

LIVEABILITY & THE SRI LANKAN HIGH-RISE

Mitigating the impact of building height on high-rise occupants

Buddhini Shashika Wijesinghe

188735 U

Degree of Master of Science /Master of Engineering

Department of Civil Engineering

University of Moratuwa

Sri Lanka

May 2023

LIVEABILITY & THE SRI LANKAN HIGH-RISE

Mitigating the impact of building height on high-rise occupants

Buddhini Shashika Wijesinghe

188735 U

Thesis/Dissertation submitted in partial fulfilment of the requirements for the degree
Master of Science /Master of Engineering in Civil Engineering

Department of Civil Engineering

University of Moratuwa

Sri Lanka

May 2023

Declaration

I declare that this is my work, and this thesis 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 the University of Moratuwa the non-exclusive right to reproduce and distribute my thesis, in whole or part in print, electronic, or other media. I retained the right to use this content in whole or part in future works (such as articles or books).

Signature:|

Date: 31-05-2023

The above candidate has researched the Masters's under my supervision.

Name of the Supervisors: DR. Chandana Siriwardana

Signature of the supervisors:

Date: 01/06/2023

Abstract: The impact of height on occupant wellbeing is a phenomenon that is well documented in Western research. However, there is a dearth of and need for such research in the Sri Lankan context due to the burgeoning high-rise development sweeping across the island. This study is a response to this need as it demonstrates how building height impacts on the wellbeing of occupants in 03 selected high-rise apartments located in Colombo, Sri Lanka. This holistic multiple-case study approach has recourse to occupants' phenomenological experiences of vertical living and building and environmental cues that impact both negatively and positively on their wellbeing. The initial literature survey conducted on occupants' experience of vertical living quantifies the parameters impacting on wellbeing. These in turn have been factored into a questionnaire in order to assess the impact of height on occupants' wellbeing, through the protocols of phenomenological enquiry. The analytical process consisted of phenomenological horizontalization, which facilitated the extraction of themes pertaining to the impact of height on wellbeing.

The results show that the natural environment does, in fact, play a pivotal role in mitigating the negative impact of building height, especially when the experiences of occupants living in the upper floors of the high-rise apartments are taken into consideration. They also show that a high-rise apartment's physical and visual connections to the natural environment, have a beneficial effect on the mental health and wellbeing of its occupants. Thus, the findings of this study corroborate those of Western research and contribute to the ongoing global discourse on the subject. It should also impact, thereby, the growth and evolution of the user-friendly high-rise of the 21st century.

Key Words: high-rise, building height, natural environment, negative impacts, livability

Acknowledgements

I wish to extend my heartfelt gratitude to those who were the driving force in making this report a reality.

First, I would be happy to express my sincere gratitude to my project supervisor Dr. Chandana Siriwardana, who gave me this golden opportunity to do this project and his valuable advice assisted me and kept me motivated throughout the report. And also, the other academic and non-academic staff of the University of Moratuwa who also helped me to complete this project.

Moreover, it is with a deep sense of gratitude that I thank all the teachers who taught me through out through this course.

Further, I am also thankful to my Employer, Eng. Wannigama, Director of Sanken Construction (Ltd) and Ms S. Vajira, Senior Engineer/Director at PACE International (Pvt) Ltd and fellow colleagues for creating me the required work environment during the Course.

I would like to express special gratitude to those, who responded to my research survey and the Condominium management committees who gave me the most valuable information to complete the task.

Last but not least, I would like to express my sincere gratitude to my beloved teacher Archt. Ravin Guneratne whose guidance and valuable advice assisted me and kept me motivated throughout the report. Without his direction and the many discussions we had, it would have been very difficult to accomplish this study. His immense knowledge, enthusiasm, and patience will always be an inspiration to me in my future endeavors.

This report was a reality of the kind of support stated above and again, I acknowledge all who helped me in numerous ways in completing this research.

Contents

CHAPTER 1: INTRODUCTION	01
1.1 Project Background	01
1.2 High-rise evolution: from megalopolis to ecumenopolis	02
1.3 High-rise living in Sri Lanka	04
1.4 Consequences of High-Rise Living	05
1.5 Significance of the Study	05
1.6 Research Questions	06
1.7 Aims and Objectives	06
1.8 Methodology	07
1.9 Scope and Limitation	08
1.10 Thesis Structure	10
CHAPTER 2: LITERATURE REVIEW	11
2.1 High-rise living, and its consequences	11
2.2 High-rise living, the negative impacts due to the building height	15
2.3 High-rise living, the human body and touching the earth	18
2.4 High-rise living, and its' importance of Greenery for the occupants' wellbeing	21
2.5 High-rise living, and its' importance of window view on occupants' wellbeing	22
CHAPTER 3: METHODOLOGY	24
3.1 Case studies selection method	26
3.2 Participants' selection method	27
3.3 Setting up the research questions	29
3.4 Questionnaire Circulation Process	30
3.5 Data collection method for this research	30
3.6 Organized and Analyzing the Data.	31
CHAPTER 4: DATA COLLECTION AND ANALYSIS	33
4.1 Overall responses overview of background information and routines of participants	34
4.2 Overall responses overview of the building height	38
4.3 Overall responses overview of the view/horizon	42
4.4 Overall responses overview of the greenery	45
4.5 Overall responses overview of the grounding/earthing	47
4.6 Cross-analysis of the three case studies	50
4.7 Summary of overall analysis	52
CHAPTER 5: CONCLUSIONS & RECOMMENDATIONS	53
5.1 Conclusions	53
5.2 Recommendations	54
5.3 Projections for the future	54

List of Tables	Page
Table 1: Sample table use for Sub-codes, Codes and themes mapping	32
Table 2: Further comparatively illustrates responses shown in figure 15	36
Table 3: Further illustrations for table 2	37
Table 4: Comparative responses overview of concerns regarding the external balcony	38
Table 5: Comparative responses overview regarding the external balcony usage	39
Table 6: Comparative responses overview regarding they look from the balcony	40
Table 7: Comparative responses overview regarding looking down from the building	41
Table 8: Comparative responses overview regarding concerns when they look outside	42
Table 9: Comparative responses overview regarding concerns when they look outside	43
Table 10: Comparative responses overview comparing the height and the view	44
Table 11: Mapping of reasons given for the figure 20	45
Table 12: Cross analysis: findings relate to the three case studies	50

List of Figures	Page
Figure 1: Summary of negative impacts effect on high-rise occupants	13
Figure 2: Medical infrared images showing inflammation reduction due to the grounding	19
Figure 3: Facial circulations changes (women) shows after 20 mini. Grounding. Dark: low circulation/Red: highest circulation	20
Figure 4: Comparison of White blood cells	20
Figure 5: Comparison of Blood pressure cuff	20
Figure 6: The nature how effect on patients stress	21
Figure 7: Sample of how room change the atmosphere with the window	23
Figure 8: The research context narrow down	25
Figure 9: Categories of high-rise apartments (Case studies) with its specific location profile	26
Figure 10: Internal arrangement and the basic shape of the selected apartment building	27
Figure 11: Corner apartments highlighted	27
Figure 12: Relationship between initial research questions and research objective	29
Figure 13: Mapping relationship diagram I	31
Figure 14: Mapping relationship diagram II	34
Figure 15: Overall responses overview of age group, nationality and fist experience living in a high-rise	35

	Page
Figure 16: Overall responses overview of where they spend their day off	35
Figure 17: A cross-sectional views of a high-rise apartments with less surrounding greener (Case study type 1)	39
Figure 18: A cross-sectional views of a high-rise apartments with more surrounding greenery (Case study type 2)	39
Figure 19: Overall responses overview of participants concerns when choosing an apartment	42
Figure 20: Comparative responses overview of what they mostly prefer to see outside	45
Figure 21: Overall responses overview of what they feel about greenery	46
Figure 22: overall responses overview of how people are affected by close greenery	46
Figure 23: Overall responses overview of what they feel about natural ground below	47
Figure 24: Overall responses overview of what they perceive when touch the ground	47
Figure 25: Overall responses overview of what they feel when they touch the natural ground	48
Figure 26: Overall responses overview of what they perceive when ground is in close proximity	48
Figure 27: Overall responses overview of what they perceive when see the natural landscape in close proximity	48
Figure 28: Mapping Overall Analysis	50
References	56

List of Appendices

Appendix	Description	Page
Appendix A	Questions for the Survey	61
Appendix B	Participants Responses	78