Benchmarking and Modelling the Sustainability of Urban Mobility System: A case study of Bangalore city, India

NAME: Nibedita Dash **DEGREE: Ph D**

SR No.: 6117-120-092-07358 **DEPARTMENT: Management Studies**

Abstract

Indian cities have dealt with the problem arising from the discordance between urbanization due to rapidly growing economies and the demand for increasing mobility services and infrastructure. However, they have failed to address the societal requirements like convenient accessibility, reasonable choice of transport modes, safety, economic requirements like cost effective mobility, financial affordability and environmental compliances requiring optimum use of natural resources, lower emission of wastes and atmospheric pollution in the purview of sustainability. In the present work, we conceive and define the concept of sustainability in the context of urban mobility and decipher it for Indian cities, in general, and Bangalore, in particular, through performance assessment framework, indicator-based hierarchical benchmarking framework and urban mobility dynamics framework respectively. The performance assessment framework evaluates efficiency of urban mobility by measuring drivers of urban system against energy used towards mobility. The assessment applies Data envelopment analysis approach to evaluate and compare performance of Indian cities through efficiency. The analysis finds that most Indian metropolitan cities perform poorly with low efficiency scores across various subsystems in the urban system.

Next, an exhaustive indicator-based hierarchical framework is proposed to represent, assess, measure and track sustainable urban mobility. The approach necessitates prioritization, quantification and aggregation of multi-dimensional indicators of sustainability. Bangalore's urban system is evaluated using this framework requiring benchmarking of the actual dimensional indicator values against upper and lower threshold levels to compute a sustainability index at subsystem level, which is further aggregated to highlight the sustainability performance of urban mobility. The estimated index values at subsystem level for Bangalore in 2011 are 0.44, 0.42, 0.46, 0.43 and 0.59 for residential, employment, commercial, industrial and transport subsystems respectively while the overall impact of these subsystems on urban mobility is expressed through the aggregated Sustainable Urban Mobility Index (SUMI) value of 0.47 for Bangalore. It suggests that Bangalore has a substantial sustainability gap to bridge.

Further, we propose to study the transition of sustainability of urban mobility over a period of time by replicating urban dynamics of its' subsystems and representing them quantitatively. The dynamic relationships are integrated into a comprehensive causal framework and simulated for multiple scenarios for a planning horizon of 39 years from 2011 to 2050 using System Dynamics approach. The urban system is evaluated on selected indicators under three dimensions of sustainability for each year under baseline and other policy scenarios to implicate its' impact on mobility. These policy scenarios show that the transport subsystem sustainability does not improve substantially for the period of simulation. It thus suggests that imposition of urban transport policies are not enough deterrent to improve sustainability by reducing preference for personal mode of transport and needs to be augmented by other policy measures. However, residential subsystem index value increases over time suggesting that urban residential policies could be identified as a measure to improve urban residential sustainability and thereby having a positive influence on sustainable urban mobility. Through this thesis, we attempted to clearly understand urban mobility, concerns of sustainability, their implications for society, economy and environment, factors contributing to it and how to enable a transition over time towards sustainable urban system in the context of mobility.