

**ANALYTICAL TRANSPORT PLANNING MODELS  
(WITH SPECIAL REFERENCE TO  
TRAVEL DEMAND FORECASTING):  
A REVIEW OF LITERATURE**

**A DISSERTATION SUBMITTED TO THE  
UNIVERSITY OF POONA  
IN PARTIAL FULFILMENT  
OF THE REQUIREMENT  
FOR THE DEGREE OF  
MASTER OF PHILOSOPHY  
(IN ECONOMICS)**

**BY  
RINKI SARKAR**

**GOKHALE INSTITUTE OF POLITICS AND ECONOMICS  
PUNE- 411 004**

**JANUARY 1988**

## ACKNOWLEDGEMENTS

I must express my deepest gratitude to Dr.S. Sriraman for all the encouragement and patient guidance given to me in the course of this study. My discussions with him and his incisive comments were extremely important for the final shape that this work has taken. Above all, I found in him a great friend to lean on any time.

Mr. A. Moghe and Mr. Inamdar deserve high praise for the efficient typing of the manuscript and for being extremely cooperative in spite of the inconveniences I have caused.

Gokhale Institute of  
Politics and Economics,  
Pune-411 004.

Rinki Sarkar

January 1988

## CONTENTS

	<u>Page</u>
ACKNOWLEDGEMENTS	(i)
LIST OF TABLES	(iii)
LIST OF FIGURES	(iv)
<u>Chapter</u>	
I INTRODUCTION	1
II AGGREGATE SEQUENTIAL MODELLING	7
APPENDIX 2.1 : CONSTRUCTION OF BASE YEAR TRIP LENGTH FREQUENCY DISTRIBUTION	104
APPENDIX 2.2 : THEORETICAL BASE OF THE GRAVITY MODEL	107
III TRANSPORT RELATED LAND USE MODELS	114
APPENDIX 3.1 : SHORT CUT METHOD OF OBTAINING EMPLOYMENT AND POPULATION LEVELS	127
APPENDIX 3.2 : MATRIX FORMULATION OF THE GARIN-LOWRY MODEL	128
IV ECONOMIC DEMAND MODELS	131
V APPLICATION OF TRAVEL DEMAND MODELS IN THE INDIAN CONTEXT	156
VI CONCLUSION	169
BIBLIOGRAPHY	172

## LIST OF TABLES

<u>Table No.</u>		<u>Page</u>
2.1	Factors Used to Estimate Trip Attractions	23
2.2	Characteristic Income Distribution	73
2.3	Minimum Path Tree for Zone Centroid 15	90
2.4	All-or-Nothing Assigned Volumes	92
4.1	Results of Regression on California Data	138
4.2	Elasticities of Passenger Travel Demand with Respect to Components of Travel Time	142
4.3	Elasticities of Passenger Travel Demand with Respect to Components of Travel Cost	143

## LIST OF FIGURES

<u>Figure No.</u>		<u>Page</u>
1	The Framework of Transport Planning	5
2	Origin Destination Matrix	25
3	Determination of Travel Time Factor Function	38
4	A Hypothetical Trip Decay Curve	50
5	A Hypothetical Study Area for Trip Distribution Analysis Using Competing Opportunities Model	54
6	Trip Interchange Modal Split Analysis: Sequence of Stages	63
7	Diversion Curves for the Traffic Research Corporation Study	68
8	Sequence of Stages for Two Stage Modal Split Models	72
9	Trip Production Rates for Captive and Choice Transit Riders	74
10	Bureau of Public Roads Diversion Curves	80
11	Travel Time and Distance Saved Diversion Curves Developed by California Division of Highways	82
12	Distance and Speed Ratio Diversion Curves Developed by the Detroit Metropolitan Traffic Study Team	84
13	Phases of the Single-Path Assignment Technique	86
14	Hypothetical Street Network	88
15	Minimum Time Path for Hypothetical Street Network Depicted in Figure 14	91

(v)

<u>Figure No.</u>		<u>Page</u>
16	'All-or-Nothing' Assignment on Hypo- thetical Street Network Depicted in Figure 14	93
17	Sequence of Stages in the Traffic Research Corporation Capacity Restraint Assignment Technique	97
18	Capacity Function Curves Developed by the Traffic Research Corporation	100
19	Trip Length Frequency Curve	106
20	Structure of the Garin-Lowry Model	117
21	Taxi Travel Characteristics: Greater Bombay, Trip Length Frequency Distribution	161
22	Trip Length Frequency Distributions (by Purpose) for HUDA Study Area	163