Exploring the connections between wellbeing, non-communicable diseases and climate change: a case study of Barbados

by

Roxanne Springer

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Examining Committee Membership

The following served on the Examining Committee for this thesis. The decision of the Examining Committee is by majority vote.

External Examiner	Dr. Isaac Luginaah Professor, Department of Geography Western University
Supervisor(s)	Dr. Susan J. Elliott Professor, Department of Geography and Environmental Management University of Waterloo
	Dr. Johanna Wandel Professor, Department of Geography and Environmental Management University of Waterloo
Internal Member	Dr. Peter Berry Adjunct Professor, Department of Geography and Environmental Management University of Waterloo
Internal-external Member	Dr. Simon Dalby Professor, Department of Geography and Environmental Studies Wilfrid Laurier University

Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract

Small island developing states (SIDS) in the Caribbean face the dual burden of climate change (manifested as increased temperatures, more intense/frequent extreme weather events, sea-level rise and higher sea surface temperatures), and chronic non-communicable diseases as the leading cause of morbidity and mortality (namely cardiovascular diseases, cancer, respiratory illnesses and diabetes) (PAHO, 2017). These two challenges jeopardise past development strides that have served to enhance the population wellbeing of these countries and hinder future developmental progress. Despite widespread awareness of the rise of NCDs and the growing threat of climate change, little research has explored wellbeing outcomes that will occur at the intersection of these challenges. Appropriate responses to climate change and the growing prevalence of NCDs are crucial for SIDS to safeguard the wellbeing of populations and ensure that these countries can meet their sustainable development goals (SDGs). However, to ensure interventions are effective, policy and decision-makers need to consider the contextual social, economic, political, and cultural factors, along with the environmental and climatic factors to which populations are exposed. It is within this context that this research investigates health and wellbeing effects of climate change in SIDS, using Barbados as an example. It takes the novel approach of investigating non-communicable diseases as a health outcome of priority that is affected by climate change. No research in Barbados or the Caribbean has explored the effects of climate change on NCDs, despite their heavy burden in the region.

A political ecology of health (PEH) approach is applied to this research to better understand how large-scale societal influences shape health and wellbeing in SIDS. Though the lens of PEH, this research draws focus to political, economic and social factors to explain how population wellbeing is affected by climate change. This was done through the following research objectives: 1) explore drivers and determinants of wellbeing among the population of Barbados, and how these components of

wellbeing affect vulnerability to the impacts of climate change; 2) explore the knowledge and perceptions of health professionals across multiple scales on the current and future burden of non-communicable diseases in Barbados, and possible connections between climate change stressors and non-communicable diseases; and 3) investigate the policy responses to NCDs in Barbados to assess the potential for the alignment of NCD and climate change adaptation policy agendas.

Using guidelines from two vulnerability assessment frameworks, participatory vulnerability assessments described by Smit and Wandel (2006) and the health vulnerability assessment described by the World Health Organisation (2013a), this study explored health and wellbeing in Barbados, and assessed vulnerabilities to climate change. Qualitative data collected using in-depth interviews with lay citizens (n = 20), key-informant interviews with Barbadian health professionals (n = 10), and a document review of NCD and climate changes strategic plans, were used to address the research objectives.

The findings of this research indicate that wellbeing in Barbados is defined by socioeconomic, social and environmental factors, made complex by the interconnectedness of drivers of wellbeing. Lay citizens displayed little awareness and concern about the effects of climate change on their wellbeing and had rudimentary knowledge of the expected impacts of climate change in Barbados. Despite this, findings indicate that through various determinants of wellbeing, there are pathways that positively or negatively affect vulnerability to climate change. As it relates to non-communicable diseases and climate change, there is widespread concern among health professionals about the current and future prevalence of NCDs in Barbados, but less concern about the future burden of NCDs in the context of a changing climate, largely because of lack of knowledge among the majority of the health experts interviewed. Those knowledgeable about potential connections, noted the difficulty that climate change would pose to the prevention and management of NCDs, given the impacts of climate stressors on food security, the built environment, and physiological and psychosocial health impacts. To compound the

risk that climate change poses to health in Barbados, findings show that there has been no planning for climate change within NCD policies on a national or regional scale. Health systems cannot effectively plan NCD interventions to reduce the burden of these diseases without considering future climate stressors. These findings have led to several recommendations for policy, practice and future research, such as suggestions for climate-sensitive wellbeing indicators and the urgent need for a climate change and health action plan in Barbados.

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Dedication

This work is dedicated to Vesta Springer.

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List of Acronyms

AIMS – African Indian Ocean, Mediterranean and South China Sea

BNR – Barbados National Registry for Chronic Non-communicable Diseases

BERT – The Barbados Economic Recovery and Transformation Programme

CARICOM – Caribbean Community

CARPHA – Caribbean Public Health Agency

CDB – Caribbean Development Bank

CFNI – Caribbean Food and Nutrition Institute

COP – Conference of the Parties

ENSO – The El Nino Southern Oscillation

EWE – extreme weather events

GEF – Global Environmental Facility

GHG – greenhouse gas

GLOWING – Global Index of Wellbeing

GOB – The Government of Barbados

HCC – Healthy Caribbean Coalition

HiAP – Health in all policies

HVA – Health vulnerability and adaptation assessment

IPCC – Intergovernmental Panel on Climate Change

LDC – least developed country

LMIC – low and middle income countries

NCD – Non-communicable disease

NOAA – National Oceanic and Atmospheric Administration

OECD – Organization for Economic Co-operation and Development

PAHO – Pan American Health Organisation

PEH – Political ecology of health

PVA – participatory vulnerability assessment

SDGs – Sustainable Development Goals

SLR – sea level rise

SIDS – Small Island Developing States

UNDP – United Nation Development Programme

USGCRP – The U.S Global Change Research Program

UN – United Nations

UNFCCC – United Nations Framework on Convention on Climate Change

VA – vulnerability assessment

WHO – World Health Organisation

Chapter 1: Introduction

1.1 Research context

One of the greatest threats to the health and wellbeing of current and future generations is anthropogenic climate change (Watts et al., 2018). Decades of research have proven climate change, extremes and variability, to be well-established threats to natural and human systems (Intergovernmental Panel on Climate Change (IPCC), 2014). Research has also led to scientific consensus that human activities after the start of the Industrial Revolution are a major contributor to rapidly occurring climate change (IPCC, 2014, 2018). These activities have resulted in an increase in levels of greenhouse gases (GHGs) present in the earth's atmosphere and the resultant increase in global temperatures (IPCC, 2014). The 21st century has seen the annual global temperature record broken five times since its beginning (National Oceanic and Atmospheric Administration (NOAA), 2018). As a result, there have been rapid changes in climate patterns across the globe; including reductions of snow cover and sea ice extent; sea-level rise (SLR); new seasonal and regional temperature extremes; changing rainfall patterns and shifting habitat ranges for biodiversity (NOAA, 2018). These climatic impacts threaten the continued functioning of our societies and undermine global development efforts.

The dangerous impacts of climate change have attracted the attention of inter-governmental and non-governmental organizations; academics and researchers; civilians and activists' groups, world leaders and decision & policy makers. These groups have responded in various ways to the threat of climate change, from research to awareness raising; GHG mitigation or adaptation efforts; or the creation of frameworks and institutions to guide climate action. The Sustainable Development Goals (SDGs)—specifically Goal 13 which calls for dedicated climate action on a global scale to

"combat climate change and its impacts"—is one of the latest global commitments to curb climate change and its impacts. Likewise, commitment to climate action on the part of the global community was displayed at the 21st Conference of the Parties (COP) held in Paris in 2015, where signatories to the United Nations Framework on Convention on Climate Change (UNFCCC) met to reaffirm their countries' commitments to action on climate change. World leaders pledged to strengthen the global response to climate change in an effort to limit warming to "well below 2°C above pre-industrial levels", while "pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels" (UNFCCC, 2015).

Even if the world can meet the ambitious targets set out in the Paris Agreement, the challenge remains that human activity has already done irreparable harm to the climate. Consequently, there will be unavoidable impacts for humanity beyond the current capacity of what natural systems can withstand or from which they can recover (IPCC, 2014, 2018). In the past, human systems have been able to respond to adverse climatic conditions through autonomous adaptation actions (Smit and Pilifosova, 2003). However, predicted climatic change, extremes and variability resulting from global warming may exceed the coping capacity of these autonomous strategies (Smit and Pilifosova, 2003). Because of this, there is an urgent need for planned, practical adaptation to safeguard against climate extremes and variability. This requires knowledge of the systems most at risk, what makes them vulnerable, and how they can be protected from or made resilient to, climate change.

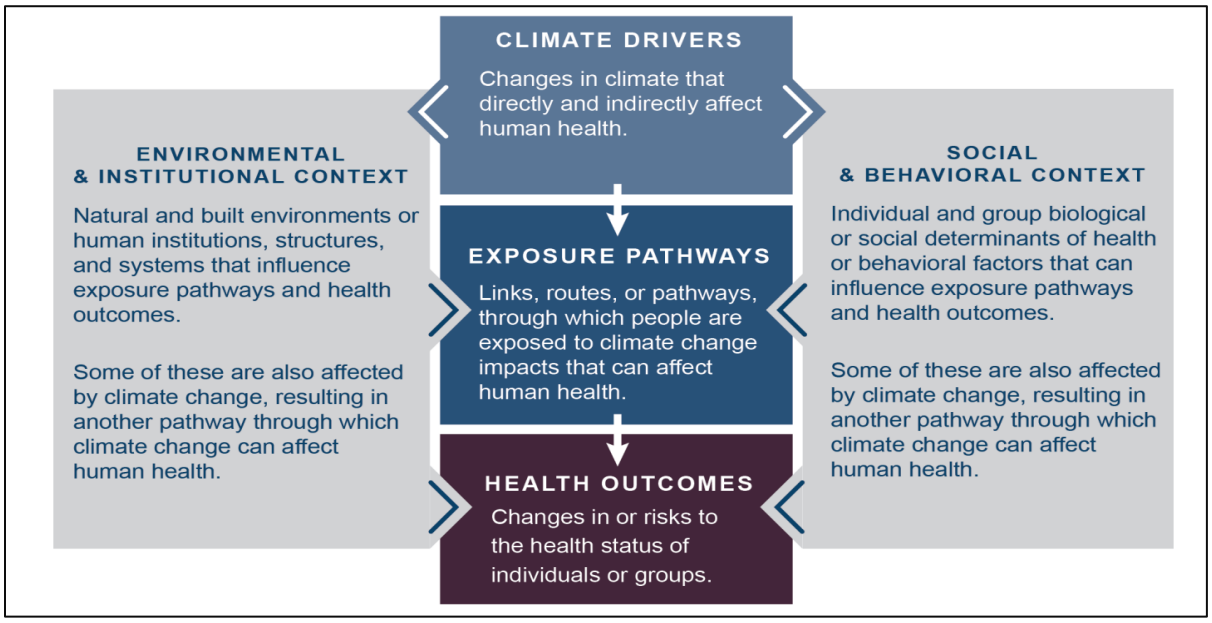
1.1.1 Climate change, health and wellbeing

One area of major concern, and the focus of this thesis, is the impact climate change will have on human health and wellbeing. As noted by the 2009 Lancet Commission, climate change is "the greatest threat to global health of the 21st century" (Costello et al., 2009). Key publications such as those by McMichael, Woodruff, & Hales (2006), Costello et al. (2009) and Smith et al. (2014), and

Watts et al. (2015) have been instrumental in bringing attention to the range of direct and indirect health and wellbeing impacts of climate change. These include loss of life and injuries; heat related illnesses; a proliferation of food-, water- and vector-borne diseases; food insecurity and undernutrition; loss of livelihoods and cultural identities; and forced migration (Costello et al., 2009; McMichael, Woodruff, & Hales, 2006; Smith et al., 2014). The health impacts of climate change are associated with climatic drivers such as rising temperatures, changing precipitation patterns, and increases in the frequency and intensity of extreme weather events (Smith et al., 2014). Projections from the World Health Organisation (WHO) hold that between 2030 and 2050, there will be approximately 250,000 additional deaths per year attributable climate change, from heat stress, malnutrition, diarrhoea and malaria, though the actual number of additional deaths will likely be much greater since it was not possible to quantify all important causal pathways (WHO, 2014a). The economic cost of this is expected to be between US$2 – 4 billion dollars in direct damage cost to health a year by 2030, which does not include costs in health-adjacent sectors like water and sanitation or agriculture (WHO, 2018a). As well, despite considerable uncertainty, climate change is linked to the internal and external displacement of people, with estimates of between 50 million to 1 billion displaced people by 2050 due to climate change related stressors (Burrows and Kinney, 2016). At risk of loss are the strides made in development and global health made over the past fifty years (Costello, 2009, United Nations (UN), 2019).

However, the negative health impacts of climate change are more than a function of climatic drivers; there are non-climatic factors that interact with climate drivers to amplify or reduce vulnerability and influence health outcomes (The U.S Global Change Research Program (USGCRP), 2016). The conceptual framework created by the USGCRP (2016) demonstrates the interaction of climate drivers with environmental and institutional contexts and social and behavioural determinants of health, creating complex exposure pathways responsible for the manifestation of climate change

impacts on human health and wellbeing (Figure 1.1). Thus, there is a need for context-specific research that considers the social, economic, political, and cultural factors in place, along with the environmental and climatic factors to which populations are exposed. This is needed to fully understand climate change impacts on population health and wellbeing and to design effective adaptation strategies.



Source: USGCRP, 2016

Figure 1.1: Exposure pathways of health impacts of climate change

This thesis focuses on the health and wellbeing impacts stemming from climate change drivers, using Barbados as a case study. It begins by exploring what wellbeing means to Barbadians. It is clear from the literature that climate change poses a threat to lives, livelihoods, economic growth and environmental sustainability, which in turn threatens the maintenance and enhancement of human and societal wellbeing. However, to understand how the wellbeing of this population is at risk to climate change, it is essential to first explore and understand what are considered to be determinants of wellbeing in the context of Barbados. This is not only important for planning adaptation to the

impacts of climate change, but also provides a way to assess the impacts of climate change on wellbeing over time to determine the success of adaptation strategies.

Future measures of wellbeing should consider the impacts of climate change given that it one of the greatest developmental challenges of the 21st century. A Global Index of Wellbeing (GLOWING[1]) is one such wellbeing measurement tool that has been proposed to assess national progress in LMICs and vulnerable SIDS, complimentary to the economic growth measures currently in use. It is hoped that a better understanding of the relationship between climate change and wellbeing from an individual level, will contribute to the identification of socially, geographically and culturally relevant climate-sensitive indicators that can be used in a Global Index of Wellbeing. The relationship between individual and national wellbeing is explained in Chapter 2. These indicators can be used to quantify the impacts of climate change on health and wellbeing. While it is beneficial to qualitatively describe the impacts of climate change on population wellbeing, quantitatively measurable impacts would provide greater support to those advocating for costly investments into health adaptation and GHG mitigation actions. Secondly, as countries implement policies and actions to protect against climate change, they should simultaneously be thinking of ways to monitor and evaluate (M&E) the effectiveness of such interventions (WHO, 2013a). This dissertation examines perceptions of wellbeing among the Barbadian population to understand what Barbadians consider to be determinants of their wellbeing.

[1] GLOWING is a multinational, multisectoral, interdisciplinary project to develop beyond economic measures of wellbeing that can be applied in low to middle income countries. This tool – the global index of wellbeing – aims to capture a true representation of societal wellbeing in all countries, with a focus on low to middle income countries. (https://uwaterloo.ca/toward-a-global-index-of-wellbeing/)

Moreover, even with the recognition of the risk climate change poses to human wellbeing and the increasing awareness of climatic impacts on health, little attention has been paid to non-communicable diseases (NCDs) (Friel et al., 2011; Kjellstrom et al., 2010). This is not to say that non-communicable diseases have been wholly absent from discussions of the effects on climate change on health. In fact, research to understand the health effects of specific climate hazards has shown links to some non-communicable diseases: respiratory illnesses from wildfires and air pollution; heat-related-illnesses from extreme temperature; psychosocial effects of global climate change, to name a few (Hayes, Berry & Ebi, 2019; De Sario, Katsouyanni & Michelozzi, 2013; Kinney, 2008). However, this dissertation makes the argument that this group of diseases is seldom the focus or the starting point of vulnerability assessments, but rather have been captured as externalities of research into specific climate hazards. This is problematic from a policy perspective, because non-communicable diseases are currently one of the largest health challenges globally and consequently, deserve special attention (World Health Organisation (WHO), 2019a).

According to the WHO (2018b), the burden of NCDs has reached epidemic proportions and they are the leading cause of deaths worldwide. In 2016, NCDs were responsible for 41 million deaths (71% of all global deaths) namely heart disease, stroke, cancers, type 2 diabetes and chronic respiratory illnesses (WHO, 2018b). While it was previously thought that NCDs were "diseases of affluence" and the burden of NCDs was concentrated in high-income countries, current data show that the burden is disproportionately greatest in low and middle income countries (LMICs); 78% of deaths in 2016 from NCDs occurred in LMICs (WHO, 2018b). Moreover, the fastest rising rates of NCDs are occurring in lower income countries (Alwan, 2011). In all countries, even high-income countries, the sections of populations most susceptible to NCDs are those of lower socio-economic status (Bennett *et. al*, 2018). The high incidence of NCDs is primarily linked to four behavioural risk factors: unhealthy diets, physical inactivity, harmful alcohol consumption and tobacco use. These risk

factors are unfortunate aspects of rapid urbanisation, industrialisation, transitioning economies and 21st century lifestyles, and are part of a cyclic relationship between poverty and non-communicable diseases: poverty exposes population to the behavioural risk factors associated with NCDs, and, in turn, NCDs are a contributing driver that can push populations further into poverty (Alwan, 2011).

In the Caribbean, non-communicable diseases are the priority health concern as they are the leading cause of morbidity and mortality (Pan American Health Organisation (PAHO), 2012). The latest 'Health in the Americas' reports seven of the ten leading causes of mortality in the region were noted to be from the group of non-communicable diseases (strokes, heart disease, hypertensive diseases, diabetes and respiratory diseases); they account for approximately four out of five deaths reported annually (PAHO, 2017). These deaths are largely preventable given a reduction in risk factors, early detection and affordable and regular access to treatment. Furthermore, the impact of these diseases extends beyond mortality; there is a burden to workforce productivity, health systems and the economic burden on individuals and countries who provide free or subsidised healthcare to their citizens.

The incidence of NCDs such as cardiovascular disease, certain cancers, respiratory illnesses, mental-health related illnesses, malnutrition and injuries may be exacerbated by climate change drivers, primarily increases in temperatures and decreases in rainfall; urban air pollution; and extreme weather events (Kjellstrom & McMichael, 2013; Kjellstrom et al., 2010; Friel et al., 2011; Ebi et al., 2019). Moreover, environmental and institutional contexts (e.g. suitable infrastructure for physical activity; access to health services) and social and behavioural determinants (e.g. dietary habits; socio-economic status) interact to create complex pathways to various NCD health outcomes. Further, climate drivers will affect the environmental and institutional contexts and the social and behavioural determinants that create exposure pathways to NCD health outcomes (Figure 1.1). Yet, despite the anticipated effects of climate change on NCDs, these complex exposure pathways have not been

widely explored by researchers, leaving substantial gaps in the literature, as well as policy and practice.

The multiplier effect of climate change on NCDs will likely increase pre-existing health inequalities within and between countries, negatively affect individual and national wellbeing, hinder development agendas and efforts to reduce global inequalities (Friel et al., 2011; Campbell-Lendrum et al., 2018; Martinez et al., 2018; Ebi et al., 2019). Of the limited studies providing insight into the impacts of climate change on NCDs, several have noted the potential for co-benefits through climate change adaptation and GHG mitigation policies that also reduce the burden of NCDs (Beaglehole et al., 2011; Friel, 2010; Friel et al., 2011; Islam et al., 2014; Kjellstorm et al., 2010). Likewise, policies and health programmes implemented to control NCDs could confer climate change adaptation and GHG mitigation benefits. For instance, efforts to equip health systems to deal with the increasing numbers of people living with non-communicable diseases, may also have the dual benefit of strengthening these systems to withstand the burdens associated with other health impacts of climate change. Furthermore, strategies implemented to facilitate healthier environments (e.g. increase in local food production and consumption; decrease in food import and built environments that support active transport), encourage sustainable living, which then can aid in efforts to decrease greenhouse gas emissions. Accordingly, this dissertation seeks to elucidate the complexities of the relationship between NCDs and climate change and provide relevant insight to decision-makers seeking to create policies and implement actions that achieve multiple benefits for individuals and society. The research conducted herein is original and timely for Barbados and the Caribbean, given the immense burden of NCDs in the region, and the pending impacts of climate change. Its focus on NCDs as the health outcome of highest priority, addresses a little recognised, and poorly understood problem that has the potential to further overburn health systems in Barbados, and hinder developmental progress.

1.1.2 Uneven distribution of climate change vulnerability

While climate change is a threat to human health and wellbeing on a global scale, vulnerability to impacts is unevenly spatially distributed, with some countries possessing higher levels of vulnerability than others (Smith et al., 2014; Taylor, Chen, & Bailey, 2009; WHO, 2015). This is particularly concerning for least developed countries (LDCs), low and middle income countries and the SIDS like those in the Caribbean region, the Pacific region and Africa, Indian Ocean, Mediterranean and South China Sea (AIMS), as these countries are disproportionately burdened by climate change (Smith et al., 2014; Taylor et al., 2009; WHO, 2015). Even on smaller scales (i.e. within countries and communities), there is uneven distribution of vulnerability to climate impacts. The health and wellbeing of some groups (e.g. children, older adults, minorities, women, persons of low socioeconomic status or with pre-existing medical conditions) are more likely to be susceptible to climate impacts because of social, political, economic or institutional marginalisation (Haines & Ebi, 2019; IPCC, 2014). These disparities in vulnerability require localised research that considers spatial and temporal scales to uncover the root causes (Smit and Wandel, 2006).

The small island states in the Caribbean are considered among the world's most vulnerable countries to climate change. Small island states have long been recognised as a special case for development, and this has now been extended to recognise that the need for specialised attention as it relates to the impacts of climate change (United Nations Conference on Environment and Development, 1993; UNFCCC, 2015). Despite negligible contributions to the world's GHG emissions (< 1 %), SIDS stand to be most impacted by the adverse impacts of climate change and are on the forefront of experiencing these impacts (Hoad, 2015). The vulnerability of these islands is partially linked to their geographical location, physical characteristics and climatic conditions. Located in the Tropics and in the Atlantic Hurricane Belt, these islands are frequently exposed to

seasonal extreme weather events like tropical storms and hurricanes that form off the West coast of Africa. They are also exposed to variability in rainfall resulting in droughts and flooding. The El Nino Southern Oscillation (ENSO) is another climate phenomenon that affects these island states. A defining physical feature of the islands in the Caribbean is their low-lying coastal zones which exposes them to sea level rise and storm surges. Sea-level rise further poses a constant threat to their limited fresh water resources.

Apart from the defining geographical, physical and climatic characteristics of SIDS, there are other political, economic, social and cultural factors which contribute to their high vulnerability to climate change. For much of the population of these countries, socio-economic activities and infrastructure are concentrated in coastal zones which makes them extremely sensitive to storm surges and sea-level rise (Kelman and West, 2009). With a narrow range of resources, they are excessively dependent on international trade to fulfil the needs of their small but growing populations; consequently, they are exposed and sensitive shocks on the global market that may result from climate change impacts in other parts of the world (United Nations Conference on Environment and Development, 1993). Of added concern is the limited financial, technological and institutional capacities of these countries, which hinders them from responding effectively to the adverse impacts of climate change (Kelman and West, 2009). The recognition of the special vulnerability of SIDS prompted the WHO to launch a special initiative in 2017, to protect the people of these countries from the health impacts of climate change. This initiative seeks to provide state health authorities with the tools needed to respond to the effects of climate change (WHO, 2018c). This support includes the empowerment of health leaders on international and national platforms; the collection of evidence to support policy creation and the case for investments into health; the implementation of health promoting polices; and facilitating access to financial resources to build resilient health systems (WHO. 2018c).

1.2 Research objectives

It is within this context that this thesis explores health and wellbeing vulnerabilities to climate change in Caribbean small island developing states, using Barbados as an example. This research focuses on non-communicable diseases as these diseases have been identified as a priority health concern for the region. It responds to a need for context-specific research that considers social, economic, political, and cultural factors in place, along with the environmental and climatic conditions to which populations are exposed, to address the following research objectives:

Objective # 1

Explore drivers and determinants of wellbeing among the population of Barbados, and how these components of wellbeing affect vulnerability to the impacts of climate change.

Objective # 2

Explore the knowledge and perceptions of health professionals across multiple scales on (1) the current and future burden of non-communicable diseases in Barbados and (2) possible connections between climate change stressors and non-communicable diseases.

Objective # 3

Investigate the policy responses to NCDs in Barbados and assess the potential for the alignment of NCD and climate change adaptation policy agendas.

These objectives will be addressed using the health vulnerability and adaptation assessment guidelines from the WHO (2013a), and the framework for participatory vulnerability assessments described by Smit and Wandel (2006). Both of these tools are described in further detail in Chapter 4. The knowledge gathered in this dissertation will help to identify and prioritize areas for action; inform

strategies for future (health) adaptation planning in Barbados and the Caribbean; and reveal areas where further research is needed.

1.3 Dissertation organisation

Including this introductory chapter, there are seven chapters in this dissertation. This first chapter introduces the range of topics covered. It begins with a justification for this research by providing background information on the threat of climate change and its impacts on health. This chapter then sets the context for the choice of non-communicable diseases as the focus of this research by establishing the magnitude of the problem globally and within the Caribbean and outlining the dearth of research on this issue. Chapter one further establishes the need for research leading to evidence-based adaptation strategies, particularly for LDCs, LMICS and SIDS, by providing insight into the uneven nature of vulnerability to climate change. This chapter concludes by outlining the research objectives addressed in this study and introducing the two tools on which the methodology employed was patterned.

Chapter two situates the dissertation in the literature. It begins by providing descriptions and explanations of the key concepts used throughout this dissertation. Given that the definitions and treatment of some of these concepts are contested or vary throughout the academic literature, this chapter seeks to clarify the meanings attributed to these concepts as used in this dissertation. Chapter two then provides a review of the literature dealing with the issue of climate change and health broadly and then answers the question "What is the nature of research that has been done on the topic of climate change and non-communicable diseases?" This chapter also highlights the nature of climate change and health research that has been done in the Caribbean region. Following this is a review of the different methodologies that have been used to conduct (health) vulnerability and adaptation assessments. Chapter two then goes on to discuss various theoretical approaches that have

been used to undertake climate change and health research and concludes with a summary of the research gaps this dissertation addresses.

The third chapter describes the methodological approach used in this research. It begins by outlining the research approach and the participant selection process, followed by a description and justification of the study location, and a timeline of the research activities. This is followed by a discussion of the two vulnerability and adaptation assessment tools used to guide the research design employed, and a description of the methods selected for data collection. The chapter then goes on to discuss the data analysis process and concludes with an overview of the ethical considerations and the positionality of the researcher.

Chapter four expands on the description of the study location provided in chapter 2. The chapter provides a country profile for Barbados that describes contextual information relevant to the wellbeing of the population, through a geographical, climatic and socio-economic lens. The country profile begins with an overview of the physical geography of Barbados; current climate trends; future climate projections; and national initiatives to address climate change. Following this, a description of key demographic data is provided, along with an overview of the country's health profile and major health initiatives to improve the health of citizens. This chapter concludes by explaining why Barbados was chosen as the study site for this research.

The results of this dissertation are presented in chapter five. This chapter is divided into three sections that address each of the three research objectives. It commences with the drivers and determinants which Barbadians consider to affect their wellbeing. It proceeds to situate conceptualisations of wellbeing in the context of climate change. The next section presents findings on the knowledge of the relationship between climate stresses and NCDs possessed by public health professionals. This chapter concludes with a document review to investigate policy responses to NCDs in Barbados and the extent to which climate change has been considered in health policies.

This dissertation concludes with chapters six and seven, where findings of this research are interpreted to respond to the research objectives set out in the introduction. Chapter seven also presents recommendations for action, reflects on the research process and discusses the limitations of the research.

Chapter 2: Literature Review

2.1 Introduction

This chapter begins by discussing the concepts of "health", "wellbeing", "climate change vulnerability and adaptation", all of which are foundational to this research. It then describes the streams of climate change and health research found throughout the literature and outlines health impacts of climate change. Following this, the chapter details the nature of research that has been done on the relationship between climate change and non-communicable diseases and speaks to the literature gap pertaining to this area of study. It then goes on to discuss the current state of climate change/health research in the context of the Caribbean and describes health vulnerability and adaption assessments and their use in a Caribbean context. Finally, the chapter concludes with a review of theoretical frameworks and methodological approaches that have been used in climate change/health research and a summary of the gaps this dissertation addresses.

2.2 Key concepts used in this research

Given that the definitions and treatment of some of these concepts are contested or vary throughout the academic literature, this section seeks to clarify the meanings attributed to these concepts as used in this dissertation.

2.2.1 Health and wellbeing

In 1948, the World Health Organisation (WHO) defined health as "complete physical, mental and social wellbeing, and not just an absence of disease or state of infirmity". Although this definition has been critiqued for its ambiguity (what is 'complete' wellbeing and how does one operationalise it?), this holistic view of health is well suited to the focus of this research. It supports the exploration

of climate change impacts on health beyond a solely medical lens and encourages a more-comprehensive look at how human lives and experiences are affected by a changing climate. The post-medical approach to health that characterises contemporary health geography is supported by the WHO (1948) definition of health and allows for investigations that consider the role of broader forces (social, economic, political, cultural and environmental)—across spatial scales and within various geographical contexts—that shape health outcomes (Dummer, 2008; Kearns and Collins, 2010). Furthermore, this definition of health is more suitable to collective population health interventions like those sought after in this study, rather than the individualistic health interventions supported by a biomedical model of health (Kearns and Collins, 2010). Overall, this definition of health supports modern health geography research that (1) engages more explicitly with social theories; (2) places a greater focus on place-specific experiences of health and illness rather than abstract views of space in the sense of spatial distribution of disease; (3) is methodologically pluralistic; and (4) attempts to critically explore disparities in health outcomes rooted in large scale structural forces (Cutchin, 2006; Kearns and Collins, 2010; Kearns and Moon, 2002; Luginaah, 2009).

Wellbeing is a concept that has attracted attention from researchers across various academic disciplines (Allin and Hand, 2014; Dodge et al.2012; Schwanen & Atkinson, 2015). Researchers from psychology, economics, public health, medical sciences, ecology, developmental studies and geography have all weighed in on the concept of wellbeing, yet there is no consensus on a single definition or means of measurement (Allin and Hand, 2014; Dodge et al, 2012; Schwanen & Atkinson, 2015). From the WHO definition of health, the implication is that wellbeing is component of health, and in order to be completely healthy, one must obtain complete wellbeing (physical, mental and social). Herrman, Saxena & Moodie (2005) attempt to clarify the relationship between health and wellbeing, arguing that to reach a state of complete mental, physical and social wellbeing, people must be able to realise their aspirations, satisfy their needs, and change or cope with their

environment. In this regard, the authors propose that health is "a resource for living" that allows one to achieve the personal, social and economic development needed to facilitate wellbeing (Herrman, Saxena & Moodie, 2005).

Dodge et al., (2012) attempt to bring clarity to the concept of wellbeing by first critiquing existing definitions of wellbeing, and then proposing a new definition they thought to be simple and universally applicable for individual use and by policy makers. This definition holds that wellbeing is "the balance point between an individual's resource pool and the challenges they face" (Dodge et al., 2012). However, it could be argued that by creating another definition of wellbeing, the authors only further add to the ambiguity surrounding the concept. Where Dodge and colleagues sought to introduce a single universal definition of wellbeing, Allin and Hand (2014) present a different perspective: that the concept of wellbeing is inherently complex and multidisciplinary. Those engaging with wellbeing have different interests, use it differently and gravitate towards the aspects of wellbeing most relevant to their purpose. It is therefore unlikely to ever be able to have a single universally accepted definition of wellbeing (Allin and Hand, 2014).

This thesis adopts British-American economist Angus Deaton's conceptual definition of wellbeing: "*all* things that are good for a person, that make for a good life" (Deaton, 2013 p. 24). He proposes that dimensions of wellbeing may include material (represented by wealth and income), physical (health), psychological (mental health & happiness), education and the ability to participate in civil society (Deaton, 2013). Wellbeing based on this definition is versatile, multifunctional, and adaptable to the place-specific conditions, thus facilitating the identification of socially, culturally and geographically relevant indicators of wellbeing. This conceptualisation is important for the creation of policies that protect wellbeing from external forces such as climate change, in an effort to further national progress (Aslam and Corrado, 2012). Though Deaton's definition reflects individual wellbeing, these dimensions may be aggregated to contribute to the measurement of wellbeing at a

national level (Allin and Hand, 2014). Individual wellbeing is an important component of national wellbeing, not discounting the importance of other higher-level factors (e.g., the state and sustainability of the environment) which have implications for the (future) wellbeing of a nation rather than solely short-term individual-level implications (Allin and Hand, 2014). Arguably, to understand how these higher-level factors will contribute to national wellbeing, it is necessary to understand how these factors influence individual experiences of a good life. This research explores meanings attributed to wellbeing from an individual level, as it is believed that to holistically and effectively measure national wellbeing, one must first understand what matters to the people whose wellbeing is in question.

2.2.2 Climate change vulnerability and adaptation

The concepts of vulnerability and adaptation are useful for framing discourses on the human dimension of climate change. These concepts are fundamental to understanding how the impacts of climate change differ across spatial-temporal scales and provide explanations for why hazards of similar magnitude in different places, or at different times, can have vastly different outcomes.

Vulnerability is a debated concept within the climate change community; there have been several attempts made to bring clarity to the term, notably by Adger (2006), Brooks (2003), Füssel (2007), and Smit and Wandel (2006). Despite this, consensus has yet to be reached, and vulnerability is interpreted in different ways by researchers. Conflicting approaches to vulnerability are partially rooted in whether vulnerability should be conceptualised as an inherent system's property or whether vulnerability is predicated on exposure to an external hazard or stress (Brooks, 2003; Füssel 2007; Füssel and Klein, 2006; IPCC, 2007; Kelly and Adger, 2000; Ribot, 2013). For example, Kelly & Adger (2000) define vulnerability based on the ability of an individual or social group to cope (or not cope) with external stresses placed on their well-being or livelihood. The ability to cope speaks to the

capacity to recover from or adapt to stresses. This definition focuses on the pre-existing conditions of the individual or group as a determination of vulnerability.

Of all the schools of thought on how vulnerability should be conceptualised, this dissertation assumes the definition of vulnerability given by the Intergovernmental Panel on Climate Change (IPCC, 2007), one that is commonly used by climate change researchers (Füssel and Klein, 2006). The definition of vulnerability used by the IPCC (2007) is "the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including variability and extremes". It further suggests that vulnerability is dependent upon the "character, magnitude and rate of climate change and variation to which the system is exposed" as well as the sensitivity of the system and its adaptive capacity (IPCC, 2007). The IPCC definition considers both the exposure of system to external climatic stresses, as well as inherent system properties that allows the system to respond to or cope with those stresses. Essentially in this definition, vulnerability is what remains after the external stress and the ability of the system to respond to the stress is considered. Ultimately, the way vulnerability is interpreted is important as it determines how vulnerability is assessed, measured and the purpose for which it will be used. Füssel (2007) outlined how different interpretations of vulnerability address different research questions and root problems; have different uses in terms of policy application; uses different vulnerability approaches and are associated primarily with certain academic disciplines. This is displayed in Chapter 3 when the methodology used for this research is discussed.

Smit and Wandel (2006) found that among the various conceptualisations of vulnerability, three elements remain consistent: "exposure", "sensitivity" (contingent upon external events or climate stressors), and "adaptive capacity" (dependent on inherent properties of the system). This framework represents how a system is likely to be impacted by climate stresses (exposure and sensitivity) and reflects the potential for adaptation in the system (adaptive capacity). Vulnerability is

also a matter of scale; broad processes and forces occurring at large scales affect exposure and sensitivity (environmental and social forces), and expressions of adaptive capacity (economic, social, political and cultural forces) at the local or community scale (Smit and Wandel, 2006). For instance, a national health policy (e.g., National Insurance Scheme) can contribute to adaptive capacity in local populations and thus, the overall vulnerability to the health impacts of climate change. Some of these forces disproportionately empower certain social groups and contribute to higher vulnerability among groups with the least power (Smit and Wandel, 2006).

Adaptation, a closely related concept to vulnerability, is defined as the process of adjustment in ecological-social-economic (natural or human) systems to actual or expected climate and its effects (Smit et al.1999; IPCC, 2014). The IPCC (2014) further elaborates that in human systems, the objective of adaptation is to "moderate harm" or where the potential exists, "exploit beneficial opportunities". In essence, adaptation to climate change should reduce the vulnerability of systems by decreasing exposure and sensitivity or increasing the capacity to cope with/manage or recover from the effects of climate change (Adger et al., 2005; Tompkins et al., 2010).

One of the first extensive characterizations of climate change adaptation was provided by Smit et al., (1999). They noted that adaptation varies according to its timing (e.g., proactive vs reactive); purposefulness (e.g., autonomous vs planned); and temporal (short term vs long term) and spatial scale (localised vs widespread) (See Smit et al.1999 for further examples). Combinations of these characteristics can be used to describe adaptation (e.g., "proactive, planned adaptation"). Adaptation could also be differentiated based on its function, form and performance (Smit et al.,1999). Despite general consensus of the definition of adaptation within the climate change literature, Adger et al., (2009) noted that adaptation success means different things to the individual, sector, society or country doing the adapting. For instance, an ideal adaptation outcome for a wealthy country or individual may be to maintain their economic status and level of development, whereas for

a developing country or poorer individual, the ideal outcome may be to continue developing and improve their economic and social situation despite climate change (Adger et al., 2009).

The WHO defines adaptation to climate change within the health sector as "the process of designing, implementing, monitoring and evaluating strategies, policies and programmes to manage the risks of climate relevant health outcomes" (WHO, 2014b). Though adaptation is a relatively recent concept within health planning, the process is not one that is wholly unfamiliar in public health planning, as it is comparable to what is known as 'prevention' (WHO, 2013a). As described above, health adaptation can be spontaneous or planned. Planned adaptation is an urgent, pivotal response to reduce climate change impacts, that requires expert knowledge on the relevant health risks and vulnerabilities (Martinez et al., 2018). Planned adaptation encompasses the range of responses by officials in health to build resiliency into health systems. These responses are needed to ensure that health systems can continue to function in adverse conditions, such as extreme weather events, disasters or public health emergencies, which are expected to occur with greater frequency and intensity because of climate change (Martinez et al., 2018). Even as national health leaders prepare for the future impacts of climate change, Martinez and colleagues remind us that there are limits to adaptation, especially given the possibility of warming above 2°C (Martinez et al., 2018). Not surprisingly, these adaptation limits will be greater for vulnerable regions (e.g.: SIDS) and populations (Smith et al., 2014). Smit and Pilifosova (2001) previously noted the inequality in the capacity to adapt to climate change impacts; the most vulnerable countries and communities are the most exposed to climate hazards and least able to limit impacts as they lack adaptive capacity.

Adaptive capacity is linked to economic resources; technological access; infrastructure; institutions; information and skills; and equitable empowerment; developing countries possess these capacities in limited amount (Smit and Pilifosova, (2001). Smit and Pilifosova (2001) argue that since the efforts required to build adaptive capacity also contribute to sustainable development, adaptation

and sustainable development initiatives could be concurrently implemented to improve the lives of people in locations where development is the goal. This essentially speaks to the "mainstreaming" of adaptation strategies with solutions to other developmental challenges or policies related to other sectors.

2.3 Climate change, health and wellbeing

In the past four decades, a considerable literature has developed around the theme of climate change and health, due to increasing interest in the human impacts of climate change and variability, along with planetary and environmental impacts. This literature includes commentaries and editorials, expert opinions, book chapters, primary research articles (e.g. Berrang-Ford et al., 2012; Mulligan, Elliott, and Schuster-Wallace, 2012; Richmond et al., 2005), review articles (e.g., de Fatima Andrade et al., 2017; Quam, Rocklöv, Quam, and Lucas, 2017; Wang et al., 2017), and research and tools for research published in the grey literature (WHO, 2013a, 2014a, 2015).

Several papers brought considerable attention to the climate/health issue (e.g., Costello et al., 2009; Haines and Patz, 2004; Haines, Kovats, Campbell-Lendrum, & Corvalan, 2006; McMichael and Haines, 1997; McMichael, Woodruff, & Hales, 2006; Watts et al., 2015). Key messages resonating from these works are driving the research agendas in this field. For instance, these articles detail numerous pathways for exposure to the health impacts of climate change and consequently, support the call for public health strategies that consider these pathways in trying to provide adequate protection to populations (Haines, Kovats, Campbell-Lendrum, & Corvalan, 2006). Some of the health challenges expected to affect populations globally include the emergence and re-emergence of infectious diseases; injuries and loss of life from extreme weather events (EWE); undernutrition and malnutrition; ailments related to heat stress and declining air quality and threats to human security

(Costello et al, 2009; McMichael, Woodruff, & Hales, 2006; Smith et al.2014). These health effects are further expanded upon in Table 2.1.

Notably, there have been a series of evolving messages in *the Lancet* on the health and climate change association (Costello et al., 2009; Watts et al., 2015; Watts et al., 2017a and Watts et al., 2017b). These articles have been instrumental in articulating the complex relationship between climate change and health, as well as in providing recommendations to drive research and responses to the health effects of climate change. The article by Costello et al., (2009) propelled the narrative that climate change was "the greatest health threat of the 21st century" and proposed that one of the huge challenges of this issue would be that climate change would reinforce and exacerbate existing health inequalities. Although this research provided a detailed outline of the health effects of climate change, it was less clear on specific responses to managing these health effects. In 2015, Watts and colleagues reiterated messaging about the challenge climate change presents to health, but also offered the possibility that responses to climate change could be a great opportunity to improve global health (Watts et al., 2015). Having established "what?" the health effects of climate change are (Costello et al., 2009), Watts et al., (2015) offered responses to the associated "so what?" by providing recommendations for policy actions needed to advance climate action to protect health and wellbeing from climate change. One of these recommendations encourages greater investment into climate change and public health research so as to provide the evidenced-based strategies that will foster climate resilient health systems necessary to protect population health. Additionally, adaptation to health impacts of climate change requires cooperation among governments (all levels and sectors), international agencies, non-governmental organisations, communities and academics (Watts et al.2015). The next article in this series further advances the literature by providing five categories of indicators representative of the association between climate change and health that should be used to track health impacts: climate change impacts, exposure and vulnerability; adaptation planning and

resilience for health; mitigation actions and health co-benefits; economics and finance; and public and political engagement (Watts et al., 2017a). In fact, much of the current literature on climate change/health can be sorted to fit into these categories. The most-recent article in this series reports on the recommendations made in Watts et al., (2015) using the indicators proposed in the following Watts et al., (2017a) article. The first progress report shows that initial progress over the past 25 years has been slow, which has placed the lives and livelihoods of humans in jeopardy. Despite this stark analysis, there is evidence that in the last five years the response to climate change has increased and this momentum continues to build across numerous sectors, providing several opportunities to improve public health (Watts et al, 2017b). Furthermore, this latest report argues for increased input from health professionals to propel momentum on climate change, and in so doing, reap the health benefits of these responses (Watts et al, 2017b).

Various streams of research are being conducted on the association between climate change and health. Along with those articles mentioned at the start of this section, a range of research has been done on the topic of impacts and vulnerability to climate change (e.g., Banu et al., 2014; Emrich and Cutter, 2011; Springmann et al., 2016; Sterk et al., 2016; Thomas et al., 2014). Some of these studies have discussed impacts and vulnerability in a general sense, while some have focused on specific vulnerable groups such as indigenous populations (e.g., Berrang-Ford et al., 2012 and Furgal and Seguin, 2006), outdoor workers (e.g., Smith et al., 2016) or children, pregnant women and impoverished populations (Bulbas and Malina, 2009). Another major stream of research has been devoted to identifying adaptation strategies or increasing adaptive capacity. This stream of research is needed to improve the resilience of health systems given that the impacts of climate change are unavoidable and likely to exceed what systems are currently capable of coping with (Ebi et al., 2019; Martinez et al., 2018; Huang et al., 2011 and Keim, 2008). Closely related to the work on adaptation, is that which considers the health co-benefits that arise from other responses to climate change (e.g.,

Anenberg et al., 2012; Cheng and Berry, 2013; de Oliveira and doll, 2016; Harlan and Ruddell, 2011 and Younger et al., 2008). This type of research is important as it provides the means of maximising the resources available to some populations who possess limited resources and capacity for adaptation. Furthermore, this type of research fosters intersectoral cooperation and the mainstreaming of climate action into existing sectors.

Table 2.1 Health impacts of climate change

Health Impacts Category	Climatic-related Drivers	Projected/Possible Health & Wellbeing Impacts	Exposure Route	Type of Illnesses
Extreme temperatures	Temperature increase	Heat related illnesses (heat exhaustion, heat stress & heat strokes, kidney disease)	Direct	Non-communicable
		Increase in respiratory ailments and cardiovascular diseases	Direct	Non-communicable
Extreme weather events	More frequent and intense extreme weather events, namely hurricanes, droughts and floods; Storm surges associated with more intense hurricanes; Sea-level rise and coastal erosion	Loss of life, injuries and illnesses from extreme weather events and their aftermath	Direct / Indirect	Injury
		Illnesses from water contamination Sanitation issues related to water insecurity	Indirect	Infectious
		Effects of population displacement and crowding into emergency shelters	Indirect	Non-communicable
Air pollution	Increase in the presence of dangerous atmospheric pollutants (e.g., ground-level ozone, air borne dust and smoke & particulate matter from wildfires	Respiratory illnesses such as pneumonia, chronic pulmonary disease, asthma and allergic rhinitis	Indirect	Non-communicable/ communicable
		Heart attack, stroke and other cardiovascular diseases	Indirect	Non-communicable

	Increased production of pollen and spores by plants	Increased risk of certain types of cancer	Indirect	Non-communicable
Vector-borne diseases	Increased or altered rainfall patterns Increase in the altitudinal range of mosquitoes Changes to the disease transmission seasons	Increase in the transmission of vector-borne diseases (e.g., mosquito diseases such as dengue fever and chikungunya)	Indirect	Infectious
		Increase in the transmission of water-borne and rodent-borne diseases (e.g., leptospirosis)	Indirect	Infectious
Water insecurity	Contamination of drinking and recreational water by run-off from heavy rainfall Contamination of freshwater resources due to sea level rise Changes in marine environments that result in algal blooms and higher levels of toxins in fish and shellfish	Increased episodes of diarrhoeal and intestinal diseases, and sea food poisoning	Indirect	Infectious
		Food-borne illnesses		
		Other diarrhoeal and intestinal diseases		
Food systems and food security	Changes in rainfall and temperature, increasing frequency and severity of EWE, coastal flooding/SLR.	Nutritional deficits (e.g.: undernutrition and malnutrition)	Indirect	Non-communicable

	Impacts lead to the disruption of agricultural production, processing and distribution. Decline in aquatic populations due to increase in ocean temperatures and ocean acidification	Increased risk of chronic diseases linked to poor diet choices due to lack of healthier alternatives	Indirect	Non-communicable
Psychosocial health impacts	Range of climate hazards: extreme weather events (e.g. extreme heat, flooding, hurricanes, wildfires, drought); sea level rise; melting permafrost etc.	Mental health outcomes (e.g.: post-traumatic stress disorder, anxiety, depression, violence, aggression, worry & fear, altruism, post-traumatic growth, etc.) Challenges to emotional and social wellbeing: 'ecoanxiety', 'ecoparalysis, 'solastalgia'	Direct/indirect	Non-communicable

Human security (wellbeing impacts)	Disruption of economic sectors and human systems by climate hazards Deterioration of living conditions due to climatic hazards (e.g., repeated extreme events or loss of land to sea level rise)	Loss of livelihoods and economic security, impoverishment Lack of basic necessities Dilution of cultural practices and human identity, particularly when these practices and identities are connected to livelihoods vulnerable to climate (e.g.: farming and fishing) Forced migration Lack of social support Psychological health effects (mental health and stress-related illnesses)	Indirect	Non-communicable

Adapted from Health Canada, 2005; Additional sources: Hayes, Berry & Ebi, 2019; Hayes et al., 2018; Schnitter and Berry. 2019; Adger et al., 2014; Kjellstrom and McMichael, 2013; Taylor et al., 2009; Smith et al., 2014; Friel et al, 2010; and Kjellstrom et al., 2009

2.3.1 Climate change and non-communicable diseases

Compared to the attention given to other climate change health impacts (e.g. mortality and injuries from EWE and communicable diseases), the connection between NCDs and climate change has been left largely unexplored (Colagiuri, Boylan and Morrice, 2015; Haines et al, 2006; WHO, 2014a; Kjellstrom et al., 2010). There is a rather recent, limited body of literature on this topic that has sought to (1) describe the connections between non-communicable diseases and climate change (e.g., Acharibasam and Anuga, 2018; Kjellstrom and McMichael, 2013; Friel et al., 2011; Kjellstrom et al., 2009; Kjellstrom et al., 2010); (2) outline future research needs and priorities to better understand the association between NCDs and climate change (e.g., Colagiuri, Boylan and Morrice, 2015) and (3) bring attention to policy opportunities (adaptation and GHG mitigation) that confer co-benefits for planetary and human health (e.g., Campbell-Lendrum et al., 2018; Kjellstrom and McMichael, 2013; Beaglehole et al., 2011; Friel, 2010; Friel et al., 2011; Islam et al., 2014; Kjellstrom et al., 2010; Mash, 2010; McMichael, Powles and Butler, 2007; Song et al., 2017).

Kjellstrom et al., (2010) reviewed the limited evidence available on the relationships between climate change and NCDs to outline potential pathways of impacts. They concluded that climate change is an additional emerging risk factor to the development of NCDs and the adverse health experiences of persons with NCDs (Kjellstrom et al., 2010). Later, Kjellstrom and McMichael, (2013) followed up by highlighting the links between climate change and health problems stemming from non-communicable diseases. They noted that evidence seems to suggest that rates of hospital admission for NCDs (e.g. kidney failure or cardiovascular diseases) increase during times of extreme heat (Kjellstrom and McMichael, 2013). Further, macro socio-economic processes that contribute to anthropogenic climate change – industrialisation, urbanisation and globalisation – also underpin

lifestyle habits that have led to the increased prevalence of NCDs (WHO, 2005). For instance, economic development is changing dietary habits, including the quantity and quality of food eaten and thus the nutritional value received. Land use patterns have changed to facilitate the agricultural landscape needed to provide food for growing populations and meat intensive diets are associated with high methane emissions (IPCC, 2014). Economic development has also changed the way people move from place to place, eschewing healthier modes of transport like walking and cycling in favour of vehicular modes of transport that contribute to carbon emissions. These connections are important as they speak to the potential for co-benefits, the redirection and optimisation of resource use, and they bring attention to the compounding effect climate change and NCDs may have on population health.

Several of the papers discussing the association between NCDs and climate change are general in scope (Bauchner, and Fontanarosa, 2014; Colagiuri, Boylan and Morrice, 2015; Friel et al., 2011; Kjellstrom et al., 2010). These articles do not speak to the experiences of individual countries or populations, and so are not conducive to place-specific adaptation strategies that consider the vulnerabilities and adaptation needs of given populations. Consequently, more research at a local scale is needed to support adaptation strategies that are specific to the needs of vulnerable populations.

2.3.2 Climate, health and wellbeing research in the Caribbean

Using the SCOPUS, JSTOR and Web of Science databases, a literature review was defined using the search terms “climate change, health and wellbeing”; “non-communicable diseases and climate change”; and “climate change and small islands states” for the period between 1975 and 2017. Fewer than thirty peer-reviewed articles were found that dealt with climate change and health in the Caribbean. Twelve of these articles focused on Cuba, four of which were published in Spanish

language journals. Other countries where research has been undertaken are Barbados, Trinidad and Tobago, Jamaica, Grenada and St Kitts and Nevis (Batchelor et al., 2012; Chadee and Sutherland, 2014; Macpherson and Akpinar-Elci, 2015; Prospero, Collard, Molinie and Jeannot, 2014; Rawlins et al., 2007). These articles have explored topics such as leptospirosis in Jamaica; flooding in Jamaica; African dust and air quality in the Caribbean Basin; Saharan dust and asthma in Grenada; knowledge, attitudes and practices related to issues of climate change and variability in Trinidad and St. Kitts; and perceptions of the local impacts of climate change among Caribbean health-care providers in Trinidad & Tobago and Grenada.

In the grey literature, there has been one comprehensive study of the impacts of climate change and climate variability on health in the entire Caribbean by Taylor and colleagues in 2009, and a small number of studies in the form of vulnerability and adaptation assessments for health conducted for individual islands (discussed in greater detail in Section 2.4). Limitations of the Taylor et al., (2009) review include the focus on the physical aspects of health, with little attention given to wellbeing and health holistically (Taylor et al., 2009). For instance, there was nothing about the climatic impacts on livelihoods or culture. These are important impacts in these countries where human lives and livelihoods are intertwined with the physical environment. Another limitation of the review is that it did not consider country or population level factors that influence the vulnerability or adaptive capacity of populations. Despite these limitations, the results of Taylor et al., (2009) provide a necessary introduction to the possible future health threats that the Caribbean may encounter. However, there is a need for national level studies that provide deeper, richer insight into the specific health and wellbeing vulnerabilities, and potential adaptive capacity of populations of individual countries.

Greater emphasis has been placed on infectious disease than any other category of health effects in these Caribbean studies. Very little mention was made of the impact of climate change on

non-communicable diseases beyond outlining the mechanisms for these impacts to occur in the Taylor et al., (2009) review, and no previous studies have comprehensively addressed the connection between NCDs and climate change in the Caribbean. While concerning, it was not an unexpected finding as this is reflective of the broader research gap that exists beyond the Caribbean region. However, it is an oversight this research seeks to address because of the current burden of non-communicable diseases on population health in the Caribbean and the possible links to climate change.

The findings of this literature review demonstrate a significant lack of attention by the academic community to the health impacts of climate change in the Caribbean that raises an important question: "Why are the health impacts of climate change not a research focus?". One reason may be the lack of financial and technological resources available in Caribbean nations to conduct research or implement adaptation strategies into the health sector that consider climate change risks and vulnerability. Additionally, the necessary expertise, tools and available data to support these research agendas may be lacking. This research while important, may be considered unfeasible if there are limited resources available to implement solutions or strategies emerging from the research findings. Furthermore, there are more immediate economic and social concerns in the view of the general public that drive political priorities; currently climate change is not one of these issues (Cashman, Nurse and Charlery, 2010). Ironically, the low priority ascribed to climate change and health by the public could be blamed on the lack of available information about how certain diseases and ailments are related to climate change and consequently, there is a little attention given to this issue. For these same reasons, it is important that researchers are proactive in contributing to this area of research so that information is readily available to decision makers and interested stakeholders.

2.4 Health vulnerability and adaptation assessments (HVAs)

Health systems have long been coping with climate-sensitive outcomes but climate variability and change challenge the management capacity of these systems. Health vulnerability and adaptation assessments are proposed as tools to address these challenges by providing relevant and useful information to public health and disaster management officials and their partners from other sectors (Berry et al., 2018; WHO, 2013a). As implied by the IPCC definition of vulnerability, health vulnerability assessments collect data on the current and future risks of climate change to inform the creation of adaptation strategies and polices that reduce climate risks to health (Ebi, Kovats and Menne, 2006; WHO, 2013a). According to Ebi et al., (2006), the concepts used in HVAs are similar to those used in health impact assessments. Kovats and colleagues (2003) outlined the common features of health impact assessments: (1) they are integrated assessments rather than focusing on a single risk factor; (2) they are typically multidisciplinary processes designed with decision makers in mind so as to provide the necessary information to make recommendations to improve health; (3) they often relate to policies outside of the health sector and (5) they quantify the expected health burden to exposures in specific populations (Kovats et al., 2003). One of the key differences noted between health impact assessments and climate change health assessments, is that the former focuses on a single exposure, whereas the later needs to consider a range of impacts (Kovats et al., 2003). Therefore, while there may be similarities between how these two types of assessments are conducted, there must be some modifications so that assessments are suited to the unique and complex nature of climate change.

Having recognised the imminent threat of climate change and the need for increased resiliency in health systems, the WHO has created guidelines for health vulnerability assessment to support “effective and evidenced-based action to protect health from climate change” (WHO, 2013a,

pg v). Steps from this assessment were used in this research and Chapter 3 describes in greater detail the guidelines for this assessment. This HVA is versatile in its application, meaning that it can be applied for a variety of purposes depending on the needs or desired outcomes of the user. For instance, the assessment can be applied to enhance the preparedness of health systems from extreme weather events, whereby a range of health risks associated with EWE may be considered (WHO, 2013a). Alternatively, a narrower or broader scope may be applied which considers a single or several health risks as the focus of the assessment.

Few health vulnerability and adaptation assessments have been conducted by the small island states in the Caribbean, though the high level of vulnerability to climate change should incentivise these countries to be proactive in this area. Antigua and Barbuda include a brief section on health vulnerability to climate change in their Third National Communication to the UNFCCC, and the areas of concern were diarrhoeal diseases, dengue fever, vector-borne diseases and water-borne diseases. This assessment used "forecast by analogy" to identify health vulnerabilities. St Lucia included a health assessment in their Third National Communication to the UNFCCC (Government of St. Lucia, 2017). The focus of their assessment was on dengue and diarrhoeal diseases and they made their conclusion based on the assessment of the current burden of climate sensitive diseases. Neither of these two assessments were comprehensive; there was little to no information provided on the framing and scoping of these assessments nor on the methodology used, and it was left up to the reader to infer how these assessments were done. Bultó and colleagues (2006) conducted an assessment of human health vulnerability to climate variability and change in Cuba, where the primary focus was dengue fever. This study used a quantitative methodological approach to analyse the associations between climatic anomalies and disease patterns to highlight current vulnerability to climate variability and used this to predict future economic impacts of climate change. The study provided much more details on the scope of the research, the methods used and offered several

adaptation options to the vulnerability found through the assessment. There was an assessment conducted for the Government of Dominica that used the WHO (2013a) HVA guidelines and employed mixed-methods to collect quantitative and qualitative data (Schnitter et al., 2019). The four priority areas of concern selected for this assessment were food security, foodborne diseases, water borne/water related diseases and vector borne diseases (Schnitter et al., 2019). The assessment examined current exposures, exposure risks, sensitivity, vulnerable populations and expected climate change impacts of these four health risks to determine the adaptive capacity in Dominica and possible adaption options for each health risk. Finally, there was a health vulnerability and adaptation assessment prepared by the Government of Grenada, that utilised a qualitative participatory approach to gather information from persons working within the Grenadian health system (Pochanke-Alff, Meincke, Scheske, & Wuttge, 2015). The priority areas of concern identified in this study were vector-borne diseases and food and water-related diseases; communicable respiratory infections and health infrastructure vulnerability. Like the Dominican assessment, the Grenadian assessment also utilised the WHO (2013a) HVA guidelines.

The focus of these assessments conducted in the Caribbean to date have been on communicable diseases. Likewise, while the application of the HVA assessment in this research will not be the first of its kind in the Caribbean, it will be the first to specifically identify non-communicable diseases as the priority area of focus.

2.5 Theoretical and methodological approaches

Krieger (2011) offered that "without theory, observation is blind and explanation is impossible". She was speaking to the importance of theoretically grounded research, essential to: (1) asking the right research questions; (2) accurately explaining observations; and (3) ultimately

providing information that will be useful to decision-makers to design effective interventions to limit the impacts of climate change on health and wellbeing**.**

Climate change research has been largely explicitly atheoretical. This does not mean researchers are not guided by theory in their research, rather that it is seldom explicitly stated. This is largely true as well for climate change and health research. In this field of study, many researchers seem to favour approaches where data that can be objectively observed and classified, are analysed to draw conclusions about climatic impacts on health (e.g., Akpinar-Ferrand and Singh, 2010; Lloyd, Kovats and Chalabi, 2011; Springmann at al., 2016; Sterk at al., 2016; Zheng et al., 2011). These types of studies are extremely useful for (1) identifying and spatially displaying large geographic areas that possess high vulnerability to climate change; (2) quantifying the effects of adaptation or mitigation policies or (3) showing how the effects of impacts and adaptation change may change over time. However, these approaches hide the spatial heterogeneity of impacts and vulnerability at smaller scales and fail to capture the individual lived experiences of persons. Individuals should not be discounted as they allow for investigations of complex behaviours and motivations for actions; and uncover diverse opinions and experiences.

Other theoretical approaches that have been employed in this area include the Ecosocial theory (e.g., Grace et al., 2015); human rights/right to health approach (e.g., Jones, Bennett, Keating, and Blaiklock, 2014); and political ecology of health (e.g., Mulligan, Elliott, and Schuster-Wallace, 2012; Richmond et al., 2015). Ecosocial theory seeks to describe causal pathways in disease distribution, using four core constructs: ‘embodiment’, ‘pathways to embodiment’, ‘cumulative interplay between exposure, susceptibility and resistance’ and ‘accountability and agency’ (Krieger, 2011). This theory also seeks to articulate how disease distribution is influenced at multiple levels from the individual to the global, and over the life course. The right to health approach is one that focuses on marginalized/discriminated populations and gives a voice to subpopulations who would

otherwise be missed. While the Ecosocial theory could be applied this research, I ultimately decided to employ the political ecology of health (PEH) approach as it presents a framework for a multi-scalar (local, national, regional and global) analysis that interrogates how health landscapes are situated within social networks that contribute to vulnerability to diseases and shape health decision-making (King, 2010). That said, there is no single approach to this field as research, and as the literature continues to grow, there likely will be the innovative application of old and new theoretical approaches.

2.5.1 Political ecology of health

Bryant and Bailey (1997) proposed three assumptions of political ecology that align with the phenomena of climate change. First, the impacts of climate change are unequally distributed. This is true on a global scale where low-to-middle income countries, developing countries and least developed countries are unequally burdened by climate despite contributing the least to the greenhouse gas emissions which have been established to be responsible for climate change (Adger, 2001; Brown, 2003; Betzold, Weiler, & Castro, 2012; Betzold, 2010; UN, 1994). Inequalities in the distribution of impacts also exist on a regional, national and local scale, where the most vulnerable are often marginalised populations based on social determinants such as age, race, gender, socio-economic status and pre-existing conditions. Secondly, the unequal distribution of impacts may reinforce or exacerbate social and economic inequalities (Bryant and Bailey, 1997). The cumulative effects of climatic and non-climatic stresses threaten to hinder or reverse the strides in development made in LMICs and vulnerable SIDS would allow them to grow economies of scale and improve their macro socioeconomic status. Likewise, the vulnerable subpopulations within countries face similar challenges on an individual level, hindering their opportunities to improve their socioeconomic status. Finally, social and economic inequalities have political implications that affect

the distribution of power (Bryant and Bailey, 1997). At a national level, this may mean that countries considered most vulnerable because of their socio-economic status are denied opportunities to acquire power that would strengthen their standing on a global scale and allow them to make or influence decisions in international negotiations. The same is true on a local scale for vulnerable populations.

PEH builds on the theoretical conceptualisations of political ecology, to situate issues of health and wellbeing within interacting political, economic, cultural and environmental systems. This framework interrogates how these systems shape local health outcomes though the spread of disease and the decision-making opportunities accessible to populations (King, 2010; Mayer, 1996). Mayer (1996) notes that within political ecology and economy, the importance of recognising "context" is key to understanding the phenomena in question. The systems referred to previously are context-dependent and need to be studied as such to understand the health outcomes of climate change impacts.

Another key consideration that makes political ecology of health applicable to this research issue, is that while the setting of the research is usually the local scale, the framework calls for a multi-scalar analysis to illustrate how local health outcomes are shaped by forces at various scales (Mayer, 1996). This is important in the Caribbean where the successes of local public health policies in CARICOM countries have been driven by health priorities at a regional level which are connected to regional integration process (Theodore-Gandi, & Barclay, 2008). Furthermore, these regional priorities are linked to the agendas of expert international health organisation like the World Health Organisation and Pan-American Health Organisation.

Additionally, the PEH framework assists in understanding how diseases are understood and represented by institutions and how these discourses may align or conflict with local understandings (King, 2010). King (2010) notes that these discourses are essential to uncovering inequalities in the distribution of power, which in turn has implications for access to resources, opportunities and

information (adaptive capacity). Inequalities in power contributes to uneven distribution of vulnerability to the health impacts of climate change. Moreover, the PEH framework supports the exploration of the knowledge of the health risks of climate change possessed by the local populations, institutions and decision-makers, necessary to determine whether there is sufficient motivation to act to reduce the burden of climate change on health and wellbeing.

2.5.2 Conceptual framework

The conceptual framework applied in this study is inspired by a PEH framework proposed by Richmond and colleagues for understanding how perceptions of environment, economy, health and wellbeing interact to influence health outcomes in a ‘Namgis First Nation community (Richmond et al. 2005). The framework by Richmond et al., (2005) has been adapted and adopted for this investigation of the impacts of climate stresses on health and wellbeing. The iterative framework has four key interdependent components: (1) autonomy; (2) the use and enjoyment of environmental resources; (3) economic opportunities; and (4) health and wellbeing. For this investigation of climate stresses, this framework would be adapted to include climate stresses as a central fifth component and the “use and enjoyment of environmental resources” would be changed to “social and cultural use of environmental resources” (Figure 2.1).

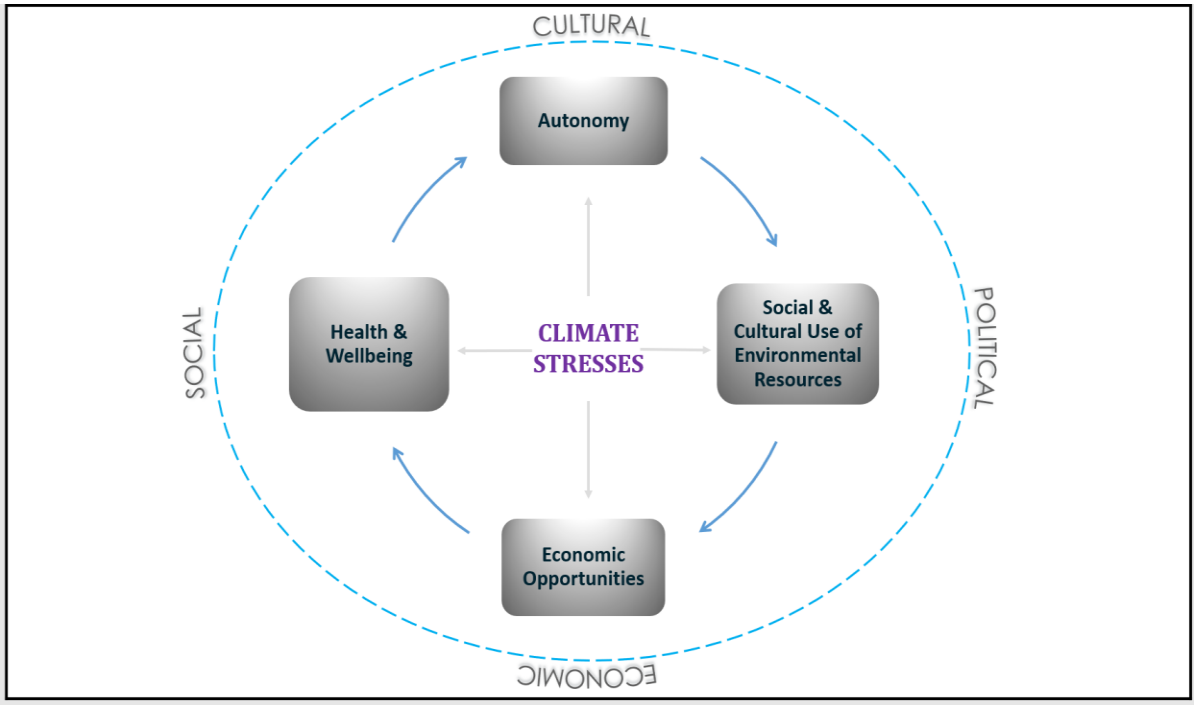


Figure 2.1: Political Ecology of Health (PEH) framework adapted from Richmond et al., 2005

Autonomy in this adapted framework refers to the power possessed by individuals to make decisions that influence their vulnerability to climate stresses. The assumption is that individuals are free to make choices that influences their vulnerability, but other decisions are constrained by political and economic factors at a larger scale. Next, autonomy is linked to the social and cultural use of environmental resources in the sense that individuals can choose when and how to use environmental resources for a variety of reasons which influences their health and wellbeing (e.g., coastal resources for food, relaxation or exercise). The third component represents economic opportunities that are derived from environmental resources or impacted by changes to the physical environment. This framework demonstrates that health and wellbeing are dependent on the other constructs and influences the autonomy to make decisions and that climate stresses directly influences each of the four constructs. Some decisions to adapt (or not) are a direct response to the climate

stresses to which individuals are exposed. However, there are times when actions are taken in response to other stimuli, but still confer adaptation benefits. The use of environmental resources for social and economic activities are affected by climate stresses. In the Caribbean for example, changing precipitation patterns could negatively affect agricultural practices, and by extension the livelihoods of resource users (i.e. farmers and vendors). The final key consideration of this framework is that all these interactions which occur at local levels are constrained by broader interdependent forces (i.e. political, economic, social and cultural) operating at larger scales (national, regional or global).

This framework was used to interrogate Barbadians' experiences of health and wellbeing within the broader social, cultural, political and economic systems, the factors that inform these experiences and the role that climate change plays in these experiences. It prompted the investigation of how policies shape the behaviours, experiences and health outcomes of local populations and the concerns of local populations which might be addressed through policy responses. The research objectives and questions were deductively informed by this framework. Likewise, the methodological approach selected for this research and the stakeholders identified for engagement, was informed by this PEH framework (Figure 2.1).

2.5.3 Methodological approaches

With the exception of the Macpherson and Akpinar-Elci, (2015) study which used semi-structured focus groups, original climate change and health research from English-speaking Caribbean nations found in this review employed quantitative methodological approaches including spatial modelling, statistical analyses/models, regression models and questionnaires (Batchelor et al., 2012; Chadee and Sutherland, 2014; Prospero, Collard, Molinie and Jeannot, 2014; Rawlins et al., 2007). This has also largely been the case with the research out of Cuba (Ortiz et al., 2015; Escobedo,

Almirall, Rumbaut, and Rodríguez-Morales, 2015; Carboneil, Ruiz, Doral, and Zucchetti, 2010). The focus of most of these studies has been infectious or vector-borne diseases for which the connection between climate and disease distribution/frequency is relatively well understood; this correlation is used to predict possible future scenarios of disease distribution based on available climate variability data (Ortiz et al., 2015). The association between NCDs and climate change was not one that had been made in the Caribbean before this study, and so an exploratory approach was deemed best suited to this pioneering research. Qualitative methods offer an effective way of collecting exploratory data to provide a nuanced understanding of the association between NCDs, climate change and health and wellbeing.

Berrang-Ford et al. (2012), Mulligan, Elliott and Schuster-Wallace, (2012) and Richmond et al. (2005) are three studies that were striking in their use of qualitative methodological approaches. Berrang-Ford et al. (2012) used a case-study, vulnerability-framework approach to determine: (1) key climate sensitive community identified health outcomes; (2) sensitivity at multiple scales and (3) potential adaptive capacity of the health system of the community. This study done in Uganda, prioritised the importance of the experiences and knowledge of local populations to assess vulnerability to climate change. Likewise, Mulligan, Elliott and Schuster-Wallace, (2012) used a case-study approach, informed by the traditions of political ecology. This case study approach used interview data from key informants, textual sources, media reports and empirical evidence to investigate the connections among urban planning, governance and dengue fever in the Global south. They reasoned that the case study approach is ideal for exploring new and complex human situations (Mulligan, Elliott and Schuster-Wallace, 2012). Finally, Richmond et al., (2005) also used qualitative methods within a case study of 'Namgis First Nation' to gather data on the perceptions of the links between environment, economy and health and well-being. The research described in this dissertation

is methodological similar to these studies but focuses on a different health outcome and geographical context.

2.6 Summary and conclusion

Having reviewed the literature that encompasses health and climate change, the overarching research gap this dissertation seeks to address is the dearth of "climate change, health and wellbeing research in a Caribbean context" – which almost completely overlooks the group of non-communicable diseases. These research gaps are addressed by exploring health and wellbeing impacts stemming from the complex pathways linking NCDs and climate change in the small island state of Barbados, using a political ecology of health approach and a qualitative methodological approach.

This research first draws upon the lived experiences of Barbadians to reveal what they consider to be the key components of wellbeing to determine how these components are impacted by climate change. As discussed earlier, the dissertation uses Deaton's (2006) definition of wellbeing, which is adaptable and allows for the identification of place and population specific determinants of wellbeing. This is a novel application in Barbados that will contribute to an understanding of the linkages between climate change, health and wellbeing, elucidating the wide-ranging impacts that climate change may have on the physical, social and economic lived experiences.

This research assesses the level of knowledge of the relationship between stresses and non-communicable diseases among public health professionals to determine pathways of impacts between climate change and NCDs. Moreover, it seeks to add to the emerging discourse on the connections between non-communicable diseases and climate change in vulnerable countries and among vulnerable populations like those in the Caribbean. This understanding of the connections between climate change, health and wellbeing is important for identifying and building upon existing

strategies, policies and practices geared towards climate change adaptation and health promotion activities that reduce the burden of NCDs.

From a theoretical perspective, it was found that that climate change and health research is largely explicitly atheoretical. Furthermore, positivist approaches to research seem to be the most common approach in this field. This research argues for the more explicit use of critical social theories, characteristic of modern "health geography", which will be instrumental in creating new understandings of health and wellness in the context of SIDS. This dissertation contributes to this through the use of a political ecology of health approach, which allows for the interrogation of Barbadians' experiences of health and wellbeing within the broader social, cultural, political and economic systems, the factors that inform these experiences and the role that climate change plays in these experiences.

Finally, this research employs the use of a health vulnerability assessment in a Caribbean context to offer a focused assessment of the impacts of climate change on NCDs. While the HVA has been used before in Dominica, the priority health concerns were communicable diseases. This research chose non-communicable diseases as the priority health concern because these diseases are currently the leading cause of mortality, yet their connection to climate change has been overlooked. Given the growing burden of NCDs and the associated economic cost, it is important to bring awareness to the impact of climate change on NCDs and learn about adaptation strategies that could reduce the cost to health systems. Quantitative methodologies have largely been used in the Caribbean to collect data on the health impacts of climate change. The research seeks to diversify the pool of Caribbean research and contribute to a more comprehensive understanding of climate change impacts by utilising a qualitative methodological approach to explore this research issue.

Chapter 3: Methodology

3.1 Introduction

The following chapter describes the qualitative research approach used to explore health and wellbeing impacts stemming from the pathways linking non-communicable diseases and climate change in a Caribbean context. More specifically, it describes the methods used to address the following research objectives:

1. Explore determinants of wellbeing among the Barbadian population;
2. Explore the knowledge and attitude of health professionals across multiple scales on the current and future burden of non-communicable diseases in Barbados and possible connections between climate change stressors and non-communicable diseases
3. Investigate policy responses to NCDs in Barbados to assess the potential for the alignment of NCDs and climate change adaptation responses.

This chapter begins with an overview of the research design used in this dissertation; provides a description of the study site and a timeline of the research. Following this, the chapter describes the framework, tools and associated methods used to address the research objectives. The chapter concludes with a reflection on researcher positionality and ethical considerations.

3.2 Research Overview

3.2.1 Research design

This research took the form of a qualitative case study of Barbados, guided by a political ecology of health theoretical framework described in the literature review (Section 2.5.2). Steps from the Health vulnerability and adaptation (HVA) assessment guidelines from WHO (2013a),

complemented by the participatory vulnerability assessment (PVA) approach described by Smit and Wandel (2006), were used to inform the research design. Qualitative case studies are a well-established methodology for exploring new and complex human situations to provide nuanced understandings of the phenomena being studied; they are valuable for the rich descriptions of human experiences they can elicit from various social situations (Hay, 2010; Berg, 2009). For this research, a case study was adopted to uncover the meanings attributed to wellbeing in Barbados, grounded in the varied perceptions and experiences of the population, and to explore the ways that climate change, a complex and unexplored phenomenon in this context, affects said wellbeing of the Barbadian population. Because the focus of this research was exploring and gaining a deeper understanding of the pathway of impacts, a qualitative approach was deemed most suitable.

The concurrent utilisation of the PVA approach (Smit and Wandel, 2006) and the WHO (2013a) VA assessment guidelines was employed in order to provide both a "bottom-up" and "top-down" analysis of health and wellbeing vulnerability to climate change. These assessments were used to gather perspectives from different scales of analysis, from the community to the national and regional level. The PVA conceptual approach recognises that although climate will have an impact on health and wellbeing, various other stimuli (social, political and economic factors) compound the vulnerability of populations (Smit and Wandel, 2006). That is, while climate change is an environmental phenomenon, the manifested impacts on populations are amplified or attenuated by macro- and micro- level factors in place. Resultantly, the PVA framework recommends full active community participation to document current exposures and sensitivities, as well as factors that constrain or support adaptive capacity. As per Smit and Wandel (2006), community stakeholder participation should involve lay persons to give a voice to those whose vulnerability are in question, as well as the expert insights of local decision makers. Other sources of useful information include scientists, resource managers and unpublished and published literature.

While the purpose of the WHO (2013a) tool is similarly to assess current exposures and sensitivities to climate change, a major difference is that the focus of this assessment, as the names implies, is on health. This approach prioritizes insights from health experts and secondary health data more so than it does the perceptions held by lay citizens. Although there are three stages and several steps to the VA (Figure 3.2), this research was guided by Stage 1 (instructions for the framing and the scoping of the assessment) and Stage 2 (steps for carrying out the assessment). Following the prescriptions outlined in both the PVA approach and the HVA guidelines, in-depth interviews with the general public, key-informant interviews with health professionals and a document review were undertaken to address the objectives of this research. The concurrent utilisation of these three methods and data sources, allowed for data triangulation to capture a comprehensive understanding of the impact of climate change on population wellbeing, as well as a means of testing the validity of the data (Patton, 1999). The information gathered from health professionals in this assessment was integrated with the views gathered from the general public and analysed for a more complete picture of the potential future exposure and sensitivity to climate change.

3.2.2 Study Site

This research was conducted in Barbados, a small island developing state in the Caribbean region. More information is provided on the study context in the Country Profile presented in Chapter four.

3.2.3 Research timeline

Field research commenced in October 2017 and was completed in January 2018. It began with the recruitment of participants which took place throughout October 2017. This entailed meetings with the members of the public facilitated through existing church based and community-

based networks; the distribution of recruitment flyers; and telephone and email contact with potential health experts. From November 2017 until January 2018, 20 in-depth interviews with citizens of Barbados and 10 key-informant interviews with health professionals were conducted. Throughout the entire field season, several documents were compiled for a document review. Data analysis took place in 2018 - 2019.

3.3 Research Tools

3.3.1 Participatory vulnerability assessment

The driving force behind the use of a participatory vulnerability assessment approach is that it focuses on the "community" level while still taking into account the broader structural forces within which the community operates as per the PEH framework (Section 2.5.1). This approach is used to investigate current exposure, sensitivities and adaptive capacity to climate change (Figure 3.1) by exploring what Barbadians think of their wellbeing (Research objective #1).

The research questions identified to address research objective 1 are:

- What do Barbadians consider to be essential or detrimental to their wellbeing?
- How are these determinants directly or indirectly affected by climate change?
- Do Barbadians perceive climate change to be a threat to their wellbeing?
    - If so, how? If not, why not?

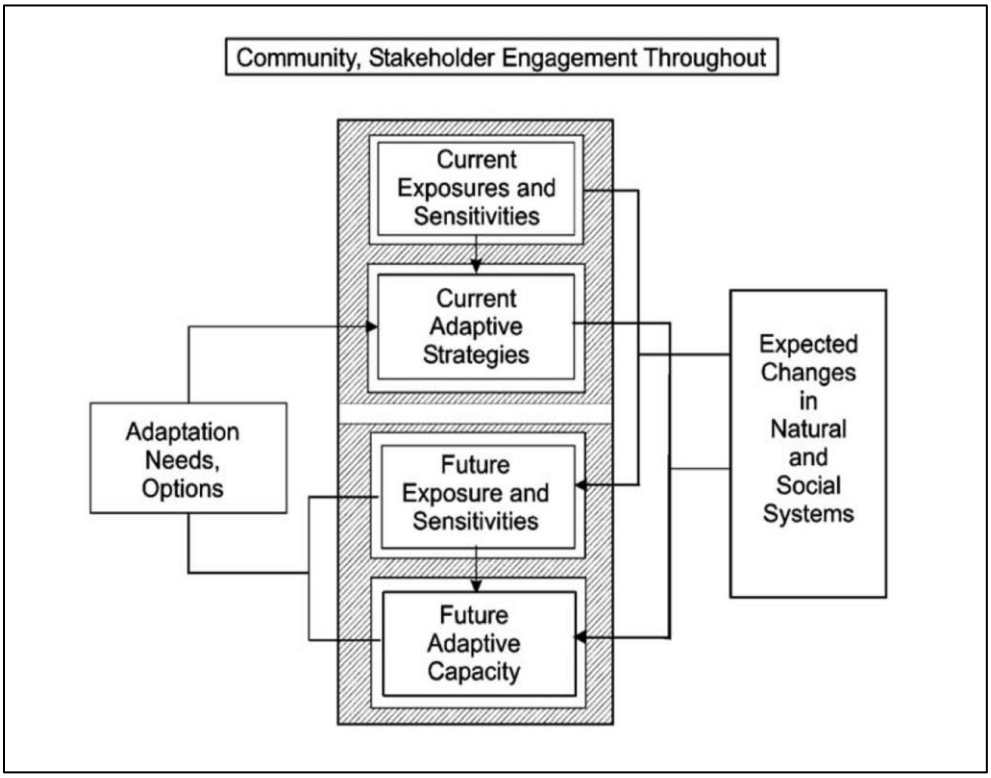


Figure 3.1: Participatory vulnerability assessment framework (Smit and Wandel, 2006)

3.3.2 Health vulnerability and adaptation assessment

The health vulnerability and adaptation assessment guidelines developed by the WHO (2013a) were created to help countries assess the vulnerability of their health sector to the impacts of climate change and provide stakeholders with information on the health risks and vulnerability associated with climate change. They also provide a framework to identify opportunities to mainstream climate change planning into existing policies and programmes to address other health issues. These assessments may be carried out at national or sub-national scale.

The WHO (2013a) HVA guidelines comprise several steps which include: (1) framing the assessment; (2) a vulnerability assessment; (3) a future impact assessment; (4) an adaptation

assessment; and (5) the establishment of an iterative process for monitoring and evaluation. These steps are further categorised into a three-stage framework: (1) Frame and scope assessment; (2) Assess and (3) Monitor and evaluate (Figure 3.2).

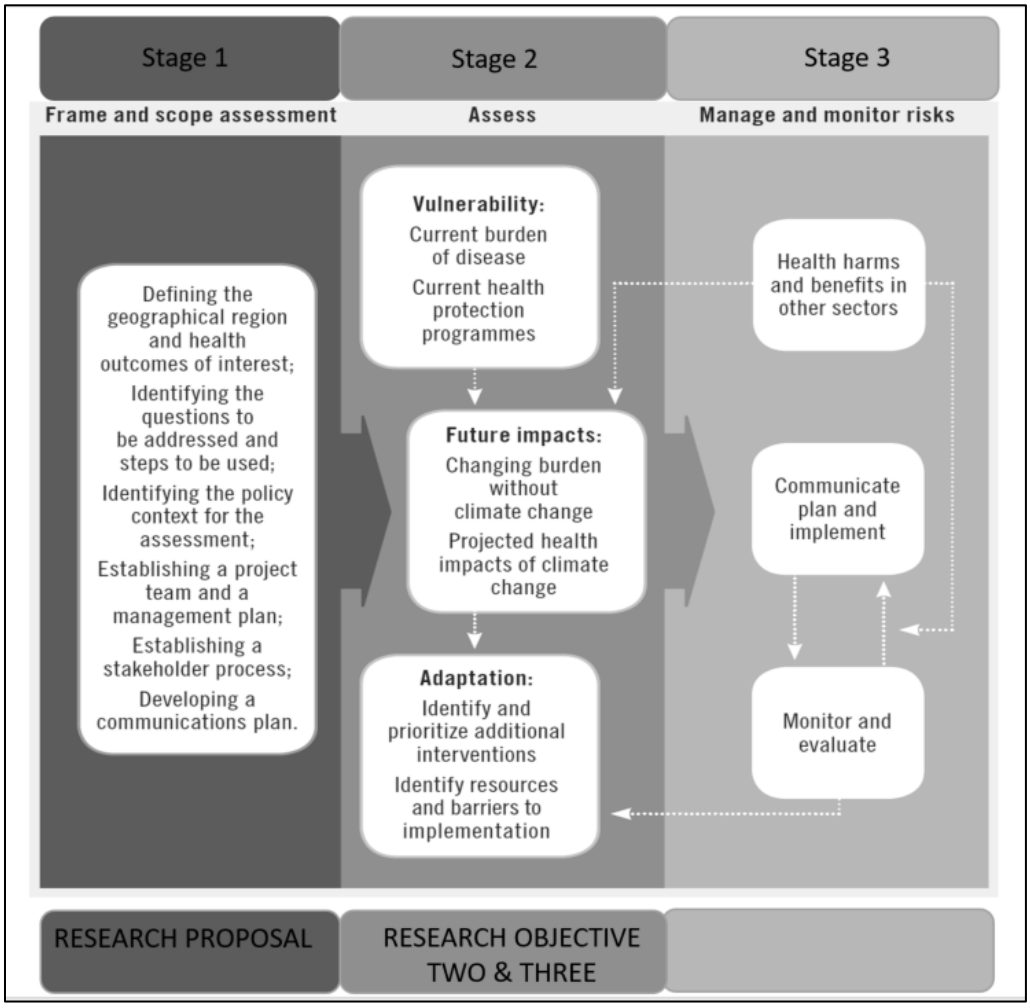


Figure 3.2: Health vulnerability and adaptation assessment - correlation to research design - Adapted from WHO (2013a)

Stage 1: Framing and scoping the assessment

The first stage of the assessment was addressed during the proposal for this research.

1. Defining the geographic area and health outcome of interest

The health outcome of interest was determined to be non-communicable diseases given data and public discourse show that these diseases are currently a priority health concern in Barbados and throughout the Caribbean. The geographic area for this research is the national level. Barbados has a single level of government, and so there are no regulatory bodies at a subnational level to make decisions that would result in heterogeneous (health) policies across different communities.

2. Questions to be addressed and steps to be used

This assessment was used to address the research questions derived from research objective #2 and #3. These research questions were carefully identified having considered the availability of data; the feasibility of work that can be completed within the allotted timeframe; and the human capacity and budget available. These questions categorised by the research objective they address are as follows:

Objective 2 – (Vulnerability Assessment, Future Impact Assessment)

- What do health stakeholders consider to be the priority health impacts as they relate to health and public policy interventions?
- What is the current burden of NCDs?
- What are the health programmes in place to reduce the burden of these diseases?
- How is the future burden of NCDs expected to change?
    a. Is climate change expected to affect this health outcome? If so, how?

Objective 3 – (Adaptation Assessment)

- What NCD-related policies exist on a national and regional level?
- What climate change and health related policies are there on a national and regional level? Are NCDS mentioned in any of these polices? If yes, to what extent?
- Is there any planning for the future burden of NCDs in Barbados?

3. Establishing a project team, management plan and stakeholder process

Given the scope of this research and the underlying purpose for which it was done, not all the steps in Stage 1 of this assessment were relevant. The project team comprised of myself as the lead researcher and author of this dissertation, with input from co-supervisors and committee members. The management plan used a guide for conducting this research contained details such as the research plan, timeline for research activities and research budget. Finally, although this research involved various stakeholders within the health sector, they were not involved in the planning of the research design.

4. Communications/dissemination plan

A summary of the research findings from this dissertation will be prepared and distributed to the health professionals who participated as key-informants in this research. Furthermore, the National NCD Commission in the Ministry of Health Barbados has been identified as a key organisation to which this research should be disseminated; a brief of research findings will be sent to them through a contact person identified during recruitment for this study. For persons that participated in the in-depth interviews, a summary of the key findings will be prepared and sent to them upon indication of interest. Furthermore, like the community meetings held to recruit participants, two follow-up meetings will be planned to distribute the research findings. These

meeting will also be used as an opportunity to share information on the effects of climate change in Barbados and the challenges climate change poses to human wellbeing.

Currently, the WHO is updating their HVA guidelines and the PAHO is creating a health vulnerability and assessment guide specifically for use in Caribbean SIDS. On advice from an individual knowledgably about those processes, the findings from this dissertation could help to inform those guidelines. Finally, manuscripts will also be prepared to share this data within the academic community. As of the time of submission of this thesis, two articles have been written, and one has been published.

Stage 2: Assess

Stage two of the VA was executed in the data collection and data analysis phase and was used to address research objectives two and three. This included an assessment of vulnerability, future impacts and adaptation.

Vulnerability, future impact and adaptation assessment

The vulnerability assessment was used to collect data on the current burden of non-communicable diseases and the health protection policies and programmes in place to address these diseases. The qualitative methods used to do this were key-informant interviews with a team of health professionals and a document review of NCD-related documents. The assessment of future health impacts was done by integrating the experiences, knowledge and expert opinions of health stakeholders with documented knowledge about the prevalence of NCDs and the impacts of climate change. The adaptation assessment was more challenging to accomplish given that Barbados is still in the early stages of experiencing climate change impacts, and per the foundation of this research, the linkages between climate change and NCDs have not yet been considered. That said, the population

of Barbados has been dealing with the burden of NCDs. Therefore, the adaptation assessment focused on (1) documenting the health policies and programming to deal with NCDs and (2) documenting the successes and failures of policies and health programming implemented to control NCDs. Based on this assessment, recommendations were made for adaptation actions from the needs identified and the resources or points of entry are available for these actions.

Stage 3: Monitor and evaluate

The final stage of this assessment, monitoring and evaluation was not addressed directly in this dissertation. However, one of the research contributions of this research is to inform the creation of indicators that reflect the impact of climate change on health and wellbeing. These indicators could be potentially used as a monitoring and evaluation tool to assess the effectiveness of policies and programmes implemented to reduce the burden of climate change on health and provide a baseline for future assessments. In that respect, these indicators could contribute to this stage of future assessments.

3.4 Data collection

This section describes in detail the three qualitative methods employed in this research.

3.4.1 In-depth interviews

Participant selection

Smit and Wandel (2006) note that a PVA approach is best supported by "ethnographic in-community methods" and so in-depth interviews with citizens were conducted to explore their perspectives on wellbeing and climate change (Research objective 1) (Figure 3.3). The selection of participants was guided by the PVA framework which prescribes the inclusion of lay persons as

essential community stakeholders whose perspectives and expertise are invaluable to vulnerability assessments (Smit and Wandel, 2006). In this research, a lay person was anyone without professional or specialised knowledge of climate change, but by virtue of their lived experiences could provide the researcher insight into exposures, sensitivities and adaptive capacity to climate change.

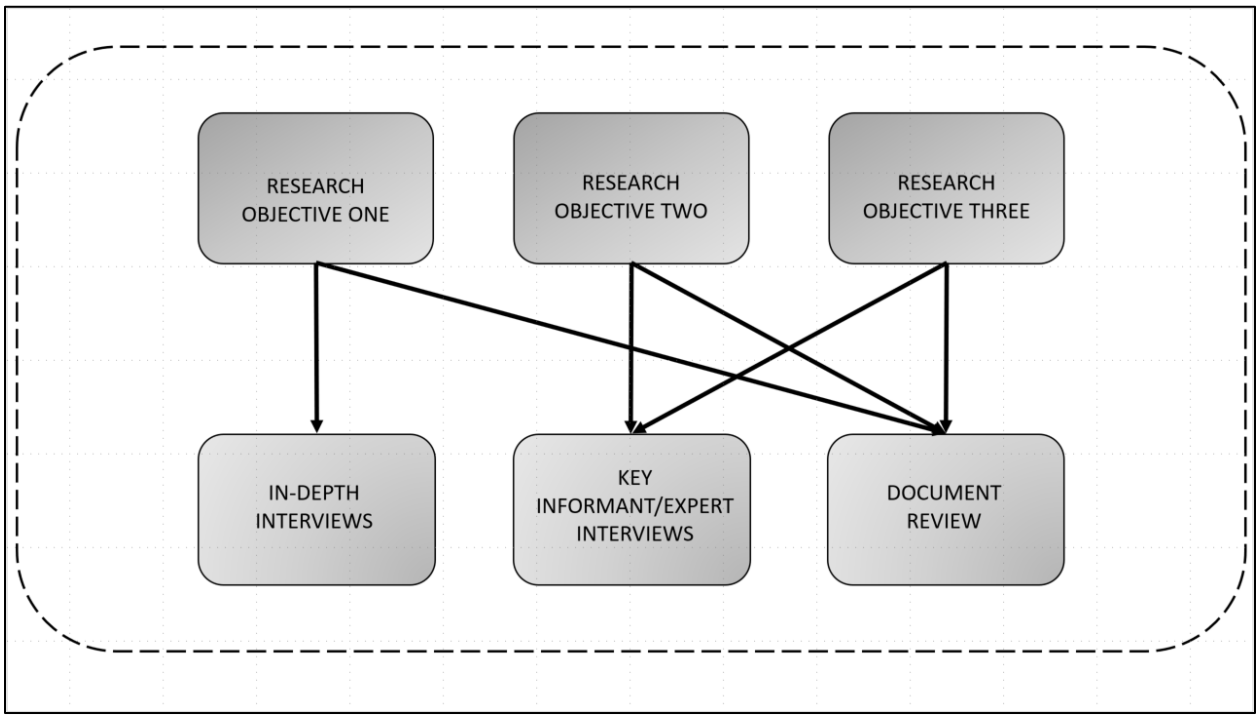


Figure 3.3: Mapping of research objectives with data collection methods

A purposive sample of 20 participants was recruited from across the entire the country to ensure a heterogenous representation of the Barbadian population. Participants were selected who were representative of the varied day-to-day lived experiences of the Barbadian population and demographic characteristics such as gender, age and occupations were considered during recruitment (Table 3.1). Eligibility criteria required individuals to be over the age of 18 years and they had to have resided in Barbados for more than 5 years. Participants were selected across three age groups:

youth (18 – 35, n = 8); middle-aged (36 – 59, n = 9); and older adults (60+, n = 3). This was done to elicit views on wellbeing from various working-aged people at different stages in life. This dissertation does not present the views of underaged or retirement-aged persons. The age distribution of the participants, though loosely comparable to the age structure in Barbados (i.e.: 18.9% of the population under 15; 71.3% of the population between 15 and 64; and 9.8% of the population over 65%) was not intended to be an accurate representation of that age distribution (CIA World Fact book, 2019).

Table 3.1: Demographic description of lay citizens (participants in in-depth interviews)

Characteristics	Sub-Groups	n/20	% of participants
Age	Youth (18 – 35)	8	40
	Middle-age (36 – 59)	9	45
	Older Adults (60+)	3	15
Gender	Female	11	55
	Male	9	45
Occupation*	Small business owner/self employed	2	10
	Manual labourer/outdoor worker	3	15
	Professional	8	40
	Service Worker	4	20
	Skilled Worker	4	20
	Student	1	5
Highest level of Education	Primary	0	0
	Secondary	7	35
	Tertiary**	13	65

* numbers do not add up to 20 because some participants fall under more than one sub-group
** community college, university, or professional certification

Participants were selected to reflect the male: female ratio in Barbados; the number of female participants were 11 and the number of male participants were 9. It was important that in selecting participants, multiple occupational experiences were represented, that reflect the distribution of the labour force in Barbados (agriculture - 10%, industry – 15% and services - 75%) (CIA World Factbook, 2019). Therefore, participants were selected from a range of professions: indoor vs

outdoor; manual labour, service workers; professionals and small business owners. The number of participants for the various occupations are moderately reflective of the distribution of occupations in Barbados, where agricultural and industry jobs make up the smallest part of the labour force, and service jobs are much more plentiful. Though participants were not recruited based on their level of education, the breakdown of 'highest level of education attained' is reflective of a highly educated population (Table 3.1). In Barbados, school attendance is compulsory and enforced up to the age of 16 (secondary level) (Refer to Section 4.4.5 for more information).

Recruitment process

Participants were identified through social networks (i.e. community and faith-based organisations) to maximise outreach. Permission was requested from the leaders of these groups to distribute recruitment flyers that described the study and invited persons to participate. People in these groups were asked to share recruitment flyers within their own networks. Twenty persons indicated interest in learning more about the research to determine whether they would want to be interviewed; 17 of these persons were selected to participate based on the criteria described above. Three persons were not selected to participate: two were underaged and the other was in the 18 – 35 age range which at that point was well represented. The final three participants were recruited through recommendations by participants who had been previously interviewed and were selected as they represented a subsection of the population which was not yet captured in the interviews. All participants were provided with a formal recruitment letter that described the study's objectives and methods; issued an invitation for their participation; and outlined the confidentiality measures and procedures for informed consent. Remuneration in the amount of $10BBD(~$6.50CAD) was offered to participants. After 20 interviews, no new ideas were emerging, indicating that I had reached saturation; recruitment was discontinued.

Interview process

A standardised interview guide was prepared and used for all interviews to ensure that discussions remained aligned with the research objectives (Appendix A). Interview questions were focused on constructs of wellbeing based on Deaton's (2013) definition of wellbeing and the Canadian Index of Wellbeing framework (Michalos, 2011) and concluded with a discussion of participants' knowledge and perceptions of climate change. Interview questions were mostly open-ended questions. Where the questions were not open-ended, or participants gave a limited answer, the interview guide contained follow-up questions to prompt respondents to be more expansive in their response. One-on-one interviews with participants lasted between 35 to 60 minutes. Participants were interviewed in their homes (n = 16) or a public space selected by the participant (n= 4); locations were chosen for the convenience and comfort of participants. All interviews were audio-recorded with permission from participants to ensure accuracy of the accounts.

Data analysis

Data processing and analysis was ongoing throughout the research process, from as early as the data collection stage. Following each interview, notes were made on emerging themes, patterns and ideas. Audio-recorded interviews were transcribed verbatim and imported into NVivo 12, a qualitative software package, for organisation, thematic coding and analysis. A coding manual was created with key themes deductively generated from the research objective, existing literature, the interview guide and the theoretical framework (Appendix B). These codes were used to perform a line-by-line analysis of the transcripts, where codes from the template were applied to corresponding passages of text (Miles and Huberman, 1994). The coding manual was first applied to two randomly selected interview transcripts by the lead researcher, and revised during the initial test application as additional themes emerged inductively from the data. The coding template was re-applied to the

interview transcripts by the lead researcher and independently reviewed by a second coder to qualitatively assess the level of agreement on emergent themes. Where disagreements on emergent themes arose, this was used as an opportunity to refine the codes through discussion. The finalised code manual was applied to all remaining transcripts.

3.4.2 Key-informant/expert interviews

Participant selection

Key informant interviews are useful for filling knowledge gaps; exploring complex behaviours and motivations for actions; and obtaining diverse opinions and experiences (Dunn, 2010). This method was selected to assess knowledge of climate change as it relates to non-communicable diseases among health professionals and to investigate the policy context and surrounding NCDs (Research objective 2 & 3) (Figure 3.3). Participants (n = 10) were selected from organisations that interact with persons living with non-communicable diseases or persons at risk of developing a non-communicable disease. Their roles include the prevention or management of NCDs, improving health literacy or the provision of technical assistance to organisations involved in these roles (Table 3.2). Participants were selected for the insight they could provide on the current burden of NCDs, the policies and strategies that have been implemented to control the burden of NCDs, success and failures to-date, the consideration given to climate change on NCD agendas and to estimate the possible additional burden of adverse health outcomes due to climate change. Health professionals were selected from organisations operating at the community, national and regional level; some professionals operate at multiple scales. Community professionals were deemed as those who provide services geared towards a single community and those operating at the national level provide services geared towards the entire country. Health professionals at the regional level were

considered to be those who work with organisations where the organisational structure extends beyond the bounds of Barbados to include neighbouring countries in the Caribbean.

Table 3.2: Description of health professionals (key informants)

Participant ID	Profession	Level of Operation of Organization	Description of Role
Health professional (HP) 1	Pharmacist	Community	Management of NCDs
HP 2	Pharmacist	Community	Management of NCDs
HP 3	Doctor	Community, national	Management and prevention of NCDS
HP 4	Doctor	Community	Management of NCDs
HP 5	Doctor	Community, national	Management and prevention of NCDS
HP 6	Head of Board of Directors of civil society health non-governmental organization NGO	National, regional	Prevention of NCDs, Health Literacy
HP 7	Representative from Pan American Health Organization (PAHO)	Community, national, regional	Technical assistance, Management and prevention of NCDS
HP 8	Nutritionist	Community, national	Management and prevention of NCDS
HP 9	Fitness instructor/personal trainer	Community	Prevention of NCDs
HP 10	Retired nurse	Community	Management and Prevention of NCDS, Health Literacy

Recruitment process

Key informants were identified through internet searches of directories for Barbadian non-governmental-health organizations, a search for governmental health contacts in the national telephone directory and social media profiles of local health businesses and organizations. Potential participants were sent a formal recruitment letter via email, and the letter described the study's

objectives and methods, issued an invitation for their participation, and outlined the confidentiality measures and procedures for informed consent. Others were contacted by telephone using a prepared script that contained the information in the recruitment letters; interested participants were sent the recruitment letter in a follow-up e-mail. Finally, using the snowball sampling technique, other participants were identified during interviews with key informants. Fifteen people were invited to participate in the study; eleven initially agreed to participate and ten were interviewed. Three attempts were made to interview one individual but we were unable to complete that interview due to schedule conflicts. Four people declined to participate; they offered that while the study seemed important, they could not offer any insight to the topic due to their lack of knowledge of climate change, and identified other participants they believed would be more suited to the study. Recruitment was deemed to be complete based on the inclusion of representatives from all levels of analysis (community, national and regional). Furthermore, we conclude that we had reached data saturation when key informants could offer no new insights, and they all identified potential participants who had already been contacted for the study.

Interview process

Interviews with key informants followed a semi-structured format using a standardized interview guide (Appendix C). Participants were allowed leeway in the interviews provided that their discussion remained within the scope of the research objective. The interview questions ranged from descriptive (e.g., role of the interviewee in their organization, research related to climate change they have conducted) to storytelling (e.g., how their work on NCDs has changed overtime and how it fits within the mandate of their organization) to opinion questions (e.g., is there a strong awareness of the links between climate, NCDs and wellbeing among the public and policy makers). Interviews lasted

between 35 and 60 min and key informants were interviewed at their place of business. All interviews were audio-recorded for transcription at a later date to ensure accuracy of the accounts.

Data analysis

Audio-reordered interviews were transcribed verbatim with permission from informants and thematically coded using the Nvivo12 qualitative analysis software program. A coding manual grounded by the literature, theoretical framework and interview guide was initially created and applied to two randomly selected interview transcripts by the lead researcher (Appendix D). This coding manual was revised during the initial test application as additional themes emerged from the data. The coding template was re-applied to two randomly selected interview transcripts by the lead researcher and reviewed by a second coder to qualitatively assess the level of agreement on emergent themes. Disagreement on emergent themes were used an as opportunity to further hone the codes, but generally, coders were consistent in the identification of themes from the data.

Other measures used to reduce researcher bias during the research process were introduced during the interview process. The lead researcher ended each interview by restating the main ideas that emerged and sought confirmation from respondents that these ideas were accurate. Respondents were also offered the opportunity to follow-up with the researcher if they wished to add any information or clarify anything they said. This was done to provide an avenue for respondent validation; one participant followed up email to clarify a point they had made during the interview and another followed up to provide sources for statistics they quoted.

3.4.3 Document review

The final part of this research was a document review to investigate the policy context surrounding NCDs, to assess the potential for the alignment of NCDs and climate change adaptation

policies (Research objective # 3) (Figure 3.3). The choice of a document analysis was informed by both the PV assessment approach and the HVA assessment guidelines. National and regional policy documents were reviewed to answer the following questions:

1. What NCD-**related** policies exist at a national and regional? What has been the response to NCDs at a national and regional level?
2. What climate change and health related policies are there on a national and regional level? Are NCDs mentioned in any of these polices? If yes, to what extent?
3. Do strategic plans for national and regional strategic plans for NCDs consider climate stressors? If so, in what way?

The data collected from the document review was also integrated with the data from the in-depth and KI interviews to address the first and second research objectives (Figure 3.3).

Inclusion criteria

The selection criteria focused on health policies between 2000 and 2017. This time frame ensured that the 2007 Port of Spain Declaration was included, given the importance this declaration to CARICOM counties and their response to the burden of NCDs on their citizens and health systems. Considering that this Declaration may have been influenced by the national or regional health agendas at the time, it was important to expand the timeframe so as to be able to consider the effect these health agendas may have had on this document. Other inclusion criteria for this review were if documents addressed the following:

1. Strategic health plans for Barbados
2. Strategic health plans for the Caribbean region that focus on the burden of non-communicable diseases,
3. Strategic plans for the development of Barbados that include planning for the health sector,

4. Strategic plans for the development of Barbados that include planning for the climate change,
5. National and regional or strategic plans for the health impacts of climate change

The documents examined in this review were all publicly available documents in electronic format and found through a web search of ministry websites and local and regional health NGOs websites (Table 3.3). The inclusion criteria above were used to finalised the list of documents for review. Some of the documents that were sought for inclusion in this analysis could not be accessed. However, updated versions of these documents were found, and through theses updated plans, it could be determined what earlier versions included as a focus.

Table 3.3: Titles of documents compiled for review

Level	Title of Document
National (n=8)	Barbados Growth and Development Strategy 2013-2020 Barbados Health of the Nation Survey: Core Findings Barbados National Strategic Plan for Health 2002 - 2012 Barbados National Strategic Plan 2005 - 2025 Barbados Strategic Plan for the Prevention and Control of NCDs 2015 - 2019 Barbados Sustainable Development Policy Food-based Dietary Guidelines for Barbados (2009, revised in 2017) Barbados Intended Nationally Determined Contribution
Regional (n=10)	Nassau Declaration on Health Declaration of Port of Spain Civil Society Strategic Plan for the Prevention and Control of NCDs for Countries of the Caribbean Community 2012 - 2016

	HCC Strategic Plan 2017 - 2021 Plan of Action for the Prevention and Control of NCDs in the Americas 2013 - 2019 Regional Food and Nutrition Security Action Plan Statement on Commonwealth Action to Combat NCDs Strategic Plan of Action for the prevention and control of NCDs for countries of the Caribbean Community Strategy and Plan of Action on Climate Change PAHO CD51.6

Data analysis

The list of documents for analysis were narrowed to only the latest versions/most recent policies, despite their being several NCD policies over the past 20 years. Additionally, two of the documents analysed under NCD policies, were not specifically health documents (See Table 5.22 in Section 5.4.1). These two documents were national planning documents which contained strategic plans for numerous sectors, including health. For some documents, given the wide range of issues covered, only specific sections were selected for coding; these selections were made based on referenced to health or climate change.

All documents were uploaded to NVivo 12 and analysed using an interview technique described by O'Leary (2004). The documents selected for this review were examined for answers to a list of questions prepared to address the stated research objective (Appendix E). NCD policy documents were analysed for references to climate change, either directly or through climate change related terminology such as climatic stressors or specific impacts of climate change. Likewise,

climate change policy or planning documents were analysed for references to non-communicable diseases.

3.5 Positionality

Traversing the social landscape of Barbados as a "Barbadian living in Canada doing research in Barbados" has prompted me to contemplate my reflexivity, positionality and power as a researcher. Even before I began my field season, I reflected on my insider/outsider status in relation to how it would influence the research objectives, questions, design and data collection, and consequently the knowledge produced from this research. Considerations of reflexivity and positionality are important to human geographers employing qualitative methods as they must be mindful to balance the role of an objective party producing socially-constructed knowledge and real person with feelings and biases which if allowed, can colour the research process (England, 1994). Interactions between participants and the researcher are influenced by the power dynamics between the two parties, as well as the position of the researcher with respect to factors like age, gender, ethnicity and class (Merriam et al., 2001). Admittedly, I began my data collection assuming my insider status (i.e. a Barbadian interviewing other Barbadians) would grant me greater access to participants, compared to a researcher with a different cultural background. However, I quickly observed that insider status was not guaranteed, and was actually more fluid that expected when factors beyond shared cultural identity were considered. My outsider status became apparent as it related to factors like age, education and residency outside of Barbados.

I was cognizant that assumptions grounded in my personal history and lived experiences in Barbados, likely came into play as I designed the research objectives, questions and data collection tools, and during data analysis and interpretation. Having reflected on this, I came to the conclusion that this was not necessarily a negative thing as it provided me with a familiarity of the study site that

another researcher would not heave possessed. However, to maintain a high level of objectivity, I ensured that every stage of the research process was guided and grounded by the academic literature and theory.

During the in-depth interviews with lay citizens, my awareness of my position as researcher in relation to my participants was heightened. Because my accent easily identifies me as a Barbadian, some participants assumed that I was greatly informed about the social and economic situation in Barbados at the time, and did not provide complete answer to interview questions on those topics. In those periods of silence and incomplete answers, it was tempting to fill those spaces with my limited personal knowledge and experiences. When this occurred, I had to figuratively "take a step back" in order to maintain an objective perspective so as not to allow my perspectives and biases to influence the interviewees thoughts. On the other hand, my shared cultural identity with participants proved to be useful when participants used the colloquial language commonly referred to as "Bajan dialect". I was able to understand the messages they were communicating without the use of a third-party. I believe this also removed the feeling of "otherness" that sometimes arises when researchers enter a community which they are not a part of. This shared position with participants likely increased the comfort level of participants and made them feel less like subjects being studied and more on an equal level with me.

One thing I struggled with as young researcher was feeling as though I was being intrusive on the time of participants, especially when interviews where scheduled during the work day. I unconsciously felt the need to increase the pace of the interview or avoid asking for clarification on certain ideas that were raised. When I became aware of this, I introduced subtle cues into the conversation to alert participants of the point we had reached in the interviews to gauge whether they were anxious for a close. Furthermore, this prompted me for future interviews to carefully indicate the length of time each interview would take. It was important for me to reflect on this, because just as I

was looking for cues from interviewees on their feelings about the length of the interview, they likely could see these cues in me as well, and this would influence their responses. It was therefore important that I projected an air of confidence in these interviews; if I was not comfortable, then the participants could not be comfortable.

The other situation that broached the issue of positionality and power differences between myself and interviewees, was when the topic shifted to climate change in the interviews. At this point, most participants became timid and looked to me to speak because of their limited knowledge of climate change and their perception of me as an "expert" on this topic (not completely inaccurate). They also looked to me to educate them on the topic at that point in time, which was not the purpose of the interviews. So as not to reinforce the perception that "I knew more than they did", which would foster an atmosphere where they were no longer comfortable speaking, I was careful to explain to participants that I was not looking for a right or wrong answer, rather I was trying to determine what they knew.

3.6 Ethical Considerations

This research involved human participants and so ethical clearance was obtained from the University of Waterloo Office of Research Ethics to conduct focus groups and key-informant interviews with participants. Ethical clearance was given in September 2017. An amendment to the ethics application was submitted and granted in December 2017 after the research design was modified to conduct in-depth interviews instead of focus group discussions. This amendment also requested permission to offer remuneration to participants.

All participants were required to provide informed consent by way of consent forms before in-depth and key-informant interviews. Participants were provided with "Information letters" and "Consent forms" that included information on the research objectives, the form of participation being

requested from the participant, and the expected outcomes and benefits of the research. Additionally, participants for the in-depth interviews received remuneration and so were provided with a "Receipt of Remuneration and Self-Declared income" form. Participants were informed of their right to withdraw from the research at any time, and their liberty to refuse to answer questions for any reason with no penalty or risk. Permission was requested from participants to audio record each interview to ensure an accurate recollection of everything that was discussed. Participants were assigned pseudonyms to ensure their privacy.

After data collection was completed, participant consent forms, written notes that may link audio-recordings and transcripts to specific participants were stored in a locked cabinet. "Receipt of Remuneration and Self-Declared income" forms were submitted to the University of Waterloo Finance Department as proof of research expenses. All audio- recordings and interview transcripts were stored on a secured computer and external hard drive (data backup) with an encrypted password; access is limited to the lead researcher and supervisor**.**

3.7 Summary

This chapter describes the qualitative research approach used to explore health and wellbeing impacts stemming from the pathways linking non-communicable diseases and climate change in a Caribbean context. The research design was guided by Smit and Wandel (2006) participatory vulnerability assessment approach and the WHO (2013a) HVA assessment instructions which provided a framework for an investigation at multiple scales (community, national and regional) of the health and wellbeing impacts of climate change in Barbados. The qualitative research methods employed were in-depth interviews with the public, key-informant interviews with health professionals and a document review. The chapter concludes with a frank assessment of researcher positionality and ethical considerations.

Chapter 4: Barbados Country Profile

4.1 Introduction

This chapter describes contextual information relevant to the wellbeing of the population, through a geographical, climatic and socio-economic lens. The country profile begins with an overview of the physical geography of Barbados; current climate trends; future climate projections; and national initiatives to address climate change. Following this, a description of key demographic data is provided, along with an overview of the country's health profile and major health initiatives introduced to improve the health of citizens. This chapter concludes by explaining why Barbados was chosen as the study site for this research.

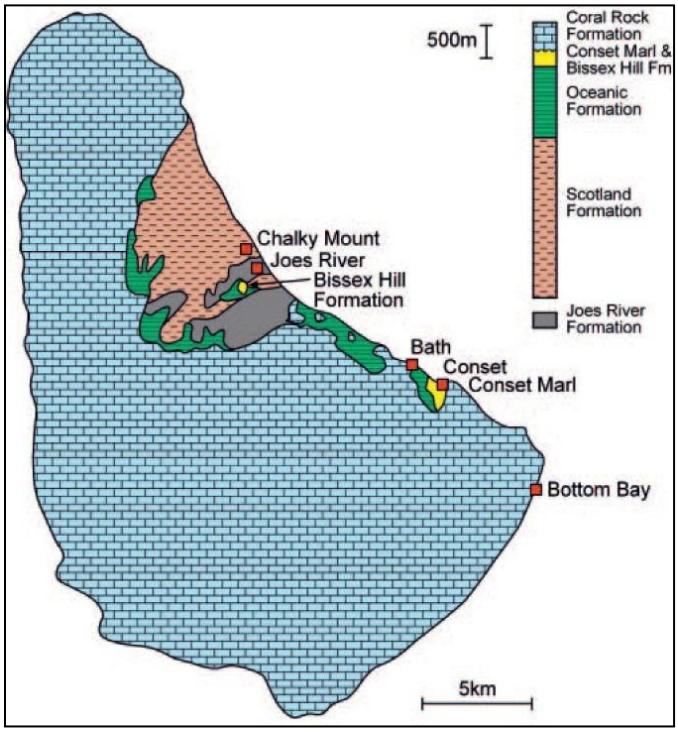
4.2 Geography

Barbados is one of the countries that forms the Windward Island chain and is the easternmost island in the Caribbean region (Figure 4.1). This small island state located at 13° North, 59° West, is 34 km long and 24 km wide, with a land area of approximately 430km^2 and 92km of coastline (GOB, 2010). Surrounded by fringing reefs, Barbados is a flat low-lying island, characterised by a gently sloping terraced coastal plains and an interior with gently rolling hills. The elevation of the hilly interior ranges between 180 – 240 metres above sea level, with the highest point being Mount Hillaby which is 336 metres above sea level (Humphrey, Vacher, Quinn, 1997).

Figure 4.1: Map depicting position of Barbados in the Caribbean

Barbados is predominantly a coral limestone island, with an 86% karst limestone landscape (Figure 4.2). The geomorphology of Barbados is such that there are numerous gully systems, sinkholes and a complex underground cave system (Humphrey, Vacher, Quinn, 1997). The permeability of the limestone cap permits overland flow from rainfall to penetrate the surface and be channelled into aquifers, where it is stored as groundwater and extracted using water wells (Humphrey, Vacher, Quinn, 1997). The water requirements of the population of Barbados and its various economic sectors are almost entirely dependent on groundwater supply. Increasing demands from a growing population and tourism industry are exerting pressure on the island's groundwater

resources and consequently, Barbados is ranked among the top 15 most water-scarce countries in the world (GOB, 2010; Carter & Singh, 2010).



(Source: Jones, 2009)

Figure 4.2: Geological map of Barbados. Coral limestone shown in blue.

4.3 Climate overview

Barbados, like many other tropical islands that fall within 10° - 20° North and South of the equator, is characterised by a tropical oceanic climate. Temperatures on the island range between 20°C – 30°C, with an average temperature of 26.8°C and very little seasonal or daily variation in temperature (GOB, 2010, Carter and Singh, 2010). Barbados experiences two seasons: a wet season that extends from June - November and coincides with the Atlantic Hurricane season and a dry season that extends from December - May. Monthly precipitation averages between a high of approximately 185 mm in the peak period during the wet season and a low of 37 mm during the dry season (GOB,

2018). Most of the rainfall that occurs during the wet season originates from tropical waves moving across the Atlantic Ocean and from the Inter-Tropical Convergence Zone (ITCZ) which extends northward in the Northern Hemisphere summer (Simpson et al. 2012).

4.3.1 Climate trends and projections

Precipitation

During the June to November wet season, Barbados receives on average between 150 – 300 mm of precipitation per month, with most of this precipitation falling during the months of September – October. The least amount of precipitation is received during the months of February to April. Annual rainfall averages 1,254 mm at sea level and 1,650 mm at the highest point in the centre of the island, Mount Hillaby (GOB, 2015). According to a Risk Profile for Barbados, under high GHG emission scenarios, climate models show both increases and decreases in monthly precipitation amounts by 2080s. These ranges are anywhere from -36 mm to +26 mm, though most projections generally trend downward (Simpson et al., 2012). Overall, some models show a decrease in annual precipitation in Barbados by -32%. More specifically, projections of reduced rainfall during the wet season when aquifers typically recharge will have serious implications for the islands water resources (GOB, 2018).

Temperature

According to the same risk profile report from Simpson and colleagues, Barbados has already begun to see small changes in temperature. Climate models show that under high emissions scenarios, Barbados can expect a 2.4˚C – 3.2˚C rise in average temperature by 2080s (Simpson et al., 2012). These temperature changes have implications for human health, local commercial crop production and livestock production. Sea surface temperature are expected to rise because of climate change all

year round. Models show increases in temperature from +0.8˚C to + 3.0˚C under all emission scenarios (Simpson et al., 2012). These sea surface temperature increase will affect marine ecosystems like coral reefs, as well as likely contribute to increased tropical storm activity (GOB, 2018).

Tropical storms and hurricanes

Simpson et al., (2012) noted that hurricane activity in the Northern Hemisphere seems to have increased in the past three decades. Some reports indicate that storm activity (Category 4 and 5 hurricanes) is expected to increase in frequency and intensity by 2100 (GOB, 2018). On the other hand, some reports only expect an increase in intensity, but not necessarily frequency (Simpson et al., 2012). Another concern for Barbados is that storms have been observed to form at lower latitudes, which will increase Barbados' exposure to these hazards.

Sea level Rise

Model predictions of global sea level rise show that levels are projected to rise between 0.26m to 0.77m by 2100 with 1.5 °C of global warming and 0.1m higher for a 2°C rise in temperature (IPCC, 2018). The Caribbean is predicted to experience sea level rise greater than the rest of the world, because of its close proximity to the equator (Simpson et al., 2010). Furthermore, sea level rise is expected to continue after 2100, even if global temperatures were stabilised at 1.5°C - 2°C, representing a continuous and irreversible threat to the region (Simpson et al., 2010; IPCC, 2018). In a report prepared by Simpson et al., 2010 on the quantification of the impacts of climate change in the Caribbean, it was stated that a 1m rise in sea level in the Caribbean could result in the loss of close to 1,300 km^2 of land, the displacement of over 110,000 people and the destruction of 1% of agricultural land. Other impacts in the region include the disruption of transportation networks either through the

loss or damage of 28% of the region's airports, the inundation of land surrounding 44 seaports and the loss of 567 km of roadways (Simpson et al., 2010). Impacts of a 2 m rise in sea level include the loss of 3,000km^2 of land area, over 260,000 people displaced and over 3% of agricultural land lost which in turns affects food security and rural livelihoods in the region. Furthermore, smaller islands like Barbados and those in the Eastern Caribbean are expected to experience greater proportional impacts (total losses compared to the size of their economies) and will have less capacity to absorb and recover from the economic impacts of sea level rise (Simpson et al., 2010).

4.4 Demographic data

4.4.1 Population

Data collected during the last population census in 2010 showed that Barbados had an estimated population of 277,821, making it one of the most densely populated countries in the world, with a density of approximately 637 persons per km^2 (Barbados Statistical Services, 2010; Government of Barbados, 2010). The population at the end of 2016 population was estimated to be 275.4 thousand, comprising 51.9% females and 48.1% males (GOB, 2017; PAHO, 2017). The 2016 birth rate was 9.0 per thousand, which was a decrease from the previous year's rate of 10.4 per thousand. The death rate was 9.3 per thousand, compared to 9.2 per thousand in 2015. The growth rate of the population in 2016 was – 0.4 %. The low growth rate of the Barbadian population is partially attributable to the implementation of island-wide family planning measures over the past fifty years (GOV, 2010). Along with a decrease in birth rate and population growth rate, the population is experiencing an increase in life expectancy. In 2015, life expectancy at birth was 75.1 years; male life expectancy was 73.1 years and female life expectancy was 77.9 years (PAHO, 2017).

The Barbadian population is predominantly black (92.4%) or mixed race (3.1%). The rest of the of the population is 2.7% white, 1.3% south Asian, 0.4% East Asian and 0.1% Middle Easterners (The World Factbook, 2018).

4.4.2 Distribution and settlement

Barbados is divided into 11 administrative units referred to as parishes. Most of the population is concentrated within the coastal parishes of St. Philip, Christ Church, St. Michael., St. James and the southern part of St. Peter which make up the south east, south and west coast of the island (Figure 4.3). All major settlements, including the capital city Bridgetown, three other major towns and 25% of the population are concentrated within 3km of the coastline (Mycoo and Chadwick, 2012). As these areas become more densely populated, population growth is expected to continue to spread from these areas to less populated parishes in the east, north and northwest parishes (GOB, 2010). Much of the island's tourism activity is also located on the south and west coast.

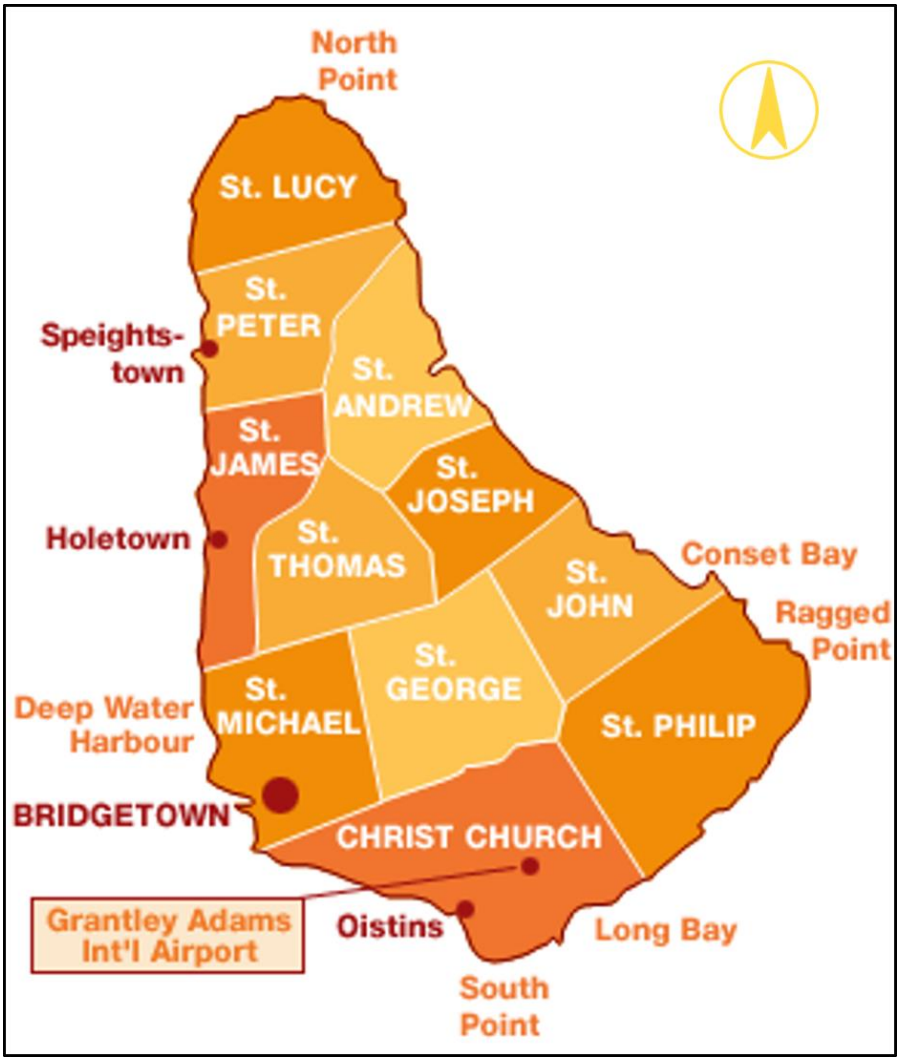


Figure 4.3: Map of Barbados showing the 11 parishes and capital towns

As a consequence of the continued development of the country, there is a greater demand for land for residential and business development at the expense of land for agricultural purposes (GOB, 2010). As of the last population and housing census, there were over 94,000 housing units (Barbados Statistical services, 2010). More than 90% of the occupied houses have access to electricity and water piped directly into houses. Along with these services, the island has a well-developed telecommunication network that includes access to fixed telephone lines, mobile phones and internet

services (GOB, 2010). Across the island is an extensive road system in place, with approximately 1475 km of paved roads that connects all eleven parishes.

4.4.3 Governance

Barbados became a democratic nation after it gained its independence from Britain in 1966; since then, the form of government has been a constitutional monarchy, with the Queen as the Head of State, represented by a Governor General (GOB, 2010). The country has a well-established democratic system and is considered to be one of the most politically stable countries in the world. General elections are held every five years; the lost was held in 2018. Barbados has a bicameral system of government. Legislative power is vested in Parliament, which consist of an elected House of Assembly of 28 persons, a nominate senate of 21 members and the Governor General. Executive power is vested in the Cabinet, which consist of the Prime Minister and other appointed Ministers of Government (GOB, 2010).

4.4.4 Economy

Barbados has no known mineral resources apart from small on-shore deposits of crude oil and natural gas (GOB, 2013). Sugar production from sugar cane had traditionally been the island's main export product, due in part to soil conditions, topography and rainfall patterns. This changed in the 1970s when manufacturing and tourism services began to emerge as major foreign exchange earners for the country. These changes saw Barbados transform from a low-income economy dependent on sugar production to a high-income economy – GDP US$4.7 billion in 2017 – based on tourism, international business and retail services (World Bank, 2018). Barbados' tourism product is supported by the island's beaches, relatively stable climate and its social stability. Furthermore, a relative stable economy has provided a welcoming environment for foreign investments and the

offshore service industry (GOB, 2013). However, dependence on these economic sectors has left the country vulnerable to external shocks as evidenced but the global financial and economic crisis of 2008-2009. These events resulted in a restriction in output, an increase in unemployment and consequently, an increase in transient poverty (GOB, 2013). The country's economic troubles are largely because of its continued reliance on a single "service-oriented" climate-dependent sector: tourism (Mandle, 2014; World Bank, 2015). As the site selected for this case study, the economic situation in Barbados is largely reflective of the economic challenges faced by other Caribbean nations. Trade policies in the current global economy hinder the competitiveness of Caribbean small island states in global markets (PAHO, 2005). This has encouraged a shift away from export-oriented agricultural industries (mainly sugar cane), to service-oriented industries (mainly tourism, telecommunications and offshore financial services) (PAHO, 2005). Like many other Caribbean small island states, Barbados has a high level of indebtedness, declining foreign exchange reserves, and limited prospects for fiscal reform (Cashman, Nurse and Charlery, 2010; Mandle, 2014).

In 2018, provisional estimates placed Barbados' National Gross Domestic Product at $5,087 million (IMF, 2019). Barbados' economy contracted by 0.6% in 2018 from the previous year (Table 5). Weak but positive growth in the tourism industry was not enough to overcome the effects of declines in construction and other non-traded sectors such as communication, transportation and business and services (CDB, 2018). During this period the unemployment rate was approximately 9.2%, which was slightly lower than 10% for the corresponding period in 2017, but significantly higher than the unemployment rate in 2007 which was 7.4% (Caribbean Development Bank (CDB), 2018; GOB, 2013).

Table 4.1: Selected key economic indicators for 2013 - 2018

Indicator	2013	2014	2015	2016	2017	2018
Real growth (%)	0.0	0.0	0.7	1.8	0.1	-0.6
Inflation (%)	1.8	1.8	1.1	1.5	4.5	3.7
Unemployment (%)	11.6	12.3	11.3	9.7	10	9.2
Public sector debt (% of GDP)	139.4	137	144.2	151.2	148.4	126.9
Expenditure on health as % of country total	11.2	10.6	12.2	15.5	n. a	n. a

Source: Government of Barbados (GOB), 2017; Caribbean Development Bank (CDB), 2018

4.4.5 Education

As part of Barbados' focus on the development of its human capital, free education is provided to all residents at the primary and secondary level; attendance to school is mandatory and enforced for all children up to the age of 16 (secondary level). Further, enrolment in tertiary institutions – of which there are 4 on the island – has steadily increased over time, reaching an all-time high of 75.7%[2] in 2009, before declining to 65.43%[2] in 2011 (UNESCO Institute for Statistics, 2020). This comes at significant cost to the country; expenditure on education in 2017 was 4.66% of the country's GDP and 12.88% of the total government expenditure (UNESCO Institute for Statistics, 2020). The return on these investments are exemplified by a high literacy rate of 97% among the over-15 age groups of the population (PAHO, 2017, GOB, 2010).

[2] **% gross enrolment** - Calculated by dividing the number of students enrolled in tertiary education regardless of age by the population of the age group which officially corresponds to tertiary education and multiplying by 100. (UNESCO Institute for Statistics).

4.4.6 Health

In the post-independence era of Barbados, significant strides have been made to improve the health of its population. For instance, the country has reduced the burden of infectious diseases, parasitic diseases and nutritional deficiencies to the point that the epidemiologic profile of the country is more reflective of a developed country (Ministry of Health, 2003). Successful immunization programmes have led to an eradication of polio (1960's) and diphtheria, whooping cough and tuberculosis meningitis in 1994. Rates of infant and child mortality have declined due to better access to health care and the improvement in the standard of living (PAHO, 2012b). Infant mortality was 13.5 per thousand at the end of 2016 (GOB, 2017). Life expectancy at birth has also increased from 69.9 years in the 1960s (Ministry of Health, 2013) to 75.5 years in 2010s (PAHO, 2017).

Improvements in health have been met in part through the collaborative efforts among various stakeholders such non-governmental organisations, government, the media and private sector. Examples of this include vector control initiatives that sought to reduce mosquito breeding grounds to control the transmission of dengue fever and control rodent populations to stop the spread of leptospirosis (Ministry of Health, 2003). Success with an Expanded Program on Immunization has reduced the incidence of vaccine-preventable diseases. HIV/AIDs deaths have been reduced due to treatment with anti-retroviral drugs, and most recently in 2016, HIV/AIDS management guidelines were released to guide healthcare professionals in the prevention and treatment of HIV (Ministry of Health, 2003; PAHO, 2012b; GOB, 2017). These efforts have led to a better quality of life for Barbadians.

Barbados has made a commitment to provide universal healthcare access for its population. This commitment has been met with an increase in the quality of health care services across the country (Ministry of Health, 2003). There is a range of supporting infrastructure to ensure that health

care is accessible to all, including a main hospital, eight strategically located community polyclinics, four district hospitals and a psychiatric hospital (PAHO, 2012b). Through the polyclinics, citizens have access to free primary health care services such as, maternal and child health care, mental health services, dental health services and general practice clinics (PAHO, 2012b). The district hospitals provide long-term care for the elderly population and the main hospital provides secondary and tertiary care. Furthermore, patients are provided with essential drugs free of cost in government institutions (Ministry of Health, 2003). Additionally, drugs listed in the Barbados Drug Formulary are provided free at private participating pharmacies to adults 65 and older, children under 16 and persons being treated for hypertension, diabetes, cancer and asthma and epilepsy (Ministry of Health, 2003).

The health advancements in Barbados is closely tied to the socio-economic development of the country. However, that has also brought along its own set of challenges, that being the increasing prevalence of chronic lifestyle diseases. Like many Caribbean countries, Barbados suffers with high rates of NCDs and the associated risk factors (PAHO, 2017; GOB, 2015). One quarter of all adults in Barbados have a non-communicable disease, with rates projected to be 1 in 3 by 2025; another one quarter are at risk of developing a non-communicable disease (PAHO, 2012b). A survey carried out in 2007 found that 44% of the population reported having at least three risk factors (e.g. alcohol use, tobacco smoking, overweight and high blood pressure) for a non-communicable disease (PAHO, 2012b). Data from 2012 report show that when maternal and child health are excluded, 80% of visits to polyclinics in Barbados were for NCD related issues (Ministry of Health, 2014).

Given the growing prevalence of NCDs, measures implemented to deal with this health crisis include the establishment of a National Commission for Chronic Noncommunicable Diseases within the Ministry of Health in 2007, a National Task force in Physical Activity and Exercise in 2009 and the Barbados National Registry for Chronic Non- communicable Disease (BNR). Furthermore, the

Ministry of Health has developed the NCD Strategic Plan for 2015 – 2019 as a guide for NCD prevention and control, for government, civil society organisations and the private sector (PAHO, 2012a).

The budget allocated for health care in 2016-2017 was $332.7 million; this was 7.6% of the projected total government expenditure for this period, $1.3 million more than was allocated for the previous fiscal year (Table 4.2). Most of this budget was spent on hospital services (54.7% for emergency, acute, secondary and tertiary care at the QEH); care of the elderly (10.8%) and a primary health care programme (8.8%). The other programmes which are funded by this budget are shown in Table 4.2.

Table 4.2: Health expenditure by programme for fiscal years 2014/15 to 2016/17

Programme	2014-2015	2015-2016	2016-2017
Direction and Policy Formulation Services	24,280,559	19,019,278	29,227,612
Primary Health Care	29,059,543	28,392,504	29,348,812
Hospital Services	184,561,434	192,365,214	182,080,578
Care for the disabled	2,697,345	2, 822,452	2,866,227
Pharmaceutical Programme	26,298,096	26,189,638	26,776,581
Care of the elderly	37,140,035	36,383,181	35,805,302
HIV/AIDs Prevention and Control Project	17,164,578	10,269,428	10,914,920
Environmental Health Services	16,201,384	16,017,955	15,720,673
Total Expenditure	337,392,974	331,459,647	332,740,705

Source: GOB, 2017

4.5 Summary

Despite its status as a high-income country and a favourable human development ranking ("high"), Barbados has experienced severe economic challenges since 2008 (World Bank, 2015). Barbados's current economic situation restricts investments into public services, the maintenance and

upgrading of aging infrastructure and other the implementation of costly adaptation strategies that would be necessary to protect the country from the adverse impacts of climate change (Cashman, Nurse and Charlery, 2010). Even with these challenges, Barbados has one of the highest performing economies in the region and has been leading in efforts to respond to climate change (Bishop and Payne, 2012). Barbados exemplifies the economic and development challenges faced by the neighbouring islands and so is a key source of data on sources of vulnerability and adaptive capacity to climate change in the region.

Even with these economic challenges, Barbados has a stable democratic government. The country has a robust health care system that endeavours to provide access to primary, secondary and tertiary care for all citizens, free at the point of delivery. Given the commitment to universal health care, along with the high level of government transparency, health data is regularly collected and was accessible for this research. The other consideration that made Barbados the ideal site for this research was that with all the services dedicated to providing health care, there were several were several health professionals with varied areas of expertise to draw upon for this research.

Chapter 5: Results

5.1 Introduction

This chapter presents the results of twenty in-depth interviews, ten key-informant interviews and a document review conducted to explore health and wellbeing impacts of climate change in Barbados. These results address the following research objectives:

1. Investigate drivers and determinants of wellbeing among the population of Barbados and how these are vulnerable to the impacts of climate change.
2. Explore the knowledge and attitude of health professionals on the current and future burden of non-communicable diseases in Barbados and possible connections between climate change stressors and non-communicable diseases
3. Investigate the policy responses to NCDs in Barbados and assess the potential for the alignment of NCD and climate change adaptation policy agendas.

Results are organized around the three above research objectives. The first section uses data collected from lay citizens to conceptualise wellbeing in a Barbadian context. This includes drivers, determinants and indicators of wellbeing that participants consider important. This is followed by an exploration of participants' knowledge and perceptions of climate change and its impacts on wellbeing. The next section focuses on non-communicable diseases and reports on the knowledge and attitudes of public health professionals in Barbados about links between climate change and non-communicable diseases. Selected quotes from participants are shown to support the data presented. Each participant was assigned a pseudonym (in-depth interviews) or unique identifier (key-informant interviews) to protect the identity of participants. The results conclude with a review of a timeline of

responses to the NCD crisis in Barbados and a content analysis of six policy documents related to non-communicable diseases and climate change.

5.2 Research objective 1: conceptualizing wellbeing in Barbados

This section presents the results of in-depth interviews conducted to explore drivers, determinants and indicators of wellbeing among the Barbadian population. The categorisations used in reporting these results emerged from wellbeing literature, specifically the domains of wellbeing conceptualised in the Canadian Index of Wellbeing (Michalos, 2011).

5.2.1 Drivers of wellbeing

Participants were asked to reflect on their lived experiences and provide an assessment of what factors they consider to affect their wellbeing. Responses revealed a range of positive and negative factors which were then categorised into drivers and determinants of wellbeing (Table 5.1). The four most frequently mentioned drivers of wellbeing were community vitality, physical environment, living standards and state of the economy (Table 5.1). There was consensus among participants that their wellbeing is positively influenced by their communities, the physical environment and their living standards (Table 5.1). Conversely, participants were more varied in their opinions of drivers that negatively affect their wellbeing, though factors related to the economy, community vitality and living standards were most frequently mentioned.

5.2.2 Determinants of wellbeing

Within each driver of wellbeing, several determinants were identified, which were then framed as either a positive or negative contributor to the wellbeing of respondents (Table 5.2). Furthermore, after establishing drivers of wellbeing respondents consider to be most impactful on their wellbeing, participants were then invited to discuss a predefined set of wellbeing drivers in

greater detail. The predefined drivers overlapped with those self-identified by respondents. However, within the predefined drivers discussed with participants, it was notable that health was the only driver not self-identified by participants as being an important part of their wellbeing. From these discussions, we were able to identify several indicators that could capture these various wellbeing drivers (Table 5.3 & 5.4); these findings were prompted based on the predefined drivers used to frame the interview guide (Appendix A).

Table 5.1: Drivers of wellbeing by participants and mention

Drivers	Participants (n/20)	Mentions (%)
Overall		
Community vitality	16	28 (30)
Physical environment	13	21 (23)
Living standard	15	19 (21)
Economy	13	19 (21)
Democratic engagement	5	5 (5)
Total		**92**[1]
Positive		
Community vitality	13	16 (38)
Physical environment	12	16 (38)
Living standards	8	10 (24)
Total		**42**[1]
Negative		
Economy	13	19 (38)
Community vitality	10	12 (24)
Living standards	8	9 (18)
Democratic engagement	5	5 (10)
Physical environment	5	5 (10)
Total		**50**[1]

[1] Total positive + Total negative = Total Overall

Table 5.2: Determinants of wellbeing by participants and number of mentions

Determinants	Positive (+ve)/Negative (-ve)[1]	Participants (n/20)	Mentions
Living standards			
Cost of living	-ve	8	9
Access to social services	+ve	5	5
(Basic) amenities	+ve	4	4
Development status of country	+ve	1	1
Community vitality			
Social relationships	+ve	11	12
Crime and violence	-ve	10	11
Safe communities	+ve	4	4
Racism	-ve	1	1
Physical Environment			
Climate/weather	+ve	11	11
Built environment	+ve, -ve	6	6
Natural resources	+ve	4	4
Democratic engagement			
Political leadership & governance	-ve	5	5
Economy			
Employment opportunities	-ve	13	15
State of the economy	-ve	3	3
Availability of goods & services	-ve	1	1

[1] '+ve' and '-ve' denotes the overall effect of the determinant on wellbeing.

Community vitality

Participants described social relationships and interactions within their communities as positive determinants of wellbeing. Relationships include familial ties, close connections with neighbours and community members and cordial interactions with strangers encountered on a daily basis. One of the most common descriptors used by respondents was "the friendliness of the people". Participants noted they derived comfort from knowing that their wellbeing matters to others around them. This is demonstrated by the following participant who said:

"This is the type of environment where the community spirit, though it has dwindled over the years, it is still very strong. People still look out for each other and there is a sense of family among the community". — **Sue, 31, Auditor**

When asked what defined a strong community, themes that emerged as essential to wellbeing were strong support networks, meaningful social connections and trust (See Table 5.3 & 5.4).

Table 5.3: Indicators of wellbeing by gender

Indicators[1]	Female mentions	Male mentions	Total mentions
Economy			
Employment opportunities	32	18	50
Living standards			
Cost of living	7	10	17
Wages	6	2	8
Community vitality			
Strong support networks	22	10	32
Meaningful social relationships	7	8	15
Trust	4	3	7
Physical environment			
State of natural resources	20	13	33
Pollution	12	4	16
Invasive species	4	2	6
Democratic engagement			
Political apathy	7	8	15
Confidence in leaders and governance	8	9	17
Health			
Non-communicable diseases	11	10	21
Psychosocial effects	6	2	8
Infectious diseases	0	1	1

Table 5.4: Indicators of wellbeing by age

Indicators	35 & under mentions	Over 35 mentions	Total mentions
Economy			
Employment opportunities	30	20	50
Living standards			
Cost of living	7	10	17
Wages	1	7	8
Community vitality			
Strong support networks	13	19	32
Meaningful social relationships	5	9	15
Trust	0	7	7
Physical environment			
Degradation of natural resources	15	18	33
Pollution	3	13	16
Invasive species	5	1	6
Democratic engagement			
Political apathy	7	8	15
Confidence in leaders and governance	7	10	17
Health			
Non-communicable diseases	9	12	21
Psychosocial effects	2	6	8
Infectious diseases	0	1	1

Support networks

A strong support network was described as one where members consider the wellbeing needs of individual community members to be important to themselves, and there is a willingness among members to support these needs. Moreover, these social networks confer benefits such as access to external resources in times of need or crisis; sharing/exchange of resources; permits transfer of cultural norms and identities; and provides a sense of safety derived from familiarity with neighbours which fosters an environment of trust within communities. One respondent said:

> *"... if you know that somebody in the community – a lady – let's say the father walked out – like a single mother with six or seven children, she just lost her job and you see that things are tight for her, to me, a good community spirit will be the community coming together and saying, "OK, let us see what funds or what we have in our homes, to give her, to help her."* — **Shani, 30, Teacher**

Another related:

> *"They would help you nail down before the hurricane pass and after it is over everyone would come out to see how everybody fare."* — **Pam, 43, Self-employed**

Social connections

Participants noted that strong social connections among community members are built through regular social interactions and feelings of belonging. Examples of social interactions offered by participants that help to build meaningful social relationships were gatherings of friends and family in homes or recreational spaces (e.g. parks or beaches) and participation in community groups and activities (e.g. church, schools, youth groups and sporting groups). Likewise, participation in shared social spaces such as markets, churches, neighbourhood 'rum shops' and daily commutes was reported to be an avenue for the development of the social connections. Meaningful social connections are further cultivated by feelings of belonging to a place. One participant noted that in many communities in Barbados, there are strong feelings of attachment to places because of how communities have formed around families that have resided in these spaces for generations. This allows for the development of deep, long-lasting emotional ties among members, vital to the social networks that are the foundations of strong communities. One participant related:

> *"In Barbados, a lot of families come from communities. Let's say you live in Britton's Hill and you're a Gibbons, you would find a whole family of Gibbons come from that area. Interestingly enough, a lot of those families, within the same area have relationships, which tend to add to the whole familiar atmosphere within the neighbourhoods and communities."***— Jamar, 35, Insurance**

The final contributing factor to the development of meaningful social connections in communities is the size of Barbados and its' population. Because Barbados is a small island with a small population, it is not uncommon to encounter familiar faces on a regular basis in shared common spaces and develop relationships with these people. Participants described this as "everyone knows everyone":

> *"It's such a small island, you go to the same market; you see the same people; they ask about you"* **— Janice, 58, Accountant**

Trust

Some participants noted that a high level of trust was important in communities. All the participants who mentioned trust were over the age of 35 (Table 5.4). Their views were shaped by past life experiences that when compared to the present situation, reflect changes in community dynamics, demonstrated by the following quote:

> "I remember one time you could definitely go to work and leave your house open, and come back home knowing nothing was stolen, but now you can't do that. Communities are getting very disconnected." **— Jim, 42, Computer engineer**

Social cohesiveness

Given the importance of community to wellbeing, participants expressed concern about weakening social cohesiveness. While some participants still considered there to be a strong sense of community among Barbadians, more than half admitted that they observed evidence of community-mindedness declining. For example, Sue noted that:

> *"I think it has dwindled over the years, but the general community atmosphere is still there. It is not what it used to be before because I remember we would always grow up hearing it takes a village or a community to raise a child. We are our brother's keeper. I find thought that that kind of aspect has dwindled a little."* **— Sue, 31, Auditor**

Respondents attributed these changes to a combination of factors: greater individual focus on upward economic mobility; migration in and out of communities; declining feelings of safety in communities and access to spaces and opportunities for social interaction. Many participants noted that with the increased focus on wealth and standing, people were prioritizing activities that could improve their socio-economic standing over engaging with their communities and relationship building. Respondents discussed how these changing priorities have contributed to the weakening of social relationships with people outside of the immediate family and negatively impacted familial relationships and societal values. For instance, one participant noted:

> *"Everybody is into their job and you're seeing less of people …. then you got your weekends home and you're just basically doing your stuff that you didn't get to do during the week and things."* **— Patsy, 50, Cashier**

Another said:

> *"In the community people use to sit and gather at night and talk about issues of the day and whatnot. Nowadays, when people come home, they just go into their houses and just wait for the next day to go off to work."* **— Ben, 50, Accountant**

Regarding relationships, Vesta noted:

> *"We bought into the lie that as we became more socially and financially mobile, upward, that the trappings of wealth and comfort were more important than relationships. So, it is not coincidental that as we became more upwardly mobile, educationally, financially, as I said with all the trappings of success, that our relationships started to go south. Husband and wife, spouses, partners, children and parents, children and their elderly parents, that sense of community was lost".*
> **— Vesta, 50, Minister of Religion**

Further, respondents commented on the changing composition of communities. Before communities grew around familial units (immediate and extended family) that have resided in a place for several generations. More recently, participants reported observing influxes of younger families who have little to no prior relationships with the existing community members and make no effort to integrate. This is demonstrated by the following quote:

> *"The younger folks now, when they grow and move out, they move into communities and they kind of keep to themselves, they don't know their next-door neighbour…"* **— Jenny, 51, Service dispatcher**

Moreover, young adults are leaving the communities they grew up in for spaces more outwardly reflective of their improved socio-economic standing. In Barbadian vernacular, this is described as moving to the "Heights and Terraces", where the implication is that people are leaving the "village life" behind. For instance, Bev stated:

> *"There is a movement away from the village life, because socio-economic situations improved to the extent where you find that families can acquire a home in the Heights and the Terraces. …. They sort of break away from that community life, where you have a sister or a brother and an uncle living next door. The sense of community even with your neighbours has been lost."* **— Bev, 65, Retired banker**

Regarding safety in communities, participants noted that in the past, people were willing to display acts of kindness to persons around them with the expectation of safety. However, given the perceived rise in violent crimes attributed to the economic downturn in Barbados, there is less interpersonal interaction beyond the family unit or close friendships as people worry about their safety and the safety of their families. This is demonstrated in the quote below:

> *"As an example, before you would pass someone on the bus stop in your car and you would stop and give them a lift. This was an example of community spirit on display. However, these days you don't really find that happening because people are afraid for their safety. Also, people don't stay outside as they would have done before. Before you would find the guys liming outside by the community centres late at night but not anymore because they don't feel safe."* **— Clint, 26, Auditor**

Furthermore, respondents were concerned about the perception of Barbados as an unsafe destination to the international community and the impact this would have on tourism. For instance:

> *"I think most recently there has been an increase in crime over the last few years. I guess it has gotten to the point where it is becoming troublesome and burdensome. Barbados markets a tourism product and the increase in crime levels have now gotten to the level where it is known on the international scene."* **— Sue, 31, Auditor**

Finally, respondents expressed concern over the lack of space and opportunities for social interaction. They note that even if there is a desire for greater community interaction, there are limited recreational spaces to facilitate these interactions. Furthermore, there are limited well organised social activities to motivate participation from community members. These deficiencies further encourage environments where people predominately interact with their immediate familial units and close friends.

> *"We have the committee centres as well that try to do things at evenings after work and school, just to bring people together. But the thing with those programs is they're not structured programs, and there is not enough funding behind those programs. It's just left up to somebody in the community, a community leader to say, "Well, we can meet in the community centre." But there is no real structure or government influence to bring a proper program together that will draw the people into the program."* **— Ben, 50, Accountant**

According to participants, these changes have contributed to increasingly individualistic outlooks on life, where people are more focused on their personal wellbeing and the wellbeing of their immediate family and less on the collective wellbeing of those around them.

Physical Environment

Participants credited the physical environment as a major contributor to their positive living wellbeing. This included the use of descriptors such as 'weather', 'climate', 'temperature' and 'proximity to beaches'. Respondents mostly expressed an appreciation for the generally stable climate and year-round tropical weather. This is demonstrated by this quote from one of the participants:

> *"What I like about living in Barbados is the weather. I mean I've never experienced snow, but just when it's chilly outside, it's really cold. I can't imagine living in anything underneath 25°C, so I like the weather."* **— Shani, 30, Teacher**

However, some respondents did state that they did not like when outside became 'too hot' as it makes them feel 'uncomfortable' and less willing to participate in outdoor activities. Though the geographic location of Barbados exposes it to the potential for hurricanes and tropical storms, it was

suggested that the avoidance of natural disasters was another determinant of wellbeing illustrated by the following quote:

> *"What I like about Barbados is that we have been spared from the elements – in the sense that we don't have any volcanoes; we don't have any major natural disasters. We may have a weather system somewhere between September…but for the most part, we have been spared. We haven't really suffered a whole set of damage."* **— Shani, 30, Teacher**

Others said that it was their proximity to natural resources that affected their wellbeing. For example, Deborah noted:

> *"I really like living so close the beach. Everywhere you go in Barbados you can see the sea. If I need to get away to relax, destress or get a sea bath for the aches and pains, I can drive and within 20 minutes I'm by a beach."* **— Deborah, 40, Temporary worker**

Conversely, participants reported that environmental degradation (e.g. beach erosion, rapid urban expansion), the decline of natural resources (e.g. beaches, fish stocks, agricultural land and green spaces), and pollution negatively affected wellbeing (Table 5.5). One participant said:

> *"We're losing more of the beaches because the sea takes back the land, so you find that you're getting more erosion at the beach. You have smaller beaches. Certain places you could go before and have a nice sea bath and relax, but now you can't really get to these areas because of the erosion".* **— Jenny, 51, Service dispatcher**

Table 5.5: Environmental concerns of participants

Issue identified	Participants (n/20)	Mentions (%)
Beach erosion	10	11 (20)
Illegal dumping	10	10 (18)
Fisheries decline/coral reef degradation	8	10 (18)
Improper management of sewage Infrastructure	6	6 (11)
Urban expansion	6	8 (15)
Invasive aquatic species	4	6 (11)
Water availability	4	4 (7)
Total		**55**

Living standards

Living standards were reported to greatly affect wellbeing and respondents noted that their access to various social services and amenities – basic or otherwise – positively affects their wellbeing. For instance, when asked what was good about her life, Rachel noted:

> *"I got free education, have free access to healthcare, public transportation…"* **— Rachel, 28, Self-employed**

Similarly, another participant responded:

> *"We have access to information via internet, we have WIFI, we have indoor plumbing. I guess these things we don't think about a lot until we have been exposed to people in other parts of the world who would give their eye teeth to have what we have and that which we take for granted. We still get a good quality of food. We have a lot of international brands. We have access to shopping, both brick and mortar and online."* — Vesta, 50, Retired Banker

However, there was concern about the ability to maintain living standards given the increase in the cost of basic needs and amenities such as food, fuel, utilities, housing and transportation, particularly for people in lower income brackets. For instance:

> *"The basic basket of goods has gotten smaller and smaller over the years. Before a pensioner could take their pension cheque to the supermarket and get a full month's groceries. Now they can only get a handful of things. Cost of living depends on your income bracket. Those at the lower end have it harder."* **— Clint, 25, Auditor**

Economy

Stagnation of wages; loss of employment benefits and rising unemployment – particularly for the youth – were major concerns for participants. Jamar stated:

> *"There is very limited opportunity pool in terms of jobs. Because, at the end of the day, you have a university that is always pumping out tons of people, you have a government that is always concentrating on human capital. But if you are not providing opportunities for that same human capital then it's a waste of time."* **— Jamar, 35, Insurance**

Some participants acknowledged that unemployment levels were not all related to the economic state of the country. Certain economic sectors and types of employment were oversaturated while others were understaffed, because of negative attitudes towards certain types of jobs, generally those that require manual or outdoor labour. Jenny said:

> *"Nowadays you find that people are going more to technical jobs maybe like accountant, lawyers, doctors and they got a few that are going into agriculture, dealing with your hands. You find that they go, and they study to be a lawyer; they study to be a doctor, you know things like that, the areas are already saturated. But you haven't really gone and looked for hands-on jobs"* **— Jenny, 51, Service Dispatcher**

Respondents discussed how people have coped with these circumstances by turning to entrepreneurial endeavours such as food and beverage vending, jewellery making or service provision. They also suggested these endeavours would be unlikely to succeed in the long-term as they were mostly unregulated, unstructured and there was little to no support from the government.

> *"A lot of people are trying to be entrepreneurs as well, but again it is hard because they don't have the necessary guidance to succeed. Before the government had the Youth Entrepreneur Scheme, but that has been cut back. Yes, people are turning to alternative means and try to do something on the side, but again there is only so much you can do."* **— Clint, 25, Auditor**

Democratic Engagement

Participants contended that political leadership and governance negatively influenced their wellbeing. These concerns were closely linked to other negative determinants of wellbeing, namely increased cost of living, lack of employment opportunities and the perceived increase in criminal activity. Respondents argued that the underlying factor responsible for these issues is the perceived failure of the country's political leadership and the lack of sound governance from political representatives. For instance, one participant noted:

> *"Cost of living is really high, and the amount of young people that are on the block is another negative thing, and I would say management of the country is to blame, but I would leave management as it is."* **— Dario; 26, Farmer**

It is noteworthy that at the time of data collection, there was an upcoming general election to be held within the next year. Surprisingly, given the prominence of this issue in the media and within communities, it was not an issue raised by most participants. However, upon prompting at a later point in the interview, all participants expressed concern about political leadership and governance.

Participants noted political apathy among citizens, based on their own participation in democratic activities and people with their social network. Feelings of apathy arise due to distrust of/lack of confidence in politicians; frustration with the political process; perceptions that politicians were indifferent to citizens and political corruption. Respondents reported feeling their issues were ignored by politicians, until those politicians needed support from citizens during election cycles. Consequently, they did not think it was beneficial to be democratically engaged:

> *"I feel the politicians these days are bold and arrogant with it. They are more about their wellbeing and less about the community. They care about you when election time comes around, but when it comes to the real serious matters, they are not really doing their job."* **— Clint, 25, Auditor**

Health

Non-communicable diseases

While participants failed to independently raise the issue of health, they were unanimous in the view that diseases categorized as chronic non-communicable were the greatest threat to health in Barbados; these include diabetes, hypertension (high blood pressure), cancers and mental-health-related concerns. Respondents demonstrated knowledge of the dangers modifiable behavioural risk factors associated with NCDs. Participants were of the view that sedentary lifestyles, lack of physical activity, diets (high sugar consumption) and obesity are responsible for the diabetes epidemic in

Barbados. One of the participants described her experiences observing her staff consuming foods with high sugar content on a daily basis:

> *"I have tried with my staff in here; I tell them all the time "A Frutee {soft drink} for breakfast or a Frutee with a current-roll {pastry} for breakfast, that's more sugar than you should eat in one day, and that's breakfast."* **— Janice, 58, Accountant**

The issue of increasing prevalence of diabetes among children was raised. Again, this was linked to shifting diets that include foods high in sugar content, as well what participants considered to be a growing trend of increased exposure to technology and less time spent being physical active. This is demonstrated in the quote below.

> *"Even small little children have diabetes; it's basically the lifestyle that we choose to live with technology. We're not going to be bothered with physically running around. Everybody is sitting down with video games."* **— Dario, 26, Farmer**

Psychosocial effects

Several participants raised concern about psychosocial health impacts. They all alluded to impacts on mental wellbeing linked to the stress brought about by the state of the social and economic environments in which they live. One participant commented that:

> *"Finances, family problems, how the economy is going, money I suppose is turning away, so it's mainly finances that is causing us headache."* **— Dario, 26, Farmer**

Another respondent stated that stress levels are exacerbated by weakening social relationships as people lack outlets to discuss their troubles and call on for support:

> *"Nowadays, people just tend to bottle that within themselves and try to deal with it on their own as opposed letting their neighbour know what they're going through…. I mean that's probably why you see a lot of people just suddenly falling ill, because the stress level is so high, and they don't have an avenue to deal with that stress."* **— Ben, 50, Accountant**

Infectious diseases

Infectious diseases were not a concern for most participants. One person discussed mosquito-borne diseases in relation to the state of the physical environment. The participant who mentioned mosquito-borne illnesses was mostly concerned about the environmental conditions that make it possible for mosquitoes to breed and spread diseases. This is illustrated by the comment below:

> *"People are just disposing off garbage out of their window; plastic bags are clogging up the drains causing flooding. Then this leads to the breeding of mosquitoes which spread dengue and chikungunya."* **— Janice, 58, Accountant**

5.2.3 Wellbeing in the context of climate change

Knowledge of climate change

Respondents were asked about climate change to determine their level of knowledge, as well as to record their opinions on how they believed their wellbeing to be impacted by climatic changes. No respondents were able to give a completely accurate description of climate change and the associated impacts, though some were able to give a partial description (Table 5.6). Even then, they mostly possessed a broad-scale understanding of the phenomena, but were less well-versed on impacts directly related to Barbados. Participants spoke about "polar bears", "melting ice caps and glaciers in the Artic" and "islands disappearing from sea level rise". The other respondents either had no knowledge of climate change, were misinformed or did not believe anthropogenic climate change to be real. Some misconceptions held by participants were that climate change had to do with the movement of the sun, while others linked it to the thinning of the ozone layer:

> *"I once watched a video about global warming, and I believe that the sun is a lot closer to the earth than it was a year or two years ago, because it seems to be a lot of hotter."* **— Shani, 30, Teacher**

There was one participant who stated they did not believe anthropogenic climate change to be real:

"Climate change is a red herring. In my mind, climate change has been an ongoing process since we have been monitoring climate. But I don't want to say what we are experiencing now is definitely human caused. Because you know the argument always changes. I remember at first it was like global warming. And then when they realized you know what, for the last 10, 20 years, the earth has generally been cooling, so how is it global warming? Global warming just morphed into climate change when it didn't fit into the meta. I'm not going to say humans haven't contributed to the climate to some extent, because I am sure they have. My issue comes with the gloom and doom predicted and the money being made is my issue."
— Jamar, 35, Insurance

There was not a large difference in the number of participants who possessed some knowledge of climate change and those who did not. Furthermore, there was no indication of a relationship between the age, gender, education levels and the accuracy participants' knowledge about climate change.

Table 5.6: Responses to questions about knowledge and perception of climate change and wellbeing

	Participants (n/20)
Describe climate change and its impacts	
Gave an accurate description	0
Gave a partial description	11
Gave an inaccurate description	2
No knowledge of climate change	6
Climate change is a hoax	1
Describe climatic or environmental changes you have observed[1]	
Increased ambient temperatures	9
Increased frequency and intensity of hurricanes	6
Changing rainfall patterns	4
Sea level rise, storm surges, beach erosion	2
Weather unpredictability	2
Feelings about climate change and wellbeing	
Concerned	5
Mildly concerned	8
Not concerned	7
Sources of information on climate change[1]	
International news media	11
Internet (social media, Google searches, personal research)	10
Local news media	2
Documentaries	3
Word-of-mouth	2
School	1

[1] Does not add up to 20 as respondents gave more than one answer

Respondents were asked about any observed climatic or environmental changes in Barbados. Predominantly reported was an increase in ambient temperature and several respondents lamented about how hot it had become in recent times. For instance:

> *"Well, I have to take the bus to get to where I'm going because I don't have a car, and it is incredibly hot. The last two years I find outside has been hotter than I ever remember it being, and it's like, "What the heck?" I find it's getting hotter. Every year is hotter than the year before."* **— Rachel, 28, Self-employed**

Other climatic changes reported by participants were increased hurricane activity and changing rainfall patterns as it relates to the timing and length of dry and wet seasons. One participant stated:

> *"I mean if you even look at the Caribbean, this year in terms of hurricanes, we've had some record type hurricanes. We had about four or five hurricanes I think that passed through the Caribbean, this year. I mean we never saw that before, so I mean there has to be some truth to it despite what some of the big names are saying. There's some truth to it."* **— Ben, 50, Accountant**

Less commonly impacts reported by participants were sea level rise and unpredictable weather (Table 5.6).

Perceptions of climate change impacts on wellbeing

Given their knowledge of climate change impacts and the environmental changes they reportedly observed, most participants indicated that they had some concern about climate change as a threat to their wellbeing and the wellbeing of Barbados (Table 5.6). Of those respondents, most reported that they were only mildly concern about climate change because they perceived it to be a distant/future problem and they believed that there were more immediate issues that posed a threat to wellbeing.

> *"Although I don't think within my lifetime the sea level will rise to the point where Barbados is completely wiped out. However, there are articles I have read where*

> *small islands that no longer exist because of sea-level rise. For me that's always a concern given that we live on an island."* **— Sue, 31, Auditor**

Other participants stated that though they felt some concern about climate change, they thought it to be out of their control. This is exemplified by the following quote:

> *"My spiritual belief keeps me balanced because Psalm 24 tells me that "The earth is the Lord's, and everything in it…. Mankind cannot do bad enough to Mother Earth to cause it to totally self-destruct. Because at the end of the day God ultimately has the last word about this. We are stewards of this, we are going to have to pay though our health, natural disasters and whatever when we are not good stewards. But at the end of the day, the ultimate word is the hands of the Body who created it. So, I do not lose too much sleep about it."* **— Vesta, 50, Minister of Religion**

Concerns from respondents included damage to personal property and public infrastructure from the increased hurricane activity and extreme weather events; the loss of recreational spaces to rising sea levels; climatic impacts on agriculture and local food production; threats to tourism from climate change and the effects of rising temperatures on daily activities and personal comfort. Respondents who reported no concern at all about climate change, felt this way either because they did not believe climate change to be real; they did not know enough to be concerned; or they felt that it was within the capacity of Barbadians to adapt to any changes experienced. For instance, one respondent said:

> *"Even if you plant something right now, and if it's dry, obviously, people can use drips to still get the water out there, right? …. I don't feel really that the weather should have anything to do with anything.* **— Tom, 53, General Worker**

Source of information

Respondents reported a range of sources of information on climate change. Notably, most of participants got their information from international, while local sources were least commonly reported as a source of information (Table 5.6). They also indicated that it was not something they had frequently heard discussed by political leaders.

Climate change-wellbeing connections

Using participants' perceptions of wellbeing and their knowledge of climate change (supplemented with literature on expected impacts in Barbados), connections were established to show pathways between climate change and wellbeing (Figure 5.1). Within each of the six drivers of wellbeing discussed earlier, there is at least one pathway from climate change that can lead to various wellbeing outcomes. These pathways can either increase or decrease the vulnerability to climate change because they affect the exposure, sensitivity or adaptive capacity of Barbadians.

Health

Participants noted that one of the biggest health concerns in Barbados in that of non-communicable diseases, though there was mention of infectious diseases. The connections between climate change and NCDs are discussed in greater detail in Section 5.3. Briefly, these connections can be summed up as climate change will undermine health through its impacts on sectors beyond health. This includes impacts to nutrition through risks to food security (availability and affordability) and risks to the physical environment that would impede or discourage physical active lifestyles. One recurring theme from participants was the challenge to "eating healthy" because of the affordability of certain foods. One participant stated:

> *Well, for me, it would be the prices on the things that you would need to have a healthy lifestyle. Because when you go to the supermarket, you see the vegetables and the fruits and the things that they're telling you to use to start this healthy lifestyle, are really, really expensive, and not everybody can really afford to do it. So, at times, if you go to the supermarket and you see something that will be "not good for you", and then you see the healthy one that is good for you, and you compare the prices: obviously, you're going to go for the unhealthy one.* **— Jenny, 51, Service dispatcher**

Other pathways include exposure to poor air quality; extreme weather events and their aftermath and conditions that facilitate the proliferation of vector-borne diseases. With these impacts, wellbeing

outcomes like rising prevalence of behavioural and metabolic risk factors associated with NCDs; respiratory and heat-related illnesses, psychological trauma from repeated exposure to EWE and loss of life or injuries can be expected.

Democratic Engagement

Knowledge of and concern for climate change in Barbados among citizens is important for the generation of political will for institutional and governmental responses to climate change. Participants noted that climate change is not an issue that seemed to be of importance to their political leaders:

> *I wouldn't say that in Barbados the politicians get involved in those issues. The impact of climate change on the world you normally hear on an international stage. But you hear very few discussions locally about this. It is not a priority for our government.* **– Clint, 25, Auditor**

Another participant posited that climate change is a low priority item on policy agendas:

> *Well, the thing with climate change is that it happens so gradually and it's something that you kind of adjust to as time goes on, whereas stuff like crime and economy will have a more immediate effect on your pocket or standard of living. So not to say that it's not important, but because it's something that happens gradually that you could kind of adjust to, I find it gets put on the back burner.* **— Rachel, 28, Self-employed**

However, lay citizens also do not consider climate change to be an issue of high concern. At this stage there is no indication of a push for leaders to address climate change from citizens.

Community vitality

Related to community vitality, participants note the importance of social relationships. These social relationships confer social capital to Barbadians, which in turn affects how they prepare and respond to extreme weather events. One participant stated when asked about community spirit:

> *"They {neighbours} would help you nail down before the hurricane pass and after it is over everyone would come out to see how everybody fare."* **— Pam, 43, Self-employed**

However, several participants also said that community spirit was declining. Changes to community vitality affects the availability of social capital to provide buffers against more frequent EWE associated with climate change. This would have the net effect of increasing or decreasing population vulnerability to climate change.

Physical Environment

Participants noted that expected climate change to a pose the risk of environmental degradation in Barbados. This includes impacts to the island's coastal resources (beaches, coral reefs, fisheries stocks); impacts to agricultural resources and changes to the island's climate and weather patterns. This is supported by the literature (Simpson et al., 2012). Some participants also discussed the risk climate change poses to infrastructure, like roadways, telecommunications and electrical systems, buildings and water infrastructure through repeated exposure to extreme weather events. As mentioned before, participants consider their wellbeing to be influenced by their physical environment, therefore any impacts to the physical environment from climate change will harm wellbeing.

Living Standards

Determinants associated with living standards both are affected by climate change and affect the ability to respond to climate change. For instance, repeated exposure to extreme weather events puts the personal property at risk, and each event can result in a further decline in living standards. This is even more so a problem if people have no financial security to protect against impacts or recover after. This is described by a participant in the following quote:

> *In terms of infrastructure when you get a lot of rain, then you get flooding. People's houses flood out, cars get flood out. That is money that you got to look for in order to replace these things, especially if you don't have any insurance.* **–Jenny, 51, Service dispatcher**

Another connection between climate change and living standards is the dependence on economic sectors vulnerable to climate change which places persons at risk of losing livelihoods or income. This participant noted instances where climatic conditions affected the livelihood of their family:

> *My father has chickens. If it is too hot, it affects production. Maybe the hens won't lay properly or sometimes the heat kills the chickens.* **– Jeff, 30, Butcher**

Similarly, one participant described challenges faced within the agricultural sector from climatic conditions:

> *With the dairy industry, the cows are not cycling properly so they aren't conceiving. Certain crops which are accustomed to growing at a particular time no longer grows. The rain is coming at the wrong time and washing out everything, so it's a big gamble right now.* **– Dario, 26, Farmer**

<u>Economy</u>

The connections between climate change and economy overlap with those described under living standards. Again, with climate risks to climate-dependent sectors like tourism, agriculture and fisheries, there is the possibility of the loss of job opportunities in these sectors. Furthermore, these sectors contribute to the Barbadian economy, so any risks to these sectors can hinder economic growth. Linked to this, the state of the economy (growth or decline) affects budgetary decisions such as expenditure on social welfare programmes, subsidies to varies services and amenities, maintenance of state-controlled infrastructure and investment into climate change adaptation planning.

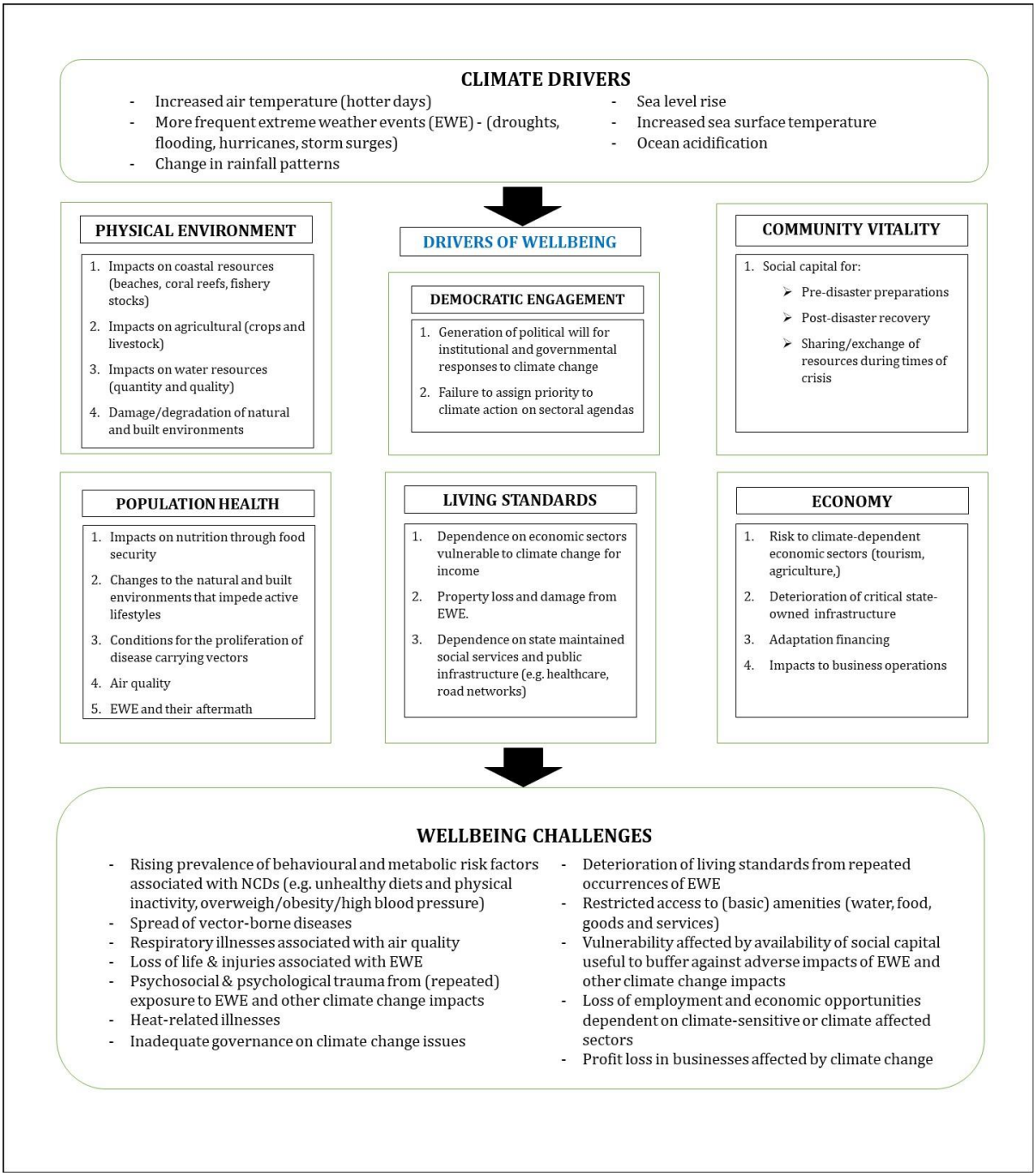


Figure 5.1: Wellbeing in the context of climate change. Graphic shows how climate change is connected to the wellbeing of participants. Each driver of wellbeing shows exposure pathways through which climate change and wellbeing are connected. These pathways may affect exposure/sensitivity to climate drivers, or they may show adaptive capacity.

5.2.4 Summary

Taken holistically, participants mainly attributed their positive wellbeing to determinants that could be categorised under physical environment, community/social factors and living standards respectively. Conversely, they perceived their poor wellbeing to be mainly linked to determinants related to living standards, community vitality and democratic engagement. Surprisingly, health did not come up in the original discussion of wellbeing as a factor that detracted from or contributed the wellbeing of participants. The varied responses related to factors that affect the lives of Barbadians demonstrate that Barbadians consider their wellbeing to be multidimensional and complex. Another noteworthy observation is that despite the importance attached to the physical environment and the descriptors related to climate and weather, none of participants expressed concern about climate change in relation to their wellbeing. However, climate change is explored in greater detail in the following section to explore Barbadians' understanding of their wellbeing as it relates to climate change.

These discussions of wellbeing also demonstrate that various dimensions of wellbeing should not be considered independent of each other. For example, participant responses demonstrated close connections between living standards and democratic engagement; the way they felt about their living standards affected their participation in political processes and their feelings about political leadership and governance. Similarly, participants were able to see the connections between community vitality and living standards. Many more of these links could be made, demonstrating the complexity of wellbeing and advancing the argument for why wellbeing should be examined holistically.

These interviews have provided some insight into the knowledge Barbadians have about climate change impacts in Barbados. The difference in the number of people who are aware of climate change and those who are not, was not noteworthy. These results indicate that already some

citizens have begun observing changes to their environment which they have been able to relate to climate change based on the knowledge they possess. Further, some participants were able to extrapolate from current conditions to postulate on how their wellbeing may be threatened by climate change in the future. Though several participants expressed concern about climate change, many noted that the level of concern was low. Given that climate change did not previously come up in discussions of wellbeing, it was not surprising that several participants felt that there were other more pressing threats.

5.3 Research objective 2 Climate change -NCD connections

The results in this section are used to assess the level of knowledge of the relationship between climate stresses and NCDs among public health professionals in Barbados. The results have been arranged under three themes: current and future burden of NCDs in Barbados and the climate change-NCDs connection.

5.3.1 Current burden of non-communicable diseases in Barbados

> *"Well right now I think that the number one problem in Barbados in terms of health issues are chronic NCDs. That is the big fish right now in Barbados."* — **HP3, Doctor**

When asked what they considered to be the greatest health challenges in Barbados, all but one key informant stated that the greatest health challenges they encounter in their respective professions were that of chronic non-communicable diseases or issues related to those diseases. Health professionals expressed concern regarding the high prevalence of these diseases given how largely preventable they can be; complications related to undiagnosed/untreated/poorly managed NCDs; state health care spending necessary to provide free or subsidized care to its citizens; and the economic and social burden to the Barbadian society (Table 5.7). This finding aligns with the views of the

respondents that participated in the in-depth interviews who also overwhelmingly perceived non-communicable diseases to be the greatest health challenge in Barbados (Section 5.2.2).

Issues associated with the burden of non-communicable diseases

> *"Four chronic diseases were identified as the chronic diseases of importance: cardiovascular disease, cancer, diabetes and chronic lung disease. And these four were identified for essentially two reasons. First of all, they accounted for some 80% of all of the deaths in the Caribbean. And also, they all for the most part, shared the same risk factors for their development…. And those four diseases are the same diseases that have been recognized internationally. Even though we recognize that there are many, many other chronic diseases."* **— HP6, Head of Board of Director of the Civil Society Health Non-governmental organization (NGO)**

Respondents were asked which NCDs specifically they considered to be of greatest concern. Responses included various forms of cancers, diabetes mellitus, cardiovascular diseases (e.g. strokes), and metabolic risk factors such as overweight/obesity and hypertension (Table 5.7). Among these responses, the top two concerns were diabetes and hypertension. Predictably, the diseases reported by health professionals are all on the list of top non-communicable disease responsible for ill-health in the Caribbean region. Based on their experiences, medical health professionals noted the difficulty in selecting a single disease of concern as many persons are living with multiple NCDs. They argued they are less concerned about specific NCD diagnoses, but rather the behaviours exhibited by persons and the environments within which they live, that hinder the prevention or management of NCDs. For example, one participant stated:

> *"I'm not concerned more so about one NCD over another, because usually you don't have one alone. …. You have diabetes and more likely, not controlled is going to lead to retinopathy or poor circulation so, it progressively leads to other things."* **— HP1, Pharmacist**

Two issues related to NCDs which key informants were particularly concerned about are the prevalence of NCDs given the preventable nature and complications arising from NCDs. Non-communicable diseases are largely caused by four behaviour risk factors: unhealthy diets, insufficient physical activity, tobacco use and harmful alcohol use which in turn lead to metabolic risk factors such as overweight/obesity and high blood pressure (WHO, 2014c). Likewise, the same risk factors are important in the management of NCDs. These risk factors are can be largely attributed to macro-socioeconomic processes such as economic transitions, rapid urbanisation, industrialisation and the globalisation of food markets (Kjellstrom et al., 2010; WHO. 2005). The behavioural risk factors discussed by participants were physical inactivity and unhealthy diets.

Table 5.7: Key informant views on health challenges in Barbados.

Health challenges	Specific diseases/issues	# of participants mentioning n/10 (%)	# of mentions
Chronic non-communicable diseases	Diabetes	10 (100)	25
	Cardiovascular diseases	8 (80)	8
	Other NCDs (cancers, lung diseases, etc.)	2 (20)	3
	Behavioural risk factors (unhealthy diets, physical inactivity)	8 (80)	11
	Metabolic risk factors (overweight/obesity, hypertension)	10 (100)	20
	Complications from undiagnosed/untreated/poorly managed diseases (e.g. amputations “diabetic foot”, kidney diseases, blindness)	5 (50)	8
	Cost to state and society	8 (80)	11
	Mental health illnesses	4 (40)	5
Infectious diseases	Zika, Chikungunya, Ebola	1 (10)	2
Extreme weather events/natural disasters	Post-disaster access to care	2 (20)	3

Responses from key-informants demonstrated an awareness that individual health affecting behaviours of Barbadians are influenced by external environments—social, cultural and economic—within which persons live. For instance, it was argued that the sedentary lifestyle of many Barbadians has contributed to increasing incidences of overweight/obesity in the population. One key-informant described it as a growing sedentary "culture" among Barbadians, where exercise and movement are no longer a regular part of the daily of life of islanders and noted that overweight or obese persons are likely to have multiple morbidities. That participant stated:

> *"It is evident that we have a sedentary culture. Exercise and movement are not a big part of island culture. I wouldn't just say Barbados, I would just say in general because it's throughout the Caribbean."* **— HP5, Doctor**

Respondents linked physical inactivity among Barbadians to income and social status. For example, one health professional hypothesized that sedentary lifestyles are a symptom of the preoccupation with upward economic mobility among Barbadians. Persons who have managed to achieve a certain level of wealth or economic success can afford material possessions that discourage or distract from the incorporation of physical activity into daily lives (e.g. motor vehicles and various forms of electronics or digital technology). Furthermore, the pursuit of materials possessions—which have become an outward symbol of affluence—takes time away from activities that contribute to healthy lives. This is demonstrated in the quote below:

> *"We need a change in our culture. We have become too materialistic. Looking at the American culture, the BET lifestyle…I think we need to get back to our old ways of living, living more contented. Park the vehicle, ride more, swim more… We like glitz and glam. I got a better car; I got a better house than you. It's more about the perception out there."* **— HP1, Pharmacist**

Again, these views are consistent with findings from the in-depth interviews with citizens who also expressed similar opinions that Barbadians have prioritised improving their socio-economic status to the exclusion of other activities that could contribute to their wellbeing.

Respondents also noted that that Barbadians are increasingly turning to more "westernized" diets. This is partially a reference to the growth in the fast-food consumption in the country which participants argued Barbadians are eating because (1) of convenience; (2) it is perceived as inexpensive; (3) of taste and (4) many parents and children view these meals as "rewards" for good behaviour or academic accomplishments. One respondent stated:

> *"The standard Barbadian diet is becoming more and more westernized and that's being really harmful to Barbadian health, cause at dinnertime now we think KFC. … More Barbadians are relying on KFC and Cheffette and those places to get their food regularly."* **— HP4, Doctor**

Further, participants noted from their interactions with person's living with NCDs, that Barbadian diets commonly consist of foods considered to be unhealthy (foods high in sugars, starches, fats or "empty calories"), again out of convenience, because of affordability. These reasons for food choices support research that determines socioeconomic status to be an important determinant of health:

> *"There are socioeconomic impacts with food choices as well. It's quicker, cheaper to purchase, starchy foods. Just to get by your day, essentially feed your kids foods like hot dogs, that type of thing, but ultimately, it's a huge impact on the health of the greater population."* **— HP10, Retired Nurse**

Another person said:

> *"I've also found that persons are eating worse. I can understand that if a persons' disposable income is less, what one would consider foods with empty calories are cheaper as compared to foods um, that are 'good for you'".***— HP1, Pharmacist**

The poor management of non-communicable diseases and their risk factors by Barbadians, leads to avoidable, debilitating complications or disabilities which can affect quality of life and the ability to be productive citizens; in some cases, the outcome is death. Key-informants suggested that many of these complications arise because there are people living with undiagnosed chronic diseases that have never sought screening, even though opportunities are regularly offered free of cost to

Barbadians. They offered that many Barbadians fail to take advantage of screening opportunities as they experience no symptoms until their conditions, having been left untreated, progresses to a dangerous stage. For example, one respondent noted:

> *"Diabetes is one of the biggest silent killers in Barbados. Diabetes is also preventable through good diet and physical activity. Diabetes also has the highest disability factor from problems with microcirculation. It is the main cause of blindness, the main cause of kidney disease, the main cause of amputation."* **— HP7, Pan American Health Organisation (PAHO) representative**

Similarly:

> *"I found that there was a lot of talk about NCDs. For the last couple of years there was a lot of talk about them. I think it has to do with a lot of people suddenly dying…. And the reality of these situations is that a lot of these people that would have just "drop down", it would have more than likely from heart problems. And that is will be a direct effect of chronic NCDs. Granted I'm not saying that everybody, it was because of those, but what I'm saying is that while they might not directly because what has happened, it indirectly contributes to those occurrences."* **— HP3, Doctor**

Another reason for these complications is that there are many persons who are non-compliant with their medication care plans, even though the cost of medication is not prohibitive, again because they do not experience any symptoms. One doctor stated:

> *"I think that what makes hypertension a little more dangerous is because people don't feel hypertension so it's very easy for them to take the same free medication and just not use it. Sometimes you will forget to take it, and it's not like diabetes where you might start to feel sluggish, or you might start to feel ill because you've not taken your medication. With high blood pressure you could be going along with pre-stroke high blood pressures and not feel it, you won't get headache, you won't get any problems until it's too late."* **— HP4, Doctor**

Interestingly, the doctors proposed that another reason for the extreme complications arising from poorly managed NCDs is a lack of confidence in health care providers. They were specifically referring to the distrust patients have for doctors as it relates to a stigma in Barbados around

amputations. They observed that Barbadians diagnosed with diabetes have a fear that if they attend a doctor, their limbs will be amputated:

> *"That stigma has been a big problem and has also often impeded the relationship between doctors and patients because there are some patients who already come with the mindset that this person wants to take my foot, and this person is against me having my foot…I'm someone who is interested in general surgery, and from what I've seen there are far too many people that end up with amputations. And it's not because they come to the hospital and we're surgeons and we're trying to cut off their foot, it's because they have come to the point where, to save their life, we have to take their foot."* **— HP3, Doctor**

5.3.2 Future burden of NCDs in Barbados

All key-informants agreed that the burden of chronic non-communicable diseases has been increasing in Barbados. Growing incidence of NCDs continues despite the varied responses, which include the establishment of a dedicated department within the government to address this problem (National Non-communicable Disease Commission); strategic health plans to direct action on NCDs, sustained education programs to disseminate information to citizens; the introduction of policies and legislations to address risk factors; inter-sectoral cooperation; multi-governmental collaborations at the regional level; and the active involvement of civil society. Key-informants posited that efforts to reduce the burden of these diseases are hindered by economic, social and cultural and factors as well as individual behaviours (Table5.8). Preoccupation with wealth and economic prosperity on the part of both individuals and businesses within the private sector conflict with good physical wellbeing. On the other hand, there are many Barbadians with limited income, which is known to be linked to poorer health. While Barbados does provide access to healthcare free of cost or heavily subsidized, participants noted the healthcare system is overburdened, due in part to the high prevalence of NCDs, and so there is concern about the capacity to maintain access to these services at the level to which Barbadians have become accustomed. Already, the leadership of Barbados has proposed fiscal austerity measures which would cut some social protection programs in place. Interestingly, a number

of respondents also noted that because health care is fairly accessible, there is much greater focus on the treatment of chronic diseases rather than prevention. Some participants also noted that despite educational health campaigns, there remains pervasive misconceptions about how Barbadians can improve their health, leading them to make poor lifestyle decisions.

Furthermore, some participants reported that along with an increasing prevalence of NCDs, they are observing is a greater number of younger people being diagnosed with non-communicable diseases. They made these comments based on their own experiences and from discussions with colleagues who have been in the profession for a longer time. For example:

> *"I remember one of the discussions we had was about the kind of patient that's coming in, and we're noticing the chronic illnesses a lot earlier. So, it's not that you are seeing people that are 50 and up coming in for the first time with high blood pressure and diabetes; you see it in their 30s and 40s and sometimes even in the younger people. There's a lot, more paediatric cases of diabetes type 2. You're seeing more of the paediatric onset of what we thought was an adult illness."* **— HP4, Doctor**

Table 5.8: Factors hindering the reduction in the burden of healthcare in Barbados

Determinants	Factors
Economic	Overburdened healthcare system
	Limited resources (financial and human) for response to the NCD crisis
	Competing goals from the private sector
	Fiscal austerity measures
Social	Income
	Access to health services
	Health Education

Cultural	Shift from traditional to "westernized" diets Different priorities for a "good life"
Individual behaviours	Noncompliance with medication regimes Health care avoidance

5.3.3 Climate change – non-communicable diseases connections

This section reports on the findings about the level and scope of knowledge of the connections between climate change and non-communicable diseases among public health professionals in Barbados.

Disparities in knowledge of climate change and health impacts

> *"You know there's not really much consideration given to the effect of the climate on NCDs, not at the places I have worked."* **— HP4, Doctor**

There was a disparity in the knowledge of climate change impacts on health possessed by the health professionals who participated in this study. The health professionals who operate at a regional level had a greater knowledge of the climate change impacts on health or were more able to postulate on the potential connections between climate stresses and non-communicable diseases. Health professionals operating at solely the community level were generally unaware of these connections (Table 5.9). The representative from PAHO was the most knowledgeable on the topic of climate stressors and chronic non-communicable diseases, and was able to discuss at length a range of potential climate change health impacts. Similarly, the health professional representing the civil-society health NGO, noted that while they were not overly familiar with the multitude of ways climate stresses could affect the prevalence of NCDs or the adverse experiences of people living with

NCDs, this was an issue that the organization has considered for future work. This participant was still able to offer some ideas on the potential connections between climate change impacts and non-communicable diseases as is described in detail below.

Participants who work with organizations that operate at the national and community level, were also less familiar with the connection between climate stresses and NCDs but were nonetheless able to offer some insight based on their expertise on NCDs and their limited knowledge of climate change. Health professionals from community level organizations were unable to offer any information on connections between climate stresses and NCDs. The participants who declined to participate in this study indicated that they were unaware of a connection between climate change and NCDs. Furthermore, responses from these health professionals about the specifics of climate change impacts in Barbados, suggest that they do not possess enough knowledge about climate change to be able to speak to any potential connections to chronic non-communicable diseases. This lack of knowledge is indicative of an overall lack of attention on climate change on the parts of the organizations where they are employed and greater lack of attention from the Barbadian health system as a whole. In fact, some of these participants indicated that this was not a topic to which they had given much, or any, thought. I cannot state that knowledge of climate change and health is correlated to the level of the organization where respondents are employed, nor do I wish to as this was not tested. However, these results do raise the possibility that the knowledge possessed by health professionals is linked to the information available to certain organizations and warrants further investigation.

Table 5.9: Key informant knowledge of climate change and health impacts.

Profession	Level of Organization	Climate change & health impacts	Connection between climate stresses & NCDs
Pharmacist	Community	No	No
Pharmacist	Community	No	No
Doctor	Community, national	Yes	Yes
Doctor	Community	Yes	No
Doctor	Community, national	Yes	Yes (with prompting)
Board of Director of health NGO	National, regional	Yes	Yes
Representative from PAHO	National, regional	Yes	Yes
Fitness instructor/personal trainer	Community	Yes	No
Retired nurse	Community	No	No
Nutritionist	Community, national	Yes	Yes

Overlap between social determinants of health and determinants of vulnerability

> *"… We speak of chronic disease being lifestyle driven, but if you go further upstream, they are really first driven by what we call the social determinants: where you live, where you play, whether you are empowered as a person, your stress levels and so on… These adverse social determinants are far more common in social class four. This is the social class more likely to get chronic diseases, and it's also the class that is most significantly impacted by hurricanes".* **— HP6, Head of Board of Directors of civil society health NGO**

A key-informant commented on the commonalities between social determinants of health that contribute to the prevalence of chronic non-communicable diseases and the factors that affect the vulnerability of populations to the impacts of climate change. These determinants included income, education, occupation, social support, exposure to environmental hazards and access to health services/resources. Similarly, these social determinants can also be the factors that affect the exposure, sensitivity and adaptive capacity of populations to climate change. Further, inequalities in

the distribution of chronic non-communicable diseases among populations are likely to mirror the vulnerable populations disproportionately impacted by climate change.

Climate change impacts could affect NCD prevention and management

Other key informants proposed that climate stresses could hinder the prevention of NCDs through the pathway of modifiable behavioural risk factors like unhealthy diets and physical inactivity.

Food security/sustainability

Nutrition is one of the key risk factors for the development of NCDs, where the calories and types of food consumed, greatly affect the likelihood of developing metabolic risk factors like obesity/overweight and hypertension. In this way, key informants proposed a link between the impacts of climate change on food security and the prevention of NCDs through constant access to high quality, affordable food. The examples given by key informants were related to the agricultural and fisheries sectors in Barbados. For example, the PAHO representative noted:

> *"…We already have a difficulty in getting affordable fresh fruits and vegetables on the market. Now if climate change effects, or weather effects are going to continue to damage our produce, it's going to get even worse."* **— HP7, PAHO representative**

As it relates to the fishing industry:

> *"If we are going to have a further increase in our sea water temperatures, the whole issue of the sustainability of fishing. We saw a few years ago the whole issue of the Sargassum weed, and how that affected the whole food chain with regards to the fishing industry. Fishing has already declined as an economically viable industry in the region, so we're relying on imported products, imported frozen fish from other sides of the world with the additional processing."* **— HP7, PAHO representative**

Similarly, another key informant noted that already Barbadians perceived "healthy foods" like fruits and vegetables as expensive, which affects their food choices, where people opt to buy cheaper processed foods. Given these behaviours in what could be considered 'normal' conditions, key informants are concerned that climate change impacts like heavy rainfall, increasing sea surface temperatures and natural disasters, could affect the availability and affordability of local foods on a more frequent basis; this would likely further negatively influence the food choices of Barbadians. This is not an unlikely scenario; in a local newspaper in 2017, the Chief Executive Officer of the Barbados Agricultural Society noted that heavy rainfalls had impeded local farmers' ability to prepare their fields, which resulted in a shortage of local vegetables and a price hike for consumers (Sealy, 2017).

Another participant noted that changing environmental conditions could detract from the attractiveness of occupations like farming for income generation; this would then have a trickle-down effect on the quantity of local foods available for market and consumption. They stated:

> *"People are staying away from the outdoors in terms of farming and doing stuff that could probably produce foods that would be more, what we would call healthy to use."* **— HP8, Nutritionist**

The PAHO key informant noted that local economic and environmental factors could conflict with the messaging promoted to reduce the burden the of NCDs in the country:

> *"We're telling people to eat fresh fruits and vegetables but then how many fresh fruits and vegetables can you find on the market? And how much is available across the island or is it in specific areas? So, availability is limited, and affordability is even more limited."* **— HP7, PAHO representative**

Physical Inactivity

Some key informants proposed that changes in climate or changes to the built environment related to climate could influence Barbadian attitudes toward physical activity. The climatic changes to which key informants were referring were increases in ambient temperatures (hotter days),

unpredictable weather patterns (heavy rainfall) and damage to the environment from extreme weather events. For example, one participant stated:

> *"We don't have a lot of active lifestyles because everyone wants to be in their car with the AC on, because they say it's hot."* **— HP8, Nutritionist**

Another participant discussed the challenges of cultivating routines that incorporated physical activity into people's daily lives because of the unpredictability of the weather or disruptions to the built environment that hinder activities:

> *"We had practically a whole month where it rained every day. Totally unusual for Barbados. "You couldn't tell your children to walk to school because you didn't know if in the afternoon it will* rain. I mean yesterday, case in point. It was a beautiful day in the beginning of the day. Hot, nice, sunny. By lunch time, torrential rain till the night." **— HP7, PAHO representative**

Also:

> *"Because of the sea surge, the sand was shifted onto the boardwalk. So, there were periods where you actually couldn't walk on the boardwalk."* **— HP7, PAHO representative**

The cumulative effect of these environmental conditions is increasingly negative attitudes towards physically active lifestyles, adding to the growing sedentary culture of Barbados.

Vulnerable populations

As it relates to the management and treatment of chronic diseases, two key informants noted that people living with chronic non-communicable diseases constitute a vulnerable population to climate change. This vulnerability is due to the additional exposures and sensitivities this population face related to their need for access to regular, on-going health services and resources during and after the passage of extreme weather events. For instance, one health professional said:

> *"We already don't have enough dialysis facilities for the public to accommodate the number of persons that are going into kidney failure. Imagine, if we do have a*

> *natural disaster that affects these facilities, those people honestly and unfortunately they will probably die."* **— HP5, Doctor**

Similarly, another noted:

> *"One of the consequences of weather events is people being cut off. People might have a week's supply of medication and if the communication and the connectivity with the town or with the nearest health centre is not there, how do they get access to their medications?"* — HP7, PAHO representative

Physiological and psychosocial impacts of climate change

Other climate change – NCD connections discussed by key informants were direct physiological effects of climatic variables. These were the potential for heat strokes brought on by heat waves and air pollution from increased vehicular use and the impacts on chronic lung diseases as reflected in the quote below:

> *"There is the increased use of vehicles which then impacts physical activity, and there are also the carbon emissions from these vehicles that also has an impact then on the chronic lung diseases."* **— HP6, Head of Board of Directors of civil society health NGO**

Finally, two key informants expressed concern that climate change impacts would affect the psychosocial wellbeing of Barbadians. They posited that this could be related to social effects of food insecurity and water insecurity, and the immediate and long-term effects of (repeated) exposure to extreme weather events. This is demonstrated in the quote below:

> *"I mean add on top of the things that we've already said. The stress of having a weather event. Think about how that affects your blood pressure and how that affects your blood glucose and how that affects all your complications arising from the NCD which you are living with."* **— HP7, PAHO representative**

5.3.4 Summary

Public health professionals in Barbados overwhelmingly agree that the burden of NCDs a major challenge for the country. The prevalence of diabetes and hypertension were noted several

times by key informants to be a concern. The challenges associated with these chronic diseases included the growing prevalence across the populations, especially in younger member demographics; the burden of undiagnosed and unmanaged diseases, and the healthcare spending by the state to provide care to persons living with NCDs. Concern for the burden and challenges associated with NCDs largely exceeds the concern for other health challenges in Barbados.

When asked about connection between NCDs and climate change, it was evident that many of the key informants had not given much, if any, thought to this topic. More specifically, public health professionals working at the community level were largely unaware of climate change in relation to health. On the other hand, the health professionals from regional organisations had much more familiarity with the topic, and indicated that these probable connections were a topic of consideration for their respective organisations. The findings from the data collected indicate that the connections between climate change and NCDs include shared determinants of health and vulnerability; and the impacts can be summarised into effects of climate change on NCD prevention and NCD management.

5.4 Research objective 3: Responses to the NCD crisis in Barbados

This section presents the results of a document review and content analysis conducted to investigate national and regional responses to the non-communicable disease crisis in Barbados. This analysis also examines to what extent, if any, climate change has been factored into health sector planning, and more specifically planning for non-communicable diseases.

5.4.1 National and regional responses to non-communicable diseases and climate change

> *"It has become evident that a broader approach to the problems of chronic non-communicable diseases and the protection of health is required. Since many of the diseases are rooted in lifestyle and behavioural practices, the challenge will be to develop effective strategies aimed at bringing about fundamental behavioural*

> *changes at the individual and community levels" -* **Barbados National Strategic Plan for Health 2002 – 2012.**

Time period: 2000 - 2004

Between 2000 – 2004, the Government of Barbadian was starting to take action in response to the burden of chronic lifestyle diseases, evidence by health policy documents made available during this period (Table 5.10). Likewise, this was an issue that had garnered attention at a regional level, but not to the extent that is seen in following years. There is less documented evidence that shows a regional response to the issues of NCDs during this period. That is not to say that there was no regional response at this time, rather, it appeared that challenges of NCDs was a health issue that was just being identified as a problem that needed to be addressed.

In the 'Nassau Declaration on Health: The Health of the Region is the Wealth of the Region', Heads of Government of the Caribbean Community committed their governments to actions to that would improve the health status of their populations through leadership, strategic planning, management and resource mobilisation within the health sectors of their respective countries. These commitments were grounded by the recognition that good health is foundational to the economic development of nations. In this declaration, a mandate was issued for the development of a Regional Strategic Plan for the Prevention and Control of the Chronic Non-Communicable Diseases and for a report to be prepared on the health situation in the Caribbean at the time. Notable about this declaration, it that though NCDs were recognised as an important health challenge at the time, HIV/AIDS seemed to be considered a greater problem at the time. This is evidenced by the emphasis on HIV/AIDS in the first three lines of the declaration, where it was stated that:

> *"We the Heads of Government of the Caribbean Community: COGNIZANT of the critical role of health in the economic development of our people and overawed by the prospect that our current health problems,* ***especially HIV/AIDS, may impede such development through the devastation of our human capital;"*** **- Nassau Declaration**

Non-communicable diseases were recognised as one of ten priority issues in the 'Barbados National Strategic Plan for Health 2002 – 2012', and as such a portion of the document was dedicated to strategic planning for these diseases. The stated overall goal was to reduce the morbidity and mortality related to chronic NCDs, and to that end, several priority issues, expected results and health indicators were outlined. Proposed efforts to reduce the burden of these diseases focused on reducing the incidence and complications of specific NCDs; improving education programmes targeted at both the public and health professionals; the implementation of early detection programmes and community and non-governmental organisation (NGO) engagement. NCDs were also indirectly mentioned in relation to another priority health issue: that of food, nutrition and physical activity.

Table 5.10: National and regional responses to managing non-communicable diseases

Timeframe	Documents	Activities
2000 - 2004	**2001** Nassau Declaration on Health: The Health of the Region is the Wealth of the Region **2003** Barbados National Strategic Plan for Health 2002 – 2012 **2004** Barbados Sustainable Development Policy 2004 Strategy for the Prevention and Control of Chronic NCD 2004*	
2005 - 2009	**2005** National Strategic Plan of Barbados 2005 – 2025 **2007** Declaration of Port of Spain: Uniting to Stop the Epidemic of Chronic NCDs (September) PAHO Regional Strategy and Plan of Action on an Integrated Approach to the Prevention and Control of Chronic Diseases	**2007** First meeting on the Barbados National NCD Commission (March) Start of the Barbados National Registry for Chronic Non-Communicable Diseases (BNR) (April) The Barbados STEPS Noncommunicable Disease Risk Factors Survey (July – September)

		First Caribbean Community (CARICOM) Summit on Chronic NCDs in Port-of-Spain, Trinidad (September)
	2008 National Commission for NCDs Strategic Plan 2009 – 2012	**2008** Health Caribbean Coalition (HCC) (informally established)
		Inaugural Caribbean Wellness Day (September)
	2009 Food-based dietary guidelines for Barbados	**2009** Commonwealth Heads of Government Meeting – Separate statement issued on the combating NCDs (November)
2010 - 2014	**2011** Strategic Plan of Action for the Prevention and Control of NCDs for countries of the CARICOM 2011 – 2015 CARICOM Regional Food and Nutrition Security Action Plan 2012 – 2026	**2011** UN-high-Level Meeting on the Prevention and Control of NCDs and UN Political Declaration (September)
	2012 PAHO Strategy for the Prevention and Control of NCDs for 2012 – 2025 Civil Society Strategic Plan for the Prevention and Control of NCDS for Countries of the Caribbean Community 2012 – 2016	**2012** Health Caribbean Coalition (HCC) (officially registered as a not-for-profit)
	2013	**2013**

	Barbados Growth and Development Strategy 2013 – 2020 **2014** Barbados Strategic Plan for the Prevention and Control of NCDs 2015 – 2019 PAHO Plan of Action for the Prevention and Control of NCDs in the Americas 2013 – 2019	Barbados Health of the Nation Survey (October 2011 – December 2013)
2015 - 2018	**2017** Food-based Dietary Guidelines for Barbados – Revised Edition (2017) HCC Strategic Plan 2017 - 2021	**2015** Forum of Key Stakeholders on NCDs: Advancing the NCD agenda in the Caribbean (June) Barbados Sugar Sweetened Beverage tax (September)

Recognising the limitations of this strategic health plan, there was a call for more detailed action plans that provide more directions on how specific expected results would be achieved.

Subsequent to the Barbados National Strategic Plan for Health 2002 – 2012 document, the first strategic plan created to address NCDs in Barbados was released titled "Strategy for the Prevention and Control of Chronic NCDs 2004". As the name suggests, the sole focus of this document was chronic lifestyle diseases and reflects the national priority of NCDs to Barbados. Though there are several references to this initial strategic plan for NCDs in ensuing NCD-focused policy documents, there was no publicly available version of this document at the time of the study.

2005 - 2009

There was a marked increase in activity in the period between 2005 – 2009, evidence of a greater national and regional responses to NCDs throughout the Caribbean region. The Government of Barbados released a National Strategic Plan for 2005 – 2025 during this period. The purpose of this document was to outline a vision for the future of the country by 2025 and six strategic goals that would help to accomplish this vision. While the National Strategic Plan is not a health policy document, the challenge that non-communicable diseases pose to future economic growth development through the detrimental effects on social capital was mentioned in this plan:

> *"HIV/AIDS, chronic non-communicable diseases, rising crime and drug abuse: These pose a serious challenge to the development of social capital, the linchpin of further economic growth."* – **National Strategic Plan of Barbados 2005 – 2025**

Furthermore, one of objectives proposed in this strategic plan was to improve the health of all Barbadians by reducing incidence and prevalence of non-communicable diseases by 2025. The highlighting of NCDs in this plan demonstrates a recognition that though NCDs are primarily a health issue, the subsequent effects are worthy of attention by governmental sectors beyond health.

In March 2007, the first meeting of the National NCD Commission in Barbados was held. The commission was created within the Ministry of Health based on a recommendation in the 2004 Strategy

for the Prevention and Control of Chronic NCDs. The purpose of the commission was to be a dedicated body within the Ministry of Health and the guiding force for strategies for the prevention and control of NCDs at the national level. This would include responsibilities such as providing advice to the Minister of Health on NCD policy and legislation; coordinating and implementing strategic plans for NCDs with assistance from other departments within the Ministry of Health; aiding in efforts to mobilise financial and human resources for programmes intended to prevent and control NCDs and foster involvement and collaborations between a range of health stakeholders from academic institutions, regional health agencies, other government sectors, NGOs, civil society, the private sector and trade unions. Later, the commission would release a Strategic Plan for the period 2009 – 2012. Though the 2009 – 2012 plan is no longer publicly available, the updated plan for the period 2015 – 2019 noted that the original plan focused on fostering intersectoral collaborations beyond the health sector and called for the involvement of academic institutions (University of West Indies), having recognised the importance of research and data in implementing evidenced-based solutions for the prevention and control of NCDs. The mandate regarding the involvement of academic institutions eventually led to the creation of the Barbados National Registry for Chronic Non-Communicable Disease (BNR), a population-based surveillance system that collects national data on three NCDs: strokes, acute myocardial infarction and cancer. The BNR is operated by the Chronic Disease Research Centre of the University of West Indies, on behalf of the Ministry of Health, Barbados. Another major activity that occurred during 2007 was the Barbados STEPS NCD Risk Factor survey based on the survey methodology from the WHO created to help countries with create their own surveillance systems to monitor NCDs. In 2009, the Barbados Food-based dietary guidelines were released, developed by the National Nutrition Centre within the Ministry of Health with support from the Food and Agriculture Organisation (FAO) of the United Nations.

In September 2007, Heads of States of CARICOM countries met in Port-of-Spain, Trinidad to discuss ways to address NCDs at the first CARICOM summit on Chronic Non-communicable Diseases. Out of this summit came an overarching declaration that documented a wide-range of policy responses to the NCD crisis in the region. These included the call for the establishment of National Commissions on

NCDs like the one created in Barbados; a commitment to pursue legislative and policy agendas that would address NCD risk factors such as tobacco use, physical inactivity and diets; support for multi-sectoral collaborations, inter-governmental agencies and the engagement of the wider society, and a call for programmes for research and surveillance of NCD risk factors. This 2007 Declaration from Heads of States also provided the impetus for the creation of the Health Caribbean Coalition (HCC)—informally established in 2008—an organisation that seeks to:

> *"Harness the power of civil society, in collaboration with government, academia, and international partners, and private enterprise as appropriate, in the development and implementation of plans for the prevention and management of chronic diseases among Caribbean people"* - **Mission statement of the HCC**

Out of the Port-of-Spain Declaration, also came Caribbean Wellness Day (CWD), an annual event held across the Caribbean to raise awareness of the burden of NCDs; facilitate the strengthening of partnerships for NCDs between the private and public sector and civil society; encourage multiple countries and sectors to become involved with efforts that promote wellness; and highlight national and community activities that have contributed to healthy lifestyles. The first CWD was held in September 2018. The Port-of-Spain declaration has also been noted to be influential in future actions taken at an international level to address the global burden of these diseases:

> *"You initiated an unprecedented momentum. The tremendous progress in the Caribbean will be included in a global action plan for the prevention and control of chronic diseases, which is under preparation at WHO. Your efforts are lessons in how to stretch resources so that benefits reach the largest possible number of people, and these need to be shared with other regions."* – **Remarks Dr. Catherine Le Gales-Camus, Assistant Director General, Noncommunicable Diseases and Mental Health, World Health Organization**[3]

Similarly, at a meeting of Commonwealth Heads of Government in 2009—a meeting where Commonwealth countries can discuss concerns about issues that affect their socio-economic

[3] Remarks made at the First Summit of CARICOM Heads of Government on Chronic, Noncommunicable Diseases (Port of Spain, Trinidad & Tobago, 15 September 2007) and preserved in written format on the WHO website - https://www.who.int/nmh/media/speeches/ADG%20Statement%20CARICOM.pdf?ua=1

development—a statement was issued that reaffirmed a commitment to action on NCDs at a national level demonstrated in an extract from the statement below:

> *"We, the Heads of Government of the Commonwealth, representing one third of the world's population, affirm our commitment to addressing the burgeoning incidence of non-communicable diseases (NCDs), and to increasing the ability of our countries to respond to this emerging health crisis."* **– Statement on Commonwealth Action to Combat NCDs**

This statement further encouraged an international response from the global health community by boldly calling for a global recognition of NCDs as a priority concern, to facilitate the international cooperation necessary to address a health crisis of this magnitude:

> *"Noting that international cooperation is critical in addressing the phenomenon of NCDs, we call for their inclusion in global discussions on development …. We similarly declare our support for the call to integrate indicators to monitor the magnitude, trend and socio-economic impact of NCDs into the core MDG monitoring and evaluation system during the MDG Review Summit in 2010.*
>
> *We further call for a Summit on NCDs to be held in September 2011, under the auspices of the United Nations General Assembly, in order to develop strategic responses to these diseases and their repercussions."* **– Statement on Commonwealth Action to Combat NCDs**

2010 – 2014

A major event that occurred during this time period was the 2011 United Nations High-Level Meeting on the Prevention and Control of NCDs, out of which emerged a Political Declaration on NCDs. While this was an occasion for the *international* community to convene and take action against NCDs, it was included in these national and regional responses because of the role the Caribbean community played in this meeting. It was leadership and advocacy from the Caribbean community that helped to elevate the issue of non-communicable diseases to the UN Development Agenda, following the 2007 summit of CARICOM Heads of Government. It was leaders from the Caribbean Community that proposed the resolution for a high-level-meeting that would address the prevention and control of NCDs (PAHO, 2011), and in the resolution, mention was made of both the 2007 CARICOM summit and the

2009 meeting of Commonwealth Heads of Government demonstrating the effectiveness of the advocacy on the part of these regional organisations:

> *"… Taking note with appreciation of the declaration of the Heads of State and Government of the Caribbean Community, entitled "Uniting to stop the epidemic of chronic non-communicable diseases", adopted in September 2007,*
>
> *Taking note with appreciation also of the statement of the Commonwealth Heads of Government on action to combat non-communicable diseases, adopted in November 2009, …"* **– A/RES/64/265**[4]

Also, in 2011, a Strategic Plan of Action for the Prevention and Control of NCDs for Countries of the CARICOM 2011 – 2015 was released, under the authorship of CARICOM Secretariat, PAHO and the WHO. This document provided a framework for action and resource mobilisation at the regional and national level for countries of the Caribbean Community. It also contained guidelines and recommendations for country plans which could be adapted by countries adapt for their own priority areas of action. In the same year, the Caribbean community released a regional food security action plan (CARICOM Regional Food and Nutrition Security Action Plan) which made several references to the link between good nutrition and food security and non-communicable diseases.

At a national level, Barbados released a Growth and Development Strategy 2013 – 2020 which mentioned NCDs as a challenge to growth and development. It went further to underscore the link between food and nutrition security. While this document does not offer solutions to the NCD crisis, the mention of these diseases reinforces the importance of addressing this health challenge from an economic perspective. In the same year, CDRC completed another Health of the Nation Survey, a two-year study to assess the prevalence of diabetes, hypertension and associated risk factors. In 2014, the National NCD commission released an updated Strategic Plan for the Prevention and Control of NCDs for 2015 – 2019, a successor to the National Commission for NCDs Strategic Plan 2009 – 2012. This plan emphasised an "all-of-society" approach to combatting this health crisis. This approach recognises the important to be

[4] Resolution adopted by the General Assembly on 13 May 2010, 64/265. Prevention and control of non-communicable diseases

played by various governmental ministries, the private sector and, civil society. Furthermore, the plan acknowledged the need to focus on food and nutrition as one of the key risk factors to NCDs and more comprehensive physical activity and obesity programmes targeted at both children and adults.

2015 - 2018

Between 2015 – 2018, there was much less activity compared to the previous 5-year period. Barbados released revised food-based dietary guidelines in 2017. The latest national strategic health plan for the period 2017 – 2022 is still being finalised according to a representative from the Ministry of Health. At a regional level, the Healthy Caribbean Coalition released for the period 2017 -2021. This plan, and others regularly released guides from the HCC, are proof of in-going, timely efforts to continue to address chronic NCDs at a regional level.

The timeline of activities discussed does not constitute every action on non-communicable on the part of Barbados or the regional community; to do so would not be feasible. To the best of my knowledge, I have highlighted major events that have propelled the goal of reducing mortality and morbidity from NCDs, based on the extensive research into documents produced by numerous stakeholder organisations involved in NCD control and prevention efforts. Moreover, I have mostly chosen to focus on documents that speak broadly to NCDs and not plans of action that focus on NCD risk factors. Along with the documents and activities highlighted in Table 5.10, there have been other regional collaborative organisations like the Caribbean Public Health Agency (CARPHA), Caribbean Food and Nutrition Institute (CFNI) and PAHO that have been active on this issue during the timeframe under study. These organisations have released their own reports and have also provided support for the creation of strategic plans and plans of action for Barbados and the Caribbean Region. Finally, a national level and below, Barbados has passed legislations that addresses risk factors, such as tobacco control laws and a Barbados Sugar Sweetened Beverage Tax. There have also been educational campaigns involving schools, faith-based organisations and community groups, and wellness activities to raise awareness of specific non-communicable diseases that have involved the private sector and civil society. The Government of

Barbados has provided support in the form of funding and human resources to facilitate these on-going activities.

Though the incidence of NCDs is expected to rise over the next 10 years and there is much more to be achieved in the fight against NCDs (WHO & United Nations Development Programme (UNDP), 2017), there are other successes to be found in the previously described responses. First, with all the work that has been done to address the burden of NCDs, there is now considerable infrastructure in place to support future efforts. This includes the National NCD commission in the Ministry of Health as a focal point of activity; regional partnerships to amplify the voice of health leaders from the Caribbean community on international and national platforms; a leadership role for Barbados among CARICOM countries in the effort combat NCDs; and regional institutions committed to research and the provision of technical support to national health sectors. Secondly, these responses have led to recognition among the Barbadian population of the magnitude of the problem. For instance, participants were all able to unanimously state that non-communicable diseases and their risk factors are the greatest health problem in Barbados, which clearly reflects the success of efforts to raise the visibility of this health challenge. Thirdly, Barbadian health officials, through the leadership of the National NCD commission, have been reliably releasing strategic NCD health plans to maintain a timely response to the challenge of non-communicable diseases, using up-to-date information and evolving strategies based on current circumstances. This timeline of responses to the NCD crisis in Barbados demonstrates the following lessons which health officials can apply to health and climate change agendas:

1. **A proactive approach to emerging health issues** - having identified NCDs as a major health concern, Barbados took a proactive approach through the formation a National NCD commission and the creation of its first strategic plan. This timeline shows that national responses to NCDs in Barbados have predated major regional initiatives like the much-heralded Port-of-Spain Declaration.

2. **Bi-directional exchange of information and support between national and regional level** – Barbados has been influential in moving forward the regional NCD agenda. Their early efforts noted

above, inspired the actions of regional bodies. Barbados has also benefitted from these regional collaborations and organisations through the technical support and the tools created by these bodies.

3. **Leadership and advocacy from the national and regional level can be instrumental in shaping international agendas –** Health leaders in Barbados and the Caribbean were instrumental in getting the international community to recognise non-communicable diseases as a huge global health challenge, by joining together to amplify their collective voices on the international stage.

4. **Momentum of responses builds over time** – when NCDs were first being recognised as an emerging health issue, responses were limited to small sections in national and regional policy documents. However, over time, and with dedicated action, advocacy from key stakeholders and research and data to support evidenced-based strategies, the responses increased. Organisations, governmental and otherwise, provided regularly updates strategic plans that reflected evolved understandings of the issue and new ways to address the problem of NCDs.

5.4.2 Policy planning for NCDs and climate change & health

Given the connections between non-communicable diseases and climate change, the following section presents the results of a content analysis performed to see how, if at all, NCDs and climate change have been considered in conjunction (Table 5.11 and Table 5.12).

Climate change in NCD planning

This analysis showed that considerations of linkages between climate change and NCDs are absent from policies for NCDs. There was no mention of climate change or its impacts in the most current national policy for non-communicable diseases in Barbados. This was not an unexpected finding given that the health professionals interviewed in this study mostly indicated that they were unaware of climate change and NCD connections or though they were aware, this issue had not made it onto health agendas for their organisations. However, it is clear from the results of the analysis, that climate change has garnered attention from leaders and decision makers as climate change was mentioned multiple times in

Barbados' Growth Development Strategy 2013 – 2020. Most mentions of climate change in this document focused on sectors other than health: tourism, fisheries, agriculture and town planning. This document indicates awareness of the need for adaptation and GHG mitigation efforts within these sectors. There was one mention of a climate change and health connection, where a link was made to vector-borne diseases. Similarly, in the Barbados National Strategic Plan 2005 – 2025, the was no reference to climate change and health and mentions of climate change focused on reducing greenhouse gas emissions and adapting to increased hurricane activity. The telling finding from this analysis is that while climate change has been incorporated into planning for other sectors, it has been largely absent from the health planning, particularly with respect to NCDs. This was case for NCD planning at both the national and regional level.

Table 5.11: Mentions of climate change in NCD policy documents

Document Title	Climate Change References		Comments
	Mentions	Summary of references/strategies	
NATIONAL POLICY DOCUMENTS			
Barbados National Strategic Plan for the Prevention and Control of NCDs 2015 – 2019	0	No references	N/A
Barbados Growth and Development Strategy 2013 – 2020	18	1. Reduce dependence on fossil fuels, ensure environmental sustainability and combat climate change 2. Support efforts to explore non-traditional sources of funding like climate change related instruments for additional sources of revenue (e.g. the adaptation fund and green climate fund) 3. Support mainstreaming of climate change considerations into public budget process and procumbent decisions 4. Build resilience against increasing intensity of natural hazards associated with climate change 5. Support the poor and disadvantaged who have fewer resources or buffers against climate shocks	One mention of climate change as risk to health through vector borne diseases. Tourism, agriculture, fisheries and town planning are sectors where there were growth and development strategies that considered climate change.

		6. Incorporate climate change planning into physical, social and economic planning	
Barbados National Strategic Plan 2005 – 2025	2	1. Ensure appropriate development standards are used to build resilience against increasing intensity of natural hazards associated with climate change 2. Eliminate practices which lead to global warming	
REGIONAL POLICY DOCUMENTS			
Healthy Caribbean Coalition Strategic Plan 2017 – 2021	0	No references	N/A
Strategic Plan of Action for the Prevention and Control of Non-Communicable Diseases for the countries of the Caribbean Community 2011 - 2015	0	No references	N/A
Plan of Action for the Prevention and Control of Non-communicable Diseases in the Americas 2013 – 2019	0	No references	N/A

Non-communicable diseases in climate change planning

There was no climate change and health policy or climate change and health plan/strategy for Barbados. Barbados' Second National Communication to the UNFCCC reported that there is a 'Draft National Climate Change Policy Framework' but it is not yet available. However, from this report, it was determined that there is a health representative on this project from the Environmental Health Department. Furthermore, though Barbados' Second National Communication is not in itself a policy document, it does report on polices relevant to climate change from various sectors, as well as on vulnerability and adaptation measures from which one can determine national priorities are in regard to climate change. There were some mentions of non-communicable diseases in Barbados' Second National Communication (Table 5.12). The report describes the state of health in Barbados where NCDs pose the biggest challenges, and highlights two ways in which NCDs in Barbados could be affected by climate change. First, the report cites a study noting a connection between climate variables and respiratory diseases and secondly, notes that malnutrition highlights a connection between climate change and health, through agriculture. Conversely, there was a much greater focus on infectious and communicable diseases related to water availability, and quality and vector-borne diseases; six long-term interventions were identified all related to these diseases. There was no mention of future adaptation planning for NCDs and climate change.

At the regional level, there is the 'Caribbean Action Plan on Health and Climate Change' from PAHO, for the period 2019 – 2013. In this plan, non-communicable diseases are noted to be "climate-sensitive" and four actions were proposed to respond to the climate risk to these diseases at the national and regional level. They mainly focused on early warning systems for and surveillance of climate related diseases. However, this plan focuses less on specific diseases, and more on strengthening health systems to respond to any and all impacts of climate change. Further, only a limited number of non-communicable diseases are recognised in this plan compared to the range of non-communicable that present a huge burden in the Caribbean region.

Table 5.12: Mentions of non-communicable diseases in climate change policy documents

Document Title	NCD References		Comments
	Mentions	Summary of references/strategies	
NATIONAL POLICY DOCUMENTS			
Barbados' Second National Communication to the UNFCC	3	1. Description of the state of health in Barbados – chronic non-communicable diseases increasing in prevalence 2. Malnutrition – recognised as important as it highlights a connection between climate change, agriculture and health 3. Linked recognised between respiratory diseases (asthma, bronchitis, respiratory-tract infections) and climate variables (temperature and relative humidity)	Health noted as a vulnerable sector to climate change but greater focus on infectious and communicable diseases associated with water availability and quality, and vector-borne diseases. However, there is some awareness of connections between certain NCDs and climate
REGIONAL POLICY DOCUMENTS			
Caribbean Action Plan on Health and Climate Change (PAHO)	10	1. Strengthen existing/develop and test new early warning systems for weather and climate-related diseases and conditions at the national/local level 2. Develop regional early warning systems for selected climate-sensitive diseases and conditions 3. Strengthen current surveillance systems at national level by including climate/weather indicators	Non-communicable diseases (e.g. undernutrition, injuries, mental health) noted to be "climate sensitive diseases"

		4. Incorporate climate-sensitive diseases and condition into regional health surveillance systems	

Chapter 6: Discussion

6.1 Introduction

This chapter discusses the results presented in Chapter 5. It begins with an interpretation of the empirical findings from the in-depth interviews with lay citizens to conceptualise wellbeing in Barbados and situate these conceptualisations within the context of climate change, followed by a discussion of the findings from key-informant interviews with health professionals and the document review. Following a reflection on the research process and the identification of study limitations, several recommended actions for policy makers are proposed.

6.2 Interpretation of research findings

6.2.1 Conceptualising wellbeing in Barbados

This research investigated wellbeing in Barbados by exploring drivers and determinants of wellbeing among lay citizens. In interpreting these findings, individual experiences of wellbeing are situated within a broader societal context. The themes emerging from the in-depth interviews show wellbeing is largely considered to be influenced by contextual, macro-level socioeconomic, social and environmental drivers such as living standards, the economy, community vitality and the physical environment, though political drivers were also mentioned to a lesser degree (See Table 5.1). These findings lend support for strategic goals outlined for Barbados entrenched in policy, that hold that the "quality of life" of Barbadians is collectively influenced by economic, social, cultural and individual factors, and not just accumulated monetary wealth and income factors (Government of Barbados (GOB), 2004). Further, these policy goals from Barbados align with a growing movement that seeks

to “measure what matters”, so that governments and decision-makers have the information needed to make effective policy choices, that preserve the wellbeing of their populations (Costanza, Hart, Talberth and Posner, 2009; Elliot at. al., 2017; Fleurbaey & Blanchet, 2013; Stiglitz, Fitoussi & Durand, 2018). Interview questions were designed to ask participants about components of wellbeing as defined in the literature reviewed prior to data collection (Appendix A). However, the factors affecting wellbeing discussed by participants were raised independent of any probing by the interviewer. These responses reinforce the existing literature on factors that affect wellbeing such as social relationships, work/leisure balance, participation in social activities, personal financial security, governance, natural environmental conditions and economy (Allin, 2007; Allin and Hand, 2014; Atkinson, 2013, Kangmennaang and Elliott, 2019). These findings also align with concepts from the political ecology of health (PEH) approach used in this research, which hold that wellness and illness are situated within macro processes that affect individual behaviour and decision-making power, thus affect how wellbeing outcomes are shaped (Mayer, 1996, King, 2010). This is discussed in greater detail below.

Distinctions were made between factors that positively affect wellbeing (e.g. support networks and social relationships, weather/climate and proximity to natural resources) and those that had a negative effect on wellbeing (e.g. cost of living, employment opportunities and crime and violence). Examining these factors in terms of negative and positive effects reveals the dynamic nature of wellbeing, where factors that presently, positively affect wellbeing may evolve overtime with negative consequences for wellbeing, and vice versa. This is consistent with literature that holds that wellbeing can be both static and amendable to change (Atkinson, 2013). Were this research to be conducted at another point in time, Barbadians might describe their positive and negative wellbeing differently depending on current circumstances, though the large-scale factors that drive their wellbeing would probably remain the same. More importantly, this distinction reinforces the

importance of creating indicators that simultaneously reflect all-encompassing components of wellbeing, and yet are specific enough to capture snapshots of wellbeing on a temporal scale that reflect the effects of policy actions. In this dissertation, components of wellbeing are categorised as drivers and determinants. Drivers herein refer to factors that broadly affect wellbeing. For instance, some of the factors that affected participants' experiences of a good life can be categorised as environment, community or economic factors. Determinants are used to describe specific factors that decisively affect wellbeing outcomes. For example, within environmental factors, it was noted that the weather/climate, proximity to natural resources and (the avoidance of) natural disasters were the determining factors that affect the wellbeing of Barbadians. The distinction between drivers and determinants herein, patterns the Canadian Index of Wellbeing (CIW), a composite index that captures Canadian wellbeing with 64 indicators across eight domains (Michalos, 2011). One perceived driver of wellbeing according to Barbadians that most closely echoes what is reflected in the CIW, is community vitality. Like wellbeing captured in the CIW, Barbadians note the importance of sense of belonging; crime and violence; social connections and social cohesiveness. Other wellbeing domains from the CIW were important to Barbadians (e.g.: democratic engagement, physical environment, living standards and health/healthy populations), but the indicators used by the CIW were not found to be as applicable to Barbadians. For instance, while physical environment was an important theme emerging from the data, Barbadians reflected more on weather/climate, natural disasters and proximity to natural resources, whereas, in the CIW, physical environment is captured by indicators like non-renewable energy, GHG emissions, ground level ozone and primary energy production (Michalos, 2011). There is a major benefit to viewing wellbeing in terms of all these components (i.e.: drivers & determinants or domains & indicators); it means that nations can create more comprehensive and dynamic indicators that are socially, culturally and geographically relevant.

Here I discuss in greater detail what wellbeing looks like in Barbados according to participants in this study. Community was frequently raised by participants as being essential to their experiences of a good life (Table 5.1). Community has long been recognised as a component of wellbeing in Barbados, with scholars providing empirical evidence of this as far back as the 1980s (Dann, 1984, Prescott-Allen, 2001). Even leaders in government have acknowledged the importance of community and social cohesion to the growth and development of Barbados (GOB, 2013). Policy-makers have stated that "strong community ties" is one feature that demonstrates sustainability in Barbados (GOB, 2004). However, there is seemingly a change in perceptions of community vitality and social cohesion, which participants asserted have declined over time. The "level" of community vitality was not measured in this research and so there is no way I can attest to the accuracy of this assertion. However, participants felt strongly about this (see Section 5.2.2), and the mere perception of this is a pertinent concern because it can influence how Barbadians choose to interact within their communities with far-reaching implications. Some participants did state that they and others around them were reluctant to participate in community and social activities and have changed their attitudes and behaviours to people around them because of changes in their communities over time. The importance of this at a societal level becomes apparent when one considers that several interventions to improve the health and wellbeing of various vulnerable social groups in Barbados (e.g. adolescents, elderly, women, disabled, homeless, abused, poor etc.), are implemented at the level of the community (GOB, 2004; GOB, 2013; Hambleton et al., 2005; WHO, 2019b). Therefore, the concerns about community raised by participants should be of great concern to community leaders, community-based organisations, decision-, and policymakers.

The environment is a key driver that demonstrates how geographical context influences wellbeing. Barbados, because of its geographic location, has defining, physical characteristics (See Chapter 4) are intrinsically tied to the way of life of citizens. These characteristics are mainly featured

in literature as it relates to tourism in Barbados, where researchers address issues such as how climate change impacts on the physical environment will affect the tourism product offered by (e.g. Cashman, Cumberbatch & Moore, 2002; Cumberbatch, Nurse, Francis, 2017; Uyarra et al., 2005). Even in local policy documents, there is a strong focus on "environment" at it relates to tourism, because the core of Barbados' tourism product is the island's natural and environmental resources and services. However, the findings of this research show that these environmental characteristics are also important to Barbadian citizens. They enjoy the predictability of the weather, the stability of the climate, the avoidance of natural hazards and proximity to natural resources for recreational purposes. They are not loud and effusive in their appreciation of the physical environment in their daily lives, but they recognise that if these conditions were to change, their wellbeing would be affected. Regarding the environmental concerns raised by participants (Table 5.5), there is an implicit understanding that responsibility for these concerns is attributable to both individual citizens (e.g. illegal dumping and clearing of green spaces for houses) and the government (improper maintenance of infrastructure). The concerns they raised echo several policy goals prescribed in a Sustainable Development Policy document for Barbados (GOV, 2004). Given the time-lapse between when the goals were created and this data was collected, it does raise the question to what extent Barbados has been successful in implementing solutions to these issues.

Concerns raised about living standards and economy were mostly related to the cost of living and the availability of job opportunities, which participants noted to be the greatest challenges to the financial security of Barbadians. These factors were discussed within the context of the economic challenges Barbados has been experiencing since 2008. As was noted in Chapter 4, Barbados experienced slow economic growth in 2017 (GDP growth -- 1.0%) with high unemployment rates (10.2%) and large public sector debt (157% of the country's GDP). Some of the decisions made by the government and leaders in the private sector to limit the impact of these economic troubles, have

negatively affected the wellbeing of some Barbadians. For instance, under advice from the International Monetary Fund (IMF), the government laid off 3000 public sector workers in efforts to cut employment by 10%, and introduced new taxation such as the Consolidation tax on income and the Municipal Solid Waste Tax in 2014 (International Monetary Fund, 2014). These and other actions directly affect the financial wellbeing of Barbadians and their ability to maintain living standards as was stated by several participants. Despite the adverse economic conditions in Barbados, Barbadians retain access to a range of social services, social programs, and basic and public amenities which they note to be essential to their wellbeing. These benefits have been made available by the state. These include access to hospitals and healthcare; government funded education from primary school to university; subsidised public transportation; transport and road systems; potable water piped to dwellings; sanitation and sewage infrastructure; electricity and telecommunications; safe recreational spaces and government maintained physical infrastructure. However, while these state-provided services and amenities help improve the wellbeing of Barbadians, dependence on them also exposes Barbadians to internal or external shocks. Future economic challenges (e.g. slow economic growth or government debts), environmental concerns (e.g. climate change) or governance strategies (e.g. change in policy priorities) will affect the government's capacity to provide continued access to services and amenities. When this happens, Barbadians are challenged to confront their precarious circumstances, recognising that some aspects of their wellbeing are dependent on external support. Already there are indications that this will happen. The government of the new ruling party elected in 2018, introduced the 'Barbados Economic Recovery & Transformation Plan' (BERT) aimed at reviving and transforming the Barbadian economy (Caribbean Development Bank CDB), 2018b). Under this plan, a 75% public transportation fare increase ($2.00 - $3.50) was introduced in 2019 to cut mounting government expenditure. The fare increase was met with resistance from some commuters who said they could not afford to pay the increased rate on their current income (Barbados

Today, 2019; Nation News, 2019). The change in social and economic policies affected some subsets of the Barbadian population, and as noted by participants some social groups within populations are more vulnerable than others.

The surprising finding emerging from these results was that none of the participants mentioned health as a driver of wellbeing. This finding is contrary to that of Onyango and Elliott (2019), who found Kenyans equate their health with their wellbeing, often using the two terms interchangeably. A possible explanation for this might be that respondents interpreted the interview question to mean externalities that contribute to their experiences of a good life, because other internal attributes often equated with wellbeing (e.g. happiness or life satisfaction) were not mentioned. Nonetheless, when health was raised as an interview topic, there was overwhelming consensus that non-communicable diseases were the greatest health concern. This is explored in further detail from the perspectives of public health professionals in Barbados (Section 6.2.3).

Drivers of wellbeing were interconnected, thus supporting appeals for wellbeing to be examined holistically. For instance, economic drivers of wellbeing were linked to other determinants such as political leadership, governance, crime and violence, and cost of living. When examined in totality, these connections were found to result in a cascade of effects. This is illustrated by one of many examples: participants perceive that lack of employment opportunities are the cause of increased rates of crime and violence in Barbados, which in turn causes people to feel unsafe in their communities. These feelings contribute to diminished social cohesiveness and community vitality, where benefits like sharing of resources and demonstrations of care for the wellbeing of others are becoming less common. Another example shows the connections between health, physical environment and economy: participants are aware of the high rates of NCDs in Barbados and the link to behavioural risk factors like unhealthy eating, but noted that the cost of local foods considered to be more healthy (e.g.: fruits, vegetable, ground provisions and local fish) was prohibitive. They also

noted that though employment opportunities were scarce, particularly for the youth, jobs in some sectors like farming and fisheries were considered least desirable to persons seeking employment. Along with the low engagement in these sectors, which has implications for production, more frequent extreme weather events, unpredictable weather and other climatic impacts pose further risks to the viability of local food production. These combined factors may impact the cost of local foods, and thus the desirability to local consumers. This in turn helps to create to unhealthy food environments that contribute to the prevalence of NCDs in the country. Based on the interconnectivity between different components of wellbeing, one could infer that responses to wellbeing challenges may be complicated, and failure to consider potential connections may lead to ineffective interventions. Take for instance participants' views regarding limited opportunities for social interaction; a plausible solution would be to host more community events. However, participants also noted that because of the perceived rise in criminal activity, people would be reluctant to attend community gatherings. In this case, more community activities would not accomplish the goal of increasing community vitality, as the root cause goes beyond lack of opportunities for socializing. Successful interventions to improve population wellbeing will require the coordination of policies, projects and programmes across various sectors.

Noticeably, the determinants to which participants attribute their wellbeing, are seemingly largely outside of individual control. Upon further reflection, descriptions of determinants reveal how wellbeing is open to influence at the individual, community and national levels, and how these levels operate interdependently. For example, participants noted that lack of employment opportunities affect wellbeing. This can be taken as a reflection of limited employment opportunities in Barbados (national), or as some participants noted, (individual) preference for certain types of jobs, which restricts employment opportunities. Similarly, political apathy was a major concern as it was noted that some Barbadians choose to forgo the democratic freedom to vote. Though political apathy is an

individual choice, participants noted it was influenced by political leadership which is a national level factor. At the community level, social networks and social relationships were key to experiences of a good life. National level influences on wellbeing include the state of the economy, governmental provision of social services and welfare and cost of living. Understanding how determinants of wellbeing interact across scales is essential for decision-makers to determine how best they can effect changes that improve or protect wellbeing, either through policy or legislation at the state level or community organization or social programs at the community level.

The theoretical approach applied in this research demonstrates how different aspects of wellbeing are affected/constrained by social, political, economic and environmental factors. Not surprisingly, the findings did not raise any issues of marginalisation or power struggles among Barbadians that would have an impact on their wellbeing. Given the homogeneity of the population, this is not unexpected. However, the findings do highlight the dependence of Barbadians on government for factors that contribute to their health and wellbeing. Among all drivers of wellbeing, participants noted how perceived failings by the leaders of Barbados contributed to their negative wellbeing. They recognised their concerns as being related to different drivers of wellbeing, but still indicated that the problems they experienced were related to Barbados' economic downturns, and the failure of political leaders to provide adequate governance response. Barbadians have become accustomed to a certain standard of living, supported by social welfare policies and other government assistance. Now that the country is unable to continue to provide the same stand of support due to shifting economic prospects, many Barbadians are struggling to adjust, and in the interim, their wellbeing is affected.

6.2.2 Situating wellbeing in the context of climate change

Citizens that participated in this research were not well-versed on the topic of climate change, especially as it relates to Barbados. Limited communication and dissemination of information on climate risks in Barbados among the general public contributes to rudimentary knowledge and little awareness of related risks. Knowledge of climate change mostly came from international sources; these sources fail to capture the relevance of this issue to people living in an "island" context. These impacts did not appear to resonate with participants. Some have never seen snow, so to expect them to relate to a melting glacier or a polar bear is questionable. Those who spoke about sea level rise also talked about islands disappearing in a way that suggested they expected it to be instantaneous and not a gradual event. Consequently, participants fail to relate to these risks and consider climate change a distant issue. Instead, they prioritize other challenges to wellbeing to which they are more acutely exposed. This problem also exists among health professionals in Barbados as I discuss in the following section, and I suspect the rest of the Barbadian population though this is speculation. Barbados needs educational and media campaigns that highlight the local realities of climate change to which Barbadians can relate. There needs to be more scientist/experts, local authorities, environmental advocates and journalists utilising public platforms to raise awareness of climate change. Admittedly, lack of robust evidence on climate change impacts is likely a major factor hindering the inclusion of climate action on national policy agendas and the widespread dissemination of knowledge to the local population. This reinforces the need for more research, particularly into the health impacts of climate change, since this was identified to be a major gap in the scientific literature, and climate change is known to pose a risk to health and health systems. A healthy population is a key resource for the continued development of Barbados, therefore, national health leaders must be proactive in their efforts to build resiliency into health systems to protect their

populations. Yet, allowances should to be made for uncertainty during these early stages. Therefore, in the absence of robust evidence on the impacts of climate change in Barbados, there is still value in advocates pushing for political leaders and high-level decision makers to move forward on this issue, and recognise that priority should be awarded to health and wellbeing in discussions of climate change. Moving forward on this issue could include health leaders engaging on a national or international platform to advance calls for climate action; facilitating access to resources needed for research and action; or seeking access to those resources from sources external to the country.

It is somewhat surprising that only one respondent reported that they got their knowledge on climate change in school. This finding may suggest the need for expanded educational curriculums that include courses, workshops, guest lectures or activities that confer reliable information on the topic of climate change. However, noting that this research focused on persons over the age of 18, it is possible that more recent school curriculums address climate change, and school-aged children in Barbados may be more familiar with the phenomenon than the adults interviewed in this study.

Climate change and wellbeing connections exist in all drivers of wellbeing investigated in this research, including those deemed to be highest priority to participants. The relationships between climate change and wellbeing are complex because of interconnected non-climatic factors that drive wellbeing. Furthermore, we see how connections may be direct as is the case with the impacts of climate change on climate-dependent economic sectors like tourism, agriculture or fisheries. There is also potential for indirect connections, because various determinants of wellbeing overlap and/or intersect. These findings further reinforce the importance of considering the relationships between political, economic and social factors with environmental issues, particular, climate change (Mayer, 1996; King, 2010). The results have shown how socioeconomic, social and political drivers of wellbeing are connected to climate change, and how these connections create pathways for multiple health and wellbeing outcomes (Figure 5.1). Decision-makers responsible for policy and actions

should be encouraged to know that the pathways from climate drivers through drivers of wellbeing do not only negatively affect vulnerability. Instead we see the potential for determinants of wellbeing to reduce vulnerability to climate change. This is because some determinants: expose persons to impacts (e.g. climate-dependent livelihoods); affect their sensitivity (e.g. dependence on social services provided by government) or confer adaptive capacity (e.g. social capital through strong social networks). Decision-makers have the opportunity to address climate change in such a way as to improve key determinants of wellbeing, reduce the cost of actions and reduce stress on health systems as climate continue to change.

Arguments have been made for the application of a wellbeing lens to climate change mitigation (Organization for Economic Co-operation and Development (OECD), 2019). Likewise, the WHO has also pushed for countries to recognise the potential for health gains from climate change mitigation actions like support for active transport, reduced food waste or low-emission vehicles (Campbell-Lendrum et al., 2018). While this is a worthy aspiration, in the context of SIDS like Barbados where GHG emissions are negligible and adaptation is a more pertinent goal, there is also value in viewing climate change adaptation through a wellbeing lens, and vice versa. Major GHG polluters have been slow to implement the urgent actions needed to stop the most extreme climate change impacts. One of the latest IPCC reports noted that already the world is seeing the consequences of a 1°C rise in temperature (IPCC, 2018). It is therefore undeniable that Barbados, like other vulnerable countries, needs to adapt to ensure a safe and sustainable future for its citizens. But what does this look like for Barbados? National leaders should be cautious that wellbeing goals and interventions do not increase vulnerability to climate change, so decision-makers need to consider potential conflicts and opportunities for maladaptation that may arise. This way of thinking can help to reveal synergistic opportunities to both improve population wellbeing and build resiliency to effects of climate change. A great example of this is a project implemented in Barbados to respond to

future concerns of the effects of water scarcity on health, through the use of treated waste water and rainwater storage. Project managers and partnering agencies and organisations also considered the association between rainwater storage and an increase *Aedes aegypti* index due to breeding domestic storage tanks (GOB, 2018). This forethinking based on past studies and expertise from professionals from the health, water and planning sectors, is representative of the kind of collaboration that needs to go into future planning. Likewise, as proposed by the OECD (2019), climate action should be able to demonstrate benefits beyond only adaptation to climate change. In a country like Barbados, where resources are limited and spending is constrained by mounting debt and slow economic growth, it would be more feasible to implement adaptation planning, if it can be shown to align with broader population wellbeing goals. Finally, viewing goals to improve population and national wellbeing through a climate change lens requires decision-makers to consider present and future environmental and climatic conditions when creating policies and programs.

6.2.3 Relationship between climate stresses and NCDs in Barbados

The second objective of this research was to explore the knowledge and attitude of health professionals across multiple levels on current and future burdens of non-communicable diseases in Barbados, and possible connections between climate change stressors and non-communicable diseases. Previous studies have been successful in directing attention to issues of the relationship between NCDs and climate change, however, the application of findings from those studies to local health interventions is limited by the broad scope of the research. Theory-driven empirical research has demonstrated how local health outcomes are produced within inter-connected social, cultural, political and economic landscapes that differ from place to place. Health professionals agree the burden of chronic diseases in Barbados will continue to grow to the detriment of individuals and wider society. They base this on the current prevalence of chronic diseases in Barbados, the attitudes

and behaviours of persons living with NCDs, the lifestyles of Barbadians, and the environments within which they live. Respondents drew attention to the effect of economic, social, and cultural factors on the health outcomes of Barbadians. Major findings from a national survey on NCDs and their risk factors outlines the extent of the NCD crisis in Barbados and lends support to the position of health professionals. Two in three adults are overweight; one in three are hypertensive; one in five have diabetes and at least one in three persons receiving treatment for hypertension or diabetes had sub-optimal control of their disease (Unwin et al., 2015). Even with a policy landscape that should be supportive of healthier day-to-day choices from the Barbadian population, the NCD crisis continues. This is compared to infectious diseases and malnutrition which have been on the decline due to successful interventions and improved social conditions (PAHO, 2012b). Overall, Barbados has a diseases profile that more closely resembles that of a developed country, though communicable diseases like HIV/AIDS, chikungunya and dengue fever still pose a risk to the population (PAHO, 2017). Consequently, it can be said that Barbados experiences the dual burden of diseases.

To reduce mortality from NCDs in Barbados by 25% by 2025—one of the targets set by the United Nations (WHO, 2013b)—greater efforts are needed given the lack of success thus far, despite the widespread attention this issue has attracted. The social, cultural and economic landscape in Barbados continues to foster an environment where the incidence and prevalence of NCDs increases unabated. This should be even more concerning to public health leaders and decision makes, given the rising threat of climate change which will likely amplify the future burden of NCDs.

It is troubling that plans to tackle the NCD crisis in Barbados and improve health outcomes have been discussed under the assumption of a stable climate. This is evidenced by the lack of concern from health professionals that participated in this research about the future burden of NCDs in the context of a changing climate. This is largely because of inadequate knowledge about climate change among the majority of the health experts interviewed. A similar observation was made about

the lay citizens interviewed for their views on climate change. Those knowledgeable about potential connections noted the difficulty that climate change would pose to the prevention and management of NCDs, given the impacts of climate stressors to food security, the built environment, as well as physiological and psychosocial impacts. Health systems cannot effectively plan interventions for NCDs without considering future climate stressors and the effects they will have on the strategies to prevent and manage these diseases. For instance, interventions designed to encourage more outdoor physical activity by improving the walkability of a neighbourhood, that neglect to consider climate stressors like increased temperatures or more regular heavy rainfall events, are not likely to lead to the stated outcome. For such an intervention to be successful, it needs to consider the impacts that climate change will have on the built environment and the attitudes or behaviours of the people for whom the interventions have been designed. Another example would be the introduction of educational campaigns that promote the benefits of certain types of food, without thinking about how climatic conditions would affect accessibility to those foods. It may necessitate the involvement of government and political leadership to make those foods more accessible through welfare programs, subsidies or other market-control measures that ensure access to all members of society, irrespective of their socio-economic status.

Lack of awareness of climate change from health professionals interviewed is symptomatic of the low priority ascribed to climate change on the national health agenda. Even more telling is that the health professionals most knowledgeable about the relationship between NCDs and climate change, are those who work with regionally operating agencies. This is suggestive of a top-down flow of information, with a clear influence of international/regional bodies like the World Health Organization and the Pan-American Health Organization. This hints at the importance of international agendas in shaping local health priorities and agenda setting. Yet, it seems that the knowledge and awareness of the climate risks to NCDs within these regional/international bodies has not reached the

magnitude needed to influence health leaders or health professionals to actively address this health challenge. However, the flow of information and influence on agenda setting does not need to be unidirectional, from the top-down, as has been demonstrated by a display of Caribbean leadership in setting a global NCD agenda. A meeting of CARICOM Heads of States to discuss the challenges of NCDs in their countries and their commitment to action in the form of the Port-of-Spain Declaration, was the first high level meeting of its kind in the world (HCC, 2017a). Furthermore, leaders from the Caribbean played a major role in advocating for the United Nation High Level Meeting on NCDs from which the United Nation Political Declaration on NCD prevention and control emerged (HCC, 2017a). Since then, there have been other global efforts to motivate countries to prevent and control NCDs such as the WHO Global Action Plan for NCD prevention (WHO, 2013b) and the 2030 Agenda for Sustainable Development Goals (WHO, 2016). Currently, there is inadequate availability of climate change information to local stakeholders to motivate political leadership to advance a policy response to climate change risks to health. This is an opportunity for research to fill these gaps in knowledge through the involvement of a variety of key stakeholders in collaboration with academic institutions. Giving stakeholders the opportunity to participate in the knowledge creation process, could encourage them to take ownership of that knowledge and use it to advance goals that protect and improve the health and wellbeing of citizens. For Barbados, this could start with a full health vulnerability and adaptation assessment as a knowledge development tool, with participation from knowledgeable persons within the health sector, as well as stakeholders from health-adjacent sectors. These stakeholders, equipped with enough information, could be influential in driving national, regional and global policy momentum from the bottom-up.

The stakeholders involved should represent a multisectoral approach to addressing this issue, given findings that climate change stressors will intersect with NCDs in various ways that would require the involvement of sectors beyond health. This might include the representatives from the

fisheries and agricultures sector, health sector, private sector, disaster management agencies, town and country planners, school boards, sports organizations, faith-based organizations, community groups, parents, teachers and members of the general public who stand to be directly impacted.

6.2.4 Policy responses to NCDs and climate change

Climate change considerations remain absent from health policies in Barbados and at a regional level. This is true of broad health policies, and policies that specifically deal with planning for non-communicable diseases. Findings from the content analysis corroborate the knowledge gathered from public health professionals, lending validity to the research findings. Health professionals across multiple levels noted that climate change has not been considered by their organisations, or that they had not yet began to incorporate planning for climate change into their agendas. Therefore, it is unsurprising to find that health policies in Barbados have yet to include any considerations of climate change. The risk of climate change in Barbados is still a relatively new and little understood challenge. Even though it is understood that planning for climate change must occur under conditions of uncertainty, it is arguably still be too premature to entrench this issue into policies without consultation with stakeholders, key partners and experts or without the requisite scientific research conducted.

However, climate change has not been completely absent from all future planning in Barbados. National strategic plans for Barbados show that climate change has been considered in relation to tourism, agriculture, fisheries and town planning. This is an interesting finding which leads one to question why decision-makers in the health sector have failed to make the associations between climate change and health, when they have been made in other sectors. One possible reason is that the association between climate change and health is more complex, because of the influence of non-climatic factors like those discussed by lay citizens about their wellbeing. Another likely

reason is the dearth of climate change and health research focused on Barbados. Considering the influence of non-climatic factors, one of the best adaptation strategies to climate change would be to improve health systems and provide access to universal healthcare to ensure a healthy population to reduce vulnerability to climate change. These goals have already been noted for the health sector of Barbados, irrespective of climate change considerations. Part of improving the health system is adopting a "health in all polices" (HiAP) as per the WHO. This approach aims to ensure that all public polices across various sectors consider the health implications of all decisions, find opportunities for synergistic actions, avoid harms to population health and promote health equity (WHO, 2014d). The findings of this dissertation which demonstrate the interconnectivity of drivers of wellbeing, support such an approach. Furthermore, health officials in Barbados should take note of recommendations from PAHO/WHO outlined in the 'Caribbean Action Plan on Health and Climate Change' that encourage Caribbean SIDS to build "climate-resilient" health systems and create health promoting mitigation policies (PAHO, 2019). Particularly, it needs to be highlighted that two guiding actions for building climate-resilient health systems are: 1.) to implement early warning systems for weather and climate-related diseases and 2.) to develop and provide climate informed health services (PAHO, 2019).

The last available strategic health plan for Barbados was for the period 2002 – 2012 and a representative from the Ministry of Health noted that a new plan is not ready for dissemination. New strategic plans for health should at this stage including strategic goals related to responses to climate change; it would be perturbing if they did not. Likewise, Barbados is due an updated strategic plan for non-communicable disease, though I am less confident that climate change will be include given the associations between climate change and NCDs are still relatively unexplored, even within the academic literature. Furthermore, the state off knowledge and attitudes to this issue from health professionals that participated in this research do not lead one to believe that there is enough interest

to generate the political commitment needed from leaders to advance climate change on NCD agendas.

Nonetheless, Barbados has been proven to be forward-thinking in its responses to serious health issues as was demonstrated by the responses to the NCD crisis in the country. There is still a window to proactively respond to the associated harms between climate change and NCDs, but this opportunity will not last for long. National leaders, health officials and key health partners should recognise the link between NCDs and climate change as an opportunity to create and strengthen intersectoral partnerships and collaborations. Lessons learnt from policy responses to non-communicable diseases will be beneficial to advance a policy agenda around climate change and health. One of the most beneficial moves made by health officials in Barbados, was the creation of the National ND committee as the focal point of the response to NCDs in the country. This was a move that was replicated by several other Caribbean islands, noting the benefits of having this commission (HCC, 2017b). As it relates to climate change, even if there are not enough resources to create such a "climate change commission", leaders in the health sector should at least endeavour to hire persons with the expert knowledge needed to direct and coordinate climate change action. These people/team of people should also be the focal point for multisectoral collaboration that involves climate change, health and other related sectors. The response to NCDs has also proven the importance of bi-directional exchange of information between the national and regional level. Again, because climate change is a shared issue with other countries in the region, Barbados can contribute to regional efforts to respond to climate change, and benefit from technical support and research capacity from regional collaborative bodies.

Finally, Barbados and other Caribbean countries demonstrated their leadership potential when they advocated for the international community to formally recognise the threat of NCDs. That opportunity has again presented itself with respect to the associations between climate and non-

communicable diseases. These linkages are not being widely discussed, which given the global burden of NCDs, is quite surprising. The implications of these linkages demand further in-depth study to inform interventions that could protect the health of populations. Caribbean nations rely on the technical support from international bodies to advance the health of their population. Therefore, if the NCD-climate change connections are not being made by these international bodies, the region misses out on this strong avenue of support.

6.3 Reflection on the research process

This section discusses the use of the vulnerability and adaptation assessment frameworks that guided this research. Specifically, it reflects on the utility of the frameworks to help address the research objectives outlined for this research. It concludes by describing some research limitations and take-away messages from some of the challenges encountered.

6.3.1 Participatory vulnerability assessment

To reiterate, a participatory vulnerability assessment was selected because of its focuses on the "community" level while still taking into account broader structural forces within which the community operates as per the PEH approach (Section 2.5.1). In choosing this framework, I sought to understand current risks and sources of adaptive capacity in order to understand how these may translate into future vulnerabilities. Guiding principles described in Smit and Wandel (2006) caution against researchers assuming they know what exposures and sensitivities are present in a community. Admittedly, this was a challenge for me because of my similarities to the participants and my familiarity with the research context (See Section 3.5 Positionality). Because I was aware of my bias and the effect it could have on participants, one of the strategies I employed was not to mention climate change until the end of the interview. I also intentionally did not explain climate change to

them as I wanted them to tell me about their lived realities, unencumbered by my own ideas of what they could be experiencing. While this allowed me to garner their unvarnished insights into climate change and their wellbeing (limited knowledge and understanding, little concern) – I acknowledge that participants could have been more knowledgably and eloquent about their own vulnerability, if they had a better understanding of what climate change means in the context of Barbados.

Another guiding principle of PVA is that they allow for the recognition of multiple, interacting stimuli, beyond climate (Smit and Wandel, 2006). This knowledge aligned with my other research goals, which were to investigate various components of wellbeing, that among participants were noted to socially, economically, environmentally and politically dependent. Based on this, I asked participants to reflect on all these drivers of wellbeing, and think about how they could be affected by climate. Furthermore, as I analysed and presented the research findings, I used this framework to explain how climate change and wellbeing are associated. It also allowed me to consider the effects of scale on vulnerability to climate change.

However, while I used the a PVA framework to guide my research, this was not a "full" vulnerability and adaptation assessment, though it did allow some insights into how vulnerability to climate change can be shaped through drivers and determinants of wellbeing. The PVA was used as a guide in participant selection, selection of methods, framing of questions and the analysis and presentation of findings in relation to Research objective # 1.

6.3.2 Vulnerability and adaptation assessment for health

The vulnerability and adaption assessment guidelines from the WHO provide one mechanism for assessing health impacts of climate change at the national or subnational level (WHO, 2013a). The methodology is adaptable based on the needs, resources and other constraints of the of users. On a larger scale, these assessments would be implemented by a ministerial body such as a Ministry of

Health, a team responsible for climate change planning within the government or by expert consultants working on behalf of ministerial bodies within government. I conducted this research without any such backing. It should also be noted that I did not conduct a full vulnerability and adaptation assessment. This decision was made in light of feasibility concerns related to time, budgetary and labour allowances. However, because of the adaptability of the WHO (2013a) assessment guidelines, I was able to select the steps that I deemed to be relevant to guide my research methodology with regard to the selection of the geographic region, health outcomes of interest, participant selection, data collection methods and tools. Despite not being a full assessment, the findings of this dissertation would make useful contributions to a health vulnerability and adaptation assessment if Ministry of Health officials in Barbados were to commission one in the future. Specifically, these findings will provide insight into the knowledge of climate change and NCD connections in Barbados, and the position of health professionals and the health system in Barbados on this issue.

From a practical standpoint, one of the takeaways from conducting this research, is that without the support from a person or organisation within the government, data collection is much more difficult. I would caution anyone contemplating similar studies, to identify a point person or organisation that could lend support when trying to recruit participants or access documents for review. For me, this meant I had to rely heavily on the documents that I could access to gather information on the positions taken on issues by the government. Additionally, where outdated policies were not available, I was able to understand past positions on issues, based on information in the updated policies.

6.3.3 Research challenges and limitations

Case study approach

The case study approach utilised was beneficial as it allowed for the deconstruction and understanding of complex interrelationships between different components of wellbeing, climate change and non-communicable diseases, driven by the specific context in which they occur. The findings of this research very intentionally reflect the lived experiences of Barbadians and health professionals in Barbados. However, given this approach, though the data is richer, it is also highly contextual and therefore may not reflect the full complexities of the effects of climate change on wellbeing and NCDs in other locations. This does not discount the utility of the findings as they reinforce the importance of context and circumstances to wellbeing and climate change research. Being cognizant that one of the criticisms of case study work is its lack of generalizability or transferability (Hays, 2010), in reporting the findings, a point was made present broad themes that reflected the circumstances in Barbados but could just as well be used to describe wellbeing in another context. For example, when participants spoke about “the sunshine” and “the warmth” and similar descriptors in relation to their wellbeing, this was presented as “weather/climate”. It is also possible that this research may resonate with researchers investigating another location with similar characteristics. To that end, these findings could be used for cross-case comparison to see whether lessons and emerging themes hold true or differ (Hay, 2010).

Moreover, even if the findings emerging from this research are not generalizable, there may still be lessons to learnt from the approach utilised herein, and so they can be reapplied in other similar contexts. For instance, small island states around the world have been recognized to share similar physical characteristics, developmental challenges and likely similar vulnerabilities to climate change (United Nations Conference on Environment and Development, 1993). A nuanced

understanding of the situation in Barbados is beneficial as a starting point for countries or communities assessing their own vulnerabilities to climate change, in order to implement health interventions or climate change policies to mitigate the impacts of climate change.

Another challenge arising was that the data was so rich and detailed, that it was challenging to condense in a way that could be simply presented this dissertation. For instance, while Figure 5.1 shows some of the relationship between wellbeing outcomes, drivers and determinants of wellbeing and climate drivers, there was also much of the relationship could not be simply portrayed in the graphic.

Participant recruitment

Barbadians were reluctant to be interviewed, even when renumeration is offered. There is a possibility that the current political climate contributed to their reticence. This data was collected in the months preceding a general election. Several people I spoke to, assumed that I was a volunteer trying to generate support for political candidates and declined to participate. Even when I explained otherwise, several people were so fatigued by political rallying that they indicated they had no desire to be interviewed. The takeaway from this is that researchers should be aware of the local circumstances and major events occurring within the study context, as this could affect various aspects of the research process such as recruitment and the content of the data collected.

Small sample size

This research does not make the claim to be representative of the entire population of Barbados because of the small sample size of participants selected to address research objective one. In the initial research proposal, focus group discussion (FGD) was the method selected to gather insights from lay citizens in Barbados on their perceptions of wellbeing and climate change. An

advantage of FGD is that they capture insights from a greater number of participants over a short period of time (Hay, 2000). I also expected the interactions among participants to foster debate and consensus which was another reason for the initial choice of FGD. Focus groups would have been conducted by age range: youth (18 – 35); middle-aged (36 – 59); and older adult (60+), while ensuring that gender and social classes are well-represented. However, after a month of recruitment, though persons expressed interest in participating, there were logistical challenges to assembling an adequate group size (n = 8 – 10) to conduct the focus group. The preferred time for most interested persons was Saturdays, as they cited arriving home late in the evenings from work as a reason for not being available during weekdays. Even on Saturdays, it proved difficult to coordinate a time for the FGD that fit with the schedules of all potential participants. On one occasion, enough participants from a community had confirmed their availability for a meeting. However, the day before that FGD was scheduled, the community was informed that due to water shortages, water services in that community would be cut off the following day. Due to this, participants backed out and the FGD had to be cancelled.

At that point, the research design was reassessed and the decision was made to use one-on-one in-depth interviews as a suitable alternative to gather data. The in-depth interviews used the same guide that was designed for the focus group discussions. Furthermore, the same eligibility criteria for participants was used for interviews. Upon further reflection, I can acknowledge that there were benefits to using the in-depth interviews. For instance, the use of interviews allowed for depth of knowledge from individual participants over breadth of knowledge from a group of participants. I was able to ask follow-up question to seek clarity on points that were raised. This allowed me to collect more insights and conduct greater in-depth analysis of participants' perceptions of wellbeing. Further, because I used interviews, I was able to gather answers from each participant on most questions on the interview guide (except the ones they choose not to answer). With FGD, time limitations would

have restricted each participant from being able to participate equally. Finally, interviews were able to overcome the major challenge encountered with FGD, that being assembling participants. Instead of having to coordinate with a group of participants to decide on a time and location, I was able to meet with participants in locations of their choosing and at their convenience. This turned out to be a major advantage as I met with participants at their workplaces during their lunch hours, at their homes at the end of their workday and in other public locations that would not have been suitable for a large group.

Missing perspectives from team of health professionals

Another challenge encountered in this research was that one key-informant was unable to participate. I consider this to be a limitation because this participant would have represented the important voice of the National NCD Commission from the Ministry of Health in Barbados. Three attempts were made to interview this individual, including an offer of a Skype interview but we were unable to complete that interview due to schedule conflicts. The final attempt was made in July 2018 when I was in Barbados. The interview was scheduled but then the participant was unexpectedly called away for an emergency meeting with representatives from another government office and so the interview was called off. Although it was unfortunate that this interview did not happen, this voice was not completely lost from the research. The argument for this is that one of the key informants interviewed played a key role in the establishment of the governmental department which that person would have represented and still continues to play a key role in that department. Furthermore, some of the documents examined in the document review were produced by the department of that individual, and were taken as indicative of the NCD Commissions response to NCDs and position on climate change.

The final research challenge also relates to the recruitment of participants for the key-informant interviews. Four people declined to participate; they offered that while the research seemed important,

they could not offer any insight to the topic due to their lack of knowledge of climate change. These participants would have represented organisations that advocate for persons living with NCDs (the Heart and Stroke Foundation of Barbados and the Barbados Diabetes Foundation). Attempts to reassure them that knowledge of climate was not necessary were unsuccessful. This in itself was considered to be important data as it demonstrates that these organisations do not consider climate change as important or they have yet to consider it.

6.4 Recommendations for action

Using knowledge gathered from research findings, this section outlines a number of recommended actions for Barbados, both in the short-term and long-term, to advance climate action in Barbados to protect population health and wellbeing from climate change.

6.4.1 Measuring wellbeing

Given the climate change and health connections outlined in this research, I propose the following climate-sensitive indicators for consideration, to assess and quantify the effects of climate change on wellbeing (Table 6.1). The goal of creating and using these indicators is to provide decision-makers and national health officials with the requisite information for designing effective interventions. Furthermore, some of these indicators should be useful in measuring the effects of activities implemented to advance adaptation and mitigation goals.

Table 6.1: Proposed climate-sensitive indicators of wellbeing

Drivers	Suggested Indicators
Physical Environment	· Daily maximum and minimum temperatures · Average maximum and minimum temperatures · Projected hot days and warm nights · Number of warning for extreme weather events (flooding, drought, tropical storms or hurricanes) · Frequency of Saharan dust incursions

	· Duration of wet and dry seasons/drought conditions/flood conditions · Number, size and duration of coral bleaching events · Fisheries and agricultural output · Size of beach/coastal areas lost to sea level rise/erosion
Living Standards	· Number of people with property insurance/ filed claims after extreme weather events · Reported property damage after extreme weather events · Number of people accessing health services and other social services · Number of houses with domestic water storage facilities · Number of houses disconnected from the main power grid/ houses with independent energy supplies
Community Vitality	· Number of active community centres · Number of people accessing community centres and other public recreational spaces (e.g. national parks) · Number of registered community organisations, sport groups, faith-based organisations · Statistics on criminal activity
Economy	· Unemployment rates in climate-sensitive economic sectors · GDP growth in climate-sensitive economic sectors · Number of people registered as entrepreneurs/self-employed · Number of government mandated island shut-downs (closure of government offices, schools, businesses, public transportation etc.) due to extreme weather
Health	· Heat related mortality, illness · Injuries and deaths from extreme weather events · Number/status of disaster shelters · Number of people living with NCDs that require frequent medical care (e.g. dialysis) · Number of vulnerable people living in high risk areas/location of vulnerable people
Democratic engagement	· Number of people accessing constituency offices/services · Attendance at political meetings/town hall meetings · Voter turn-out

These proposed indicators are a preliminary list to stimulate thinking in this area. Likely, as health, adaptation and other sectoral experts assemble to determine the plans/policies/activities needed to

best address climate change in Barbados, this list of indicators would be refined to better reflect the social, economic, political and environmental concerns plaguing the country.

Ideally these indicators would be used to populate an index, like a Global Index of Wellbeing (GLOWING), to measure wellbeing on a national scale (Refer to Chapter 1). Some of the indicators are intended to be predictive (e.g.: projected hot days and warm nights) and could be used for prognostic purposes (e.g. early warning systems for climate-sensitive illnesses or diseases). Others are intended to be descriptive (e.g.: number of insurance claims filed after extreme weather events) and could be used to quantify the effects of climate change. Alternatively, or additionally, these indicators could be used separately, at the discretion of various governmental departments, to advance their agendas in relation to population wellbeing. For instance, the disaster management agency for Barbados might be interested in the size of vulnerable populations living in hazardous areas, in order to effectively allocate resources and disaster management services for subsequent hurricane seasons. Public health officials might have interest in the numbers and types of injuries and illnesses that present post-disaster, in order to effectively plan public health responses for future adverse weather events. Community leaders who are trying to generate community spirit could use the data from community vitality indicators, to evaluate the success of their initiatives or investigate factors that might be hindering success. There are a range of purposes that these indicators could serve, provided data is available.

The responsibility of data collection for these indicators can be spread among various governmental departments or agencies. For instance, the Ministry of Environment, the Ministry of Agriculture and Food Security, and the Ministry of Energy and Water Resources, would be recommended as the ministries responsible for indicators that reflect the physical environment. Departments within these ministries, like the Coastal Zone Management Unit (CZMU), the Barbados Meteorological Services and the Fisheries Division are already tasked with the responsibility of

protecting the resources reflected by the proposed indicators, and so ideally, would have access to this type of data. Similarly, other ministries like the Ministry of Health and Wellness; Ministry of Housing, the Ministry of Economic Affairs and the Ministry of Youth and Community Engagement can, and should be, involved in efforts to create and implement these indicators of wellbeing. Even if these ministries are not yet collecting this type of information, there is a strong argument to be made for the importance of accurate, timely data to support evidence-based polices to the betterment of population health and wellbeing. It is strongly recommended that research and data be recognised as a priority for the government of Barbados, across all sectors and ministries.

6.4.2 Policy and actions to address the associated harms between NCDs and climate change

Recommended actions for the Barbadian health sector as it relates to non-communicable diseases are described below.

Awareness raising of climate change in relation to health

I hesitate to say that health professionals need to be educated about the climate change effects on non-communicable diseases, because these health professionals may be instrumental in producing knowledge of these effects in Barbados. However, among some of the health professionals interviewed, there seems to be a lack of clear understanding about climate change. Therefore, I recommend efforts to increase the awareness of climate change and its impacts among health professionals so that they can play a more informed role in establishing the connection between climate change and NCDs in Barbados.

Evidenced-based action

1. Surveillance systems – Barbados currently has a national surveillance system that collects data on new reported cases of certain NCDs (BNR). Through this existing infrastructure, it is recommended that there be more extensive monitoring of NCDs that can be affected climate. Furthermore, the hospital, polyclinics and other medical centres should track admissions of certain illnesses and health concerns. This health data, along with climatic data would be instrumental in future research that explores the relationships between NCDs and climate change.
2. Strengthen research capacity – there are several questions Barbados and other countries in the region need to consider as it relates to NCDs and climate change. For instance, what are the direct physiological effects of climate change that these countries need to be concerned about? Can the future risks of climate change to NCDs be quantified in effort to reduce the uncertainties under which decisions are made? Is there any correlation between admissions of illnesses into the healthcare systems and weather conditions? It would be ideal if there was a dedicated research institution/office committed to addressing these and other issues that may arise as Barbados and other Caribbean countries adjust to new climatic conditions.
3. Collate data on the locations of vulnerable populations (i.e. those living with NCDs that require regular medical attention) – in the short-term, this information is important for disaster management as these are likely populations that will need priority attention in the aftermath of extreme weather events.

Advocacy for climate action

To open a policy window on climate change and non-communicable diseases, there needs to be political interest on the issue. There has been incremental movement in this direction. The Lancet

Countdown on Climate Change, in partnership with several Caribbean health organisations (two of which participated in this research) held an event titled 'Climate Change and NCDs in the Caribbean' to launch the 2019 Lancet Countdown on Health and Climate Change Report'. This event was attended by the Minister of Health and Wellness and Minister of Environment of Barbados. Furthermore, the Prime Minister of Barbados has weighed in on the issue of climate change on an international stage, which has demonstrated the importance of this challenge to the country, and a commitment to action. However, what is needed is more involvement of health professionals and health stakeholders to raise the profile of this issue through advocacy within the health sector. One of the participants in this research that represents a civil society NGO focused on NCDs, indicated interest from their organisation on addressing this issue. Only dedicated attention to this issue, as was seen with respect to NCDs, can move this issue forward as a priority on the national health agenda.

Funding

The research and resources needed to support urgent health adaptation to climate change requires funding that Barbados, and other SIDS, lack. Lack of funding and resources restricts adaptation planning and increases the vulnerability of these countries to climate change. The longer they wait to begin to address their vulnerabilities, the more adaptation they will have to do, and likely, the residual health impacts on population will be greater (Martinez et al., 2018). If health officials in Barbados can articulate the connections between NCDs and climate change among their population, they could potentially access new sources of funding for projects that confer co-benefits in the area of managing non-communicable diseases and climate change adaption. There are climate funds available to developing and least developed countries to support their long-term and short-term adaptation goals in areas like water resources management, land management, agriculture, health, infrastructure development etc. (Dessai, 2003). The Special Climate Change Fund, made

available through the Global Environment Facility (GEF), is one such funding avenue. Barbados has benefited from this fund in the past when it participated in a UN Project "Piloting Climate Change Adaptation to Protect Human Health" (GOB, 2018). Barbados' project focused on the use of treated wastewater for non-potable purposes and rainwater storage. Specific reference was made to health issues such increased risk of microbial contamination, gastrointestinal diseases due to basic hygiene practices in the face of water scarcity and increasing incidence of dengue fever due to improper storage of water (GOB, 2018). Interestingly, given the magnitude of the NCD crisis in Barbados, this was a prime opportunity missed to link climate change to non-communicable diseases. Irrigation in the agriculture sector is a major use of water that will be affected by water scarcity. Therefore, the case could be made that water scarcity poses a risk to good nutrition, which has implications for the prevention and control of NCDs. Nonetheless, if the link can be made between climate change and NCDs, it is possible to leverage these connections to access innovative sources of funding.

Encourage the use of existing climate tools

Regional agencies in the Caribbean have already begun to create climate tools hat can be used in climate change adaptation efforts. One such tool is the Caribbean Health Climatic Bulletins (Appendix F). Health leaders in Barbados should promote and encourage the use of these for the management of chronic non-communicable diseases. These tools can be used by healthcare providers for timely monitoring and emergency warnings for climatic conditions that affect a variety of health conditions. By using these bulletins, health care providers can be alerted to increase their vigilance for health issues or to provide warnings to the population. Tools like this will be useful for incorporating climate and weather data into health operations, which would be instrumental in mainstreaming climate change risks into the health management (Trotman et al., 2018). Furthermore, the use of these

tools by healthcare providers will prompt them to consider, and recognise, the connections between health and weather/climate.

Regional cooperation

Efforts to build a health sector resilient to climate change in Barbados and other Caribbean countries could benefit from regional cooperation. Both climate change and non-communicable diseases are challenges shared by the entire Caribbean region. Consequently, these countries should engage with and learn from the experiences of others in the region. Furthermore, instead of "reinventing the wheel", there are several existing interregional health and research institutions which could become focal points for climate change and NCD research, planning and advocacy.

6.4.3 Climate change and health action plan for Barbados

Barbados urgently needs a fully implemented, national climate change and health action plan. Following the lead of regional partners like PAHO, health systems in Barbados would benefit from the creation an action plan that would be instrumental in establishing and detailing national responses to climate change now and in the future. The 'Caribbean Climate Change and Health Action Plan' from PAHO was created in response to the 'Climate Change and Health in SIDS Special Initiative'. A climate change and health action plan for Barbados should endeavour to address the following:

1. Leadership – there is a need for leaders in Barbados' health sector to strengthen institutional responses to the risk of climate change. Furthermore, health leaders will be instrumental in advocating health adaptation planning to national leaders.
2. "Climate change and health action in-all-sectors" – a process that facilitates the incorporation of climate change and health planning in all sectors in Barbados to protect all aspect of

population and national wellbeing from climate change. Building resiliency into all of society will require intersectoral collaboration and cooperation.

3. Evidence building – the Barbadian health sector needs to strengthen its research capacity on issues around climate change and health. This may require more collaborations with, or providing support for, research institutions like the University of West Indies. Climate change and health research is needed to reduce the uncertainty under which planning and decisions about climate change action are made.
4. Stakeholder engagement – efforts to reduce the effects of climate change on health and wellbeing will require the input of various people, organisations, institutions and business. The effects well be felt in the private sector, public sector, civil society and government. Therefore, there should be processes that allow persons and entities whose wellbeing stand to be affected by decisions about climate action, to influence the decisions being made and the implementation of climate action.
5. Capacity development within health institutions to strengthen their ability to respond to climate change – this may also require engagement with regional partners to build national capacities.
6. Establish financial mechanisms through which funding can be accessed for climate change action. This may require health leaders to press for larger national health budgets or urge larger GHG polluter countries to contribute climate funds for developing or least developed countries.
7. Communication & knowledge dissemination strategies to spread information on the wellbeing and health risks climate change poses to Barbados and Barbadians.

6.4.4 Climate change policy for Barbados

Barbados also urgently needs a fully implemented, national climate change policy. Since 2012, there has been indication that Barbados is to have a climate change policy that addresses issues related to climate change in Barbados. However, this policy is still in draft form and not yet ready for

dissemination. A climate change policy for Barbados would be instrumental in establishing and detailing responses to climate change now and in the future. More specifically as it relates to the findings of this research, such a climate policy for Barbados should include mechanisms for intersectoral and multisectoral collaborations, given that findings demonstrate the interconnectedness of drivers of wellbeing of Barbadians. Any climate change policy for Barbados should have at the forefront of its mission a process for adapting to climate change, both in the short term and in the long term. While climate change mitigation is worthy goal, particularly as it relates to diversifying energy sources in Barbados, I maintain the argument that adapting to the effects of climate change and building resiliency into all sectors should be the main priority for Barbados.

Chapter 7: Conclusion

7.1 Introduction

The research set out to explore health and wellbeing vulnerability to the impacts of climate change in Caribbean small island states, using Barbados as an example. The goal was to understand how factors that influence wellbeing, affect vulnerability to climate change and three research objectives were identified to accomplish this goal. First was to explore perceptions and opinions of drivers and determinants of wellbeing among Barbadians, and how these components of wellbeing affect vulnerability to climate change. The second objective was to explore knowledge and perceptions of health professionals on the burden of non-communicable diseases in Barbados and possible connections between climate change stressors and non-communicable diseases. The final objective was to investigate the policy responses to NCDs in Barbados. By addressing these research objectives, this research contributes a theoretically-ground understanding of wellbeing in a SIDS context, substantive proof of connections between climate, wellbeing and health and validation of uncommon methodological approaches to climate change and health research in the Caribbean and Barbados.

This final chapter highlights how the research findings address the research objectives. In Chapter 3, research questions related to each objective was presented; in this chapter, these questions are used to frame responses to the research objectives. Following this, the theoretical/conceptual, methodological and substantive contributions of this work are described. The chapter concludes with a set of possible future research directions.

7.2 Addressing research objectives

7.2.1 Research objective #1: Drivers and determinants of wellbeing and they affect vulnerability to climate change.

What do Barbadians consider to be essential or detrimental to their wellbeing?

This research provides further insights into population wellbeing, contextually defined based on the perceptions and lived experiences of individuals in Barbados. This research propels efforts to progressively view wellbeing in a holistic way, shifting focus from dominantly economic measures to include social indicators of wellbeing that are contextually relevant (Matthews, 2012; Elliott et al., 2017). Data collection tools, guided by the PEH framework, uncovered findings that confirm Barbadians perceive their wellbeing to be multidimensional. Social, economic, environmental factors were considered to be the main drivers of wellbeing, though political factors were found to also underpin wellbeing. Six drivers of wellbeing examined in further detail, were found to be interdependent to such a degree that it would inadvisable to address without considering possible cascade effects. Within drivers of wellbeing, several determinants were identified that can affect have a positive of negative effect on wellbeing, subject to time and changing circumstances. These include social relationships and community cohesiveness, criminal activity in Barbados, weather/climate, proximity to and use of natural resources, amenities and services and employment opportunities.

How are these determinants connected to climate change?

This research further contributes by situating wellbeing within the context of climate change, providing support for appropriate adaptation strategies, and advancing an argument for the framing of climate change adaptation in vulnerable countries as one means of protecting and enhancing population wellbeing. Thus, this research expands the narrative of climate change effects on public

health to provide a more comprehensive look at the effects of climate change on all aspects of human life. With each driver of wellbeing investigated, connections were found to exist that link wellbeing to climate stresses. They were direct connections like the impacts of climate change on climate-dependent economic sectors like tourism, agriculture or fisheries, and indirect connections like dependence on state provided services and amenities, which could make populations more or less vulnerable to impacts. Overall, the results have shown how socioeconomic, social and political drivers of wellbeing are connected to climate change, and how these connections create the pathways for multiple health and wellbeing outcomes (Figure 5.1). Furthermore, the findings confirm how the effects of climate driver on health and wellbeing can potentially be mediated by environmental and social context within which populations reside.

Do Barbadians perceive climate change to be a threat to their wellbeing? If so, how? If not, why?

While Barbadians recognise that climate change poses a risk to their wellbeing, they do not consider it to be an immediate concern. Instead, they prioritize other challenges to wellbeing to which they are more exposed. Findings suggest that it is the lack of clear understanding of climate change in Barbados that contributes to the low priority ascribed to climate change as risk to wellbeing. Participants generally got their knowledge of climate change from international sources which fail to reflect local realities. Furthermore, it is not a topic they have observed being regularly addressed by government officials or experts.

7.2.2 Research objective #2: Knowledge and perceptions of health professionals on the burden of non-communicable diseases and climate change

What do health stakeholders consider to be the priority health impacts as they relate to health and public policy interventions? What is the current burden of NCDs?

Non-communicable diseases are one of the priority health concerns for the Caribbean region. Public health professionals in Barbados noted non-communicable diseases and their related risk factors to be the leading health issue in the country. This is supported by statistical data which show chronic diseases are the leading cause of death among adult in Barbados. Statistics show that one in every ten adults has a chronic non-communicable disease; two in three adults are overweight; one in three are hypertensive; and at least one in three of persons receiving treatment for hypertension or diabetes do not have their disease well-managed (PAHO, 2017, Unwin et al., 2015). From their experiences, health professionals expressed concern about the high prevalence of preventable diseases, complications from undiagnosed/untreated/poorly managed NCDs; state health care spending necessary to provide free or subsidized care to its citizens; and the economic and social burden to the Barbadian society. They also note how economic factors (e.g.: competing goals from the private sector), social factors (e.g.: access to health services), cultural factors (e.g.: priorities for a "good" life) and individual behaviours, hinder efforts to reduce NCDs in Barbados.

How is the future burden of NCDs expected to change? Is climate change expected to affect this health outcome? If so, how?

The burden of chronic non-communicable diseases has been increasing in Barbados, and is expected to continue to increase. The prevalence of these disease continues to rise despite a variety of responses and dedicated action from all spheres of society. Even as Barbados deals with this crisis,

climate change poses a risk to the prevention and management of these diseases. Non-communicable diseases are for the most part not recognised as being climate-sensitive in the way that vector borne diseases are, and so the links are not readily apparent. It is far more recognisable that during periods of water scarcity, water storage goes up and then so to do rates of dengue fever contraction (Beebe et al., 2009). These acute diseases are easy to link to climate change. However, non-communicable diseases are lifestyle diseases that develop over the life course. People may go their entire life without knowing they have an illness, until the fall "suddenly" ill. However, the decisions made along the life course that lead to these diseases are influenced by the environment in which they live. Climate change influences this environment, so, though it may be difficult to make a direct connection, it is clear that climate change and its impacts will be greatly influential in the development of these diseases over time. This includes the impact of climate change on food security and the effect this has on good nutrition; the impacts on the physical environment and how this affects active lifestyles and the psychosocial effects of climate change. Furthermore, persons living with NCDs are a vulnerable sub-group who are even more at risk to the impacts of climate change.

Non-communicable diseases are more than a health problem that can be addressed within the boundaries of the health sector. Recognition of the effects of climate change on the prevention and management of NCDs reinforces this premise and strengthens the call for an "all-sector" approach to reducing the health burden of both NCDs and climate change. It is problem of food security, disaster management, community action and cultural values, education and social-economic determinants. Efforts to address the management of these diseases will benefit from the involvement and cooperation of a variety of governmental sectors (health sector and key partners), community groups, faith-based groups, schools etc.

7.2.3 Research objective #3: Policy responses to NCD and climate change

What has been the national and regional policy response to NCDs? Do these policies mention climate change?

The Barbadian response to NCDs predated the influential Port-of-Spain declaration. The response has included the establishment of a national NCD commission; several strategic plans that have outlined actions related to risk factors, the provision of healthcare, pharmaceutical services, surveillance and research, and collaborative partners; and legislative and regulatory actions aimed at controlling NCD behavioural risk factors. In all these plans, there has been no mention of climate change and its linkages to non-communicable diseases. Even in broad health policies, the mention of climate change has been absent. However, both of the national strategic plans for health and non-communicable diseases are outdated, and the most current plans have not yet been disseminated. Therefore, there are limits to what is known about the current awareness of climate change from a policy perspective, reflected by policy documents. One of the greatest responses at a regional level outside of the Port-of-Spain declaration, has been the creation of a non-governmental organisation that coordinates civil society participation in the management of NCDs. This and other regional organizations have contributed to policies on NCDs, but again, these plans do not address climate change. It is inadvisable for health officials in Barbados to continue to plan NCD interventions without considering the effects that future climate stressors will have on the burden of NCDs and the interventions put in place to reduce said burden. There is great risk for residual impacts if health planning does not take into consideration the impacts of climate change.

Are there any national and regional climate change and health policies? Are NCDs mentioned in any of these polices? If yes, to what extent?

Barbados does not have any type of national climate change policy. At the regional level, there is a climate change and health action plan from the Pan American Health Organisation. In this plan, non-communicable diseases are recognised to be climate-sensitive, which represents the kind of discourse needed to further health agendas that plans for the associated harms between climate stresses and non-communicable diseases. Most of recommendations in this plan were for early warning systems for weather and climate-related diseases, and better surveillance of climate sensitive diseases. Given the lack of extensive research dedicated to climate change and the absence of cross-mentions of NCDs and climate change in policy, the scope of this document review was limited.

7.3 Research contributions

The findings in this dissertation make important contributions to society and the academic community. Unprecedented global climate change and the failure of large polluters to significantly reduce GHG emissions justifies the demand for research into the impact of climate change on human wellbeing. At the same, high vulnerability of the Caribbean to climate change, while they already grapple with the rising prevalence of chronic non-communicable diseases, warrants investigation into associated harms between these two wellbeing challenges. I discuss in detail the theoretical/conceptual, methodological, substantive and policy contributions of this research.

7.3.1 Theoretical/conceptual contributions

The research contributes a conceptual definition of wellbeing that reflects a tropical small island developing state context, based on the perceptions and lived experiences of individuals in Barbados. There are conceptual definitions of wellbeing already in the literature applicable to

Western developed countries or developing countries in sub-Saharan African (e.g. Kangmennaang & Elliott, 2019; Michalos, 2001). However, these conceptual definitions do not fully reflect wellbeing concerns in a SIDS. Therefore, this research adds a new theoretically grounded perspective of wellbeing. There are similarities in the larger forces that drive wellbeing, as was expected, because the framework from Michalos (2011) was used to help guide the research. However, the more specific wellbeing concerns of Barbadians vary from the findings of these other works.

This research was guided by a political ecology of health approach. An adapted conceptual framework (Figure 2.1) from Richmond and colleagues (Richmond et al., 2005) was used to help guide the research design and data collection tools. After interpreting the research findings, it can be confirmed that while some of the constructs and theoretical linkages from that framework are applicable in this context, some were not demonstrated by the findings. For instance, autonomy was a major construct in that framework. However, participants did not discuss how their own choices, behaviours or attitudes were influenced by their wellbeing so this was not a theme that emerged from the data. Likewise, culture was another construct that did not materialize from the research findings. Participants did not have a lot to say about cultural factors, even when asked. Conversely, the other constructs and linkages from the adapted framework were more apparent in the research findings. Social use of environmental resources and economic opportunities were found to be linked to the wellbeing of Barbadians. Further, it was confirmed how influential political, economic, social factors were to experience of wellbeing. Community is an important factor that affects wellbeing of Barbadians, that was not reflected in this framework. Overall, the visual representation of these constructs and linkages do not accurately represent the political ecology of health and wellbeing in Barbados. While it was useful in guiding this research design, it was not as useful in presenting and describing the research findings. This does not mean that the framework is flawed. It simply demonstrates how important context is to understand how health and wellbeing are shaped. A new

graphic was created to visually represent the political ecology of health and wellbeing in Barbados (Figure 5.1).

7.3.2 Methodological contributions

The methodological contributions of this research come from the novel application of a vulnerability assessment to understand how climate change can affect wellbeing in Barbados. To the best of my knowledge, and certainly as reflected in the literature, this has not been done before. Furthermore, though vulnerability assessments have been performed in Grenada and Dominica, they have not been used to assess the effects on non-communicable diseases in the Caribbean. Climate change is an unavoidable problem for the Caribbean. National leaders and decision-makers for these countries need reliable, tested approaches to examine the association between climate stresses and vulnerable sectors, to assess the potential for future risks. This dissertation shows how vulnerability assessments can be used to do this, even on a small scale, with limited resources and a small team. Furthermore, this research could be scaled up to provide an even more comprehensive outlook of vulnerability in these countries.

This research also highlights the usefulness of methodologies that gather qualitative data in the form of lived experiences, perceptions and opinions of experts. As was discussed in the literature review, most studies conducted in English-speaking Caribbean countries on climate change and health, have utilised quantitative methods live spatial modelling, statistical analyses/models, regression models and quantitative questionnaires. The research provides an alternative to the dominant quantitative approaches to climate change and health research in the Caribbean. Qualitative data will be vital to assess vulnerability to climate change given restrictions in data availability, the limits of climate modelling, and limited funds and resources to conduct assessments (Berry et al., 2018). The experiences of lay citizens and insights from community leaders, experts and other key

stakeholders are a valuable source of data that can be accessed through qualitative methodologies as demonstrated by this dissertation.

7.3.3 Empirical contributions

- **Community-based perspectives of wellbeing based on the lived experiences of Barbadians**. Components of wellbeing are thematically sorted into drivers and determinants of wellbeing to comprehensively describe how Barbadians perceived their quality of life to be socially, economically, environmentally and, to a lesser extent, politically driven.
- **Insights into multiple sources of exposure, sensitivity and adaptive capacity to climate change impacts based on the lived experiences of Barbadians.** These factors are portrayed through "pathways" between climate drivers and wellbeing outcomes, to demonstrate how wellbeing drivers and determinants can influence vulnerability to climate change. These findings contribute to an improved understanding of the relationship between wellbeing outcomes and climate change.
- **Perspectives from Barbadian health professionals on the associated harms between climate change and non-communicable diseases.** Previous studies in the Caribbean have placed greater emphasis on infectious diseases compared to other categories of health effects. No other research in this region Caribbean has had as its focus investigations into the connections between climate change and NCDs.
- **Findings from this research could be used as the basis for future research.** A nuanced understanding of the situation in Barbados is beneficial as a starting point for further examination of wellbeing on a larger scale in Barbados or for other countries or communities assessing their own vulnerabilities to climate change.
- **Awareness raising of climate change among health professionals and lay citizens.** Health professionals who were previously unaware of the connection between climate and non-

communicable diseases, were introduced to new information which they noted to be of interest. Similarly, when lay citizens were asked about climate change, they also indicated interest in learning more.

7.3.4 Policy contributions

- Evidence to strengthen the case for the mainstreaming of climate change considerations into all sectoral policies.
- Evidence to bolster climate change advocacy among stakeholders in Barbados to encourage government officials and political leaders to proactively address the Barbados' vulnerability to climate change.
- Evidence for educational campaigns to inform the public of the association between their wellbeing and climate change
- Knowledge that will guide policy and decision makers to build upon or identify strategies, policies and practices geared towards climate change adaptation and health promotion activities that reduce the burden of NCDs.

7.4 Directions for future research

Below are avenues for future research to contribute to efforts to improve wellbeing and adapt to climate change in Barbados:

1. Quantitative or mixed method studies to quantify wellbeing, generalizability to the wider population. A quantitative survey could be used to investigate whether the perceptions and understandings of wellbeing emerging from this dissertation are reflective of the wider Barbadian population.

2. Explorative studies that gather the insights of community leaders and organisers, key stakeholders from various sectors and other national-decision makers to provide additional insight into wellbeing in Barbados.
3. Longitudinal studies to observe and record how wellbeing changes over time as circumstances change. This would provide insight to other factors that affect wellbeing that may not have been apparent in these findings. This would be particularly interesting in Barbados given the changes to social welfare programs that have been in place for a long time. As Barbadians adjust to a new "normal", such a study would aid in understanding the effects these changes will have on the population.
4. Vulnerability and adaptation assessments that focuses on specific vulnerable populations. Even within countries, vulnerability to climate change is not equally distributed and some populations are more vulnerable than others, or they are vulnerable because of different factors. Future studies could investigate vulnerability and adaptive capacity among different sub-groups such as workers from climate-sensitive economic sectors (fisheries, agriculture or tourism); person living with NCDs; the elderly or outdoor workers.
5. Further explore the associations between climate change and non-communicable diseases. The health professionals that participated in this research were selected for the insight they could provide on the state of knowledge of climate change within the local health sector, and the priorities of local health agendas. However, there are other stakeholders who could provide insights to this issue. Future studies could explore attitudes and perspectives of average citizens or other key partners from outside the health sector. Additionally, these studies could also investigate the impacts on other non-communicable diseases beyond the four mentioned here. This could include allergies, asthma and other respiratory illnesses, heat strokes etc.

6. Further explore the benefits of social relationships and community cohesiveness to the human wellbeing.
7. Further explore how to increase awareness of climate change among Barbadians so that they can better understand how climate change poses a risk to their wellbeing.
8. Further explore how to increase awareness of climate among key stakeholders in the health sector so that they can be more active in building resiliency into the health system.
9. Further investigate how health policies can be adapted to include adaptation planning.

References

Adger, W. N. (2001). Scales of governance and environmental justice for adaptation and mitigation of climate change. *Journal of International development*, *13*(7), 921-931.

Akpinar-Ferrand, E., & Singh, A. (2010). Modelling increased demand of energy for air conditioners and consequent CO2 emissions to minimize health risks due to climate change in India. *Environmental science & policy*, *13*(8), 702-712.

Acharibasam, J. W., & Anuga, S. W. J. C. R. M. (2018). Psychological distance of climate change and mental health risks assessment of smallholder farmers in Northern Ghana: Is habituation a threat to climate change?, 21, 16-25

Adger, N. W., Arnell, N. W., & Tompkins, E. L. (2005). Successful adaptation to climate change across scales. Global Environmental Change, 15(2), 77-86.

Adger, W. (2006). Vulnerability. Global Environmental Change, 16(3), 268-281.

Adger, W., Dessai, S., Goulden, M., Hulme, M., Lorenzoni, I., Nelson, D., Naess, L., Wolf, J., and Wreford, A. (2009). Are there social limits to adaptation to climate change? Climatic Change, 93(3), 335-354.

Allin, P. (2007). Measuring societal wellbeing. *Economic & Labour Market Review, 1*(10), 46.

Allin, P., & Hand, D. J. (2014). *The Wellbeing of Nations: Meaning, motive and measurement*. John Wiley & Sons.

Alwan, A. (2011). *Global status report on noncommunicable diseases 2010*. World Health Organization.

Anenberg, S. C., Schwartz, J., Shindell, D., Amann, M., Faluvegi, G., Klimont, Z., ... & Emberson, L. (2012). Global air quality and health co-benefits of mitigating near-term climate change through methane and black carbon emission controls. *Environmental Health Perspectives*, *120*(6), 831.

Aslam, A., & Corrado, L. (2012). The geography of wellbeing. *Journal of Economic Geography, 12*(3), 627-649.

Atkinson, S. (2013). Beyond components of wellbeing: The effects of relational and situated assemblage. Topoi, 32(2), 137-144.

Banu, S., Hu, W., Guo, Y., Hurst, C., & Tong, S. (2014). Projecting the impact of climate change on dengue transmission in Dhaka, Bangladesh. *Environment international*, *63*, 137-142.

Barbados Statistical Services (BSS). (2010). Barbados Population and Housing Census 2010. – Retrieved from http://www.barstats.gov.bb/files/documents/PHC_2010_Census_Volume_1.pdf on 4/4/2017.

Balbus, J. M., & Malina, C. (2009). Identifying vulnerable subpopulations for climate change health effects in the United States. *Journal of occupational and environmental medicine*, *51*(1), 33-37.

Barbados Today. (2019, April 12). Bus "pass". *Barbados Today.* Retrieved from https://barbadostoday.bb/2019/04/12/bus-pass/ on 21,12,19.

Batchelor, T. W. K., Stephenson, T. S., Brown, P. D., Amarakoon, D., & Taylor, M. A. (2012). Influence of climate variability on human leptospirosis cases in Jamaica. *Climate Research, 55*(1), 79-90. doi:10.3354/cr01120

Bauchner, H.; & Fontanarosa, P. (2014). Climate change: A continuing threat to the health of the world's population. *JAMA***,** *312*(15), 1519. **DOI:** 10.1001/jama.2014.13094

Beaglehole, R.; Bonita, R.; Alleyne, G.; Horton, R.; Li, L.; Lincoln, P.; Mbanya, J. C.; Mckee, M.; Moodie, R.; Nishtar. S.; Piot, P.; Reddy, K. S. & Stuckler, D. (2011). UN high-level meeting on non-communicable diseases: addressing four questions. *The Lancet*, *378*(9789), 449-455.

Beebe, N. W., Cooper, R. D., Mottram, P., & Sweeney, A. W. (2009). Australia's dengue risk driven by human adaptation to climate change. *PLoS neglected tropical diseases*, *3*(5), e429.

Bennett, J. E., Stevens, G. A., Mathers, C. D., Bonita, R., Rehm, J., Kruk, M. E., ... & Beagley, J. (2018). NCD Countdown 2030: worldwide trends in non-communicable disease mortality and progress towards Sustainable Development Goal target 3.4. *The Lancet*, *392*(10152), 1072-1088

Berrang-Ford, L., Dingle, K., Ford, J. D., Lee, C., Lwasa, S., Namanya, D. B., ... & Edge, V (2012). Vulnerability of indigenous health to climate change: A case study of Uganda's Batwa Pygmies. *Social Science & Medicine, 75*(6), 1067-1077.

Berry, P., Enright, P., Shumake-Guillemot, J., Villalobos Prats, E., & Campbell-Lendrum, D. (2018). Assessing health vulnerabilities and adaptation to climate change: A review of international progress. *International Journal of Environmental research and public health*, *15*(12), 2626.

Betzold, C. (2010). 'Borrowing' Power to Influence International Negotiations: AOSIS in the Climate Change Regime, 1990-1997. *Politics (Oxford), 30*(3), 131-148.

Betzold, C., Weiler, F., & Castro, P. (2012). AOSIS in the UNFCCC negotiations: From unity to fragmentation? *Climate Policy, 12*(5), 591-613.

Bishop, M. L., & Payne, A. (2012). Climate change and the future of Caribbean development. *The Journal of Development Studies, 48*(10), 1536-1553.

Brooks, Nick, (2003). Vulnerability, Risk and Adaptation: A Conceptual Framework. Working Paper 38, Tyndall Centre for Climate Change Research, University of East Anglia, Norwich.

Brown, D. (2003). The importance of expressly examining global warming policy issues through an ethical prism. *Global Environmental Change, 13*(4), 229-234.

Bryant, L. R and Bailey, S (1997) Third world political ecology. Routledge

Bultó, P. L. O., Rodríguez, A. P., Valencia, A. R., Vega, N. L., Gonzalez, M. D., & Carrera, A. P. (2006). Assessment of human health vulnerability to climate variability and change in Cuba. *Environmental health perspectives, 114*(12), 1942.

Burrows, K., & Kinney, P. L. (2016). Exploring the climate change, migration and conflict nexus. *International journal of environmental research and public health, 13*(4), 443.

Campbell-Lendrum, D., Wheeler, N., Maiero, M., Villalobos Prats, E., & Nevelle, T. (2018). World Health Organization COP24 Special Report on Health and Climate Change. *World Health Organization*.

Carboneil, L. T., Ruiz, E. M., Doral, W. C., & Zucchetti, M. (2010). Global and local atmospheric pollution evaluation and control. Challenges for a small island and for developing countries. *Fresenius Environmental Bulletin, 19*(10 A), 2354-2360.

Caribbean Development Bank (CDBa). (2018). Country economic review 2017 Barbados. St. Michael Barbados.

Caribbean Development Bank (CDBb). (2018b). Country economic review 2018 Barbados. St. Michael Barbados.

Carter, S & Singh, A. (2010). National environmental summary Barbados. United Nations Environmental Programme (UNEP)/ROLAC (Regional Office for Latin America and the Caribbean).

Cashman, A., Cumberbatch, J., & Moore, W. (2012). The effects of climate change on tourism in small states: evidence from the Barbados case. *Tourism Review, 67*(3), 17-29.

Cashman, A., Nurse, L., & Charlery, J. (2010). Climate Change in the Caribbean: The Water Management Implications. The Journal of Environment & Development, 19(1), 42-67.

Chadee, D. D., & Sutherland, J. M. (2014). Health effects of flooding in Trinidad and Tobago. (pp. 97-122)

Cheng, J. J., & Berry, P. (2013). Health co-benefits and risks of public health adaptation strategies to climate change: a review of current literature. *International journal of public health*, *58*(2), 305-311.

CIA World Factbook. (2019). Labour force – by occupation. Retrieved from https://www.cia.gov/library/publications/the-world-factbook/fields/219.html on 10/03/2020.

Colagiuri, R., Boylan, S., & Morrice, E. (2015). Research Priorities for NCD Prevention and Climate Change: An International Delphi Survey. *International Journal of Environmental Research and Public Health*, 12(10), 12941-12957.

Costanza, R., Hart, M., Talberth, J., & Posner, S. (2009). Beyond GDP: The need for new measures of progress. *The pardee papers*.

Costello, Anthony, Abbas, Mustafa, Allen, Adriana, Ball, Sarah, Bell, Sarah, Bellamy, Richard, . . . Patterson, Craig. (2009). Managing the health effects of climate change: And University College London Institute for Global Health Commission. *The Lancet,373*(9676), 1693-1733.

Cumberbatch, J., Nurse, L., & Francis, K. (2017). Case Study Barbados: Policy, practice and science: perspectives on climate change and tourism in Barbados-conflict or congruence? *Global Climate Change and Coastal Tourism: Recognizing Problems, Managing Solutions and Future Expectations*, 159.

Cutchin, P. M. (2006). The need for the "new health geography" in epidemiologic studies of environment and health. Health and Place. 13: 725-742

Dann, G. (1984). *The quality of life in Barbados*. Macmillan Caribbean.

Deaton, A. (2013). *The great escape: Health, wealth, and the origins of inequality*. Princeton, New Jersey: Princeton University Press.

de Fatima Andrade, M., Kumar, P., de Freitas, E. D., Ynoue, R. Y., Martins, J., Martins, L. D., ... & Gonçalves, F. L. T. (2017). Air quality in the megacity of São Paulo: Evolution over the last 30 years and future perspectives. *Atmospheric Environment*

de Oliveira, J. A. P., & Doll, C. N. (2016). Governance and networks for health co-benefits of climate change mitigation: lessons from two Indian cities. *Environment international*, *97*, 146-154.

Dessai, S. (2003). The special climate change fund: origins and prioritisation assessment. *Climate Policy*, *3*(3), 295-302.

De Sario, M., Katsouyanni, K., & Michelozzi, P. (2013). Climate change, extreme weather events, air pollution and respiratory health in Europe. *European Respiratory Journal*, *42*(3), 826-843.

Dodge, R., Daly, A., Huyton, J., & Sanders, L. (2012). The challenge of defining wellbeing. *International Journal of Wellbeing*, *2*(3), 222–235. https://doi.org/10.5502/ijw.v2i3.4

Dummer, Trevor J.B. (2008). Health geography: Supporting public health policy and planning. (Public health) (Report). CMAJ: Canadian Medical Association Journal, 178(9), 1177.

Ebi, K. L., Kovats, R. S., & Menne, B. (2006). An approach for assessing human health vulnerability and public health interventions to adapt to climate change. *Environmental health perspectives*, *114*(12), 1930-1934.

Ebi, K.L., P. Berry, D. Campbell-Lendrum, G. Cissé, J. Hess, N. Ogden, and R. Schnitter. (2019). Health System Adaptation to Climate Variability and Change. Rotterdam and Washington, DC. Retrieved from www.gca.org. on March 3, 2020.

Elliott, S. J., Dixon, J., Bisung, E., & Kangmennaang, J. (2017). A GLOWING footprint: Developing an index of wellbeing for low to middle income countries. *International Journal of Wellbeing*, *7*(2).

Emrich, C. T., & Cutter, S. L. (2011). Social vulnerability to climate-sensitive hazards in the southern United States. *Weather, Climate, and Society*, *3*(3), 193-208.

England, K. (1994). Getting Personal: Reflexivity, Positionality, and Feminist Research*. *Professional Geographer*, *46*(1), 80-89.

Escobedo, A. A., Almirall, P., Rumbaut, R., & Rodríguez-Morales, A. J. (2015). Potential impact of macroclimatic variability on the epidemiology of giardiasis in three provinces of Cuba, 2010-2012. *Journal of Infection and Public Health*, *8*(1), 80-89. doi: 10.1016/j.jiph.2014.06.001

Fleurbaey, M., & Blanchet, D. (2013). *Beyond GDP: Measuring welfare and assessing sustainability*. Oxford University Press.

Friel, S. (2010). Climate change, food insecurity and chronic diseases: sustainable and healthy policy opportunities for Australia. *New South Wales Public Health Bulletin*, *21*(6), 129-133.

Friel, Bowen, Campbell-Lendrum, Frumkin, McMichael, & Rasanathan. (2011). Climate Change, Noncommunicable Diseases, and Development: The Relationships and Common Policy Opportunities. *Annual Review of Public Health*, *32*, 133-147

Furgal, C., & Seguin, J. (2006). Climate change, health, and vulnerability in Canadian northern Aboriginal communities. *Environmental health perspectives*, *114*(12), 1964.

Füssel, H. (2007). Vulnerability: A generally applicable conceptual framework for climate change research. Global Environmental Change, 17(2), 155-167.

Füssel, H., & Klein, R. (2006). Climate Change Vulnerability Assessments: An Evolution of Conceptual Thinking. Climatic Change, 75(3), 301-329.

Gatrell, A. C. & Elliott, S, J. (2015). Geographies of health: an introduction. 2nd Ed. Wiley-Blackwell.

Government of Barbados. (GOB). (2004). *National sustainable development policy for Barbados.* Ministry of of Housing, Lands and the Environment (Environment). St. Michael, Barbados.

Government of Barbados. (GOB). (2010) Barbados national assessment report of progress made in addressing vulnerabilities of SIDS through implementation of the Mauritius strategy for further implementation (MSI) of the Barbados Programme of Action. Ministry of Environment, Water Resources Management and Drainage, St, Michael, Barbados.

GOB. (2013). Barbados Growth and Development Strategy 2013 – 2020. Ministry of Finance and Economic Affairs. St. Michael, Barbados. Retrieved from http://caribbean.cepal.org/content/barbados-growth-and-development-strategy-2013-2020 on 9/12/2019.

Government of Barbados (GOB). (2015). Chief Medical Officer's Report 2010 -2012. Ministry of Health, Planning and Research Unit, St, Michael, Barbados.

Government of Barbados (GOB). (2017). Barbados Economic and Social Report 2016. Ministry of Finance and Economic Affairs, Research and Planning Unit, St, Michael, Barbados.

Government of St. Lucia. (2017). Third national communication on climate change for St Lucia. Ministry of Education, Innovation, Gender Relations & Sustainable Development, St. Lucia Retrieved from https://unfccc.int/sites/default/files/resource/THIRD%20NATIONAL%20COMMUNICATION%20_%20SAINT%20LUCIA%202017.pdf on 18/07/17.

GOB. (2018). *Barbados' second national communication Under the United Nations Framework Convention on Climate Change.* Policy Research, Planning and Information Unit, Ministry of environment and Drainage, GOB, St. Michael, Barbados.

Grace, K., Davenport, F., Hanson, H., Funk, C., & Shukla, S. (2015). Linking climate change and health outcomes: Examining the relationship between temperature, precipitation and birth weight in Africa. *Global Environmental Change*, *35*, 125-137.

Haines, A., & Ebi, K. (2019). The imperative for climate action to protect health. *New England Journal of Medicine*, *380*(3), 263-273.

Haines, A., & Patz, J. A. (2004). Health effects of climate change. *JAMA, The Journal of the American Medical Association*, *291*(1), 99-103

Haines, A., Kovats, R. S., Campbell-Lendrum, D., & Corvalán, C. (2006). Climate change and human health: impacts, vulnerability and public health. *Public health*, *120*(7), 585-596.

Hambleton, I. R., Clarke, K., Broome, H. L., Fraser, H. S., Brathwaite, F., & Hennis, A. J. (2005). Historical and current predictors of self-reported health status among elderly persons in Barbados. *Revista Panamericana de Salud Pública*, *17*, 342-352.

Harlan, S. L., & Ruddell, D. M. (2011). Climate change and health in cities: impacts of heat and air pollution and potential co-benefits from mitigation and adaptation. *Current Opinion in Environmental Sustainability*, *3*(3), 126-134.

Hay, I. (2010). Qualitative research methods in human geography. (3rd edition), Oxford University Press, Melbourne Australia.

Hayes, K., Berry, P., & Ebi, K. L. (2019). Factors Influencing the Mental Health Consequences of Climate Change in Canada. *International journal of environmental research and public health*, *16*(9), 1583.

Hayes, K., Blashki, G., Wiseman, J., Burke, S., & Reifels, L. (2018). Climate change and mental health: Risks, impacts and priority actions. *International journal of mental health systems*, *12*(1), 28.

Healthy Caribbean Coalition (HCC). (2017a) Strategic Plan 2017 – 2021: Enabling Caribbean civil society's contribution to national, regional and global action for NCD prevention and control. HCC: St. Michael, Barbados. Retrieved from https://www.healthycaribbean.org/wp-content/uploads/2017/02/HCC-Strategic-Plan_WEB.pdf on 4/10/18).

Healthy Caribbean Coalition. (HCC). (2017b). Getting NCD Commissions Up and Running – A framework for the establishing and strengthening of national NCD commissions in the Caribbean. HCC, St. Michael, Barbados.

Herrman H. S., Saxena, S. & Moodie, R. (2005). *Promoting Mental Health: Concepts, Emerging Evidence, Practice.* A WHO Report in collaboration with the Victoria health Promotion Foundation and the University of Melbourne. Geneva: World Health Organization; Retrieved from http://www.who.int/mental_health/evidence/MH_Promotion_Book.pdf. on November 23, 2016.

Hoad, D. (2015). Reflections on small island states and the international climate change negotiations (COP21, Paris, 2015). *Island Studies Journal*, *10*(2), 259-262.

Huang, C., Vaneckova, P., Wang, X., FitzGerald, G., Guo, Y., & Tong, S. (2011). Constraints and barriers to public health adaptation to climate change: a review of the literature. *American journal of preventive medicine*, *40*(2), 183-190.

Humphrey, J. D., Vacher, H. L., & Quinn, T. M. (1997). Geology and hydrogeology of Barbados. *Geology and hydrogeology of carbonate islands. Developments in Sedimentology*, *54*, 381-406.

IPCC. (2007). Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 976pp

IPCC. (2014). Summary for policymakers. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1-32.

IPCC. (2018). Summary for Policymakers. In: *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [Masson-

Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. *World Meteorological Organization, Geneva, Switzerland, 32 pp.*

Islam, S. M. S., Purnat, T. D., Phuong, N. T. A., Mwingira, U., Schacht, K., & Fröschl, G. (2014). Non-Communicable Diseases (NCDs) in developing countries: a symposium report. *Globalization and health*, *10*(1), 81.

International Monetary Fund (IMF). (2014, February). *Barbados 2013 Article IV Consultation. IMF Country Report No 14/52*, Washington, D.C. Retrieved from https://www.imf.org/external/pubs/ft/scr/2014/cr1452.pdf on December 21, 2019.

International Monetary Fund (IMF). (2019). Reports for selected countries: Barbados. World Economic Outlook Database, October 2019. Retrieved from img.org on 21 October, 2019.

Jones, R. W. (2009). Stratigraphy, palaeoenvironmental interpretation and uplift history of Barbados based on foraminiferal and other palaeontological evidence. *Journal of Micropalaeontology*, *28*(1), 37-44.

Jones, R., Bennett, H., Keating, G., & Blaiklock, A. (2014). Climate change and the right to health for Māori in Aotearoa/New Zealand. *Health and Human Rights Journal*, *16*, 54-68.

Kangmennaang, J., & Elliott, S. J. (2019). 'Wellbeing is shown in our appearance, the food we eat, what we wear, and what we buy': Embodying wellbeing in Ghana. *Health & place*, *55*, 177-187.

Kearns, R. and Collins, D. (2010). Health geography. In T. Brown, S. McLafferty, & G. Moon, (2011). A companion to health and medical geography health. (pp. 15-32) Blackwell Publishing

Kearns, R. A. and Moon, G. (2002). From medical to health geography: novelty, place and theory after a decade of change. Progress in Human Geography, 26(5): 605-625

Kelly, P. M., & Adger, W. N. (2000). Theory and practice in assessing vulnerability to climate change and facilitating adaption. Climatic Change, 47(4), 325.

Kelman, I., & West, J. J. (2009). Climate change and small island developing states: a critical review. *Ecological and Environmental Anthropology*, *5*(1), 1-16.

King, B. (2010). Political ecologies of health. *Progress in Human Geography*, *34*(1), 38-55.

Kinney, P. L. (2008). Climate change, air quality, and human health. *American journal of preventive medicine*, *35*(5), 459-467.

Kjellstrom, T., Kovats, R. S., Lloyd, S. J., Holt, T., & Tol, R. S. (2009). The direct impact of climate change on regional labor productivity. *Archives of Environmental & Occupational Health*, *64*(4), 217-227.

Kjellstrom, T., Butler, A., Lucas, J., & Bonita, R. (2010). Public health impact of global heating due to climate change: Potential effects on chronic non-communicable diseases. *International Journal of Public Health*, *55*(2), 97-103.

Kjellstrom, T., & McMichael, A. J. (2013). Climate change threats to population health and well-being: the imperative of protective solutions that will last. *Global health action*, *6*(1), 20816.

Kovats, R. S., Menne, B., Ahern, M. J., & Patz, J. A. (2003). National assessments of health impacts of climate change: a review. *Climate change and health: risks and responses. Geneva, World Health Organization*.

Krieger, N. (2011). Epidemiology and the people's health: Theory and context (Oxford Scholarship Online). New York: Oxford University Press

Lloyd, S., Kovats, R., & Chalabi, Z. (2011). Climate Change, Crop Yields, and Undernutrition: Development of a Model to Quantify the Impact of Climate Scenarios on Child Undernutrition. *Environmental Health Perspectives*, *119*(12), 1817-1823.

Luginaah, I. (2009). Health Geography in Canada: Where are we headed? The Canadian Geographer. 53(1): 89-97

Macpherson, C. C., & Akpinar-Elci, M. (2015). Caribbean heat threatens health, well-being and the future of humanity. *Public Health Ethics*, *8*(2), 196-208. doi:10.1093/phe/phv008

Mandle, J. (2014). Moving Barbados Forward. *IDEAS Working Paper Series from RePEc*. Retrieved from http://search.proquest.com/docview/1698196475/ on 25\02\2017.

Martinez, G.S., Berry, P., Balbus, J., Hodgson, T., Salazar, M. Sellers, S., and J. Hess. (2018). Chapter 5: The Global Adaptation Gap, In UNEP 2018. The Adaptation Gap Report 2018. United Nations Environment Programme (UNEP), Nairobi, Kenya.

Mash, R. (2010). Chronic diseases, climate change and complexity: The hidden connections. *South African Family Practice*, 52(5), 438-445. **DOI**:10.1080/20786204.2010.10874022

Matthews, G. (2012). Happiness, culture and context. *International Journal of Wellbeing*, *2*(4), 299-312. https://doi.org/10.5502/ijw.v2.i4.2

Mayer, J. (1996). The political ecology of disease as one new focus for medical geography. *Progress in Human Geography, 20*(4), 441-456.

McMichael, A. J.; Powles, J. W.; Butler, C. D.; & Uauy, R. (2007). Food, livestock production, energy, climate change, and health. *The Lancet* **2007**, 370(9594), 1253-1263. **DOI**: 10.1016/S0140-6736(07)61256-2

McMichael, A. J., Woodruff, R. E., & Hales, S. (2006). Climate change and human health: Present and future risks. The Lancet, 367(9513), 859-869.

Merriam, S., Johnson-Bailey, J., Lee, M., Kee, Y., Ntseane, G., & Muhamad, M. (2001). Power and Positionality: Negotiating Insider/Outsider Status within and across Cultures. *International Journal of Lifelong Education, 20*(5), 405–416. https://doi.org/10.1080/02601370120490

Macpherson, C. C., & Akpinar-Elci, M. (2015). Caribbean heat threatens health, well-being and the future of humanity. *Public Health Ethics, 8*(2), 196-208. doi:10.1093/phe/phv008

Michalos, A., Canadian Index of Wellbeing, & Canadian Electronic Library. (2011).*The Canadian Index of Wellbeing technical paper : Canadian Index of Wellbeing 1.0*. Waterloo, Ont.: Canadian Index of Wellbeing.

Miles, M.B., Huberman, A.M. (1994). Qualitative Data Analysis: an Expanded Sourcebook, 2nd ed. Sage, Thousand Oaks, CA.

Ministry of Health. (2013). The Health of the Nation is the Wealth of the Nation, Barbados Strategic Plan for Health 2002 – 2012. Project Design and Implementation Unit, Ministry of Health, St. Michael Barbados.

Ministry of Health. (2014). Barbados strategic health plan for the prevention and control of noncommunicable diseases 2015-2019. National NCD Commission, Ministry of Health, St. Michael, Barbados.

Moser, S. (2008). Personality: a new positionality? *Area, 40*(3), 383–392. https://doi.org/10.1111/j.1475-4762.2008.00815.x

Mulligan, K., Elliott, S.J., & Schuster-Wallace, C. (2012). The place of health and the health of place: Dengue fever and urban governance in Putrajaya, Malaysia. *Health and Place, 18*(3), 613-620.

Mycoo, M., & Chadwick, A. (2012). Adaptation to climate change: The coastal zone of Barbados. *Proceedings of the Institution of Civil Engineers,165*(4), 159-168.

Nation Online. (2019, April 15). Bus fare hike in effect today. *Nation News.* Retrieved from https://www.nationnews.com/nationnews/news/239315/bus-fare-hike-effect on 21/12/19.

NOAA. (2018) - State of the Climate: Global Climate Report for Annual 2017 published online January 2018. Retrieved from NOAA National Centers for Environmental Information on September 11, 2018 from https://www.ncdc.noaa.gov/sotc/global/201713.

OECD (2019), *Accelerating Climate Action: Refocusing Policies through a Well-being Lens*, OECD Publishing, Paris, https://doi.org/10.1787/2f4c8c9a-en.

O'Leary, Z. (2004). The essential guide to doing your research project (2nd ed.). Thousand Oaks, CA: SAGE Publications, Inc.

Onyango, E., & Elliott, S. (2019). *Exploring health and wellbeing in a low-to-middle income country : a case study of Kenya* . University of Waterloo, Waterloo, Ontario, Canada.

Ortiz, P. L., Rivero, A., Linares, Y., Pérez, A., & Vázquez, J. R. (2015). Spatial Models for Prediction and Early Warning of Aedes aegypti Proliferation from Data on Climate Change and Variability in Cuba. *MEDICC Review, 17*(2), 20-28.

Pan American Health Organization. (2005). PAHO/WHO Eastern Caribbean cooperation strategy 2006-2009: PAHO/WHO medium term cooperation strategy for Barbados and member countries of the Organization of Eastern Caribbean States. Pan American Health Organization. Retrieved from https://apps.who.int/iris/handle/10665/168797 on 17/03/2017.

Pan American Health Organization. (2011). FAQS on the **United Nations General Assembly High-Level Meeting** on the Prevention and Control of Non-communicable Diseases (NCDs). Washington, DC.

Pan American Health Organization (PAHO). (2012a). Health in the Americas 2012 Edition. Regional Outlook and Country Profiles. Washington, DC.

Pan American Health Organization (PAHO). (2012b). Health in the Americas 2012 Edition: Country Volume – Barbados. PAHO: Washington, DC**.**

Pan American Health Organization (PAHO). (2017). Health in the Americas+, 2017 Edition. Summary: Regional Outlook and Country Profiles. Washington, D.C.

Pan American Health Organization (PAHO). (2019). Caribbean Action Plan on Health and Climate. Washington, D.C.

Patton, M. Q. (1999). Enhancing the quality and credibility of qualitative analysis. *Health services research*, *34*(5 Pt 2), 1189.

Pochanke-Alff, A., Meincke, M., Scheske, L., & Wuttge, E. (2015). Grenada Climate Change and Health Vulnerability and Adaptation Assessment. *Report Prepared for the Government of Grenada Ministry of Health, Social Security and International Business and the German Federal Ministry for Economic Cooperation and Development (BMZ) Division of Health*.

Prescott-Allen, R. (2001). *The wellbeing of nations*. Island Press.

Prospero, J. M., Collard, F. -., Molinié, J., & Jeannot, A. (2014). Characterizing the annual cycle of African dust transport to the Caribbean Basin and South America and its impact on the environment and air quality. *Global Biogeochemical Cycles, 28*(7), 757-773. doi:10.1002/2013GB004802

Quam, V. G., Rocklöv, J., Quam, M., & Lucas, R. A. (2017). Assessing Greenhouse Gas Emissions and Health Co-Benefits: A Structured Review of Lifestyle-Related Climate Change Mitigation Strategies. *International Journal of Environmental Research and Public Health, 14*(5), 468.

Rawlins, S. C., Chen, A., Rawlins, J. M., Chadee, D. D., & Legall, G. (2007). A knowledge, attitude and practices study of the issues of climate change/variability impacts and public health in Trinidad and Tobago, and St. Kitts and Nevis. *West Indian Medical Journal, 56*(2), 115-121.

Ribot, J. (2013). Vulnerability does not just fall from the sky: Toward multi-scale pro-poor climate policy. In *Handbook on climate change and human security*. Edward Elgar Publishing.

Richmond, C., Elliott, S., Matthews, R., & Elliott, B. (2005). The political ecology of health: perceptions of environment, economy, health and well-being among 'Namgis First Nation. *Health and Place*, *11*(4), 349–365. https://doi.org/10.1016/j.healthplace.2004.04.003

Schnitter, R., & Berry, P. (2019). The Climate Change, Food Security and Human Health Nexus in Canada: A Framework to Protect Population Health. *International journal of environmental research and public health*, *16*(14), 2531.

Schnitter, R., Verret, M., Berry, P., Chung Tiam Fook, T., Hales, S., Lal, A., & Edwards, S. (2019). An assessment of climate change and health vulnerability and adaptation in Dominica. *International journal of environmental research and public health*, *16*(1), 70.

Schwanen, T., & Atkinson, S. (2015). *Geographies of wellbeing: an introduction.(Report)*. *181*(2).

Sealy, D. (2017). Vegetables 'price hike'. 201. *Nation News*, **25 November, 2017.** Retrieved from https://www.nationnews.com/nationnews/news/104225/vegetables-price-hike on 4 October 2019.

Simpson, M. C., Clarke, J., Scott, D. J., New, M., Karmalkar, A. V., Day, O. J., . . . Charles, S. (2012). *CARIBSAVE Climate Change Risk Atlas - Barbados.* DFID, AusAID and The CARIBSAVE Partnership.

Smit, B., Burton, I., Klein, R., & Street, R. (1999). The Science of Adaptation: A Framework for Assessment. *Mitigation and Adaptation Strategies for Global Change, 4*(3), 199-213.

Smit, B., & Pilifosova, O., (2001). Adaptation to climate change in the context of sustainable development and equity. In: McCarthy, J.J., Canziani, O., Leary, N.A., Dokken, D.J., White, K.S. (Eds.), Climate Change 2001: Impacts, Adaptation and

Smit, B., & Pilifosova, O. (2003). Adaptation to climate change in the context of sustainable development and equity. *Sustainable Development, 8*(9), 9.

Smit, B., & Wandel, J. (2006). Adaptation, adaptive capacity and vulnerability. *Global environmental change, 16*(3), 282-292.

Smith, K.R., A.Woodward, D. Campbell-Lendrum, D.D. Chadee, Y. Honda, Q. Liu, J.M. Olwoch, B. Revich, and R. Sauerborn, (2014). Human health: impacts, adaptation, and co-benefits. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A. N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L.White

Smith, K. R., Woodward, A., Lemke, B., Otto, M., Chang, C. J., Mance, A. A., ... & Kjellstrom, T. (2016). The last Summer Olympics? Climate change, health, and work outdoors. *The Lancet, 388*(10045), 642-644.

Song, G., Li, M., Fullana-i-Palmer, P., Williamson, D., & Wang, Y. (2017). Dietary changes to mitigate climate change and benefit public health in China. *Science of the Total Environment, 577*, 289-298.

Springmann, M., Mason-D'Croz, D., Robinson, S., Garnett, T., Godfray, H. C. J., Gollin, D., ... & Scarborough, P. (2016). Global and regional health effects of future food production under climate change: a modelling study. *The Lancet, 387*(10031), 1937-1946.

Sterk, A., de Man, H., Schijven, J. F., de Nijs, T., & de Roda Husman, A. M. (2016). Climate change impact on infection risks during bathing downstream of sewage emissions from CSOs or WWTPs. *Water research*, *105*, 11-21.

Stiglitz, J., J. Fitoussi and M. Durand (2018), *Beyond GDP: Measuring What Counts for Economic and Social Performance*, OECD Publishing, Paris, https://doi.org/10.1787/9789264307292-en.

Taylor, M.A., Chen, A.A., and Bailey, W. (2009). Review of health effects of climate variability and climate change in Caribbean. Retrieved from http://dms.caribbeanclimate.bz/php/gateway/info.php on 23/01/17

Thomas, F., Sabel, C. E., Morton, K., Hiscock, R., & Depledge, M. H. (2014). Extended impacts of climate change on health and wellbeing. *Environmental Science & Policy*, *44*, 271-278.

The World Factbook. (2018). Barbados demographics profile 2018. Washington, DC: Central Intelligence Agency.

Theodore-Gandi, B., & Barclay, G. (2008). Protecting and improving the health of the Caribbean people. *American Journal of Public Health, 98*(4), 586-588. doi:10.2105/AJPH.2007.131086

Tompkins, E. L., Adger, W. N., Boyd, E., Nicholson-Cole, S., Weatherhead, K., & Arnell, N. (2010). Observed adaptation to climate change: UK evidence of transition to a well- adapting society. Global Environmental Change,20(4), 627-635.

Trotman, A. R., Mahon, R., Shumake-Guillemot, J., Lowe, R., & Stewart-Ibarra, A. M. (2018). Strengthening Climate Services for the Health Sector in the Caribbean. *Bulletin of the World Meteorological Organization, 67(2)*.

UNESCO Institute for Statistics (UNESCO). (2020). Barbados – Education and Literacy. Retrieved from http://uis.unesco.org/en/country/bb on 10/03/2020.

UNFCCC. (2015, December). *Adoption of the Paris Agreement and Proposal by the President. Proceedings from the Paris Climate Conference – November, 2015*. United Office at Geneva. Geneva, Switzerland.

United Nations Conference on Environment and Development. (1993). *Agenda 21 : programme of action for sustainable development ; Rio Declaration on Environment and Development ; Statement of Forest Principles: The final text of agreements negotiated by governments at the United Nations Conference on Environment and Development (UNCED), 3-14 June 1992, Rio de Janeiro, Brazil*. New York, NY: United Nations Dept. of Public Information.

United Nations. (1994). *Report of the Global Conference on the Sustainable Development of Small Island Developing States: Bridgetown, Barbados, 26 April-6 May 1994*. (A/CONF.167/9 United Nations publication sales no. 94.I.18). New York, NY. Retrieved from: http://www.preventionweb.net/files/resolutions/N9427699.pdf

United Nations. (2019). *The Sustainable Development Goals Report 2019.* UN, New York, NY. https://doi.org/10.18356/55eb9109-en.

Unwin, N.; Rose, A.; George, K.; Hambleton, I. & Howitt, C. (2015). The Barbados Health of the Nation Survey: Core Findings. Chronic Disease Research Centre, The University of the West Indies and the Barbados Ministry of Health: St. Michael, Barbados.

U.S. Global Change Research Program (USGCRP). (2016). *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment*. Crimmins, A., J. Balbus, J.L. Gamble, C.B. Beard, J.E. Bell, D. Dodgen, R.J. Eisen, N. Fann, M.D. Hawkins, S.C. Herring, L. Jantarasami, D.M. Mills, S. Saha, M.C. Sarofim, J. Trtanj, and L. Ziska, Eds. U.S. Global Change Research Program, Washington, DC, 312 pp. http://dx.doi.org/10.7930/J0R49NQX

Uyarra, M. C., Cote, I. M., Gill, J. A., Tinch, R. R., Viner, D., & Watkinson, A. R. (2005). Island-specific preferences of tourists for environmental features: implications of climate change for tourism-dependent states. *Environmental conservation*, *32*(1), 11-19.

Wang, Q., Gao, C., Liu, H., Li, W., Zhao, Y., Xu, G., ... & Lang, L. (2017). Hypertension modifies the short-term effects of temperature on morbidity of haemorrhagic stroke. *Science of The Total Environment*, *598*, 198-203.

Watts, N., Adger, W. N., Agnolucci, P., Blackstock, J., Byass, P., Cai, W., ... & Cox, P. M. (2015). Health and climate change: policy responses to protect public health. *The Lancet*, *386*(10006), 1861-1914.

Watts, N., Adger, W. N., Ayeb-Karlsson, S., Bai, Y., Byass, P., Campbell-Lendrum, D., ... & Depoux, A. (2017a). The Lancet Countdown: tracking progress on health and climate change. *The Lancet*, *389*(10074), 1151-1164.

Watts, N., Amann, M., Ayeb-Karlsson, S., Belesova, K., Bouley, T., Boykoff, M., ... & Cox, P. M. (2018). The Lancet Countdown on health and climate change: from 25 years of inaction to a global transformation for public health. *The Lancet*, *391*(10120), 581-630.

Watts, N., Amann, M., Arnell, N., Ayeb-Karlsson, S., Belesova, K., Berry, H., ... & Campbell-Lendrum, D. (2018). The 2018 report of the Lancet Countdown on health and climate change: shaping the health of nations for centuries to come. *The Lancet*, *392*(10163), 2479-2514.

WHO. (1948). Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June, 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948.

World Bank (2015). Barbados – Data. Retrieved from http://data.worldbank.org/country/barbados

World Bank. (2018). Country Profile: Barbados. Retrieved from https://databank.worldbank.org/views/reports/reportwidget.aspx?Report_Name=CountryProfile&Id=b450fd57&tbar=y&dd=y&inf=n&zm=n&country=BRB on 30/10/2019

World Health Organisation (WHO). (2005). Preventing chronic diseases —a vital investment. WHO: Geneva: Switzerland.

World Health Organisation (WHO). (2013a). Protecting health from climate change: Vulnerability and adaptation. *World Health Organisation.* Geneva: Switzerland Retrieved from http://wwww.who.int/globalchange/resources/adaptationresources/en/ on 17/08/17

World Health Organization (WHO). (2013b). Global action plan for the prevention and control of noncommunicable diseases 2013-2020. Geneva, Switzerland.

World Health Organisation (WHO). (2014a). Quantitative risk assessment of the effects of climate change on selected causes of death, 2030s and 2050s. Geneva: Switzerland

World Health Organization. (2014b). WHO guidance to protect health from climate change through health adaptation planning. WHO: Geneva, Switzerland.

World Health Organization. (2014c). *Global status report on noncommunicable diseases 2014* (No. WHO/NMH/NVI/15.1). WHO: Geneva, Switzerland. Retrieved from https://apps.who.int/iris/bitstream/handle/10665/148114/9789241564854_eng.pdf on 4 October 2019.

World Health Organization. (2014d). Health in all policies: Helsinki statement. Framework for country action.

World Health Organisation (WHO). (2015). - Operational framework for building climate resilient health systems. Geneva: Switzerland

World Health Organization (WHO). (2016). World health statistics 2016: monitoring health for the SDGs sustainable development goals. Geneva, Switzerland, pp. 29-39.

World Health Organization (WHO). (2018a) Climate change and health fact sheet, February 2018

World Health Organization (WHO). (2018b). Non-communicable diseases country profiles 2018. Geneva: Switzerland, License CC BY-NCSA 3.0 IGO.

World Health Organization. (2018c). Climate change and health in Small Island Developing States: a WHO special initiative, Pacific island countries and areas.

World Health Organization (WHO). (2019a). Ten Threats to Global Health in 2019. Retrieved from https://www.who.int/emergencies/ten-threats-to-global-health-in-2019 on 4 October 2019.

World Health Organization (WHO). (2019b). Barbados – meeting the health needs of its adolescents. WHO/MCA/19.04 CC BY-NC-SA 3.0 IGO licence.

World Health Organization & United Nations Development Programme. (2017). The investment case for non-communicable disease prevention and control in Barbados. World Health Organization.

Younger, M., Morrow-Almeida, H. R., Vindigni, S. M., & Dannenberg, A. L. (2008). The built environment, climate change, and health: opportunities for co-benefits. *American journal of preventive medicine*, *35*(5), 517-526.

Zheng, J., Jiang, P., Qiao, W., Zhu, Y., & Kennedy, E. (2016). Analysis of air pollution reduction and climate change mitigation in the industry sector of Yangtze River Delta in China. *Journal of Cleaner Production*, *114*, 314-322

Appendix A: Interview Guide for In-depth Interview with Lay Citizens

Study Title: Exploring the relationship between climate change, health and wellbeing in the Caribbean: a case study of Barbados		
Purpose: *To understand how individuals perceive their wellbeing and what do they think contributes to or detracts from their wellbeing*		
Construct	**Question**	**Probe (if needed)**
Assessment of life in Barbados	I am just going to give you a couple of minutes to reflect upon your wellbeing/experiences living in Barbados. Let's start the discussion by talking about whether you think Barbados is a good place to live and what contributes to this?	Why? What are some of the positive things about living in this country? Now let's talk about some of the negative aspects of living in this country? If there was anything you could change about your country to make it better, what would it be?
Perceptions on health in Barbados • Meaning • Priorities	Let's now move on to discuss the health and wellbeing of Barbados. What do you think makes a person healthy? What about a country? Do you think Barbados is a healthy country? What do you think are the major health issues facing the country?	Explain NCDs, metal health, infectious diseases etc.

	What issues are most important to you? Why? Is there anything you would change in your country to make it healthier?	
Community/Social factors	Do you think there is a strong sense of community in Barbados? What are some of the things that make for a strong sense of community? Do you think there has been a change in the sense of community over time? What types of changes have you observed? /How have these changed over time? Do you think neighbours and community members can rely on each other for help when they need it? Are there many opportunities for social interactions within communities? Are there any emerging social issues of concern you would like to raise? What would you change in your community to strengthen it?	Good/bad/segregated/cohesive? If yes…when was this change observed? Family dynamics/ social interactions within communities, safety, trust Financial, help around the house, childcare, assistance to the elderly Volunteer, church groups, sport groups, community organizations? Community activities, events, culture, economy, interests, goals

Economic factors	How would you describe the economy of your country? Have the types of employment/ ways of earning a living changed over time? Do you think some economic sectors are more important/more stable/better than others? What do you think about the opportunities for employment? What changes would you like to see in regards to employment opportunities?	Poor/good stable/unstable Economic opportunities/ Liveable wages / cost of living Compared with the past? How does this affect health and wellbeing? How has it changed? When? Why? Is this good or bad? Tourism, agriculture, construction, finance and businesses services Why might this be/Why do you think this is the case? What factors would work to strengthen the economy of your country? Job creation and diversity, training, educations, investment into small business owners, Where would you like to see investments to improve employment/economic opportunities?
Political situation, government, decision making	Is there enough political engagement in the country? Are people engaged enough in the political process in their communities? How do you engage in political matters? What avenues are there for participation?	 -Party meetings, voting, access to your member of parliament,

	Do you feel free to engage in political matters? Do feel it is worthwhile to engage in the political process?	Why, why not?
	Are there any concerns that you believe are not being addressed by political representatives?	Do you feel as though your opinions, values and concerns are heard and represented by politicians? Are you concerns reflected on the political platforms/agendas of representatives?
	What do you do if you are unhappy about a government decision?	Is this effective?
Physical environment - Defining the physical environment - (Use of) Natural Resources - Environmental Challenges	What do you understand to be meant by the physical environment?	Natural and man-made environment? What do you think of? Sea, sand, soil, trees/vegetation/mangroves, water features, physical infrastructure, roads, parks, pastures,
	What do you consider to be the natural resources of Barbados?	Beaches/coastline, mangroves, agricultural land, fisheries, coral reefs
	How do you use the natural resources? What do you enjoy most about your natural environment?	Leisure & Enjoyment, Health, economic, employment, natural storm buffers,
	What are the main changes you have observed in the natural environment over the last 20 years?	Explain,

	How would you compare the quality of the physical environment today with the state of the environment 20 years ago? Are the natural resources protected when decisions are being made about economic development or environmental resource use? What are some of the environmental issues/challenges facing this country? Describe	By whom/what body? How is this related to health and wellbeing? How have you adapted to these challenges? How has the government responded to these challenges? Did you/do you find these responses effective?
Lifestyle behaviour	What behaviours do you think contribute to a healthy life? What types of food are most commonly consumed? What do you consider to be healthy food? Do you think there is enough physical activity? Is cigarette smoking/alcoholism a concern in your country? Who are most affected? Are there enough resources promoting healthy lifestyles?	Are healthy foods readily available? If no, why do you think this is? How would you improve this? Are there facilities/infrastructure available to support active lifestyles? Are conditions conducive to this? If yes, what do you think are the factors that contribute to this behaviour? What type are resources are available?
Health services	What do you think are some of the most important issues regarding health care services?	Considering what you have described, would you consider the health care system effective? If yes/no, why?

	What are some of the challenges regarding health care services that you experience?	Accessibility, drug availability, health insurance, specialized care and waiting time? How have you adapted? Are there alternatives?
CLIMATE CHANGE		
Knowledge of climate change	Let's move on to discuss climate change. What do you know about climate change?	What is climate change? Is there a difference between climate change and global warming? Weather and climate? What causes climate change? What are some of the impacts?
Climate change, health and wellbeing	Could you describe how you are affected by weather and climate? Can you think of anyway the climate would affect…?	Relate to the factors discussed above. Economy Culture Community cohesiveness Lifestyle and behaviour
Perception of risk	Do you think climate change will affect Barbados? How?	Do you think it is a priority area of concern? Compared to …crime, economy, access to education etc.? Why/Why not?

	Do you **think** climate change will affect you or your family personally? Do your think climate change is an important issue for politicians, member of parliament?	Do you think it will have any effect on your health and wellbeing? How? Are you concerned? Do you think it is an immediate issue? What are you most worried about? Do you recall ever hearing them discuss this issue? Who, when, why do you think this is? Do you think Barbados is prepared for the impacts?
Source of information	Where do you get your information about climate change?	
General/concluding thoughts	Of the topics we have discussed today, what would you say are the most important issues you would like to reinforce? If there was anything you could change about your country to make life better, what would it be? Is there anything else you would like to add that we haven't already talked about?	

Interview: DEMOGRAPHIC INFORMATION SHEET

This sheet will provide us with some basic background information about you.

INSTRUCTIONS: Please answer the following questions in the spaces provided, circle or tick the most appropriate options.

1. Age:……

2. Are you: (please tick as necessary) □ Male □ Female

3. What is your occupation/professional background?.....

4. What is your highest level of education: (choose one)

☐ Primary school

☐ Secondary (CSEC – Caribbean Secondary Education Certificate Examinations)

☐ Post-secondary (CXC Caribbean Advanced Placement Examination)

☐ Tertiary – College/University

☐ Prefer not to answer

Thank you for taking the time to complete this questionnaire.

Appendix B: Theme Code Set for In-depth Interviews

(1) Overall assessment of life in Barbados

- Views on living in Barbados
  - Positive [P]
  - Negative [N]

(2) Perception of health and wellbeing in Barbados

- Barbados as a healthy country/healthy place to live
  - Yes [HCY]
  - No [HCN]
- Health issues of major importance in Barbados
  - NCDs [HI1]
  - Mental health [HI2]
  - Infectious diseases [HI3]
  - Other [HI4]
- Opportunities for improvement in health and wellbeing in Barbados? [OIH]

(3) Perception of Community and Social Factors

- Sense of community in Barbados
  - Strong [SC1]
  - Weak [SC2]
- Change in sense of community over time
  - Change
    - Family dynamics [CC1]
    - Social interactions within communities [CC2]
    - Safety [CC3]
    - Trust [CC4]
  - No change [CC5]
- Opportunities for social interaction in Barbados
  - Volunteer groups [SI1]
  - Church groups [SI2]
  - Sport groups [SI3]
  - Community organizations [SI4]
  - Other [SI5]

- Emerging social issues of concern [ESI]
- Opportunities for improvement in communities [OIC]

(4) Perception of Economic factors

- Views on the economy
    - Poor/unstable [VE1]
    - Good/stable [VE2]
    - Economic opportunities [VE3]
    - Liveable wages [VE4]
    - Cost of living [VE5]
    - Economic sectors viewed as most stable [VE6]
    - Economic opportunities available to youth [VE7]
- Economy now vs economy past
    - No change [ENP1]
    - Better then [ENP2]
    - Better now [ENP3]
    - Changes in types of employment [ENP4]
- Relationship between economy and wellbeing [REW]
- Changes desired related to employment opportunities
    - Job creation and diversity [EO1]
    - Training [EO2]
    - Education [EO3]
    - Investment into small business owners [EO4]

(5) Perceptions of political situation, government, decision making

- Level of political engagement
    - High [PE1]
    - Low [PE2]
- Avenues for political engagement [APE]
- Freedom to engage politically
    - Yes [PF1]
    - No [PF2]
- Is it worthwhile/effective to engage in political matters?
    - Yes (why) [WE1]
    - Now (why) [WE2]

(6) Perceptions on the Physical Environment

- Understanding/meaning of the physical environment [PE]

- Natural resources of Barbados
    - Resources identified [NR1]
    - No resources identified [NR2]
- Use of natural resources
    - Uses identified [UNR1]
    - No uses identified [UNR2]
- Changes observed in the natural environment over the past 20 years
    - Change [NE1]
    - No change [NE2]
- Quality of the environment now vs 20 years ago
    - Better [QE1]
    - Worse [QE2]
    - No change [QE3]
- Environmental issues/challenges facing the country
    - Issues identified [EC1]
    - No issues identified [EC2]

(7) Perceptions on lifestyle behaviour

- Views on behaviours that contribute to a healthy lifestyle [BHL]
- Adequate exposure/access to resources that promote a healthy lifestyle
    - Yes [HL1]
        - Types of resources available [HL1a]
    - No [HL2]
- Adequate physical activity
    - Yes [PA1]
    - No [PA2]
- Types of food commonly consumed by Barbadians [FC]
- Foods considered healthy [HF]

(8) Perception of Health Services

- Issues regarding health care services [HS]
- Challenges experienced when accessing health care services [CHS]

(9) Knowledge and perceptions of climate change

- Knowledge of climate change
    - Yes [CK1]

    - No [CK2]
    - Unclear [CK3]
- Perception of risk to Barbados
    - Climate change will affect Barbados [RP1]
    - Climate change will not affect Barbados [RP2]
- Perception of risk to self and family
    - Climate change will affect individual and family [RPI1]
    - Climate change will not affect individual and family [RPI2]
- Importance of climate change to politicians or on political agendas
    - Important [CCI1]
    - Not important [CCI2]
- Source of information on climate change
    - Local media [SI1]
    - International media [SI2]
    - Internet [SI3]
    - Reading/personal research [SI4]
- Information on climate change readily available
    - Yes [AI1]
    - No [AI2]

Appendix C: Semi-structured Interview Guide with Key informants

(NGO representatives, health professionals at primary, secondary and tertiary health institutions (physicians and nurses); personal trainers/fitness professionals; policy makers)

Study Title: Exploring the relationship between climate change, health and wellbeing in the Caribbean: a case study of Barbados		
Purpose: ***To gather insight from key health stakeholders about their perceptions and experiences with NCDs (current and future concerns); To provide an insight into the awareness and consideration of linkages between climate change and NCDs***		
Construct	Primary Question	Secondary Question/ Probe
Context	What is the full name of your organisation?	
	Can you tell me about the formation/history of your organisation?	What is its mandate? Has it changed over time?
	Can you tell me about yourself?	Can you describe your role in your role in your organisation? How long? What brought you to this position?
	What are [has been] some of the biggest health challenges you have observed over the years?	How have these changed over time? Which ones have changed?
	Are there any areas where you think Barbados has made great strides in improving health?	What lessons could be learned from this?
	Does your organisation cater to a certain demographic?	Children, elderly, working age Why? How?

Perception and experiences of climate change, health and NCDs	How has the burden of NCDs on the health care system changed over time? Are they any specific NCDs that you are concerned about? Is enough being done to address the prevalence of NCDs in Barbados? Are Barbadians sufficiently aware of the burdens of NCDs? Are you optimistic/pessimistic about reducing the burden of NCDs in Barbados?	What do you think is accounting for these changes? Why/Why not? What more could be done? What would you like to see done? What could be done/what has been done to increase awareness? If you had no barriers, how would you increase awareness? Why? How does/will/can your organisation contribute to this?
	Do you think climate change is a problem? Are you aware of health impacts of climate change? Are you aware of any linkages between NCDs and climate change? If your organisation was aware of the impacts of climate change on NCDs, would climate change be incorporated into you planning?	When you hear climate change impacts in Barbados, what comes to mind? What are they? Air pollution, Heat stress? Food insecurity? Extreme impacts and mental stress / injuries (diabetics)? Do you think this is something that would be beneficial? Why, why not? What information would your organisation need to make this happen? Do you think this would incentivise people to pay attention to climate change of NCDs?
	In your role as a personal trainer/fitness professional, do you encounter many people with NCDs?	Do you require them to disclose this information? How does this affect your training regime?

	Do you that climate change would affect NCD sufferers and persons at risk of developing NCDs?	How do you think this would affect their commitment to active lifestyles? How would this affect your training regimes?
Policy Context	What health policies are there in place to reduce the burden of NCDs? Do you know how these policies are drafted, agreed upon and implemented? How effective do you think current health policies are at effectively addressing NCDs? Are these policies helpful to you in your role/your organisation?	Are there any changes that you think would help improve this situation? Is this information readily available?
	What are some of the perceived facilitators and barriers to preventing, diagnosing and managing NCDs in Barbados?	In your opinion is, there a place for climate change on the agenda?
General/Concluding thoughts	Is there anything else you would like to add that we have not already discussed? Is there anyone else you think we should talk to NCDs or climate change and health?	

Appendix D: Theme Code Set for Key-informant Interviews

[1] Background

- Length of time in profession
  - > 1 year [LTP1]
  - 1 - 2 years [LTP2]
  - 3 – 5 years [LTP3]
  - < 5years [LTP4]
- Level of organisation
  - Local [OL1]
  - National [OL2]
  - Regional [OL3]
  - International [OL4]
- Focus/role of organisation
  - Health advocacy [FO1]
  - Health literacy [FO2]
  - Prevention of NCDs [FO3]
  - Diagnosis of NCDs [FO4]
  - Treatment of NCDs [FO5]
  - Data collection/surveillance [FO6]
  - Combination of all [FO7]
- Demographic catered to by organisation/target audience
  - Children [DO1]
  - Elderly [DO2]
  - Working aged [DO3]
  - Private sector [DO4]
  - Public sector [DO5]
  - Civil society [DO6]
- Health improvements in Barbados
  - Access to (free) health care facilities [HIB1]
  - Access to free/cost-effective medications [HIB2]
  - (Strong) leadership [HIB3]

[2] Perceptions and experiences of NCDs

- Specific NCDs of greatest concern
  - Cardiovascular diseases [GC1]

- Diabetes [GC2]
- Stroke [GC3]
- Hypertension [GC4]
- Cancer [GC5]
- Mental health [GC5]
- Risk factors (e.g. obesity, physical inactivity) [GC6]

- Vulnerable groups
  - Children [VG1]
  - Elderly [VG2]
  - Low-socioeconomic status [VG3]
- Burden of NCDs in Barbados
  - Increasing
  - Decreasing
  - No change
  - Economic burden (individual, family, society)
  - Decreased productivity
  - Disability

- Measures to address the prevalence of NCDs[5]
  - Health literacy [MAP1]
  - Health advocacy [MAP2]
  - Access to (free) health care facilities [MAP3]
  - Access to free/cost-effective medications [MAP4]
  - Legislation(s) [MAP5]
  - Screening and detection [MAP6]
  - Commitments to programmes, processes, structures for the prevention and control of NCDs [MAP7]
  - Multi-sectoral collaborations [MAP8]
  - Other (more to be done/not enough) [MAP9]

- Challenges to tackling the burden of NCDs
  - Competing goals from business/private sector with public health goals [CTB1]
  - Sedentary lifestyles [CTB2]
  - Perceptions about the cost of healthy diets [CTB3]
  - Cultural values [CTB4]
  - Greater focus on treatment/reliance on medications/ lack of attention to prevention [CTB5]
  - Ineffective polices [CTB6]

[5] Could also code this to identify measures aimed at prevention, detection and management

- Access to health care [CTB7]

- Views on reducing the burden of NCDs in Barbados
  - Optimistic [VRB1]
  - Pessimistic [VRB2]
  - Both [VRB3]

[3] Knowledge of Climate change

- Views on climate change as a problem in Barbados
  - Yes [CCP1]
  - No [CCP2]
  - Unsure/Unaware of climate change [CCP3]
- Climate change impacts associated with Barbados
  - Sea-level rise [CIB1]
  - Increased temperatures [C1B2]
  - Extreme weather events [CIB3]
- Views on health impacts of climate change
  - At least one example [HIC1]
  - 2 - 3 [HIC2]
  - 4 or more [HIC3]
  - Unaware
- Awareness of linkages between NCDs and climate change
  - Some awareness [LCC1]
  - Very aware [LCC2]
  - Unaware [LCC3]
- Willingness to incorporate climate change impacts on NCDs into future planning
  - There is a place for climate change [FP1]
  - There is no place for climate change [FP2]

[4] Policy Context

- Policies/legislations in place to reduce burden of NCDs
  - Aware of policies [PRB1]
  - Unaware if policies [PRB2]
  - Unsure [PRB3]
- Policy drafting and implementation process
  - Aware of the process [PDP1]
  - Unaware of the process [PDP2]
  - Unaware but interested [PDP3]

- Unsure [PDP4]

- Views on the effectiveness of these polices/legislations
  - Effective [PE1]
  - Non -effective [PE2]
  - Unaware of any policies [PE3]

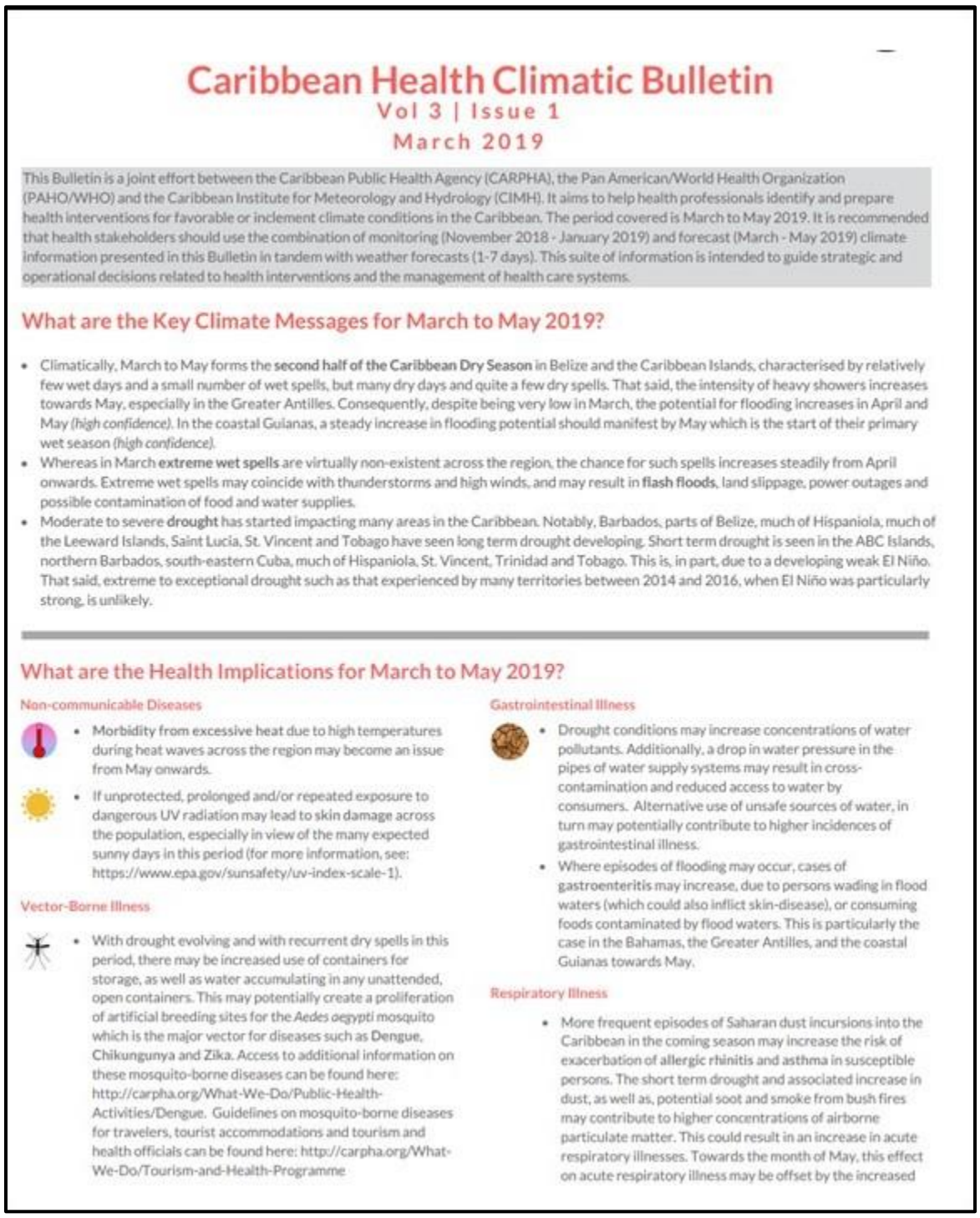
[5] Facilitators and barriers to preventing, diagnosing and managing NCDs

- Facilitators [F]
- Barriers [B]

Appendix E: Questions for Document Review

1. Title of document
2. Leve of publication (i.e. national, regional, international)
3. What is the timeline for the creation of these policies and what actions or circumstances precipitated their creation (Year of publication)?
4. Who are the individuals, or organisations responsible for the creation of these policies (Authorship)?
5. Type pf document (i.e. guidelines, strategic plan, report)
6. What is the purpose of the document?
7. Who do these policies target (Target audience)?
8. Timeframe for Implementation?
9. Are they any refences to other documents/supplemental documents?

Appendix F: Example of Available Climate Tools for use in Health



Caribbean Health Climatic Bulletin

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March 2019

This Bulletin is a joint effort between the Caribbean Public Health Agency (CARPHA), the Pan American/World Health Organization (PAHO/WHO) and the Caribbean Institute for Meteorology and Hydrology (CIMH). It aims to help health professionals identify and prepare health interventions for favorable or inclement climate conditions in the Caribbean. The period covered is March to May 2019. It is recommended that health stakeholders should use the combination of monitoring (November 2018 - January 2019) and forecast (March - May 2019) climate information presented in this Bulletin in tandem with weather forecasts (1-7 days). This suite of information is intended to guide strategic and operational decisions related to health interventions and the management of health care systems.

What are the Key Climate Messages for March to May 2019?

- Climatically, March to May forms the **second half of the Caribbean Dry Season** in Belize and the Caribbean Islands, characterised by relatively few wet days and a small number of wet spells, but many dry days and quite a few dry spells. That said, the intensity of heavy showers increases towards May, especially in the Greater Antilles. Consequently, despite being very low in March, the potential for flooding increases in April and May *(high confidence)*. In the coastal Guianas, a steady increase in flooding potential should manifest by May which is the start of their primary wet season *(high confidence)*.
- Whereas in March **extreme wet spells** are virtually non-existent across the region, the chance for such spells increases steadily from April onwards. Extreme wet spells may coincide with thunderstorms and high winds, and may result in **flash floods**, land slippage, power outages and possible contamination of food and water supplies.
- Moderate to severe **drought** has started impacting many areas in the Caribbean. Notably, Barbados, parts of Belize, much of Hispaniola, much of the Leeward Islands, Saint Lucia, St. Vincent and Tobago have seen long term drought developing. Short term drought is seen in the ABC Islands, northern Barbados, south-eastern Cuba, much of Hispaniola, St. Vincent, Trinidad and Tobago. This is, in part, due to a developing weak El Niño. That said, extreme to exceptional drought such as that experienced by many territories between 2014 and 2016, when El Niño was particularly strong, is unlikely.

What are the Health Implications for March to May 2019?

Non-communicable Diseases

- Morbidity from excessive heat due to high temperatures during heat waves across the region may become an issue from May onwards.
- If unprotected, prolonged and/or repeated exposure to dangerous UV radiation may lead to skin damage across the population, especially in view of the many expected sunny days in this period (for more information, see: https://www.epa.gov/sunsafety/uv-index-scale-1).

Vector-Borne Illness

- With drought evolving and with recurrent dry spells in this period, there may be increased use of containers for storage, as well as water accumulating in any unattended, open containers. This may potentially create a proliferation of artificial breeding sites for the *Aedes aegypti* mosquito which is the major vector for diseases such as Dengue, Chikungunya and Zika. Access to additional information on these mosquito-borne diseases can be found here: http://carpha.org/What-We-Do/Public-Health-Activities/Dengue. Guidelines on mosquito-borne diseases for travelers, tourist accommodations and tourism and health officials can be found here: http://carpha.org/What-We-Do/Tourism-and-Health-Programme

Gastrointestinal Illness

- Drought conditions may increase concentrations of water pollutants. Additionally, a drop in water pressure in the pipes of water supply systems may result in cross-contamination and reduced access to water by consumers. Alternative use of unsafe sources of water, in turn may potentially contribute to higher incidences of gastrointestinal illness.
- Where episodes of flooding may occur, cases of gastroenteritis may increase, due to persons wading in flood waters (which could also inflict skin-disease), or consuming foods contaminated by flood waters. This is particularly the case in the Bahamas, the Greater Antilles, and the coastal Guianas towards May.

Respiratory Illness

- More frequent episodes of Saharan dust incursions into the Caribbean in the coming season may increase the risk of exacerbation of allergic rhinitis and asthma in susceptible persons. The short term drought and associated increase in dust, as well as, potential soot and smoke from bush fires may contribute to higher concentrations of airborne particulate matter. This could result in an increase in acute respiratory illnesses. Towards the month of May, this effect on acute respiratory illness may be offset by the increased