

**A STUDY ON THE ASPECTS OF WALKABILITY
OF DIFFERENTLY ABLED PEOPLE WITHIN THE
PUBLIC TRANSPORT DISTRICT IN A CITY:
THE CASE OF COLOMBO PETTAH, SRI LANKA.**

M. K. S. Saubhagya

(209296 J)

Master of Urban Design

Department of Architecture

University of Moratuwa

Sri Lanka

November 2023

**A STUDY ON THE ASPECTS OF WALKABILITY
OF DIFFERENTLY ABLED PEOPLE WITHIN THE
PUBLIC TRANSPORT DISTRICT IN A CITY:
THE CASE OF COLOMBO PETTAH, SRI LANKA.**

M. K. S. Saubhagya

(209296 J)

Dissertation submitted in partial fulfilment of the requirements for the
Master of Urban Design

Department of Architecture

University of Moratuwa
Sri Lanka

November 2023

DECLARATION

I declare that this is my own work, and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text. Also, I hereby grant to University of Moratuwa the non-exclusive right to reproduce and distribute my thesis, in whole or in part in print, electronic or other medium. I retain the right to use this content in whole or part in future works (such as articles or books).

Signature

2023-11-22

.....

.....

Name of the candidate: M.K.S. Saubhagya

Date

The above candidate has carried out this research for the dissertation under my supervision.

Signature of the Supervisor

.....

.....

Name of Supervisor: Archt. Janaka Dharmasena

Date

ACKNOWLEDGEMENT

This study owes much, to the assistance and guidance given by all the following, whom I wish to extend my gratitude.

First of all, I wish to acknowledge Dr. Janaka Wijesundara, Head of the Department, Department of Architecture, University of Moratuwa, & the Course Director - Master's Degree Program in Urban Design, University of Moratuwa for his principal guidance on the process of the dissertation.

Then, I would like to express my deepest gratitude to Archt. Janaka Dharmasena, who supervised me throughout the process, as well as the coordinator of the dissertation – Master's program in Design, University of Moratuwa.

Moreover, my special thanks also going to Ms. Sandumini Nimashi, one of my colleagues, and all other friends who supported me to complete this product in a successful manner.

Also, my kind appreciation goes to Ms. Rasanga Nirmani & all other non-academic staff of the Department of Architecture, University of Moratuwa who supported the program throughout the process.

Finally, yet importantly, I wish to thank my family members for their patient, encouragement and for the help they gave me in every possible way to make this dissertation a success.

ABSTRACT

This evidence-based research investigates the aspects of walkability within public transport districts, with a specific focus on the needs of differently abled individuals. Drawing insights from the universal design theory, the study underscores the importance of ensuring easy and safe access for often disadvantaged populations in urban environments. The research centers on the public transport district of Pettah in Colombo, Sri Lanka—a critical hub integrating railway transportation, public and private bus services, and a bustling economic center. The main research question revolves around the walkability aspects in existing public transport districts, with two main objectives: understanding the current level of walkability (Objective 01) and the pedestrian environment's quality (Objective 02) for differently abled people within this district. To achieve the first objective, the study employs a walkability checklist, examining six key factors: Sidewalks and Pathways, Crosswalks and Pedestrian Crossings, Pedestrian Safety, Accessibility, Amenities and Comfort, and Land Use and Destination. The checklists cover five zones in the public transport district, revealing that the existing walkability conditions fall short of meeting the needs of differently abled pedestrians, highlighting the need for urgent improvements. For the second objective, the Pedestrian Environmental Quality Index (PEQI) serves as a comprehensive evaluation tool. The PEQI analysis covers 34 intersections and 57 street segments, revealing that 64.7% of intersections were not suitable for pedestrians, and 57.7% of street segments had poor environmental conditions for differently abled individuals. Geographical Information Systems (GIS) represent PEQI attributes and scores, facilitating informed decision-making for pedestrian system improvements. A Walkability Survey with 20 differently abled pedestrians further reinforces the study's findings, highlighting their perceptions of the pedestrian environment within the district. The respondents' overall perception rates the walkability as 'very poor' by 60% and 'poor' by 35%, underlining the pressing need for improvements. Aligning with the case study findings, the research offers recommendations for integrating urban land use and activity networks with walkable planning considerations. Special attention is advised for providing lacking pedestrian infrastructure while maintaining existing facilities properly. By addressing the challenges faced by differently abled individuals, this research provides valuable insights for urban designers and policymakers, enabling them to comprehend the current state of walkability and foster inclusive and enriching urban spaces that enhance the overall well-being of our communities. The findings and recommendations contribute to creating more accessible and equitable urban environments, ensuring that all individuals, regardless of ability, can move freely and safely within public transport districts.

Keywords: Walkability, Differently Abled People, Public Transport Districts

TABLE OF CONTENTS

DECLARATION	i
ACKNOWLEDGEMENT	ii
ABSTRACT	iii
TABLE OF CONTENTS	iv
LIST OF FIGURES	vii
LIST OF TABLES	ix
INTRODUCTION	1
I. Background to the Study.....	1
II. Need of the Study	2
III. Research Question.....	3
IV. Research Objectives.....	3
V. Methodology	4
VI. Limitations and Scope of the Study	5
CHAPTER ONE: LITERATURE REVIEW	6
1. 1 The Role of Public Transport Districts in the City Formation	6
1.1.1 The City and Its Functions.....	6
1.1.2 Definition of Public Transport Districts	7
1.1.3 Global Examples for Public Transport Districts	7
1.2 Walkability.....	8
1.2.1 Defining Walkability.....	8
1.2.2. Built Environmental Concerns that Account for Walkability	9
1.2.2.1 Side Walks and Pathways.....	9
1.2.2.2 Pedestrian Crossings	10
1.2.2.3 Curbing.....	11
1.2.2.4 Signs and Signals	12
1.2.2.5 Street Furniture and Amenities and Green Infrastructure	12
1.3 The Need of Disability Considerations within Walkable Public Transport Districts	13
1.3.1 Walkability and Universal Design Theory.....	14

1.3.2 Walkability for Differently Abled People	14
1.3.3 Definition of Differently Abled People	14
1.3.4 Principles of Universal Design Theory for Differently Abled People.....	15
1.4 Universal Accessibility Considerations for Differently Abled People in Walkable Public Transport Districts	16
1.4.1 Standard Dimensions of Pedestrian Infrastructure for Differently Abled People	16
1.4.1.1 Sidewalks and Pathways	17
1.4.1.2 Pedestrian Crossings	17
1.4.1.3 Curb Ramps.....	18
1.4.1.4 Pedestrian Information	18
1.4.1.5 Street Furniture, Amenities and Green Infrastructure	21
1.4.2 Identifying Barriers for Differently Abled People in Public Transport Districts	22
1.4.2.1 Physical Barriers for Differently Abled People in Public Transport Districts	22
1.4.2.2 Current Accessibility Regulations for Differently Abled People	25
1.5 Walkability Assessment Methods	28
1.5.1 Pedestrian Environment Quality Index (PEQI)	30
CHAPTER TWO: THEORETICAL FRAMEWORK AND RESEARCH METHODOLOGY.....	34
2.1 Theoretical Framework	34
2.2 Research Methodology	36
2.2.1 Site Selection	36
2.2.1.1 Site Boundaries	40
2.2.2 Data Collection Methods and Tools.....	40
2.2.2.1 Data Collection Methods.....	41
2.2.2.2 Data Collection Tools	42
2.2.3 Data Presentation Methods	45
2.2.4 Method of Analysis	45
CHAPTER THREE: ANALYSIS AND FINDINGS	50
3.1 Walkability Checklist to Understand the existing Walkability Level of Differently Abled People in the Pedestrian Environment	50

3.1.1 Olcott Mawatha.....	50
3.1.2 Railway Station Entry Road	54
3.1.3 W.E. Bastian Mawatha.....	59
3.1.4 Saunders Place	63
3.1.5 Bodhiraja Mawatha and Other Cross Streets	67
3.1.6 Summary.....	71
3.2 PEQI to Understand the Existing Walkability Quality for Differently Abled People in the Public Transport District.....	73
3.2.1 Intersections	73
3.2.2 Segments.....	74
3.2.3 Summary.....	76
3.3 Walkability Survey to Understand the User Perception Towards the Pedestrian Environment in the Public Transport District.....	79
3.4 Recommendations for Improving the Quality of Walkability of Differently Abled People within the Public Transport District	83
CONCLUSION.....	86
REFERENCES.....	90

LIST OF FIGURES

Figure 1: Connectivity of City Functions	6
Figure 2: Transit Station as the Central Hub of Transport Districts.....	7
Figure 3: Cross-Section Illustrating Pedestrian Zone	9
Figure 4: Ample Space Provided in Sidewalks for Comfortable Movement.....	10
Figure 5: A) Types of Street Crossings, B) Pedestrian Crossing Spacing.....	11
Figure 6: Curb Radius Tightening for Reducing Crossing Distance.....	11
Figure 7: A) Pedestrian Crossing Signal B) In-Street Pedestrian Signs for Narrow Spaces, C) Wayfinding Signs	12
Figure 8: Different Street Furniture Including Movable Chairs, Lighting and Landscaping	13
Figure 9: Sorts of Disability Among Individuals	15
Figure 10: Moving Speeds of People	16
Figure 11: Sidewalk Widths for Disabled Users	17
Figure 12: A) Guide Strips B) Road Humps	18
Figure 13: Pedestrian Ramp Orientation for Disabled.....	18
Figure 14: Tactile Paving and Textural Variations	19
Figure 15: Colour Palette of Signage and Recommended Level for Information Panels	20
Figure 16: A) Furniture Spacing; B) Furniture Dimensions; C) Water Fountain Height Recommendations	21
Figure 17: Dangers and Obstacles in Sidewalks and Pathway Surfaces.....	23
Figure 18: A) Movement Obstructed by Ground Holes B) Unexpected Bridges to Cross.....	24
Figure 19: The Dimension of Observed Methods and Tools	29
Figure 20: Original PEQI Indicators by Domain	31
Figure 21: Original PEQI Indicators by Domain	32
Figure 22: Research Methodology	34
Figure 23: Theoretical Framework.....	35
Figure 24: Pettah Location Map.....	37
Figure 25: Bus Terminals and Stops in the Pettah Area	38
Figure 26: Major Transits and Boarding Locations in Pettah	38
Figure 27: Land Use Map	38
Figure 28: Site Boundaries.....	40
Figure 29: Data Collection Methods and Tools	41
Figure 30: Observation Zones for Walkability Checklist.....	43
Figure 31: Formation of the Walkability Checklist.....	43
Figure 32: Exemplary Key Map for Identify Intersections and Segments.....	44
Figure 33: Assigned Score Values for Walkability Checklists	46

Figure 34: PEQI Intersection and Street Segment Formulas	48
Figure 35: Olcott Mawatha Location and Pedestrian Environment.....	50
Figure 36: Walkability Score for Olcott Mawatha	51
Figure 37: Sidewalk Condition Observed in Olcott Mawatha	51
Figure 38: Sidewalk Obstructions in Olcott Mawatha.....	52
Figure 39: Obstructions in Crosswalks and Pedestrian Crossings in Olcott Mawatha	52
Figure 40: Accessibility Barriers in Olcott Mawatha.....	53
Figure 41: Good Shading Levels in Olcott Mawatha.....	54
Figure 42: Railway Station Entry Road Location and Pedestrian Environment.....	55
Figure 43: Walkability Score for Railway Station Entry Road.....	56
Figure 44: Sidewalk Conditions Observed in Railway Station Entry Road	56
Figure 45: Obstructions in Crosswalks and Pedestrian Crossings in Railway Station Entry Road	57
Figure 46: Accessibility Barriers in Railway Station Entry Road	58
Figure 47: Available Sources of Amenities and Comfort in Station Entry Road.....	58
Figure 48: W.E. Bastian Mawatha Location and Pedestrian Environment.....	59
Figure 49: Walkability Score for W.E. Bastian Mawatha	60
Figure 50: Sidewalk Condition Observed in W.E. Bastian Mawatha	61
Figure 51: Barriers to Crossroads for Pedestrians at W.E. Bastian Mawatha.....	61
Figure 52: Accessibility Conditions in W.E. Bastian Mawatha	62
Figure 53: Amenities and Sources of Comfort Observed in W.E. Bastian Mawatha	63
Figure 54: Saunders Place Location and Pedestrian Environment	64
Figure 55: Walkability Score for Saunders Place.....	64
Figure 56: Sidewalk Obstructions Observed in Saunders Place	65
Figure 57: Crosswalks and Pedestrian Crossings in Saunders Place	65
Figure 58: Railway Station Entry Road Location and Pedestrian Environment.....	67
Figure 59: Walkability Score for Bodhiraja Mawatha and Other Cross Streets	68
Figure 60: Sidewalk and Pathway Conditions Observed in Cross Streets.....	69
Figure 61 : Obstructions in Crosswalks and Pedestrian Crossings in Cross Streets.	69
Figure 62 Distribution of: Land Uses and Destinations along Cross Streets.....	70
Figure 63: Overall Walkability Level Score for Each Factors and Indicators	71
Figure 64: Overall Walkability Level Score for Each Zone.....	72
Figure 65: Frequency Distribution of PEQI Scores	77
Figure 66: Intersections & Segments PEQI Score Interpretation	77

LIST OF TABLES

Table 1: Gained Walkability Score for Olcott Mawatha	46
Table 2: PEQI Score Interpretation	48
Table 3: Overall Walkability Level Score for Each Factors and Indicators	72
Table 4: PEQI Summary Table for Intersections	73
Table 5: PEQI Summary Table for Segments	74
Table 6: Respondents Profile	79
Table 7: Score Obtained for Walkability Survey Part 1	80
Table 8: Score Obtained for Walkability Survey Part 11	82

LIST OF APPENDICES

Appendix A: Walkability Checklist.....	Error! Bookmark not defined.
Appendix B: Intersection Form.....	Error! Bookmark not defined.
Appendix C: Segment Form	Error! Bookmark not defined.
Appendix D: Walkability Survey	Error! Bookmark not defined.
Appendix E: Numerical Identifier Code for Intersections and Segments.....	Error! Bookmark not defined.
Appendix F: Intersection Form Coder's Version	Error! Bookmark not defined.
Appendix G: Segment Form Coder's Version	Error! Bookmark not defined.
Appendix H: Assigned Weights for Creating PEQI Overall Score- Intersections	Error! Bookmark not defined.
Appendix I: Assigned Weights for Creating PEQI Overall Score- Segments....	Error! Bookmark not defined.
Appendix J: Distribution of PEQI Scores for Intersections	Error! Bookmark not defined.
Appendix K: Sample Minimum and Maximum Scores for Intersections.....	Error! Bookmark not defined.
Appendix L: Distribution of PEQI Scores for Segments	Error! Bookmark not defined.
Appendix M: Sample Minimum and Maximum Scores for Segments	Error! Bookmark not defined.
Appendix N: Data Entry Sheets for Walkability Survey	Error! Bookmark not defined.