	3,450,000	3,622,500	3,803,625	3,993,806	4,193,497
Manpower at Central Station	2,346,000	2,463,300	2,586,465	2,715,788	2,851,578
Consumables	115,000	120,750	126,788	133,127	139,783
AMC	1,150,000	1,207,500	1,267,875	1,331,269	1,397,832
Data communication between each Camera and local server	5,000	5,250	5,513	5,788	6,078
Data communication between local servers and central station	264,960	278,208	292,118	306,724	322,061
Data communication and printing cost for handheld devices	66,240	69,552	73,030	76,681	80,515
Lease Rent	240,000	252,000	264,600	277,830	291,722
Interest on Term loan	10,312,950	8,021,184	5,729,417	3,437,650	1,145,883
Depreciation	31,950,450	12,780,180	5,112,072	2,044,829	817,932
PROFIT BEFORE TAXATION	(2,300,440)	20,932,853	32,866,389	40,423,256	46,388,045
Provision for Taxation :	-	6,791,664	10,663,500	13,115,325	15,050,601
PROFIT AFTER TAXATION	(2,300,440)	14,141,189	22,202,889	27,307,930	31,337,444

Balance Sheet

	Year 1	Year 2	Year 3	Year 4	Year 5
SOURCES OF FUNDS					
Shareholders' Funds					
Capital	37,776,375	37,776,375	37,776,375	37,776,375	37,776,375
Reserves and Surplus	-2,300,440	11,840,748	34,043,638	61,351,568	92,689,012
Loan Funds					
Secured Loans	70,515,900	52,886,925	35,257,950	17,628,975	0
Total	105,991,835	102,504,048	107,077,963	116,756,918	130,465,387
APPLICATION OF FUNDS					
Fixed Assets					
Gross block	125,921,250	125,921,250	125,921,250	125,921,250	125,921,250
Less Depreciation & Non-Cash Expenses	31,950,450	44,730,630	49,842,702	51,887,531	52,705,462
Net block	93,970,800	81,190,620	76,078,548	74,033,719	73,215,788
Current assets, Loans and Advances					
Current assets					
Cash and bank balances	12,021,035	21,313,428	30,999,415	42,723,199	57,249,599
Net current assets	12,021,035	21,313,428	30,999,415	42,723,199	57,249,599
Total	105,991,835	102,504,048	107,077,963	116,756,918	130,465,387

Cash Flow Statement

	Year 1	Year 2	Year 3	Year 4	Year 5
A. CASH FLOW FROM OPERATING ACTIVITIES					
Net Profit before tax and extraordinary items	-2300440	20932853	32866389	40423256	46388045
Adjustments for:					
Depreciation	31950450	12780180	5112072	2044829	817932
Interest	10312950	8021184	5729417	3437650	1145883
Taxes Payable	0	6791664	10663500	13115325	15050601
Cash generated from operations	39962960	34942552	33044378	32790409	33301259
Net cash from operating activities (A)	39962960	34942552	33044378	32790409	33301259
B. CASH FLOW FROM INVESTMENT ACTIVITIES:					
Purchase of Fixed Assets	-125921250	0	0	0	0
Cash from investment activities (B)	-125921250	0	0	0	0
C. CASH FLOW FROM FINANCING ACTIVITIES:					
Interest/Finance charges on borrowings	-10312950	-8021184	-5729417	-3437650	-1145883
Increase / (Decrease) in Owners' Equity	37776375	0	0	0	0
Increase / (Decrease) in Long term Loans	70515900	-17628975	-17628975	-17628975	-17628975
Cash from financing activities (C)	97979325	-25650159	-23358392	-21066625	-18774858
Net Increase/(Decrease) in Cash & Cash equivalents (A+B+C)	12021035	9292394	9685986	11723784	14526400
Cash and Cash Equivalents (Opening Balance)	0	12021035	21313428	30999415	42723199
Cash and Cash Equivalents (Closing Balance)	12021035	21313428	30999415	42723199	57249599

Financial Summary – Belgaum

Profit and Loss Statement

	Year 1	Year 2	Year 3	Year 4	Year 5
INCOME					
VMS display Advertisement Revenue	31,733,100	34,985,743	38,571,781	42,525,389	46,884,241
O&M support	24,915,000	24,915,000	24,915,000	24,915,000	24,915,000
EXPENDITURE					
Data Communication between VMS & central control	3,450,000	3,622,500	3,803,625	3,993,806	4,193,497
Data linking and communication at central server	2,346,000	2,463,300	2,586,465	2,715,788	2,851,578
Manpower at Central Station	115,000	120,750	126,788	133,127	139,783
Consumables	1,150,000	1,207,500	1,267,875	1,331,269	1,397,832
AMC	5,000	5,250	5,513	5,788	6,078
Data communication between each Camera and local server	397,440	417,312	438,178	460,086	483,091
Data communication between local servers and central station	99,360	104,328	109,544	115,022	120,773
Data communication and printing cost for handheld devices	360,000	378,000	396,900	416,745	437,582
Lease Rent	240,000	252,000	264,600	277,830	291,722
Interest on Term loan	12,565,159	9,772,902	6,980,644	4,188,386	1,396,129
Depreciation	31,950,450	12,780,180	5,112,072	2,044,829	817,932
PROFIT BEFORE TAXATION	3,870,331	28,672,393	42,285,034	51,642,691	59,542,474
Provision for Taxation :	1,255,729	9,302,758	13,719,379	16,755,471	19,318,556
PROFIT AFTER TAXATION	2,614,602	19,369,635	28,565,655	34,887,220	40,223,918

Balance Sheet

	Year 1	Year 2	Year 3	Year 4	Year 5
SOURCES OF FUNDS					
Shareholders' Funds					
Capital	46,026,225	46,026,225	46,026,225	46,026,225	46,026,225
Reserves and Surplus	2,614,602	21,984,237	50,549,892	85,437,111	125,661,029
Loan Funds					
Secured Loans	85,915,620	64,436,715	42,957,810	21,478,905	0
Total	134,556,447	132,447,177	139,533,927	152,942,241	171,687,254
APPLICATION OF FUNDS					
Fixed Assets					
Gross block	153,420,750	153,420,750	153,420,750	153,420,750	153,420,750
Less Depreciation & Non-Cash Expenses	31,950,450	44,730,630	49,842,702	51,887,531	52,705,462
Net block	121,470,300	108,690,120	103,578,048	101,533,219	100,715,288
Current assets, Loans and Advances					
Current assets					
Cash and bank balances	13,086,147	23,757,057	35,955,879	51,409,022	70,971,967
Net current assets	13,086,147	23,757,057	35,955,879	51,409,022	70,971,967
Total	134,556,447	132,447,177	139,533,927	152,942,241	171,687,254

Cash Flow Statement

	Year 1	Year 2	Year 3	Year 4	Year 5
A. CASH FLOW FROM OPERATING ACTIVITIES					
Net Profit before tax and extraordinary items	3870331	28672393	42285034	51642691	59542474
Adjustments for:					
Depreciation	31950450	12780180	5112072	2044829	817932
Interest	12565159	9772902	6980644	4188386	1396129
Taxes Payable	1255729	9302758	13719379	16755471	19318556
Cash generated from operations	47130211	41922717	40658371	41120435	42437979
Net cash from operating activities (A)	47130211	41922717	40658371	41120435	42437979
B. CASH FLOW FROM INVESTMENT ACTIVITIES:					
Purchase of Fixed Assets	-153420750	0	0	0	0
Cash from investment activities (B)	-153420750	0	0	0	0
C. CASH FLOW FROM FINANCING ACTIVITIES:					
Interest/Finance charges on borrowings	-12565159	-9772902	-6980644	-4188386	-1396129
Increase / (Decrease) in Owners' Equity	46026225	0	0	0	0
Increase / (Decrease) in Long term Loans	85915620	-21478905	-21478905	-21478905	-21478905
Cash from financing activities (C)	119376686	-31251807	-28459549	-25667291	-22875034
Net Increase/(Decrease) in Cash & Cash equivalents (A+B+C)	13086147	10670910	12198822	15453144	19562945
Cash and Cash Equivalents (Opening Balance)	0	13086147	23757057	35955879	51409022
Cash and Cash Equivalents (Closing Balance)	13086147	23757057	35955879	51409022	70971967

Financial Summary – Gulbarga

Profit and Loss Statement

	Year 1	Year 2	Year 3	Year 4	Year 5
INCOME					
PIS Advertisement Revenue					
on bus stop Panel	5,288,850	5,830,957	6,428,630	7,087,565	7,814,040
on bus terminal panel	1,762,950	1,943,652	2,142,877	2,362,522	2,604,680
on VMS display	8,814,750	9,718,262	10,714,384	11,812,608	13,023,400
Website Advertisement Revenue	10,950	11,498	12,072	12,676	13,310
SMS Revenue	73,000	76,650	80,483	84,507	88,732
O&M Support	20,555,000	20,555,000	20,555,000	20,555,000	20,555,000
EXPENDITURE					
License for Vehicle Tracking System	115,000	120,750	126,788	133,127	139,783
Data Communication between GPS & central control	248,400	260,820	273,861	287,554	301,932
Voice Communication between bus & central control	186,300	195,615	205,396	215,666	226,449
Data Communication between VMS & central control	27,600	28,980	30,429	31,950	33,548
PIS data communication	82,800	86,940	91,287	95,851	100,644
Data linking and communication at central server	3,450,000	3,622,500	3,803,625	3,993,806	4,193,497
Manpower at Central Station	2,346,000	2,463,300	2,586,465	2,715,788	2,851,578
Consumables	115,000	120,750	126,788	133,127	139,783
AMC	1,150,000	1,207,500	1,267,875	1,331,269	1,397,832
Website Hosting Fee	5,000	5,250	5,513	5,788	6,078
Lease Rent	240,000	252,000	264,600	277,830	291,722
Interest on Term loan	7,491,218	5,826,503	4,161,788	2,497,073	832,358
Depreciation	33,037,200	13,214,880	5,285,952	2,114,381	845,752
PROFIT BEFORE TAXATION	(11,989,018)	10,730,231	21,703,081	28,081,667	32,738,208
Provision for Taxation :	-	3,481,423	7,041,564	9,111,097	10,621,912
PROFIT AFTER TAXATION	(11,989,018)	7,248,808	14,661,516	18,970,570	22,116,297

Balance Sheet

	Year 1	Year 2	Year 3	Year 4	Year 5
SOURCES OF FUNDS					
Shareholders' Funds					
Capital	27,440,359	27,440,359	27,440,359	27,440,359	27,440,359
Reserves and Surplus	-11,989,018	-4,740,210	9,921,306	28,891,876	51,008,173
Loan Funds					
Secured Loans	51,222,003	38,416,502	25,611,002	12,805,501	0
Total	66,673,344	61,116,651	62,972,666	69,137,735	78,448,531
APPLICATION OF FUNDS					
Fixed Assets					
Gross block	91,467,863	91,467,863	91,467,863	91,467,863	91,467,863
Less Depreciation & Non-Cash Expenses	33,037,200	46,252,080	51,538,032	53,652,413	54,498,165
Net block	58,430,663	45,215,783	39,929,831	37,815,450	36,969,697
Current assets, Loans and Advances					
Current assets					
Cash and bank balances	8,242,681	15,900,868	23,042,835	31,322,286	41,478,834
Net current assets	8,242,681	15,900,868	23,042,835	31,322,286	41,478,834
Total	66,673,344	61,116,651	62,972,666	69,137,735	78,448,531

Cash Flow Statement

	Year 1	Year 2	Year 3	Year 4	Year 5
A. CASH FLOW FROM OPERATING ACTIVITIES					
Net Profit before tax and extraordinary items	-11989018	10730231	21703081	28081667	32738208
Adjustments for:					
Depreciation	33037200	13214880	5285952	2114381	845752
Interest	7491218	5826503	4161788	2497073	832358
Taxes Payable	0	3481423	7041564	9111097	10621912
Cash generated from operations	28539400	26290190	24109256	23582024	23794406
Net cash from operating activities (A)	28539400	26290190	24109256	23582024	23794406
B. CASH FLOW FROM INVESTMENT ACTIVITIES:					
Purchase of Fixed Assets	-91467863	0	0	0	0
Cash from investment activities (B)	-91467863	0	0	0	0
C. CASH FLOW FROM FINANCING ACTIVITIES:					
Interest/Finance charges on borrowings	-7491218	-5826503	-4161788	-2497073	-832358
Increase / (Decrease) in Owners' Equity	27440359	0	0	0	0
Increase / (Decrease) in Long term Loans	51222003	-12805501	-12805501	-12805501	-12805501
Cash from financing activities (C)	71171144	-18632004	-16967288	-15302573	-13637858
Net Increase/(Decrease) in Cash & Cash equivalents (A+B+C)	8242681	7658187	7141967	8279450	10156548
Cash and Cash Equivalents (Opening Balance)	0	8242681	15900868	23042835	31322286
Cash and Cash Equivalents (Closing Balance)	8242681	15900868	23042835	31322286	41478834

Annexure E - Sensitivity Analysis

Mangalore

capital cost								
		30%	20%	10%	0%	-10%	-20%	-30%
Project IRR (Post Tax)	12.29%	2.92%	5.61%	8.70%	12.29%	16.32%	20.89%	26.49%
Equity IRR	15.00%	-15.86%	-6.27%	3.86%	15.00%	27.00%	40.02%	55.63%
Average DSCR	1.51	1.18	1.27	1.38	1.51	1.66	1.84	2.07

O&M Costs								
		30%	20%	10%	0%	-10%	-20%	-30%
Project IRR (Post Tax)	12.29%	9.94%	10.73%	11.51%	12.29%	13.06%	13.83%	14.59%
Equity IRR	15.00%	7.76%	10.21%	12.62%	15.00%	17.34%	19.65%	21.92%
Average DSCR	1.51	1.42	1.45	1.48	1.51	1.54	1.56	1.59

Concession Period								
		3.00	4.00	5.00	6.00	7.00		
Project IRR (Post Tax)	12.29%	-7.55%	4.77%	12.29%	17.18%	20.52%		
Equity IRR	15.00%	-9.60%	5.13%	15.00%	26.33%	32.13%		
Average DSCR	1.51	1.40	1.44	1.51	1.51	1.51		

O&M Support								
		30%	20%	10%	0%	-10%	-20%	-30%
Project IRR (Post Tax)	12.29%	18.80%	16.74%	14.65%	12.29%	9.85%	7.38%	4.85%
Equity IRR	15.00%	34.30%	28.31%	22.13%	15.00%	7.52%	-0.27%	-8.52%
Average DSCR	1.51	1.75	1.67	1.59	1.51	1.42	1.34	1.25

Belgaum

capital cost								
		30%	20%	10%	0%	-10%	-20%	-30%
Project IRR (Post Tax)	12.33%	3.23%	5.93%	9.03%	12.33%	16.15%	20.72%	26.32%
Equity IRR	15.00%	-13.99%	-4.78%	5.05%	15.00%	26.00%	38.72%	54.03%
Average DSCR	1.52	1.20	1.29	1.40	1.52	1.67	1.86	2.10

O&M Costs								
		30%	20%	10%	0%	-10%	-20%	-30%
Project IRR (Post Tax)	12.33%	10.55%	11.15%	11.74%	12.33%	12.92%	13.50%	14.08%
Equity IRR	15.00%	9.69%	11.49%	13.26%	15.00%	16.72%	18.42%	20.09%
Average DSCR	1.52	1.46	1.48	1.50	1.52	1.54	1.57	1.59

Concession Period								
		3.00	4.00	5.00	6.00	7.00		
Project IRR (Post Tax)	12.33%	-8.13%	4.55%	12.33%	17.41%	20.88%		
Equity IRR	15.00%	-11.52%	4.42%	15.00%	26.50%	32.44%		
Average DSCR	1.52	1.38	1.44	1.52	1.52	1.52		

O&M Support								
		30%	20%	10%	0%	-10%	-20%	-30%
Project IRR (Post Tax)	12.33%	17.09%	15.53%	13.94%	12.33%	10.69%	8.95%	7.07%
Equity IRR	15.00%	28.80%	24.31%	19.72%	15.00%	10.14%	4.84%	-0.93%
Average DSCR	1.52	1.70	1.64	1.58	1.52	1.46	1.40	1.33

Gulbarga

capital cost								
		30%	20%	10%	0%	-10%	-20%	-30%
Project IRR (Post Tax)	12.28%	3.08%	5.72%	8.75%	12.28%	16.46%	21.51%	27.75%
Equity IRR	15.00%	-15.58%	-6.03%	4.00%	15.00%	27.53%	42.39%	60.66%
Average DSCR	1.50	1.19	1.28	1.38	1.50	1.66	1.85	2.09

O&M Costs								
		30%	20%	10%	0%	-10%	-20%	-30%
Project IRR (Post Tax)	12.28%	9.02%	10.12%	11.21%	12.28%	13.35%	14.41%	15.46%
Equity IRR	15.00%	4.84%	8.31%	11.69%	15.00%	18.24%	21.42%	24.56%
Average DSCR	1.50	1.39	1.43	1.47	1.50	1.54	1.58	1.62

Concession Period						
		3.00	4.00	5.00	6.00	7.00
Project IRR (Post Tax)	12.28%	-7.21%	4.90%	12.28%	17.10%	20.40%
Equity IRR	15.00%	-8.44%	5.53%	15.00%	26.19%	31.94%
Average DSCR	1.50	1.41	1.44	1.50	1.50	1.50

O&M Support								
		30%	20%	10%	0%	-10%	-20%	-30%
Project IRR (Post Tax)	12.28%	19.78%	17.32%	14.82%	12.28%	9.70%	7.07%	4.38%
Equity IRR	15.00%	37.58%	30.20%	22.69%	15.00%	7.03%	-1.33%	-10.29%
Average DSCR	1.50	1.77	1.68	1.59	1.50	1.41	1.32	1.23

Annexure F: Terms of Reference for engaging Technical Consultant

1. BACKGROUND

The term 'Intelligent Transport System' (ITS) refers to a seamless integration of information, communication and control technologies to improve a transportation network and its operations. This involves vehicles, drivers, passengers, public transport operators, traffic controllers/managers and emergency services all interacting with each other, and linking with often complex backbone infrastructure systems. Improving the efficiency of public transport and traffic networks is a key objective of many ITS services. ITS systems also help to reduce the adverse effects of transport systems on the environment.

Intelligent Transportation Systems (ITS) encompass a broad range of wireless and wire line communications-based information and electronics technologies. When integrated into the transportation system's infrastructure, and in vehicles themselves, these technologies relieve congestion, improve safety and enhance productivity. The options of technologies vary from optimizing the public transportation planning process to tracking and penalizing the traffic offenders.

The Department of Urban Land Transport, Government of Karnataka recognizes that ITS applications are complex and systems involving advanced information technology and system engineering. Therefore DULT intends to employ technical knowledge to assist in evaluating the feasibility of various ITS applications in the cities of Mangalore, Belgaum and Gulbarga.

Components of the Project

Below are listed few of the systems that can be introduced under ITS. The components of each system are listed along with it.

Vehicle Tracking System- An automated Vehicle Tracking System allows the transport corporation to track, trace and monitor their vehicles in real time using GSM/GPRS technology. It sends the location address to a central server at a pre-defined interval. It also sends alerts to the computer or to a mobile phone whenever an exceptional event has occurred such as erratic vehicle movements, excessive speeding etc. Some constituents of a Vehicle Tracking System are:

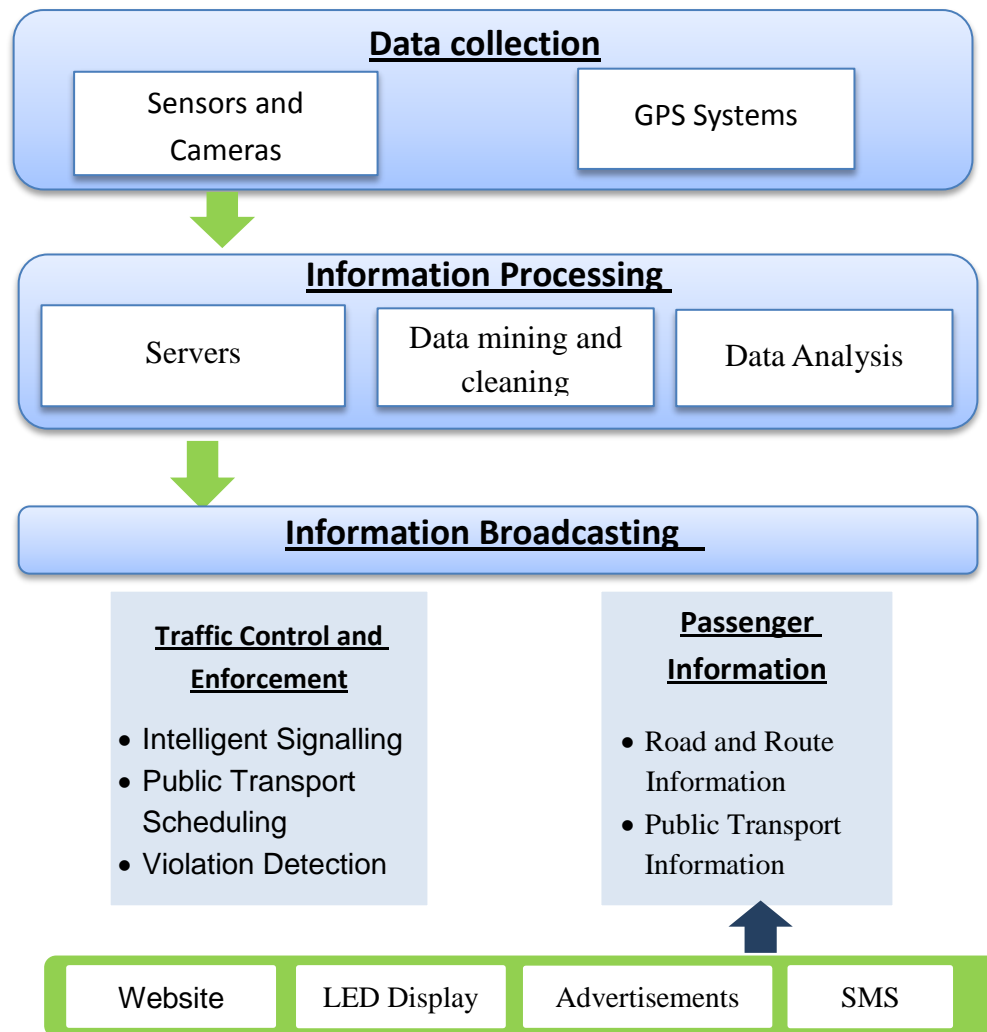
- Vehicle Tracking Unit (VTU)
- Global Positioning System (GPS)
- Machine generating alerts for non-adherence to schedule performance.
- Two way communications between the control-room and the crew
- Map, graph, text display and MIS reports
- Communication Headset/Speaker Mike to the driver

- Expert Systems

Passenger Information System- A real time Information dissemination system allow passengers to confirm scheduling information, improve transfer coordination, and reduce wait times. Electronic transit status information signs at bus stops help passengers manage time, and on-board systems such as next-stop audio enunciators help passengers in unfamiliar areas reach their destinations. It may be used both physically within a public transport vehicle and remotely using a web browser or mobile device. Some constituents of a Passenger Information System are:

- LED Boards displaying real time information of arrival and departure (including incident related information such as delay)
- Variable Message Sign Boards
- Short Message Service
- Internet service
- Data Center

Traffic Regulation and Enforcement System- An advanced Traffic Regulation and Enforcement System allows automated enforcement of traffic rules at important intersections of a city. Real time traffic monitoring is accomplished through Pan – Tilt – Zoom Cameras (PTZ cameras) which are connected through local servers to the central control centre. These cameras are integrated with the traffic light control system to automatically detect traffic offenders and are equipped with Automatic Number-plate Recognition System. The information shall be relayed back to the control centre, and challans can be generated based on the information. The system would also include maintenance of an online payment portal for payment of traffic violation fines.



2. Objective of the Study

The objective of the study is to identify the existing and future transport infrastructure requirements of the subject cities which can be mechanised and made more efficient using automated and intelligent transport solutions. The study would also identify options to bring in private sector efficiencies and assess the training and coordination requirements for various departments associated with recommended solutions.

3. SCOPE OF WORK

The scope of work for technical consultant is subdivided into three phases:

- Phase 1 – Need Assessment
- Phase 2 – Plan Development
- Phase 3 – Financial Feasibility

Phase 1 – Need Assessment (data collection, concept exploration, elaboration of concept of operation, identification of system requirements)

- Gather basic background information such as existing and projected accident and traffic statistics. In addition temporary (short-term) traffic counts undertaken by the consultant may assist to verify and complement statistical information and shall support the analysis and mapping of traffic flows and patterns on concerned intersections.
- Review all existing relevant reports, City Development Plans, Comprehensive Traffic and Transportation Plan and Municipal road development plans.
- Consult and interview staff of all concerned stakeholder agencies on current practices, safety and operational issues, traffic engineering and management, and the needs for solutions.
- Identify relevant technologies that can be realistically implemented under the current technology regime for the immediate and long terms. Technologies shall support the implementation of the related traffic management strategies.
- Address applicable standards for all subsystems and components following the international standards for various ITS technologies.
- Identify best practices from elsewhere based on similar traffic, road, and weather characteristics.
- Estimate life-cycle costs and benefits of potential ITS applications. Costs include initial capital and maintenance and operating costs.
- Perform a risk analysis for recommended technologies and strategies, and identify traffic safety and operation impacts and financial risks.
- Develop a phased implementation plan of the ITS system. Identify locations of the various ITS components on plans. These plans will recommend staging options for deployment based on needs.

Deliverables:

- Prepare and submit a Needs Assessment Report summarizing the findings of the above tasks and identifying the ITS requirements in the concerned city (Concept of Operation and System Requirements).
- Make a formal presentation at a workshop hosted by DULT on the proposed Concept of Operation and identified ITS System Requirements.

Phase 2 – Plan Development (System Design)

This phase would involve the following

- Develop a strategy on the dissemination of information to the public, communication with emergency services, and authorities via messaging, Internet, or other media, including policy and protocol for messaging and information exchange between concerned authorities. Part of the strategy should include recommendations on communications infrastructure including fiber optic and wireless communications.
- Develop a strategy on monitoring and managing vehicle as well as non-motorized traffic.
- Prepare a detailed “System Description” that explains all system functions for implementing the strategies above.
- Identify opportunities to include ITS elements in the plan, design and expansion of the road transport infrastructure facilities.

- Prepare detailed tender-ready specifications for ITS components and subsystems that are recommended for immediate implementation, including recommendations for technical specifications suitable for the climate and conditions of the city. The tender-ready documents shall include functional and performance specification as well as detailed systems and equipment specifications. This may include field surveys, equipment placement drawings, and typical installation details drawings as deemed necessary.
- The study must, to a varying but adequate degree of detail, address the previously listed individual ITS components. The consultant should explore opportunities for integrating these components and leveraging their capability to achieve practical and cost effective solutions.
- The consultant shall also explore innovative approaches of ITS systems to customize subsystems as well as system functions and operations to the particular needs and requirements of the city. The recommended technology should be based on its effectiveness, maintenance, serviceability, durability, and conformance with international ITS architecture standards.

Deliverables:

- Prepare and submit to DULT a draft technical feasibility report detailing the results and recommendations of the above tasks.
- Make at least one formal presentation of the recommendations to DULT, and if necessary at workshops held with concerned stakeholders.
- Finalize the report incorporating feedback from DULT

Phase 3 – Financial Feasibility

- The consultant shall explore the advertisement and branding potential of the proposed facilities and forecast the revenues that can be generated from the same.
- Detailed financial analysis is required to be undertaken by the Consultant. However, the Consultant shall provide the estimated procurement costs, setup and commissioning costs, operation and maintenance costs, demand forecast, revenues etc. as part of its financial analysis and appraisal of the Project. The Consultant shall also estimate the amount of government support required for the concessionaire to earn an appropriate IRR over an appropriate concession period.
- Identify the necessary training requirements for the individual departments to take over operations of the system at the time of transfer.

Deliverables:

- Prepare and submit to DULT a financial feasibility report detailing the results and recommendations of the above tasks.
- Make at least one formal presentation of the recommendations to DULT, and if necessary at workshops held with concerned stakeholders.
- Prepare and submit to DULT a final feasibility report encompassing all aspects of the study.
- Finalize the report incorporating feedback from DULT and concerned stakeholders

4. STUDY DELIVERABLES

The study is to be completed within 26 Weeks. The deliverables are listed below. The consultant may also submit working papers for comment as required.

Deliverable	Submission Date (max time in weeks)	No. of Copies (Hard copies)
Inception Report and Detailed Work Plan	2	3
Need Assessment Report	10	3
Draft Technical Feasibility Report	15	5
Draft Financial Feasibility Report	20	5
Final Feasibility Report and Presentation	26	10

A soft copy of all reports including database material (in Word /Excel /PPT/Dwg – editable format) shall be submitted with each of the above deliverables. Maximum time for completion of the project would be 26 Weeks including the time taken by client to convey the observations on each deliverables.

5. Report format and submission:

Reports shall be submitted in an easily readable format with data relevant to each chapter consultants shall take at most care to submit a report without spelling mistakes and grammatical errors. The report shall have proper cross referencing and numbering of subtitles in every chapter. The report shall have a neat index with correct page numbers. The consultants shall submit draft copies of every report to DULT for its initial comments before taking it to the stakeholder's consultation meetings. The consultants shall then incorporate all the comments of DULT and stakeholders and submit a fair copy of the report as per numbers mentioned in the RFP for all the reports.

Report formats shall be proposed in the Inception presentation and after agreement with the client, subsequent reports shall be submitted in the agreed format.

6. Payment Schedule

Payment shall be made according to the following Schedule, which is based on the submission of deliverables.

Submission/Acceptance of	Payment as Percentage of Total Payable Fee
Inception Report and Detailed Work Plan	10%
Need Assessment Report	15%
Draft Technical Feasibility Report	30%

Draft Financial Feasibility Report	25%
Final Feasibility Report and Presentation	20%

7. INFORMATION ON FIRM AND PROPOSED STAFFING

It is also envisaged that the study will be undertaken by Indian/International consultants having a registered office in India and demonstrated experience of having worked with government agencies having expertise and experience in similar projects.

8. Composition of the Consultants Team

The consultants shall provide details of relevant experience in carrying out similar work along with a copy of client certificates/testimonials. CVs for proposed staff should be included with the Technical Proposal. Staff should have experience in the following disciplines:

- Team Leader / Transport Engineering Expert
- Transport Planner / Traffic Management Expert
- ITS Systems Expert
- ITS – IT / Communications Specialist

In the selection of consultants much importance will be attached to the experience and quality of key members of the proposed consulting team and in particular, of the person proposed to lead it in the field. The proposal should identify the team leader, who is to be available to the project full time, and other key members of the team, indicating length of time for which each is intended to be assigned to the study.

The team leader, in addition to being technically authoritative, must be fully able to fulfill the responsibility of managing all the staff working on the study. Responsibility for study findings will rest with the consultants.

9. Study duration

The study is to be conducted within overall period of 26 weeks (6 Months).

10. Responsibilities for Study Findings and Products

Responsibility for study findings will rest with the consultants. The consultant study team leader will be responsible for managing all the staff working on the study.

All data accomplished by the consultants during the Study shall be the property of the client. The data collected, computer software purchased for and / or modified, during the course of the consultancy assignment should be handed over to employer by the consultant free of cost. Similarly the consultant shall hand over raw data on CDs used by them for data storage in a suitable database format. Every copy of the report will be submitted in soft copies also.

All the study reports shall be prepared in English and shall use SI units in mathematical, engineering and statistical data analysis.

11. Employer Support

Consultants will be provided essential background documents, available (base maps / DP). Necessary information for identification and delineating various areas / zones and road network in the study area will be made available for the consultants. The designated officer would liason with other organizations to facilitate surveys and data from secondary sources. Assistance shall be provided in establishing contact with respective agencies.

12. Study Task Manager

An officer will be designated, who will act as Liason Officer between the consultant and various agencies and organizations. The consultants shall closely liaise with him/her at all stages and all matters pertaining to this consultancy assignment.

Annexure G: Terms of Reference for Engaging Transaction Advisor

1. Objective of the consultancy Services

Directorate of Urban Land Transport (the "Authority") is engaged in the enhancement of the transport infrastructure facilities in major cities of Karnataka. As part of this endeavour, the Authority has decided to undertake the development of the subject project on PPP mode. The primary objective of the services is to assist the Authority in selecting a concessionaire for the same.

2. SCOPE OF Services

The scope of services shall include:

- (i) assisting the Authority in the entire bidding process up to the signing of the concession agreement;
- (ii) evaluation of the strategic objectives of the Authority in relation to the Project and advising on the commercial and capital structuring, especially with reference to Applicable Laws;
- (iii) review cost estimates contained in the Feasibility / Detailed Project Report (FR/DPR);
- (iv) prepare a reasonable estimation of the likely revenues;
- (v) assisting the Authority in identification of project risks and in allocation of the same in an efficient and economic manner;
- (vi) identification and quantification of estimated financial impact of the Project on government resources;
- (vii) development of various possible alternatives for revenue maximisation and preparation of revenue model for the project;
- (viii) advising on tax-related issues arising out of the Project structuring;
- (ix) Prepare the draft Concession Agreement;
- (x) preparation of a consolidated list of approvals/consents/clearances required from Government Instrumentalities;
- (xi) assist in preparation of Bid documents
- (xii) Assist in invitation and evaluation of bids.
- (xiii) Assist the Authority in negotiations with the bidders till signing of the agreement
- (xiv) Assist the Authority till financial closure

In making its projections, recommendations and Reports, the Consultant shall identify the underlying assumptions and reach an agreement with the Authority in relation thereto. The services to be rendered by the consultants are briefly explained hereunder:

A) Transaction Adviser

The Consultant shall be responsible for review of the financial parameters and examination of the viability of the Project. The Consultant will render advisory services for preparation of bidding documents and in conducting the bidding process for selection of the concessionaire for the project. The Consultant shall also maintain, update and disseminate the necessary data and information related to the Project and the bid process. During interaction with the bidders and stakeholders, the Consultant shall assist the Authority in responding to all queries satisfactorily and within the specified time. The

Consultant shall render advisory services up till Financial Closure by the selected Concessionaire.

B) Review of costs

The FR/DPR will indicate the nature and extent of infrastructure, facilities and services to be provided by the Concessionaire. The Consultant shall review and comment on the cost estimates contained in the FR/DPR. He shall ensure that appropriate provisions have been made for physical and price contingencies, financing costs, interest during construction, etc. The Consultant shall also make a broad assessment of O&M expenses to be incurred by the Concessionaire during the entire Concession period based on appropriate standards.

C) Estimation of revenue

The Consultant shall evaluate the available data and information with a view to prepare a reasonable estimation of the likely revenues of the concessionaire from the charges to be collected from the Project and from other sources of revenue, if any. It shall propose various options for optimising such revenues.

D) Development of Financial Model

The Consultant shall identify and quantify all costs, expenses and revenues of the Project, and shall prepare cash-flow statements for an appropriate concession period. Based on the above, the Consultant shall prepare the Financial Model which will indicate the possible capital structure, likely sources of financing, the costs of financing, the cash flow, debt service, return on investment etc. This would also include sensitivity analysis in relation to the critical parameters of the Financial Model.

E) Impact of Project on Government Resources

The Consultant shall also identify and quantify the estimated financial impact of the Project on the resources of the Central / State Governments and the Project Authority.

F) Project Appraisal

Based on the above analysis, the Consultant shall prepare an Appraisal Report for the Project outlining the salient features of the Project, its financial viability and its social and economic benefits. The Consultant shall work out the financial viability of the Project with a view to estimating the likely IRR over the entire concession period. The consultant would identify and suitably allocate the risk factors affecting the Project.

G) Finalization of Project Structure:

The consultant shall prepare a final project structure which will be capable of achieving sustainable operational and financial viability, thereby balancing the risks for the Authority and viability for the Concessionaire. Various commercial and legal options for Project structuring shall be examined to recommend a suitable PPP model and implementation structure. The analysis should include feedback on potential acceptability of the PPP structure by developers and lenders.

H) Drafting a Concession Agreement

The Consultant shall prepare a draft Concession Agreement (CA) based on Department of Economic Affairs, Ministry of Finance, Government of India guidelines.

I) Preparation of Bid Documents

The Consultant shall assist in preparing the bid document including Request for Proposal based on the Model RFP published by the Planning Commission, available at www.infrastructure.gov.in.

J) Assistance in the Bid Process

The Consultant shall assist the Authority in the bid process for selection of the Concessionaire from among the Bidders. This will primarily relate to participation in pre-bid meeting and answering questions or issuing clarifications with the approval of the Authority. The Consultant shall also assist the Authority in engaging with the bidders on different aspects of the Project such as its assets, the process of the transaction, the Financial Model and the structure of the Project. It will also assist the Authority in preparing internal notes and projections for securing governmental approvals, if any.

K) Assistance in selection of the preferred Bidder

The Authority intends to select the preferred bidder on the basis of the Proposals received from pre-qualified bidders. Only financial proposals will be invited as part of the Bidding Process. The Consultant shall also assist the Authority in evaluating the financial proposals and in engaging with the selected bidder till execution of the Concession Agreement and financial closure.

3. Deliverables

In pursuance of this TOR, the Consultant shall undertake/deliver the following deliverables (the "Deliverables") during the course of this Consultancy. Each deliverable shall include an executive summary, analyses, assumptions, results of computations, tables, charts, recommendations, and such other contents that generally comprise deliverables for similar consultancy work by way of best practices. The deliverables shall include:

S. No.	Deliverable	Submission Date (max time in weeks)
1	Inception Report	2
2	Draft Appraisal Report	6
3	Final Appraisal Report	8
4	Submission of Draft Bidding Documents	12
5	Assistance in conducting the RFQ process	14
6	Evaluation Report of the Bids	20
7	Signing of the Concession Agreement	22
8	Financial Closure by the Concessionaire	32

4. Report format and submission:

Reports shall be submitted in an easily readable format with data relevant to each chapter consultants shall take at most care to submit a report without spelling mistakes and grammatical

errors. The report shall have proper cross referencing and numbering of subtitles in every chapter. The report shall have a neat index with correct page numbers. The consultants shall submit draft copies of every report to DULT for its initial comments before taking it to the stakeholder's consultation meetings. The consultants shall then incorporate all the comments of DULT and submit a fair copy of the report.

5. Payment Schedule

Payment shall be made according to the following Schedule, which is based on the submission of deliverables.

S. No.	Deliverable	Payment as Percentage of Total Payable Fee
1	Inception Report	5%
2	Draft Appraisal Report	10%
3	Final Appraisal Report	25%
4	Submission of Draft Bidding Documents	15%
5	Assistance in conducting the RFQ process	5%
6	Evaluation Report of the Bids	15%
7	Signing of the Concession Agreement	20%
8	Financial Closure by the Concessionaire	5%

6. INFORMATION ON FIRM AND PROPOSED STAFFING

It is envisaged that the study will be undertaken by Transaction Advisers empanelled with the Department of Economic Affairs, Ministry of Finance, Government of India. The consultants must have demonstrated experience of having worked with Karnataka government agencies having expertise and experience in similar assignments.

7. Composition of the Consultants Team

The consultants shall provide details of relevant experience in carrying out similar work along with a copy of client certificates/testimonials. CVs for proposed staff should be included with the Technical Proposal. Staff should have experience in the following disciplines:

- Team Leader (15 Years' relevant experience)
- PPP/Contract Specialist (MBA with 10 Years of relevant experience)
- Technical Expert (Computer Engineer with 10 Years of relevant experience)
- Financial Specialist (MBA Finance/CA with 5 Years of relevant experience)

- Legal Specialist (LLB with 5 Years of relevant experience))

8. Data Produced

All data accomplished by the consultants during the Study shall be the property of the client. The data collected, computer software purchased for and / or modified, during the course of the consultancy assignment should be handed over to employer by the consultant free of cost. Similarly the consultant shall hand over raw data on CDs used by them for data storage in a suitable database format. Every copy of the report will be submitted in soft copies also.

9. Employer Support

Consultants will be provided essential background documents available including FR/DPR. The designated officer would liason with other organizations to facilitate surveys and data from secondary sources. Assistance shall be provided in establishing contact with respective agencies and prospective bidders. The Authority shall bear the cost of taking out advertisement(s), hosting pre-bid conference etc.



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