

**Climate Change Threats and Adaptation
Responses in Small Island Developing States:
A Comparative Analysis of
Antigua & Barbuda and Vanuatu**

Adelle Anelta Camelita Blair

BSc (Hons-1) (The University of Technology, Jamaica)

MSc (University of East Anglia, United Kingdom)

MSc (University of Southampton, United Kingdom)

**A Thesis submitted for the degree of
Doctor of Philosophy (Sustainable Resource Management)**

The School of Environmental and Life Sciences
University of Newcastle, Australia

July 2017

Statement of Originality

The thesis contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. I give consent to the final version of my thesis being made available worldwide when deposited in the University's Digital Repository, subject to the provisions of the Copyright Act 1968.

Adelle Anelta Camelita Blair

Signed:

Date: 24/07/2017.....

Acknowledgements

I wish to express my sincere thanks to the Australian Agency for International Development (AusAID) for bestowing on me an Australian Development Awards Scholarship to pursue this doctoral research programme at the University of Newcastle, Australia. Special thanks to Lynne Williams and the other officers who assisted me over the years.

I convey my heartfelt gratitude to Associate Professor Dr Salim Momtaz, my principal supervisor, for guiding me through this research, constantly challenging me to improve. I wish to also thank Dr. Maria Schreider, my co-supervisor, for her input in completing this research.

Special thanks to the Government of Antigua & Barbuda in general and the Ministry of Tourism in particular for granting the requisite permission. Avonelle Alfred and Kimone Powell, sincere thanks for bringing the scholarship to my attention and facilitating the process.

To the Government of the Republic of Vanuatu, for allowing part of the research to be conducted in Efate and Epi, thank you. To Malcolm Dalesa and, Brian Phillips for their invaluable assistance, I am indebted and express sincere thanks.

To the government officials, the farmers, fishers and accommodation owners and managers in Antigua, Barbuda, Efate and Epi, who participated in the pilot survey, the questionnaire surveys, interviews and focus group discussions, thank you all. Special

thanks to Wesley Roberts for facilitating the focus group discussions and Alec John for his assistance.

I am thankful to my family and friends, for their support and encouragement and for making my time away from home bearable.

Above all, I am grateful to Almighty God for the privilege to participate in this programme, for His wisdom and protection throughout the process.

Dedication

I dedicate this humble work to the memory of my late parents,

Hezekiah Adolphus Blair and

Gwendolyn Irene Joseph Blair

As well as my original co-supervisor,

Dr Kenneth Zimmerman

Publications

The following articles are based on the results of the research work conducted under this study and have been submitted for publication:

Journal: *Climatic Change*

Title: **Climate Variability and Change in the Caribbean and the South Pacific: Learning from Farmers' Perceptions and Responses in Antigua and Efate**

By: Adelle Blair and Salim Momtaz. Submitted 19-04-2017. Reviewed 20-09-2017

Journal: *Ocean and Coastal Management*

Title: **Climate Change Perception and Response: Case studies of Fishers from Antigua and Efate**

By: Adelle Blair and Salim Momtaz. Submitted 08-06-2017. Reviewed 30-08-2017.

Journal: *Climate and Development*

Title: **Hoteliers' Perceptions and Responses to Climate Variability and Change in Antigua and Efate**

By: Adelle Blair and Salim Momtaz. Submitted 05-07-2017

Table of Contents

List of Figures	xi
List of Tables	xiii
List of Photos.....	xiv
List of Boxes	xv
List of Maps.....	xv
Abstract.....	xvi
Chapter 1: Introduction	1
1.1 Background	1
1.2 Problem Statement.....	4
1.3 Research Aims, Objectives and Questions.....	5
1.4 Research Methodology	7
1.5 Thesis Outline.....	9
Chapter 2 Literature Review	11
2.1 Historical Background	11
2.2 Climate Change Adaptation – Theoretical Context.....	14
2.2.1 Hazard or impacts-based approach	15
2.2.2 Risk Management-based Approach	16
2.2.3 Vulnerability-based Approach	17
2.2.4 Resilience-based approach	18
2.2.5 Adaptive Capacity Approach.....	18
2.2.6 Adaptation	19
2.2.7 Adaptation Policy Framework.....	21
2.3 Small Island Developing States	23
2.3.1 Changing Climate	27
2.4 The Gap	36
2.5. Research Questions	39
2.6 Conclusion.....	41
Chapter 3: Methodology.....	43
3.1 Introduction	43
3.2 Research Methodologies	43
3.3 Research Design	44
3.4 Research Methods	45

3.4.1	Survey Research	46
3.4.2	Archival or Existing Data Research.....	46
3.4.3	Comparative Research Design	47
3.5	Data Collection.....	48
3.5.1	Survey Research.....	48
3.5.2	Sampling.....	50
3.5.3	Structure of the Questionnaire	54
3.5.4	Focus Group Discussions Schedule	56
3.5.5	Structured Interview Schedule	57
3.6	Data Analysis Methods	58
3.6.1	Analysis Process of Questionnaire data	58
3.6.2	Parametric and Non-Parametric Tests.....	59
3.6.3	Fisher’s Exact Test of Independence.....	60
3.6.4	Analysis Process of Structured Interviews data	61
3.6.5	Analysis Process of Focus Group Discussions and Nominal Group Interviews...	61
3.6.6	Analysis Process for Secondary data.....	61
3.6.7	Comparative Analysis of Research Data	65
3.7	Reliability and Validity.....	65
3.8	Ethical Considerations.....	67
3.9	Procedures Used	68
3.10	Study Limitations	69
3.11	Conclusion.....	70
Chapter 4: Climate Change Impacts on Livelihoods in.....		71
Antigua and Efate.....		71
4.1	Introduction	71
4.2	Results of the Survey Questionnaire.....	71
4.2.1	Farmers	71
4.2.2	Fishers	89
4.2.3	Hoteliers.....	107
4.3	Discussion.....	124
4.3.1	Farmers	124
4.3.2	Fishers	133
4.3.3	Hoteliers.....	146
4.4	Conclusions	160

Chapter 5: Climate Change Impacts on Livelihoods in.....	162
Barbuda and Epi	162
5.1 Introduction	162
5.2 Barbuda	162
5.2.1 Farmers	162
5.2.2 Fishers	169
5.2.3 Hoteliers	174
5.3 Epi.....	180
5.3.1 Farmers	180
5.3.2 Fishers	185
5.3.3 Hoteliers	192
5.4 Discussion.....	199
5.4.1 Farmers	199
5.4.2 Fishers	203
5.4.3 Hoteliers	205
5.5 Conclusions	207
Chapter 6: Mainstreaming of Climate Change Adaptation and Evaluation and Analysis of Adaptation Projects	209
6.1 Introduction	209
6.2 Results of the Structured Interviews	213
6.2.1 Demographic Profile	213
6.2.2 Natural Resources and Climate Change Management Agencies.....	214
6.2.3 Ministries of Finance	219
6.3 Discussion.....	224
6.4.1 Minimal Incorporation of Mainstreaming	225
6.4.2 Agencies attend International Meetings to Access Funding for local Adaptation 230	
6.4.3 Public Awareness is Inadequate to address Climate Change	232
6.4.4 Very Little or no Change in Governance due to Climate Change.....	233
6.4.5 Tourism will continue to play a Vital Role in the Economies of both Countries	235
6.4.6 Conclusion.....	237
6.5 Evaluation of Donor-funded Projects, Plans, Programmes and Assessments.....	238
6.6 Discussion of the Findings of the Evaluated Adaptation Projects	246
6.6.1 Introduction	246

6.6.2	Project Support was in Accordance with the Priorities of the Funding Agencies	247
6.6.3	Most of the Projects focused on Capacity Building	248
6.8.4	Some Projects Provided very little Funding to Small Islands	250
6.6.5	Most Projects were found to be Relevant and Replicable.....	252
6.7	Conclusions	253
Chapter 7:	Conclusions and Recommendations	255
7.1	Summary of the Major Empirical Findings.....	256
7.2	Theoretical Implications.....	259
7.3	Policy Implications and Recommendations	262
7.4	Limitations and Future Research Directions.....	266
	Bibliography	269
	Appendices.....	291
	Appendix A: Farmers Questionnaire.....	291
	Appendix B: Fishers Questionnaire	300
	Appendix C: Hoteliers Questionnaire.....	309
	Appendix D: Pre-test Feedback Form	318
	Appendix E: Facilitator’s Guidelines Focus Group Discussions	319
	Appendix F: Focus Group Discussion Themes for Farmers, Fishers and Hoteliers	320
	Appendix G: Interview Schedule 1 - Resource Management Agencies	327
	Appendix H: Interview Schedule - Ministries of Finance	328
	Appendix I: Project Evaluation and Analysis Tables.....	330

List of Figures

Figure 2.1	The key risks caused by Climate Change	13
Figure 2.2	Annual rainfall for Antigua, 1950-2014	28
Figure 2.3	Drought Episodes experienced in Antigua, 1964-2014	30
Figure 2.4	Annual average Max and Min Temperatures for VC Bird Airport, 1971-2014	31
Figure 2.5	Annual Average Max and Min Temperatures for Bauerfield Airport, 1986-2014	33
Figure 2.6	Annual rainfall for Efate, 1972-2014	34
Figure 3.1	The typology of adaptation strategies used in classifying adaptation options	63
Figure 3.2	Evaluation criteria selected for this study	64
Figure 4.1	The meaning of Climate Change, Farmers	74
Figure 4.2	Perceived causes of Climate Change, Farmers	75
Figure 4.3	Information sources, Farmers	78
Figure 4.4	Perceived impacts of extreme weather events on Farms	81
Figure 4.5	Crop management measures recently implemented, Farmers	83
Figure 4.6	Water management measures recently implemented, Farmers	84
Figure 4.7	Land management measures recently implemented, Farmers	85
Figure 4.8	Extreme Weather Events Expected in the Future, Farmers	87
Figure 4.9	Hindrances to further Climate Change Preparation, Farmers	88
Figure 4.10	Additional Comments on Climate Change and the Farming Industry	89
Figure 4.11	Meaning of Climate Change, Fishers	93
Figure 4.12	Perceived Causes of Climate Change, Fishers	94
Figure 4.13	Perceived Effects of Climate Change, Fishers	96
Figure 4.14	Perceived Impacts of Extreme Weather Events on Fishing	102
Figure 4.15	Recent Changes by Fishers - Antigua and Efate	103
Figure 4.16	Extreme Weather Events Expected in the Future, Fishers	104
Figure 4.17	Hindrances to Climate Change Preparation, Fishers	106
Figure 4.18	The Meaning of Climate Change, Hoteliers	110
Figure 4.19	Causes of Climate Change, Hoteliers	111

Figure 4.20	Information Sources, Hoteliers	113
Figure 4.21	Extreme Weather Events Expected in the Future, Hoteliers	121
Figure 4.22	Hindrances to Climate Change Preparation, Hoteliers	122
Figure 6.1	Areas Requiring Adaptation Support in Antigua and Barbuda	239
Figure 6.2	Priority Areas Identified for Support in Vanuatu	243

List of Tables

Table 2.1	Climate Change Impacts and Resulting Threats	24
Table 2.2	Country Statistics	26
Table 3.1	Structured Interview Participants	53
Table 4.1	Demographic Characteristics of the Farmers	72
Table 4.2	Perceived Effects of Climate Change, Farmers	76
Table 4.3	Perceived Changes in the Climate and on the Farm	79
Table 4.4	Demographic Characteristics of the Fishers	90
Table 4.5	Perceived Changes, Fishers	98
Table 4.6	Top Disagreements with Perceived Changes, Fishers	100
Table 4.7	Demographic Characteristics of the Hoteliers	108
Table 4.8	Perceived Effects of Climate Change, Hoteliers	112
Table 4.9	Perceived Changes, Hoteliers	114
Table 4.10	Perceived Weather Events Affecting Hoteliers and their Impacts	117
Table 4.11	Recent Changes and Plans, Hoteliers	118
Table 5.1	Participant Characteristics, Barbuda - Farmers	163
Table 5.2	Participant Characteristics, Barbuda - Fishers	169
Table 5.3	Participant Characteristics, Barbuda - Hoteliers	174
Table 5.4	Participant Characteristics, Epi - Farmers	181
Table 5.5	Participant Characteristics, Epi - Fishers	186
Table 5.6	Participant Characteristics, Epi - Hoteliers	193
Table 6.1	Agencies with responsibility for natural resource management and climate change	211
Table 6.2	Structured Interview Participants Profile	214
Table 6.3	Incorporation of Mainstreaming Considerations	215
Table 6.4	Benefits of Meeting Attendance Responses	216
Table 6.5	Making the Case for Mainstreaming Results – Ministries of Finance	220
Table 6.6	Organisational Level Results- Ministries of Finance	221
Table 6.7	Operational Level Results- Ministries of Finance	222
Table 6.8	Implementation Level Results - Ministries of Finance	223
Table 6.9	Adaptation Strategies used in the Antigua & Barbudan Projects	240

Table 6.10	Results of the Projects' Performance against the Evaluation Criteria – Antigua & Barbuda	242
Table 6.11	Adaptation Strategies used in the Vanuatu Projects	244
Table 6.12	Results of the Projects' Performance against the Evaluation Criteria - Vanuatu	245

List of Photos

Photo 4.1	Dried dam in South Central zone, Antigua	77
Photo 4.2	Water conservation methods, showing two forms of drip irrigation	83
Photo 4.3	Typical Antiguan Fishing Vessels	91
Photo 4.4	Typical fishing canoe in Vanuatu	92
Photo 4.5	Lionfish caught by an Antiguan Fisher	99
Photo 4.6	Groin along Dickenson Bay, Antigua because of erosion	115
Photo 4.7	Erosion along Devil's Point Road, Efate	116
Photo 5.1	One of Barbuda's oldest wells	166
Photo 5.2	Beach on Barbuda's north coast showing the flatness of the island	170
Photo 5.3	Aquaculture project in Vanuatu	190
Photo 5.4	Epi Paradise Sunset Bungalows	192
Photo 5.5	Erosion along Lamen Bay Airstrip on Epi	194
Photo 5.6	Typical and modern housing on Epi	196

List of Boxes

Box 1 Perceived meaning of Climate Change, Farmers - Barbuda	163
Box 2 Perceived Climatic Changes, Farmers - Barbuda	164
Box 3 Perceived changes on the farm due to Climate Change, Barbuda	165
Box 4 Perceived meaning of Climate Change, Fishers - Barbuda	170
Box 5 Perceived Effects of Climate Change, Fishers - Barbuda	171
Box 6 Perceived Changes in Fisheries, Barbuda	172
Box 7 Perceived meaning of Climate Change, Hoteliers - Barbuda	174
Box 8 Perceived Changes in the Climate, Hoteliers - Barbuda	175
Box 9 Perceived Changes on the Property due to Climate Change (a), Barbuda	176
Box 10 Perceived Changes on the Property due to Climate change (b), Barbuda	177
Box 11 Perceived meaning of Climate Change	181
Box 12 Perceived effects of Climate Change, Farmers- Epi	182
Box 13 Perceived Changes on the Farm due to Climate Change, Epi	183
Box 14 Fishers Perception of Climate Change, Epi	186
Box 15 Perceived Climatic Changes, Fishers - Epi	187
Box 16 Perceived changes in Fisheries, Epi	188
Box 17 Perceived Climatic Changes, Hoteliers - Epi	195
Box 18 Perceived changes on the Property	196

List of Maps

Map 1	Location Map of Antigua and Barbuda	25
Map 2	Location Map of Vanuatu	26

Abstract

The economies of Small Island Developing States (SIDS) heavily depend on coastal and other natural resources. These natural resources are being impacted by climate variability and change which threaten their food security and ability to achieve growth and economic development. Island nations within the Caribbean Sea and the Pacific Ocean are some of the most vulnerable countries to the effects of climate change. The aim of this study is to examine climate change impacts on and the resulting adaptation responses in Antigua & Barbuda and Vanuatu. Research on SIDS is lacking as well as studies which compare farmers, fishers and hoteliers. Data were collected from four islands: Antigua, Barbuda, Efate and Epi with the use of questionnaires, focus group discussions, nominal group interviews and structured interviews. Archival data were used in the evaluation of donor-funded adaptation projects. Key government agencies with responsibility for natural resource management also participated in the study. The study found that most farmers, fishers and hoteliers knew of climate change. Their perception was influenced by their residential location, level of education, sex and age. Whilst the process of mainstreaming of climate change considerations into development policies and plans had started in Vanuatu, this was not the case in Antigua & Barbuda. The greatest barriers to mainstreaming were the lack of financial and technical resources. Most donor-funded projects both countries received addressed capacity building, providing very little tangible adaptation actions. These findings mean that these countries still have a long way to go in building their resilience to the impacts of climate variability and change. Donor-funding cannot be the only strategy relied on to finance adaptation activities. These countries must therefore better manage their environmental and financial resources to respond to the perceived impacts of climate change.