

**APPROPRIATE RESIDENTIAL SITE ENVIRONMENTS
FOR THE ELDERLY IN BAAN PONG NUEA SUB-DISTRICT
MUNICIPALITY OF HANG DONG DISTRICT
IN CHIANG MAI PROVINCE**

by

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ABSTRACT

Old age is a critical stage of life, in which a person's physical environment of the residential site plays an important role. However, although the most important characteristics of a suitable environment for the elderly is well described, the perceptions of older people within residential site environmental settings and their features have yet to be studied in-depth in Asian countries within rural settings.

As critical points of at least two inter-related gaps, this study addresses these gaps by widening the focus on residential sites in a rural Asian context, with a mixed-methodology based on the extent of Person-Environment (P-E) fit. Thus, the principal research aims of this project are to understand how older adults perceive, utilise and relate to their residential site environments in a rural context as evaluated by older residents themselves in a case study of a village in northern Thailand.

This study considers three research questions concerning the residential site environments in the rural Asian context - their concepts as the main considerations of the characteristics, the contribution to the outdoor usages and satisfaction, and the perceptions and evaluations among older people. The evidence presented in the study suggests that residential sites' environmental characteristics are essential to creating appropriate relationships between elders and their environments in a rural context and affect elders' perception, outdoor usage, and environmental satisfaction.

This study contributes to the developed line of analysis of the residential site environments for ageing in a rural Asian context to broaden what has been set in that existing body of knowledge relating to living environments for older people. This

research could lead to residential and rural development policy interventions and has implications for practice. The findings from this study allow elders or related organisations to promote, apply and create the appropriate and desirable residential environments in confronting an ageing society.

Keywords: Residential site environment, perception, older adult, Person-Environment (P-E) fit, mixed-methods, rural

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LIST OF ABBREVIATIONS

EG	Environmental Gerontology
P-E fit	Person-Environment fit
WHO	World Health Organisation

TABLE OF CONTENTS

ABSTRACT	I
ACKNOWLEDGEMENTS	III
LIST OF ABBREVIATIONS.....	VI
TABLE OF CONTENTS	VII
LIST OF FIGURES	XII
LIST OF TABLES.....	XIX
LIST OF APPENDICES	XXII

PART ONE: INTRODUCTION

CHAPTER 1: <i>INTRODUCTION</i>	1
1.1 INTRODUCTION TO RESEARCH	1
1.2 BACKGROUND OF THE RESEARCH	2
1.3 PURPOSE OF THE RESEARCH	7
1.4 IMPORTANCE OF THE STUDY	11
1.5 OVERVIEW OF RESEARCH DESIGN	12
1.6 DEFINITIONS OF TERMS.....	14
1.7 SCOPE AND LIMITATIONS OF THE RESEARCH STUDY	15
1.8 OUTLINE OF THE STRUCTURE OF THE THESIS	18
1.9 CONCLUSION	24

PART TWO: LITERATURE REVIEW

CHAPTER 2: <i>HUMAN AGEING AND GEOGRAPHIES OF AGEING, FAMILY AND CARE IN RURAL CONTEXT</i>	26
2.1 INTRODUCTION	26

2.2 HUMAN AGEING	27
2.2.1 PHYSICAL CHARACTERISTICS	29
2.2.2 SOCIAL AND PSYCHOLOGICAL CHARACTERISTICS	31
2.3 ACTIVE AGEING	33
2.4 GEOGRAPHIES OF AGEING AND THE RURAL CONTEXT	34
2.5 GEOGRAPHIES OF FAMILY AND CARE	40
2.6 CONCLUSION	45
 CHAPTER 3: MICRO-GEOGRAPHIES OF LIVING ENVIRONMENTS FOR AGEING..	47
3.1 INTRODUCTION	47
3.2 MICRO-GEOGRAPHIES OF LIVING ENVIRONMENTS	48
3.2.1 RESIDENTIAL ENVIRONMENT FOR ELDERLY PEOPLE	49
3.2.2 ENVIRONMENTAL GERONTOLOGY (EG)	52
3.2.3 PERSON-ENVIRONMENT (P-E) FIT	56
3.3 PERCEPTION AND COGNITION OF THE ENVIRONMENT	59
3.4 CONCLUSION	62
 CHAPTER 4: THE CONTEXT OF AGEING IN THAILAND.....	64
4.1 INTRODUCTION	64
4.2 SITUATION OF AGEING IN THE ASIAN CONTEXT AND THE LIVING ARRANGEMENTS.....	66
4.3 THAILAND’S NATIONAL PLANS FOR AGEING.....	76
4.4 BACKGROUND OF POPULATION AGEING FROM THE CASE STUDY	80
4.5 CONCLUSION	82

PART THREE: METHODOLOGY

CHAPTER 5: *RESEARCH DESIGN, METHODOLOGY, MEASURES AND ANALYSIS*...84

5.1 INTRODUCTION	84
5.1.1 A BRIEF DISCUSSION OF THE RESEARCH BACKGROUND, OBJECTIVES, QUESTIONS, AND RESEARCH APPROACH	86
5.1.2 METHODOLOGICAL FRAMEWORK.....	89
5.2 THE CASE STUDY DISTRICT AND PARTICIPANTS	92
5.2.1 THE CASE STUDY DISTRICT.....	92
5.2.2 THE PARTICIPANTS	93
5.3 RESEARCH DESIGN AND METHODS.....	100
5.3.1 THE QUANTITATIVE AND QUALITATIVE APPROACHES IN MIXED METHODS RESEARCH DESIGN	100
5.3.2 DATA COLLECTION AND PROCEDURES.....	102
5.4 MEASURES AND ANALYSIS.....	109
5.4.1 MEASUREMENTS	109
5.4.2 METHODS OF DATA ANALYSIS	117
5.5 CONCLUSION	120

PART FOUR: FINDING, ANALYSIS AND RESULTS

CHAPTER 6: *THE CHARACTERISTICS AND PHYSICAL ENVIRONMENTAL*

***FEATURES OF RESIDENTIAL SITE ENVIRONMENT*.....122**

6.1 INTRODUCTION.....	122
6.2 THE CHARACTERISTICS OF A CASE STUDY VILLAGE IN THE RURAL ASIAN CONTEXT.....	123
6.2.1 THE PHYSICAL CHARACTERISTICS OF THE VILLAGE.....	127
6.2.2 THE SETTLEMENT CHARACTERISTIC OF THE RESIDENTIAL SITES IN THE VILLAGE	132

6.3 THE CHARACTERISTICS OF OLDER ADULTS' RESIDENTIAL SITE ENVIRONMENTS.....	144
6.3.1 RESIDENTIAL SITE LEVEL.....	144
6.3.2 RESIDENTIAL DWELLING LEVEL	189
6.4 CONCLUSION	214
 CHAPTER 7: <i>THE OUTDOOR USAGE CHARACTERISTICS OF OLDER ADULTS IN THE RESIDENTIAL SITE ENVIRONMENT IN A RURAL CONTEXT.</i>	 216
7.1 INTRODUCTION.....	216
7.2 THE PHYSICAL ACTIVITIES IN THE RESIDENTIAL SITE ENVIRONMENT	217
7.2.1 THE OUTDOOR ACTIVITIES IN THE RESIDENTIAL SITE ENVIRONMENT.....	218
7.2.2 THE OUTDOOR SOCIAL ACTIVITIES IN THE RESIDENTIAL SITE ENVIRONMENT.....	247
7.3 THE MOST UTILISED RESIDENTIAL SITE AREAS OR SPACES	257
7.4 CONCLUSION	270
 CHAPTER 8: <i>PERCEPTIONS AND EVALUATIONS OF RESIDENTIAL SITE ENVIRONMENTS BY OLDER ADULTS IN A RURAL CONTEXT.</i>	 272
8.1 INTRODUCTION.....	272
8.2 THE OLDER ADULTS' PERCEPTIONS AND EVALUATIONS OF RESIDENTIAL SITE ENVIRONMENTS	274
8.2.1 THE NECESSITY OF THE RESIDENTIAL SITE ENVIRONMENTS	278
8.2.2 THE PHYSICAL ASPECTS OF THE RESIDENTIAL SITE'S ENVIRONMENTAL CHARACTERISTICS	282

8.3 THE CHARACTERISTICS AND PHYSICAL FEATURES OF THE RESIDENTIAL SITE ENVIRONMENT FROM OLDER ADULTS’ PERSPECTIVES AND PERCEPTIONS.....	292
8.4 CONCLUSION	316

PART FIVE: CONCLUSIONS

CHAPTER 9: CONCLUSION AND SUGGESTIONS FOR FURTHER WORK.....	319
9.1 INTRODUCTION	319
9.2 REVIEWING THE RESEARCH PROBLEM, QUESTIONS, AIM AND OBJECTIVES	319
9.3 ANSWERING THE RESEARCH QUESTIONS	322
9.3.1 THE MAIN CONSIDERATIONS IN THE CHARACTERISTICS OF RESIDENTIAL SITE ENVIRONMENTS FOR OLDER ADULTS IN A RURAL ASIAN CONTEXT.....	322
9.3.2 THE RESIDENTIAL SITE’S ENVIRONMENTAL CHARACTERISTICS AND PHYSICAL FEATURES CONTRIBUTE TO THE OUTDOOR USAGE AND SATISFACTION OF OLDER ADULTS IN THE RURAL CONTEXT.....	345
9.3.3 THE PERCEPTIONS AND EVALUATIONS OF RESIDENTIAL SITE ENVIRONMENTS AMONG OLDER PEOPLE IN THE RURAL CONTEXT	366
9.4 IMPLICATIONS.....	372
9.4.1 IMPLICATIONS FOR THEORY AND LITERATURE.....	372
9.4.2 IMPLICATIONS FOR PRACTICE	374
9.5 LIMITATIONS OF THE RESEARCH STUDY AND FURTHER RESEARCH.....	376
REFERENCES	379
APPENDIX.....	411

LIST OF FIGURES

CHAPTER ONE

Figure 1.1:	Links between this study's research questions and objectives (Author, 2020).....	10
Figure 1.2:	Town plan of Baan Pong Nuea sub-district municipality of the Hang Dong district in Chiang Mai province and locations of the sample sites (Hongthong, 2020).	16
Figure 1.3:	Structure of this study (Author, 2020).....	18

CHAPTER FOUR

Figure 4.1:	Percent of the Population Age 60 Years or Over: 1960 - 2040 (Foundation of Thai Gerontology Research and Development Institute (TGRI), 2013; National Population and Housing Census for 1970, 1980,1990, 2000, and 2010, NSO; and Population Projections for Thailand, 2010 – 2040).....	67
Figure 4.2:	Population by age and residence, 2017 (Glinskaya et al., 2021).....	68
Figure 4.3:	Index of Ageing in Thailand by Region: 2013 (Population Projections for Thailand, 2010 – 2040 and Foundation of Thai Gerontology Research and Development Institute (TGRI), 2013).	81

CHAPTER SIX

Figure 6.1:	The location of Baan Pong Nuea village in Hang Dong district, Chiang Mai province, Thailand (Hongthong, 2020).....	129
Figure 6.2:	The aerial view of Baan Pong Nuea with the topographical and characteristic features of the village and surroundings (Hongthong, 2020).....	130

Figure 6.3:	Town plan of Baan Pong Nuea sub-district municipality of the Hang Dong district in Chiang Mai province and locations of coded sample sites (Hongthong, 2020).	131
Figure 6.4:	The settlement characteristics of the residential sites for older adults in Baan Pong Nuea village (Hongthong, 2020).....	132
Figure 6.5:	The settlement characteristics of the residential sites for older adults in the area near the highway (Hongthong, 2020).	133
Figure 6.6:	The settlement characteristics of the residential sites for older adults in the area in the village (Hongthong, 2020).....	134
Figure 6.7:	The settlement characteristics of the residential sites for older adults in the lowland area (Hongthong, 2020).....	135
Figure 6.8:	The settlement characteristics of the residential sites for older adults in the foothill area (Hongthong, 2020).	136
Figure 6.9:	The areas of settlement characteristics of the residential sites for older adults from the topographical and characteristic features of the village (Hongthong, 2020).	137
Figure 6.10:	The areas of the price of land during the year 2017 - 2020 (price per square wah, one sq. wah = four sq. m.) of the residential sites of the village (Hongthong, 2020).....	138
Figure 6.11:	The frequency of the characteristics of plot type of the residential sites (Author, 2020).	146
Figure 6.12:	The samples of residential plot type characteristics with the comparison of the shared plots (Author, 2020).....	147
Figure 6.13:	The samples of residential plot type characteristics with the comparison of the other type plots (Author, 2020).....	147
Figure 6.14:	The samples of a residential plot type characteristic of the interior plot (Author, 2020).	148
Figure 6.15:	The samples of a residential plot type characteristic of the corner plot (Author, 2020).	148

Figure 6.16:	The frequency of the characteristics of plot coverage of the residential sites (Author, 2020).	155
Figure 6.17:	The sample of residential site characteristics with plot coverage less than 25 percent (Author, 2020).	156
Figure 6.18:	The sample of residential site characteristics with plot coverage 25 to 49 percent (Author, 2020).	156
Figure 6.19:	The sample of residential site characteristics with plot coverage 50 to 75 percent (Author, 2020).	157
Figure 6.20:	The sample of residential site characteristics with plot coverage of more than 75 percent (Author, 2020).	157
Figure 6.21:	The frequency of the characteristics of plot size of the residential sites (Author, 2020).	161
Figure 6.22:	The sample of residential plot size characteristic of approximately 400 - 800 sq.m. (Author, 2020).	162
Figure 6.23:	The sample of residential plot size characteristic of approximately 200 – 399 sq.m. (Author, 2020).	162
Figure 6.24:	The sample of residential plot size characteristic of approximately more than 800 sq.m. (Author, 2020).....	160
Figure 6.25:	The sample of residential plot size characteristic of approximately less than 200 sq.m. (Author, 2020).....	163
Figure 6.26:	The frequency of the percentage of outdoor residential sites area covered in the land plot (Author, 2020).	168
Figure 6.27:	The sample of residential site characteristics with the outdoor areas covered in land plot around 25 to 49 percent (Author, 2020).	169
Figure 6.28:	The sample of residential site characteristics with the outdoor areas covered in land plot around 50 to 75 percent (Author, 2020).	169
Figure 6.29:	The sample of residential site characteristics with the outdoor areas covered in the land plot more than 75 percent (Author, 2020).	170

Figure 6.30:	The sample of residential site characteristics with the outdoor areas covered in land plots less than 25 percent (Author, 2020).	170
Figure 6.31:	The frequency of the levels of shading of trees or canopy in the residential sites (Author, 2020).	173
Figure 6.32:	The sample of residential site characteristics with the levels of shading of tree or canopy around 25 to 49 percent (Author, 2020).	173
Figure 6.33:	The sample of residential site characteristics with the levels of shading of tree or canopy around 50 to 75 percent (Author, 2020).	174
Figure 6.34:	The sample of residential site characteristics with the levels of shading of tree or canopy less than 25 percent (Author, 2020).	174
Figure 6.35:	The sample of residential site characteristics with the levels of shading of tree or canopy more than 75 percent (Author, 2020).	175
Figure 6.36:	The frequency of the width of the community frontage road attached to the residential sites (Author, 2020).	177
Figure 6.37:	The frequency of the material of community streets attached to the residential sites (Author, 2020).	183
Figure 6.38:	The frequency of the dwelling type in the residential sites (Author, 2020).	190
Figure 6.39:	The sample of residential dwelling characteristics with the single house (Author, 2020).	191
Figure 6.40:	The sample of residential dwelling characteristics with the multi-houses (Author, 2020).	191
Figure 6.41:	The frequency of the dwelling size in the residential sites (Author, 2020).	193
Figure 6.42:	The sample of residential dwelling characteristics with the dwelling size 100 – 199 sq.m. (Author, 2020).	194
Figure 6.43:	The sample of residential dwelling characteristics with a dwelling size less than 100 sq.m. (Author, 2020).	194

Figure 6.44:	The sample of residential dwelling characteristics with the dwelling size 200 - 300 sq.m. (Author, 2020).	195
Figure 6.45:	The sample of residential dwelling characteristics with a dwelling size of more than 300 sq.m. (Author, 2020).	195
Figure 6.46:	The frequency of the height of dwelling (storeys) (Author, 2020).	199
Figure 6.47:	The sample of residential dwelling characteristics with the height of dwelling of one storey (Author, 2020).	199
Figure 6.48:	The sample of residential dwelling characteristics with the height of the dwelling of two storeys (Author, 2020).	200
Figure 6.49:	The sample of residential dwelling characteristics with the height of the dwelling of three storeys (Author, 2020).	200
Figure 6.50:	The frequency of the dwelling orientation toward the frontage road (Author, 2020).	202
Figure 6.51:	The sample of residential dwelling characteristics with the short side of the dwelling is parallel to the frontage road (Author, 2020).	203
Figure 6.52:	The sample of residential dwelling characteristics with the long side of the dwelling is parallel to the frontage road (Author, 2020).	203
Figure 6.53:	The frequency of the dwelling construction types (Author, 2020).	205
Figure 6.54:	The frequency of the material of surroundings adjacent to the dwelling (Author, 2020).	210

CHAPTER SEVEN

Figure 7.1:	The frequency of the purposes of time spent outdoors compared the usage characteristics in general and the most used space or area in the residential site environments (Author, 2020).	228
Figure 7.2:	The sample of residential site characteristics with the side garden for outdoors activities (Author, 2020).	231
Figure 7.3:	The sample of residential site characteristics of area or space for daily life activities (Author, 2020).	233

Figure 7.4:	The frequency of the day spent outdoors comparing the usage characteristics in general and the most used space or area in the residential site environments (Author, 2020).	237
Figure 7.5:	The sample of residential site characteristics of the shady area in the most used semi-outdoor terrace during noon time (Author, 2020).	239
Figure 7.6:	The frequency of the duration of time spent per day outdoors in their residential site environments (Author, 2020).	244
Figure 7.7:	The duration of time spent outdoors per day comparing spending time alone and with other people in the residential site environments (Author, 2020).	255
Figure 7.8:	The comparison between the preferences or most used areas or spaces in residential site environments (Author, 2020).	268

CHAPTER EIGHT

Figure 8.1:	Older adult perception and evaluation of the necessity of the residential site environments from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).	278
Figure 8.2:	The sample of residential site characteristics that could be considered as environmental barriers (Author, 2020).	281
Figure 8.3:	Older adults' perception and evaluation of the physical aspects of the residential site environmental characteristics with the level of importance from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).	284
Figure 8.4:	The sample of residential site characteristics of area or space for daily life activities (Author, 2020).	286
Figure 8.5:	The sample of residential site characteristics of environmental motivators from the garden landscaping and green area and natural surroundings (Author, 2020).	288

Figure 8.6:	Older adults' perception and evaluation of the typology of the residential site environmental characteristics with the level of preference from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).....	295
Figure 8.7:	The sample of characteristics of the dwelling orientations concerning the sun faces east-west (Author, 2020).	297
Figure 8.8:	Older adults' perception and evaluation of the motivator of the residential site environmental characteristics with the level of preference from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).....	300
Figure 8.9:	The sample of the residential site environmental characteristics with the surroundings of natural environments that affect the perception within a residence (Author, 2020).	304
Figure 8.10:	Older adults' perception and evaluation of the functionality of the residential site environmental characteristics with the level of preference from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).	308
Figure 8.11:	The sample of the residential site environmental characteristics of the indoor-outdoor connections (Author, 2020).....	309
Figure 8.12:	The sample of the perceived physical environmental features in the residential site (Author, 2020).....	312
Figure 8.13:	Older adults' perception and evaluation of the safety of the residential site environmental characteristics with the level of preference from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).....	314

LIST OF TABLES

CHAPTER FIVE

Table 5.1	Links between the research objectives, questions, and methods adopted in this study (Source: Hongthong, 2021).	87
Table 5.2	Demographic or personal characteristics of study participants used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).	94
Table 5.3	Social characteristics of study participants used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).....	97
Table 5.4	The attitude of residents in terms of relationship with family members, friends, and community members of study participants used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019)..	99
Table 5.5	Purpose of the questionnaires adopted in this research (Source: Hongthong, 2019).	103

CHAPTER SIX

Table 6.1	Correlations among demographic, social, and the characteristics and physical environmental features in residential sites predictors, N = 90 (Source: fieldwork 2019).....	125
Table 6.2	Characteristics and physical environmental features of residential sites at residential site level from fieldwork observation used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).....	145
Table 6.3	Characteristics and physical environmental features of residential sites at residential dwelling level from fieldwork observation used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).....	189

CHAPTER SEVEN

Table 7.1	Variables of the characteristics of outdoor activities of study participants from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).....	218
Table 7.2	Correlations among demographic, social, and the variables of outdoor usage characteristics of older adults in residential sites predictors, N = 90 (Source: fieldwork 2019).....	220
Table 7.3	Variables of the purposes and analysis of the prevalence of physical activities that older participants spend their time at the most used space or area in the residential site environments from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork and interview 2019).....	228
Table 7.4	Variables of the outdoor social activities of study participants from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).....	247
Table 7.5	The preferences or most used areas or spaces in residential sites from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).....	257

CHAPTER EIGHT

Table 8.1	Correlations among demographic, social, and the characteristics and physical environmental features in residential sites predictors, N = 90 (Source: fieldwork 2019).....	276
Table 8.2	Older adult perception and evaluation of the necessity of the residential site environments from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).....	279
Table 8.3	Variables of the perception and evaluation of physical aspects of the residential site environmental characteristics with the level of importance from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).....	290

Table 8.4	Variables of the preference level of the residential site environmental characteristics at the residential dwelling and site levels from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).....	293
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LIST OF APPENDICES

CHAPTER FIVE

Appendix 5.1:	Questionnaires	411
Appendix 5.2:	Interviews	414
Appendix 5.3:	Fieldwork observations.....	415
Appendix 5.4:	Information letters sent to older adults in a case study village of a rural area in Baan Pong Nuea inviting them to participate in the study....	416
Appendix 5.5:	Transcription of the interviews which were interpreted and categorised into the related theme with the positive and negative physical characteristics mentioned by older adults when their residential site environments were evaluated	423

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION TO RESEARCH

The subject of this study is to examine the appropriate residential site environments for the elderly and their effects on elder perception and evaluation of this environment. Unlike most of the earlier works on environments for the elderly, the focus in this study is exclusively on residential sites in rural contexts from the assessment of elders' perceptions and attitudes based on the extent of Person-Environment (P-E) fit. The mixed-methodology combines fieldwork on the residential sites, and the questionnaires from older adults in the case study area are adopted. The study first explores and describes the selected residential site environments and the evaluation of senior residents. Secondly, there is an examination of the environmental features of elder perception and attitudes co-constructed by the fieldwork data, questionnaires, and interviews.

In this introductory chapter, an interest is developed in the residential site environment for older adults, a description of the context of the environment for an ageing population in a rural area with the elder's perception and evaluation and a brief outline of the analytical frameworks that are drawn on in this study. Overall, this chapter presents the research background and questions and introduces the residential site's significance for older adults in a rural context. The chapter then presents the investigation in terms of (i) the background of the research, (ii) the purpose of the study, (iii) the research approach and

methodology, (iv) the rationale, and (v) the scope and limitation of the research study. Finally, it defines specific terminologies adopted in this study and summarises the thesis's structure.

1.2 BACKGROUND OF THE RESEARCH

The current rapid change of pace of demographic ageing, in which the ratio of elders increase within the total population (International Labour Office (ILO), 2009), has become a global phenomenon. The global proportion of older people aged 60 and over will nearly double from 12 percent to 22 percent between 2015 and 2050 (World Health Organization (WHO), 2017). In this regard, many Asian countries are experiencing the same phenomenon, and within the next few decades, Asia will have the most aged population in the world (Sasiwongsaroj, Pornsiripongse, Burasith, Ketjamnong, & Koosakulrat, 2012). East and Southeast Asian countries reveal the most rapid growth with the most significant increase in percentage (Sun, Phillips, & Wong, 2018; World Health Organization (WHO), 2015). In addition, this global trend is expected to be indicated that at least 40 percent of the elderly population, who would be from low and middle-income economies, is predominantly affecting the less developed Asian countries (Knodel & Chayovan, 2008; Pathike, O'Brien, & Hunter, 2017; United Nations, 2013; World Health Organization (WHO), 2015, 2017).

Many older adults will be living in rural areas as this age group tends to be higher with the faster-increasing growth rate occurring in rural rather than urban areas (Dandy & Bollman, 2008; James & Davies, 2012; United Nations, 2019a).

As a result, many rural areas will see the most remarkable surge and become geographically defined communities with a large proportion of older people (Baernholdt, Yan, Hinton, Rose, & Mattos, 2012; Currie & Philip, 2019).

Rural settings are directly related to the quality of life of older people. The residential environment in this context substantially impacts behaviour and well-being in old age (Baernholdt et al., 2012; Iwarsson, 2005). More senior people spend most of their time, estimated up to 80 percent per day on average, in the residential site (Brasche & Bischof, 2005). The residential site includes the dwelling and immediate dwelling environment. Therefore, older adults especially identified with the influence of this environmental context (Rantakokko, Törmäkangas, Rantanen, Haak, & Iwarsson, 2013; H. W. Wahl & Oswald, 2010). Typical residential site environmental design features could promote older adults' interactions with their outdoor environments and even limit their physical activities in their gardens (Wang & Lee, 2010; Wang, Rodiek, & Shepley, 2006). Hence, the residential site environments could bring many challenges for older adults influencing their living to a high standard of well-being and experiencing a good quality of life.

Therefore, residential sites have been receiving significant attention in environmental ageing, namely 'Environmental Gerontology' (EG), studying the relationship between the environment and the elderly (Sheets, 2005). However, although the importance of the environment for the elderly is well described and familiar to many, the causal link between the residential site and seniors' perception and evaluation in Asian countries needs further exploration as they are less well-established. Moreover, there is little known about the environmental

features in rural settings as most studies have focused on neighbourhoods in urban areas (Ahrentzen & Tural, 2015; Cunningham & Michael, 2004; Ding & Gebel, 2012; Menec & Nowicki, 2014; Saelens & Handy, 2008). Nevertheless, the development of such appropriate residential site environments in rural areas and their challenges can be used as a lesson for other Asian countries with related contexts in confronting ageing societies and aid future planning.

The relationship between older people and the residential site environment needs to be investigated carefully. An association between ‘what residential site environment could offer’ and ‘what older people need’ will be critical to ageing residents, particularly in Asian cities in rural areas. The way that older adults manage themselves and their living environment, across physical, psychological, and social perspectives, is an essential component of ageing well. The balance between a person (P) and their surrounding environment (E) is known as Person-Environment (P-E) fit that has been studied in EG (Lawton & Nahemow, 1973). However, the theories and practices of Person-Environment (P-E) fit have to date primarily been situated in Western countries (Sun et al., 2018). At the same time, the specific characteristics of the residential environment that affect the well-being of older people are currently not well understood (Lien, 2013; H.-W. Wahl, Iwarsson, & Oswald, 2012).

Apart from this, most existing plans and studies on the appropriate environments for the elderly in rural Asian areas are limited to a few studies. For example, previous studies about elders in environmental contexts have concentrated principally on the interior design of the house with the focus on the housing functional modifications and the improvement of the house with the

architectural design (Lieorungruang, Kittikul, Chumduang, & Laoratananuruk, 2009; Salee, 2010). Nevertheless, previous studies have not dealt with the residential site environments.

Apart from this, one study by the Foundation of Thai Gerontology Research and Development Institute (TGRI) (2013) provides valuable recommendations for housing, indicating that homes need to be modified or remodelled to accommodate the older aged residents in the household, especially the areas of frequent use such as a porch. However, the research has been concentrated on exploring alternative architectural construction models to match the environment better and convenient facilities that are appropriate and safe for the older adult. This research only covers such universal design areas as handrails, walkers, bathroom fixtures, seats in the shower, backrests, and toilets for the disabled and older adults. All of which do not consider the outdoor and residential site environment but only the elements, types of equipment, or furniture in the residences.

Thus, because of the limited research approach that existing studies have taken, only a limited number of effective research on the residential site environments have been identified due to a lack of attention to outdoor and residential site environments in rural contexts in Asian countries.

Moreover, the residential site environment has the characteristics of a place or space of care and support in old age that involve the relationships of family, relatives, friendship and other intimate relations. Given that, for example, in Thailand, most elderly adults who require care and support needs still receive informal care at home provided by their families and relatives (Aung

et al., 2021). According to the fact that private health care services and long-term care systems in Asian countries, on the other hand, are out of reach for the indigenous population (Osuke & Komazawa, 2021). Furthermore, the government-run hospital lacks the capacity to meet the care needs of an ageing population (Asian Development Bank, 2020). The family and care with the approach to everyday life and relationships in geographical discipline are also the key interests within human geography (Garrett & Poulain, 2018). Primarily in the Asian context where the government acknowledges the significance of ageing in place with long-term care management (Knodel, Teerawichitchainan, & Pothisiri, 2018). So far, however, there has been little discussion about the role of family and care within the geographical discipline (Hall, 2019; Valentine, 2008).

As a critical point of elders' living environments in a rural context, there is a need to identify the appropriate environments for the elderly regarding residential sites to understand elders' preferences or perceptions. Therefore, to fill these gaps, this study extends the focus of environmental gerontology with P–E fit to the Asian context, identifying how older adults perceive their living environment in a case study of a village in northern Thailand. While Thailand has the National Plan on housing and living environments for older people, these plans have paid very little attention to the role of the residential site environments.

Therefore, the key research aims of this project are to understand how older adults perceive the residential site environments in the rural context and to understand how older persons utilise and relate to their environments. Older people's perceptions of the residential site environments will be evaluated based

on the extent of P-E fit. This study will help understand older people's perspectives towards the environment and identify residential environmental features in a rural context that meet their needs as assessed by older people themselves. Designing guidelines for site plans could be created and used to improve the quality of residential site environments for older adults, potentially leading to higher levels of environmental preferences and satisfaction and better outdoor usage that fits their needs. This study is helpful for residential and rural development to improve and create appropriate residential site environments for older adults in Asian countries and related contexts with an increasingly aged society.

1.3 PURPOSE OF THE RESEARCH

This research aims to study older adults' needs for residential site environments in a rural context. As a result, the appropriate future facilities and residential site environmental features may be designed and applied to encourage optimal use of the residential site environments to benefit older residents' potential outdoor usage and environmental satisfaction. This aim of the research is achieved by (1) assessing on and around seniors' residential sites from dwelling levels and site levels in a selected rural area and (2) examining and indicating whether the specific features of the residential site environment are appropriate and affect outdoor usage and environmental satisfaction that meet elders' needs. From this are derived the research objectives driving this thesis which are:

Research objective A: Investigation of the characteristics and physical environmental features of older adults' residential sites in the rural Asian context from a case study.

Research objective B: Investigation of the outdoor usage characteristics of older adults in the residential site environments in a rural context in terms of (i) the physical activities in the residential site environments and (ii) the most utilised residential site areas or spaces.

Research objective C: Analysis of older adults' perceptions and evaluations toward their residential site environments in a rural area with regard to (i) the necessity of the residential site environments and (ii) the physical aspects of the residential site environmental characteristics that need to be taken into account in these residential site environments.

Research objective D: Evaluation and investigation of preferences and satisfaction of older adults in terms of (i) the residential site environmental characteristics and (ii) the characteristics and physical environmental features of the residential site environments that influence the outdoor usage and environmental satisfaction through older adults' perspectives and perceptions.

The main purposes of this research are to (1) understand how older adults perceive the residential site environments in a rural context and (2) understand how they utilise and relate to their environments. Therefore, the following leading questions directed the focus of this study which are:

Research question 1: “What are the main considerations in the characteristics of residential site environments for older adults in the rural Asian context?”

Research question 2: “Which residential site environmental characteristics and physical features contribute to the outdoor usage and satisfaction of older adults in the rural context?”

Research question 3: “What are the perceptions and evaluations of residential site environments among older people in the rural setting?”

Elderly residents themselves will evaluate older people’s perceptions of the residential site environments. This study will help understand older people’s perceptions and perspectives towards the environment and identify residential environmental features in rural contexts evaluated by older people themselves.

Figure 1.1 illustrates the links between the research questions and the research objectives of this study.

THE LINKS BETWEEN RESEARCH QUESTIONS AND OBJECTIVES

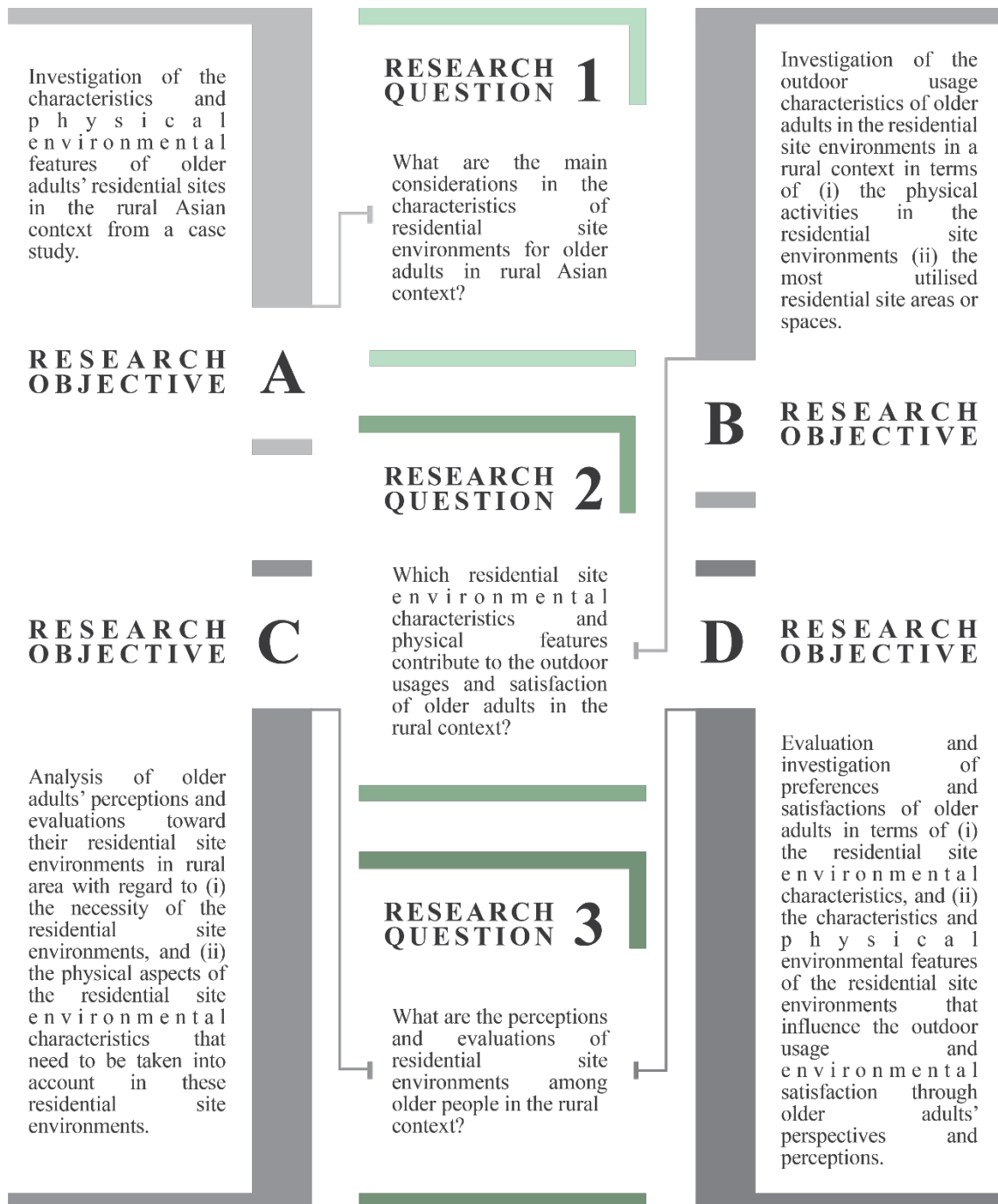


Figure 1.1: Links between this study's research questions and objectives (Author, 2020).

1.4 IMPORTANCE OF THE STUDY

As stated in the background of the study, population ageing or ageing societies is often perceived as a prevalent phenomenon. Thailand, one Asian developing country, is currently ranked as the third rapidly ageing population globally (HelpAge International, 2019; United Nations, 2019b) and also the second of the Association of Southeast Asian Nations (ASEAN) countries (Prachuabmoh, 2015). Additionally, Thailand has the most rapid rate of ageing societies in the developing world (Jittapunkul, Kangkanpanich, Kespichayawattana, Wivatvanit, & Panyacheewin, 2003), with the prediction to grow from 16.4 percent in 2013 to 47.5 percent of the population in 2050 (United Nations, 2013).

With this rapid pace of population ageing, the demand for changes in elders' living environment to improve their lives is becoming essential. The rate of decline is determined mainly by factors relating to their environments (World Health Organization (WHO), 2007). Many studies show that active involvement in the residential site environments and nature connection supports physical and mental health, which could help maintain or improve health and lowers national costs (Prachuabmoh, 2015; Scott, Masser, & Pachana, 2020; Wang et al., 2006). To retain the traditional lifestyle of ageing-in-place, it seems that an appropriate residential site environment is becoming a fundamental approach in Thailand. The development of such appropriate residential site environments and their challenges can be used as a lesson for other Asian countries or related rural contexts in confronting ageing societies.

In addition, Thailand is presently undergoing rapid ageing, and this rapid change will severely affect the rural communities. Furthermore, the Thai government has taken a limited role in addressing the long-term care system for older adults who are ageing in place, including the heterogeneity of responses to older single-person households and family-based informal care in relation to multigenerational families. Until now, this issue has been hampered by a lack of empirical evidence to support such policy planning (Knodel et al., 2018).

Therefore, the understanding of residential site environments in this context from the perspective of older residents has received considerable critical attention from many researchers (Neville, Napier, Adams, Shannon, & Clair, 2020; Pathike et al., 2017; Seangpraw, Ratanasiripong Nop, & Ratanasiripong, 2019). However, existing studies on residential site environment outcomes in rural contexts for older people remain relatively deficient in Thailand. The case study area of the residential site environment in Baan Pong Nuea village, municipality of the Hang Dong district in Chiang Mai province of Northern Thailand, provides an opportunity to explore these specific kinds of environmental features. Along with reimagining how we approach geography and the outdoor environment and gaining a better understanding of the residential site environments for seniors in a rural Asian context.

1.5 OVERVIEW OF RESEARCH DESIGN

The rural area in Baan Pong Nuea, a sub-district municipality of the Hang Dong district in Chiang Mai province, northern Thailand, is presented as a case

study in this research because it has a higher number of elderly than other villages (Noichan, 2011). The samples of 90 older participants were classified into two groups the Early Stage (60-74 years old, 60 inhabitants) and the Later Stage (75 years old and above, 30 inhabitants). Due to the sample size, data availability, and the participants' culture, a mixed-methods approach was considered the most appropriate way to conduct this research, including questionnaires, interviews, and observations. Literature on related topics reveals that mixed techniques are beneficial for investigations into processes and systems that are complex and multidimensions (Lien, Steggell, & Iwarsson, 2015; Sun et al., 2018).

The approach will influence the selected methods in this study that involves a dynamic relationship between ageing and environment, which represents an interactive relationship between a person (P) and their environment (E) or known as Person-Environment (P-E) fit that has been studied in environmental gerontology. To measure P-E fit, Lien (2013) described that a person, their environment, and the interaction between the two need to be evaluated using a set of indicators encompassing three dimensions of psychological, physical, and social perspectives.

The quantitative data collection method was from the questionnaire and analysed using SPSS, which consisted of socio-demographic data and the perceptions and evaluations of environmental components. The qualitative part collected the data through an in-depth investigation of two parts: guideline-structured interviews and fieldwork. These were grouped into themes and analysed through content analysis. Data should show the understanding of older adults' preferences or perceptions of their environment in a rural context which will be

reflected through their evaluation. Furthermore, the physical characteristics of the residential site planning will be collected and illustrated from the field survey as this will be analysed as a guideline. The environmental assessment instruments would provide insight into the implementation, usability, and perception of residential site environment adaptations and satisfaction among older adults living at home or ageing in place in an Asian rural context.

1.6 DEFINITIONS OF TERMS

The following terms are defined to avoid misunderstanding the terminologies adopted in this thesis and help the reader understand the context of each term in this study.

a. **“Residential site environment”**: this term refers to the environment within a residential property that covers the outdoor area or space immediately adjacent to a dwelling, such as gardens and terraces (Brasche & Bischof, 2005).

b. **“Rural context”**: this term is defined as geographic localisation, total population, territorial extension, demographic density, population and immigrants, and general economic activities.

c. **“Elderly people”**: Elders, Older adults, Older people, and Seniors are all people aged 60 years old or above (World Health Organization (WHO), 2017).

d. **“Early Stage”**: this term is described to elderly people aged 60-74 years old (Pan & Fukuda, 2016).

e. **“Later Stage”**: this term is identified elderly people aged 75 years and older (Pan & Fukuda, 2016).

f. **“Person-Environment (P-E) fit”**: this term refers to an interactive relationship between a person (P) and their environment (E), or known as Person-Environment (P-E) fit.

These terms will be discussed and defined in more detail in later chapters of this thesis.

1.7 SCOPE AND LIMITATIONS OF THE RESEARCH STUDY

There are several scope and limitations to this study with such items as the broad approaches adopted by this study, samples or participants, and the setting or case study of this research.

The scope of this study about the setting or case study context is the area of Baan Pong Nuea village, municipality of the Hang Dong district in Chiang Mai province of Northern Thailand. The case studies of the residential sites with elderly residents or sample sites and their locations are presented in the town plan (see Figure 1.2).

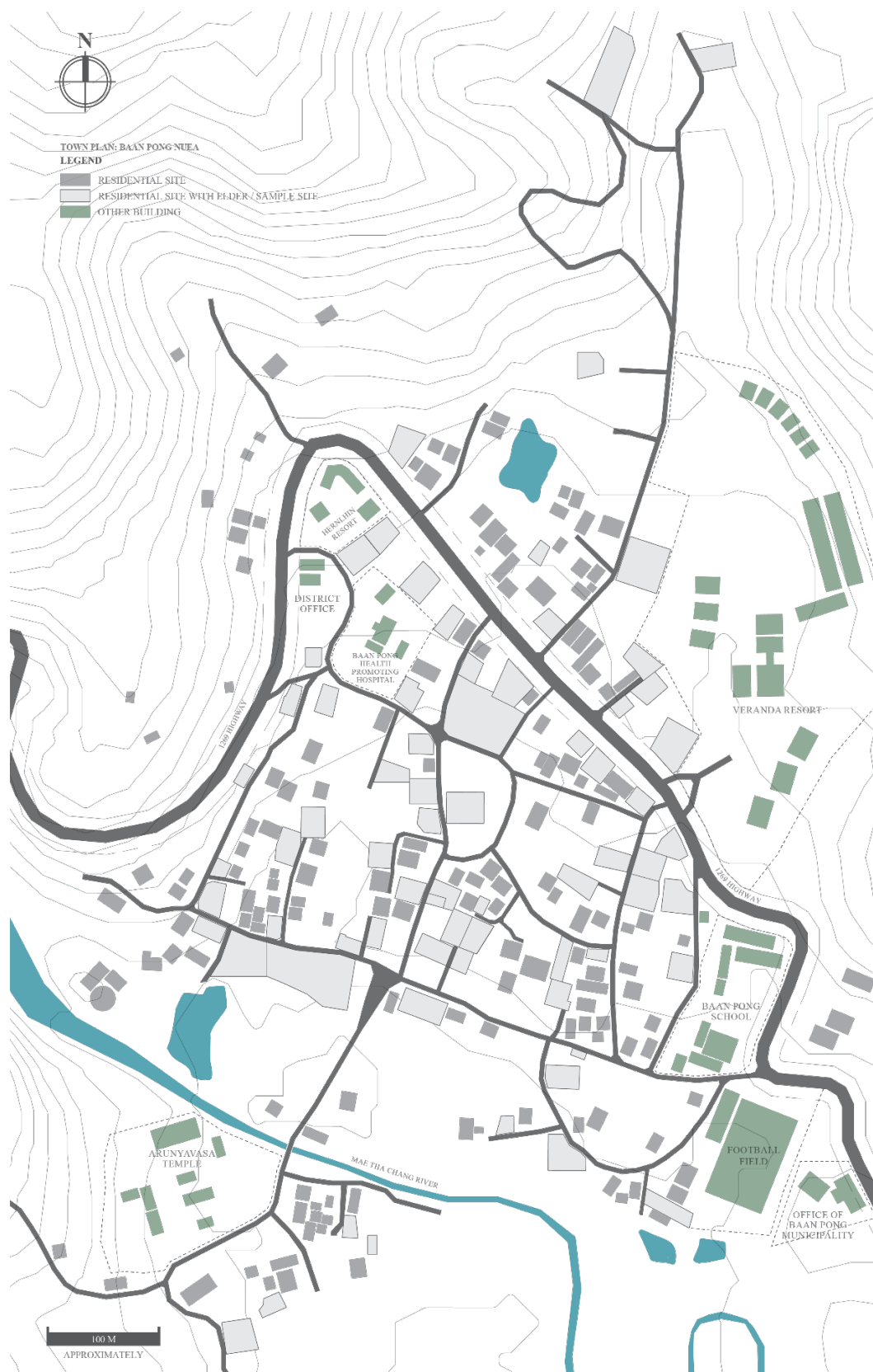


Figure 1.2: Town plan of Baan Pong Nuea sub-district municipality of the Hang Dong district in Chiang Mai province and locations of the sample sites (Hongthong, 2020).

Another scope or limitation of this study concerning the samples or populations is that the participants in the survey were people aged 60 and older from a case study village in Chiang Mai, Northern Thailand. These participants may not fully represent the norm for all older adults in the Asian rural context. More extensive and diversified participants from different case studies may provide more insight into the perceptions and evaluations of the residential site environment in the Asian rural context. Perceptions may vary in other areas, such as the older participant's culture, living arrangements, or other related factors. The findings may not be applicable across different residential site environmental situations, as environmental settings and their surroundings drive factors related to perceptions and evaluations.

Moreover, it is crucial to describe the underlying logic of the broad approaches adopted by this research. The scope of the data is confined to the approaches of human ageing and geographies of ageing, family and care in a rural context, and the micro-geographies of living environments for older people with the focus on residential and built environments for older people also Environmental Gerontology (EG) and Person-Environment (P-E) fit. Unlike most earlier works on environments for elders, this study focuses on residential sites in a rural Asian context, with a mixed-methodology based on the extent of Person-Environment (P-E) fit. This study will help us understand and identify residential site environmental characteristics in a rural context.

1.8 OUTLINE OF THE STRUCTURE OF THE THESIS

The structure of this research is organised into five parts and nine chapters (see Figure 1.3). Part one is the introduction of this study. Part two is the literature review which consists of Chapters Two, Three, and Four—followed by Part Three, which is the methodology. Then, Part four is the finding, analysis, and results, including Chapters Six, Seven, and Eight. Finally, Part five, is the conclusions of the research.

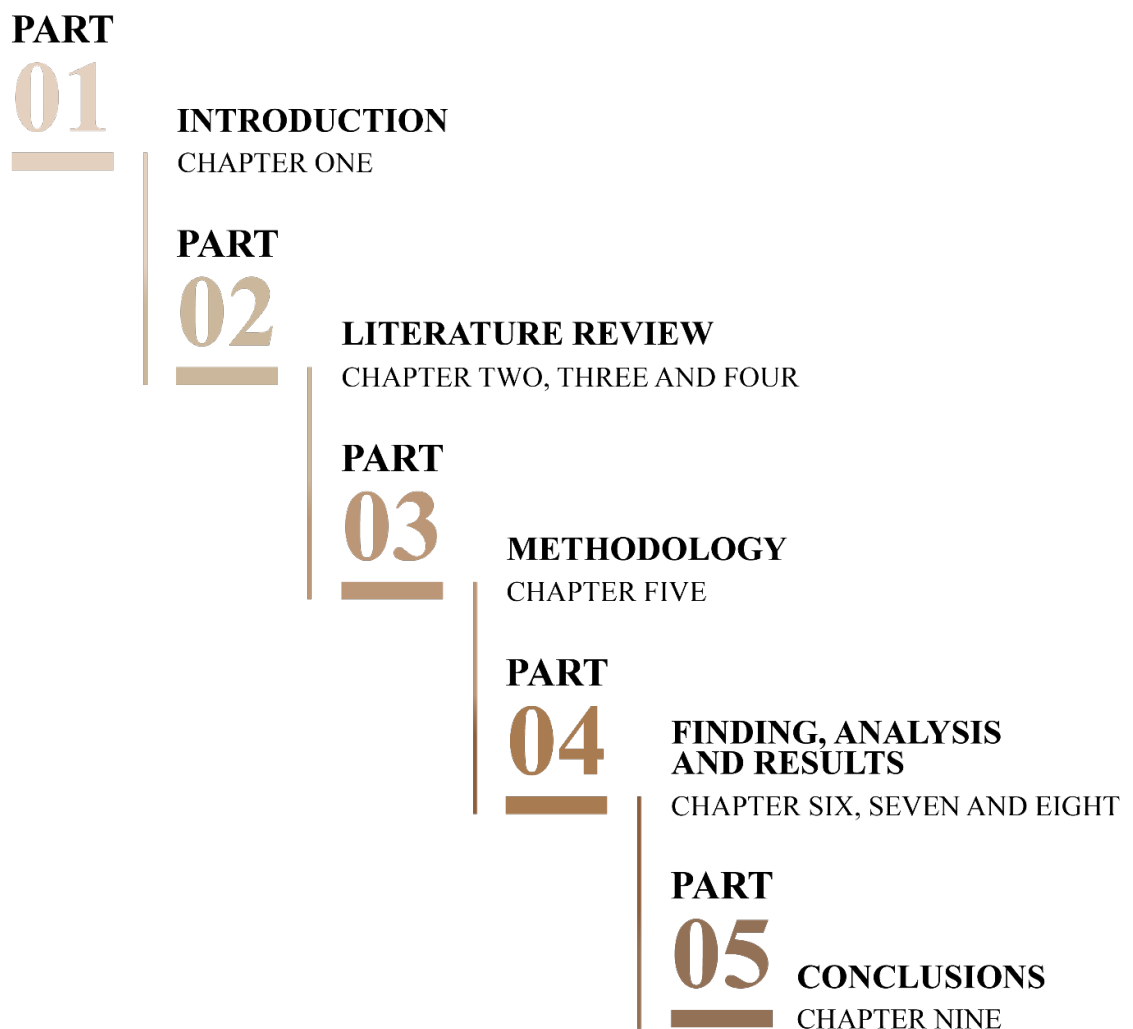


Figure 1.3: Structure of this study (Author, 2020).

PART ONE - Introduction

▪ **Chapter One: *Introduction***

This chapter introduces the research background, purposes, importance of the study, and overview of the research design. In the end, this chapter presents a definition of terms, scope and limitations and a summary of all chapters of this thesis.

PART TWO - Literature review

▪ **Chapter Two: *Human Ageing and Geographies of Ageing, Family and Care in Rural Context***

This chapter is structured into four main parts: (i) human ageing, (ii) active ageing, (iii) geographies of ageing and the rural context and (iv) geographies of family and care. This chapter introduces the themes of human ageing and analyses the physical, social, and psychological conceptual. Chapter Two also introduces the concept of active ageing, geographies of ageing, family and care, particularly in the rural context. In the end, the primary principles of human ageing and the geographies of ageing, family and care in a rural context adopted to build this research's theoretical and conceptual framework are summarised.

▪ **Chapter Three: *Micro-geographies of Living Environments for Ageing***

This chapter is structured into two main parts: (i) micro-geographies of living environments and (ii) perception and cognition of the environment. First, this chapter deals with the micro-geographies of living environments for older

people. It provides a critical review of the literature, identifying and analysing current knowledge, and understanding the research focusing on older adults' residential and built environment, Environmental Gerontology (EG), and Person-Environment (P-E) fit. It also analyses the concept of perception and cognition and the concepts of preference and satisfaction with the environment. In the end, it identifies the final issues taken into account in this study to build the theoretical and conceptual framework of this research on micro-geographies of living environments for older people.

▪ **Chapter Four: *The Context of Ageing in Thailand***

This chapter refers to the context of ageing in rural Asia from the case study context of Thailand. This chapter is structured into three main parts: (i) the situation of ageing in the Asian context and the living arrangements, (ii) Thailand's national plans for ageing and (iii) the background of population ageing from the case study. This chapter reviews the current ageing situation in the rural context with the system of multi-generational households that family and relatives acting as the main caregiver or the informal care and support for older people, and the living environments of older adults in Thailand. It explores the aspects involved in Thailand's national plans on ageing and the background of the case study village. This chapter also provides a brief description of the physical, psychological, and social characteristics of older people in a rural Asian context from the case study from the analysis of the demographic or personal characteristics and the social aspects of older adults. In the end, this chapter summarises the context of ageing in Thailand.

PART THREE - Methodology

▪ **Chapter Five: *Research Design, Methodology, Measures and Analysis***

This chapter provides the research design, methodology, measures, and analysis adopted to achieve the research aims and answer the research questions. This chapter is structured into two main parts: (i) the case study village and the participants, (ii) the research design and data collection methods and (iii) the study's measurements and analysis. First, it presents the study district and the participants in this study. Next, this chapter discusses the choice of research design, methodology of data collection and procedures. Then the chapter describes the measurements and analysis adopted in this thesis. Finally, this chapter introduces the quantitative and qualitative data approaches to the measures and analysis. In the end, the summary of the research design, methodology, measurement and analysis of this study are presented.

PART FOUR - Finding, analysis and results.

▪ **Chapter Six: *The Characteristics and Physical Environmental Features of Residential Site Environment***

This chapter refers to research objective A (see Figure 1.1). This chapter presents a brief contextualisation of the case study village. It identifies the characteristics and physical environmental features of older adults' residential sites in the selected rural area from the quantitative data analysis of the questionnaire and the qualitative from the fieldwork data collection. The chapter is divided into two main parts: the characteristics of a case study village in the

rural Asian context and the characteristics of older adults' residential site environments. This chapter presents the findings related to the characteristics of the case study village of (i) the physical characteristics of the village and (ii) the settlement characteristic of the residential sites in the village. This chapter also provides the characteristics and physical environmental features from the assessment on and around older adults' residential sites from the site and dwelling levels. In the end, this chapter emphasises the main considerations of the characteristics and physical features of older adults' residential site environments from the settlement, site and dwelling variations of the case study village in the rural Asian context. The results of this investigation show that some of those characteristics reveal the pertinent role that may encourage older people to spend time, be active, and engage in activities in these residential site environments and reflect the living arrangements from the satisfaction and preferences of Asian cultures.

▪ **Chapter Seven: *The Outdoor Usage Characteristics of Older Adults in the Residential Site Environments in a Rural Context***

This chapter refers to research objective B (see Figure 1.1). This chapter presents the results of the outdoor usage characteristics of elderly adults in the residential site environments in a rural context from the quantitative analysis of the questionnaire and the qualitative from the in-depth interviews. This chapter is divided into two main parts: (i) the physical activities in the residential site environment and (ii) the most utilised residential site areas or spaces. First, this chapter identifies the outdoor usage characteristics of the older residents' outdoor activities and social activities in their residential site environments. This chapter

also explores older adults' preferences and usage characteristics of the residential site areas or spaces. In the end, this chapter sets out the preliminary results. It provides insights into the outdoor and social activities characteristics that can affect older adults' sense of preferences and use of the residential site areas or spaces in a rural Asia context.

▪ **Chapter Eight: *Perception and Evaluation of Residential Site Environment by Older Adults in a Rural Context***

This chapter refers to research objectives C and D (see Figure 1.1). This chapter describes the findings of older adults' perceptions and evaluations of the residential site environments in a rural context from the quantitative analysis of the questionnaire and the qualitative results from the in-depth interviews. This chapter is divided into two main parts: (i) the older adults' perceptions and evaluations of residential site environments, and (ii) the characteristics and physical features of the residential site environment from older adults' perspectives and perceptions. This chapter highlights older adults' perceptions and evaluations toward their residential site environments in a rural area concerning physical features of the residential site and environmental characteristics recognised by older people as important in the residential site environments. It also explores the preferences of residential site environments and the characteristics and physical environmental features of the residential site environments from the elderly participants' perspectives and perceptions. In the end, this chapter highlights the older adults' perceptions and evaluations of the residential site environments in terms of the environmental characteristics and features in a rural

context that are important to create appropriate relationships between older people and their residential places.

PART FIVE – Conclusions

▪ **Chapter Nine: *Conclusion and Suggestions for Further Work***

This chapter draws the final summary from the main findings of Chapters Six, Seven and Eight, answering the research questions. Finally, it analyses the broader implications of the results, discusses this study's significance, and suggests possible further investigations and recommendations.

1.9 CONCLUSION

This study sought to understand older people's perceptions and perspectives towards the environment and identify residential environmental features in a rural context, using a mixed-methods approach, including questionnaires, interviews, and observations. The study provides significant, new findings in addition to those already found from existing studies on P-E fit interactions. The evidence presented in the study suggests that perceptions and preferences for environmental characteristics of residential sites, as well as geographies of ageing, family, and care, are essential to creating appropriate relationships between older adults and their places or residences. This promotes active functioning and influences positive and negative feelings toward environments where people have social relationships with family, relatives, and community members. This study could lead to

residential and rural development policy interventions and has implications for practice. The outcomes from this study allow elders, governments, or related organisations to promote, apply and create appropriate and desirable residential environments in confronting an ageing society with the consideration of ageing in place through informal care and support.

CHAPTER 2

HUMAN AGEING AND GEOGRAPHIES OF AGEING, FAMILY AND CARE IN RURAL CONTEXT

2.1 INTRODUCTION

In this study, the literature review introduces the adopted research approach and the concepts that drive the research themes presented in three parts of Chapters two, three and four.

This chapter is the first stage of the intellectual inquiry of this thesis with key contemporary interests within human geography. It introduces the research approaches adopted in this study with the themes of human ageing and geographies of ageing, family, and care in the rural context. The chapter will be structured in the following way: First, this chapter begins by briefly describing the background, definition and importance of human ageing, active ageing and the geographies of ageing, family, and care, particularly in the rural context. These provide a comprehensive picture of the significance of human ageing with the concepts and attributes of physical, social and psychological ageing to be analysed the older adults, and the concept of active ageing is presented. In the section that follows, the geographies of ageing in a rural context are discussed with the geographical experiences or perspectives of growing old in the local community of the rural context. In the remainder of this chapter, the geographies of family and care constitute the geographical and social experiences of older adults and their families in the environment.

At the end of this chapter, the conclusion summarises the preliminary principles of human ageing with physical, social, psychological and active ageing, together with the geographies of ageing in the rural context adopted for this investigation's theoretical and conceptual framework.

2.2 HUMAN AGEING

Old age is known as the final stage of human life phase. As stated by the World Health Organization (WHO), human ageing has been defined as a chronological age of 60 years old or above (World Health Organization (WHO), 2017). Older adults often describe themselves by relying on their physical ageing signs, including their physical health and appearance (Lien, 2013; Thorson, 2000). However, elderly people can be classified into two groups based on the ageing stage, with those from 60 to 74 years old referred to as 'early stage' and those over 75 years old as 'later stage' (Pan & Fukuda, 2016). Firstly, ageing at the early stage (60-74 years old), those who are relatively healthy can still accomplish the necessary and desired activities of daily living, just retired from working life and having a relaxing and comfortable lifestyle (Fumitake, 2012; Lien, 2013; Thorson, 2000). Secondly, in the later stage (75 years old and more), the possibility of declining health may affect their necessary and desired activities of daily living and even outdoor activities (Lien, 2013; Pan & Fukuda, 2016; Thorson, 2000).

The ageing phenomenon is a natural human process in which the body undergoes psychosocial, social, mental and physiological changes. The ageing

process tends to cause a decline of the five senses of vision, loss of hearing, smell, taste, and touch sensitivity with increasing age (Lien, 2013; Thorson, 2000). Human beings grow older through different stages, cycles, or phases of life. Therefore, the ageing of humans is a process of becoming older, which is the last stage of life or the later part of the human life cycle (ERBAŞ, 2006).

Carstens (2003) highlights that the ageing process includes adaptation to physical, social, and psychological changes. The details of these characteristics will be discussed in depth in the subsequent sections.

The relationships between psychological, social, and physiological ageing are notable as one is naturally interactive or affects the other characteristics in numerous ways (Lien, 2013). These characteristics may, for example, define or maintain the older adult's social relationships or self-identity through a physiological decline (Charles & Carstensen, 2010; Lien, 2013). On the other hand, older people's physical health can deteriorate from social and psychological stressors, which can affect a person's ability to react or adapt to environmental stress and its consequences (Lien, 2013).

Apart from this, it has been suggested that the ageing process with physiological, social, and psychological characteristics, especially in terms of behaviour and well-being in old age, depends on factors such as living or residential environments (Hadafi & Barough, 2017; Iwarsson, 2005). In the same vein, the ability of older adults to utilise their residential environments to meet their daily living needs is further challenged by certain changes in their physical, social, and psychological systems.

Previous research has established that an older person's needs, which relate to the quality of spaces and living environments, are characterised by a variety of processes and changes in physical and sensory, social and psychological abilities and functioning (Hadafi & Barough, 2017; Iwarsson et al., 2007; Lien, 2013; Woodrow, 2002). In addition, human ageing has a moral or psychological and physical or material motivation. These are the forces that drive the behaviour adopted to meet the elderly's needs (Hadafi & Barough, 2017).

According to Hadafi and Barough (2017), recognising the elderly's needs is critical in creating an appropriate relationship between an older person's life and their surrounding environment. Such patterns have psychological background and are associated with the qualitative considerations of the social and physical environment (Lien, 2013). Given all that has been discussed so far, one may conclude that recognising human ageing status and studying older adults' needs should constitute the first stage of the environment exploration process (Hadafi & Barough, 2017). It includes assessing the characteristics of the living environment. In this section, concerning the discussion above, the following briefly describes the older adults' physical, social, and psychological characteristics as they are examined and divided into two groups.

2.2.1 Physical characteristics

Ageing relates to physical changes or losses in later life and can be debilitating on several levels. Older people experience difficulties conducting everyday activities due to limited physical functions or mobility (Park, 2017).

Physical ageing, especially mobility, is fundamental to active and healthy ageing because it is intimately related to basic human needs and health status (Ryan, Wretstrand, & Schmidt, 2015; Webber, Porter, & Menec, 2010).

By drawing on the concept of physical changes, Hadafi and Barough (2017) and Lien (2013) point out that the problems related to ageing people have examined specific needs and affected design features in living environments. They include slowing speed of reaction, a decrease of the strength needed for movement, shortening of stature to below average, reduced field of vision and the overall decline in sensory processing of sight, smell, sound and sensitivity of touch together with less control of motor function and balance. Moreover, Lien (2013) points out that age-related decline in physical characteristics can change and transform how older people react to particular environmental situations. However, the most critical concern is that ageing people tend to have an increasing problem with physically navigating their residential environments (Lien, 2013; Lien, Steggell, & Iwarsson, 2015).

These physiological characteristics can challenge an ageing person's ability to function safely, comfortably, satisfactorily, and independently within the residential environment (Iwarsson, Nygren, Oswald, Wahl, & Tomsone, 2006; Lien, 2013; Lien et al., 2015; Stoeckel & Porell, 2010). As noted by Hadafi and Barough (2017), approximately half of the reduction in physiological activities in ageing people is due to environmental factors. Therefore, the design and characteristics of the living or residential environment for older adults should take into consideration their physical and health conditions.

2.2.2 Social and Psychological characteristics

Generally, maintaining social and psychological function is an essential factor for an ageing well (Lien, 2013). Social and psychological age-related characteristics can affect older adults in various ways. For example, the characteristics of strong social networks and supportive functions of interpersonal relationships of older adults help preserve emotional or psychological well-being and life satisfaction. These are beneficial in reducing stress in older age (Charles & Carstensen, 2010; Lien, 2013; Lien et al., 2015).

In addition, social connectivity for ageing can become strained, particularly from the loss of family, friends, or community members through several situations such as relocation, retirement, or death (Lien, 2013; Lien et al., 2015). One of the significant findings in social gerontology over the last few decades is that older adults spend less time physically active and socialising or networking (Lien, 2013; Marcum, 2013). Lien (2013) noted that several studies show that older adults actively prune their social networks. This process maintains a more substantial psychological status and a more intimate and supportive relationship with those who provide and support their lives with value and meaning (Carstensen, 2006; Charles & Carstensen, 2010). In addition, psychological well-being is also increased during this process, as older adults with some social relationships and networks provide more positive social exchanges with others and experience fewer instances of interpersonal distress (Charles & Piazza, 2007; Lien, 2013; Newsom, Rook, Nishishiba, Sorkin, & Mahan, 2005).

Moreover, the other aspects of social and psychological characteristics of independence, autonomy, privacy, and control over the living environment are highly valued by ageing people (Lien, 2013). Lien (2013) suggests that the influence of the living environment on social and psychological health in ageing is quite pronounced. Although psychological and social functioning remains primarily intact with their advancing age, maintaining psychological health and social relationships in the residential environments can be challenging for older adults (Franklin & Tate, 2009; Lien, 2013).

According to Hadafi and Barough (2017), older adults' compatibility with their surroundings and living environments can be challenging; therefore, elders might benefit from influencing their residential environments to reduce the psychological changes and pressures caused by altering or renovating those environments. Much of the available literature on social and psychological characteristics of older adults concludes that the emotional and psychological needs are related to the sense of ownership, self-esteem, independence, loneliness, and the desire to get the attention of others. Socialisation is as important and significant as physical changes affecting how seniors visualise themselves and relate to their surroundings and residential environments (Charles & Carstensen, 2010; Hadafi & Barough, 2017; Lien, 2013). Following on from all that has been discussed so far, one may conclude that social and psychological characteristics in later life are also highly dependent on capability and competence in managing the living or residential environment (Lawton & Nahemow, 1973; Lien, 2013).

2.3 ACTIVE AGEING

For older people, active living is a way of life that integrates any physical activity into daily routines. Examples of such activities include exercise, recreational, occupational and household activities (Nathan, Wood, & Giles-Corti, 2013; Sallis et al., 2006). Nathan et al. (2013) noted that regular physical activity, particularly in later life, has been established to improve older people's health with both physical and psychological benefits.

By drawing on the concept of later-life with active ageing, Maddox (2013) points out that older adults who are transferring into a final phase of frailty with traumatic or gradual loss of health and reduction of physical or psychological ability are indicated by a constriction of their activities. In that period of ageing, people may continue with activities that maintain social participation and integration, which continue to be an essential factor in later-life satisfaction and health (Ahrentzen & Tural, 2015; Maddox, 2013; Nathan et al., 2013). Moreover, in a longitudinal study of those older adults with viable health and income status, active ageing with outdoor activities in the residential site has been found to be the main factor distinguishing high levels of later life satisfaction among older adults (Maddox, 2013; Nathan et al., 2013; Palmore, 1979).

Apart from the health and physical and psychological benefits from active living for later life, participation in sufficient amounts of outdoor activity declines with age (Nathan et al., 2013; Wang & Lee, 2010). In this case, in many countries, rates of sufficient physical activity decrease from more than 58 percent in adults aged 45 to 49 to just approximately 30 percent in those people aged 80 or more

(Nathan et al., 2013; Saarloos, Nathan, Almeida, & Giles-Corti, 2008). Therefore, encouraging more physical activities in outdoor environments for people in later life is important for maintaining physical, social, and psychological independence, which is a critical issue for the elderly adult population at present.

2.4 GEOGRAPHIES OF AGEING AND THE RURAL CONTEXT

From a global perspective, the percentage of people aged 60 and over actively increases in rural communities forming a more significant proportion of the population with the expectation of this being a rising ratio (United Nations, 2019; Winterton & Warburton, 2012). In addition, recent population censuses in many countries have highlighted the growing proportion of their population ageing. This is typically more extensive in rural regions and places rather than urban areas, especially throughout the entire East and Southeast Asian region (Knodel & Chayovan, 2008; Mujahid, 2006). Take, for example, the situation in Thailand, where there was 71.4 percent of older residents in rural districts in 2012 compared with 28.6 percent in municipal or urban areas (Pathike, O'Brien, & Hunter, 2014).

This situation can be attributed to rural areas, which have evolved over time due to the “ageing-in-place” for older adults who have preferences to continue living in their own homes and community as they age. Migration patterns, in which young adults are relocating to urban areas while older people have moved into rural areas in retirement, have also had an effect on this rise (Baernholdt, Yan, Hinton, Rose, & Mattos, 2012). Drawing on the significant movements of older people

from urban to rural places to enable ageing in place, the geographies of ageing in the rural context has become more complex in recent decades.

This is due to the fact that geography plays a crucial role in people's longevity, especially those in old age, as the space and place that people settle impact their quality of life as they age (Garrett & Poulain, 2018; Poulain, 2012). Recent work by geographers has established that these spaces and places of rural areas gain significance to construct the meaning and experience of age during the life course stages (Hopkins & Pain, 2007; Koops & Galič, 2017; Pain, 2005; Valentine, 2008). The rural locations influence older people to have different ways to access, participate and experience these places on the lands of their age. On the other hand, the spaces individuals inhabit affect how individuals act and feel and who use those spaces and places in relation to specific age groups and local contexts in daily life (Hopkins & Pain, 2007). As well as that, the use of space and place can influence people's characters by actively creating and resisting their specific age identities (Hopkins & Pain, 2007; Pain, 2005; Valentine, 2008). Indeed, there are characteristic changes of emphasis both within and among the modalities of geographical experience when a person grows older in that context (Milbourne, 2012; Rowles, 1978).

Rural areas have evolved due to the "ageing-in-place" and migration patterns in which older people have moved in, and younger residents have moved out (Baernholdt et al., 2012). This phenomenon is due to the fact that the rural-urban migration of younger people appears to have been influenced by the economic and employment opportunities and the desire to urbanise as fundamental drivers to encouraging such mobility (Lyu, Dong, Roobavannan, Kandasamy, &

Pande, 2019). On the other hand, the environmental press for elders in an urban context, such as high traffic, noise and pollution, and high levels of crime, might drive older adults to move from urban communities (Wu et al., 2015). Along with the scenic landscape and feeling of connectedness to the land, communal sharing and helping among people in rural areas are among the reasons why older people feel that their quality of life may be better in rural residences (Cromartie, 2009; Institute of Medicine, 2001).

Considering that this study is about rural context, a search of the literature on the physical and social environment and psychological of older adult-related outcomes revealed most studies are heavily urban-centred (Cunningham & Michael, 2004; Ding & Gebel, 2012; Menec & Nowicki, 2014; Saelens & Handy, 2008). Thus, much less is known about the environmental features of ageing in rural settings. Consequently, examining seniors in a rural context is essential, given that the proportion of older people in most regions of the world tends to be higher in rural or local than in urban areas, with the population in rural areas growing older at faster rates than urban areas (Dandy & Bollman, 2008; James & Davies, 2012; United Nations, 2019). However, despite the increase of urbanisation in many countries resulting in significant numbers of older adults with reduced family relations and support in rural settings, few countries have developed a policy specifically addressing the situation or issues of ageing populations in rural areas (Williamson, 2015).

According to Rowles (1978), his research was conducted four decades ago in the context of an American city. However, his idea has much to offer today's researchers of rural ageing, ageing well and the environment globally (Maclaren,

2018; Pijpers, de Kam, & Dorland, 2016; Wahl, Iwarsson, & Oswald, 2012). The study proposes geographical experiences or perspectives of growing old; there are three crucial changes to people's senses of space and place in the later years of their lives. First, there is spatial constriction within the domain of action, as older people declined physical movements and reduced social networks, which dictate more of a focus of their lives on the residential and local community context spaces. Second, a process of increasing psychological investment within specific environments turns into the dominant concept of change within the dimensions of location and feeling amongst older people. Third, the sense of place concerns how older adults' geographical experience or perspective becomes enlarged and enriched through 'geographical vision' with references made to the broad pattern of spaces and places that have been encountered throughout their lives.

Keating (2008) points out that the ageing population presents significant challenges for this century as living a longer life is the outcome of critical gains in standards of living environment. Although older people may be a significant population, they do not always live in the settings they desire or need because their requirements change as they age. Then those in rural areas may be doubly disadvantaged. Like others, older adults, especially in the rural context, require supportive and enabling living environments to compensate for physical, psychological, and social changes associated with the rural geographies of ageing.

Drawing on an extensive range of sources, much of the literature considers that the local contexts of place, community and environment play an essential part in shaping geographical experiences amongst older people in rural locations

(Keating, 2008; Mark W. Skinner, Cloutier, & Andrews, 2015; Mark W Skinner & Winterton, 2017). Rural areas have a set of characteristics, including a low density of settlement and small population size. Rural-urban differences in economic structure, income and community capacity can make ageing in a rural environment different from ageing in urban places (Edmund, 2012). For elders, the scenic landscape and feeling of connectedness to the land, as well as the concept of sharing and helping that is common among people in rural areas, are among the reasons why older people feel their quality of life may be better in a rural area (Cromartie, 2009; Institute of Medicine, 2001). Mostly, rural communities are vital to the country's population. They supply or produce food and other fundamental necessities of daily living, provide natural resources that underpin industries and often help preserve the environment. However, to be sustainable, rural places must provide the appropriate contexts of place, community and environment to support their residents' well-being and physical, psychological and social needs (Keating, 2008).

Regardless of the trend of increased numbers of people who will be ageing in many rural locations, the importance of the geographies of ageing in rural environments, and therefore the question of how to maintain a positive quality of life for older rural populations assumes great importance (Winterton & Warburton, 2012). Nevertheless, the literature on older adult-related physical, social, and psychological outcomes is mostly urban-oriented (Cunningham & Michael, 2004; Ding & Gebel, 2012; Menec & Nowicki, 2014; Saelens & Handy, 2008).

Furthermore, as noted by writers about areas for research, policy and practice are that the issue of geographical experiences or perspectives of older

people in rural places has received little critical attention from the researchers within the rural geographies of ageing to date (Atterton & Thompson, 2015; Milbourne, 2012; Walsh, O'Shea, & Scharf, 2019). There remains a paucity of evidence on references to ageing from scanning mainstream rural journals in recent editions. Similarly, social gerontology has paid scant attention to older people's situations, experiences, and needs in a rural context (Milbourne, 2012; Warburton, Scharf, & Walsh, 2017).

Despite the importance of geographical experiences of growing old, there remains a paucity of discussion about the study of geographical dimensions of ageing (M. Cutchin, Skinner, & Andrews, 2017; M. P. Cutchin, 2009; Garrett & Poulain, 2018). Historically the literature in the field of the geographies of ageing has tended to focus on an ecological model and demography of ageing. Recently there has been a growing body of literature that covers or focuses on a common topic or theme of how we internalise our living environment (Garrett & Poulain, 2018; Mark W. Skinner et al., 2015). However, emerging themes of the geographies of ageing should incorporate the new development of divergent concepts and consolidate different disciplines such as physiology, psychology, sociology, demography, and rural studies with a geography and gerontology approach (Garrett & Poulain, 2018).

These indicate a need to raise the understanding of older people within the rural geographies of ageing studies and the dimensions of ageing within environmental gerontology. Ageing in a rural retirement destination or ageing-in-place is primarily a function of how well individuals fit their environment

physically, psychologically and socially (Brown & Glasgow, 2008; Edmund, 2012).

Such approaches, however, it is important to also gives an account of interests within geographies of family and care. Given that the geographical dimensions of ageing with family relations and support, as mentioned previously, are the constitution of the core of significant geographical and social experiences in the environment. The following part of this research moves on to describe in greater detail the geographies of family and care.

2.5 GEOGRAPHIES OF FAMILY AND CARE

As indicated above, the demographic, physical, psychological and social changes have resulted in the ageing population within the past few decades. These also lead to an increase in the complexity of family structures and care from the growing need for familial support and social relationships. As previously stated, demographic, physical, psychological, and social changes have resulted in an ageing population over the last few decades. These factors also contribute to an increase in the complexity of family structures and care, and the need for familial support and social relationships (Agree, 2018; Mance, 2019). As a result, these alterations with increasing age may have an impact on age-related family and social relationships (Mance, 2019).

Changes to household structure and family formation, alongside an increase in ageing in place within a rural context, have reshaped everyday care provision towards informal institutions (Hall, 2019; Holdsworth, 2013; Smith,

2011). The existing body of research on geographies of care suggests that social networks of bridging relationships with members of neighbours and bonding relationship members, such as friends and relatives, typically involve informal, supportive and care relationships (Bowlby, 2012; Hall, 2019; Li, Kabayama, Tseng, & Kamide, 2022). In particular, previous research has revealed that family and kinship still matter for later life with regard to everyday support (Finch & Mason, 2003; Hall, 2019; Valentine, 2008).

According to the sociological studies of intergenerational relations, which have established that despite rapid socioeconomic change and the growth of personal independence and life satisfaction, and different types of living arrangements, older people still remain committed to reciprocal care and support of family and relatives in various types, such as the financial, emotional, informational and instrumental support (Brannen, Moss, & Mooney, 2004; Finch & Mason, 2003). Indeed, these various kinds of informal care and support include everyday practical support, such as mobility support, companionship and support getting out and about, household tasks and child-minding or looking after the grandchild(ren); and emotional support, such as providing counsel and comfortable and safe environments for older people (Edwards & Gillies, 2004; Hall, 2019; Morrison, Johnston, & Longhurst, 2013; Pinkerton & Dolan, 2007; Thomson, Hadfield, Kehily, & Sharpe, 2010).

In providing this support, it has been demonstrated that the role of family and relatives involved in more complex relations from the impact of intergenerational negotiations (Hall, 2019). These multi-generational dynamics of care provision are associated with indebtedness and gratitude, obligations and

responsibilities, fairness and equality, dependency and independence (Hall, 2019; Heath & Calvert, 2013). This is evident in the case of Asian societies with their long traditions, such as the Philippines, Singapore, Taiwan, Thailand and Vietnam, that use filial piety as a method of informally obligating children and family members to care for their elderly parents (Ramdas, 2015; Teerawichitchainan, Pothisiri, & Long, 2015).

However, Finch and Mason (2003) point out that the responsibilities between elderly parents and their children for each other develop over the life course through compromise rather than a fixed set of obligations that terminate at a certain age. This process of negotiation is relational. Which responsibilities of care and support are a product of familial interaction among individuals over time. It is also context specific that these relationships are often embedded within the specific material circumstances and the environmental spaces of care and support (Valentine, 2008).

In addition to this, the location, space and place, which define the nature of geography, where older adults reside, and the people that live near their residences, are also crucial to everyday care and support (Hall, 2019; Holdsworth, 2013). As well as the space and place of family and everyday life are the material places with which geographers might engage more directly (Luzia, 2010; Tarrant & Hall, 2020). This exploration of the space and place co-constitute family subjectivities and also establishes the temporal and dynamic character of the family with the identities and life within the lens of everyday life (Harker, 2010; Harker & Martin, 2012; Tarrant & Hall, 2020).

These spaces and places are also spatially diverse across different spatial features of the residence, such as the indoor spaces, outdoor spaces, garden and terrace, and also involve various relationships of family, relatives, friendship and other intimate relations. Furthermore, consistent with the existing body of research on human geography, which suggests that these spatial features have the capacity to socially co-produced and reshape relational spaces and places of care (Hall, 2019; Koops & Galič, 2017). According to the concept of geographies of care with caring scapes or the space and place dimensions of care, therefore, policy landscape or the residential site of the residence can shape everyday relationships. This is due to the responsibilities of care and support and the social relationships within family, relatives and multi-generational caring practices change across the life course (Bowlby, 2012; Hall, 2019).

Furthermore, several lines of evidence suggest that the demographic, economic and social changes have particular consequences for the family and relatives in the space and place involved in the social relations of care and support between different generations. This alteration, therefore, re-centred the geographies of family and care with the consideration of the processes that have produced the geographically differentiated effects and conditions that provoke the demand for increased reliance on informal sources of support and care in old age (Hall, 2019; Hall & Holdsworth, 2016; Tarrant & Hughes, 2019).

Together these studies provide important insights into the focus on family, relatives, friendship and intimate relationships, which signify the core of everyday social relationships and informal care and support in later life. The evidence reviewed here appears to suggest a relevant role for geographically

understandings of family and care progressing with intradisciplinary connections between geographies of everyday life, relationships, culture, spatial practices of caring scapes, or the space and place dimensions of care and support that configure and are configured within the living environment of ageing in place.

Despite the significant changes in older people and their families, previous research has established that very little attention has been paid to the role of family and care within the geographical discipline (Hall, 2019; Valentine, 2008). Therefore, the studies of ageing, family and care geographies can offer interesting possibilities for geographical understandings of the ageing population and how individualities, experiences and relationships can create and alter the environment (Hall, 2019). The way to address the importance of geographical dimensions of ageing, family and care is to emerging themes that incorporate how social relationships and experiences are configured through and across space and how people internalise their environment (Garrett & Poulain, 2018; Mance, 2019).

To conclude this section, the literature identifies that the geographical experiences or perspectives of ageing people, family, friendship, intimacy with care and support within their living environment have the potential to enhance and develop current geographical understandings and the experiences or perspectives of older people with their living environment. Moreover, the rapid changes in population ageing in rural contexts seriously affect later life with the need for informal care in the residential site. Therefore, this indicates a need to investigate these concerns and address these research gaps.

2.6 CONCLUSION

The ageing process represents an adaptation to a series of possible changes in physical ability and health, psychological, social and functional roles. The optimal physiological, social and psychological characteristics can be achieved with appropriate and adequate residential environmental planning in relation to the older person (Lien, 2013; Lien et al., 2015; Oswald & Wahl, 2004). Consequently, understanding older adults' psychosocial needs or their perspectives through their environment can help explain how they identify with, relate to and navigate their physical residential environment (Lien, 2013; Oswald, Jopp, Rott, & Wahl, 2011). The evidence discussed here suggests a pertinent role for examining older adults' living and residential environments, which significantly impact their behaviour and well-being.

Moreover, the evidence presented in this section suggests that, in the rural context of communities, the geography and residential environment plays an essential role in shaping living experiences amongst older people. Rural context incorporates various elements that influence older people's later lives, and the ageing population of rural areas seems likely to increase rapidly (Dandy & Bollman, 2008; James & Davies, 2012; United Nations, 2019). The characteristics and conditions of rural life make older adults feel that their quality of life may be better in urban areas. Moreover, the geographies of family and care offer interesting possibilities for understanding old age with family and care in everyday life. Together, they represent the core of significant social relationships within the spaces and places of care and support.

However, the literature linking human ageing, geographical experiences, and perspectives of older people in rural places and the approach to family and care within the geographical discipline has received little attention. In this regard, a greater understanding of older adults living environment in a rural context with the significance of family relations and care across the life course will generate implications and recommendations for future studies, practices and policies that will allow older people to age well in their home setting.

The next chapter presents the micro-geographies of living environments, focusing on the residential environments of older adults, Environmental Gerontology (EG), and Person-Environment (P-E) fit. The following chapter also provides the concepts of perception and cognition of the environment for older people.

CHAPTER 3

MICRO-GEOGRAPHIES OF LIVING ENVIRONMENTS FOR AGEING

3.1 INTRODUCTION

This chapter introduces the micro-geographies of living environments for ageing. It provides a critical review of the literature, identifying and analysing current knowledge and understanding the research focusing on the residential environment of older people, including Environmental Gerontology (EG), Person-Environment (P-E) fit and the perception and cognition of the environment.

The discussion here is based on the environmental context of the approach to ageing. It explores older adults' perceptions, evaluations, behaviours, and attitudes to their residential site environment from a P-E fit perspective. Following on from this, the remainder of this chapter introduces concepts applied later in this research to analyse the environmental features of residential sites related to the perception and evaluation of old age in rural contexts.

In the end, the conclusion identifies the preliminary issues related to the micro-geographies of living environments also the perception and cognition of the environment that are adopted for the theoretical and conceptual framework of this study.

3.2 MICRO-GEOGRAPHIES OF LIVING ENVIRONMENTS

“Place and space” defines the nature of geography as a dynamic process pertaining to the integrated physical, social and psychological aspects that interact with a range of various scales (Wiles, 2005; Wiles et al., 2009). As was pointed out in the geography of ageing in Chapter two (see chapter 2, section 2.4), there are increasing numbers in the ageing population in rural regions. In contrast, the literature on the living environments for older adults revealed that most studies are heavily based on a macro scale and are urban-centred.

By drawing on the trends of micro-geographies, Skinner, Andrews, and Cutchin (2017) highlight the need for a new study of the geography of the older population within their living environments. Consequently, this field of study is now receiving increased attention aimed at understanding and reinventing the living environment in rural areas. This is because retirement communities and residents tend to opt for ageing in place. Therefore, the geographical experiences or perspectives of growing old need to focus on the micro-scale of the local community and residential areas in a rural context.

Whilst ageing occurs within rural environments, these spaces or places give rise to the experience of ageing rurally at household and community levels. These are the micro-level geographies characteristics of the living environment (Cutchin, Skinner, & Andrews, 2017). Generally, older adults spend increasing amounts of time in their locality (Buffel, Phillipson, & Scharf, 2012; Lager, 2015). Consequently, older adults spend more time in their proximate living environment

and as such, this experimental setting, consisting of the residential environment, gains importance (Lager, 2015).

The residential environment is a crucial feature of living for the elderly. The concept of residential environments for older adults in the rural context and how best to explore these environmental settings needs to take into account the demands, cognition, perceptions and behaviour of older people. The theme of the thesis, “residential environments” that are appropriate for the elderly, is the primary focus of the ageing environment. This study includes finding out the best fit in which older people actively interact with the environment and the extent that the environment meets their needs based on Person-Environment (P-E) fit.

Therefore in this section and concerning the discussion above, the following parts give a brief overview of the residential environment for older adults, Environmental Gerontology (EG), and Person-Environment (P-E) fit.

3.2.1 Residential Environment for Elderly People

The residential environment is defined here as an amalgamation of the living environment’s natural and built features. According to Cunningham and Michael (2004), the concept guiding the study is the impact of the living environment on physical activity for older adults. Environmental factors of the outdoor environment should be taken into account to promote physical activity and relationships to place and space. In terms of the outdoor environment for older people’s physical activities and experiences of place, Wang, Rodiek and Shepley (2006) and Wang (2014) state that the common outdoor environment experienced

by community-dwelling older people in their daily lives is their residential site environment.

Residential site environments are defined as environments within a residential property which are immediately adjacent to a dwelling, such as gardens and terraces. These are critical for older adults as their immediate spaces of interaction (Cutchin et al., 2017; Wang, Rodiek, & Shepley, 2006). The residential site environment is also the first place people enter when they go outside and provides the starting point to venture out of the dwelling and is the first point of return (Wang, 2014). The residential site environment allows the residents to perform various activities and experiences within the physical environment, social environment and psychological environment (Lien, 2013; Tiwari et al., 2015). Older adults use different residential environments as spaces or places for participation in a broad range of outdoor activities. Community-dwelling older adults spend most of their time at home, estimated to be over 80 percent of the day on average (Brasche & Bischof, 2005).

Lien (2013) suggests that older adults' residential environment plays a significant role in the sense of geographical place shaped by older adults' characteristics, together with their interpretations, perceptions, perspectives, and experiences. The importance of the residential environment to ageing people is acknowledged as a critical aspect of quality of life and well-being from the physiological, sociological, and psychological perspectives (Iwarsson et al., 2007; Lien, 2013; Frank Oswald, Hieber, Wahl, & Mollenkopf, 2005).

According to Lien (2013) and Wahl and Gitlin (2007), the living arrangements of the residential environment of ageing provide older adults with opportunities to express independence, autonomy, and privacy. Consequently, the residential environment's characteristics can impede, restrict or enable older people to lead an independent, active and participatory later life (Christiansen & Townsend, 2010; Lager, 2015). As noted by Wang et al. (2006), since some older adults are environmentally inactive, they may be more physically active if the environments are senior-friendly and inviting for physical activities. Indeed, the typical residential site environment design features depend on specific environmental characteristics that can promote older adults' interactions with the outdoor environment or possibly even limit their physical activities in their residential environment (Wang & Lee, 2010; Wang et al., 2006). Therefore, the residential site environment has been a significant focus of research in environmental ageing. This has been called "Environmental Gerontology" (EG) since residential site environments have a substantial impact on behaviour and well-being in old age (Iwarsson, 2005).

Despite the fact that the importance of the environment for the elderly is well described and widely understood to many, there is a paucity of evidence in the literature that might relate aspects of appropriate residential site environments for the seniors and the physical characteristics of those environmental features to the perception and evaluation of seniors in rural Asian settings. Such evidence could allow for clear conclusions to be drawn about the uniqueness of this relationship.

The literature shows many theoretical concepts suggesting what older adults from different contexts prefer regarding dwelling features and residential site environments. However, the research should contribute to the seniors' perception in terms of the appropriate residential site environment, especially in Asian rural contexts. Several differing environments for older adults are currently studied in urban and other contexts. However, these dynamics are not based on the fundamentals derived from the perception and evaluation of older adults from rural contexts and the data collections from field surveys. The interface between older adults and the residential environment in a rural context needs to be articulated carefully by examining the fit between what residential environment features can offer and what older adults want. This will be critical to finding the appropriate ideal residential site for the elderly, in particular for the Asian context.

3.2.2 Environmental Gerontology (EG)

Studies of the ageing environment have acknowledged that there has to ideally be proper optimisation and compatibility between the connection or relationship involving psychological, social and physical environments in ageing (Golant, 2012; Wahl, 2001; Wahl & Gitlin, 2007; Wahl & Oswald, 2010). Investigation into the environment of ageing is also known as “Environmental Gerontology” (EG) that includes various aspects of the environment, housing features, perceptions, functional status and quality of life in old age (Safran-Norton, 2010).

The environmental gerontology-related issues are most likely to reach excessive proportions over the next few decades as a result of the rise and significance of population ageing, especially in developing regions within rural contexts (Cutchin et al., 2017; Rodríguez-Rodríguez & Sánchez-González, 2016; Sánchez González & Rodriguez Rodriguez, 2016). This trend also supports and emphasises the phenomenon in rural areas that have become geographically defined communities with a large proportion of older people, particularly in Asian countries, as mentioned in Chapter one (see chapter 1, Sections 1.2 and 1.4).

In addition to this, Sánchez González and Rodriguez Rodriguez (2016) and Cutchin et al. (2017) point out that the most significant challenges of promoting active ageing in rural context will demand greater investigation of the relationships between physical and social environments for older adults. This includes encouraging an understanding of the micro-level geographies of the living environment with an examination of adaptations and adjustments made between older adults and their environmental features and the effect on the quality of life of older people. Furthermore, the ageing phenomenon, which grows more prominent in the context of environmental crisis, is associated with rapid changes in the geographic distribution of the increasing ageing population living in mainly rural settings and their changing needs. Therefore, EG will be required to develop fundamental approaches concerning the characterised effects geographically, especially in developing countries of East and Southeast Asian countries.

As discussed above, the academic literature on EG can play an essential role in addressing the issue of micro- geographies of the living environment. According to research in the EG field, it includes a diverse range of topics, particularly the

specialised living environments required by older people, such as housing and residential accommodations and interactions within environments (Andrews, Milligan, Phillips, & Skinner, 2009). The research also included various aspects of the environment, housing features, perceptions, functional status and quality of life (Safran-Norton, 2010). The main insights from EG emphasise two interrelated viewpoints for ageing well. One is environmental or external factors, including the physical and social dimensions, which could act as stimuli for older adults' functioning and feelings. Correspondingly, older adults' competence and internal factors such as psychological dimension, health status and living capabilities can influence their various degrees of adaptation to the environment (Sun, Phillips, & Wong, 2018).

Additionally, EG has been characterised by the increasing development of multidisciplinary and interdisciplinary research into ageing from the contributions of various social sciences such as environmental psychology (Abbas & Ghazali, 2012; Charles & Carstensen, 2010; Nasar, 1981; Nyunt et al., 2015; Frank Oswald, Jopp, Rott, & Wahl, 2011). Along with the geography of interests in the spatial dimensions of older people's health and the link between ageing populations and their environments (Andrews, Cutchin, McCracken, Phillips, & Wiles, 2007; Davies & James, 2016; Hodge, 2008; Skinner, Cloutier, & Andrews, 2015; Sylvestre, 1999).

In this, EG aims to understand, analyse, modify and optimise the relationship between the person who is ageing and their physical and social surroundings (Andrews et al., 2009; Rodríguez-Rodríguez & Sánchez-González, 2016). These approaches relate to the Person-Environment fit theory, which

focuses on an interaction between the characteristics of individuals and their environments. This issue will be discussed in detail in the next section.

Old age is a critical life stage during which seniors spend most of their time in their dwelling or the immediate dwelling environment. Their life quality can be greatly influenced by the physical environment of the residential site (Rantakokko, Törmäkangas, Rantanen, Haak, & Iwarsson, 2013; Wahl & Oswald, 2010). Residential environments significantly impact behaviour and well-being in old age (Iwarsson, 2005). Investigations of the residential environments' effects on older adults' health and well-being have a long but intermittent history in gerontology (Maddox, 2013). However, there is a growing body of research that recognises the importance of residential environments within a field of EG, that is, the study of the relationship between the environment and older people, as a branch of gerontology (Rodríguez-Rodríguez & Sánchez-González, 2016).

Therefore, the residential site has been a significant focus of research in EG, which includes the concept that older adults may have a sense of attachment or tend to live a long time in their current residence or the same place (Falkingham, Chepngeno, & Evandrou, 2012; Frank Oswald & Wahl, 2004). In addition, previous studies in those fields have concluded that the outdoor environment has a significant association with elders' behaviour (Iwarsson et al., 2007; Sugiyama & Thompson, 2006; Thompson, Alves, & Aspinall, 2016). However, the causal link between the residential site and seniors' perception and evaluation of the rural context in Asian countries is not well established.

3.2.3 Person-Environment (P-E) fit

A consideration of exploring the balance between the demanding characteristics of the environment and explaining how well people interact and adapt to their living environments is a field of study generally referred to as Person-Environment (P-E) fit (Phillips, Cheng, Yeh, & Siu, 2009). According to the ecological theory of ageing (ETA), Lawton and Nahemow (1973), ageing well involves an interactive relationship between a person (P) and their environment (E). This interactive relationship is also an essential aspect of environmental gerontology that indicates the necessary understanding of P-E interchange processes in ageing (Sun et al., 2018). Theoretically, the concept of P-E fit suggests that the well-being of older people depends on their spatial experiences when they use the environment and engage in social relationships (Rodríguez-Rodríguez & Sánchez-González, 2016).

P-E fit emphasises two equally essential elements of environmental settings that is resources and demands and also older people's cognition, perceptions and behaviours (Maddox, 2013; Phillips et al., 2009; Sun et al., 2018). In everyday life, older people confront, interact with and adapt to these environments, during which they gain spatial experience as well as develop ties with their residential environment and places (Rodríguez-Rodríguez & Sánchez-González, 2016). With regard to P-E fit, "Person" (P) is defined as a person's characteristics, competence the basic capacities to survive. This help satisfies human needs, from the satisfaction of basic psychological needs to a positive end of self-actualisation (Sun et al., 2018). "Environment" (E) is defined as environmental characteristics

which are essential in an older adult's life course and which shape older people as social, intellectual and natural beings (Sack, 1993).

Particularly for older people, an environment potentially exhibits many challenging characteristics, including environmental features and behaviour demands. Several pathways are available whereby older people achieve better physical and mental health through an adaptive response to the environment (Glass & Balfour, 2003). For example, suppose a residential site looks comfortable and inviting. In that case, elders will use it, becoming more likely to develop positive feelings about the environment, do more physical activities, and socialise with other people. Thus, it will be a valuable perspective to identify the coherence of the environment features and older people (Sun et al., 2018).

Maddox (2013) noted that the P-E fit approach proved to help investigate how well elderly individuals were managing their environments and evaluate the effects of older people's perspectives on enriched environments. Therefore, it is crucial to bring P-E fit into a study to determine the best fit in which older people actively interact with the environment and the extent to which the environment meets their needs. In this case, the environment could act as stimuli for older people's functioning and feelings.

By drawing on the concept of P-E fit, Lien (2013) points out that researchers interested in how the living environment affects older people have used P-E fit models to frame the research and applied them for scholarly work. These theoretical models also serve as appropriate frameworks for design and policy that allow older adults to maintain or improve their well-being and quality of life within

their surrounding residential environments (Lien, 2013; Lien, Steggell, & Iwarsson, 2015).

While the study of EG with the P-E fit perspective offers rich insights into ageing in place, its theories and practice have primarily been situated in Western societies and, indeed, mainly in English-speaking countries. However, as noted by Sun et al. (2018), recent years have witnessed some explorative studies applying environmental gerontology to the Asia-Pacific region and developing economies. There are a growing number of studies in the Asia-Pacific region that emphasise various characteristics of the neighbourhood or community environment and their implications for the subjective feelings of older persons in the urban context (Loo, Lam, Mahendran, & Katagiri, 2017; Wong, Chau, Cheung, Phillips, & Woo, 2015; Ye, Gao, & Fu, 2018). Previous studies adapt the P-E fit perspective in the neighbourhood or community environment domain, but there is a lack of research in subscale or micro-geography of residential site environments within a rural context. (Phillips et al., 2009; Zhang & Zhang, 2017). Moreover, apart from the physical environment domain, the studies in China have emphasised the necessity of taking the social factors of cultural characteristics of the family orientated and living arrangements into account when using the P-E fit approach (Chan, 2005; Hermalin, 2010).

As well as this, Rodríguez-Rodríguez and Sánchez-González (2016) point out that a predominant proportion of studies in EG have focussed on the social environment associated mainly with health. Despite the importance of living environments for ageing, there remains a paucity of evidence based on the physical environments of the natural and built environment. This impact limits a

comprehensive understanding of older adults' physical and social environment. This is crucial and a significant challenge to promote ageing in place. Thus, this study will incorporate physical and social environmental factors in exploring older person's well-being and the best P-E fit in Thailand.

3.3 PERCEPTION AND COGNITION OF THE ENVIRONMENT

The process of personal evaluation of the environment involves the interactions between individuals and their surroundings, with two principles of perception and cognition (Portella, 2007; Sun et al., 2018). First, perception is associated with how persons receive visual information from the environment through stimuli. In the case of this research into living environments, these stimuli are physical features of the residential site, such as the characteristics of the residences, outdoor furniture, plantations and so on. Secondly, the cognition process involves symbolic meanings related to the environments, which can be influenced by the individual's culture, values, individual experiences, and rural context (Basile & Cavallo, 2020; Portella, 2007; Sebastien, 2020; Sun et al., 2018).

Portella (2007) suggests that the process of perception and cognition, based on Gestalt psychology principles, involves three interlinked factors multi-sensorial perception, symbolic meanings, and the relationship between the physical characteristics of the environment and symbolic meanings. In this approach, individual perception of the environment involves more than a solely psychological association related to a perceived object. Still, it is also linked with

the cognitive process from that perception. The outcome of these processes establishes the mental representation of the environment that a person evaluates as positive or negative when the environment is analysed. In this regard, this mental representation from perception and cognition is an approach of this study. As indicated in Chapter One, this research analyses how older adults perceive and evaluate the residential site environments from a rural context.

As both contributors to and receivers of their residential environments, older adults can help researchers, policymakers, and practitioners more fully understand the importance of P-E fit and its applications in research and practice. The relationship between a person and their living environment is an interactive relationship in which the objective and perceived conditions affect the objective and subjective reaction to the other environment characteristics (Lien, 2013; Lien et al., 2015; Frank Oswald & Kaspar, 2012).

Nyunt et al. (2015) suggest that the environmental measurement of subjective and objective responses to those dimensions complement each other and provide information on the environmental characteristics' perception and cognition. In the review of perception and recognition of the characteristics of ageing people in regard to their needs, Hadafi and Barough (2017) also highlight that it is apparent that the study on older adults' needs is to investigate their preferences and requirements.

There will be a challenging approach to integrating the elders' preferences because a preference is an individual's emotional response to a set of environments. This involves cognitive processes and the products of perception,

which may be appropriate to be used in studying human comprehension and attitudes towards the environment. Preference is conceived of as human understanding and behaviour that can be used to study and observe their perception and attitudes. (Hongthong & Raksawin, 2014; Kaplan, Taşkın, & Önenç, 2006). Portella (2007) points out that objective dimensions related to the environment's physical features can be evaluated, for example, characteristics such as a neat and tidy area or a small and narrow space. Subjective dimensions are emotional factors concerning affective feelings associated with the cognition of elders' interpretations of an environment. They occur when elders evaluate the environment through qualities such as pleasantness or stressfulness.

The elderly residents' requirements for a residence and residential site should be considered fundamental to the appropriate design of a living environment. Therefore, a space and living environment with qualities and satisfaction, from an older person's perspective, can provide a long-term relationship to the resident, including a sense of belonging to the place or the residential site (Hadafi & Barough, 2017). In this light, there should be an appropriate relationship between persons and their social, psychological, and physical environments in ageing, such as in the concept of Environmental Gerontology (EG).

This research considers how older adults feel regarding the appearance of these environments with subjective dimensions evaluation. The study includes exploring the physical characteristics and features of residential site environments which influence older adults' perceptions and assessment, with an objective dimension's evaluation. Furthermore, this study explores the residential site

environment's physical characteristics noted as positive and negative by elders from their perceptions and perspectives, together with analysing and interpreting the data about the standard features of a residential site and environment.

3.4 CONCLUSION

The residential environment, in a rural context, is considered micro-level geography with specific characteristics of a living environment. As demonstrated above from the literature, the residential site environment is an important and pertinent place and space, especially for those of older age, to enable the experience of ageing rurally (Cutchin et al., 2017; Lien, 2013; Frank Oswald & Kaspar, 2012; F. Oswald et al., 2007). Considering older adults spend increased time within the residential environment, primarily because of the changes of old age affecting physical and social life (Buffel et al., 2012; Lager, 2015; Lien, 2013; Nygren et al., 2007). The changes in the ageing of the body and life events can lead to the transformation of experiences and perceptions of the ageing self and their residential environment (Leith, 2006; Lien, 2013; Lien et al., 2015).

As a critical component of everyday life for old age, older people's residential site environment provides a context within which the interactive Person-Environment relationship between older dwellers and their residential site environments can be examined (Lien, 2013; F. Oswald et al., 2007). In addition to this, most research that adapts the P-E fit perspective to date has tended to focus on the neighbourhood or community environment rather than the micro-geography

of the residential site environment within a rural context (Phillips et al., 2009; Zhang & Zhang, 2017).

Based on the theoretical foundations of P-E fit, it is apparent that P-E fit and adaptation to ageing is a product of the older person and their residential site environment, which is both objective and subjective or perceptive (Lien, 2013; Maddox, 2013; Phillips et al., 2009; Sun et al., 2018). In this regard, it is crucial to utilise the assessments and perceptions of P-E fit when exploring Person-Environment interactions along with the preference of the older people. This forms part of cognitive processes and products of perception and attitudes towards the residential environment (Hongthong & Raksawin, 2014; Kaplan et al., 2006; Portella, 2007). A greater understanding of P-E fit and P-E interactions will generate implications and recommendations for future research, practice and policy that will allow older adults to age well in the residential environment in the rural context.

The following chapter presents the context of ageing in the case study in Thailand. This chapter reviews the current situation of ageing in a rural context, the living arrangements of older adults, the aspects involved in Thailand's national plans on ageing and the background of the case study village.

CHAPTER 4

THE CONTEXT OF AGEING IN THAILAND

4.1 INTRODUCTION

This chapter describes in greater detail the ageing in a rural Asia context from a case study of Thailand. As was pointed out in Chapter One, Asia will be the oldest region in the world within the next few decades (Sasiwongsaroj, Pornsiripongse, Burasith, Ketjamnong, & Koosakulrat, 2012). In this regard, Eastern and South-Eastern Asia are home to the largest proportion of the world's older population of the world's older people, with approximately one in three older adults is living in these regions in 2019, and this is expected to remain so in 2050 (United Nations, 2019a). As well as that, at least 40 percent of the elderly population would be from low and middle-income economies in Asian countries (J. Knodel & Chayovan, 2008; Pathike, O'Brien, & Hunter, 2017; United Nations, 2013; World Health Organization (WHO), 2015, 2017).

In particular, the speed of demographic change with the rapidity of population ageing in middle-income countries such as Thailand is remarkable. Provided that Thailand is currently ranked the third most rapidly population of ageing globally and also experiencing among the most rapid rates in the developing world (HelpAge International, 2019; Lorthanavanich et al., 2021; United Nations, 2019b). The expected amount of time to increase the percentage of the elderly population is much lower in Thailand than in many industrialized countries. These values range from 7 percent in 2007 to 14 percent in 2029. This rapid change will

seriously affect ageing in the rural context (United Nations, 2017; World Health Organization (WHO), 2010).

In reviewing the literature in Chapters Two and Three, the older population of rural areas seems likely to continue to increase rapidly (Dandy & Bollman, 2008; Davies, 2011; James & Davies, 2012; United Nations, 2019a). In this respect, older adults spend increasing amounts of time in their locality and residential environment and experience their ageing rurally, which is the micro-level geographies characteristics of the living environment (Buffel, Phillipson, & Scharf, 2012; Cutchin, Skinner, & Andrews, 2017; Lager, 2015). Undoubtedly, the rural context that incorporates various elements in the communities and residential environment plays an essential role in shaping geographical experiences in the later lives of older adults. Moreover, the space and place of the residential site with the dimensions of informal care and support involve various relationships of family, relatives, friendship and other intimate relations within the living environment of the ageing in place. Therefore, the relationships between the residential site and rural ageing in Asian countries with the option of an informal care system need further exploration as they are less well-established (Sun, Phillips, & Wong, 2018).

Therefore, understanding residential site environments in this rural context from the case study in Thailand has received considerable critical attention. The following is a brief description of the current ageing situation in the Asian context and the living arrangements of older adults in Thailand. In addition, it explores the aspects involved in Thailand's national plans on ageing and the background of the

case study village. In the end, this chapter summarises the context of ageing in Thailand.

4.2 SITUATION OF AGEING IN THE ASIAN CONTEXT AND THE LIVING ARRANGEMENTS

Population ageing is unique in Asia, given the rapid pace at which it is proceeding and the immense social and economic challenges for Asian populations and their governments that the region is experiencing as a whole (Chan, 2005; J. Knodel & Chayovan, 2009). Based on The Asian Development Bank (ADB) (2017) and World Health Organization (WHO) (2020), Asian society and governments have much fewer timeframes to prepare for the situation of population ageing compared to their Western counterparts.

J. Knodel and Chayovan (2008) and (2009) point out that in Western countries, the older population will take many decades for the proportion to double from 7 percent to 14 percent. In contrast, it will take Asian countries just a little more than two decades to do so. Notably, as discussed in Chapter One (see chapter 1, section 1.2), Eastern and South-Eastern Asia have the most significant older population increase with a predicted alteration of 120 percent between 2019 and 2050 (Nations, 2019). Therefore, Asian countries will need to adapt much more rapidly to the transformation of an older population and its implications for individuals, families, communities, and particularly ageing society.

For example, Thailand, a country located in the centre of mainland Southeast Asia, technically became classified as an “aged society” in 2005 when

the proportion of the ageing population reached 10 percent of the total population (see Figure 4.1). In the near future, or about 2023, Thailand will have become a “complete aged society” when the older adults reach 20 percent of the population and a “super-aged society” in 2035 when the elderly people comprise nearly a third or 30 percent of the total indigenous population (Foundation of Thai Gerontology Research and Development Institute (TGRI), 2013).

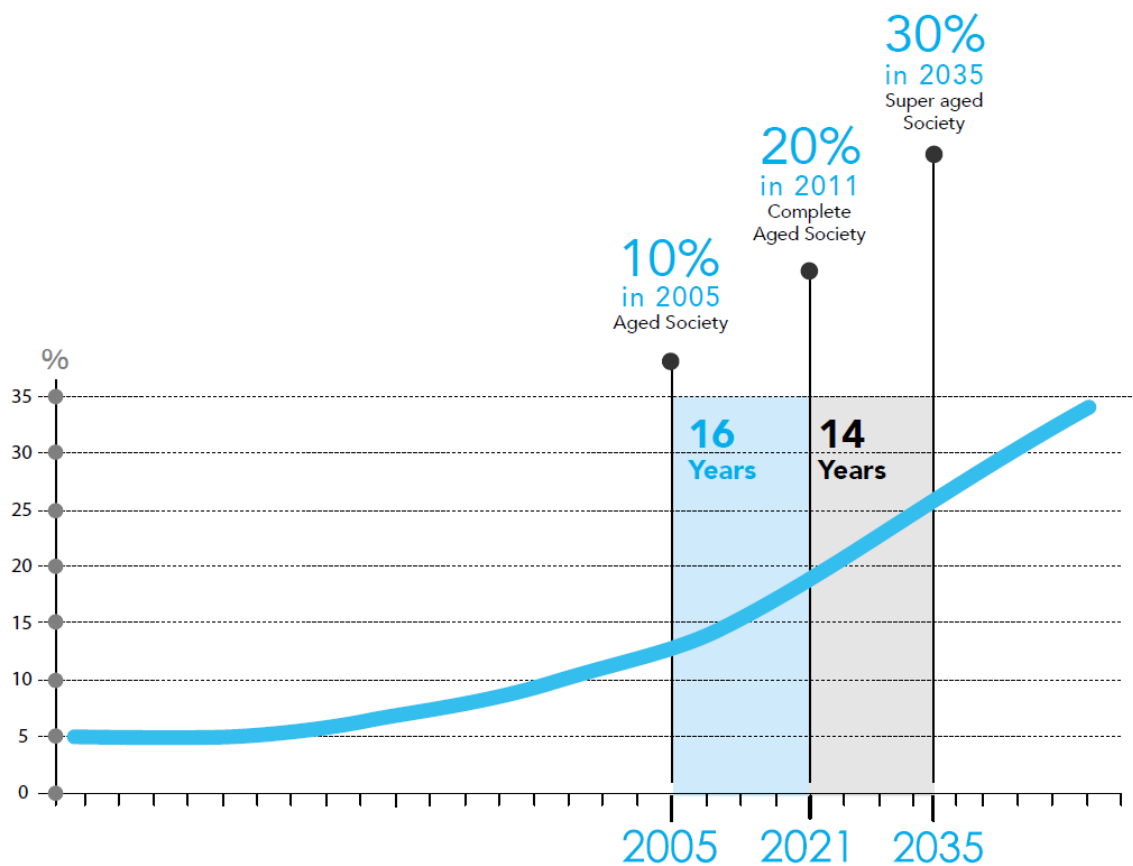


Figure 4.1: Percent of the Population Age 60 Years or Over: 1960 - 2040 (Foundation of Thai Gerontology Research and Development Institute (TGRI), 2013; National Population and Housing Census for 1970, 1980, 1990, 2000, and 2010, NSO; and Population Projections for Thailand, 2010 – 2040).

Further to this, much of the available literature on population ageing draws our attention to the impact that this ageing is particularly apparent in the rural regions and places, especially throughout the entire East and South-East Asian region (Dandy & Bollman, 2008; Davies, 2011; James & Davies, 2012; J. Knodel & Chayovan, 2008; Mujahid, 2006; United Nations, 2019a). Mujahid (2006) concludes that the rural ageing population is more aged than the urban areas in East and South-East Asia. For instance, Thailand has 71.4 percent of older people living in rural provinces, which is significantly higher than the urban elderly population (Glinskaya, Walker, & Wanniarachchi, 2021; Pathike, O'Brien, & Hunter, 2014).

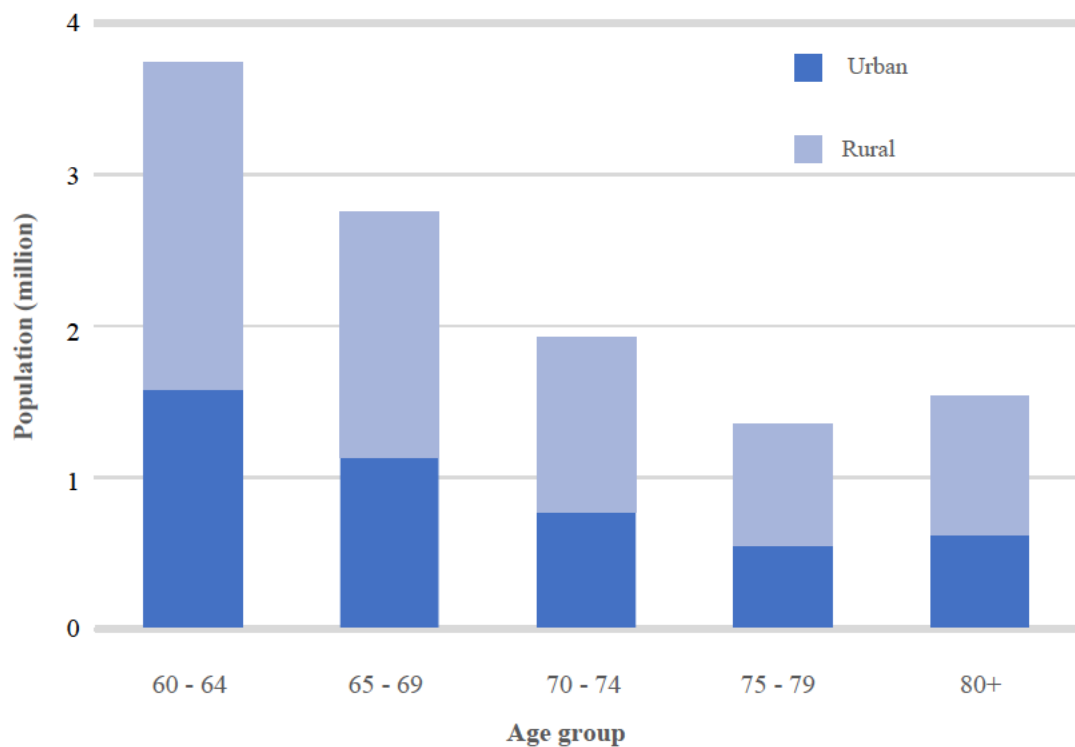


Figure 4.2: Population by age and residence, 2017 (Glinskaya et al., 2021)

The different ageing trends in rural and urban contexts in East and South-East Asia reflect the impact of economic development, which correlates with internal migration (Chan, 2005; Mujahid, 2006). The internal migration is characterized by an outflow of young adult cohorts from rural to urban settings (Brown & Glasgow, 2008; Buffel et al., 2012; Chan, 2005; J. Knodel & Chayovan, 2009; J. Knodel, Kespichayawattana, Saengtienchai, & Wiwatwanich, 2010). Generally, primarily young people move out to urban areas for more education, employment, business opportunities, and a higher standard of living. However, the ageing imbalance is also aggravated by population movement in terms of older adults returning to their small towns or villages on retirement from their urban employments (J. Knodel & Chayovan, 2008, 2009; J. Knodel et al., 2010; Mujahid, 2006; Srichuae, Nitivattananon, & Perera, 2015).

Given these points, these Asian rural areas are expected to face increasing demand for a geographical contribution to the satisfaction and quality of life of older people (Davies, 2011; Lowe & Speakman, 2006). As shown above, population ageing is one of the most critical demographic phenomena with implications for all societies. The ageing population is already having a far-reaching impact on living arrangements (Guzman, 2012). According to Cutchin et al. (2017) and Sylvestre (1999), it became evident from the gerontological research that older adults are affected by their locations, settings and living environments within which they experience the ageing process. One of the most significant concerns about ageing is the appropriate housing and residential environments in this context, which also has an important impact on the characterisation of ageing

and their quality of life in rural communities (Baernholdt, Yan, Hinton, Rose, & Mattos, 2012; Davies, 2011; Iwarsson, 2005; Lowe & Speakman, 2006).

From the above mentioned, Asian societies are experiencing dramatic changes in the larger environment from economic development (Brown & Glasgow, 2008; Buffel et al., 2012; Chan, 2005). According to Chan (2005) and J. Knodel and Chayovan (2009), the impact of migration, urbanization, and globalization affects the family structures' internal dynamics, intergenerational support, and the status of older adults in Southeast and East Asia. However, the family support of older persons in the Asian context may not be deteriorating as predicted by modernization theory (Chan, 2005). Asian families continue to have a significant role in supporting older members.

The living arrangements of the elderly in Thailand, as in the case of most Asian countries, the primary responsibility and source of support for the older people has traditionally been with the family as the social institution (Center, 2010; Chinese Academy of Social Sciences, Indian National Science Academy, Indonesian Academy of Sciences, National Research Council of the U. S. National Academies, & Science Council of Japan, 2011; Krainatee, Dhammasaccakarn, & Sungkharat, 2020; Palloni, 2001). These authors point out that this institution has family roles in maintaining social relationships that influence older people's well-being and quality of life in the ageing society. Therefore, most observers believe it is in the government's and the future elderly's interest to preserve this system. For instance, elders in Thailand are usually cared for at home by family members and relatives. However, more recently, as noted in Chapter two (see Chapter 2, section 2.4), Thailand's tradition of adult children caring for old parents has been

eroded. This change is due to increased migration from rural agricultural communities to urban centres that offer better employment opportunities (J. Knodel et al., 2010; J. Knodel & Saengtienchai, 2007; Lyu, Dong, Roobavannan, Kandasamy, & Pande, 2019).

According to an update based on the 2014 survey of older persons in Thailand (J. Knodel, Teerawichitchainan, Prachuabmoh, & Pothisiri, 2015b), living with one or more adult children or a multi-generational household is a longstanding practice among older age parents in many Asian countries and also Thailand. This trend has traditionally been viewed as an important way to meet their needs once they require support and assistance from others. Most of the population live in their own houses with their roots or ancestry extended families (Pathike et al., 2017). Despite the continuing widespread normative support for living with children, co-residence with children fell steadily from 71 percent in 1995 to only 55 percent in 2014 among persons 60 and above (J. Knodel et al., 2015b).

In recent years, older adults with few children have been less likely to live with an adult child. This fact suggests that the trend towards smaller families combined with a higher dispersion of children will contribute to a continuing decline of co-residence with children in the foreseeable future. While living alone or only with a spouse of Thais 60 and older that lived measures independently by 2014, 9 percent of older adults lived alone, and 19 percent lived only with their spouse (J. Knodel et al., 2015b). However, living independently does not necessarily mean geographical isolation from children or other relatives. As of 2014, roughly 30 percent of elders who live alone or only with a spouse have a

child living nearby or next door and 46 percent have a child at least within the same locality of Thailand (J. Knodel et al., 2015b).

In addition, in terms of household size, J. Knodel et al. (2015b) found that over two-thirds of older persons live in multi-generational households. Between 1994 and 2014 living in three or more generation households decreased from 47 percent to 32 percent. Among all persons 60 and older, 43 percent live in households with at least one grandchild, including 10 percent living in skip-generation families, defined as elders who live with their grandchild without their children (J. Knodel et al., 2015b). There is, therefore, the trend of living arrangements from older persons' preferences and expectations which suggests that fewer of the elderly will live with their children in the future. Apart from this, the family support system for ageing will become less effective for older adults who desire to rely on their children as people have fewer children and live longer. (Center, 2010; Reher & Requena, 2018)

Therefore, as discussed above, it is clear that the family and relatives have been the primary caregiver for the informal care and support for older people in most Asian countries with an increase in the number of older persons (Asian Development Bank, 2020; Glinskaya et al., 2021; Teerawichitchainan, Pothisiri, & Long, 2015). However, a decrease in the number of adult children with the increased migration for work from rural areas is all reducing the capacity of the family to provide care and support for their older family members (Asian Development Bank, 2020; J. Knodel et al., 2010; J. Knodel & Saengtienchai, 2007; J. Knodel et al., 2015b; Lyu et al., 2019).

As was previously mentioned in Chapter two, these alterations may arise in an elderly individual in family-based social relationships. This leads to concerns related to residence and living arrangements with daily personal care, including financial and social support. For instance, in Thailand, these primary and essential social relationships gain and develop through family interaction and relationships over time. These phenomena continue to play a crucial role in defining the function, well-being and quality of life of people in old age (Chen & Chunharas, 2008).

However, family caregivers with the family-based long-term care approach often experience stress, pressure and difficulties with their health and well-being, and other hardships and challenges. Additionally, some older individuals who are ageing in place have complex care requirements that family caregivers do not have the capacity to undertake. Therefore, as in the existing condition, reliance on informal caregivers is insufficient. The advanced development of the country's services and long-term care system for those with complex care needs and inadequate caregiving support at home has also emerged as an essential issue (Asian Development Bank, 2020).

For example, most residential care services and systems in Thailand for older dependents are situated in private hospitals and nursing homes. Regardless of this, the government and charitable organizations finance and support some residential care homes for seniors living in poverty (Srifuengfung et al., 2021). These facilities and institutions provide services and support ranging from fundamental to complex care. Moreover, such care facilities and institutions are becoming more numerous. This is illustrated by the statistic from the government's

Department of Business Development in 2016 stating 442 private facilities. However, this statistic excludes a limited number of public welfare residential care homes. In this case, the government has established its primary role as a regulator of residential care (Asian Development Bank, 2020).

The main factor driving this trend of private health care expansion in Southeast Asia can be identified as medical tourism for long-term care (Pocock & Phua, 2011). An explanation for this is that the lifestyle achieved, for example, in Thailand, is perceived as mitigating negative impacts and improving well-being in old age (Botterill, 2016). This industry is evolving as a profitable business venture. As a result, medical tourism for long-term care, particularly in destination countries, is an increasingly common phenomenon with implications for health systems policy (Pocock & Phua, 2011).

Southeast Asian countries with developing medical tourism industries are making use of their popularity as tourist destinations by offering high-quality medical, healthcare, and long-term care services at affordable prices for foreigners with tourist packages. The organizational structure of some countries health care systems is creating advantages in service provision compared to the foreign consumers' local health care system. Furthermore, the medical tourism industry of private sectors and governments in Southeast Asia is being marketed. However, the equity in access and availability to health care systems for local consumers is potentially negatively impacted. Therefore, this issue must be the government's primary concern (Pocock & Phua, 2011). To demonstrate, the residential care facilities or long-term care hospitals of both private and government-run hospitals provide health care and medical treatment. Whereas the cost of privatisation of

health and social care is generally higher and unaffordable for local elders (Osuke & Komazawa, 2021). According to Aung et al. (2021), the research on ageing at home with informal care has highlighted that poverty plays a role in the willingness to use intermediary care services from private and government-run hospitals. Therefore, there is a necessity for alternative respite care to support and strengthen family-based long-term ageing care in an Asian context.

To conclude this section, it has been shown from the review that all across Asia, the population ageing process is expected to grow more dramatically than in Western countries. Along with the proportion of the elderly population in rural areas compared to urban areas will be greater due to the effects of migration, urbanization, and globalization effects. Furthermore, in most traditional Asian societies, elders live in multi-generational households and rely on their adult children, spouses, and other family members for support. However, the changes in the living arrangement are under pressure from demographic, social, and economic changes, which probably indicate a broader decline in the traditional family support system.

Moreover, the private health care services and systems to support older people with long-term care are unaffordable for the native population. In addition, the government-run hospital has insufficient capacity to cope with the care needs of a rapidly ageing population. Therefore, supporting the families of people ageing in place with informal care should be a main focus for the government. Informal care is a more efficient method of ensuring adequate quality care for ageing populations while maintaining social interactions and relationships with family members.

Altogether, researchers and public policy must provide a deeper insight into these challenges of facing a remarkable pace of Asia's ageing population with ageing in place. In this case, Thailand, one of the fastest ageing countries globally, is selected to be a case study for this research. In the section that follows, it moves on to describe in greater detail Thailand's national plans on ageing, which there were established or extended programs for older persons.

4.3 THAILAND'S NATIONAL PLANS FOR AGEING

In Thailand, the population is set to age rapidly over the next few decades. Therefore, the ageing population and older persons' well-being are significant challenges for families, communities, and governments in Thailand and much of Asia (J. Knodel, Teerawichitchainan, Prachuabmoh, & Pothisiri, 2015a). Consequently, Thai and Asian governments will need accurate information to develop appropriate policy responses for the ageing population (Chinese Academy of Social Sciences et al., 2011).

The Thai government and related organizations have been giving serious attention to ageing situations and issues. This situation was presented by adopting several significant developments (J. Knodel et al., 2015a). These include their increasing prominence in the last four National Economic and Social Development Plans. Explicit mention of the Second National Plan for Older Persons covering 2002-2022, which was adopted in 2002, coinciding with the UN-sponsored Second World Assembly on Ageing. These plans for the older people purpose to support and promote the long-term care system through the informal care within the family,

adapt the built and living environments to the needs of the elders, and provide health and social services within the residence, community, and institutions so older adults can be cared for in their places (Glinskaya et al., 2021).

In addition to this, the recent National Plan for Older Persons in Thailand acknowledges the significance of ageing in place with long-term care management. The challenge that ageing in place presents in light of the declining availability of family support is one that the Thai government is fully cognizant. Nevertheless, the Thai government has played a limited role in addressing the long-term care system for older adults who are ageing in place, which includes the heterogeneity of responses to older single-person households and family-based informal care in relation to multi-generational families. So far, this issue has been constrained by a lack of empirical evidence supporting such policy planning (J. Knodel, Teerawichitchainan, & Pothisiri, 2018).

The Ministry of Public Health's Health Development Strategic Plan for the Elderly (2013-2023), which extends its previous 2008-2011 plan, specifically points out a strategy to address long-term care with ageing in place. The scheme is premised on the idea that the quality of life of elderly people can be best maintained through a combination of family assistance and a supportive system of healthcare and social services in their own community. The importance of community and local administrative organizations working together to implement the long-term care system is emphasized, along with the necessity of allocating financial resources for that purpose (Foundation of Thai Gerontology Research and Development Institute & College of Population Studies, 2012; Foundation of Thai

Gerontology Research and Development Institute (TGRI), 2013; J. Knodel et al., 2018).

Furthermore, there is also an Act for elderly Thais. In 2003, the Thai government passed the Older Persons Act, which mandated the permanent establishment of the National Commission on the Elderly. Its principal function is to set policies and guidelines to oversee matters related to older persons. The Older Persons Act also provides rights, benefits, and support to persons 60 and older in various areas. This Act on Older Persons has been in force since 1 January 2004 to ensure welfare covers many aspects for the elderly (J. Knodel et al., 2015a; Tiativiriyakul & Xenos, 2018).

The central welfare is the Old Age Allowance (OAA) program in Thailand, which expanded in 2009. This OAA is the universal social pension welfare for all Thai citizens aged 60 and older who lack other pension coverage (J. Knodel et al., 2015a). The allowance amount is a step-up function according to the age of retirees or based on the general progression towards the need for assistance for older people at the early and later stages. The amount of the OAA is meagre compared to the average monthly income per household in Thailand from 2004 to 2020 of THB 27,000 (approx. £675), starting at THB 600 (approx. £15) per month, and it will rise to THB 1,000 (approx. £25) per month depending on the age of the recipient (Ratanabanchuen, 2019; Statista Research Department, 2022).

Nevertheless, despite the modest benefit of support, today, the allowance from OAA is the primary source of income for approximately 15 percent of older persons. It is estimated to have reduced the national poverty rate among older

adults by almost 30 percent (Vydmanov & Khiewrord, 2016). In addition, the government recently investigated the possibility of introducing a pension scheme for farmers, self-employed, and other informal employees (Glinskaya et al., 2021). Apart from this, the National Savings Fund was set up in August 2015 to encourage savings for old age, including self-employed persons and others in the informal sectors.

Moreover, the Ministry of Social Development and Human Security operates public residential care called “Social Welfare Development Centres for Older Persons.” This project aims to provide accommodation and a form of care for older residents in case their care support needs are developed. The services at residential care facilities include fundamental to complex care and support. Public residential care consists of accommodations for long term care, assistance with ADL, care that requires nursing skills, help with personal hygiene, day care, rehabilitation, and respite and hospice care (Srifuengfung et al., 2021).

Thus far, considering the national plans for ageing with the focus of this study about the living environments for ageing people, there are plans for housing and the living environment for the old age that have been established in the old person strategy or legislation in Thailand. These plans are included in the constitution (1997) and (2007), Act on Older Persons (2003), and Second National Long-term Plan for Older Persons (2002-2022). In addition, the ageing agenda covers housing and the living environment, focusing on environment-house modification (Williamson, 2015). This agenda is about realising a safe living environment at home, developing models of housing and improving the housing environment for increased convenience of the older adult, and includes

establishing measures on the loan sources with lower interest rates for modification or construction of older person's housing and built environments (Foundation of Thai Gerontology Research and Development Institute (TGRI), 2013).

According to the facts mentioned above, there are plans for elders that aim to adapt and modify the built environment to the needs of older people. The potential of construction loans offers an opportunity to improve that residential environment. These plans and implementation strategies are needed to develop, support, and promote the living environment and the residential sites for older persons according to the critical impact of the residential environment on the quality of life of older people. Consequently, further studies of the appropriate environments for the elderly regarding outdoor and residential sites are fundamental to enhancing our understanding of this issue. Regardless of this, much research covers only the physical environments-house, which focuses on housing functional modifications. It seems that the appropriate environments for the older adult in the scope of outdoor and residential sites lack a research approach to improve the quality of residential site environments. It potentially leads to higher levels of environmental preferences and satisfaction of older people, especially in a rural context where the ageing population is increasing.

4.4 BACKGROUND OF POPULATION AGEING FROM THE CASE STUDY

This part provides the characteristics of population ageing in a rural Asian context from the case study of the older people in Chiang Mai province, northern Thailand. By geographic region, the level of the Thai population ageing differs.

As shown in Figure 4.3, the North region had the highest proportion of ageing populations, followed by Bangkok, the Central, and Northeast regions in Thailand. Finally, the South had the lowest rate of older adults (Foundation of Thai Gerontology Research and Development Institute (TGRI), 2013).

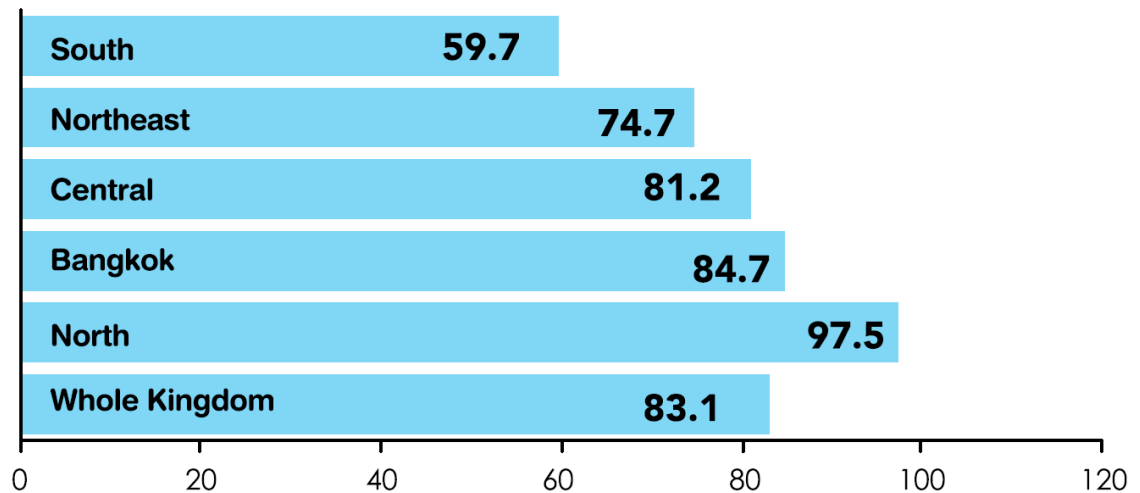


Figure 4.3: Index of Ageing in Thailand by Region: 2013 (Population Projections for Thailand, 2010 – 2040 and Foundation of Thai Gerontology Research and Development Institute (TGRI), 2013).

Currently, the number of older adults is increasing in the North region, especially in Chiang Mai province (Aree, Tanphaichitr, Suttharangsri, & Kavanagh, 2004; Foundation of Thai Gerontology Research and Development Institute (TGRI), 2013). As previously stated in Chapter one, ‘Baan Pong Nuea’ village, a sub-district municipality of the Hang Dong district in Chiang Mai, is presented as a case study in this research with a higher percentage of the population aged 60 years and over than other villages (Municipality Baan Pong, 2020; Noichan, 2011). This rural context of ‘Baan Pong Nuea’ has 90 elderly residents, including two groups of population ageing at the Early Stage (60-74

years old, 60 inhabitants) and the Later Stage (75 years old and above, 30 inhabitants). This case study village is a small settlement in a rural setting which exhibits the characters of village communities and residential sites as recruitment sites in this study. The next chapter will give more details of this case study village.

4.5 CONCLUSION

At present, Asian society is confronting the process of population ageing. In Asian countries, the number of older populations will take only more than two decades for the proportion to double the number of ageing people (J. Knodel & Chayovan, 2008, 2009). Moreover, this population ageing is particularly apparent in the rural regions and places, especially throughout the entire East and South-East Asian region (Dandy & Bollman, 2008; Davies, 2011; James & Davies, 2012; J. Knodel & Chayovan, 2008; Mujahid, 2006; United Nations, 2019a).

In the near future, Thailand, one of the countries in the middle of mainland Southeast Asia, will have become a “complete aged society” when the older adults reach 20 percent of the population, with more than 70 percent of elderly Thai people living in rural provinces (Foundation of Thai Gerontology Research and Development Institute (TGRI), 2013; Pathike et al., 2014).

This population dynamic poses severe challenges for traditional informal family support, communities’ ability to provide backup support, relationships among older persons, and government policies. Although this may be true, Thailand has a robust health care system and services. However, it is still in need

of appropriate strategies and policies to support an effective family-based long-term care model for the number of an ageing population that is expected to reach 20 million in 2050 (Aung et al., 2021; J. E. Knodel, Rūpfölō, & Chayovan, 2013). Regardless of this, almost all the older adults who require care and support still receive informal care at home provided by their families and relatives (Aung et al., 2021).

Given these points, the Thai government has been focusing on ageing issues with the plans for housing and the living environment for old age. However, these plans and implementation strategies require further studies from the researchers to develop, support and promote living environments and residential sites for older persons according to the strong impact of the residential environments on the quality of life of older people. Therefore, social, behavioural, and environmental science research can be an indispensable tool to better understand Asian social conditions and critical aspects of the well-being of older populations in their living environments (Chinese Academy of Social Sciences et al., 2011).

The following chapter provides the research design and methodology adopted to achieve the research aims and answer the research questions. The topics discussed include the research design, methodology, measures and analysis, and specific details of the study.

CHAPTER 5

RESEARCH DESIGN, METHODOLOGY, MEASURES AND ANALYSIS

5.1 INTRODUCTION

This research uses a mixed methods approach to examine, as a case study, a village in a rural area of Baan Pong Nuea. A mixed methods research approach uses questionnaires, interviews, and observations to identify the appropriate characteristics of the residential site environment for the older adults. The understanding of older adults' perceptions and perspectives in a rural context is reflected through the study of their evaluation of the environment.

A review of the existing literature shows at least two inter-related gaps in previous studies. Firstly, an in-depth study of the interface between older people and the environment in a non-western context. That is examining the ageing residents' environment-related experiences (e.g., spatial and psychological) in their residential environment and establishing which of the characteristics of the residential site are most crucial to older adults' outdoor usage and needs in residential sites in a rural context.

Secondly, the satisfaction and perception of older people with their residential site environment satisfaction remain less known, particularly in rural areas. As previously stated in chapter two, there are a large number of published studies on the physical and social environment and health of older adults related outcomes. Still, these are mainly focused on those older residents in urban

settings.(Cunningham & Michael, 2004; Ding & Gebel, 2012; Menec & Nowicki, 2014; Saelens & Handy, 2008). Whilst much less is known about the influence of environmental features in rural settings, the evaluation of P-E fit in the rural environment is essential since the proportion of older adults tends to be higher in rural than in urban areas in most regions of the world (Dandy & Bollman, 2008; James & Davies, 2012; United Nations, 2019). This current study has shown that although the methodologically and the quantitative, cross-sectional analysis does identify the relationships between people's health and environmental factors, it still fails to spell out the pathways or scenarios in which P-E interactions happen. For example, it is unclear how the environment impacts the ageing dwellers in their daily community life (Sun, Phillips, & Wong, 2018). Therefore it is important to examine people's daily living routines within their residential environment in order to generalise their spatial experiences and subjectivity further.

This chapter presents the research design, methodology, measures, and analysis of the thesis. The introduction briefly discusses the research background, questions, objectives, research approach and methodological framework. This chapter is structured into three main sections. The first section explores the case study village and the participants. It also provides a brief description of the physical, psychological and social characteristics of older people in a rural Asian context by analysing the demographic, personal characteristics, and social aspects of these older adults. The second section presents the research design and data collection methods. Finally, the third section discusses the study's measurements and analysis. In the end, issues related to the fieldwork are discussed, and a summary of the chapter is presented.

5.1.1 A brief discussion of the research background, objectives, questions, and research approach

Different approaches to studying the residential site environment for older adults have been carried out in several different living environments. However, these approaches are usually isolated, specific initiatives which are not based on a general theory related to the relationship between older people and their living environments or aimed at understanding the older adults' preferences or perception and evaluation of their residential site environments. At the same time, only a limited amount of satisfactory research into residential site environments has been identified due to the lack of interest shown in outdoor and residential site environments in rural settings in Asian countries. Therefore, as suggested by Iwarsson, Horstmann, Carlsson, Oswald, and Wahl (2009) and Sun et al. (2018), a reliable and valid assessment of older persons and their surrounding environment or Person-Environment (P-E) fit have to date primarily been situated in Western countries, and the applicable methodological requirements are needed.

Therefore, this research aims to study and find the appropriate residential site environment for older adults based on the extent of P-E fit and the perception and evaluation of older people in an Asian rural context. Furthermore, this study will help understand older people's perspectives towards their interior and exterior environment and identify residential environmental features in a rural context that meet their needs, potentially benefiting and improving their satisfaction and quality of life. In light of these issues, the research questions are as follows:

Research question 1: “What are the main considerations in the characteristics of residential site environments for older adults in the rural Asian context?”

Research question 2: “Which residential site environmental characteristics and physical features contribute to the outdoor usage and satisfaction of older adults in the rural context?”

Research question 3: “What are the perceptions and evaluations of residential site environments among older people in the rural context?”

The main purpose of this research is to understand how older adults in a rural setting perceive their residential site environment and understand how they utilise and relate to their environments. Table 5.1 shows the links between the research objectives, questions, and methods chosen in this investigation.

Table 5.1

Links between the research objectives, questions, and methods adopted in this study (Source: Hongthong, 2021).

RESEARCH OBJECTIVE	LINK TO RESEARCH QUESTIONS	METHODS
A. Investigation of the characteristics and physical environmental features of older adults’ residential sites in the rural Asian context from a case study.	This objective will help to answer research question 1.	Questionnaire and fieldwork observation.

Table 5.1 (Continue)

Links between the research objectives, questions, and methods adopted in this study (Source: Hongthong, 2021).

RESEARCH OBJECTIVE	LINK TO RESEARCH QUESTIONS	METHODS
B. Investigation of the outdoor usage characteristics of older adults in the residential site environments in a rural context in terms of (i) the physical activities in the residential site environments and (ii) the most utilised residential site areas or spaces.	This objective will help to answer research question 1.	Questionnaire and in-depth interviews.
C. Analysis of older adults' perceptions and evaluations toward their residential site environments in a rural area concerning (i) the necessity of the residential site environments and (ii) the physical aspects of the residential site environmental characteristics that need to be taken into account in these residential site environments.	This objective will help to answer research question 2.	Questionnaire.
D. Evaluation and investigation of preferences and satisfaction of older adults in terms of (i) the residential site environmental characteristics and (ii) the characteristics and physical environmental features of the residential site environments that influence the outdoor usage and environmental satisfaction through older adults' perspectives and perceptions.	This objective will help to answer research questions 1, 2 and 3.	Questionnaire and in-depth interviews.

The research uses a case study village by applying a mixed methods approach. There are three different data collection methods in this study: 1) questionnaire, 2) in-depth interview, and 3) fieldwork observation. This

investigation adopts the Person-Environment (P-E) with an environmental and behavioural research approach, which contemplates questions about an older person (P) and their surrounding environment (E) with older adults' perception and evaluation of the living environment. This approach involves theories, concepts and methodologies related to ageing and the geography of ageing in the rural context, micro-geographies of living environments for older people with Person-Environment (P-E) fit and perception and cognition of the environment discussed in Chapters Two and Three.

5.1.2 Methodological framework

The methodological framework of this research adopts quantitative and qualitative methods of data collection and analysis to answer the research questions and meet the research aim and objectives. The approach that influenced this study's selected methods involves a dynamic relationship between ageing and the environment. It represents an interactive relationship between a person (P) and their environment (E), known as Person-Environment (P-E) fit, as has been studied in environmental gerontology. The appropriate measurements of P-E fit align with an assessment that includes an investigation of the effects of the environment on residential satisfaction and the perspective towards the environment in older age (Iwarsson et al., 2009; Lawton & Teresi, 1994).

To measure P-E fit, Lien (2013) described that a person, their environment, and the interaction between the two need to be evaluated using a set of indicators encompassing three dimensions of psychological, physical, and social

perspectives. These dimensions have been noted by Sun et al. (2018) that it is a triangulation of interactions among individuals by way of ‘mental or psychological’ reflections of older residents toward the environment, ‘places or physical’ environment of an individual and ‘others or social’ context, which invoke the best P-E fit for older residents. For instance, the levels of neighbourhood social cohesion and engagement in physical activity (Fisher, Li, Michael, & Cleveland, 2004; Wang, Shepley, & Rodiek, 2012). Likewise, the level of outdoor activities for ageing people is related to the physical characteristics of the living environments (Hadafi & Barough, 2017). Therefore, a design approach needs to encompass those three P-E dimensions essential in creating a well-fit environment for older adults (Iwarsson et al., 2007; Lien, 2013).

Similarly, community-dwelling aged adults who live with family members or relatives may associate with the psychological aspect since they may have more independent years at home than those living alone (Wang et al., 2012). Similarly, in most Asian countries such as Thailand, the elders are usually cared for at home by family members, as discussed in Chapter Four. However, more recently, Thailand’s tradition of adult children caring for elderly parents has been eroded due to increased migration from rural agricultural communities to urban centres, which offer better employment opportunities (Knodel, Kespichayawattana, Saengtienchai, & Wiwatwanich, 2010; Knodel & Saengtienchai, 2007). Therefore, these circumstances bring out the need to study those dimensions of psychological, physical, and social perspectives within the Asian context, which needs to be taken into account when examining the residential environment of older adults.

Therefore, the mixed methods approach of the qualitative and quantitative design was considered the most appropriate to answer the given research questions. This framework applies mixed methods data collection designed to combine methods that compensate for the faults and limitations of each one (Portella, 2007). Moreover, the mixed methods approach was considered the most appropriate way to conduct this research due to the sample size, data availability and participants' culture. Literature on related topics reveals that mixed techniques are beneficial for investigations into processes and systems that are complex and multidimensional (Lien, Steggell, & Iwarsson, 2015; Sun et al., 2018). In addition to this, mixed methods research represents an approach with the potential to explore the intersections of context and psychological phenomena within cultures (Bartholomew & Brown, 2012).

In previous studies, Sun et al. (2018) used an integrated qualitative and quantitative design method to examine older people's perceptions of the urban environment and their spatial experiences through a P-E fit perspective. Moreover, Lien et al. (2015) used mixed methods of quantitative data, describing objective P-E fit and qualitative data to explore perceived P-E fit relating to the accessibility and usability of the home environment. So far, however, there has been little attention to understanding residential sites in Asian rural context by studying the elders' perceptions, attitudes and utilisations of the environment, such as a daily life routine, with a mixed methods approach.

Furthermore, reliable and valid assessment tools of P-E fit in the appropriate residential site environments with suitable methodological requirements are needed (Iwarsson, 2005). In order to differentiate between the

component of P–E fit, the evaluation of residential site environments must be validly operationalised. Thus, applying the new approach to conceptualising and measuring P–E fit with the environment behavioural research approach of perception and cognition of the environment is essential.

Next, this chapter presents (i) the case study district and participants, (ii) the research design and methods of data collection and procedures, and measures and analysis.

5.2 THE CASE STUDY DISTRICT AND PARTICIPANTS

The focus of this study is exclusively on residential sites of older adults in a case study within the Asian rural context. The following sections present a brief overview of the case study district and participants in this study.

5.2.1 The Case Study District

The case study district “Baan Pong Nuea” in the present study is a rural setting located in the north of Thailand. Baan Pong Nuea is a sub-district municipality of the Hang Dong district in Chiang Mai province. It was utilised as the recruitment site as it is an agricultural and residential area with a higher number of older adults than other villages (Municipality Baan Pong, 2020; Noichan, 2011).

The Northern district, where the study is located, is the most densely populated area in Thailand (Pathike, O’Brien, & Hunter, 2017). The majority of

older adults were Thai and Buddhist. Most people use the Thai language for communication, and the Northern dialect is mainly used when speaking. Geographically, the landscape in the selected area is separated into a residential region which is surrounded by farmers' fields. The people in the villages work on their farms. They also grow vegetables and fruits and harvest them to consume or sell to other villagers. Meanwhile, other careers are grocers and self-employed people, and most are retired elders (Municipality Baan Pong, 2020; Noichan, 2011).

The seniors in Baan Pong Nuea are satisfied with their hometown and familiar with traditional ways of life and surroundings in spite of some inadequate and unsafe environmental factors and varying health problems. The motivation to participate in the community's social activities for seniors seems to decrease with age. (Noichan, 2011). Together with being outdoors, older adults can access nature and view delightful natural scenes, which may tend to increase positive emotions and decrease depression (Ulrich, 1991). Hence, the environment of the residential site in the village provides an ideal opportunity to represent the case study of a rural context in an Asian country. This research explores specific types of residential site environments, how we approach and investigate rural and outdoor settings, and their effect on the seniors and the environmental theory.

5.2.2 The Participants

The municipality of the case study area has 825 inhabitants. Those aged 60 and above number 90 (i.e., 10.9% of the population) were the respondents assessed

in this study. They can be classified into two groups, considering their ageing stage (Pan & Fukuda, 2016), the early stage (60 - 74 years old) of 60 inhabitants and the later stage (75 years old and above) of 30 inhabitants. The study performed a purposive sampling procedure using the Baan Pong Neua Population Census as the source of socio-economic and related data.

The characteristics of the elderly persons from the case study in this section include the data from the findings of (i) the demographic or personal characteristics of older adults, (ii) the social characteristics and (iii) the attitude of residents in terms of relationship with family members, friends and community members.

1.) The demographic or personal characteristics of older adults

The demographic or personal characteristics of the older adults' present findings such as factors of gender, age, educational level, marital status, economic activity status, personal disposable income, medical and health physical health, mental and emotional health and the disease(s) or disorder(s) status. Table 5.2 shows an overview of all variables of the profile of the participants.

Table 5.2

Demographic or personal characteristics of study participants used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).

Characteristics	Categories / Levels	N	Percent
1. Gender	Female	50	55.6
	Male	40	44.4
<i>*The higher this value, the more positive rating of the variable from participants.</i>			

Table 5.2 (Continue)

Demographic or personal characteristics of study participants used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).

Characteristics	Categories / Levels	N	Percent
2. Gender	Female	50	55.6
	Male	40	44.4
3. Age	Early stage (60 – 74 years old)	60	66.7
	Later stage (75 years old and above)	30	33.3
4. Educational level	Elementary or lower	84	93.3
	Junior high school	1	1.1
	Senior high school	3	3.3
	Junior College or higher	2	2.2
4. Marital status ^a	Currently married	82	91.1
	Currently not married	8	8.9
5. Economic activity status ^b	Employed	23	25.6
	Retired	51	56.7
	Other	16	17.8
6. Personal disposable income	Insufficient	33	36.7
	Just enough	49	54.4
	Sufficient	8	8.9
7. Medical and health			
- Physical health (Mean score* = 3.68)	Very Poor	0	0.0
	Poor	12	13.3
	Moderate	29	32.2
	Good	25	27.8
	Very good	24	26.7
- Mental and emotional health (Mean score* = 4.22)	Very Poor	0	0.0
	Poor	4	4.4
	Moderate	13	14.4
	Good	32	35.6
	Very good	41	45.6
- Disease(s) or disorder(s)	Yes	65	65.0
	No	25	25.0

**The higher this value, the more positive rating of the variable from participants.*

^a Marital status: “Currently married” and “Currently not married”; the latter included those who were never married, widowed, separated and divorced.

^b Economic activity status: “Employed”, “Retired”, and “Others”; the latter included unemployed persons, self-employed persons, farmers, merchants, and freelancers.

It can be seen from the results of demographic or personal factors that more women than men participated in the study. This is not surprising since women have a higher average life expectancy (Kemperman & Timmermans, 2014). At more than 66 percent, most are in the age category of the early stage (60–74 years of age). On the other hand, just under 33 percent of the participants are at the later stage (75 years old and above), as presented in Table 5.2.

It is apparent from the results that most of the elderly participants live in a household with a low socio-economic status (based on income and education level). As shown in Table 5.2, most older participants have an educational level of elementary or lower at approximately 93 percent, with the proportions of personal disposable income response rate around 54 percent of '*sufficient*'. Among the older participants, most of them, at over 56 percent, are retired, followed by employed, 23 percent and others, such as self-employed, for around 16 percent. This outcome may relate to the expectation of older people that their children will provide them with an income and, in turn, they will help take care of the grandchildren in multi-generational households. Particularly in rural areas, it is common to have adult children working and living in the city and sending money home to their ageing parents so they can take care of the family (Henri et al., 2017).

Finally, a large proportion of 65 older participants have the disease or disorder status. However, most older participants consider their mental and emotional health as '*very good*' for more than 45 percent and '*moderate*' at approximately 32 percent for their physical health. Overall, elderly participants have a better condition of mental and emotional health (mean = 4.22) than physical health (mean = 3.68).

2.) The social characteristics

The social characteristics of older persons present as findings from factors such as building ownership, living arrangements and length of residency. Table 5.3 gives an overview of older participants' social characteristics.

Table 5.3

Social characteristics of study participants used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).

Variable	Categories / Levels	N	Percent
1. Building ownership	Owner occupier / no mortgage	76	84.4
	Owner occupier / mortgage	5	5.6
	Live with partner / family	7	7.8
	Other	2	2.2
2. Living arrangement	Living alone	10	11.1
	Partner or spouse	17	18.9
	Relatives	3	3.3
	Children	27	30.0
	Spouse and children	33	36.7
3. Length of residence	Less than one year	1	1.1
	1 - 3 years	3	3.3
	4 - 6 years	6	6.7
	7 - 9 years	1	1.1
	10 years and above	79	87.8

The significant aspects of social factors from Table 5.3 indicate that slightly over 36 percent of the respondents live with spouses and children; 30 percent live with children; 18.9 percent live with partners or spouses; 3.3 percent live with relatives, and only 11.1 percent live alone. These results corroborate the ideas of Pathike et al. (2017) and the 2014 survey of older persons in Thailand (Knodel, Teerawichitchainan, Prachuabmoh, & Pothisiri, 2015) that older adults in Thailand

prefer to age in place, with their relatives. Moreover, it shows that living with one or more adult children is a longstanding practice among older parents in Thailand. It has traditionally been considered a meaningful way to meet their health needs once they require others' current or future support and assistance (Greenfield, 2012). This preference remains robust even when life circumstances change, including children or family members moving away, marriage, separation, divorce, or widowhood (Wagnild, 2001).

Turning now to the length of residence, many older people in the study had spent many years in the same home or neighbourhood. The result shows the highest percentage at over 87 percent of respondents have lived in their current residence for ten or more years while the lowest, at 1.1 percent, for less than one year. In accordance with the present results, previous research has also demonstrated that older people may have a sense of attachment to and tend to live a long time in their current residence or the same area (Falkingham, Chepngeno, & Evandrou, 2012; Oswald & Wahl, 2004). In addition, most older adults in Thailand, because there is a strong culture (particularly amongst this age group) of being able to age in place, tend to remain at home rather than live out their remaining years of life in a care facility (Thorson & Davis, 2000).

3.) The attitude of residents in terms of the relationship

In terms of connection, residents' perspective provides the outcomes by studying the factors of relationships with family members, friends, and community

members. Table 5.4 presents an overview of older participants' attitudes to their residency in terms of their relationships.

Table 5.4

The attitude of residents in terms of relationships with family members, friends and community members of study participants used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).

Variable	Mean score*	Levels	N	Percent
Attitudes of relationship				
1. Family member(s)	4.40	Very Poor	0	0.0
		Poor	0	0.0
		Moderate	9	10.0
		Good	36	40.0
		Very good	45	50.0
2. Friend(s)	4.51	Very Poor	0	0.0
		Poor	0	0.0
		Moderate	7	7.8
		Good	30	33.3
		Very good	53	58.9
3. Community members	4.63	Very Poor	0	0.0
		Poor	0	0.0
		Moderate	3	3.3
		Good	27	30.0
		Very good	60	66.7

**The higher this value, the more positive attitude of the variable from participants.*

The critical findings of the attitude of residents from Table 5.4 were that most respondents have 'very good' attitudes toward a relationship with family members at 50 percent, friends at around 59 percent (mean = 4.40), and community members at 66.7 percent (mean = 4.51). While the community members have the

highest mean score at 4.63 (mean = 4.63), this result may relate to the residential site's environmental usage and social participation with other people.

5.3 RESEARCH DESIGN AND METHODS

In order to provide empirical evidence to answer the research questions, the research design and methods were chosen to fulfil the research objectives (see Table 5.1). The following parts present the research design and methodology with (i) the quantitative and qualitative approaches in mixed methods research design and (ii) data collection and procedures.

5.3.1 The quantitative and qualitative approaches in mixed methods research design

This research is based on a mixed methods design with quantitative and qualitative approaches. This section highlights the general characteristics of the two research methods of the quantitative and qualitative techniques. In addition, it helps to understand the incentives that drive this investigation's research design and methodology.

The methodology in research is a strategy that embraces different approaches (Portella, 2007). It involves systematic methods, data gathering, and analysis techniques that can be quantitative or qualitative. A quantitative approach concerns research design and procedures that deal with numeric and measurable information to generate quantifiable data. The research that is mainly based on the quantitative method is often conceptualised with a logical structure in which

theories determine the research's problems. On the contrary, a qualitative approach involves methods that investigate participant behaviours, experiences, perceptions, perspectives and evaluations from the individuals' perspectives or points of view. This approach attempts to study the field of social science in order to describe and analyse humans' cultural and behavioural insights. As noted by Portella (2007), qualitative methods use logical implications to obtain and interpret gathered data dealing with the human and environmental elements.

The selection of quantitative or qualitative design methods depends on the aims and objectives of the study. However, each research approach has its strengths and weaknesses. The quantitative method with accurate observation and data analysis are fundamentals to developing regulations that account for all relationships between variables or factors (Portella, 2007). On the other hand, the qualitative method describes the reality of the social phenomena with the non-measurable factors, which may be the most important (Coolican, 2017; Portella, 2007). The use of both quantitative and qualitative approaches to complement each other is gaining popularity (De Silva, 2011; Portella, 2007). Adopting a mixed methods approach helps to overcome or support some of the methodological weaknesses of single-method research. For example, Lien (2013) carried out semi-structured interviews (qualitative method) and questionnaires (quantitative method) to analyse environmental barriers within the home environment, and the overall theme of the results from the combination of these two approaches was mutually strengthening.

The research design and methods adopted in this study combine quantitative and qualitative data collection and analysis approaches. The methodological design

for the research methods is also built on the basis determined by the research questions, aim, and objectives. In this research, quantitative methods have been adopted with a global qualitative frame and give precise and testable or verifiable expression to the qualitative interpretations. On the other hand, the qualitative research methods have been used to understand the meanings of the numeric data, add an explanation to the patterns produced by the quantitative methods and probe more deeply into significant issues. Consequently, the mixed methods design allows the researcher to combine methodology, compensate for their particular faults and limitations and acquire their strengths.

5.3.2 Data Collection and Procedures

A multistage framework was employed to identify respondents for the mixed methods approach with data collection and fieldwork observations in the village. Three methods of data collection were selected to gather the essential information to answer the research questions: (i) questionnaires, (ii) in-depth interviews, and (iii) fieldwork observations. The rationalities for selecting these sources of evidence, their design and their application are discussed in the following parts of this section. Apart from these research designs and methods, the literature review (see Chapters 2, 3 and 4) was taken into account to support the design of the research methods and the interpretation of the data, satisfying research objectives A and B (see Table 5.1).

1.) Data Collection

The following parts discuss the data collection in this study which included (i) questionnaires, (ii) in-depth interviews, and (iii) fieldwork observations.

A. Questionnaires

Questionnaires are widely utilised in the environment behavioural research field as an effective method for gathering information about people's perceptions, attitudes, perspectives and behaviour (Coolican, 2017; Portella, 2007). In this research, two types of questionnaires were carried out to satisfy research objectives A, B, C and D (see Table 5.1), with the purpose of each questionnaire being described in Table 5.5.

Table 5.5

Purpose of the questionnaires adopted in this research (Source: Hongthong, 2019).

PURPOSE		
TYPE OF QUESTIONNAIRE	TYPE A	Analyse participant demographic or personal and social information of (i) gender, (ii) age, (iii) educational level, (iv) current marital status, (v) economic activity status, (vi) personal disposable income, (vii) medical and health information, (viii) building ownership, (ix) living arrangement, (x) length of residence, and (xi) attitudes of relationships.
	TYPE B	Analyse participant perception and evaluation of the necessity of the residential site environments and the physical aspects of the residential site environmental characteristics that need to be taken into account in the residential site environments of (i) the necessity of the residential site environments, (ii) the physical aspects of the residential site environmental characteristics, (iii) levels of perceived environmental features, (iv) levels of building orientation toward the sun, (v) the appearance of residential site environments preferences, and (vi) the usages of outdoor residential site environments.

Questionnaires were designed to be as simple, precise, specific and short as possible in order to avoid older respondents getting bored, confused, or tired. Questionnaire type A was comprised of 15 questions, and questionnaire type B contained 19 questions of the multiple-choice type (see Appendix 5.1). Multiple-choice questions were included in the questionnaires for the following reasons: (i) there were a large number of older respondents in the study, (ii) the answers were designed to be scored by statistical methods and (iii) the responses of different age groups need to be compared. This controlled approach provides respondents with specific options for answers to multiple-choice alternatives that make numerical comparison relatively easy. Two different levels of measurement were applied: nominal and ordinal. The first was adopted to inform categorical information, while the second was chosen to provide information about the size and direction of participants' answers.

B. Interviews

The interview questions were designed to investigate older adults' perceptions, perspectives and preferences concerning their residential site environment and its features. This particular method was carried out in this study to satisfy research objectives B and D (see Table 5.1). Structured interviews were used in this study because the researcher had a specified set of questions to investigate. The following issues were explored: (i) the characteristics of environmental features, spaces and areas of the residential site that older residents utilise or have a preference for, (ii) the activities that older residents carry out in these preferred, most utilised spaces or areas, (iii) the positive and negative

characteristics of the residential site, (iv) the most and the least used areas of the residential site environment for outdoor usage and resident's needs, (v) the appropriate residential sites' improvement or renovation needed to meet the usages and demands of older residents, (vi) other issues or factors affecting the residential site environment for older adults (see Appendix 5.2).

The interview sessions were designed using standardised procedures in which the questions were formulated before the interview and asked in a specific order and manner to every elderly interviewee. This approach helped minimise the diversity of interpersonal variables involved in a two-way conversation and ensure greater consistency in data gathering. The interview itself was carried out in an informal, relaxed atmosphere in which complete and meaningful answers, kept in context, were forthcoming.

C. Fieldwork observations

By making field visits to the study areas within the town, for each case study, the fieldwork observation of the residential site environment was carried out from the town plan for each case study in the residential sites of the village. The purpose of these observations was to identify: (i) the general visual characteristics of the case study context with the drawings of each residential site and (ii) the existing characteristics and physical environmental features of the residential site environments (see Appendix 5.3). In addition, these observations helped the researcher to understand the phenomenon being studied in the case study context and were related to research objective A (see Table 5.1).

2.) Procedure

For the descriptive data, the data collection provides information on personal and social information about the person and their residential environment in the context of the dwellings and environmental components of the residential sites. The qualitative part collected the data through in-depth interviews following interview guidelines and observations. The quantitative research data was collected from the questionnaires.

Area data and fieldwork observation allow a sample to be identified from its geographical location and population lists. This gives the desired sample its characteristics, in this case, selecting residents aged 60 and above. Prior to participant recruitment, the protocol was reviewed and approved by the Science, Technology, Engineering, and Mathematics Ethical Review Committee at the University of Birmingham. The review included ethical considerations for audio recordings, fieldwork observations and the informed consent process, and this was formally approved. All participants read, signed and were given a copy of the consent form before collecting any data.

The first stage used the 2017 Baan Pong Neua Population Census as the source of socio-economic and related data. The residential areas with households containing people aged 60 or more were identified from this. The second stage identified the selected residential research areas within the village using pilot field observation to create a local map. In this stage, the researcher contacted and informed the village headman to ask permission for fieldwork and his cooperation to inform the villagers that the researcher would be accessing the village during

data collection and fieldwork. This data collection and fieldwork formed the study area for the research. Local maps showed the outline of the residential areas that were prepared ready for the observers for each selected research area.

To approach and recruit participants, information letters were sent to intended participants in the study group (see Appendix 5.4), followed by telephone calls. The purpose is to ask for informed consent and confirm an appointment. The covering letter asked for their cooperation and informed them that this research is useful and valuable for future planning of residential and rural development. The participants would be aiding in improving and creating appropriate residential site environments for older adults in developing countries with an increasingly aged society.

Data collection was performed during home visits by the research staff, the researcher (PhD student undertaking this research) and experienced occupational architects who were trained to conduct face-to-face data collection with the older respondents in the village. They were available, if needed, to aid in completing these questionnaires and conduct interviews and field observation procedures. The fieldwork requires professional architects to perform measurements and illustrative data of the existing dwellings, residential site plans, and town plans. Besides descriptive data, the data collected provided information on personal and social information of the person, the residential environmental context of the dwelling and the environmental components of the residential site.

The research staff accomplished, in two and a half weeks, producing a draft of the town plan illustration to be used as the area's guideline and a map for coding.

Then the research staff completed all participant visits in the following seven and a half weeks. Each visit could range in length from forty-five minutes to two hours per participant. All interviews were audiotaped for accuracy in transcription. In addition, direct fieldwork, field notes and layout of participants' residential site environment were collected during the visit.

The illustrations of each participant's physical residential site environment and dwelling were generally collected during the administration of the assessment questionnaire at the visit. Then the finalised graphics of the town plan and the residential sites were collected and produced about fourteen and a half weeks after the visit to the residential site. The illustrations of residential site environments are an essential component of the study. They help visually describe the residential site's environmental characteristics and act as an objective role in contrasting or supporting participants' perceived evaluations of P-E fit.

The data collection was undertaken in the Thai language. The transcripts were translated into English by the PhD student undertaking this research. Data preparation and analysis used surveys that were coded during data entry in order to protect the confidentiality of responses. Residential site environment data collection and fieldwork, environmental assessments and surveys were aggregated into a database so that individuals and facilities could not be identified.

Furthermore, this part concerns the discussion of the quantitative and qualitative approaches in mixed methods research design and the data collection and procedures for the investigation. Finally, the following section gives a brief overview of the measurement and analysis of this study.

5.4 MEASURES AND ANALYSIS

This section describes the measurements and methods of data analysis adopted in this research and is divided into two main parts as follows.

5.4.1 Measurements

By drawing on the concept of valid and reliable environmental measurements, Lawton and Teresi (1994) set out that the environmental assessment scales should be based on three data sets which are respondent evaluations, fieldwork, and technical measures. The environmental fieldwork and technical assessments can be enlightening in view of the differences among the older adult residents. This method was adapted into data collection of respondent evaluations at the home visit of each elderly resident by questionnaires and interviews, fieldwork and technical assessments of visual data collected of the community area and the existing residential site environment.

Since the residential site environment plays a critical role in ageing well, it is essential to understand P-E fit by measuring how a person's perception matches their surrounding environment. However, there are currently few valid and reliable instruments or tools to measure the fit of residential site environment facilities within the home of older adults, especially in Asian countries such as Thailand. Regardless of this, a prominent and promising assessment instrument utilising an objective P-E fit approach is the Housing Enabler (Iwarsson & Slaug, 2010; Lien, 2013). This instrument is a rating form version of the Housing Enabler (Iwarsson & Slaug, 2010). It provides an evaluation that focuses on a person's dwelling and

its immediate environment relative to the older adults' functional limitations and behaviour. This approach helps to increase the understanding of the role of dwellings and the living environment they provide for older people.

Similarly, most of the studies in geography and environmental gerontology are beneficial in investigating the magnitude of accessibility problems within the home environment, outdoor environment use and activities of functionally limited older adults who are ageing in place (Kahana, Lovegreen, Kahana, & Kahana, 2003; Lawton & Teresi, 1994; Lien, 2013; Van Der Pas et al., 2015; Wang, Rodiek, & Shepley, 2006). However, those assessments have thus far only been used and adapted to several European contexts (Lien, 2013). Furthermore, the studies' instruments do not include perceptions of P-E fit or consider the preferences and attitudes of older adults. There is a lack of integration of fieldwork data collection from existing residential site environments from the perspective of designers who, in this study, are architects. Architects are one of the professionals who have experience and knowledge of practice while also creating an 'immense' body of knowledge (Collins, 2014). This case is exhibited notably in a scope that involves the built environment, such as the dwelling and its surroundings.

Given the measurements related to this study, Cunningham and Michael (2004) concluded that measuring the elements of the built environment and understanding the specific environmental factors must also take into account the attitude and opinions of the seniors in the community. This is because their perceptions of the built environment are associated with the reality of existence within the built environment. It provides them with an opportunity to be a part of the research process to ensure that their unique perspectives are considered.

Moreover, residents' opinions are considered essential attitudes, as they clarify which aspects of the setting or neighbourhood significantly impact their overall residential environmental satisfaction. The potential environment utilised and defined by residents and their perceptions of it may form an effective environment (Adriaanse, 2007; Gans, 1968). In addition to understanding the well-being of an individual, Diener and Suh (1997) reveal that there must be a measurement of a person's environment from their emotional and cognitive reactions. The environment can influence this, and elders' dwellings have formed part of the environmental gerontology approach (Harper & Laws, 1995).

It is important to use assessments and perceptions of P-E fit to shed light on the interactive relationship between people and their environments with the perception of preferences and attitudes to gain a better understanding of how person-environment relationships contribute to ageing well. From the abovementioned, the residential environmental context and components of data were divided into two main parts. Firstly, there are *dwelling components* – dwelling ownership, living arrangement, dwelling unit type (*i.e.*, single-family) and construction type (*i.e.*, wood, reinforced concrete), the area and height of dwelling and favourite and frequency of the outdoor area usage, entrance (*i.e.*, stairs, ramps) etc. Secondly, the *environmental components* – site type, area, length and size of relevant environmental features, levels of perceived environmental features, levels of the orientation of the dwelling toward the sun and the frontage street, the presence or absence of environmental features, levels of shading, feeling of safety and security at home and exterior surroundings in general (*i.e.*, paths, slope, surface), sitting out areas such as a balcony or deck.

There are components of the residential environment that influence elders' satisfaction and also each individual's physical and social characteristics, which might affect elders' attitudes toward their residential environment (Canter & Rees, 1982; Rioux & Werner, 2011). The predictors of residential environment satisfaction have been identified as having several aspects such as the physical environment support for goals (conversions in dwelling, distance to services, distance to green space), social environment (visitors, local outings or trips), perceived well-being (financial, health, physically active) and demographic characteristics (age, gender, household size, owner, type of dwellings, leisure activities). The predictors related across subscales of satisfaction with different environmental domains. There are local areas (satisfaction with home-related attributes such as comfort, size of the dwelling and residential site, distribution aesthetics, safety, the pace of activity), accessibility within the residential site (proximity, walkability), social relations with neighbours (positive and negative aspects) and dwellings and environments (pleasant and accommodating).

Considering the residential environment, based on the literature on the age-friendly framework for housing and residential site environments (Frochen & Pynoos, 2017; Kamp, 2011; Wang et al., 2006; Yeo & Heshmati, 2014), these residential site environmental features were sorted into categories following:

1.) Typology

A typology of physical characteristics is provided in residential site environments. This includes the aspects of dwelling type such as size, height

measured as the number of stories, orientation toward sun direction, orientation toward the frontage or attached street, setback from streets, site type, size or plot area, lot coverage and density and also physical size and shape of the setting.

2.) Motivators

The environmental amenities or attractiveness encourage older adults to go outdoors. The characteristics of motivators include pleasant, shaded sunshine areas, good window views from the dwelling, level garden landscaping and inviting transitional areas at the site level.

3.) Functionality

This is an overall function of the environmental features aiding the convenience of seniors' outdoor activities, including possible indoor-outdoor connections, connecting paths, side areas, site walkability, paving and shading of the dwelling and significant plantation and vegetation.

4.) Safety

Environmental features are thought to be related to safety, as perceived by seniors in the residential site or on the property, such as the distance from the site entrance to the nearest main street. This aspect also includes accessibility, which is the physical aspect of residential sites that either enables or disables older adults to get around their homes comfortably and safely. Perceived residential site safety can be considered a demand of the environment or an environmental pressure on

older people's physical or psychological capacity to manage that demand (Choi & Matz-Costa, 2017).

These features are divided into dimensions of the elders' perceptions, attitudes and objectives, for example, which environmental features must be perceived in order to ensure a sense of well-being such as security, pleasure, comfort, appreciation of needs of older people, sensitivity toward the environment and a sense of coherence of the community and a pleasant atmosphere.

The residential environment will also be studied at the dwelling and site level. The study considers the design of existing site planning, as noted by Wang et al. (2006), that it has a significant impact on the quality of site environments. Therefore, the study will considerate the design of site planning, appropriately dealing with the issues of building orientation, ground plan, configuration, placement, arrangement, connections including openings or windows for outdoor viewing, transitional areas such as side gardens and other areas relatively private or semi-enclosed such as between front and rear areas. These characteristics significantly impact the quality of site environments as applied to the residential environmental satisfaction predictors approach.

This study's adaptation of environmental assessment instruments would provide insight into the implementation, usability and perception of residential site environment adaptations and needs among older adults living at home in an Asian rural context. Therefore, considering all the above-mentioned evidence, the assessment in this study will be divided into two main parts, which are:

1.) Indicators of personal and social components

Personal background has been studied as one relevant determinant of residential satisfaction. Specifically, demographic factors such as age, income, education and marital status have been associated with residential satisfaction (Golant, 2012; Kahana et al., 2003). Other personal preferences for the age mix of residents or multigeneration living in residence have not been extensively studied. They may, however, relate to some residential characteristics (*i.e.*, Thailand has over two-thirds of older residents living in multi-generational households (Knodel et al., 2015)). For example, the cultural context, including social activities, relationships with the community, family relationships and living together as an extended family, may also affect elderly well-being in Thailand (Rojpaisarnkit, 2016). The data in this part will be personal information, levels of physical and mental health conditions, education levels and monthly household income, etc.

2.) Indicators of residential environmental context components

Kahana et al. (2003) point out that environmental features that affect the residential satisfaction of older adults need to be considered. These range from the microenvironment (*i.e.*, dwelling unit) to larger environmental units (*i.e.*, building, neighbourhood or the community at large). These environmental domains may be salient for defining residential satisfaction to differing degrees for different groups of older persons. Accordingly, the cultural amenities of a rural area also contribute to the quality of life of older adults. For example, for rural elders, salient environmental factors may be those pertaining to the township or county (Windley & Scheidt, 1983).

Moreover, measures of P-E fit were measured using a five-point scale. This permits the use of Likert-type response categories, which are likely to be easier for most non-academic user groups (Portella, 2007). The initial questionnaire included questions that were theoretically devised to assess the three aspects of P-E fit: physical, social, and psychological dimensions. For each element of fit, questions were presented to allow participants the flexibility to form their appraisals of which values, needs, demands, similarities and unique roles influence their fit with their environment. This fit assessment is concordant with Beasley, Jason, and Miller's (2012) method for examining fit. The measure and subscales were scored by calculating the mean of the items, with higher scores indicating a more excellent fit between resident fit and their satisfaction with their residential site environment. The elderly persons' satisfaction with their residential site environment was then assessed using a subscale with Likert-type measurement and a self-reported inventory of residents' satisfaction with their residential site environment. It is both valid and reliable (Beasley et al., 2012).

So far, this section has described the measurements in this research. It is now necessary to explain the data analysis methods in which the qualitative and quantitative approaches were adopted. The methods of data analysis applied in this study are presented below.

5.4.2 Methods of data analysis

The data analysis methods in this research were conducted and divided into three parts: questionnaires, interviews, fieldwork and survey. Data analysis in research is, in some more detail, as follows.

1.) Analysis of the questionnaires: A quantitative approach

Data from questionnaires was analysed descriptively through the frequencies of older participants' responses. The mean values and nonparametric statistical tests were also applied for data analysis. The mean was adopted because it is the most reliable and widely used measure of central value (Emmers-Sommer, 2004). The nonparametric statistical approach was selected because, according to Portella (2007), this is a more reliable method to employ when making assumptions about the participants as their perception, attitude and evaluation of the built environments are examined. In this case, the study has utilised measures of association for variables with the bivariate Pearson's correlation coefficient. This statistical measure indicates the strength and direction of the linear relationships between two variables.

The significant results from data analysis are presented in later chapters. The correlation coefficient approach is measured on a scale. The scale ranges from - 1 to + 1, where 0 indicates that association is absent and a solid linear relationship is expressed as + 1 for a positive relationship or - 1 for a negative relationship (Ratner, 2009; Schober, Boer, & Schwarte, 2018). As a common practice in the social sciences, all significant correlations with the probability level ≤ 0.05 were used to interpret the data and draw conclusions (Portella, 2007).

The descriptive statistics were prepared using the statistical analysis software package of SPSS (Statistical Package for the Social Sciences). The findings of this study with statistical results are presented and discussed with reporting of the findings in Chapters Six, Seven, and Eight

Turning to the content analysis, the study was carried out to evaluate data from the open-ended questions. However, this analysis was based on an inductive approach with categories or themes created to examine user responses that were not pre-determined. The content analysis was divided into four stages: (i) the translation of participant answers from Thai to the English language, (ii) the answers related to similar topics or concepts were grouped into the higher order categories, (iii) these categories of information were inserted into the SPSS database and (iv) the analysis of the content was based on the frequencies of these meanings and categories. These categories and user answers related to residential site environments' positive and negative characteristics are presented in Appendix 5.5. In addition, the findings from this stage of the study are shown in later chapters.

2.) Analysis of the interviews: A qualitative approach

This research adopted a qualitative method to analyse data from the interviews, including a version of content analysis. The data from the interviews were analysed to find themes and support the data from the quantitative approach. The analysis of the results and the reporting of each theme were related to one or more quotations from the data. The process of data analysis involved (i) a careful translation of the interviews data from Thai to the English language, ensuring that the translation retained the same meaning as the original participant responses, (ii) transcriptions of the research interviews, (iii) identification of data and theme concerning the issues investigated with relevant connections and (iv) interpretation of the interviews data (see Appendix 5.5).

Moreover, the transcriptions with the identification of thematic analysis involved coding. This coding concerned essential sections of the texts and the definition of labels to index or categorise those themes (Portella, 2007). This process indicates thematic ideas regarding the specific subjects investigated. The codes in this study were used as collection points for important data that reflected the representation of facts. In addition, the codes were adopted to focus the data, which enables further exploration (Magnifique, 2011). The interpretation of the qualitative data in this research focused on an analytical understanding that helps explain and comprehend the characteristics of the residential site environment as identified by participants and how an individual subjectively perceives and evaluates their living environment.

3.) Fieldwork and survey

The fieldwork and survey for this study contributed to understanding the phenomenon of ageing within a rural context. This data helps to identify the general physical characteristics of the residential site environments from a case study village. Existing environmental data from fieldwork and survey were coded on maps, and measurements were taken within each residential site. Illustrations of the residential site were produced and used in relation to support the quantitative and qualitative data.

In this section, it has been explained that the data collected shows the understanding of older adults' perceptions and perspectives on their environment in a rural context as reflected through the study of their evaluations. Furthermore,

the physical characteristics of the residential site planning were collected and illustrated from the field survey.

5.5 CONCLUSION

This chapter's research design and methodology were developed to provide appropriate data to answer the research questions. This study adopted the P-E fit with the environmental and behavioural research approach and applied quantitative and qualitative data collection methods and analysis to answer the research questions, thereby satisfying the research objectives. Mixed methods research design was used to combine different approaches to compensate for their limitations and faults.

In this study, the quantitative research data was collected using measures of P-E fit, among older adult participants in residential sites in the selected case study area, in northern Thailand. The statistics package SPSS was used for quantitative data analyses in this study. Qualitative questionnaires and interviews focused on participants' perceived P-E fit. The study employed surveys, residential site environment data collection and fieldwork in order to explore the residential site's environmental features and outdoor space usage.

The research outcomes from data collection and analysis describe the best fit in which older people actively interact with their environment and the extent to which the environment meets their needs. The environment could act as a stimulus for older people's functioning and feelings.

In the next section, a summary of the main findings, analysis and results are provided. These are presented in the following three chapters. Firstly, Chapter Six describes the residential site environment's characteristics and physical environmental features. Secondly, Chapter Seven presents the characteristics of outdoor space usage of older adults in their residential site environment in this rural context. Finally, Chapter Eight describes the perception and evaluation of the residential site environment, in this rural setting, by its older inhabitants.

CHAPTER 6

THE CHARACTERISTICS AND PHYSICAL ENVIRONMENTAL FEATURES OF RESIDENTIAL SITE ENVIRONMENT

6.1 INTRODUCTION

Chapter Five outlined the research design, methods, measures and analysis to be used in this study; the following part, which consists of three chapters, presents the study's findings, analysis and results. Firstly, Chapter Six describes the residential site environment's characteristics and physical environmental features. Next, Chapter Seven presents the outdoor usage characteristic of older adults in a residential site environment in a rural context. Lastly, Chapter Eight describes the perception and evaluation of the residential site environment by older adults living in a rural context. In the end, each chapter sets out the preliminary results and summary.

In the first part of the recording, analysis and results of the study, this chapter addresses one of the research objectives of this study:

a. **Research objective A:** Investigation, from a case study, of the characteristics and physical environmental features of older adults' residential sites in the rural Asian context.

The introduction presents a brief description of the section of this chapter. Next, the chapter presents the results of the characteristics and physical environmental features of older adults' residential sites in the selected rural area

from the quantitative data analysis of the questionnaire and the qualitative from the fieldwork data collection. The chapter is divided into two main sections.

The first section deals with the town plan of the case study village in the rural Asian context studied from the fieldwork data collection. The data illustrates the physical locations of the older adults' residential site and other elements or facilities in the village. The second section is concerned with the characteristics and physical environmental features from the assessment and fieldwork data collection. The data presents the environmental features on and around the older adults' residential sites at two levels, from the residential site to the dwelling.

These sections refer to research objective A. The results help answer research question 1: "What are the main considerations in studying the characteristics of residential site environments for older adults in the rural Asian context?"

In summary, this chapter focuses on the characteristics and environmental features of the residential site environment that influence older adults' outdoor usage and elements of the environment that satisfies and meets their needs.

6.2 THE CHARACTERISTICS OF A CASE STUDY VILLAGE IN THE RURAL ASIAN CONTEXT

This section presents the physical characteristics of the case study village, 'Baan Pong Nuea' village, and its association with the location of the older adults' residential sites and other physical features in the town.

The analysis provides a study of the characteristics of the case study village, which is structured around two main topics that emerged from the data and fieldwork: (1) the physical characteristics of the village and (2) the settlement characteristics of the residential site in the village. The contextualisation of the case study village is fundamental to providing a general image of residential sites in the rural Asian context and that which the older participants of this investigation experience.

In the present study, there is also an examination of the correlation between demographic characteristics (twelve predictors of individual characteristics), socio-demographic characteristics (three predictors of attitudes toward three categories of groups of people) and the characteristics and physical environmental features of older adults' residential sites (the assessments of dwelling, residential site and street; with the total of twenty-three predictors of the categories). The themes identified in the correlations can be compared in Table 6.1. This correlation analysis summarises and describes the characteristics and physical environmental features of the residential sites from the level of both site and dwelling.

Table 6.1

Correlations among demographic, social factors and the characteristics and physical environmental features in residential sites predictors, N = 90 (Source: fieldwork 2019).

	Predictors	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	
Demographic	1 Gender	1 00																																						
	2 Age stage	-0 06	1 00																																					
	3 Age	-0 19	.79**	1 00																																				
	4 Marital status	0 11	0 11	-0 06	1 00																																			
	5 Econ activity status	-.30**	0 12	0 12	-0 08	1 00																																		
	6 Disposable income	0 04	0 01	-0 03	-0 11	-0 08	1 00																																	
	7 Physical health	.24*	-0 10	-0 20	0 10	-0 11	.21*	1 00																																
	8 Mental & emotion	-0 05	-0 16	-0 14	0 19	0 01	0 05	.28**	1 00																															
	9 Disease / disorder	-0 09	0 07	0 14	0 02	0 04	-.24*	-.49**	-0 04	1 00																														
	10 Living arrangement	-0 03	0 07	0 12	-.27**	0 11	0 13	-0 04	-0 11	-0 15	1 00																													
	11 Household size	0 00	-0 03	-0 08	-.25*	0 03	0 18	0 03	0 00	-0 20	.70**	1 00																												
Social	12 Duration of residence	-0 07	0 05	0 13	-0 13	0 10	0 00	-0 06	-0 10	-0 16	.33**	.27*	1 00																											
	13 Att toward family	-0 07	0 04	0 08	0 11	0 12	0 08	-0 01	.43**	0 04	.21*	0 14	-0 03	1 00																										
	14 Att toward friends	-0 05	-0 05	-0 15	0 12	-0 12	-.29**	-0 18	0 04	0 19	-0 11	-0 15	-.23*	0 17	1 00																									
	15 Att toward community	0 07	0 04	-0 02	0 07	-0 05	-.37**	-.23*	0 08	.36**	-0 04	-0 05	-0 19	.22*	.73**	1 00																								
Dwelling and Site	16 Area location	0 11	-0 09	-0 09	0 09	-0 13	-0 12	0 01	0 02	0 19	-0 04	-0 10	-.39**	0 06	0 17	.21*	1 00																							
	17 Price of land	-0 19	0 01	0 07	-0 05	0 18	0 14	0 01	0 05	-0 18	0 07	0 07	.21*	0 06	-0 10	-.23*	-.75**	1 00																						
	18 Plot type	0 03	-0 10	-0 03	0 04	0 03	-0 08	0 03	0 12	0 09	0 01	0 00	-.28**	0 17	0 04	.21*	.33**	-.21*	1 00																					
	19 Plot size	-0 02	0 00	0 09	-0 16	0 14	0 06	-0 10	.21*	0 11	0 19	0 10	0 14	0 10	-0 12	0 02	0 09	-0 11	.25*	1 00																				
	20 Plot coverage	-0 02	-0 13	-0 20	-0 08	-0 19	0 13	0 07	0 12	-0 16	0 01	0 08	0 00	-0 03	0 00	-0 18	0 01	0 10	-0 14	-.59**	1 00																			

***. Correlation is significant at the 0.01 level (2-tailed).*

**. Correlation is significant at the 0.05 level (2-tailed).*

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 6.1 (Continued)

Correlation between demographic, social factors and the characteristics and physical environmental features in residential sites predictors, N = 90 (Source: fieldwork 2019).

Predictors	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38						
21 Outdoor coverage	0 01	-0 09	-0 11	0 06	-0 10	0 06	-0 12	0 11	-0 01	-.22*	-0 20	-0 03	-0 04	0 10	0 14	-0 10	0 12	0 06	0 02	-0 05	1 00																							
22 Level of shading	0 07	-0 12	-0 14	0 19	0 04	0 06	0 02	-0 01	-0 07	-.34**	-.37**	-.33**	-0 14	0 02	-0 11	0 19	-0 08	.23*	-0 20	0 05	0 14	1 00																						
23 Dwelling type	-0 13	0 02	0 13	0 00	0 04	-0 05	0 19	0 18	-0 07	0 12	-0 04	0 13	0 18	0 02	0 00	0 03	0 00	.25*	0 19	.29**	-0 01	0 00	1 00																					
24 Dwelling size	-0 12	0 01	0 10	-.29**	0 00	.40**	-0 08	0 00	-0 02	.28**	0 19	0 20	.24*	-.21*	-0 19	-0 05	0 05	0 02	.43**	0 14	-0 02	-.21*	0 17	1 00																				
25 Height of building	-0 14	0 08	0 09	-0 02	0 03	0 11	-0 13	0 01	0 05	0 18	0 14	0 09	0 20	0 11	0 05	0 06	0 08	-0 09	0 20	0 03	-0 16	-0 19	0 13	.43**	1 00																			
26 Dwelling orientation	0 19	-0 08	-0 14	0 00	-0 06	-0 02	0 11	-0 07	-0 13	0 02	-0 10	0 06	-0 01	-0 02	0 06	-0 12	0 13	0 02	0 13	-.27**	0 14	-0 03	.29**	-0 05	-0 12	1 00																		
27 Masonry	-0 11	-0 06	0 09	-0 02	0 06	0 19	0 07	-0 01	0 06	-.26*	-0 10	-.31**	-0 20	-.21*	-.31**	0 02	0 12	0 10	0 04	-0 03	-0 09	.26*	0 03	-0 08	-.33**	-0 14	1 00																	
28 Wooden	-0 08	-0 17	-0 16	-0 03	0 10	0 04	0 05	0 00	-0 14	-0 06	0 16	0 08	-0 12	-0 20	-.27**	-0 02	-0 07	0 00	-0 01	0 13	-0 18	0 01	0 12	0 02	-0 06	-0 11	.26*	1 00																
29 Semi-wooden	0 09	0 11	-0 06	0 06	-0 01	-.32**	-0 17	-0 01	0 10	0 20	0 08	.26*	0 21	.31**	.46**	-0 02	-0 09	-0 10	-0 06	0 04	0 06	-.27*	-0 12	-0 02	.27*	0 03	-.87**	-.45**	1 00															
30 Other	0 17	-0 14	-.22*	0 06	-.26*	0 01	0 03	0 01	-0 10	-.26*	-0 17	-.43**	-0 01	.22*	0 16	0 20	-0 11	0 11	-0 13	0 04	0 15	.25*	-0 16	-0 18	-0 16	0 14	0 16	-0 14	-.22*	1 00														
31 Cement concrete	-0 02	0 05	0 12	0 01	0 04	0 10	0 11	0 01	-0 21	-0 04	0 00	0 03	-0 13	-0 15	-0 17	0 06	0 05	-0 04	-0 09	-0 01	-0 06	0 11	0 15	-0 05	-0 02	0 10	.35**	0 19	-.38**	0 05	1 00													
32 Grass	0 05	0 07	0 02	-0 05	-0 03	-0 11	-0 09	0 15	.22*	0 05	-0 13	-0 05	.27*	0 19	.33**	0 25	-0 16	0 18	-0 04	0 05	0 01	-0 11	-0 04	-0 02	0 09	0 05	-.33**	-.30**	.42**	-0 07	0 04	1 00												
33 Ground	0 15	-.21*	-0 19	-0 11	-0 05	-.28**	0 00	0 10	0 05	-0 04	-0 06	-0 06	0 19	0 16	.28**	0 02	-0 06	.28**	.28**	-0 19	0 11	-0 03	0 05	0 03	0 09	0 03	-.27*	-0 10	.34**	-0 11	-.24*	.27**	1 00											
34 Other	0 08	-0 05	-0 11	0 00	-0 01	-.22*	-0 02	-0 14	0 00	.22*	0 17	0 05	-0 07	0 13	0 19	0 07	-0 06	-0 09	0 03	0 04	0 04	-.21*	-0 14	-0 11	-.21*	0 01	-.24*	-0 16	.29**	0 06	-0 16	0 11	0 05	1 00										
35 Street width	-0 05	-0 02	0 02	-0 13	0 11	.26*	0 09	-0 05	-.24*	0 12	0 18	.33**	-0 09	-.38**	-.51**	-.53**	.63**	-0 18	0 12	0 00	0 00	0 03	0 05	0 14	0 09	0 11	0 10	0 15	-0 19	-.23*	0 06	-.30**	-0 02	-0 15	1 00									
36 Cement concrete	-0 10	0 08	0 00	-0 12	0 06	0 12	-.31**	-0 04	0 16	-0 03	-0 06	-0 07	-0 12	.25*	.32**	.019	-.24*	-0 17	-0 08	0 08	-0 01	-0 07	-0 11	-0 01	0 05	0 05	-0 15	-0 03	.24*	-0 19	-0 15	0 17	0 01	0 04	-.38**	1 00								
37 Asphalt	0 04	-0 02	0 05	-0 02	0 07	-.23*	0 20	0 01	-0 11	-0 03	-0 02	0 13	0 15	-0 19	-.22*	-.35**	.41**	0 07	0 16	-0 18	0 07	0 04	0 15	-0 01	0 00	0 13	0 04	-0 06	-0 15	0 15	0 04	-0 16	0 10	0 00	.53**	-.79**	1 00							
38 Compact dirt	0 12	-0 09	-0 12	0 23	-0 17	.27*	.22*	-0 07	-0 13	0 10	0 16	-0 07	-0 03	-0 07	-0 15	.016	-.013	0 12	-0 11	0 16	-0 10	0 02	-0 10	-0 02	-0 06	-.25*	0 14	0 13	-0 10	0 12	0 16	0 01	-0 16	0 04	-0 09	-.39**	-0 17	1 00						

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

6.2.1 The physical characteristics of the village

The case study village ‘Baan Pong Nuea’ was originally in an agricultural area with horticultural production of crops for sale or consumption. In 1777, the Temple of Baan Pong was constructed. After that, schools and government facilities were built, making it a permanent community. Since then, many facilities have been built alongside Highway 1269, which have made the community grow.

Baan Pong Nuea is a village settled in a valley. It is situated in the northwest of Hang Dong District, approximately 25 kilometres west of Chiang Mai province, within 300 to 400 meters of height from sea level, as shown in Figure 6.1. There is a main road, Highway 1269, which cuts through the village. There are forests and mountain ranges of the Thai highlands surrounding the town. The town is bordered to the east and north by the intermountain plateaus and steep peaks of these important mountain ranges. These peaks are Doi Suthep and Doi Pui, situated in the area of Suthep - Pui National Park. The west of the village is bordered by Mae Tha Chang - Mae Khanin National Forest Reserve and Ob Khan National Park, which is declared as Ob Khan National Park.

The topographical and characteristic features of the village are the intermountain basins with steeply sloping terrain, forests and mountains. Most of the town is sloping with occasional plains and level areas. Many streams, such as Huai Luek and Mae Tuen, flow through the village. There is also an important river that nourishes life and is used in agriculture, the Mae Tha Chang River. This river has permanent forests on both sides (see Figure 6.2).

The village location, in the sloping terrain of the foothills, makes the overall area of the community different to other communities, in which a village may be located in the flatter centre of the valley (see Figure 6.3). Another relative feature is that of the main road, which cuts through the valley but not through the middle of intermountain basins. Instead, the main highway traverses around the edge of the intermountain basins due to road engineering reasons so that the road does not exhibit excessive gradient. As a result, the difference between the lowest and the highest level of the settlement area of Baan Pong Nuea village is more than 100 meters. These different levels of the village affect the characteristics of the residential sites and settlements for older adults. A summary of the settlement characteristic of the residential site in the case study village is provided in the next section.

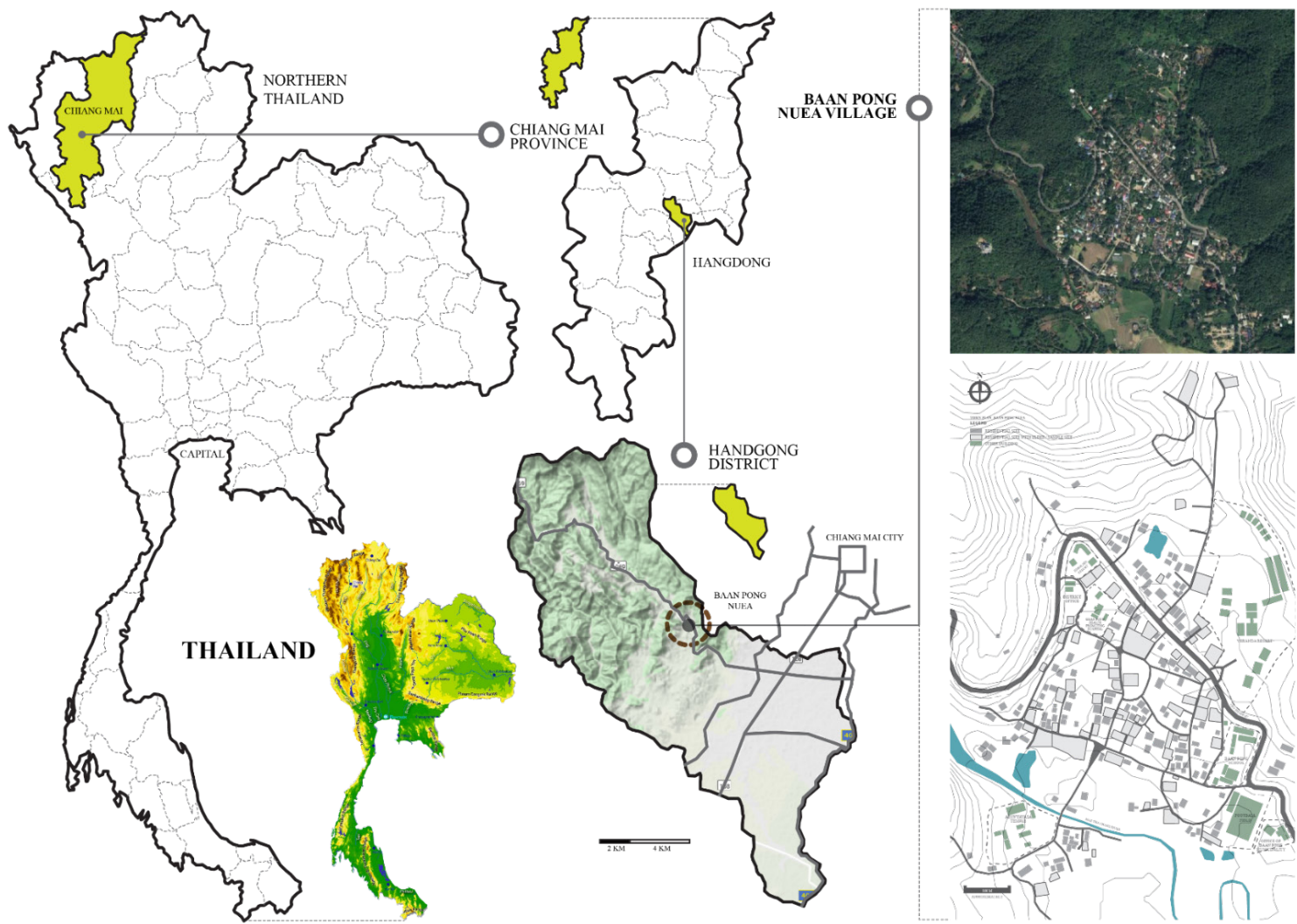


Figure 6.1: The location of Baan Pong Nuea village in Hang Dong district, Chiang Mai province, Thailand (Hongthong, 2020).



Figure 6.2: The aerial view of Baan Pong Nuea with the topographical and characteristic features of the village and surroundings (Hongthong, 2020).

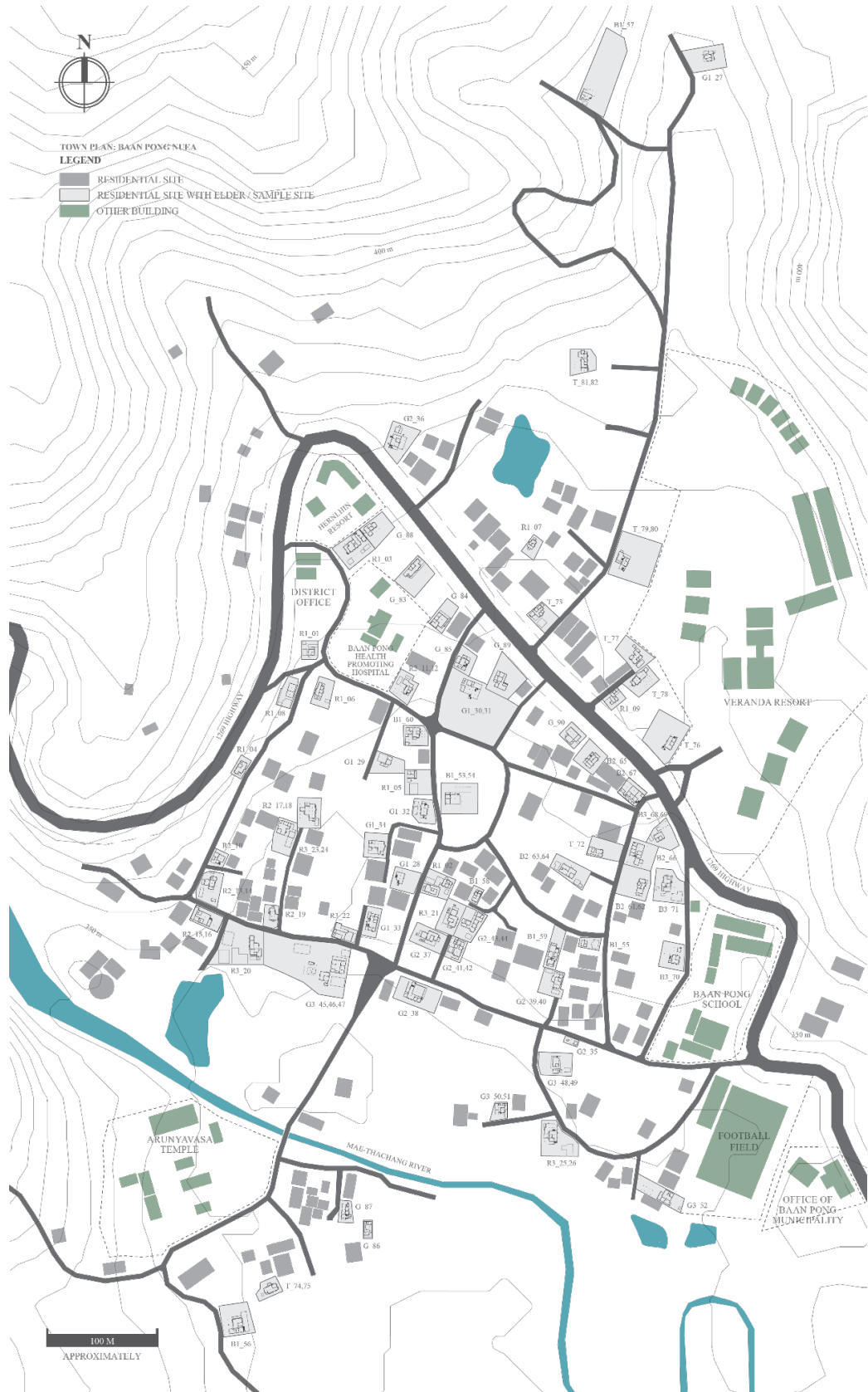


Figure 6.3: Town plan of Baan Pong Nuea sub-district municipality of the Hang Dong district in Chiang Mai province and locations of coded sample sites (Hongthong, 2020).

6.2.2 The settlement characteristic of the residential sites in the village

Based on field data collection, Figure 6.3 shows the characteristics of the Baan Pong Nuea village from the town plan together with the locations of the older adults' residential sites. The overall image of the village characteristics and the locations of the older dwellers' residential sites, together with the environmental features, is presented in Figure 6.4.

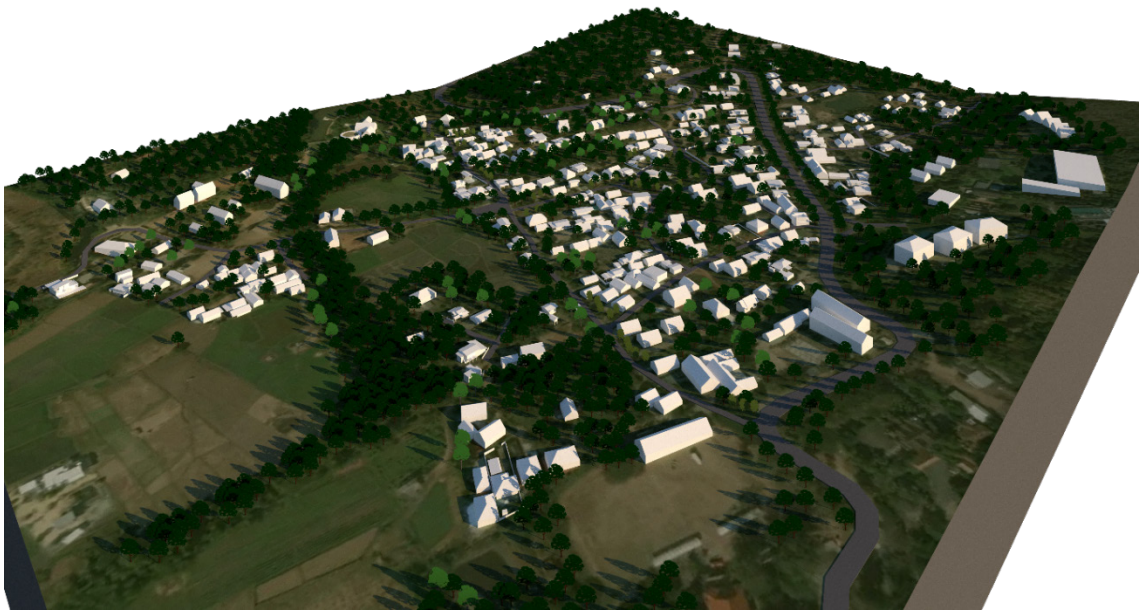


Figure 6.4: The settlement characteristics of the residential sites for older adults in Baan Pong Nuea village (Hongthong, 2020).

The fieldwork data collection and the town plan show the settlement characteristics revealing the locations and areas in the village where older residents settle; these are shown in Figure 6.4 and Figure 6.9. In addition, the estimated price of land for those residential sites is also presented in Figure 6.10, the cost of land being for the years 2017 - 2020. These settlement characteristics for the residential

sites, ascertained from the topographical and mapping studies of the village, can be classified into four main areas as follows:

1.) The area near the highway

The area near the main road is mainly level and easily navigated and includes some facilities with a variety of shops around. The residential sites near the highway have the characteristic of being set back from the main road, with a larger street width compared to other areas or locations (see Figure 6.5). There are thirteen older adults' residential sites (about 18.8%) located near the main road. Figure 6.9 with area A (green colour area) presents the area near the main road or highway. This area has an estimated price of land of approximately 600 Thai Baht per square wah (approximately 2,400 Thai Baht per sq. m. during the years 2017 - 2020). This is the highest land value estimate in the village (see Figure 6.10, pink colour area).

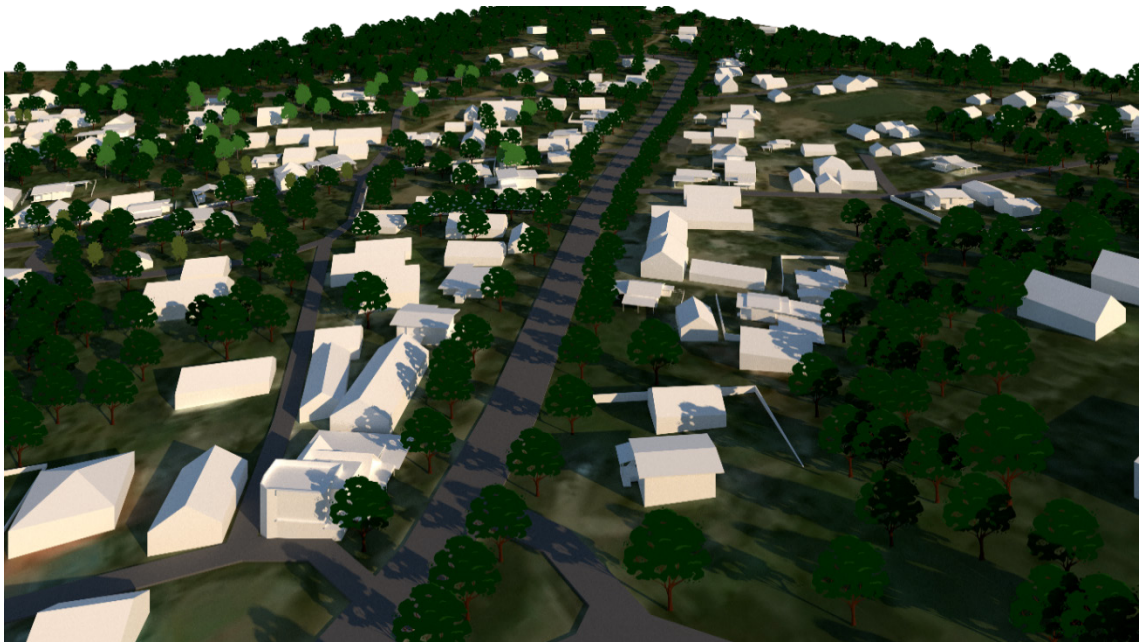


Figure 6.5: The settlement characteristics of the residential sites for older adults in the area near the highway (Hongthong, 2020).

2.) The area of the village

In general, the area of the village has a sloping terrain. However, the living environments have been adjusted to accommodate these slopes (see Figure 6.6). As a result, the roads in the village have slopes not exceeding the Road Traffic Regulation recommendations. This area has the greatest number of older adults' dwellings in the village, that is, forty-five residential sites (about 65.2%). Figure 6.9, with area B (yellow colour area), represents the area in the village. This area has an estimated price of land, approximately 500 Thai Baht per square wah (approximately 2,000 Thai Baht per sq. m. during the year 2017 - 2020, see Figure 6.10 with the grey colour area).

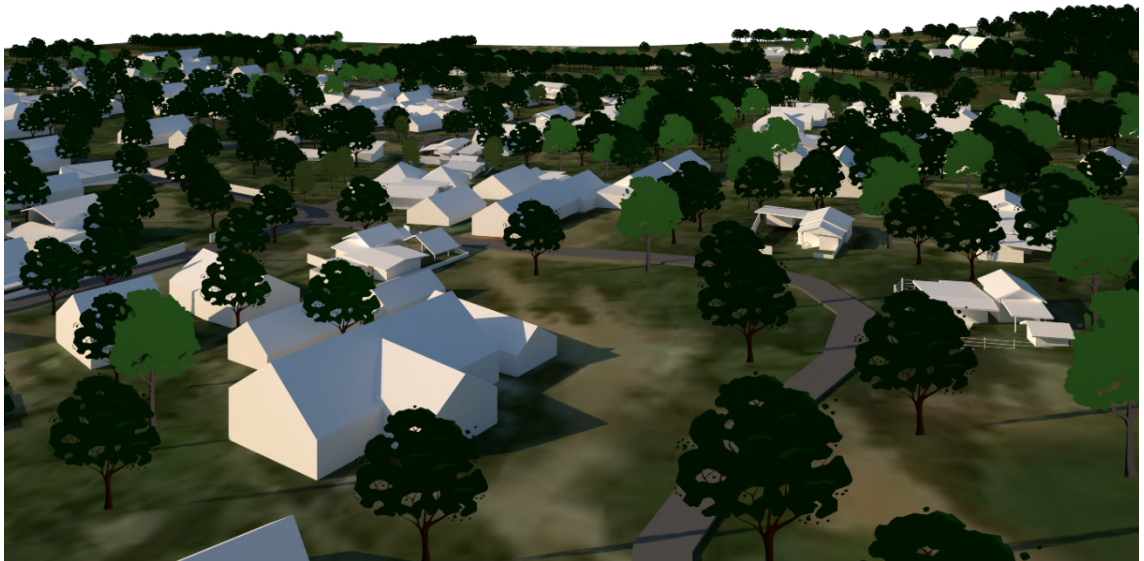


Figure 6.6: The settlement characteristics of the residential sites for older adults in the area in the village (Hongthong, 2020).

3.) The lowland area

The south area of the Mae Tha Chang River has the character of a lowland area. There are houses, temples and agricultural regions. It consists of a broad area

of relatively flat land or plain (see Figure 6.7). Nevertheless, this area is far away from the facilities. Only three older adults' residential sites (about 4.3%) are located in the lowland area. Figure 6.9 with area C presents (orange colour area) the lowland area. This area has an estimated price of land, approximately 500 Thai Baht per square wah (approximately 2,000 Thai Baht per sq. m. cost during the years 2017 - 2020, see Figure 6.10 with the grey colour area).

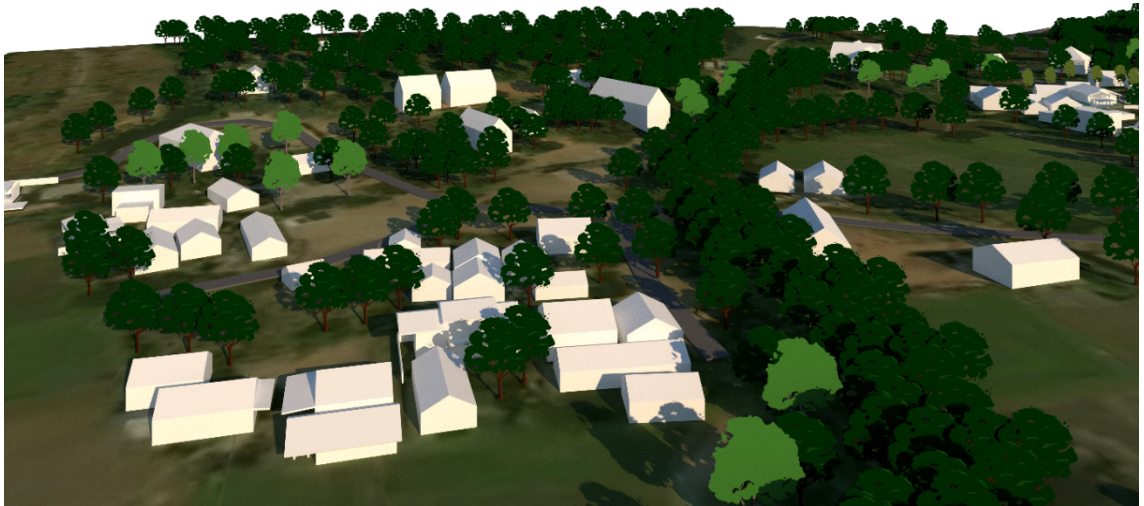


Figure 6.7: The settlement characteristics of the residential sites for older adults in the lowland area (Hongthong, 2020).

4.) The foothill areas

Due to the village's population density and land prices, some residential sites are sporadically located at the foot of the slope where the land is inclined (see Figure 6.8). However, this area is far from the facilities and commuting is more difficult. There are six older adults' residential sites (about 11.6%) located in the foothill area. Figure 6.9 with area D (purple colour area) represents the foothill

areas. This area has an estimated price of land of approximately 450 - 500 Thai Baht per square wah (approximately 1,800 - 2,000 Thai Baht per sq. m. cost between the years 2017 - 2020, see Figure 6.10 with areas of brown and grey colours).



Figure 6.8: The settlement characteristics of the residential sites for older adults in the foothill area (Hongthong, 2020).

Overall, these results from fieldwork data collection provide insights into the settlement characteristics of the residential sites for older adults in the village. Most of the older adults' residential sites are located in the village and some areas near the main road or the highway. Another group of residential sites are sporadically situated to the north near the mountains. Only a few are located in the plains of the intermountain basins or near the Mae Tha Chang River. Most in the south are in agricultural areas (see Figure 6.4, Figure 6.9 and Figure 6.10).

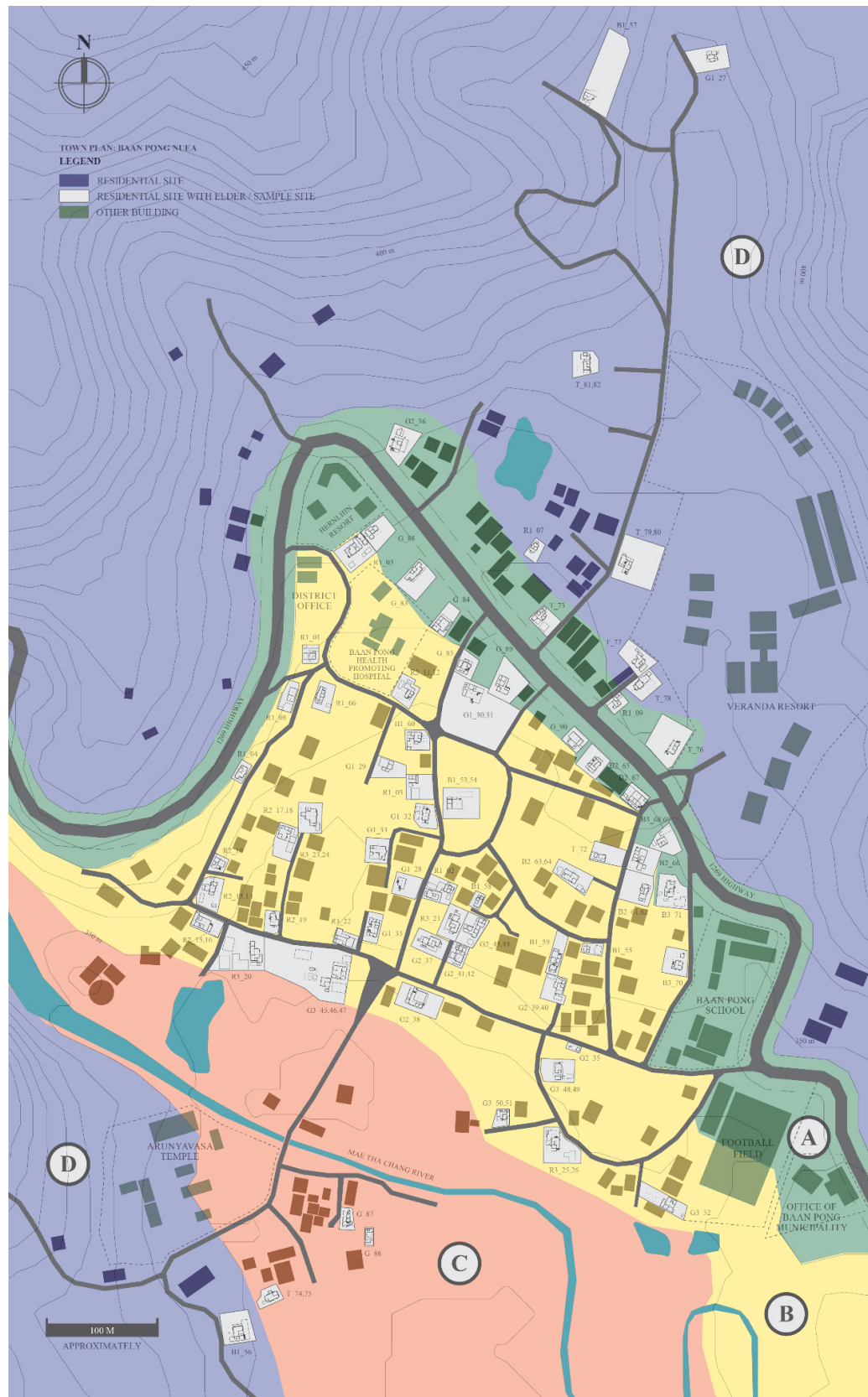


Figure 6.9: The areas of settlement characteristics of the residential sites for older adults from the topographical survey and other features of the village (Hongthong, 2020).

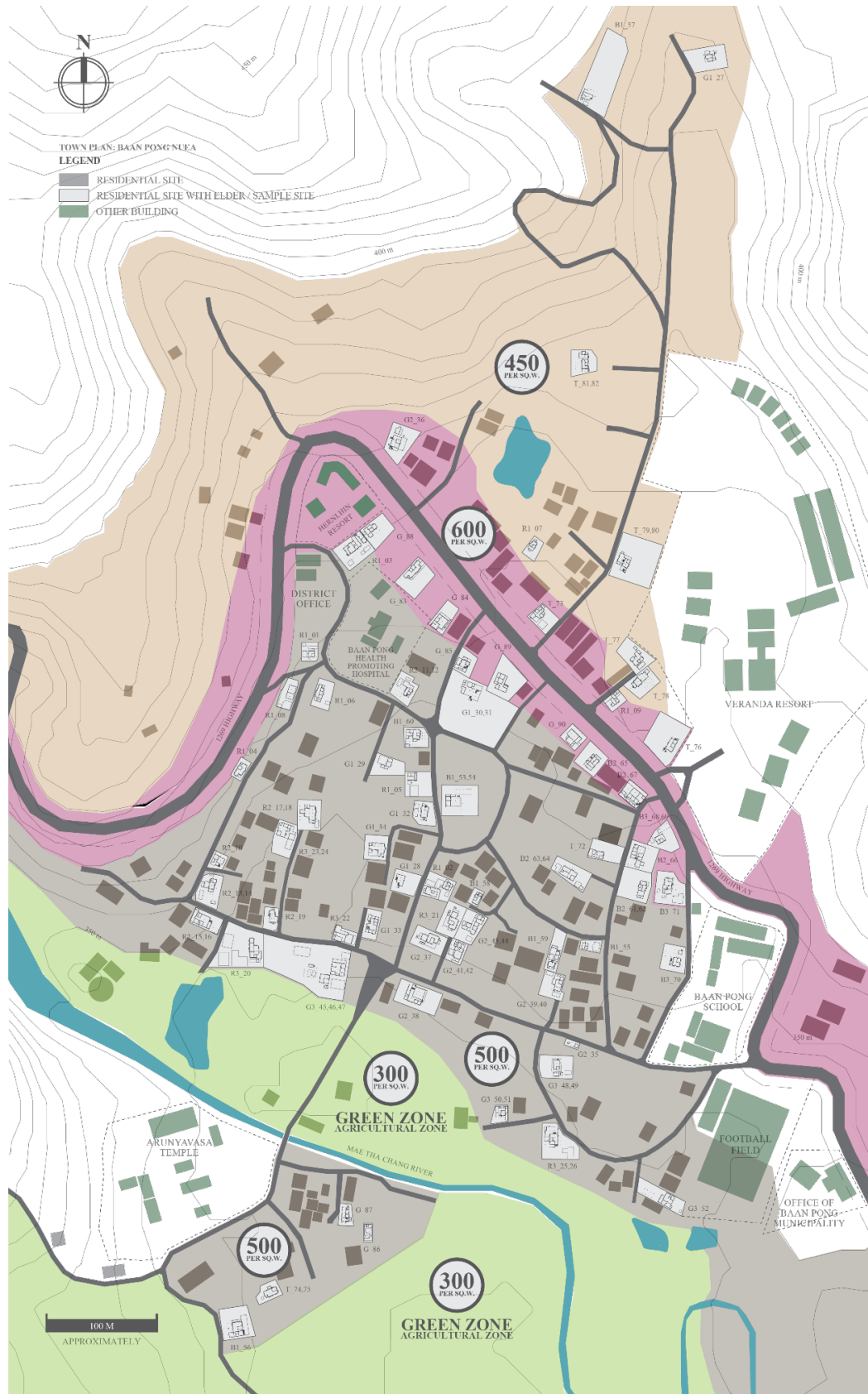


Figure 6.10: The areas of the price of land during the year 2017 - 2020 (price per square wah, one sq. wah = four sq. m.) of the residential sites of the village (Hongthong, 2020).

Aside from the results from the study of the fieldwork data, the examination of correlations between demographic, social, dwelling and site characteristics and the settlement characteristics of locations and areas in the village reveal some patterns worth exploring, as shown in Table 6.1. The analyses of correlations showed that the demographic, dwelling and site characteristics were negatively associated with the settlement characteristics. On the other hand, different outcomes of comparisons showed moderate and significant positive correlations between the characteristics of settlement, the residential site level and the social characteristic factors.

Firstly, there was a negative correlation between the settlement characteristics and demographic predictor of duration of residence, $r(90) = -.39$, $p < .01$ (see Table 6.1). The results show that older adults who have a shorter duration of residence are associated with the locations and areas of settlement in the area near the highway. Whereas the older people in the village, who have a longer duration of residence, tend to live in the foothill areas, lowland areas, and more central areas of the village, respectively.

This result revealed that the locations and areas in the village lead to the settlement characteristics, which link to the older residents' perspectives towards the residential site environment and its surroundings. The locations and areas in the village are also related to the geographies of residential density. For example, the foothill areas have the lowest population density residential land use, which is evident in Figure 6.9. In addition, during the in-depth interviews, one of the older participants described the settlement characteristics of the location in the foothill

area and the effect it had on this individual's perspective towards their residential site environment, as noted:

... 'The environmental surroundings of mountains and forest around the residential site make me feel more peaceful than those near the main street or highway. I chose this location for living as it meets my needs of the peaceful, shady, pleasant and comfortable area.' ...

In accordance with the present results, previous studies have demonstrated that the attributes of the geographies of residential density, the surroundings of greenery and aesthetically pleasing scenery appear to be essential and desirable aspects of the living environment and are important to older people (Barnett et al., 2017; Rioux & Werner, 2011). It has been suggested that these characteristics can inform interventions supporting the physical and mental health status and active ageing (Barnett et al., 2017).

Secondly, the settlement characteristics were positively and moderately correlated with the social characteristic factor of the attitude toward community, $r(90) = .21$, $p < .05$ (see Table 6.1). This finding indicated the pattern that older people who settle in the foothill areas are associated with higher levels of positive attitudes toward their community, neighbours and other community members.

A reasonable explanation for this correlation may be that the surroundings of the areas or locations affect the relationships between older dwellers and their neighbours and community members. According to the in-depth interviews, this is exemplified in the following quote by an older resident who lives in the foothill

area, discussing the surroundings of the location and the time spent with the neighbours, for example, noted:

... 'The location of the residential site has peaceful and relaxing natural surroundings from the valleys and forests, where I enjoy spending time with friends and neighbours. It makes me feel satisfied.' ...

This finding corroborates the ideas of Public Health England (2020), who suggested that the natural environments or spaces improve social cohesion and help bring communities together. Particularly for older people, natural surroundings or greenspaces can reduce isolation and loneliness by providing the opportunity to participate in social activities, which inspires physical activity and social connection through its characteristics. In addition to this, the aesthetics, peaceful and relaxing atmospheres and social environments found within a residential site play a vital role in the older person wanting to use the space and continue to spend time in that environment (Klumrat, 2011; Public Health England, 2020).

Moreover, the findings also show a solid significant negative correlation between the price of land and the settlement characteristics, $r(90) = -.75$, $p < .01$ (see Table 6.1). It also agrees with the observations, which showed that the area near the highway has the highest land value estimates. In contrast, the foothill areas have the lowest land value compared to other settlement locations (see Figure 6.10).

The correlation data also demonstrates that the predictors of street construction materials and dimensions were negatively associated with the settlement characteristics, $r's(90) = -.35$ and $-.53$, respectively, $p < .01$ (see Table 6.1). The results show that the characteristics of wider streets and the construction material of asphalt are associated with the locations and areas of settlement near the highway (see area A in Figure 6.4). This correlation is related to the highway characteristic, and the most common material used for paving roads wider than 5 metres is asphalt.

This finding further supports the idea of streets that are mainly constructed using asphalt being major rural travel ways or highways, similar to those in urban areas. The government only takes care to maintain roads and highways in urban regions to allow better access and transportation. However, it is difficult for the government to pave the roads in rural areas with asphalt, which is costly and high maintenance (Dae Young, 2018). These results reflect those of Dae Young (2018), who also found that the development gap between urban and rural contexts in Southeast Asian countries has caused the rural areas to suffer from poor road infrastructure. At the same time, Neville, Napier, Adams, Shannon, and Clair (2020) point out that older people showed concern for features in the town and rural areas, such as poorly maintained and unsealed roads.

Additionally, there was a significant positive correlation between the characteristics of settlement with the residential site level or height and of the plot type, $r(90) = .33$, $p < .01$ (see Table 6.1). This result revealed that older dwellers who live in the foothill areas are more likely to have residential sites with shared plots than those who live in the area near the main road or highway. This finding

is broadly attributed to the previous outcomes in this section about the foothill areas' characteristics of less density of residential land use and the price of land. Therefore, according to these data, the results can infer that older dwellers, who have residential sites with shared plots, settle in the foothill areas with low-density residential land use rather than near the main road or highway.

Together, these outcomes highlight the impact of factors that can affect the settlement characteristics of those areas or locations. The evidence from this study suggests that the settlement characteristics for older adults in a rural Asian context are often moderated by variables such as demographic predictors such as the duration of residence, the social predictor of the attitude towards community members, the price of land, the street construction material and dimensions and the site level of the plot type.

Reviews have shown that the geography of residential sites in low-density areas and the quality of the environment, such as the greenery and aesthetically pleasing scenery are the critical consideration of the environment for older adults. Moreover, the physical environment of nature or greenspaces improves social cohesion and can help bring communities together. Natural surroundings, especially with an aesthetic, peaceful and relaxing atmosphere, can provide places where older adults can come together to engage in social activities. They can reduce isolation and loneliness, help elders feel connected to their communities, and encourage a connection to nature.

6.3 THE CHARACTERISTICS OF OLDER ADULTS' RESIDENTIAL SITE ENVIRONMENTS

This section refers to research objective A, presenting the investigation of a case study of older adults' residential sites' characteristics and physical environmental features in the rural Asian context. In general, the section has given an account of the residential site environments from the assessment on and around older adults' residential sites from the site and dwelling levels in a selected rural area. Taken together, the results provide important insights into the characteristics and physical environmental features of the residential site environments.

6.3.1 Residential site level

The physical environmental features of residential settings, particularly of the site level, involve issues related to seven varying factors. First, there are the assessments of the different characteristics of the site, including the plot type, size, and plot coverage. Also examined is the percentage area of the total land plot that forms the outdoor residential site, levels of shading of trees or canopy, the width of the community frontage road attached to the residential site and the construction material of the community street connected to the residential site. Table 6.2 presents an overview of all variables of the characteristics and physical environmental features of residential sites at the residential site level.

Table 6.2

Characteristics and physical environmental features of residential sites at residential site level from fieldwork observation used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).

Variable	Categories	Responses	
		N	Percent
1. Plot type	Corner plot	15	16.7
	Interior plot	19	21.1
	Shared plot (3 types)	30	33.3
	▪ Corner with a shared plot	14	15.6
	▪ Interior with a shared plot	4	4.4
	▪ Other types with a shared plot	12	13.3
	▪ Other	26	28.9
2. Plot coverage	Less than 25 percent	50	55.6
	25 percent to 49 percent	31	34.4
	50 percent to 75 percent	7	7.8
	More than 75 percent	2	2.2
3. Plot size	Less than 200 sq.m.	9	10.0
	200 - 399 sq.m.	24	26.7
	400 - 800 sq.m.	45	50.0
	More than 800 sq.m.	12	13.3
4. The percentage of outdoor residential sites area covered in a land plot	Less than 25 percent	6	6.7
	25 percent to 49 percent	46	51.1
	50 percent to 75 percent	28	31.1
	More than 75 percent	10	11.1
5. Levels of shading of tree or canopy	Less than 25 percent	15	16.7
	25 percent to 49 percent	40	44.4
	50 percent to 75 percent	31	34.4
	More than 75 percent	4	4.4
6. The width of the community frontage road attached to the residential site	Less than 2 m	3	3.3
	2 – 2.99 m	42	46.7
	3 – 3.99 m	35	38.9
	4 - 5 m	5	5.6
	More than 5	5	5.6
7. The material of the community street attached to the residential site	Cement concrete	60	66.3
	Asphalt	24	27.2
	Compact dirt	6	6.5

1.) Plot type

This part focuses on the plot type of the residential sites. According to Table 6.2, the response options for the categories ranged from the corner plot, interior plot, shared plot (three types of the shared plot), and other plot types. Figure 6.11 presents an overview of the characteristics of each plot type from the frequency.

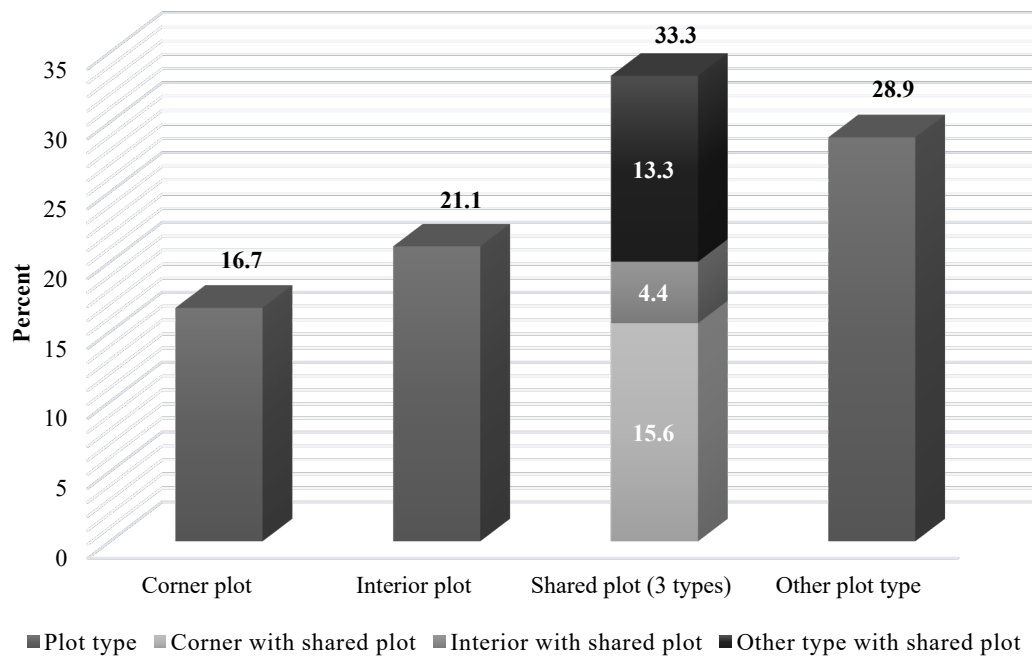


Figure 6.11: The frequency of the characteristics of plot type of the residential sites (Author, 2020).

From the data in Table 6.2, the results show that the most frequent type of residential site is the shared plot, with a value of over 33 percent. The shared plot has three types, which include the corner shared plot at 15.6 percent (see Figure 6.12A), other types, such as a shared plot that is located next to the field or forest, at 13.3 percent (see Figure 6.12B) and a few (about 4.4%) of the residential sites were interior shared plots (see Figure 6.12C).



Figure 6.12: The samples of residential plot type characteristics with the comparison of the shared plots (Author, 2020).

The residential sites with other plot types make up almost 29 percent (see Figure 6.11). The residential site characteristics of other type plots include the plot that is located at the end of the road (see Figure 6.13A) that has only one side attached to another land plot (see Figure 6.13B) and is disconnected from the road (see Figure 6.13C).

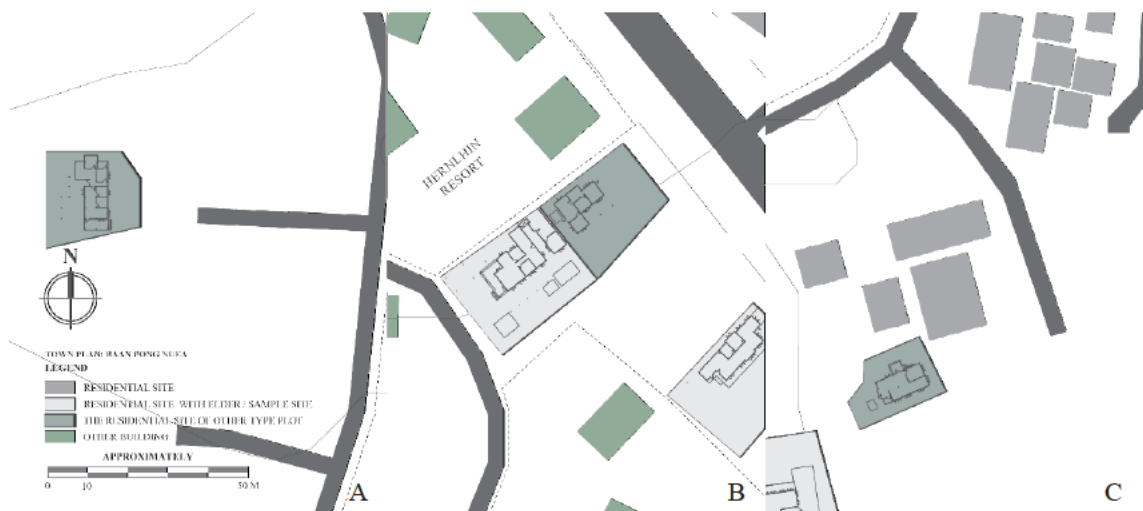


Figure 6.13: The samples of residential plot type characteristics with the comparison of the other type plots (Author, 2020).

The residential sites with interior plots constitute more than 21 percent (see Figure 6.11). The characteristics of the internal plot have at least two sides attached or closed to other sites, as illustrated in Figure 6.14.



Figure 6.14: The samples of a residential plot type characteristic of the interior plot (Author, 2020).

The residential sites with corner plots constitute more than 16 percent (see Figure 6.11). The residential site characteristics with corner plots are defined as having at least two frontage roads immediately adjacent to the property. This plot type has some outdoor areas generated along the roads, as shown in Figure 6.15.



Figure 6.15: The samples of a residential plot type characteristic of the corner plot (Author, 2020).

Furthermore, the analyses revealed the relationship of the plot type of the residential sites with the predictors of demographic, social, and site characteristics (see Table 6.1). The correlations showed that the factors of demographic and residential sites at the site level were negatively associated with the plot type characteristics. Further correlations showed a moderate positive correlation between the variables of plot type characteristics with the social characteristic predictor.

The examination of correlations between demographic characteristics and the plot type characteristics shows some interesting patterns. The duration of residence factor was negatively associated with the plot type characteristics, $r(90) = -.28, p < .01$ (see Table 6.1). This result revealed that older dwellers who have a shorter duration of residence tend to live in a shared plot, more so than those who have a longer duration of residence. This relationship may reflect that the duration of residence affects choices of the plot type characteristics for older adults.

There are several possible explanations for this result. A possible reason for this might be the characteristics of older persons' residential arrangements with household living arrangements of older adults having intergenerational ties. These are traditionally strong and highly valued, and as such, living in a dwelling with a shared plot is an essential factor associated with the economic status, health and well-being of older people (Lin & Yi, 2013; United Nations, 2019). There is, however, a contrary line of research emerging which argues that older adults living in multi-generational households are more prone to chronic disease or disability due to the presence of adult children and grandchildren in co-residential living (Cohen, Agree, Ahmed, & Naumova, 2011; Samanta, Chen, & Vanneman,

2014). It is proposed that chronic disease and disability of older persons are often positively associated with short-term morbidity (Samanta et al., 2014). In the same vein, Zuera, Rutigliano, and Trias-Llimós (2020) note that an older person who lives in co-residential living is associated with higher mortality than when living with a partner. Therefore, the higher co-residence rates in a shared plot could increase short-term illnesses for older adults living in multi-generational households.

Moreover, it also seems possible that these results are due to the availability of resources to older persons and the necessity and demands of the intergenerational co-residence when living with the family (Grundy, 2010; Lin & Yi, 2013). Although the co-residence of adult children and grandchildren with elderly parents, particularly in Asian societies, is considered the traditional ideal of filial piety, the actual co-residence with one's parents as they age has continued to decline (Lin & Yi, 2013; Yasuda, Iwai, Yi, & Xie, 2011).

One of the factors would refer to adult children leaving the parental home to live independently and grandchildren no longer needing practical support from older people. However, adult children were willing to live in the same town or village as their elderly parents (Lin & Yi, 2013). Although adult children are less willing to live with elderly parents in the long term, they may have a stronger desire to support or contribute financially toward elderly parents' living expenses (Lin & Yi, 2013).

Therefore, it is likely that such connections exist between the older persons' duration of residence and the multi-generational households living in the dwellings

with a shared plot. Furthermore, these relationships can be supported by the factors mentioned above that may affect older adults' shorter duration of residence. The possible factors are the chronic disease and disability of older persons living in multi-generational households. It also includes the decline of intergenerational relations in which adult children live independently. Moreover, there is the completeness of grandchildren's need for practical support and the intention to support elderly parents financially rather than living in a multi-generational co-residence environment.

Additionally, there is also a moderate positive correlation between the plot type characteristics with the social factor of attitude toward community, $r(90) = .21, p < .05$ (see Table 6.1). The results show that older people who live in the shared plot are associated with higher levels of positive attitudes toward the community among neighbours and community members.

This finding supports evidence from previous work (e.g., Keating, Kwan, Hillcoat-Nalletamby, & Burholt, 2015; Pain, 2005). By drawing on the concept of multi-generational family with community and neighbourhood, Pain (2005) suggests that intergenerational relations of multi-generational living arrangements are a part of the social identity. Older people with multi-generational households have material relationships which affect their experiences and quality of life in particular settings, such as living in a shared plot. This is important for individuals, families and neighbourhood cohesion amongst the broader community.

There are links between the quality of intergenerational relationships in families and exchanges of resources among neighbours and community members.

It applies especially to elders with multi-generational households in the community, such as supporting, sharing experiences, or spending time with grandchildren and neighbours' families within their residential sites (Keating, Kwan, Hillcoat-Nalletamby, & Burholt, 2015). These characteristics influence and reflect societal attitudes, creating and developing positive and meaningful relationships between older residents with extended families and among neighbours and community members (Pain, 2005).

The findings also show that the price of land was modestly but significantly correlated to the plot type characteristics, $r(90) = -.21$, $p < .05$ (see Table 6.1). Overall, the results show that the residential corner plot has the highest price of land compared to other plot types in the same area. This finding corroborates the ideas of Goyal (2011), who suggested that the corner residential plots usually have a higher price and value than the typical plots of a similar size. These corner plots are considered to have several benefits over other residential plots that it offers to the residents. The advantages of the corner plot include the examples of the side passage, lighting, ventilation and the presence of a side terrace (Goyal, 2011).

A side passage in the residential plot plan has its advantages. Some people desire to have a through and through a passage to the back area or space of the residential site for many reasons. For example, the side passage can be used as an independent entry for residents and visitors without entering the owner's dwelling and for ease of delivering supplies and services. For lighting and ventilation aspects, a corner residential plot also benefits from inviting extra natural light and ventilation to the residential site and dwelling via the side wall facing the road. In particular, east or west-facing corner plots may further have the advantage of north

light for the dwellings and outdoor areas or spaces located on the northern end of the plot.

Another advantage of the corner plot is the side terrace. The side of the dwelling may have a terrace that will lend more ventilation to the residence and add a regal touch with functional space for socialisation. Moreover, the side elevation of the dwelling and the residential site appear much more attractive. Therefore, a corner residential plot has many advantages for residents, much more than the extra value of the plot, in various ways such as function, aesthetics and natural design.

In summary, these results show that most of the residential site's dwelling types are shared plots. In accordance with the present finding, it corroborates the ideas of Teerawichitchainan, Knodel, and Pothisiri (2015), who suggested that Asian cultures have preferences for multi-generational living arrangements. This characteristic of the residential site consisting of a shared plot type provides an essential insight into the association of multi-generational living within the same residential area, as indicated previously. In addition, these shared plots have the advantage of providing more than one dwelling or building, such as an annexe within the same area or space within the residential site.

However, this study indicates that some factors can potentially affect the characteristics of a residential site's varying dwelling types. Factors such as demographic predictors of length of tenure, duration of residence, social factors such as attitude toward community members and site characteristics such as the estimated price of the residential land.

As previously stated, the extent of co-residency has implications for the demand for residential sites of plot types which in turn influences elders' choice of residency. This study indicates that co-residence in a shared plot may increase the potential drivers of societal change among older people. Multi-generational households could be attributed to the positive quality of intergenerational relationships in families, in the community, among neighbours and community members by forming moments of connection and sharing of life experiences.

However, the findings of the current study reveal that the duration of older persons' residency may be influenced by the factors like the greater risk of short-term health problems, the decline of intergenerational relations and grandchildren's practical support requirements, together with aspects of financial support from the adult children. These viewpoints mean that the characteristics of plot types and the prevalence of this type of multi-generational household are important. Apart from this, the availability of some residential sites' plot types could be affected by the land price. It may be that these residential sites and plot types benefitted from the elements, features and environment of the residential plot type.

2.) Plot coverage

This section deals with the plot coverage of the residential sites. Plot coverage represents the extent to which the residential plot is covered with dwellings, other buildings or structures and when the sun is directly overhead at noon, affecting shading. Objects in sunlight cast shadows. The shortest shadows

can be expressed as a percentage of the ratio of the built-up area to the plot area. (Government of Tamil Nadu, 2019).

According to Table 6.2, the response options were categorised into four groups, which are: (1) less than 25 percent, (2) 25 to 49 percent, (3) 50 to 75 percent, and (4) more than 75 percent. Figure 6.21 presents the summary statistics for the characteristics of the plot coverage and frequency.

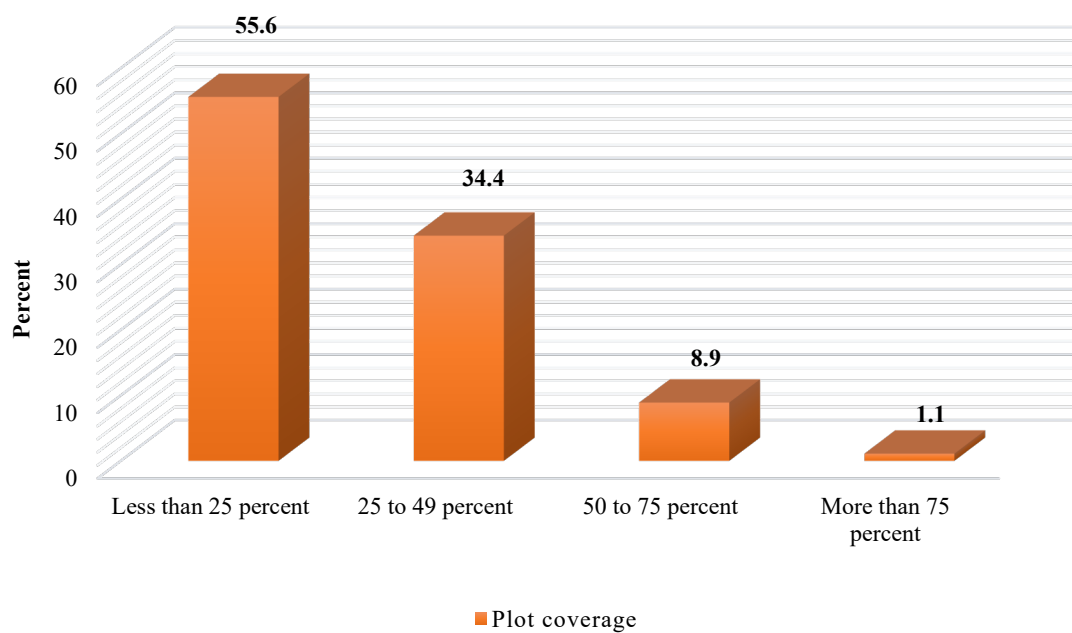


Figure 6.16: The frequency of the characteristics of plot coverage of the residential sites (Author, 2020).

As shown in Figure 6.21, over half of the older adults' residential sites have a plot coverage of less than 25 percent of their residential sites. The figure below illustrates the sample of residential site characteristics with plot coverage of less than 25 percent.



Figure 6.17: The sample of residential site characteristics with plot coverage of less than 25 percent (Author, 2020).

The residential sites with plot coverage of 25 to 49 percent constitute more than 34 percent (see Figure 6.21). The sample of residential site characteristics with plot coverage of 25 to 49 percent is presented in Figure 6.23.

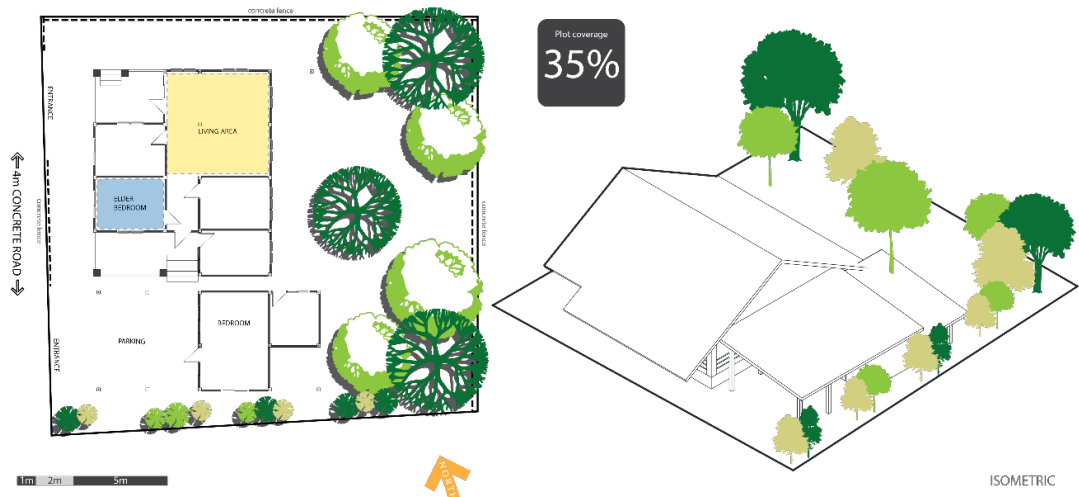


Figure 6.18: The sample of residential site characteristics with plot coverage of 25 to 49 percent (Author, 2020).

The residential sites with plot coverage of 50 to 75 percent constitute almost 9 percent (see Figure 6.21). The sample is illustrated in Figure 6.24.

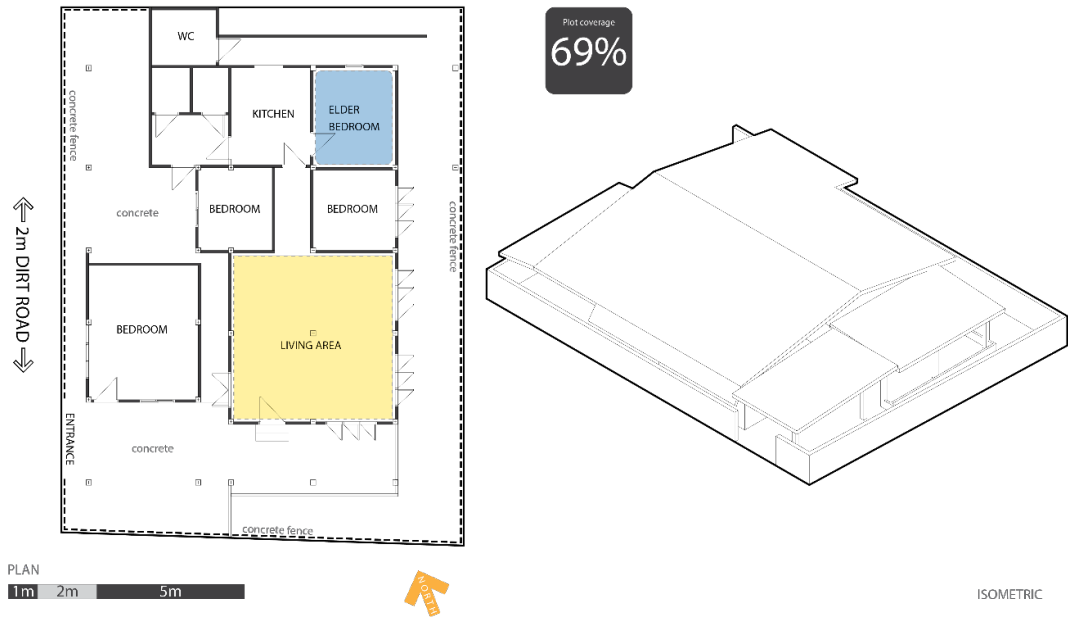


Figure 6.19: The sample of residential site characteristics with plot coverage of 50 to 75 percent (Author, 2020).

The residential sites with more than 75 percent plot coverage constitute only a few (1.1%, see Figure 6.21). The sample is presented in Figure 6.25.

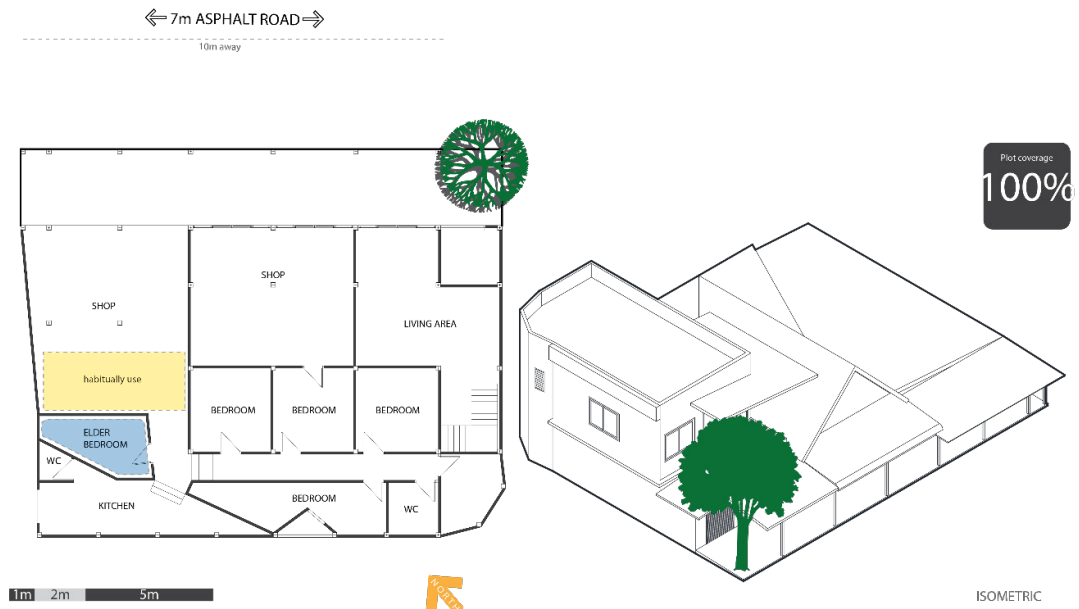


Figure 6.20: The sample of residential site characteristics with plot coverage of more than 75 percent (Author, 2020).

Apart from those results, the analyses revealed correlations between the plot coverage of the residential sites with the residential site characteristics of dwelling

variables (see Table 6.1). The values showed that residential plot coverage characteristic was negatively related to those factors of the residential dwelling orientation and dwelling type; r 's (90) ranged from -.27 to -.29, respectively, p 's $< .01$ (see Table 6.1).

Overall, the results show that the older adults' residential sites with the characteristics of plot coverage, more than 75 percent of their residential sites tend to have the dwelling type of single house with the dwelling's orientation of long side parallel toward the frontage road. It is possible that the plot coverage proportion relates to surroundings such as natural or environmental features and orientation which then affects the dwelling type in the residential site. This finding supports evidence from fieldwork data collection by confirming that most older dwellers in a single house type tend to have most of the areas of their dwellings, including semi-outdoor spaces, situated with the long side of the dwelling parallel toward the frontage road.

In addition to this, the factor of residential dwelling orientation is one of the most critical in residential design because it has the most impact on thermal flow, ventilation, daylight and pleasant outlook or view (Hull City Council, 2020; Nedhal, Syed Fadzil, & Harun, 2011). In particular, in the dwelling type of single house with a higher ratio of plot coverage, thermal and visual comfort and scenery from the windows is essential (Nedhal et al., 2011). The characteristic of building orientation with the long side of the dwellings parallel toward the frontage road has the advantages of allowing airflow and thermal comfort from natural ventilation and allowing daylight to penetrate the building and outdoor space whilst providing shading. This view was echoed by some interviewees who

indicated negatively about the thermal comfort of the dwelling in the residential site, for example, noted:

*... 'The outdoor areas are suitable to spend time during the daytime
as the indoor areas are too hot.' ...*

Additionally, a single house with a higher percentage of plot coverage also has more views of the surroundings, such as the window views or a front terrace facing the frontage road. These dwellings tend to be situated parallel to the frontage road. Through these characteristics of window views or front terraces, the visual field allows older dwellers to perceive and interact with the surroundings and from the road (Sarkar, Gallacher, & Webster, 2013). Accordingly, one of the older participants described the view of the surroundings from a dwelling parallel to the frontage road or main street, as noted:

*... 'The residential site is located next to the main street, which makes
me satisfied by providing an opportunity to see people roaming on
the street.' ...*

According to this data, it can be seen that the characteristics of residential sites with a high ratio of plot coverage tend to have the dwelling type being a single house with the dwelling's orientation of long side parallel toward the frontage road. This optimises the view, lighting, ventilation, and thermal and visual comfort for older residents.

In summary, it has been shown from the findings that most of the older adults' residential sites in the village have a plot coverage of less than 25 percent of their residential sites, with only a few having plot coverage of more than 75 percent. This result may be explained by the fact that older people prefer less plot coverage from dwellings and other buildings in order to maximise outdoor space. According to the in-depth interviews, this is exemplified in the following quote by some of the older residents, expressing their opinion positively about the characteristics of outdoor areas or spaces in the residential site environment which represent less plot coverage, for instance, noted:

... *'A large courtyard at the front of the residential site has a suitable space to spend time outdoors.'* ...

Regardless of this, some factors of the residential sites can affect the characteristics of plot coverage and the residential dwellings attributes. This study indicates that the association of plot coverage of the residential site is often moderated by factors such as residential dwelling orientation and dwelling type. It seems possible that these factors are due to the aspects of the daylight, ventilation, views of the surroundings, and thermal and visual comfort for elderly dwellers, as illustrated and presented earlier in this review.

3.) Plot size

This part focuses on the plot size of the residential sites. Site area or Plot size means the area of a contiguous parcel of land or site enclosed by definite

boundaries over which the landowner has a legal right for development and includes part of the site used as an entirely open space or reservation area, passage and internal roads within the boundaries. (Government of Tamil Nadu, 2019).

According to Table 6.2, the response options of the plot size of the residential sites were categorised into four groups, which are: (1) less than 200 sq.m., (2) 200 - 399 sq.m., (3) 400 - 800 sq.m., and (4) more than 800 sq.m. Figure 6.16 provides the summary statistics for the characteristics of those plot sizes from their frequency.

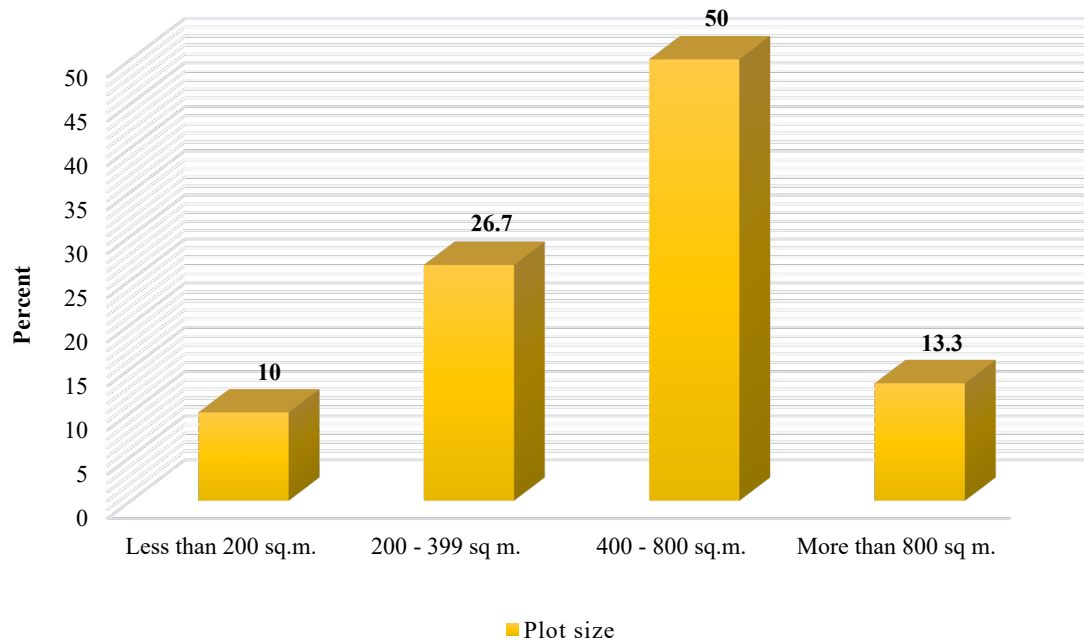


Figure 6.21: The frequency of the characteristics of plot size of the residential sites (Author, 2020).

It can be seen from the data in Figure 6.16 that half of the older adults' residential sites in the village have a plot size of approximately 400 - 800 sq.m. The sample is illustrated in Figure 6.17.

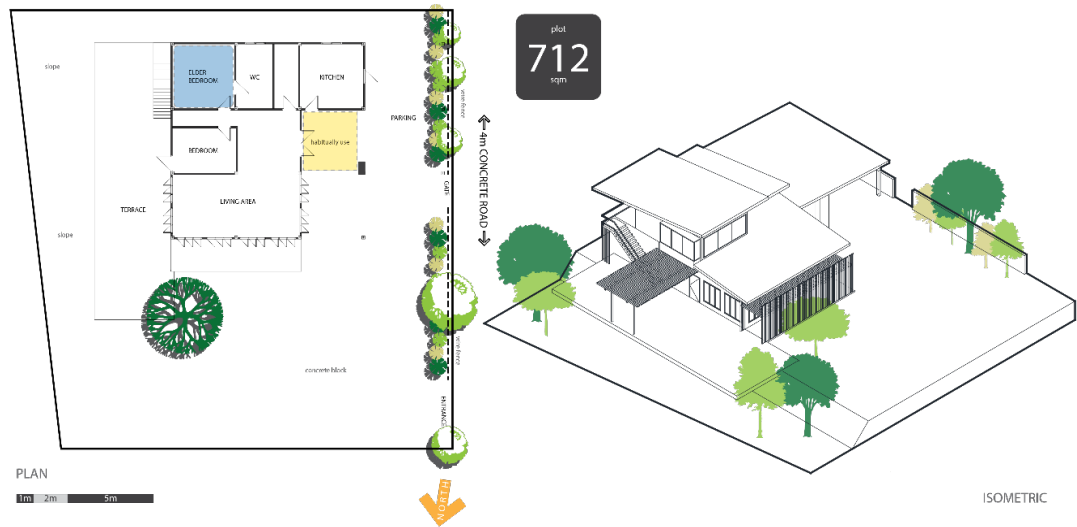


Figure 6.22: The sample of residential plot size characteristic of approximately 400 - 800 sq.m. (Author, 2020).

The older adults' residential sites with a plot size of approximately 200 – 399 sq.m. comprise almost 27 percent (see Figure 6.9). The sample is presented in the figure below.



Figure 6.23: The sample of residential plot size characteristic of approximately 200 – 399 sq.m. (Author, 2020).

The residential sites with a plot size of more than 800 sq.m. comprise over 13 percent (see Figure 6.16). The sample is presented in Figure 6.19.

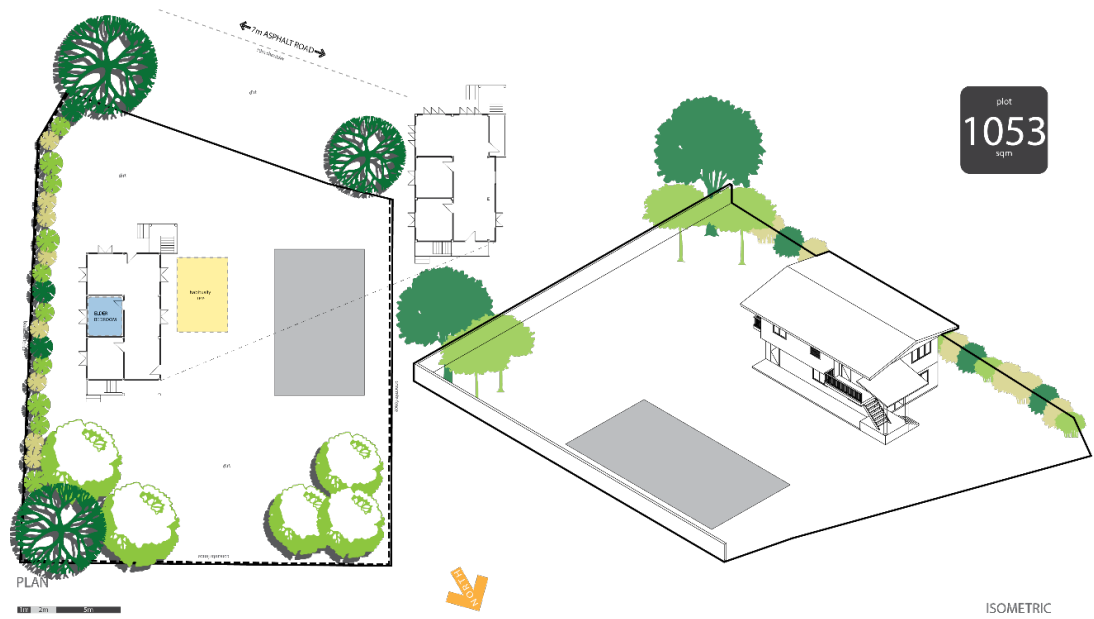


Figure 6.24: The sample of residential plot size characteristic of approximately more than 800 sq.m. (Author, 2020).

The residential sites with a plot size of approximately less than 200 sq.m. constitute around 10 percent (see Figure 6.16). Figure 6.20 presents the sample of residential plot size characteristic of less than 200 sq.m.

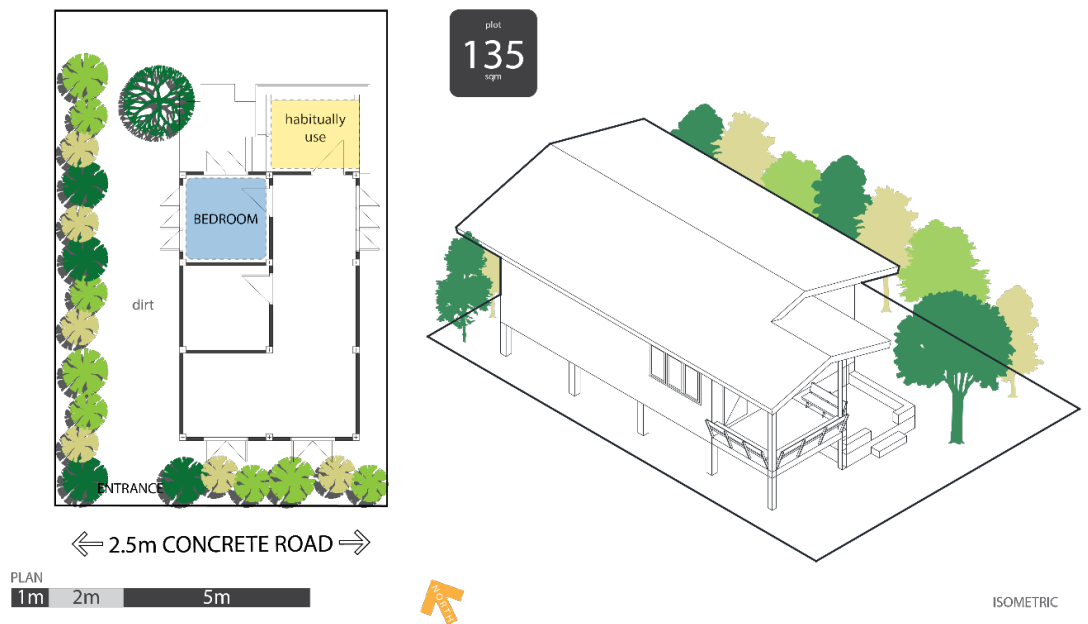


Figure 6.25: The sample of residential plot size characteristic of approximately less than 200 sq.m. (Author, 2020).

Additionally, aside from the survey results in Table 6.2, the examination of correlations between the residential plot size characteristics, the demographic, dwelling type and site characteristics showed some interesting patterns (see Table 6.1). The residential plot size characteristic was negatively associated with the site characteristics factor. There were also positive correlations between residential plot size and the demographic, dwelling and site characteristics.

From Table 6.1, there were relationships between residential plot size, demographic characteristics of mental and emotional health factors, and residential site characteristics of plot type, $r(90)$ ranged from .21 to .25, respectively, with $p < .05$. Firstly, the results show that more areas of the residential plot size are associated with the higher levels of mental and emotional health in older persons, $r(90) = .21$, $p < .05$ (see Table 6.1). Thus, these relationships may reflect that the areas or spaces of residential plot size are associated with older people's mental and emotional health.

In accordance with the present results, previous studies have demonstrated that the built environment configuration or dwelling level of architectural features is independently associated with psychological distress (Francis, Wood, Knuiman, & Giles-Corti, 2012; Sarkar et al., 2013). As noted by Francis et al. (2012), there is a positive association between mental and emotional health, low psychosocial distress and living in an environment with larger areas of residential plot size. This allows for more external areas and a higher quality of outdoor space. Supporting this idea from the in-depth interviews, some older residents mentioned the need for outdoor areas or spaces in their residential sites to enable outdoor activities, for example, noted:

... *'I need more space to do activities with the grandchildren.'* ...

... *'I need more area to do gardening and grow vegetables.'* ...

Secondly, the outcomes revealed that the greater area of the residential plot size could affect the plot type characteristics. A reasonable explanation for this may be that a bigger residential plot size area allows older residents to have a shared plot in their residential site. This would support multi-generational living arrangements, including multi-houses with a shared plot type. According to the interviews, this is exemplified in the following quote by an older resident, discussing the planning of living with the adult child in the same residential site, which represents the multi-houses with the shared plot type, for example, noted:

... *'There is another dwelling on the same site, which is currently under construction. It is for my child's residence.'* ...

Moreover, the significant positive correlation between the two variables also indicates that a relationship exists between residential plot size and dwelling size characteristics, $r(90) = .43$, $p < .01$ (see Table 6.1). This result showed that older dwellers with more residential plot sizes tend to have dwelling sizes with more spaces or areas. This finding supports evidence from earlier results and observations about the relationship between residential plot size and demographic characteristics of mental and emotional health factors. The result confirms that the residential plot size can fulfil older adults' needs for the proportions of areas or spaces with the opportunities to have more areas or spaces in their dwellings and residential sites.

The correlation analysis also indicates the strength of the negative association between the residential plot size and the site characteristic of plot coverage, $r(90) = -.59$, $p < .01$ (see Table 6.1). In general, the results show that it is less likely for older dwellers to have more plot coverage in residential sites with more areas or spaces. This relationship may reflect the effect of the outdoor areas or spaces in that older residents prefer to have more open areas or spaces for their outdoor, daily life activities or other requirements. This view was echoed in the following quote by some of the respondents, discussing the needs and effect of residential plot size with the potential for more outdoor areas or spaces in the residential site environment, for example, noted:

... 'The size of the outdoor areas gives me an incentive to go outside. Therefore, I need more garden area at the front of the residential site.' ...

It also accords with our earlier finding, which showed that more areas or spaces of outdoor spaces have a positive relationship with the mental and emotional health of elderly residents. Therefore, it is likely that the ratio of plot coverage in the residential site within the residential plot size can contribute to older adults' health and well-being and their expectations of the outdoor areas or spaces in the residential site environment.

Overall, these results indicate that most of the older adults' residential sites in the village have a plot size of approximately 400 - 800 sq.m. Only a few have plot sizes of approximately less than 200 sq.m. It is apparent from the outcomes that there are also differences concerning plot size, in that the bigger the plot size,

the more outdoor areas or spaces are available in the residential sites for older adults, as can be compared from those samples in this section (see Figure 6.17 - Figure 6.20).

Nevertheless, from examining correlations, some factors can influence or affect the residential plot size characteristics. The results suggest associations between the residential plot size and the demographic factors such as mental and emotional health with the residential site characteristics of dwelling size, plot type, and plot coverage.

The relationships between these factors can be explained by the fact that the built environment configuration at the residential site level and dwelling level of architectural features, such as residential plot size and outdoor space, are associated with mental and emotional health in older people. In addition, the residential plot size or area has also influenced the shared plot type within the residential site. This supports multi-generational living arrangements. Therefore, there is a need for effective intervention in determining the residential plot size with the residential site planning and design of the built environment or dwelling in order to achieve the goal of addressing the mental and emotional health-sustaining needs of dwellers.

4.) The outdoor areas covered in residential sites

This section deals with the percentage of outdoor residential sites covered in the land plot. Regarding the data in Table 6.2, the response options were categorised into four groups, which are: (1) less than 25 percent, (2) 25 to 49

percent, (3) 50 to 75 percent, and (4) more than 75 percent. Figure 6.26 presents the summary statistics for the percentage of outdoor areas covered in residential sites from the frequency.

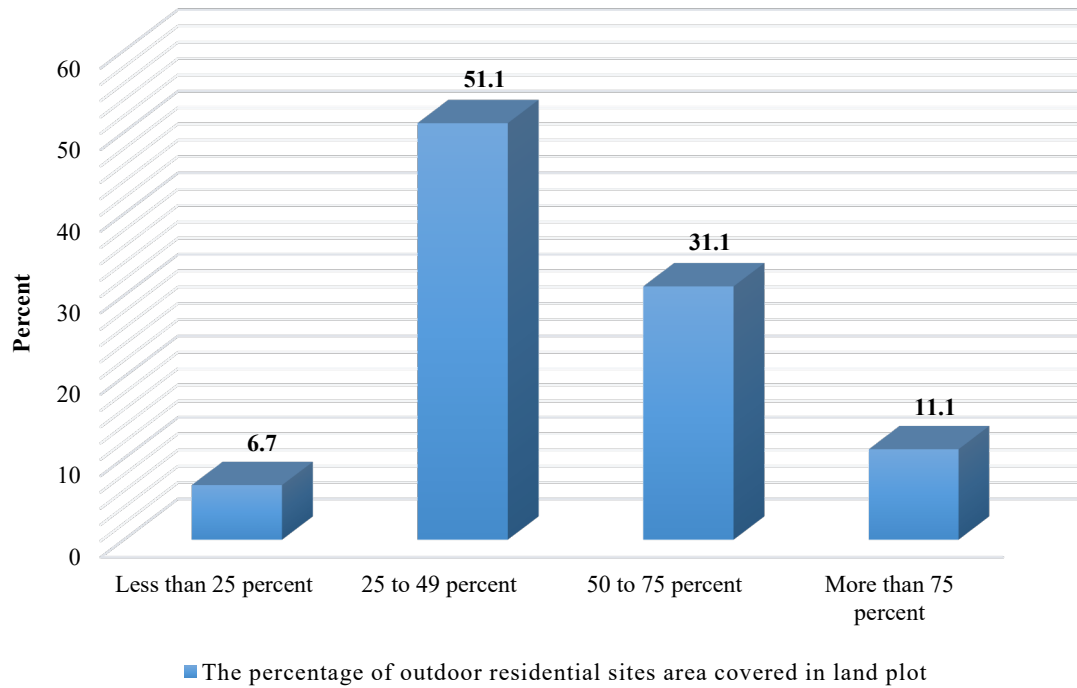


Figure 6.26: The frequency of the percentage of outdoor residential sites area covered in the land plot (Author, 2020).

From Figure 6.26, it can be seen that over half of the older adults' residential sites have the outdoor areas covered in land plots, around 25 to 49 percent of their residential sites (about 51.1 %). The figure below presents the sample of residential site characteristics with the percentage of outdoor areas covered in land plots around 25 to 49 percent.

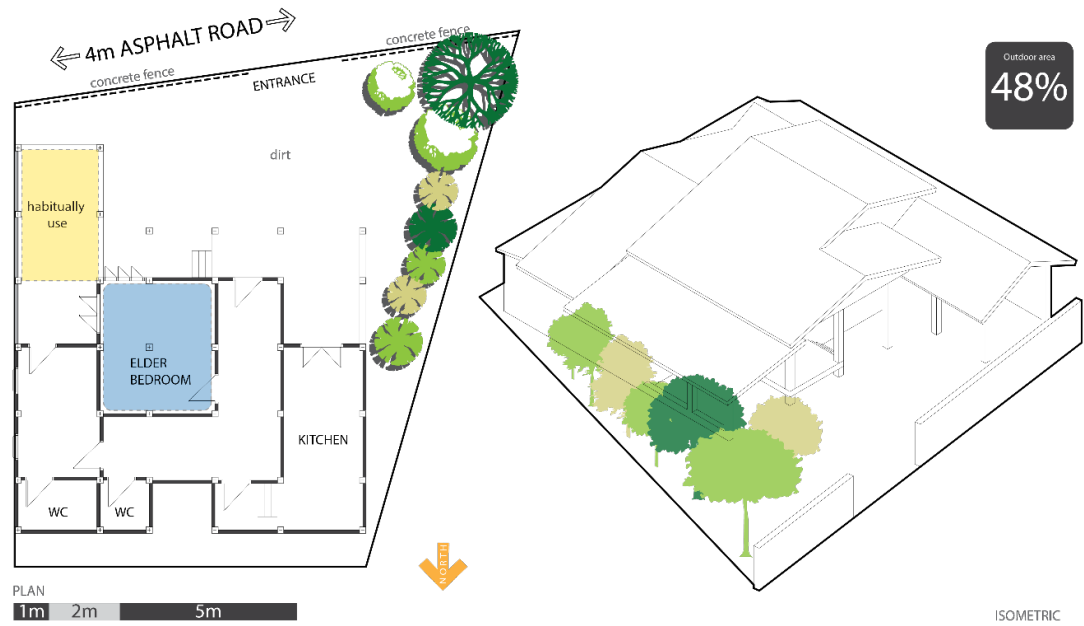


Figure 6.27: The sample of residential site characteristics with the outdoor areas covered in land plots around 25 to 49 percent (Author, 2020).

The residential site with the outdoor areas covered in land plots of around 50 to 75 percent constitutes more than 31 percent (see Figure 6.26). The sample of this residential site characteristic is presented in Figure 6.28.



Figure 6.28: The sample of residential site characteristics with the outdoor areas covered in land plots around 50 to 75 percent (Author, 2020).

The residential site with the outdoor areas covered in more than 75 percent of the land plot constitutes around 11.1 percent (see Figure 6.26). The sample of this residential site characteristic is presented in Figure 6.29.

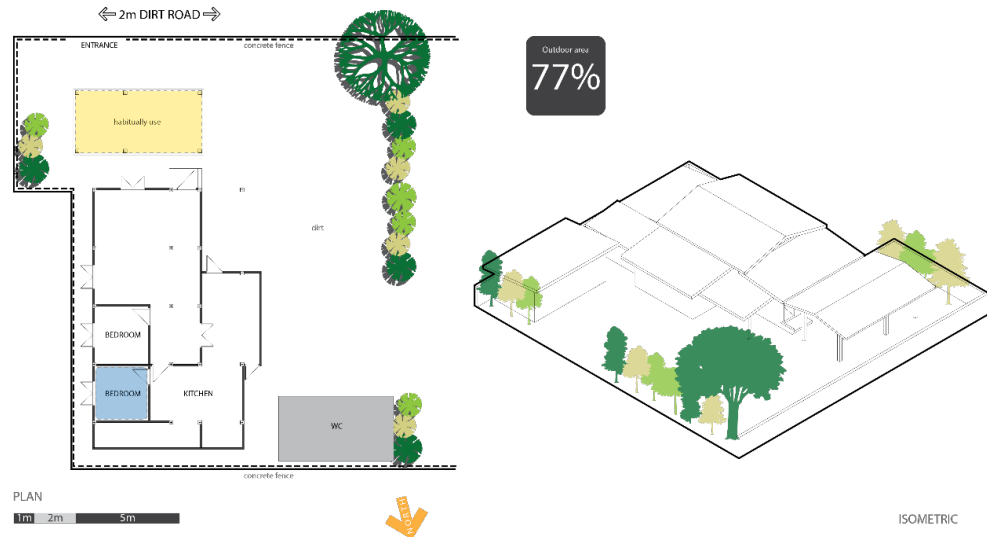


Figure 6.29: The sample of residential site characteristics with the outdoor areas covered in the land plot more than 75 percent (Author, 2020).

The residential site with outdoor areas covered in less than 25 percent of land plots constitutes around 6.7 percent (see Figure 6.26). The sample of residential site characteristics with outdoor areas less than 25 percent is presented in Figure 6.30.

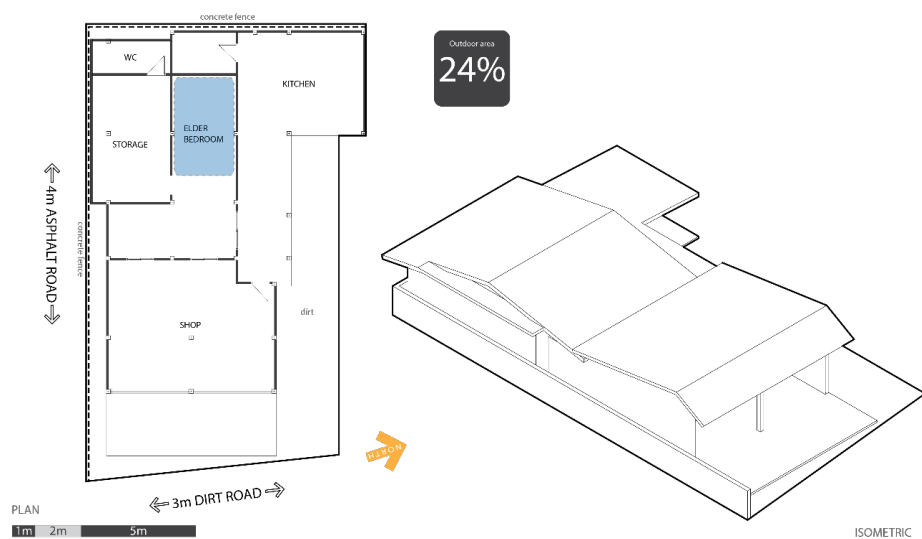


Figure 6.30: The sample of residential site characteristics with the outdoor areas covered in land plots less than 25 percent (Author, 2020).

Furthermore, the analyses revealed a correlation between the outdoor areas covered in the land plot in the residential site environments and the demographic factor (see Table 6.1). The examination showed that the outdoor areas covered in the land plot were modestly but significantly correlated to the demographic characteristic of living arrangement, $r(90) = -.22$, $p < .05$ (see Table 6.1). This result showed that solo-dwelling elders are more likely to have more of the outdoor areas or spaces covered in the land plot in the residential site environments. This is possibly because solo elderly dwellers tend to have the outdoor areas covered in their land plot more so than those residential dwellings of multi-generational families whose members include older residents.

These results corroborate the ideas of Livingston (2019), who suggested that older adults who live by themselves spent more time alone, on average, about ten and a half hours each day. This is almost twice as much time spent alone as those older residents who have multi-generation or other living arrangements. Moreover, the time spent includes all outdoor and daily life activities except those engaged in personal physical activities such as grooming. Therefore, it may be the case that the high ratio of outdoor areas covered in the land plot in their residential sites could provide the solo older adults with more outdoor areas or spaces for their time spent in outdoor and daily life activities.

In summary, it has been shown from this section that most older adults have outdoor areas covered in land plots of around 25 to 49 percent, with only a few having outdoor areas less than 25 percent of their residential sites. Interestingly, approximately 42 percent of the older people's residential sites have the outdoor areas of their land plot covered by 50 percent and above. Therefore, this part

indicates that the outdoor areas covered in the land plot for older adults may affect the characteristics of their residential sites of the areas for outdoor activities.

In addition to the findings, the outcomes showed correlations between some factors influencing the characteristics of the outdoor areas covered in the land plot in the residential site environments. The results suggest associations between the outdoor areas covered in a land plot and the demographic factor of living arrangements. It seems possible that these results are because the characteristics of living arrangements as a solo older dweller are closely associated with more time spent outdoors in the residential site. Therefore, the outdoor areas covered in the land plot can support those outdoor and daily life activities.

5.) Levels of shading of tree or canopy

This section deals with the shading of trees or canopy in residential sites. This study used the sun's position and shadow cast based on the built-in solar modelling from the 3D modelling tool in SketchUp, with the sun casting the average length of shadow during daytime. As shown in Table 6.2, the response options were categorised into four groups, which are: (1) less than 25 percent, (2) 25 to 49 percent, (3) 50 to 75 percent, and (4) more than 75 percent. Figure 6.31 presents the summary statistics for the characteristic of the levels of shading of trees or canopy in the residential sites from their frequency.

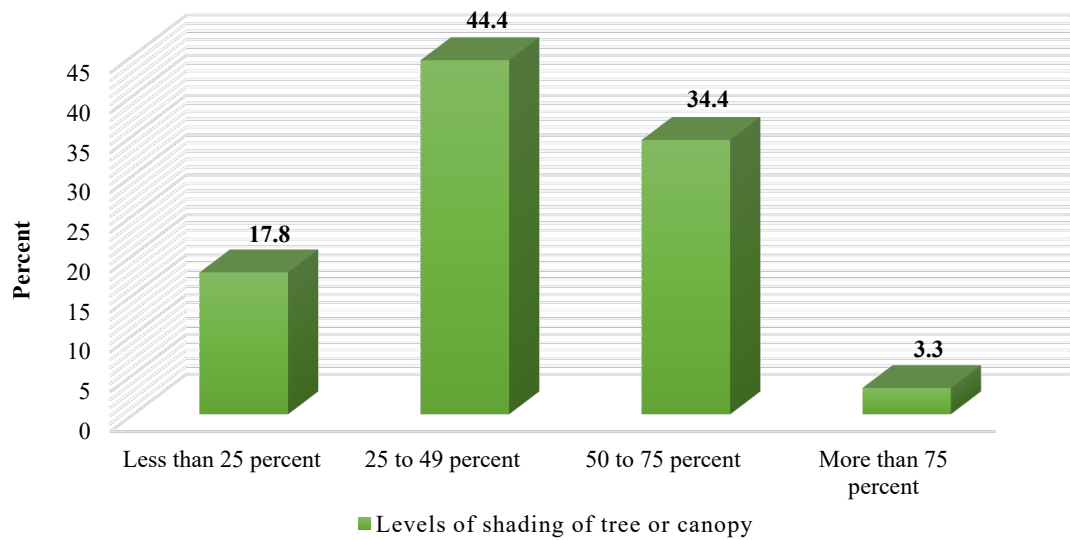


Figure 6.31: The frequency of the levels of shading of trees or canopy in the residential sites (Author, 2020).

As shown in Figure 6.31, the highest proportion for around 44 percent of the older adults' residential sites has the levels of shading of tree or canopy around 25 to 49 percent of their residential sites. The sample of this residential site characteristic is presented in Figure 6.32.

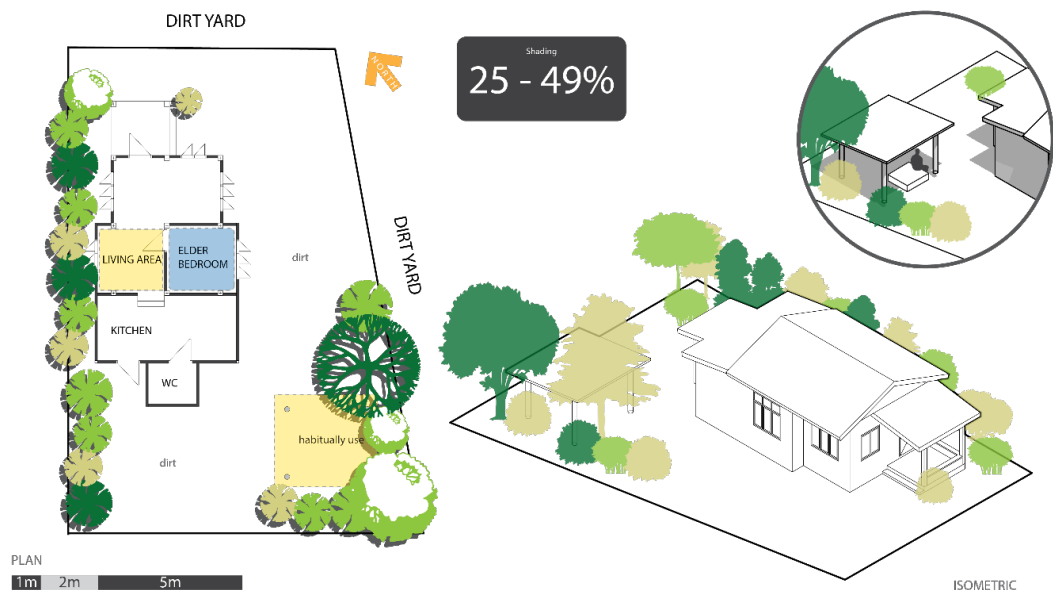


Figure 6.32: The sample of residential site characteristics with the levels of shading of tree or canopy around 25 to 49 percent (Author, 2020).

The residential sites with the levels of shading of trees or canopy around 50 to 75 percent constitute more than 34 percent (see Figure 6.31). The sample of this residential site's characteristics is illustrated in Figure 6.33.

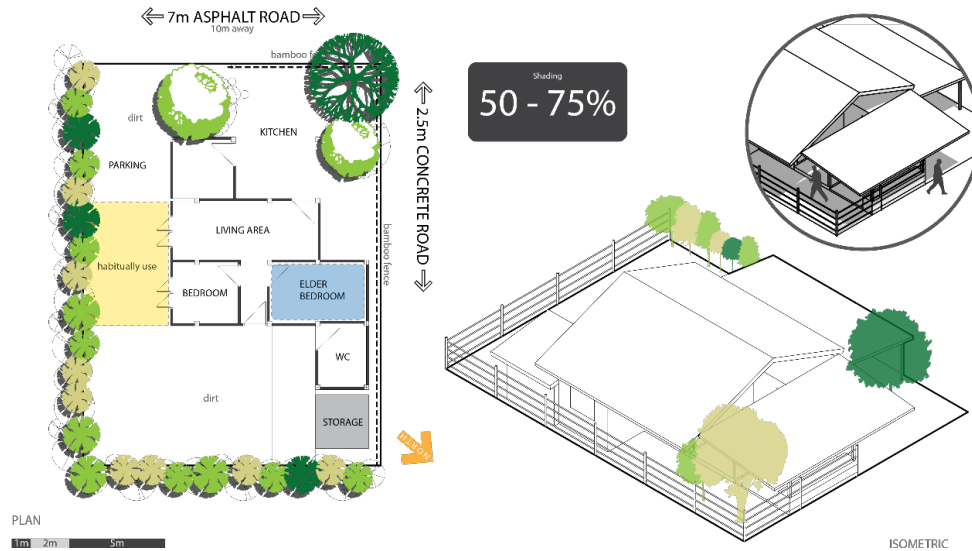


Figure 6.33: The sample of residential site characteristics with the levels of shading of tree or canopy around 50 to 75 percent (Author, 2020).

The residential sites with the levels of shading of trees or canopy less than 25 percent constitute almost 18 percent (see Figure 6.31). The sample of this residential site's characteristics is presented in Figure 6.34.

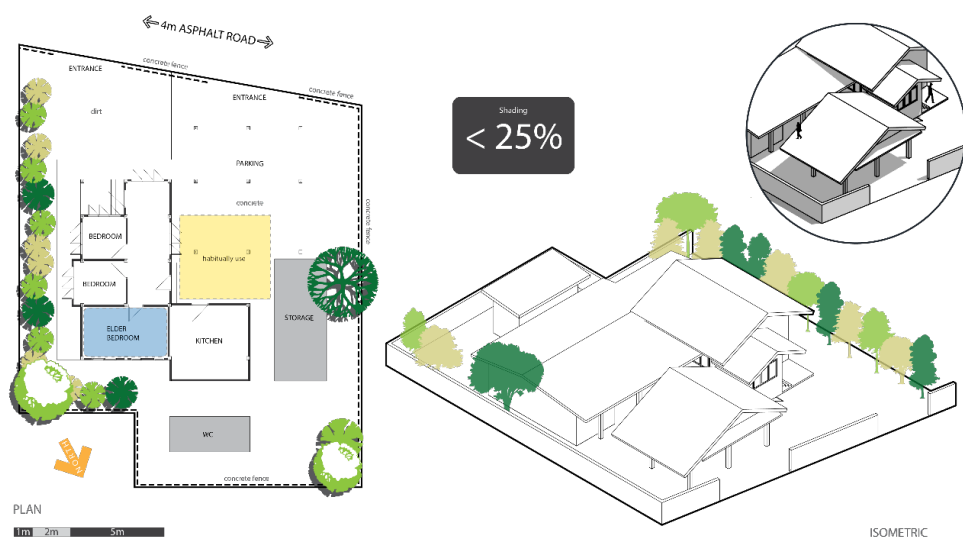


Figure 6.34: The sample of residential site characteristics with the levels of shading of tree or canopy less than 25 percent (Author, 2020).

Only a few residential sites with levels of shading of trees or canopy of more than 75 percent constitute around 3.3% (see Figure 6.31). The sample of this residential site's characteristics is illustrated in Figure 6.35.

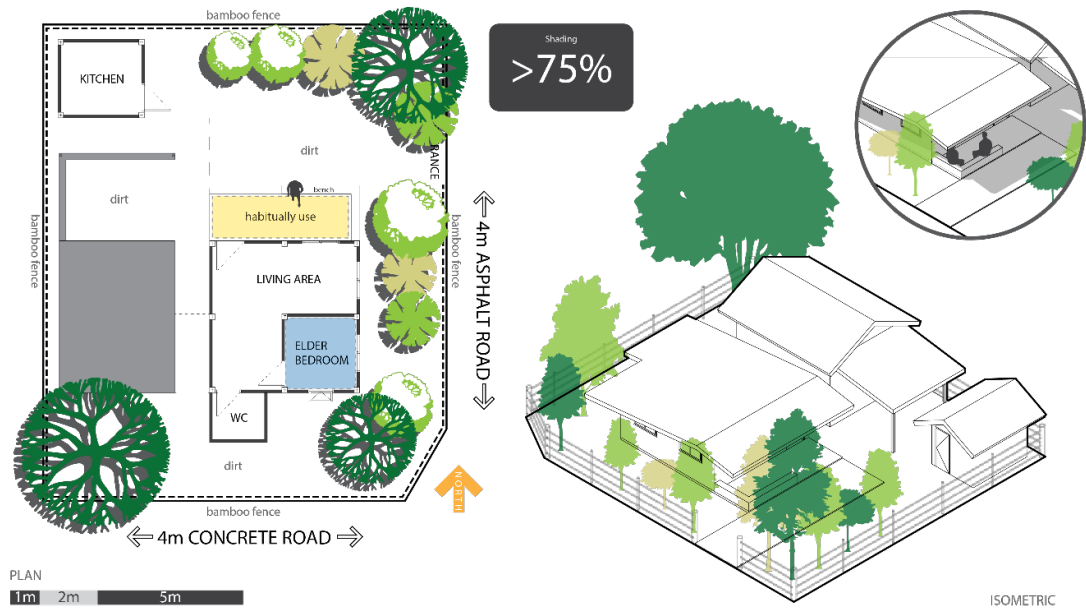


Figure 6.35: The sample of residential site characteristics with the levels of shading of tree or canopy more than 75 percent (Author, 2020).

Aside from the result from the survey in Figure 6.31, the examination of correlations between the levels of shading of trees or canopy, demographic characteristics, and the residential dwelling characteristics showed some interesting patterns (see Table 6.1). The shading of trees or canopy in the residential sites was moderate and significantly associated with demographic and residential dwelling characteristics.

From Table 6.1, the outcomes of correlation showed a moderate correlation between the levels of shading of tree or canopy with the residential dwelling characteristic factor of dwelling size, $r(90) = -.21$, $p < .05$. In general, the results

show that higher levels of shading of trees or canopy are associated with the smaller size of the residential dwellings. It is possibly because the size of the residential dwellings allows more levels of shadings from the buildings and surroundings, as presented in Figure 6.32 and Figure 6.35. Therefore, the relationship may reflect that the size of residential dwellings is associated with the levels of shading from trees or canopy in the residential sites. Consequently, the smaller size of residential dwellings has more outdoor space leaving a greater space and area for higher levels of shading from trees or canopy.

Moreover, there were also negative relationships between the levels of shading from trees or canopy and the demographic characteristics of the duration of residence, living arrangement and household size; r 's (90) ranged from $-.33$ to $-.37$, respectively, p 's $< .01$ (see Table 6.1). Thus, the results show that the higher levels of shading of trees or canopy are associated with older dwellers who are in single-person households and have a shorter duration of residence in the village. This result may be explained by the demographic factors that influence the residential site environment for those groups of older people. Furthermore, these relations affect the shading of trees or canopy related to the outcome from the previous section concerning the solo older person who spends more time in outdoor activities at the residential site.

To conclude this section, the results of this part indicate that most older adults' residential sites have levels of shading of trees or canopy around 25 to 49 percent, with only a few having more than 75 percent of their residential sites. The shading of trees or canopy may reflect the design factors of buildings and environmental features in the residential sites.

In addition to this, the findings also suggest associations between the levels of shading of trees or canopy with demographic predictors of duration of residence, living arrangement, household size of older people and the residential dwelling characteristic of dwelling size. These findings suggest that the size of the residential dwellings and the proportion of outdoor space affect the levels of shading of trees or canopy. These characteristics have a pivotal role in meeting the needs of a solo older person who spends more time in outdoor activities at their residential site.

6.) The width of the community frontage road attached to the residential site

This part deals with the width of the community frontage road attached to the residential sites. According to Table 6.2, the response options were categorised into five groups, which are: (1) less than 2 meters, (2) 2 – 2.99 meters, (3) 3 – 3.99 meters, (4) 4 - 5 meters, and (5) more than 5 meters. Figure 6.36 shows the summary statistics for the characteristics of the width of the community frontage road attached to the residential sites from their frequency.

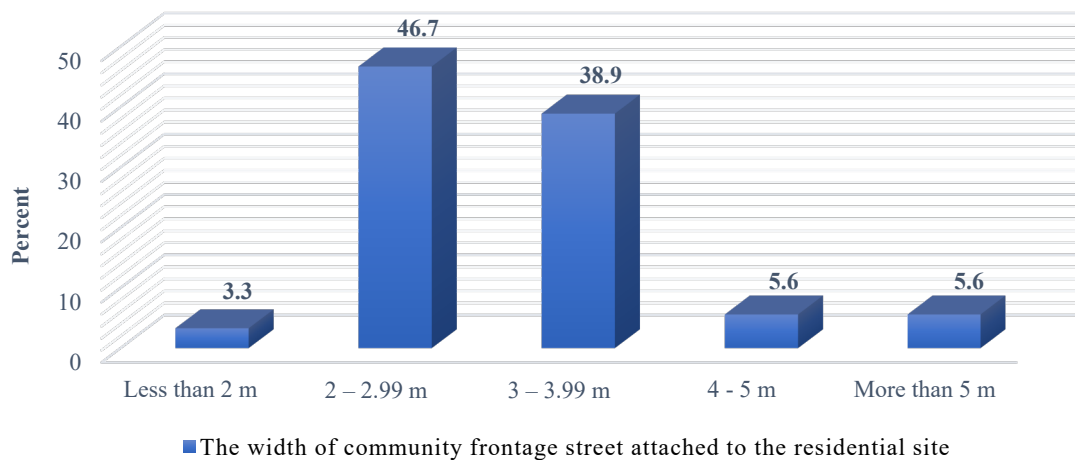


Figure 6.36: The frequency of the width of the community frontage road attached to the residential sites (Author, 2020).

From the figures above, we can see that most older adults' residential sites have a width of community frontage road attached to their residential sites, approximately 2 – 2.99 meters for over 46 percent. While the residential sites with the width of community frontage road around 3 – 3.99 meters have the proportion of almost 40 percent, the width of the road at 4 – 5 meters and more than 5 meters have the same rate at around 5.6 percent, and the width of street at less than 2 meters has only 3.3 percent. These characteristics of the width of community frontage road reveal the locations of the older adults' residential sites in the village since the width of the street greater than 5 meters is nearer the main road or the highway area, while the narrower community frontage roads are in other areas as presented in Figure 6.9.

The findings also show the relationships between the width of the community frontage road attached to the residential sites with the characteristics of demographic, social and residential site predictors (see Table 6.1). The width of the community frontage road was moderately and significantly associated with the demographic and social factors of the residential site characteristics.

According to the factors of demographic characteristics, the duration of residency was positively related to the width of the community frontage road, $r(90) = .33, p < .01$ (see Table 6.1). In general, the results show that the elderly dwellers who have a longer duration of residence tend to have their residential sites with wider community frontage roads compared to those older people who have lived in the village for a shorter period. These relationships may partly be explained by the older residents, who have a longer duration of residence, being more likely to live in the areas where they perceive a greater opportunity for walking or travelling

to other destinations if the community frontage road was wider. In accordance with the present results, a previous study has demonstrated that the size of areas or spaces occupied by frontage roads was positively associated with the perceived presence of opportunity for visiting destinations for older people in the community (Wang & Lee, 2010). These results suggest that older people's perceptions about their environments and surroundings represent the actual environmental features fairly precisely where there are wider sizes of areas or spaces of community frontage roads.

There is also a moderate positive correlation between the width of the community frontage road with the disposal income of elderly residents, $r(90) = .26$, $p < .05$ (see Table 6.1). The result suggests about the residential sites that older dwellers who have sufficient disposable income tend to have wider community frontage roads compared to those who have insufficient disposable income. This relationship may reflect the width of the community frontage road attached to the residential sites from the influence of elderly residents' disposable income.

This outcome seems to relate to further analyses of correlations which showed that there were correlations between the width of community frontage road with the areas of residential site location and the price of land, $r's(90)$ ranged from $-.53$ to $.63$, respectively, $p's < .01$ (see Table 6.1). Overall, the results show that the wider community frontage road is associated with the residential sites near the main road or highway and the higher land value estimation.

These investigations further support the idea that the areas in the residential sites which are located near the main road or highway have the

highest land value estimates and the greatest width of community frontage road of more than 5 meters. Therefore, it seems possible that these characteristics are attractive features for wealthy elders. Furthermore, these relationships may partly be explained by the street openness and pleasant view that represents the visual effect of scenic and more expansive space from the perspective of the roadway. Therefore, this can reduce stress in older adults and attract those who have sufficient disposable income (Meng et al., 2020). These findings are also consistent with data obtained in the earlier observations from the site survey and data collection (see Figure 6.9 and Figure 6.10) and evidence from the previous outcomes in this chapter.

Furthermore, the demographic characteristic of a disease or disorder status of older people was negatively and moderately associated with the width of the community frontage road, $r(90) = -.24$, $p < .05$ (see Table 6.1), which may be related to the older persons' health problems. In general, the results show that older dwellers who have the disease or disorder issues have a higher chance of living with narrower widths of community frontage roads attached to their residential site.

It is assumed that the width of the community frontage road may affect older people's physical activity, which also depends on the slowing of activities due to a gradual decline in mobility with age (Rioux & Werner, 2011). In addition, the small or narrow road space may cause unhealthy factors in the daily life of the elderly residents, such as increasing impaired cognitive function or incidence of neurological disorders resulting from the impact of noise, heavy traffic, traffic

accidents and car exhaust pollution from the congested road environment (Meng et al., 2020; Yuchi, Sbihi, Davies, Tamburic, & Brauer, 2020).

Additionally, the findings also show a relationship between the width of the community frontage road with attitudes toward residents, friends and community members as ascertained from the social predictor. The values were negatively related to the factors of attitude toward other people; r 's (90) ranged from $-.38$ to $-.51$, respectively, p 's $< .01$ (see Table 6.1). These results revealed that older residents tend to improve their attitudes toward other people, such as friends, neighbours and community members, as associated with the narrower community frontage road.

The result reflects the significant characteristic of the width of community frontage road as it can affect the attitudes toward other people, including friends, neighbours and community members. The width of the community frontage road might facilitate conviviality for older residents in meeting with others and communicating among friends, neighbours and community members. These results reflect those of Meng et al. (2020), who also found that social communication is crucial for older adults to achieve social health and community frontage road space is one of the carriers of its recognition. The community frontage road can enable older people to generate more social opportunities, thereby increasing the convenience of social interactions and connections among elders in the community. Therefore, the characteristics of the street space environment may increase the tendency of older people to participate in activities and social interactions with others.

Together these results suggest that there are associations between the width of community frontage road attached to the residential sites for older dwellers with the characteristics of demographic predictors (the duration of residence and disease or disorder status), social predictors (the attitude toward friends, neighbours, and community members) and the residential site characteristics (the areas of location and price of land).

The community frontage roads potentially affect older people's perceptions about their environment and surroundings in the community. The characteristics of the community frontage roads can reduce the sense of stress in older adults from the openness of the road and the visual effect of street view. In addition, the size of the community frontage roads could reflect older people's physical activity or mobility on the street or even support social health by enabling older people to generate more social interactions and connections among local elders in the community. However, the density of street space environment characteristics may cause unhealthy factors to the elderly residents from noise and air pollution from the street. The land value estimation and the location of the residential sites in the village are also influenced by the width of the community frontage road.

7.) The construction material of the community street attached to the residential site

This part presents the materials composing the community streets attached to the residential sites. As shown in Table 6.2, the response options of street materials were categorised into three groups, which are: (1) cement concrete, (2)

asphalt, and (3) compact dirt. Figure 6.37 illustrates the summary statistics for the characteristics of the width of the community frontage road attached to the residential sites from the frequency.

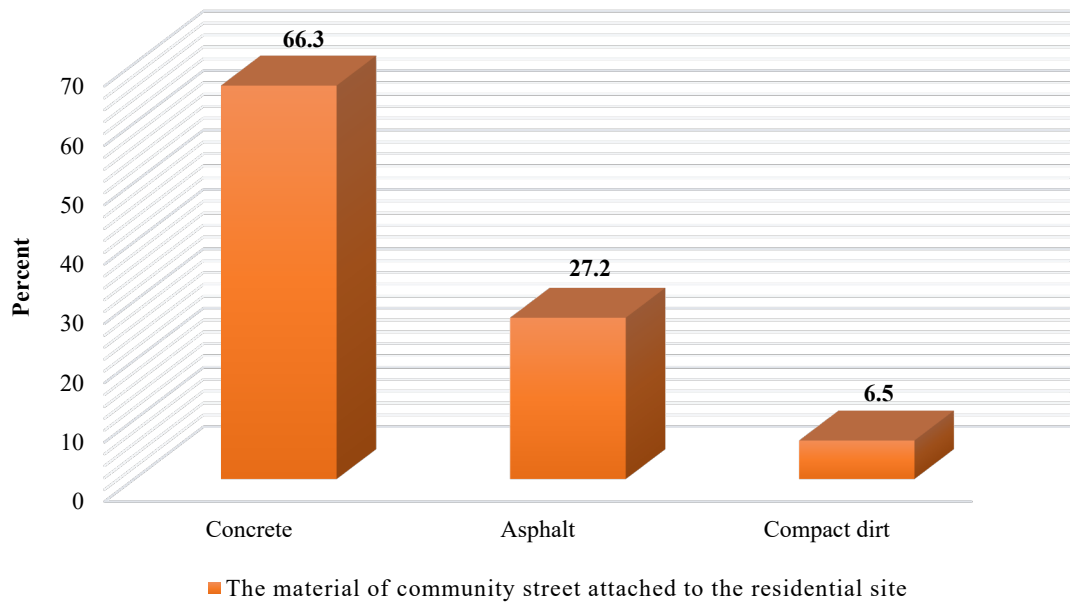


Figure 6.37: The frequency of the material of community streets attached to the residential sites (Author, 2020).

As shown in Figure 6.37, most of the material of the community street attached to the residential sites is cement concrete for over 66 percent. The other materials of community streets attached to the residential sites are asphalt for around 27 percent and compact dirt at 6.5 percent. Furthermore, the findings from the correlation analyses indicated that the materials of community streets attached to the residential sites revealed associations with the characteristics of demographic, social, and residential site factors (see Table 6.1).

From Table 6.1, the demographic characteristics of disposable income were negatively related to the asphalt surfaced community street, $r(90) = -.23$, $p < .05$,

and the compact dirt surfaced community street was modestly but significantly correlated, $r(90) = .27, p < .05$. In general, the results show that older dwellers who have insufficient disposable income tend to live in the areas where the material of community streets attached to their residential sites is compact dirt compared to those who have just enough or sufficient disposable income. Alternatively, the asphalt surfaced community streets tend to be applied to the areas where elderly residents have sufficient disposable income.

The outcomes of the association to disposable income may also relate to the price of land and street width, as occurred in previous sections in this chapter. According to the findings, which also show that the cost of land was modestly but significantly correlated to the cement concrete surfaced community street, $r(90) = -.24, p < .05$ and the asphalt surfaced community street was associated considerably, $r(90) = .41, p < .01$ (see Table 6.1). Overall, the results show that the higher price of land has more potential to have asphalt surfaced community streets attached to the residential sites. In comparison, the lower land price mostly has cement concrete surfaced community streets.

Additionally, the findings also show the relationship of the material of community streets attached to the residential sites with the characteristics of street width. The values of street width was positively related to asphalt surfaced community street, $r(90) = .53, p < .01$ and the cement concrete surfaced community street was significantly correlated, $r(90) = -.38, p < .01$ (see Table 6.1). Overall, the results show that the material of community streets attached to the residential sites with a width of the street more than 5 meters are mostly asphalt surfaced. Differing from the community street surface of cement concrete

material which is more likely to be applied to the community street of fewer than 2 meters width.

These relationships may reflect the characteristics of the materials of community streets attached to the residential sites from the influence of elderly residents' disposable income, the price of land, and street width. This result can be explained by the previous findings in this chapter that the road with a well-maintained and durable street is costly and requires high maintenance, affecting the land cost in different locations (Dae Young, 2018). Therefore, the older residents' disposable income, especially those with sufficient income, could be attributed to residential sites with higher land value estimation. As a result, the streets have the most space with well-maintained and durable qualities in the community.

Moreover, the values of the physical health in older adults were significantly related to the cement concrete surfaced community street, $r(90) = -.31$, $p < .01$, and the compact dirt surfaced community street was modestly but significantly correlated, $r(90) = .22$, $p < .05$ (see Table 6.1), which may be related to older adults' physical health issues. In general, the results show that compact dirt surfaced community street is associated with older residents with very good physical health. In contrast, the cement concrete surfaced community street relates to the low level of physical health.

These results suggest that the materials of community streets attached to the residential sites influence the physical health of older adults. According to the relationships, there are some possible explanations for this result. The exposures

may partly explain the relationships between the community street surface's thermal comfort and air pollution as potential risk factors. According to Jiang, Huang, and Sha (2018), the street surface of cement concrete and asphalt became the main types of high-grade road materials and the vital source of traffic-related air pollution. According to some elderly residents mentioned the negative impact of the material of the community street attached to the residential site, for example, noted:

... *'There is some air pollution from the community street at the front
of the residential site.'* ...

Exposure to air pollution, particularly in long-term conditions, appears to have multiple adverse health effects in older adults, including increased risks for cardiovascular and respiratory disease (Weuve et al., 2016; Yuchi et al., 2020). Apart from this, the temperature of the street material of cement concrete and asphalt street surface rise rapidly under solar radiation, which is significantly higher than that of engineered natural surface, such as compact dirt surface (Yuchi et al., 2020). For this reason, the potential temperature effect from the community street surfaces may have influenced the heat and thermal comfort of the residential sites nearby and the older residents. Therefore, heat and thermal comfort conditions are identified as a risk for morbidity and mortality and are most likely to change how older adults engage in their physical daily life activities (Clarke, Yan, Keusch, & Gallagher, 2015).

In addition to the attitudes toward other people from the social predictors, the cement concrete surfaced community street was positively related to the

attitude toward community members, $r(90) = .32, p < .01$, and the asphalt surfaced community street was modestly but significantly correlated, $r(90) = -.22, p < .05$. As well as that, the cement concrete surfaced community street was modestly but significantly related to the attitude toward friends, $r(90) = .25, p < .05$ (see Table 6.1). Thus, the relationship between the material of the community street attached to the residential sites and the social predictors indicated a pattern in which higher levels of interaction toward friends, neighbours and community members are associated with the cement concrete surfaced community street. In contrast to this, the asphalt surfaced community street is associated with lower levels of interaction toward community members.

Overall, the results show that higher levels of social attitudes toward other people, friends, neighbours, and community members are associated with the materials of community streets, especially those roads with cement concrete surfaces. These results are consistent with data obtained in the earlier findings on the width of the community frontage road. Furthermore, the section mentioned earlier has demonstrated that cement concrete surfaced community street is more likely to be applied to the least space width community street. In contrast, asphalt surfaced roads have the greatest width of the road in the community. Therefore, it can be suggested that this characteristic of the materials of community streets attached to the residential sites influences the street space. These characteristics also lead to positive consequences to generate more social opportunities and increase the convenience of social interactions and connections among friends, neighbours, and local members of the community.

In summary, the results in this section provide essential insights into the physical environmental features of residential sites. The majority of the residential sites have the plot type of shared plot with a plot size of 400 - 800 sq.m. The percentage of outdoor residential sites covered in the land plot has the highest proportion of 25 percent to 50 percent. Most of those outdoor areas have levels of shading of trees or canopy at 25 percent to 50 percent. Over half of residential sites have plot coverage below 25 percent. Most of the community frontage streets attached to the residential sites are made of cement concrete with a width of approximately 2 - 2.99 meters.

Apart from this, these results suggest that there are associations between the material of community streets attached to the residential sites and for older residents with the characteristics of demographic predictors (disposable income and physical health), social predictors (the attitude toward friends, neighbours, and community members) and the residential site characteristics (the price of land and street width).

Overall, these results indicate that older residents' disposable income could be attributed to the characteristics of residential sites with land value estimation and with the space and material quality of the streets in the community. The characteristic of community street materials attached to the residential sites influences the street space and potentially results in more social interactions and connections among friends, neighbours and community members. However, the materials of community streets attached to the residential sites influence the risks of physical health effects in older adults, such as cardiovascular and respiratory

disease from exposure to air pollution and a chance for morbidity and mortality from the heat and thermal comfort conditions.

6.3.2 Residential dwelling level

The physical environmental features of residential sites at the dwelling level have issues related to six factors. There are assessments of dwelling characteristics, including dwelling type, dwelling size, dwelling height (storeys), dwelling orientation toward the frontage road, dwelling construction types and the material of surroundings adjacent to the dwelling. Table 6.3 presents an overview of all variables of residential sites' characteristics and physical environmental features at the residential dwelling level.

Table 6.3

Characteristics and physical environmental features of residential sites at residential dwelling level from fieldwork observation used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).

Variable	Level / Categories	N	Percent
1. Dwelling type	Single house	60	66.7
	Multi-houses	30	33.3
2. Dwelling size	Less than 100 sq.m.	31	34.4
	100 - 199 sq m.	43	47.8
	200 - 300 sq m.	11	12.2
	More than 300 sq m.	5	5.6
3. The height of the dwelling (storeys)	One	67	74.4
	Two	21	23.3
	Three	2	2.2
4. Dwelling orientation toward the frontage road	The long side of the dwelling is parallel	34	37.8
	The short side of the dwellings is parallel	56	62.2

Table 6.3 (Continued)

Characteristics and physical environmental features of residential sites at residential dwelling level from fieldwork observation used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).

Variable	Level / Categories	N	Percent
5. The dwelling construction types	Masonry	27	29.8
	Wooden	10	11.3
	Semi-wooden	34	37.9
	Other	19	21.0
6. The material of surroundings adjacent to the dwelling	Cement concrete	32	35.9
	Grass	14	15.8
	Ground	38	42.4
	Other	6	6.0

1.) The dwelling types

This part presents the dwelling types in the residential sites. According to Table 6.2, the response options were categorised into two groups: (1) single houses and (2) multi-houses. Figure 6.38 shows the summary statistics for the characteristics of the dwelling types in the residential sites from the frequency.

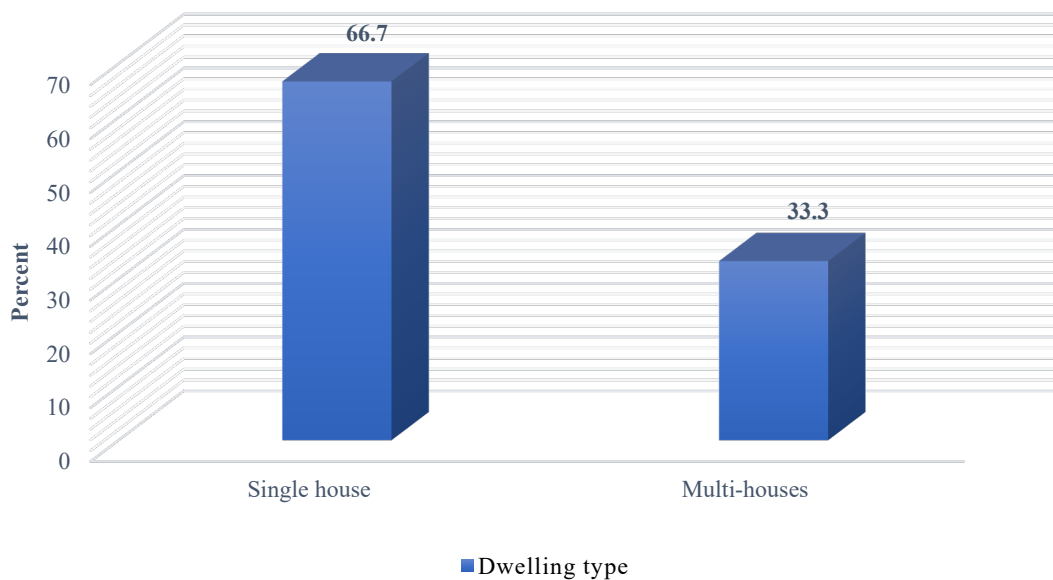


Figure 6.38: The frequency of the dwelling type in the residential sites (Author, 2020).

As shown in Figure 6.38, the highest proportion for more than 66 percent of the older adults' residential sites has the dwelling type of single house. Figure 6.39 illustrates the sample of the dwelling type of single house characteristics.

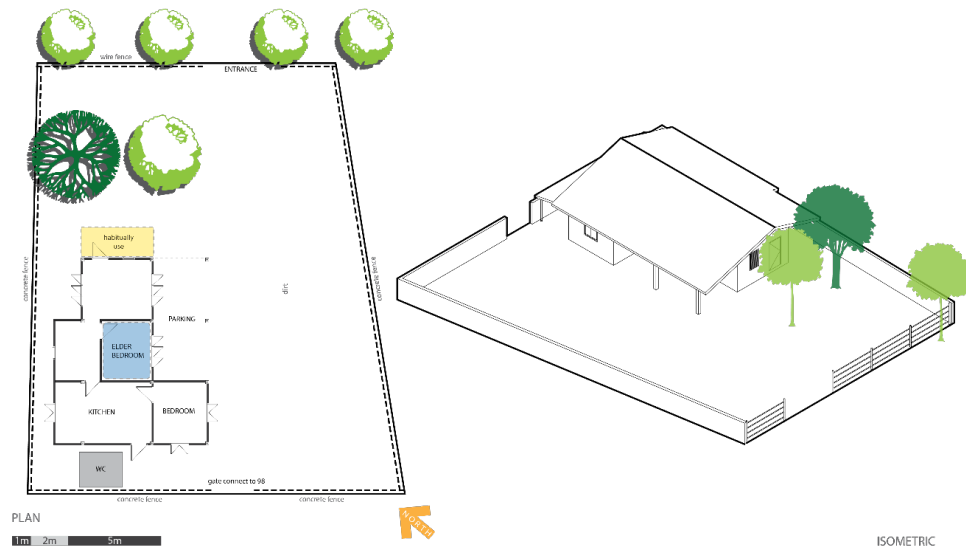


Figure 6.39: The sample of residential dwelling characteristics with the single house (Author, 2020).

The residential sites of older adults with the dwelling type of multi-houses constitute around 33 percent. The sample of this residential site's characteristics is presented in Figure 6.40.

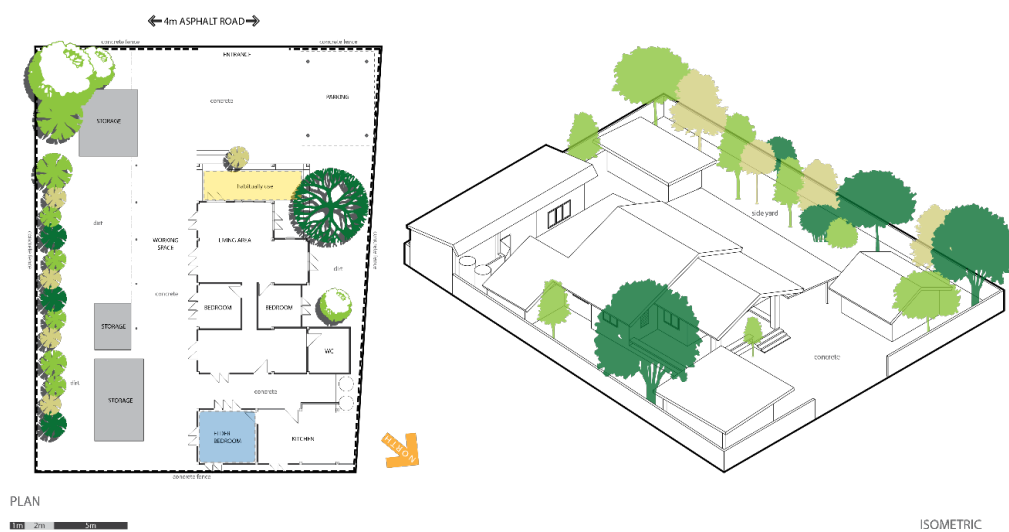


Figure 6.40: The sample of residential dwelling characteristics with the multi-houses (Author, 2020).

Further analyses showed the relationship of the dwelling types with the factors of residential site characteristics by examining correlations (see Table 6.1). The dwelling type was positively related to the residential site factor of plot type, $r(90) = .25$, $p < .01$ (see Table 6.1). This result revealed that the residential dwelling characteristics of the multi-houses are associated with the shared plot type. The correlation between the dwelling type and the plot type also accords with the earlier findings (see chapter 6, section 6.3.1), which further supports the idea of multi-generational living characters. The residential site with the multi-houses in a shared plot mostly has intergenerational households, including two or more generations of the same family within the same residential sites, typically seen in Asian countries (Enfield Council & Metropolitan Thames Valley, 2020; Teerawichitchainan et al., 2015).

Moreover, the dwelling types in the residential sites were modestly but significantly correlated with the plot coverage, $r(90) = .29$, $p < .05$ (see Table 6.1). In general, the results show that a higher percentage of plot coverage is associated with the dwelling type of multi-houses. These relationships reflect that the multiply occupied dwellings or buildings in the residential site take up more space of plot coverage.

In summary, the results show that most of the older adults' residential sites in the village have the dwelling type of single house rather than multi-houses. Comparing the two results of the dwelling types reveals that this finding is contrary to previous results, which have suggested that most of the characteristics of the residential site of plot types are shared plots. However, the dwelling types in the residential sites can impact some characteristics of the residential sites. This study

indicates that the association of the residential site characteristics' factors, such as the plot type and plot coverage, are often moderated by the dwelling types in those residential sites.

2.) The dwelling sizes

This section presents the dwelling size in the residential sites. According to Table 6.2, the response options were categorised into four groups, which are: (1) less than 100 sq.m., (2) 100 - 199 sq.m., (3) 200 - 300 sq.m., and (4) more than 300 sq.m. Figure 6.41 shows the summary statistics for the dwelling size characteristics in the residential sites from the frequency.

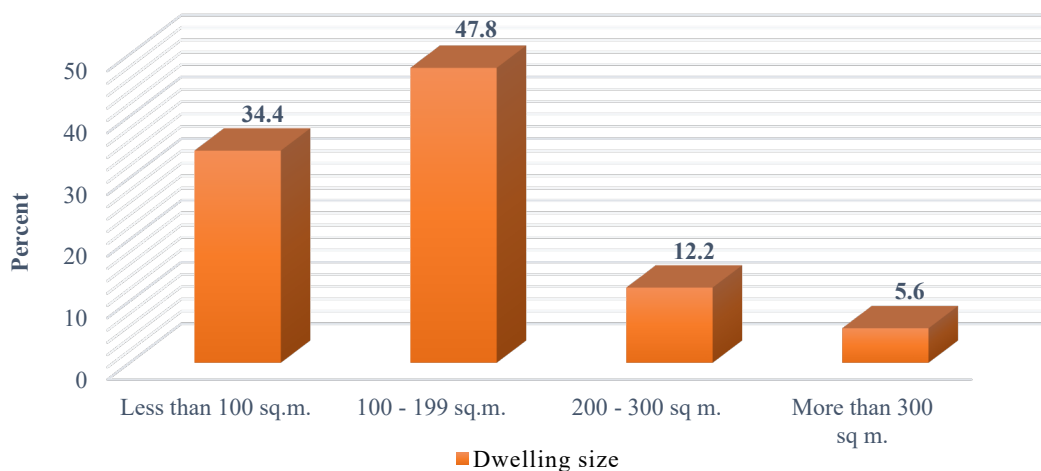


Figure 6.41: The frequency of the dwelling size in the residential sites (Author, 2020).

From Figure 6.41, the highest proportion for almost 48 percent of the older adults' residential sites has a dwelling size of approximately 100 - 199 sq.m. As shown in Figure 6.43, the sample of the characteristics of dwelling size is approximately 100 - 199 sq.m.

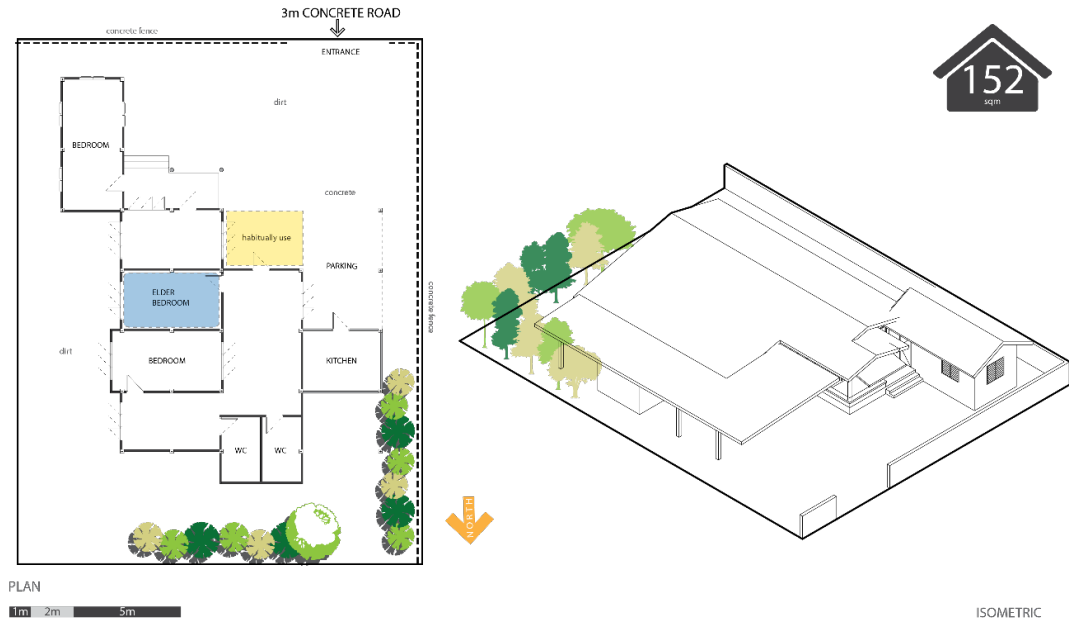


Figure 6.42: The sample of residential dwelling characteristics with the dwelling size of 100 – 199 sq.m. (Author, 2020).

The residential sites with a dwelling size of approximately less than 100 sq.m. constitute around 34 percent (see Figure 6.41). The sample is presented in Figure 6.43.

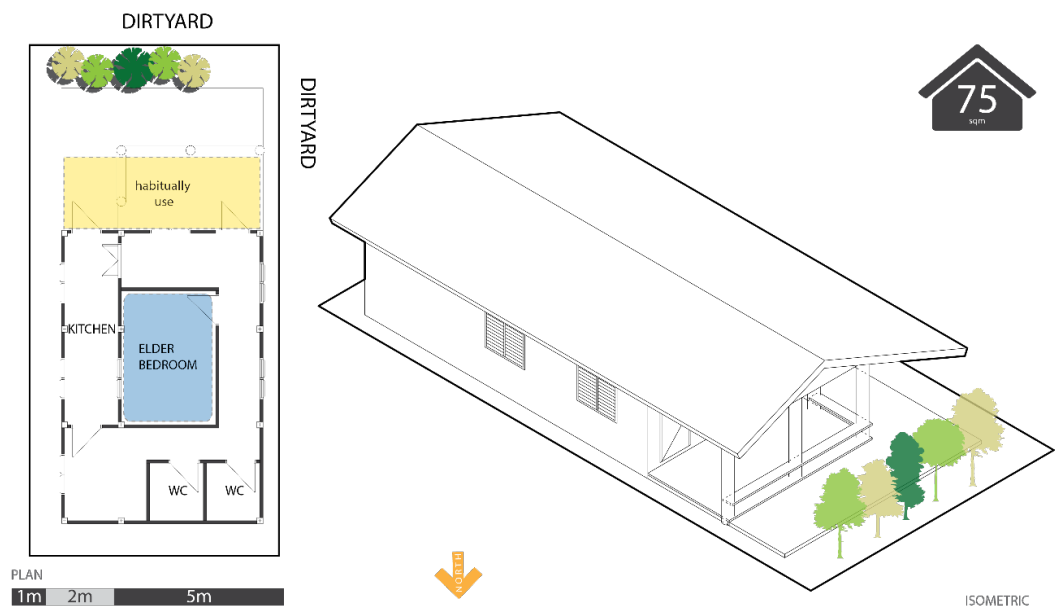


Figure 6.43: The sample of residential dwelling characteristics with a dwelling size of less than 100 sq.m. (Author, 2020).

The residential sites with a plot size of about 200 - 300 sq.m. constitute around 12.2 percent (see Figure 6.41). The sample is presented in Figure 6.44.

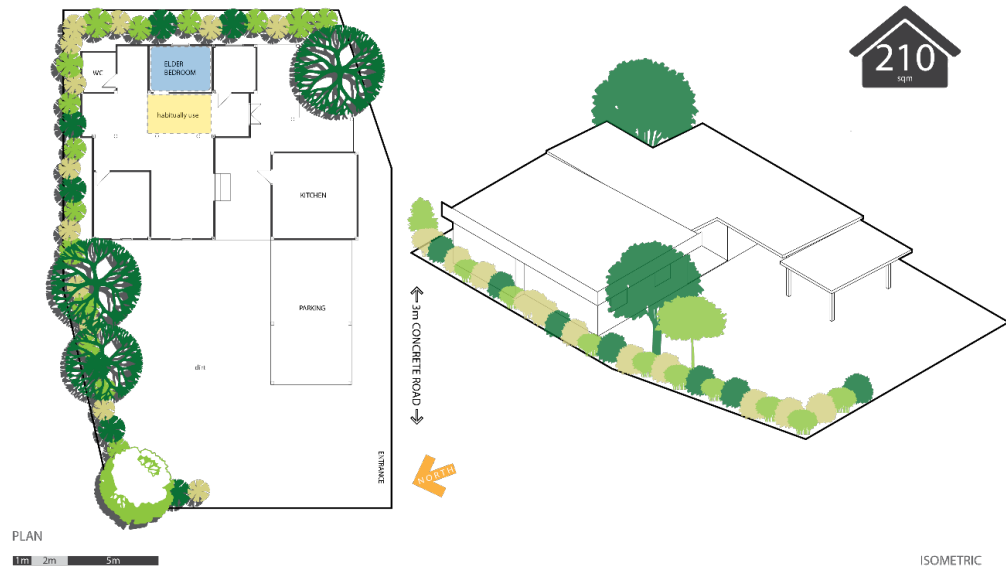


Figure 6.44: The sample of residential dwelling characteristics with a dwelling size of 200 - 300 sq.m. (Author, 2020).

Only a few residential sites have a dwelling size of approximately more than 300 sq.m. (around 5.6%, see Figure 6.41). The sample of the characteristics is presented in Figure 6.45.

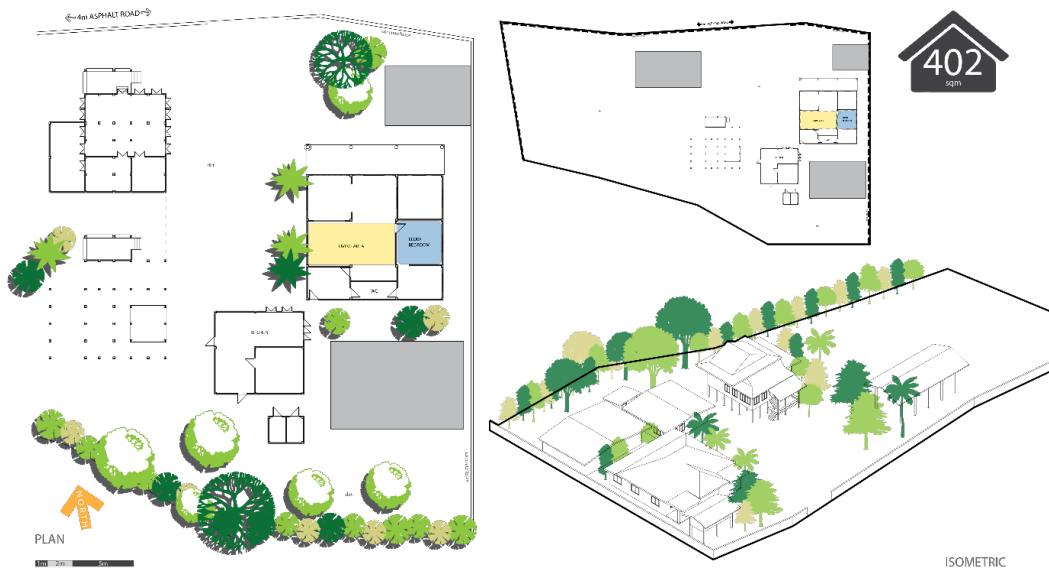


Figure 6.45: The sample of residential dwelling characteristics with a dwelling size of more than 300 sq.m. (Author, 2020).

Apart from this, the outcomes from the correlation analysis indicated that the residential dwelling characteristics of the dwelling size revealed the associations with the characteristics of demographic and social factors of older adults, as shown in Table 6.1.

It can be seen from the data in Table 6.1 that the demographic characteristics of marital status were negatively related to the dwelling size, $r(90) = -.29$, $p < .01$. After interpreting the data, the results show that the married older dwellers live in a larger dwelling size than those currently not married elders. The result is likely to be related to the characteristics of elderly married persons who tend to have a more prominent family or multi-generational living. Therefore, the elderly married people may live in the multi-houses that require more dwelling sizes.

This information infers that older adults' married status influences the dwelling size with the potential of multi-generational living arrangements in the residential sites. In accordance with the present results, previous studies have demonstrated that the average household size is influenced by marriage patterns in older adults (Yumiko & Sara, 2020). Multi-generational living or co-residence is an efficient way for married older persons and family members to support each other and permits them to combine household resources. It also leads to more companionship, a higher economy of scale and the introduction of multi-houses or expanding dwelling sizes (Yumiko & Sara, 2020; Zueras et al., 2020).

There were also positive correlations between the dwelling size with living arrangement and disposable income of older adults, r 's(90) ranging from .28

to .40, p 's < .01 (see Table 6.1). In general, the findings show that older people who have multi-generational living arrangements with sufficient disposable income are associated with a dwelling size with more areas or spaces, especially dwelling size of more than 300 sq.m.

It is possible because the elderly dwellers with more family members require more areas or spaces of the dwelling size than those solo dwellers. Moreover, it is assumed that the elderly dwellers, who have sufficient disposable income, prefer to have large dwelling sizes to satisfy their need for indoor areas or spaces. These relationships may reflect the characteristics of the dwelling size in the residential sites and be influenced by the elderly residents' living arrangements, household size and disposable income.

Moreover, the findings also show the relationship of the dwelling size with the positive attitudes toward friends and family members among older people from the social predictor. Again, the values were modestly but significantly correlated to the dwelling size; r 's (90) ranged from -.21 to .24, respectively, p 's < .05 (see Table 6.1). These results suggest that the dwelling size with more areas is associated with higher positive attitudes toward family members but lower for friends.

These relationships may reflect that the dwelling size is associated with positive attitudes toward other people resulting from social contact with friends and family members. A possible explanation might be that the dwelling size provides more private spaces and areas to engage in social activities with family members rather than with friends. As noted by Pain (2005), which aforementioned

co-residence in another section, the intergenerational relationship between older adults and their family members in multi-generational living arrangements is a part of the social identity.

Overall, the results in this part indicate that most of the older adults' residential sites in the village have a dwelling size of approximately 100 - 199 sq.m. Only a few have dwelling sizes around more than 300 sq.m. However, some factors can affect the residential dwelling characteristics of the dwelling size. This study indicates that the association of the dwelling size is often moderated by factors such as demographic predictors (the marital status, disposable income and living arrangement) and social predictors (the attitude toward friends and family members). Overall, these results suggest that marriage patterns influence the dwelling size in the residential sites in older adults, with the associations of resources, companionship, and economy from the multi-generational living arrangements. Nevertheless, the household and dwelling size could affect social contact and relationships with friends and family members.

3.) The height of the dwelling

This part deals with the height of dwellings in the residential sites. According to Table 6.2, the response options of the dwellings' height were categorised into three groups, which are: (1) one storey, (2) two storeys, and (3) three storeys. Figure 6.46 shows the summary statistics for the characteristics of the height of dwellings in the residential sites from the frequency.

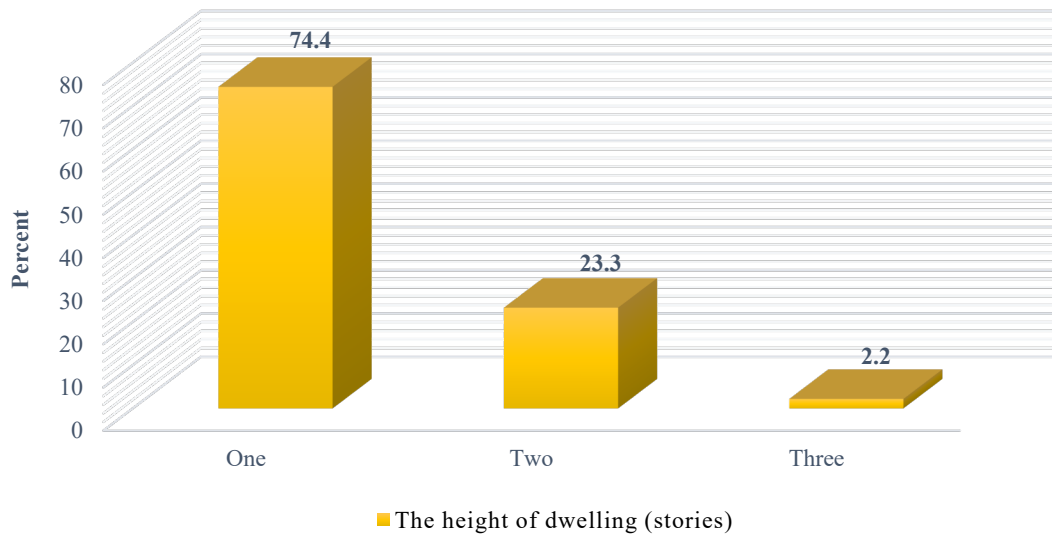


Figure 6.46: The frequency of the height of the dwelling (storeys) (Author, 2020).

It can be seen from the data in Figure 6.46 that the highest proportion of around 74 percent of the older adults' residential sites has a height of dwelling of one storey. The sample of residential site characteristics with the height of dwelling of one storey is shown in Figure 6.47.

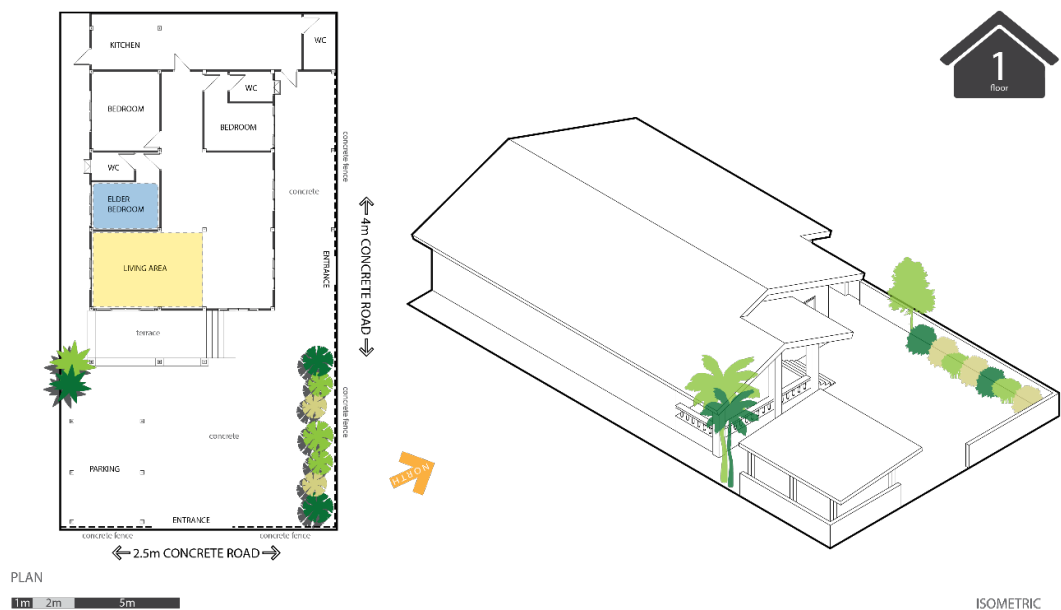


Figure 6.47: The sample of residential dwelling characteristics with the height of dwelling of one storey (Author, 2020).

The residential sites with the dwelling characteristics of two storeys constitute around 23 percent (see Figure 6.46). The sample is presented in Figure 6.48.

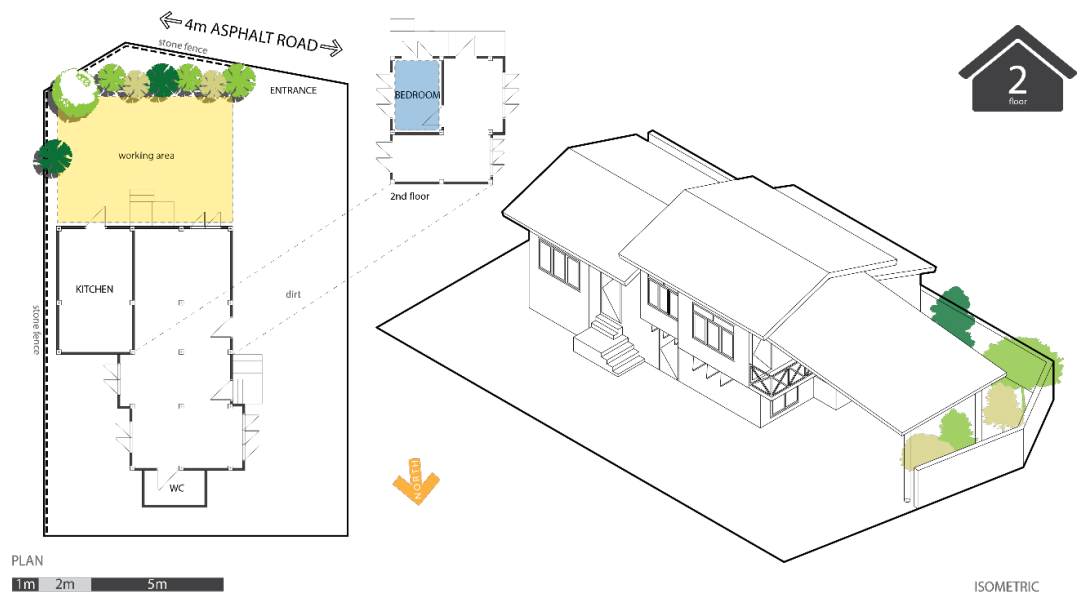


Figure 6.48: The sample of residential dwelling characteristics with the height of the dwelling of two storeys (Author, 2020).

Only a few residential sites have a dwelling with three storeys (around 2.2%, see Figure 6.46). The sample is presented in Figure 6.49.



Figure 6.49: The sample of residential dwelling characteristics with the height of the dwelling of three storeys (Author, 2020).

Furthermore, the analyses revealed a correlation between the residential dwelling characteristic of the height of the dwelling and the dwelling size factor (see Table 6.1). The examination showed that the height of the dwelling was significantly correlated to the dwelling size, $r(90) = .43$, $p < .01$ (see Table 6.1). This result showed that the height of the dwelling is associated with a greater area of dwelling size. This is possible because the more storeys the dwelling has, the more the area of the dwelling size in total.

In summary, these results reveal that most of the older adults' residential sites in the village have a height of dwelling of one storey with only a few dwellings of three storeys. In addition to the findings, the correlation outcomes indicated some factors that can influence dwelling height in residential site environments. The results suggest associations between the height with the size of the elderly's dwelling. This result may be explained by the fact that one-storey dwellings are more popular for older adults, possibly because of their health conditions or declining capacity. These results reflect those of Christ (2019), who also found that a one-floor dwelling was one of the desired features most strongly associated with ageing in place, mainly because health and mobility problems in older persons need addressing in the design of the environments they inhabit.

4.) The dwelling orientation toward the frontage road

This part deals with the dwelling orientation toward the frontage road of the residential sites. According to Table 6.2, the response options of the dwelling orientation were categorised into two groups: (1) the long side of the dwelling is

parallel, and (2) the short side of the dwelling is parallel toward the frontage road. Figure 6.50 shows the summary statistics for the characteristics of the dwelling orientation toward the frontage road from the frequency that it occurs.

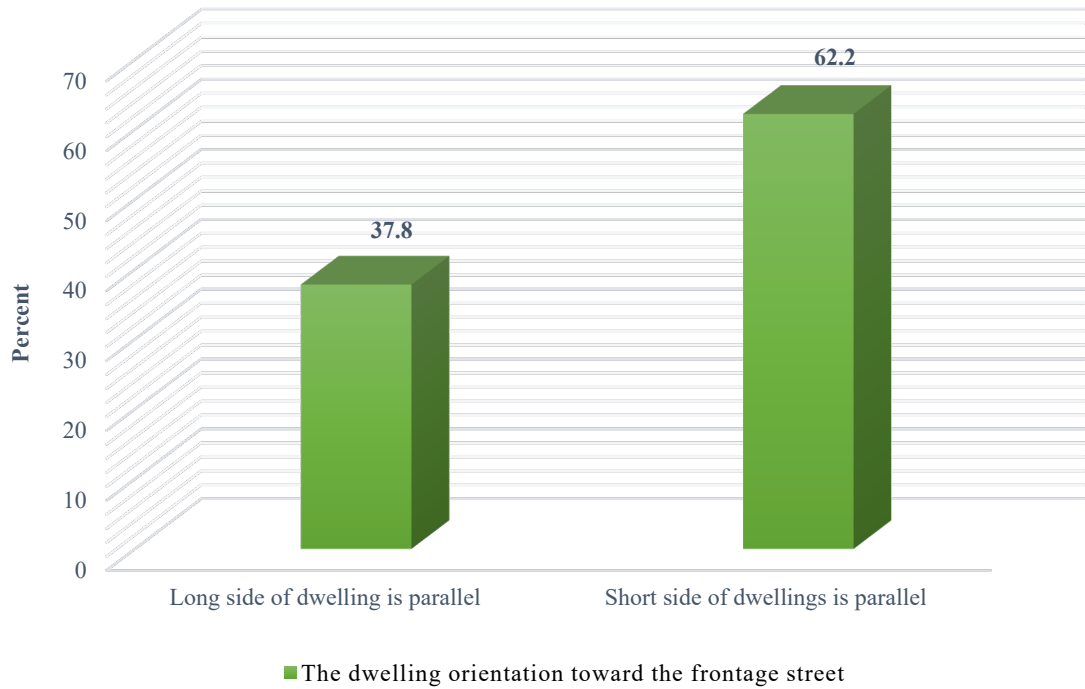


Figure 6.50: The frequency of the dwelling orientation toward the frontage road (Author, 2020).

The figure above shows that the highest proportion of more than 62 percent of the older adults' residential sites has the orientation of the short side of dwellings parallel toward the frontage road. The sample of residential site characteristics with the short side of the dwelling parallel to the frontage road is illustrated in Figure 6.51.

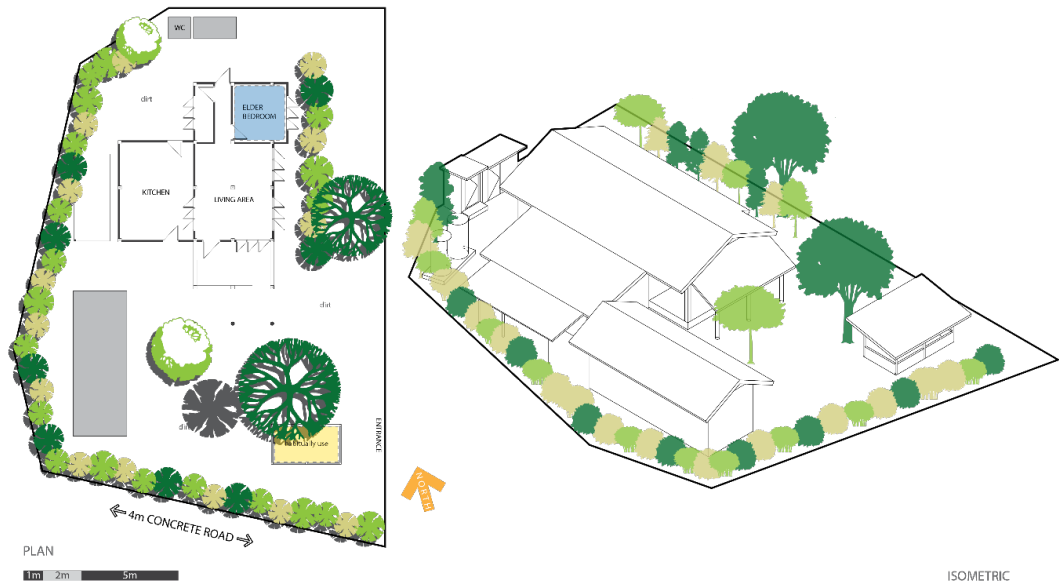


Figure 6.51: The sample of residential dwelling characteristics with the short side of the dwelling parallel to the frontage road (Author, 2020).

Around 38 percent of the residential sites have the long side of the dwelling parallel to the frontage road (see Figure 6.50). The sample of residential site characteristics with the long side of the dwelling parallel to the frontage road is illustrated in Figure 6.52.

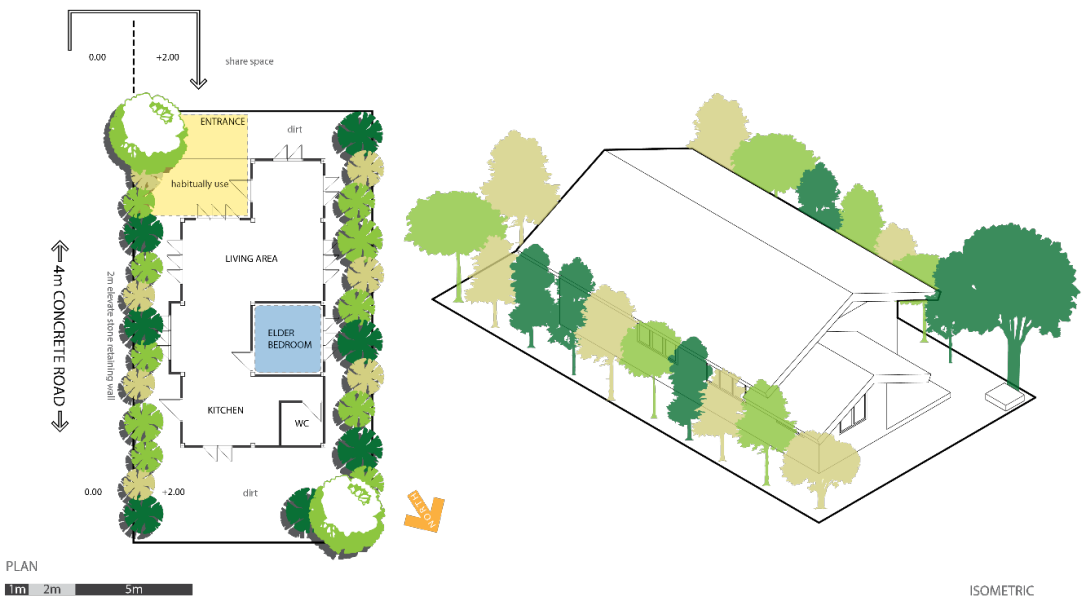


Figure 6.52: The sample of residential dwelling characteristics with the long side of the dwelling parallel to the frontage road (Author, 2020).

Apart from the result from the survey in Table 6.1, the examination of correlations between the dwelling orientation toward the frontage road and the residential site characteristics at two levels of the residential dwelling and site showed some interesting patterns.

The dwelling orientation toward the frontage road was significantly related to the factors of plot coverage and dwelling type; r 's (90) ranged from $-.27$ to $.29$, respectively, p 's $< .01$ (see Table 6.1). In general, the result shows that the single house within the residential sites, with plot coverage of more than 75 percent, have the orientation of the long side of dwellings parallel toward the frontage road. On the contrary, the dwelling type of multi-houses, within the residential sites, with plot coverage below 25 percent, have the orientation of the short side of dwellings parallel toward the frontage road. These relationships may reflect that the types of residence and plot coverage are associated with the characteristics of dwelling orientation toward the frontage road. It is probably because the characteristics of types of dwelling and plot coverage have important influences on the space or area planning of the dwellings in the residential sites.

In summary, the outcomes in this part indicate that most older adults' residential sites have the orientation of the short side of dwellings parallel toward the frontage road. Only 25 percent of dwellings have the long side parallel to the frontage road. According to this data, these characteristics may depend on the settlement of the residential sites. However, another important finding suggests that there are associations between the dwelling orientation toward the frontage road with the residential site characteristics at two levels with the predictors of the dwelling type and plot coverage.

5.) The dwelling construction types

This section presents the dwelling construction types in the residential sites. As shown in Table 6.2, the response options were categorised into four groups, which are: (1) masonry, (2) wooden, (3) semi-wooden, and (4) other types. Figure 6.53 provides the summary statistics for the characteristics of the dwelling construction types from the frequency.

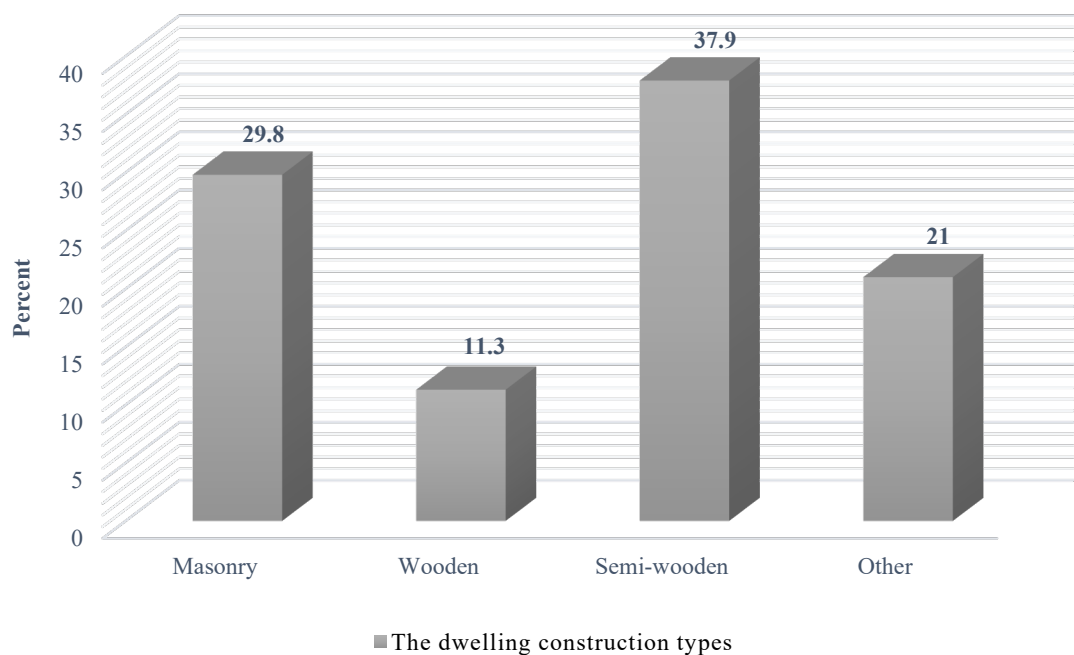


Figure 6.53: The frequency of the dwelling construction types (Author, 2020).

As shown in Figure 6.53, the most common dwelling construction type in residential sites is semi-wooden at almost 38 percent. The other dwelling construction types are masonry with nearly 30 percent, other types such as cement concrete or cement concrete with steel for 21 percent and wooden at around 11 percent. Aside from the result from the survey, as shown in Figure 6.53, the examination of correlations between demographic and social characteristics and

the dwelling construction types in the residential sites showed some interesting information (see Table 6.1).

As shown in Table 6.1, the results indicate that the demographic characteristics of older adults' age and economic activity status were negatively related to the other dwelling construction types; r 's (90) ranged from -.22 to -.26, respectively, p 's < .05. In general, the results show that elderly dwellers, who are less senior and employed, tend to live in the dwellings with the construction of other types, such as cement concrete or cement concrete with steel. This is compared to those other residents who are the oldest, retired, unemployed or have another economic activity status. Thus, this may reflect the relationship between characteristics of the dwelling construction types with the influence of age and the economic activity status of those elderly residents.

Moreover, there was also a significant correlation between the dwelling construction type and the disposable income, $r(90) = -.32$, $p < .01$ (Table 6.1). The negative relationships between the dwelling construction type of semi-wooden and the disposable income showed that older adults who have insufficient disposable income tend to have their dwellings of the semi-wooden construction type. A possible explanation for this might be that this construction type is affordable for this group of older residents. Accordingly, some older adults with insufficient disposable income mentioned their dwelling construction type, for example, noted:

... *'The dwelling has the construction type of semi-wooden because it is an affordable and durable type of material.'* ...

In addition, it seems possible that these results support further findings concerning other types of dwelling construction. These relationships may partly be explained by the possibility that employed older adults with sufficient disposable income are more likely to afford the cost of material construction of other types, such as cement concrete or cement concrete with steel, for their dwellings.

Furthermore, the analysis also revealed that there were moderate correlations between the dwelling construction types and the demographic characteristic of living arrangements, $r(90) = -.26$, $p < .05$ (see Table 6.1). Overall, the data infers that the solo-dwelling elders are more likely to reside in the dwelling construction type of masonry and other types such as cement concrete or cement concrete with steel. These results are likely related to solo dwellers' characteristics associated with the dwelling size with fewer areas or less than 100 sq.m. (see chapter 6, section 6.3.2). Consequently, the dwelling construction type of masonry and other types are reasonable options in terms of the efficient building materials needed to build a dwelling size of less than 100 sq.m.

Apart from this, the correlation shows the association between the dwelling construction types and the demographic characteristic of the duration of residence. The values of the duration of residence of dwellers were negatively related to the dwelling construction types of masonry, and other types, $r's(90)$ ranged from $-.31$ to $-.43$, respectively, $p's < .01$ and the semi-wooden was positively correlated, $r(90) = .26$, $p < .05$ (see Table 6.1). Overall, these results suggest that older people with shorter residence duration mostly have dwellings with the construction types of masonry or other types. This is in contrast to the semi-wooden type of construction, which is more likely to be applied to the dwellings of inhabitants

with a longer duration of the residency. This result may be explained by the fact that wood dwellings can survive a long time, and wood is one of the available primary materials for dwelling construction in Thailand (Punpairoj, 2013). Whereas, nowadays, due to the processes of modernization, masonry, cement, concrete or cement and concrete with steel are more popular materials for the options of dwelling construction,

Other important findings also show the relationship between the dwelling construction types and the social characteristics of attitudes toward friends and community members. The attitude towards friends, from the social predictor, was modestly but significantly correlated to the dwelling construction types of masonry and other types, $r(90)$ ranged from $-.21$ to $.22$, respectively, with $p's < .05$. The semi-wooden construction type, was positively related, $r(90) = .31$, $p < .01$ (see Table 6.1). Overall, the results show that higher levels of a positive attitude toward friends are associated with the dwellings with the construction types of other types, especially semi-wooden materials. On the contrary, the dwelling construction types of masonry lead to lower levels of positive attitude towards friends for older residents.

In addition to the factors of social characteristics, the attitudes toward other people (among neighbours and community members) were significantly correlated to the dwelling construction types of wooden and masonry, $r(90)$ ranged from $-.27$ to $-.31$, respectively, $p's < .01$, and the semi-wooden was positively related, $r(90) = .46$, $p < .01$ (see Table 6.1). These results revealed that older dwellers, who have a higher attitude towards neighbours and community members, have their dwellings with construction types of semi-wooden material. In comparison, the

lower attitude levels towards friends are associated with the dwelling construction types of wooden and masonry materials.

From this data, it can be seen that the dwelling construction types of semi-wooden can positively affect the attitudes of elderly residents toward other people, friends, neighbours and community members. Nevertheless, elderly adults tend to have lower attitudes toward other people from dwelling construction types of masonry materials. Therefore, these findings may indicate that the characteristic of construction type of dwellings for older people can also influence their attitudes toward other people, friends, neighbours and community members.

Outdoor and interior environments of the dwellings and residential sites tend to be dominated by manmade designs and objects (Engineer, Sternberg, & Najafi, 2018). One of the natural elements is that the dwelling construction types, representing a natural atmosphere and sensory stimuli, such as from a semi-wooden material, could positively influence an older person's health, well-being and socialisation (Engineer et al., 2018; Klumrat, 2011). Furthermore, the natural elements of dwelling construction materials may inspire physical activity and social connection among older adults from the natural features and characteristics of the surrounding environment.

In summary, these results provide important insights into the associations between the dwelling construction types in the residential sites with other factors. In addition, there are the predictors of demographics (age, economic status, disposable income, living arrangement and duration of residency) and social factors (attitudes toward friends, neighbours, and community members). Overall,

these results indicate that the dwelling construction type used may be influenced by the availability and materials easily obtained by older dwellers. In this case, the properties of the construction materials, which represent the natural atmosphere and give sensory stimuli to older people, also affect the social relationships among older adults in the community.

6.) The material of surroundings adjacent to the dwelling

This part deals with the material of surroundings adjacent to the dwelling in the residential sites. According to Table 6.2, the response options of the surroundings' material were categorised into four groups, which are: (1) cement concrete, (2) grass, (3) ground, and (4) other materials. Figure 6.54 presents the summary statistics for the characteristics of the material of surroundings adjacent to the dwelling in the residential sites by their frequency.

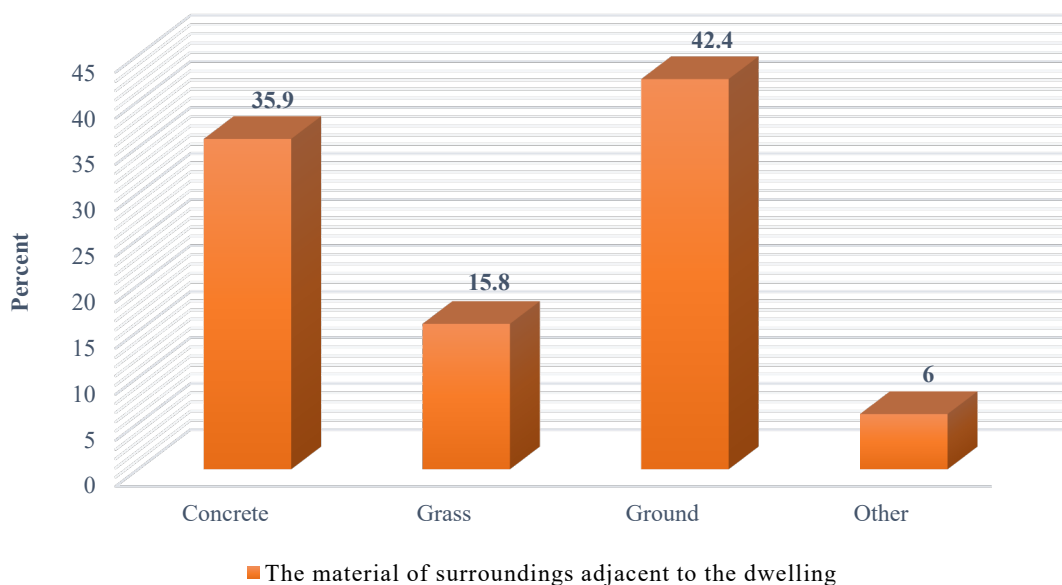


Figure 6.54: The frequency of the material of surroundings adjacent to the dwelling (Author, 2020).

From Figure 6.54, we can see that most of the material surrounding the dwelling in the residential sites is ground, at around 42 percent. The other surrounding materials are cement concrete for almost 36 percent, grass for nearly 16 percent and other types such as gravel for only 6 percent. Aside from the result from the survey in Figure 6.54, the examination of correlations between demographic and social characteristics and the material of surroundings adjacent to the dwelling in the residential sites showed some interesting patterns (see Table 6.1).

It can be seen from the data in Table 6.1 that the demographic items were modestly but significantly correlated with the material of the surroundings in the residential site. Firstly, there was a moderate negative correlation between the surrounding material of ground in the residential sites and the age stage of older people (Table 6.1: $r(90) = -.21$, $p < .05$), and the disposable income was negatively related, $r(90) = -.28$, $p < .01$ (see Table 6.1). The outcome revealed that elderly dwellers at an early stage of age with insufficient income have the material ground for the surroundings in their residential sites more than the later stage group with sufficient income. The result may reflect the effect on the surroundings in the residential sites from the elderly dwellers' age stage and their surplus income.

Secondly, there was a positively modest link between the demographic characteristic of a disease or disorder status and the surrounding material of grass, $r(90) = .22$, $p < .05$ (see Table 6.1). This result showed that older people with a lower disease or disorder status tend to have grass in their residential sites. It seems possible that these results are due to the health of older people and maybe that they

benefit from grass in their garden. This view is supported by Seo, Sungkajun, Sanchez, and Suh (2015), who found that grass evoked positive responses from older adults as it has the potential to create healthy interactions from related activities such as gardening. Etherington (2012) also noted that grass is considered to create a therapeutic environment and reduce negative arousal levels, improving health and creating positive effects on well-being.

The examination of correlations between the other types of surrounding material in the residential sites and demographic characteristics of the disposable income and living arrangement showed some relationship between factors (see Table 6.1). The other types of surroundings' materials were associated with disposable income and living arrangement; r 's (90) ranged from $-.22$ to $.22$, respectively, p 's $< .05$ (see Table 6.1). In general, the results show that residential sites with surroundings of other types, such as gravel, are associated with older people who live with their family members and have insufficient disposable income. It is possible because these elderly dwellers have less money and can afford only some material types, especially when they have a more significant family.

In addition to the materials of surroundings in the residential sites, the attitude towards community members, according to the social predictor, was positively related to ground and grass, r 's(90) ranged from $.28$ to $.33$, respectively, p 's $< .01$. The attitude towards family was modestly but significantly correlated with grass, $r(90) = .27$, $p < .05$ (see Table 6.1). Overall, the results revealed that the materials of surroundings and the social predictors indicated a pattern of higher levels of attitudes toward other people (family, neighbours and community

members) as associated with materials of ground and grass, especially the impact ground and grass have on attitude towards the community members of older dwellers. Therefore, after interpreting the data, the materials of surroundings with ground and grass in the residential sites may affect the relationships and perspectives by supporting outdoor activities with family, neighbours and community members.

Taken together, these results suggest that there are associations between the material of surroundings adjacent to the dwelling in the residential sites with the other factors of elderly dwellers. There are the predictors of demographic (age stage, disease or disorder status, disposable income and living arrangement) and social factors (attitudes toward family, neighbours, and community members).

In summary, these results show that over 66 percent of the sample residential dwellings are single houses. Most of the residential dwellings, over 47 percent, have an area of approximately 100 – 199 sq.m. At the same time, less than 6 percent have more than 300 sq.m. of dwelling size. The dwellings having a height of one storey make up 74 percent. Over 62 percent of dwellings have a short side orientation toward the frontage road. Moreover, the dwelling construction types in the residential sites are semi-wooden for almost 38 percent, with 42 percent of the residential sites having ground as the material of surroundings adjacent to the dwelling.

6.4 CONCLUSION

The results in this chapter indicate that the characteristics of older adults' residential site environments from their settlement, site and dwelling characteristics reflect the characteristics of the case study village in the rural Asian context. The residential environment of the site and dwelling levels also show the existing characteristics. Some of those variations reveal the multi-generational living arrangements as a preference of Asian cultures and which also affects the site and dwelling types (Teerawichitchainan et al., 2015).

Moreover, the characteristics of a residential site with a large plot size and low plot coverage were assumed to provide more areas or spaces externally, enabling older adults to spend more time outdoors. However, more plot coverage could affect the shading available from the canopy, buildings and also from trees and environmental features in the residential site.

The characteristics of the community frontage road, from the width of the street, may affect the setback position of the buildings, and the road material may influence the older people's perspective of the surrounding areas of the residential sites. The frontage road could also bring interesting or unpleasant views into their residential sites, depending on the dwelling orientation toward the frontage road.

In addition, the evidence reviewed here seems to suggest a pertinent role of the dwelling size and height. These factors could show the areas of the dwelling, which may influence older adults' decisions to spend more time outside, in the residential site, rather than indoors. Furthermore, landscaping characteristics of the materials of surroundings in the residential site or on the property may

encourage older people to spend time being active, interacting and engaging in activities in these residential site environments.

However, some factors can potentially affect the residential sites' characteristics at residential dwelling and site levels. This study indicates associations between the settlement, residential site and dwelling characteristics with the demographic and social factors of older people. In view of all that has been mentioned so far, one may suppose that these associations are essential for older adults, whose daily life and outdoor activities usually tend to be confined to the vicinity of the elders' dwellings and residential sites. This would make older residents more vulnerable to the physical, mental, and emotional health-promoting or inhibiting attributes of the residential sites' physical configuration.

The chapter that follows presents the results of the outdoor usage characteristics of elderly adults in the residential site environment in a rural context. The topics discussed include the outdoor usage characteristics related to the older residents' outdoor activities and outdoor social activities in their residential site environment and the older adults' preference and usage characteristics of their residential site areas or spaces.

CHAPTER 7

THE OUTDOOR USAGE CHARACTERISTICS OF OLDER ADULTS IN THE RESIDENTIAL SITE ENVIRONMENT IN A RURAL CONTEXT

7.1 INTRODUCTION

In the last chapter, this study presented the findings, analysis, and results of the residential site environment's characteristics and physical environmental features. In this chapter, the study will describe the outdoor usage characteristics of older adults in residential site environments in a rural context. This chapter is crucial in the aim of the thesis in order to address one of the research objectives of this study as follows:

a. **Research objective B**: Investigation of the outdoor usage characteristics of older adults in the residential site environments in a rural context in terms of (i) the physical activities in the residential site environments and (ii) the most utilised residential site areas or spaces.

In the introduction of this chapter, a brief description of the sectors in this chapter is presented. Next, the chapter presents the results of the outdoor usage characteristics of elderly adults in the residential site environments in a rural context from the quantitative analysis of the questionnaire and the qualitative from the in-depth interviews. The chapter is divided into two main sections.

The first section looks at the physical activities of older adults in the residential site environments. In this part, the study identifies the outdoor usage

characteristics of the older residents' outdoor and social activities in their residential site environments. The second section examines the most utilised residential site areas or spaces. Finally, this section explores older adults' preferences and usage characteristics of the residential site areas or spaces.

These sections refer to research objective B to investigate older adults' outdoor usage characteristics in the residential site environments in a rural context in terms of the physical activities and the most utilised residential site areas or spaces in the residential site environments. Moreover, these sections of this chapter are also designed to answer research question 2: "Which residential site environmental characteristics and physical features contribute to the outdoor usage and satisfaction of older adults in the rural context?"

To conclude, this chapter sets out the preliminary outcomes of the thesis about the outdoor usage characteristics of older adults in the residential site environments in a rural context in order to begin to answer the research questions.

7.2 THE PHYSICAL ACTIVITIES IN THE RESIDENTIAL SITE ENVIRONMENT

This section refers to research objective B presenting the outdoor usage characteristics of older adults in the residential site environments in a rural context in terms of physical activities.

The analysis of the physical activities of older adults in the residential site environments is structured around two key themes that emerged from the data: (1) the outdoor activities and (2) the social activities in the residential site

environments. Together, these themes highlight how the outdoor and social activities characteristics of the older respondents' daily lives and socialisation are constituted and how these characteristics affect their sense of perception and use of the residential site environments in the rural Asia context.

7.2.1 The outdoor activities in the residential site environment

The outdoor activities of older adults in the residential site environment's theme include the examinations in three parts. First, there are the purposes of time spent outdoors (five categories of outdoor activities), the time of the day spent outdoors (in general and the most used space or area, with four types of the period of time), and the duration of time spent per day in the residential site environments (five categories of the duration of time). Table 7.1 presents an overview of all variables of the characteristics of outdoor activities, their categories, responses, and frequencies.

Table 7.1

Variables of the characteristics of outdoor activities of study participants from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).

Variable	Categories	Responses		Percent of Cases*
		N	Percent	
1. The purpose of time spent outdoors	Daily life activities	88	67.7	97.8
	Hobbies	9	6.9	10.0
	Exercises	8	6.2	8.9
	Leisure activities	3	2.3	3.3
	Other	22	16.9	24.4

**The value from the multiple-choice questions.*

Table 7.1 (Continue)

Variables of the characteristics of outdoor activities of study participants from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).

Variable	Categories	Responses		Percent of Cases*
		N	Percent	
2. The time of the day spent outdoors	Before 9 am	61	29.9	67.8
	9 - 12 am	49	24.0	54.4
	12 am – 3 pm	34	16.7	37.8
	After 3 pm	60	29.4	66.7
3. The time of the day spent at the most used space or area	Before 9 am	53	27.3	58.9
	9 - 12 am	56	28.9	62.2
	12 am – 3 pm	37	19.1	41.1
	After 3 pm	48	24.7	53.3
4. The duration of time spent per day (hours)	Less than 1	11	12.2	
	1 – 4	35	38.9	
	4 – 7	26	28.9	
	7 – 10	16	17.8	
	More than 10	2	2.2	

**The value from the multiple-choice questions.*

In the present study, there is also the examination of correlations between demographic characteristics (thirteen predictors of individual characteristics), socio-demographic characteristics (three predictors of attitudes toward three categories of groups of people), and the measures of outdoor usage characteristics of elderly participants in residential sites (four themes of the characteristics: the purposes of time spent outdoors, the time of the day spent outdoors and the duration of time spent per day, the outdoor areas or spaces, and the time spent with other people; with the total of seventeen predictors of the categories). The themes identified in the correlations can be compared in Table 7.2. This correlations analysis summarises and describes the two key themes data of outdoor and outdoor social activities in residential site environments.

Table 7.2

Correlations among demographic, social, and the variables of outdoor usage characteristics of older adults in residential sites predictors, N = 90 (Source: fieldwork 2019).

Predictors	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
Demographic																																	
1 Gender	1.00																																
2 Age stage	-0.06	1.00																															
3 Age	-0.19	.79**	1.00																														
4 Economic activity status	-.30**	0.12	0.12	1.00																													
5 Disposable income	0.04	0.01	-0.03	-0.08	1.00																												
6 The amount of income	0.19	-0.11	-0.17	-.31**	.35**	1.00																											
7 Physical health	.24*	-0.10	-0.20	-0.11	.21*	.21*	1.00																										
8 Mental and emotion health	-0.05	-0.16	-0.14	0.01	0.05	0.05	.28**	1.00																									
9 Disease / disorder status	-0.09	0.07	0.14	0.04	-.24*	-0.02	-.49**	-0.04	1.00																								
10 Living arrangement	-0.03	0.07	0.12	0.11	0.13	-0.11	-0.04	-0.11	-0.15	1.00																							
11 Household size	0.00	-0.03	-0.08	0.03	0.18	-0.11	0.03	0.00	-0.20	.70**	1.00																						
12 Duration of residence	-0.07	0.05	0.13	0.10	0.00	-.34**	-0.06	-0.10	-0.16	.33**	.27*	1.00																					
13 Attitude toward family	-0.07	0.04	0.08	0.12	0.08	0.04	-0.01	.43**	0.04	.21*	0.14	-0.03	1.00																				
14 Attitude toward friends	-0.05	-0.05	-0.15	-0.12	-.29**	0.18	-0.18	0.04	0.19	-0.11	-0.15	-.23*	0.17	1.00																			
15 Attitude toward community	0.07	0.04	-0.02	-0.05	-.37**	0.12	-.23*	0.08	.36**	-0.04	-0.05	-0.19	.22*	.73**	1.00																		
Social																																	
16 Daily life	0.13	-0.05	-0.11	0.10	-0.07	0.04	0.10	-0.14	-0.09	-0.04	-0.08	-0.05	-0.14	-0.12	-0.10	1.00																	
Purposes																																	
17 Hobbies	0.15	-0.16	-0.20	-0.02	-0.03	-0.11	0.00	0.04	0.04	0.14	-0.04	0.12	0.13	0.14	0.16	0.05	1.00																
18 Exercises	0.11	0.19	0.08	-0.02	0.01	0.14	-0.09	-0.17	0.19	0.08	-0.03	0.06	-0.13	-0.07	0.07	0.05	0.16	1.00															
19 Leisure	-0.17	0.00	0.06	-.26*	-0.02	-0.02	-.25*	-0.05	0.12	0.09	0.13	0.07	-0.11	0.05	0.12	-.39**	-0.06	0.16	1.00														
20 Other activities	-0.20	0.04	0.02	0.19	-0.12	-0.05	-0.18	0.09	0.18	-0.01	-0.12	0.04	.24*	.44**	.38**	-0.09	0.16	0.00	-0.11	1.00													

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Table 7.2 (Continued)

Correlations among demographic, social, and the variables of outdoor usage characteristics of older adults in residential sites predictors, N = 90 (Source: fieldwork 2019).

Predictors	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
Duration & Time																																	
21 Duration of time spent	-0.01	-0.04	0.02	0.19	-0.08	-0.20	-0.05	-0.08	0.04	0.19	0.04	-0.04	0.05	-0.05	0.11	0.17	0.10	-0.11	-0.05	0.11	1.00												
22 Before 9 am	-.24*	0.13	0.15	-0.01	0.19	-0.01	-0.01	-0.15	0.10	0.08	0.10	0.02	-0.16	-0.04	0.06	-0.10	-0.17	0.05	0.13	0.00	0.17	1.00											
23 9 - 12 am	-0.08	0.03	0.10	.30**	-.38**	-.32**	0.00	0.03	0.03	0.02	-0.06	-0.02	-0.02	-0.11	0.04	0.16	0.01	-0.18	-0.08	-0.05	.66**	-0.01	1.00										
24 12 am – 3 pm	0.04	0.13	0.07	0.13	-.32**	-.24*	-0.16	-0.01	0.13	0.14	-0.04	0.00	.22*	0.06	.23*	-0.04	0.12	0.00	-0.02	.25*	.44**	-.30**	.34**	1.00									
25 After 3 pm	-0.03	-.35**	-.30**	-0.08	.26*	0.21	0.19	-0.09	-.23*	0.14	0.06	-0.05	-0.14	-.21*	-.22*	0.05	0.00	-0.03	0.00	0.02	0.09	0.12	-0.13	-.32**	1.00								
Outdoor spaces/areas																																	
26 Front garden or area	0.03	-0.05	-0.10	-0.02	-0.10	0.15	-0.12	0.04	0.07	-0.09	-0.15	-0.01	0.07	.39**	.30**	-0.05	0.00	0.11	0.00	.31**	-0.04	-0.07	-0.06	-0.02	0.00	1.00							
27 Back garden or area at the back	0.04	0.07	0.04	0.00	0.02	0.01	-0.10	-0.03	0.17	0.13	-0.06	-0.06	0.11	0.20	0.14	-0.16	0.09	.22*	-0.07	.23*	0.16	-0.08	-0.04	.23*	0.00	0.00	1.00						
28 Side garden or area	0.08	-0.16	-0.12	0.01	-.29**	-0.14	0.10	-0.09	0.05	0.17	0.05	0.17	0.05	0.10	.27**	0.07	.31**	0.05	0.07	0.12	0.17	0.03	.21*	.33**	-0.08	-0.10	-0.11	1.00					
29 Terrace	0.19	0.03	0.01	-.25*	-0.05	0.12	0.04	0.00	-0.07	-0.10	0.03	-0.08	-0.02	-0.14	-0.08	0.01	-0.14	0.05	-0.08	-0.15	-0.13	0.04	-0.16	0.02	-0.08	-0.21	-0.17	-0.01	1.00				
30 Other areas	-.22*	0.07	0.04	0.11	0.10	-0.11	-0.09	-0.09	-0.15	0.17	0.06	0.02	-0.05	0.01	-0.03	0.09	-0.11	-0.09	0.18	-0.16	0.14	0.08	0.08	0.07	0.04	-0.20	0.00	-0.02	-.44**	1.00			
31 Most used space or area	0.01	0.11	0.04	0.07	0.08	-0.18	0.06	-0.06	-0.19	0.08	0.15	0.13	-0.13	-.24*	-0.18	.25*	-0.07	-0.12	-0.08	-.25*	0.05	0.01	0.03	0.02	0.06	-.51**	-0.20	-0.02	0.05	.52**	1.00		
32 Pp most spending time outdoor	0.04	-0.10	-0.13	-.21*	-0.10	.22*	-0.12	0.09	0.17	-.23*	-.34**	-.23*	0.00	.38**	.35**	-0.19	.32**	0.17	0.01	0.19	-.25*	-0.10	-.23*	-0.05	-0.10	0.20	.31**	0.06	-0.01	-.26*	-.36**	1.00	
33 Duration of time spent with pp	-.002	0.00	0.03	0.15	-0.01	-.23*	-0.01	-0.12	-0.11	0.13	.23*	0.11	-0.03	-0.15	-0.09	0.07	-0.18	-.25*	0.03	0.00	.44**	0.07	.47**	0.13	0.00	-0.12	-0.10	0.08	-.24*	0.20	0.17	-.40**	1.00

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

1.) The purpose of time spent outdoors

This part focuses on the purpose of time spent outdoors on older adults' outdoor activities. There are studies of the purpose of time spent outdoors in the general spaces or areas, where older adults choose to spend time depending on their activities, and the most used space or area, where elders spend time outdoors the most in the residential site environments.

A. Time spent outdoors in the general spaces or areas

This part concentrates on the time spent outdoors that older adults spend in general spaces or areas. According to Table 7.1, the response options for the categories ranged from daily life activities, hobbies, exercises, leisure activities, and other activities.

The results of the purpose of time spent outdoors in the general spaces or areas show that the vast majority of elderly participants (67%) spend time in the residential site environments for their daily life activities (see Table 7.1). Other purposes of time spent outdoors are other activities 16.9 percent, hobbies 6.9 percent, exercise 6.2 percent and leisure activities 2.3 percent.

Aside from the result from the survey in Table 7.1, the examination of correlations between demographic and social characteristics and the measures of time spent outdoors in the general spaces or areas showed some interesting patterns (see Table 7.2). The purpose of time spent outdoors for their daily life activities was negatively associated with leisure activities, $r(90) = -.39$, $p < .01$ (see Table 7.2), possibly because elderly participants who spent time mostly on leisure

activities spent less time for daily life activities in the general spaces or areas. In addition, during the in-depth interviews, older participants were more likely to say they mostly spend time on leisure activities in the most used areas or spaces, for example, noted:

... 'There is a semi-outdoor terrace in front of the dwelling. I like to spend time there the most for relaxing and spending time with family.' ...

Moreover, the two simple demographic items were modestly but significantly correlated with the purpose of time spent outdoors for leisure activities; r 's(90) ranged from -.25 to -.26, p 's < .05 (see Table 7.2). Firstly, there was a negatively modest link between the factors of physical health and the purpose of time spent outdoors for leisure activities, $r(90) = -.25$, $p < .05$ (see Table 7.2), which may be related to the older adults' physical health problems. This outcome also accords with the earlier literature review in Chapter three and Rioux and Werner (2011) and Yen and Lin (2018), which showed that engaging in physical activities positively impacts personal physical and well-being in later life.

Secondly, there was also a moderate negative correlation between the purpose of time spent outdoors for leisure activities and the economic activity status (Table 7.2: $r(90) = -.26$, $p < .05$). It was lower for older residents who are employed than for the elderly participants who are retired, unemployed or have another economic activity status. This result is possible because employed older adults spend their daytime working and have less time after work, and the less

spare time they have, the less time spent on leisure activities. This view was echoed by another informant who described the routine of time spent outdoors after finishing work, for instance, noted:

... 'I spend time working at the grocery shop during the daytime and relaxing at the terrace in the evening after finishing work.' ...

In accordance with the present results, previous studies have demonstrated that longer time allocated to work-related activities may increase time pressures at old age and also reduce the time available for outdoor activities such as participation in leisure and social involvement (Adjei, Jonsson, & Brand, 2018; Gautam, Saito, & Kai, 2007). These results suggest that although ageing people spend time outdoors in the general spaces or areas in the residential site environment, the decision on the activities also depends on some factors. In part because of their employment and physical health concerns (the economic activity status of employed and low scores on physical health rating; see chapter 5).

In this regard, the economic activity status and the time invested in work-related activities for employed elders summarised here as time use activities seem consistent with another research. These results found that these may, to some extent, explain the differences in time spent outdoors in the general spaces or areas of the residential site (Adjei et al., 2018). Moreover, the result may also reflect that physically active older people would participate outdoors depending on the decline in activities as a gradual decline with age (Rioux & Werner, 2011). In accordance with the present outcomes, previous studies have demonstrated that engaging in physical activities also plays an essential role in active ageing and

active leisure, which correlates to a positive health-related outcome (Yen & Lin, 2018).

In addition to the purpose of time spent outdoors, the two attitudes toward friends and community members from the social predictor were positively related to the other activities; r 's(90) ranged from .38 to .44, p 's < .01, and the attitude towards the family was modestly but significantly correlated, $r(90) = .24$, $p < .05$ (see Table 7.2). In general, the results show that higher levels of positive attitudes toward other people (among family members, friends, neighbours, and community members) are associated with higher chances of time spent on other activities.

These relationships may reflect that the type of outdoor activities for other purposes is associated with attitudes toward other people from the social contact among family members, especially with friends, neighbours, and community members. Supporting this idea from the in-depth interviews, older participants spend time for other activities by meeting with visitors, friends, and neighbours or looking after their grandchildren in the residential site environments (see Table 7.3). According to some residents mentioned the purpose of outdoor activity with family members, for example, noted:

... 'I spend time looking after the grandchildren when they're riding bicycles in front of the residential site.' ...

This outcome broadly supports evidence from the literature review, as mentioned in Chapter three, that older adults spend increased time within the

residential environment because of changes to their social life and relationships in old age (Buffel, Phillipson, & Scharf, 2012; Lager, 2015; Lien, 2013; Nygren et al., 2007). These older people's personal and social networks also accord with those of other studies indicating that older individuals are more likely to contact and spend time with family members and long-time friends (Marcum, 2013). At the same time, time used for outdoor activities with a range of close and not-so-close people is vital for maintaining well-being in old age (Marcum, 2013; Shaw, Krause, Liang, & Bennett, 2007).

Taken together, these results imply that some of the purposes of time spent outdoors that older adults would do depend on the factors of demographic (physical health and economic activity status), social (attitudes toward family members, friends, neighbours, and community members), and types of activities that are related to the general areas or spaces in the residential site. In general, therefore, it seems possible that these results are likely to be associated with the transactional nature of the relationship. They include the experiential and social aspects of older people's time use activities from the economic activity status (Adjei et al., 2018), a physical and social network changes with age (Marcum, 2013; Rioux & Werner, 2011), and engagement with outdoor areas or spaces are closely tied to environmental aspects and features of the residential site of general areas or spaces (Inclusive Design for Getting Outdoors, 2007).

B. Time spent outdoors in the most used space or area

This section focuses on the time spent outdoors that older adults spend in the most used space or area. From Table 7.1, the response options for the categories

ranged from daily life activities, hobbies, exercises, leisure activities, and other activities. A more detailed account of the purposes of physical activities that older participants spend their time in the residential site environments is given later in the following part and shown in Table 7.3. This section also highlights the comparisons between time spent outdoors in the general spaces or areas and the most used space or area in the residential site environments.

Interestingly, there are differences in the ratios of the usage characteristics in the most used space or area in the residential site environments (see Figure 7.1). From the data in Table 7.2, it is apparent that the activities in which they spent time in the most used space or area were far more different than the purpose of time spent outdoors overall in the residential site environments. Almost two-thirds of the older participants (63.1%) spent time outdoors for leisure activities in the most used space or area, resulting in a higher rate than time spent outdoors in general spaces or areas for almost 61%. It seems possible that these findings are due to environmental features and attributes, such as most used space or area and general spaces or areas, hinder or facilitate older people carrying out outdoor activities in different ways (Inclusive Design for Getting Outdoors, 2007).

Furthermore, over 13 percent of older residents spent time outdoors for hobbies, almost 12 percent for daily activities, and around 10 percent for other activities. On the other hand, a minority of participants (1.3%) indicated that they spent time on exercise.

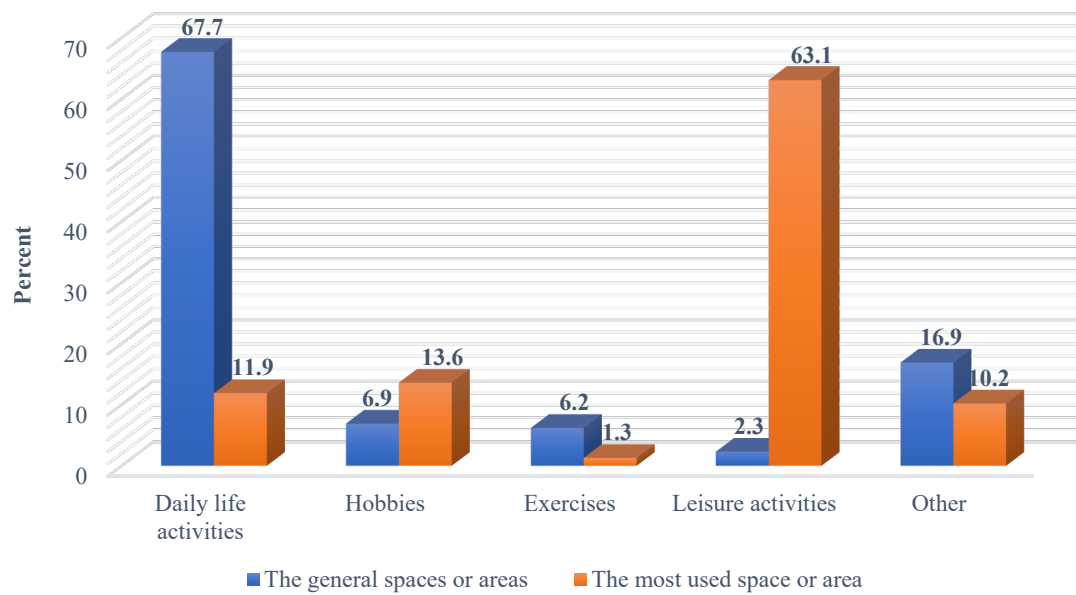


Figure 7.1: The frequency of the purposes of time spent outdoors compared the usage characteristics in general and the most used space or area in the residential site environments (Author, 2020).

Moreover, the study also gathered the purposes of physical activities that older participants spend their time in the most used space or area in the residential site environments from the in-depth interviews, as shown in Table 7.3.

Table 7.3

Variables of the purposes and analysis of the prevalence of physical activities that older participants spend their time at the most used space or area in the residential site environments from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork and interview 2019).

The purposes of time spent outdoors	The physical activities	Prevalence, N Cases *	Total	Percent
1. Daily life activities	- Having meals outdoors (with family, Friends, Neighbours)	10	28	11.9
	- Cooking outdoors	7		
	- Working	7		
	- Doing housework	4		

*The value from the qualitative content analysis of the transcribed interview.

Table 7.3 (Continue)

Variables of the purposes and analysis of the prevalence of physical activities that older participants spend their time at the most used space or area in the residential site environments from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork and interview 2019).

The purposes of time spent outdoors	The physical activities	Prevalence, N Cases *	Total	Percent
2. Hobbies	<ul style="list-style-type: none"> - Doing gardening - Growing vegetables - Listening to the radio - Making things (Sculptures, brooms) 	18 10 2 2	32	13.6
3. Exercises	<ul style="list-style-type: none"> - Doing exercise 	3	3	1.3
4. Leisure activities	<ul style="list-style-type: none"> - Relaxing (with family, Friends, and Neighbours) - Spending time with people (Family, friends, neighbours) - Having a nap or resting - Admiring the garden 	86 57 5 1	149	63.1
5. Other	<ul style="list-style-type: none"> - Looking after the grandchild(ren) - Meeting with people (Visitors, friends, neighbours) - Watching people roaming on the street 	7 3 14	24	10.2

**The value from the qualitative content analysis of the transcribed interview.*

Several in-depth interviews from older respondents indicated that they did not mainly spend time on daily activities but were actively spending time on leisure activities (63.1%) in the most used space or area. These results reflect those of Payne (2017), who also found that the old age group spends the most time outdoors on leisure-time physical activities. Table 7.3 describes the physical activities for those purposes of time spent outdoors that older participants spend their time in

the most used space or area. In the third and fourth columns of Table 7.3, the older participants reported those activities from the in-depth interviews.

The leisure activities of those surveyed were reported by 86 elderly participants as relaxing alone or with other people, including family, friends, and neighbours. Slightly over half of the elderly respondents mentioned time spent with family, friends, and neighbours, and five older participants spent time having a nap or resting. Only one spent time admiring the garden in their residential site environments. According to the in-depth interviews, some older adults mentioned the leisure activities in the residential site environment, for example, noted:

... 'I spend time outdoors relaxing and spending time with family and neighbours at the benches under the mango tree at the side of the residential site.' ...

Followed by the purpose of hobbies at 13.6 percent. The older participants reported outdoor activities for hobbies such as gardening, growing vegetables, listening to the radio, and making sculptures or brooms (see Table 7.3). This finding may be explained by the fact that most hobbies, especially gardening and growing plants, relate to the time, daylight, and season the older adults must do those activities outdoors. This substantiates previous outcomes in the literature that reachable plants, vegetation, and seasonal features with increased light exposure in outdoor spaces are related to supporting access to nature and improved mood to spend time outdoors in older adults (Engineer, Sternberg, & Najafi, 2018; Lu, 2018; Traynor, Fernandez, & Kent, 2013). According to the in-depth interviews, this is exemplified in the following quote by some of the older

residents about the outdoor activities for hobbies such as gardening and growing vegetables, for instance, noted:

... 'The side garden provides space for gardening and growing vegetables, which gives me an incentive to go outside.' ...

Additionally, the illustration shows the side garden for outdoors activities according to the elderly resident's explanations from the interview, as presented in Figure 7.2.

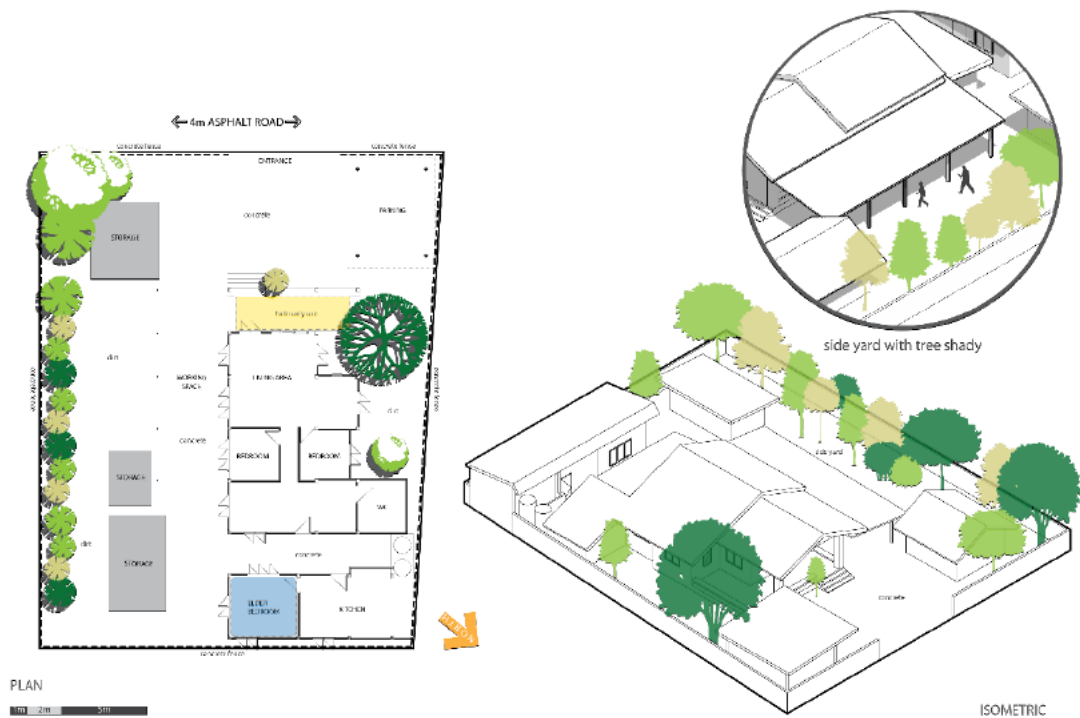


Figure 7.2: The sample of residential site characteristics with the side garden for outdoors activities (Author, 2020).

Moreover, the economic dependency on the geographical location may have played a vital role in bringing about outdoor activities for hobbies. In accordance

with the present findings, previous studies have demonstrated that some villagers in Thailand are provided with an income that indirectly depends on areas, such as the broom makers, indicated that they had some earnings from the young people collecting the forest resources for the older adults to make the products (Poulsen, Gkotsi, Sonntag, Kirstine, & Jeppesen, 2017). This view was echoed by some elderly residents who mentioned the outdoor activities for the hobbies with the local product making, for example, noted:

... 'I spend time making brooms as my hobby and also for sale at the side terrace adjacent to the vegetable garden in the afternoon.' ...

Further replications showed that elderly participants at 11.9 percent spent time on daily life activities: having meals outdoors (individually or with other people such as family, friends, and neighbours), cooking outdoors, working, and doing household chores. Supporting the outcomes from the in-depth interviews of some older residents who reported about the daily life activities in their residential sites, for example, noted:

... 'The semi-outdoor terrace at the side of the dwelling has outdoor cooking and laundry areas which meets my needs.' ...

... 'I spend time cooking outdoors at the terrace connected to the dwelling.' ...

In addition to the interviews, the illustration below presents the characteristics of the area or space for daily life activities in the residential site, as shown in Figure 7.3.

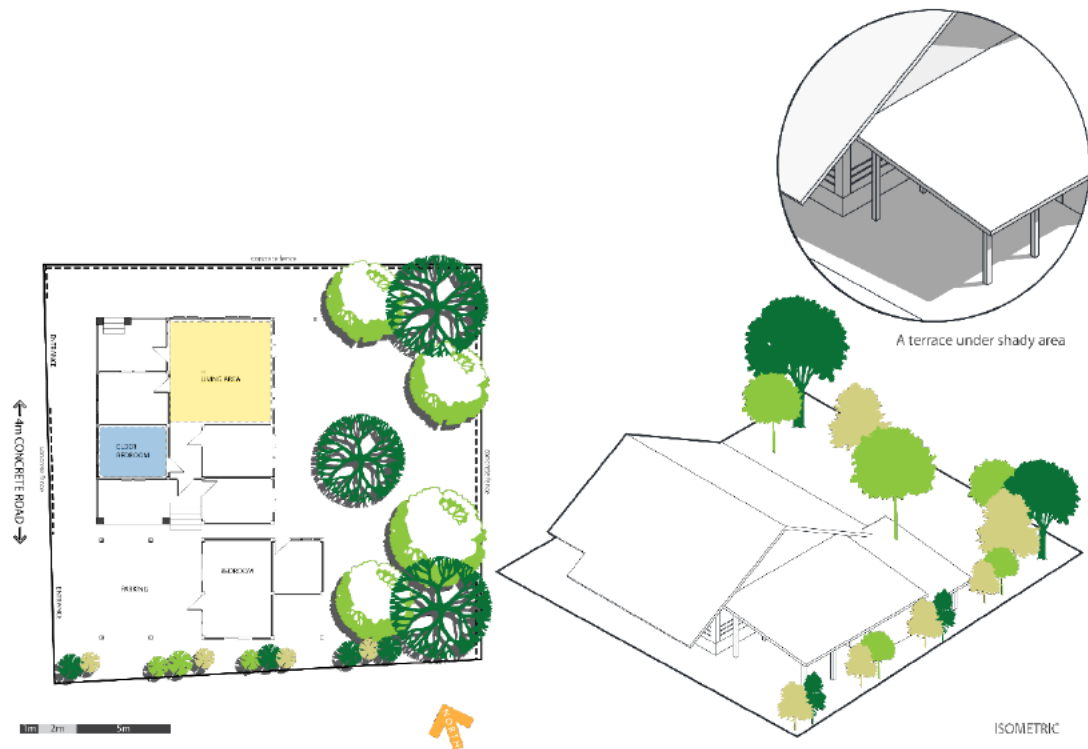


Figure 7.3: The sample of residential site characteristics of area or space for daily life activities (Author, 2020).

It is apparent from this data that most older adults spend time on daily life activities at the terraces or in semi-outdoor areas. In accordance with the present outcomes, previous studies have shown that all dwellings, in general, should be provided with adequate open space in the form of a terrace, balcony, or garden, as it is desirable in all circumstances (Design for London, 2010). According to these data, we can infer that these terraces or semi-outdoor areas or spaces are

particularly favourable characteristics for older adults during their day-to-day activities.

Apart from this, in the context of time use during daily activities, these results broadly reflect Marcum (2013), who found that older adults may spend more time alone and spend less time with other people during their daily routine activities. Arguably, the finding from this study was unexpected and showed that most older people spent time with other people for having meals outdoors in the most used spaces or areas than other daily activities. This somewhat contradictory result may be due to the culture of Thai older community members who are both the receivers and givers, which is sharing food with others. This view is supported by Bubpa and Nuntaboot (2018), who points out that Thai elders, especially in a rural context, often bring food and have a meal together in a small group of friends and acquaintances at an outdoor appointed place the group members' residences.

In addition, around 10.2 percent of older participants spent time on other activities such as looking after the grandchild(ren), meeting with people (visitors, friends, neighbours), and watching people roaming on the street (see Table 7.3). In general, therefore, it seems that these activities may be associated with age-related social characteristics. Older people may spend their time doing other more conducive activities to being with other people. This finding contradicts previous studies, as mentioned in the literature review of Chapter two, which have suggested that older adults spend less time physically active with others such as family, friends, and neighbours (Lien, 2013; Marcum, 2013). A possible demonstration of this might be that older adults may be encouraged to increase their outdoor physical

activities if influenced by friends or family members, as noted by McPhee et al. (2016).

Moreover, it is apparent from the data that very few elderly dwellers, at 1.3 percent, spent time on exercises in the residential site environments (see Table 7.3). The evidence shows that participation in physical activities with exercises remains low amongst older adults. The interpretations of this result are that time spent on exercise time physical activity decreases with age, and older people may be living in less affluent areas or rural contexts where low-cost or fun gym-free exercises are more desirable (McPhee et al., 2016; Suryadinata, Wirjatmadi, Adriani, & Lorensia, 2020). However, by drawing on the concept of exercise for seniors, McPhee et al. (2016) suggests that some factors may encourage older adults to increase their physical activities with exercise. They include the impacts from friends or family members, keeping enjoyment high, facilitating proper spaces or areas and raising self-efficacy for participating in the exercise.

It seems possible that these outcomes are due to specific characteristics of environmental features that limit the use of areas or spaces in the residential site environments. Thus, elderly participants reacted to these constraints by modifying how they approached, organised, facilitated, or used their areas or spaces to accommodate those outdoor activities. These behaviours may be a consequence of a lack of the appropriate characteristics of some outdoor areas or spaces conducive to spending time outdoors in the residential site environments (Cohen-Mansfield & Werner, 1998; Traynor et al., 2013). In accordance with the present findings, previous studies have revealed that the outdoor environment which affords engagement, more open space provided per dwellings, or desirable

characteristics, such as semi-outdoor terraces or gardens, for outdoor activities can potentially benefit the time spent outdoors and environmental satisfaction in older adults (Design for London, 2010; Inclusive Design for Getting Outdoors, 2007).

In summary, for the informants in this part, it can be concluded that the most used space or area is of significant importance for time spent outdoors in the residential site environments. The characteristics of the most used space or area in the living environment may provide more proper residential site environments and support their needs than in general spaces or areas. This approach has the potential outcome of discovering more about the residential site environmental characteristics that affect time spent outdoors in the residential site environments in the rural Asia context.

2.) The time of the day spent outdoors

This part concentrates on the time of the day that older adults spend time outdoors. From Table 7.1, the response options for the categories ranged from morning (before 9 am), late morning (9 – 12 am), afternoon (12 am – 3 pm), and late afternoon (after 3 pm). The figure below also illustrates the summary statistics for the time of the day spent outdoors compared between the usage characteristics in general and the most used space or area in the residential site environments (see Figure 7.4).

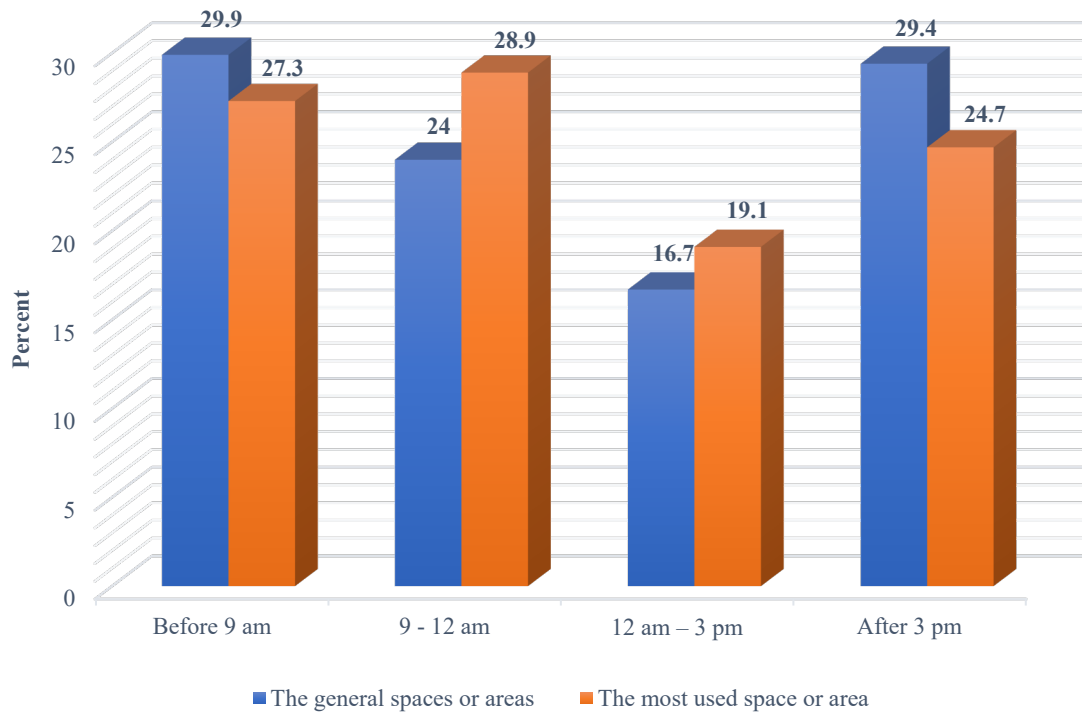


Figure 7.4: The frequency of the day spent outdoors comparing the usage characteristics in general and the most used space or area in the residential site environments (Author, 2020).

The overall response from in-depth interviews was that approximately one-third (33%) of older people mentioned and expressed negative feelings about sunlight and hot climate during late morning (9 – 12 am) and afternoon (12 am – 3 pm). This result is exemplified in the following quote by some of the respondents, discussing the time of the day spent outdoors in the residential site environment, for example, noted:

... *‘It is impossible to use the terrace in the late morning and afternoon because it is too hot and sunny.’* ...

This outcome also relates to the result from questionnaires, as shown in Table 7.1. Most of the elders spend time in the residential site in the morning before 9 am at almost 30 percent, and after 3 pm, around 29.4 percent (see Table 7.1). Other periods of the day to spend time outdoors are 9 – 12 am at approximately 24 percent, and 12 am – 3 pm at 16.7 percent of the respondents. It shows that the periods of the day during the morning (before 9 am) and late afternoon (after 3 pm) are more appropriate to spend time in the residential site environments. This result suggests that the time of the day influences the outdoor usage of older people who live in a tropical climate.

However, the analysis of the time spent outdoors in the responses of the most used space or area shows some interesting evidence, which differs from the findings of the time of the day spent outdoors in general spaces or areas the residential site environments. In contradiction with those findings, it is apparent from the data of the time of the day in Figure 7.2 that elderly participants spend time outdoors resulted in the highest value during late morning (9 – 12 am) at almost 29 percent (see Table 7.1). Furthermore, the proportions of time spent at the most used space or area in the late morning (9 – 12 am) and afternoon time (12 am – 3 pm) were slightly higher than in general spaces or areas at 4.9 percent and 2.4 percent, respectively (see Figure 7.4). In comparison, the time of the day spent outdoors at the most used space or area during the morning before 9 am at around 27.3 percent, and after 3 pm, around 24.7 percent had lower response rates than in general spaces or areas (see Table 7.1).

The possible explanation for the results of the time of the day spent outdoors in the responses between the most used and in general spaces or areas is that those

spaces or areas can promote or hinder their physical activities from the impacts of the daylight during daytime. This outcome may be explained by the fact that older adults desire to spend time in the most used space or area with more suitable characteristics to support their activities with the proper sunlight or shady features. As shown in Figure 7.5, the illustration provides the sample of characteristics of the shaded area in the most used semi-outdoor terrace during noon time.

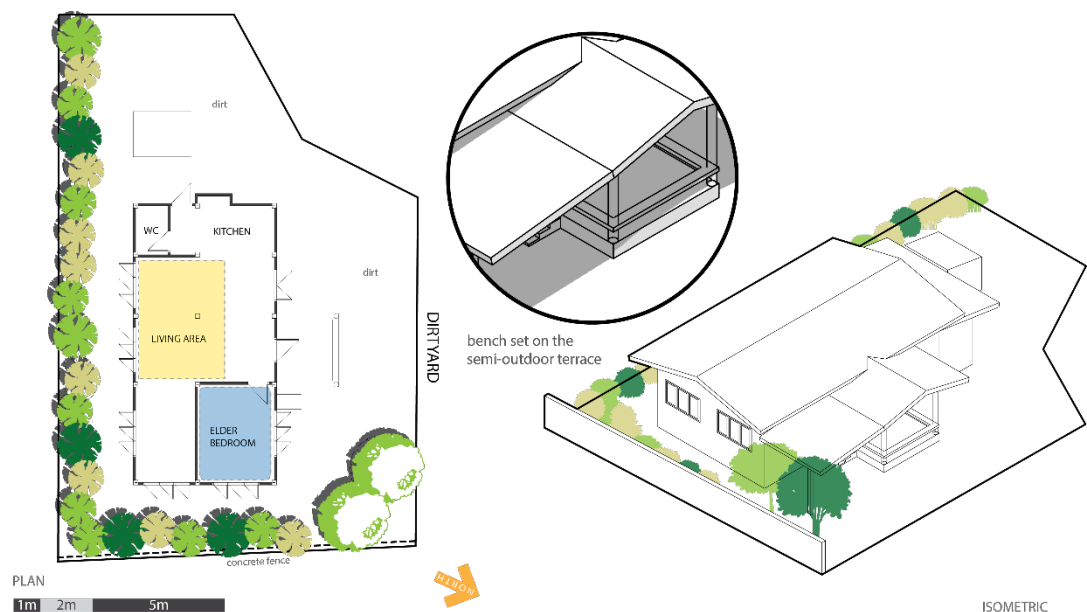


Figure 7.5: The sample of residential site characteristics of the shady area in the most used semi-outdoor terrace during noon time (Author, 2020).

Further analyses showed additional evidence for the time of the day spent outdoors in the residential site environments from older adults' experiences. A strongly expressed or selected goal of participants was to spend time outdoors and maximise independence or socialisation despite the time of the day limitations or barriers of sunlight and hot climate. The opposing perspectives about the time of

the day have threatened older adults' accessibility and usability in the residential site environments. One of the older residents expressed the opinion positively and negatively about their residential site's environmental characteristics, for example, noted:

... 'A large courtyard at the front of the residential site has a suitable space to spend time outdoors, but it is inappropriate to use during daytime as it is too hot and sunny during that period of the day.' ...

However, to maximise the possibility of spending time in the residential site with consequences of the sunlight and climate, older adults actively or passively adopted particular behaviours or altered attitudes to achieve real or perceived P-E fit as a means to spend time outdoors. The adapted outdoor activities can support the choice goal of spending time in the residential site environments among older participants' everyday lives, which further served to alter behaviour toward alternatives. For example, some elders spent their time outdoors in the area appropriate during the morning and then moved to other locations in the afternoon because of the sunlight and hot climate barriers in those areas in the residential site environments.

The other goal is to improve the characteristics of residential site environments with the tropical climate factor, which will bring satisfaction and appropriate characteristics that fit elders' needs. This view was echoed by some informants who indicated the requirement of the residential site environmental renovation to increase the usability of the particular space or area, for example, noted:

... 'I want to renovate the large courtyard at the front of the residential site to make it suitable to spend time outdoors all day.' ...

There are several possible options for improvement or renovation. In compliance with the result, the main objectives of the residential site's improvement will be to provide shade around the requirement areas or spaces. Therefore, amount of the hot air, bright sunlight, and radiated heat resulting from the sunlight is significantly reduced. For instance, the residents can use the awnings to prevent harsh light and shadows from entering the desirable outdoor areas, keeping temperatures low for the residents and comfortable in the outside heat. Alternatively, vegetation, such as plants, shrubs, and trees, can provide shade in the residential sites. The shade resources include towering trees with reaching branches and dense foliage that shade large areas of the gardens to shrubs that cool off the terrace. These vegetations can be placed in the middle of the garden for maximum shade or near structures, such as terraces, to shade specific areas. However, Miksen (2013) suggests that residents should create pockets of shadow in particular areas or spaces rather than shading the entire residential sites. The contrast between the sunny areas and shady areas in the residential sites naturally attracts the human visual perception.

As demonstrated above, the natural environment with the atmospheric conditions of tropical climate may shape mobility outdoors in old age (Luoma-Halkola & Häikiö, 2020). The characteristics of sunlight and hot weather can be considered the environmental barriers associated with restricted and decreased older people's likelihood of outdoors mobility (Rantakokko, Iwarsson, Portegijs,

Viljanen, & Rantanen, 2015). Whereas a supportive residential environment, such as a shady space or area, increases and motivates older people to participate in activities outside (Clarke & Gallagher, 2013; Finlay, Franke, McKay, & Sims-Gould, 2015). Therefore, the ability to organise outdoor activities and mobility in old age involves the interdependence of older people with their residential site surroundings (Coleman, Kearns, & Wiles, 2016; Luoma-Halkola & Häikiö, 2020).

According to these data, we can assume that such connections exist between sunlight and geographical features of the rural Asian context in a tropical climate. Drawing on the concept of daytime and sunlight characteristics, Edensor and Hughes (2019) have highlighted the relevance of shade and shadow attributes which are generally shaped by distinctive kinds of solar radiance, human visual perception, and cultural representations. The context of residential sites in this study represents the climate where most solar radiation arrives in the tropics (Haigh, 2011). In general, therefore, it seems that the atmosphere of tropical regions may affect the diverse ways older people live from the shadowy effects in different geographical contexts, which shade and shadow have been differently exposed in the residential sites across the area, space and time (Edensor & Hughes, 2019).

Taken as a whole, the apparent findings to emerge from the analysis of the time of the day spent outdoors in the residential site environments indicate that older adults desired to spend time outdoors during the daytime most of the day. However, there were some crucial factors of the problematic areas and spaces in the residential site environments or the requirement of the adopted behaviours or altered attitudes from older adults to spend time outdoors at the desired time of the

day. Consequently, those factors affected the quality of the time the day for older adults to spend time outdoors. Furthermore, high consumption of the time of the day spent outdoors in the Asian context could be associated with geographical contexts, particularly with sunlight and hot climate. In contrast, shaded areas create aesthetically pleasing surroundings, affecting older people's likelihood of outdoors mobility in the residential site environments in various ways. These results highlight just how important the time of the day spent outdoors at the residential site environments in the different types of geographical context are.

3.) The duration of time spent per day

This part presents the findings focusing on the duration of time that older adults spend time outdoors per day. The response choices for the categories ranged from less than 1 hour, 1 – 4 hours, 4 – 7 hours, and 7 – 10 hours (see Table 7.1).

In general, the results show that the duration of time that most older people spend per day in their residential site is 1 – 4 hours for almost 39 percent of the residents. On the other hand, nearly thirty percent of the older participants spent time outdoors in their residential site for 4 – 7 hours, less than 1 hour for 12.2 percent, 7 – 10 hours for 17.8 percent, and very few (about 2.2%) of the respondents spend time for more than 10 hours (see Figure 7.6).

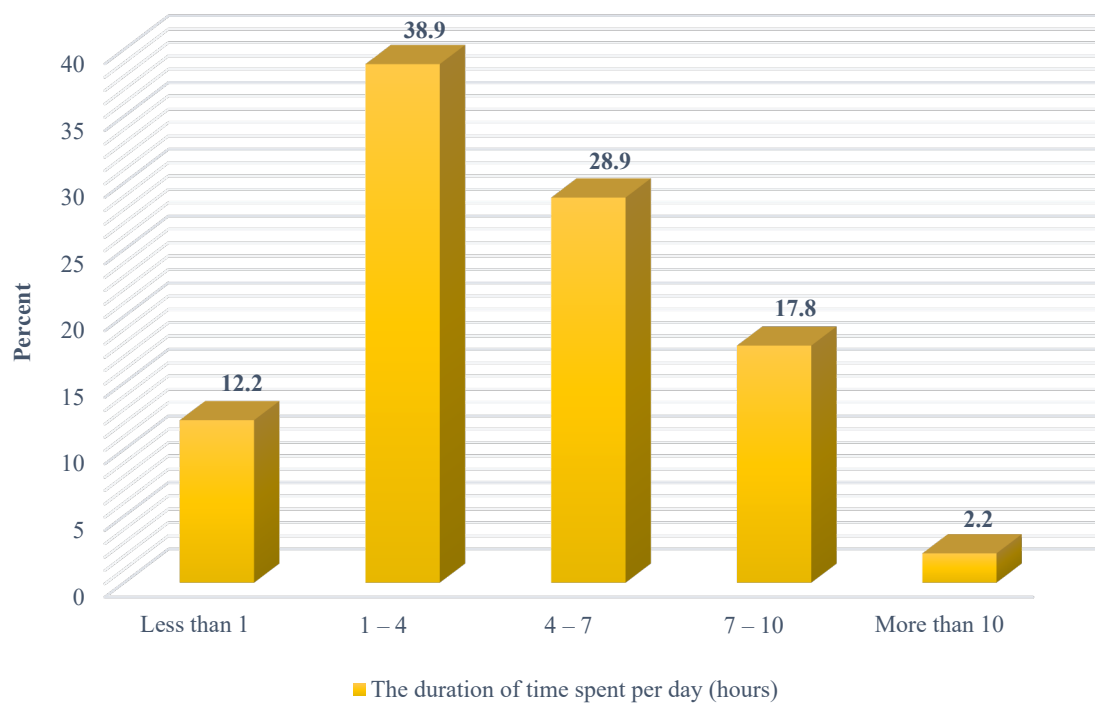


Figure 7.6: The frequency of the duration of time spent per day outdoors in their residential site environments (Author, 2020).

In accordance with the present results, these outcomes support evidence from previous observations (Horgas, Wilms, & Baltes, 1998; Lu, 2018). Elderly participants, on average, reported spending time outdoors about 166 - 217 minutes or approximately 2 hours 46 minutes – 3 hours 37 minutes (Horgas et al., 1998). In the same vein, Lu (2018) found that older adults spend time in the outdoor spaces 442.8 minutes per week or around an hour per day on average. However, it should be noted that those studies were based on a variety of site environmental characteristics ranging from a private dwellings, private houses, apartment buildings, and long-term care facilities (e.g., assisted living and nursing homes) for the elderly. Nevertheless, according to these data, we can infer that older

adults, on average, spend time outdoors about 1 – 4 hours per day in the residential site environments.

Aged residents of different accommodation settings may spend much time in dynamic behaviour outdoors in varied ways. This aspect may be partly due to older adults' physical impairment or health problems (Park, 2017). However, there may also be setting-related factors, including the physical and social environment in the accommodation settings, that could influence the amount of elderly residents' time used in the outside environments (Douma et al., 2017).

Concerning the setting-related factors, older residents may differ in how they value, experience, and respond to the environmental aspects of the living settings. According to Douma et al. (2017) and Othman and Fadzil (2015), the physical and social environment factors may contribute to the duration of time spent outdoors. They include the environmental aspects and compatibility with the abilities of an elderly resident, the accessibility, comfort, security, and aesthetics of the environmental settings, and possibly the presence of some desirable or specific spaces or areas for daily life and social interactions. In addition, the older resident's level of satisfaction with their accommodation settings and their attitude towards others in the living environments in different types of residential settings can sometimes play a role in the amount of time spent on outdoor activities (Douma et al., 2017; Menec & Nowicki, 2014; Rioux & Werner, 2011).

The findings also show the relationship of the amount of time spent per day with the time of the day spent outdoors. The duration of time spent per day was positively associated with the time of the day during late morning (9 – 12 am) and

afternoon (12 am – 3 pm); r 's(90) ranged from .44 to .66, p 's < .01 (see Table 7.2). The correlation between the duration of time spent per day and the time of the day spent outdoors is interesting because elderly participants tend to spend more time increasingly during the late morning (9 – 12 am) and afternoon (12 am – 3 pm).

Although the result of the time of the day spent outdoors indicated that older adults are thought to be less likely to spend time in the late morning and afternoon. Still, the levels of daylight during those periods might explain this finding. As put forward by Traynor et al. (2013), the evidence supports the idea that spending time outdoors in residential sites in daylight is enjoyable and is associated with improved quality of life in older adults. Spending time outdoors in the living environments in daylight has shown to provide substantial benefits in maintaining overall health and well-being in old age. It has been established that the benefits of spending time outdoors may contribute to participating in socially related activities and interaction among older people and increase mood from the exposure to a range of various natural elements such as vegetation and fresh air (Finlay et al., 2015; Kemperman & Timmermans, 2014). Together these findings suggest an association between the light exposure of daylight during daytime and the time of the day spent outdoors in the residential site environments.

The most remarkable result to emerge from the data is that many older adults desired to spend more time outdoors during the daytime but with the appropriate characteristics of the residential site environments under sunlight and hot climate. This outcome also accords with the earlier observations, which showed that an older adult's day, therefore, consists of the nature and diversity of the

outdoor activities in which one engages and the dimensions of time use and outdoors mobility (Horgas et al., 1998).

Indeed, the sample of the aged population on a person-day basis can provide a representative picture of the daily life and outdoor activities of older adults and provide a glimpse into factors that influence successful activity engagement in the residential site environments. Thus, it is essential to look at the duration of time spent per day data to get a complete picture of how the average day is spent outdoors for older people in their residential site environments.

7.2.2 The outdoor social activities in the residential site environment

The theme of outdoor social activities presents the people most spending time outdoors together (four categories of type of people) and the duration of time spent outdoors with other people (five categories of the duration of time) in the residential site environments. The themes identified in these responses are summarised in Table 7.4.

Table 7.4

Variables of the outdoor social activities of study participants from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).

Variable	Level / Categories	Responses	
		N	Percent
1. The people most spend time outdoors together	Relative	47	52.2
	Neighbour	19	21.1
	Friend	4	4.4
	Other	20	22.2

Table 7.4 (Continue)

Variables of the outdoor social activities of study participants from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).

Variable	Level / Categories	Responses	
		N	Percent
2. The duration of time spent outdoors with other people per day (hours)	Less than 1	33	36.7
	1 – 4	37	41.1
	4 – 7	19	21.1
	7 – 10	1	1.1
	More than 10	0	0.0

1.) The people most spend time outdoors together in the residential site environment

This part focuses on how older adults most spend time outdoors together in their residential site environments. Response options for the categories ranged from relative, neighbour, friend, and other (see Table 7.4).

Of the study population, over half of older participants mostly spend time outdoors for social activities in the residential site environments with relatives or family members such as their partners, children, and grandchildren (52.2%). In response to other groups of people most spending time outdoors together, 22.2 percent of older participants indicated that they mostly spent time with other people such as visitors and members of social groups for social activities. Twenty-one percent of the older residents reported that they spent time outdoors with their neighbours, and only 4.4 percent spent time with their friends (see Table 7.4). According to some older dwellers mentioned spending time outdoors with other people in their residential site environments, for example, noted:

*... 'I spend time relaxing, having meals outdoor and spending time with
friends and neighbours.' ...*

This outcome is contrary to that of a report released by the National Seniors Productive Ageing Centre (2013), which indicated that approximately 25 percent of older Australian adults participated in outdoor social activities with friends in one month. Whereas under 15 percent of older respondents engaged in outdoor social activities with relatives. However, this finding corroborates the ideas of Henri et al. (2017), who suggested that Asian cultures have strong family values, and 'Family' is also described as the most influential factor in life for all generations. This argument, which associates the culture of Asia, ties in closely with the cultural explanations as families have strong bonds and tend to spend much of their time together, especially in Thailand. This condition shows in every aspect of their lives, from communications to spending time with their family to living arrangements (Taste of Thailand, 2017). To clarify, while western culture has slowly created generations of independent children and those older adults are socialised with their friends more than family members, Asian people keep a strong relationship with their families. They are closer to their families than most Westerners (Taste of Thailand, 2017). Due to Asian cultural preferences for close and strong family ties, multi-generational living arrangements, and frequent social interactions among extended family members (Teerawichitchainan, Knodel, & Pothisiri, 2015).

Furthermore, the analysis revealed significant correlations between the people most spending time outdoors together in the residential site environments and

other factors (see Table 7.2). Examining correlations between demographic characteristics and the people most spending time outdoors together shows interesting patterns. The number of people spending time outdoors together was modestly but significantly correlated to the amount of income, $r(90) = .22$, $p < .05$ (see Table 7.2). This result revealed that elderly participants with a higher income tend to spend time outdoors with other people, friends, and neighbours, respectively. This finding is consistent with Feng, Cramm, Jin, Twisk, and Nieboer (2020), who concludes that income may inhibit older adults from participating in social activities. This relationship may reflect an actual increase in expenses for socialisation, such as material items required for leisure activities, the costs of hosting meals in the residential sites, and their awareness that they may be able to afford those expenses for more social activities with others (Scharf, Phillipson, & Smith, 2005). Furthermore, as noted by Feng et al. (2020), impoverished older people with poverty in combination with shame may associate with the incompetence to have a decent life, which leads eventually to engagement reduction in social participation.

The findings also show the relationship between the people that elderly participants who most spend time outdoors and the two attitudes toward friends and community members from the social predictor. The values were positively related to those factors of attitudes; r 's(90) ranged from .38 to .35, respectively, p 's $< .01$ (see Table 7.2). Overall, the results show that higher levels of attitudes toward other people (among friends, neighbours, and community members) are associated with higher chances of time spent outdoors with those groups of people. This outcome may be explained by the fact that performing physical activity in outdoor areas or

spaces has been shown to provide psychosocial benefits from social interactions with other people and a more outstanding commitment to the action being performed in the residential site environments (Traynor et al., 2013). Moreover, Takano, Nakamura, and Watanabe (2002) point out that using outdoor natural areas or spaces can improve social relationships and networks among elderly residents and community members.

There were also negatively moderate correlations between the people most spending time outdoors together with the living arrangement, duration of residence and economic activity status; r 's(90) ranged from -.23 to -.21, p 's < .05 (see Table 7.2). In general, the results show that solo-dwelling elders with shorter residence duration or who have employed status are associated with a higher possibility of sharing outdoor activities with groups of neighbours, friends, and others, respectively. This outcome is possible because the elderly dwellers with employed status or shorter length of residence prefer to spend time outdoors with their neighbours, friends, and other people to satisfy the needs of sharing outdoor activities with those groups of people. Moreover, time spent outdoors for elders who live alone with their neighbours, friends, and other people can be experienced as more normal and desirable than the possible alternative of spending time alone in the residential site environments.

On the one hand, it is implied that solo dwellers, particularly those childless elders who do not live adjacent to a child or their family members, tend to have fewer family obligations. Thus, they can afford to participate in social activities with neighbours, friends, and community members more frequently in their residential site environments. The result reflects those of Teerawichitchainan et al. (2015), who

also found that solo-living elders are more likely to maintain active social ties with neighbours, friends, and community members, such as having meals and spending time in the residential sites, compared to those living with their spouse.

Apart from this, the single-person household among older residents in developing Asian countries has only just begun to emerge. In comparison, the proportion of older residents who live alone is low compared to the data observed in western contexts (Palloni, 2000; Teerawichitchainan et al., 2015). This outcome may be explained by the fact that attitudinal change in a living arrangements in the Asian context combined with the increased migration of adult children from rural to urban areas and declining family size has led to the increased proportion of older adults living alone (Knodel, Teerawichitchainan, Prachuabmoh, & Pothisiri, 2015).

A further explanation for employed older adults with time spent outdoors for socialisation may be linked to psychosocial and psychological benefits. Employed older adults gain or maintain social networks among the older adults' family and community members from time use in their residential sites combined with low levels of depression at old age (Adjei et al., 2018; Traynor et al., 2013). Moreover, spending time outdoors in natural areas and spaces in the residential sites extends to psychosocial advantages from participating in socially related activities, which also improved social networks and relationships among the older adults, as referred to in previous sections in this chapter.

Furthermore, the household size factor was negatively associated with the people most spending time outdoors together, $r(90) = -.34, p < .01$ (see Table 7.2).

This outcome may be due to elderly participants with bigger family sizes or more members in their residences mostly spending time outdoors together. This finding supports evidence from previous observations (Teerawichitchainan et al., 2015). The result confirms that the household size can increase older adults' family obligations with time spent outdoors in the residential site environment, thus reducing their participation in social activities with their neighbours, friends, and other people. In addition to this, as noted by Teerawichitchainan et al. (2015), there is also an economic clarification for solo dwellings with higher income levels. It enables the older adults to afford more privacy from the family members living alone. This solo dwelling characteristic ties in closely with the cultural demonstration that associates the decline in family-centred expectations and values and the increase in solitary livelihood with the rise in individualism, which can influence residential site environmental social engagement among older residents and their family.

In brief, elderly participants mostly tend to spend time outdoors with their relatives or family members such as their partners, children, and grandchildren in the residential site environments as the influence of a rural Asian context. However, some factors can affect the preference of people that elders desire to share outdoor activities in their residential site environments. The results of this research show that the association of the people most spending time outdoors with older persons is often moderated by factors such as demographic predictors (the economic activity status or occupation, amount of income, living arrangement, household size and duration of residence) and social predictors (the attitude toward friends and community members).

2.) The duration of time spent outdoors with other people

This section focuses on the duration of time spent outdoors with other people per day for older adults in their residential site environments. The response choices for the categories ranged from less than 1 hour, 1 – 4 hours, 4 – 7 hours, and 7 – 10 hours (see Table 7.4).

Overall, the outcomes show that the duration of time spent outdoors with other people per day in their residential site is mostly 1 – 4 hours at approximately 41.1 percent of the older participants. About 37 percent of elderly participants spend time with other people for less than an hour. In comparison, a minority of participants (21.1%) indicated that they spent time outdoors with other people for 4 – 7 hours, and only around 1 percent of the respondents spent more than 7 – 10 hours in the residential site environments (see Table 7.4).

However, the duration of time spent outdoors per day in the responses of spending time alone shows some interesting evidence compared to the findings of spending time with other people in the residential site environments. In contradiction with those findings, it is apparent from the data on the duration of time spent outdoors in Figure 7.7 that older adults spent time outdoors with other people resulted in the highest value of the duration of 1 – 4 hours (41.1%) and followed by the duration of less than an hour (36.7%) per day (see Table 7.4). Additionally, the proportion of the duration of time spent outdoors for 4 – 7 hours per day with other people was slightly lower than in spending time alone in the residential site environments at 7.5 percent (see Figure 7.7). In comparison, the duration of time spent outdoors with other people for 7 – 10 hours at just only 1% had lower response

rates than spending time alone for 16.7 percent. There was no report of elderly residents who spent more than 10 hours outdoors with other people in their residential site environments (see Figure 7.7).

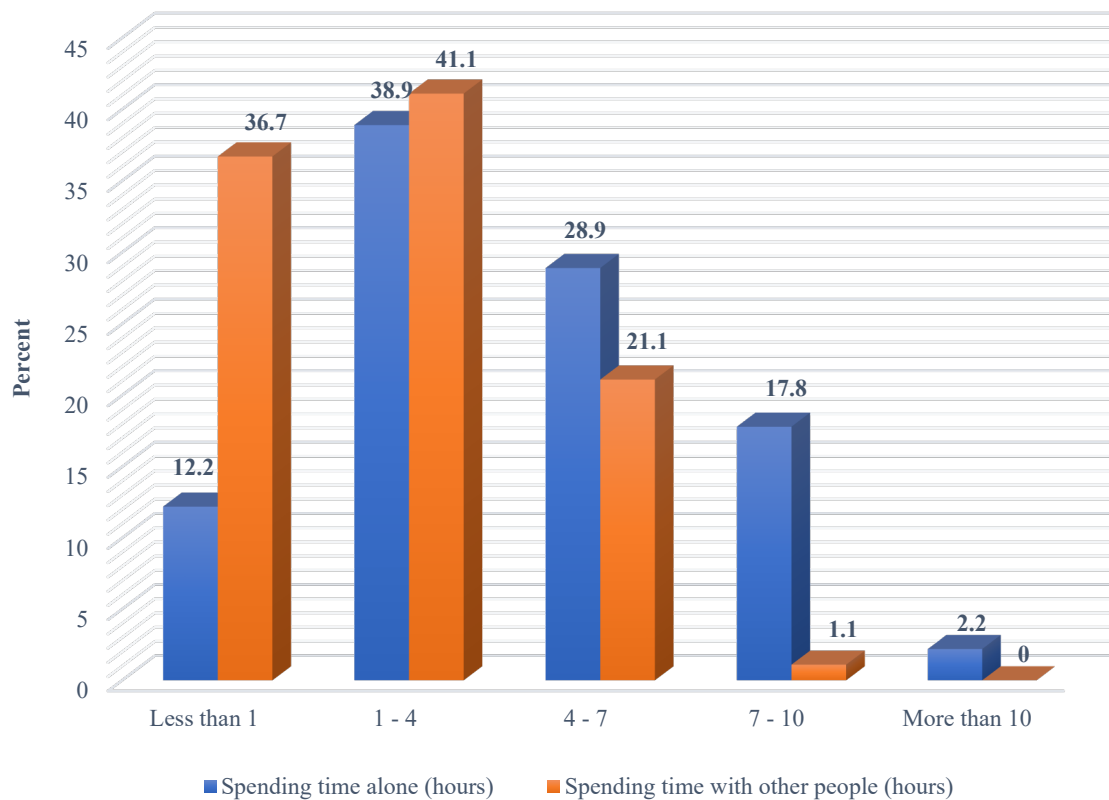


Figure 7.7: The duration of time spent outdoors per day comparing spending time alone and with other people in the residential site environments (Author, 2020).

The results also show the relationship between the duration of time spent outdoors with other people per day and some demographic characteristics. Further analyses showed that there were moderate correlations between the duration of time spent outdoors with other people and the amount of income and household size. The duration of time spent with other people per day was negatively moderate associated with the amount of income, $r(90) = -.23$, $p < .05$ (see Table 7.2).

The result of this correlation is interesting because older residents tend to spend more duration of time with other people in the residential site environments increasingly when they have less amount of income. This finding contradicts previous results reported that older adults who have less income tend to spend time outdoors in the residential site environments alone or just with their relatives. A possible clarification for this might be that time spent outdoors for social participation with other people may increase satisfaction in elders who have less money to afford socialised. There are concerning costs of hosting meals, drinks, and material items for leisure activities in the residential sites, as mentioned in the earlier section of this chapter.

Moreover, the household size factor was positively moderate correlated with the duration of time spent outdoors with other people in the residential site environment, $r(90) = .23, p < .05$ (see Table 7.2). The positive relationship between the household size and the duration of time spent outdoors with other people indicated that older people with a bigger family size reported the greatest satisfaction with more time spent outdoors with friends, neighbours, and community members in the residential site environments.

This result is in complete agreement with the previous outcome of the relationships between the household size and the people most spending time outdoors together in the residential site environment and also concurs well with Teerawichitchainan et al. (2015). As put forward by those findings, the evidence points to the influence of the household size that can develop elders' social participation with more duration of time spent outdoors with other people in the residential site environments. This outcome is consistent with the previous result in

this chapter about the household size that can increase older adults' family obligations and more time spent outdoors in the residential site environment.

Taken together, these results in this section show that elderly participants mostly spend time outdoors with other people for 1 – 4 hours per day in the residential site environments. In addition, another important finding suggests that there are associations between the duration of time spent outdoors with friends, neighbours, and community members per day with demographic predictors of the amount of income and household size.

7.3 THE MOST UTILISED RESIDENTIAL SITE AREAS OR SPACES

In this study, participants rated the most utilised residential site areas or spaces, which they have preferences (five categories of space or area) and the space or area that were used far more intensively than others (five categories of space or area), in the residential site environments. The themes identified in these responses are summarised in Table 7.5.

Table 7.5

The preferences or most used areas or spaces in residential sites from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).

Variable	Categories	Responses		Percent of Cases*
		N	Percent	
1. The preferences for spaces or areas	Front garden or area at the front	30	22.9	33.3
	Back garden or area at the back	12	9.2	13.3
	Side garden or area at the side	17	13.0	18.9
	Terrace	49	37.4	54.4
	Other	23	17.6	25.6

**The value from the multiple-choice questions.*

Table 7.5 (Continue)

The preferences or most used areas or spaces in residential sites from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).

Variable	Categories	Responses		Percent of Cases*
		N	Percent	
2. The most used space or area	Front garden or area at the front	18	20.0	
	Back garden or area at the back	6	6.7	
	Side garden or area at the side	14	15.6	
	Terrace	36	40.0	
	Other	16	17.8	
*The value from the multiple-choice questions.				

1.) The preferences for spaces or areas

This part presents the elderly participants' preferences for spaces or areas in their residential site environments. The response options for the categories ranged from front garden or area at the front, back garden or area at the back, side garden or area at the side, terrace, and other spaces or areas in the residential site (see Table 7.5).

Concerning the preferences for spaces or areas variables, the terrace was rated as the most favourite space or area with a rating of 37.4 percent (see Table 7.5). This result was followed by the response to the front garden or area of the residential site, where almost 23 percent of older residents rated their preferences for spaces or areas. In comparison, the response rate for other spaces or areas, such as pavilions, stilt floor areas, and shops, was 17.6 percent. Thirteen elders rated their preferences for spaces or areas as a side garden or area at the side of the residential site, and a minority of older participants (9.2%) indicated that a back garden or area

at the back of the residential site is their preferences for spaces or areas (see Table 7.5).

Furthermore, the analyses revealed significant correlations between the preferences for spaces or areas in the residential site environments and other factors (see Table 7.2). Those categories of the preferences for spaces or areas have relationships with the predictors of demographic, social, and the variables of outdoor usage characteristics of older adults in different ways. Thus, the overall structure of the results takes the form of five parts of each space or area, including a front garden or area at the front of the residential site, a back garden or area at the back of the residential site, a side garden or area at the side of the residential site, terrace, and other spaces or areas in the residential site.

A. Front garden or area at the front of the residential site

Examining correlations between the preferences for spaces or areas in the front garden or area at the front of the residential site and the predictors of social characteristics and purposes of time spent outdoors shows interesting patterns. First, the values were positively related to those factors of attitudes toward friends and community members from the social predictor and purpose of time spent outdoors for other activities; $r's(90) = .39, .30, \text{ and } .31$, respectively, $p's < .01$ (see Table 7.2).

This result revealed that elderly participants who have higher attitudes toward other people (among friends, neighbours, and community members) are associated with a higher chance of time spent outdoors in the front garden or area at the front of the residential site. This outcome may be due to the front garden or area at the front of the residential site being the space or area that the elderly participants

typically use to be the first place for welcoming and sharing outdoor activities with friends, neighbours, and community members. Their relationships are the factor that influences the time spent outdoors in their residential site environments.

Moreover, the findings also show the relationship of the preferences for spaces or areas with the purposes of time spent outdoors for other activities such as meeting with people (visitors, friends, neighbours). Overall, the results show that elderly residents spend time outdoors in the front garden or area of the residential site as their preferred area for other activities more than daily life activities, hobbies, exercises, and leisure activities. According to these correlations, this is exemplified in the following quote by some of the older residents, discussing time spent outdoors at the most preference space or area in the residential site environment, for example, noted:

... 'The front garden is my most preferred area. I spend time there meeting with other people.' ...

These results suggest that the front garden or area of the residential site presents a space or area for older adults to spend outdoors for other activities, especially for welcoming and meeting people. It should be noted that these residential sites are fenced. Therefore, only people acquainted with older residents are allowed to enter and engage in outdoor activities in these areas or spaces. Additionally, the attitudes toward other people (among friends, neighbours, and community members) can affect the use of elders in the front garden or area in their residential site environments.

B. Back garden or area at the back of the residential site

These results revealed the significant associations between the preferences for spaces or areas in the back garden or area at the back of the residential site and the predictors of purposes of time spent outdoors and the time of the day that older adults spend time outdoors. There were significant positive correlations between the preferences for a back garden or area at the back of the residential site with the time of the day during the afternoon (12 am – 3 pm) and the purposes of time spent outdoors for other activities and exercises; r 's(90) ranged from .23 to .22, respectively, p 's < .01 (see Table 7.2).

From this data, it can be seen that the use of the back garden or area at the back of the residential site accordingly to their preferences for spaces or areas may increase when older adults spend time outdoors at the time of the day during the afternoon (12 am – 3 pm). Predictably, this finding perhaps reflects the characteristics of the back garden or area at the back of the residential site, which is suitable for elderly residents to spend time outdoors during the afternoon as this area may represent a private space for casual time in old age. According to some older adults mentioned spending time outdoors in the back garden or area at the back of the residential site during the afternoon (12 am – 3 pm) in their residential site environment, for example, noted:

... 'There is a bench in a shady area under the pomelo trees in the back garden, which is my most preferred area. I spend time there relaxing and listening to the radio in the afternoon.' ...

Additionally, elders are more likely to spend time in the back garden or area at the back of the residential site as their preferences for spaces or areas for exercises and other activities such as watching people roaming on the street. A possible demonstration for this might be that the location of the residential site led to the usage characteristics which link to the surroundings around the residential site environment. One of the older participants described the time spent outdoors in the residential site environments at the back garden, for instance, noted:

... 'The back garden is my most preference area, as it provides me an opportunity to see people roaming on the street and also brings satisfaction to me.' ...

In this case, the back areas or gardens perform as the space in the residential sites where older adults can view the public or other people on the street and be open to public view. These characteristics of residential site environments could be represented as the supportive outdoors spaces that contribute to a more outdoors lifestyle which are correlated with older people's life satisfaction and emotional and psychological impacts that affect the quality of life in later life (Inclusive Design for Getting Outdoors, 2007).

In summary, these results show that older participants probably spend time in the back garden or area at the back of the residential site according to their preferences for spaces or areas depending on the time of the day during the afternoon (12 am – 3 pm). The purposes of exercises and other activities include looking after the grandchild(ren), meeting with people (visitors, friends, neighbours), and watching people roaming the street from their residential site environments.

C. Side garden or area at the side of the residential site

The overall results of the preferences for spaces or areas at the side garden or area at the side of the residential site revealed significant associations with the characteristics of demographic, social, the purposes of time spent outdoors and the time of the day that older adults spend time outdoors (see Table 7.2).

From Table 7.2, there was a significant negative correlation between the preferences for spaces or areas at the side garden or area at the side of the residential site with a demographic indicator of disposable income, $r(90) = -.29$, $p < .01$. This result revealed that elderly participants who have insufficient disposable income tend to prefer the side garden or area at the side of the residential site compared to those who have just enough or sufficient disposable income. This relationship may reflect an actual increase in preferences for spaces or areas in the side garden or area at the side of the residential site from the influence of elderly residents' disposable income. A possible explanation for these outcomes may be that older people with poverty may be associated with the incompetence to have more areas or spaces of the side area or garden (Feng et al., 2020), which leads to engagement reduction in the preferences for the side garden or area.

Moreover, the values of the preferences for a side garden or area at the side of the residential site were positively related to those factors of attitudes toward community members from the social predictor and purpose of time spent outdoors for hobbies; r 's(90) ranged from .31 to .27, respectively, p 's $< .01$, (see Table 7.2). These results suggest that older residents tend to increase their preferences for the side garden or area at the side of the residential site, associated with higher levels of

attitude toward community members. Furthermore, elderly adults tend to have more preferences for the side garden or area at the side of the residential site to spend time outdoors for hobbies. The comment below illustrates the time spent outdoors for hobbies at the side garden in the residential site that is, noted:

... *'The side garden provides space for gardening and growing vegetables, which gives me an incentive to go outside.'* ...

The experiences may partly explain these relationships in intimate physical settings from the social interaction and community contexts with neighbours who they routinely see over the fence, according to older residents can often spend time outdoors doing their gardens (Chalfont, 2007).

In addition, the preferences for a side garden or area at the side of the residential site were also positively related to the time of the day during the afternoon (12 am – 3 pm), $r(90) = .33$, $p < .01$, and the late morning (9 – 12 am) was modestly but significantly correlated, $r(90) = .21$, $p < .05$ (see Table 7.2). In general, the results show that older adults prefer to spend time in the side garden or area at the side of the residential site during the late morning (9 – 12 am) and especially during the afternoon (12 am – 3 pm). For example, some elderly interviewees stated about time spent at the side area at the side of the residential site, noted:

... *'I spend time relaxing and having a nap during the afternoon at the side area of the residential site.'* ...

Together these results suggest that there are associations between the preferences for the side garden or area at the side of the residential site with the factors of the demographic of disposable income, social factor with the attitude toward community members, the purposes of time spent outdoors for hobbies, and the time of the day that older adults spend time outdoors during late morning (9 – 12 am) and especially during the afternoon (12 am – 3 pm).

D. Terrace

The result indicated significance exclusively in the demographic indicator of economic activity status (see Table 7.2). As shown in Table 7.3, the results suggest that the economic activity status factor was negatively moderate correlated with the preferences for space or area at the terrace in the residential site environment, $r(90) = -.25, p < .05$.

The negative relationships between the preferences for the terrace and the economic activity status showed that older adults who are employed reported the greatest preferences for time spent outdoors at the terrace more than elders who are retired or have another economic activity status, respectively. The characteristics of the terrace may partly explain these relationships. A terrace is an open space or area that generally be attached to a dwelling. This characteristic may also be the first essential area or space for older residents to use this terrace and then step towards outdoor activities, such as relaxing at the terrace after work before entering the residence, from the connections between indoors and outdoors (Chalfont, 2007). This view was echoed by the older resident who spent time at the terrace after work, for example, noted:

... 'The shady area at the terrace allows me to spend time outdoors in the evening after I finish work.' ...

The finding shows that only the factor of the demographic indicator of economic activity status affects the preferences of elderly dwellers for space or area at the terrace in the residential site environments.

E. Other spaces or areas

The results of the preferences for other spaces or areas reveal the correlation with the demographic indicator of gender (see Table 7.2). The preferences for other spaces or areas in the residential site environment were negatively correlated with the gender factor, $r(90) = -.22$, $p < .05$. (see Table 7.2). This outcome shows that older female residents prefer other spaces or areas, such as pavilions, stilt floor areas, and shops in the residential site environment, compared to male elders.

In summary, the result shows that only the factor of the demographic indicator of gender influences the preferences of older residents for other spaces or areas in the residential site environments.

Taken together, these outcomes provide important insights into the associations of factors that may affect the older adults' preferences for spaces or areas in their residential site environments. There are the predictors of demographic (gender, economic status, disposable income, the amount of income, living arrangement, and household size), social (attitudes toward friends, neighbours, and community members), the purposes of time spent outdoors (daily life activities,

hobbies, exercises, and other activities), the duration of time spent, and the time of the day spent time outdoors (during late morning and afternoon).

2.) The most used space or area

This section presents the elderly adults' most used space or area in the residential site environments. The response choices for the categories ranged from front garden or area at the front, back garden or area at the back, side garden or area at the side, terrace, and other spaces or areas in the residential site (see Table 7.5).

The majority of older participants (40%) indicated that the terrace is the area where they spend time outdoors in the residential site environments the most. Twenty percent of older adults rated the front garden or area at the front of the residential site as the most used space or area. Almost 18 percent of elders reported that the most used space or area is other residential site spaces or areas. Of the 15.6 percent of the older respondents rated the side garden or area at the side of the residential site as the most used space or area. Only a few (6.7%) of older residents indicated that the back garden or area at the back of the residential site is the most used space or area in their residential site environments (see Table 7.5).

However, the analysis of the most utilised residential site areas or spaces in the most used space or area responses show some interesting outcomes, which differ from the preferences for spaces or areas in the residential site environments (see Figure 7.8). The value of the most used space or area shares a similarity with the result of the preferences for space or area that terrace resulted in the highest value. The most used space or area was slightly higher than the preferences for the terrace

at around 2.6 percent. In comparison, the most used space or area at the front garden or area at the front of the residential site and the back garden or area at the back of the residential site had lower response rates than the result from the preferences for spaces or areas at around almost 3 percent and 2.5 percent, respectively. Furthermore, the proportions of the most used space or area at the side garden or area at the side of the residential site and other spaces and areas were slightly higher than the result of the preferences for spaces or areas at around 2.6 percent and 0.2 percent, respectively (see Figure 7.8).

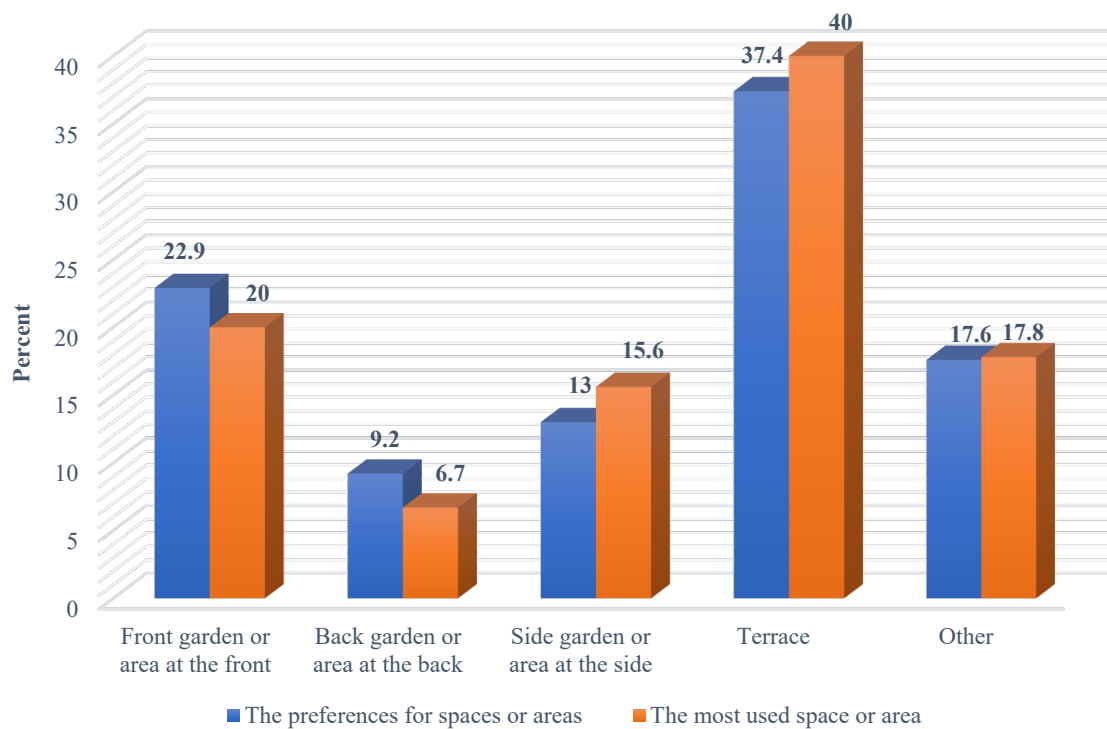


Figure 7.8: The comparison between the preferences or most used areas or spaces in residential site environments (Author, 2020).

Additionally, aside from the result from the survey in Table 7.5, the examination of correlations between the most used space or area and the social characteristics and the purposes of time spent outdoors showed some interesting

patterns (see Table 7.2). The most used space or area in the residential site environment was negatively correlated with the social characteristics factor of attitude toward friends, $r(90) = -.24, p < .05$. (see Table 7.2). This result shows that elderly participants, who have a higher attitude toward friends, rated the most used space or area as the front garden or area at the front of the residential site. This finding is in accord with the previous result of the preferences for spaces or areas, indicating that the front garden or area at the front of the residential site is the space or area that the older adults typically use as the area or space for welcoming and sharing outdoor activities with friends. Their relationships are the factor that influences the time spent outdoors in those areas or spaces in their residential site environments.

Moreover, the purposes of time spent outdoors for daily life activities was positively moderate associated with the most used space or area in the residential site environment, $r(90) = .25, p < .05$. At the same time, the purposes of time spent outdoors for other activities negatively moderate associated with the most used space or area in the residential site environment, $r(90) = -.25, p < .05$ (see Table 7.2). The outcome reveals that older adults spend time for daily life activities in other areas or spaces and spend time for other activities in the front garden or area as the most used space or area at the front of the residential site. In summary, these results show that the purposes of time spent outdoors can stimulate the decisions of older residents on the most used space or area in the residential site environment.

7.4 CONCLUSION

Overall, these results in this part indicate that the most used space or area can be influenced by the social characteristics and the purposes of time spent outdoors. Nevertheless, having a favourite or the most used spaces or areas in the residential site environments was not explicitly linked to levels of physical impairment. Most of the older participants' perspectives toward these 'residential site environments' from those findings indicate that this living environment is more of a practical function of spending a lot of time at the residential site environments.

Elderly dwellers have more preferences for some residential site areas or spaces than others because of the older residents' habits, pleasant, and preferences, rather than being a restriction imposed by their health conditions or declining capacity (Krasner, 2005; Wiles et al., 2009) or as a strategy to bolster autonomy or maintain the appearance of occupying the residential site environments (Lawton, 1985; Wiles et al., 2009). The preferences of these residential site characteristics emphasise the importance of the living environment in increasing the amount of time spent on outdoor levels. It is interesting as it suggests a residential site environment with the residents engaging and participating is not necessarily limited to impairment. It may indeed be other factors, such as the characteristics of demographic, social, the purposes and the duration of time spent, and the time of the day spent outdoors, that many older adults who spend time in residential site environments experience.

The following chapter presents older adults' perceptions and evaluations toward their residential site environments in rural areas concerning the necessity

and physical features of residential site environmental characteristics recognised by older people as essential in the residential site environments. It also explores the preferences of residential site environments and the characteristics and physical environmental features of the residential site environments from the elderly participants' perspectives and perceptions.

CHAPTER 8

PERCEPTIONS AND EVALUATIONS OF RESIDENTIAL SITE ENVIRONMENTS BY OLDER ADULTS IN A RURAL CONTEXT

8.1 INTRODUCTION

Pertaining to the previous chapter, the study presents the results of the outdoor usage characteristics of elderly adults in residential site environments in a rural context. Chapter seven also explores older adults' preferences and usage characteristics of the residential site areas or spaces. The last chapter of part four describes the finding, analysis, and results of older adults' perceptions and evaluations of the residential site environments. Finally, this chapter addresses two of the research objectives of this study:

a. **Research objective C**: Analysis of older adults' perceptions and evaluations toward their residential site environments in a rural area concerning (i) the necessity of the residential site environments and (ii) the physical aspects of the residential site environmental characteristics that need to be taken into account in these residential site environments.

b. **Research objective D**: Evaluation and investigation of preferences and satisfaction of older adults in terms of (i) the residential site environmental characteristics and (ii) the characteristics and physical environmental features of the residential site environments that influence the outdoor usage and environmental satisfaction through older adults' perspectives and perceptions.

The introduction of this chapter presents a brief description of the sections in this chapter. Next, this chapter is divided into two main sections. The first section describes the findings from the quantitative analysis of the questionnaire. This section refers to research objective C to analyse older adults' perceptions and evaluations toward their residential site environments in rural areas regarding the necessity and physical features of residential site environmental characteristics recognised by older people as necessary in the residential site environments. The first section of this chapter is designed to answer research question 2.

The second section of this chapter presents the quantitative analysis of the questionnaire and the qualitative results from the in-depth interviews with the older residents. This section refers to research objective D to evaluate the preferences of residential site environments and investigate the characteristics and physical environmental features of the residential site environments from the reflection of elderly participants' perspectives and perceptions. This discussion also highlights and shows the influence of the specific features of the residential site environments on outdoor usage characteristics evaluated positively and negatively by older dwellers. The results from this section help to answer research questions 1, 2, and 3 as follows:

Research question 1: “What are the main considerations in the characteristics of residential site environments for older adults in the rural Asian context?”

Research question 2: “Which residential site environmental characteristics and physical features contribute to the outdoor usage and satisfaction of older adults in the rural context?”

Research question 3: “What are the perceptions and evaluations of residential site environments among older people in the rural context?”

To conclude, this chapter highlights the older adults’ perceptions and evaluations of the residential site environments regarding the environmental characteristics and features in a rural context.

8.2 THE OLDER ADULTS’ PERCEPTIONS AND EVALUATIONS OF RESIDENTIAL SITE ENVIRONMENTS

This section presents the outcomes from the quantitative analysis of the questionnaire. The findings, relating to research objective C, discuss the perception and evaluation of older adults toward their residential site environments in the rural Asia context.

This part presents the principal findings of the current analysis in terms of (1) the necessity of the residential site environments and (2) the physical aspects of the residential site environmental characteristics that need to be taken into account in the residential site environments. In addition, responses of older people in different age groups of early stage and later stage are compared. Finally, this section describes how the residential site environments and the physical features are considerably perceived and evaluated as significant by older people.

Apart from the quantitative approach data, this study supplemented an in-depth investigation of older people's subjective perceptions and expectations towards life concerning the residential site environment in which they live. The qualitative data analysis aims to explain the patterns found in the quantitative data analysis by reflecting older participants' perspectives and perceptions of the residential site environment and their engagement with rural life. Several interesting issues emerged, which the quantitative data analysis alone would not have revealed.

Furthermore, this study also explored the correlations between the factors of demographic characteristics (twelve predictors of individual characteristics), socio-demographic characteristics (three predictors of attitudes toward three categories of groups of people), the necessity and importance of the residential site environments (the assessments of five predictors), and the characteristics and physical environmental features of older adults' residential sites (the assessments of perception and evaluation; with the total of thirteen predictors of the categories) as presented in Table 8.1. This correlations analysis is used to illustrate the data of necessity, importance, perception, and evaluation of older adults toward their residential site environments.

Table 8.1

Correlations among demographic, social, and the characteristics and physical environmental features in residential sites predictors, N = 90 (Source: fieldwork 2019).

Predictors	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1 Gender	1 00																																	
2 Age stage	-0 06	1 00																																
3 Age	-0 19	.79**	1 00																															
4 Economic activity status	-.30**	0 12	0 12	1 00																														
5 Disposable income	0 04	0 01	-0 03	-0 08	1 00																													
6 The amount of income	0 19	-0 11	-0 17	-.31**	.35**	1 00																												
7 Physical health	.24*	-0 10	-0 20	-0 11	.21*	.21*	1 00																											
8 Mental and emotion health	-0 05	-0 16	-0 14	0 01	0 05	0 05	.28**	1 00																										
9 Disease / disorder status	-0 09	0 07	0 14	0 04	-.24*	-0 02	-.49**	-0 04	1 00																									
10 Living arrangement	-0 03	0 07	0 12	0 11	0 13	-0 11	-0 04	-0 11	-0 15	1 00																								
11 Household size	0 00	-0 03	-0 08	0 03	0 18	-0 11	0 03	0 00	-0 20	.70**	1 00																							
12 Duration of residence	-0 07	0 05	0 13	0 10	0 00	-.34**	-0 06	-0 10	-0 16	.33**	.27*	1 00																						
13 Attitude toward family	-0 07	0 04	0 08	0 12	0 08	0 04	-0 01	.43**	0 04	.21*	0 14	-0 03	1 00																					
14 Attitude toward friends	-0 05	-0 05	-0 15	-0 12	-.29**	0 18	-0 18	0 04	0 19	-0 11	-0 15	-.23*	0 17	1 00																				
15 Attitude toward community	0 07	0 04	-0 02	-0 05	-.37**	0 12	-.23*	0 08	.36**	-0 04	-0 05	-0 19	.22*	.73**	1 00																			
16 Necessity of environment	0 08	-0 19	-.21*	-0 11	-0 01	0 09	0 09	-0 01	-0 01	0 17	0 09	0 06	0 13	0 00	0 05	1 00																		
17 Important of typology	0 11	-0 08	-0 10	-0 14	0 11	0 07	0 16	-0 02	0 06	0 05	0 05	0 04	-0 08	-0 14	-0 01	.31**	1 00																	
18 Important of motivator	0 20	-0 09	0 04	-.22*	0 17	0 07	0 02	0 08	0 03	-0 14	-0 12	-0 02	-0 14	-.27*	-.23*	-0 19	0 13	1 00																
19 Important of functionality	-0 04	-0 01	-0 03	0 06	0 03	-0 14	0 11	0 15	-0 05	0 14	0 12	0 12	0 13	-0 02	-0 04	0 04	-0 15	-0 07	1 00															
20 Important of safety	0 06	0 07	-0 06	-0 15	-0 19	0 08	-0 07	0 02	0 05	.22*	0 10	-0 08	.28**	.49**	.58**	0 08	0 02	-0 12	-0 01	1 00														

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 8.1 (Continued)

Correlations among demographic, social, and the characteristics and physical environmental features in residential sites predictors, N = 90 (Source: fieldwork 2019).

Predictors		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34		
Perception and Evaluation	21 Buildings facing N-S	-0.09	0.04	0.07	0.02	0.18	0.12	0.07	0.12	0.04	0.00	-0.05	0.06	-0.01	0.04	0.00	0.12	.24*	0.20	0.10	0.08	1.00															
	22 Buildings facing E-W	-0.03	0.03	-0.01	-0.12	0.11	0.18	0.04	0.09	0.16	0.19	0.00	-0.05	0.14	0.20	0.06	0.05	0.00	0.10	0.17	0.11	.30**	1.00														
	23 Location of site	-0.04	0.06	0.09	-0.14	0.17	0.20	0.07	0.07	0.09	.24*	0.12	0.02	0.12	0.19	0.20	.25*	.32**	0.04	0.15	.30**	.60**	.42**	1.00													
	24 Surrounding areas	0.14	-.22*	-0.15	-0.08	0.11	0.16	0.17	0.03	-0.02	0.05	0.01	0.01	0.07	.22*	.24*	0.16	.35**	0.08	0.09	0.20	.28**	.45**	.61**	1.00												
	25 Indoor sunshine	-0.05	0.05	-0.08	-0.03	-.28**	-0.13	-0.08	-0.05	0.05	-0.04	-0.05	-0.06	-0.09	-0.09	-0.05	0.00	0.01	-0.06	-0.08	-0.06	-.36**	-.27**	-.31**	-.50**	1.00											
	26 Good window views	0.09	-.21*	-0.12	-0.13	0.13	.25*	0.09	0.08	0.00	-0.18	-0.07	-0.09	-0.08	0.16	0.13	0.07	0.18	0.14	0.06	0.03	.23*	.38**	.33**	.77**	-.54**	1.00										
	27 Percep within a residential	0.16	-0.08	-0.03	-0.05	0.11	.26*	0.13	0.18	.23*	0.11	0.04	-0.11	0.20	.31**	.29**	0.08	0.17	-0.05	0.15	0.20	0.13	.49**	.51**	.57**	-.26*	.41**	1.00									
	28 Garden landscaping	0.01	0.06	0.03	-0.05	0.00	-0.08	-0.02	-0.02	-0.02	.33**	0.08	0.06	0.04	0.09	0.01	0.12	-0.06	-0.08	.23*	0.13	0.07	.34**	.35**	.30**	-0.16	.21*	.49**	1.00								
	29 Perception of surroundings	0.08	-0.09	-0.08	-0.06	0.16	0.12	.24*	0.05	0.03	.26*	0.14	0.12	0.14	0.05	0.12	0.19	.35**	0.04	0.16	0.21	0.21	.36**	.70**	.79**	-.29**	.36**	.60**	.32**	1.00							
	30 Indoor-outdoor connections	0.02	0.05	0.02	0.03	-0.06	0.12	-0.03	0.04	0.03	-0.03	-0.09	0.04	0.17	0.00	0.01	0.11	-0.08	0.06	.24*	0.08	0.03	.26*	0.12	0.16	-0.18	0.19	0.09	0.20	0.10	1.00						
	31 Site walkability	0.09	-0.07	-0.03	-0.11	-0.06	0.02	.23*	-0.02	-0.09	-0.02	-0.04	0.08	-0.12	-0.07	-0.01	0.17	0.08	0.17	.26*	0.08	0.06	0.13	.27**	.38**	-0.13	.32**	0.17	.31**	.30**	.46**	1.00					
	32 Environmental features	0.01	-0.04	-0.01	-0.18	0.05	.22*	0.06	0.00	0.00	.24*	0.20	0.04	0.03	0.19	0.12	0.16	0.15	-0.16	.27**	.31**	0.16	.33**	.66**	.43**	-0.18	.36**	.50**	.38**	.42**	.25*	.35**	1.00				
	33 Sense of safety from indoor	0.12	-0.04	0.00	-0.03	-0.16	0.09	0.02	0.00	0.04	0.09	-0.02	0.05	0.12	0.12	0.18	0.19	-0.02	0.03	.24*	.40**	-0.05	0.20	.28**	.36**	-0.20	.29**	.22*	.34**	.29**	.71**	.72**	.47**	1.00			
	34 Feeling of safety	0.06	-0.06	0.07	-0.15	-0.19	0.08	-0.07	0.02	0.05	.22*	0.10	-0.08	.28**	.49**	.58**	0.08	0.02	-0.12	-0.01	1.00**	0.08	0.11	.30**	0.20	-0.06	0.03	0.20	0.13	0.21	0.08	0.08	.31**	.40**	1.00		
**, Correlation is significant at the 0.01 level (2-tailed).																																					
*, Correlation is significant at the 0.05 level (2-tailed).																																					

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

8.2.1 The necessity of the residential site environments

In later life, the residential site environment is acknowledged as a critical aspect of quality of life and well-being, as mentioned in Chapter three (Iwarsson et al., 2007; Lien, 2013; Oswald, Hieber, Wahl, & Mollenkopf, 2005). Adriaanse (2007) also points out that it is essential to approach the residential environment defined by older residents and their perceptions (see Chapter five, section 5.4). This part displays the necessity of the residential site environments in later life from older people's perception and evaluation, including the examination with three levels of necessity. Figure 8.1 presents an overview of older adults' perceptions and assessments of the necessity of the residential site environments with their responses and frequencies.

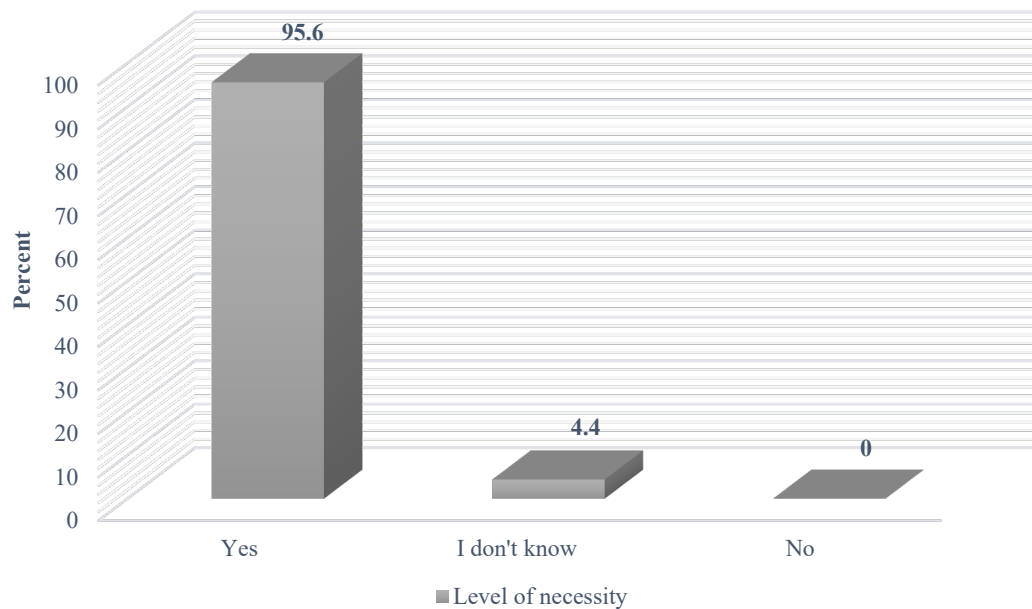


Figure 8.1: Older adult perception and evaluation of the necessity of the residential site environments from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).

The results from the data analysis of the questionnaire show that most respondents agree that the residential site environments are necessary for older people, many more than 95 percent. However, a minority of older participants (around 4.4%) rated as ‘I don’t know’ for the necessity of the residential site environments (see Figure 8.1).

In addition, the responses of older people in different age groups of early stage and later stage are compared. It can be seen from the data in Table 8.2 that older adults who are at the early stage share the similarity views with elders at the later stage. There are only slight differences in older adults’ perceptions and evaluations of the necessity between different age groups.

Table 8.2

Older adult perception and evaluation of the necessity of the residential site environments from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).

Age stage group	Level of necessity (N, Percent)			Total
	Yes	I don’t know	No	
Early stage	59 (98.3)	1 (1.7)	0 (0.0)	60
Later stage	27 (90.0)	3 (10.0)	0 (0.0)	30
TOTAL	86 (95.6)	4 (4.4)	0 (0.0)	90

Along with the result of the necessary examination, the investigation of the correlation between the demographic characteristics of age and the necessity of the residential site environments revealed some interesting patterns, as shown in Table

8.1. The analyses of correlations showed that the necessity of the residential site environments was moderately associated with the age variable, $r(90) = -.21, p < .05$ (see Table 8.1).

In general, the outcome indicated that older people in the early stage or less senior tend to perceive and evaluate that residential site environments are more necessary than those elders of the greater age in a later stage. These relationships may partly be explained by a gradual decline with age, which influences a sudden decrease in the activity of older people (Klimova & Dostalova, 2020; Rioux & Werner, 2011). In addition, research, as noted by Rioux and Werner (2011), shows that elderly persons in older age groups felt less active than the younger group. Therefore, it is possible that older persons with more senior stage may consider that residential site environments are less necessary because their physical limitations have made them less mobile and remain in residence (Rioux & Werner, 2011; Yen & Lin, 2018).

On the other hand, in old age with physically active, the characteristics of the residential site environments in which older adults live may tend to increase positive emotions and attitudes toward the outdoor environments and promote engaging in appropriate physical activities (Sugiyama & Thompson, 2006, 2007; Wang, 2014). As noted by Wang (2014), residential site environments can be the most readily available outdoor places near residents for older adults to participate in physical activities. However, as mentioned in Chapter seven, some negative features of the residential site environments can be perceived as environmental barriers which lead to outdoors mobility decline and reduce the necessity of the residential site environments in later life (Rantakokko, Iwarsson, Portegijs,

Viljanen, & Rantanen, 2015). It also accords with the interviews from this study in which the older participants in a later stage reported examples of residential site environments' characteristics that could be considered as environmental barriers, for instance, noted:

... 'The back garden is too steeply inclined, reducing my ability to access the outdoor area.' ...

In addition to the interviews, the illustration below shows the characteristics of residential site environments that could be considered environmental barriers. These characteristics also tend to reduce the necessity of the residential site environments in later life, accordingly to the older resident's explanations from the interview as presented in Figure 8.2.

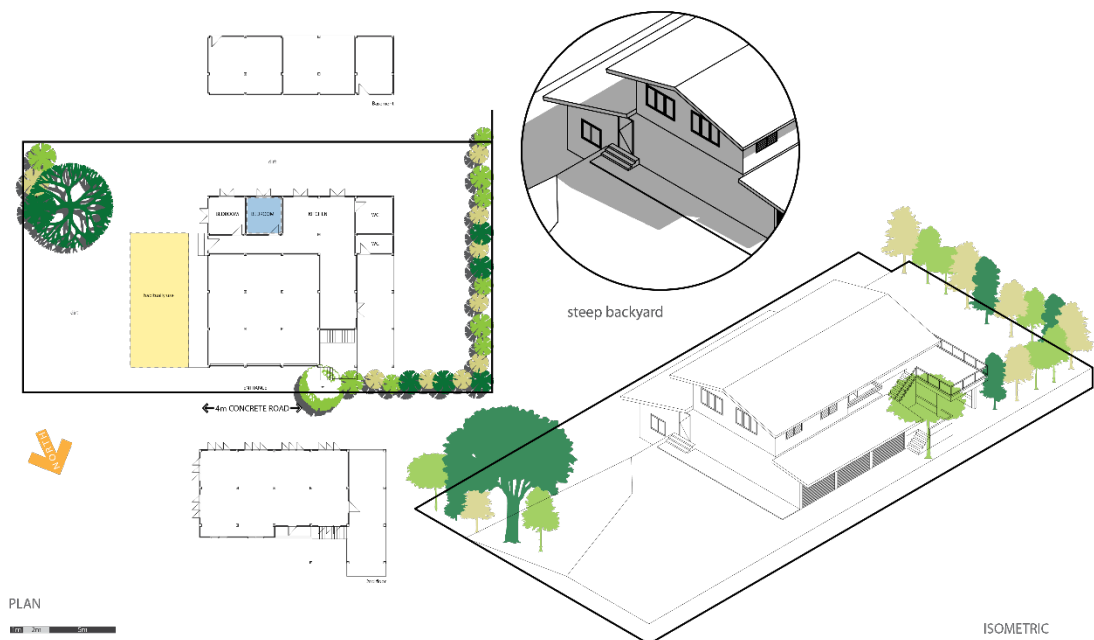


Figure 8.2: The sample of residential site characteristics that could be considered environmental barriers (Author, 2020).

These results reflect those of Rodiek and Lee (2009) and Newton, Ormerod, Burton, Mitchell, and Ward-Thompson (2010), who also found that the residential site's environmental features, such as the outdoor and indoor connections and outdoor walkways, are considered to be essential for older people with increasing age due to the mobility in later life.

Thus, on the whole, it can say that the link between the age stage and the necessity refers to the factors of the elderly's ageing process results in the capabilities which are under the influence of their physical changes, and therefore the perception and evaluation of the necessity of the residential site environments. In accordance with the present outcomes, previous studies have explained that age groups impacted older people's perceptions and attitudes towards housing and living environment characteristics with advancing age (Mulliner, Riley, & Maliene, 2020). On the other hand, as people age, the characteristics of the residential site environments may encourage physical activity engagement opportunities and increase the desire for outdoors mobility. This finding might suggest that the necessity results from the significant association between the capability of elderly adults at different age stages and the characteristics of residential site environments.

8.2.2 The physical aspects of the residential site's environmental characteristics

This part presents the older adults' perception and evaluation of the physical aspects of the residential site's environmental characteristics related to (i) the

typology, (ii) the motivator, (iii) the functionality, and (iv) the safety, which also includes the examination with five levels of importance. As mentioned in the literature review in Chapter five (see Chapter five, section 5.4), these physical aspects are based on the categories of residential site environmental features from the age-friendly framework for housing and residential site environments (Frochen & Pynoos, 2017; Kamp, 2011; Wang, Rodiek, & Shepley, 2006; Yeo & Heshmati, 2014).

Firstly, typology is one of the physical characteristics of residential site environments. This environmental aspect includes the dwelling and site characteristics such as type, size, dwelling orientation toward sun direction and the frontage or attached street, etc. Secondly, the motivators are the environmental amenities or attractiveness encouraging older adults to go outdoors, such as the characteristics of pleasant indoor sunshine and good window-views at the dwelling level, garden landscaping and green area and inviting transitional areas at the site level, etc. Thirdly, the overall functions of environmental features convenient to seniors' outdoor activities, including possible indoor-outdoor connections, site walkability, paving, shading from dwellings and significant plantations, etc. Finally, safety is the physical aspect of environmental features that relates to the safety perceived by older adults in their residential sites, including the accessibility that affects older adults' mobility around their residential sites safely.

As demonstrated above, the physical aspects of the residential site's environmental characteristics are presented in the theme, which identified an overview of older adults' perceptions and evaluations of the physical aspects of

the residential site's environmental characteristics with their responses are set out in Figure 8.3.

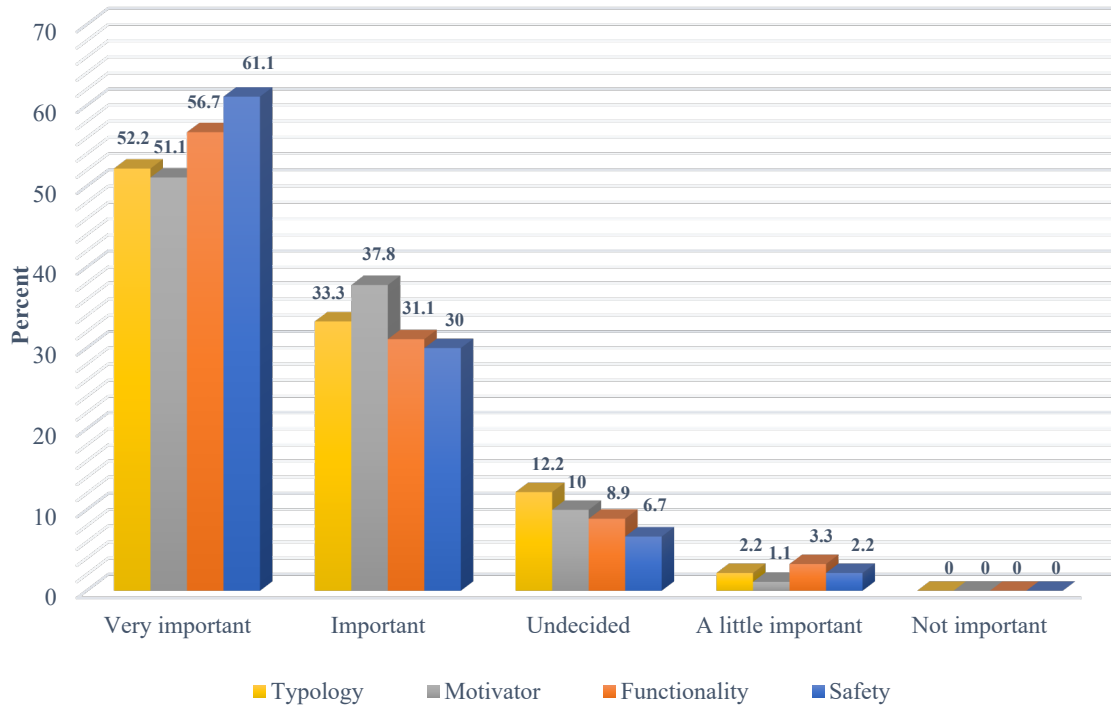


Figure 8.3: Older adults' perception and evaluation of the physical aspects of the residential site environmental characteristics with the level of importance from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).

The majority of older people agree that the environmental characteristics of the residential site should comprise the physical aspects related to safety, functionality, motivator, and typology, respectively. These four aspects are mostly recognised as 'very important' or 'important' in residential site environmental characteristics (see Figure 8.3). The results, as shown in Figure 8.3 and Table 8.3, indicate that the physical aspect of 'the safety' was responded to as the most

important with a rating as ‘very important’ or ‘important’ of 91.1 percent of elderly respondents’ perception and evaluation ($M = 4.50$). Followed by the response to the physical aspects of the functionality ($M = 4.41$), the motivator ($M = 4.39$), and the typology ($M = 4.36$) of residential site environmental characteristics, respectively.

First and foremost, the findings of the physical aspects related to safety may be explained by the fact that perceived residential site safety is essential to the well-being of older people who are vulnerable to the effects of residential site environments (Choi & Matz-Costa, 2017). As mentioned in Chapter five, the environmental characteristics of safety could affect an older adult’s psychological health and physical functioning and the capacity to manage mobility and outdoor activities in the residential site environment. According to the information, this view was echoed in the following quote by the elderly informant who discussed the negative characteristic of safety in their residential site environment, for example, noted:

... *‘The side and back gardens are difficult to walk and have caused me to have accidents many times.’* ...

In addition to the interviews, the illustration below presents the example of a negative characteristic of safety from the slope in the residential site environment, as shown in Figure 8.4.

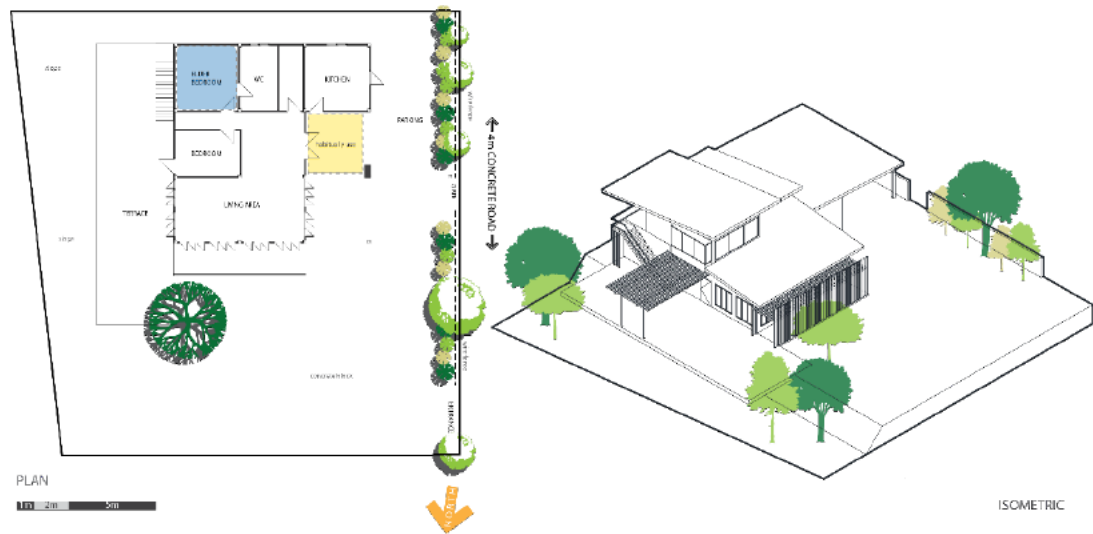


Figure 8.4: The sample of residential site characteristics of area or space for daily life activities (Author, 2020).

Moreover, older adults tend to place higher importance on perceived residential site safety because of the growing concern regarding mobility issues from trips and falls on the residential site (Mulliner et al., 2020). This view was echoed by some older residents who indicated the requirement of the residential site environmental renovation to increase safety in the residential site environment; for example, noted:

... 'I would like to erect a fence at the back of the residential site to provide some safety from falling into the canal.' ...

According to the abovementioned, the data reflects those of Ewen, Smith, Washington, Carswell, and Emerson (2017), who found that safety is the environmental factor that can reduce risks and promote the well-being of older people in the residential environment.

Secondly, functionality is a significant factor that relates to the older adults' concerns about the functions of environmental features with regards to, for example, the design of the built environment of appropriate outdoor and indoor connections and the walkability of the residential site environment (Rodiek & Lee, 2009; Wang & Lee, 2010). The functionality also affects residential environmental satisfaction and influences older adults' use of residential site environments (Inclusive Design for Getting Outdoors, 2007; Mulliner et al., 2020). Supporting the data from the in-depth interviews, some older adults negatively mentioned the functionality with the characteristic of site walkability in their residential sites, for example, noted:

... 'The outdoor and indoor connection area is difficult to walk, which reduces site walkability.' ...

The functionality of the environmental components is considered essential for older adults because it may encourage physical activity, increase outdoor usage, and significantly impact the health and well-being of elderly residents (Rodiek & Lee, 2009).

Thirdly, the environmental factor of motivator would attract older adults to be physically active in the residential environment and engage in more physical activity outdoors (Yu et al., 2021). The environmental motivators of the residential site environments, such as pleasant sunshine, garden landscaping, and natural areas or surroundings, include health improvement in old age and enjoying physical activity outdoors (Yarmohammadi, Mozafar Saadati, Ghaffari, & Ramezankhani, 2019; Yu et al., 2021). It is exemplified in the following quote

from the in-depth interview by some of the elderly respondents, discussing the characteristics of environmental motivators in the residential site environment, for example, noted:

... 'There are many trees around the residential site which make most of the outdoor area shady, pleasant, and comfortable and allow me to spend time outdoors throughout the day.' ...

Additionally, the illustration also shows the characteristics of the environmental aspect of motivators from the garden landscaping and green area and natural surroundings accordingly to the older resident's explanations from the interview as presented in Figure 8.5.

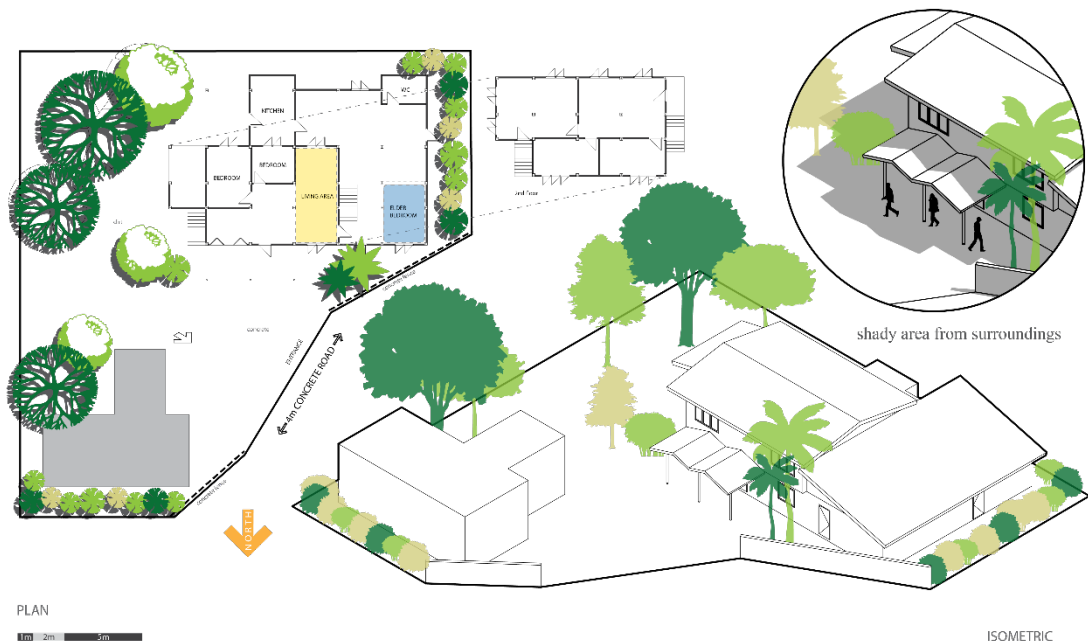


Figure 8.5: The sample of residential site characteristics of environmental motivators from the garden landscaping and green area and natural surroundings (Author, 2020).

Lastly, the typology is the physical characteristics of environmental features in residential site environments, including dwelling and site characteristics such as type, size, orientation, the attached street, etc. The typology of the environmental feature has been associated with well-being, quality of life and environmental satisfaction in old age, and successful ageing (Mulliner et al., 2020). Supporting the outcomes from the in-depth interviews of some older people expressed their opinion about the environmental characteristics of typology which influenced the perceived environmental quality and satisfaction in the residential site, for example, noted:

... 'Sometimes the noise from the passing traffic from the street outside at the front of the residential site can be disturbing and make me stressed.' ...

As shown above, the outcomes strongly emphasise that, in addition to the residential site environments' features, older adults' perceptions and evaluations toward the physical aspects of the residential site environmental characteristics are key drivers behind the environmental preferences in later life. The physical factors of safety, functionality, motivator and typology in residential site environments influence older people's physical and psychological well-being, quality of life and environmental satisfaction, and successful ageing.

Table 8.3

Variables of the perception and evaluation of physical aspects of the residential site environmental characteristics with the level of importance from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).

Age stage	Variable of perceived factors	Level of importance (N, Percent)					Mean score*
		Not important	A little important	Undecided	Important	Very important	
Early stage	Typology	0 (0.0)	0 (0.0)	8 (13.3)	20 (33.3)	32 (53.3)	4.40
	Motivator	0 (0.0)	0 (0.0)	6 (10.0)	22 (36.7)	32 (53.3)	4.43
	Functionality	0 (0.0)	1 (1.7)	6 (10.0)	20 (33.3)	33 (55.0)	4.42
	Safety	0 (0.0)	2 (3.3)	5 (8.3)	16 (26.7)	37 (61.7)	4.47
Later stage	Typology	0 (0.0)	2 (6.7)	3 (10.0)	10 (33.3)	15 (50.0)	4.27
	Motivator	0 (0.0)	1 (3.3)	3 (10.0)	12 (40.0)	15 (50.0)	4.30
	Functionality	0 (0.0)	2 (6.7)	2 (6.7)	8 (26.7)	18 (60.0)	4.40
	Safety	0 (0.0)	0 (0.0)	1 (3.3)	11 (36.7)	18 (60.0)	4.57
TOTAL	Typology	0 (0.0)	2 (2.2)	11 (12.2)	30 (33.3)	47 (52.2)	4.36
	Motivator	0 (0.0)	1 (1.1)	9 (10.0)	34 (37.8)	46 (51.1)	4.39
	Functionality	0 (0.0)	3 (3.3)	8 (8.9)	28 (31.1)	51 (56.7)	4.41
	Safety	0 (0.0)	2 (2.2)	6 (6.7)	27 (30.0)	55 (61.1)	4.50

*The higher this value, the more important the variable for participants.

The comparison of older people in different age groups of the early and the later stages was investigated. From the data in Table 8.1, it is apparent that the analysis did not reveal any significant statistical differences between different age groups in terms of the importance attributed to the perceived factors of safety, functionality, motivator, and typology of the residential site environmental characteristics. The table above illustrates that older people at both stages have a resemblance point of view in terms of the aspects of the residential site's

environmental characteristics that need to be considered in the residential site environments.

In summary, the results in this section show that elderly adults in the early and the later stages agree that the residential site environments are necessary for older people. Furthermore, the evaluations are consistent with data obtained in the previous section that the residential site environmental characteristics should comprise the physical aspects related to safety, functionality, motivator, and typology, respectively.

Moreover, the only difference found between older adults from the different age groups relates to necessity. Elders at the early stage, who are less senior and more likely to be physically active, tend to perceive and evaluate that residential site environments are necessary than older persons of the greater age in the later stage (Rioux & Werner, 2011; Yen & Lin, 2018). These outcomes may also relate to the older adults' satisfaction and attitudes from the influences of the characteristics of the residential site environments of those physical aspects.

In the view of ageing in place, Ewen et al. (2017) point out that the older people's capability to successfully age in place depends not only on their functional abilities and physical health but on the characteristics of the physical features in their living environment. Therefore, such analyses are essential, as results can inform the residential site environmental characteristics of the physical aspects that can potentially promote older adults' physical and psychological well-being and physical activities in the residential environments.

8.3 THE CHARACTERISTICS AND PHYSICAL FEATURES OF THE RESIDENTIAL SITE ENVIRONMENT FROM OLDER ADULTS' PERSPECTIVES AND PERCEPTIONS

This section refers to research objective D presenting the characteristics and physical environmental features of the residential site environments that influence outdoor usage and environmental satisfaction by reflecting older participants' perspectives and perceptions. It also highlights the residential site environment's specific features of outdoor usage evaluated positively and negatively by older residents.

This part presents the results from analysing the residential site environment's specific characteristics and physical environmental features. The illustrations reveal the existing residential site environments from the fieldwork data collection and the qualitative results from the interviews with the older residents. While some perceptions and preferences in the residential site environment may be influenced by the older resident's living environment context, others (universals) may be common to most older people from different residential site environmental characteristics and features. Therefore, it may be useful to define general principles that guide preference and satisfaction. Furthermore, an extended framework of living environmental characteristics in a rural Asian context, with an emphasis on residential sites for later life, was developed through this research. Therefore, an extensive analysis of the relevant data of similarities and differences between the existence of the residential site environments and the responses of older people from different residential site environmental characteristics and features was conducted.

To begin with, this study shows the effects that different environmental factors have on residential sites through older adults' perceptions and evaluations of (i) the typology, (ii) the motivators, (iii) the functionality, and (iv) the safety (the assessments with a total of thirteen categories of perceived factors at five levels of preference) through the residential site environmental characteristics at the residential dwelling and residential site levels. Table 8.4 presents an overview of all variables of the perceived characteristics of the residential sites, their categories, responses, frequencies, and mean score (M).

Table 8.4

Variables of the preference level of the residential site environmental characteristics at the residential dwelling and site levels from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).

Variable of perceived factors	Preference level (N, Percent)					Mean score*
	Very poor	Poor	Moderate	Good	Very Good	
Typology						
<i>Residential dwelling level</i>						
▪ Dwelling orientation concerning the sun						
- Facing north-south	2 (2.2)	8 (8.9)	34 (37.8)	39 (43.3)	7 (7.8)	3.46
- Facing east-west	1 (1.1)	12 (13.3)	34 (37.8)	29 (32.2)	14 (15.6)	3.48
<i>Residential site level</i>						
▪ Location of the residential sites	0 (0.0)	2 (2.2)	27 (30.0)	50 (55.6)	11 (12.2)	3.78
▪ Surrounding residential land uses	0 (0.0)	2 (2.2)	17 (18.9)	45 (50.0)	26 (28.9)	4.06
*The higher this value, the more preference of the variable from participants.						

Table 8.4 (Continue)

Variables of the preference level of the residential site environmental characteristics at the residential dwelling and site levels from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).

Variable of perceived factors	Preference level (N, Percent)					Mean score*
	Very poor	Poor	Moderate	Good	Very Good	
Motivators						
<i>Residential dwelling level</i>						
▪ Pleasant indoor sunshine	2 (2.2)	10 (11.1)	33 (36.7)	29 (32.2)	16 (17.8)	3.52
▪ Good window - views	1 (1.1)	9 (10.0)	21 (23.3)	35 (38.9)	24 (26.7)	3.80
▪ Perceived residential site environments from the perception within a residence	0 (0.0)	5 (5.6)	29 (32.2)	35 (38.9)	21 (23.3)	3.80
<i>Residential site level</i>						
▪ Garden landscaping	0 (0.0)	8 (8.9)	25 (27.8)	37 (41.1)	20 (22.2)	3.77
▪ Perceived residential site environments from the perception of surroundings area or neighbourhood	1 (1.1)	2 (2.2)	33 (36.7)	29 (32.2)	25 (27.8)	3.83
Functionality						
<i>Residential dwelling level</i>						
▪ Indoor-outdoor connections	1 (1.1)	8 (8.9)	23 (25.6)	45 (50.0)	13 (14.4)	3.68
<i>Residential site level</i>						
▪ Perceived site walkability	3 (3.3)	6 (6.7)	18 (20.0)	50 (55.6)	13 (14.4)	3.71 4.04
▪ Perceived environmental features	0 (0.0)	3 (3.3)	14 (15.6)	49 (54.4)	24 (26.7)	
Safety						
<i>Residential dwelling level</i>						
▪ Sense of safety in the residential site from the perception within a residence	0 (0.0)	2 (2.2)	9 (10.0)	66 (73.3)	13 (14.4)	4.00
<i>Residential site level</i>						
▪ Feeling secure and safe at the residential site	0 (0.0)	2 (2.2)	6 (6.7)	27 (30.0)	55 (61.1)	4.50
*The higher this value, the more preference of the variable from participants.						

1.) The typology

This part presents the older people's perception and evaluation of preferences for the typology of their residential site environments. According to Table 8.4, the response options for the categories range from the residential dwelling level with the dwelling orientation concerning the sun faces north-south and east-west and the residential site level with the residential sites and the surrounding residential areas' land uses. Figure 8.6 presents an overview of preferences on the characteristics of each typology factor from the frequency.

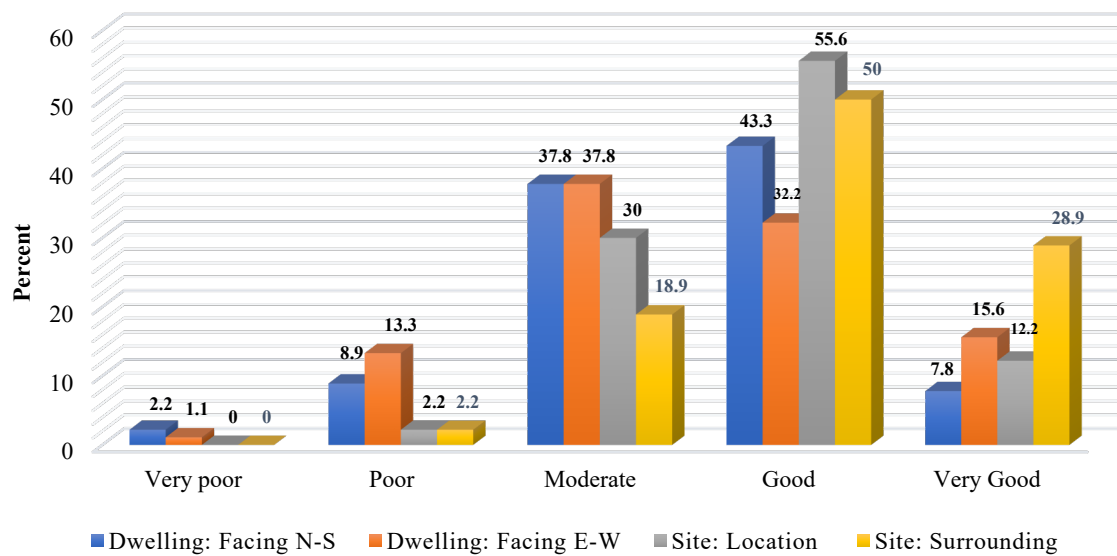


Figure 8.6: Older adults' perception and evaluation of the typology of the residential site environmental characteristics with the level of preference from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).

A. The dwelling orientation concerning the sun faces north-south

In general, the results show that most older people rated the dwelling orientation concerning the sun faces north-south as 'good' and 'very good' at over

half of the respondents (51.1%, see Figure 8.6). On the other hand, as shown in Figure 8.6, a minority of older participants (11.1%) were evaluated as ‘poor’ and ‘very poor’ for the preference for the sun faces north-south. Approximately 38 percent rated as ‘moderate’. Interestingly, we can see that the dwelling orientation concerning the sun facing north-south resulted in the lowest preference among all environmental factors ($M = 3.46$, see Table 8.4).

B. The dwelling orientation concerning the sun faces east-west

Overall, the outcomes from Figure 8.6 show that almost half of elderly individuals responded to the dwelling orientation concerning the sun facing east-west as ‘good’ and ‘very good’ (47.8%). On the other hand, as shown in Figure 8.6, only 14.4 percent of older respondents rated this characteristic as ‘poor’ and ‘very poor’, and around 38 percent rated it as ‘moderate’, which is the same outcome as the sun faces north-south. The data in Table 8.4 reveals that the orientation facing east-west has more preference than north-south ($M = 3.48$).

Comparison of the findings with dwelling orientations concerning the sun faces north-south and east-west reflect Mizsei and Horváth (2021). They found that regional Thai dwellings were mainly oriented lengthwise concerning the sun in the east-west direction. This characteristic may be explained by the fact that the residences could avoid excessive heating from the amount of sun (Tharavichitkun, 2011). As shown in Figure 8.7, the illustration provides the sample of characteristics of the dwelling orientations concerning the sun facing east-west.

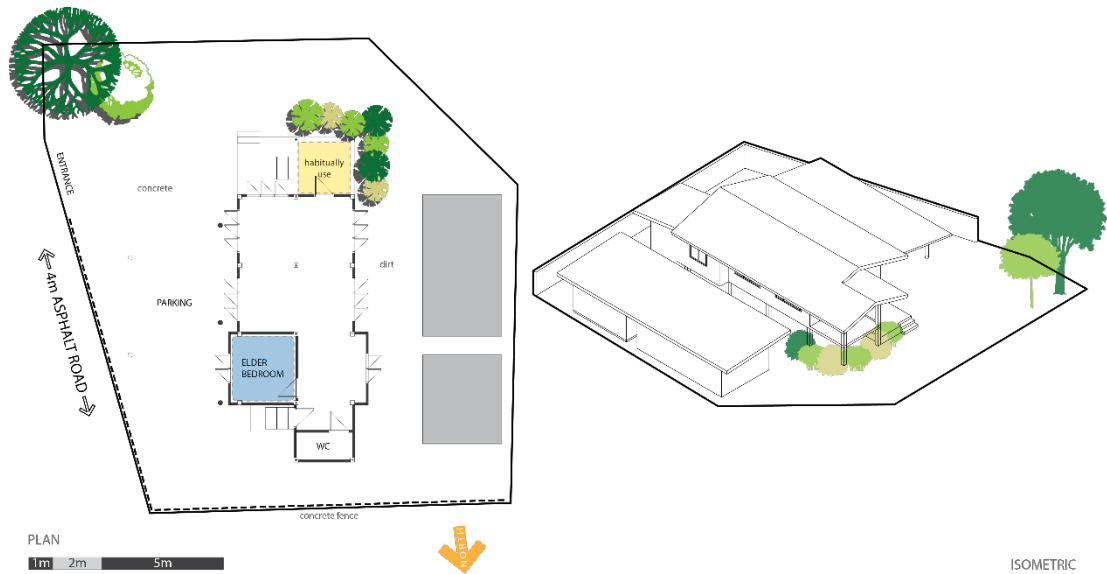


Figure 8.7: The sample of characteristics of the dwelling orientations concerning the sun faces east-west (Author, 2020).

C. The location of the residential sites

According to the data in Table 8.4, the outcome shows that the location of residential sites has the overall preference as moderate to good ($M = 3.78$). From the data in Figure 8.6, the results show that almost 68 percent of older adults rated the location of the residential sites as ‘good’ and ‘very good.’ As shown in Figure 8.6, only a few elders evaluated the location as ‘poor’ and ‘very poor’ (2.2%), and approximately 30 percent rated it as ‘moderate.’

This result may be explained by the fact that the characteristics of locations and effects of the related features may lead to outdoor usage and environmental satisfaction, as presented in Chapter seven about elderly participants’ preferences for spaces or areas in their residential site environments (see Chapter seven, section

7.3). This view was echoed by some older adults who mentioned typology with the characteristic of the location of the residential sites, for example, noted:

... 'The characteristics of the mountainous location of the residential site have a positive effect which makes me feel peaceful.' ...

D. The surrounding residential land uses

The results obtained from Figure 8.6 reveals that older people evaluated the surrounding residential land uses as 'good' and 'very good, approximately 79 percent.' As shown in Figure 8.6, only 2.2 percent of older persons rated their preference for the surrounding residential land uses as 'poor' and 'very poor.' Whereas around 19 percent of older people rated as 'moderate.' Moreover, the results in Table 8.4 show that this characteristic has the highest preference among all environmental factors of the typology ($M = 4.06$).

It seems possible that these results are due to the characteristics and benefits of the surrounding residential land uses, such as the valleys, mountains, forests, and rice fields. Supporting the idea from the in-depth interviews, some of the older residents discussed the typology with the characteristic of the surrounding residential land uses, for example, noted:

... 'The location of the residential site has good and relaxing natural surroundings such as mountains, forests, and rice fields.' ...

Altogether, there seems to be some evidence to indicate that generally, the preferences for the typology of the residential site environments relate to the geographical location. These outcomes accord with previous studies (Barnett et al., 2017; Rioux & Werner, 2011) and data in Chapter six (see Chapter six, section 6.2.2), indicating that the geographies of residential sites' locations and surroundings and the context of tropical climate appear to be the significant aspects of the living environment and environmental satisfaction among old age in this rural Asian context.

2.) The motivator

This section presents the older people's perception and evaluation of preferences for the motivator of their residential site environments. As shown in Table 8.4, the response choices for the categories range from the residential dwelling level with pleasant indoor sunshine, good window – views, and perceived residential site environments from the perception within a residence. Also, at the residential site level with garden landscaping and green area and perceived residential site environments from the surrounding area or neighbourhood. The figure below illustrates the preferences on the characteristics of each motivator factor from the frequency.

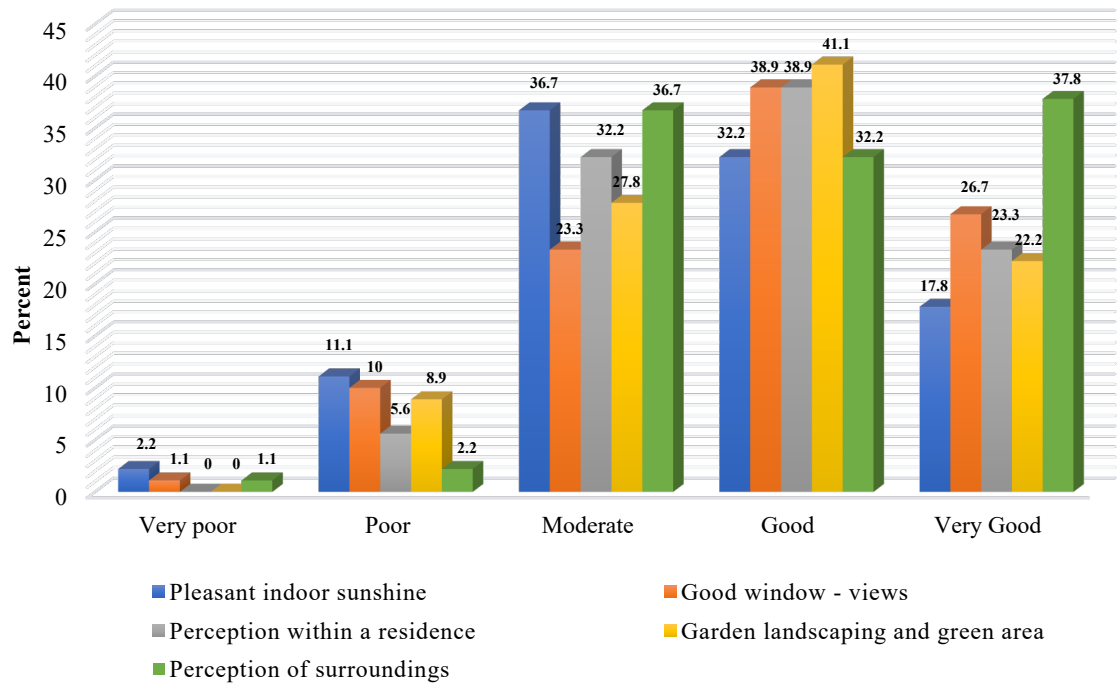


Figure 8.8: Older adults' perception and evaluation of the motivator of the residential site environmental characteristics with the level of preference from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).

A. The pleasant indoor sunshine

Overall, the outcomes show that half of older participants rated their preference for pleasant indoor sunshine as 'good' and 'very good' (50%, see Figure 8.8). Moreover, as shown in Figure 8.8, a minority of older people were evaluated as 'poor' and 'very poor' for the pleasant indoor sunshine (13.3%). Approximately 37 percent of older participants rated as 'moderate'. In addition, the data shows that the pleasant indoor sunshine resulted in the lowest preference among the residential site environmental characteristic factors of the motivator (M = 3.52, see Table 8.4).

These results are likely to be related to the characteristics of the openings or windows of the dwellings. According to Mizsei and Horváth (2021), the quality of the openings or windows provide enough natural daylighting from the sun throughout the day and also lets in the most direct sunlight into the residence in the evening to contribute pleasant indoor sunshine. Moreover, apart from the valuable contribution to interior luminance, the side effect of indoor sunlight potentially influences the indoor thermal comfort for older residents, especially in tropical regions with hot climates. According to the in-depth interviews, this is exemplified in the following quote by some older people who described indoor characteristics with sunlight consequence, for example, noted:

*... 'The outdoor areas are suitable to spend time during the daytime
when the indoor areas are too hot.' ...*

These results are consistent with the findings of Wang et al. (2006), who suggested that the strong afternoon sunshine usually produces the highest temperature of the day and potentially causes glare and uncomfortable thermal comfort indoors. Furthermore, this also accords with the earlier outcomes in Chapter seven and those of Luoma-Halkola and Häikiö (2020) and Rantakokko et al. (2015), which showed that the atmospheric condition of tropical climate might shape the person's perception and perspective of ageing in place (see Chapter seven, section 7.2.1).

B. The good views from the window

Generally, the results from Figure 8.8 show that almost two-thirds of elderly people responded to rate the preference for good views from the window as ‘good’ and ‘very good’ (47.8%). Furthermore, as presented in Figure 8.8, only 11.1 percent of older individuals this characteristic as ‘poor’ and ‘very poor’, and around 23 percent rated it as ‘moderate.’ From the data in Table 8.4, the data reveals that the good view from the window has the preference evaluation as moderate to good ($M = 3.80$).

This result may partly be described by the perceived characteristics of the environmental features and surroundings that can potentially affect the views from the window into the residential site environments. Supporting this idea from the in-depth interviews of the older resident mentioned the perceived characteristics of the environmental feature in the residential sites, for example, noted:

... ‘I am delighted with the surroundings of green areas and trees in the residential site perceived from the windows.’ ...

This finding seems consistent with Wang et al. (2006) and Orr, Wagstaffe, Briscoe, and Garside (2016). They suggested that the good views from the window or viewing nature perceived from indoors can develop the attractiveness in the living environment for older people.

*C. The perceived residential site environments from the perception
within a residence*

From the data in Figure 8.8, the results show that around 62 percent of older people evaluated the perceived residential site environments the perception within a residence as ‘good’ and ‘very good.’ As shown in Figure 8.8, only a small number of elders evaluated the location as ‘poor’ and ‘very poor’ (5.6%). Whereas approximately 32 percent of older people rated as ‘moderate.’ Moreover, the results in Table 8.4 show that this characteristic has the same preference rate as the factors of the good window views ($M = 3.80$).

These results reflect those of Orr et al. (2016), which showed that scenery of greenery, the garden, and attractive surroundings from the windows and the outdoor areas were appreciated by older residents and significantly impacted their well-being. This view was echoed in the following quote by some of the respondents, discussing the perceived residential site environmental characteristics from the perception within a residence, for example, noted:

*... ‘The surroundings of natural environments give me an incentive to
go outside.’ ...*

The illustration also shows the side garden for outdoors activities according to the elderly resident’s explanations from the interview, as presented in Figure 8.9.

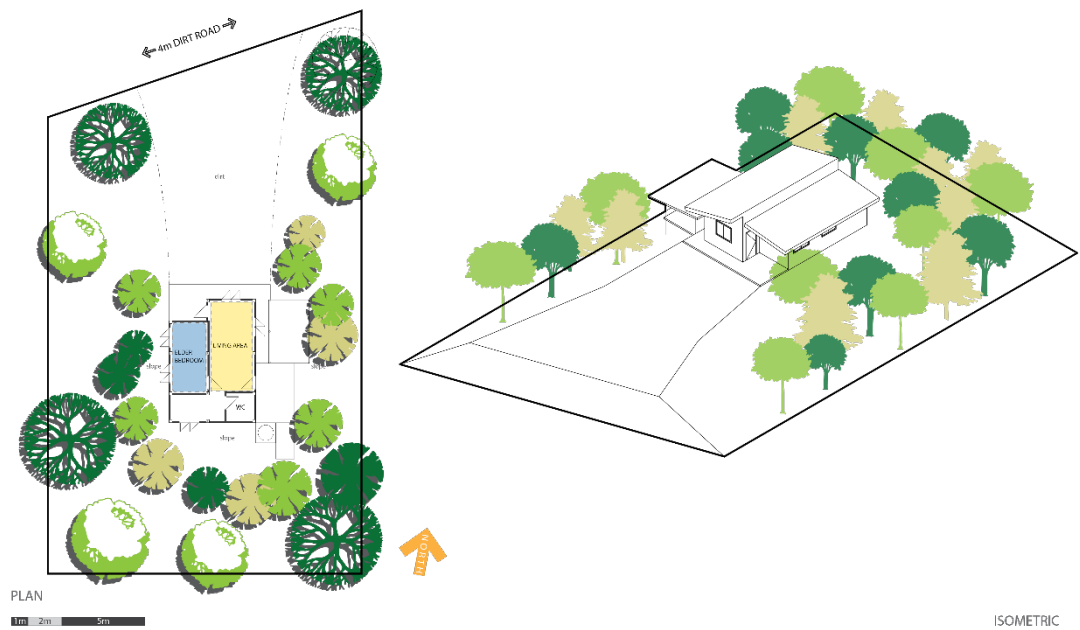


Figure 8.9: The sample of the residential site environmental characteristics with the surroundings of natural environments that affect the perception within a residence (Author, 2020).

The results seem to be consistent with other research by Wang et al. (2006), who suggested that the residential site environments should continuously maintain the quality of visual and sensory perception when elderly residents go outdoors to encourage physical activities in the residential site environments.

D. The garden landscaping and green area

Overall, the data in Table 8.4 shows that the garden landscaping and green area have the overall preference as moderate to good ($M = 3.77$). The results obtained from Figure 8.8 show that older individuals evaluated the garden landscaping and green area as ‘good’ and ‘very good’, approximately 63 percent. On the other hand, from Figure 8.8, we can see that almost 9 percent of older

people rated their garden landscaping and green area as ‘poor’ and ‘very poor’, and around 28 percent rated it as ‘moderate.’

A possible explanation for these results may be that the residential site environments should provide older adults opportunities to do activities outdoors with the presence of garden landscaping and green area characteristics. Supporting the outcomes from the in-depth interviews of the older residents reported about the characteristics of garden landscaping and green area in their residential sites, for example, noted:

... ‘*I need more space to do gardening and to grow vegetables.*’ ...

These results reflect those of Scott, Masser, and Pachana (2020), who also found that garden landscaping and green area can provide older adults with opportunities for actively engaging with their residential site environments and nature connection. In the same vein, Wang et al. (2006) assert that the attractive garden landscaping and green area in the outdoor settings can attract older adults an active involvement in the residential site environments.

E. The perceived residential site environments from the perception of the surrounding area or neighbourhood

In the data report in Table 8.4, the outcomes show that the perceived residential site environments from the perception of surroundings area or neighbourhood have the highest preference among all environmental factors of the motivator (M = 3.83). The outcomes from Figure 8.8 reveal that older people

evaluated the perception of the surrounding area or neighbourhood as ‘good’ and ‘very good at 60 percent.’ Moreover, as shown in Figure 8.8, only 3.3 percent of older respondents rated this characteristic as ‘poor’ and ‘very poor’. Around 37 percent of elders rated it as ‘moderate’, which is the same outcome as the pleasant indoor sunshine characteristic.

A possible demonstration for this might be that characteristics of the surrounding area or neighbourhood, such as the residential density, land use mix of residential areas, forests, rice fields, and natural features of mountains or valleys, affect the aesthetic perception in the environment (Yu et al., 2021). This is exemplified in the following quote by some of the respondents, discussing the perceived residential site environments from the perception of the surrounding area, for example, noted:

... *‘The surroundings of forests around the residential site make me feel peaceful.’* ...

According to Yu et al. (2021), a pleasing aesthetic environment of perceived surroundings area or neighbourhood would motivate older adults to participate in more activities outdoors and possibly increase their environmental satisfaction.

In summary, these results show that the motivator of their residential site environments should promote the attractiveness on and around the residential site environment by considering the preferences for pleasant indoor sunshine with the atmospheric conditions of tropical climate. Moreover, the good views from the window of the environmental features surroundings perceived from the indoors

and the outdoor areas can develop the preferences in the residential environments and significantly impact older people's well-being.

As well as the presence of garden landscaping and green area characteristics can provide older adults with opportunities for actively engaging with their residential site environments and nature connections. In addition, perceived residential site environments from the perception of the surrounding area or neighbourhood tend to motivate older adults to participate in more activities outdoors and possibly increase their aesthetic perception and environmental satisfaction.

3.) The functionality

This part concentrates on the older persons' perception and evaluation of preferences for the functionality of their residential site environments. Table 8.4 provides the response choices for the categories ranging from the residential dwelling level with indoor-outdoor connections at the residential site level with perceived site walkability and environmental features. According to Figure 8.10, the data illustrates the preferences on the characteristics of each functionality factor from the frequency.

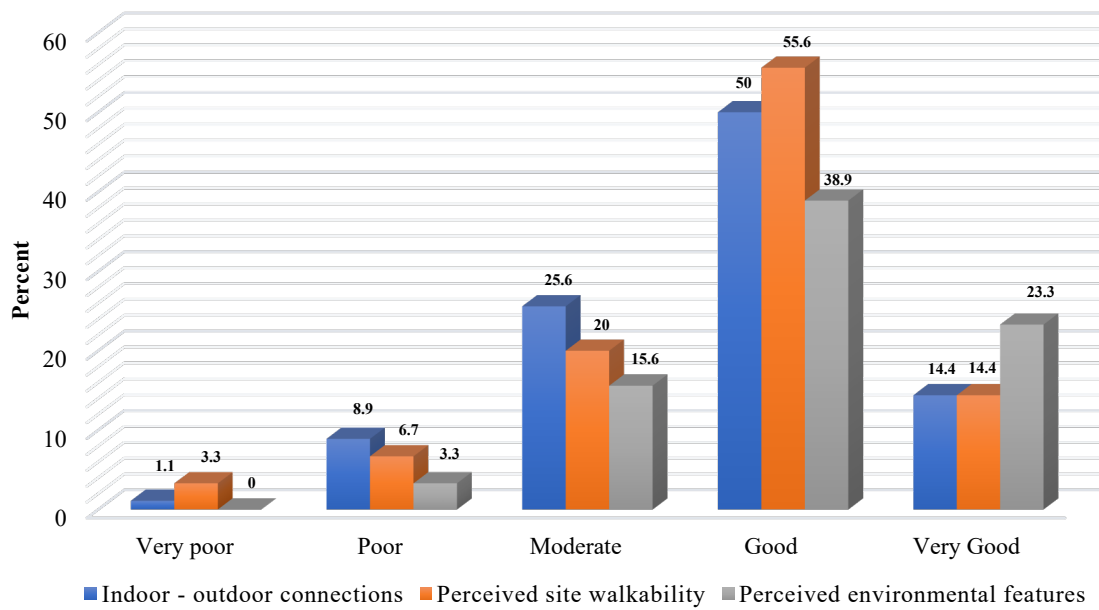


Figure 8.10: Older adults' perception and evaluation of the functionality of the residential site environmental characteristics with the level of preference from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).

A. The indoor-outdoor connections

In general, the results show that most older people rated indoor-outdoor connections as 'good' and 'very good' at two-thirds of the elderly respondents (64.4%, see Figure 8.10). On the other hand, as shown in Figure 8.10, a minority of older participants (10%) were evaluated as 'poor' and 'very poor' for their preference for the characteristic of indoor-outdoor connections, and approximately 26 percent rated as 'moderate'. Furthermore, we can see that the indoor-outdoor connections resulted in the lowest preference among the environment characteristic factors of the functionality ($M = 3.68$, see Table 8.4).

This result may be explained by the fact that the character of the indoor-outdoor connections in residential sites is one of the critical environmental features

that support connection to the outside world (Lu, 2018). The negative characteristics of the indoor-outdoor connections can potentially cause frustration or injury in old age (Rodiek, Nejati, Bardenhagen, Lee, & Senes, 2016). Supporting the data, one of the older residents expressed the opinion negatively about their residential site's environmental characteristics of the indoor-outdoor connections, for example, noted:

... 'The connection area between the dwelling and front garden entrance is too steep.' ...

In addition to the interviews, the illustration below presents the characteristics of the indoor-outdoor connections, as shown in Figure 8.11.

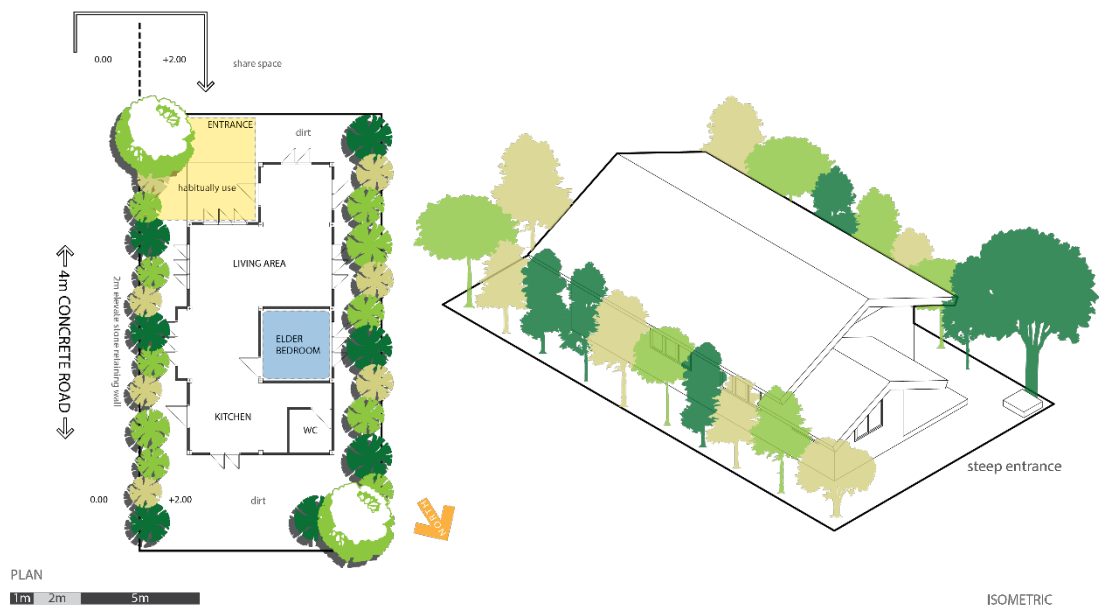


Figure 8.11: The sample of the residential site environmental characteristics of the indoor-outdoor connections (Author, 2020).

In accordance with the present findings, previous studies have demonstrated that the appropriate indoor-outdoor connection areas in residential sites can increase accessibility and encourage older people to engage in the outdoor areas or spaces (Lu, 2018).

B. The perceived site walkability

Overall, the outcomes from Figure 8.10 show that more than 70 percent of elderly individuals responded to the perceived site walkability characteristic as ‘good’ and ‘very good’. As presented in Figure 8.10, just under 10 percent of older respondents rated the preference for this characteristic as ‘poor’ and ‘very poor’, and approximately 20 percent rated it as ‘moderate.’ Moreover, from the data in Table 8.4, the results reveal that the perceived site walkability has an overall preference of moderate to good ($M = 3.71$).

The perceived site walkability characteristics should provide good sidewalk conditions and easy access to destinations within the residential environment. According to Alves et al. (2020), site walkability can affect older persons’ walkability levels. It includes the impacts on their outdoor physical activities’ length and frequency of time spent. This view was echoed in the following quote by some of the elderly respondents, discussing the perceived site walkability characteristic, for example, noted:

*... ‘The site walkability or spaces around the dwelling are too narrow
and small.’ ...*

... 'There is a good site walkability with flat and level ground.' ...

Wang (2014) points out that the good quality of landscaping or outdoor areas in the residential site environments tends to affect site walkability characteristics and may encourage older adults to be mobile, active, and desire to engage in activities in those outdoor areas or spaces.

C. The perceived environmental features

The results obtained from Figure 8.10 reveal that older people evaluated their preference for the perceived environmental features as 'good' and 'very good' well over 81 percent. As shown in Figure 8.10, only 3.3 percent of older persons rated the surrounding residential land uses as 'poor' and 'very poor.' While approximately 16 percent of older people rated as 'moderate.' Moreover, the results in Table 8.4 show that this characteristic has the highest preference among all environmental factors of the functionality ($M = 4.04$).

The perceived environmental features are one of the main factors to attract older adults to use outdoor spaces such as plantations, water features, other natural elements, and built environments of awnings and ponds (Lu, 2018). According to the in-depth interviews, this is exemplified in the following quote by some of the older residents about the perceived physical environmental features, for instance, noted:

... 'The fishpond and awning provide a shady, pleasant, and comfortable area.' ...

Additionally, the illustration shows the perceived physical environmental features in the residential site according to the elderly resident's explanations from the interview, as presented in Figure 8.12.

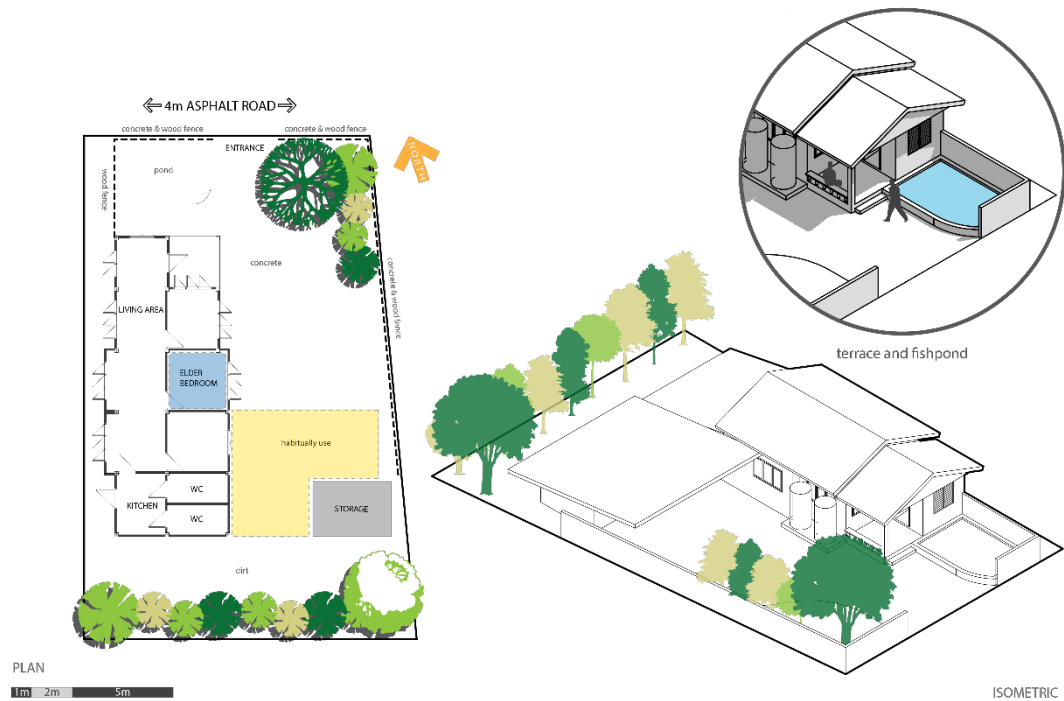


Figure 8.12: The sample of the perceived physical environmental features in the residential site (Author, 2020).

Bamzar (2019) highlighted the significance of the perceived physical environmental characterises of the living environment for old age in either maintaining or decreasing the independence of the older persons in the residential sites.

Considering all the evidence, it seems that the functionality factors with the characteristic of the indoor-outdoor connections were evaluated with the lowest preference level. In contrast, the perceived environmental features were rated with

the highest preference among all environmental factors. The indoor-outdoor connections can increase accessibility and encourage older people to engage with the outside world. At the same time, the perceived environmental features can either maintain or decrease the independence of the older persons in the residential sites. Then the perceived site walkability tends to be associated with good sidewalk conditions and easy access to destinations within the residential environment that may encourage older adults to be active and desire to engage in activities in those outdoor areas or spaces.

4.) The safety

This part presents the findings focusing on the elders' perception and evaluation of preferences for the safety of their residential site environments. Table 8.4 provides the response choices for the categories ranging from the residential dwelling level with a sense of safety in the residential site from the perception within a residence and at the residential site level with feeling secure and safe at the residential site. Figure 8.13 provides the preferences on the characteristics of each safety factor from the frequency.

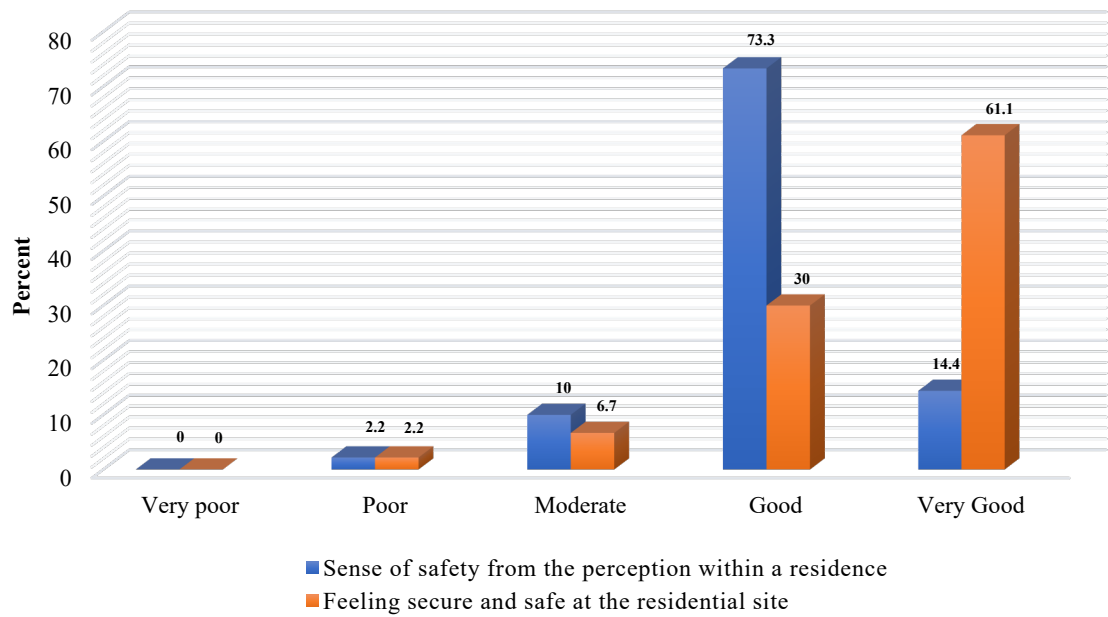


Figure 8.13: Older adults’ perception and evaluation of the safety of the residential site environmental characteristics with the level of preference from the survey used in the study analysis and their descriptive statistics, N = 90 (Source: fieldwork 2019).

A. The sense of safety in the residential site from the perception within a residence

On the data report in Table 8.4, the outcomes show that the characteristic of a sense of safety in the residential site from the perception within a residence has the preference evaluation as good to very good ($M = 4.0$). The outcomes from Figure 8.13 reveal that older participants evaluated the sense of safety in the residential site from the perception within a residence as ‘good’ and ‘very good, many more than 87 percent.’ Moreover, as shown in Figure 8.13, fewer than 2.2 percent of older people rated this characteristic as ‘poor’ and ‘very poor’, and around 10 percent rated it as ‘moderate’.

B. The feeling secure and safe at the residential site

From the data in Figure 8.13, the results show that more than 91 percent of older individuals evaluated feeling secure and safe at the residential site as ‘good’ and ‘very good.’ As shown in Figure 8.13, only a small number of elders evaluated the location as ‘poor’ and ‘very poor’ (2.2%). Approximately 7 percent of older people rated as ‘moderate.’ Moreover, the results in Table 8.4 show that this characteristic has the highest preference among all environmental factors as good to very good evaluation ($M = 4.5$).

In accordance with the present results, previous studies and the earlier outcomes about safety (see section 8.2.2) have demonstrated that outdoor safety is the most important environmental feature in the residential site that affects elderly adults’ choices of whether to use outdoor areas or spaces and well-being in later life (Choi & Matz-Costa, 2017; Lu, 2018).

However, the results showed that feeling secure and safe at the residential site has a higher preference than the sense of safety in the residential site from the perception within a residence. These differences can be partly explained by the characteristics of environmental aspects as demonstrated in earlier sections of typology, motivator and functionality that these physical aspects tend to affect older persons’ perceptions of safety in residential sites. Older adults’ evaluations of the secure and safe feelings at the residential site may increase by entering and engaging in those areas or spaces than perceived from within a residence. This view was echoed in the following quote by some of the older respondents,

discussing the feeling of security and safety at the residential site characteristic of the typology of open space, for example, noted:

*... 'The residential site has open space, which makes the resident feel
safe and satisfied.' ...*

By drawing on the concept of outdoor environments, Wang (2014) highlights that the living environments for old age should be safe, as perceived and evaluated by older adults both from indoors or within a residence and in the outdoor settings of the residential sites. It can thus be suggested that the other characteristics of environmental aspects should attract and invite older adults to go outdoors in their residential sites with the increasing level of sense of safety in the residential site.

8.4 CONCLUSION

In summary, the study provides significant findings that add to existing studies on P-E fit interactions. First, the study confirms that the residential site environment is a 'setting for action' with those environmental characteristics necessary to pursue desired outdoor activities (Sun, Phillips, & Wong, 2018; Williams & Patterson, 2008). Research has shown that older people consider the residential site environments necessary for later life. This finding might suggest that the necessity results from the significant association between the capability of elderly adults at different age stages and the characteristics of residential site

environments that may promote physical activities engagement opportunities and increase the desire for outdoors mobility.

The second significant finding was that the residential site environmental characteristics at different levels are essential to creating appropriate relationships between older people and their places conducive to active functioning and positive feelings in those environments. Moreover, the frequent use of outdoor spaces in the residential site environment may lead to a possibly high level of satisfaction in life, physical activities, social participation, and connection.

Moreover, the characteristics of residential site environments both at dwelling and site levels appear to play a decisive role in older people's perceptions of residential site environments. Positive features include safety, greenery, the functionality of outdoor spaces, sufficient and suitable access to residential dwellings and sites, open spaces, and good quality walkable areas in the residential site environments. Specifically, the analysis indicates that the 'natural environment', the trees, vegetations or green spaces environments and amenities, are perceived to possess ecological, aesthetical, and affective functions for people's active and healthy behaviours.

The study emphasised that old-age residential environments play a significant role in physical and psychological health and well-being (Hadafi & Barough, 2017; Iwarsson, 2005), alongside the physical aspects and residential environmental characteristics themselves. Therefore, residential site environments need to consider the environmental features of the physical aspects to support and encourage older adults with outdoor activities, such as the environmental

motivators of the window views and pleasant indoor sunshine, typology of the orientation of the dwellings and site type, the functionality of connections areas and site walkability, and the safety of the environmental features. Furthermore, these physical aspects of environmental elements in the residential site affect elderly adults' health improvement and well-being in later life and the choices and quality of outdoor areas or spaces used for physical activity.

The chapter that follows presents a conclusion and suggestions for further work. This chapter draws the final summary from the empirical chapters' main findings and answers the research questions. It also analyses the broader implications of the results, discusses the significance of this study, and suggests possible further investigations and recommendations.

CHAPTER 9

CONCLUSION AND SUGGESTIONS FOR FURTHER WORK

9.1 INTRODUCTION

In the previous part, the three chapters of chapters Six, Seven, and Eight presented the study's findings, analysis, and results. In this final part, the chapter summarises the main findings of the last part and reviews the research problem, questions, aim, and objectives of this study. Finally, it analyses the broader implications of the results, discusses this study's significance, and suggests possible further investigations and recommendations.

Next, the chapter is divided into four main sections. Section 9.2 reviews the research problem, the research questions, the aim, and the study's objectives. The second section presents the study's conclusions addressing the findings discussed in Chapters Six, Seven and Eight to answer the research questions. Finally, the third section highlights the contribution to knowledge and practice. In the end, this chapter suggests further investigations and recommendations.

9.2 REVIEWING THE RESEARCH PROBLEM, QUESTIONS, AIM AND OBJECTIVES

Considering the rapidly increasing population ageing in rural communities and the proportion is expected to rise (United Nations, 2019a; Winterton & Warburton, 2012), the understanding of micro-level geographies characteristics of

the living environment with the experience of ageing rurally is essential. At the same time, the residential site in senior living environments has a substantial impact on older adults' outdoor usage and their environmental satisfaction (Lu, 2018).

This research was related to the living environments for older adults focusing on the residential site environments in a rural Asian context. As a critical point of elders' living environments in a rural context, it was found that far too little attention has been paid to the literature about the appropriate residential site environments with the perception and evaluation of older adults, especially in the Asian region (Lien, 2013; Wahl, Iwarsson, & Oswald, 2012),.

The literature review in this thesis shows that the relationship between older people and the residential site environment needs to be investigated; environmental gerontology with P–E fit is the best-known theory related to these concepts. However, it was found that there is a lack of attention or evidence that indicates the causal link with the residential site environments for the elderly and the focus of environmental gerontology with P–E fit to the Asian countries. With regard to the abovementioned context, this thesis explored older people's perceptions and perspectives towards the environment and identified the importance of residential environmental features in rural context to creating appropriate relationships between older adults and their residential site environments in a case study of a village in northern Thailand. Among the Asian developing country, Thailand has currently ranked the third most rapidly ageing population globally (HelpAge International, 2019; United Nations, 2019b).

The research problem was defined as the lack of the specific characteristics of the residential site environment that affect the well-being of older people based on the perception and evaluation of older people in the rural Asian context. Therefore, the environmental perception and cognition research approach (see Chapter 3, section 3.3), which contemplates older adults' perception and evaluation of the built environment, and a multiple method survey design were adopted to solve this problem.

The principal research aims of this research were to understand how older adults perceive the residential site environments in a rural context and understand how they utilize and relate to their environments. From this are derived the research objectives driving this thesis which are:

Research objective A: Investigation of the characteristics and physical environmental features of older adults' residential sites in the rural Asian context from a case study.

Research objective B: Investigation of the outdoor usage characteristics of older adults in the residential site environments in a rural context in terms of (i) the physical activities in the residential site environments and (ii) the most utilised residential site areas or spaces.

Research objective C: Analysis of older adults' perceptions and evaluations toward their residential site environments in a rural area concerning (i) the necessity of the residential site environments and (ii) the physical aspects of the residential site environmental characteristics that need to be taken into account in these residential site environments.

Research objective D: Evaluation and investigation of preferences and satisfaction of older adults in terms of (i) the residential site environmental characteristics and (ii) the characteristics and physical environmental features of the residential site environments that influence the outdoor usage and environmental satisfaction through older adults' perspectives and perceptions.

In this context, a case study of a village in northern Thailand was adopted for the empirical investigation of this study. This work could contribute to our understanding of older people's perceptions and perspectives on residential site environments and their features in the rural Asian context. Furthermore, it helps relevant authorities, organisations, and practitioners to apply this approach and implement the appropriate residential site environments in a similar context to an increasingly aged society.

9.3 ANSWERING THE RESEARCH QUESTIONS

The main questions that this study plans to answer derive from the thesis's theoretical and empirical aims and objectives. This section responds to the research questions in three parts.

9.3.1 The main considerations in the characteristics of residential site environments for older adults in a rural Asian context

The first question of this study is posed: "*What are the main considerations in the characteristics of residential site environments for older adults in the rural Asian context?*" approaches the objective of unravelling the characteristics and

physical environmental features of older adults' residential sites in the rural Asian context to make it applicable to empirical research.

The findings from this study make several contributions to the current literature. First and foremost, the insights gained from this study may assist our understanding of the settlement characteristics of the residential sites in a similar rural context. Generally, the results of this investigation show that the settlement characteristics of the residential sites from the topographical and characteristic features of the case study village for older residents can be classified into four main areas the area near the highway, the area in the town, the lowland area, and the foothill areas. The locations and areas in the village of the foothill areas have the lowest density of residential land use, while the area in the village and area near the main road or the highway has the highest density. Regarding these settlement characteristics, the evidence from this study suggests that locations and areas in the village correlate with the settlement characteristics of the geographies of residential places and density.

This study strengthens the idea that the geographies of residential areas with low density and the quality of the residential site environments are critical for older adults. The geographical characteristics of the residential sites' locations are likely to be the essential aspects of the settlement characteristics among older residents. They can inform interventions supporting the physical and mental health status and active ageing.

In addition to this, the results of this study indicate that the settlement characteristics of older adults are often moderated by variables such as

demographic predictor of the duration of residence, the social predictor of the attitude toward community members, the price of land, the residential sites at site level of the plot type, and the street materials and dimensions.

To clarify, these findings suggest that the settlement and geographical characteristics with the surroundings of greenery and aesthetically pleasing scenery appear to be the essential aspects of the environment among older people with a longer duration of residence. Moreover, the surroundings of the areas or locations can affect the relationships between older dwellers and their neighbours and community members. For example, the foothill areas with peaceful and relaxing natural surroundings from the valleys and forests are associated with higher levels of positive attitudes toward community among neighbours and community members.

The settlement characteristics in terms of the price of land are likely to be related to residential sites with shared plots. These relationships may partly be explained by the presence of facilities, density of residential land use, and ease of commuting in those areas. In addition, the price of land is usually based on location, size, and potential benefits from the surroundings of the land and areas. An implication of this is the possibility that these aspects are associated with older adults and their living arrangements, from the difference in family support with the abilities to commute and access to the facilities or other places.

Other factors were the street materials and dimensions with the most common materials used for paving roads with the difference in street width between the area near the highway and others. This finding further supports the

idea that the significant rural travelled way or highway construction material is usually asphalt and has a wider dimension than other villages' roads. This research also reflects those of Dae Young (2018) and Neville, Napier, Adams, Shannon, and Clair (2020). They suggest that the investment in rural transportation infrastructure in Southeast Asian countries is more likely to cause rural areas to suffer from poor road infrastructure and affect older people's settlement characteristics.

In addition to this, the current data highlight the importance of the physical environment of natural environments or greenspaces. These environmental features affect the relationships between older dwellers and their neighbours and community members by improving social cohesion and integration of communities, which inspires physical activity, social connections, and supports active ageing through its characteristics. Therefore, it may be the case that natural surroundings, especially with the aesthetics, peaceful, and relaxing atmospheres, may help reduce isolation and loneliness by providing older adults with the opportunity to engage in social activities, feel connected to their communities, and encourage a connection to nature.

The study has also identified older adults' residential sites' characteristics and physical environmental features in the rural Asian context. The results provide important insights into the characteristics and physical environmental features of the residential site environments from the site and dwelling levels as follows:

A. Residential site level

The physical environmental features of residential sites at site level issues are related to seven factors. There are characteristics of the site, including the plot type, plot size, plot coverage, the area percentage of the outdoor residential site covered in the land plot, levels of shading of tree or canopy, the width of the community frontage road attached to the residential site, and the material of community street connected to the residential site.

1.) Plot type

The results of this study indicate that most of the residential site's characteristics of plot types are shared plots (see Chapter 6, section 6.3.1). The shared plot has the characteristics of providing more than one dwelling or building where there are annexe or separate buildings in the same areas or spaces of the residential sites. In accordance with the present finding, it corroborates the ideas of Teerawichitchainan, Knodel, and Pothisiri (2015), who suggested that Asian cultures have preferences for multi-generational living arrangements. This characteristic of the residential site with a shared plot type provides essential insights into the association with the multi-generational living within the same residential site.

Moreover, the current study's findings reveal that the duration of older persons' residency with multi-generational households in a shared plot may have been influenced by some factors. The possible factors are the decline of intergenerational relations in which adult children live independently, the completeness of grandchildren's practical support, and the intention to support

elderly parents financially rather than living in the intergenerational co-residence environment (Grundy, 2010; Lin & Yi, 2013). It is, however, a contradiction of the earlier point that intergenerational households are a feature of Asian ageing, but at the same time, they are also declining.

Furthermore, co-residence has implications for the demand for residential sites of plot types which influences elders' residency. This study indicates that co-residence in a shared plot may increase the potential drivers of societal change among older people. It seems that co-residence could be attributed to the positive quality of intergenerational relationships in families and the community among neighbours and community members from the moments of supporting, connection and sharing life experiences (Keating, Kwan, Hillcoat-Nalletamby, & Burholt, 2015; Pain, 2005).

Apart from this, some characteristics of residential sites' plot types could affect the land price. The findings suggest that, in general, the residential corner plot has the highest price of land compared to other plot types in the same area. This finding corroborates the ideas of Goyal (2011), which suggested that the corner residential plots usually have a higher price and value than the typical plots of a similar size. These corner plots are considered to have several benefits over other types of residential plots that it offers to the older residents, valuing much more than the extra cost of the plot for various ways of functions, aesthetics, and natural purposes.

2.) Plot coverage

Plot coverage represents the extent to which the residential plot is covered with dwellings, other buildings, or structures when the sun is directly overhead at noon shadow, and objects cast the shortest shadows and expressed as a percentage of the ratio of the built-up area to the plot area (Government of Tamil Nadu, 2019). This study has shown that over half of the older adults' residential sites have a plot coverage of less than 25 percent of their residential sites (see Chapter 6, section 6.3.1). This study's evidence suggests that the plot coverage proportion generally relates to surroundings and natural or environmental features associated with the dwelling type and orientation in the residential sites. Further, these findings suggest that these factors are generally due to the daylight, ventilation, views of the surroundings, and thermal and visual comfort for older residents.

Residential dwelling orientation is one of the most critical in residential design because it has the most impact on thermal flow, ventilation, daylight and views for dwellers (Hull City Council, 2020; Nedhal, Syed Fadzil, & Harun, 2011). In particular, for the dwelling type of single-house with a higher ratio of plot coverage, these thermal and visual comfort and scenery from the windows are essential for older residents' satisfaction (Nedhal et al., 2011). In addition, the characteristic of building orientation with the long side of the dwellings parallel toward the frontage road has the advantages of allowing air flow and thermal comfort from natural ventilation and daylighting to penetrate the building with less outdoor or open space plot coverage.

In addition to this, the characteristics of dwelling type with a higher percentage of plot coverage make the most views from the surroundings, such as the window views or front terrace facing the frontage road, which the dwellings parallel toward the frontage road. Through these characteristics of window views or front terraces, the visual field allows older dwellers to perceive and interact with the surroundings from the street or outdoor environments (Sarkar, Gallacher, & Webster, 2013) and, therefore, affect their preferences regarding views from the environmental surroundings.

3.) Plot size

Site area or plot size represents the area of a contiguous parcel of land or site enclosed by definite boundaries over which the landowner has a legal right for development and includes part of the site used as an entirely open space or reservation area, passage and internal roads within the boundaries (Government of Tamil Nadu, 2019). This study has shown that half of the older adults' residential sites in the village have a plot size of approximately 400 - 800 sq.m. (see Chapter 6, section 6.3.1). There are also differences in the plot size that the bigger the plot size, the more outdoor areas or spaces in the residential sites for older adults. Nevertheless, some factors can influence or affect the residential plot size characteristics. The results suggest associations between the residential plot size characteristics with the demographic factors of mental and emotional health and residential site characteristics at two levels of dwelling size, plot type, and plot coverage.

Firstly, the evidence from this study suggests that more areas of the residential plot size are associated with higher levels of mental and emotional health in older persons. In accordance with the present results, previous studies have demonstrated that the built environment configuration or dwelling level of architectural features is independently associated with psychological distress (Francis, Wood, Knuiman, & Giles-Corti, 2012; Sarkar et al., 2013). As noted by Francis et al. (2012), there is a positive association between mental and emotional health of low psychosocial distress and living in an environment with bigger areas and higher quality of outdoor space.

Secondly, the outcomes revealed that older dwellers with bigger residential plot sizes tend to have dwelling sizes with more spaces or areas. This finding supports evidence from earlier results and observations about the relationship between residential plot size and demographic characteristics of mental and emotional health factors. Overall, this study strengthens the idea that the residential plot size can fulfil older adults' needs of the proportions of areas or spaces with the opportunities to have more areas or spaces for their dwellings and residential sites. It may include the need for a shared plot type of their residential site and support the multi-generational living arrangements or the multi-houses with the shared plot type.

Finally, the results show that older dwellers tend to have less plot coverage in the residential site within the residential plot size with more areas or spaces. This relationship may reflect the effect of the outdoor areas or spaces. Older residents prefer to have more open areas or spaces for their outdoor and daily life activities or other requirements. Therefore, the current data highlight the

importance of the ratio of plot coverage in the residential site within the residential plot size, which can contribute to older adults' health and well-being and their expectations of the outdoor areas or spaces in the residential site environment.

Taken together, these results suggest that the relationships of these factors can be explained by the fact that the built environment configuration at the residential site level and dwelling level of architectural features, such as residential plot size and outdoor space, are associated with mental and emotional health in older people. In addition, the residential plot size areas also have influenced the shared plot type of their residential site, which supports multi-generational living arrangements.

4.) The outdoor areas covered in residential sites

This study has found that most older adults generally have outdoor residential sites area covered in land plots of around 25 to 49 percent, with only a few having outdoor areas less than 25 percent of their residential sites. Interestingly, approximately 42 percent of the older people's residential sites have the outdoor areas covered in their land plot for 50 percent and above (see Chapter 6, section 6.3.1). Therefore, the findings of this study suggest that the outdoor areas covered in the land plot for older adults may affect the characteristics of their residential sites of the areas for outdoor activities.

The correlation outcomes showed that the demographic factor of living arrangement could influence the characteristics of the outdoor areas covered in the land plot in the residential site environments. This study has found that generally,

solo elderly dwellers tend to have outdoor areas covered in the land plot in their residential sites more than residential dwellings for family members of those older residents with multi-generation families.

These results corroborate the ideas of Livingston (2019), who suggested that older adults who live by themselves spend time alone for outdoor and daily life activities, on average, about ten and a half hours each day, which is almost twice as much time spent as those older residents who have multi-generation or other living arrangements. Therefore, it may be the case that the high ratio of outdoor areas covered in the land plot in their residential sites could provide the solo older adults with more outdoor areas or spaces for their time spent in outdoor and daily life activities.

5.) Levels of shading of tree or canopy

The results of this study indicate that the majority of older adults' residential sites have levels of shading of trees or canopy around 25 to 49 percent, with only a few having more than 75 percent of their residential sites (see Chapter 6, section 6.3.1). The evidence from this study suggests that characteristics of shading of trees or canopy may reflect the buildings and environmental features in the residential sites. In addition to this, the findings also indicate associations between the levels of shading of trees or canopy with demographic factors of duration of residence, living arrangement, household size of older people, and the residential dwelling characteristic of dwelling size.

In general, the size of the residential dwelling is associated with the levels of shading of trees or canopy in the residential sites. Consequently, the smaller size of the residential dwellings with more outdoor space provides more area and space for higher levels of shading from the buildings, trees and surroundings. Furthermore, the results of this study indicate that the levels of shading of trees or canopy related to the outcome from the previous section about the solo older person who spends more time in the residential site for outdoor activities.

These findings suggest that the size of the residential dwellings and the proportion of outdoor space affect the levels of shading of trees or canopy. These characteristics have a pivotal role in a solo older person who spends more time in the residential site for outdoor activities.

6.) The width of the community frontage road attached to the residential site

This study has found that most older adults' residential sites have the width of a community frontage road attached to their residential sites, approximately 2 – 2.99 meters for over 46 percent (see Chapter 6, section 6.3.1). These characteristics of the width of the community frontage road reveal the locations of the older people's residential sites in the village, as the width of the street is more than 5 meters appear near the main road or the highway area, while the narrower community frontage roads are in other areas.

The research has also shown that there are associations between the width of community frontage road attached to the residential sites for older dwellers with the characteristics of demographic predictors (the duration of residence and disease

or disorder status), social predictors (the attitude toward friends, neighbours, and community members), and the residential site characteristics (the areas of location and price of land).

In general, therefore, it seems that the older residents, who have a longer duration of residence, were more likely to live in the spaces where they perceive the presence of surroundings or walking destination if the community frontage road was wider. In accordance with the present results, a previous study has demonstrated that the size of areas or spaces occupied by frontage roads was positively associated with the perceived presence of destinations for older people in the community (Wang & Lee, 2010). These results suggest that older people's perceptions about their environments and surroundings represent the actual environmental features precisely where there are wider sizes of areas or spaces of community frontage roads.

The research has also shown that the wider community frontage road is associated with the residential sites near the main road or highway and a higher land value estimation. Furthermore, older dwellers with sufficient disposable income tend to have wider community frontage roads than those with insufficient disposable income. This research further supports the idea that the areas of the residential sites, which are located near the main road or highway, have the highest land value estimates, with the most width of community frontage road of more than 5 meters. Therefore, it seems possible that these characteristics are attractive features for wealthy elders. Furthermore, the street openness and view image may partly explain these relationships that they represent the visual effect of a sky picture and more expansive space from the perspective of the roadway,

which can reduce the sense of stress in older adults and attract those who have sufficient disposable income (Meng et al., 2020).

In addition, older dwellers, who may have disease or disorder issues, have higher chances of living where there are more narrow community frontage roads attached to their residential sites. An implication of this is the possibility that the width of community frontage roads may reflect older people's physical activity or mobility on the road, which also depends on the decline in activities as a gradual decline with age (Rioux & Werner, 2011). In addition, the small or narrow road space may cause unhealthy factors to the daily life of the elderly residents with impaired cognitive function and incidence of neurological disorders, such as impacts of noise, heavy traffic, traffic accident, and car exhaust pollution from the density road space environment (Meng et al., 2020; Yuchi, Sbihi, Davies, Tamburic, & Brauer, 2020).

Moreover, the current data highlight the important characteristic of the width of community frontage road as it can affect the attitudes toward other people among friends, neighbours, and community members. To demonstrate, the width of the community frontage road might facilitate conviviality for older residents to meet and communicate with others. These results reflect those of Meng et al. (2020), who also found that social communication is crucial for older adults to achieve social health, and community frontage road space is one of the carriers of its recognition. Therefore, the characteristics of the street space environment can enable older people to generate more social opportunities and may increase the convenience of social interactions and connections among elders in the community.

Taken together, these results suggest that the community frontage roads potentially affect older people's perceptions about their environments and surroundings in the community. To clarify, the characteristics of the community frontage roads can reduce the sense of stress in older adults from the openness of the road and the visual effect of street view. In addition, a type of the size of the community frontage roads could reflect older people's physical activity or mobility on the street or even support social health by enabling older people to generate more social interactions and connections among local elders in the community. On the other hand, the density of street space environment characteristics may cause unhealthy factors to the elderly residents from noise and air pollution from the street. Besides, the land value estimation and the location of the residential sites in the village can influence the width of the community frontage road.

7.) The material of the community street attached to the residential site

The results of this investigation show that most of the material of the community street attached to the residential sites is cement concrete (see Chapter 6, section 6.3.1). The research has also shown that the materials of community streets attached to the residential sites revealed associations with the characteristics of demographic (the disposable income and physical health), social (the attitude toward friends, neighbours, and community members), and the residential site characteristics (the price of land and street width).

Overall, these results indicate that older residents' disposable income could be attributed to the characteristics of residential sites with land value estimation

and the space and materials quality of the streets in the community. The previous conclusion can explain this result in this chapter that the road with a well-maintained and durable street is costly and requires high maintenance, affecting the land cost in different locations (Dae Young, 2018). Therefore, the older residents' disposable income, especially those with sufficient income, could be attributed to residential sites with higher land value estimation. In addition, their residential sites may be located on the streets that have the most space with well-maintained and durable qualities of materials, such as asphalt, in the community.

Apart from this, the findings of this study suggest that the character of community street materials attached to the residential sites influences the street space and potentially results in more social interactions and connections among friends, neighbours, and community members. However, the materials of community streets attached to the residential sites influence the risks of physical health effects in older adults. The potential risk factors from the street surface are cardiovascular and respiratory disease from exposure to air pollution (Jiang, Huang, & Sha, 2018; Weuve et al., 2016; Yuchi et al., 2020), and a chance for morbidity and mortality from the heat and thermal comfort condition (Clarke, Yan, Keusch, & Gallagher, 2015; Yuchi et al., 2020).

B. Residential dwelling level

The physical environmental features of residential sites at the dwelling level issues are related to six factors. There are the dwelling characteristics, including dwelling type, dwelling size, dwelling height (storeys), dwelling orientation

toward the frontage road, dwelling construction types, and the material of surroundings adjacent to the dwelling.

1.) The dwelling types

This study has found that most of the older adults' residential sites have the dwelling type of single house (see Chapter 6, section 6.3.2). This study indicates that the association of the residential site characteristics' factors, such as the plot type and plot coverage, are often moderated by the dwelling types in those residential sites.

In general, the results show that a higher percentage of plot coverage is associated with the dwelling type of multi-houses and the plot type. These relationships reflect that multiply occupied dwellings or buildings in the residential site take up more space of plot coverage. It also accords with the earlier findings, which further support the idea of the characters of multi-generational living. The residential site with the multi-houses in a shared plot mostly has intergenerational households, including two or more generations of the same family within the same residential sites, typically seen in Asian countries (Enfield Council & Metropolitan Thames Valley, 2020; Teerawichitchainan et al., 2015).

2.) The dwelling sizes

This study has shown that most of the older adults' residential sites in the village have a dwelling size of approximately 100 - 199 sq.m. (see Chapter 6,

section 6.3.2). Moreover, the study indicates that demographic and social factors often moderate the association of the dwelling size.

These findings suggest that older people who have multi-generational living arrangements with sufficient disposable income are associated with a dwelling size with more areas or spaces. It is possible because the elderly dwellers, who have sufficient disposable income, prefer to have large dwelling sizes to satisfy their needs for indoor areas or spaces. In addition to this, the older adults' married status influences the dwelling size with the potential of multi-generational living arrangements in the residential sites. This research supports the idea that the average household size is influenced by marriage patterns in older adults (Yumiko & Sara, 2020). Multi-generational living or co-residence is an efficient way for married older persons and family members to support each other and permits them to combine household resources, which also leads to more companionship, a higher economy of scale, and the multi-houses or expansion of dwelling size (Yumiko & Sara, 2020; Zueras, Rutigliano, & Trias-Llimós, 2020).

Furthermore, the results show that the dwelling size with more areas is associated with higher positive attitudes toward family members but lower for friends. These relationships may reflect that the dwelling size is related to attitudes toward other people from the social contact with friends and family members. A possible explanation might be that the dwelling size provides more private spaces and areas to engage in social activities with family members than with friends. As noted by Pain (2005), which aforementioned co-residence in other section, the intergenerational relations among older adults and their family members with multi-generational living arrangements are a part of the social identity.

Overall, these results suggest that marriage patterns influence the dwelling size in the residential sites in older adults with the associations of resources, companionship, and economy from the multi-generational living arrangements. Nevertheless, the household and dwelling size could affect social contact and relationships with friends and family members.

3.) The height of the dwelling

This study has revealed that most of the older adults' residential sites in the village have a dwelling height of one storey (see Chapter 6, section 6.3.2). This result may be explained by one storey's characteristics being more popular for older adults, possibly because of their health conditions or declining capacity. These results reflect those of Christ (2019), who also found that a one-floor dwelling was one of the features most strongly associated with ageing in place because health problems in older persons also include the environments they inhabit.

In addition to the findings, the results suggest that the dwelling size can influence the dwelling height in the residential site environments. This result showed that the height of the dwelling is associated with more areas of the dwelling size. It is possible because the more storeys the residence has, the more total areas of dwelling size.

4.) The dwelling orientation toward the frontage road

This study has identified that most older adults' residential sites have the short side of dwellings parallel to the frontage road (see Chapter 6, section 6.3.2). According to these data, these characteristics may depend on the settlement of the residential sites. However, another important finding suggests that there are associations between the dwelling orientation toward the frontage road with the residential site characteristics of the dwelling type and plot coverage. It is probably because the characteristics of types of dwelling and plot coverage have essential influences on the space or area planning of the dwellings in the residential sites.

5.) The dwelling construction types

The results of this investigation show that most dwelling construction types in residential sites are semi-wooden (see Chapter 6, section 6.3.2). The research has also provided important insights into the characteristics of the dwelling construction types from the influence of the factors of demographics and social factors.

These findings suggest that, in general, the solo-dwelling elders, who are less senior and employed with sufficient disposable income, are likely to afford the cost of materials construction of other types, such as cement concrete or cement concrete with steel, for their dwellings. At the same time, the results are likely related to solo dwellers' characteristics associated with the dwelling size with fewer areas or less than 100 sq.m. as mentioned earlier in this section.

Consequently, the dwelling construction type of masonry and other types are reasonable options in terms of the efficient building materials to build with a dwelling size of less than 100 sq.m.

Apart from this, the evidence suggests that the dwelling construction type of semi-wooden is more likely to be applied to the dwelling constructions of those dwellers who have a longer residence duration. This result may be explained by the fact that wood dwellings can survive a long time, and wood is one of the available primary materials for dwelling construction types in Thailand (Punpairoj, 2013). Whereas, nowadays, due to the processes of modernization, masonry, cement concrete or cement concrete with steel are more popular options for dwelling construction types.

Taken together, these results strengthen the idea that outdoor and interior environments from the dwellings and residential sites tend to be dominated by manmade designs and objects (Engineer, Sternberg, & Najafi, 2018). One of the natural elements is that the dwelling construction types representing natural atmospheres and sensory stimuli, such as semi-wooden material, could positively influence older persons' health, well-being, and socialisation (Engineer et al., 2018; Klumrat, 2011). The evidence from this study suggests that the natural elements of dwelling construction materials may inspire physical activity and social connection among older adults from the natural features and characteristics of the surrounding environment.

Overall, these results indicate that the dwelling construction types may be influenced by the availability and obtainability of materials for older dwellers. In

this case, the properties of the construction materials representing natural atmospheres and sensory stimuli in older people also affect the social relationships among older adults in the community.

6.) The material of surroundings adjacent to the dwelling

This study has found that most of the surrounding material adjacent to the residence in the residential sites is ground (see Chapter 6, section 6.3.2). The research has also shown associations between the material of surroundings adjacent to the dwelling in the residential sites and demographic and social factors.

The results of this study indicate that elderly dwellers at an early stage of age with insufficient income have the material ground for the surroundings in their residential sites. The residential sites and the surroundings of other types, such as gravels, are associated with the older people who live with their family members with insufficient disposable income. The result may reflect the effect on the surroundings in the residential sites from the elderly dwellers' age stage, living arrangement, and income impact. It is possible because elderly dwellers have less money to afford only some material options, especially when they have a more prominent family.

Moreover, older people who have a disease or disorder status tend to have grass in their residential sites. The findings suggest that these results are due to the health of older people and maybe that they benefit from grass in their garden. This view is supported by Seo, Sungkajun, Sanchez, and Suh (2015), who found that grass evoked positive responses from older adults as it has the potential to create

healthy interactions from related activities such as gardening. Etherington (2012) also noted that natural materials are considered to create a therapeutic environment and reduce negative arousal levels, improving health and creating positive effects on well-being. This research also provides insights into the materials of surroundings with ground and grass in the residential sites, which may affect the relationships and perspectives from supporting outdoor activities with family, neighbours, and community members.

Overall, this thesis has provided a deeper insight into older adults' residential site environments from the settlement and site and dwelling characteristics. These variations reflect the characteristics of the case study village in the rural Asian context. The study contributes to our understanding of the residential site environments with those variations that reveal the multi-generational living arrangements from the preferences of Asian cultures, such as the site and dwelling types (Teerawichitchainan et al., 2015).

Moreover, the characteristics of a residential site with a large plot size and low plot coverages were assumed to provide more areas or spaces of the outdoor residential site covered in the land plot for older adults to spend time outdoors. However, more plot coverages could affect the shading from the canopy and buildings with some shadings from the tree and environmental features in the residential site.

The characteristics of the community frontage road from the width of the street may affect the setback of the buildings, and the materials may influence the older people's perspective of the surrounding areas from the residential sites. The

frontage road could also bring interesting or unpleasant views into the residential sites, relating to the dwelling orientation toward the frontage road.

In addition, the evidence of this study seems to suggest a pertinent role for the dwelling size and height that could show the areas of dwelling which may influence older adults' decisions to spend time in the residential sites than indoors. Furthermore, landscaping characteristics from the materials of surroundings in the residential site or on the property may encourage older people to spend time, be active, and engage in activities in these residential site environments.

However, some factors can potentially affect the residential sites' characteristics at residential dwelling and site levels. This study indicates associations between the settlement, the residential site and dwelling characteristics, and the demographic and social factors of older people. In view of all that has been mentioned so far, one may suppose that these associations are essential in older adults, whose daily life and outdoor activities usually tend to be confined to the vicinity of elderly dwellings and residential sites, making them more vulnerable to the physical, mental, and emotional health-promoting or inhibiting attributes of residential site physical configuration.

9.3.2 The residential site's environmental characteristics and physical features contribute to the outdoor usage and satisfaction of older adults in the rural context

The second question of this study is posed: *“Which residential site environmental characteristics and physical features contribute to the outdoor*

usage and satisfaction of older adults in the rural context?” approaches the objective of investigating older adults’ outdoor usage characteristics in the residential site environments in a rural context in terms of the physical activities and the most utilised residential site areas or spaces in the residential site environments.

First and foremost, this study has identified the physical activities of older adults in the residential site environments, which is structured around two key themes that emerged from the data: (1) the outdoor activities and (2) the social activities in the residential site environments. Together, these themes highlight how the outdoor and social activities characteristics of the older respondents’ daily lives and socialisation are constituted and how these characteristics affect their sense of perception and use of the residential site environments in the rural Asia context.

A. The outdoor activities in the residential site environment

The outdoor activities of older adults in the residential site environment’s theme include the main research findings in three parts. There are the purposes of time spent outdoors, the time of the day spent outdoors, and the duration of time spent per day in the residential site environments.

1.) The purpose of time spent outdoors

There are studies of the purpose of time spent outdoors in the general spaces or areas, where older adults choose to spend time depending on their activities, and

the most used space or area, where elders spend time outdoors the most in the residential site environments.

a) Time spent outdoors in the general spaces or areas

This study has shown that most elderly participants spend time in the residential site environments for their daily life activities. Other purposes of time spent outdoors are other activities, hobbies, exercise and leisure activities (see Chapter 7, section 7.2.1). The findings of this study suggest that some of the purposes of time spent outdoors depend on demographic and social factors and types of activities related to the general areas or spaces in the residential site.

In general, therefore, it seems possible that older people's time spent is likely related to the experiential and social aspects of the economic activity status. These findings suggest that the purpose of time spent outdoors for leisure activities generally relates to the economic activity status. In accordance with the present results, previous studies have demonstrated that longer time allocated to work-related activities may increase time pressures at old age and also reduce the time available for outdoor activities such as participation in leisure and social involvement (Adjei, Jonsson, & Brand, 2018; Gautam, Saito, & Kai, 2007).

Moreover, the findings of this study suggest that the physical health of older adults can influence the purpose of time spent outdoors. This research may reflect that the physically active older people would participate outdoors depending on the decline in activities as a gradual decline with age (Rioux & Werner, 2011). In accordance with the present results, previous studies have demonstrated that engaging in physical activities also plays a vital role in active

ageing and active leisure, which correlates to a positive impact on personal physical and well-being in later life (Yen & Lin, 2018).

In addition, the type of outdoor activities for other purposes is associated with attitudes toward other people from the social contact among family members, especially with friends, neighbours, and community members. The results of this research broadly support evidence from the literature review that older adults spend increased time within the residential environment because of changes to their social life and relationships in old age (Buffel, Phillipson, & Scharf, 2012; Lager, 2015; Lien, 2013; Nygren et al., 2007). These older people's personal and social networks also accord with those of other studies indicating that older individuals are more likely to contact and spend time with family members and long-time friends (Marcum, 2013). At the same time, time used for outdoor activities with a range of close and not-so-close people is essential for maintaining well-being in old age (Marcum, 2013; Shaw, Krause, Liang, & Bennett, 2007).

b) Time spent outdoors in the most used space or area

The evidence from this study suggests that the activities in which they spent time in the most used space or area are far more different than the purpose of time spent outdoors overall in the residential site environments. Almost two-thirds of the older participants spent time outdoors for leisure activities in the most used space or area, which the result has a higher rate than time spent outdoors in general spaces or areas (see Chapter 7, section 7.2.1). These results reflect those of Payne (2017), who also found that the old age group spends the most time outdoors on leisure-time physical activities.

Therefore, most elderly participants spend time in leisure activities such as relaxing alone or with other people such as family, friends, and neighbours. Followed by time spent with family, friends, and neighbours, having a nap or resting, and admiring the garden in their residential site environments. For hobbies, older participants spend time gardening, growing vegetables, listening to the radio, and making sculptures or brooms. Further replications showed that elderly participants spent time on daily life activities: having meals outdoors (individually or with other people such as family, friends, and neighbours), cooking outdoors, working, and doing household chores.

Moreover, these results are possibly due to environmental features and attributes, such as most used space or area and general spaces or areas, which hinder or facilitate older people carrying out outdoor activities in different ways (Inclusive Design for Getting Outdoors, 2007). The evidence from this study suggests that most of the hobbies, especially gardening and growing plants, relate to the time, daylight, and season the older adults must do those activities outdoors. It substantiates previous findings in the literature that reachable plants, vegetation, and seasonal features with increased light exposure in outdoor spaces are related to supporting access to nature and improved mood to spend time outdoors in older adults (Engineer et al., 2018; Lu, 2018; Traynor, Fernandez, & Kent, 2013).

Moreover, the economic dependency on the geographical location may have played a vital role in bringing about outdoor activities for hobbies. In accordance with the present results, previous studies have demonstrated that some villagers in Thailand are provided with an income that indirectly depends on areas, such as the broom makers, indicated that they had some earnings from the young people

collecting the forest resources for the older adults to make the products (Poulsen, Gkotsi, Sonntag, Kirstine, & Jeppesen, 2017).

This study also suggests that terraces or semi-outdoor areas or spaces are particularly favourable characteristics for older adults during their day-to-day activities. In accordance with the present results, previous studies have demonstrated that all dwellings, in general, should be provided with adequate open space in the form of a terrace, balcony, or garden as it is desirable in all circumstances (Design for London, 2010).

Apart from this, in the context of time use during daily activities, these results broadly reflect Marcum (2013), who found that older adults may spend more time alone and spend less time with other people during their daily routine activities. Arguably, the finding from this study was unexpected and showed that most older people spent time with other people for having meals outdoors in the most used spaces or areas than other daily activities. This somewhat contradictory result may be due to the culture of Thai older community members who are both the receivers and givers, which is sharing food with others. This view is supported by Bubpa and Nuntaboot (2018), who points out that Thai elders, especially in a rural context, often bring food and have a meal together in a small group of friends and acquaintances at an outdoor appointed place the group members' residences.

In addition, older participants spent time on other activities such as looking after the grandchild(ren), meeting with people (visitors, friends, neighbours), and watching people roaming on the street. In general, therefore, it seems that these activities may be associated with age-related social characteristics. Older people

may spend their time doing more conducive activities with other people. This finding contradicts previous studies, as mentioned in the literature review of chapter two, which have suggested that older adults spend less time physically active with others such as family, friends, and neighbours (Lien, 2013; Marcum, 2013). A possible explanation for this might be that older adults may be encouraged to increase their outdoor physical activities if influenced by friends or family members and cultural factors, as noted by Bubpa and Nuntaboot (2018) and McPhee et al. (2016).

Moreover, the results of this study indicate that very few elderly dwellers spent time on exercise at the residential site. The evidence shows that participation in physical activities with exercises remains low amongst older adults. The interpretations of this result are that time spent on exercise time physical activity decreases with age, and older people may be living in less affluent areas or rural contexts where low-cost or fun gym-free exercises are more desirable (McPhee et al., 2016; Suryadinata, Wirjatmadi, Adriani, & Lorensia, 2020). However, by drawing on the concept of exercises for seniors, McPhee et al. (2016) suggests that older adults may be encouraged to increase their physical activities with exercises. It includes the impacts of friends or family members, keeping enjoyment high, facilitating proper spaces or areas and raising self-efficacy for participating in the exercise.

Therefore, these results are due to specific characteristics of environmental features that limit the use of areas or spaces in the residential site environments. Thus, elderly participants reacted to these constraints by modifying how they approached, organised, facilitated, or used their areas or spaces to accommodate

those outdoor activities. It may be a consequence of a lack of the appropriate characteristics of some outdoor areas or spaces conducive to spending time outdoors in the residential site environments (Cohen-Mansfield & Werner, 1998; Traynor et al., 2013). In accordance with the present results, previous studies have demonstrated that the outdoor environment which affords engagement, more open space provided per dwellings, or desirable characteristics, such as semi-outdoor terraces or gardens, for outdoor activities can potentially benefit the time spent outdoors and environmental satisfaction in older adults (Design for London, 2010; Inclusive Design for Getting Outdoors, 2007).

2.) The time of the day spent outdoors

This study has identified the time of the day that older adults spend time outdoors, ranging from morning (before 9 am), late morning (9 – 12 am), afternoon (12 am – 3 pm), and late afternoon (after 3 pm). The research has found that most of the elders generally spend time in the residential site in the morning before 9 am and after 3 pm (see Chapter 7, section 7.2.1). However, most older people mentioned and expressed negative feelings about sunlight and the hot climate during the late morning and afternoon.

Moreover, the analysis of the time of the day spent outdoors in the responses of the most used space or area shows some interesting evidence, which differs from the findings of the time of the day spent outdoors in general spaces or areas the residential site environments. This study indicates that the location of spaces or areas can promote or hinder their physical activities from the impacts of the daylight during daytime. This result may be explained by the fact that older

adult desires to spend time in the most used space or area where there are more suitable characteristics to support their activities with the proper sunlight or shady features.

The research has also shown additional evidence for the time of the day spent outdoors in the residential site environments from older adults' experiences. Participants' strongly expressed or selected goals to spend time outdoors and maximise independence or socialisation despite the time of the day limitations or barriers of sunlight and hot climate. The negative perspectives about the time of the day have threatened older adults' accessibility and usability in the residential site environments.

However, older adults actively or passively adopted behaviours or altered attitudes to maximise the possibility of spending time in the residential site with consequences of the sunlight and climate. Therefore, the adapted outdoor activities can support the choice goal of spending time in the residential site environments among older participants' everyday lives, which further adjusted behaviour toward alternatives.

These findings suggest that, in general, such connections exist between sunlight and geographical features of the rural Asian context in a tropical climate. Drawing on the concept of daytime and sunlight characteristics, Edensor and Hughes (2019) have highlighted the relevance of shade and shadow attributes which are generally shaped by distinctive kinds of solar radiance, human visual perception, and cultural representations. This study's context of residential sites represents the climate where most solar radiation arrives in the

tropics (Haigh, 2011). In general, therefore, it seems that the atmosphere of tropical regions may affect the diverse ways older people live from the effects of shade in different geographical contexts, which shade and shadow have been differently exposed in the residential sites across the area, space and time (Edensor & Hughes, 2019).

Taken as a whole, the findings from the analysis of the time of the day spent outdoors in the residential site environments indicate that older adults desire to spend time outdoors during the daytime most of the day. However, there are some crucial factors of the inappropriate areas and spaces in the residential site environments or the requirement of the adopted behaviours or altered attitudes from older adults to spend time outdoors at the desired time of the day. Consequently, those factors affect the quality of the time of the day older adults spend time outdoors. Furthermore, high consumption of the time of the day spent outdoors in the Asian context could be associated with geographical contexts, particularly with sunlight and hot climate. In contrast, shaded areas create aesthetically pleasing surroundings, which affect older people's likelihood of outdoors mobility in the residential site environments in various ways. These results highlight the importance of the time of the day spent outdoors at the residential site environments in the different types of geographical contexts.

3.) The duration of time spent per day

Overall, this study strengthens the idea that older adults, on average, spend time outdoors, about 1 – 4 hours per day in the residential site environments (see Chapter 7, section 7.2.1). In accordance with the present results, these outcomes

support evidence from previous observations (Horgas, Wilms, & Baltes, 1998; Lu, 2018). Elderly participants, on average, reported spending time outdoors about 166 - 217 minutes or approximately 2 hours 46 minutes – 3 hours 37 minutes (Horgas et al., 1998). In the same vein, Lu (2018) found that older adults spend time in the outdoor spaces 442.8 minutes per week or around an hour per day on average. However, it should be noted that those studies were based on a variety of site environmental characteristics ranging from private dwellings, private houses, and apartment buildings to long-term care facilities (e.g., assisted living and nursing homes) for the elderly.

The findings of this study suggest that aged residents of different kinds of accommodation settings may spend much time in active behaviour outdoors in varied ways. It may be partly due to older adults' physical impairment or health problems (Park, 2017). However, there may also be setting-related factors, including the physical and social environment in the accommodation settings, that could influence elderly residents' time use in the outside environments (Douma et al., 2017).

Regarding setting-related factors, older residents may differ in how they value, experience, and respond to the environmental aspects of the living settings. According to Douma et al. (2017) and Othman and Fadzil (2015), the physical and social environment factors may contribute to the duration of time spent outdoors. They include the environmental aspects and compatibility with the abilities of an elderly resident, the accessibility, comfort, security, and aesthetics of the environmental settings, and possibly the presence of some desirable or specific spaces or areas for daily life and social interactions. In addition, the older

resident's level of satisfaction with their accommodation settings and their attitude towards others in the living environments in different types of residential settings can sometimes play a role in the amount of time spent on outdoor activities (Douma et al., 2017; Menec & Nowicki, 2014; Rioux & Werner, 2011).

The research has also shown the relationship between the amount of time spent per day with the time of the day spent outdoors. The findings of this study suggest that elderly participants tend to spend more time increasingly during the late morning (9 – 12 am) and afternoon (12 am – 3 pm). The current data highlight the importance of daylight levels during those periods of time. However, this result is contrary to previous outcomes that suggested that older people mentioned and expressed negative feelings about sunlight and hot climate during late morning and afternoon. This inconsistency may be due to the availability of sunshine and its benefits. As put forward by Traynor et al. (2013), the evidence supports the idea that spending time outdoors in residential sites in daylight is enjoyable and is associated with improved quality of life in older adults. Spending time outdoors in the living environments in daylight has shown to provide substantial benefits in maintaining overall health and wellbeing in old age. It has been established that the benefits of spending time outdoors may contribute to participating in socially related activities and interaction among older people and increase mood from the exposure to a range of various natural elements such as vegetation and fresh air (Finlay, Franke, McKay, & Sims-Gould, 2015; Kemperman & Timmermans, 2014).

B. The outdoor social activities in the residential site environment

The theme of outdoor social activities in this study includes people spending time outdoors together and the duration of time spent outdoors with other people in the residential site environments.

1.) The people most spend time outdoors together in the residential site environment

This study has found that generally, elderly participants mostly tend to spend time outdoors with their relatives or family members such as their partners, children, and grandchildren in the residential site environments as the influence of a rural Asian context (see Chapter 7, section 7.2.2). The results of this research support the idea of Henri et al. (2017), who suggested that Asian cultures have strong family values. ‘Family’ is also described as the most influential factor in all generations.

This argument ties in closely with the cultural explanation, which associates the culture of Asia, especially Thailand, as families have strong bonds, and they tend to spend much of their time together. It shows in every aspect of older people’s lives, from communications to spending time with their family to living arrangements (Taste of Thailand, 2017). According to Asian cultural preferences for close and strong family ties, multi-generational living arrangements and frequent social interactions are crucial aspects among extended family members (Teerawichitchainan et al., 2015).

The research has also shown that some demographic and social factors can affect elders’ preference for sharing outdoor activities with other people in their

residential site environments. Moreover, this investigation shows that elderly participants who have a higher income tend to spend time outdoors with other people, friends, and neighbours, respectively. This finding is consistent with Feng, Cramm, Jin, Twisk, and Nieboer (2020), who concludes that income may inhibit older adults from participating in social activities.

The findings of this study suggest that this relationship may reflect an actual increase in expenses for socialisation, such as material items required for leisure activities, the costs of hosting meals in the residential sites, and their awareness that they may be able to afford those expenses for more social activities with others (Scharf, Phillipson, & Smith, 2005). Furthermore, as noted by Feng et al. (2020), impoverished older people with poverty in combination with shame may be associated with the incompetence to have a decent life, which leads eventually to engagement reduction in social participation.

Additionally, the research has also shown that higher attitudes toward other people are associated with higher chances of time spent outdoors with friends, neighbours, and community members. The current data highlight the importance of performing physical activity in outdoor areas or spaces, which has been shown to provide psychosocial benefits from social interactions with other people, and a greater commitment to the activity being performed in the residential site environments (Traynor et al., 2013). Moreover, Takano, Nakamura, and Watanabe (2002) point out that using outdoor natural areas or spaces can improve social relationships and networks among elderly residents and community members.

Furthermore, this study has shown that factors of living arrangement, duration of residence and economic activity status associate with the people most spending time outdoors together in their residential site environments. This study has found that generally, solo-dwelling elders with shorter residence duration or have employed status are associated with a higher possibility of sharing outdoor activities with groups of neighbours, friends, and others, respectively.

An implication of this is the possibility that solo dwellers, particularly those childless or who do not live adjacent to a child or their family members, tend to have fewer family obligations. Therefore, they can afford to participate in social activities more frequently with neighbours, friends, and community members in their residential site environments. The result reflects those of Teerawichitchainan et al. (2015), who also found that solo-living elders are more likely to maintain active social ties with neighbours, friends, and community members than the networks of those living with their spouses. The outdoor activities include having meals and spending time together in the residential sites.

Apart from this, the single-person household among older residents in developing Asian countries has only just begun to emerge. In comparison, the proportion of older residents who live alone is low compared to the data observed in western contexts (Palloni, 2000; Teerawichitchainan et al., 2015). This result may be explained by the fact that attitudinal change in the living arrangement in the Asian context combined with the increased migration of adult children from rural to urban areas and declining family size has led to the increased proportion of older adults living alone (Knodel, Teerawichitchainan, Prachuabmoh, & Pothisiri, 2015).

The findings of this study also suggest that the characteristics of employed older adults with time spent outdoors for socialisation may be linked to psychosocial and psychological benefits. Employed older adults gain or maintain social networks among the older adults' family and community members from time use in their residential sites combined with low levels of depression at old age (Adjei et al., 2018; Traynor et al., 2013). Moreover, spending time outdoors in natural areas and spaces in the residential sites extends to psychosocial advantages from participating in socially related activities, which also improved social networks and relationships among the older adults, as referred to in previous sections.

In addition, this study has shown that elderly participants who have a bigger family size or more members in their residences spend time outdoors with their relatives. This research supports the idea that the household size can increase older adults' family obligations with time spent outdoors in the residential site environment, thus reducing their participation in social activities with their neighbours, friends, and other people. In addition to this, as noted by Teerawichitchainan et al. (2015), there is also an economic clarification for solo dwellings with higher income levels. It enables the older adults to afford more privacy from the family members living alone. This solo dwelling characteristic ties in closely with the cultural demonstration that associates the decline in family-centred expectations and values and the increase in solitary livelihood with the rise in individualism, influencing social engagement among older residents and their families.

2.) The duration of time spent outdoors with other people

This study has found that generally, elderly participants mostly spend time outdoors with other people for 1 – 4 hours per day in the residential site environments (see Chapter 7, section 7.2.2). In addition, another important finding suggests that there are associations between the duration of time spent outdoors with friends, neighbours, and community members per day with demographic predictors of the amount of income and household size.

The results of this study indicate that older people who have a bigger family size with less amount of income reported the greatest satisfaction with more time spent outdoors with friends, neighbours, and community members in the residential site environments. The results of this research support the idea of previous outcomes of the relationships between the household size and the people most spending time outdoors together in the residential site environment and concurs well with Teerawichitchainan et al. (2015). As put forward by those findings, these results suggest that the influence of the household size can develop elders' social participation with more duration of time spent outdoors with other people in the residential site environments. Overall, this study strengthens the idea that household size can increase older adults' family obligations and more time spent outdoors in the residential site environment.

Apart from the physical activities of older adults, this study has also identified the most utilised areas or spaces they have preferences for and used far more intensively in the residential site environments.

1.) The preferences for spaces or areas

The elderly participants' preferences for spaces or areas in their residential site environments ranged from front garden or area at the front, back garden or area at the back, side garden or area at the side, terrace, and other spaces or areas in the residential site. This study has shown that the terrace was rated as the most favourite space or area (see Chapter 7, section 7.3). However, the research has also shown that the preferences for spaces or areas have relationships with demographic and social factors and the outdoor usage characteristics of older adults in different ways. The themes identified in five categories of space or area are as follows:

a) Front garden or area at the front of the residential site

This study indicates that the preferences for spaces or areas in the front garden or area at the front of the residential site can be influenced by the social characteristics and purposes of time spent outdoors. This study has shown that elderly participants who have higher attitudes toward other people are associated with higher chances of time spent outdoors in the front garden or area at the front of the residential site. Moreover, research has also shown that elderly residents spend time outdoors in the front garden or area of the residential site as their preferred area for other activities such as meeting with friends, neighbours, and community members.

Taken together, these results suggest that the front garden or area at the front of the residential site is the space or area that the elderly participants typically use to be the first place for welcoming and sharing outdoor activities with friends, neighbours, and community members. Their relationships are the factor that

influences the time spent outdoors in their residential site environments. It should be noted that these residential sites are fenced. Therefore, only people acquainted with older residents are allowed to enter and engage in outdoor activities in these areas or spaces.

b) Back garden or area at the back of the residential site

This study has shown that the preferences for spaces or areas in the back garden or area at the back of the residential site were associated with the purposes of time spent outdoors and the time of the day that older adults spend time outdoors. These findings suggest that, in general, the use of space or area at the back garden or area at the back of the residential site accordingly to their preferences for spaces or areas may increase when older adults spend time outdoors at the time of the day during the afternoon (12 am – 3 pm).

These findings show that elders are more likely to spend time in the back garden or area at the back of the residential site as their preferences for spaces or areas for exercises and other activities, such as looking after the grandchild(ren), meeting with people (visitors, friends, neighbours), and watching people roaming on the street from their residential site environments.

The evidence from this study suggests that the characteristics of the back garden or area at the back of the residential site are suitable for elderly residents to spend time outdoors during the afternoon as this area may represent a private space for casual time in old age. Moreover, an implication of this is the possibility that the back areas or gardens perform as the space in the residential sites where older adults can view the public or other people on the street and be open to public

view. Therefore, these characteristics of residential site environments could be represented as supportive outdoor spaces contributing to a more outdoors lifestyle. In addition, they correlated with older people's life satisfaction and emotional and psychological impacts that affect later life quality (Inclusive Design for Getting Outdoors, 2007).

c) Side garden or area at the side of the residential site

This study has shown that there are associations between the preferences for spaces or areas at the side garden or area at the side of the residential site and the demographic factor of disposable income, social attitude toward community members, the purposes of time spent outdoors for hobbies, and the time of the day that older adults spend time outdoors during late morning (9 – 12 am) and especially during the afternoon (12 am – 3 pm).

In general, preferences for spaces or areas in the side garden or area at the side of the residential site are associated with higher disposable income. Furthermore, elderly adults tend to have more preferences for the side garden or area at the side of the residential site to spend time outdoors for hobbies. The findings of this study suggest that older people with poverty may be associated with the incompetence to have more areas or spaces, the side area or gardens (Feng et al., 2020). Therefore, it eventually reduces the preferences for the side garden or area and ultimately affects their outdoor activities.

In addition, the study has shown that older residents tend to increase their preferences for the side garden or area at the side of the residential site with associated with higher levels of attitude toward community members. This research

supports the idea that the experiences in intimate physical settings from the social interaction and community contexts with neighbours who they routinely see over the fence while spending time outdoors doing their gardens (Chalfont, 2007).

d) Terrace

These findings suggest that only the factor of economic activity status generally affects the preferences of elderly dwellers for space or area at the terrace in the residential site environments. In addition, this study has shown that older adults who are employed reported the most significant preferences for time spent outdoors at the space or area at the terrace in the residential site environments.

The evidence from this study suggests that a terrace is an open space or area that generally is attached to a dwelling. This characteristic may also be the first essential area or space for older residents to use as the connection between indoors and outdoors. To clarify, older adults may use this terrace and then step towards outdoor activities, such as relaxing at the terrace after work before entering the residence (Chalfont, 2007).

e) Other spaces or areas

The results of this study indicate that only gender influences the preferences of older residents for other spaces or areas in the residential site environments. This study has shown that older female residents prefer other spaces or areas, such as pavilions, stilt floor areas, and shops in the residential site environment.

2.) The most used space or area

In general, most older participants (40%) indicated that the terrace is the space or area they spend time outdoors in the residential site environments the most (see Chapter 7, section 7.3). However, older adults spend time for daily activities in other areas or spaces and spend time for other activities in the front garden or area at the front of the residential site as the most used space or area.

Furthermore, the results of this study indicate that the most used space or area can be influenced by the social characteristics and the purposes of time spent outdoors. The findings of this study suggest that elderly participants, who have a higher rate of attitude toward friends, rated the most used space or area as the front garden or area at the front of the residential site. The evidence from this study strengthens the idea of previous findings on the preferences for spaces or areas. It indicates that the front garden or area at the front of the residential site is the space or area that the older adults usually use to welcome and share outdoor activities with friends. Moreover, the aspect of their relationships is the factor that influences the time spent outdoors in those areas or spaces in their residential site environments.

9.3.3 The perceptions and evaluations of residential site environments among older people in the rural context

The third question of this study is posed: *“What are the perceptions and evaluations of residential site environments among older people in the rural context?”* this approaches the objective of unravelling older adults’ perceptions

and evaluations toward their residential site environments in a rural area concerning (i) the necessity of the residential site environments, and (ii) the physical aspects of the residential site environmental characteristics that need to be taken into account in these residential site environments. In addition to this, the study also evaluates and investigates (i) preferences and satisfaction of older adults towards the residential site environmental characteristics and (ii) the characteristics and physical environmental features of the residential site environments that influence the outdoor usage and environmental satisfaction through older adults' perspectives and perceptions.

A. The older adults' perceptions and evaluations of residential site environments

In general, elderly adults in the early and the later stages agree that the residential site environments are necessary for older people. This study has shown that the only difference found between older adults from the different age groups relates to the level of necessity. Elders at the early stage, who are less senior and more likely to be physically active (Rioux & Werner, 2011; Yen & Lin, 2018), tend to perceive and evaluate that residential site environments are more necessary than older persons of the greater age in a later stage. These outcomes may also relate to the older adults' satisfaction and attitudes from the influences of the characteristics of the residential site environments of those physical aspects.

Furthermore, this study strengthens the idea that the residential site's environmental characteristics should comprise the physical aspects related to

safety, functionality, motivator, and typology, respectively. The findings of this study suggest that older adults' perceptions and evaluations of the physical aspects of the residential site environmental characteristics are key drivers behind the environmental preferences in later life, in addition to the features of the residential site environment itself. The physical aspects of safety, functionality, motivator, and typology in residential site environments can influence older people's physical and psychological well-being, quality of life and environmental satisfaction, and successful ageing.

In the view of ageing in place, Ewen, Smith, Washington, Carswell, and Emerson (2017) point out that the capability of older people to successfully age in place depends on not only their functional abilities and physical health but also the characteristics of the physical features in their living environment. Therefore, such analyses are essential, as results can inform the residential site environmental characteristics of the physical aspects that can potentially promote older adults' physical and psychological well-being and physical activities in the residential environments.

B. The characteristics and physical features of the residential site environment from older adults' perspectives and perceptions

This study has identified the effects of different environmental factors on residential sites through older adults' perceptions and evaluations of the typology, motivators, functionality, and safety.

1.) The typology

In general, the findings of this study suggest that the preferences for the typology of the residential site environments relate to the geographical location. This study has shown that the characteristics of the locations and the effects from the surrounding, related features, and residential land uses, such as the valleys, mountains, forests, and rice fields, may lead to outdoor usage and environmental satisfaction.

Furthermore, the current data highlights the importance of the geographies of residential sites' locations, surroundings and the tropical climate in affecting environmental satisfaction in old age in this rural Asian context, which is also in accord with previous studies (Barnett et al., 2017; Rioux & Werner, 2011) and data in the earlier section.

2.) The motivator

This study suggests that the motivator of their residential site environments should promote the attractiveness on and around the residential site environment by considering the preferences on the pleasant indoor sunshine with the atmospheric conditions of tropical climate. Moreover, the good views from the window of the environmental features surroundings perceived from the indoors and the outdoor areas can develop the preferences in the residential environments and significantly impact older people's wellbeing.

The presence of garden landscaping and green area characteristics can allow older adults to engage with their residential site environments and nature

connections actively. In addition, perceived residential site environments from the perception of the surrounding area or neighbourhood tend to motivate older adults to participate in more activities outdoors and possibly increase their aesthetic perception and environmental satisfaction.

3.) The functionality

The results of this study about the characteristic factors of the functionality indicate that older adults have the least preference for the characteristic of the indoor-outdoor connections. In contrast, the perceived environmental features have the highest preference from elders among all environmental factors. The research has also shown that indoor-outdoor connections can increase accessibility and encourage older people to engage with the outside world. In comparison, the perceived environmental features can either maintain or decrease the older persons' independence in the residential sites. This study also suggests that the perceived site walkability tends to be associated with good sidewalk conditions and easy access to destinations within the residential environment that may promote older adults to be active and desire to engage in activities in those outdoor areas or spaces.

4.) The safety

This research supports the idea that outdoor safety is the most important environmental feature in the residential site that affects elderly adults' choices of using outdoor areas or spaces and well-being in later life (Choi & Matz-Costa, 2017; Lu, 2018).

However, the results of this study indicate that a feeling of security and safety has a higher preference than the sense of safety in the residential site from the perception within a residence. The findings of this study suggest that these differences can be explained in part by the characteristics of environmental aspects as demonstrated in earlier sections of typology, motivator, and functionality that these physical aspects tend to affect older persons' perceptions of safety in residential sites. Therefore, older adults' evaluations of the secure and safe feelings at the residential site may increase by entering and engaging in those areas or spaces than perceived from within a residence.

This study strengthens the idea of Wang (2014) that the living environments for old age should be safe, as perceived and evaluated by older adults both from indoors or within a residence and in the outdoor settings of the residential sites. An implication of this is the possibility that the other characteristics of environmental aspects should attract and invite older adults to go outdoors with the increasing sense of safety in the residential site.

To sum up, the study emphasized that residential environments for old age play a significant role in physical and psychological health and wellbeing (Hadafi & Barough, 2017; Iwarsson, 2005), alongside the physical aspects and residential environmental characteristics themselves. Therefore, residential site environments need to consider the environmental features of the physical aspects to support and encourage older adults with outdoor activities, such as the environmental motivators of the window views and pleasant indoor sunshine, typology of the orientation of the dwellings and site type, the functionality of connections areas and site walkability, and the safety of the environmental features. Furthermore,

these physical aspects of environmental features in the residential site affect elderly adults' health improvement and well-being in later life, as well as choices and quality of outdoor areas or spaces usage for physical activity.

9.4 IMPLICATIONS

The importance of this study was justified in its concern with the appropriate residential site environment for the elderly and its effects on elder perception and evaluation of this environment. This thesis has provided a deeper insight into understanding older adults' perceptions of the residential site environments in rural contexts and how they utilize and relate to their environments. This study provides the main implications for theory and literature, and practice as follows:

9.4.1 Implications for theory and literature

This study helps fill a gap in the existing evidence base on how the residential site environment impacts and relates to ageing in place in the Asian rural context. Although there is a rapidly growing interest in the importance of the environment for the elderly, the causal link between the residential site and seniors' perception and evaluation in Asian countries needs further exploration as they are less well-established. Developing such appropriate residential sites environment in rural areas and their challenges can be used as a lesson and develop existing theories or pieces of knowledge. Furthermore, it can help explain residential site environmental influence on the behaviour and perception

of older adults in other Asian countries or related contexts in confronting ageing societies.

In addressing the study of ageing, the synthesis of significant disciplines of human ageing and geographies of ageing, family and care in rural contexts help clarify the theoretical foundations on how geography affects individual ageing and social relationships from the context of space and place of care. This approach will prove helpful in expanding our understanding of how the geographical work that points to the informal care for ageing in place may enhance an older person's ability to remain ageing well at the residence as a site of care in a rural context in the long term. This study has also drawn attention to a definite need for the study of geographies of ageing, family and care to pay more consideration to the ways in which everyday social relationships and informal care and support in later life, as well as the space and place of the living environment, affect caring experiences, exchanges and encounters in the face of cultural, generational and material constraint.

In addition, the research contributes to our understanding of geographical, physical, social, and cultural characteristics. These characteristics influence the ability of older adults to maintain various outdoor activities, social interactions, and personal identities, which appear to play a decisive role in older people's perceptions of residential site environments. The geographical location highly influences older adults with ageing in place. The evidence from this research suggests that the rural Asian context provides different experiences for those who live in urban settings. Rural settings are directly related to the quality of life of

older people in which the residential environment has an important impact on behaviour and well-being in old age.

Moreover, the contribution of this study has been to confirm that the different climate conditions and weather patterns create additional challenges and shape the person's perception, perspective, and outdoors mobility in old age. Moreover, the geographies of residential sites' locations and surroundings and the context of the atmospheric condition of tropical climate appear to be significant aspects of the living environment and environmental satisfaction in old age in the rural Asian context.

This research indicates the need to be more supportive of the natural features in the residential site environments for ageing in the atmospheric conditions of tropical climate. The characteristics of climate conditions and weather patterns can be considered the environmental barriers associated with restricted and decreased older people's likelihood of outdoors mobility. Whereas a supportive residential environment, such as a shady space or area, increases and motivates older people to participate in activities outdoor.

9.4.2 Implications for practice

National, regional, and local authorities can benefit from having information on residential site environments and their features that support older residents' usage of outdoor areas. Furthermore, the insights gained from this study may be helpful in convincing decision-makers or residential and rural development

to improve and create appropriate residential site environments for older adults in Asian countries or related contexts with an increasingly aged society.

Designing guidelines for site plans could be created and used to improve the quality of residential site environments for older adults, potentially leading to higher levels of environmental preferences and satisfaction and better outdoor usage that fits their needs. Moreover, according to the approach of geographies of ageing, family and care in a rural context, the key policy main concern should therefore be to plan for the informal care and support of old age. While it is unlikely that any demographically significant segment of the rural older population in need of long-term care will rely on institutional care in the foreseeable future. Whereas ageing in place at home is likely to play an increasing role in long-term care of older persons. In the near future, it is unlikely that any demographically significant portion of the rural elderly population who require long-term care will rely on institutional or formal care. As opposed to this, home-based ageing is expected to play a growing role in long-term care planning for seniors. As a result, the suitable program for informal care should provide a range of services and supports, including counselling in improving family relationships, planning for the future, and assisting and supporting families to have an appropriate living environment for ageing in place.

This study's relative role of different residential site environmental characteristics will make it easier for administrators and related fields to make informed decisions with cost-effectiveness when allocating scarce budget resources. Taken together, the residential site environmental improvements for ageing may have the advantages of being relatively permanent and cost-effective

after initial investments and development plans are made. Despite a growing population of older adults in a rural context, it may be possible to significantly improve and create appropriate relationships between older adults and their residential site settings with the considerations of family and informal care through environmental design.

9.5 LIMITATIONS OF THE RESEARCH STUDY AND FURTHER RESEARCH

This study has the process of collecting data in one language (Thai) and presenting the findings in another (English). It involves the researcher taking translation-related decisions that directly impact the validity of the research and its report. Therefore, there is a need for the researcher who has to translate data from one language to another to be explicit in describing the choices and decisions, translation procedures and resources used. The factors that affect the quality of translation in research include the translator's knowledge of the culture of the people under study, the linguistic competence of the translators, and the autobiography of those involved in the translation (Birbili, 2009; Tyupa, 2011).

Consequently, cross-cultural researchers have very rigorous requirements regarding the quality of translation to keep the meaning of the data as the source (Squires, 2009). According to Tyupa (2011), one of the most popular methods to assess the quality of translation is the back-translation technique. Therefore, this study used the back-translation method. It is a process whereby the translated information is re-translated back into the original language. This method is

undertaken by a translator who has not seen the original data. Therefore, if any differences are found between the original text and back-translation, this can indicate translation errors in the target language version.

Another limitation of this study is that the boundaries of a generalization of the findings are evident because the sampling of residents is not random (see Chapter Five, section 5.2). In this regard, the results from the empirical investigation need to be interpreted as pertaining to the sample of older residents in the Asian rural context with a case study of a selected village in Chiang Mai, Thailand, and not of a wider population. On the other hand, the research findings remain relevant to the quantitative and qualitative understandings of older people's perceptions and evaluations of residential site environments. Therefore, instead of allowing a set of quantitative predictions to be made, the applicability of the research findings to other residential site environments in a similar context is treated as probable assumptions rather than something to which can be assigned specific universal laws. It is also hoped that the findings of this thesis improve future actions to residential site environments in the Asian rural context. Moreover, it expects to help discuss how these characteristics of the residential site environments can be designed to create satisfaction and promote outdoor activities for older adults in a similar rural context.

Apart from this, the study of the residential site environments for ageing in the rural Asian context is a less well-established field of study. Therefore, the further line of investigation is filled with challenges for researchers. Moreover, this research is only a first step in living environments for older people and then leaves other researchers approaching future developments.

A possible future stage of investigations and recommendations for the research might be the application of this research methodology to other villages, case studies and Asian countries. It can possibly lead to the universal perceptions and evaluations of the residential site environments from older adults from different rural contexts with the consideration of the informal care and support from family and relatives or multi-generational households.

In terms of the practical recommendations for further research which can help decision-makers, residential and rural development, and local authorities, this research suggests that the mixed methodology of questionnaires, interviews, and fieldwork collection are helpful methods to explore older people's behaviours, perceptions, and perspective toward the living environments. Therefore, these methods should be applied, and the findings from this research should be used as a theoretical background to develop residential site environment guidelines.

In conclusion, this research on residential site environments for older adults in the rural Asian context is just one part of the living environment for ageing. This study presents many other perspectives prompted by the environmental contexts and demographic change during the rapid pace of population ageing. The advance in the knowledge about the relationship between older people and the residential site environment represents a significant challenge for those researchers and other Asian countries or related rural contexts in confronting ageing societies.

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APPENDIX

Appendix 5.1: Questionnaires

RESIDENTIAL SITE ENVIRONMENTAL ASSESSMENT

Q 1) When completing this checklist, use all information available. Please check those used:

[1] written records [2] voice records [3] primary respondent [4] other informants [5] fieldwork

Q 2) Date / / Q 3) Participant No. , , Q 4) Case Details / /
Day Month Year Site Participant Address Duration

PART A: DEMOGRAPHIC OR PERSONAL, AND SOCIAL INFORMATION

A.1 GENDER (1) ☐ Female (2) ☐ Male

A.2 AGE (1) ☐ Early stage (60 – 74 years old)
(2) ☐ Later stage (75 years old and above)

A.3 EDUCATIONAL LEVEL (Select the single best option)

(1) Elementary or lower ☐ (3) Senior high school ☐
(2) Junior high school ☐ (4) Junior College or higher ☐

A.4 CURRENT MARITAL STATUS: (Check only one that is most applicable)

(1) Currently married ☐ (2) Currently not married ☐

A.5 ECONOMIC ACTIVITY STATUS (Select the single best option)

(1) Employed ☐ (3) Other ☐
(2) Retired ☐ (please specify)

A.6 PERSONAL DISPOSABLE INCOME (Select the single best option, unit in Thai baht)

(1) Insufficient ☐ (3) Sufficient ☐
(2) Just enough ☐ (please specify the amount)

A.7 MEDICAL AND HEALTH INFORMATION

(1) How do you rate your physical health in the past month?

1)Very good ☐ 2)Good ☐ 3)Moderate ☐ 4)Poor ☐ 5)Very poor ☐

(2) How do you rate your mental and emotional health in the past month?

1)Very good ☐ 2)Good ☐ 3)Moderate ☐ 4)Poor ☐ 5)Very poor ☐

(3) Do you currently have any disease(s) or disorder(s)?

☐ NO ☐ YES If YES, please specify:

A.8 BUILDING OWNERSHIP (Select the single best option)

(1) Owner occupier / no mortgage ☐ (4) Rent privately ☐
(2) Owner occupier / mortgage ☐ (5) Tenant ☐
(3) Live with partner / family ☐ (6) Other ☐
(please specify)

Note: The document was translated into Thai language.

A.9 LIVING ARRANGEMENT *(Select the single best option)*

- | | | | |
|-----------------------|--------------------------|-------------------------|--------------------------|
| (1) Living alone | <input type="checkbox"/> | (4) Children | <input type="checkbox"/> |
| (2) Partner or spouse | <input type="checkbox"/> | (5) Spouse and children | <input type="checkbox"/> |
| (3) Relatives | <input type="checkbox"/> | (6) Other | <input type="checkbox"/> |
- (please specify) _____ Total ____ people

A.10 LENGTH OF RESIDENCE *(Select the single best option)*

- | | | | | | |
|-----------------------|--------------------------|-----------------|--------------------------|------------------------|--------------------------|
| (1) Less the one year | <input type="checkbox"/> | (3) 4 - 6 years | <input type="checkbox"/> | (5) 10 years and above | <input type="checkbox"/> |
| (2) 1 - 3 years | <input type="checkbox"/> | (4) 7 - 9 years | <input type="checkbox"/> | | |

A.11 ATTITUDES OF RELATIONSHIPS

- (1) Individual attitudes of immediate family member(s) *(Select the single best option)*
 1)Very good ☐ 2)Good ☐ 3)Moderate ☐ 4)Poor ☐ 5)Very poor ☐
- (2) Individual attitudes of friend(s) *(Select the single best option)*
 1)Very good ☐ 2)Good ☐ 3)Moderate ☐ 4)Poor ☐ 5)Very poor ☐
- (3) Individual attitudes of community members *(Select the single best option)*
 1)Very good ☐ 2)Good ☐ 3)Moderate ☐ 4)Poor ☐ 5)Very poor ☐
-

PART B: RESIDENTIAL SITE ENVIRONMENTAL INFORMATION**B.1 NECESSITY AND THE PHYSICAL ASPECTS OF THE RESIDENTIAL SITE ENVIRONMENTS**

- (1) Do you think that the residential site environments are necessary? *(Select the single best option)*
 1)Yes ☐ 2)No ☐ 3)I don't know ☐
- (2) How important is the residential site environmental characteristic of typology? *(Select the single best option)*
 1) Very important ☐ 2) Important ☐ 3) Undecided ☐
 4) A little important ☐ 5) Not important ☐
- (3) How important is the residential site environmental characteristic of motivator? *(Select the single best option)*
 1) Very important ☐ 2) Important ☐ 3) Undecided ☐
 4) A little important ☐ 5) Not important ☐
- (4) How important is the residential site environmental characteristic of functionality? *(Select the single best option)*
 1) Very important ☐ 2) Important ☐ 3) Undecided ☐
 4) A little important ☐ 5) Not important ☐

Note: The document was translated into Thai language.

B.4 THE APPEARANCE OF RESIDENTIAL SITE ENVIRONMENTS PREFERENCES

- (1) What do you think of the residential site environments from the perception within a residential property? *(Select the single best option)*
- 1)Very good [] 2)Good [] 3)Moderate [] 4)Poor [] 5)Very poor []
- (2) What do you think of the residential site environments from the perception of surroundings area or neighbourhood? *(Select the single best option)*
- 1)Very good [] 2)Good [] 3)Moderate [] 4)Poor [] 5)Very poor []

B.5 THE USAGES OF OUTDOOR RESIDENTIAL SITE ENVIRONMENTS

- (1) The purposes to spend time at outdoor environment area *(Select the single best option)*
- 1)Daily life activities [] 2)Hobbies [] 3)Exercises []
4)Leisure activities [] 5)Other [] *(please specify)* _____
- (2) The frequency of time spent at outdoor environment area usage per day *(Select the single best option, unit in hour)*
- 1)Less than 1 [] 2)1 - 4 [] 3)4 - 7 [] 4)7 - 10 [] 5)More than 10 []
- (3) The period of day of spending time outdoor at the residential site environments *(Select all that apply)*
- 1)Before 9 am. [] 2)9 - 12 am [] 3)12 am – 3 pm [] 4)After 3 pm []
- (4) The favourite space(s) or area(s) outdoor at the residential site environments *(Select all that apply)*
- 1)Front garden [] 2)Back garden [] 3)Side garden []
4)Terrace [] 5)Other [] *(please specify)* _____
- (5) The most usage space or area outdoor at the residential site environments *(Select the single best option)*
- 1)Front garden [] 2)Back garden [] 3)Side garden []
4)Terrace [] 5)Other [] *(please specify)* _____
- (6) The period of day of spending time outdoor at the residential site environments from the answer of previous question *(Select all that apply)*
- 1)Before 9 am. [] 2)9 - 12 am [] 3)12 am – 3 pm [] 4)After 3 pm []
- (7) The most participation way that you prefer to spend time outdoor at the residential site environments with other people *(Select the single best option)*
- 1)Relative(s) [] 2)Neighbour(s) [] 3)Friend(s) [] 4)Other [] *(please specify)* _____
- (8) The frequency of time spent at outdoor environment area usage with other people per day *(Select the single best option, unit in hour)*
- 1)Less than 1 [] 2)1 - 4 [] 3)4 - 7 [] 4)7 - 10 [] 5)More than 10 []

Note: The document was translated into Thai language.

Appendix 5.2: Interviews

PART C: INTERVIEW GUIDE *(Interview questions)*

1. Describe the spaces, areas, environmental features within and immediately environmental surrounding your residential site that you utilize or have preference the most.

*Probe: Why do you spend the most time in those particular spaces or areas?
Why do you have most preference in those environmental features?*

2. Describe what kinds of activities you do in those particular spaces or areas.

Probe: What about each space or area makes it easy and/or difficult to pursue such activities? Why?

3. Indicate the main positive and negative characteristics of spaces, areas, environmental features within and immediately environmental surrounding your residential site.

Probe: What about the effects of those positive and negative characteristics to your perception and preferences towards your residential site environment? How do you utilise those spaces, areas, environmental features to fit your needs?

4. What aspects of your residential site environment that meet your outdoor usages and needs the most and the least?

Probe: Do you feel that your residential site environment provides a preferred level of challenge to you? Why or why not?

5. Describe what, if anything, you have done to make it be more appropriate to meet your usages and needs of your favourite spaces, areas, environmental features and/or complete your favourite activities or environmental preferences within or immediately environmental surrounding your residential site.

*Prompts:(if nothing, ask) Do you have plans to make any changes in the future?
Why?*

6. Is there anything else you would like to tell me regarding how you feel or think about the residential site environment that you live now?

Note: The document was translated into Thai language.

Appendix 5.3: Fieldwork observations

PART D: FIELDWORK OBSERVATION

D.1 BUILDING TYPE *(Select the single best option)*

- | | | | |
|------------------------|--------------------------|----------------|--------------------------|
| (1) Single-house | <input type="checkbox"/> | (3) Row-houses | <input type="checkbox"/> |
| (2) Multi-houses | <input type="checkbox"/> | (4) Other | <input type="checkbox"/> |
| (please specify) _____ | | | |

D.2 SITE TYPE *(Select the single best option)*

- | | | | |
|------------------------|--------------------------|------------------|--------------------------|
| (1) Corner lots | <input type="checkbox"/> | (3) Sharing lots | <input type="checkbox"/> |
| (2) In between lots | <input type="checkbox"/> | (4) Other | <input type="checkbox"/> |
| (please specify) _____ | | | |

D.3 THE HEIGHT OF BUILDING _____ floor(s)

D.4 LEVELS OF BUILDING ORIENTATION TOWARD THE FRONTAGE STREET

- | | |
|--|--------------------------|
| (1) Long sides of buildings are parallel to the frontage street | <input type="checkbox"/> |
| (2) Short sides of buildings are parallel to the frontage street | <input type="checkbox"/> |
| (3) Other (please specify) _____ | <input type="checkbox"/> |

D.5 LEVELS OF SHADING: the percentage of site areas shaded by tree or canopy *(Select the single best option)*

- | | | | |
|------------------------------|--------------------------|------------------------------|--------------------------|
| (1) Below 25 percent | <input type="checkbox"/> | (3) 50 percent to 75 percent | <input type="checkbox"/> |
| (2) 25 percent to 50 percent | <input type="checkbox"/> | (4) More than 75 percent | <input type="checkbox"/> |

D.6 DWELLINGS AND SURROUNDINGS CHARACTERISTICS

(1) The dwelling construction type *(Select all that apply)*

- 1)Masonry ☐ 2)Wooden ☐ 3)Semi-wooden ☐ 4)Other ☐ (please specify) _____

(2) The material(s) of surroundings adjacent to the dwelling *(Select all that apply)*

- 1)Concrete ☐ 2)Grass ☐ 3)Ground ☐ 4)Other ☐ (please specify) _____

(3) The width of community frontage street attached to the residential site *(Select all that apply)*

- 1)Less than 2 m ☐ 2)2 - 3 m ☐ 3)3 - 4 m ☐ 4)4 - 5 m ☐ 5)More than 5 ☐

(4) The material(s) of community street attached to the residential site *(Select all that apply)*

- | | | | |
|------------|--------------------------|----------------|---|
| 1)Concrete | <input type="checkbox"/> | 3)Compact-dirt | <input type="checkbox"/> |
| 2)Asphalt | <input type="checkbox"/> | 4)Other | <input type="checkbox"/> (please specify) _____ |

(5) The percentage of outdoor residential site areas covered in land plot *(Select the single best option)*

- | | | | |
|----------------------------|--------------------------|----------------------------|--------------------------|
| 1)Below 25 percent | <input type="checkbox"/> | 3)50 percent to 75 percent | <input type="checkbox"/> |
| 2)25 percent to 50 percent | <input type="checkbox"/> | 4)More than 75 percent | <input type="checkbox"/> |

Note: The document was translated into Thai language.

Appendix 5.4: Information letters sent to older adults in a case study village of a rural area in Baan Pong Nuea inviting them to participate in the study.

Recruitment Advertisement

Alisa Hongthong

PhD student in Geography, Earth and Environmental Sciences, University of Birmingham, UK

PROJECT

Appropriate Residential Sites Environment for the Elderly in Baan Pong Nuea Sub-District
Municipality of the Hang Dong District in Chiang Mai Province

As part of the postgraduate program in Geography, Earth and Environmental Sciences, University of Birmingham, UK. I am carrying out a study to understand how older adults perceive the residential site environments in a rural context and to understand how they utilise and relate to their environments.

I am inviting you to participate in this study due to the significant part of inhabitants in Baan Pong Nuea sub-district municipality of the Hang Dong district in Chiang Mai province. By participating, you will agree to do the questionnaire, be interviewed and allow for fieldwork of your residential site which will last about one to two hours.

You will fill out the document and letters attached in this postage at that time. Participation is entirely voluntary, and you are also free to withdraw from the research at any time before the end of the data collection process, or within three months after completing the questionnaire and interview, without providing any reason.

The researcher would like to thank you in advance for your time and consideration. The researcher would be very grateful if you would be willing to take part in this study. If you are interested, please contact the researcher by phone call using the contact details below prior to the home visit. The researcher will then ask for the informed consent and confirm an appointment for home visit. This study has been reviewed and approved by University Ethical Review Committees, University of Birmingham, UK.

Researcher

Ms Alisa Hongthong, Doctoral Researcher

School of Geography, Earth and Environmental Sciences, University of Birmingham

Telephone: [REDACTED] (In United Kingdom), [REDACTED] (In Thailand)

Email address: [REDACTED]

Address: University of Birmingham, Edgbaston, Birmingham, B15 2TT, UK

Note: The document will be translated into Thai language.

Participant Information Sheet

Title of the project

Appropriate Residential Sites Environment for the Elderly in Baan Pong Nuea Sub-District
Municipality of the Hang Dong District in Chiang Mai Province

Alisa Hongthong

PhD student in Geography, Earth and Environmental Sciences, University of Birmingham, UK

I am a PhD student at the University of Birmingham, United Kingdom, in the School of Geography, Earth and Environmental Sciences. I am planning to conduct a research study, which I invite you to take part in this research. Whether or not you take part is your choice. If you don't want to take part, you don't have to give a reason. If you do want to take part now, but change your mind later, you can pull out of the study at any time prior to the end of data collection process, or within three months after completing the home visit.

This Participant Information Sheet will help you decide if you'd like to take part. It sets out why I am doing the research, what your participation would involve, what the benefits might be, and what would happen after the research ends. I will go through this information with you and answer any questions you may have. You do not have to decide today whether or not you will participate in this research. Before you decide, you may want to talk about the research study with other people, such as family, friends, or village headman. Please feel free to do this.

WHAT ARE THE PURPOSES OF THE STUDY?

This research aims at studying and finding out seniors' needs for residential sites environment in rural context. The objectives of this research are to assess on and around seniors' residential sites from dwelling levels and site levels in selected rural area, and to examine and indicate the specific features of residential site environment that appropriate and affects outdoor usage and environmental satisfaction that meet elders' needs.

The main purposes of this research are to (1) understand how older adults perceive the residential site environments in rural context and (2) understand how they utilize and relate to their environments. The study includes interviewer administered questionnaires, an interview which will be face-to-face, and observations of the residential site environment.

The result of the study will help understand older people's perceptions and perspectives towards the environment and identify residential environmental features in rural context.

WHAT WILL MY PARTICIPATION IN THE STUDY INVOLVE?

You are invited to participate in this study due to the significant part of inhabitants in Baan Pong Nuea sub-district municipality of the Hang Dong district in Chiang Mai province.

Note: The document will be translated into Thai language.

What will I do if I choose to be in this study?

By participating, you will agree to do interviewer administered questionnaire, be interviewed and allow for fieldwork of your residential site in regard to the inhabitant status in Baan Pong Nuea sub-district municipality of the Hang Dong district in Chiang Mai province.

There will be the researcher and two research assistants, who are professional architects that have been trained for this data collection, as the research staffs. You are allowed to have your family member(s) or relative(s) being present during visits, if you are unable to do so on your own. If you agree to take part in this study, you could inform the researcher by phone call. Then you will be asked for the informed consent and confirm an appointment for home visit.

Study time and location:

The research participation of questionnaire, interview, and fieldwork will take approximately about one to two hours. All study procedures will take place at your residential site as a home visit. You can also have your relatives or loved ones, being present during visits, to help or support the given of that information if you are unable to do so on your own.

The content of the questionnaire, interview, and fieldwork will not be shared with other participants. I would like to electronically audio-record the verbal interview to ensure the accuracy of data and mitigate for any misrepresentation. I will keep these records in securely locked away in a locked filing cabinet and located in secured locations. Access to files will be restricted and supervised by the researcher. A summary of the questionnaire and interview will be provided to you in person in order to modify any inaccuracy of the interpretation. In case of any modification requires, the researcher will amend the interpreted record according to your comments. However, full editorial control of the research result remains with the researcher. If you prefer not to be audio-recorded, I will take notes instead.

You will be sent a copy of the executive summary of the study, which will be translated in Thai language, once the research is completed.

WHAT ARE THE POSSIBLE RISKS AND BENEFITS OF THIS STUDY?

To the best of my knowledge, the things you will be doing have no more risk of harm than you would experience in everyday life. But if you are uncomfortable with some of the questions and topics we will ask about, you are free to not answer or to skip to the next question or can withdraw at any point of the interview.

Taking part in this research study may not benefit you personally, but we may learn new things that will help others. The result of the study will help understand older people's perspectives and perception towards the environment and identify residential environmental features in rural context that meet their needs evaluated by older people themselves. Also, the analysed physical characteristics of the residential site planning will be illustrated from the field survey as this will be a guideline for the site plans that could be created and used to improve the residential site environments. This study is useful for residential and rural development to improve and create appropriate residential sites environments for older adults in other ASEAN countries or related rural contexts in confronting ageing societies.

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HOW WILL THE PARTICIPATION IN THE PROJECT REMAIN CONFIDENTIAL?

Results of this study may be used in publications and presentations. Your study data will be handled as confidentially as possible. If results of this study are published or presented, individual names and other personally identifiable information will not be used

To minimize the risks to confidentiality, the researcher and research assistants will keep your information confidential in accordance with international ethical and legal standards. Access to the data will be restricted to the researcher. Both electronic and hard copies will be stored securely, through password protection and encrypted. Your record will not be named. The code is linked to the participant number and only to be known by research team members.

Personal information that you do not wish to disclose will not be collected and used for research purposes. Backup copies of data are taken on a daily basis and data is stored in separate buildings from the live data. All data collected in hard copy will be destroyed after ten years of research publishing.

Data storage and security of data collecting in term of hard copies, such as interview notes, prints of fieldwork illustrations, and audio recordings, will be kept securely locked away in a locked filing cabinet and located in secured locations. Access to files will be restricted to the supervisory team. As the event that research activities are not carried on campus, it is necessary to maintain the consent forms at the research site, copies of the signed consent forms will also be stored on a secure location.

Prior to the project publication, the data will be stored at the University of Birmingham database at Research Data Store (RDS) which provides a secure and fast service to store active or working research data. As well as in the personal data storage devices of the researcher, which will be strongly encrypted or password protected, and kept in a secure location when they are not in use. At the publication of a paper, a subset of the data that underpins the paper will be transferred to the University of Birmingham Research Data Archive (RDA) and at Chiang Mai University in Thailand. The data collected is to be kept for ten years. All data collected and keys will be placed in separate, password protected, or encrypted files and each file will be stored in a different secure location.

The data will not be shared until after the publication to prevent any lost or alteration. Data underlying publications will be shared through the University of Birmingham's ePapers repository (epapers.bham.ac.uk). The Chiang Mai University officers, under the supervision of the researcher, may access to the data for further research.

By the way during the data collection, if you may reveal that you are distressed (either as a result of the research or incidentally), or that you are at risk of harm. If the researcher feels that it is necessary to break confidentiality, the researcher will discuss this with you first and explain the researcher's concerns, unless doing so would be likely to increase the risk to you or the researcher. In discussing the issue with you, the researcher may be providing you with information about appropriate support or counselling (such as the social care staffs from the Ban Pong Sub District Administration Organization) regarding the issue, to avoid the need for the researcher to breach confidentiality.

Note: The document will be translated into Thai language.

WHAT ARE MY RIGHTS AS A RESEARCH PARTICIPANT?

Participation in this study is voluntary. You do not have to answer any question you do not want to answer. If at any time and for any reason, you would prefer not to participate in this study, please feel free not to. If at any time you would like to stop participating, please tell me. We can take a break, stop and continue at a later date, or stop altogether. You may withdraw from this study at any time prior to the end of data collection process, or within three months after completing the home visit, and you will not be penalized in any way for deciding to stop participation.

If you decide to withdraw from this study, the researchers will ask you if the information already collected from you can be used or any information collected from the participant will not be used if the participant decides to withdraw before finishing the study.

WHO DO I CONTACT FOR MORE INFORMATION OR IF I HAVE CONCERNS?

If you have questions, you are free to ask me now. If you have questions later, you may contact the researcher at the University of Birmingham or at Chiang Mai university at any point. My phone numbers are [REDACTED] (In United Kingdom) and [REDACTED] (In Thailand) and my emails are [REDACTED]. You can also inform the village headman or the assistant village headman which will contact me directly.

If you have any questions about your rights as a participant in this research, you can contact my leading supervisor, Dr Patricia Noxolo, a senior lecturer in Human Geography, School of Geography, Earth and Environmental Sciences, University of Birmingham, at [REDACTED] (In United Kingdom) and [REDACTED].

FUNDING OF RESEARCH:

This research is partially funded by the Chiang Mai University, Thailand and School of Geography, Earth and Environmental Sciences, University of Birmingham, UK.

This research project is under the supervision of Dr Patricia Noxolo, Dr Lloyd Jenkins, and Dr Yueming Zhang, University of Birmingham, UK.

CONTACT DETAILS:

Leading supervisor

Dr Patricia Noxolo, Lecturer in Human Geography
School of Geography, Earth and Environmental Sciences, University of Birmingham
Telephone: [REDACTED] (In United Kingdom)
Email address: [REDACTED]
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Co- supervisors

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Note: The document will be translated into Thai language.

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Researcher

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Note: The document will be translated into Thai language.

Consent Form

Title of the project

Appropriate Residential Sites Environment for the Elderly in Baan Pong Nuea Sub-District
Municipality of the Hang Dong District in Chiang Mai Province

By signing this consent form, I confirm that (please tick box as appropriate):

▪	I confirm that I have read and understand the participant information sheet and clearly informed about this research study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	<input type="checkbox"/>
▪	I understand that my participation is voluntary and that I am free to withdraw from this study at any time before three months after this questionnaire, interview, and fieldwork without giving any reason. This will have no impact on my future cooperation with any of Chiang Mai University and University of Birmingham. My data will be omitted from the study and will be destroyed.	<input type="checkbox"/>
▪	I agree that these data of questionnaire and fieldwork will be collected, interview will be audio-recorded, and the information recorded will be transcribed.	<input type="checkbox"/>
▪	I understand that the information I provide for this study will be treated confidentially as possible.	<input type="checkbox"/>
▪	I understand that the data may be used for future research projects.	<input type="checkbox"/>
▪	I understand that if I inform the researcher that myself is at risk of harm, the researcher may have to report this to the relevant authorities - the researcher will discuss this with me first but may be required to report with or without my permission.	<input type="checkbox"/>
▪	I understand that I will receive a copy of the executive summary of the study once the research has concluded.	<input type="checkbox"/>

By signing this, you do not waive any legal rights.

Declaration by participant:

I hereby consent to take part in this study.

Participant's name:

Signature:

Date:

Declaration by researcher:

I believe that the participant understands the study and has given informed consent to participate.

Researcher's name:

Signature:

Date:

Note: The document will be translated into Thai language.

Appendix 5.5: Transcription of the interviews which were interpreted and categorised into the related theme with the positive and negative physical characteristics mentioned by older adults when their residential site environments were evaluated

Area	Code	INTERV 1. Describe the most preference environment	INTERV 2. Describe activities residents do in those areas	INTERV 3. Indicate positive and negative characteristics of the environment	INTERV 4. Aspects of the environment meet usages and needs the most and least	INTERV 5. If anything, residents have done to make it more appropriate	INTERV 6. Anything else residents would like to tell
R1	01	<ul style="list-style-type: none"> - There is a bench on the terrace in front of the residential site. 	<ul style="list-style-type: none"> - Relaxing in the morning as it is a shady area at this time of the day. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area in the morning. - (+) The morning is the most suitable time for relaxing outdoors. - (-) There are too many trees that impede site walkability. - (-) The entrance or connection to the dwelling is too steep. 	<ul style="list-style-type: none"> - (+) The terrace at the front of the dwelling is a functional area in the morning. - (-) The site walkability or spaces around the dwelling are too narrow and small. 	<ul style="list-style-type: none"> - Renovate the walkable area around the dwelling to improve site walkability. 	<ul style="list-style-type: none"> - The terrace in front of the dwelling is also an area for meeting with friends and neighbours.
R1	02	<ul style="list-style-type: none"> - There is a large area of front garden. 	<ul style="list-style-type: none"> - Relaxing and working. 	<ul style="list-style-type: none"> - (+) Good site walkability with flat and level ground. - (+) Good airflow from the wind. 	<ul style="list-style-type: none"> - (+) A large front garden is a functional area for doing activities. 	<ul style="list-style-type: none"> - The resident needs an easy to access, cool and shady area outdoors. 	<ul style="list-style-type: none"> - N/A
R1	03	<ul style="list-style-type: none"> - The side garden with a space for gardening and growing vegetables. 	<ul style="list-style-type: none"> - Doing gardening and growing vegetables. 	<ul style="list-style-type: none"> - (+) A shady, pleasant, and comfortable area with good airflow from the wind all day. 	<ul style="list-style-type: none"> - (+) The shady areas allow the resident to spend time outdoors throughout the day. 	<ul style="list-style-type: none"> - The resident needs more space to do gardening and to grow vegetables. 	<ul style="list-style-type: none"> - N/A

Area	Code	INTERV 1. Describe the most preference environment	INTERV 2. Describe activities residents do in those areas	INTERV 3. Indicate positive and negative characteristics of the environment	INTERV 4. Aspects of the environment meet usages and needs the most and least	INTERV 5. If anything, residents have done to make it more appropriate	INTERV 6. Anything else residents would like to tell
				<ul style="list-style-type: none"> - (+) The best area for the resident to grow vegetables and do gardening. - (+/-) Because of the numerous trees, the resident has to spend time clearing up leaves, although remarked this gives the resident an incentive to go outside and remain active. 	<ul style="list-style-type: none"> - (+) The side garden provides space for gardening and growing vegetables, which gives the resident an incentive to go outside. 		
R1	04	<ul style="list-style-type: none"> - There is a bench in a shady area under the jackfruit trees in the front garden. 	<ul style="list-style-type: none"> - Relaxing and admiring the garden. 	<ul style="list-style-type: none"> - (+) Good airflow from the wind. - (+) The shady, pleasant, and comfortable areas underneath the big jackfruit trees and the tree line. - (-) The connection area between the entrance to the dwelling and the front garden is too steep. 	<ul style="list-style-type: none"> - (+) The shady areas allow the resident to spend time outdoors throughout the day. - (-) The outdoor and indoor connection area is difficult to walk, reducing site walkability. 	<ul style="list-style-type: none"> - The resident needs to trim the branches or cut down some trees around the residential site because the amount of the trees makes the resident feels unsafe during the storm in the rainy season. 	<ul style="list-style-type: none"> - Spending time in the front garden provides an opportunity to see people roaming on the street, which brings satisfaction to the resident.

Area	Code	INTERV 1. Describe the most preference environment	INTERV 2. Describe activities residents do in those areas	INTERV 3. Indicate positive and negative characteristics of the environment	INTERV 4. Aspects of the environment meet usages and needs the most and least	INTERV 5. If anything, residents have done to make it more appropriate	INTERV 6. Anything else residents would like to tell
R1	05	<ul style="list-style-type: none"> - There is a bench at the outdoor terrace with the shade from buildings and trees all day. 	<ul style="list-style-type: none"> - Relaxing and having a nap during the afternoon. 	<ul style="list-style-type: none"> - (+) Good airflow from the wind. - (+) The big trees from the neighbourhood's site provide shade at the front of the residential site area during the afternoon. 	<ul style="list-style-type: none"> - (+) The pleasant view of trees and gardens on the neighbour's site. - (+) Good airflow from the wind through the tree line into the dwelling area. - (-) Unable to use the front of the residential site area in the morning because it is too hot and sunny. 	<ul style="list-style-type: none"> - The resident needs more garden area at the front of the residential site. 	<ul style="list-style-type: none"> - N/A
R1	06	<ul style="list-style-type: none"> - There is a terrace and a fishpond in front of the residential site with the shade from an awning. 	<ul style="list-style-type: none"> - Relaxing in the afternoon. 	<ul style="list-style-type: none"> - (+) The fishpond and awning provide a shady, pleasant, and comfortable area. - (+) The trees from the side garden provide adequate airflow and shade in front of the dwelling area. 	<ul style="list-style-type: none"> - (+) The size of the outdoor areas gives the resident an incentive to go outside. 	<ul style="list-style-type: none"> - The resident needs more natural surroundings at the side garden. 	<ul style="list-style-type: none"> - N/A
R1	07	<ul style="list-style-type: none"> - There is a bench in a shady area under the pomelo trees at the back garden. 	<ul style="list-style-type: none"> - Relaxing, listening to the radio in the afternoon and doing laundry. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area with good airflow from the 	<ul style="list-style-type: none"> - (+) The shady area at the back garden is appropriate for the resident to spend 	<ul style="list-style-type: none"> - N/A 	<ul style="list-style-type: none"> - The back garden provides an opportunity for the resident to see people

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				wind throughout the back garden all day.	time outdoors throughout the day.		roaming on the street in front of the residential site, which satisfies the resident.
R1	08	<ul style="list-style-type: none"> - The terrace at the side of the residential site which has shade from the back fence. 	<ul style="list-style-type: none"> - Relaxing, having a nap during the afternoon, and having meals outdoors. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area of the terrace with good airflow from the wind at the side of the residential site. - (-) The residential site areas are too narrow and small. - (-) The connection area between the entrance and front garden is too steep. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable outdoor area allows the resident to spend time outdoors during the daytime. 	<ul style="list-style-type: none"> - The resident would like some areas with vegetation such as grass or earth as the outdoor area is currently concrete. 	<ul style="list-style-type: none"> - The outdoor areas are suitable to spend time during the daytime as the indoor areas are too hot.
R1	09	<ul style="list-style-type: none"> - The front and side areas of the residential site which have the shade from buildings and Longan trees all day. 	<ul style="list-style-type: none"> - Relaxing and having a nap during the afternoon. - Looking after the grandchildren when they're riding bicycles in front of the residential site. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable with good airflow from the wind area of the front and side areas of the residential site. - (-) The passing traffic from the street outside at the front of 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable areas allow the resident to spend time outdoors throughout the day. - (-) Sometimes the noise from the street outside at the front of the residential site 	<ul style="list-style-type: none"> - Renovate the walkable area around the dwelling to improve site walkability. 	<ul style="list-style-type: none"> - N/A

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				the residential site creates noise which is disturbing in the residential site.	can be disturbing and make the resident stressed.		
R2	10	- The terrace which is connected to the dwelling.	- Relaxing and cooking outdoors.	<ul style="list-style-type: none"> (+) The shady, pleasant, and comfortable at the terrace area with a good airflow from the wind. (+) The residential site is located adjacent to the small hill area, which provides shade to the terrace area. 	- (+) The shady, pleasant, and comfortable area at the terrace is appropriate for the resident to spend time outdoors.	- The resident needs more natural surroundings if the resident has some funds.	- N/A
R2	11	- There is a fishpond at the front area of the residential site.	- Relaxing and looking after the grandchildren.	<ul style="list-style-type: none"> (+) The fishpond and shade from the buildings provide a sheltered, pleasant, and comfortable area. (-) The residential site areas are too narrow and small. (-) There is no green area. 	<ul style="list-style-type: none"> (+) The outdoor areas provide a space for the resident to spend time with their grandchildren. (-) Unable to use the outdoor area in the late morning because it is too hot and sunny. 	- The resident needs more natural surroundings.	- The resident sometimes enjoys spending time outdoors which provides an opportunity to see people roaming on the street.

Area	Code	INTERV 1. Describe the most preference environment	INTERV 2. Describe activities residents do in those areas	INTERV 3. Indicate positive and negative characteristics of the environment	INTERV 4. Aspects of the environment meet usages and needs the most and least	INTERV 5. If anything, residents have done to make it more appropriate	INTERV 6. Anything else residents would like to tell
					- (-) There is only shade from the buildings.		
R2	12	- There is a marble bench set in the front garden.	- Relaxing and spending time with the grandchildren.	- (+) The shady, pleasant, and comfortable area in the front garden with a good airflow from the wind during morning and evening. - (-) There is some air pollution from the street outside at the front of the residential site.	- (+) The shady, pleasant, and comfortable areas allow the resident to spend time outdoors. - (-) Sometimes the front area of the residential site has not got enough space for the resident to do activities with the grandchildren.	- The resident needs more space to do activities with the grandchildren.	- A marble bench set in the front garden is also an area for meetings with friends and neighbours.
R2	13	- There is a bench in a shady area under the big trees at the front garden.	- Relaxing and doing gardening.	- (+) The shady, pleasant, and comfortable area under the big trees in the front garden with a good airflow from the wind.	- (+) The shady, pleasant, and comfortable areas allow the resident to spend time outdoors.	- N/A	- The outdoor areas are suitable to spend time during the daytime as the indoor areas are too hot.
R2	14	- There is a bench in a shady area under the big trees in the front garden.	- Doing gardening and growing vegetables.	- (+) The shady, pleasant, and comfortable area under the big trees in the front garden with	- (+) The shady, pleasant, and comfortable areas in the front garden	- N/A	- The outdoor areas are suitable to spend time during the daytime, as the indoor areas are too hot.

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				good airflow from the wind.	allow the resident to spend time outdoors.		
R2	15	- The side area of the residential site is connected to the kitchen.	- Relaxing and spending time with family.	- (+) Good airflow from the wind at the side area of the residential site. - (-) The stairs that connect the indoor and outdoor areas are too steep.	- (+) Good airflow from the wind at the side area of the residential site through the kitchen where the resident spends the most time.	- N/A	- The outdoor areas are suitable to spend time during the daytime as the indoor areas are too hot.
R2	16	- A terrace that is adjacent to the front of the dwelling.	- Relaxing and spending time with family.	- (+) The shady, pleasant, and comfortable area at the terrace with a good airflow from the wind. - (+) The residential site is close to the grandchildren's residence, which stops the resident from feeling lonely. - (-) The stairs that connect the indoor and outdoor areas are too steep.	- (+) The shady, pleasant, and comfortable area at the terrace allows the resident to spend time outdoors. - (+) The location of terrace is adjacent to the front of the dwelling. It makes the resident feel safe, and it is convenient to access. - (-) The site walkability is poor, the connection between the outdoor	- N/A	- The outdoor areas are suitable to spend time during the daytime when the indoor areas are too hot.

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					and indoor areas is difficult to walk.		
R2	17	- A large terrace that is adjacent to the front of the dwelling.	- Relaxing, spending time with family, and looking after the grandchild.	- (+) The shady area at the terrace with a good airflow from the wind. - (-) Some areas of the residential site are too narrow and small.	- (+) The shady area at the terrace allows the resident to spend time outdoors. - (+) The large terrace is a functional area for spending time with the grandchild. - (-) Some areas of the residential site are unsuitable for spending time outdoors.	- N/A	- N/A
R2	18	- A large terrace that is adjacent to the front of the dwelling.	- Relaxing and spending time with family.	- (+) The shady area at the terrace with a good airflow from the wind.	- (+) The shady area at the terrace allows the resident to spend time outdoors in the evening after they finished from work. - (+) The terrace provides a pleasant area for the resident to tie up and lay in a hammock.	- N/A	- The terrace provides the best opportunity for the resident to see the surroundings of the residential site.

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R2	19	<ul style="list-style-type: none"> - A terrace at the side area of the residential site which is adjacent to a nephew's repair-shop and the side garden. 	<ul style="list-style-type: none"> - Relaxing and spending time with family and neighbours in the evening. 	<ul style="list-style-type: none"> - (-) There is some air pollution from the adjacent repair shop. - (-) There are damaged bikes and their engines around the house. 	<ul style="list-style-type: none"> - (-) Unable to use the outdoor area in the morning and afternoon because it is too hot and sunny. - (-) Most residential site areas are unsuitable for spending time outdoors because of the repair-shop works. 	<ul style="list-style-type: none"> - The resident needs to manage the areas between the residential site and the repair shop into appropriate proportions - The resident needs the residential site to be tidier. - The resident needs more natural surroundings. 	<ul style="list-style-type: none"> - The resident spends time at the farm in the morning and afternoon because of the unsuitable areas during these periods of the day.
R3	20	<ul style="list-style-type: none"> - A small terrace at the side area of the residential site. 	<ul style="list-style-type: none"> - Relaxing and spending time with family. 	<ul style="list-style-type: none"> - (+) The shady area at the terrace with a good airflow from the wind. - (-) The connection area between the dwelling and the front garden entrance is too steep. 	<ul style="list-style-type: none"> - (+) The shady area at the terrace allows the resident to spend time outdoors. - (-) The site walkability of the outdoor and indoor connection areas is difficult to walk. 	<ul style="list-style-type: none"> - The resident needs more terrace area to spend time outdoors. - Renovate the walkable area around the dwelling to improve site walkability. 	<ul style="list-style-type: none"> - There is another dwelling on the same site, which is currently under construction. It is for the resident's child.
R3	21	<ul style="list-style-type: none"> - A small terrace at the side area of the residential site. 	<ul style="list-style-type: none"> - Relaxing and spending time with family. 	<ul style="list-style-type: none"> - (+) The shady area at the terrace with a good airflow from the wind. - (-) Too much rubble creates an uneven 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area at the terrace allows the resident to spend time outdoors. 	<ul style="list-style-type: none"> - Renovate the walkable area around the dwelling to improve site walkability. 	<ul style="list-style-type: none"> - The outdoor areas are proper to spend time during the daytime when the indoor areas are too hot.

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				<p>surface on the walkable area surrounding the dwelling.</p> <ul style="list-style-type: none"> - (-) The bench is too high for sitting comfortably. 	<ul style="list-style-type: none"> - (-) The site walkability of the walkable area around the dwelling is difficult to walk. 	<ul style="list-style-type: none"> - The resident needs to make the bench has the proper height for sitting. 	<ul style="list-style-type: none"> - The terrace in front of the dwelling is also an area for meetings with friends and neighbours.
R3	22	<ul style="list-style-type: none"> - A terrace and bench at the side areas, and the shop in front of the residential site. 	<ul style="list-style-type: none"> - Working at the grocery shop during the daytime and relaxing in the evening. 	<ul style="list-style-type: none"> - (-) There are not enough green areas and big trees to make outdoor areas shaded. 	<ul style="list-style-type: none"> - (-) Unable to use the outdoors area during the daytime because it is too hot and sunny. 	<ul style="list-style-type: none"> - The resident needs more natural surroundings. 	<ul style="list-style-type: none"> - The residents spend less time in the outdoor areas than they used to because the big trees fell down after a storm in the summer, making the terrace much sunnier and hotter.
R3	23	<ul style="list-style-type: none"> - There is a bench in a shady area under the Longan trees at the front of the residential site. 	<ul style="list-style-type: none"> - Relaxing, doing gardening and growing vegetables. 	<ul style="list-style-type: none"> - (+) The shady area under the Longan tree in the front garden has good airflow from the wind. - (-) Some areas of the residential site are too narrow and small. 	<ul style="list-style-type: none"> - (+) The shady area allows the resident to spend time outdoors. - (-) The walkable area around the dwelling is difficult for passing through. 	<ul style="list-style-type: none"> - Renovate the walkable area around the dwelling to improve site walkability. 	<ul style="list-style-type: none"> - The dwelling is currently being renovated.
R3	24	<ul style="list-style-type: none"> - There is a bench in a shady area under the Longan trees at the 	<ul style="list-style-type: none"> - Relaxing and having meals outdoor. 	<ul style="list-style-type: none"> - (+) The shady area under the Longan tree in the front garden 	<ul style="list-style-type: none"> - (+) The shady area allows the resident to spend time outdoors. 	<ul style="list-style-type: none"> - Renovate the walkable area around the dwelling to 	<ul style="list-style-type: none"> - The dwelling is currently being renovated.

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		front of the residential site.		has good airflow from the wind. - (-) Some areas of the residential site are too narrow and small.	- (-) The site walkability of the walkable area around the dwelling is difficult for passing through.	improve site walkability. - The resident needs more natural surroundings.	
R3	25	- A semi-outdoor area under the rice barn building at the front of the residential site.	- Relaxing and spending time with family.	- (+) The shady, pleasant, and comfortable area at the terrace with a good airflow from the wind. - (+) The surrounding trees make the resident feel peaceful.	- (+) The shady, pleasant, and comfortable area at the terrace allows the resident to spend time outdoors throughout the day. - (+) There are many trees around the residential site which make most of the outdoor area shady, pleasant, and comfortable, and this meets the resident's needs.	- N/A	- The resident is very satisfied with the surroundings of green areas and trees at the residential site perceived from the windows. - The resident sometimes enjoys spending time outdoors, which provides an opportunity to see people roaming on the street. - The terrace in front of the dwelling is also an area for meetings with neighbours and friends.
R3	26	- A semi-outdoor area under the rice barn	- Relaxing, spending time with family,	- (+) The shady, pleasant, and	- (+) The shady, pleasant, and	- To improve site walkability, the	- The resident sometimes enjoys

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		building at the front of the residential site.	doing gardening and growing vegetables.	comfortable area at the terrace with a good airflow from the wind. - (-) The grass grows rapidly in the rainy season, making it difficult for the resident to do the gardening because of their health issues.	comfortable area at the terrace allows the resident to spend time outdoors all day. - (+) The characteristics of the residential site have good effects, which give the resident an incentive to go outside.	resident needs to clear and renovate the walkable area towards the vegetables patch and garden areas.	spending time outdoors, which provides an opportunity to see people roaming on the street. - The terrace in front of the dwelling is also an area for meeting with neighbours and friends.
G1	27	- The front garden and terrace at the side of the residential site.	- Relaxing, doing gardening and making sculptures.	- (+) The shady, pleasant, and comfortable area in the front garden and terrace with a good airflow from the wind. - (+) The surroundings of mountains and forests around the residential site make the resident feel peaceful more than those located near the main street or highway.	- (+) The shady, pleasant, and comfortable area at the terrace allows the resident to spend time outdoors throughout the day. - (+) The characteristics of the mountainous location of the residential site have a positive effect that makes the resident feels peaceful and meet the resident's needs.	- N/A	- The resident chose this location for living as it meets the resident's needs of a peaceful, shady, pleasant, and comfortable area.

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G1	28	<ul style="list-style-type: none"> - A terrace at the front and side of the residential site. 	<ul style="list-style-type: none"> - Relaxing and spending time with family. 	<ul style="list-style-type: none"> - (+) The shady area at the terrace in the early morning and evening. - (-) There are not enough big trees or vegetation to provide shade to the outdoor areas. 	<ul style="list-style-type: none"> - (+/-) A large courtyard at the front of the residential site has a suitable space to spend time outdoors, but it is inappropriate to use during the daytime as it is too hot and sunny. - (-) Unable to use the terrace in the late morning and afternoon because it is too hot and sunny. 	<ul style="list-style-type: none"> - The resident needs more natural surroundings. - The resident needs to renovate the large courtyard at the front of the residential site to make it suitable to spend time outdoors all day. The resident needs some funds to do this. 	<ul style="list-style-type: none"> - N/A
G1	29	<ul style="list-style-type: none"> - A terrace at the front of the residential site which is adjacent to the grandchild's dwelling. 	<ul style="list-style-type: none"> - Relaxing and spending time with family. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area at the terrace with a good airflow from the wind. - (-) The walkable area surrounding the dwelling has an uneven surface. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area at the terrace allows the resident to spend time outdoors. - (-) The site walkability of the walkable area around the dwelling is difficult for passing through. 	<ul style="list-style-type: none"> - Renovate the walkable area around the dwelling to improve site walkability. 	<ul style="list-style-type: none"> - N/A

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G1	30	- There is a bench in a shady area under the trees at the front of the residential site and a semi-outdoor area on the stilt floor.	- Relaxing and spending time with neighbours.	- (+) The shady, pleasant, and comfortable area at the terrace with a good airflow from the wind.	- (+) The shady, pleasant, and comfortable area at the terrace allows the resident to spend time outdoors.	- N/A	- The dwelling is currently being renovated.
G1	31	- The semi-outdoor area on the stilt floor.	- Relaxing, having meals outdoors, and spending time with family and neighbours.	- (+) The shady, pleasant, and comfortable area on the stilt floor has good airflow from the wind. - (-) Some of the areas surrounding the dwelling have an uneven surface. - (-) The area on the stilt floor is sometimes too sunny during the morning.	- (+) The shady, pleasant, and comfortable area on the stilt floor allows the resident to spend time outdoors throughout the day. - (+) The surroundings of trees and the open walkable area give the resident an incentive to go outside much more. - (-) Sometimes it's unable to use the area on the stilt floor in the morning because it is too sunny during that period of the day. - (-) The site walkability of some areas surrounding	- The resident needs to change the surface of the ground adjacent to the dwelling from uneven grass to smooth concrete, and this will improve site walkability.	- The resident is satisfied with the area usage on the stilt floor for meetings with friends and neighbours.

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					and adjacent to the dwelling is difficult for passing through.		
G1	32	<ul style="list-style-type: none"> - The pavilion under the trees. 	<ul style="list-style-type: none"> - Relaxing, spending time with family, and looking after the grandchild. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area at the pavilion with a good airflow from the wind. - (-) The walkable area surrounding the dwelling has a slippery surface. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area at the pavilion allows the resident to spend time outdoors throughout the day. - (-) The site walkability of the walkable area is difficult for passing through. 	<ul style="list-style-type: none"> - The resident needs to renovate and change the material of the walkable area around the dwelling into concrete to improve site walkability. 	<ul style="list-style-type: none"> - The resident is satisfied with the pavilion usage for spending time with the grandchild. - There is the child's shop in front of the residential site.
G1	33	<ul style="list-style-type: none"> - A terrace at the front and side of the residential site. 	<ul style="list-style-type: none"> - Relaxing and spending time with neighbours. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area at the terrace with a good airflow from the wind. - (-) Some areas of the residential site are too narrow and small. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area at the terrace allows the resident to spend time outdoors throughout the day. - (-) The site walkability of the walkable area at the back of the residential site is 	<ul style="list-style-type: none"> - The resident needs more natural surroundings and shady areas. - Renovate the walkable area at the back of the residential site to improve site walkability. 	<ul style="list-style-type: none"> - The outdoor areas are suitable to spend time during the daytime when the indoor areas are too hot.

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					difficult for passing through.		
G1	34	- A terrace at the side of the residential site adjacent to the vegetable garden.	- Relaxing and making brooms for sale in the afternoon.	- (+) The shady, pleasant, and comfortable area at the terrace with a good airflow from the wind. - (-) Some areas of the residential site are too narrow and small.	- (+) The shady, pleasant, and comfortable area at the terrace allows the resident to spend time outdoors in the afternoon. - (-) The site walkability of the walkable area at some areas of the residential site is difficult for passing through.	- Renovate the walkable area to improve site walkability.	- N/A
G2	35	- A semi-outdoor terrace at the front and side of the residential site.	- Relaxing and cooking meals outdoors.	- (+) The shady, pleasant, and comfortable area at the terrace with a good airflow from the wind.	- (+) The shady, pleasant, and comfortable area at the terrace allows the resident to spend time outdoors throughout the day.	- N/A	- N/A
G2	36	- A terrace in front of the dwelling and side garden of the residential site.	- Relaxing, working, and looking after the grandchild.	- (+) The shady, pleasant, and comfortable area at the terrace with a	- (+) The shady, pleasant, and comfortable area at the terrace allows the	- Renovate the walkable area to improve site walkability.	- The resident sometimes enjoys spending time outdoors, which

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				<p>good airflow from the wind.</p> <ul style="list-style-type: none"> - (-) The walkable area surrounding the dwelling has an uneven surface with rubble reducing site walkability. 	<p>resident to spend time outdoors throughout the day.</p> <ul style="list-style-type: none"> - (+) The residential site is located next to the main road, which satisfies the resident by providing an opportunity to see people roaming on the street. - (-) The site walkability of the walkable area around the dwelling is difficult for passing through 		<p>provides an opportunity to see people roaming on the street.</p> <ul style="list-style-type: none"> - The terrace in front of the dwelling is also an area for meeting with neighbours and friends.
G2	37	<ul style="list-style-type: none"> - The side garden and terrace at the side of the residential site. 	<ul style="list-style-type: none"> - Relaxing, doing gardening and growing vegetables. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area at the terrace with a good airflow from the wind. - (+/-) There are too many trees and vegetables, which reduces the walkable area around the dwelling, but they 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area at the terrace allows the resident to spend time outdoors in the morning. - (-) The site walkability of the walkable area around the dwelling 	<ul style="list-style-type: none"> - Renovate the walkable area to improve site walkability. 	<ul style="list-style-type: none"> - N/A

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				also provide a shady area for the resident. - (-) Some areas of the residential site are too narrow and small.	is difficult for passing through.		
G2	38	- The side of the residential site and the back garden connected to the creek.	- Relaxing and doing exercise.	- (+) The shady, pleasant, and comfortable area at the terrace with a good airflow from the wind all day. - (-) The back garden is too steep.	- (+) The shady, pleasant, and comfortable area at the terrace allows the resident to spend time outdoors in the afternoon. - (+) The surroundings of natural environments give the resident an incentive to go outside. - (-) The back garden is difficult for passing through and sometimes causes a resident to have accidents.	- Renovate the back garden area to improve site walkability.	- N/A
G2	39	- A semi-outdoor terrace in front of the dwelling.	- Relaxing and spending time with family.	- (+) The shady, pleasant, and comfortable area at the terrace with a	- (+) The shady, pleasant, and comfortable area at the terrace allows the	- Renovate the walkable area to improve site walkability.	- Spending time at the terrace provides an opportunity to see people roaming on

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				<p>good airflow from the wind all day.</p> <ul style="list-style-type: none"> - (-) Some areas of the residential site are too narrow and small. 	<p>resident to spend time outdoors throughout the day.</p> <ul style="list-style-type: none"> - (-) The site walkability of the walkable area around the dwelling is difficult for passing through. 		the street, which brings satisfaction to the resident.
G2	40	<ul style="list-style-type: none"> - A semi-outdoor terrace in front of the dwelling and the side garden. 	<ul style="list-style-type: none"> - Relaxing, doing gardening, growing vegetables and spending time with family. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area at the terrace and side garden with a good airflow from the wind all day. - (-) Some areas of the residential site are too narrow and small. - (-) The areas away from the terrace are too hot to spend time during the daytime. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area at the terrace and side garden allows the resident to spend time outdoors throughout the day. - (-) The site walkability of the walkable area around the dwelling is difficult for passing through. 	<ul style="list-style-type: none"> - Renovate the walkable area to improve site walkability. - The resident needs more natural surroundings with big trees for more shady areas in the residential site. 	<ul style="list-style-type: none"> - Spending time at the terrace provides an opportunity to see people roaming on the street, which brings satisfaction to the resident.
G2	41	<ul style="list-style-type: none"> - A semi-outdoor terrace in front of the dwelling. 	<ul style="list-style-type: none"> - Relaxing and having meals outdoors. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area at the terrace. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area at the terrace allows the resident to spend 	<ul style="list-style-type: none"> - The resident needs a larger terrace area to spend more time outdoors. 	<ul style="list-style-type: none"> - N/A

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				- (-) Not enough airflow through the terrace.	time outdoors throughout the day. - (-) Not enough airflow through the terrace, which makes a resident unsatisfied.	- The resident needs more natural surroundings with big trees, so there are more shady areas in the residential site.	
G2	42	- A semi-outdoor terrace in front of the dwelling.	- Relaxing and looking after the grandchildren.	- (+) The shady, pleasant, and comfortable area at the terrace. - (-) There are not enough vegetation or big trees to make other outdoor areas shady. - (-) Some areas of the residential site are too narrow and small.	- (+) The shady, pleasant, and comfortable area at the terrace allows the resident to spend time outdoors throughout the day. - (-) The site walkability of areas around the dwelling is too narrow and small.	- The resident needs a larger terrace area to spend more time outdoors. - The resident needs more vegetation to provide more shady areas in the residential site. - Renovate the walkable area around the dwelling to improve site walkability.	- N/A
G2	43	- There are benches under the mango tree at the side of the residential site.	- Relaxing and spending time with family and neighbours.	- (+) The shady, pleasant, and comfortable side area of the residential site during the afternoon and evening has shade from buildings	- (+) The shady, pleasant, and comfortable area at the side area of the residential site allows the resident to spend time outdoors	- The resident needs more garden and vegetations areas. - The resident needs more trees for more shady areas at the east of the residential site.	- The characteristics of the residential site provide the opportunity for the resident to see family members do activities in the site area, which

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				<p>and surrounding trees.</p> <ul style="list-style-type: none"> - (+) Good airflow from the wind all day. - (-) The side area of the residential site is too hot and sunny during the morning. 	<p>in the afternoon and evening.</p> <ul style="list-style-type: none"> - (+) There are many trees around the residential site that make most of the outdoor area shady, pleasant, and comfortable, which meets the resident's needs. - (-) It's unable to use the area at the side of the residential site in the morning because it is too hot and sunny during that period of the day. 	<ul style="list-style-type: none"> - The resident needs more seating areas under the trees to spend time outdoors. 	brings satisfaction to the resident.
G2	44	<ul style="list-style-type: none"> - There are benches under the mango tree at the side of the residential site and the front garden. 	<ul style="list-style-type: none"> - Relaxing, gardening, growing vegetables and spending time with family and neighbours. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable side area of the residential site during the afternoon and evening has shade from buildings and surrounding trees. - (+) Good airflow from the wind all day. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area at the side area of the residential site allows the resident to spend time outdoors in the afternoon and evening. - (+) The surroundings of trees and 	<ul style="list-style-type: none"> - The resident needs more trees, so there are more shady areas in the residential site, but the resident is also worried about the impact of storms in the rainy season. 	<ul style="list-style-type: none"> - Spending time at the side of the residential site provides an opportunity to see people roaming the street, which brings satisfaction to the resident.

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				<ul style="list-style-type: none"> - (-) The sunshine in the morning makes the side area of the residential site too uncomfortable to use. 	<ul style="list-style-type: none"> vegetation around the residential site make the outdoor area shady, pleasant, and comfortable. It gives the resident an incentive to go outside. - (-) It's unable to use the area at the side of the residential site in the morning because it is too hot and sunny during that period of the day. 		
G3	45	<ul style="list-style-type: none"> - A large semi-outdoor terrace in front of the dwelling. 	<ul style="list-style-type: none"> - Relaxing and spending time with family. 	<ul style="list-style-type: none"> - (+) Good airflow from the wind all day. - (+) The terrace has a large functional area for doing activities. - (-) The walkable area surrounding the dwelling and the terrace has uneven ground 	<ul style="list-style-type: none"> - (+) The shady area at the terrace allows the resident to spend time outdoors. - (-) The terrace has uneven ground, making the resident spend less time outdoors. - (-) The site walkability of the walkable area around the dwelling and the terrace is 	- N/A	- N/A

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					difficult for passing through.		
G3	46	- The semi-outdoor area on the stilt floor.	- Relaxing, doing housework and spending time with family.	- (+) The shady, pleasant, and comfortable area at the area on the stilt floor with a good airflow from the wind.	- (+) The shady, pleasant, and comfortable area on the stilt floor allows the resident to spend time outdoors.	- N/A	- N/A
G3	47	- The semi-outdoor area on the stilt floor.	- Relaxing and spending time with family and neighbours.	- (+) The shady, pleasant, and comfortable area on the stilt floor has shade from buildings and surrounding trees. - (+) Good airflow from the wind.	- (+) The shady, pleasant, and comfortable area on the stilt floor with the surrounding trees allows the resident to spend time outdoors.	- The resident needs to make the residential site have more shady areas.	- The resident is satisfied with the surroundings of trees at the residential site.
G3	48	- The terrace at the back of the dwelling, the semi-outdoor area on the stilt floor, and a marble bench set at the side garden.	- Relaxing and spending time with family.	- (+) The shady, pleasant, and comfortable areas have shade from buildings and surrounding trees with good airflow from the wind.	- (+) The shady, pleasant, and comfortable areas with the surrounding trees allow the resident to spend time outdoors. - (+) The site walkability of the	- N/A	- Spending time at the side garden provides an opportunity to see people roaming on the street.

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				<ul style="list-style-type: none"> - (+) The surroundings of forests around the residential site make the resident feel peaceful. - (-) The grass grows rapidly during the rainy season. 	walkable area around the dwelling is suitable for passing through. It gives the resident an incentive to walk around the residential site.		
G3	49	<ul style="list-style-type: none"> - The garden around the residential site, the terrace at the back of the dwelling, and a marble bench set at the side garden. 	<ul style="list-style-type: none"> - Relaxing, doing gardening, and spending time with family. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable areas have shade from buildings and surrounding trees with good airflow from the wind. - (+) A canal at the back garden makes the garden more comfortable and a more pleasant area. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable areas with the surrounding trees allow the resident to spend time outdoors. - (+) The surroundings of trees and vegetation around the residential site, especially Longan and bamboo trees, make most of the outdoor area shady, pleasant, and comfortable. It gives the resident an incentive to go outside. 	- N/A	<ul style="list-style-type: none"> - Spending time at the front garden provides an opportunity to see people roaming on the street.

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					- (-) The resident has to spend time clearing up leaves because of the numerous trees.		
G3	50	- The front garden and semi-outdoor terrace at the front of the residential site.	- Relaxing, having meals outdoors and spending time with family and neighbours.	- (+) The shady, pleasant, and comfortable areas have shade from buildings and surrounding trees in the morning and evening. - (+) Good airflow from the wind all day	- (+) The shady, pleasant, and comfortable areas allow the resident to spend time outdoors in the morning and evening. - (-) The resident is unable to use the front garden in the afternoon because it is too hot during that period of the day.	- N/A	- Spending time in the front garden provides opportunities to see and greet people roaming on the street, which brings satisfaction to the resident.
G3	51	- The front garden and semi-outdoor terrace at the front of the residential site.	- Relaxing and spending time with family and neighbours.	- (+) The shady, pleasant, and comfortable areas have shade from buildings and surrounding trees in the evening. - (+) Good airflow from the wind all day	- (+) The shady, pleasant, and comfortable areas allow the resident to spend time outdoors in the evening. - (+) The light from the street makes the front garden bright at night-time. It gives	- N/A	- Spending time in the front garden provides opportunities to see and greet people roaming on the street, which brings satisfaction to the resident.

Area	Code	INTERV 1. Describe the most preference environment	INTERV 2. Describe activities residents do in those areas	INTERV 3. Indicate positive and negative characteristics of the environment	INTERV 4. Aspects of the environment meet usages and needs the most and least	INTERV 5. If anything, residents have done to make it more appropriate	INTERV 6. Anything else residents would like to tell
				- (+) The residential site is located close to the road, which has streetlights. It provides light into the site at night-time.	the resident an incentive to go outside later in the day rather than spend time indoors. - (-) The front garden is unsuitable for use in the afternoon because it is too hot and sunny during that period of the day.		
G3	52	- The semi-outdoor terrace at the front of the dwelling, the front area of the residential site, and the back garden.	- Relaxing, having meals outdoors and spending time with family.	- (+) The shady, pleasant, and comfortable areas have shade from buildings and surrounding trees and good airflow from the wind all day.	- (+) The shady, pleasant, and comfortable areas allow the resident to spend time outdoors throughout the day.	- The resident needs a larger garden and more areas of vegetation.	- Spending time at the terrace and front area of the residential site provides opportunities to see the street outside at the front of the residential site.
B1	53	- The semi-outdoor terrace at the front of the dwelling and the back garden.	- Relaxing, doing gardening, and spending time with family.	- (+) The shady, pleasant, and comfortable areas from surrounding trees and good airflow from the wind all day.	- (+) The shady, pleasant, and comfortable areas allow the resident to spend time outdoors throughout the day. - (-) The trees in the back garden make	- The resident needs to make the residential site have more shady areas.	- N/A

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					the resident feel unsafe during the storms in the rainy season.		
B1	54	<ul style="list-style-type: none"> - The semi-outdoor terrace at the front of the dwelling, the side garden and the back garden. 	<ul style="list-style-type: none"> - Relaxing, cooking outdoors, and spending time with family. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable areas from surrounding trees in the morning and evening. - (+) Good airflow from the wind all day - (+) There are large side garden and the back garden areas with surrounding trees, especially the Longan trees. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable areas allow the resident to spend time outdoors in the morning and evening. - (-) The resident is unable to use the garden areas in the afternoon because they are too hot during that period of the day. 	<ul style="list-style-type: none"> - The resident needs to make the residential site have more shady areas and feel safer during the storms in the rainy season. 	<ul style="list-style-type: none"> - N/A
B1	55	<ul style="list-style-type: none"> - The semi-outdoor terrace at the side of the dwelling which is located close to daughter's dwelling in the same site. 	<ul style="list-style-type: none"> - Relaxing, cooking outdoors, and spending time with family and neighbours. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area from surrounding trees and good airflow from the wind all day. - (-) The residential site has a lower ground level than the 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area allows the resident to spend time outdoors throughout the day. - (+) The terrace has outdoor cooking and laundry areas that 	<ul style="list-style-type: none"> - The resident needs more outdoor areas to spend time outside. - Renovate the walkable area around the dwelling and at the entrance to improve site walkability. 	<ul style="list-style-type: none"> - The terrace is located close to the neighbour's dwelling, which provides the resident with an opportunity to talk with neighbours next door, which the resident enjoys.

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				<p>street outside at the front of the residential site, which is too steep.</p> <ul style="list-style-type: none"> - (-) There are too many obstructions that impede site walkability. 	<p>meets the resident's needs.</p> <ul style="list-style-type: none"> - (-) The residential site entrance is difficult to walk, reducing site walkability. - (-) The site walkability of areas around the dwelling is unsuitable because they're too narrow, small, and dangerous. 	<ul style="list-style-type: none"> - The resident needs to have more natural light in the dwelling. 	
B1	56	<ul style="list-style-type: none"> - The large areas of the terrace at the back of the dwelling and the roof terrace. 	<ul style="list-style-type: none"> - Relaxing, doing gardening, and spending time with family. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable areas from surrounding trees in the morning and evening. - (+) Good airflow from the wind all day - (-) The side and the back garden areas are too steep. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable areas allow the resident to spend time outdoors in the morning and evening. - (+) The location of the residential site has good and relaxing natural surroundings such as mountains, forests, and rice fields. 	<ul style="list-style-type: none"> - Renovate the side and the back garden areas around the dwelling to improve site walkability. 	<ul style="list-style-type: none"> - N/A

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					- (-) The site walkability of the side and the back gardens is difficult to walk and has caused the resident to have accidents many times.		
B1	57	- The semi-outdoor terrace at the front of the dwelling.	- Relaxing, having meals outdoors and spending time with family and neighbours.	- (+) The shady, pleasant, and comfortable area from surrounding trees and good airflow from the wind all day. - (+) There are large side and back garden areas surrounded by a Longan orchard and a tree line around the residential site.	- (+) The shady, pleasant, and comfortable area allows the resident to spend time outdoors throughout the day until bedtime. - (+) The location of the residential site has peaceful and relaxing natural surroundings from the valleys and forests. - (-) It's not suitable to use the terrace in the rainy season because it gets too wet.	- The resident needs more trees for more shady areas in the residential site.	- The terrace is also a functional area for meeting with friends and neighbours, which brings satisfaction to the resident.
B1	58	- The semi-outdoor terrace at the back of	- Relaxing, having meals outdoor and	- (+) The shady, pleasant, and	- (+) The shady, pleasant, and	- Renovate the walkable area around	- N/A

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		the dwelling and the side garden.	spending time with friends and neighbours.	comfortable areas from surrounding trees in the morning and evening. - (+) Good airflow from the wind all day - (-) Too much rubble and overgrown vegetation create an uneven surface on the walkable area surrounding the dwelling.	comfortable areas allow the resident to spend time outdoors in the morning and evening. - (-) It's not suitable to use the terrace in the afternoon because it is too hot and sunny during that period of the day. - (-) The site walkability of the walkable area around the dwelling is difficult for passing through.	the dwelling to improve site walkability.	
B1	59	- The semi-outdoor terrace at the front of the dwelling.	- Relaxing, spending time with family and looking after the grandchildren.	- (+) The shady, pleasant, and comfortable area in the morning and evening. - (+) Good airflow from the wind all day - (+) There is a large courtyard at the front of the residential site.	- (+) The shady, pleasant, and comfortable area allows the resident to spend time outdoors in the morning and evening. - (-) The site walkability and spaces around the dwelling are too narrow and small.	- Renovate the walkable area around the dwelling to improve site walkability.	- The resident would like to spend time outdoors in the courtyard in the evening but has difficulty walking.

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B1	60	<ul style="list-style-type: none"> - The semi-outdoor terrace at the front of the dwelling, the courtyard at the front of the residential site and the side garden. 	<ul style="list-style-type: none"> - Relaxing, cooking outdoors, and spending time with family. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable areas in the evening. - (+) Good airflow from the wind all day. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable areas allow the resident to spend time outdoors in the evening. - (+) The site walkability of each outdoor connection area is suitable to walk. - (-) The site walkability or spaces around the dwelling are too narrow, small and difficult to walk. 	<ul style="list-style-type: none"> - The resident needs more trees for more shady areas in the residential site. - Renovate the walkable area around the dwelling to improve site walkability. 	<ul style="list-style-type: none"> - N/A
B2	61	<ul style="list-style-type: none"> - The semi-outdoor terrace at the side of the dwelling and the courtyard at the front of the residential site. 	<ul style="list-style-type: none"> - Relaxing and spending time with family, friends and neighbours. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable areas in the morning. - (+) Good airflow from the wind all day. - (+) There are large areas of the semi-outdoor terrace at the side of the dwelling and the courtyard at the front of the residential site. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable areas allow the resident to spend time outdoors in the morning. - (+) The courtyard at the front of the residential site is suitable for friends and neighbours visiting. 	<ul style="list-style-type: none"> - Renovate the courtyard area to reduce air pollution from dirt. 	<ul style="list-style-type: none"> - N/A

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					- (-) The courtyard area has dust from dirt and rubble, which causes air pollution in the residential site.		
B2	62	- The semi-outdoor terrace at the side of the dwelling.	- Relaxing and spending time with family and neighbours.	- (+) The shady, pleasant, and comfortable areas in the morning. - (+) Good airflow from the wind all day.	- (+) The shady, pleasant, and comfortable areas allow the resident to spend time outdoors in the morning. - (+) The courtyard at the front of the residential site is suitable for friends and neighbours visiting.	- The resident needs more natural surroundings if the resident has funds available.	- N/A
B2	63	- The front garden and the semi-outdoor terrace at the front of the dwelling.	- Relaxing, doing gardening, and spending time with family.	- (+) The shady, pleasant, and comfortable areas in the morning and evening. - (+) Good airflow from the wind all day. - (+) There are large areas of the front	- (+) The shady, pleasant, and comfortable areas allow the resident to spend time outdoors in the morning and evening. - (-) The resident is unable to use the front garden in the	- The resident needs more trees or shading to make more shaded areas in the residential site.	- N/A

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				garden, garden and vegetation area. - (-) The front garden is too hot and sunny during the afternoon.	afternoon because it is too hot and sunny during that period of the day.		
B2	64	- The front garden and the semi-outdoor terrace at the front of the dwelling.	- Relaxing, doing gardening, and spending time with family.	- (+) The shady, pleasant, and comfortable areas in the morning and evening. - (+) Good airflow from the wind all day. - (-) The front garden and semi-outdoor terrace are too hot and sunny during the afternoon. - (-) There are not enough shaded areas that meet the resident's needs.	- (+) The shady, pleasant, and comfortable areas allow the resident to spend time outdoors in the morning and evening. - (-) The resident is unable to use the outdoor areas in the afternoon because it is too hot and sunny during that period of the day, which makes the resident spend less time outdoors,	- The resident needs more trees or shading to make more shaded areas in the residential site.	- N/A

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B2	65	<ul style="list-style-type: none"> - The semi-outdoor terrace at the front of the dwelling. 	<ul style="list-style-type: none"> - Relaxing and spending time with family and neighbours. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area from surrounding trees and good airflow from the wind all day. - (-) The walkable area surrounding the dwelling has different levels with much rubble and uneven surface. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area allows the resident to spend time outdoors throughout the day. - (-) The site walkability of the walkable area around the dwelling is difficult for passing through. 	<ul style="list-style-type: none"> - Renovate the walkable area to improve site walkability. 	<ul style="list-style-type: none"> - N/A
B2	66	<ul style="list-style-type: none"> - The semi-outdoor terraces at the front and back of the dwelling. 	<ul style="list-style-type: none"> - Relaxing, cooking outdoors, and spending time with family. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable areas in the morning and evening. - (+) Good airflow from the wind all day. - (-) There are many trees and obstructions that impede site walkability. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable areas allow the resident to spend time outdoors in the morning and evening. - (-) It's unsuitable to use the areas in the afternoon because they are too hot and sunny during that period of the day. - (-) The site walkability of the walkable area 	<ul style="list-style-type: none"> - Renovate the walkable area around the dwelling to improve site walkability. 	<ul style="list-style-type: none"> - N/A

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					around the dwelling is difficult for passing through.		
B2	67	<ul style="list-style-type: none"> - The front garden and the terrace at the front of the dwelling. 	<ul style="list-style-type: none"> - Spending time with family and neighbours. 	<ul style="list-style-type: none"> - (-) The outdoor areas are too small and not shady enough. - (-) The residential site has unsuitable areas to spend time outdoors. 	<ul style="list-style-type: none"> - (-) It is not suitable to use the areas in the afternoon because they are too hot and sunny during that period of the day. - (-) The residential site is located close to the main street or highway, which makes the resident feel unsafe and less inclined to spend time outdoors. 	<ul style="list-style-type: none"> - The resident needs more shaded outdoor areas in the residential site. - The resident needs more natural light in the dwelling. 	<ul style="list-style-type: none"> - The outdoor areas of the residential site are frequented by the public during the day, as at the front of the residential site is also a shop.
B3	68	<ul style="list-style-type: none"> - The semi-outdoor terrace at the front of the dwelling. 	<ul style="list-style-type: none"> - Relaxing and spending time with family. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area in the morning and evening. - (+) Good airflow from the wind all day. - (-) The outdoor area is too small. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area allows the resident to spend time outdoors in the morning and evening. - (-) It is unsuitable to use the terrace in the afternoon because it is too hot and sunny 	<ul style="list-style-type: none"> - The resident needs more outdoor areas but the resident requires some funds. 	<ul style="list-style-type: none"> - N/A

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					during that time of the day, and in the rainy season, it gets too wet.		
B3	69	<ul style="list-style-type: none"> - The semi-outdoor terrace at the front of the dwelling. 	<ul style="list-style-type: none"> - Relaxing and spending time with family. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area in the morning and evening. - (+) Good airflow from the wind all day. - (-) The outdoor area is too small. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area allows the resident to spend time outdoors in the morning and evening. - (-) It's difficult to use the terrace in the afternoon because it is too hot and sunny during that period of the day, making the resident less inclined to spend time outdoors. - (-) It's unsuitable to use the terrace in the rainy season because it gets too wet. 	<ul style="list-style-type: none"> - The resident needs more outdoor areas, but the resident requires some funds. 	<ul style="list-style-type: none"> - N/A
B3	70	<ul style="list-style-type: none"> - The semi-outdoor area on the stilt floor, the pavilion under the 	<ul style="list-style-type: none"> - Relaxing and doing gardening. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable areas 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area on the stilt floor allows 	<ul style="list-style-type: none"> - Renovate the walkable area to improve site walkability. 	<ul style="list-style-type: none"> - Spending time outdoors provides an opportunity to see people roaming on

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		trees and the side garden.		<p>with a good airflow from the wind all day.</p> <ul style="list-style-type: none"> - (-) The walkable area surrounding the dwelling has different levels with much rubble and uneven surface. 	<p>the resident to spend time outdoors throughout the day.</p> <ul style="list-style-type: none"> - (+) The residential site has open space, which makes the resident feel safe and be satisfied. - (-) The site walkability of the walkable area around the dwelling is difficult to walk. 	<ul style="list-style-type: none"> - The resident needs more shady outdoor areas in the residential site. 	the street, which makes the resident not be lonely and brings satisfaction to the resident.
B3	71	<ul style="list-style-type: none"> - The semi-outdoor terrace at the front of the dwelling and the garden around the residential site. 	<ul style="list-style-type: none"> - Relaxing and spending time with family. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area in the morning and evening at the terrace. - (+) Good airflow from the wind all day. - (+/-) There is a large garden around the residential site, but there are not enough green areas or big trees to make the garden be shadier. - (-) There are too many obstructions 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area allows the resident to spend time outdoors at the terrace in the morning and evening. - (-) It's not suitable to use the terrace in the afternoon because it is too hot and sunny during that period of the day. - (-) The garden is too hot and sunny all 	<ul style="list-style-type: none"> - The resident needs more shady outdoor areas in the residential site. - Renovate the walkable area around the dwelling and at the entrance to improve site walkability. 	- N/A

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				that impede site walkability in some areas.	day, making the resident less inclined to spend time outdoors.		
T	72	<ul style="list-style-type: none"> - There is a bench on the terrace in front of the residential site and the front garden. 	<ul style="list-style-type: none"> - Relaxing and spending time with neighbours. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area in the morning at the terrace. - (+) Good airflow from the wind all day. - (+) There are big trees that provide shade at the front of the residential site area, which brings satisfaction to the resident. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area allows the resident to spend time outdoors at the terrace in the morning. - (-) Most of the residential site areas are unsuitable for spending time outdoors for meeting with neighbours. It gives the resident an incentive to go to neighbours' sites. 	<ul style="list-style-type: none"> - The resident needs more shaded and functional outdoor areas for meeting with neighbours in the residential site. 	<ul style="list-style-type: none"> - N/A
T	73	<ul style="list-style-type: none"> - The semi-outdoor terrace at the front of the dwelling and the front garden with the shade from buildings and trees all day. 	<ul style="list-style-type: none"> - Relaxing, growing vegetables, gardening, cooking outdoors, and spending time with family. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable areas with good airflow from the wind all day. - (-) The dwelling has a humidity problem 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable areas allow the resident to spend time outdoors throughout the day. - (+) The front garden is the best area for 	<ul style="list-style-type: none"> - Renovate the walkable area around the dwelling to improve site walkability. - The resident needs land levelling and a proper drainage 	<ul style="list-style-type: none"> - N/A

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				<p>due to shade from the surrounded buildings.</p> <ul style="list-style-type: none"> - (-) The residential site has a lower ground level than the street outside at the front of the residential site, which leads to minor flooding and drainage issues in some areas and causes dampness in the rainy season. - (-) There are many obstructions that impede site walkability. 	<p>the resident to grow vegetables, do gardening, and cook outdoors, which satisfies the resident.</p> <ul style="list-style-type: none"> - (-) The resident feels unsatisfied with the dampness and humidity problems at the residential site. - (-) The site walkability or spaces around the dwelling are unsuitable because they're too narrow, small, and difficult to walk. 	<p>system to improve the flooding problem.</p> <ul style="list-style-type: none"> - The resident needs more natural light to improve the humidity problem in the residential site. - The resident needs easy to access outdoor areas. 	
T	74	<ul style="list-style-type: none"> - A marble bench set on the semi-outdoor terrace in front of the residential site. 	<ul style="list-style-type: none"> - Relaxing, growing vegetables, doing gardening, and spending time with family. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area in the morning at the terrace. - (+) There is a small vegetation area at the front of the residential site. - (-) There are too many trees that 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area allows the resident to spend time outdoors at the terrace in the morning. - (-) It's unsuitable to use the terrace in the afternoon because it is too hot and sunny 	<ul style="list-style-type: none"> - Renovate the walkable area around the dwelling to improve site walkability. - The resident wants more shaded outdoor areas in the residential site. - The resident wants to grow more flowers to 	<ul style="list-style-type: none"> - The terrace is also a functional area for meeting with friends and neighbours, which brings satisfaction to the resident.

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				<p>impede site walkability.</p> <ul style="list-style-type: none"> - (-) There are many mosquitoes due to a small canal and the rice field at the back of the residential site. 	<p>during that period of the day.</p> <ul style="list-style-type: none"> - (-) The resident is less inclined to spend time outdoors at the terrace because of the mosquitoes. 	<p>make the residential site smell nice.</p>	
T	75	<ul style="list-style-type: none"> - The pavilion at the back of the residential site is adjacent to the rice field. 	<ul style="list-style-type: none"> - Relaxing, listening to the radio, and spending time with family and neighbours. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area in the evening at the pavilion. - (+) Good airflow from the wind all day. - (-) There are lots of mosquitoes due to a small canal and the rice field at the back of the residential site. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area allows the resident to spend time outdoors at the pavilion in the evening after returning home from work. - (+) The location of pavilion at the back of the residential site has peaceful and relaxing natural surroundings from the rice field. 	<ul style="list-style-type: none"> - The resident would like to build a terrace at the back of the dwelling overlooking the rice field. 	<ul style="list-style-type: none"> - The pavilion is also a functional area for meeting with friends and neighbours, which brings satisfaction to the resident.
T	76	<ul style="list-style-type: none"> - The semi-outdoor area at the daughter's shop. 	<ul style="list-style-type: none"> - Helping her daughter in their shop and talking with customers. 	<ul style="list-style-type: none"> - (+) The shady and open space area with good airflow from the wind all day. 	<ul style="list-style-type: none"> - (+) The shadiest and open area at the shop allows the resident to spend time outdoors all day. 	<ul style="list-style-type: none"> - Renovate the walkable area at the shop to improve site walkability. 	<ul style="list-style-type: none"> - The resident was pleased to spend time and help her daughter at the shop.

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				<ul style="list-style-type: none"> - (-) The shop area is covered in rubble and uneven ground. 	<ul style="list-style-type: none"> - (+) The shop area provides activities for the resident to help her daughter and talk to people, which brings satisfaction. - (-) The site walkability or spaces around the shop are unsuitable for the resident. 	<ul style="list-style-type: none"> - The resident wants more shaded areas or trees in the residential site. 	
T	77	<ul style="list-style-type: none"> - The pavilion at the side of the resident and the back garden. 	<ul style="list-style-type: none"> - Relaxing, doing exercise, and spending time with family. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable areas with good airflow from the wind all day. - (-) The residential site has a higher ground level than the back garden which is adjacent to the canal and is too steep. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable areas from the surrounding trees allow the resident to spend time outdoors throughout the day. - (+) The residential site is located close to a resort, which prevents the resident from feeling lonely and allows them to remain active. - (-) Spaces at the back of the residential site 	<ul style="list-style-type: none"> - Renovate the walkable area at the back of the residential site and level the land to improve site walkability. - The resident would like to erect a fence at the back of the residential site to provide some safety from falling into the canal. 	<ul style="list-style-type: none"> - Spending time outdoors at the pavilion provides an opportunity to see people roaming at the resort's site, which prevents the resident from feeling lonely and brings satisfaction to the resident.

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					are too narrow and steep. It has caused the resident to have an accident previously.		
T	78	<ul style="list-style-type: none"> - The pavilion at the back of the residential site and the back garden. 	<ul style="list-style-type: none"> - Relaxing, working, and spending time with family. 	<ul style="list-style-type: none"> - (+) Most shady, pleasant, and comfortable areas with good airflow from the wind all day. - (-) The residential site has a higher ground level than the back garden, which is adjacent to the canal and is too steep. - (-) There are many obstructions that impede site walkability in some areas. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable areas from the surrounding trees and the canal at the back of the residential site allow the resident to spend time outdoors throughout the day. - (+) The residential site is located close to a resort, which prevents the resident from feeling lonely. - (-) The areas at the back of the residential site are too steep and dangerous, making the resident feel unsafe. 	<ul style="list-style-type: none"> - Renovate the walkable area at the back of the residential site and level the ground to improve site walkability. 	<ul style="list-style-type: none"> - Spending time outdoors at the pavilion provides an opportunity to see people roaming at the resort's site, which stops the resident from feeling lonely and brings satisfaction to the resident.

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T	79	<ul style="list-style-type: none"> - The pavilions close to the lime burning area at the back of the residential site and at the side garden under the Longan trees. 	<ul style="list-style-type: none"> - Relaxing, working, and spending time with family. 	<ul style="list-style-type: none"> - (+) The shady areas with good airflow from the wind all day. - (+/-) Because of the lime burning site work, the resident has to spend time clearing up the stones, although remarked this gives the resident an incentive to go outside and remain active. - (-) The walkable area surrounding the pavilions has different ground levels with frequent rubble and stones from site work and uneven surfaces. 	<ul style="list-style-type: none"> - (+) The shady areas from the surrounding trees allow the resident to spend time outdoors throughout the day. - (-) The site walkability of the walkable area at the side garden is difficult for passing through. 	<ul style="list-style-type: none"> - Renovate the walkable area around the pavilions to improve site walkability. 	<ul style="list-style-type: none"> - The resident prefers to spend time outdoors with people to reduce stress.
T	80	<ul style="list-style-type: none"> - The pavilions are close to the lime burning area at the back of the residential site and the side garden under the Longan trees. 	<ul style="list-style-type: none"> - Relaxing, working, and spending time with family. 	<ul style="list-style-type: none"> - (+) The shady areas with good airflow from the wind all day. - (+) The pleasant view of trees on the resort's site. 	<ul style="list-style-type: none"> - (+) The shady areas from the surrounding trees allow the resident to spend time outdoors throughout the day. 	<ul style="list-style-type: none"> - Renovate the walkable area around the pavilions to improve site walkability. - The resident wants more shaded areas or 	<ul style="list-style-type: none"> - The resident has to spend time outdoors at the pavilions for lime burning work and looking after the workers.

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				<ul style="list-style-type: none"> - (-) The heat from the lime kiln creates unpleasant hot air through the pavilions' areas. - (-) The walkable area surrounding the pavilions has different ground levels with frequent rubble and stones from lime burning areas and uneven ground surface. 	<ul style="list-style-type: none"> - (-) The site walkability of the walkable area at the side garden is difficult for passing through. 	trees in the residential site but is also worried about the effects of the storms in the rainy season.	
T	81	<ul style="list-style-type: none"> - The semi-outdoor terrace at the front of the dwelling. 	<ul style="list-style-type: none"> - Relaxing, having meals outdoors, having a nap, and spending time with family. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area with good airflow from the wind all day. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area from the surrounding bushes and trees allows the resident to spend time outdoors throughout the day. - (+) The resident is satisfied with the usage of the terrace for spending time with grandchildren. - (+) The terrace is a peaceful area which 	<ul style="list-style-type: none"> - The resident is satisfied with the residential site environment. 	<ul style="list-style-type: none"> - The resident prefers to spend time at the terrace in the residential site and enjoy the peaceful environment rather than go outside.

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					is surrounded by a small garden. It brings satisfaction to the resident.		
T	82	<ul style="list-style-type: none"> - The bench under the Longan trees at the side garden. 	<ul style="list-style-type: none"> - Relaxing, having a nap, and spending time with relatives and family. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area with good airflow from the wind all day. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area from the surrounding trees allows the resident to spend time outdoors throughout the day. - (+) The resident is delighted with the surroundings of trees at the side garden. - (+) The side garden is located close to the entrance, which meets the resident's needs. - (-) The area is too steeply inclined to allow the resident easy access. 	<ul style="list-style-type: none"> - Renovate the walkable area at the side garden to improve site walkability. - The resident would like to erect a fence around the residential site to prevent the public from using the area as a shortcut. 	<ul style="list-style-type: none"> - The bench under the Longan trees is also an area for family meetings.
G	83	<ul style="list-style-type: none"> - The pavilion at the back garden and the front garden. 	<ul style="list-style-type: none"> - Relaxing, spending time with family, and meeting with visitors. 	<ul style="list-style-type: none"> - (+) The shadiest, pleasant, and comfortable areas 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable areas 	<ul style="list-style-type: none"> - Renovate the walkable area around the dwelling to 	<ul style="list-style-type: none"> - Spending time in the front garden and at the pavilion provides

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				<p>with good airflow from the wind all day.</p> <ul style="list-style-type: none"> (+) The characteristics of the pavilion at the back garden and the front garden areas make the resident feel relaxed physically and mentally. (-) There are too many obstructions that impede site walkability. 	<p>from the surrounding trees allow the resident to spend time outdoors throughout the day.</p> <ul style="list-style-type: none"> (+) The resident likes to be visible to the public from the pavilion and the front garden areas as she often passes out. (-) The site walkability around the dwelling is unsuitable because it's too narrow, small, and obstructed. 	<p>improve site walkability.</p> <ul style="list-style-type: none"> The factors influencing the resident's outdoor usage are the presence of shady areas, proper sunlight, and is in view of the public, as the resident feels safer with people around due to the resident's illness. 	<p>an opportunity to see people roaming on the street and have some visitors, which brings satisfaction to the resident.</p>
G	84	<ul style="list-style-type: none"> The semi-outdoor terrace at the front of the dwelling which is adjacent to the front garden. 	<ul style="list-style-type: none"> Relaxing, spending time with son-in-law, and meeting with visitors. 	<ul style="list-style-type: none"> (+) The shady, pleasant, and comfortable area at the terrace and the front garden in the morning and evening at the pavilion. (+) Good airflow from the wind all day. (+) The resident likes to be visible to the 	<ul style="list-style-type: none"> (+) The shady, pleasant, and comfortable areas allow the resident to spend time outdoors at the terrace in the morning and evening. (+) The characteristics of the residential site 	<ul style="list-style-type: none"> The resident is satisfied with the residential site environment. The resident would like the front garden with more vegetation such as grass, as most of the front garden area is currently earth. 	<ul style="list-style-type: none"> Spending time at the terrace and the front garden provides an opportunity to see people at the shops in front of the residential site and have some visitors, which brings satisfaction to the resident.

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				public from the front garden.	environment make the resident feel safe and feel satisfied, which give the resident an incentive to go outside much more. - (-) It's unsuitable to use the terrace in the afternoon because it is too hot and sunny during that period of the day.		
G	85	- The semi-outdoor terrace at the front of the dwelling and the front garden.	- Relaxing, doing housework, and spending time with family.	- (+) The shady, pleasant, and comfortable areas at the terrace and the front garden in the morning and evening. - (+) Good airflow from the wind all day. - (-) Some of the walkable areas surrounding the dwelling have different ground levels with frequent rubble and uneven surface.	- (+) The shady, pleasant, and comfortable areas allow the resident to spend time outdoors at the terrace and front garden in the morning and evening. - (+/-) The large front garden and the terrace are suitable spaces to spend time outdoors, but they are unable to use during the afternoon	- Renovate the walkable area around the dwelling to improve site walkability. - The resident needs more trees or shading for more suitable areas to spend time outdoors in the residential site.	- N/A

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					as they are too hot and sunny during that period of the day. - (-) The resident was less inclined to spend time outdoors in the front garden because there was no shade.		
G	86	- The semi-outdoor terrace at the side of the dwelling.	- Relaxing, having meals outdoors, and spending time with family.	- (+) The shady, pleasant, and comfortable area with a good environment and surroundings at the terrace in the afternoon and evening. - (+) Good airflow from the wind all day. - (-) Some of the walkable areas surrounding the dwelling have different ground levels with frequent rubble and uneven ground surface.	- (+) The shady, pleasant, and comfortable area allows the resident to spend time outdoors at the terrace in the afternoon until night-time. - (+) The residential site is located close to the rice field, forest, and tourist attraction, which satisfies the resident. - (-) It's unable to use the terrace in the morning because it is too hot and sunny	- Renovate the walkable area around the dwelling to improve site walkability.	- Spending time outdoors at the terrace provides an opportunity to see people roaming at the tourist attraction, which brings satisfaction to the resident.

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					during that period of the day.		
G	87	- The semi-outdoor terrace on the stilt floor.	- Relaxing and spending time with family and neighbours.	- (+) The shady, pleasant, and comfortable area at the terrace in the morning and evening. - (+) Good airflow from the wind all day. - (-) Some of the walkable areas surrounding the dwelling have different ground levels with frequent rubble and uneven ground surface.	- (+) The shady, pleasant, and comfortable area from the surrounding trees allows the resident to spend time outdoors at the terrace in the morning and evening. - (-) It's unsuitable to use the terrace in the afternoon because it is too hot and sunny during that period of the day.	- Renovate the walkable area around the dwelling to improve site walkability. -	- N/A
G	88	- The front and side gardens.	- Relaxing, spending time with family, doing gardening and growing vegetables.	- (+) The shady, pleasant, and comfortable areas with good airflow from the wind all day. - (-) Some of the walkable areas surrounding the dwelling have different ground	- (+) The shady, pleasant, and comfortable areas from the surrounding trees allow the resident to spend time outdoors throughout the day. - (+) The large front and side gardens	- Renovate the walkable area around the dwelling to improve site walkability. -	- N/A

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				levels with frequent rubble and uneven ground surface.	have a suitable space to spend time outdoors, making the resident feel relaxed and meeting the resident's needs.		
G	89	- The front garden.	- Relaxing, doing exercise, and meeting with people.	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area at the front garden in the morning and evening. - (+) Good airflow from the wind all day. - (-) There are some obstructions that impede site walkability in some areas. 	<ul style="list-style-type: none"> - (+) The shady, pleasant, and comfortable area allows the resident to spend time outdoors in the front garden in the morning and evening. - (+) Spending time in the front garden doing daily activities gives the resident an incentive to go outside. - (-) It's unsuitable to use the front garden in the afternoon because it is too hot and sunny during that period of the day as there is no shade from the trees. 	<ul style="list-style-type: none"> - The resident is satisfied with the residential site environment. - The resident needs more trees or shading for more areas out of direct sunlight in the residential site. - Renovate some of the walkable areas of the residential site to improve site walkability. 	- Spending time in the front garden provides the resident with an opportunity to see people roaming on the street, which brings satisfaction to the resident.

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G	90	- The semi-outdoor area at the shop at the front of the residential site.	- Relaxing, doing housework, and spending time with neighbours.	- (+) The shadiest, most pleasant, and comfortable area with good airflow from the wind all day. - (-) The residential site area makes the resident uncomfortable.	- (+) The shady, pleasant, and comfortable area from the surrounding trees allows the resident to spend time outdoors throughout the day. - (+) The shop area provides the resident with an opportunity for meeting and talking to people, which brings satisfaction to the resident.	- The resident needs more trees or shading for more areas out of direct sunlight in the residential site.	- N/A