

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

The population of the city of Bangalore and also its vehicular population are growing. This growth in vehicular population has triggered lot of problems like traffic congestion, increase in travel time, vehicular pollution etc., In order to reduce the traffic congestion and also to make the roads of Bangalore safer the Bangalore Traffic Improvement Project (B-TRAC) was conceived.

1.2 OBJECTIVE OF THE STUDY

The objective of this is to evaluate and study the impact of B-TRAC project in Bangalore City.

1.3 SCOPE OF THE STUDY

The scope of the study is limited to evaluate and study the impact of B-TRAC project with the help of questionnaires, interviews, site visits to important traffic junctions, visit to TMC at Ashoknagar Police Station etc.,.

1.4 METHODOLOGY OF THE STUDY

The methodology of the study is given below,

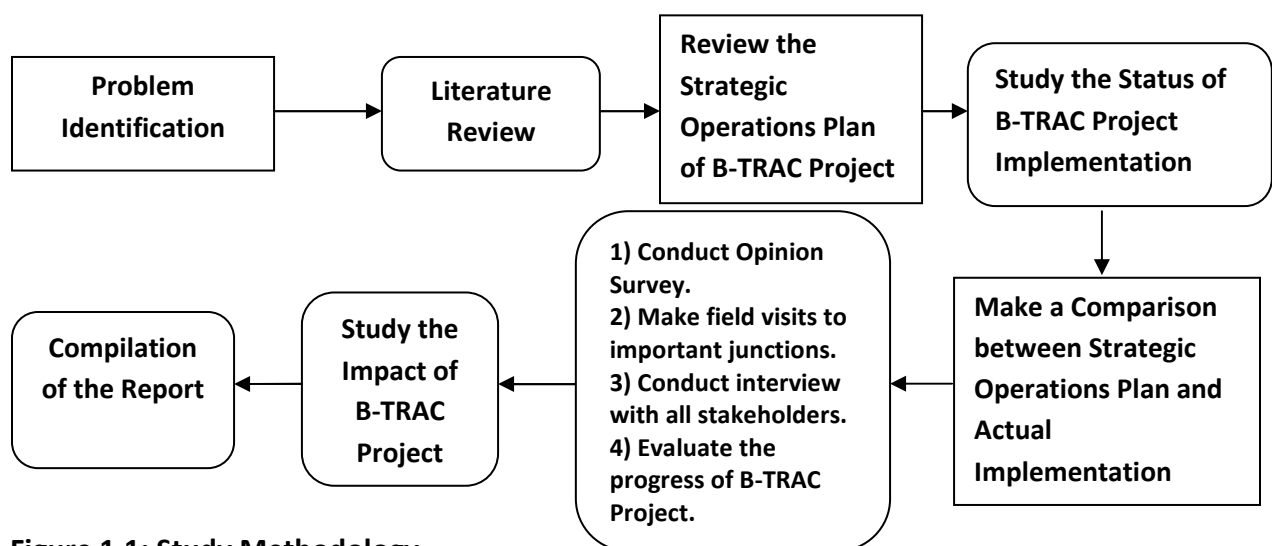


Figure 1.1: Study Methodology

CHAPTER 2

B-TRAC PROJECT

2.1 INTRODUCTION

B-TRAC was envisaged by the Bangalore Traffic Police in order to address the ever growing traffic operational needs of Bangalore City Traffic. The Bangalore City Police obtained the approval for this project from Government of Karnataka vide G.O. HD: 73: POP: 2006 dated 22/5/2006 to initiate immediate steps for traffic improvement in Bangalore City. The first tranche of grants was released and Bangalore City Police in turn had signed a Memorandum of Understanding (MOU) with Karnataka Road Development Corporation Limited (KRDC), a special purpose vehicle to implement the project on its behalf. The B-TRAC project is divided into five phases covering a time period of five years starting with 2006-07.

Table 2.1: Phases of B-TRAC Project

Sl. No.	Phase	Year
1	Phase 1	2006-07
2	Phase 2	2007-08
3	Phase 3	2008-09
4	Phase 4	2009-10
5	Phase 5	2010-11

Source: Strategic Operations Plan, B-TRAC, IIM, Bangalore.

2.2 BENEFITS OF B-TRAC

The following are the benefits of B-TRAC project,

- 1) It will lead to reduced congestion in the Central Area of Bangalore City.
- 2) It will lead to substantial compliance of Traffic Laws and Rules.
- 3) The junction improvement will help in streamlining the traffic.
- 4) The road markings and the signs will help in considerably improving the traffic safety.
- 5) Variable Message Signs (VMS) will help in diverting the traffic from the congested portion of the city to alternate routes.

- 6) The establishment of Traffic Management Centre will help in better management of traffic in the Bangalore city.

2.3 STRATEGIC OPERATIONS PLAN

The B-TRAC plan was implemented in five phases and the first phase was started in 2006-07, second phase in 2007-08, third phase in 2008-09, fourth phase in 2009-10 and the fifth phase in 2010-11. The total cost of the project originally conceived was Rs. 350 Crores. After working out the details of the operational plans, the total expected cost under BTRAC project worked out to be Rs. 352.12 Crores. The main item of activities proposed in the different phases of the project and its cost are given in the following table,

Table 2.2: Proposed Budget for Different Phases of B-TRAC Project

Sl. No.	Year	Components	Cost in Rs. Crores
1	2006-07	Road Markings, Auto Medians, Signage, Tubular Cones, Signals, Surveillance Camera, Enforcement Camera, Flourescent Batons, Reflective Jackets, Movable Steel Barricades.	44.00
2	2007-08	ITS, VMS, Traffic Command Centre, Study for Corridor Improvements and ATC, Training for Institutional Capacity Building	91.35
3	2008-09	Junction Improvements, Street Furniture and Road Markings, ITS, Surveillance and Enforcement Cameras, Education, Publicity, Training etc.,	73.73
4	2009-10	Junction Improvements, Street Furniture and Road Markings, ITS, Surveillance and Enforcement Cameras, Education, Publicity, Training etc.,	88.59

5	2010-11	Junction Improvements, Street Furniture and Road Markings, ITS, Surveillance and Enforcement Cameras, Education, Publicity, Training etc.,	98.44
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Source: Strategic Operations Plan, B-TRAC, IIM, Bangalore.

The main activities of the different phases are given below,

Phase 1 & 2 Improvements

The following are the improvements proposed to be done in Phase 1 & 2,

- 1) A total of 125 junctions were to be improved by providing better geometrics, providing channelizing islands, intersection markings etc.,
- 2) Fifty eight kilometers of arterial roads, forty three kilometers of sub-arterial roads and eighty kilometers of collector streets will be improved with road markings, sign boards, pedestrian barriers etc.,
- 3) Eighty surveillance/monitoring and five enforcement cameras will be installed at selected junctions and road stretches.
- 4) Signal improvements with appropriate detectors, control boxes, software etc., will be installed at 200 new junctions. One hundred existing signals will also be improved.
- 5) The basic work on the TMC will be initiated and appropriate allocations are made.
- 6) Institutional capacity building through better training will also be initiated in this phase.
- 7) A total sum of Rs. 91.35 crores have been earmarked for Phase 1 & 2.

Phase 3 Improvements

- 1) A total of 101 junctions were to be improved by providing better geometrics, providing channelizing islands, intersection markings etc., Out of these seventy nine will be new locations and twenty two places have already existing signal systems.

- 2) Fifty three kilometers of arterial roads, forty six kilometers of sub-arterial roads and eighty kilometers of collector streets will be improved with road markings, sign boards, pedestrian barriers etc.,
- 3) Two hundred surveillance/monitoring and seven enforcement cameras will be installed at selected junctions and road stretches. Three crashlabs and two interceptors will be acquired for improving traffic compliance.
- 4) Signal improvements with appropriate detectors, control boxes, software etc., will be installed at forty five junctions. Out of these, twenty four are existing signals.
- 5) Three corridors will be taken up for improvements which will include signal interlinking for minimizing journey times.
- 6) Forty five pedestrian actuated light signals are proposed. Traffic police will identify the areas where they have to be installed.
- 7) Variable Message Signs (VMS) are proposed to be installed in fifteen locations.
- 8) The construction work of the TMC will be initiated and appropriate allocations are made.
- 9) Institutional capacity building through better training will also be initiated in this phase.
- 10) Works on the construction of a new permanent traffic training institute will be started. Training and refresher programs will be conducted for traffic police personnel. Interactions with public, publicizing the activities of B-TRAC, educating school children on traffic aspects will be taken up.
- 11) A total sum of Rs. 73.73 crores have been earmarked for this Phase 3.

Phase 4 Improvements

- 1) A total of 101 junctions were to be improved by providing better geometrics, providing channelizing islands, intersection markings etc., All these junctions have already existing signal systems which are already upgraded in the earlier phase.
- 2) Seventy kilometers of arterial roads, fifty kilometers of sub-arterial roads and eighty kilometers of collector streets will be improved with road markings, sign boards, pedestrian barriers etc.,

- 3) Two hundred surveillance/monitoring cameras and seven enforcement cameras will be installed at selected junctions and road stretches. Two interceptors and three crashlabs will be acquired.
- 4) Signal improvements with appropriate detectors, control boxes, software etc., will be installed at forty five junctions. Out of these, five are existing signals.
- 5) Five corridors will be taken up for improvements which will include signal interlinking for minimizing journey times.
- 6) Forty five pedestrian actuated light signals are proposed. Traffic police will identify the areas where they have to be installed.
- 7) Variable Message Signs (VMS) are proposed to be installed in fifteen locations.
- 8) The construction work and equipping of the TMC will be continued.
- 9) The works on the construction of a new permanent traffic training institute will be completed and equipping the TTI will commence.
- 10) A total sum of Rs. 88.59 crores have been earmarked for this Phase 4.

Phase 5 Improvements

- 1) A total of 173 junctions are to be improved by providing better geometrics, providing channelizing islands, intersection markings etc., Out of these 62 junctions have already existing signal systems.
- 2) Seventy kilometers of arterial roads, fifty eight kilometers of sub-arterial roads and eighty kilometers of collector streets will be improved with road markings, sign boards, pedestrian barriers etc.,
- 3) Two hundred surveillance/monitoring and seven enforcement cameras will be installed at selected junctions and road stretches.
- 4) Signal improvements with appropriate detectors, control boxes, software etc., will be installed at fifty junctions.
- 5) The remaining six corridors will be taken up for improvements which will include signal interlinking for minimizing journey times.
- 6) Vidhana Soudha area will be taken up for installing Area Traffic Control System.

- 7) Fifty pedestrian actuated light signals are proposed. Traffic police will identify the areas where they have to be installed.
- 8) Variable Message Signs (VMS) are proposed to be installed in ten locations.
- 9) The construction work and equipping of the TMC will be completed.
- 10) The works on equipping the new permanent Traffic Training Institute will be completed.
- 11) A total sum of Rs. 98.44 crores have been earmarked for the Phase 5.

Table 2.3**Activity Details in Different Phases**

Components	Unit	Phase 1 & 2	Phase 3	Phase 4	Phase 5	Total
Junction Improvement	Nos.	125	101	101	173	500
Existing	Nos.	4	22	101	62	189
Proposed	Nos.	121	79	0	111	311
Street Furniture-Arterial Roads	Kms	58	52.98	70.06	70.68	251.72
Street Furniture-Sub-Arterial Roads	Kms	42.9	45.77	50.83	58.27	197.77
Street Furniture-Collector Roads	Kms	80	80	80	80	320
Project Report Preparation-Corridors	Nos.	7				7
Corridor Improvement	Nos.		3	5	6	14
Vidhan Soudha Area-Area Traffic Control	Nos.				1	1
User Information System on Roads	No. of Roads		150	150	150	150
Signal Improvement-New	Nos.	200	21	40	50	311
Signal Improvement-Existing	Nos.	160	24	5	0	189
Pelican Signals	Nos.		45	45	50	140
Variable Message Systems	Nos.		15	15	10	40

Surveillance Camera	Nos.	80	200	200	200	680
Enforcement Camera	Nos.	5	7	7	7	26
Crash Labs	Nos.		3	3	3	9
Interceptors	Nos.		2	2	2	6
Total Costs of Improvements	Rs. Crores	91.35	73.73	88.59	98.44	352.12

Source: Strategic Operations Plan, B-TRAC, IIM, Bangalore.

Table 2.4

Activity Costs in Different Phases

Costs of Components in Rs. Crores	Phase 1 & 2	Phase 3	Phase 4	Phase 5	Total
Junction Improvements	8.01	5.37	6.51	11.85	31.74
Cost-Street Furniture-Arterial Roads	10.56	9.64	12.75	12.86	45.81
Cost-Street Furniture-Sub-Arterial Roads	8.43	8.33	9.25	10.61	36.62
Cost-Street Furniture-Collector Roads	4.00	4.00	4.00	4.00	16.00
Cost-Project Report Preparation	1.90				1.90
Cost-Corridor Improvement		9.00	15.00	18.00	42.00
Cost-Vidhana Soudha Area ATC				4.00	4.00
Costs-User Information System on Roads		2.25	2.25	2.25	6.75
Signal Improvement Cost Including Backend Connectivity	23.89	3.26	3.90	4.50	35.56

Miscellaneous Aspects	1.80	0.23	0.23	0.25	2.50
Costs-Pelican Signals		2.25	2.25	2.50	7.00
Cost-Variable Message Systems		6.00	6.00	4.00	16.00
TMC-Temporary	0.90	0.6	0.5	0.5	2.50
TMC-Permanent	13.00	2.00	2.00	2.00	19.00
Software	10.80	1.35	1.35	1.50	15.00
Costs-Surveillance Camera	4.00	10.00	10.00	10.00	34.00
Costs-Enforcement Camera	2.03	2.84	2.84	2.84	10.53
Costs-Crash Labs		1.05	1.05	1.05	3.15
Costs-Interceptors		0.50	0.50	0.50	1.50
Costs-TTI-Courses	0.91	0.94	1.09	1.11	4.06
Costs-Traffic Training Institute-Building	0.00	3.00	3.00	0.00	6.00
Costs-Traffic Training Institute-Labs	0.00	0.00	3.00	3.00	6.00
IE & C Programs	1.13	1.13	1.13	1.13	4.50
Total Costs of Improvement	91.35	73.73	88.59	98.44	352.12

Source: Strategic Operations Plan, B-TRAC, IIM, Bangalore.

2.4 COMPONENTS OF B-TRAC PROJECT

The various components that have been taken up under B-TRAC project as per Transport Training Institute and Consultancy (TTIC) Report (June 2012) for 2006-07, 2007-08, 2008-09, 2009-2010 and 2010-2011 works are listed below,

A) Components of 2006-07 Works

1. Road Markings
2. Upgradation of Signals
3. Signage

4. Enforcement Cameras
5. Surveillance Cameras
6. Tubular Cones
7. Signage-Over head and Stand Alone
8. Auto Lanes
9. Reflective Jackets
10. Flourescent Batons
11. 13th and 14th Floor Building Electrical Work
12. Movable Steel Barricades

B) Components of 2007-08 Works

1. Back end Connectivity
2. Signage
3. Movable Cones
4. Junction Improvements
5. Traffic Management Centre

C) Components of 2008-09 Works

1. Installation of 204 New Signals
2. Road Markings
3. Back End Connectivity
4. Reflective Median Marker
5. Octagonal Sign Boards, Chevrons, Square Form Delineators and Object Markers
6. Solar Blinkers
7. Rain Coats
8. Reflective Jackets
9. Signage Boards for West and North Sub-Division
10. Signage Boards for East, Central and Audugodi Sub-Division
11. Cats Eye

12. Hazard Markers
13. Variable Message Signs (VMS)
14. Alcometers
15. Interceptors
16. Overhead Message Signboards on Existing Cantilever Poles
17. Informatory Sign Boards on Ring Road
18. Traffic Information Data Storage System
19. Solar Backup for Existing Signal Junctions
20. Selection of Facility Management and Software Development Vendor
21. Commissioning of Hardware Devices
22. Providing and Enhancing the Blackberry Operations
23. Surveillance Camera Phase 2
24. Junction Improvements (Package I, II and III)

D) Components of 2009-2010 Works

1. Road Markings for West Division (Package I)
2. Road Markings for East Division (Package II)
3. Overhead Message Signboards on Existing Cantilever Poles
4. Informatory Sign Boards (Package II)
5. Movable Steel Barricades (Package II)
6. Commissioning of Hardware Devices
7. Installation of Pelican Signals
8. Junction Improvements (Package IV, V, VI, VII)

E) Components of 2010-2011 Works

1. Wheel Clamps
2. Training for Police
3. Road Safety Workshop
4. Traffic Management Plans in Bangalore City

2.5 ACTUAL FUNDING FOR B-TRAC PROJECT

The B-TRAC scheme was started in the year 2006-07 and the annual grants given by the government for implementation of this project are as follows;

Table 2.5: Actual Funding for B-TRAC Project

Year	Amount Released
2006-07	Rs. 44 Crores
2007-08	Rs. 35 Crores
2008-09	Nil
2009-10	Rs. 40 Crores
2010-11	Rs. 5 Crores
Total	Rs. 124 Crores

Though, the government had released funds from the financial year 2006-07, the implementation of the project started in the year 2008-09.

2.6 STATUS OF B-TRAC PROJECT IMPLEMENTATION

The status of B-TRAC project implementation as per TTIC Report (June 2012) in different phases is given below,

Phase 1 (2006-07)

Sl. No.	Components	Target for Project Period	Status
1	Road Markings	62,500 Sq. mts	Tender Closed
2	Upgradation of Existing Signals	164 Locations	Maintenance Period Completed
3	Traffic Signage	1500 Nos.	Tender Closed
4	Lane Delineator Tubular Cones	10,000 Nos.	Tender Closed

5	Enforcement Camera	5 Locations	Maintenance period completed and has been extended for further 6 months
6	Surveillance Camera	80 Locations	Maintenance Period Completed
7	Overhead Signage Standalone	20 Locations	Contract Terminated
8	Auto Lane (Auto Median)	4,500 mts	Contract Terminated
9	Reflective Jackets	1,500 Nos.	Tender Closed
10	Flourescent Batons	1,500 Nos.	Tender Closed
11	Movable Steel Barricades	2,000 Nos.	Tender Closed
12	13 th and 14 th Floor Public Utility Building Electrical Work	Electrical Works	Tender Closed

Source: Transport Training Institute and Consultancy (TTIC), June 2012 Report.

Phase II (2007-08)

Sl. No.	Components	Target for Project Period	Status
1	Signage	9,130 Nos.	Maintenance for the 9 th Quarter is in Progress
2	Back End Connectivity	164 Locations	AMC is under progress for the 5 th annual year
3	Movable Cones	2,000 Nos.	Tender Closed
4	Junction Improvements	7 Locations	Tender Closed

Source: Transport Training Institute and Consultancy (TTIC), June 2012 Report.

Phase III (2008-09)

Sl. No.	Components	Target for Project Period	Status
1	Installation of New Signals	204 Nos.	193/199 Locations signal installation work completed. Work is in progress for remaining locations
2	Back-end Connectivity	204 New Traffic Signal Locations	Commissioned 156 Nos.
3	Road Markings	50,000 Sq.m.	Tender Closed
4	Reflective Median Markers	5,000 Nos	Tender Closed
5	Chevrons	50 Nos.	Warranty Completed.
6	Octagonal Sign Boards	200 Nos.	Maintenance is in progress
7	Square Form Delineators	200 Nos.	
8	Objective Markers	500 Nos.	
9	Solar Blinkers		Maintenance is in progress
10	Rain Coats	2000 Nos.	Tender Closed
11	Reflective Jackets	2000 Nos.	Tender Closed
12	Signage for West and North sub division	9989 Nos.	Under 3 rd year maintenance
13	Signage for East, Central and Aduodi sub division	9989 Nos.	Under 2 nd year maintenance
14	Cats Eye	19,500 Nos.	Warranty Completed and recommended for Retention Money
15	Hazard Markers	5000 Nos.	Under 9 th quarter

			maintenance
16	Alcometers	125 Nos.	Maintenance completed
17	Interceptors	5 Nos.	Maintenance completed
18	Overhead Message Signboards on existing cantilever poles	200 Nos.	Warranty and maintenance period completed
19	Informatory Signboards on Ring Road	125 Nos.	Warranty and maintenance period completed
20	Reflective median marker package II	10,000 Nos.	Warranty Completed, maintenance is under progress
21	Cats Eye – Package I	20,000 Nos.	Warranty completed and recommended for retention money
22	Traffic Information Data Storage System	1 No.	Maintenance period completed
23	Solar backup for existing signal junctions	Power backup- 61 Underground cabling work - 68	Warranty completed, 1 st year maintenance is under progress
24	Variable Message Signs (VMS)	20 Nos.	Warranty completed, 2 nd year maintenance is under progress
25	Surveillance Camera	Additional 19 Nos.	Warranty completed, under 8 th quarter maintenance
26	Facility Management Services at TMC	Maintenance Work	Tender Closed
27	Hardware devices for TMC	1 time activity	Tender Closed

28	Junction Improvement	Package I Package II Package III	Tender Closed
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Source: Transport Training Institute and Consultancy (TTIC), June 2012 Report.

Phase IV(2009-2010)

Sl. No.	Components	Target for Project Period	Status
1	Road Markings West	62,500 sq.m.	Warranty Completed. Under 3 rd quarter maintenance
2	Road Markings East	50,000 sq.m.	Warranty Completed. Under 3 rd quarter maintenance
3	Overhead Signage on Cantilever Poles	300 Nos.	Pre-closed the work
4	Informatory sign boards	300 Nos.	Completed
5	Commissioning of Hardware Devices	Commissioning	Work completed
6	Movable Steel Barricades	1000 Nos.	Warranty completed and recommended for security deposit
7	Blackberry Devices	370 devices and 520 handheld printers with AMC	AMC for 10 th quarter is under progress
8	Installation of Pelican Signals	30 Locations	16/30 completed
9	Junction Improvement	Package IV	<ul style="list-style-type: none"> • Mayo hall junction completed • Old race course road junction completed

4	Facility Management and annual maintenance contract for IT hardware and software	3 years	Awaiting for work order to be released
5	Supply of batteries to BSNL back and connections under BTRAC Project		Work Order Received
6	Supply of wheel clamps for Traffic Police, Bangalore under B-TRAC (2 nd Phase)		Work Order Received
7	Design and supplying of hoardings for pollution (2 Nos.)and Seat Belt (1 Nos.)to Bangalore Traffic Police under B-TRAC Project		Work Order Received
8	Printing and Supply of Brochure of 18 page booklet on 220gsm paper with pinning and 1 page with 2 fold		Work Order Received
9	Design of lane discipline hoardings (3 Nos.) to Bangalore Traffic Police under B-TRAC project		Work Order Received
10	Traffic alert facility to citizens of Bangalore through SMS		Work Order Received

Source: Transport Training Institute and Consultancy (TTIC), June 2012 Report.

2.7 COMPARISON OF PROPOSED B-TRAC OBJECTIVES (as per Strategic Operations Plan) AND ACTUAL IMPLEMENTATION

Phase I & II (2006-07 & 2007-08)

Sl. No.	Objectives as per Strategic Operations Plan	Actual Implementation
1	A total of 125 junctions were to be improved by providing better geometrics, providing channelizing islands, intersection markings etc.,	Tender Closed for Junction improvements for seven locations.
2	Fifty eight kilometers of arterial roads, forty three kilometers of sub-arterial roads and eighty kilometers of collector streets will be improved with road markings, sign boards, pedestrian barriers etc.,	<ol style="list-style-type: none"> 1) Tender Closed for 62,500 square meters of Road Markings. 2) Tender Closed for 1500 Traffic signage in 2006-07 and 9130 Nos. signage have been provided in 2007-08. 3) Tender Closed for 10,000 Nos. of lane delineator tubular cones. 4) Tender Closed for 1,500 Nos. Reflective jackets. 5) Tender Closed for 1,500 Nos. Fluorescent Batons. 6) Tender Closed for 2,000 Nos. of Movable Steel Barricades. 7) Tender Closed for 2,000 Nos. of Movable Cones.
3	Eighty surveillance/monitoring and five enforcement cameras will be installed at selected junctions and road stretches.	Completed

4	Signal improvements with appropriate detectors, control boxes, software etc., will be installed at 200 new junctions. One hundred existing signals will also be improved.	Existing signals have been upgraded in 164 locations. Back end connectivity completed for 164 locations.
5	The basic work on the TMC will be initiated and appropriate allocations are made.	Electrical works have been completed
6	Institutional capacity building through better training will also be initiated in this phase.	

Phase III (2008-09)

Sl. No.	Objectives as per Strategic Operations Plan	Actual Implementation
1	A total of 101 junctions were to be improved by providing better geometrics, providing channelizing islands, intersection markings etc., Out of these seventy nine will be new locations and twenty two places have already existing signal systems.	The Tender has been closed for Junction Improvements under Package I, Package II and Package III.
2	Fifty three kilometers of arterial roads, forty six kilometers of sub-arterial roads and eighty kilometers of collector streets will be improved with road markings, sign boards, pedestrian barriers etc.,	<ol style="list-style-type: none"> 1) Tender has been closed for 50,000 sq.m. of road markings. 2) Tender has been closed for 5,000 Nos. of Reflective Median Marker.

		<p>3) 50 chevrons has been Completed and maintenance is in progress.</p> <p>4) 200 Nos. of Octagonal Signboards has been completed and maintenance is in progress.</p> <p>5) 200 Nos. of Square form Delineators has been completed and maintenance is in progress.</p> <p>6) 500 Nos. of Objective Markers has been completed and maintenance is in progress.</p> <p>7) Solar blinkers has been provided.</p> <p>8) 2000 Nos. of rain coats has been provided for the police.</p> <p>9) 2000 Nos. of reflective jackets has been provided for the police.</p> <p>10) 9989 Nos. of signage's for West and North Sub Division has been provided and they are under 3rd year of maintenance.</p> <p>11) 9989 Nos. of signage's for East, Central and Audugodi Sub-Division has been provided and they are under 3rd year of maintenance.</p> <p>12) 19,500 Nos. of Cats eye has been provided.</p>
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		<p>13) 5,000 Nos. of Hazard Markers has been provided.</p> <p>14) 125 Alcometers has been provided to the police.</p> <p>15) 5 Nos. of interceptors has been provided for the police.</p> <p>16) 200 Nos. of Overhead Message Signboards on existing cantilever poles has been provided.</p> <p>17) 125 Nos. of Informatory Signboards on Ring Road has been provided.</p> <p>18) 10,000 Nos. of Reflective Median Marker under Package II has been provided.</p> <p>19) 20,000 Cats Eye has been provided under Package I.</p> <p>20) 1 No. of Traffic Information Data Storage System has been provided.</p> <p>21) 61 Solar backup for existing signal junction has been provided and underground cabling work has been completed for 68 Nos. of Signal junction.</p>
3	Two hundred surveillance/monitoring and seven enforcement cameras will be installed at selected junctions and road	80 Nos. of Surveillance Camera has been installed in Phase I and 19 Nos. of Surveillance Camera has been installed

	stretches. Three crashlabs and two interceptors will be acquired for improving traffic compliance.	in Phase III.
4	Signal improvements with appropriate detectors, control boxes, software etc., will be installed at forty five junctions. Out of these, twenty four are existing signals	<ol style="list-style-type: none"> 1) Installation of 204 new signals is ongoing. Installation of 193 signals has been completed. 2) Backend connectivity for 204 new signals is ongoing. Backend connectivity has been completed for 156 signals.
5	Three corridors will be taken up for improvements which will include signal interlinking for minimizing journey times	Nil
6	Forty five pedestrian actuated light signals are proposed. Traffic police will identify the areas where they have to be installed.	Nil
7	Variable Message Signs (VMS) are proposed to be installed in fifteen locations	20 Nos. of Variable Message Signs (VMS) has been provided and maintenance is under progress.
8	The construction work of the TMC will be initiated and appropriate allocations are made	<ol style="list-style-type: none"> 1) Maintenance for Facility Management Services at TMC has been completed. 2) Tender has been closed for Hardware Devices for TMC.
9	Institutional capacity building through better training will also be initiated in this phase.	Nil

10	Works on the construction of a new permanent traffic training institute will be started. Training and refresher programs will be conducted for traffic police personnel. Interactions with public, publicizing the activities of B-TRAC, educating school children on traffic aspects will be taken up	Nil
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Phase IV (2009-10)

Sl. No.	Objectives as per Strategic Operations Plan	Actual Implementation
1	A total of 101 junctions were to be improved by providing better geometrics, providing channelizing islands, intersection markings etc., All these junctions have already existing signal systems which are already upgraded in the earlier phase.	Junction improvement ongoing for Package IV, Package V, Package VI and Package VII
2	Seventy kilometers of arterial roads, fifty kilometers of sub-arterial roads and eighty kilometers of collector streets will be improved with road markings, sign boards, pedestrian barriers etc.,	<ol style="list-style-type: none"> 1) Road Markings for West Side completed for 62,500 sq.m and maintenance is in progress. 2) Road Markings for East Side completed for 50,000 sq.m and maintenance is in progress. 3) 300 Nos. Overhead Signages on Cantilever Poles erected.

		<p>4) 300 Nos. Informatory Signboards erected.</p> <p>5) 1000 Nos. of Movable Steel Barricades has been provided.</p> <p>6) 370 Blackberry devices & 520 hand held printers has been supplied for the police and they are under Annual Maintenance Contract (AMC).</p>
3	Two hundred surveillance/monitoring and seven enforcement cameras will be installed at selected junctions and road stretches. Two interceptors and three crashlabs will be acquired.	Nil
4	Signal improvements with appropriate detectors, control boxes, software etc., will be installed at forty five junctions. Out of these, five are existing signals	Nil
5	Five corridors will be taken up for improvements which will include signal interlinking for minimizing journey times.	Nil
6	Forty five pedestrian actuated light signals are proposed. Traffic police will identify the areas where they have to be installed.	Pelican signals have been installed at 16 locations out of 30 locations selected.
7	Variable Message Signs (VMS) are proposed to be installed in fifteen	Nil

	locations.	
8	The construction work and equipping of the TMC will be continued.	Commissioning of hardware devices completed.
9	The works on the construction of a new permanent traffic training institute will be completed and equipping the TTI will commence.	Nil

Chapter 3.0

B-TRAC IMPACT STUDY

3.1 INTRODUCTION

The impact of B-TRAC project in Bangalore City is quite significant. The Junction Improvements, New Signals, Upgradation of Old Signals, Road Markings, Auto Medians, Tubular Cones, Signals has helped in systematic movement of traffic. The Surveillance Cameras and Enforcement Cameras has helped in monitoring the traffic and also helped in enforcement which has resulted in lesser traffic violations. The provision of reflective jackets to police officers has helped in their safety and provision of Fluorescent Batons has helped in better regulation of traffic especially during night times. The Signages, VMS etc., has helped in providing advance and proper information to the road users. The construction of Traffic Management Centre and Training Centre will help in better monitoring and management of traffic and also help in providing proper training to the traffic police. The impact of B-TRAC project can be studied by conducting Before and After Studies (i.e., Before B-TRAC Implementation and After B-TRAC Implementation) like finding out the waiting time at signals before B-TRAC project and finding out the waiting time at signals after implementation of B-TRAC project. But since *Before Studies* have not been done so there was no point in conducting *After Studies*. Here the impact of the B-TRAC has been studied by two methods i.e., Desk Research and Opinion Surveys,

1) Based on Planned and Actual Implementation

A desk research has been done by comparing the planned work as per strategic operations plan and actual work done in the field. It will show the gap between the planned and actual work and also the benefits of whatever works that has been done.

2) Based on Field Visits & Opinion Surveys

Opinion survey has been conducted to find out the impact of B-TRAC project. Three types of opinion surveys has been done, Public Opinion Survey, Traffic Police Opinion Survey and Public Organization Opinion Survey (BBMP, BDA, PWD etc.,). These surveys will help us to find out whether the B-TRAC project has really helped in terms of better

movement of traffic, safer movement of traffic etc., Apart from opinion surveys field visits has been made to various junctions, TMC etc., to collect the relevant data.

3.2 IMPACT OF B-TRAC BASED ON PLANNED AND ACTUAL IMPLEMENTATION

3.2.1 Junction Improvement

Junction Improvement was proposed to be done for a total of 500 junctions as per the Strategic Operations Plan as given below,

- a) 125 Junction Improvements to be done in Phase I and Phase II (2007-08)
- b) 101 Junction Improvements to be done in Phase III (2008-09)
- c) 101 Junction Improvements to be done in Phase IV (2009-2010)
- d) 173 Junction Improvements to be done in Phase v (2010-2011)

But Junction improvement was done only for 46 junctions under various packages as shown in the Table 3.1.

Table 3.1: Junction Improvement Actually Done

Sl. No.	Package	Name of the Junction
1.	Package I-4 Junctions	a) Karnataka Bhavan Circle b) BEL Road – Devasandra Junction c) Lalbagh West Gate Junction d) Ramakrishan Ashram Circle
2.	Package II-7 Junctions	a) Dickenson-Compensation Road Junction b) Gangadhar Chetty-Compensation Road Junction c) Sadanandanagar – NGEF Junction d) Basaveshwara Circle e) Janatha Dal Circle f) RRMR – Vittal Mallya Hospital

		g) Frazer Town Police Station Junction
3.	Package III-8 Junctions	<ul style="list-style-type: none"> a) Bashyam Circle b) Rajajinagar 41st Cross c) Rajajinagar 50th Cross d) Rajajinagar ESI Junction e) Navrang Bar Junction f) Rajajinagar 36th Cross Temple Junction g) Rajajinagar Police Station – RR Kalyana Mantapa Junction h) Panchmukhi Vinayaka Temple Junction
4.	Package IV – 4 Junctions	<ul style="list-style-type: none"> a) Mayo Hall Junction b) Old Race Course Road Junction c) Sindhi Colony Junction d) Sanjay Nagar Junction
5.	Package V – 11 Junctions	<ul style="list-style-type: none"> a) Banaswadi Main Road – 100 ft Main Road Junction b) Kammanahalli –Ulasappa Circle c) Banaswadi Main Road-Horamavu Main Road Junction d) Hennur Main Road – Lingarajapuram Junction e) Banaswadi Main Road- Chikka Banaswadi Road Junction f) Hennur Main Road – St. Thomas Junction g) Selva Nagar – Mukund Theatre Junction h) Poornima Theatre Junction i) Siddalingaiah Junction j) Richards Park k) Kullappa Circle

6.	Package VI – 5 Junctions	<ul style="list-style-type: none"> a) JD Mara Junction b) Bilekhalli Junction c) Arakere Junction d) Wilson Garden 10th Garden Junction e) Madhu Petrol Bank Junction
7.	Package VII – 7 Junctions	<ul style="list-style-type: none"> a) St. Johns Junction b) R.T. Nagar Junction c) Saunders Road Junction d) Haines Junction e) MM Road and Tannery Road Junction f) Place Cunningham Junction g) Miller Cunningham Junction

If junction improvements had been done for all the 500 junctions as identified in the Strategic Operations Plan, the movement of traffic would have been smoother in these junctions. Figure 3.1 and Figure 3.2 shows some of the junctions where junction improvement was done. Still more work needs to be done under junction improvement and more junctions which are unchannelized should be channelized.

Figure 3.1: Cambridge Road – Sai Baba Temple Junction Improvement

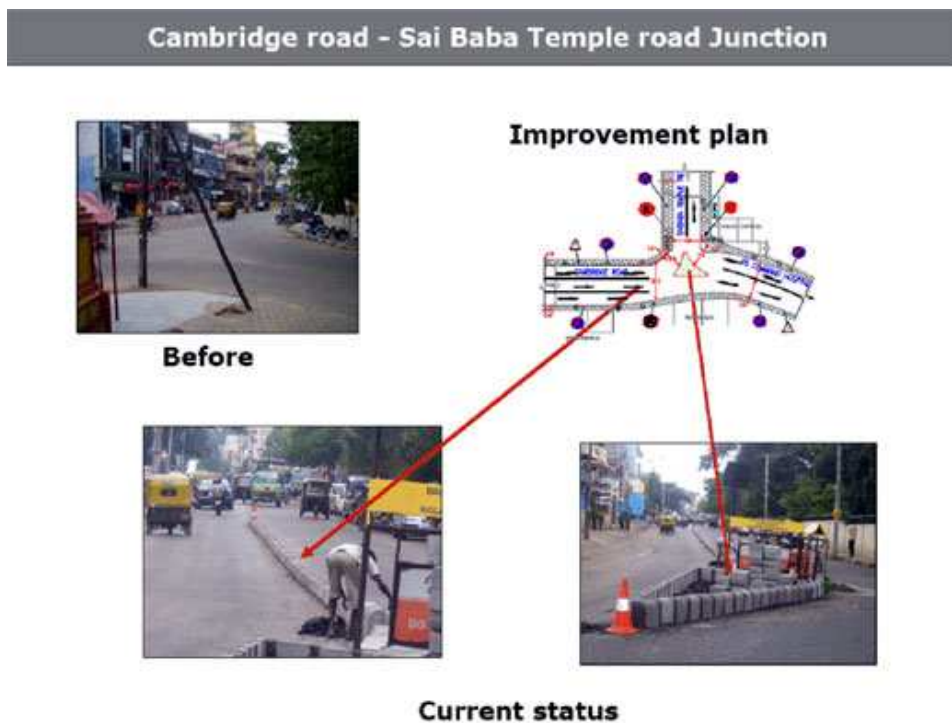
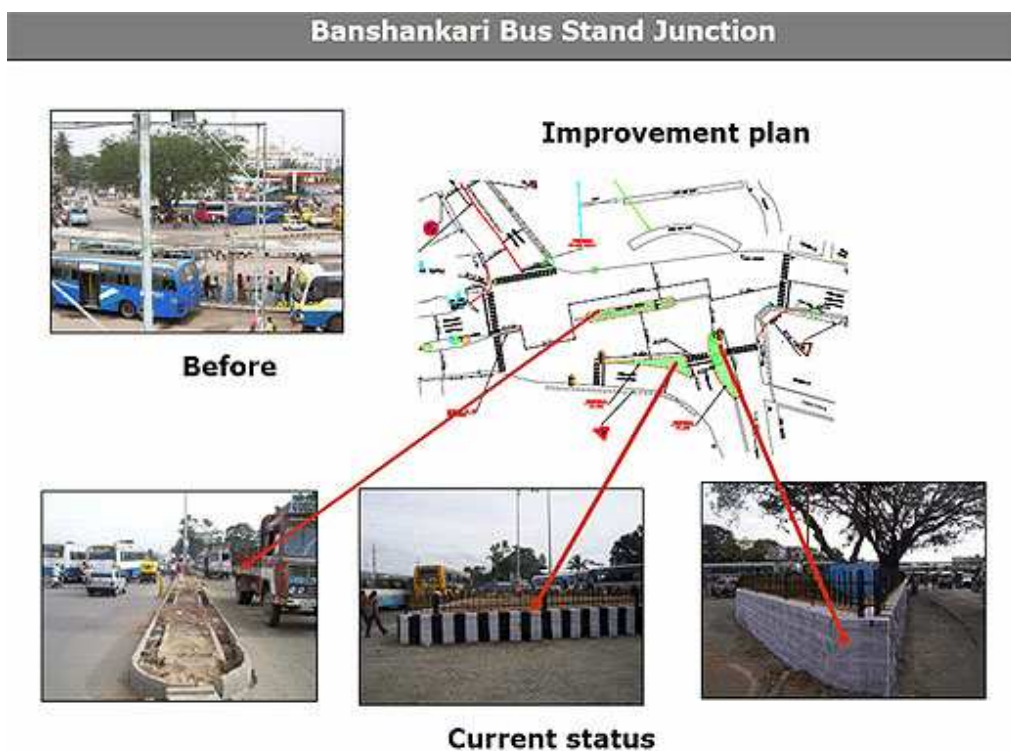


Figure 3.2: Banashankari Bus Stand Junction Improvement



3.2.2 Signal Improvements

The following Table 3.2 shows the signal improvements planned as per Strategic Operations Plan and actual signal improvements done. It shows that signal improvements and new signals have not been provided to as many junctions as planned in the Strategic Operations Plan. It was planned that new signals will be provided for 311 junctions and signals will be improved for 129 junctions but actually new signals have been installed at only 193 junctions and signals have been improved at 170 locations.

Table 3.2: Signal Improvements Planned v/s Actual

Sl. No.	Signal Improvements Planned as Per Strategic Operations Plan	Signal Improvements Actually Done
1.	Phase I and II: Signal improvements with appropriate detectors, control boxes, software etc., will be installed at 200 new junctions and 100 existing will be improved.	Signals have been upgraded at 170 locations and new signals have been installed at 193 locations.
2.	Phase III: Signal improvements with appropriate detectors, control boxes, software etc., will be installed at 45 out of these 24 are existing signals.	Nil
3.	Phase IV: Signal improvements with appropriate detectors, control boxes, software etc., will be installed at 45 out of these 5 are existing signals.	Nil
4.	Phase V: Signal improvements with appropriate detectors, control boxes, software etc., will be installed at 50 junctions.	Nil

The installation of new signals and upgradation of old signals has helped in the following ways,

- 1) The movement of traffic is more systematic due to construction of new signals and upgradation of old signals.
- 2) Reduced travel time due to signal optimization.
- 3) Average savings in time of 15% achieved for 80% of junctions (as per Additional Commissioner of Police presentation).
- 4) Due to synchronization of signals the journey speed has increased from 9 major corridors from 18 kmph to 23 kmph (as per Additional Commissioner of Police presentation).
- 5) The installation of timers has helped in tremendous savings in fuel.

3.2.3 Road Markings

Even though the road markings should have been done for 251 kms of Arterial Roads, 197 kms of Sub-Arterial Roads and 320 kms of Collector Streets as per Strategic Operations Plan, but actually 62,500 sq. mts of road marking was done in the first phase and 50,000 sq. mts of road marking was done in the third phase. Reflective thermoplastic road markings have been used in this B-TRAC project.

Table 3.3: Road Markings Planned v/s Actual

Sl. No.	Road Markings Planned as per Strategic Operations Plan	Road Marking Actually Done
1	Phase I & II: Fifty eight kilometers of arterial roads, forty three kilometers of sub-arterial roads and eighty kilometers of collector streets will be improved with road markings, sign boards, pedestrian barriers etc.,	Road Markings of 62,500 sq. mts has been done in Phase I
2	Phase III: Fifty three kilometers of arterial roads, forty six kilometers of sub-arterial roads and eighty kilometers of collector streets will be improved with road markings, sign boards,	Road Markings of 50,000 sq.mts has been done in Phase III

	pedestrian barriers etc.,	
3	Phase IV: Seventy kilometers of arterial roads, fifty kilometers of sub-arterial roads and eighty kilometers of collector streets will be improved with road markings, sign boards, pedestrian barriers etc.,	Nil
4	Phase V: Seventy kilometers of arterial roads, fifty eight kilometers of sub-arterial roads and eighty kilometers of collector streets will be improved with road markings, sign boards, pedestrian barriers etc.,	Nil

The road marking has helped in systematic movement of traffic as given below,

- 1) The lane markings have helped the traffic to move in proper lanes.
- 2) The centerline marking with cats eye has helped the drivers to see the centerline during night times.
- 3) The edge line markings have helped the traffic to clearly see the edge of the road.
- 4) The pedestrian markings have helped in the safe crossing of pedestrians.

But still a lot of road markings needs to be done because there are many roads where there are no markings in different parts of the Bangalore and it is very dangerous. In order to effectively enforce lane discipline, we need to make sure that all our roads have proper lane markings.

Figure 3.3: Pedestrian Road Markings

Source: Bangalore City Traffic Police

3.2.4 Enforcement Cameras

The Table 3.4 shows the Enforcement Cameras proposed to be installed as per Strategic Operations Plan and Enforcement Cameras Actually installed in different phases. People in Traffic Management Centre (TMC) were interviewed regarding these enforcement cameras and they told that it has helped in catching drivers who are overspeeding.

Table 3.4: Enforcement Cameras Planned v/s Actual

Sl. No.	Enforcement Cameras Proposed to be installed as per Strategic Operations Plan	Enforcement Cameras Actually Installed
1	Phase I: 5 Enforcement Cameras	Phase I: 5 Enforcement Cameras
2	Phase II: 7 Enforcement Cameras	Nil
3	Phase III: 7 Enforcement Cameras	Nil
4	Phase IV: 7 Enforcement Cameras	Nil

The construction of enforcement cameras at vital junctions and provision of blackberrys and printers to the police has helped in better enforcement by catching more traffic offenders and collection of fines. The total amount of fines collected from 2007-2010 are shown in Table 3.5 below,

Table 3.5: Fine Collected after B-TRAC Project

Sl. No.	Year	Number of Cases Registered	Total Fine Amount Rs. in Crores
1	2007	1340056	19.91
2	2008	1784590	29.51
3	2009	2513639	37.62
4	2010	3199915	47.56

Figure 3.4: Enforcement Camera**Figure 3.5: Surveillance Camera**

Source: www.bangalorettrafficpolice.gov.in

Source: www.bangalorettrafficpolice.gov.in

3.2.5 Surveillance Cameras

Totally 680 surveillance cameras should have been installed as per Strategic Operations Plan in different phases but only 99 Surveillance cameras were installed as shown in the Table 3.6. These cameras have helped the Traffic Management Centre to monitor and better manage the traffic at different junctions. Out of the 99 surveillance cameras installed, some of the cameras have been removed because of metro project. As per Traffic Management Centre (TMC) 179 cameras have been installed out of which 11 cameras have been removed due to BBMP, BDA, Expressway, Underpass work etc., On an average 125 cameras will be operating as per TMC. Surveillance cameras has helped in monitoring the traffic and also helped in catching traffic violators.

Table 3.6: Surveillance Camera Planned v/s Actual

Sl. No.	Surveillance Cameras Proposed to be installed as per Strategic Operations Plan	Surveillance Cameras Actually Installed
1	Phase I: 80	Phase I: 80
2	Phase II: 200	Nil
3	Phase III: 200	Phase III: 19
4	Phase IV: 200	Nil

3.2.6 Pelican Signals

Table 3.7 Pelican Signals Planned v/s Actually Installed

Sl. No.	Pelican Signals Proposed to be installed as per Strategic Operations Plan	Pelican Signals Actually Installed
1	Phase 1: 45 Pedestrian Actuated Signals	16 Pelican Signals have been installed out of 30 planned
2	Phase II: 45 Pedestrian Actuated Signals	Nil
3	Phase III: 5 Pedestrian Actuated Signals	Nil

Pelican signals are very important for the pedestrians to cross safely. Out of the 95 pelican signals planned only 16 have been installed.

3.2.7 Variable Message Signs (VMS)

Twenty numbers of Variable Message Signs (VMS) have been installed at various locations in Bangalore City. The advance warning messages displayed by variable message signs have helped the vehicle drivers to move away from the congested roads and use alternate routes.

Figure 3.6: Variable Message Signs (VMS)



Source: www.bangalorettrafficpolice.gov.in

Figure 3.7: Variable Message Signs (VMS)



Source: www.bangalorettrafficpolice.gov.in

3.2.8 Street Furniture

a) Flexible Cones with Reflective Tapes

Figure 3.8: Flexible Cones with Reflective Tapes



Source: www.bangalorettrafficpolice.gov.in

The flexible cones with reflective tapes are used as lane dividers and the reflective tapes help the drivers to see the dividers in the night. Around 2000 numbers of movable cones have been installed for B-TRAC Project. Almost all the 2000 plastic tubular cones which are installed by the traffic police in June have been broken or bent. Many junctions do not have even a single cone. A police constable stationed at a major junction on M.G. Road, where nine out of ten cones

have been smashed revealed that “Most of the cones are broken at night by speeding cars and two wheelers”. These vehicle drivers should be fined heavily if caught.

b) Cats Eye

The cat’s eye is a retro-reflective lane marker. It helps the drivers to know the centre line and the edge line of the pavement during night times as well as during rainy days. Nearly 19,250 Numbers of cats eye have been installed in the Bangalore City roads.

Figure 3.9: Cats Eye Road Stud



Source: Skyscrapercity.com

Figure 3.10: Cats Eye at Night Time



Source: roadsafetymark.net

c) Hazard Markers

Hazard markers are provided in places of obstructions like guard rails and abutments adjacent to the carriageway. Nearly 5000 numbers of hazard markers have been installed in Bangalore city. The hazard markers have retro-reflective paints which will help the drivers to identify the hazards during night time.

Figure 3.11: Hazard Markers

Source: duracurb.net

d) Reflective Median Markers

The reflective median markers are used to enhance the visibility of medians in the night and help reduce accidents. Nearly 5000 numbers of reflective median markers have been installed in Bangalore City. Still there are large number of medians in the city where reflective median markers need to be provided along with cats eye because the medians are not visible during night times and it may lead to accidents. There should be uniformity in marking of median markers, traffic islands, kerb marking etc., because at some places they have been marked with Black and White paint but at some other locations it is marked with Yellow and Black paint.

Figure 3.12: Reflective Median Markers during Day and at Night

Source: www.bangalorettrafficpolice.gov.in Source: www.bangalorettrafficpolice.gov.in

e) Movable Steel Barricades

Nearly 2500 numbers of movable steel barricades have been provided to the police. These barricades help in better traffic management.

f) Informatory Signboards and Overhead Message Sign Boards

Nearly 400 Nos. of Informatory Signboards and 200 Nos. of Overhead Message Sign Boards have been constructed as part of B-TRAC project. These signboards have helped the drivers tremendously in directing them to reach their destinations safely. More informatory signboards like these should be installed in more number of places so that the drivers will not have any problems in finding their destinations.

Figure 3.13: Informatory Sign Boards



Source: www.bangalorettrafficpolice.gov.in

3.2.9 Wheel Clamps for Traffic Police

Nearly 500 Nos. of wheel clamps have been provided to the traffic police. This has helped in enforcing no parking laws strictly. Wheel clamps were put to vehicles that have parked in “No Parking Zones” and once the driver pays the fine then only the wheel clamp will be removed. The provision of wheel clamps to the police has helped a lot in catching people who have parked in ‘No Parking Zones’.

3.3 OPINION SURVEYS

Three types of opinion surveys have been conducted such as Public Opinion Survey, Police Opinion Survey and Public Organization Opinion Survey to study the impact of B-TRAC project.

3.3.1 Public Opinion Survey

A public opinion survey was conducted at various locations in Bangalore City to study the impact of B-TRAC project. A questionnaire was prepared in which apart from general questions like name, age, gender, education, occupation, annual income etc., questions were asked about the knowledge of public about B-TRAC, advantages of road signs and markings, advantage of providing blackberry and printers to the police, improvements in flow of traffic after junction improvements, signal upgradation, installation of new signals etc., A copy of the questionnaire is enclosed in the Appendix.

Table 3.8: General Profile of the Respondents of Public Opinion Survey

Sl. No.	Description	Percentage
1.	Gender of the Respondents	
	a) Male	63 %
	b) Female	37%
2.	Age Group of Respondents	
	a) Under 25	17%
	b) 25 to 34	46%
	c) 35 to 44	22%
	d) 45 to 54	9%
	e) 55 to 64	5%
	f) >65	1%
3.	Education of the Respondents	
	a) High School	6%
	b) Associate Degree	14%

	c) Bachelors Degree	48%
	d) Masters Degree	26%
	e) Ph.D	6%
4.	Occupation of the Respondents	
	a) Administrative or Management	6%
	b) Professional or Technical	34%
	c) Marketing or Sales	15%
	d) Administrative Support or Sales	17%
	e) Service	3%
	f) Landscaping or Animal Care	Nil
	g) Precision Worker or Craftman	Nil
	h) Operators, Fabricator or Labourer	2%
	i) Work at Home	3%
	j) Others	20%
5.	Annual Income of the Respondents	
	a) Under Rs. 50,000/-	18%
	b) Rs. 50,000 to Rs. 1,00,000/-	15%
	c) Rs. 1,01,000 to 5,00,000/-	49%
	d) Rs. 5,01,000 to Rs. 10,00,000/-	16%
	e) Greater than Rs. 10,00,000/-	2%

Table 3.9: Questions and Response Pertaining to B-TRAC (Public Opinion)

Sl.No.	Description	Response in Percentage
1.	Do you anything about B-TRAC Project?	
	a) Yes	61.54%
	b) No	38.46%
2.	Do you see any improvements in the flow of traffic	

	after Junction Improvement? a) Yes b) No	65.63% 34.37%
3.	Do you see any improvements in the flow of traffic after Signal Upgradation? a) Yes b) No	75% 25%
4.	Do you see any improvements in the flow of traffic after installation of New Signal? a) Yes b) No	79.69% 20.31%
5.	Do you see any advantages of providing the following road markings? 5.1 Lane Markings a) Yes b) No 5.2 Edge Markings a) Yes b) No 5.3 Centreline Markings a) Yes b) No 5.4 Pedestrian Markings a) Yes b) No	90.77% 9.23% 89.23% 10.77% 90.77% 9.23% 89.23% 10.77%
6.	Do you see any advantages of providing the following signages? 6.1 Informatory Signs (Direction Signs)	

	a) Yes	96.92%
	b) No	3.08%
	6.2 Warning Signs (One Way Signs)	
	a) Yes	96.92%
	b) No	3.08%
	6.3 Regulatory Signs (Parking Signs)	
	a) Yes	96.92%
	b) No	3.08%
7.	Do you see any advantages of providing blackberry's and printers to the traffic police?	
	a) Yes	61.54%
	b) No	38.46%

The following are some of the key findings of the B-TRAC public opinion survey,

- 1) Majority of the respondents (61.54%) knew about the B-TRAC Project.
- 2) Majority of the respondents saw improvement in the flow of traffic after junction improvement, signal upgradation and installation of new signals.
- 3) Majority of the respondents saw the advantages of road markings like lane markings, edge line markings, centerline markings and pedestrian markings which helped in systematic movement of traffic.
- 4) Majority of the respondents saw the advantages of signages like informatory signs, warning signs and regulatory signs. The informatory signs provided at majority of the junctions helped the drivers to reach their destinations safety.
- 5) Majority of the respondents said that the blackberrys and printers provided to the police were really advantageous. The survey respondents told that the blackberry saves time, avoids going to court, good for enforcement, excellent tool for catching overspeeding vehicles, signal jumping vehicles and malpractices and they are also happy because they get on the spot receipts for payment of fines.

- 6) Nearly 44.62% of the respondents have said that their average waiting time at the signalized junctions has reduced after the implementation of B-TRAC project.

Some of the suggestions given by the respondents of the public opinion survey are,

- 1) Pedestrian zebra crossings are fading away and they should be repainted.
- 2) There is improper/illegal parking near Malls, Hotels, Cinema Theatres, BMTC Bus stands which should be strictly enforced.
- 3) General public and the drivers should be educated about the traffic rules regularly.
- 4) Provide adequate amenities for pedestrians, bicyclists, physically challenged people and provide landscaped medians etc.,
- 5) Traffic laws should be strictly enforced.
- 6) There should be proper maintenance of traffic junctions, sign boards etc.,
- 7) Drivers who are violating speed limits and jumping red signal should be heavily penalized.
- 8) There should be better traffic signal management such as signal optimization, synchronization of signals etc.,

3.3.2 Police Opinion Survey

A police opinion survey was also conducted at several important junctions in Bangalore City to study the impact of B-TRAC Project. A questionnaire was prepared in which questions were asked regarding improvements in the flow of traffic after signal upgradation, junction improvement, installation of new signal etc., Questions were also asked regarding reduction of accidents, increase in collection of fines after implementation of B-TRAC Project. Visits were made to Traffic Management Centre (TMC) in Ashoknagar and data was collected regarding the number of surveillance cameras installed and average number of cameras working at any given time.

Table 3.10: Questions and Response Pertaining to B-TRAC (Police Opinion)

Sl. No.	Description	Response in Percentage
1.	Do you see any improvements in the flow of traffic after Junction Improvement? a) Yes b) No	100% 0%
2.	Do you see any improvements in the flow of traffic after Signal Upgradation? a) Yes b) No	100% 0%
3.	Do you see any improvements in the flow of traffic after installation of New Signal? a) Yes b) No	100% 0%
4.	Do you see any decrease in traffic violations due to installation of enforcement cameras? a) Yes b) No	100% 0%
5.	Do you see any improvements in traffic management due to surveillance camera? a) Yes b) No	90% 10%
6.	Do you see any advantages of providing the following road markings? 6.1 Lane Markings a) Yes b) No 6.2 Edge Markings	90% 10%

	<p>a) Yes b) No</p> <p>6.3 Centreline Markings</p> <p>a) Yes b) No</p> <p>6.4 Pedestrian Markings</p> <p>a) Yes b) No</p>	<p>90% 10%</p> <p>90% 10%</p> <p>88.89% 11.11%</p>
7.	<p>Do you see any advantages of providing the following signages?</p> <p>7.1 Informatory Signs (Direction Signs)</p> <p>a) Yes b) No</p> <p>7.2 Warning Signs (One Way Signs)</p> <p>a) Yes b) No</p> <p>7.3 Regulatory Signs (Parking Signs)</p> <p>a) Yes b) No</p>	<p>100% 0%</p> <p>80% 20%</p> <p>90% 10%</p>
8.	<p>Do you see any advantages of providing blackberry's and printers to the traffic police?</p> <p>a) Yes b) No</p>	<p>100% 0%</p>
9.	<p>Do you see any increase in collection of fines after providing wheel clamps for illegal parking?</p> <p>a) Yes b) No</p>	<p>75% 25%</p>
10.	<p>Do you see any reduction of accidents due to B-</p>	

	TRAC Project?	
	a) Yes	100%
	b) No	0%

The following are the key findings of the B-TRAC police opinion survey,

- 1) All the respondents (100%) saw improvement in flow of traffic after junction improvement, signal upgradation and installation of new signals.
- 2) All the respondents (100%) saw decrease in traffic violations after the installation of enforcement cameras.
- 3) Majority of the respondents (90%) saw improvement in traffic management after installation of surveillance cameras.
- 4) Majority of the respondents (90%) saw the advantages of road markings like lane markings, edge line markings, centerline markings and pedestrian markings which helped in systematic movement of traffic.
- 5) Majority of the respondents (90%) saw the advantages of signages like informatory signs, warning signs and regulatory signs.
- 6) All the respondents (100%) said that the blackberrys and printers provided to the police were really advantageous. The survey respondents told that the blackberrys has helped the police to quickly find out the violations of the traffic vehicle and repeat offenders and issue necessary fine and take action and also helped in monitoring their driving behavior.
- 7) All the respondents (100%) said that there is reduction in accidents due to implementation B-TRAC Project.
- 8) As far as benefits of B-TRAC are concerned the respondents told that the B-TRAC project has helped in reduction of road accidents and traffic violations. They also told that the B-TRAC project has helped them in regulating the city traffic with the help of modern technology like enforcement cameras, surveillance cameras, Blackberrys etc.,

Some of the suggestions given by the police are,

- 1) Traffic Management Centre (TMC) needs more cameras for monitoring and better managing the traffic.
- 2) Maintenance of surveillance cameras, enforcement cameras, traffic signals etc., should be done periodically to make sure maximum number of cameras and signals are working at any given time.
- 3) Raincoats should be provided for the traffic police who are monitoring the traffic junction during rainy days.

3.3.3 Public Organization Opinion Survey (BBMP, BDA, etc.,)

An opinion survey was also conducted by interviewing the officials of public organizations like BBMP, BDA etc., to study the impact of B-TRAC project. A questionnaire was prepared in which questions were asked regarding improvements in the flow of traffic after signal upgradation, junction improvements, installation of new signals etc. and also the advantages of providing lane markings, signages, blackberrys and printers to police.

Table 3.11: Questions and Response Pertaining to B-TRAC (Public Organization)

Sl. No.	Description	Response in Percentage
1.	Do you anything about B-TRAC Project? a) Yes b) No	83.33% 16.67%
2.	Do you see any improvements in the flow of traffic after Junction Improvement? a) Yes b) No	100%
3.	Do you see any improvements in the flow of traffic after Signal Upgradation? a) Yes	100%

	b) No	
4.	Do you see any improvements in the flow of traffic after installation of New Signal? a) Yes b) No	100%
5.	Do you see any advantages of providing the following road markings? 5.1 Lane Markings a) Yes b) No 5.2 Edge Markings a) Yes b) No 5.3 Centreline Markings a) Yes b) No 5.4 Pedestrian Markings a) Yes b) No	100% 100% 100% 100%
6.	Do you see any advantages of providing the following signages? 6.1 Informatory Signs (Direction Signs) a) Yes b) No 6.2 Warning Signs (One Way Signs) a) Yes b) No 6.3 Regulatory Signs (Parking Signs)	100% 100%

	a) Yes b) No	100%
7.	Do you see any advantages of providing blackberry's and printers to the traffic police? a) Yes b) No	83.33% 16.67%

The following are the findings of the B-TRAC public organization opinion survey,

- 1) Majority of the respondents (83.33%) are knowledgeable about the B-TRAC Project.
- 2) All the respondents (100%) saw improvement in flow of traffic after junction improvement, signal upgradation and installation of new signals.
- 3) All the respondents (100%) agree with the advantages of road markings like lane markings, edge line markings, centerline markings and pedestrian markings which are helping in the systematic movement of traffic.
- 4) All the respondents (100%) saw the advantages of signages like informatory signs, warning signs and regulatory signs. The informatory signs provided in majority of the junctions helped the drivers to reach their destinations without any hazzles.
- 5) Majority of the respondents (83.33%) said that the blackberrys and printers provided to the police were really advantageous. The survey respondents told that it will make the drivers more cautious in driving, they will know the fines on the spot, helps to fine defaulters and helps in tracking traffic violations.

Some of the suggestions given by the respondents are,

- 1) B-TRAC should focus more on physical infrastructure like Junction Improvements, footpaths, median, busbays, pedestrian walkways, cyclepaths etc.,
- 2) Increase traffic awareness among the general public about traffic laws and giving right of way to pedestrians and bicyclists.
- 3) Police should enforce traffic laws and prevent more traffic violations.

- 4) There were too many signs provided at one location which will distract drivers but it also confuses the drivers.

3.3.4 Field Survey

Field survey was conducted in which various junctions in Bashyam Circle, Rajajinagar 41st Cross, Rajajinagar 50th Cross, Rajajinagar ESI Junction, Navrang Junction, BEL Road – Devasandra Junction etc., were visited to study the implementation of B-TRAC Project. It was found that at some of the junctions the informatory signs were not clearly visible and it was covered with trees and in some junctions too many traffic signs were erected which created confusion among the drivers.

3.4 POSITIVE IMPACTS OF B-TRAC

Following are the positive impacts of B-TRAC,

- 1) Junction improvements in 46 junctions have helped in systematic movement of traffic.
- 2) The travel time has reduced due to signal optimization and journey speed has increased after synchronization of signals.
- 3) The road markings like centerline, median markings, lane markings and edge line markings on some major roads have helped in safer movement of traffic.
- 4) The enforcement cameras, blackberry's and printers have helped in catching the traffic violators and also increased the collection of fines as shown in Table 3.12 and in the Table 3.13 below. The surveillance cameras have helped in better monitoring and management of the traffic and also in catching traffic violators and also in increasing the collection of fines.

Table 3.12: The Number of M.V. Act, K.P. Act and Towing Cases Booked from the Year 2002 to 2012 in Bangalore city

M.V.ACT, K.P.ACT AND TOWING CASES					
YEAR	M.V.Act Cases	K.P.Act Cases	Towing Cases	Automation Cases	Total Cases
2002	1168475	15629	136609	13592	1334305
2003	1132888	11736	123648	15268	1283540
2004	1053154	11133	33539	31611	1129437
2005	1575240	9962	61465	58132	1704799
2006	1518809	8611	85973	42077	1655470
2007	1340056	5298	51736	47008	1444098
2008	1784590	4883	111246	178352	2079071
2009	2310479	7836	118811	203160	2640286
2010	2999303	8648	124549	200612	3333112
2011	3177992	8916	123974	1479959	4790841
2012	3505344	8847	65894	1624715	5204800

Source: www.bangalorettrafficpolice.gov.in

Table 3.13: The Number of M.V. Act, K.P. Act and Towing Fine Amount Collected from the Year 2002 to 2012 in Bangalore City

K.P.ACT AND TOWING FINE AMOUNT					
YEAR	M.V.Act Fine	K.P.Act Fine	Towing Charges	Automation Fine Amount	Total Fine Collected
2002	119054290	523710	14756950	1618300	135953250
2003	125417865	435300	13357550	1920400	141131115
2004	120154600	406325	4352400	3858300	128771625
2005	182631240	360250	12546900	7298100	202836490
2006	188434665	303550	17751200	6245500	212734915
2007	182018650	258570	10776000	6058900	199112120
2008	252772000	388700	21731100	20123000	295014800
2009	321889150	705900	24364500	29165820	376125370
2010	425399650	838000	25181900	24167302	475586852
2011	453031800	870900	25149550	26609275	505661525
2012	506146700	826800	13369775	18174654	538517929

www.bangalorettrafficpolice.gov.in

Table 3.14: M.V. ACT Cases Booked in Different Heads for the Year 2012 (Upto December) in Bangalore City

M.V.ACT CASES BOOKED IN DIFFERENT HEADS		
Sl.No.	Type of Offences	No. of Cases booked
1	Dangerous Driving	65167
2	Over Speeding	119894
3	Over Loading	21753
4	Drunken Driving	60973
5	Refuse to go for Hire	27655
6	Demanding Excess Fare	16725
7	A/R Display Card	5689
8	Defective Fare Meter	19
9	Defective Silencer	11109
10	Emitting Black Smoke	1258
11	Shrill Horn	13886
12	Using Black Film/Other Materials	78282
13	Without D.L	72629
14	Jumping Traffic Signal	536940
15	Wrong Parking	1491071
16	Lane Discipline	225614
17	Defective Registration No Plate	67314
18	No Entry	501957
19	HTV Prohibited	48564
20	Without Uniform	74963
21	Without I.C.	9079
22	Without F.C	3
23	Defective Head Light	24148
24	Defective Tail Light	872
25	Bald Tires	-
26	Foot Board Traveling	-
27	Not Produce Documents	26502
28	Gents in Ladies Seat	-
29	Over taking by left	3990

30	Mobile Phone	207490
31	Safety Belt	256754
32	Without Helmet	752525
33	Others	407234
Total		51,30,059

www.bangaloretrafficpolice.gov.in

Table 3.15: Vehicle wise Distribution of Cases Booked for the year 2012 (Upto December)

VEHICLE WISE DISTRIBUTION OF CASES BOOKED FOR THE YEAR 2012 (up to September)						
Buses	Goods Vehicles	Auto Rickshaw	LMV	Two Wheelers	Tempos	Total
98346	608934	601012	1507287	1901768	412712	5130059

www.bangaloretrafficpolice.gov.in

Table 3.16: Vehicle Population in Bangalore City (Upto 29/2/2012)

Vehicle Population in Bangalore City (up to 29-02-2012)						
Two Wheelers	L.M.V	A/R	H.T.V	H.G.V	Others	Total
2881791	903478	112155	98191	47683	127764	4171062

www.bangaloretrafficpolice.gov.in

- 5) The Variable Message Signs (VMS) have helped in giving advance information to the drivers so that they can deviate and can take alternate routes.
- 6) The Street Furniture's like Flexible Cone with Reflective Tape, Cats Eye, Hazard Markers, Reflective Median Markers, Movable Steel Barricades, Informatory Signboards have helped in reduction of accidents and safe movement of traffic.
- 7) B-TRAC project has helped in reducing the accidents by 18% between three years from 2007 to 2010 as shown in Table 3.17.

Table 3.17: Impact of B-TRAC – Reduction in Accidents

Sl. No.	Year	Number of Road Accidents
1	2007	8426
2	2008	7772
3	2009	6875
4	2010	6483
5	2011	6024
6	2012	5502

Table 3.18: The Number of Fatal and Non-Fatal Cases Reported, Persons Killed and Injured from the Year 2002 to 2012 in Bangalore City

Accident Statistics					
YEAR	Fatal	Killed	Non-Fatal	Injured	Total
2002	783	820	9073	7577	9856
2003	843	883	9662	7980	10505
2004	875	903	8226	6921	9101
2005	796	836	6782	5899	7578
2006	880	915	6681	6048	7561
2007	957	981	7469	6591	8426
2008	864	892	6908	6150	7772
2009	737	761	6138	5668	6875
2010	816	858	5667	5343	6483
2011	727	757	5297	4976	6024
2012	N.A.	755	N.A.	4471	5502

The accident rate of Bangalore City has come down because of various measures taken by Bangalore Traffic Police. Some of the measures taken by Bangalore Traffic Police are given below,

- 1) Effective Enforcement of Traffic Rules:** Bangalore Traffic Police have registered highest number of traffic violations in the year 2012 i.e., 51.30 Lakh cases were registered and

Rs. 53.85 Crores of fine amount were collected from the violators. This is the highest number of cases booked and highest fines collected in any city in the world.

- 2) **Suspension of Driving License of Repeated Offenders:** A database of repeated offenders was made and their driving licenses were seized.
- 3) **Automation Enforcement:** To bring in more transparency in payment of fines 500 digital cameras were provided to policemen manning the junctions and during the year 2012 16,91,863 cases were booked using the cameras.
- 4) **Implementation of Uniform Speed Limits:** In each of the traffic police limits, prominent road junctions were identified and campaigns were undertaken to bring awareness of speed limits through advertisements. Additional four interceptor vehicles were used to book 1.19 Lakh cases against violating individuals who were riding their vehicles in rash and negligent manner.
- 5) **Campaigns:** Various campaigns has been conducted like drunken driving campaign, lane discipline campaign, ambulance priority campaign, innovative public eye campaign, seat belt campaign, helmet less campaign and campaign to remove tinted glasses. An effective campaign against helmet less two wheeler drivers was conducted in 2012 in which a total of 7.52 Lakh cases were registered.
- 6) **Auto Rickshaw Reforms:** In Bangalore City, the autorickshaw drivers refuse to go for hire and also demand excess fare and in this regard huge complaints were raised by the public with the traffic police. The police have taken the following actions,
 - a) Sixteen prominent places were identified to start pre-fixed auto counters.
 - b) The Auto Display Card System was revitalized so that the card was displayed more visibly to the passengers boarding it and whenever things were left behind in the autorickshaw, they were traceable because of the campaign.
 - c) The IVRS complaint system to report demanding of excess fare and refuse to go for hire was established enabling prosecution of the autorickshaw drivers.
 - d) The SMS facility was also provided to register complaints against such erring auto drivers.
 - e) Complaint by emails against the erring auto drivers was also established.

The above listed measures have helped the citizens immensely thus reducing the number of complaints.

- 7) **Road Safety Training:** Road safety training was imparted for private transport vehicles and school bus and van drivers so that it results in less accidents
- 8) **Removal of Unscientific Road Humps:** Unauthorized and unscientific road humps were identified and removed in Bangalore City because they were contributing to fatal accidents. On the main roads, to control road accidents occurring due to overspeeding vehicles road humps has been installed as per IRC standards.
- 9) **Establishment of Three New Traffic Police Stations:** With an increasing vehicular population and an effort to reduce road accidents three new traffic police stations were commissioned. They were a) Kengeri Traffic Police Station b) Jalahalli Traffic Police Station and 3) Hulimavu Traffic Police Station.
- 10) **Effective Citizen Interaction:** In order to ensure smooth traffic flow and to reduce road accidents in Bangalore City, Citizen's Traffic Forum was started under the Chairmanship of Commissioner of Police. On every 3rd Saturday of the month police station level meetings will be held in all 42 Traffic Police Stations involving general public between 11.30 a.m. and 1.30 p.m. A '**Bangalore Traffic Police**' face book page has also been created which has more than 57,000 followers.

Because of the excellent work done by Bangalore Traffic Police in reducing the accidents in the city of Bangalore, they have been awarded the following awards,

- 1) **National Award for Best use of Information and Communication Technology (ICT) by the Department of Personnel and Training (DoPT), Government of India in the year 2011.**
- 2) **Award for Excellence by Ministry of Urban Development, Government of India in the year 2011.**
- 3) **Golden Peacock Award for Innovative Products/Services Award-2012.**
- 4) **Golden Peacock HR Excellence Award – 2012.**

3.5 NEGATIVE IMPACTS OF B-TRAC

1) Standard and consistency should be maintained in providing traffic signs. Number of existing signs convey the message in their own colours and styles and some of the parking signs do not show the distance to which parking is restricted and some of the parking signs are wrong as shown in Figure 3.14 because it is showing the vertical distance instead of horizontal distance and another Figure shows parking sign which does not show any horizontal distance. IRC standards should be followed while erecting the traffic signs.

Figure 3.14: Wrong Parking Signs



2) There are too many signs for a single hump as shown in Figure 3.15. There should only one sign and it should be located at the right distance and also at right height as per IRC standards.

Figure 3.15: Too Many Signs in One Location



- 3) Some of the traffic signs are not made properly and erected as per IRC standards as shown in Figure 3.16.

Figure 3.16: Traffic Signs not properly made and erected



- 4) Some of the signs are erected at wrong places as shown in Figure 3.17.

Figure 3.17: Traffic Signs Erected at Wrong Places



- 5) Some of the traffic signs erected as part of B-TRAC project are not visible as shown in Figure 3.18 because it is covered by trees and bushes which needs to be trimmed.

Figure 3.18: Traffic Signs Covered by Trees.



- 6) Some of the traffic signs are hidden behind the advertisement boards as shown in Figure 3.19.

Figure 3.19: Traffic Signs hidden behind the advertisement boards



- 7) As per the B-TRAC project, the dedicated auto lanes that were created on trial basis at few locations in Bangalore City were aimed at helping faster movement of BMTC and KSRTC buses. These were abandoned later due to non use by autorickshaw drivers.

The figure from 3.14 to 3.19 shows that the traffic signs are not erected at right places, at right distances, at right height as per IRC standards and also there are too many signs provided at one location which confuses and distracts the drivers. The signs are also not made as per IRC standards and some of the signs are covered by trees and shrubs, advertisement boards etc., which does not help the drivers in any way. Instead of putting too many signs at one location, a thorough road safety audit should be conducted and unnecessary signs should be removed and distance between signs should be maintained.

CHAPTER 4.0

CONCLUSIONS AND RECOMMENDATIONS

4.1 CONCLUSIONS

The following are the conclusions of this B-TRAC Evaluation and Impact Study,

a) **General Conclusions**

- 1) The actual funding for this project (Rs. 124 Crores) is less than the Estimated Budget (Rs. 352.12 Crores) as per Strategic Operations Plan because of which the benefits of B-TRAC could not be fully realized.
- 2) Junction Improvements was proposed to be done for a total of 500 junctions but actually junction improvement was done for only 46 junctions. Junction improvement should have been done for all the 500 junctions identified.
- 3) The provision of blackberry's and printers to the police has helped tremendously in catching traffic violators subsequently reducing number of accidents and also helped in increased collection of fines.
- 4) The traffic signs are not erected as per IRC standards. The traffic signs should be located at right place and at right distance. The height of the traffic signs should be as per IRC.
- 5) There are too many traffic signs erected at one location which distracts and creates confusion among the drivers.
- 6) Illegal advertisement signs were erected at several places blocking the traffic signs and also tree branches are blocking some of the overhead traffic signs.
- 7) With limited manpower, Bangalore Traffic Police is doing an exemplary job in managing the traffic by enforcing the traffic rules and reducing the accidents. The following measures were taken by Bangalore Traffic Police to reduce accidents,
 - i. Effective Enforcement of Traffic Rules.
 - ii. Suspension of Driving License of Repeated Offenders.
 - iii. Automation Enforcement.
 - iv. Implementation of Uniform Speed Limits.

- v. Various campaigns like drunken driving campaign, lane discipline campaign, ambulance priority campaign, innovative public eye campaign, seat belt campaign, helmet less campaign and campaign to remove tinted glasses.
- vi. Autorickshaw Reforms.
- vii. Road Safety Training.
- viii. Removal of Unscientific Road Humps.
- ix. Effective Citizen Interaction.

b) Public Opinion Survey Conclusions

- 1) Majority of the respondents were aware about the B-TRAC project.
- 2) Nearly 44.62% of the respondents have said that their average waiting time at the signalized junction has reduced after implementation of B-TRAC project.
- 3) Majority of the respondents said that the blackberrys and printers provided to the police were really advantageous. The survey respondents told that the blackberry saves times, avoids going to court, good for enforcement, excellent tool for reducing the violations due to overspeeding vehicles, signal jumping vehicles and malpractices and they are also happy because they get on the spot receipts for the payment of fines.
- 4) Majority of the respondents saw the advantages of signages like informatory signs, warning signs and regulatory signs. The informatory signs provided at majority of the junctions helped the drivers to reach their destinations safely.

c) Police Opinion Survey Conclusions

- 1) All the respondents (100%) have experienced improvement in the flow of traffic after junction improvements, signal upgradations and installation of new signals.
- 2) All the respondents (100%) saw decrease in traffic violations after installation of enforcement cameras.
- 3) Majority of the respondents (90%) saw improvement in traffic management after installation of surveillance cameras.
- 4) All the respondents (100%) said that the blackberrys and printers provided to the police were really advantageous. The survey respondents told that the blackberrys

has helped the police to quickly find out the violations of the traffic vehicle and repeat offenders, and also helped in monitoring.

- 5) All the respondents (100%) said that there is reduction in accidents due to B-TRAC Project.

d) **Public Organizations Opinion Survey Conclusions**

- 1) Majority of the respondents (83.33%) knew about the B-TRAC Project.
- 2) Majority of the respondents (83.33%) said that the blackberrys and printers provided to the police were really advantageous. The survey respondents told that it will make the drivers more cautious in driving, they will know the fines on the spot, helps to fine defaulters and helps in tracking previous traffic violations.
- 3) All the respondents saw the advantages of signages like informatory signs, warning signs and regulatory signs.
- 4) There were too many signs provided at one location which will distract and confuse the drivers.

4.2 RECOMMENDATIONS

- 1) Since the actual funding (Rs. 124 Crores) was less than the estimated funding (Rs. 352.12 Crores), the work should have been *prioritized*.
- 2) The cycle length of nearly 98 out of the 324 signals is more than 180 seconds which is too high. The optimum cycle length should be fixed based on traffic volumes.
- 3) The traffic signs should be erected as per IRC standards and also at right locations. Some of the signs are located at wrong locations and also there are too many signs at some locations.
- 4) Area wise improvements (like Jayanagar, Rajajinagar, Malleswaram etc.,) in terms of junction improvements, signal up gradation, installation of new signals, road markings, signage's etc., should be done so that the traffic management will be better in the entire city of Bangalore. More importance should be given to the new areas or layouts which are on the outskirts of the Bangalore City.

- 5) Bangalore city traffic police should co-ordinate with BBMP and establish a task team with representatives from both the agencies to make sure:
 - a) The pot holes on all major roads are filled up using appropriate materials and technology to make it long-lasting.
 - b) The advertisement boards should not be permitted to be erected in front of any traffic signs.
 - c) Sufficient lighting should be provided to all signalized and unsignalized junctions and to make sure that the lights are in working condition.
 - d) The tree branches/bushes are trimmed so that the overhead and permanent traffic signs are clearly visible to the travelling public.
- 6) Many of the medians in the city cannot be seen at night and it can lead to accidents. Reflective median markers with cats eye should be provided so that the median is visible at night.
- 7) In order to maintain lane discipline at the junctions all the unchannelized intersections should be converted to channelized intersections. The difference between channelized intersections and unchannelized intersections is that in channelized intersections there will be traffic islands which can guide the traffic and in unchannelized intersections there will not be any traffic islands.
- 8) The entire proposed funding of Rs. 352.12 Crores should be released to complete the entire project in a phased manner.
- 9) A detailed junction analysis and volume study should be done at all major junctions by the reputable independent organization to come up with solutions for optimum cycle lengths.
- 10) For the safety of Bangalore City Police and the guards managing the junctions, retro-reflective safety vests and breathing masks should be provided to all of them and it should be mandated to wear it during duty hours.
- 11) Since the existing traffic police are not sufficient, more traffic police should be appointed to efficiently manage the ever increasing volume of traffic in Bangalore City.

- 12) All the footpaths should be properly paved so that the pedestrians can walk on the footpath instead of walking on the road. When the pedestrians walk on the road the capacity of the road will further reduce. Pedestrian guardrail should be provided so that the pedestrians do not spill over to the roads and also pedestrians cross the street at the right place where the pedestrian zebra crossings are provided. Provision of proper footpath and guardrails will also prevent jaywalking.
- 13) A legislative policy change needs to be enacted so that the traffic fines collected by Bangalore City Traffic Police must be earmarked and dedicated to spend only on traffic management activities in Bangalore City.

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APPENDIX I

**Centre for Infrastructure, Sustainable Transportation and Urban Planning
(CiSTUP)**

**SID Complex, Indian Institute of Science,
Bangalore**

**Bangalore Traffic Improvement Project (B-TRAC) IMPACT SURVEY –Public
Opinion Survey**

Name of the Survey Location: _____

Data and Time of Survey: _____

Surveyed By: _____

1. Name of the Respondent: _____

2. Age of the Respondent:

Under 25	<input type="checkbox"/>	45 to 54	<input type="checkbox"/>
25 to 34	<input type="checkbox"/>	55 to 64	<input type="checkbox"/>
35 to 44	<input type="checkbox"/>	> 65	<input type="checkbox"/>

3. Gender of Respondents:

Male	<input type="checkbox"/>	Female	<input type="checkbox"/>
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4. Education of the Respondent:

High School	<input type="checkbox"/>	Masters Degree	<input type="checkbox"/>
Associate Degree	<input type="checkbox"/>	Ph.D.	<input type="checkbox"/>
Bachelors Degree	<input type="checkbox"/>		

5. Occupation of the Respondent:

Administrative or Management	<input type="checkbox"/>	Landscaping or Animal Care	<input type="checkbox"/>
Professional or Technical	<input type="checkbox"/>	Precision Worker or Craftsman	<input type="checkbox"/>
Marketing or Sales	<input type="checkbox"/>	Operators, Fabricator or Labourer	<input type="checkbox"/>
Administrative Support or Sales Service	<input type="checkbox"/>	Work at Home	<input type="checkbox"/>
	<input type="checkbox"/>	Others	<input type="checkbox"/>

6. Annual Income of the Respondent:

Under Rs. 50,000	<input type="checkbox"/>	5,01,000 to 10,00,000	<input type="checkbox"/>
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Rs. 50,000 to Rs. 1,00,000 Greater than 10,00,000
 Rs. 1,01,000 to 5,00,000

7. Home Location of the Respondent: _____

8. Work Location of the Respondent: _____

9. Do you know anything about the B-TRAC Project? Yes No
 If yes, what do you know about the B-TRAC Project:

10. Do you see any improvements in the flow of traffic after Junction Improvement? Yes No

11. Do you see any improvements in the flow of traffic after Signal Upgradation? Yes No

12. Do you see any improvements in the flow of traffic after installation of New Signal? Yes No

13. Do you see any advantages of providing the following road markings,

- | | | |
|------------------------|-----|----|
| a) Lane Markings | Yes | No |
| b) Edge Markings | Yes | No |
| c) Centreline Markings | Yes | No |
| d) Pedestrian Markings | Yes | No |

14. Do you see any advantages of providing the following signage's,

- | | | |
|--|-----|----|
| a) Informatory Signs (Direction Signs) | Yes | No |
| b) Warning Signs (One way Signs) | Yes | No |
| c) Regulatory Signs (Parking Signs) | Yes | No |
| d) Variable Message Signs (VMS) | Yes | No |

15. Do you see any advantages of providing blackberrys and printers to the police? Yes No

If Yes, how it has helped _____

16. Average Waiting Time at the Signalized Junction Before B-TRAC: _____

17. Average Waiting Time at the Signalized Junction After B-TRAC: _____

18. Do you have any suggestion for B-TRAC Project? _____

APPENDIX II

**Centre for Infrastructure, Sustainable Transportation and Urban Planning
(CiSTUP)
SID Complex, Indian Institute of Science,
Bangalore**

B-TRAC IMPACT SURVEY –Traffic Police Opinion Survey

Name of the Junction: _____

Date and Time of Survey: _____

Name of the Police Station: _____

- 1) Name of the Police Officer: _____
- 2) Do you see any improvements in the flow of traffic after Junction Improvement? Yes No
- 3) Do you see any improvements in the flow of traffic after signal upgradation? Yes No
- 4) Do you see any improvements in the flow of traffic after installation of new signal? Yes No
- 5) Do you see any decrease in traffic violations due to installation of enforcement cameras? Yes No
If yes, how much decrease in traffic violations in percentage?

- 6) Do you see any improvements in traffic management due to surveillance camera? Yes No
- 7) Do you see any advantages of providing the following road markings,
 - e) Lane Markings Yes No
 - f) Edge Markings Yes No
 - g) Centreline Markings Yes No
 - h) Pedestrian Markings Yes No
- 8) Do you see any advantages of providing the following signage's,
 - e) Informatory Signs (Direction Signs) Yes No

f) Warning Signs (One way Signs) Yes No

g) Regulatory Signs (Parking Signs) Yes No

9) Do you see any advantages of providing blackberrys and printers to the police? Yes No

If yes, how it has helped in booking of violation and collection of fines,

10) Do you see any increase in collection of fines after providing wheel clamps for illegal parking? Yes No

If yes, how much increase in the collection of fines?

11) Do you see any reduction of accidents due to B-TRAC Project?

Yes No

If yes, How much reduction of accidents in percentage?

12) Write in your own words the benefits of B-TRAC.

13) Do you have any suggestion for B-TRAC Project?

APPENDIX III

**Centre for Infrastructure, Sustainable Transportation and Urban Planning
(CiSTUP)
SID Complex, Indian Institute of Science,
Bangalore**

B-TRAC IMPACT SURVEY –Public Organization Opinion Survey

(BDA, BBMP, PWD, BMRCL, NH etc.,)

1. Name of the Organization: _____

2. Name of the Survey Respondent: _____

3. Date and Time of Survey: _____

4. Do you know anything about the B-TRAC Project? Yes No

If yes, what do you know about the B-TRAC Project:

5. Do you see any improvements in the flow of traffic after Junction Improvement? Yes No

6. Do you see any improvements in the flow of traffic after Signal Upgradation? Yes No

7. Do you see any improvements in the flow of traffic after installation of New Signal? Yes No

8. Do you see any advantages of providing the following road markings,

i) Lane Markings Yes No

j) Edge Markings Yes No

k) Centreline Markings Yes No

l) Pedestrian Markings Yes No

9. Do you see any advantages of providing the following signage's,

h) Informatory Signs (Direction Signs) Yes No

i) Warning Signs (One way Signs) Yes No

j) Regulatory Signs (Parking Signs) Yes No

10. Do you see any advantages of providing blackberrys and printers to the police? Yes No

If yes, how it has helped _____

11. Do you have any suggestion for B-TRAC Project?

APPENDIX IV

Table 3.19: Cycle Length of Different Junctions

SI No	JUNCTION NAME	TRAFFIC STATION NAME	Cycle Time(Peak hours)
1	Adugodi Junction	ADUGODI	190
2	Aishwarya Department (7th Main 1st Block Junction)	ADUGODI	175
3	BDA Junction	ADUGODI	130
4	KoramangalaWater Tank Junction	ADUGODI	205
5	Krupanidhi College Junction	ADUGODI	155
6	Maharaja Junction	ADUGODI	113
7	MICO Bande Junction(Bannerughatta Road)	ADUGODI	235
8	Micro Land Junction	ADUGODI	175
9	NGV Rear Gate Junction	ADUGODI	150
10	SonyWorld Junction (Koramangala 80ft rd)	ADUGODI	265
11	Srinivagilu Junction (Ejipura)	ADUGODI	210
12	UCO Bank Junction (Forum)	ADUGODI	260
13	Wipro Junction	ADUGODI	200
14	Forum Mall Other gate	ADUGODI	Signal free
15	Jaipuria	ADUGODI	145
16	Devara Beesana Halli Junction	AIRPORT	220
17	ISRO Junction - Airport Road	AIRPORT	193
18	Kadu beesanahalli Junction	AIRPORT	190
19	Kuvempu Circle Junction, HAL Main Gate	AIRPORT	205
20	Manipal Hospital Junction	AIRPORT	193
21	Marathalli Bridge Junction	AIRPORT	225
22	Yamalur Junction	AIRPORT	100

23	Anepalya Junction	ASHOK NAGAR	105
24	Arts & Craft Circle Junction	ASHOK NAGAR	170
25	Ashirwadam Junction	ASHOK NAGAR	130
26	Ashok Nagar Junction (Shoolay circle)	ASHOK NAGAR	245
27	Buchery Junction	ASHOK NAGAR	120
28	Campbell Road Junction	ASHOK NAGAR	135
29	Cash Pharmacy Junction	ASHOK NAGAR	160
30	CMP Gate Junction	ASHOK NAGAR	135
31	D'Souza Circle Junction	ASHOK NAGAR	125
32	Johnson Market Junction	ASHOK NAGAR	130
33	Lower Agaram Junction (India garage)	ASHOK NAGAR	230
34	Mayo Hall Junction	ASHOK NAGAR	150
35	Mother Theresa Junction	ASHOK NAGAR	120
36	Nanjappa circle Junction	ASHOK NAGAR	115
37	Old Police Station Junction	ASHOK NAGAR	135
38	OPERA Junction	ASHOK NAGAR	125
39	Palmgroove Junction	ASHOK NAGAR	85
40	Richmond Circle Junction	ASHOK NAGAR	180
41	Garuda mall	ASHOK NAGAR	Signal free
42	Arvind Super Bazaar Junction	BANASHANKARI	140
43	Attimobbe Junction	BANASHANKARI	120
44	Banashankari Bus Stand Junction	BANASHANKARI	235
45	Devegowda Petrol bunk Junction (Rani channamma circle)	BANASHANKARI	285
46	Hosakerahalli Junction (KEB Junction)	BANASHANKARI	120
47	Itmadu Junction	BANASHANKARI	135
48	JBS Nursing home Junction	BANASHANKARI	240

49	JSS Junction	BANASHANKARI	215
50	Kamakya Junction	BANASHANKARI	140
51	Katriguppe Junction	BANASHANKARI	205
52	K R Road Junction, Near JSS	BANASHANKARI	200
53	K R Road 14th Cross Junction	BANASHANKARI	136
54	NCERT Junction	BANASHANKARI	180
55	Seeta Circle Junction - Bhanashankari	BANASHANKARI	125
56	Yediyur Maternity Hospital Junction Kanakapura Main Rd.	BANASHANKARI	155
57	Hennur Road - ORR Junction	BANASVADI	253
58	Horamavu Junction	BANASVADI	88
59	Jyothi School Junction	BANASVADI	110
60	Kalyan Nagar ORR Junction	BANASVADI	180
61	Kammanahalli Junction	BANASVADI	190
62	Mariappa Circle Junction (CMR circle)	BANASVADI	170
63	Nagavara Junction (ORR)	BANASVADI	250
64	Ullasappa Junction	BANASVADI	200
65	Vishweswaraiah Junction (Uttam Sagar)	BANASVADI	131
66	Bharathi Nursing Home Junction (K.R Road)	BASAVANAGUDI	110
67	Chamrajpet 5th Main Junction	BASAVANAGUDI	220
68	Deevan Madhav Rao Junction	BASAVANAGUDI	95
69	Halli Thindi Junction	BASAVANAGUDI	100
70	Lalbagh West Gate Junction	BASAVANAGUDI	165
71	National College Junction	BASAVANAGUDI	140
72	R.V. Teachers College Junction	BASAVANAGUDI	195
73	Vanivilas Road & Shankarmutt Road Junction	BASAVANAGUDI	155
74	Vidyapeeta Circle Junction	BASAVANAGUDI	185

75	Yediyur Circle Junction	BASAVANAGUDI	140
76	Attiguppe Circle Junction	BYATARAYANAPURA	150
77	Chandra Layout - Near water tank Junction	BYATARAYANAPURA	170
78	Hoysala Circle Junction - Kengeri upanagara	BYATARAYANAPURA	140
79	KIMCO Junction (Mysore Road)	BYATARAYANAPURA	170
80	Mysore Road - Near Madhu petrol bunk Junction	BYATARAYANAPURA	115
81	Mysore Road - Ring Road Junction	BYATARAYANAPURA	185
82	Rajarajeshwari Junction	BYATARAYANAPURA	150
83	Satellite Bus stand Junction	BYATARAYANAPURA	125
84	PES Devegowda circle	BYATARAYANAPURA	93
85	Bangalore Body Builders Junction	CENTRAL	150
86	Medical College Circle Junction	CENTRAL	185
87	Minto Junction	CENTRAL	125
88	Royan Circle Junction	CENTRAL	110
89	Sirsi Circle Junction	CENTRAL	225
90	Chikkjala Junction	CHIKKAJAALA	110
91	Sadahalli Junction	CHIKKAJAALA	125
92	Vidyanagar Junction	CHIKKAJAALA	113
93	A.S Char Street - Mysore road Junction	CHIKKAPET	125
94	Binny Mill Junction	CHIKKAPET	110
95	Briyand Circle Junction	CHIKKAPET	205
96	Dr. TCM Royan Road Junction -Near Ambedkar Statue	CHIKKAPET	160
97	Khodays Junction (DV Urs circle)	CHIKKAPET	180
98	Shanthala Junction	CHIKKAPET	160
99	Anil Kumble Circle Junction	CUBBON PARK	185
100	Basaveswara Circle (LH) Junction	CUBBON PARK	170

101	Coffee Board Junction	CUBBON PARK	190
102	Gopal Gowda Circle Junction	CUBBON PARK	232
103	Indian Express Junction	CUBBON PARK	190
104	Minsk Square (CTO Junction)	CUBBON PARK	190
105	Police Timmaiah Circle Junction (GPO)	CUBBON PARK	190
106	Queens Statue Circle Junction (Jewels De Paragon)	CUBBON PARK	225
107	Siddalingiah Junction	CUBBON PARK	190
108	Devanahalli Cross (Bypass Cross)	DEVANAHALLI	95
109	Doddballapura Cross Jn. (Vijipura Cross & bypass - Doddballapura)	DEVANAHALLI	90
110	Nandi Cross (Rani cross)	DEVANAHALLI	121
111	Vijipura Cross Junction - Devanahalli cross	DEVANAHALLI	120
112	BHEL Junction	ELECTRONIC CITY	88
113	Electronic City - Phase 2	ELECTRONIC CITY	125
114	Naganathapura Junction	ELECTRONIC CITY	170
115	Timkin Junction	ELECTRONIC CITY	110
116	Veerasandra Junction	ELECTRONIC CITY	120
117	Wipro Junction	ELECTRONIC CITY	83
118	Hennur Road - Davis Road Junction	FRAZER TOWN	225
119	Mosque Circle (Mosque road - MM road Junction)	FRAZER TOWN	140
120	Pottery Circle Junction	FRAZER TOWN	210
121	Veeranna Palya Junction (BEL, H.O.)	FRAZER TOWN	180
122	Bhadrapa Layout Junction	HEBBAL	170
123	Hebbal Fly over Junction	HEBBAL	160
124	Kodigehalli gate Junction	HEBBAL	145
125	Nanjappa Circle (Vidyaranyaपुरa)	HEBBAL	80
126	Chandrika Junction	HIGH GROUNDS	80

127	Chaundaraya Circle / Udaya TV (Rotary) Circle Junction	HIGH GROUNDS	175
128	Krishna Floor Mill Junction	HIGH GROUNDS	230
129	Link Road Malleshwaram Junction	HIGH GROUNDS	125
130	LRDE Junction	HIGH GROUNDS	110
131	Platform Road Junction	HIGH GROUNDS	180
132	Shivanand Circle Junction	HIGH GROUNDS	240
133	Subedhar Chatram road Junction– Near Sheshdripurm PS	HIGH GROUNDS	135
134	B.M. Shri Junction (CMH & 100 Ft. Rd. Junction)	INDIRANAGAR	140
135	BEML Gate Junction - Suranjandas Rd Junction	INDIRANAGAR	140
136	Big Bazaar Junction (Pharmed Factory Junction)	INDIRANAGAR	130
137	Byappanahalli Junction (Suranjandas & OM Road)	INDIRANAGAR	200
138	CMH Rd & Indiranagar 80ft Road Jn (13th Mn & 80 Ft) Junction	INDIRANAGAR	125
139	Indiranagar ESI hospital Junction	INDIRANAGAR	205
140	OM Road & BMTC Depot Junction	INDIRANAGAR	150
141	OM Rd & Double rd Junction (Police Station Junction)	INDIRANAGAR	108
142	OM Rd & Indiranagar 80 Ft. Rd. Junction	INDIRANAGAR	190
143	OM Rd & Indiranagar 100ft Junction	INDIRANAGAR	145
144	OM Rd & Suddagunte palya Junction	INDIRANAGAR	130
145	Sony world Junction (I.Ngr 12th Main & I.Ngr 100 Ft.Rd.)	INDIRANAGAR	210
146	Indiranagar 13th Main(80ft Rd- JB Rd)	INDIRANAGAR	180
147	Arbindo Circle	JAYANAGAR	150
148	Canara bank Junction (Jayanagar 27th Cross & 9th main)	JAYANAGAR	150
149	Delmia - Jayanagar Junction	JAYANAGAR	170
150	Geeta circle - Jayanagar Junction	JAYANAGAR	140
151	Jayanagar 27th Cross Junction (Jaya nagar 4th main)	JAYANAGAR	185
152	JP Nagar 15th Cross Junction (JP Nagar 24th Main) - Underpass	JAYANAGAR	125

153	JP Nagar 9th Cross - 24th main Junction	JAYANAGAR	145
154	Puttanna Junction	JAYANAGAR	135
155	Rajalakshmi Junction	JAYANAGAR	140
156	South End Circle Junction	JAYANAGAR	175
157	Syndicate Bank Circle Junction - Jayanagar	JAYANAGAR	195
158	Fire Force Junction -(WCR 72nd Cross Jn) Rajajinagar	KAMAKSHI PALYA	120
159	Ring road - Near Kengunte Junction	KAMAKSHI PALYA	148
160	Ring road - Ullal Junction	KAMAKSHI PALYA	155
161	Srigandakavalu Junction	KAMAKSHI PALYA	165
162	Basappa Circle Junction	KR MARKET	220
163	Bharat Talkies Junction	KR MARKET	200
164	K.R. Market Junction	KR MARKET	145
165	Minerva Circle Junction	KR MARKET	233
166	Basappa Circle Junction	KR PURAM	130
167	Bharat Talkies Junction	KR PURAM	110
168	K.R. Market Junction	KR PURAM	165
169	Minerva Circle Junction	KR PURAM	145
170	Devasandra Junction	KR PURAM	115
171	ESIHospital Junction - K.R.Puram	KR PURAM	Configuration under progress
172	Mari Muthu Temple	KR PURAM	Signal free
173	Ramamurthy nagarJunction	KR PURAM	50
174	Doddanakundi Jn	KR PURAM	55
175	Kanakpura - Ring Road Junction	KS Layout	195
176	Konanakunte Junction (Kanakapur Road)	KS Layout	130
177	Automart Junction	MADIWALA	125
178	Ayappa Temple Junction	MADIWALA	160

179	Bommanahalli Junction	MADIWALA	175
180	Garvebavipalya Junction	MADIWALA	145
181	HSR 14th Main Junction	MADIWALA	255
182	Iblur Junction (Sarjapur Road)	MADIWALA	210
183	Koodlu Junction	MADIWALA	115
184	Madiwala Check Post Junction	MADIWALA	160
185	Sarjapur road - Check post Junction	MADIWALA	235
186	Silk Board Junction	MADIWALA	250
187	Automart Junction	MADIWALA	150
188	Basavamantappa circle Junction, Dr. Rajkumar Road	MAGADI ROAD	115
189	Cholur Palya Junction	MAGADI ROAD	100
190	Leproly Hospital Circle Junction (Hunsemara)	MAGADI ROAD	250
191	M.C. Circle	MAGADI ROAD	95
192	Prasanna Junction	MAGADI ROAD	180
193	Dr. Rajkumar Road, 10th cross Junction	MALLESWARAM	200
194	Dr. Rajkumar Road, 17th cross Junction	MALLESWARAM	125
195	Karnataka Bhavan Junction	MALLESWARAM	185
196	Malleswaram 18th Cross Junction, Sampige rd Junction	MALLESWARAM	120
197	Malleswaram 8th Main 18th cross Junction	MALLESWARAM	85
198	Margosa 18th Cross Junction	MALLESWARAM	130
199	Mill Corner Junction (Sampige road)	MALLESWARAM	135
200	Modi Bridge Junction	MALLESWARAM	180
201	Navrang Theatre Junction	MALLESWARAM	175
202	Rajajinagar 1st Block Junction	MALLESWARAM	205
203	Rajajinagar 19th Main Junction	MALLESWARAM	180
204	RRR (Okalipuram) Junction	MALLESWARAM	185

205	28th main Jayanagar 9th block Junction	MICO LAYOUT	185
206	29 th BTM Road Junction	MICO LAYOUT	185
207	Arakere Gate Junction	MICO LAYOUT	225
208	Bileka halli Junction	MICO LAYOUT	195
209	BTM 16th Main - ORR Junction	MICO LAYOUT	210
210	Dairy Circle Junction	MICO LAYOUT	100
211	Gurappanapalya Junction	MICO LAYOUT	190
212	Hulimavu Junction	MICO LAYOUT	120
213	J.D. Mara Junction	MICO LAYOUT	170
214	Jayadeva Hospital (BTM Layout) Junction	MICO LAYOUT	160
215	Marenahalli 18th Main petrol bunk Junction	MICO LAYOUT	140
216	Sagar Apollo Junction	MICO LAYOUT	225
217	Swagat Main Road Junction	MICO LAYOUT	180
218	14th Cross Peenya Junction	PEENYA	150
219	Bagalgunte Junction	PEENYA	170
220	Hesaragatta Cross Junction	PEENYA	165
221	Jalahalli Cross (SM circle) Junction	PEENYA	175
222	NTTF Circle	PEENYA	170
223	Peenya 2nd Stage Junction	PEENYA	130
224	SBM Junction	PEENYA	130
225	T.V.S. Cross Junction	PEENYA	215
226	SRS Junction	PEENYA	60
227	Bhashyam Circle Junction- Rajajinagar	RAJAJI NAGAR	138
228	ESI hospital Junction- Rajaji nagar	RAJAJI NAGAR	148
229	FTI Junction (Kanteerava studio)	RAJAJI NAGAR	215
230	Mahalaxmi Entrance Junction	RAJAJI NAGAR	145

231	Navrang Bar Junction (Dr. Rajkumar Rd & Bridge stone)	RAJAJI NAGAR	110
232	Rajaji Nagar Entrance Junction	RAJAJI NAGAR	85
233	Rajarajeshwari Kalyana Mantapa Junction, Dr. Rajkumar Road	RAJAJI NAGAR	108
234	CIL Cross Junction, Jayamahar Road	RT NAGAR	220
235	Devasandra Junction	RT NAGAR	98
236	Gulabi Junction	RT NAGAR	146
237	ISRO Junction, New BEL Road	RT NAGAR	185
238	M.S. Ramaiah Hospital Junction	RT NAGAR	222
239	RT Nagar PS Junction	RT NAGAR	153
240	Tarala Balu Junction	RT NAGAR	88
241	Bhashyam Circle Junction	SADASHIV NAGAR	230
242	Mekhri Circle Junction	SADASHIV NAGAR	170
243	Sadashivanagar Junction	SADASHIV NAGAR	190
244	Tata institute circle Junction	SADASHIV NAGAR	205
245	Vinayaka Junction	SADASHIV NAGAR	138
246	Coles Park Junction	SHIVAJI NAGAR	123
247	Hains Junction	SHIVAJI NAGAR	183
248	Haj camp Junction	SHIVAJI NAGAR	65
249	Kamraj Road Junction	SHIVAJI NAGAR	190
250	Manipal Centre Junction	SHIVAJI NAGAR	160
251	Naga theater Junction - Ulsoor	SHIVAJI NAGAR	157
252	Vetenary Hospital Junction, Queens Road	SHIVAJI NAGAR	123
253	Safina Plaza Junction (Shivaji nagar)	SHIVAJI NAGAR	55
254	Shivaji Nagar Intersection Junction (BRV)	SHIVAJI NAGAR	190
255	Thomas Bakery Junction	SHIVAJI NAGAR	110
256	Tyagi Hengalvaraya Junction (Dickenson Road)	SHIVAJI NAGAR	165

257	Adigas Junction (Ulsoor Rd Dickenson Rd)	ULSOOR	160
258	Anjeneya temple Junction	ULSOOR	135
259	ASC Junction	ULSOOR	180
260	Begum Mahal Junction	ULSOOR	205
261	CB Road Airport Junction	ULSOOR	178
262	Domlur water tank Junction	ULSOOR	155
263	Hosmat Junction	ULSOOR	118
264	Kensington Oval Junction	ULSOOR	118
265	Ramaiah Circle Junction - Ulsoor Police Station	ULSOOR	160
266	Tamari kannan Junction	ULSOOR	143
267	Trinity Circle Junction	ULSOOR	210
268	Webbs Circle Junction	ULSOOR	160
269	CMH Rd Adarsh Theater Jn	ULSOOR	60
270	Ramaiah Circle Jn	ULSOOR	180
271	Blood Bank Circle Junction	ULSOOR GATE	190
272	Devanga Hostel Junction	ULSOOR GATE	110
273	Hudson Circle Junction	ULSOOR GATE	200
274	N.R. Square Junction	ULSOOR GATE	200
275	Police Corner Junction	ULSOOR GATE	200
276	Poornima Theatre Junction	ULSOOR GATE	128
277	Shivaji Talkies Junction	ULSOOR GATE	200
278	Town Hall Junction	ULSOOR GATE	200
279	Ulsoor Gate Junction	ULSOOR GATE	200
280	Anand Rao Junction	UPPAR PETH	170
281	Elite Junction	UPPAR PETH	120
282	K.G. Junction	UPPAR PETH	120

283	Sagar Theatre Junction	UPPAR PETH	150
284	SBM Junction	UPPAR PETH	150
285	Subbanna Junction	UPPAR PETH	125
286	Upparpeth Junction	UPPAR PETH	110
287	5th Main Road. RPC Layout and Magadi Chord road Junction	VIJAYA NAGAR	135
288	Dhobi Ghat Junction	VIJAYA NAGAR	180
289	Havanur Circle Junction (Basaveshwarnagar)	VIJAYA NAGAR	240
290	Jaimunirao Circle Junction - Magadi Main Road	VIJAYA NAGAR	105
291	KHB Junction	VIJAYA NAGAR	150
292	Marenahalli Junction (Vijaynagar)	VIJAYA NAGAR	170
293	Modi Hospital Junction	VIJAYA NAGAR	175
294	National School Junction	VIJAYA NAGAR	93
295	Puttamma choultry Junction - Nagarbhavi road	VIJAYA NAGAR	180
296	Shankara Mutt Circle Junction (Vijayanagar)	VIJAYA NAGAR	200
297	Shivanahalli Junction, W.O.C road	VIJAYA NAGAR	145
298	Vijayanagar Bus Stand Junction	VIJAYA NAGAR	160
299	Big Bazar Junction (White Field)	WHITE FIELD	140
300	Graphite India Junction	WHITE FIELD	170
301	Hope Farm Junction	WHITE FIELD	220
302	Kundenahalli Gate Junction	WHITE FIELD	210
303	BMTC Junction, K.H. Road	WILSON GARDEN	148
304	K.H Junction	WILSON GARDEN	180
305	Lalbagh Main Gate Junction	WILSON GARDEN	140
306	NIMHANS Junction	WILSON GARDEN	110
307	Siddapura Junction	WILSON GARDEN	150
308	Urvashi Junction	WILSON GARDEN	150

309	Wilson Garden, 10 th cross Junction	WILSON GARDEN	180
310	Amruthahalli Junction (Byatarayanapura Airport Road)	YELAHANKA	140
311	Bagalur Cross Junction	YELAHANKA	110
312	Hunsemarrenhalli Junction	YELAHANKA	135
313	Kogilu cross Junction	YELAHANKA	132
314	Yelahanka Circle Junction	YELAHANKA	155
315	Yelhanka Bypass Junction	YELAHANKA	130
316	Santheveedi	YELAHANKA	60
317	Unnikrishna Jn	YELAHANKA	100
318	BEL Circle Junction	YESHAVANTAPUR	250
319	Gokuldas Images Junction	YESHAVANTAPUR	210
320	Guruguntapalya Junction	YESHAVANTAPUR	135
321	Kuvempu Circle, BEL Junction	YESHAVANTAPUR	140
322	M.S. Ramaiah Junction (Toll Gate)	YESHAVANTAPUR	185
323	Tumkur road Marappana Palya Junction - Metro work	YESHAVANTAPUR	80
324	Yeshwanthapura Flyover Junction	YESHAVANTAPUR	200

Source: www.bangalorettrafficpolice.gov.in