

INTERRELATIONSHIPS BETWEEN ENVIRONMENTAL PSYCHOLOGICAL
FACTORS AND ENVIRONMENTAL BEHAVIOUR AMONG MALAYSIANS

NEO SAU MEI

A thesis submitted in fulfilment of the
requirements for the award of the degree of
Doctor of Philosophy (Facilities Management)

Faculty of Built Environment and Surveying
Universiti Teknologi Malaysia

MARCH 2019

DEDICATION

This thesis is dedicated to my beloved parents and siblings, thank you for all your endless love and support in terms of spiritual and encouragement for the completion of this thesis.

ACKNOWLEDGEMENT

First and foremost, I would like to deliver my highest appreciation to my supervisor, Associate Professor Dr. Choong Weng Wai for his encouragement, guidance and support throughout the course of this study. His patient, unsurpassed knowledge and advice have assisted me greatly into completing this study. In addition, I also wish to thank my co-supervisors, Professor Rahmalan Ahamad and Dr Irina Safitri Zen who had enlightened me throughout my study. Other than that, I would like to express gratitude Associate Professor Dr. Zainura Zainon Noor and Associate Professor Dr. Haslenda Hashim as panel judges that had helped in giving opinions and suggestions in improving this study during proposal defence stage. Without their guidance, I am sure that this study would not be completed as it is now.

Besides that, I would like to express my sincere gratitude to my family. They have been my pillar of strength throughout all the difficulties that I have faced during this study. They have provided endless love, moral support and valuable advice when I am faced with obstacles and challenges. Because of their support, I can move ahead without any doubts.

Lastly, I would like to thank those individuals that I had accidentally missed out here for directly and indirectly lending your hand throughout this study.

ABSTRACT

The facilities management profession has been extended to engage with issues of sustainability and environmental degradation mostly caused by human activities such as energy consumption, water wastage, solid waste generation and air pollution. Previous studies suggested that environmental behaviour is influenced by a series of psychological factors. Understanding the interrelationship between these factors and the behaviour in the local context will help policy maker form better strategies to improve environmental behaviour among Malaysians. Furthermore, such studies are currently absent. To address these issues, this research identified environmental psychological factors that influence environmental behaviour. Next, an investigation on the interrelationship between environmental psychological factors and environmental behaviours pertaining to the four major environmental issues, namely water, air, solid waste and climate change were conducted. Finally, significant differences in the influence of the environmental psychological factors on environmental behaviours across urban and rural community were examined. In the research, a nationwide survey was conducted in 13 states and 3 federal territories in Malaysia. The sampling method used was multistage stratified random sampling. 6616 questionnaires from respondents across different demographics of Malaysians were collected. Structural Equation Modelling (SEM) was used to illustrate the interrelationship of the affecting environmental psychological factors and environmental behaviours (water quality conservation behaviour, air quality conservation behaviour, solid waste reduction behaviour and low carbon behaviour). In addition, Multigroup Analysis (PLS-MGA) was conducted to compare these interrelationships across urban and rural groups. Findings revealed that the environmental awareness, concern and attitude were significant and positively related to corresponding behaviours. Notably, the environmental concern was the most influencing factor to determine water and air quality conservation behaviours as well as the low carbon behaviour. Besides, awareness of water pollution and climate change towards their corresponding behaviours; and concerns towards the water and air quality conservation behaviour were significantly different across the urban and rural residents. The findings would be beneficial for government and non-government agencies to form better environmental policy and decision making, especially in fostering positive environmental behaviour among Malaysians.

ABSTRAK

Profesion pengurusan fasiliti telah diperluaskan untuk melibatkan isu-isu kemampuhan dan kemerosotan alam sekitar yang kebanyakannya disebabkan oleh aktiviti manusia seperti penggunaan tenaga secara berlebihan, pembaziran air, penjana sisa pepejal dan pencemaran udara. Kajian terdahulu telah menunjukkan bahawa tingkah laku alam sekitar dipengaruhi oleh faktor-faktor psikologi. Memahami hubungan antara faktor-faktor dan tingkah laku ini dalam konteks tempatan boleh membantu penggubal dasar membentuk strategi untuk meningkatkan tingkah laku alam sekitar dalam kalangan rakyat Malaysia. Tambahan pula, kajian seperti ini tidak wujud. Untuk membangkitkan isu-isu ini, kajian ini mengenal pasti faktor psikologi alam sekitar yang mempengaruhi tingkah laku alam sekitar. Seterusnya, kajian berkaitan hubungan antara faktor-faktor psikologi alam sekitar dan tingkah laku alam sekitar yang berkaitan dengan empat isu alam sekitar utama iaitu air, udara, sisa pepejal dan perubahan iklim telah dijalankan. Akhirnya, perbezaan ketara dalam pengaruh faktor-faktor psikologi alam sekitar terhadap tingkah laku alam sekitar dalam kalangan masyarakat bandar dan luar bandar telah dikaji. Dalam kajian ini, satu tinjauan di seluruh negara telah dijalankan di 13 negeri dan 3 wilayah persekutuan di Malaysia. Kaedah pensampelan yang digunakan adalah pensampelan rawak berstrata berganda. 6616 soal selidik daripada responden pelbagai jenis demografi dalam kalangan rakyat Malaysia telah dikumpul. Model Persamaan Struktur (SEM) digunakan untuk menjelaskan hubungan antara faktor-faktor psikologi dan tingkah laku alam sekitar (tingkah laku pemuliharaan kualiti air, tingkah laku pemuliharaan kualiti udara, tingkah laku pengurangan sisa pepejal dan tingkah laku rendah karbon). Tambahan pula, Analisis Kumpulan Pelbagai (PLS-MGA) telah dijalankan untuk membandingkan hubungan tersebut antara golongan bandar dan luar bandar. Dapatan kajian menunjukkan bahawa semua kesedaran, keprihatinan dan sikap adalah penting dan berkaitan dengan tingkah laku yang sepadan. Terutamanya, keprihatinan alam sekitar adalah faktor yang paling berpengaruh untuk menentukan tingkah laku pemuliharaan kualiti air, tingkah laku pemuliharaan kualiti udara dan tingkah laku rendah karbon. Di samping itu, kesedaran mengenai pencemaran air dan perubahan iklim terhadap tingkah laku yang sepadan; dan keprihatinan terhadap tingkah laku pemuliharaan kualiti air dan udara sangat berbeza dalam kalangan penduduk bandar dan luar bandar. Penemuan ini akan memberi manfaat kepada agensi kerajaan dan bukan kerajaan untuk merancang dasar alam sekitar dan membuat keputusan yang lebih baik, terutamanya dalam memupuk tingkah laku alam sekitar positif dalam kalangan rakyat Malaysia.

TABLE OF CONTENTS

	TITLE	PAGE
	DECLARATION	ii
	DEDICATION	iii
	ACKNOWLEDGEMENT	iv
	ABSTRACT	v
	ABSTRAK	vi
	TABLE OF CONTENTS	vii
	LIST OF TABLES	xiii
	LIST OF FIGURES	xv
	LIST OF ABBREVIATIONS	xvi
	LIST OF APPENDICES	xviii
CHAPTER 1	INTRODUCTION	1
	1.1 Research Background	1
	1.2 Problem Statement	6
	1.3 Research Questions	11
	1.4 Research Objectives	11
	1.5 Research Scope	13
	1.6 Research Process	13
	1.7 Thesis Chapters	18
CHAPTER 2	LITERATURE REVIEW	21
	2.1 Introduction	21
	2.2 Review of Environmentalism Theories	21
	2.2.1 Theory of Reasoned Action (TRA) and Theory of Planned Behaviour (TPB)	21
	2.2.2 Model of Responsible Environment Behaviour (REB)	24

2.2.3	Justification of Proposed Model for Evaluating Environmental Behaviour	27
2.2.3.1	Knowledge of Issue, Action Skill and Knowledge of Strategies Versus Environmental Awareness	28
2.2.3.2	Personality Factors	29
2.2.3.3	Situational Factors and Demographic Factors	32
2.3	Selection of Indicators	34
2.3.1	Environmental Awareness	34
2.3.2	Environmental Attitude	35
2.3.3	Environmental Concern	37
2.3.4	Environmental Behaviour	38
2.4	Environmental Issues in Malaysia	39
2.4.1	Water Pollution	39
2.4.2	Air Pollution	41
2.4.3	Solid Waste	42
2.4.4	Climate Change	46
2.5	Summary	55
CHAPTER 3	RESEARCH METHODOLOGY	57
3.1	Introduction	57
3.2	Research Process Flow Chart	57
3.2.1	Stage 1: Literature Review	61
3.2.2	Stage 2: Identify Environmental Psychological Factors that Influence Environmental Behaviour	61
3.2.2.1	Questionnaire Development	61
3.2.3	Stage 3: Verification and Validation via Focus Group and Pilot Test	62
3.2.3.1	Verification via Focus Group	62
3.2.3.2	Validation via Pilot Test	63
3.2.4	Stage 4: Conduct Nationwide Survey	63
3.2.4.1	Nationwide Study	63
3.2.4.2	Data Inquiry	64

3.2.5	Stage 5: To Investigate The Interrelationship Between Environmental Psychological Factors and Environmental Behaviours (Water, Air, Solid Waste And Climate Change) among Malaysians	65
3.2.6	Stage 6: To Examine the Significant Differences of Environmental Psychological Factors on Environmental Behaviours (Water, Air, Solid Waste And Climate Change) across Urban and Rural Residents in Malaysia	65
3.3	Instrument Development, Verification and Validation	66
3.3.1	Instrument Development	66
3.3.1.1	Exogenous Variables	68
3.3.1.1.1	Environmental Awareness	68
3.3.1.1.2	Environmental Attitude	71
3.3.1.1.3	Environmental Concern	72
3.3.1.2	Endogenous Variable	73
3.3.1.2.1	Environmental Behaviour	74
3.3.2	Instrument Translation	77
3.3.3	Focus Group	77
3.3.3.1	Discussion of Focus Group Results	78
3.3.3.1.1	Formulation of the Research Questions or Objectives	80
3.3.3.1.2	Selection of Communication Content and Sample	80
3.3.3.1.3	Development of Content Categories	81
3.3.3.1.4	Finalisation of Units of Analysis	81
3.3.3.1.5	Preparation of Coding Schedule for Pilot Testing	81
3.3.3.1.6	Analysis of Collected Data	82
3.3.4	Pilot Study	87
3.3.4.1	Discussion of Pilot Study Results	88
3.4	Sampling Frame	90

	3.4.1	Sample Size	92
3.5		Data Collection Method	93
3.6		Data Analysis Method	97
	3.6.1	Partial Least Square-Structural Equation Modelling (PLS-SEM)	97
	3.6.2	Partial Least Square-Multigroup Analysis (PLS-MGA)	98
3.7		Summary	98
CHAPTER 4		DATA ANALYSIS AND FINDINGS	99
4.1		Introduction	99
4.2		Respondent Profiles	99
4.3		Descriptive Analysis for Urban and Rural Respondents	102
4.4		Hypotheses	104
	4.4.1	Hypotheses of the Second Objective	104
	4.4.2	Hypotheses of the Third Objective	109
4.5		Model Assessment	113
	4.5.1	Test of Measurement Models	114
		4.5.1.1 Internal Consistency Reliability	115
		4.5.1.2 Convergent Validity and Indicator Reliability	116
		4.5.1.3 Discriminant Validity	125
	4.5.2	Testing of Structural Models	127
		4.5.2.1 Collinearity Assessment	127
		4.5.2.2 Path Analysis	128
		4.5.2.3 Coefficient of Determination	129
		4.5.2.4 f^2 Effect Sizes	131
4.6		Partial Least Square-Multigroup Analysis (PLS-MGA)	132
4.7		Hypotheses Testing	133
	4.7.1	Whole Samples of Malaysians (H1-H12)	133
	4.6.2	Urban and Rural Samples of Malaysians (H1a-H12a)	135
4.8		Summary	140

CHAPTER 5	DISCUSSION	141
5.1	Introduction	141
5.2	Second Objective: Discussion of the Interrelationship between Environmental Psychological Factors and Environmental Behaviours (Four Major Environmental Issues: Water, Air, Solid Waste and Climate Change) among Malaysians	141
5.2.1	Water Quality Conservation Behaviour	142
5.2.2	Air Quality Conservation Behaviour	143
5.2.3	Solid Waste Reduction Behaviour	144
5.2.4	Low Carbon Behaviour	145
5.3	Third Objective: Discussion of the Effect of Significant Differences in Environmental Psychological Factors on Environmental Behaviours (Four Major Environmental Issues: Water, Air, Solid Waste and Climate Change) across Urban and Rural Residents in Malaysia	146
5.3.1	The Significant Difference in the Effect of Environmental Awareness of Water Pollution on Water Quality Conservation Behaviour	147
5.3.2	The Significant Difference in the Effect of Environmental Awareness of Climate Change on Low Carbon Behaviour	147
5.3.3	The Significant Difference in the Effect of Environmental Concern on Water Quality Conservation Behaviour	148
5.3.4	The Significant Difference in the Effect of Environmental Concern on Air Quality Conservation Behaviour	149
5.3.5	The Insignificant Difference in the Effect of Environmental Awareness in Air Pollution and Solid Waste Management on Air Quality Conservation Behaviour and Solid Waste Reduction Behaviour	151

5.3.6	The Insignificant Difference in the Effect of Environmental Concern on Solid Waste Reduction Behaviour and Low Carbon Behaviour	152
5.3.7	The insignificant Difference in the Effect of Environmental Attitude on Water Quality Conservation Behaviour, Air Quality Conservation Behaviour, Solid Waste Reduction Behaviour and Low Carbon Behaviour	152
5.4	Policy Implications	153
5.5	Summary	154
CHAPTER 6	CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS	155
6.1	Introduction	155
6.2	Conclusion of Study	155
6.2.1	Achievement of the First Objective	155
6.2.2	Achievement of the Second Objective	156
6.2.3	Achievement of the Third Objective	158
6.3	Research Contributions	159
6.3.1	Contribution to Knowledge	159
6.3.2	Contribution to Government and Policymakers	160
6.4	Limitations of Study	160
6.5	Recommendations for Future Research	161
	REFERENCES	163
	Appendices A-F	185-221
	LIST OF PUBLICATIONS	222

LIST OF TABLES

TABLE NO.	TITLE	PAGE
Table 1.1	Policy Category within Each Objective of the Malaysia EPI	6
Table 2.1	Environmental Attitude Statements	36
Table 2.2	Environmental Concern Statements	38
Table 2.3	Environmental Awareness Statements	51
Table 2.4	Environmental Behaviour Statements	53
Table 3.1	Questionnaire on Environmental Awareness Referred to in this Study	69
Table 3.2	Improvised Questionnaire of Environmental Awareness	70
Table 3.3	Environmental Attitude Questionnaire	71
Table 3.4	Environmental Concern Questionnaire	73
Table 3.5	Questionnaire on Environmental Behaviour Referred to in this Study	75
Table 3.6	Improvised Questionnaire of Environmental Behaviour	76
Table 3.7	Respondent Profile of the Focus Group	78
Table 3.8	Analysis of Collected Data	82
Table 3.9	Cronbach's Alpha Results for Environmental Awareness (Section A)	90
Table 3.10	Cronbach's Alpha Results for Environmental Behaviour (Section B)	90
Table 3.11	Sample Size (Example of Johor State)	93
Table 3.12	Selected City Hall, City Council, Municipal Council and District Council in Each State/Federal Territory	95
Table 4.1	Summary of Response Rate	98
Table 4.2	Respondent Profile	101
Table 4.3	Descriptive Analysis of Urban and Rural Respondents	103
Table 4.4	Item loadings, AVE and CR of Whole Samples	117
Table 4.5	Item loadings, AVE and CR of Urban Samples	120
Table 4.6	Item loadings, AVE and CR of Rural Samples	122
Table 4.7	Fornell-Larcker's Criterion of Whole Samples	125

Table 4.8	Fornell-Larcker's Criterion of Urban Samples	126
Table 4.9	Fornell-Larcker's Criterion of Rural Samples	126
Table 4.10	Inner VIF Values of Whole Samples	128
Table 4.11	Inner VIF Values of Urban Samples	128
Table 4.12	Inner VIF Values of Rural Samples	128
Table 4.13	R ² Values of Whole Samples	130
Table 4.14	R ² Values of Urban Samples	130
Table 4.15	R ² Values of Rural Samples	130
Table 4.16	Path Coefficient, t value, p-value, and f ² Effect Size for Hypothesis Testing of Whole Samples	137
Table 4.17	Path Coefficient, t value, and p-value for Hypothesis Testing of Urban and Rural Sample	138

LIST OF FIGURES

FIGURE.NO	TITLE	PAGE
Figure 1.1	Malaysia EPI	5
Figure 1.2	Conceptual Framework	12
Figure 1.3	Research Process Flow Chart	17
Figure 2.1	Theory of Reasoned Action (TRA)	23
Figure 2.2	Theory of Reasoned Action (TRA)	23
Figure 2.3	Theory of Planned Behaviour (TPB)	23
Figure 2.4	Model of Responsible Environmental Behaviour	24
Figure 2.5	Proposed Model for Evaluating Environmental Behaviour	33
Figure 2.6	Composition of Water Pollution Resources by Sector	40
Figure 2.7	Hierarchy of Waste Options	44
Figure 3.1	Research Process Flow Chart	58
Figure 3.2	2-Stage Sampling Method	92
Figure 4.1	PLS-SEM Results of Whole Samples of Malaysians	135
Figure 4.2	PLS-MGA Results of Urban Sample	139
Figure 4.3	PLS-MGA Results of Rural Sample	139

LIST OF ABBREVIATIONS

AVE	-	Average Variance Extracted
BBP	-	Biodiversity and Forestry Management
BSASH	-	Water Resources Drainage and Hydrology
CFC	-	Chlorofluorocarbon
CR	-	Composite Reliability
DOE	-	Department of Environment
DOS	-	Department of Statistic
EATT	-	Environmental Attitude
EA_Air	-	Environmental Awareness in Air Pollution
EA_ClimateChange	-	Environmental Awareness in Climate Change
EA_Waste	-	Environmental Awareness in Solid Waste Management
EA_Water	-	Environmental Awareness in Water Pollution
EB_Air	-	Air Quality Conservation Behaviour
EB_ClimateChange	-	Low Carbon Behaviour
EB_Waste	-	Solid Waste Reduction Behaviour
EB_Water	-	Water Quality Conservation Behaviour
EC	-	Environmental Concern
EPI	-	Environmental Performance Index
GHG	-	Greenhouse Gases
ISSP	-	International Social Survey Programme
KeTTHA	-	Ministry of Energy, Green Technology and Water
MNS	-	Malaysian Nature Society
NEP	-	New Ecological Paradigm
PLS-MGA	-	Partial Least Square Multigroup Analysis
PLS-SEM	-	Partial Least Square Structural Equation Modeling

REB	-	Model of Responsible Environmental Behaviour
SE	-	Standard Error
SEDA	-	Sustainable Energy Development Authority Malaysia
SIRIM	-	Standards and Industrial Research Institute of Malaysia
SPAN	-	National Water Services Commission
TPB	-	Theory of Planned Behaviour
TRA	-	Theory of Reasoned Action
VIF	-	Variance Inflation Factor
WEEE	-	waste electrical and electronic equipment
WWF	-	World Wide Fund for Nature

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
Appendix A	Previous Environmental Studies and Research Gap	185
Appendix B	Questionnaire	188
Appendix C	Focus Group Transcript	197
Appendix D	Illustration of PLS-SEM	219
Appendix E	Illustration of PLS-MGA (Urban Sample)	220
Appendix F	Illustration of PLS-MGA (Rural Sample)	221

CHAPTER 1

INTRODUCTION

1.1 Research Background

International Facilities Management (IFMA) defines facilities management as the “organisational function, which integrates people, place, and process within the built environment with the purpose of improving the quality of life of people and the productivity of the core business.” Sustainability has gradually been integrated with green practices in the facility management of buildings (Hodges, 2005; Elmualim et al., 2010). Therefore, it can be surmised that sustainable facilities management involves the process of integrating the people, place, and process of an organisation with the purpose of optimising economic, social, and environmental benefits for sustainability.

Accordingly, a new core competency for Environmental Stewardship and Sustainability was added to form the 11 core competencies of facilities management, which include: Communication, Leadership and Strategy, Finance and Business, Quality, Technology, Operations and Maintenance, Human Factors, Emergency Preparedness and Business Continuity, Real Estate and Property Management, Project Management, and Environmental Stewardship and Sustainability (IFMA, 2009). The 11 core competencies of facilities management were identified and included based on responses obtained from facility professionals in 62 countries collected by IFMA’s global job task analysis (GJTA) in 2009. The addition of new core competencies of environmental stewardship and sustainability has shown that the facilities management profession can be extended to engage with the issues of sustainability to provide a more holistic solution in order to conserve and protect the natural environment. As global environmental issues have brought severe impacts on nations, and vice versa, the facilities management profession should extend its role to

investigating environmental issues from a broader perspective such as the national level.

At the national level, Malaysia is on the verge of collapse as a result of a serious environmental issues that has followed since its rapid economic growth. To name a few, harmful waste secretions, climate change, environmental pollution, and ecosystem breakdown are the environmental catastrophes threatening the well-being of the general public. These issues have been long articulated by the significant amount of researches from varied scientific disciplines (Abdullah, 1995; Dominick, et al., 2012). The major cause of these occurrences is triggered by the urge to satisfy human needs through aggressive economic activities. Air pollution, water pollution, solid waste management, and climate change are among the environmental problems that Malaysia is confronted with.

Open burning cases reported in all States in Malaysia have been increasing (DOE, 2012). In Malaysia, the issue of air pollution has frequently been traced as emissions from motor vehicles, aircraft, industries, and areas of high population density (Dominick et al., 2012). However, motor vehicles contribute the most air pollutants in Malaysia (Afroz et al., 2003; Ishii et al., 2007; Azmi et al., 2010). Prior to this, air pollution has been particularly severe in Klang Valley, Malaysia (Azmi et al., 2010). Air pollution leads to major issues including harm to human health, vegetation, forestry, buildings, architectural works of art, and the ecosystem (Afroz et al., 2003; Ilyas et al., 2010). In addition, the transboundary haze of neighbouring countries can also cause adverse health impacts on Malaysians.

Our nation's environmental disasters not only ends with air pollution; water pollution is a significant issue too. In Malaysia, the degradation of water and rivers has been a critical issue due to the fast growth of development (Othman and Mohamed, 2012). Moreover, the demand for fresh water is on the rise due to the tremendous boom in industrial development and rising human population density (Ramakrishnaiah et al, 2009). According to Al-Badaii et al. (2013), the rivers in Selangor, Malaysia, has become polluted as a result of industrial and agricultural

activities, livestock farming, and soil erosion. Therefore, the polluted water has to be treated extensively so that it can be reused for domestic usage.

Likewise, solid waste in Malaysia is also a problem worth mentioning due to increased anthropogenic activities in the country (Manaf et al., 2009). A case study in Kuala Lumpur, Malaysia, showed that electrical and electronic equipment waste (WEEE) has now become a worrying issue, considering that among Malaysians, the electrical and electronic equipment is replaced within two thirds of its targeted service lifetime (Afroz et al., 2012). In 2003, the average amount of municipal solid waste generated in Malaysia was 0.5–0.8 kg/person/day; this number has increased to 1.7 kg/person/day in major cities (Kathirvale et al., 2003). By the year 2020, the quantity of municipal solid waste generated is estimated to increase to 31,000 tonnes.

The concern towards climate change has increased lately; several researchers have articulated that climate change is drastically increasing because of humans (McBean, 2004; Gu et al., 2013). Malaysia may experience temperature variations from +0.7°C to +2.6°C and precipitation changes ranging from –30% to +30%. Temperatures have actually increased 0.18°C per decade from 1951 to 1996, due to global climate change (NRE, 2005). In another similar report from NRE, Malaysia experienced temperature variations of 0.6°C to 1.2°C every 50 years based on 40 years of historical data (1969-2009); this is projected to increase from 1.5°C to 2°C by 2050 (NRE, 2011).

Considering that the above-mentioned environmental problems are derived from anthropogenic activities, there is a need to improve environmental awareness and behaviour among Malaysians (Arnocky, 2007; Klöckner, 2013). All endeavours and aspirations to foster awareness and concern towards nature are driving motivations behind the behavioural intention of humans. Therefore, since human behaviour is the root cause of environmental degradation, there is a need to study and explore the status of environmental behaviour among Malaysians.

The Global Environmental Performance Index is a well-established environmental performance indicator system. The index introduces comprehensive

indicators for measuring and tracking a country's environmental performance. Since 2006, the Environmental Performance Index (EPI) quantifies and ranks environmental performance regionally, including both environmental health and ecosystem vitality of 133 countries. Countries that use EPI ranking have increased in number to up to 178 in 2014. EPI was developed by the Yale Centre for Environmental Law and Policy and the Centre for International Earth Science Information Network of Columbia University (Environmental Sustainability Index, 2012).

The Global EPI consists of two (2) major objectives known as Environmental Public Health and Ecosystem Vitality performances. In spite of the Global EPI pedagogy, Malaysia has developed its own signature EPI known as Malaysia EPI (as shown in Figure 1.1), which includes additional major objectives for Socioeconomic Sustainability (as shown in Table 1.1). The additional major objective for Socioeconomic Sustainability could be important, as it manifests the indicators in the Malaysia EPI, which would help both government and non-government organisations perform better decision-making, especially in policy implementation and management. Environmental awareness and behaviour are highlighted under this additional objective of Socioeconomic Sustainability with the aim to examine the level of environmental awareness and behaviour among Malaysians.

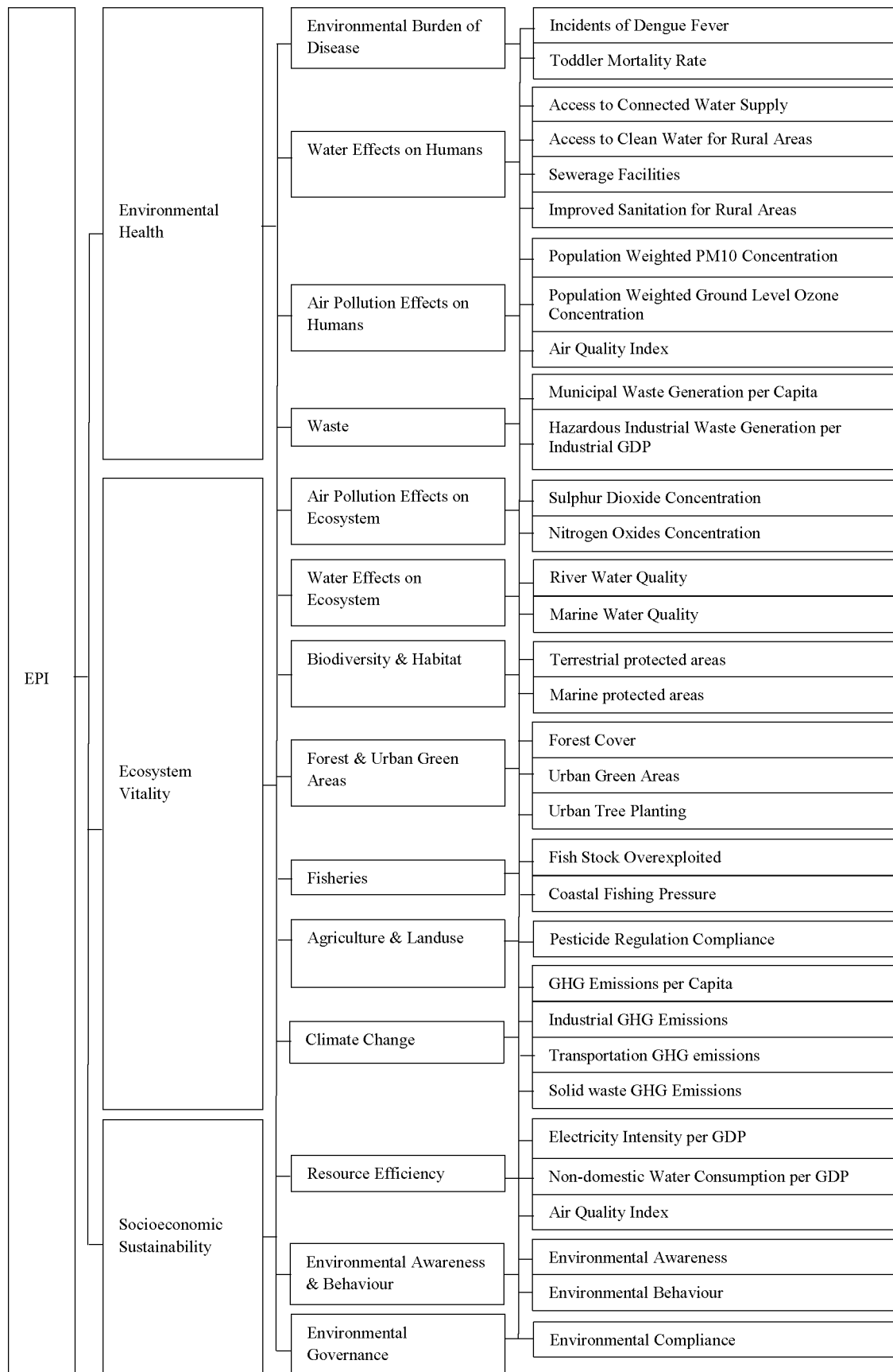


Figure 1.1 Malaysia EPI (Source: Malaysia EPI 2012)

Table 1.1 Policy Category within Each Objective of the Malaysia EPI

OBJECTIVE	POLICY CATEGORY
Environmental Health	<ol style="list-style-type: none"> 1. Environmental Burden of Disease 2. Water Effects on Human 3. Air Pollution Effects on Human 4. Waste
Ecosystem Vitality	<ol style="list-style-type: none"> 1. Air Pollution Effects on Ecosystem 2. Water Effects on Ecosystem 3. Biodiversity & Habitat 4. Forest & Urban Green Areas 5. Fisheries 6. Agriculture & Landuse 7. Climate Change
Socioeconomic Sustainability	<ol style="list-style-type: none"> 1. Resource Efficiency 2. Environmental Awareness & Behaviour 3. Environmental Governance

1.2 Problem Statement

The existing Malaysia EPI recommends environmental awareness as the only indicator to demonstrate environmental psychological factors that affect environmental behaviour. However, environmental awareness alone is not strong enough to predict the behavioural performance of humans in preserving the earth (Hungerford and Volk, 1990; Klöckner, 2013; Kollmuss and Agyeman, 2002). Environmental awareness is way too simplified to reveal a clear picture of the environmentalism trend among Malaysians. It is said that not all people who have awareness about environmental issues are motivated to practice and behave environmentally-friendly ways (Krajhanzl, 2010).

Furthermore, government and non-government organisations have launched and promoted many environmental programmes through different relevant ministries and agencies as part of Vision 2020 Malaysia. Among these include "Towards Smart Energy Culture" by the Energy Commission Malaysia, "One State One River Programme" by the Ministry of Agriculture, "Recycle for Nature" by the Malaysian

Nature Society, and other environmental campaigns. Policy makers design environmental campaigns to convey environmentally-friendly information so as to instill green values among Malaysians. Nevertheless, as explained in the "Information Deficit Model", these efforts would not effectively prompt environmental behaviour because simply delivering environmentally-friendly information will not necessarily foster environmental behaviour among Malaysians (Burgess et al., 1998; McKenzie-Mohr, 2000). Therefore, it is important to identify other environmental psychological factors that influence environmental behaviour.

Environmental psychological factors are psychological factors related to environmental aspects that can influence human decisions to engage in environmental behaviour. These factors are associated with elements that work with the mind or psyche such as awareness, attitude, and concern. For instance, environmental psychological factors include environmental awareness, environmental concern, and environmental attitude. Previous studies have investigated the influence of environmental psychological factors on environmental behaviour. Psychological factors such as awareness (Latif et al., 2013), concern (Dietz et al., 1998; Tam and Chan, 2017), and attitude (Barr, 2007) are reportedly related to human environmental behaviour. People with environmental awareness are people with awareness of the causes and consequences of environmental issues and have the know-how and skills to mitigate those issues (Freije et al, 2017). Environmental concern is an individual emotion regarding environmental issues and the response i.e. willingness to solve the issues (Ostman and Parker, 1987; Franzen and Vogl, 2013). Meanwhile, individuals with environmental attitude are individuals with a combination of belief, value, and intention related to environmental activities and issues (Schultz et al., 2005). In summary, people who are aware, concerned, and have a positive attitude towards the natural environment tend to preserve the environment more. Therefore, they are more motivated to engage in environmental behaviour.

Apparently, researchers and policymakers have discovered that human behaviour can further degrade environmental issues (Mobley et al., 2010; Klöckner, 2013). Understanding or environmental behaviour prediction will aid in mitigating

environmental threats from the social and political context, as environmental issues is a global issue (Harth et al., 2013). In other words, for policymakers, detecting the changes in attitude and behaviour of the general public will enable them to recognise the public environmental behaviour that can be changed (Owens and Driffill, 2008). This is important for drafting environmental laws, policies, and guidelines. Change in attitude can more likely induce change in behaviour rather than the other way round (Dobson, 2007). Therefore, for an environmental policy to be operative, the government has to understand how and why residents become motivated to engage in an environmental behaviour. In this regard, interrelationships between environmental psychological factors and behaviour must be evaluated to determine the behavioural pattern of the subjects that can greatly affect environmental quality and the effectiveness of environmental strategies (Steg and Vlek, 2009; Takahashi and Selfa, 2014).

There are several demographic factors that influence environmental performance such as gender (Stern et al., 1993; De Groot et al., 2007; Sengupta, et al., 2010; McCright, 2010; Abdul-Wahab and Abdo, 2010; Hassan et al., 2010), nationality (Aoyagi-Usui et al., 2003; Vicente-Molina et al., 2013), race (Liu et al., 2014), age (De Groot et al., 2007; Abdul-Wahab and Abdo, 2010), State or area (urban or rural) (Hassan et al., 2010; Ambrosius and Gilderbloom, 2015), education level (Abdul-Wahab and Abdo, 2010; Haşiloğlu et al., 2011), and monthly income level (De Groot et al., 2007). However, among all these demographic factors, not many studies have used an environmental behaviour environmentalism model and considered living areas, especially urban and rural regions, or covered this as part as a nationwide study among Malaysians as a whole. Previous studies have only focused on the cross-compatibility of environmental behaviour among school students in urban and rural areas (Hassan et al., 2010) or public residents in a specific district (Lin et al., 2010), but a nationwide survey has yet to be conducted.

By incorporating environmental theories, the study of behaviour-driven factors could improve the effectiveness of environmental policies and guideline provisions (Huffman et al., 2014). Using a structural model to explain behaviour is paramount in presenting a holistic development of either effective strategies,

approaches or programmes (Von Eye and Bergman et al., 2003; Lanza et al., 2010; Terzian et al., 2014). In other words, prediction of the public's environmental behaviour using theories or models would result in the better provision of environmental policies, guidelines, or approaches that might be beneficial in changing human behaviour towards environmental preservation.

There are several environmentalism theories of human behaviour, which have been adopted in previous works such as the Norm Activation Theory (Schwartz, 1977) and Value Belief Norm theory (Stern, 2000). These have been cross-nationally surveyed in European and Latin American countries such as Peru, Mexico, Nicaragua, Spain, the United States (Schultz and Zelezny, 1998), and Austria, Czech Republic, Italy, and the Netherlands and Sweden (De Groot et al., 2007) to test the interrelationship between environmental psychological factors in influencing behaviour. However, similar studies of Malaysia case study are limited.

Notably, other environmentalism theories such as Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975; Ajzen and Fishbein 1980), Theory of Planned Behaviour (TPB) (Ajzen, 1985,1991), and Model of Responsible Environmental Behaviour (REB) (Hines, Hungerford, and Tomera, 1986;1987) have been widely used to predict the behavioural intention of people's visit to green hotels (Chen and Tung, 2014); water pollution among boaters (Cottrell and Graefe, 1997); environmental education (Hsu and Roth, 1998; Hsu, 2004); ecotourism (Chiu et al., 2013); and environmentally responsible behaviour via reading of environmental literature (Mobley et al., 2010). However, there is a lack of studies on the behavioural prediction of the general public via a nationwide study based on these theoretical models.

In line with this, there are numerous previous studies (as shown in Appendix A) that have highlighted the different environmental psychological variables that influence human behaviour to protect nature. Some researchers focused their study on environmental education, considering its importance in nurturing the future generations of "nature lovers", through incorporating environmental awareness and knowledge among youngsters (Cetin and Nisanci, 2010, Haşiloğlu et al., 2011;

Vicente-Molina et al., 2013). Therefore, only a few studies have been concerned with the inclusion of the general public as respondents; considering that the targeted respondents in previous studies were mostly students.

There are available studies that have examined the public's environmental awareness, environmental knowledge, environmental concern, and environmental attitude and their effect on environmental behaviour (Aoyagi-Usui et al., 2003; McCright, 2010; Mondejar-Jimenez et al., 2011; Franzen and Meyer, 2010). However, to date, there are only limited studies that have combined these environmental psychological factors such as environmental awareness and knowledge, environmental concern, and environmental attitude in explaining environmental behaviour using a nationwide survey (Shoukry et al, 2012).

Meanwhile, previous studies have investigated human environmental behaviour solely focusing on specific human behaviour in terms of particular environmental issues such as water saving (Mondejar-Jimenez et al., 2011), climate change (McCright, 2010), waste from electrical and electronic equipment (Afroz et al., 2013), solid waste management (Desa et al., 2011, 2012), recycling of solid waste (Jibril et al., 2012), and municipal waste management (Saeed et al., 2009). Hence, it is important to point out that these previous studies covered specific environmental issues that correspond to simultaneous case studies. To date, there are no case studies in Malaysia that have investigated environmental behaviours in regard to environmental issues in Malaysia. For this reason, there is a need to conduct a tailored research that investigates Malaysia's environmental issues and develop an environmentalism model that could explain the environmental behaviours in response to on-going environmental issues in Malaysia.

Considering the problem and the gap that exists in examining environmental behaviours among Malaysians, this study aims to identify the environmental psychological factors that affect environmental behaviour rather than just focusing on single factors to evaluate environmental behaviour. This study also aims to investigate the interrelationship between environmental psychological factors and environmental behaviours pertaining to four major environmental issues, which are

water, air, solid waste, and climate change among Malaysians, and later, extend this objective to include understanding of the significant difference of these interrelationships across urban and rural residents.

1.3 Research Questions

Based on the problem statement, the research questions of this study are as follows:

- a) What are the environmental psychological factors that influence environmental behaviour?
- b) What is the interrelationship between environmental psychological factors and environmental behaviour pertaining to four major environmental issues, which are water, air, solid waste, and climate change among Malaysians?
- c) Is there any significant difference in the effect of environmental psychological on environmental behaviour pertaining to four major environmental issues, which are water, air, solid waste, and climate change across urban and rural residents in Malaysia?

1.4 Research Objectives

Based on the problem statement, the following objectives of this study are formulated:

- a) To identify the environmental psychological factors that influence environmental behaviour.
- b) To investigate the interrelationship between environmental psychological factors and environmental behaviours pertaining to four major environmental issues, which are water, air, solid waste, and climate change among Malaysians.

- c) To examine significant differences in the effect of environmental psychological factors on environmental behaviours pertaining to four major environmental issues which are water, air, solid waste, and climate change across urban and rural residents in Malaysia.

The framework of Figure 1.2 was developed to illustrate the concept and relevance of the environmental psychological factors (awareness, concern, and attitude) and environmental behaviour categorised as water pollution, air pollution, solid waste management, and climate change. This relationship is tested and investigated throughout this study.

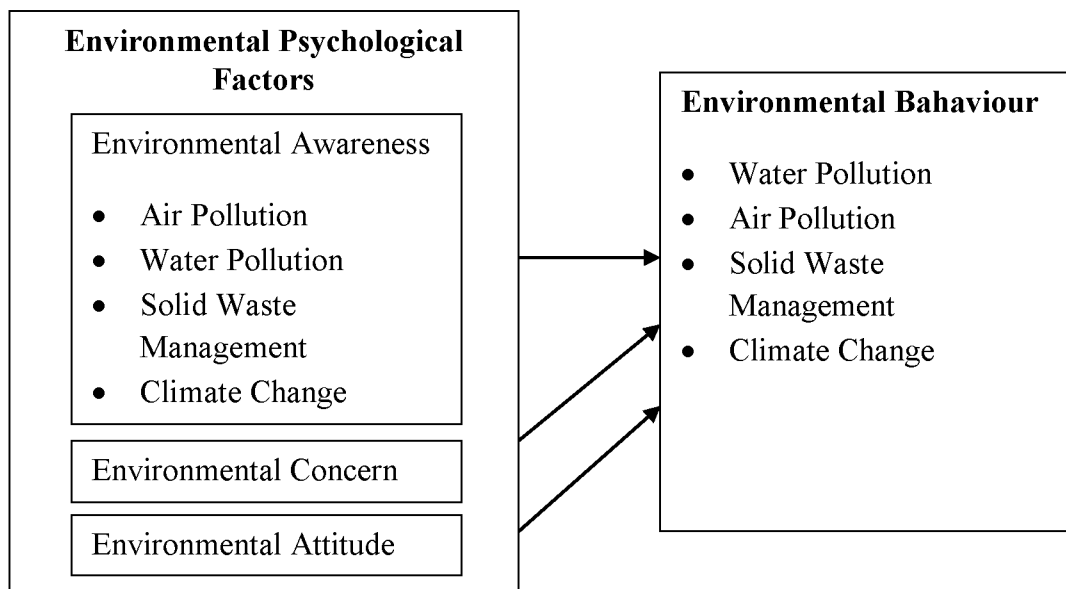


Figure 1.2 Conceptual Framework

1.5 Research Scope

The nationwide survey conducted in this study covers a total of 13 States and 3 Federal Territories in Malaysia including Sabah, Sarawak, Johor, Kedah, Kelantan, Melaka, Negeri Sembilan, Pahang, Perak, Perlis, Pulau Pinang, Selangor, Terengganu, Federal Territory of Kuala Lumpur, Federal Territory of Putrajaya, and Federal Territory of Labuan. This study adopted a questionnaire survey that was conducted from August 2014 to November 2014. The questionnaire was reviewed through a focus group discussion with respondents from the Department of Environment (DOE), Ministry of Energy, Green Technology and Water (KeTTHA), Biodiversity and Forestry Management (BBP), Water Resources Drainage and Hydrology (BSASH), Sustainable Energy Development Authority Malaysia (SEDA) and National Water Services Commission (SPAN), Malaysian Nature Society (MNS), Malaysian Green Technology Corporation, and the World Wide Fund for Nature (WWF) Malaysia. After that, the questionnaires were disseminated in selected city halls, city councils, municipal councils, and district councils of each State and Federal Territory to target the respondents, namely Malaysians from both urban and rural areas.

1.6 Research Process

The following discussion explains the stages for completing the research objectives in more detail:

Stage 1: Literature review

The literature regarding environmentalism theories and models is reviewed. The affecting variables that predict environmental behaviour are revised and studied. Then, the Theory of Reasoned Action (TRA), Theory of Planned Behaviour (TPB), and Model of Responsible Environmental Behaviour (REB) are explored.

Stage 2: Identify environmental psychological factors that influence environmental behaviour

In this stage, environmental psychological factors are identified after the related environmentalism theories are reviewed and the literature review conducted. The key output in this stage is the selected environmental psychological variables or the proposed indicators, including environmental awareness (four major topics: water, air, solid waste and climate change), environmental concern, environmental attitude, and environmental behaviours (four major topics: water, air, solid waste, and climate change).

Stage 3: Verification and validation of proposed indicators and questionnaire

Later, the identified environmental psychological factors are reviewed by environmental-related government and non-government agencies through a focus group discussion. Consequently, the applicability of the questionnaire, and the relevance and consistency of each item in the questionnaire are explored. The focus group discussion is recorded for further analysis. Content analysis is adopted to analyse the expert reviews and comments.

After the focus group discussion, the questionnaire is amended such that a comprehensive research instrument for this study is generated. A pilot study is conducted right after the questionnaire is finalised. The results from the pilot study take into consideration of the items that are ambiguous or difficult to answer, whether or not the length of the survey is appropriate, and identification of any repetitive or redundant items. Then, corrections are made to the questionnaire, which is brought forward to Stage 4.

Stage 4: Conduct nationwide survey

To execute Stage 4, a nationwide survey is conducted involving 13 States and 3 Federal Territories. The questionnaire is distributed to the Malaysian public. A total of 13 States and 3 Federal Territories in Malaysia are surveyed including Sabah,

Sarawak, Johor, Kedah, Kelantan, Melaka, Negeri Sembilan, Pahang, Perak, Perlis, Pulau Pinang, Selangor, Terengganu, Federal Territory of Kuala Lumpur, Federal Territory of Putrajaya, and Federal Territory of Labuan.

The sampling method used in this study is multistage and stratified sampling. Because the entire nation is too large to survey, especially because the public population is widely distributed, multistage sampling is adopted to narrow down the scope of sampling frame in a systematic way. Stratified sampling is considered the most suitable to use for a sample that is heterogeneous (Varshney et al., 2011). Stratified sampling requires the whole population of the study to be subdivided into subpopulations called strata on the condition that the combination of all strata will form the population (Yadolah, 2008). By following the proportion of each stratum, the sampling is randomly selected, so that the fullest coverage of population distribution in the Malaysian population is accomplished.

It is important to note that as this study is a nationwide survey, the questionnaire distribution must be equally conducted based on the ethnic distribution composition in Malaysia, which was retrieved from the Department of Statistics Malaysia. Then again, the ratio of gender, living areas (urban and rural), age group of the respondents must also be widely covered and not only focusing on one group of age only. Both urban and rural areas in Malaysia are covered accordingly for each type of local authority, referred to as the city hall, city council, municipal council, and district council of each State in Malaysia. This is to ensure balanced yet thorough coverage of residents in Malaysia.

Stage 5: Analyse data using Partial Least Square Structural Equation Modelling (PLS - SEM)

This stage is executed by analysing the collected data using Partial Least Square Structural Equation Modelling (PLS-SEM) in order to investigate the interrelationships between environmental psychological factors that predict environmental behaviours (four major topics: water, air, solid waste, and climate change) among Malaysians (Ullman, 2007). By using SmartPLS software version 2.0

M3 (Ringle et al., 2005), PLS-SEM is conducted to present the interrelationships between environmental awareness (four major topics: water, air, solid waste, and climate change), environmental attitude, environmental concern, and environmental behaviour (four major topics: water, air, solid waste, and climate change) among Malaysians. These interrelationships are determined to accomplish the second objective of this study.

Stage 6: Analyse data using PLS-MGA

As for the sixth stage, the collected data is analysed using Partial Least Square Multigroup Analysis (PLS-MGA) to examine the significant differences in environmental behaviours (four major topics: water, air, solid waste, and climate change) across urban and rural groups. At this stage, SmartPLS software version 2.0 M3 (Ringle et al., 2005) is adopted as well to execute PLS-MGA. The significant differences of path models in between environmental awareness (four major topics: water, air, solid waste, and climate change), environmental attitude, environmental concern, and environmental behaviour (four major topics: water, air, solid waste, and climate change) across urban and rural groups are confirmed and discussed.

The research methodology is depicted in Figure 1.3.

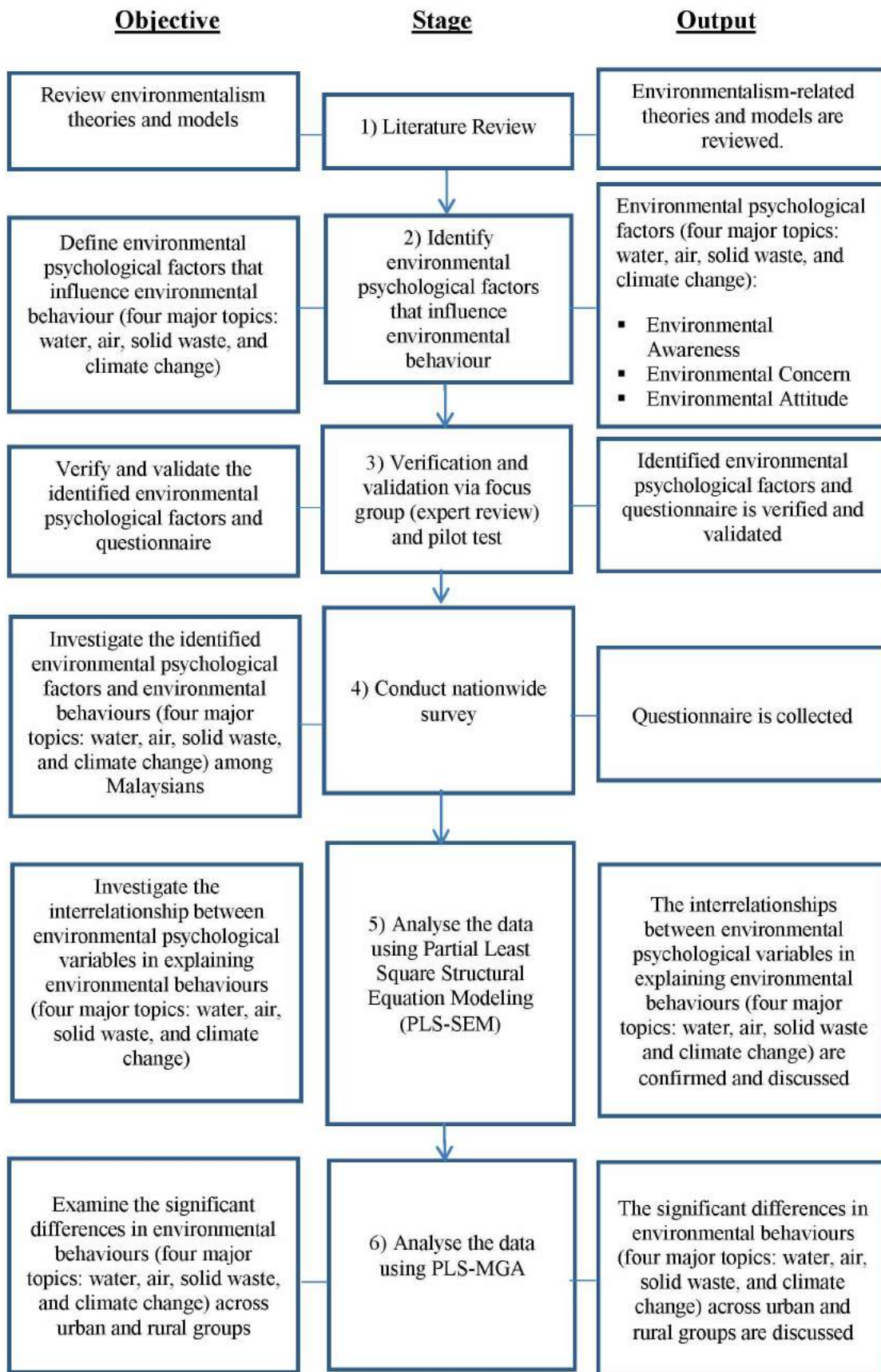


Figure 1.3 Research Process Flow Chart

1.7 Thesis Chapters

This section presents the research outline, which consists of six (6) chapters:

Chapter 1: Introduction

Chapter 1 presents the introduction to the study. This chapter discusses the research background and problem statements in relation to the environmental issues in Malaysia. The research questions, objectives, scope, and research process, are also outlined in this chapter.

Chapter 2: Literature Review

Chapter 2 lays out the literature review of relevant studies in this field. This chapter includes a review and identification of environmental psychological factors that influence environmental behaviour based on previous research. The first objective of this study is achieved at this stage. Later, grounded theories extracted from previous studies are discussed in order to develop an environmentalism model to explain the interrelationships between the proposed indicators or environmental psychological factors in predicting environmental behaviours (four major topics: water, air, solid waste, and climate change). The selection of environmental psychological factors that influence environmental behaviours (four major topics: water, air, solid waste, and climate change) are discussed in this chapter as well.

Chapter 3: Research Methodology

Chapter 3 presents the research methodology used to conduct the study. Questionnaire design based on the literature review, validation through focus group, and the pilot study are further discussed in detail in this chapter. Meanwhile, the nationwide survey covering sampling method, respondents, and data collection method is elaborated as well. Furthermore, the data analysis method including PLS-SEM and PLS-MGA is also delineated.

Chapter 4: Data Analysis and Findings

Chapter 4 reports the respondent profile and results gathered from the data analysis. The results of model assessment, which include measurement model assessment and structural model assessment, are discussed as well. Findings of hypothesis and testing of hypothesis of the second and third objectives are revealed in this chapter before proceeding with Chapter 5.

Chapter 5: Discussion

Chapter 5 discusses the results from the second and third objectives: 1) to investigate the interrelationships between environmental psychological variables and environmental behaviours pertaining to four major environmental issues, which are water, air, solid waste, and climate change among Malaysians; 2) to examine the significant differences in the effect of environmental psychological variables on environmental behaviours pertaining to four major environmental issues, which are water, air, solid waste, and climate change across urban and rural residents in Malaysia.

Chapter 6: Conclusions, Limitations, and Recommendations

Chapter 6 presents the conclusions and recommendations for this study. A summary of the findings is given and future research recommendations in the relevant field are discussed. The limiting conditions are also highlighted.

REFERENCES

- Abdullah, A. R. (1995). Environmental Pollution in Malaysia: Trends and Prospects. *TrAC Trends in Analytical Chemistry*, 14(5), 191-198.
- Abdul-Wahab, S. A., & Abdo, J. (2010). The Effects of Demographic Factors on the Environmental Awareness of Omani Citizens. *Human and Ecological Risk Assessment: An International Journal*, 16(2), 380-401.
- Adams, E. A. (2014). Behavioral Attitudes towards Water Conservation and Re-use among the United States Public. *Resources and Environment*, 4(3), 162-167.
- Afroz, R., Hassan, M. N., & Ibrahim, N. A. (2003). Review of Air Pollution and Health Impacts in Malaysia. *Environmental Research*, 92(2), 71-77.
- Afroz, R., Masud, M. M., Akhtar, R., & Duasa, J. B. (2012). Public Environmental Awareness and Performance in Kuala Lumpur City, Malaysia: A Case Study on Household Electrical and Electronic Equipment. *Environment and Urbanization Asia*, 3(2), 385-396.
- Afroz, R., Masud, M. M., Akhtar, R., & Duasa, J. B. (2013). Survey and Analysis of Public Knowledge, Awareness and Willingness to Pay in Kuala Lumpur, Malaysia – A Case Study on Household WEEE Management. *Journal of Cleaner Production*, 52(0), 185-193.
- Afroz, R., & Masud, M. M. (2011). Using A Contingent Valuation Approach for Improved Solid Waste Management Facility: Evidence from Kuala Lumpur, Malaysia. *Waste Management*, 31(4), 800-808.
- Ahmad, Z. A. (2011, August 12). All Govt Offices to Keep Air Cond Temperature at 24 °C from Now. *The Star Online*. Retrieved from <http://www.thestar.com.my/story.aspx/?file=%2f2011%2f8%2f12%2fnation%2f9285195&sec=nation>
- Ajzen, I. & Fishbein, M. (1980). *Understanding Attitudes and Predicting Social Behavior*. Englewood Cliffs, NJ: Prentice-Hall
- Ajzen, I. (1985). From Intentions to Actions: A Theory of Planned Behavior. In J. Kuhl & J. Beckman (Eds.), *Action-control: From Cognition to Behavior*. 11-39

- Ajzen, 1991. The Theory of Planned Behavior. *Organizational behavioral and human decision processes* 50, 179-211
- Aktamis, H. (2011). Determining Energy Saving Behavior and Energy Awareness of Secondary School Students according to Socio-demographic Characteristics. *Educational Research and Reviews*, 6(3), 243.
- Alam, M. S., & McNabola, A. (2014). A Critical Review and Assessment of Eco-Driving Policy & Technology: Benefits & Limitations. *Transport Policy*, 35(0), 42-49.
- Al-Badaai, F., Shuhaimi-Othman, M., & Gasim, M. B. (2013). Water Quality Assessment of the Semenyih River, Selangor, Malaysia. *Journal of Chemistry*, 10.
- Ambrosius, J. D., & Gilderbloom, J. I. (2015). Who's greener? Comparing Urban and Suburban Residents' Environmental Behaviour and Concern. *Local Environment*, 20(7), 836-849.
- Anderson, B. A., Romani, J. H., Phillips, H., Wentzel, M., & Tlabela, K. (2007). Exploring Environmental Perceptions, Behaviors and Awareness: Water and Water Pollution in South Africa. *Population and Environment*, 28(3), 133-161.
- Aoyagi-Usui, M, Vinken, H, Kuribayashi, A. (2003). Pro-environmental Attitudes and Behaviors: An International Comparison. *Human Ecology Review*, 10 (1), 23–31.
- Aprile, M. C., & Fiorillo, D. (2016). Water Conservation Behavior and Environmental Concerns.
- Ardito, L., & Morisio, M. (2014). Green IT – Available Data and Guidelines for Reducing Energy Consumption in IT Systems. *Sustainable Computing: Informatics and Systems*, 4(1), 24-32.
- Arnocky, S., Stroink, M., & DeCicco, T. (2007). Self-construal Predicts Environmental Concern, Cooperation, and Conservation. *Journal of Environmental Psychology*, 27(4), 255-264.
- Assayed, A., Hatokay, Z., Al-Zoubi, R., Azzam, S., Qbailat, M., Al-Ulayyan, A., Saleem, M. A., Bushnaq, S., Maroni, R. (2013). On-site Rainwater Harvesting to Achieve Household Water Security Among Rural and Peri-urban Communities in Jordan. *Resources, Conservation and Recycling*, 73(0), 72-77.

- Asmuni, S., Hussin, N. B., Khalili, J. M., and Zain, Z. M. (2015). Public Participation and Effectiveness of the No Plastic Bag Day Program in Malaysia. *Procedia - Social and Behavioral Sciences*, 168(Supplement C), 328-340.
- Aydin Coşkun, A., & Gençay, G. (2011). Kyoto Protocol and “deforestation”: A Legal Analysis on Turkish Environment and Forest Legislation. *Forest Policy and Economics*, 13(5), 366-377.
- Azmi, S. Z., Latif, M.T., Ismail, A.S., Juneng, L., Jemain, A.A. (2010). Trend and Status of Air Quality at Three Different Monitoring Stations in the Klang Valley, Malaysia. *Air Qual Atmos Health*, 3, 53–64.
- Bamberg, S. (2003). How Does Environmental Concern Influence Specific Environmentally Related Behaviors? A New answer to An Old Question. *Journal of environmental psychology*, 23(1), 21-32.
- Barr, S. (2007). Factors Influencing Environmental Attitudes and Behaviors: A U.K. Case Study of Household Waste Management. *Environment and Behavior*, 39(4), 435-473.
- Battaglia, M. P. (2008) *Multi-Stage Sample. Encyclopedia of Survey Research Methods*. Sage Publications, Inc. Thousand Oaks, CA: Sage Publications, Inc.
- Bazrbachi, A., Sidique, S. F., Shamsudin, M. N., Radam, A., Kaffashi, S., & Adam, S. U. (2017). Willingness to Pay to Improve Air Quality: A study of Private Vehicle Owners in Klang Valley, Malaysia. *Journal of Cleaner Production*, 148, 73-83.
- Bernstad, A. (2014). Household Food Waste Separation Behavior and the Importance of Convenience. *Waste Management*, 34(7), 1317-1323.
- Berz, G., Kron, W., Loster, T., Rauch, E., Schimetschek, J., Schmieder, J., Siebert, A., Smolka, A., Wirtz, A. (2001). World Map of Natural Hazards – A Global View of the Distribution and Intensity of Significant Exposures. *Natural Hazards*, 23(2-3), 443-465.
- Berelson, B. (1952). *Content analysis in communication research*, New York: The Free Press
- Best, H., & Mayerl, J. (2013). Values, Beliefs, Attitudes: An Empirical Study on the Structure of Environmental Concern and Recycling Participation. *Social Science Quarterly*, 94(3), 691-714.

- Blake, J. (1999). Overcoming the 'Value - Action Gap' in Environmental Policy: Tensions between National Policy and Local Experience. *Local Environment*, 4 (3), 257-278.
- Bohdanowicz, P. (2006). Environmental Awareness and Initiatives in the Swedish and Polish Hotel Industries Survey Results. *International Journal of Hospitality Management*, 25(4), 662-682.
- Bolaji, B. O. and Huan, Z. (2013). Ozone Depletion and Global Warming: Case for the Use of Natural Refrigerant – A Review. *Renewable and Sustainable Energy Reviews*. 18(0), 49-54.
- Brand, C., Goodman, A., & Ogilvie, D. (2014). Evaluating the Impacts of New Walking and Cycling Infrastructure on Carbon Dioxide Emissions from Motorized Travel: A Controlled Longitudinal Study. *Applied Energy*, 128(0), 284-295.
- Brotherson, M.J (1994). Interactive Focus Group Interviewing: A Qualitative Research Method in Early Intervention. *Topics in Early Childhood Special Education*, 14(1), 101-118.
- Burgess, J., Harrison, C. M., & Filius, P. (1998). Environmental Communication and the Cultural Politics of Environmental Citizenship. *Environment and planning A*, 30(8), 1445-1460.
- Cerin, E. (2011). Statistical Approaches to Testing the Relationships of the Built Environment with Resident-Level Physical Activity Behavior and Health Outcomes in Cross-Sectional Studies with Cluster Sampling. *Journal of Planning Literature*, 26(2), 151-167.
- Cetin, G., & Nisanci, S. H. (2010). Enhancing Students' Environmental Awareness. *Procedia - Social and Behavioral Sciences*. 2(2), 1830-1834.
- CETREE. (2002). *Your Guide to Energy Efficiency at Home: Tips on Smart Use of Energy to Save Money at Home*. Centre for Education and Training in Renewable Energy and Energy Efficiency (CETREE)
- Chang, S. J. (2013). Solving the Problem of Carbon Dioxide Emissions. *Forest Policy and Economics*, 35(0), 92-97.
- Chaffee, S. H. & Roser, C. (1986). Involvement and the Consistency of Knowledge, Attitudes and Behaviors. *Communication Research*, 13(3), 373-399.

- Chao, Y.-L. (2012). Predicting People's Environmental Behaviour: Theory of Planned Behaviour and Model of Responsible Environmental Behaviour. *Environmental Education Research*, 18(4), 437-461.
- Chen, M.-F., & Tung, P.-J. (2014). Developing an Extended Theory of Planned Behavior Model to Predict Consumers' Intention to Visit Green Hotels. *International Journal of Hospitality Management*, 36(0), 221-230.
- Chiu, Y.-T. H., Lee, W.-I., & Chen, T.-H. (2013). Environmentally Responsible Behavior in Ecotourism: Exploring the Role of Destination Image and Value Perception. *Asia Pacific Journal of Tourism Research*, 19(8), 876-889.
- Chun-sheng, Z., Shu-wen, N., & Xin, Z. (2012). Effects of Household Energy Consumption on Environment and its Influence Factors in Rural and Urban Areas. *Energy Procedia*, 14(Supplement C), 805-811.
- Chung, S.S. & Poon, C.S. (2000). A Comparison of Waste Reduction Practices and the New Environmental Paradigm in Four Southern Chinese Areas. *Environmental Management*, 26, 195.
- Clara, C. (2011, August 11). To Cut Energy Bills, Putrajaya Sets Office Air-Con at 24 ° C. *The Malaysian Insider*. Retrieved on <http://www.themalaysianinsider.com/malaysia/article/to-cut-energy-bills-putrajaya-sets-office-air-con-at-24c>
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Earlbaum Associates.
- Cottrell, S. P. & Graefe, A. R. (1997). Testing a Conceptual Framework of Responsible Environmental Behavior. *The Journal of Environmental Education*, 29(1), 17-27.
- Cottrell, S. P. & Meisel, C (2003). Predictors of Personal Responsibility to Protect the Marine Environment Among Scuba Divers. *Proceedings of the 2003 Northeastern Recreation Research Symposium*. Edited by: Murdy, J. (pp.252-261). Newtown Square, PA: USDA Forest Service, Northeastern Research Station. (Gen. Tech. Rep. NE-317)
- Dangi, M. B., Urynowicz, M. A., Gerow, K. G., & Thapa, R. B. (2008). Use of Stratified Cluster Sampling for Efficient Estimation of Solid Waste Generation at Household Level. *Waste Management & Research*, 26(6), 493-499.

- De Groot, J. I. M., & Steg, L. (2007). Value Orientations and Environmental Beliefs in Five Countries: Validity of an Instrument to Measure Egoistic, Altruistic and Biospheric Value Orientations. *Journal of Cross-Cultural Psychology*, 38(3), 318-332.
- Denscombe, M. (2009). Item Non-response Rates: A Comparison of Online and Paper Questionnaires. *International Journal of Social Research Methodology*, 12(4), 281-291.
- de Nazelle, A., Morton, B. J., Jerrett, M., & Crawford-Brown, D. (2010). Short trips: An Opportunity for Reducing Mobile-source Emissions? *Transportation Research Part D: Transport and Environment*, 15(8), 451-457.
- Department of Environment. (2008). *Environmental Friendly Practices*. Third Edition-2008. Ministry of Nature Resources and Environment, Malaysia.
- Department of Environment. (2012). Environmental Statistic Time Series 2012. Department of Environment (DOE) website. Retrieved on 28 April, 2014.
- Department of Statistic Malaysia. (2013). *Compendium of Environment Statistic 2013*. Department of Statistic Malaysia Official Website. Retrieved on 28 April, 2014.
- Department of Statistics Malaysia. (2014). *Characteristic of Household 2010*, Department of Statistics Malaysia.
- Desa, A., Kadir, N. B. y. A., & Yusoff, F. (2011). A Study on the Knowledge, Attitudes, Awareness Status and Behaviour Concerning Solid Waste Management. *Procedia - Social and Behavioral Sciences*, 18(0), 643-648.
- Desa, A., Kadir, N. B. y. A., & Yusoff, F. (2012). Waste Education and Awareness Strategy: Towards Solid Waste Management (SWM) Program at UKM. *Procedia - Social and Behavioral Sciences*, 59(0), 47-50.
- Dharmender Singh. (2011, January 1). Nationwide Campaign on “No Plastic Bags on Saturdays” Launched. *The Star Online*. Retrieved on <http://www.thestar.com.my/story.aspx/?file=%2f2011%2f1%2f1%2fnation%2f20110101154253>
- Diamantopoulos, A., Riefler, P., Roth, K.P. (2003). Advancing Formative Measurement Models. *Journal of Business Research*, 61, 1203–1218.
- Diekmann, A., & Franzen, A. (1999). The Wealth of Nations and Environmental Concern. *Environment and Behavior*, 31(4), 540-549.

- Dietz, T., Stern, P. C., & Guagnano, G. A. (1998). Social Structural and Social Psychological Bases of Environmental Concern. *Environment and Behavior*, 30(4), 450-471.
- Dobson, A. (2007). Environmental Citizenship: Towards Sustainable Development. *Sustainable Development*, 15(5), 276-285.
- Dominick, D., Juahir, H., Latif, M. T., Zain, S. M., & Aris, A. Z. (2012). Spatial Assessment of air Quality Patterns in Malaysia Using Multivariate Analysis. *Atmospheric Environment*, 60(0), 172-181.
- Dunlap, R.E. & Van Liere, K.D. (1978). The “New Environmental Paradigm”: A Proposed Measuring Instrument and Preliminary Results. *Journal of Environmental Education*, 9, 10-19.
- Dunlap, R. E. (1994). International Attitudes Towards Environment and Development. *Green Globe Yearbook of International Co-operation on Environment and Development*, 115-126.
- Dunlap, R. E., Van Liere, K. Mertig, A., & Jones, R. E. (2000). Measuring Endorsement of the New Ecological Paradigm: A revised NEP scale. *Journal of Social Issues*, 56(3), 425-442.
- Dunlap, R. E. & Jones, R. E. (2002). Environmental Concern: Conceptual and Measurement Issues. In Dunlap, R. and Michelson, W. (Eds.), *Handbook of Environmental Sociology*. Westport: Greenwood Press, 482–524.
- Dzulkifly, D., & Anand, P. (2014, June 17). Opt for Other Ways to Cool Down, Say Experts. *Malay Mail Online*. Retrieved on <http://www.themalaymailonline.com/malaysia/article/opt-for-other-ways-to-cool-down-say-experts>
- Elmualim, A., Shockley, D., Valle, R., Ludlow, G., and Shah, S. (2010). Barriers and Commitment of Facilities Management Profession to the Sustainability Agenda. *Building and Environment*, 45(1), 58-64.
- Falk, R. Frank & Nancy B. Miller. (1992). *A Primer for Soft Modeling*. Akron, Ohio: University of Akron Press.
- Fishbein, M. & Ajzen, I. (1975). *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*. Reading, MA: Addison-Wesley
- Fornell, C., & Larcker, D.F., (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research* 18, 39-50.

- Fransson, N. & Gärling, T. (1999). Environmental Concern: Conceptual Definition, Measurement Methods, and Research Findings. *Journal of Environmental Psychology, 19*(4), 369-382.
- Franzen, A. (2003). Environmental Attitudes in International Comparison: An Analysis of the ISSP Surveys 1993 and 2000*. *Social Science Quarterly, 84*(2), 297-308.
- Franzen, A., & Meyer, R. (2010). Environmental Attitudes in Cross-National Perspective: A Multilevel Analysis of the ISSP 1993 and 2000. *European Sociological Review, 26*(2), 219-234.
- Franzen, A., & Vogl, D. (2013). Two Decades of Measuring Environmental Attitudes: A comparative Analysis of 33 Countries. *Global Environmental Change, 23*(5), 1001-1008.
- Freije, A. M., Hussain, T., & Salman, E. A. (2017). Global Warming Awareness among the University of Bahrain Science Students. *Journal of the Association of Arab Universities for Basic and Applied Sciences, 22*, 9-16.
- Frick, J., Kaiser, F. G., & Wilson, M. (2004). Environmental Knowledge and Conservation Behavior: Exploring Prevalence and Structure in a Representative Sample. *Personality and Individual Differences, 37*(8), 1597-1613
- Gadenne, D. L., Kennedy, J., & McKeiver, C. (2009). An Empirical Study of Environmental Awareness and Practices in SMEs. *Journal of Business Ethics, 84*(1), 45-63.
- Gifford, R., & Nilsson, A. (2014). Personal and Social Factors that Influence Pro-environmental Concern and Behaviour: A Review. *International Journal of Psychology, 49*(3), 141-157.
- Gilbertson, M., Hurlimann, A., & Dolnicar, S. (2011). Does Water Context Influence Behaviour and Attitudes to Water Conservation? *Australian Journal of Environmental Management, 18*(1), 47-60.
- Gray, R.M., Kasteler, J.M. & Geertsen, H.R. (1973). Public Attitudes toward Air Pollution as a Motivational Factor in Taking Action. *Ann Reg Sci, 7*(2), 106-114.
- Gu, Z. H., Sun, Q., & Wennersten, R. (2013). Impact of Urban Residences on Energy Consumption and Carbon Emissions: An Investigation in Nanjing, China. *Sustainable Cities and Society, 7*, 52-61.

- Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate Data Analysis, fifth edition*. New Jersey: Prentice-Hall International, Inc.
- Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a Silver Bullet. *Journal of Marketing Theory and Practice, 19*, 139-151.
- Hair, J., Sarstedt, M., Ringle, C., & Mena, J. (2012). An Assessment of the Use of Partial Least Squares Structural Equation Modeling in Marketing Research. *Journal of the Academy of Marketing Science, 40*(3), 414-433.
- Hair J. F.Jr., Hult G. T. M., Ringle C. M., & Sarstedt M. (2014). *A primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*. Thousand Oaks, CA: SAGE.
- Hansla, A., Gamble, A., Juliusson, A., & Gärling, T. (2008). The Relationships Between Awareness of Consequences, Environmental Concern, and Value Orientations. *Journal of Environmental Psychology, 28*(1), 1-9.
- Harth, N. S., Leach, C. W., & Kessler, T. (2013). Guilt, Anger, and Pride about In-group Environmental Behaviour: Different Emotions Predict Distinct Intentions. *Journal of Environmental Psychology, 34*(0), 18-26.
- Hassan, A. a., Noordin, T. A., & Sulaiman, S. (2010). The Status on the Level of Environmental Awareness in the Concept of Sustainable Development amongst Secondary School Students. *Procedia - Social and Behavioral Sciences, 2*(2), 1276-1280.
- Hashim, H., Hudzori, A., Yusop, Z., & Ho, W. S. (2013). Simulation Based Programming for Optimization of Large-scale Rainwater Harvesting System: Malaysia Case Study. *Resources, Conservation and Recycling, 80*(0), 1-9.
- Haşiloğlu, M. A., Keleş, P. U., & Aydın, S. (2011). Examining Environmental Awareness of Students from 6th, 7th and 8th Classes with respect to Several Variables: "Sample of Agri City". *Procedia - Social and Behavioral Sciences, 28*(0), 1053-1060.
- Hayward, K. (1990). Responsible Environmental Behaviour: A test of the Hines model. *Thesis and Dissertations (Comprehensive)*. 588.
- Hawcroft, L. J., & Milfont, T. L. (2010). The use (and abuse) of the New Environmental Paradigm Scale over the last 30 years: A meta-analysis. *Journal of Environmental Psychology, 30*, 245-248.

- Heerwegh, D. (2009). Mode Differences Between Face-to-Face and Web Surveys: An Experimental Investigation of Data Quality and Social Desirability Effects. *International Journal of Public Opinion Research*, 21(1), 111-121.
- Heerwegh, D., & Loosveldt, G. (2008). Face-to-Face versus Web Surveying in a High-Internet-Coverage Population: Differences in Response Quality. *Public Opinion Quarterly*, 72(5), 836-846.
- Hines, J. M., Hungerford, H. R., & Tomera, A. N. (1986/87). Analysis and Synthesis of Research on Responsible Environmental Behavior: A Meta-Analysis. *The Journal of Environmental Education*, 18(2), 1-8.
- Hodges, C. P. (2005). A Facility Manager's Approach to Sustainability. *Journal of Facilities Management*, 3(4), 312-324.
- Hosseini, S. E., Wahid, M. A., & Aghili, N. (2013). The Scenario of Greenhouse Gases Reduction in Malaysia. *Renewable and Sustainable Energy Reviews*, 28(0), 400-409.
- Hsu, S. J. & Roth, R. E. (1998). An Assessment of Environmental Literacy and Analysis of Predictors of Responsible Environmental Behaviour Held by Secondary Teachers in the Hualien Area of Taiwan. *Environmental Education Research*, 4(3), 229-249.
- Hsu, S.J. (2004). The Effects of an Environmental Education Program on Responsible Environmental Behavior and Associated Environmental Literacy Variables in Taiwanese College Students. *The Journal of Environmental Education*, 35(2), 37-48.
- Hsu, J.L., & Lin, T.Y. (2015). Carbon Reduction Knowledge and Environmental Consciousness in Taiwan. *Management of Environmental Quality: An International Journal*, 26(1), 37-52
- Huebner, R. B., & Lipsey, M. W. (1981). The Relationship of Three Measures of Locus of Control to Environmental Activism. *Basic and Applied Social Psychology*, 2(1), 45-58.
- Huffman, A. H., Van Der Werff, B. R., Henning, J. B., & Watrous-Rodriguez, K. (2014). When do Recycling Attitudes Predict Recycling? An Investigation of Self-reported Versus Observed Behavior. *Journal of Environmental Psychology*, 38(0), 262-270.

- Hungerford, H. R. & Volk, T. L. (1990). Changing Learner Behavior Through Environmental Education. *The Journal of Environmental Education*, 21(3), 8-21.
- Ilyas, S., Khattak, A., Nasir, S. M., Qurashi, T., & Durrani, R. (2010). Air Pollution Assessment in Urban Areas and its Impact on Human Health in the City of Quetta, Pakistan. *Clean Technologies and Environmental Policy*, 12(3), 291-299.
- Inglehart, R. (1995). Public Support for Environmental Protection: Objective Problems and Subjective Values in 43 Societies. *Political Science and Politics*, 28, 57-72.
- Ingelhart, R. (1997). *Modernization and Postmodernization: Cultural, Economic, and Political Change in 43 Societies*. Princeton, NJ: Princeton University Press
- Intergovernmental Panel on Climate Change (IPCC). (2007). *Green Peace Briefing. Contribution of Working Group II to the Fourth Assessment Report of the IPCC Cambridge*, Cambridge University Press.
- Intergovernmental Panel on Climate Change (IPCC). (2014). *Climate Change 2014 - Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fifth Assessment Report of the IPCC Cambridge*, Cambridge University
- Ishii S, Bell, J. N. B., Marshall, F. M. (2007) Phytotoxic Risk Assessment of Ambient Air Pollution on Agricultural Crops in Selangor State, Malaysia. *Environ Pollut*, 150, 267-279
- Islam, M. T., Abdullah, A. B., Shahir, S. A., Kalam, M. A., Masjuki, H. H., Shumon, R., & Rashid, M. H. (2016). A Public Survey on Knowledge, Awareness, Attitude and Willingness to Pay for WEEE Management: Case study in Bangladesh. *Journal of Cleaner Production*, 137, 728-740.
- Japan Times. Retrieved on 10 May, 2014 from <http://www.japantimes.co.jp/life/2013/06/24/environment/malaysia-chokes-as-air-pollution-hits-16-year-high/#.U22TWtLHlmw>
- Jairath, N., Hogerney, M., & Parsons, C. (2000). The Role of the Pilot Study: A Case Illustration from Cardiac Nursing Research. *Applied Nursing Research*, 13(2), 92-96.

- Jayaratne, K. (2012). Inculcating the Ergonomic Culture in Developing Countries: National Healthy Schoolbag Initiative in Sri Lanka. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 54(6), 908-924.
- Jekria, N., & Daud, S. (2016). Environmental Concern and Recycling Behaviour. *Procedia Economics and Finance*, 35, 667-673.
- Jibril, J. D. a., Sipan, I. B., Sapri, M., Shika, S. A., Isa, M., & Abdullah, S. (2012). 3R s Critical Success Factor in Solid Waste Management System for Higher Educational Institutions. *Procedia - Social and Behavioral Sciences*, 65(0), 626-631.
- Johanson, G. A., & Brooks, G. P. (2010). Initial Scale Development: Sample Size for Pilot Studies. *Educational and Psychological Measurement*, 70(3), 394-400.
- Karatekin, K. (2014). Social Studies Pre-service Teachers' Awareness of Solid Waste and Recycling. *Procedia - Social and Behavioral Sciences*, 116, 1797-1801.
- Karim Ghani, W. A. W. A., Rusli, I. F., Biak, D. R. A., & Idris, A. (2013). An Application of the Theory of Planned Behaviour to Study the Influencing Factors of Participation in Source Separation of Food Waste. *Waste Management*, 33(5), 1276-1281.
- Karstensen, K. H., Parlikar, U. V., Ahuja, D., Sharma, S., Chakraborty, M. A., Maurya, H. P., Mallik, M., Gupta, P. K., Kamyotra, J. S., Bala, S. S., Kapadia, B. V. (2014). Destruction of Concentrated Chlorofluorocarbons in India Demonstrates An Effective Option to Simultaneously Curb Climate Change and Ozone Depletion. *Environmental Science & Policy*, 38(0), 237-244.
- Kathirvale, S., Muhd Yunus, M.N., Sopian, K., Samsuddin, A.H., (2003). Energy Potential from Municipal Solid Waste in Malaysia. *Renewable Energy*, 29, 559-567.
- Kerlinger, F.N. (1986). *Foundations of behavioural research* (3rd ed), New York: Holt, Rinehart and Winston.
- Kershaw, T., & Lash, D. (2013). Investigating the Productivity of Office Workers to Quantify the Effectiveness of Climate Change Adaptation Measures. *Building and Environment*, 69(0), 35-43.
- Khailani, D. K. & Perera, R. (2013). Mainstreaming Disaster Resilience Attributes in Local Development Plans for the Adaptation to Climate Change Induced

- Flooding: A Study Based on the Local Plan of Shah Alam City, Malaysia. *Land Use Policy*, 30(1), 615-627.
- Kilbourne, W., & Pickett, G. (2008). How Materialism Affects Environmental Beliefs, Concern, and Environmentally Responsible Behavior. *Journal of Business Research*, 61(9), 885-893.
- Kitzinger, J. (1994b). The methodology of focus groups: The Importance of Interaction between Research Participants. *Sociology of Health and Illness* 16,103-21.
- Klößner, C. A. (2013). A Comprehensive Model of the Psychology of Environmental Behaviour—A Meta-Analysis. *Global Environmental Change*, 23(5), 1028-1038.
- Ko, Y. (2013). Urban Form and Residential Energy Use: A Review of Design Principles and Research Findings. *Journal of Planning Literature*, 28(4), 327-351.
- Kollmuss, A. & Agyeman, J. (2002). Mind the Gap: Why do People Act Environmentally and What are the Barriers to Pro-environmental Behavior? *Environmental Education Research*, 8(3), 239-260.
- Kolony Gunting (2013). *Green Technology Initiatives in Malaysia*. Ministry of Energy, Green Technology and Water (KeTTHA). Retrieved on 13 March 2014. <http://home.jeita.or.jp/greenit-pc/activity/asia/file/malaysia1.pdf>
- Krajhanzl, J. (2010). Environmental and Pro-environmental Behaviour. *School and Health*, 21, 251–274.
- Lane, G. W. S., & Wagner, T. P. (2013). Examining Recycling Container Attributes and Household Recycling Practices. *Resources, Conservation and Recycling*, 75(0), 32-40.
- Lansana, F. M. (1993). A Comparative Analysis of Curbside Recycling Behavior in Urban and Suburban Communities. *The Professional Geographer*, 45(2), 169-179.
- Lanza, S. T., Patrick, M. E., & Maggs, J. L. (2010). Latent Transition Analysis: Benefits of a Latent Variable Approach to Modeling Transitions in Substance Use. *Journal of Drug Issues*, 40(1), 93-120.
- Latif, S. A., Omar, M. S., Bidin, Y. H., & Awang, Z. (2013). Analyzing the Effect of Situational Factor on Recycling Behaviour in Determining the Quality of Life. *Journal of Asian Behavioural Studies*, 3(8)

- Leary, M. R., & Hoyle, R. H. (Eds.). (2013). *Handbook of Individual Differences in Social Behavior*. Guilford Publications
- Lin, T., Guo, X., Zhao, Y., Pan, L., & Xiao, L. (2010). A study of Residents' Environmental Awareness among Communities in a Peri-urban Area of Xiamen. *International Journal of Sustainable Development & World Ecology*, 17(4), 285-291.
- Liu, X., Vedlitz, A., & Shi, L. (2014). Examining the Determinants of Public Environmental Concern: Evidence from National Public Surveys. *Environmental Science & Policy*, 39(0), 77-94.
- Luckas, B., J. Hair, & D. Ortinau. (2004). *Marketing Research*. North Ryde, N.S.W: McGraw-Hill.
- Mabahwi, N. A., Leh, O. L. H., & Omar, D. (2015). Urban Air Quality and Human Health Effects in Selangor, Malaysia. *Procedia - Social and Behavioral Sciences*, 170(Supplement C), 282-291.
- MacNaughton, P., Melly, S., Vallarino, J., Adamkiewicz, G., & Spengler, J. D. (2014). Impact of Bicycle Route Type on Exposure to Traffic-related Air Pollution. *Science of The Total Environment*, 490(0), 37-43
- Madden, T. J., Ellen, P. S., & Ajzen, I. (1992). A Comparison of the Theory of Planned Behavior and the Theory of Reasoned Action. *Personality and Social Psychology Bulletin*, 18(1), 3-9.
- Mahmud, M. (2013). Assessment of Atmospheric Impacts of Biomass Open Burning in Kalimantan, Borneo during 2004. *Atmospheric Environment*, 78(Supplement C), 242-249.
- Malaysian Green Technology & Renewable Energy Industry Overview (2011). Retrieved on 13 March 2014 at [http://www.ice.gov.it/paes/asia/malaysia/upload/173/GT_&_RE_Report\[1\].pdf](http://www.ice.gov.it/paes/asia/malaysia/upload/173/GT_&_RE_Report[1].pdf)
- Manaf, L. A., Samah, M. A. A., & Zukki, N. I. M. (2009). Municipal Solid Waste Management in Malaysia: Practices and challenges. *Waste Management*, 29(11), 2902-2906.
- Manoli, C. C., Johson, B., & Dunlap, R. E. (2007). Assessing Children's Environmental Worldviews: Modifying and Validating the New Ecological Paradigm Scale for Use With Children. *The Journal of Environmental Education*, 38(4), 3-13.

- Manomaivibool, P., & Vassanadumrongdee, S. (2012). Buying Back Household Waste Electrical and Electronic Equipment: Assessing Thailand's Proposed Policy in Light of Past Disposal Behavior and Future Preferences. *Resources, Conservation and Recycling*, 68(0), 117-125.
- Martin, V. Y., Weiler, B., Reis, A., Dimmock, K., & Scherrer, P. (2017). 'Doing the right thing': How Social Science can help Foster Pro-environmental Behaviour Change in Marine Protected Areas. *Marine Policy*, 81, 236-246.
- McBean, G., Weaver, A., Roulet, N. (2001). The Science of Climate Change—What do We Know? *Isuma-Can. J. Policy Res.* 2 (4), 16–25.
- McBean, G., & Ajibade, I. (2009). Climate Change, Related Hazards and Human Settlements. *Current Opinion in Environmental Sustainability*, 1(2), 179-186.
- McBean, G. (2004). Climate Change and Extreme Weather: A Basis for Action. *Natural Hazards*, 31(1), 177-190.
- McDaniels, T. L., Axelrod, L. J., and Cavanagh, N. (1998). Public Perceptions regarding Water Quality and Attitudes toward Water Conservation in the Lower Fraser Basin. *Water Resources Research*, 34(5), 1299-1306.
- McCright, A. M. (2010). The Effects of Gender on Climate Change Knowledge and Concern in the American Public. *Population and Environment*, 32(1), 66-87.
- McKenzie-Mohr, D. (2000). Promoting Sustainable Behavior: An Introduction to Community-based Social Marketing. *Journal of Social Issues*, 56(3), 543–554.
- McMichael, A. J., Woodruff, R. E., & Hales, S. (2006). Climate Change and Human Health: Present and Future Risks. *The Lancet*, 367(9513), 859-869.
- Meng, M., Koh, P. P., Wong, Y. D., & Zhong, Y. H. (2014). Influences of Urban Characteristics on Cycling: Experiences of Four Cities. *Sustainable Cities and Society*, 13(0), 78-88.
- Mensah, A. E., Adrienne, M., Olufunke, C., & Liqa, R.-S. (2016). Perceptions, Attitudes and Behaviours toward Urban Surface Water Quality in Accra, Ghana. *Management of Environmental Quality: An International Journal*, 27(5), 491-506.
- Mezghenni, R., & Zouari, S. (2016). Concern for the Environment in Terms of Waste Sorting Behavior. *SAGE Open*, 6(4), 2158244016657140.

- Milfont, T. L., Richter, I., Sibley, C. G., Wilson, M. S., & Fischer, R. (2013). Environmental Consequences of the Desire to Dominate and Be Superior. *Personality and Social Psychology Bulletin, 39*(9), 1127-1138.
- Ministry of Housing and Local Government Malaysia (2005). *National Strategic Plan for Solid Waste Management*. Local Government Department, Ministry of Housing and Local Government Malaysia Report.
- Ministry of Natural Resources and Environment Malaysia (NRE), 2005. *Climate Change in Malaysia*. Putrajaya, Malaysia.
- Ministry of Natural Resources of Environment Malaysia (NRE) (2011). *Malaysia's second national communication to the UNFCCC*. Putrajaya, Malaysia.
- Ministry of Natural Resources and the Environment (NRE) in collaboration with Universiti Teknologi Malaysia (UTM). (2012). Environmental Performance Index for Malaysia 2012.
- Min, W. (2011). An Analysis on Environmental Awareness and Behavior in Chinese Hospitality Industry—A Case of Xiamen City. *Energy Procedia, 5*(0), 1126-1137.
- Mobley, C., Vagias, W. M., & DeWard, S. L. (2010). Exploring Additional Determinants of Environmentally Responsible Behavior: The Influence of Environmental Literature and Environmental Attitudes. *Environment and Behavior, 42*(4), 420-447.
- Moh, Y. C., & Abd Manaf, L. (2014). Overview of Household Solid Waste Recycling Policy Status and Challenges in Malaysia. *Resources, Conservation and Recycling, 82*(0), 50-61
- Mondejar-Jimenez, J. A., Cordente-Rodriguez, M., Meseguer-Santamaria, M. L., & Gazquez-Abad, J. C. (2011). Environmental Behavior and Water Saving in Spanish Housing. *International Journal of Environmental Research, 5*(1), 1-10.
- Mooi, E. A., & Sarstedt, M. (2011). *A Concise Guide to Market Research: The Process Data and Methods using IBM SPSS Statistic*. Berlin: Springer.
- Moreno, T., Lavín, J., Querol, X., Alastuey, A., Viana, M., & Gibbons, W. (2009). Controls on Hourly Variations in Urban Background Air Pollutant Concentrations. *Atmospheric Environment, 43*(27), 4178-4186.
- Mostafa, M.M. (2007). A Hierarchical Analysis of the Green Consciousness of the Egyptian Consumer. *Psychology & Marketing, 24* (5), 445-473.

- Nasrudin, N. a., Nor, A. R. M., Noor, H. M., & Abdullah, Y. A. (2013). Urban Residents' Awareness and Readiness for Sustainable Transportation Case Study: Shah Alam, Malaysia. *Procedia - Social and Behavioral Sciences*, 105(Supplement C), 632-643.
- New Straits Times (2014, February 26). Retrieved on 10 May 2014 on <http://www.nst.com.my/latest/haze-in-malaysia-caused-by-domestic-factors-meteorological-department-1.493689>
- Ng, K.-M., Trusty, J., & Crawford, R. (2005). A Cross-Cultural Validation of the Attachment Style Questionnaire: A Malaysian Pilot Study. *The Family Journal*, 13(4), 416-426.
- Nolan, J. M. (2010). "An Inconvenient Truth" Increases Knowledge, Concern, and Willingness to Reduce Greenhouse Gases. *Environment and Behavior*, 42(5), 643-658.
- Noorhosseini, S. A., Allahyari, M. S., Damalas, C. A., & Moghaddam, S. S. (2017). Public Environmental Awareness of Water Pollution from Urban Growth: The Case of Zarjub and Goharrud rivers in Rasht, Iran. *Science of The Total Environment*, 599–600, 2019-2025.
- Nunnally, J. C., & Bernstein, I. (1994). *Psychometric theory*. New York: McGraw-Hill.
- Olson J., & Zanna, M. (1993). Attitudes and Attitude Change. *Annual Review of Psychology*, 44, 117-154.
- Oreg, S., & Katz-Gerro, T. (2006). Predicting Proenvironmental Behavior Cross-Nationally: Values, the Theory of Planned Behavior, and Value-Belief-Norm Theory. *Environment and Behavior*, 38(4), 462-483.
- Ostman, R., Parker, J. (1987). Impact on Education, Age, Newspapers and Television on Environmental Knowledge, Concerns and Behaviours. *Journal of Environmental Education*, 19, 3D9.
- Othman, F., M. E, A. E., & Mohamed, I. (2012). Trend Analysis of A Tropical Urban River Water Quality in Malaysia. *Journal of Environmental Monitoring*, 14(12), 3164-3173.
- Othman, J., Sahani, M., Mahmud, M., & Sheikh Ahmad, M. K. (2014). Transboundary Smoke Haze Pollution in Malaysia: Inpatient Health Impacts and Economic Valuation. *Environmental Pollution*, 189(0), 194-201.

- Owens, S., & Driffill, L. (2008). How to Change Attitudes and Behaviours in the Context of Energy. *Energy Policy*, 36(12), 4412-4418.
- Poortinga, W., Steg, L., & Vlek, C. (2004). Values, Environmental Concern, and Environmental Behavior: A Study into Household Energy Use. *Environment and behavior*, 36(1), 70-93.
- Rada, V. D. d., & Domínguez-Álvarez, J. A. (2014). Response Quality of Self-Administered Questionnaires: A Comparison Between Paper and Web Questionnaires. *Social Science Computer Review*, 32(2), 256-269.
- Ramakrishnaiah, C.R, Sadashivaiah, C, & Ranganna, G. (2009). Assessment of Water Quality Index for the Groundwater in Tumkur Taluk, Karnataka State, India. *E-Journal of Chemistry*, 6 (2). 523–530.
- Rao, K., Kaminska, O., & McCutcheon, A. L. (2010). Recruiting Probability Samples for a Multi-Mode Research Panel with Internet and Mail Components. *Public Opinion Quarterly*, 74(1), 68-84.
- Rauwald, K. S., & Moore, C. F. (2002). Environmental Attitudes as Predictors of Policy Support across Three Countries. *Environment and Behavior*, 34(6), 709-739.
- Rehan, R., & Nehdi, M. (2005). Carbon Dioxide Emissions and Climate Change: Policy Implications for the Cement Industry. *Environmental Science & Policy*, 8(2), 105-114.
- Rhead, R., Elliot, M., & Upham, P. (2015). Assessing the Structure of UK Environmental Concern and its Association with Pro-environmental Behaviour. *Journal of Environmental Psychology*, 43, 175-183.
- Ringle, C.M., Wende, S. and Will, A. (2005). *SmartPLS 2.0 (Beta)*. SmartPLS, available at: www.smartpls.de (accessed January 24, 2015).
- Rosas-Flores, J. A., Rosas-Flores, D., & Gálvez, D. M. (2011). Saturation, Energy Consumption, CO2 Emission and Energy Efficiency from Urban and Rural Households Appliances in Mexico. *Energy and Buildings*, 43(1), 10-18.
- Rotter, J. B. (1966). Generalized Expectancies for Internal versus External Control of Reinforcements, *Psychological Monographs*, 80, (609).
- Rotter, J.B. (1975). Some Problems and Misconceptions Related to the Construct of Internal versus External Control of Reinforcement. *Journal of Consulting and Clinical Psychology*, 43, 56–67

- Rui Wang, Cheng Wu, Ma, X.-Q., Zhao, Y.-F., Yan, X.-Y., & Jia He. (2011). Health-related Quality of Life in Chinese People: A Population-based Survey of Five Cities in China. *Scandinavian Journal of Public Health*, 39(4), 410-418.
- Saeed, M. O., Hassan, M. N., & Mujeebu, M. A. (2009). Assessment of Municipal Solid Waste Generation and Recyclable Materials Potential in Kuala Lumpur, Malaysia. *Waste Management*, 29(7), 2209-2213.
- Sanchez, G. (2013). PLS Path Modeling with R. Trowchez Editions. Berkeley, 2013. Retrieved on 6 June 2014 at http://www.gastonsanchez.com/PLS_Path_Modeling_with_R.pdf
- Sarker, R., Yeasmin, M., Rahman, M. A., & Islam, M. A. (2018). People's Perception and Awareness on Air Pollution in Rural and Urban areas of Mymensingh Sadar upazila. *Progressive Agriculture*, 29(1), 22-32.
- Sarstedt, M., Henseler, J., & Ringle, C. M. (2011). Multigroup Analysis in Partial Least Squares (PLS) Path Modeling: Alternative Methods and Empirical Results. *Measurement and Research Methods in International Marketing*, 22, 195–218.
- Schultz, P.W., & Zelezny, L. (1998). Values and Pro-environmental Behavior: A Five-Country Survey. *Journal of Cross-Cultural Psychology*, 29, 540-558.
- Schultz, P. (2002). Environmental Attitudes and Behaviors across Cultures. *Online Readings in Psychology and Culture*, 8(1), 4.
- Schultz, P. W (2002). Knowledge, Information, and Household Recycling: Examining the Knowledge-Deficit Model of Behavior Change. *New Tools for Environmental Protection: Education, Information, and Voluntary Measures*. Washington, DC: The National Academies Press, 2002
- Schultz, P. W (2001). The Structure of Environmental Concern: Concern for Self, Other People, and the Biosphere. *Journal of Environmental Psychology*, 21(4), 327-339.
- Schultz, P. W., Gouveia, V. V., Cameron, L. D., Tankha, G., Schmuck, P., & Franěk, M. (2005). Values and Their Relationship to Environmental Concern and Conservation Behavior. *Journal of Cross-Cultural Psychology*, 36(4), 457-475.

- Schwartz, S.H. (1977). Normative Influence on Altruism. In L. Berkowitz (Ed.). *Advances in Experimental Social Psychology*, (Vol. 10, pp. 221-279). New York, Academic Press.
- Sengupta, M., Das, J. & Maji, R.K. (2010). Environmental Awareness and Environment Related Behavior of Twelfth Grade Students in Kolkata: Effects of Stream and Gender. *Anwesa*, 5, 1-8.
- Sivak, M., & Schoettle, B. (2012). Eco-driving: Strategic, Tactical, and Operational Decisions of the Driver that Influence Vehicle Fuel Economy. *Transport Policy*, 22(0), 96-99.
- Shoukry, S. H., Saad, S. G., & Eltemsahi, A. M. (2012). Awareness, Attitude, and Concerns of Workers and Stakeholders of an Environmental Organization Toward the Environment. *SAGE Open*. 2(4).
- Stefan, V., van Herpen, E., Tudoran, A. A., & Lähteenmäki, L. (2013). Avoiding Food Waste by Romanian Consumers: The Importance of Planning and Shopping Routines. *Food Quality and Preference*, 28(1), 375-381.
- Steg, L., & Vlek, C. (2009). Encouraging Pro-environmental Behaviour: An Integrative Review and Research Agenda. *Journal of Environmental Psychology*, 29(3), 309-317.
- Stern, P. C., Dietz, T., & Kalof, L. (1993). Value Orientations, Gender, and Environmental Concern. *Environment and Behavior*, 25(5), 322-348.
- Stern, P. C., & Dietz, T. (1994). The Value Basis of Environmental Concern. *Journal of Social Issues*, 50(3), 65-84.
- Stern, P. C. (2000). New Environmental Theories: Toward a Coherent Theory of Environmentally Significant Behavior. *Journal of Social Issues*, 56(3), 407-424.
- Stuart, T. (2009). *Waste: Uncovering the Global Food Scandal*. Penguin Books.
- Sumiani Y., Onn C.C., Mohd D & Wan W.Z. (2009). Strategies for Planning of Optimum Landfillsitting Decision Making. *Journal of Sains Malaysiana*. 457-62
- Sundblad, E. L., Biel, A., & Gärling, T. (2014). Intention to Change Activities that Reduce Carbon Dioxide Emissions Related to Worry about Global Climate Change Consequences. *Revue Européenne de Psychologie Appliquée/European Review of Applied Psychology*, 64(1), 13-17.

- Takahashi, B., & Selfa, T. (2014). Predictors of Pro-Environmental Behavior in Rural American Communities. *Environment and Behavior*, 47 (8), 856-876.
- Tam, K.-P., & Chan, H.-W. (2017). Environmental Concern has a Weaker Association with Pro-environmental Behavior in Some Societies than Others: A Cross-cultural Psychology Perspective. *Journal of Environmental Psychology*, 53, 213-223.
- Terzian, M. A., Li, J., Fraser, M. W., Day, S. H., & Rose, R. A. (2014). Social Information-Processing Skills and Aggression: A Quasi-Experimental Trial of the Making Choices and Making Choices Plus Programs. *Research on Social Work Practice*, 25(3), 358-369.
- Tranter, B., & Lester, L. (2015) Climate patriots? Concern over Climate Change and other Environmental Issues in Australia. *Public Understanding of Science*, 26(6), 738-752.
- Ullman, J. B. (2007). Structural Equation Modeling. In B. G. Tabachnick & L. S. Fidell (Eds.), *Using Multivariate Statistics* (5th ed., pp. 676–780). Boston: Allyn and Bacon.
- Varshney, R., Ahsan, M. J., Khan, M. G. M. (2011). An Optimum Multivariate Stratified Sampling Design with Nonresponse: A Lexicographic Goal Programming Approach. *Journal of Mathematical Modelling and Algorithms*, 10(4), 393-405.
- Vicente-Molina, M. A., Fernández-Sáinz, A., & Izagirre-Olaizola, J. (2013). Environmental Knowledge and Other Variables Affecting Pro-environmental Behaviour: Comparison of University Students from Emerging and Advanced Countries. *Journal of Cleaner Production*, 61(0), 130-138.
- Von Eye, A., & Bergman, L. R. (2003). Research Strategies in Developmental Psychopathology: Dimensional Identity and the Person-oriented Approach. *Development and Psychopathology*, 15(03), 553-580.
- Walsh, C., Jakeman, P., Moles, R., & O'Regan, B. (2008). A Comparison of Carbon Dioxide Emissions Associated with Motorised Transport Modes and Cycling in Ireland. *Transportation Research Part D: Transport and Environment*, 13(6), 392-399.
- Wang, Y., Sun, M., Yang, X., & Yuan, X. (2016). Public Awareness and Willingness to Pay for Tackling Smog Pollution in China: A Case Study. *Journal of Cleaner Production*, 112, Part 2, 1627-1634.

- Winifred, A., Ng, B. (2014, June 25). Haze Sends Air Quality to Unhealthy Levels. *Malaysia Mail Online*. Retrieved from <http://www.themalaymailonline.com/malaysia/article/haze-sends-air-quality-to-unhealthy-levels#v2EJxXu4kSw6xSFp.97>
- Wong, K. K. K. (2013). Partial Least Squares Structural Equation Modeling (PLS-SEM) Techniques Using SmartPLS. *Marketing Bulletin*, 24.
- World Health Organization (WHO) (2007). *Climate Change Country Profile: Malaysia*. Workshop on Climate Change and Health in South-East and East Asian Countries. WHO publication.
- WWF (2014). Managing Water Resources Well for Sustainability Retrieved on 10 May 2014 on http://www.wwf.org.my/about_wwf/what_we_do/freshwater_main/freshwater_sustainable_water_use/projects_sustainability_of_malaysia_s_water_resources_utilisation/smwru_issues/
- Yadolah, D. (2008). Stratified Sampling. *The Concise Encyclopedia of Statistics*, Springer New York: 523-525.
- Yale Center for Environmental Law and Policy (YCELP) and Center for International Earth Science Information Network (CIESIN) of Columbia University. (2012). Environment Sustainability Index. USA
- Yau, Y. H. & Pean, H. L. (2011). The Climate Change Impact on Air Conditioner System and Reliability in Malaysia—A Review. *Renewable and Sustainable Energy Reviews*, 15(9), 4939-4949.
- Yousuf, T., & Rahman, M. (2007). Monitoring Quantity and Characteristics of Municipal Solid Waste in Dhaka City. *Environmental Monitoring and Assessment*, 135(1-3), 3-11.
- Zen, I. S., Ahamad, R., and Omar, W. (2013). No Plastic Bag Campaign Day in Malaysia and the Policy Implication. *Environment, development and sustainability*, 15(5), 1259-1269.
- Zurbrugg, C. (2002). Urban Solid Waste Management in Low-income Countries of Asia How to Cope with the Garbage Crisis. Presented for: *Scientific Committee on Problems of the Environment (SCOPE) Urban Solid Waste Management Review Session*, Durban, South Africa, 1-13.