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# STUDY OF LONG TERM AND SHORT TERM TRAFFIC AND TRANSPORTATION PLAN FOR RAIPUR URBAN AGGLOMERATION

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## Abstract

The population of Raipur urban agglomeration is 11.22 lakh as per 2011 census. Large-scale urbanization and rapid growth of vehicles population has laid sever stress on the existing urban transport system in Raipur city. With the sharing of limited right of way by a variety of modes and other utility services, the problems have become unmanageable resulting in traffic congestion, accidents, and inadequate parking area and environment deterioration. The demand of commuters on certain high dense corridors might not be met by existing bus transportation system. The nature of trips that the people have to make is also quite varied and they use private means of transport for most of these trips given the convenience of accessibility. The main objectives to Study of Transportation needs for Raipur Urban Agglomeration' have been outlined as under: To formulate a short-term (5 years) medium term (10 years) and long term (20 years) traffic and transportation mobility plan for the urban agglomeration developing around Raipur city. To provide, promote and ensure safe, economic and efficient movement of all categories of passengers and goods with least pollution through an integrated multi-modal transportation system. To recommend policy framework, institutional frame work, investment action plans and suggestions for financial resources.

***Keywords:*** *Traffic, Transportation, Agglomeration, Raipur.*

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## 1. Introduction

Raipur district is important in historical and archaeological point of view. This district was once part of Southern Kosal and considered to be under Mourya Kingdom. Raipur city had been the capital of the Haihaya Kings, controlling the traditional forts of the Chhattisgarh for a long time. The town of Raipur has been in existence since the 9th century, the old site and ruins of the fort can be seen in the southern part of the city. Satawahana Kings

ruled this part till the 2nd-3rd century AD. In the 4th Century AD the king Samudragupta had conquered this region and established his domination till Fifth-Sixth Century AD when this part had come under the rule of Sarabhpuri Kings. For some period in Fifth-Sixth Century A.D., Nala kings dominated this area. Later on Soma-vanshi kings had taken the control over this region and ruled with Sirpur as their capital city.

The Kalchuri Kings of Tumman ruled this part for a long time making Ratanpur as capital. The old inscriptions of Ratanpur, Rajim and Khallari refer to the reign of kalchuri kings. It is believed that the King Ramachandra of this dynasty established the city of Raipur and subsequently made it the capital of his kingdom. King Ramachandra's son Brahmdeo Rai had established Raipur. His capital was Khalwatika (Khallari). The newly constructed city was named after Brahmdeo Rai as 'Raipur'. It was during his time in 1402 A.D. that Hajiraj Naik the temple of Hatkeshwar Mahadev was constructed in the banks of river Kharun.The decline of this dynasty's rule came with the death of king Amarsingh Deo. This region had become the domain of Bhosle kings after the Amarsingh deo's death. With the death of Raghuji the III, the territory was assumed by the British Government from Bhonsla'a of Nagpur and Chhatisgarh was declared a seperate Commissionery with its Headquarters at Raipur in 1854. After independence Raipur district was included in Central Provinces and Berar. The city of Raipur is located near the centre of a large plain, sometimes referred as the "rice bowl of India", where hundreds of varieties of rice are grown. The Mahanadi River flows to the east of the city of Raipur, and the southern side has dense forests. The 8 Maikal Hills rise on the North-West of Raipur; on the north, the land rises and merges with the Chota Nagpur Plateau, which extends North-East across Jharkhand state. On the south of Raipur lies the Baster Plateau. Raipur city is situated on the Mumbai-Howrah route of Indian Railways and is well connected with such important places as Mumbai, Howrah, Kolkata (Calcutta), Delhi, Amritsar, Pune, Kochi, Patna, Dhanbad, Secundrabad and Bangalore.

On the basis of ruins of a fort and other structures located on the southern part of the city, some historians believe that the city of Raipur was in existence even during the 9 th century. However, most historians agree that King Rama Chandra Rai founded the city in the last quarter of the 14th century. Raipur is the capital city of the recently formed state of Chhattisgarh. It was formerly a part of Madhya Pradesh before the state of Chhattisgarh was formed on November 1,2000. Raipur is a fast developing important, industrial, commercial, and administrative centre. Headquarters of the District and Division located in Raipur capital city of this newly formed State Chhattisgarh. The high rate of urbanization, which is being experienced throughout the world, has become a cause of concern, as we experienced the darker side of urbanization in the form of urban sprawl, congestion, and pollution. Raipur as a city has seen manifold growth in its area over the years; which is shown in Figure 2.1. It can be seen that the city has grown radially in all direction.

## 2. Problem Audit

The outputs from the analysed data have been used to identify the major problem areas, problem types and quantification of problems in the study area in short term perspective. The demand-supply ratios of various transport

facilities have been undertaken to give an insight into the type and extent of problems in various areas, corridors and junctions.

The following parameters have been considered and evaluated for problem identification in the short term perspective:

- Volume to capacity ratio
- Pedestrian vehicular movement (PV2 value)
- Parking parameters
- Approach volumes at junctions.

### *2.1 Evaluation of Parameters*

#### *2.1.1 Volume to Capacity Ratio (V/C) For Base Year (2009)*

The V/C (volume capacity) ratio is a measure of the congestion on the road stretches. The results are based on the analysed database and standards adopted for capacity analysis for urban roads. The V/C ratios have been computed for major road links on the network. The road capacity utilization analysis (Figure 1) indicates that the service levels are low with values exceeding permissible limits on some of the important roads. It was found that about 14 locations V/C ratio is optimal i.e. 0.8 and some balance service capacity is still available on these roads. However, it was observed about 36 locations have V/C ratio between 0.8 and 1.5. At 8 locations the road capacity utilization factor exceeded 1.5.

The overall scenario of road capacity utilization is presented in Table 1. G.E. road carrying the maximum traffic in the city has V/C ratio of 2.14 at Sharda chowk towards Azad chowk similarly at Telibandha chowk towards Mandir Hasaud section has V/C ratio is about 2.1.

In the central area Malviya road has a V/C ratio ranging between 1.07 to 1.3. On 83

MG road towards Gurunanak chowk V/C ratio 0.96 and at Gurunanak chowk towards Rathor chowk V/C ratio is 1.28. On major arterials like Ring road -1, Bilaspur road V/C ratio is between 0.58 to 1.2 and 1.14 to 1.49 respectively.

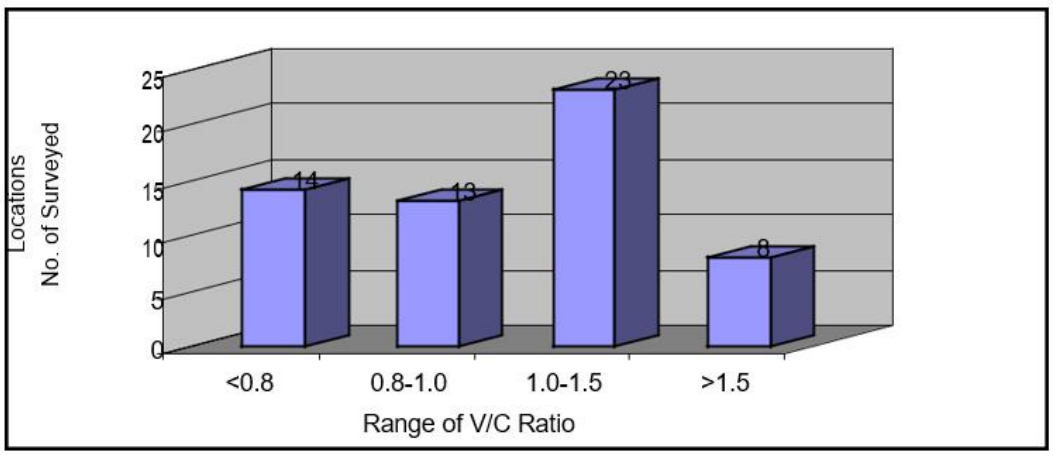


**Figure 1. Road Capacity Utilization**

On Vidhan Sabha road considerable service capacity is still available to road traffic has V/C ratio about 0.74. Railway station road has some capacity problems between Fafadih chowk to Railway station chowk (V/C ratio 1.92). Subhash marg has a V/C ratio of 1.6 at Telghani naka towards Rathor chowk and same 1.6 towards railway station chowk also. Mahadev ghat road will also require significant improvement with existing V/C ratio being 0.91 to 1.68 which is quite high.

**Table 1. Road capacity utilization (Volume Capacity Ratio)**

| S. No. | Road | Location | Peak Hour Traffic (PCU) | No. of Lane | Capacity/ Lane | Total Capacity | Road Capacity Utilisation (V/C) |
|---|---|---|---|---|---|---|---|
| 1 | Vidhan Sabha Road | Near Pandri Bus Stand, Narrow Gauge Railway Crossing | 3976 | 6 | 900 | 5400 | 0.74 |
| 2 | CM House Road | Near Gandhi Udyan Park | 942 | 4 | 600 | 2400 | 0.39 |
| 3 | Shyam Nagar Road | Near Guru Nanak Dwar | 1165 | 3 | 600 | 1800 | 0.65 |
| 4 | Avanti Bai Chowk to Telibandha Rly Crossing | Near Crystal Arcade | 1861 | 3 | 600 | 1800 | 1.03 |
| 5 | M. G. Road | Near Gugu Nanak Chowk towards Rly. Station | 1335 | 3 | 600 | 1800 | 0.74 |
| 6 | G.E. Road | Telibandha Chowk towards Mandir Hasaud | 3155 | 2 | 750 | 1500 | 2.10 |
| 7 | G.E. Road | Near Telibandha Narrow Gauge Railway Crossing | 3026 | 4 | 750 | 3000 | 1.01 |
| 8 | G.E. Road | Bhagatsing Chowk towards Telibandha Chowk | 2984 | 8 | 900 | 7200 | 0.41 |
| 9 | G.E. Road | Collectorate Chowk towards Bhagatsing Chowk | 6364 | 8 | 900 | 7200 | 0.88 |
| 10 | G.E. Road | Collectorate Chowk towards Ghadi Chowk | 6915 | 7 | 900 | 6300 | 1.10 |
| 11 | GE Road | Ghadi Chowk towards Shastri Chowk | 7520 | 7 | 900 | 6300 | 1.19 |
| 12 | GE. Road | Shastri Chowk towards Jaystambh Chowk | 5548 | 7 | 900 | 6300 | 0.88 |
| 13 | G.E. Road | Sharda Chowk towards Jaystambh Chowk | 4885 | 5 | 900 | 4500 | 1.09 |
| 14 | G.E. Road | Sharda Chowk towards Azad Chowk | 4808 | 3 | 750 | 2250 | 2.14 |
| 15 | G.E. Road | Azad Chowk towards A.mapara Chowk | 4760 | 5 | 900 | 4500 | 1.06 |
| 16 | G.E. Road | Amapara Chowk towards Ashram | 4116 | 6 | 900 | 5400 | 0.76 |
| 17 | G.E. Road | Tatibandh Chowk towards Amapara Chowk | 1710 | 4 | 900 | 3600 | 0.48 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 18 | GI, Road | Tatibandh Chowk to-wards L & T Chowk | 3304 | 6 | 900 | 5400 | 0.61 |
| 19 | G.E. Road | L & T Chowk towards Durg | 3285 | 4 | 900 | 3600 | 0.91 |
| 20 | Malviya Road | Pachpedinaka Chowk to-wards Dhamtari | 3208 | 4 | 750 | 3000 | 1.07 |
| 21 | Malviya Road | Kalibadi Chowk towards Pachpedinaka Chowk | 3701 | 4 | 750 | 3000 | 1.23 |
| 22 | Malviya Road | Jaystambh Chowk to-wards Kalibadi Chowk | 3899 | 4 | 750 | 3000 | 1.30 |
| 23 | K.K. Road | Jaystambh Chowk to-wards Fafadih Chowk | 2914 | 4 | 750 | 3000 | 0.97 |
| 24 | Bilasp ur Road | Fafadih Chowk towards Bhanpuri Chowk | 4277 | 5 | 750 | 3750 | 1.14 |
| 25 | Bilaspur Road | Bhanpuri Chowk towards Bilaspur | 3356 | 3 | 750 | 2250 | 1.49 |
| 26 | Ring Road -1 | Near Narrow Gauge Rail-way Crossing | 1785 | 4 | 750 | 3000 | 0.60 |
| 27 | Ring Road - 1 | Pachpedinaka Chowk Towards Telibandha | 3018 | 4 | 900 | 3600 | 4.00 |
| 28 | Ring Road - 2 | Pachpedinaka Clio,,vk towards Santoshi Nagar Chowk | 368_ 5 | 4 | 900 | 3600 | 1.02 |
| 29 | Ring Road - 3 | Santoshi Nagar Chowk towards Tatibandh Chowk | 2104 | 4 | 900 | 3600 | 0.58 |
| 30 | Ring Road - 2 | Bhanpuri Chowk towards L & T Chowk | 2205 | 6 | 750 | 4500 | 0.49 |
| 31 | Mahadev Ghat Road | Amapara Chowk towards Lakhe Nagar Chowk | 2020 | 2 | 600 | 1200 | 1.68 |
| 32 | Ma hadev Ghat Road | Lakhe Nagar Chowk to-wards Mahadev Ghat | 2427 | 3 | 725 | 2175 | 0.12 |
| 33 | Mahadev Ghat Road | Near Raipura Chowk | 1982 | 3 | 725 | 2175 | 0.91 |
| 34 | Shankar Nagar Road | Bhagath Singh Chowk towards Shankar nagar | 3916 | 4 | 600 | 2400 | 1.63 |
| 35 | Shankar Nagar Road | Near Visakhapatnam Railway Crossing | 137-5 | 2 | 600 | 1200 | 1.15 |
| 36 | MG Road | Sharada Chowk towards Gurunanak Chowk | 2879 | 5 | 600 | 3000 | 0.96 |
| 37 | MG Road | Gurunanak Chowk to-wards Rathor Chowk | 3074 | 4 | 600 | 2400 | 1.28 |
| 38 | Jail Road | Shastri Chowk towards Mekahara Chowk | 5036 | 8 | 900 | 7200 | 0.70 |
| 39 | Jail Road | Fatadth C howk towards Mekahara Chowk | 5529 | 6 | 900 | 5400 | 1.02 |
| 40 | Railway Station Road | Fafadih Chowk towards Railway Station | 4614 | 4 | 600 | 2400 | 1.92 |
| 41 | Banzari Road | Sharada Chowk towards Banzari Chowk | 1527 | 2 | 600 | 1200 | 1.27 |
| 42 | Rajbhavan Road | Collectorate Chowk to-wards Rajbhava n | 3124 | 4 | 725 | 2900 | 1.08 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 43 | Subhash Marg | Telgani Naka towards Railway Station Chowk | 3475 | 3 | 725 | 2175 | 1.60 |
| 44 | Subhash Marg | Telgani Naka towards Rathor Chowk | 2879 | 3 | 600 | 1800 | 1.60 |
| 45 | Subhash Marg | Near Ratho re Chowk | 2595 | 4 | 600 | 2400 | 1.08 |
| 46 | Subhash Marg | Near Tatiyapara Chowk | 1485 | 3 | 600 | 1800 | 0.83 |
| 47 | Old Dhamtari Road | Santhoshi Nagar Chowk towards Dharntari | 1527 | 4 | 725 | 2900 | 0.53 |
| 48 | Old Dhamtari Road | Santhoshi Nagar Chowk towards Tikrapara Chowk | 1579 | 4 | 725 | 2900 | 0.54 |
| 49 | Budha Talab Road | Buda Talab Chowk to-wards Lakhe Nagar Chowk | 2773 | 3 | 600 | 1800 | 1.54 |
| 50 | Katora Talab Road | Katora Talab Chowk towards Ring Road 1 | 2095 | 4 | 600 | 2400 | 0.87 |
| 51 | Katora Talab Road | Katora Talab Chowk to-wards Neer Bhavan Chowk | 2908 | 5 | 725 | 3625 | 0.80 |
| 52 | Ghadi Chowk To Kali Badi Chowk | Ghadi Chowk towards Moti Bagh Chowk | 4794 | 5 | 725 | 3625 | 1.32 |
| 53 | Ghadi Chowk To Kali Badi Chowk | Moti Bagh Chowk to-wards Madhusudhan Das Chowk | 3327 | 4 | 600 | 2400 | 1.39 |
| 54 | Ghadi Chowk To Kali Badi Chowk | Kalibadi Chowk Towards Madhusudan Chowk | 2016 | 4 | 600 | 2400 | 0.84 |
| 55 | Madhusudhan Chowk To Neer Bhavan Chowk | Madhusudhan Chowk to-wards OCM Chowk | 1995 | 4 | 600 | 2400 | 0.83 |
| 56 | Madhusudhan Chowk To Neer Bhavan Chowk | Neer Bhavan Chowk to-wards OCM Chowk | 2652 | 3 | 725 | 2175 | 1.22 |
| 57 | Bhesthan Road | Telgani Naka to Agarsen Chowk | 4273 | 5 | 725 | 3625 | 1.18 |
| 58 | Bhesthan Road | Near Subic Mandl | 2057 | 3 | 725 | 2175 | 0.95 |

Above analysis shows that many places ROW capacity will need to be enhanced through road widening or traffic management measures.

### *2.1.2 Pedestrian - Vehicular Conflicts (PV2)*

The Index of conflict between pedestrian and vehicular traffic is represented as $PV^2$. It is the product of peak hour pedestrian volume (P) crossing the road and square of peak hour vehicular traffic (V). As per IRC grade separated pedestrian facilities may be warranted at locations when;

- Peak hour volume of pedestrians (P) and vehicles (V) are such that $PV^2 >= 10^8$ for undivided carriageway and $PV^2>= 2x10^8$ for divided carriageways.
- Approach speeds of vehicles exceeds 65 kmph
- Waiting time for pedestrians / vehicles becomes too long
- Accidents records indicate 5 or more injuries to pedestrians in a year due to collisions The values computed at pedestrian survey locations are presented in Table 2.

**Table 2. Pedestrian vehicular conflict**

| S. No | Road Junction n | Location/Approach | Peak Hour Volume | | $PV^2$ |
|---|---|---|---|---|---|
| 1 | Sarda Chowk | | **Pedestrians cross-ing** | **Vehi-cles** | |
| | | Sharda Chowk towards Gurunank Chowk | 551 | 3571 | $7.03\times10^9$ |
| | | Shar09 Sharda Chowk towards Jai Stambh | 172 | 6138 | $6.48\times10^9$ |
| | | Sharda Chowk towards Banjari Road | 48 | 1745 | $1.46\times10^8$ |
| | | Sharda Chowk towards Azad Chowk | 75 | 6262 | $2.94\times10^9$ |
| 2 | Railway Station Chowk | Railway Stn. Chowk towards Fafadih | 394 | 5462 | $1.18\times10^{10}$ |
| | | Railway Stn. Chowk towards Telghani Naka | 695 | 686 | $3.27\times10^8$ |
| | | Railway Station Chowk towards Rd itway Stn. | 698 | - | - |
| | | Railway Stn. Chowk towards Glad i llari | 670 | 2196 | $3.23\times10^9$ |
| 3 | Kalibadi Chowk | Kalibadi Chowk towards Jaistambh Chowk | 292 | 3552 | $3.68\times10^9$ |
| | | Kalibadi Chowk towards Madhusudan Chowk | 279 | 2933 | $2.40\times10^9$ |
| | | Kalibadi Chowk towards Tikrapara. | 354 | 5239 | $9.72\times10^9$ |
| | | Kalibadi Chowk towards Girl Degree Col-lege | 714 | 489 | $1.71\times10^8$ |
| 4 | Fafadih Chowk | Fafadih Chowk towards Railway Stn. | 233 | 5462 | $6.95\times10^9$ |
| | | Fafadih Chowk towards Bilaspur Road | 117 | 5617 | $3.69\times10^9$ |
| | | Fafadih Chowk towards MecaharaChowk | 242 | 6685 | $1.08\times10^8$ |
| | | Fafadih Chowk towards Jai Stambh Chowk | 118 | 3738 | $1.65\times10^9$ |
| 5 | Jai Stambh Chowk | Jai Stambh Chowk towards Shardha Chowk | 379 | 6242 | $1.48\times10^{10}$ |
| | | Jai Stambh Chowk towards Fafadih | 379 | 3976 | $5.99\times10^9$ |
| | | Jai Stambh Chowk towards Shastri Chowk | 319 | 6808 | $1.4/\times10^{10}$ |
| | | Jai a zaStr Chowk towards Gok B109 xambh | 335 | 5265 | $9.29\times10^9$ |
| 6 | City Kotwali Chowk | City Kotwali Chowk towards Kalibari Chowk | 36 | 3552 | $4.54\times10^8$ |
| | | City Kotwali Chowk towards Sadar Bazar | 197 | - | - |
| | | City Kotwali Chowk towards Jaistambh Chowk | 47 | 5265 | $1.30\times10^9$ |

| | | | | | |
|---|---|---|---|---|---|
| | | City Kotwali Chowk towards Moti Bagh | 631 | - | - |
| 7 | Bhagat Singh Chowk | Bhagat Singh Chowk towards Ghadi Chowk | 84 | 4855 | $1.98\times10^{9}$ |
| | | Bhagat Singh Chowk towards Shankar Nagar | 62 | 5905 | $2.16\times10^{9}$ |
| | | Bhagat Bhagat Singh Chowk towards Telibandha chowk | | 4102 | $4.37\times10^{8}$ |
| | | Bhagat Singh Chowk towards CivilLine | 104 | 4453 | $2.06\times10^{9}$ |
| 8 | Pandri Bus Stand | Pandri Bus Stand towards Kaea.hari | -11) | 5538 | $6.13\times10^{8}$ |
| | | Pandri Bus Stand towards Bus Stand | 3 ] 3 | - | - |
| | | Pandri Bus Stand towards Pandri | 122 | 5538 | $3.74\times10^{9}$ |
| | | Pandri Bus Stand towards Raja Talab | 472 | - | - |
| 9 | Shastri Chowk | Shastri Chowk towards JaistambhChowk | 216 | 7276 | $1.14\times10^{10}$ |
| | | Shastri Chowk towards Mecahara Chowk | 844 | 6658 | $3.74\times10^{10}$ |
| | | Shastri Chowk towards Ghadi Chowk | 198 | 9634 | $1.84\times10^{10}$ |
| 10 | G.E. Road | Lal Ganga Shopping Complex | 216 | 7276 | $1.14\times10^{10}$ |

The pedestrian vehicular conflict observed on all surveyed locations is high. The highest pedestrian-vehicular conflict is observed near Shastri chowk. Cross pedestrian traffic is heavy at Railway station chowk, Kalibadi chowk, Police line chowk and Jaystambh chowk. The main problem for crossing pedestrians has been the vener-ability to cross the junctions without any control and protection. Uncontrolled crossing of pedestrian at Jaystambh chowk and Shastri chowk can be seen in Figure 2.

**Figure 2. Uncontrolled crossing**

### *2.1.3 Parking Problems*

The parking demand in Raipur city is predominantly short term and is served mostly with on-street provisions. On many roads stretches along Maliviya road, MG road, Sadar bazar road, GE road and Gol bazar area the demand

exceeds the supply. It is important to note that parking is consuming a lot of expensive road space otherwise meant for traffic movement.

An insight into the analysed database for parking demand in comparison with problems at important locations. The parking problems faced by Raipur are not unique but common in most of the Indian cities. The conversion of open and green spaces into commercial activity with limited provisions of parking has seriously affected the road capacity. The demand at locations exceeds the supply. The increased demand for parking is also due to increase in vehicle ownership, especially the car ownership. It may be added that there is a limited scope of increasing parking supply on busy arterial roads in Raipur.

Any fresh supply of 'on-street' parking would result into negative benefits to road traffic. It is important to understand this aspect and construction of 'off-street' lots shall have accorded due thought and top priority. Parking facilities available at Jawahar gate, old bus stand, MG road and Railway station has been shown in Figure 3 to Figure 7 respectively.

Figure 3. Off-street parking at Jawahar gate parking lot

Figure 4. Off-street parking at old bus stand parking lot

Figure 5. On street mid road parking at MG Road

Figure 6. Off-street parking of 2 W at railway station parking lot

Figure 7. Off-street parking of auto at railway station parking lot

## 3. Strategy for Transport Development

### *3.1 Need for Transport Strategy*

Urban transport strategy can play an important role in tackling urban problems, traffic congestion constraints and business efficiency which degrades the quality of life. Urban transport projects can reduce journey times and their unpredictability yielding large savings of travel time and vehicle operating costs and thus release city's economic and social potential. The urban transport problem may be described as fundamentally an economic problem of matching supply and demand with social, energy and environmental aspects and funding, institutional and political constraints. Urban transport strategy should be based on a rigorous definition of problems. Urban transport problems of Raipur urban agglomeration have been analyzed in the context of city-wide problems and transport strategy evolved. This strategy will achieve efficiency in transport sector and provide better and safe transportation to the people of Raipur urban agglomeration.

### *3.2 National Urban Transport Policy*

The Government of India has evolved a policy to overcome the problem of poor mobility which dampens the economic growth and deterioration in the quality of life. The approach is to deal with this rapidly growing problem as also it can offer a clear direction and a framework for future action.The vision of this policy is:

To recognize that people occupy centre-stage in our cities and all plans would be for their common benefit and well being

To make our cities the most livable in the world and enable them to become the "engines of economic growth" that power India's development in the 21st century to allow our cities to evolve into an urban form that is best suited for the unique geography of their locations and is best placed to support the main social and economic activities that take place in the city.

The objective of this policy is to ensure safe, affordable, quick, comfortable, reliable and sustainable access for the growing number of city residents to jobs, education, recreation and such other needs within our cities. This is sought to be achieved by:

- Incorporating urban transportation as an important parameter at the urban planning stage rather than being a consequential requirement.
- Encouraging integrated land use and transport planning in all cities so that travel distances are minimized and access to livelihoods, education, and other social needs, especially for the marginal segments of the urban population is improved.
- Improving access of business to markets and the various factors of production.
- Bringing about a more equitable allocation of road space with people, rather than vehicles, as its main focus.

- Encourage greater use of public transport and non- motorized modes by offering central financial assistance for this purpose.
- Enabling the establishment of quality focused multi-modal public transport systems that are well integrated, providing seamless travel across modes.
- Establishing effective regulatory and enforcement mechanisms that allow a level playing field for all operators of transport services and enhanced safety for the transport system users.
- Establishing institutional mechanisms for enhanced coordination in the planning and management of transport systems.
- Introducing Intelligent Transport Systems for traffic management Addressing concerns of road safety and trauma response.
- Reducing pollution levels through changes in travelling practices, better enforcement, stricter norms, technological improvements, etc.
- Building capacity (institutional and manpower) to plan for sustainable urban transport and establishing knowledge management system that would service the needs of all urban transport professionals, such as planners, researchers, teachers, students, etc.
- Promoting the use of cleaner technologies.
- Raising finances, through innovative mechanisms that tap land as a resource, for investments in urban transport infrastructure.
- Associating the private sector in activities where their strengths can be beneficially tapped.
- Taking up pilot projects that demonstrate the potential of possible best practices in sustainable urban transport.

## 4. Conclusion and Scope of Work

### *4.1 Conclusions*

- Population of Raipur Urban Agglomeration expected to increase from 10 Lakh in the year 2009 to 30 Lakh by the year 2031.
- The average work force participation rate in the Raipur urban agglomeration is expected to increase from 38.20% in 2009 to 39.13% in 2031. Total employment in Raipur urban agglomeration is expected to increase from 3.79 Lakh in 2009 to 11.73 Lakh in 2031.
- The substantial increase in area of office / commercial / industrial and other activities expected to grow in Raipur area. This will mean a large increase in employment in Raipur area. This will attract large traffic to Raipur. Thus, mass transport system to Raipur will need to be extended / augmented to cater to expected transport demand. And other morden transport system like metros and BRTS are more demanding modes of transport.

### *4.2 Scope of Work*

- Study of existing traffic and travel characteristics and projection of transport demand upto long-term plan period - design and development of road intersections, exclusive pedestrians and cycle tracks. \
- Study of existing and proposed land use plans/master-plans, by local governments. Study the available report/plans on traffic and transport situation and related matters and collection of relevant data from various offices.
- Carry out primary surveys relating to traffic volume counts at midblock and Intersections, origin destination survey, speed and delay study for selected, important corridors and public transport survey.
- Collection of primary road inventory data and identification of primary network. Detailed survey for paid and free parking space with suggestion for private and public transport system.
- Analysis and interpretation of collected data to elicit the traffic and travel characteristics of the study area.
- Development four-stage transport demand model, Calibrate and validate the 118-transport demand model and proposed land use plans.
- Project the transport demands up to the end of long-term plan period based on the calibrated models and proposed land use plans.
- Indicate the problems with priority areas and priority junctions, and carry traffic estimates/projects on major travel corridors.
- Identify the transport corridors on the basis of transport demand.
- Suggested alternative transport strategies short medium- and long-term strengthening transport infrastructure.
- Suggest Policy framework and Institutional Frame work.
- Suggest reduction of traffic in core areas of the city.
- Estimate the preliminary project cost for the proposal under short, medium and long term.

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