CHAPTER 8: SUMMARY AND CONCLUSIONS

8.0 GENERAL:

This chapter presents the short summary, conclusion and scope for further work.

8.1 SHORT SUMMARY OF THE STUDY:

Demand deconcentration to attain demand - supply equilibrium and improvement of operational performance of the supply system is the objective framed in the study. The study involves planning, design and orientation of road network configurations to decentralize and deconcentrate the travel demand over the supply system. The study is framed with supply system characterization, evaluation and design comprising of: 1. Attainment of self similarity and uniformity in supply controlled entities, 2. Path prioritization for improvement to serve as a tool for road administrators. Indigenous GIS software has been developed as a supporting tool for the analysis. The study is initiated with supply system characterization through demand and supply characterization for analyzing in a normalized scale on a static mode. This is attempted by urban form and travel pattern characterization and generalization through identification of demand and static analyzers. A static evaluation of the supply system is made through concepts of spatial dispersion, centrality and fractal geometry. The spatial evaluation is assumed to be proxy to the operational performance evaluation of the network. These characteristics are often
near to ideal in CBD areas which are subjected to constant transformations in functionality of the road systems and are regularized with respect to the supply system. Demand – supply equilibrium is reached and transportation system coordination is warranted in such areas. The evaluation parameters are worse in the transitional urban areas which are unplanned developments and have their functionality undefined. Hence transitional urban areas have been selected as the study areas. The choice of locations for data collection are defined with respect to two elements – Explicit characteristics that are common for all the study locations like urban shape and transportation network; Implicit characteristics that have varied characteristics within them such as Built up area, road network density, population density etc. The 10 municipalities surrounding the Hyderabad city have been identified as the study locations based on explicit and implicit characteristics. The data included collection of information from road network characterization and traffic characterization studies. Travel demand analysis is made and the travel profiles are configured with respect to trip intensity, trip orientation and trip length. Trip intensity signifies the utility characteristic of a link / node measured in terms of dynamic traffic load in trips /day and static intensity in terms of overlap size. Trip orientation signifies the user preferences in travel between the OD pairs and are measured in terms of the desire of interactions and the type of movements on the paths in the network (E.g.: Internal – Internal ; Internal – External etc). Trip length defines the travel length
and is measured along the user preferred path in the network with
distance as the impedance parameter. These controlling variables
obtained from the static and dynamic analysis of the network are used
in development of fractal network which identifies the nodes and links
highly functional. Node similarity is attempted with $p$-median
approach which is a branch of facility location problems in operations
research as node (Major junction) is treated as a facility in the supply
system that receives the major demand and acts as a transition point
in transferring the flows. The controlling variables defined in $p$–
median approach are node characteristics specific to a node (No of
external based trips passing through that node, No of path overlaps
when trip exists, No of path overlaps when trips doesn’t exist, Trip
intensity ), neighborhood characteristics around the node (No of
access points in the influence area of 0.5 km radius around nodes, No
of perfect connectivities, Built up area surrounding the node, Road
length, Higher order road length) and impedance factor (distance
between the nodes). Link similarity is attempted by a spatial decision
support system with subset analysis in identifying the highly
functional links in the supply system. The controlling variables in
development of SDSS are the trip intensity, orientation and trip
length.

Existing functional / major corridors are to be improved to
develop an efficient network and this requires a prioritization of
existing paths. An approach for path prioritization which identifies the
critical major paths in a network is attempted with Multi criteria evaluation techniques that compare the various criterions controlling the performance of the path in light of geometric, traffic and land use characteristics. MCE involves different phases for prioritization – Input phase that identifies the functional attributes driving the performance of the path through system wide impacts, Design phase to standardize the input data and determine the weightage criteria, Analysis phase to analyze the multiple criteria, Evaluation and validation phase to validate the analyzers and check the flexibility of the method in different scenarios, Choice phase to help in decision making process. Three analyzers were used – IPA, AHP and concordance. Ideal point analysis technique is adopted which measures the distance from the ideal points with respect to geometric, traffic and land use characteristics of a link. A relational analysis is conducted between the variables to determine the weightage and role of each criterion in the performance. A sensitivity and uncertainty analysis is conducted to measure the robustness of the method.

Validation and evaluation for the proposed network and path prioritization is made to generalize the approaches formulated in the study.

8.3 CONCLUSION:

An approach for spatial planning and development of urban policy for addressing urban transportation problems is attempted in the study from system wide perspective taking into account static
network topology, urban form and dynamic travel demand. A lead to the urban policy on demand – supply equilibrium, fractal form of supply system for demand deconcentration, land use dissemination, integration of network neighborhoods, immediate improvement of operational performance of the supply system are obtained from the study. These efficient leads can produce urban areas with a sustainable transport environment by revitalizing the existing supply system to meet the demand. The research provides a new dimension for the urban transport policies, the strategies for achieving the objectives and the implementation techniques at field level. It also provides an innovative understanding of the supply infrastructure in terms of demonstrating in a scientific way how demand deconcentration can be made and homogeneity in travel can be achieved.

Specific conclusions drawn from the study are as follows:

1. A temporal tool for demand deconcentration which orients the supply system / landuse in a consistent, similar and uniform configuration has been developed.
2. An approach for consolidation of travel demand variations by equipotential nodes of interactions and facilitating smooth transitional flow between the neighborhoods is identified.
3. Planning strategies and management techniques for existing supply system development are demonstrated with path prioritization.
4. An approach for identification of fractal network configuration to make a uniform transitional demand transfer is developed.

8.4 SCOPE FOR FURTHER WORK:

Furtherance of study can be extended to the development of fractal system with respect to other urban form entities such as land use to promote demand deconcentration at a rapid pace. The perspective of spatial planning can also be extended to the development planning for land use/ time districts facilitating an integrated demand management. The fractal system identified in the study can be further analyzed for system integration, geofencing and introduction of intelligent transport systems. Supply system enhancement can be further operationalised with new infrastructure development and identification of missing links with the three dimensional spatial planning perspective through engineering face lift. Road utility assessment and functionality allocation can be viewed from activity based road utility rather than land use / location / accessibility based criterions.