# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>i</td>
</tr>
<tr>
<td>List of Abbreviations Used</td>
<td>vi</td>
</tr>
<tr>
<td>List of Tables</td>
<td>ix</td>
</tr>
<tr>
<td>List of Figures</td>
<td>xii</td>
</tr>
<tr>
<td>List of Pictures</td>
<td>xv</td>
</tr>
<tr>
<td>List of Annexure</td>
<td>xvi</td>
</tr>
</tbody>
</table>

## CHAPTER- I  INTRODUCTION

1.1 BACKGROUND OF THE STUDY ............................................. 1  
1.2 REVIEW OF LITERATURE .................................................. 3  
1.3 RESEARCH GAP ..................................................................... 7  
1.4 OBJECTIVES OF THE STUDY ................................................ 7  
1.5 DATA SOURCE AND RESEARCH METHODOLOGY ................................... 8  
1.6 PLAN OF WORK ........................................................................ 8

## CHAPTER- II  AN OVERVIEW ON THE HISTORY OF KOLKATA AND ITS TRAFFIC CHARACTERISTICS INCLUDING POPULATION

2.1 AN OVERVIEW ON THE HISTORY OF KOLKATA .................................. 10  
2.2 TRAFFIC CHARACTERISTICS ..................................................... 12  
  2.2.1 Registered Motor Vehicles ............................................ 12  
    (a) India and States of Metropolitan cities .......................... 13  
    (b) Metropolitan cities in India ......................................... 14  
    (c) Registered Vehicles in Kolkata ..................................... 15  
  2.2.2 Vehicles Composition .................................................... 16  
    (a) India, Metropolitan Cities and States of Metropolitan Cities... 16  
    (b) Vehicle Density of Metropolitan Cities of India ............... 17  
2.3 ROAD ACCIDENT ........................................................................ 19  
  2.3.1 Road Accident in India and its Metropolitan Cities of India .... 19  
    (a) Profile of Road Accidents in India .................................. 20  
    (b) Major Metropolitan Cities of India ................................. 23  
    (c) Normalised Indicators of Road Accidents, Injuries & Fatalities in Metropolitan Cities in India ................................. 26  
    (d) Comparative Analysis of Road Accidents Parameters of Metropolitan Cities in India ........................................... 30  
    (e) Overall Incidence of Road Accidents, Deaths and Injuries in Metropolitan cities of India ........................................ 32  
  2.3.2 Vehicle-wise Road Accident in Kolkata ................................ 32  
  2.3.3 Road Safety level of Kolkata ............................................ 34  
  2.3.4 Overall observations on road accident characteristics in Kolkata ... 35  
2.4 ROAD USERS’ ACCIDENTAL RISK IN KOLKATA ............................... 36  
  2.4.1 Growth Analysis of All Road Users’ Death and Injury ............ 36  
  2.4.2 Growth Analysis of Pedestrians’ Death and Injury ............... 39  
  2.4.3 Statistical Analysis on Road Accidental Risk in Kolkata ........ 39  
    (a) Empirical Results and Analysis Road traffic fatalities and injuries in Kolkata .................................................. 39
CHAPTER- III   PEDESTRIANS BRIDGES IN KOLKATA: THEIR
STRUCTURAL, SOCIAL, AND FINANCIAL IMPLICATION

3.1 HISTORY AND LOCATIONAL PROFILE OF PEDESTRIAN BRIDGES
IN KOLKATA

3.1.1 Sealdah Pedestrian Bridge (SLPB) .................................................. 44
3.1.2 Dhakuria Pedestrian Bridge (DHPB) ................................................. 45
3.1.3 Ekdalia Pedestrian Bridge (EPB) .................................................... 46
3.1.4 Park circus Pedestrian Bridge (PPB) .................................................. 48
3.1.5 Raja Bazar Pedestrian Bridge (RBPB) ............................................... 49
3.1.6 Bidhan Sishu Udyan Pedestrian Bridge (BSUPB) .......................... 50
3.1.7 Ultadanga Pedestrian Bridge (UTPB) .............................................. 51
3.1.8 Gholaghata Pedestrian Bridge (GGPB) ............................................ 52
3.1.9 Sree Bhumi Pedestrian Bridge (SBPB) ............................................. 53
3.1.10 Lake Town Pedestrian Bridge (LTPB) ............................................ 54

3.2 METHODOLOGY ............................................................................. 55

3.3 DEMOGRAPHIC PROFILE OF PEDESTRIAN BRIDGES IN
KOLKATA

3.3.1 Household, Population and Gender Analysis adjacent to Pedestrian
Bridges .................................................................................................. 57

3.4 LAND USE PATTERN OF PEDESTRIAN BRIDGES IN KOLKATA.... 63

3.4.1 Importance of Project Area ................................................................ 63
3.4.2 Details land use pattern in the vicinity of SLPB .............................. 64
3.4.3 Land use pattern adjacent to other pedestrian bridges ............... 69
3.4.4 Walk Ability Index in the vicinity of Pedestrian Bridges in Kolkata 71

3.5 STRUCTURAL SPECIFICATION OF DIFFERENT PEDESTRIAN
BRIDGES ............................................................................................. 72
3.5.1 Specification of Structure of different Pedestrian Bridges .......... 72

3.6 TRAFFIC FLOW BENEATH THE PEDESTRIAN BRIDGES IN
KOLKATA ............................................................................................ 75
3.6.1 Traffic Flow beneath the different Pedestrian Bridges .............. 75

3.7 TRAFFIC SPEED AND CONGESTION TIME ................................ 85

3.7.1 Fundamental Parameters of Traffic Flow ...................................... 85
3.7.2 Traffic Flow, Speed and Density beneath the Pedestrian Bridge... 87
3.7.3 Observations of vehicle speed under Pedestrian Bridges in Kolkata 88
3.7.4 Traffic Speed and Accidental Risk ................................................. 89
3.7.5 Traffic Congestion Time adjacent to Pedestrian Bridges .......... 90
3.7.6 Statistical Results of Congestion Time and Vehicles Speed ...... 91
3.7.7 Vehicle-wise Speed and Risk of Pedestrians .............................. 91

3.8 FINANCIAL COST AND REVENUE STRUCTURE OF PEDESTRIAN
BRIDGES IN KOLKATA ........................................................................ 92

3.8.1 Project Financials ............................................................ 93
3.8.2 Project Cost and Operating and Maintenance Costs ................. 93
3.8.3 Financial Revenue Income ....................................................... 95
3.8.4 Financial Costs and Revenues of pedestrian bridge- A sample case of SLPB ................................................................. 96
3.8.5 Financial Costs and Revenue of different Pedestrian Bridges .... 97

CHAPTER- IV   UTILISATION PATTERN OF PEDESTRIAN BRIDGES
IN KOLKATA – A CASE STUDY
4.1 INTRODUCTION................................................................................. 99
4.2 METHODOLOGY.............................................................................. 99
4.3 OVERALL INCIDENCE OF USE OF PEDESTRIAN BRIDGES IN KOLKATA........................................................................ 102
  4.3.1 Age and Sex Analysis.............................................................. 103
  4.3.2 Time Analysis........................................................................... 106
  4.3.3 Pedestrian’s Perceptions on Pedestrian Bridge......................... 109
    (a) Bridge-Users’ Perceptions....................................................... 109
    (b) Bridge Non-users’ Perceptions.................................................. 110
    (c) Overall Pedestrians’ Perceptions.............................................. 110
  4.3.4 Problems of Pedestrians.......................................................... 111
  4.3.5 Occupational Status............................................................... 114
  4.3.6 Educational Status................................................................. 117
  4.3.7 Purpose of Pedestrians’ Journey.............................................. 119
  4.3.8 Consciousness on Obeying the Traffic Rules............................ 121
  4.3.9 Income Status......................................................................... 123
  4.3.10 Summary of Logistic Regression Results................................. 125
4.4 ANALYSIS ON LOGISTIC REGRESSION RESULTS OF SELECTED PEDESTRIAN BRIDGES IN KOLKATA................................................. 127
  4.4.1 Empirical Results of Park Circus Pedestrian Bridge.................... 127
  4.4.2 Empirical Results of Sealdah Pedestrian Bridge......................... 129
  4.4.3 Empirical Results of Ultadanga Pedestrian Bridge...................... 131
  4.4.4 Empirical Results of Lake Town V Pedestrian Bridge.................. 133

CHAPTER- V COST-BENEFIT ANALYSIS OF THE PEDESTRIAN BRIDGES IN KOLKATA

5.1 INTRODUCTION................................................................................. 135
5.2 SOCIAL COST-BENEFIT ANALYSIS..................................................... 139
  5.2.1 Valuation of Tradable Goods..................................................... 141
  5.2.2 Valuation of Non-Tradeable Goods........................................... 142
  5.2.3 Shadow Wage Rate.................................................................. 143
  5.2.4 Social Discount Rate................................................................ 144
  5.2.5 Externalities............................................................................. 145
  5.2.6 Value of Travel Time............................................................... 146
  5.2.7 Calculation of the Net Present Value....................................... 147
  5.2.8 Application of the Net Present Value Test................................. 147
5.3 METHODOLOGY OF COST AND BENEFIT ANALYSIS OF PEDESTRIAN BRIDGES IN KOLKATA.................................................. 147
5.4 SOCIAL COSTS AND BENEFITS ANALYSIS- A SAMPLE CASE OF SLPB...................................................................................... 151
  5.4.1 Financial cost and benefit converted into social costs and benefits 152
  5.4.2 Externalities of Pedestrian Bridge.............................................. 154
  5.4.3 Results of Net Present Value..................................................... 155
  5.4.4 Results of Net Present Value Test............................................. 156
5.5 RESULTS OF SOCIAL COSTS AND BENEFITS ANALYSIS OF OTHER PEDESTRIAN BRIDGES IN KOLKATA................................. 157
  5.5.1 Private or Internal Costs and Benefits....................................... 157
  5.5.2 Externalities or “Spillover effect” or Pecuniary Benefits and Costs. 157
    (a) Actual to Standard Speed Ratio............................................... 157
    (b) Individual Congestion Time to Average Congestion Time Ratio  157
(c) Benefit of Physical Fitness ................................................. 158  
(d) Advantage Benefit ......................................................... 158  
(e) Travel Time Saved ......................................................... 158  
(f) Value of Travel Time Saved .............................................. 159  

5.5.3 Pecuniary Benefits and Costs of Pedestrian Bridges in Kolkata .... 161

CHAPTER- VI PEDESTRIAN BRIDGES IN KOLKATA - A COMPARATIVE ANALYSIS

6.1 COMPARATIVE ANALYSIS OF POPULATION OF SURVEY AREA .. 163  
6.2 COMPARATIVE ANALYSIS OF LAND USE PATTERN IN THE VICINITY OF PEDESTRIAN BRIDGES IN KOLKATA ................. 164  
6.3 COMPARATIVE ANALYSIS OF TRAFFIC FLOW BENEATH THE PEDESTRIAN BRIDGES ....................................................... 165  
6.4 COMPARATIVE ANALYSIS OF TRAFFIC FLOW, SPEED AND DENSITY BENEATH THE PEDESTRIAN BRIDGES ..................... 166  
6.5 COMPARATIVE ANALYSIS ON TRAFFIC SPEED AND CONGESTION TIME RELATIONSHIP AMONG PEDESTRIAN BRIDGES IN KOLKATA .............................................................. 167  
6.6 COMPARATIVE ANALYSIS OF THE STRUCTURE OF PEDESTRIAN BRIDGES ................................................................. 168  
6.7 COMPARATIVE ANALYSIS OF FINANCIAL COSTS AND REVENUE OF PEDESTRIAN BRIDGES .............................................. 168  
6.8 COMPARATIVE ANALYSIS OF LOGISTIC REGRESSION RESULTS OF SOCIO-ECONOMIC FACTORS AMONG SELECTED PEDESTRIAN BRIDGES IN KOLKATA .................................................. 171  
6.9 COMPARATIVE ANALYSIS OF PRIVATE OR INTERNAL COSTS AND BENEFITS ................................................................. 175  
6.10 COMPARATIVE ANALYSIS OF “EXTERNALITY” OR “SPILOVER EFFECT” OF PEDESTRIAN BRIDGES IN KOLKATA ................. 175

CHAPTER- VII CONCLUSION AND SUGGESTIONS

7.1 SUMMARY OF THE WORK .................................................. 177  
7.2 SUGGESTIONS .................................................................. 196  
7.3 SIGNIFICANCE OF THE STUDY ............................................ 198  
7.4 SCOPE OF FURTHER RESEARCH ......................................... 199

ANNEXURE ........................................................................... 200

BIBLIOGRAPHY ...................................................................... 228