CHAPTER III
ANALYSIS OF GOVERNMENT PLAN AND POLICIES

1. Introduction:

Transport system is said to be as the nerves of the whole economy. Keeping its importance the government has attached great emphasis on its development. Certain government policies and plan are there which plays a crucial role in the urban transport planning, development, operation and management of its infrastructure in general. The plan for the city of Guwahati prepared by GMDA is said to be “The Comprehensive Mobility Plan” (CMP) which seeks to create an integrated land use and transport plan that aims to guide investments in transport in an efficient manner to achieve an overall mobility vision for the City. The Mobility Plan will also emphasize the movement of people and goods, not only just motor vehicles but also will give priority to public transit and non-motorized modes.

It is predicted that by the year 2030, the population will be approximately 2.7 Million within the Guwahati Metropolitan Area (GMA). This will result into an approximately estimated 1,26,000 peak hour vehicle trips in the year 2030, which will be about 2.7 times the present day volumes (source: GMDA Master Plan). The impact of this is serious to the quality of life of Guwahati.

Therefore the need for a Comprehensive Mobility Plan arises from the truth that transport improvement projects accomplished or in progress in Guwahati city (like construction of junction improvements, flyovers, foot over bridges etc) which also includes the second bridge over River Brahmaputra, are only projects in separation and not actually proposed to be part of an overall transport plan for the city of Guwahati. Besides
this, for funding to these very projects under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) is also selected.

The Comprehensive Mobility Plan, apart from preparing a transport improvement roadmap for the future which also includes identifying the transport speculation program containing short, medium and long term projects that hysterics into the Comprehensive thought process. While the Comprehensive Mobility Plan reaches out into the future (20 year prospect) with vibrant growth and fluctuations in our fast growing economy. The basics of the Comprehensive Mobility Plan need to be revised at least every five years for smooth functioning of the road transportation in the Guwahati city. It has also been observed that the Transport vision for Guwahati was conceived on the basis of consensus with the GMDA and the stakeholders.

2. **Issues Related to Road Transportation:**

The main issues relating to the road transportation in Guwahati can be viewed on the following ground as:

2.1. **Issues related to Road:**

- Lack of sufficient road space: The length of surfaced road within the city is presently 218 km. The major corridor roads suffer from insufficient right of way, illegal construction and improper planning and design. The roads in the residential neighborhoods are extremely narrow (lack of proper regulations) and ill maintained causing problems related to both traffic and infrastructure installations (*Assam Remote Sensing Application Centre-ARSAC*).
• Water Logging in the roads are serious problem in Guwahati city which leads to traffic congestion and submerging of economic activity.

• The roads are being encroached by the street hawkers and have reduced the road capacity.

2.2. Issues Related to Public Transport

• Public Transit Routes are unregulated; too many buses in one route are seen.

• Trekkers are competing with city buses in many routes of the city.

• There is no Bus bays system in the Guwahati city rather the bus stands are seen every after 200 meters.

• Water Transport facilities are inadequate that leads to the more load in the city routes.

2.3. Issues Related to Traffic:

• It is seen that High Volume in Central Business District area like very busy areas such as Paltanbazar, Chandmari, Ganeshguri, GS Roads etc.

• The Junctions in the Guwahati city are not designed properly.

• Flyovers in the city exist at high volume junctions.

• Flyovers are not always aligned to traffic flow of the city.

• There are about 16% through truck traffic, that has no business in the City

2.4. Issues Related to Non-Motorized and Pedestrian Facilities:

• Non Motorized Transport mode of travel in Guwahati is 25%, but Non Motorised Transport facilities are deplorable in nature.
• It is seen that there is no lane segregation for slow moving vehicles in the city.
• There is lack of pedestrian crossings and posing safety hazards in the city.
• Most of the footpaths are encroached by street hawkers in the city.

2.5. Issues Related to Parking:

• Parking’s are haphazard and it is a major contributor to congestion on roads in the Central Business District area of the city.

• Truck parking’s are predominant on the main arterials roads and it is reducing road capacity.

Based on the above mentioned issues and threat, the government of Assam has identified the following plan related to road transportation for the city of Guwahati, which is as follows:

1. Mobility Corridor Plan.


5. Traffic Engineering.

6. Travel Demand Management plan.


These individual plan elements are discussed detailed in the subsequent sections:
3. Government Plan on Mobility Corridor:

As Stated above, mobility plan of the government for corridors emphasized on mobility of transportation and it aims at maximizing the throughput of the people in the city. Mobility Corridors also focus on public transit systems, ensuring when designing these corridors, all these modes of travel is considered and integrated. It is essential; therefore certain strategies relating to roads need to be designated as Mobility Corridors to focus on corridor mobility. These corridors get priority for increasing the throughput as well as operating point of service.

3.1. The road based corridors would be expected to have the following cross sectional elements:

- The road cross section should be at least 25meter for mixed traffic conditions or 30meter for dedicated public transport lane conditions in the city.

- Continuous kerb, footpath-cum-drain & bi-cycle lanes need to be enhanced in the city.

- Service roads need to be feasible.

- Restriction or preferably prohibitions of parking on the carriageway/shoulders need to be enhanced.

- At-grade/grade-separated public transport systems as per the public transport should be there.

3.2. Mass transport master plan.

The mobility corridors plan for the Guwahati Metropolitan Area constitutes of radial roads complemented with circumferential roads to form a radial and ring pattern of
the municipal network. The mobility corridors of the transportation plan forms the radial networks with the following roads:

1. GS Road
2. AT Road
3. Zoo Road
4. Lokhra Road
5. Fatasil Ambari Road
6. MRD Road

In Guwahati, though the radial network of road is present but the network needs to be upgraded to mobility corridor standards. This network should be widened at least 30 meter ROW of the roads norms. Along with these it is suggested that ring road will provide the dispersal of traffic from the Central Business District area of the city.

3.3. The orbital network of mobility corridors plan are as follows:

The Core Orbital road of the plan for city includes of MG Road - B Baruah Road - Kakoti Road - RK Choudhury Road. The road is utilized the existing sections (upgraded to mobility corridor standards) and it encircle the core area of the city. Road traffic which is not destined to the central part of area can be utilized inner ring road to bypass the central area for relieving the congestion of the city and surrounding area.

The Inner Orbital road is connecting GS Road with Fatasil Ambari Road. Linking it with AT Road, near Maligaon would have been completed the ring and would be provided easy connectivity from Lower Assam to the Maligaon areas of the city. However,
due to topographical problems, this connection will be very expensive and may not be possible.

The Outer Orbital Road: The third ring (existing By Pass Road-NH37) would be a regional ring circumscribing the GMDA. North portion which connects NH-31 and Amingaon areas circumscribe the two new towns, South portion is connecting with NH-37, Basistha Road, Lokhra Road and Fatasil Ambari, East portion connects Chandrapur Road and Narengi, via the VIP Road of the city. This would be enormously important as the large employment centers are being planned by the authority as per the Master Plan along this existing road (NH 37). This Outer Orbital road will include a major bridge (2nd Brahmaputra Bridge) across the mighty River Brahmaputra. The outer orbital should have to have a minimum of 40 meter ROW, whereas the inner and core rings should have a minimum of 30 meter ROW.

The numbers of estimated trips that the mobility corridors would carry in the peak hour of the day in the year 2030 is presented in Table.
Fig1. Traffic Flows on Major Mobility Corridors -2031

Source: GMDA
Table: C-1

Daily Trips (Vehicle and Public Transit) on Mobility Corridors (As projected by the GMDA for the Year 2030)

<table>
<thead>
<tr>
<th>Mobility Corridor</th>
<th>Daily Vehicle Trips</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS Road</td>
<td>94,800</td>
</tr>
<tr>
<td>Lokhra Road</td>
<td>79,800</td>
</tr>
<tr>
<td>Core Orbital</td>
<td>41,800</td>
</tr>
<tr>
<td>Inner Orbital</td>
<td>57,900</td>
</tr>
<tr>
<td>Outer Orbital</td>
<td>98,000</td>
</tr>
<tr>
<td>A T Road</td>
<td>1,40,000</td>
</tr>
<tr>
<td>New Town I Road</td>
<td>10,5000</td>
</tr>
<tr>
<td>New Town II Road</td>
<td>95,000</td>
</tr>
<tr>
<td>Riverside Road</td>
<td>10,6000</td>
</tr>
</tbody>
</table>

Source: Record of GMDA

The table C-1 exhibits that the growth of the daily trip in the city by 2030. This implies that the number of vehicular trip will reach at peak. If the measures would be taken to tackle such problem in advance than there will be smooth follow of road traffic otherwise it will create severe traffic problem. Therefore the government should give first priority to solve traffic congestion in the city.

4. Government Plan on Public Transport:

One of the major strategies that identified in the government plan as a part of the vision is enhancement of the existing share of seats in public transports (modes like cumulative of road, rail and water but excluding IPT) by 60%. The present transport share
is 13% of the projected capacity for the year 2030. If nothing is done for future; the situation will be worsening by the year 2030. For these purposes the government has identified number alternative strategies for public transportation system. The alternatives are as follows:

- Enhance Bus System, including Route Rationalization
- Bus System and Higher Order Mass Transit System

4.1. Public Transport Plan: Bus Fleet Enhancement

Before any severe public transport corridor plan is projected, it is important to make better use of and upgrade the existing public transport. As stated earlier approximately 900 buses ply in Guwahati (Average daily) and instead of that the transit share very is low. The major problem of transportation lies in unregulated routes system of the city. As a part of this situation, ASTC will be required to lessen the bus route system, with sufficient frequencies in the required routes of the city. The bus fleet system of the city need to be controlled by a central authority and also will need to substitute the part of the existing bus fleet with modern buses. The bus services offered should be appropriate for various segments and services along with ITS applications.

As it has mentioned earlier, a Bus Transport Supply Index (BTS) (buses per lakh of population) of approximately 50 is recommended by Central Institute of Road Transport (CIRT), Pune. The existing index is 72. Depending on the projected index, the numbers of buses per lakh of population is adequate. Nevertheless, the private buses and trekkers that comprise part of the public transit have much inferior capacity (i.e. 50%) than that of full size buses.
If it is taken in the consideration than the index (reworked) are about 40. This means that the supplementary fleet requirement is around 110 buses for the present situation. For 2030, the bus necessity will be around 1300. The bus fleet augmentation should be paying attention on modern buses where selection of bus technology is important, as it will strappingly influence the system’s performance and commuter perceptions. Vehicles have straight impact on speed, capacity, ecological friendliness and comfort. The urban transport model is used to replicate traffic distinctiveness under this scenario (2011). It may be seen that the predictable public transport modal share increases by about 3% from a Do Nothing level under this scenario. It is imperative that additional strategies are required to increase public transport modal share (source: Guwahati Municipal Development Agency 2011).

4.2. Public Transport Plan – 2011- 2021

As suggested in the temporary land use strategy of the governments plan, the expansion and development focus should be concentrated on New Town III. Its closeness to the airport recommends great growth prospective to the area in and around New Town III. The public transportation strategy therefore focuses on expansion of a linear public transit corridor, along with additional mass transit corridors feeding into it. The AT Road Corridor need to be upgraded to the higher order mass transit corridor. The new corridor would be as follows:

**Corridor 1:** In the corridor 1 the existing railway lines are well-matched from an arrangement perspective to run commuter trains on this corridor. This way would run south west to east from New Town III via the Airport and Jalukbari to Narengi. The corridor would be just about 35 km in length. 17 stations are projected along the corridor.
They are: Airport, Azara, Boragaon, New Town III, Tetelia, Jalukbari, Adabari, Maligaon, Kamakhya, Bharalumukh, Fancy Bazaar, Paltan Bazaar, Silpukhri, Bamunimaidan, Noonmati, Narengi, and Forest Gate. To make certain a comprehensive permanence to the above corridors, other mass transportation corridors have been recognized. They are:

**Corridor 2:** This corridor as recognized for Public transportation Plan 2011 will remain Bus Rapid Transit corridors throughout this interim period. This corridor would run north-south directions from the Guwahati Railway stations towards G.S. road. The length of this corridor about 10 km, is projected to be aligned along the Guwahati Shillong (GS) road, and the main proposed stations along this corridor will be Guwahati Station/Paltan Bazaar, Ulubari, Bhangagarh, Ganeshguri, Dispur, Six mile, and Khanapara.

**Corridor 3:** The corridor 3 is starting from the Railway Station and heading southwards along the Lokhra road, where a new activity compound with employment capacity of more than 1,00,000 has been projected. From these points it turns westwards all along the Outer Ring Road to meet Corridor 1 (commuter rail) at Boragaon.

**Corridor 4:** The corridor 4 will be next to the existing bypass road (NH 37), from Khanapara to Boragaon, where corridor densification is estimated.

**Corridor 5:** The corridor 5 would be next to the existing bypass road (NH 37), from Jalukbari to New Town III.

The corridors 2, 3 and 4 are projected to have peak hours to load of about 5000 PPHPD. Depending on this, a bus speedy transit system will be advantageous. However, commitment of the corridors 3 and 4 to an elevated order mass transit corridor would depend on the expansion of the areas as projected in the Master Plan.

While it has been believed that the commuter line must be developed for Corridor 1, the Governments initial discussion with the railway authorities expose that at the
present instant there are no authentic plans for running commuter trains and in view of the present load on the lines, using the existing lines to run an proficient commuter train with 10 minute frequencies would not be possible. For Corridor 1, the preliminary solutions need to be developed a BRT. It has been recommended that a monorail be installed by 2016.

4.3. Public Transport Plan – 2030

With the growth and enlargement of the additional two new towns (New Town I and II) in the Guwahati city, the mass transit corridor system needed to be extended to include all new institutions of activity in the GMA area of Guwahati. The existing railway routes are well suited from a configuration perspective to run traveler trains on three central corridors. One corridor (Corridor 1) has already been recognized in the interim period, as a commuter rail corridor.

**Corridor 1:** This route will be running in the south west to east direction from New Town III via the Airport and Jalukbari to Narengi. This corridor will have approximately 35 km in length. 17 stations are to be proposed all along the corridor. These are: New Town III, Airport, Azara, Boragaon, Tetelia, Jalukbari, Adabari, Maligaon, Kamakhya, Bharalumukh, Fancy Bazaar, Paltan Bazaar, Silpukhri, Bamunimaidan, Noonmati, Narengi, and Forest Gate.

**Corridor 2:** This route will be running in the direction of south west to north from the New Airport to Amingaon via Jalukbari. This corridor is about 20 km in length. 9 stations are projected all along the corridor. These are: Airport, Azara West Boragaon, Jalukbari, Amingaon and New Town III.
**Corridor 3:** This route will be running in the direction of south west to east from New Town III to Narengi via Jalukbari. This corridor is about 30 km in length. 16 stations are projected all along the corridor. These are: New Town III, Amingaon, Jalukbari, Adabari, Maligaon, Kamakhya, Bharalumukh, Fancy Bazaar, Paltan Bazaar, Narengi, Silpukhri, Bamunimaidan, Noonmati and Narengi Forest Gate.

To ensure a wide-ranging integration with the above mentioned corridors, other mass transit feeder corridors have been recognized. They are:

**Corridor 4:** This will be running in the direction of north-south, from New Town I up to the Khanapur via the ongoing 2nd Bridge (only road) over the river Brahmaputra and the Guwahati Railway station, running all along G.S. road. The corridor length is of 20 km, proposed to be aligned along the G.S. road. The important stations projected all along this corridor would be New Town I, Abhoypur, Guwahati Station/Paltan Bazar, Ulubari, Bhangagarh, Ganeshguri, Dispur, Six mile, and Khanapara. The Second Bridge on the river Brahmaputra will only be a road bridge, as part of this corridor.

**Corridor 5:** This corridor will be connecting the north – south mass transit corridor (Corridor 4) to New Town II and will be parallel to the River in North Guwahati.

**Corridor 6:** This corridor is starting from the Railway Station and heading towards southwards along the Lokhra road, where a new commercial activity complex with large number of employment spaces is about more than 1, 00,000 has been projected. From these points it turns westwards all along the Outer Ring Road to meet Corridor 1 (commuter rail) at Tetelia-West Boragaon.

**Corridor 7:** This corridor would be all along the existing bypass road (NH 37), from Khanapara to Tetelia-West Boragaon, where corridor densification is expected.
**Corridor 8:** This corridor would be from airport road (NH 37), to New Town III via Jalukbari. These corridors (mainly 4, 5, 6, 7 and 8) are projected to have a peak hour moving capability ranging from 2000-9000 PPHPD. Depending on this, a bus rapid transit arrangement will be desirable. It has been observed that a monorail system may be feasible along some of the corridors like Corridor 4 (from Khanapara to Paltan Bazaar), Corridor 5, 6 and 8.

A contrast of different types of transportation systems may be painstaking for the study area. A Techno Economic Viability Study considering performing capability, numerical constrains, capital & operating costs, alternative analysis etc. would be determined the final alignment and technology of the corridor. The Passenger per Hour per Direction (PPHPD) of the corridors is presented in Table C-2.
### Table C-2

**2030 PPHPD on Mass Transit Corridors**

<table>
<thead>
<tr>
<th>Mass Transit Corridor</th>
<th>PPHPD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corridor 1</td>
<td>5500</td>
</tr>
<tr>
<td>Corridor 2</td>
<td>3100</td>
</tr>
<tr>
<td>Corridor 3</td>
<td>1500</td>
</tr>
<tr>
<td>Corridor 4</td>
<td>3250</td>
</tr>
<tr>
<td>Corridor 4A</td>
<td>4200</td>
</tr>
<tr>
<td>Corridor 5</td>
<td>5400</td>
</tr>
<tr>
<td>Corridor 6</td>
<td>2500</td>
</tr>
<tr>
<td>Corridor 7</td>
<td>2500</td>
</tr>
<tr>
<td>Corridor 8</td>
<td>4500</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>32450</strong></td>
</tr>
</tbody>
</table>

Source: GMDA

It is anticipated that there will be 32,450 public transport trips (intra-city) by the year 2030. In all, public transportation trips would be 52% of total person trips in 2030. Therefore the government recommends that the Commuter lines need to be developed on the existing rail network (i.e. Corridors 1, 2 and 3) all along with Monorail on the five recognized corridors. If in the occurrence, commuter lines cannot be formed it would become indispensable to enhance the 2011 BRT corridors by way of Monorail to meet the forecasted demand. Depending on the enlargement and regional impact of the earlier stated plans, more transportation corridors may need to be looked into the account, on a
later date. The final mass transportation corridor routes at first adopted for the purposes of Comprehensive Mobility Plan. Introducing mass transportation system of high degree into the transportation system in calculation to the fleet intensification will raise the public transport share to 52% (excluding non-motorized and IPT trips in the city).

4.4. Bus Stations

It is very significant that the bus stations are expediently and quickly accessible by public transportation and Non Motorized Transport. Presently the terminal runs public buses to various parts of Guwahati city and neighboring areas. It is suggested that intercity buses operate from the ISBT and Paltan Bazaar bus station. New bus terminals recently developed in the plan are shown as below.

Table: C-3

<table>
<thead>
<tr>
<th>Recently developed new bus terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Paltan Bazaar</td>
</tr>
<tr>
<td>2. Chandmari</td>
</tr>
</tbody>
</table>

Source: GMDA Master Plan

These stations should be ensured integration Non Motorised Transport modes like cycle – rickshaws, IPT modes as similar to taxis and auto-rickshaws, make available park
and ride facilities and also incorporate with other public transport modes (bus to commuter rail/monorail/LRT etc.). Bicycle incorporation would consist of association of bicycle ways to the station, bicycle parking conveniences and rental facilities. Taxis, auto-rickshaws and trekkers are very often seen as a major competitor to public transport rather than as harmonizing services that can efficiently extend the coverage of the transportation systems service area.

Incorporated fare policies are imperative for flawless travel between modes. To promote comprehensive and incorporated fare structure and payment expertise accepted by all participants’ parties by coordinating all the public transit organizations connected to different modes.

The bus stations should be incorporated with intelligent transportation Systems which encompass a wide range of narrative technology tools for managing transportation networks efficiently and it also provides better services for travelers. The various combinations of technologies unite to form different types of Intelligent Transportation Systems with the following:

- AVL (Automatic Vehicle Location)
- ASD (Automatic Scheduling and Dispatch)
- TSP (Transit Signal Priority)

Intelligent Transportation Systems (ITS) applications in a bus station and in bus will give advantages to the drivers and concern person the following benefits:

- Vehicle Prioritization
- Electronic Fare Collection
5. **Government Plan on Non-Motorized Transport:**

As per the plan of the government about 25% of trips in Guwahati are being made by Non-motorized transport (NMT) in the city. The mobility transportation plan targets 50% of NMT trips. To make certain more and safe NMT trips, stipulation of foot path, secure pedestrian crossing facilities and slow moving vehicle lanes are projected as part of the NMT Plan.

5.1. **Footpaths**

A considerable portion of the trips (i.e. 15%) are made absolutely by walk. Sidewalks have important community benefits. The target predetermined for Walk ability index is 100%. The following is recommended for the installation of footpath:

- Foot path is to be installed on the anticipated mobility corridors and also on the secondary arterials, as a lowest amount of requirement. It needs to be installed in all the residential roads, where possible.

- A minimum functional width of 1.5 meters should be provided for footpath.

- It is advantageous to have a footpath breadth of 2.0 meter for all roads.

- Obstructions on footpath must have to be relocated. The footpath should be clean and even of comfortable to walk on.

- Footpath blueprint must dishearten two wheelers using the footpath all through the periods of congestion.
At every signalized intersection pedestrian zebra crossings must be undoubtedly marked.

Footpaths at all busy intersections should be provided with handrails to put into effect pedestrians cross at zebra crossings.

5.2. Pedestrian Facilities:

Walking is a major mode in the city of Guwahati. The transportation system plans, promotes and facilitates walking. The most important strategies and procedures proposed as part of the plan are as under:

- Prerequisite of sidewalks on the primary arterials, sub-arterials and the collectors on both sides of the road and at least one side on local roads is needed in the city.

- Cross pedestrian amenities need to be provided as per the warrants suggested by Indian Roads Congress.

- Sidewalks at the major roads need to be designed for level of service “C”

- Improvement procedures in terms of pedestrian controlled conveniences at intersections, grade separators and widening of sidewalks in the essential Area and along major corridors

5.3. Pedestrian Grade Separated Facilities

The government’s plan has put a little effort to alienate grade pedestrian crossing facilities, these must be positioned on the mobility corridors and the near pedestrian demanding land uses. An appraisal of the past studies and pedestrian crossing demand had
been utilized to identify a prima facie a few selective locations where grade-separated crossing amenities are necessary. The locations that are being suggested for grade separation are at Maligaon, MG Road (Fancy Bazaar),

1. Adabari
2. MG Road
3. Guwahati Club,
4. Chandmari,
5. Ali Road Railway crosses (Lakhtokia),
6. Paltan bazaar
7. Lachitnagar
8. Ganeshguri
9. Zoo Road
10. Basistha
11. Garpandu
12. Kachari
13. RG Baruah Road (In front of Zoo)

Priority must be given in the short-term to some of the areas like Chandmari, Maligaon, Lachit Nagar, and also ABC Point. It is very indispensable that pedestrians are isolated from public transportation systems securely onto footpaths.

5.4 Bi-cycle Lanes

Numbers of trips exceeding a trip length of 2 KM are always made by the inhabitant through bi-cycle. It is reported that about 12% of the total journey trips in
Guwahati are being made by cycles and cycle rickshaws. To encourage and accommodate
to these trips committed the bi-cycle lanes must be provided in the city. The non-
motorized vehicle lanes should be continued and form a smooth flow network. The cycle
lanes need to be provided on all mobility Corridors of the city and those roads that has
high share of bi-cycle traffic in the city.

5.5. Cycle Stands and Rickshaws Stands

Cycle rickshaw stands need to be located all along the public transportation
corridors, along with safe and protected parking for cycles. These will provide faultless
mobility for passengers by means of public transit system and the same should be attached
with local area bike path.

6. Government Plan on Freight Management:

6.1. Freight management

Freight transport management plan is the very important for controlling entire
traffic of the city. It includes number of strategies in increasing the efficiency of freight
and commercial transport.

It is important for restricting the delivery times in main (central) business districts
and at important Corridors. If it is implemented than user will have the following
advantages:

- It helps truck traffics to be restricted at busy areas such as A.T. Road, MG Road
  and GS Road of the city.
➢ It helps to use of proportionate number of small and medium size of vehicles with modern emission controls in the central city areas need to be restricted.

➢ It helps to organized delivery systems of the vehicles so that very few numbers of vehicle trips are needed to distribute goods (e.g., using common carriers that consolidate loads, rather than company fleets).

➢ It helps the authority to change the delivery times to reduce traffic congestion.

To have the better freight management plan the Government should Provide Truck Terminals at the following area:

1. Narengi
2. Khanapara
3. Lokhra Chairali
4. Mirjapur
5. North Guwahati

6.2.Goods Movement

A large volume of vehicles of goods traffic moves within the Guwahati facilitating city’s production and consumption patterns. Proficient movement of goods traffic is significant in reducing expenditure and increasing economic productivity of the city activities. It is very important that requirement of goods traffic are given attention at the different planning stage and adequate land resources are allocated.
6.3. Goods Traffic Prospects

The transportation modeling has indicated that, the goods vehicle traffic, at the Outer Cordon, will be approximately 38764 vehicles on an average per day, by the perspective year (*source: GMDA Master Plan*). It is very significant that the movement of goods traffic is streamlined to improve productivity, increase efficiency, reduce congestion and promote safety.

6.4. Planning for Goods Movement

Planning is very important for goods movement in an urban area like Guwahati city. Therefore the government has plan for:

- Separate planning for goods generating activities is required like for wholesale markets, major industries, warehousing and storage areas, etc.
- Separate planning for movement of goods modes and planning for parking and servicing of goods vehicles.

6.5. Goods Terminals

A major goods terminal is projected to be developed by the government as part of the Integrated Freight Complex along through rail depot and truck terminal at North Guwahati area in planned New Town I. This will be rail cum road terminal. The suggestion is to extend an Integrated Freight Complex at the new location of the city. In the land use plan of the government, an area of 238 ha in North Guwahati has been projected for the IFC. The IFC and other interrelated facilities like truck terminal, rail terminal, supporting public and semi public facilities etc. are to be developed in this area.
Therefore it is recommended that a pre viability study of the IFC should be conducted and an incorporated plan and program of accomplishment need to prepare immediately. The concept of IFCs has been simply put; it is replication of Central Area, in terms of functions and amenities, at a slighter scale, at the new location which is recognized for relocation of commercial activities. The IFC is not commodity particular but would comprised of all commodities markets so that a purchaser within or outside the Guwahati, would be capable to get commodities at his needs at one place.

The very significant and critical constituent of an IFC is the transportation component. The IFC is associated to other parts of the city of Guwahati, including the main central business area, and the city regions, with the good transport network and the service system. Transportation terminal of both the truck and rail terminals are essential parts of an IFC. Enough parking place for all modes is very important. An association which is called as the ‘Guwahati Integrated Freight Complex Company (GIFCC)’ can be set up with impartiality contribution by Guwahati Metropolitan Development Authority (GMDA) and the stakeholders. The Guwahati Integrated Freight Complex Company (GIFCC) shall be responsible for preparing plan and promoting the development of the IFC. It should also mobilize resources for IFC expansion. It should advocate for ratification of proclamations/regulations for the procedure of the IFC. The GIFCC may also advocate for execution of incentives and disincentives for rearrangement of trade and other functions from essential area to the IFC.

The GIFCC might set up one or additional Special Purpose Vehicles (SPVs) to build, operate and manage all or the diverse components of the IFC. The administration of the SPVs shall be with private sector by a small share in the equity by the GIFCC.
Planning, expansion, operation and administration of IFC (s) is an answer to the growing needs of the city, rising congestion within and worsening environment quality of central areas, mounting accidents on the road network system, rising costs of goods and services, falling productivity of resources and falling competitiveness and image of the city of Guwahati.

6.6. Truck Terminal Space Norms

Truck terminal and Rail terminal are incorporated as adjacent parts of an Integrated Freight Complex (IFC) in the Guwahati city. Looking at the present demand of goods vehicle in the city, the government has decided to have the following spaces norms for the truck terminals. As per the plan laid by the government, the broad land use break up of a truck terminal will be as under:

Table: C-4

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Use Type</th>
<th>% of Area</th>
<th>Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Transport Operators (office, storage, loading/unloading)</td>
<td>30.0</td>
<td>18.0</td>
</tr>
<tr>
<td>2</td>
<td>Service Industry (Fuel Filling Stations, Service area, weigh bridge, etc)</td>
<td>6.0</td>
<td>3.6</td>
</tr>
<tr>
<td>3</td>
<td>Public &amp; Semi-Public (Police, Post, Telephone, Telecommunication, health conveniences, etc)</td>
<td>3.0</td>
<td>1.8</td>
</tr>
<tr>
<td>4</td>
<td>Commercial (eating places, dormitories, rest rooms, shops, etc)</td>
<td>3.0</td>
<td>1.8</td>
</tr>
<tr>
<td>5</td>
<td>Parking (Idle, transit, others)</td>
<td>18.0</td>
<td>10.8</td>
</tr>
<tr>
<td>6</td>
<td>Open Spaces</td>
<td>10.0</td>
<td>6.0</td>
</tr>
<tr>
<td>7</td>
<td>Circulation</td>
<td>28.0</td>
<td>16.8</td>
</tr>
<tr>
<td>8</td>
<td>Others</td>
<td>2.0</td>
<td>1.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>100.0</strong></td>
<td><strong>60.0</strong></td>
</tr>
</tbody>
</table>

Source: GMDA
The table C-4 exhibits truck parking space norms. As per the governments plan, 30% requires for Transport Operators requires, 6% for Service Industry, 3% for Public & Semi-Public, 3% for commercial use, 18% for parking (i.e. idle, transit and others) 10% for open spaces, 28% for circulation and 2% is needed for other purpose. It is reported that above mention spaces are indispensable for smooth maintaining the parking.

6.7. Rail Link

To develop the commercial activity in the state, the rail link to commercial hub is very important. Therefore the above recognized (i.e. Truck points) location should to be linked by the regional rail system. The core rail line to Guwahati runs on the west of the projected zone. It is recommended that a rail branch linkage from this main line need to be extended up to the IFC. Nevertheless the rail terminal and its depot plan should be prepared as an integral component of IFC plan in the Guwahati city.

The state government had projected the rail link to extend and to run all along the eastern edge of New Town I and North Guwahati and as per plan it crosses mighty river Brahmaputra to link with main line. The projected bridge across the mighty river Brahmaputra might be a rail-cum-road bridge or there can be two separate bridges. Therefore the techno economic viability study should to be carried out to make a decision the location of the bridge(s), alignment of the rail line and the alignment of the peripheral by-pass Road of the city.

6.8. Road Network for Major Goods Movement

A special road network to accommodate future needs of Guwahati Metropolitan Area has been proposed in the CMP-2025 of the GMDA. At the very top of the hierarchy,
the bypass system taking off from the NH-31 in the North of the city, delineating the projected wholesale market area, crosses the mighty river Brahmaputra on the east side of the city, runs eastwards all along the river bank up to Tadibagan, moves southwards and it run southwards to meet Guwahati Shillong Road via (NH-37) at the junction with the current Bypass road. A new road of south Guwahati of the existing Bypass road and in equivalent to it is projected from Shillong road to the Airport road (Azara). On the other hand the western side the peripheral Bypass road which runs from the NH-31 of the north Guwahati, run westwards linking the projected New Town and turn southward and it crosses the river Brahmaputra and run southwards west of the airport and again it connect to the road network of the projected New Town of the south Guwahati. In this regards two bridges across river Brahmaputra are being proposed, on the other east and west sides of the existing bridge and all along the proposed Bypass is alignment. All heavy goods vehicles are planned to be routed all along this Bypass Road of the city, accessing the wholesale market area, the industrial areas, the New Towns and other destination points.

(source: Master plan prepared by the Guwahati Metropolitan Development Authority)

6.9. Movement of Goods Modes

The movement of goods traffic modes on the road network of the city needs to be rationalized. Goods modes may be grouped into three types as under for smooth flow of road transportation as:

- Small sized vehicles like pick ups
- Medium sized vehicles like LCVs and
- Large size vehicles like 2/3 Axle Trucks, Truck Trailer & MAVs
Small size vehicles like ‘Pick up vans’ performs an indispensable distribution function. In space occupancy and maneuverability of these vehicles are similar to cars. Their movement on all roads of the Guwahati city, at all times of day may be permitted. As a part of traffic management plans, the authority may separate the parking areas for ‘Pick up vans’ may be identified.

Medium size vehicles like LCVs are also important to move with goods to and from industries, warehouses and other major activities of the city. They distress overall level of service of traffic in the city therefore these should not to be permitted in the central areas of the city.

Large sized goods vehicles consume elevated amount of road capacity, hinder traffic flows, cause accidents and adversely affect environment and also consume large extent of land for parking. These vehicles required to receive at the urban periphery and assist in terms of planned the terminals. Major truck terminals and good parking place is proposed to be developed as part of IFC in Guwahati city.

6.10. Movement of ‘Non-Destined’ Traffic

Traffic surveys of the plan indicated that a high share of ‘non-destined’ or ‘through’ traffic of goods vehicles are seen at the outer cordon of the city. With the enlargement of the North East Region and the centralized road system has led to the increased of ‘non-destined’ traffic in the city. This traffic may be facilitated through the system of bypass roads.

7. Government Plan on Traffic Management:

Traffic Management Plan of the Government of will include the following Characteristics (GMDA Master Plan):
• Junction improvements

• Area Traffic Control Systems

• Traffic Management Measures

• Safety Measures

• Parking Management Plan

7.1. Junction Improvements

Junctions are the major source for hindrance in the smooth flow of road transportation system. As the traffic volume increases on major arterial roads, it requires improving safety and providing systematic movement of vehicles traffic signals will be acceptable. Traffic delays continue to rise at the junctions, the following traffic management procedures must be measured before any major improvements:

• Reduction of number of points.

• Restriction of right turns. The restricted right turn traffic must suitably be rerouted through indirect right turns or U-turns etc.

• Widening the intersection throat to increase the approach capacity.

• Coordinating traffic signals on adjacent intersections using ITS.

• Installation of medians and closing the cross street to divert traffic to other high capacity intersections if feasible.

• Improving one way rule.

Since vehicle owners will not come down directly to develop the economy, hence extremely congested junctions of the city would continue to witness large delays and
traffic jams even after following the above stated traffic management measures of the Government. Such dangerous intersections can be prospective for the capacity intensification by way of grade partition of one or more road traffic movements. Fundamentally, Grade division would have been positioned only on Mobility Corridors with a view to make sure the full probable of the Mobility Corridors be reached.

Some junctions of the Guwahati city that needs improvements are mentioned below and shown in the following Figure. A comprehensive engineering study need to be conducted for all of the intersections to draw closer up with detailed design solutions. These junctions are:

1. Amingaon Junction
2. Bharalamukh Junction
3. Fatasil and R Chowdary Road Junction
4. Sarabatti Junction
5. Nepali Mandir
6. Vishal Mall Junction
7. Laktokia Junction
8. RBI Point
9. Guwahati Club Junction
10. Chandmari
11. Bhangagarh
12. Ganeshguri
13. Last Gate Point
14. Beltola Tiniali

15. Joynagar

Some other junctions of the Guwahati city that require improvements are Jorabat Tiniali and Junction near GNRC.

Fig.2 Junctions of Guwahati City

Presently, a prominent corridor is projected on the GNB Road from Chandmari area to Guwahati Club point. A pre-viability study has been done. Nevertheless, the extent of the elevated corridor should be planned depending on the significant on the adjacent intersections and the collision on the whole GNB corridor.
7.2. Signal coordination & optimization

Traffic Signals were installed at a number of select junctions in Guwahati, but installed signals are not functioning properly at present, except, the signal installed at Zoo road junction. Some of the Junctions which are needed to be signalized are listed below.

- RBI Junction
- Ulubari
- Bhangagarh
- Ganeshguri
- Chandmari

In fact appropriately used, traffic control signals are very important devices for controlling the vehicular and pedestrian traffic congestion. They allocate the right way to the various traffic schedules and thereby extremely influence smooth flow of traffic in the city. Traffic controlling signals that are accurately designed, operated, located, and maintained would have many advantages. These traffic signals, phasing, spacing, offsets need to be optimized for all types of traffic on the different corridors to ensure a prompt throughput. On the other hand possible actuated (demand response) traffic signals must be provided for smooth flow of road transportation.

7.3. Pavement Markings and Signage

In wide-ranging, it has been observed that the traffic signs are found inadequate in city of Guwahati. It is suggested that proper signs need to be installed at suitable locations. Road signs are differentiated into three categories: They are compulsory signs, Cautionary signs, and informative signs. It is suggested that signs nearby schools, college need to be
installed on priority basis. Traffic controlling facilities are also important in this regard such as: Center line, Stop lines, Pedestrian crossings, Traffic lane lines, Kerb marking for visibility, Parking space limits, Obstruction marking etc. should be provided, keeping in observation of all users of the road and particularly for night time driving.

7.4. Traffic Management Measures

The inventory of the roads which has been undertaken as a part of the road network analysis, recommends that the road space allocations for less important road systems do not permit for any foremost reorganization ranges from 3.0 to 10.0 (m). The areas that needs a special attention in reduction the current situation that are facing certain traffic administration measures might be adopted, after cautious analysis and study of the following areas.

- Fancy Bazaar Area
- Shilpukhuri-Chandamari area
- Paltan Bazaar Area
- MG Road
- AT Road
- GS Road
- RP Road

Ensuring smooth road traffic movements in such cases can only be obtained through the incorporated application of traffic management system like segregations, one way street systems, pedestrian areas etc. Some of main roads in Guwahati which has not been provided central median such as Rehabari Road, Lokhra Road, Manipur basti (AT
Road), Baralumukh (GS Road), B Barua Road and NH 31 etc. In order to reduce accident menace and enlarge the level of service in the central medians should be provided on these congested roads. On Street parking should be designed, base on all the Mobility Corridors for rearranging road space proficiently to make certain locations. As there are 4 ASTC depots from which buses operates to the various parts of Guwahati city. Out of 4 terminals, the Muchkowa and Paltan bazaar bus stations are located in very congested surroundings. Station Area Traffic Improvement Schemes (STATIS) need to be implemented at all the stations but more purposely for the two stations. It is recommended that STATIS must include in the traffic management.

7.5. Area Traffic Control Systems

The Area Traffic Control Systems shall be linked with various elements of Intelligent Transportation Systems as surveillance cameras, vehicle actuated traffic signals, enforcement cameras etc., and facilitating decision makers to recognize and respond to a confrontation in a timely mode depending on the real-time data. The ATC will help to reduce incident response times, disseminate traveler information, lower incident rates (mainly secondary incidents) and hence reduce congestion and enhance safety on the roads.

7.6. Safety Measures

Poor roads and insufficient street lighting along with limited road space and lack of traffic sagacity both to pedestrians and drivers increase the occurrence of accidents. Mostly they are caused due to the informal approach of the road commuters towards driving rules, safety regulations and precautions. The following short term options must be
measured for implementation by the government to improve the safety of the road commuters:

- Black spots at the major roads must be identified along with specific improvements must be projected at those locations. A Road Accident Analysis System depending on the average accident database must be implemented for correct reporting and make use of in geometric improvements.

- All the speed breakers of the roads and humps be noticeable and signed sufficiently for night time visibility.

- All the road traffic signage must be made retro reflective.

- Need to create road traffic safety patrol programs or awareness for student volunteers at all schools.

- Install pavement markings system at such as lane lines, median lines, stop bar, fog line, parking stalls/bays etc on all radial arterials and other major sub arterials.

- Ensure that sufficient street lightings are provided on all collectors, sub-arterials, and arterials roads of the city.

- Need to set up a Road Accident Analysis System (RAAS) in the city of Guwahati.

7.7. Parking Management Plan

On the basis of the principles, which the CMP has been developed, it is envisaged that planned parking hubs would be developed and incorporated with the remaining CMP elements. The parking model either isolated or incorporated with the public transportation terminals, need to meet some of the following necessities before it implementation:
The parking hubs must be discouraged for other commercial uses in the same grounds. It ensures the following features:

- The parking Hubs must be facilitated public transport.
- The parking hubs must be facilitated non-motorized transport.
- The parking hubs should be off-set exclusion of on street parking.
- The parking hubs should be improved the traffic circulation of the surrounding area.

Parking models in the main city area integrated in the DP must be integrated and implemented with the public transportation and Non Motorized Transport proposals. The locations of the projected parking hubs are shown and included the following.

1. Baralumukh 8. Ganeshguri
3. Fancy Bazaar 10. Paltan bazaar
4. Laktokia 11. Maligaon
5. Chandmari 12. Adabari
7. Zoo Road 14. Hatigaon

**7.7.1. Parking Policy:**

Every vehicle trip finishes in a demand for parking when trip gets end. The parking of trip generated vehicles needs extensive and exclusive land area. Or else parking would spill out over to other use in areas like footpaths, road carriageway and open spaces. On
the other they affect safety and ecological quality. The growing demand and varied needs of parking places in Guwahati can only be met and prepared in the structure of a comprehensive Parking Policy. Therefore the parking policies need to be moved from ‘non-restrictive’ to ‘restrictive’ policy. ‘Restrictive’ policy would also be included from prohibition of parking to restricted provision, pricing of parking spaces and regulation.

### 7.7.2. Parking Characteristics

Parking distinctiveness within city of Guwahati varies by land use activities, by areas, and by time period. In housing or residential areas it is by individual vehicles and is of long-term duration during the night hours. The parking in the central areas is seen of mixed type such as private vehicles, passenger vehicles and public vehicles, and goods carriage vehicles and of long term and short term needs. In commercial, warehousing and wholesale market areas are predominantly occupied by the goods vehicles. In this regard an on-street parking survey was carried out as part of the Master Plan Study by the GMDA and has presented interesting characteristics. Parking Surveys has been done at 10 select on-street stretches of the Guwahati and it is indicated the following characteristics.

(Information source: GMDA)

- Peak accumulation, per half an hour, is high, ranging between 143 ECS (AT Road) to 237 ECS (HB Road).
- Two wheelers constitute the major share (around 54%) of parked vehicles (up to 67.7% on SS Road)
- Cars constitute 41.5% of parked vehicles on Kamarpatty Road
- Short term (up to 2 hours) parking accounted for the maximum share (80 to 92%)
• Medium term (2 to 4 hours) parking accounted for a low of 7% (AT Road) to a high of 29.3% (on MS road).

• Long term parking was considerably low at all stretches ranging in between 2 to 6.1% except at two locations where it was 15.8 and 8.2% respectively at MS Road and Kedar Road.

7.7.3. Planning of Parking Areas by GMDA:

Provision or planning of parking areas should be through with multi pronged strategies by providing parking areas at three levels (or types), these are:

• On-street

• Public off-street spaces

• Private off-street spaces

7.7.4. Equivalent Car Space

Each type of vehicle has dissimilar physical size and prepared maneuverability. For setting up parking principles they are articulated in equivalent car spaces (ECS) with car as the average reference unit. The recommended ECS values for dissimilar types of vehicle types in Guwahati are as follows:
Table C-5

Equivalent Car Space

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>ECS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two Wheeler</td>
<td>0.25</td>
</tr>
<tr>
<td>Auto</td>
<td>0.5</td>
</tr>
<tr>
<td>Cars, Taxis, Jeeps, etc.</td>
<td>1.0</td>
</tr>
<tr>
<td>Small Bus</td>
<td>1.0</td>
</tr>
<tr>
<td>Large Bus</td>
<td>2.0</td>
</tr>
<tr>
<td>LCV</td>
<td>1.5</td>
</tr>
<tr>
<td>Medium Truck</td>
<td>2.0</td>
</tr>
<tr>
<td>Heavy Truck</td>
<td>2.5</td>
</tr>
<tr>
<td>Truck Trailer</td>
<td>3.0</td>
</tr>
</tbody>
</table>

Source: GMDA

7.7.5. Norms and Space Standards

7.7.5.1. Parking Norms

The following norms by use type are prescribed.

Table: C-6

Parking Norms

<table>
<thead>
<tr>
<th>Use Type</th>
<th>Number of ECS per 100 sqm of Floor Space</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>1.33</td>
</tr>
<tr>
<td>Commercial</td>
<td>1.67</td>
</tr>
<tr>
<td>Public and Semi Public</td>
<td>1.00</td>
</tr>
<tr>
<td>Industrial</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Source: GMDA

It is significant that the norms are from time to time reviewed and revised to provide accommodation for changing patterns and needs. The condition of the car spaces
could be in open area of the condominiums outline, under the stilts of the buildings or combined and provided in one or supplementary break up areas as part of the parking complex. The last option is suggested for acceptance, as it would be enabled the maximization of the space and better administration by the association of inhabitants. Over a long period of term, it is provided some elasticity for the extension of the capacity through transformation of latest technology. In this regard the following space standards are suggested by the GMDA:

- Open surface level: 23 Sqm per ECS
- Under stilts: 28 Sqm per ECS
- In basement: 32 Sqm per ECS

7.7.6. On-street Parking

On-street parking space are being provided by the GMDA on the right-of-way, on or off the provided by the PWD and being controlled by the traffic police or municipal enforcement officers. While providing the on-street parking, the needs of the efficient hierarchy of the roads should to be appreciated. Safety boundaries at the intersections are also be provided. Movements of the public mass transportation types are not to be intermittent. Their coming in and going out must be defined. Stops not to be blocked are to be predefined to its commuters. As a universal rule no on-street parking is permitted on the carriageway of the roads identified for high speed movement. On the other hand on the arterial road and sub arterial road, on-street parking may be provided only, if the size of the road is 6-lanes or more wide in nature. In case of collector streets (road) on street parking may be provided if the size of road is 4-lanes that also without median. Parking should be prohibited on footpaths or on all links roads of the city. If in case the size of the
road or right-of-way is wide in nature then, the footpaths may be provided and the parking all along service roads can be well organized. In case of parking in front of a building or the residential area can be measured as private parking which should be strictly regulated. Beside to these very parking, the footpaths may also be strictly prohibited. In case of the cross streets or road in essential areas, where traffic flow is less and carriageway is 4-lanes in capacity size or more, parking on both sides might be well organized with the modern technique. When carriageway capacity is less than 4-lane in size, then the road stretch may be declared as one-way and similar to this place, parking on one side of the carriageway can be scientifically organized.

7.7.7. Off-street Public Parking Spaces/Facilities:

Sternly organized and successfully enforced on-street parking can meet a logical but only a part of the when demand arises. The supply needs to be supported by provision of off-street public parking conveniences. The venture on, expansion and administration of these off-street amenities may be by public departments or by private sector organization by promoting off street parking amenities or facilities as a business enterprise by provision of land at concessional lease rates by the government, and permitting them the capacity to be a multi-use hubs or complex with marketable or commercial uses and setting down the charges for parking depending on type of vehicle and duration of the parking.

7.7.8. Lane Markings and Signage

The Government has the plan and policies regarding lane marking and signage with the following characteristics; according to the plan:-

- All on-street parking spaces should to be clearly defined by lane markings.
➢ Adequate and suitable signage need to be installed at all places at the select street network to recognize ‘parking’ and ‘no parking’ areas.

➢ Off-street parking areas should to be clearly recognized by signs distinguishing marks.

It has been observed that though the plan talks about the above mentioned characteristics, in practical above mentioned policies are not practiced in Guwahati city, therefore the government should prepare such a plan which can be implemented effectively and efficiently without delay.

7.7.9. Access Policy

A prospective condition of off-street public parking space and amenities in the Central Area and sub centers is very essential. The place and the location of the parking facility must be selected looking at the goal set in the traffic management plan of the government. If the approach is ‘full penetration’ then the position of off-street parking space and facility may be organized anywhere subject to traffic flow or the demand of parking requirements. If the approach is ‘partial-penetration’ then the parking capacity needs to be restricted to access the part of the essential area. If the approach is ‘no-penetration’ then the facility of parking should be provided at the central area all along the essential area of orbital road of the city. Currently, in Guwahati, the approach is ‘full penetration’. However it is practical to adopt ‘partial-penetration’ approach and move towards ‘no penetration’ approach over the years. Therefore the location of off-street parking space or amenities should to be carefully determined so that they can incorporate with the traffic management plans of the city. The blueprint of capability should also allow flexibility in the use of the capability.
7.7.10. Park and Ride System

Parking Policy must be incorporate with the Public Mass Transport System planning and policies of the city of Guwahati. Each and every, most important bus terminal system and all station of the medium, high capacity system like Light Rail Transit and Bus Rapid transportation shall be build up as a ‘Park and Ride’ facility. Adequate parking area for different types of vehicles are being envisaged in as a part of the Public Mass Transportation stations, predominantly in the distant inhabited areas, so that the inhabitant can easily park their private vehicles at these selected stations and travel with the said public mass transportation of the plan.

7.7.11. Traffic Collars

When the city continues to expand and grow, the side by side traffic volumes of the city also increases and the levels of congestion within the essential areas will move high. As the Traffic Collars is a part of Traffic Management Plans of the government, it is suggested to expand off-street parking services with all along the ‘traffic collars’, a series of fantasy circular rings spaced away from the important area. The capacity of the competence of parking need to increase as it moves away from the important areas of the city.

7.7.12. Location of off street parking areas:

In Guwahati the government of Assam has projected 14 major parking areas which are to be developed soon. Out of total 12 are projected as part of facility centers. On the other hand one will be set up in individual location and one as the part of present jail area.
which is of about 1 hac. Each space accommodates about 300 cars at a time in each individual location.

7.7.13. Promotion of Public Mass Transport System (PMTS):

The Parking Policy of the Government of Assam needs to promote as public mass transport system (PMTS). Restricted or constrained parking condition also need to be attached with good quality service offered by PMTS and should have a successful measure to promote Public Mass Transport for reducing congestion in important areas of the city which will help to optimize the resources and which also improves the overall quality of the environment.

7.7.14. Parking Pricing

Price used for parking space is a significant component of the Parking Policy of every area. Parking on public places in the Guwahati city at any time, by any mode of vehicles, must be charged a price. The main objectives of pricing are to:

(i) Provide employment, especially to poor.
(ii) Generate revenues.
(iii) Restrain demand.
(iv) Encourage private sector investment.
(v) Promote Public Mass Transport and
(vi) Rationalize parking duration.
Condition of parking space may costs money. It should be recouped by charging a reasonable parking fee. This strategy of charging fee, for on-street parking need to be extended to all the roads stretched over the city of Guwahati. Besides generating revenues, the parking pricing should be used as an important tool for road transportation for its demand management. It is very significant to make a design and put into real practice with a differential parking price strategy with low fees at the margin of the city, increasing a fee as one steps towards the central business areas. The discrepancy parking policy may be united with the provision of good superiority Public Mass Transport service of the city, with ‘park & ride’ policy facilities which would also dishearten the use of private operated vehicles for their trip to the important areas of the city and encourage patronage of Public Mass Transport systems. The ongoing ‘discrepancy pricing’ of the parking policy needs to be practical by time duration. Long duration on-street parking should be disheartened and short term parking should be encouraged by the initiatives of the government to maximize turn over.

7.7.15. Compounding Fee:

The off-street private vehicle parking policy of the plan should be zone and need to build as per the parking norms. This approach is significant for smooth functioning of the system. Parking places which is shown at the time of allotment of the building plans are responsible for abuse and embezzlement to other uses. The provision of parking places as per compounding fee norms may be costly but the opportunity costs of the space created are reasonably high. The result is that the parking demand spills over to on-street. The parking should not be misused therefore the concerned public departments should exercise strict monitoring and controlling. It is needed to avoid such a nasty circle, for which it is suggested that the policy of charging ‘Compounding Fee’ or ‘In-lieu Fee’ may be
implemented. In such cases, the property developer must attention in paying a compounding fee at per unit parking places fixing from time to time, having mutual understanding with the concern Municipal Authorities of the city. For the entire parking space that needs to provide as per regulation or byelaw. It abstain him from the compulsion of providing and maintaining the public parking places within individuals premises. The Municipal authority should pool up these ‘compounding fees’ and use them suitably to promote and development the off-street parking facilities in private sector organization. The government should prescribe ‘compounding fees’ rate from time to time, by position. This approach may be practical in important areas or part of the city, where the demand for parking space is high and the availability is low and opportunity costs are relatively high.

7.7.16. Technology

The technology plays an important role in all spares of business. It is seen that the technology of parking and collecting fees are relatively low in the plan of government of Assam. The government should think for modern technology for parking. The technology will help parking space owner to use space efficiently. The off-street parking facilities need to be introduced for efficient space utilization. As has been said, in the long run, it is prudent to adopt mechanical parking technology wherein, the cars are received at the entry, assigned and parked at a bay and retrieved and delivered at the exit gate, by automatic microprocessor systems. The advantage of the technology is in the increase of car spaces per unit land area.

7.7.17. Functional Plans

Over the period of time, it is very important to prepare the ‘functional plans’ for every link road of the primary road network system including the arterial, sub-arterial and
collector streets of the city. The being functional plan important it should be incorporated with all the aspects of the road like geometrics, controls, traffic management and uses including on-street parking demarcation. The government should prepare appropriate organizational arrangements looking at the capacity and logistics of GMDA and providing traffic engineering & traffic management plans and Traffic Police providing traffic enforcement.

7.7.18. Private Sector Participation

As per the government plan the private sector is presently involved in controlling, maintaining and managing the on-street parking of the Guwahati city. The government should encourage more private participant and their function should to be extended to maintain and manage on-street parking across the city and more, develop, manage and to invest in, off-street public parking facilities. The Municipal Authorities need to facilitate this process by giving land at concessional rate or lease for long run, permitting multi-uses in the complex regulating on-street parking, and extending the other administrative and required support. As per the plan the 14 parking areas in Guwahati could be developed through PPP mode (Private sector participation).

7.7.19. Parking for Disadvantaged

There is a concept of ‘Orange Badge’ in case of disadvantaged person which can be introduced by the government to facilitate easy and convenient parking of vehicles driven by such disadvantaged persons. Here the vehicles are distinguished by special orange bands or tokens and disadvantaged persons are given priority for parking their vehicles and also exempted from some of the rules and regulation of the parking as applicable to general public.
8. Government Plan on Travel Demand Management:

The improved public transportation is very important for smooth management of travel demand. Knowing the pattern of the flow of road traffic, the study can be done. After implementing the public transport corridors and the other necessary proposals for public transport, the results of the travel demand model indicate that the share of the trips would increase up-to approximately 60-65% of the motorized trips. As discussed in the earlier section, further increase public transport modal shares leads to necessity of additional demand management and interventions.

8.1. Congestion Pricing

To reduce the demand of the vehicular travel demand and congestion, a congestion pricing policy may be introduced within the essential and central areas of Guwahati city. As per the report of Guwahati Metropolitan Development Authority, the congestion operating hours can be estimated as from 9:00 AM to 7:30 PM, Monday through Friday, excluding public holidays. A stipulated fee may be charged as the congestion charge for those driving the vehicles within the very busy or restricted central area of the city. The government has to made provision for paying parking fee via internet or gas stations or at shops etc. and need to get registered their database. A number of CCTV or video cameras should to be installed to scan the rear license plates and number plates of the vehicles that enter the restricted central area daily. This information need to be matched each night with the database furnished by the motorist. Anyone who has failed to pay the charges should be fined. If such things be well managed with the improved public and non-motorized transport, parking, land use interventions and congestion pricing the entire busy area can
expect a public transport share of about 60% fulfilling the vision of the Comprehensive Mobility Plan of the government.

8.2. Parking Control

To control the parking, the mobility management plan can include restrictions on the vehicle traffic in case they enter in congested areas during the peak times. The government should implement such schemes which include car-free streets, cordon controls on entering a particular area (e.g. Singapore’s Area Licensing Scheme and Electronic Road Pricing; and proposals for central London), and odd or even schemes and variations based on number plates etc. Beside that along with the high entry fee should be charged in some busy areas for motorized vehicles the safe zone and non motorized vehicle parking should be considered for parking control. The congested areas like Fancy Bazaar area, Shilpukhuri-Chandamari area, and Paltan Bazaar Area along the major corridors like AT Road and GS Road can be consider as busy and restricted zone. Parking control in these very areas along with the proposed parking plazas would also require alternative circulation strategies. The government should prepare a detailed traffic study plan considering the impacts of parking.

9. Government Plan on Road Network:

9.1. City Road Network

The Master Plan-2025 prepared by GMDA recommends development of a hierarchy based arterial road network system comprising primary arterial, sub-arterial and collector roads. The main classifications of the roads recommended by the government are:
– Peripheral Ring Road to enable movement of bypass traffic

– CBD Orbital

– Ring Roads

– City Radials/Axials

– Alternative Corridors

– All Purpose Roads in Central Area

 Approximately around additional 194km of road network has been proposed by the government to be developed over and above the existing road network. This configuration reflects the net effective carriageway requirements for traffic movements.

9.2. Proposed road network

The proposed road network by the government comprises of a radial-cum ring system. The radial is also known by axial roads are inter-connected by the three ring roads i.e. inner ring road (CBD Orbital), ring road and the peripheral ring road in the entire city of Guwahati. The peripheral ring runs at the outer part of Guwahati Metropolitan Area (GMA) with a proposed Right of Way (ROW) which is of 60 meter in size. The CBD orbital road which connects the central areas of the city would help in diverting the non-destined traffic away from the central area of the city. It would also help in accessing to the central important and the main area from the periphery.

9.3. Movement around Central Area

The share of ‘non-destined’ traffic in the Guwahati city is relatively high. The movement pattern of this traffic needs to be re-organized with the suitable plan of the
government. As a part of the city road network planning system, an orbital road around the Central Business District has been identified and proposed in the plan to develop as the high speed urban corridor with adequate level-of-service. The government should also encourage through traffic management measures to move along the orbital road of the city and enter Central Area at entry points near to their destination.

9.4. The existing roads:

The government has proposed to upgrade the existing roads of Guwahati in terms of ROW, relating to its capacity and other geometrics affairs. The new roads need to be well planned and designed for a higher level of service from their entry into Guwahati Metropolitan Area (GMA) to meet with the CBD orbital Road of the city. The roads in the main area will lose their characteristics and are to be developed for all-purpose roads. The primary arterial roads have a ROW varying between 45 to 60 meters. In addition, the city level roads comprised sub-arterial roads (24-45 m R/W), and collector roads (15-24 m R/W) which is very narrow in size.

9.5. The network grids:

The each roads network grids of the Guwahati encompass an area of about 2 to 3 sq. km. The roads within each grid need to be well planned as part of the Local Area Plan (LAP) for each sector. The main roads within them inter connecting arterial grid roads will need to be classified as sub-arterial and collector roads. Residential access roads will be planned and developed as part of residential area development plans.
9.6. The road links in CBD

The road links within the CBD Orbital area of the Guwahati needs to be classified as ‘All Purpose’ roads. The traffic volumes on these roads are relatively high. Speed of the vehicles need to be brought down. Providing parking space on these roads is very important. However it should be as per the Parking Policy laid down by the GMDA Plan. It is seen that pedestrian movement to these very roads are also high therefore wide footpaths, safe crossing with exclusive phase period where signalized, clear markings, refuge islands, good lighting, good signage, guard rails are essential important components of the roads.

9.7. Radial cum Orbital Network

The present road of the Guwahati city network comprises of radial corridors diverging from the city CBD area. The major corridors are:

- Jalukbari - Bharalumukh - Kachari - Noonmati - Narengi
- Paltan Bazar - Bhangagarh - Ganeshguri - Khanapur
- Paltan Bazar - Lokhra
- Kumarpara - Garchuk

A few new roads of the Guwahati links are added to the road network system to enable it to function as in a more defined radial-cum-orbital network system. Some new links, bypass along with eastern side branching from NH-31 through –North Guwahati-Rajarduwar, new bridge across Brahmaputra-Uzan Bazar- Narengi (along the river bank)-Panjabari-Khanapara are added to these plan. Through these the northern bank of the Brahmaputra is also connected with southern bank by newly constructed bridge over
Brahmaputra, which is Adjacent to the existing saraighat bridge on of the city. The new peripheral road connecting from Basistha chariali, off bypass, to run along south boundary of Guwahati Metropolitan Area (GMA) up-to its intersection of NH-37 and it touches the orbital road passing through Saulkuchi, Beltola and orbital road through Dhirenpara, Odalbakra, Kahilipara and Dispur last gate along with a tunnel in the Fatasil hill ranges meets AT Road of the city.

The new link from Dhirenpara to GMC Jn. Lal Ganesh jn. – Ganeshguri (part existing; part new). Hengerabari – BG Tiniali are also a part of radial cum orbital network of the plan which connects the road network in new towns and wholesale market area.

A tunnel is proposed in the plan to connect AT road with Fatasil-Ambari road. It will connect the proposed orbital road via Dhirenpara, Kahilipara and Dispur last gate to AT road. It has been observed that this link is going to carry substantial amount of traffic. Therefore the government has proposed to conduct the feasibility study on this tunnel link as the substantial amount of travel time and travel cost can be saved through this roads.

10. Government Plan & Policies on Light Rail Transit System:

The government has a plan of introducing a light rail transit in the Guwahati city looking at modal share of about 55% of all vehicular trips which is generated by the public mass transportation. It is estimated that the public mass transpport pull the demand of about 12 lakh trips on an average per day through the PMT system. This led to the calls for introduction of a medium capacity rail based system in the city of Guwahati. It is proposed in the plan to make a plan and develop the Medium Capacity rail Transit System in the Guwahati city. In this regard three corridors are identified. The proposed technology for this plan would include Bus Rapid Transit System and or Light Rail Transit System in the
city. To settle the problem is traffic congestion an incremental development approach is suggested by the government. In this regard the first phase Bus Rapid Transit System (BRTS) has been developed and operated so far on a trial basis. The city of Guwahati is growing and the traffic builds up and exceeds the capacity of BRTS rapidly, the system technology is needed to be replaced by Light Rail Transit System (LRTS) to reduce the load of the road. To introduce BRTS, it would require a segregated right-of-way in the city. It is assumed that it is quite difficult to provide segregated right-of-way; so the elevated way may be provided in alternative to that. However the plan needs to be designed properly to accommodate LRTS in the future in Guwahati city. In this regard the first corridor has been designed and it called Green Corridor which runs east-west, from Narengi to Jalukbari. This corridor runs through the heart of the city as CBD area. It has been proposed that this system would be aligned and developed along the existing rail line of the city. However this would be an independent of the Railways in terms of its operation, ownership and management. The proposed corridor is of 16.3 km in length. The 13 stations are proposed to make full destination along the corridor at: Narengi, Forest Gate, Noonmati, Bamunimaidan, Silpukhri, Paltan Bazar, Fancy Bazar, Bharalumukh, Kamakhya, Maligaon, Adabari, Jalukbari.

A another second corridor has also been proposed in the north-east direction running from the Guwahati Railway station to G.S. road, upto the Khanapara which is to be called as Blue Corridor. This proposed corridor has the length 10.2 km aligned with the G.S. road on elevated tracks of the city. Beside this 7 more stations are proposed along with this corridor and they are: Paltan Bazar, Ulubari, Bhangagarh, Ganeshguri, Dispur, Six mile, Khanapara

The third proposed BRTS/LRTS corridor called the Orange Corridor, it starts from the main railway station and runs northwards along with the Fatasil-Aambari road up-to
Lokhra road where a new commercial activity complex is growing with the employment of more than 100,000 has been proposed. From this point it turns westwards to propose capital complex of the city and from there, it runs northwest along with the road corridor to airport, and it ends at the airport point.

The proposed Orange Corridor which is about 22.6 km in length. The 9 stations are proposed at: Paltan Bazar, Sarabpatti, Lokhra, Garchuk, West Boragaon, Kalapahar, Lalganesh junction, Azara and Airport Guwahati Rail station would be a major crossing point station amongst the three major corridors and between them there is the regional rail system. It has been estimated that there would be 13.7lakh public transport trips (intra-city) by the year 2025 estimated by GMDA. In addition to this about 3.47 lakh trips will be generated by inter-city public transport passengers in the Guwahati city who use the intra-city network. In all cases, the public transport trips would be approximately 48% of the total person trips by 2025.

11. Government Plan & Policies on Bus System and Terminals:

The government has the policy relating to the existing bus system. The existing policy has needs to be modernized and expanded with latest technology and should to meet the travel needs in the future. There is a complete need to improve its image and the quality of service offered by the existing system. The government should think for Modernization and need the high capacity urban buses to be introduced. The operating environment also needs to be improved by providing the buses dedicated lanes with the major radial corridors of the city. The bus system should come up with improved quality of service and good infrastructure which support in terms of depots, terminals, and bus stoppage etc. according to the plan of the GMDA the capacity of the buses of 60 whose
fleet utilization is 90% and vehicle utilization at per day 200 km and a load factor of 0.7
tone, with the implementation of Light Rail Transit system by 2025, is estimated to be
around, the requirement of buses would be 900. This would mean an addition of 45 buses
per year in the system and in addition to which are replacements. The need of the buses
will go up to around 2400 if the Light Rail Transit system is not implemented soon.
Therefore the efforts are required to be made to identify and give in franchise to private
sector operators, to operate and manage the city bus system with adequate capacity.

11.1. Bus Depots

Bus depot or terminals are very important for smooth flow of road traffic. To have
better service 9 depots have been included in the government’s plan, which is of 2 ha in
extent, that are required along with the LRT system implementation. As per the plan the
requirement of bus depots may go up-to 24 along with the other sufficient number
infrastructure for the bus system if the LRT system is not implemented. The buses depots
are proposed by the government at the following locations are:

• In the industrial area of Guwahati

• Adjacent to the all 6 nodal terminals

• One in each of the two New Towns (Northwest and South)

11.2. Terminals

In the integrated transport network concept of the governments plan, the terminals
are very important mechanism as they enable integration between the various modes of the
system. A large number of terminals with the different type and size will be developed by
the government in a city of Guwahati. The objective of the plan is to organise the
terminals in a hierarchy and locate them appropriately.
11.3. Passenger Terminals

The plan also focuses on the passenger terminals which will be implemented during the plan period are:

• Inter-city Rail Passenger Terminal at existing Guwahati Railway Station

• Inter-city Bus terminal at Lokhra along Bypass Road

• Intra-city Bus Passenger Terminals at 6 locations

11.4. Inter – City Bus Terminal

The plan of the government has indicated that, by the horizon year 2025, on an average day there will be 3.47lakh passenger trips which to be served by intercity buses to move into and out of Guwahati city. For this purpose a new bus terminal, along by-pass road, is being developed in the plan. This terminal which is developed has been proposed to be expanded and developed as an integrated part of bus terminal which provides for inter-city, inter-state and intra-city bus services from the city of Guwahati. Facilities need to be provided such as parking of private and IPT modes and other passenger. The terminal which is touches the existing bypass road of the city (which is proposed to be developed as a major urban activity corridor) and the proposed radial road. Hence the proposed terminal has good accessibility from all parts of the city. The terminal which is proposed to be developed has the provision of having multi-use complex, providing enough space for commercial activity, public, semi-public and institutional uses. This would allow the terminal to be developed as a bankable project through the Public Private Partnership (PPP) mode. A land preservation of 5 ha for the integrated terminal has been made along with.
11.5. Intra – City Bus Terminals

Intra-city Bus Terminals has been planned by the government at three levels as:

i. City Level Nodal Terminals;

ii. Zonal Level Sub Nodal Terminals and

iii. Local Area Level Mini Terminals

11.5.1. Nodal Bus Terminals:

The government has proposed 6 Nodal Bus Terminals for intra-city bus services at the following locations:

i. In the present Central Area abutting proposed CBD Orbital, presently functioning as intercity terminal.

ii. Along with Inter-city Bus Terminal along the by-pass road.

iii. In the proposed District centres I, II, III.

iv. In North Guwahati Area as part of the proposed District centre IV.

An area of 2 ha land for each of these nodal terminals has been kept as reserve. The nodal terminals proposed by the government need to provide parking facilities for the private and IPT modes for making it convenient. The nodal terminals that have been proposed need to develop as multi-use commercial complexes, under Private Public Partnership mode.

11.5.2. Sub – Nodal Terminals

In the comprehensive plan of the government, 10 sub-nodal terminals has been proposed at the different locations, beside that 7 sub-nodal terminals at the facility centers
has been included in the plan at point 1, 2, 3, 6, 8, 11, 12; 1 at the Airport, 1 at the Capital Complex, 1 at office complex and 1 at the proposed whole sale trade complex (as facility centre x). An extent of 1 ha of land has been proposed for each of the sub nodal terminals. Beside few sub nodal terminals has been proposed to be developed as multi-use commercial complexes under PPP mode.

11.5.3. Local Area Mini Terminals:

The government has the policy under local area mini terminal plan to facilitate mini terminal for buses and other vehicles moving in short distance. These terminal facilities could be incorporated as part of the commercial/facilities complex of the Local Area. Hence no separate allocation and reservation of land is made for these terminals. Care to be taken to provide for easy access and exit provisions, convenient bays for the buses and shelters for the passengers. Such terminals can be provided in the proposed neighborhood centres.

11.6. Bus Route Network System:

It is recommended that the entire intra-city bus services route network system need to be reorganized. The concept of direction oriented services need to be adopted. ‘Hub and spoke’ form of network system provides good scope for organizing the bus services. Direct, fast and frequent services are to be operated amongst the nodal terminals. There have planning for integration of groups of sub-nodal terminals with identified nodal terminal along with bus services. Local Area terminals are to be connected to sub-nodal terminals. While, the above proposed route structure system enables optimization of bus services, special direct services between major OD traffic generators need to be operated.
Here OD traffic generators (i.e. on demand traffic generators) comprises of Auto Rickshaw, Taxi and cabs etc.

There should have also need of comprehensive study on movement of City Buses to rationalize the routes and to organize bus route service pattern; which may also contribute in planning and development of bus related infrastructure.

11.7. Bus Stops:

The bus stops should be easily accessible at the walking distance of not more than 500 meters. The spacing of bus stops should be located in the range between 500 to 600 meters. Bus shelters should to be well designed to give better serve and to provide shelter to the passengers and add aesthetics to streetscape etc. The bus shelters have proposed to be developed in the government plan as revenue generating measures, with provision of adequate spaces for commercial advertisement and hoardings.

12. Governments Other Miscellaneous Plans:

Beside the above state plans of the government, few more plans as other plan has been included in the plan prepared by the government which focuses on the following:

- Plan for Missing Links
- Plan for Railway Over Bridges Plan
- Plan for Encroachment and Hawker Management
- Plan for Education and Enforcement
- Plan for Road Maintenance and Management
12.1. Missing Links:

The road network system of the Guwahati city has not grown commensurate to the vehicle growth due to the inadequacy of road links but the city is expanding its size and operation rapidly. Because of the lack of connectivity among the important roads of the Guwahati, the traffic from all the roads and from all directions has been passing through the Central Business District means form the important areas of the city. This has led in severe traffic congestion on arterial roads and it has reduced speeds of the vehicles in the inner parts of the city. A new link road has been proposed to divert traffic from the congested roads and providing access to developing settlements. The proposed missing links roads include and are shown are as:

- Connectivity between Lokhra road and Fatasil Ambari road near Jetkuchi
- Connectivity between Lalganesh and Fatasil ambari road
- Connectivity between Kalpahar and R Chowdary road

The missing road links has identified requirement of small bridges to be constructed over River Bharalu of the Guwahati such in between:

- Connectivity between Lokhra road and Fatasil Ambari road near Jetkuchi
- Connectivity between and Fatasil Ambari road
- Connectivity between Kalpahar and R Chowdary road

A further feasibility study need to be carried out to identify the minor connections (bridges) to increase the connectivity to Fatasil Ambari Road of the city.

12.2. Railway Over bridges Plan:

It has been observed that the railway tracks run almost parallel to AT Road of Guwahati city. Due to the presence of railway crossings, the traffic flow to from AT Road
face congestion and safety hazards by the surface road user. The rail over bridges provides a safe and uninterrupted traffic flow at the various railway crossings of the city. To overcome such problems the rail over bridges has been recommended at the following select locations of the city.

1. Bharalamukh on RK Choudhury Road
2. Fatasil Ambari Road, south of AT Road
3. near Shilpukuri
4. Railway High School Road, near Anuradha Theatre

Other than the surface roadway infrastructure, there are many other complimentary projects that which will help road user to use conveniently and it must be implemented in tandem to the public transport corridors. The afore said project may achieve conducive environment towards a successful public transport system that will help to meets the objectives and goals which are stated in mobility plan of the government, such as:

- Augmentation and strengthening of feeder service network
- Appropriate vehicle and terminal design
- Safe, faster and convenient pedestrian dispersal system
- Rationalization of existing bus routes in light of the public transport corridors
- Public transport friendly tax structure
- Use of Intelligent Transport System (ITS) technology
- Signal prioritization for public transport vehicles

It is very important and practical that the above mentioned actions must not be treated as important.
12.3. Encroachment & Hawker Management

Maximum roads of the Guwahati are being encroached by the street hawkers. These hawker encroachments are one of the hindrances to the movement of people and it has reduced the capacity of the roadways of all the major roads of the city which has led pedestrians to walk forcefully on the carriageway. The areas of encroachments have created hazardous situations for both themselves and to the traffic. In this regard, the government has proposed “Hawker Zones” in the plan which aimed at decongesting the main roads of the Guwahati city, while at the same time; it protects the interests of the street hawkers. Accordingly to the plan, the three types of zones would be proposed for Guwahati which will also regularize the street vending operations: these are: Green, Amber & Red zones.

12.3.1. Green Zone: The areas of the roadways marked would be marked as ‘Green Zones’ which allow hawkers to do their business at all the times at the specified locations without any restrictions. The locations around the market areas generally are designated as Green Zones.

12.3.2. Amber Zone: The Amber zone areas that will have some restrictions for the vendors and hawkers. These restrictions would be either by time of the day, or by the day of the week. On the times or the days specified in advance, hawkers would not be allowed to do their trading activities, standing on the street. On all other times, vending is allowed at designated areas under the Amber Zone.
12.3.3. **Red Zone**: As the name itself suggests, hawkers or vendors are not allowed at these designated areas at any time. The zones which have been identified as Red Zones will always restrict the hawkers. All the busy corridors of the cities and town will come under the Red Zone and hence it is said to be hawker-free zones. According to the municipal officials the traders and the developers of the city will have to come up with a hawking zone plan. In this regard the different hawking zones need to be identified in advance and the proposals have to be enforced strictly by the government.

**12.4. Education & Enforcement**

The overall awareness campaign relating to traffic discipline and compliance with the traffic rules to road users in Guwahati by the concern department is below the desired level. The traffic Police presently in Guwahati are seen taking positive leadership in this direction to make people aware about the responsible and rule abiding on road users. The government should plan special traffic drives to make the public aware of the traffic rules and regulation. Making them aware they need to impose needful fines on the spot and the procedure for defaulters may be reviewed in view of the large backlog of pending traffic offence cases. The governments road safety programs must be aimed primarily at the adult road users and it should serve the three main purposes:

i. To inform the public of new regulations or changes to the traffic regulation system.

ii. To influence the attitudes towards road safety.

iii. To persuade road users to change their behavior in relation to identified causal factors in road accidents. The aforementioned traffic management measures are normally easy to implement, requires no land acquisition and not costly.
12.5. Road Maintenance and Management Plan

According to the government’s plan on road maintenance and management, the concern authorities have made best efforts, which aimed at improving the urban road transport network as the roads exists below desired level. However the urban roads can be well maintained and managed using modern techniques of Road Maintenance Management System (RMMS) at a very high level of serviceability. The concern department can be supported with modern and systematic Road Information System (RIS). This will not only help to evaluate the existing condition of the roads but also measures the roads so that cost-effective modern technologies can be efficiently used to provide the high level of serviceability by applying regular and timely maintenance. Road Maintenance Management System (RMMS) is tools which facilitate the road network of the city as an asset management at the rural and urban levels. RMMS as an asset management tool requires a strong data base as Road Information System which needs to be collected. This is maintained and managed scientifically by using GIS. Road Maintenance Management System (RMMS) is characterized by:

- It creates database of road inventory, road condition, traffic, geographic data, demographic and socio-economic parameters helps concern department to manage efficiently.

- It finalizes the performance standards of necessary maintenance activities and creates the cost data base in respect of various regions for the network.

- Through this the data base on budgetary support will be available for maintenance.

- It helps to design maintenance the model to make predictions with respect to short, medium and long-term frames.
• It helps to generate various scenarios of maintenance within the given constraints of funding and predict the level of service achieved within these constraints.

• It helps to priorities the investment needs.

• It helps to ensure the available recourses of the road and put into optimum use, and

• It helps to centralize the outputs of the proposed maintenance management system of the road and decides the state level planning, prioritization and optimization for network.

13. Government Plan on Institutional Arrangement:

To manage the affairs related to the road transportation there is an institutional set up, which maintains, manage and controls road related issue in the city of Guwahati. According to the plan of the government the following mentioned are engaged in managing the road related issues:

13.1. Present Institutional Set-Up

As per the plan the agenda for development of Guwahati City is carried out by three main agencies viz,

i. The Guwahati Municipal Corporation (GMC)

ii. The Guwahati Metropolitan Development Authority (GMDA) and

iii. Public Work Department (PWD).

These three Departments are responsible for planning and development related to urban transport sector in the city of Guwahati. These three organizations are responsible for construction, planning, operation and maintenance of the municipal roads of the city including flyovers, along with street lighting etc. On the other the GMDA is responsible
for the overall planning in the area of Guwahati city. PWD is responsible for maintaining
the roads of the city. Beside these three main organizations the Guwahati Development
Department (GDD) is the sole authority for administering the functions of the Guwahati
Municipal Corporation (GMC) and Guwahati Metropolitan Development Authority
(GMDA).

13.2. Issues with the Present Institutional Setup

Taking reference to the above mentioned point it can be seen that, there is the
presence of multiple agencies discharging similar duties which involve in the urban
transport planning and its functions. This has led to compounding the problem of service
delivery and other road related problem in the City of Guwahati. However each of the
organization has some demarcation with respect to different services delivered in the
specific locations, but many a time it is seen that there are duplications of effort. This has
also led to the lack of accountability in respect to the service delivery system of the
concern department. It is noticeable fact that there is no agency looking after only urban
transport issues of the Guwahati city. As stated earlier, the urban transport has never been
given priority in the City of Guwahati. Thus there should be a nodal agency which would
look after only urban the transport issues of the city. The performance of the different
modes of transport needs to be controlled by their respective institutions. There should not
be hindrance to a nodal agency which control on the accountability in ownership,
performance, and maintenance in transportation issues. The issues relating to organization
can be summarized as follows:

- Multiplicity of organizations involved in Urban Transport

- Lack of coordination among organizations involved in Urban Transport
• Lack of Transport Planning expertise in the organizations

• No accountability in ownership, performance, and maintenance transportation infrastructure and systems operations

• No single apex agency regulating, facilitating and integrating operations of different modes.

13.3. Proposed Institutional Framework

The policy measures of the government suggested in the National Urban Transport Policy (2006) for application of plan and policies will require capacity building at two levels, one is of individual and another is of institutional. Taking this as the institutional aspect at this moment, government may develop the drawing relating to deficiencies that currently exist in the urban transport sector of the city. The gaps which have been identified in the previous section might go a long way by suggesting the institutional requirements to take care of them. The policy making, investment, planning, operations and management responsibilities should be streamlined and strengthened in the institutional. An empowered body is needed to look over, to coordinate, and to regulate the entire transportation project of the Guwahati city. Framework essential for implementation of effective Public Transport plan of the Government. The Policy which will be prepared should address all the functions, assignment of responsibilities and need to be responsive to all the citizens. In this regard, the apex Institutional Framework is needed for Guwahati has been shown below. As per the plan the suggested Institutional framework will have ‘Four Tiers’. Each tier would be responsible for some specific functions. Beside that co-operation among three tiers agency is very important.
13.3.1 Tier I: State Transport Planning and Regulatory Commission STPRC.

As per the plan of the government, the State Transport Planning and Regulatory Commission (STPRC) should be the statutory body having the sole power to control, monitor etc. need to be created by an Act of Parliament. The STPRC should have adequate transport planning expertise and need to study the population growth of Guwahati and need to prepare perspective plans for transportation and its related facilities. The State Transport Planning and Regulatory Commission (STPRC) should be responsible for undertaking and updating all the transport studies, including preparing Comprehensive Mobility Plans (CMP) at an interval of 3 to 5 years of time. The plan should also channelize the funding policies of the state government. The State Transport Planning and Regulatory Commission should approve the project relating to the need of the road. As the regulatory authority it should also be responsible to set performance standards for bus, roadways, Transit etc. The stated statutory agency should have bus/vehicle operating standards, and also need to be responsible for traffic management and transport policies for the Guwahati city. The important role of the agency is to establish coordination between other urban infrastructure departments, as well as the other tiers in the institutional framework.

The management of the commission will determine the utility and effectiveness in playing an essential role in improving the urban transportation. This is not a new idea as the National Transport Policy Committee (NTPC) has already suggested the constitution of a National Transport Commission at the national level. The NTPC has also envisaged such Commissions at state level. In the body constitution there will have a chairman, at least two transport planners, one finance expert and one transport economist. To fill the position of chairman and members need to be advertised and appropriate persons must be recruited for a tenure of 5-year. These positions should be treated as important positions
and need to be filled by transfer or shuffle at will if needed. The procedure for filling up such positions should be done by an open advertisement. It should not be nominated as happens in the other regulatory commissions. The Commission should reflect clear disciplines of road transport economics, transport planning, general management and transport engineering. The ultimate analysts are the officials of the commission; therefore they need to be trained properly as their commitment and zeal to the cause of progress will determine the success or failure of institutions.

13.3.2 Tier II: Local Authorities

As stated in the plan, the second tier is the so called local or city government or the municipality. It has been observed that most of them are in a financial crisis because they do not have the power of collecting the taxes due. It is therefore important to give municipalities’ the power of collecting such taxes in public transport for the greater interest of the general public. If it is done they remain the democratic institutions closest to the people. The municipality government should be made responsible for the mobility plan of the transportation and should play an active role in promoting public participation to influence transportation policies of the government. The local municipality government’s responsibility includes preparation of the Comprehensive Mobility Plan within the city, Traffic System Management, Traffic Impact Assessments, Issuance of Building Permits, Travel Demand Management, and other current existing duties. If the institution is already existing there than the state transport undertaking, municipality should play an enabling role in deciding subsidizing overall need of infrastructure and evaluation of public satisfaction on services delivered. Each local municipality should have a small team of transport planners, transport economists and management staff for efficient running of the system. The number of the employee may vary with the size and the structure of the city,
but each city should have one such team of employee to provide advice and direction to the local municipal government. The role of municipality becomes more active, where there is no state transport undertaking, and it also assumes the role of bus service management, transit planning and also acts as the facilitator for Private Public Partnership initiatives. The municipal transport should be able to contract, administer and evaluate private sector provision of public transport services group (Municipal Transport Group) on the basis of transport density information provided by the state commission. The team of employee need to determines the routes, timings and service-mix and will pay the operators by the kilometer run by. The task of Municipal Transport Regulatory Group (MTRG) would be to monitor and supervise all buses operating in the city. At the same time, these groups need to take decisions regarding the quantum and quality of para-transit vehicles running in the city, such as auto-rickshaws, etc. Since the traffic police commissioner regulates all the traffic of the city, an important task at this level is to ensure proper coordination with the enforcement authority to have maintained proper mobility and for safety of the road transportation.

13.3.4 Tier III and IV: Bus Operators and Enforcement Entities

In the tier III and IV of the state commission, the general policy will be to lay down the guidelines of the commissioner relating to the general safety requirements, quality of buses, and public responsiveness. This III and IV tier involves the operator and the enforcement entities as:

13.3.4.1 Responsibilities of Operators

Here the responsibilities include the assurance of the level of service offered by the buses in the city, as well as the staffing, maintenance and upkeep of the bus fleet on the road. The functions include an operational efficiency as well as the day-to-day operations
relating to buses. The responsibility will be clearly demarcated to all the staff of the buses including the drivers and other staff who involves in operation; as also that of maintenance, upkeep and fitness of buses. However, the municipality may provide maintenance facilities on contract at agreed rates.

13.3.4.2 Responsibilities of the Enforcement Entity

In the second part of the III and IV tier the traffic police are also included; here the traffic police will enforce their duty such as traffic rules and other transport policies (parking, congestion pricing, user fees, etc) on the ground of the city. This duty should be entrusted as the duty of maintenance and keeping accident database with the traffic police.

14 Conclusion:

Road transportation is one of the most promising means for rapid industrialization and agricultural advancement. It is not only playing an important role in the economy of the country but also providing basic infrastructure for bringing the majority inhabitants who reside in far off villages, into mainstream of life by connecting them with the rest of the country.

Development of the public transport system in urban context requires a comprehensive study of the system, addressing mobility, infrastructures, operation and findings in order to develop an ambitious modernization plan which is professional, competitive and sustainable. Looking at the goal of the mobility plan, there is urgent need to modernize the infrastructure for the interest of the environmental protection, fuel economy, safety and lower running costs and in this regard the government should come up with the strategic plans in order to make smooth functioning of the roads in Guwahati city.