

**TRAVEL DEMAND ESTIMATION OF LOW INCOME
HOUSEHOLDS IN INFORMAL SETTLEMENTS:
CASE STUDY DELHI**

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By

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CERTIFICATE

This is to certify the thesis entitled “**Travel demand estimation of low income households in informal settlements: Case study Delhi**” being submitted by Mr. Sadhu Srinivasa Lakshmi Narasimha Sarma to the Indian Institute of Technology Delhi, India, for the award of the degree of **DOCTOR OF PHILOSOPHY**, is a record of original bona fide research work carried out by him. Sadhu Srinivasa Lakshmi Narasimha Sarma has worked under my guidance and supervision.

To the best of my knowledge, the thesis has reached the requisite standard. The material contained in this thesis has not been submitted, in part or in full to any other University or Institute for the award of any degree or diploma.

Dated: Dec 2014

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ABSTRACT

The unprecedented growth of the urban population coupled with scarcity of affordable housing, and ineffective land management has led to proliferation of informal settlements housing the poor that have become a part of the cityscape of developing countries. Poor and migrant population from the rural areas mainly inhabit these settlements with different socioeconomic characteristics *vis-a-vis* inhabitants of formal residential areas. These differences are further reflected in the travel behavior of the poor dwellers of informal land use. The conventional transportation surveys and transportation planning techniques do not respond to these diversities in travel behavior of informal land use and fail to cater to their travel needs equanimously.

Many earlier works on the informal settlements have brought out interesting facets of their socioeconomic characteristics, their contribution to the urban economy and travel patterns. Several of these publications have pointed to the necessity of transportation planning to shift from its anti-poor policies to recognize and cater to travel needs of urban poor. However, the professionals still do not have the planning tools to incorporate the travel behavior of the poor inhabitants of the informal settlements. A gap remains even in the research as to how to take the travel behavior of people living in these settlements in to consideration in the urban transportation planning strategies.

Trips based travel demand models, which are a part of the widely used four-step models, have the flaw of not recognizing that the travel is a derived demand while taking it in to the model fold. Activity based tour demand models, on the other hand, resolve this problem by modeling the activities from which travel is generated.

With the aim of bringing out the unique features of travel behavior of residents of informal settlements, and develop technique to model their travel demand, an activity based survey has been carried out in informal settlements of Delhi. The analysis of the survey results endorse the need for inclusive travel demand technique that addresses where and how and to what purpose these inhabitants travel.

The study has developed two tour based models, viz. employee tour destination choice model and employee tour destination and mode choice model. A tour is defined as a circuit of travel commencing from home and ends at home with one or more stops to perform one or more activities. Discrete choice activity based modeling has been adopted for its strength in handling large set of alternatives and ability to include the tour characteristics in the model.

The employee tour destination choice model has included the land uses that are actually frequented by employees of informal settlements, departing from conventional land uses that are used by the city planners, such as construction

areas, which are not spatially static and office areas where residents of informal settlements seek low-wage employment. The choice set has been developed with ten choices, using combinations of these land uses with activities of work, non-work and education. The results show that travel times, and travel costs have significant negative effect on the activities and destination choice. The model also indicates a decreased probability of education tours in the settlements near resettlement colonies pointing to the need for introspection of rehabilitation policies of city governments.

The employee tour destination and mode choice model has developed a choice set of 28 choices which are combinations of modes and activity based destinations, in order to study how the residents of informal settlements travel. The model has shown that the short trips and non-motorized transport trips can be modeled effectively, which was not possible using the conventional planning methods. The mode choice model shows the insignificance of personal motorized vehicle tours for the inhabitants of informal settlements and highlights the importance of walk and non-motorized transportation trips. The results of this model confirm the negative effect of travel time and cost, as was brought out by the employee tour destination choice model, on the destination and mode choices of residents of informal settlements.

The tour based model have the flexibility and capability to handle long term as well as short term planning effectively. They overcome the deficiencies of the conventional transportation planning techniques and will be a useful tool in the hands of transportation professionals for inclusive and sustainable transportation planning for the future.

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