CHAPTER 7: RESEARCH FINDINGS

7.0 GENERAL:
A lead on urban transportation policy is generated and the key findings in reference to study are as follows. Policy makers can take advantage of the shifting terrain on which urban transportation operates through a number of steps which would inaugurate a revolutionary change in greatly improving urban life.

7.1 DEMAND DECONCENTRATION AND TRAFFIC DECENTRALISATION:

The existing highly functional supply system entities (major corridors and junctions) generate heterogeneous land use development with the migration of socio-economic and demographic characteristics in the urban form. The land use variation along these entities creates an imbalance in the urban areas with respect to congestion, excess delay in travel, road accidents, pollution etc. To transform the urban fabric in homogeneous form, land use planning with categorization into time districts / space districts would be an ideal solution which involves stringent urban policy decisions. Hence this work serves as a temporal tool for demand deconcentration which orients the supply system in a consistent, similar and uniform configuration. This is achieved by orienting and identifying the highly functional nodes and links in a network so that these entities receive the demand homogeneously. Demand deconcentration would decentralize the traffic getting concentrated only in the existing major junctions and links.
Alternative route choices are opened for trip movements through longitudinal and transitional corridors in the area. 636 km of road length are identified as the longitudinal and transitional corridors in the study area which comprise 12.8% of the road network. Guidelines for the functional road network development from the existing built up area and user preferred paths are given below in the figure 7.1.

Figure 7.1: Functional road network development from the user preferred path

It is observed that 50% of the user preferred paths in a network can be made functional to serve external based movements. Higher road density and high built up areas require higher functional road network. The variation of built up area coverage with the functional road network is shown in the figure 7.2 below.
7.2 FRACTAL FORM OF SUPPLY SYSTEM IN URBAN ENVIRONMENT:

Supply system in a network is often underutilized due to demand concentration only on few supply entities. Moreover the external based movements contribute high percentage of trip interactions due to higher trip lengths, existing land use and user preferences. Though the potential links in a network are present for external based movements in a supply system, only few links and junctions in a network are treated as functional due to the government policies. In the study area considered for analysis, only 3% of the existing road network is utilized effectively in external based movements which contribute 75% of the trip interactions in the urban areas. The potential for utilization of the network is up to 29% and it is converged to 17% to maintain continuity in trip movements. However, this can still be further enhanced if the connectivity patterns are increased by

Figure 7.2: Functional road network as a function of built up area.
identifying the missing links in the network. This work has evolved a methodology for identifying the functional junctions and corridors due to its connectivity, accessibility and spatial patterns in the network with trip intensity, trip orientation and trip length as controlling parameters. 700 km of road length are identified as the functional corridors in the study area which comprise 14% of the road network. 686 potential junctions were identified for functional treatment that generates uniform, hierarchical and well mobility system in the area. These supply entities truly represent self similar nature in spatial configuration for acting as transitional demand transfer points. The fractal nature of the supply system is limited to the spatial configuration of the urban form with respect to major junctions and functional corridors. The supply system identified poses more uniform and self similar demand coverage. Attainment of fractal form of supply system spread uniformly and homogeneously in the supply system will transform the land use system to be developed uniformly over a time frame.

7.3 UNIFORMITY IN TRANSITIONAL DEMAND TRANSFER TO THE SUPPLY: DEMAND – SUPPLY EQUILIBRIUM:

The trip interactions do not appear between all O-D pairs in the urban system but the supply system must be capable of handling the unforeseen trip interactions between the OD pairs. Hence to include these unforeseen trip interactions in the travel patterns of the users, a static analysis of the network is conducted and the trip loading with
respect to number of static overlaps (Overlap size) is considered along with the dynamic trip intensities on the junctions and links. The trip interactions between the OD pairs are a function of demographic, socio-economic and land use characteristics. Since they are non-uniform in the spatial form, irregularities in the trip interactions between the OD pairs is observed. The supply system is configured to attain a fractal form with respect to major junctions and functional links. As this system transforms the land use homogeneously, the demand also spreads uniformly in the urban form. These supply system entities shall serve as uniform transitional demand transfer to attain demand-supply equilibrium. Trip length, trip intensity and trip orientation are the three important hallmarks on characterizing the demand with matching orientation to critical entities of supply network.

In the study area, only 22% of the O–D pairs have shown trip interactions. The trip interactions between other OD pairs is assessed with static analysis and the network orientation is made with overlap size as a controlling parameter. SDE of the proposed major / functional junctions and corridors in the municipalities indicate uniform spread of the demand attainment points / layers throughout the area compared to the existing scenario of existing major junctions and corridors. Uniform spread and access to major corridors and junctions facilitates opening of more access to the area and effective utilization of the existing road network in the mobility. An
improvement of Coverage index indicates more population coverage compared to the existing scenario. This also indicates a self similar network configuration.

7.4 IMPROVEMENT OF OPERATIONAL PERFORMANCE OF NETWORK – PATH PRIORITISATION

Since, the proposed supply system development / reorientation for demand – supply equilibrium needs huge investment needs and careful road auditing for implementation at field level, an immediate improvement in the operational performance by prioritizing the existing functional roads is suggested using Multicriteria evaluation technique. Prioritization of roads for development over a time will generalize the transportation planning relevant with policy decisions. The correlation parameters between the observed field data and prioritization obtained from the model indicate that the critical paths identified in the network through MCE are the worst paths with respect to geometric, traffic, land use characteristics. Average Spearman Correlation coefficient between the ranks obtained from IPA, AHP and Concordance methods is 0.88. Sensitivity analysis conducted within the methods reveal a Spearman correlation coefficient of 0.96 for IPA, 0.94 for Concordance and 0.95 for AHP method. This method of prioritization is used for the development of road paths with limited budget constraints and it serves as a promising tool for the road administrators and government to implement at field level.
7.5 INTEGRATION OF NEIGHBOURHOOD NETWORKS:

An integration and coordination of the supply system with the neighborhood network is a prime concern for maintaining connectivity, mobility and accessibility in an urban environment. Hence the functional supply entities must be well integrated to promote consolidation of travel demand variations by equipotential nodes of interactions and facilitating smooth transitional flow between the neighborhoods. The longitudinal and transitional corridors identified in the network are coordinated to form radial and circular supply system patronages which also promotes development of uniform land use development as the urban growth progresses. Two alternative alignments of circular routes (Belt way) were identified of 85 km and 114 km around the CBD area. Radial roads from the city CBD to the municipalities comprise 2.7 % of the total road network with 134 km.

7.6 LAND USE DISSEMINATION:

The work indirectly gives a lead to land use planning as the self similar structure paves way to uniformity of land use (temporal), demand spread over a time and space, and pedestrian interaction and its deconcentration. The transitional impacts of traffic common areas of major access to minor junctions promotes uniform opening of supply pockets in the spatial configuration and land use deconcentration from node / clustered patterns to linear patronage. Sustenance of self similarity through nodes, links, paths and network
will generate user friendly, land use uniformity, equilibrium between demand variations and supply facilitating paths.

7.7 POLICY IMPLICATIONS – RECOMMENDATIONS FOR POLICY AND PLANNING:

A lead generated from the methodology framed on spatial planning of supply system through coordinated network of hierarchical and functional system will generate way for optimal utility of roads uniformly and preferentially. Three major policy initiatives shown in table 7.1 were derived through the study that can change urban structure

Table 7.1: Policy framework for supply infrastructure

<table>
<thead>
<tr>
<th>SNo</th>
<th>Policy</th>
<th>Strategies</th>
<th>Implementation requisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Optimal utilization of existing infrastructure</td>
<td>Demand deconcentration and traffic decentralization</td>
<td>Identification of functional road network</td>
</tr>
</tbody>
</table>
| 2   | Demand supply equilibrium        | a) Fractal urban environment  
b) Uniformity in transitional demand transfer to the supply | a) Path similarity  
b) Node similarity  
c) Integration of neighborhood networks |
| 3   | Operational performance improvement | Path utility and functional behavior assessment | Path prioritization                       |