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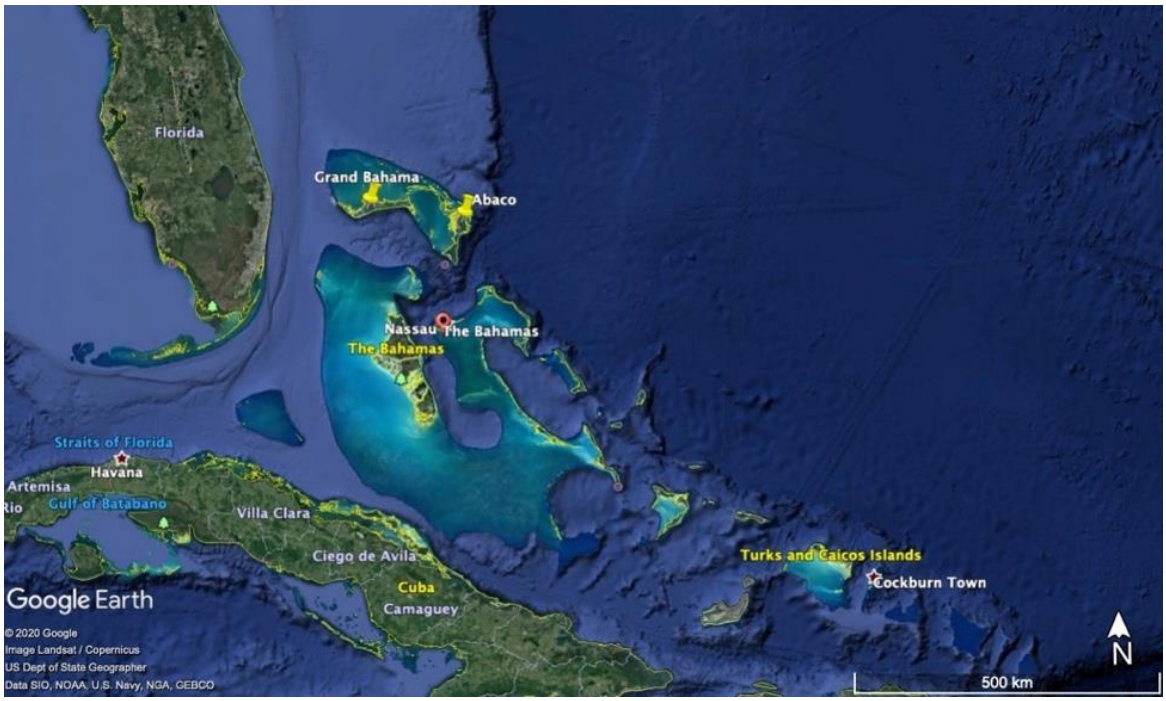
Resilient Disaster Recovery

An exploration of operationalizing climate change adaptation measures in disaster recovery at the community level on Grand Bahama and Abaco



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Abstract

This explorative case-study examines the dynamics of operationalizing climate change adaptation (CCA) measures in the aftermath of climate change induced natural disaster at the community level in a low-lying coastal Nation State with fragile institutional capacity. It explores the roles and responsibilities different stakeholder groups take and identifies constraints and facilitators for operationalizing CCA measures in disaster recovery to ultimately explore leverage points or pathways towards greater integration of CCA measures in the phase of disaster recovery. This is achieved through fieldwork and 20 in-depth interviews with key stakeholders such as government representatives, community leaders, private enterprise, and local and international NGOs. The study finds that stakeholders involved in disaster recovery have significant potential to more effectively integrate CCA measures through capacity building recovery approaches via community empowerment and community-integration. It highlights the necessity for decentralizing key water, energy, and food systems, and the key role of education and skill-building alongside devolution of decision-making and implementation to the local level.

Keywords: Climate Change Adaptation, Resilience, Disaster Recovery, Decentralization, Community, Build Back Better

Executive Summary

As global average temperatures reach 1.5C, slow and rapid onset hazards such as coastal erosion, sea-level rise, forest fires, and oceanic storm events will become more frequent, and more intense (IPCC, 2018). As a result, climate change impacts pose existential threats for low-lying Nation States with low institutional capacity, defined e.g. by "vulnerability to humanitarian crises (including slow and rapid onset disasters resulting from natural hazards); underdevelopment; political instability; lack of security; lack of legitimacy and authority; lack of political commitment of a government to perform its duties; lack of capacity to deliver basic services" (Faria 2011, *cited in* Hamza et al., 2012, p.6). The World Bank estimates the global economy will lose $520 billion while 26 million people enter poverty as a result of natural hazards every year (UNISDR, 2019a). It is therefore necessary to 'build resilience' to impacts through climate change adaptation (CCA).

CCA aims "to reduce the vulnerability of communities to hazards by improving the ability to better **anticipate**, **resist**, and **recover from** them" (ACT et al., 2015, p. 171). This can be achieved by minimizing exposure to hazards and improving adaptive capacity; the "ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences" (IPCC, 2014, p. 1758).

However, for many low-lying Nation States with low institutional capacity, the onslaught of climate change impacts prevents preventative action, and there is therefore a need to understand how CCA measures such as coastal setbacks, installation of microgrids, or planting coastal protective species, can be operationalized in the time of disaster recovery. Nevertheless, climate change impacts vary between different localities due to local vulnerability determinants that exacerbate the consequences of natural disasters. It is therefore suggested that the implementation of CCA measures (*see Table 1*) must occur at a municipal, city, or community-level, with strong financial, institutional, and knowledge-based support from central government agencies (Dodman & Mitlin, 2013; Nalau et al., 2015). In Nation States with low institutional capacity where the operationalization of both CCA measures and disaster recovery presents a significant challenge, it is argued that creative stakeholder partnerships and community-centered response is necessary (Chen et al., 2013; UNISDR, 2019).

As a result, the choices made during disaster recovery and rebuilding can have fundamental long-term effects that may either create more robust climate resilient communities, have the communities return to the same state, or worse, become even more vulnerable to future climate change impacts than before. The ways different stakeholders such as community leaders, local and international NGOs, state bodies, and private actors influence these choices may be instrumental to ensure more climate change resilient recovery, both in terms of infrastructure, livelihood, and environment. However, this operationalization and integration remains presently undefined, and previous studies often fail to include social vulnerability determinants and locally contextualized barriers and enablers (Alves et al., 2020; Lahsen et al., 2010); it is therefore stressed that a greater amount of empirical examples are needed to understand how integration can occur, and CCA can be operationalized within the process of disaster recovery (Weir, 2020).

Consequently, this study undertakes this endeavor by investigating disaster recovery in the wake of Hurricane Dorian on Grand Bahama and Abaco Islands, The Bahamas. The Bahamas is an exemplifying case to undertake this investigation due to the extreme destruction caused by Dorian, the State's low institutional capacity for policy enforcement, and the influx of actors seeking to ensure 'resilient' recovery (Robinson, 2018).

Aim and Research Questions

The aim of this study is to contribute to understanding the process of operationalizing CCA measures in low-lying Nation States with fragile institutional capacity in the phase of disaster recovery. The aim is achieved by answering the following research questions:

1. What roles and responsibilities are stakeholders undertaking in the operationalization of CCA measures at a community-level on Grand Bahama and Abaco in the aftermath of Hurricane Dorian?

2. What are the key barriers and facilitators for operationalizing CCA measures at the community level on Grand Bahama and Abaco?

3. How can stakeholders better support the integration of CCA measures in disaster recovery in the short and long term?

Study Design and Research Methods

Two key research methods were followed to answer these questions. First, a thorough literature review of CCA and disaster risk reduction guidelines and their implementation as outlined by leading organizations and academic literature allowed the author to create a conceptual framework of what measures and processes may facilitate the operationalization of CCA, and how different stakeholders may influence this process (*see Chapter 3*). Second, a situated exploration of The Bahamian local context and vulnerability determinants was made to understand what pre-existing vulnerabilities create greater exposure to climate change impacts *(see Chapter 4)*. Third, a fieldtrip was conducted on Grand Bahama and Abaco where 20 in-depth semi-structured interviews with five community leaders, four local NGOs, three international NGOs, four private sector actors, and four government authorities involved in the recovery process allowed the author to provide recommendations for integration of CCA measures in the wake of disaster. Once the data was collected, interviews were transcribed in full and thematically analyzed through open-axial coding.

Major Findings

1. Stakeholder Roles and Responsibilities:

Community leaders had significant roles in the operationalization of CCA measures via advocacy for community needs, coordination with other stakeholders seeking to assist in recovery, management of NGO projects and community-run projects, and distribution of aid and materials for rebuilding. Depending on the skill-level, awareness, and connections of the leaders, CCA measures were included in recovery to a greater or lesser extent.

Local NGOs were instrumental in building adaptive capacity in political institutions and citizens via empowerment, education, and advocacy programs, as well as incentivizing nature-based solutions. They additionally played key roles in distributing recovery materials and provisions through informal community leadership structures and churches; thereby using contextual social and environmental knowledge to direct aid more effectively.

International NGOs played a key role in funding immediate humanitarian relief (water, food, energy and shelter) and infrastructural recovery by sourcing materials and workers to the islands. In a few cases they additionally built adaptive capacity via responsibility delegation to community leaders, skills-training, and provision of SME recovery grants.

Private sector actors were significant in funding, and through funding, shaping the type and degree of adaptation included in recovery. Some enterprises were additionally found to be influential in their business aims and visions by providing innovations in technology or business models that could be targeted to community implementors and increase local value creation.

Government actors influenced the prioritization and approval of CCA measures particularly through policy development, creation of new institutions, as well as more focused monitoring and enforcement of private resident rebuilding practices. Additionally, stakeholder coordination was a significant role due to the ability to include or exclude actors.

2. Barriers and Facilitators to Operationalizing CCA Measures:

Key barriers to the operationalization of CCA measures were predominantly funding deficiencies, a perceived high cost of sustainability, market-based approaches to recovery, poor stakeholder coordination, low trust, and overly centralized systems with weak local government.

Key facilitators were identified in partnerships founded upon community integration, citizen-led self-starting, planning and behavioral changes, and capability/empowerment-based projects that combined disaster recovery with community leadership, upskilling and education.

3. Integration of CCA Measures in Disaster Recovery in the Short and Long Term:

In the short term, the study finds integration of CCA measures (*See Table 1*) and disaster recovery requires immediate instatement of communication and coordination structures between government, informal community leaders, local & international NGOs and donors, capability-based approaches to recovery that discourage international NGOs from recovery through service provision and instead strengthens community-based autonomy in decision-making.

Long term *(see Table 9)*, The Bahamas can create wide-spanning contingency plans based, for instance, on cost-benefit analyses that include the social cost of adaptation, to immediately utilize the opportunity of the crisis and destruction to transform systems and building practices.

Table 9 Actions Stakeholders Can Take to Support the Integration of CCA measures in Disaster Recovery in the Short and Long term

	Short Term	**Long Term**
Government Actors	• Facilitate communication structures integrated with community support and local management entities. • Set standards for small-scale sustainable transitions and ensure they are monitored and enforced in recovery. This could include rebuilding on raised foundations, or supporting NGOs seeking to assist with solar and small scale wind-units by demanding and legislating for grid connections. • Employ a 'waste as resource' approach to debris removal, apply mulching machines to utilize fallen trees for soil. • Restore roads with porous materials, and consideration to road-side drainage opportunities. • Re-plant damaged soil stabilizing vegetation and mangroves.	• Focus on upskilling and supporting management at the community level, also through funding. • Implement of 'win-win' sustainable systems that also assist in disaster recovery e.g. solar microgrids and wind/wave combinations. • Support internal food security via aquaculture & warehouse farming. • Recover and replant mangroves, reefs and wetlands. • Implement green and blue belts to improve storm water drainage and ecosystem services. • Where set-backs are necessary, possibly, provide new property ownership leases for residents on generational land.

Private Sector	• Support sustainable diversified business recovery that integrates local resources and local income-sources. • Assist in financing CCA measures in recovery (see Appendix D). • Direct assistance through local entities.	• Use CSR to enhance local capacity by funding e.g. mangrove restoration projects or upskilling populations in leadership activities. • Ensure sustainable development practices are instilled that preserve ecosystem services.
International NGOs	• Ensure science-based environmental standards in recovery actions. • Empower local residents, experts, and NGOs via inclusion in direction of recovery projects and policies. • Consider material types and possible lock-ins created through material and repair provision. • Check if funding can be redirected from solely service provision to creating local capacity for sustained service provision.	• Assist governmental entities, community leaders, and local NGOs in implementing CCA measures (e.g. Appendix D). • Combine housing recovery with NBS such as green roofs, drainage canals, and 'green/blue' belts. • Assist in funding and building long-term water and energy solutions for settlements.
Local NGOs	• Engage with recovery-responsible government agencies and international NGOs to ensure local social and environmental expertise is incorporated into response. • Apply capability-based approaches to upskill and educate local residents, community leaders and developers in natural resource management. • Advocate and communicate to central government the needs of local communities.	• Build local leadership through empowerment projects for young men and women. • Assist governmental entities in building contingency plans for socially and environmentally 'resilient' recovery. • Assist community leaders in creating community-contingency plans. • Develop and nurture long term partnerships with International NGOs and Private Sector.
Community Leaders	• Create internal management structures with clearly defined roles and responsibilities for natural resource management. • Ensure equitable distribution of materials and resources used for recovery. • Advocate for ecosystem protections and community needs.	• Collaborate on community projects, e.g. maintenance of a community aquaponics facility, community garden, fish trap reinstallation. • Incentivize diversification of livelihood sources within the community. • Manage natural resources and ensure residents follow government standards e.g. via 'peer pressuring' or 'nudging'.

Source: Authors Own

Overall, the findings emphasize that stronger attention to educational systems and skill-building in key sectors such as construction, natural resource management, localized energy systems, logistics, budgeting and management, could significantly increase the adaptive capacity of rural coastal communities. Additionally, scenario planning and practicing roles and responsibilities could create practical preparedness for climate change impacts and their reduction. In combination, education and livelihood diversification could therefore be a significant leverage point for increasing adaptive capacity and operationalizing CCA measures.

The exploration additionally highlights a variety of 'wicked problems' that exist in disaster recovery, particularly in low-lying 'fragile' Nation States with low institutional capacity. It is for instance found that while government support and central state-driven development is key for longevity, the poor operation of the state alienates other stakeholders from collaboration and fosters a 'going it alone' stance, where non-government actors exclude the State, or actively seek to avoid engagement to ensure implementation of their projects. This contradiction was found to pose a serious blockage to building partnerships and a joint-response.

Implications for Practitioners: Policy-Makers, NGOs, and Private Enterprise

This study illustrates that disaster can be a catalyst for change, and that in order to ensure the implementation of CCA measures, disaster recovery *must* incorporate their operationalization. Yet, it is highlighted that this a highly complex process that includes a host of wicked problems and trade-offs. It is therefore necessary for stakeholders seeking to provide greater resilience in community recovery to invest time and resources into understanding localized vulnerability determinants in order to create contingency plans that account for necessary climate change adaptation measures beyond simply physical infrastructural improvements (see Chapter 3.2).

The findings of this study therefore suggest:

- In low-lying nations vulnerable to climate change impacts, National Adaptation Plans, disaster preparedness planning, emergency response units, and ministries must include guidance criteria and standard-setting, a stronger degree of legislatively supported responsibility delegation to local governmental entities, and clearer role specifications to be able to utilize large scale climate change disruptions as opportunities for transformation.

- Practitioners must 'do their homework' so to speak, to understand why, and how, to integrate CCA measures in disaster recovery projects within the local context to avoid mal-adaptations, negative side-effects, or possible material lock-ins. This may be helped by facilitating community-created contingency plans within each settlement, so leaders know how to direct stakeholders seeking to assist in recovery projects.

- Targeted citizen and stakeholder involvement could provide key leverages to make use of the NGO and donation influx to direct funding to projects that integrate resilience and adaptive capacity.

- Stakeholders could apply capability approaches to disaster recovery to ensure project longevity within the impacted communities and facilitate autonomous project creation, particularly, as education and skills were identified as a key gap for communities to autonomously direct recovery projects.

- Stakeholders to actively upskill and educate communities on key ecosystem service management and protection, construction materials and methods such as building on raised foundations etc., organizational management and logistics, infrastructural maintenance, development of renewable microgrids, community farming, and rainwater harvesting.

- Stakeholders to support 'win-win' solutions that both reduce green-house gases (GHG) and provide measures that ensure basic necessities such as water, energy, and food when centralized systems fail. This could help communities or regions better withstand and recover from extreme weather events. It could include actively fostering diversified and decentralized energy systems, including sustainable development principles in rebuilding, and implementing coastal setbacks or blue/green buffer zones.

Given the small scale of this study, it is necessary for future research to explore through practical experimentation how CCA measures such as coastal setbacks, green roofs, green and blue belts etc., can be integrated into disaster recovery processes.

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Abbreviations

ACT- Adapting to Climate Change in Time project

CCA- Climate Change Adaptation

DRR- Disaster Risk Reduction

DRA- Disaster Reconstruction Authority

EbA- Eco-system based adaptation

GBPA- Grand Bahama Port Authority Limited

GCA- Global Commission for Adaptation

GoTB- Government of The Bahamas

IFRC- International Federation of the Red Cross

NBS- Nature Based Solutions

NGO- Non-governmental Organization

OECD- Organization for Economic Cooperation and Development

PPP – Public Private Partnerships

PTSD- Post-traumatic stress disorder

RO- Reverse Osmosis

SIDS- Small Island Developing State

UN- United Nations

1 Introduction

1.1 Context

The days, weeks, and months after a natural disaster is a time that one can only imagine having gone through it. It is a time of devastation, grief, and desperation; it is a time of hopelessness. For many, facing the seemingly impossible reconstruction of everything, facing the loss of a home, a family history, and basic necessities such as water and power, life will never be the same. But with rising levels of carbon dioxide in the atmosphere causing anthropogenically induced climate disruption, the frequency and intensity of natural disasters will become a more common occurrence in the lives of people all over the world (IPCC, 2014). In fact, the World Bank estimates the global economy will lose $520 billion while 26 million people enter poverty as a result of natural hazards every year (UNISDR, 2019a). Thus, alongside climate change mitigation, measures must be adopted to better withstand these changes and reduce the impact of climate disruption through adaptation (IPCC, 2014).

Climate Change Adaptation (CCA) measures (*see Table 1*) support the adjustment of societal and natural systems to better withstand climate change impacts such as flooding, sea-level rise, temperature increase, forest fires, and more. The aim of CCA is "to reduce the vulnerability of communities to hazards by improving the ability to better **anticipate**, **resist**, and **recover from**" them (Adapting to Climate Change in time (ACT) et al., 2015, p.171). To reduce vulnerability, the IPCC argues Nation States must reduce exposure to possible impacts and increase adaptive capacity, which can be understood as "ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences" (IPCC, 2014, p. 1758). The outcome can then be summarized in the concept of '*Resilience*': "the ability of a system, community, or society to absorb or recover from change in a timely and efficient manner" (UNISDR, 2009, p.24).

As a result of the pressing nature of climate change impacts, a growing number of Nation States are implementing National Adaptation Plans (NAPs) or integrating Disaster Risk Reduction (DRR) and CCA strategies to 'build resilience' (Alves et al., 2020; Biesbroek et al., 2010; UN, 2015). Resilience-building measures include 'grey infrastructural interventions' such as the construction of flood walls, or the relocation of vulnerable infrastructure to higher ground; 'Nature Based Solutions' (NBS) in the form of natural storm barriers such as wetlands, mangroves, and coral reefs; and social policy interventions aimed at increasing institutional and local capacity to deal with the changes e.g. via livelihood improvement (Donovan & Mycoo, 2017; Global Commission on Adaptation (GCA), 2019). In fact, some scholars argue that "adaptation is as much about changing attitudes and behaviors, as finding technical solutions" (Dulal, Shah & Ahmad, 2009, p. 379).

Due to this relatively broad understanding of CCA measures and increasing adaptive capacity, it is found that specific policy solutions in the field of CCA are lacking, and that while global CCA or DRR tools and frameworks exist, effective implementation and locally contextualized measures are severely missing from National Adaptation Plans (NAPs), rendering them more or less symbolic, rather than actionable (Alves et al., 2020; Biesbroek et al., 2010; Lahsen et al., 2010; Wamsler et al., 2018). A recent study of NAPs from 13 different nations with wildly different governance structures showed that most NAPs refer to similar adaptation measures and implementation mechanisms in spite of their institutional structures and vulnerability factors differing hugely (Alves et al., 2020). Such vulnerability factors may include geography and topography, e.g. low-lying island nations and their vulnerability to sea-level rise; but vulnerability to climate change impacts is further exacerbated by socio-political or cultural factors, historical land-use practices and mismanagement of natural resources; the failure to implement and coordinate infrastructural and natural transitions;

inequitable distribution of resources, goods and opportunities, as well as low financial or political capacity (Hamza, Smith & Vivekananda, 2012; Jones, Oven, Manyena & Aryal, 2014; Trundle, Barth & Mcevoy, 2019; Ziervogel et al., 2017).

Exclusion of contextual vulnerability determinants in adaptation policy frameworks is then highly problematic, and it is stressed that without attention to them and the inter-actor power dynamics that shape them, CCA interventions will likely fail (Dulal et al., 2009; Hamza et al., 2012; Lahsen et al., 2010; Ribot, 2010). In this way, development, climate change mitigation, CCA, and DRR become inextricably linked, and it has been stressed that adaptation must be viewed as a set of interlinked problems that require linked solutions (Hamza et al., 2012; Wamsler, Brink & Rivera 2013).

1.2 Problem Definition

In the wake of natural disaster, these concepts and challenges are particularly salient as climate change vulnerable communities seek to implement recovery actions that will make them less susceptible to future climate change impacts. Whether conceptualized as 'build-back-better', 'disaster resilient recovery', 'disaster risk reduction in recovery' etc., the same outcomes are shared: to more effectively withstand climate change impacts by increasing the ability to anticipate, resist, and recover from impacts.

Yet, in Nation States with low institutional capacity, defined e.g. by a "vulnerability to humanitarian crises (including slow and rapid onset disasters resulting from natural hazards); underdevelopment; political instability; lack of security; lack of legitimacy and authority; lack of political commitment of a government to perform its duties; lack of capacity to deliver basic services" (Faria 2011*, cited in* Hamza et al., 2012, p.6), the operationalization and implementation of CCA measures is severely lacking. As a result, scholars and development institutions highlight the necessity for creative stakeholder collaborations and community-level implementation to more effectively provide the policy spaces in which adaptive capacity can be strengthened (Trundle et al., 2019; Vachette, 2017; Ziervogel et al., 2017, UN, 2015).

However, the understanding and development of such systems in low-lying coastal nations with low institutional capacity remains in infant stages and only a few examples exist, or explore how CCA measures can be more effectively implemented at the community-level with due account taken to the roles and possible influences of state actors, private actors, Non-Governmental Organizations (NGOs), faith-based organizations or public institutions (Chen, Chen, Vertinsky, Yamagulova & Park, 2013; Pearson, McNamara, Nunn & Filho, 2020; Platt, 2018; Vachette, 2017). Even fewer exist that also include the social dynamics of adaptation and the role of context-based vulnerability determinants (Hamza, et al., 2012; Ribot, 2010; Trundle et al., 2019).

In the aftermath of natural disasters, multi-actor influences are ever more significant as a range of new actors join existing actor-networks (Chen et al., 2013; Islam & Walkerden, 2014; Platt, 2018). These may include humanitarian relief organizations, international NGOs, and development organizations[1], in addition to private relief and recovery donations to aid these actors in the implementation of their projects. The choices made during this time of disaster recovery and rebuilding may thereby be instrumental in ensuring more climate-resilient recovery, both infrastructurally, socially, and environmentally; and can have fundamental long-term effects that may either create more robust climate resilient communities, have the communities return to the same state, or worse, become even more vulnerable to future climate change impacts than before (Chen et al., 2013; GCA, 2019; Hamza et al., 2012; Sadri et al., 2018).

1 E.g. UN Bodies, the World Bank, the International Development Bank etc.

Consequently, the wide range of stakeholders involved in this process may have a driving influence on the degree to which CCA measures are included in the recovery process; and different actors may play different roles and make use of wildly different approaches to CCA. While actor typologies have been outlined for how NGOs, private sector actors, government agencies, and communities may contribute to this process in the provision of CCA in OECD nations (ACT et al., 2015; Chen et al., 2013), whether these same typologies are valid in the recovery and build-back-better processes in low-lying climate change vulnerable Nation States with low institutional capacity requires further investigation (Weir, 2020).

Furthermore, it is only recently that scholars and organizations are starting to explore the operationalization and integration of CCA measures and 'resilient disaster recovery' in policies (Islam & Walkerden, 2014; Platt, 2018; Sadri et al., 2018). Thus, pathways as well as explorations of the processes through which CCA measures can be operationalized in disaster recovery are dearly needed, particularly through real-life examples and evidence-based case-studies (Lahsen et al., 2010; Weir, 2020). These must include reference to the constraints, facilitators and gaps present in the process of creating 'resilient' disaster recovery (Lahsen et al., 2010.) The Bahamas, as a low-lying Nation State with low institutional capacity, classified as one of the most climate change vulnerable nations in the world, provides such a case, as the country now recovers from category 5 Hurricane Dorian.

1.3 Case Introduction: The Bahamas

On September 1st, 2019, Category 5 'Hurricane Dorian' hit the two Bahamian Islands Abaco and Grand Bahama with gale force winds of 280 km/h, a storm surge tide of 6.1-7.6 meters and 0.91 meters of rain (IDB, 2019). 70% of Grand Bahama flooded due to the storm surge and about 9000 homes were damaged on both islands, with nearly 75% of dwellings on Abaco destroyed (IDB, 2019). The hurricane left entire settlements on Abaco and Grand Bahama demolished, thousands of residents displaced across The Bahamas and the South-East coast of the USA, and caused severely limited access to immediate sanitation and energy systems (IDB, 2019). Damages amounted to an estimated 2.5 billion with 91% accrued to the private sector and 9% to the public sector (IDB, 2019). The IDB found that the greatest impacts occurred in the social sector (housing, education and health)[2].

Located in the midst of the Atlantic hurricane belt, with nearly 80% of its landmass within 1.5 meters of mean sea level, The Bahamas is known as one of the most climate vulnerable nations in the world; and as climate change impacts become ever more severe, flooding, sea-level rise, rising temperatures, and the growing intensity and unpredictability of oceanic storms pose existential threats (OECD et al., 2019; Thomas & Benjamin, 2019). As a result, policies and frameworks created to tackle CCA and DRR have existed on The Bahamas since 2005 (Lacambra et al., 2018; Thomas & Benjamin, 2019). However, extreme impacts, particularly to the most vulnerable communities persist, and the scale of destruction from Hurricane Dorian suggests the presence of significant barriers to policy implementation. To understand why this may be the case, it is important to note that while a member of the 'Small Island Developing State' (SIDS) categorization, The Bahamas is by no means a low-income country. Indeed, with one of the highest Gross Domestic Products (GDP) and average salaries in the Caribbean, the World Bank classifies it as a High-Income Nation (World Bank, 2019). However, GDP fails to account for income distribution and governmental shortcomings, and the Gini Coefficient reveals The Bahamas to have one of the greatest inequitable income distributions in the Caribbean (OECD et al., 2019). In addition, it is

2 Secondly greatest impacts occurred to the infrastructural sector (power, telecommunications, water and sanitation), thirdly, the productive sector (tourism, commerce, fisheries and agriculture) and finally the environmental sector (ground water contamination).

suggested that political short-termism, financial constraints, party-line governance, years of austerity, and unsustainable development policies have favored business and resort development over the provision of public goods, such as resilience to climate change impacts (Alves et al., 2020; Howard, 2018; Robinson, 2018; Thomas & Benjamin, 2018b; Wise, 2014). Moreover, the presence of institutional and political corruption has created growing mistrust in central government and the political systems in which policy is created (Robinson, 2018). In combination, these elements have led to poor institutional policy enforcement capabilities. As a result, hundreds of small communities now face the seemingly impossible task of recovery and adaptation to new realities and must navigate an influx of international, local, and state actors providing materials, tools, and plans for recovery and humanitarian relief in an ad hoc manner.

Consequently, this is a case in which explorations can be made on what roles and responsibilities different stakeholders can take to operationalize CCA measures at the community level in the phase of disaster-recovery. It provides the opportunity to contextually investigate CCA and building adaptive capacity in a low-lying climate vulnerable Nation State with low institutional capacity, thus adding an empirical example and situated resilience-building measures to the presently undefined field; and explore the relationships between disaster recovery, CCA, and resilience.

1.4 Aim and Research Questions

To address the problems described above, the aim of this study is to contribute to understanding the process of operationalizing CCA measures in low-lying Nation States with fragile institutional capacity in the phase of disaster recovery. To contribute to the aim, the research objectives are to explore stakeholder roles and responsibilities, constraints and facilitators, and areas for integration of CCA and disaster recovery at the community level, on Grand Bahama and Abaco in the wake of Hurricane Dorian. This is achieved by answering the following research questions:

1. What roles and responsibilities are stakeholders undertaking in the operationalization of CCA measures at the community level on Grand Bahama and Abaco in the aftermath of Hurricane Dorian?

2. What are the key barriers and facilitators for operationalizing CCA measures at the community level on Grand Bahama and Abaco?

3. How can stakeholders better support the integration of CCA measures in disaster recovery in the short and long term?

In all, this study will provide insights into the approaches and roles different stakeholders may take in operationalizing CCA in highly impacted coastal communities. It explores the factors that may facilitate, challenge, or be omitted in the implementation of CCA measures and identifies pathways towards more effective operationalization of CCA measures in both the short and long term of disaster recovery.

As the field of specific CCA and adaptive capacity building measures remain notably undefined, to learn from this case, it is first necessary to create a 'normative' understanding of CCA measures based on context-sensitive research, and CCA best-practices tools and frameworks (Hamza et al., 2012; UN-Habitat, 2014). This may then illuminate differing influences on the decision-making spaces in which components of CCA are operationalized and contribute to filling some of the above characterized knowledge gaps on operationalizing CCA measures in the phase of disaster recovery, at the community level. As one of the challenges in operationalizing CCA measures is missing attention to contextually created vulnerability determinants, the study takes a vulnerability-based approach with due account taken to root vulnerability determinants and the social dynamics of

adaptation. The study is achieved through a qualitative explorative case study based on key informant interview data, and the results are analyzed through open axial thematic coding.

1.5 Scope and Delimitations

To effectively include the wide variety elements necessary for a study of this nature, it was necessary create some delimitations.

Firstly, the climate change impact categories included in the scope of this study are impacts due to flooding, high category storm events, extreme rainfall, and sea-level rise. Other significant impacts such as droughts, biodiversity loss, and more, are not included in the central CCA measures integrated in this study, though their relevance and impact on creating greater vulnerabilities to extreme storm events, sea-level rise, extreme rainfall, and flooding are accounted for.

Secondly, an exploratory case-study methodology is adopted to allow for a holistic cross-sectoral perspective on climate change adaptation to emerge. The necessity for cross-sectoral, cross-disciplinary and linked solutions is highlighted by key CCA and DRR researchers and institutions such as the United Nations Office for Disaster Risk Reduction (UNISDR), The Global Commission for Adaptation (GCA), UN Habitat, and the EU LIFE project 'Adapting to Climate Change in Time' (ACT). All call for the inclusion of multiple aspects for CCA measures to be deemed 'effective'. Consequently, a single sector, e.g. energy, water, or housing, has not been chosen to scope this study. The exploratory case-study design creates wider study boundaries that allows space for new or unexpected findings to emerge from semi-structured interviews and literature reviews.

Thirdly, this study is focused on an exploration of the process of recovery. It delineates what elements may enable the operationalization of CCA in recovery, and what components may deter more adaptive capacity creation in recovery, as the study takes place in the aftermath of a large-scale climate disruption. This is of course highly linked to the implementation of CCA measures *before* the disruption, as well as pre-existing power structures, and socio-political and historical vulnerability determinants that must be understood and accounted for to understand how both state agencies, private sector actors, NGOs, and community leaders experience and influence the process of CCA at the community level. Therefore, attention will be given in Chapter 4 to explore possible vulnerability determinants and the present policy response on The Bahamas from secondary literature, grey literature, and government created content.

Fourth, the 'stakeholders' included in the scope of this study were Community Leaders, Local NGOs, International NGOs, Government Agencies, and Private Sector Actors. Other significant stakeholders who may also influence the development and implementation of CCA measures in the wake of climate change induced destruction such as private donors, research institutions, or large development agencies were not included due to time and resource considerations.

The geographic scope pertains to The Bahamas, and in particular, Grand Bahama and Abaco. This was chosen due to the low-lying geography, recent impact, and defined low institutional capacity. Additionally, the characteristics of both Abaconian and Grand Bahamian rural settlements reflect those of other rural climate vulnerable communities with small populations, high concentration of the populations living near the coast on low elevation, and a large presence of vulnerable groups such as elderly, poor, and disabled. 'Community' is understood to refer to a group of individuals living in the same area, exposed to the same risks, sharing the same culture and resources, and exposed to the same political, economic, and environmental issues (IFRC, 2014). The communities included in this study are defined in 'settlements' or 'townships' as this is the dominant discourse on The Bahamas. The settlements/communities in focus on these two islands were chosen based

on the high level of impact from Hurricane Dorian, and were found to be more rural and exposed. This was done to better understand how underlying vulnerabilities influence the degree of impact. Given equity concerns and livelihood development is located at the center of improving adaptive capacity, it was found that their inclusion would give greater depth and understanding of possible adaptive capacity and CCA measures needed at the community level. Learnings from community leaders in these locations may therefore give a better understanding of stakeholder influences, and possible gaps or oversights in the operationalization of CCA measures in the recovery process. Of course, communities are not homogenous, and neither are broad actor categorizations of 'Local NGO', 'International NGO', 'Government Agency', and 'Private Sector'. Therefore, the findings can only truly pertain to the stakeholders included in the study and are unlikely to be representative of the whole community or actor categorization, nor all the communities on the two islands.

1.6 Audience

The findings of this thesis may be of value to NGOs, private enterprise, community leaders, as well as government agencies in low-lying Nation States with low institutional capacity, seeking to support the integration and operationalization of CCA measures at the community level, in the wake of climate change induced natural disaster. Specifically, the findings may guide the activities and choices of these actors towards the integration of more effective adaptation measures that can be integrated into the disaster recovery phase.

The study was carried out in collaboration with the new Climate Change Adaptation and Resilience Research Centre at the University of The Bahamas, and support was given by the director of the center in the form of information on The Bahamas. In addition, the author was hosted and given room and board by the CEO of one of the private-enterprises included in the study. While both actors were supportive in the undertaking of this study, no agreements regarding direction or input were promised, and the research was in no way developed to support their organizational aims. To ensure this, both actors were informed that the research would remain objective and unbiased to their cause. Nevertheless, the explorations from the study will likely be useful to both organizations' due to the nature of their agendas.

1.7 Ethical Considerations

This study must take account of a variety of serious ethical considerations. As a non-Bahamian, ethnically 'white' author, this is important, especially as the subject matter of vulnerability, equity, and race is sensitive in this location. To account for this, the author undertook measures to ensure confidentiality, and establish trust. The authors experience and sensitivity training in working with marginalized and displaced communities in Colombia, and refugees in Malmö, may have assisted in this process. In addition, actions were taken to ensure the participants remained anonymous if they wished, and pseudonyms were applied to protect privacy when needed.

Furthermore, any sensitive information collected was stored in password coded private locations, inaccessible to others, and no participants were included without prior informed consent and verbal agreement to interview and study participation. The freedom to withdraw at any time was made clear from the beginning, and to avoid the possibility of deception and harm, the aims and goals of the project were detailed clearly to all participants. To ensure transparency, the local island administrator was informed prior to research initiation so intentions were made clear. Research permission was also sought from The Bahamas Environment, Science & Technology Commission (BEST), to ensure relevant parties were aware research was taking place. All ethical considerations and research were carried out in ordinance with Lund University's Ethical Guidelines.

The author was aware that discussing the impacts of a recent catastrophic event in any way at all, even if the questions did not directly relate to this, could bring up bad memories and psychological trauma. To mitigate any traumatic dwelling, the author attempted to create an action-focused

interview guide concentrated on pathways forwards and the activities undertaken by the community, and other actors, to assist in reducing future climate change impacts.

Finally, the author is aware and hopeful that the research results will benefit the organizations included, possibly local authorities, as well as government representatives working with recovery and CCA. As subject identity will be kept private, the study will aim not to jeopardize their dignity or reputation, and to avoid any 'expectation raising', the author was clear about their intentions and did not make promises about final research outcomes or goals.

1.8 Outline

Chapter 1 introduces the reader to the topic and presents the aim and research questions.

Chapter 2 presents the research design and methodology. It further illustrates how results will be analyzed against a conceptual framework based upon the findings of chapter 3.

Chapter 3 explores what key institutions and peer reviewed journals have found to constitute adaptation measures to climate change. It explores the field of DRR and recovery, as well as role classifications of different stakeholders in the operationalization of CCA and recovery. Finally, a conceptual framework for CCA is presented within which results will be analyzed.

Chapter 4 introduces the Bahamian socio-economic, political, and environmental case study, and presents key background information regarding the two islands in focus: East Grand Bahama and Abaco.

Chapter 5 answers the research questions and presents the study's key findings.

Chapter 6 discusses the findings within the context of the literature and the conceptual framework.

Chapter 7 highlights the key findings and suggestions for further research.

2 Research Design, Materials and Methods

This chapter presents the research design and research methodology. Section 2.1. illuminates why a qualitative and explorative case-study was employed to answer the above research questions. Section 2.2. and 2.3. provides an overview of data collection methods and the strategies employed for data analysis, and section 2.4 exemplifies the possible limitations of this type of research methodology.

2.1 Research Design: An explorative Case Study

This research is based on case-study design. Yin (2009) p. 18 defines a case-study to be "an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between the phenomenon and the context are not clearly evident". As this research aims to explore and describe the dynamics of operationalizing CCA measures in disaster recovery, a flexible and explorative case-study methodology is adopted to inform the research design. The exploratory case study is chosen to allow new explorations and new learnings obtained from immersion within the context of disaster recovery to emerge. As this is a field in which greater contextual understanding is sought (Weir, 2020), the exploratory case is most appropriate. Streb (2010) further highlights its necessary role when data, hypotheses, and research has not yet been well defined in a certain field of study. In addition, scholars in the field of CCA and 'fragile' states have called for more case-studies on the processes and interactions that underpin stakeholder influences on community-centered recovery and CCA, to add to the relatively small collection of case-studies that explore this (Nakamura & Kanemasu, 2020; Sadri et al., 2018; Vachette, 2017).

As Flyberg (2006) p. 19 argues: "the advantage of the case-study is that it can 'close in' on real life situations and test the views directly in relation to phenomena as they unfold in practice". The choice of a *qualitative* case-study approach thereby allows the research to be situated within the lived experience of those actors present in the process of recovery and implementation of CCA. In addition, as previous research in this field highlights a need for greater attention to the complex social, political, and institutional dynamics that underpin the implementation of CCA, a qualitative research approach that accounts for these processes through detailed stakeholder engagements and in-depth interviewing is perceived to better highlight the dynamics of such complex social processes; including the beliefs and motivations of the wider range of actors, than i.e. a survey would (Blaikie & Priest, 2019).

When conducting a case-study situated in a real-world context, O'Leary (2005) therefore stresses that flexibility in research design is necessary to account for the rapidly changing research environment (O'Leary, 2005). An iterative approach to the conduct of this case-study is thereby deemed necessary where findings, literature review, and research goals are seen to evolve as a cyclical rather than linear process. In addition, use of semi-structured interviews and the snowball sampling method allows this greater level of flexibility to be built into the research design.

2.2 Methods for Data Collection

This section presents the two central methods of data collection employed for this study. The first section details the literature review and the second the empirical data collection as part of a field trip, in particular through semi-structured interviews.

2.2.1 Literature Review

Two types of literature review were carried out to complete this study, one on 'components of effective CCA' at the community-level and stakeholder typologies, and one on The Bahamas.

The aim of the first literature review was to learn more about CCA in low-lying coastal nations with high vulnerability to climate change impacts such as storms, extreme rainfall, sea-level rise and flooding. To allow for a large degree of flexibility in carrying out the following steps of the research, a broad literature review was at first initiated. Key search terms such as /climate change adaptation/ /disaster risk reduction/ /community-based adaptation/ /equity and justice in CCA/ /SIDS/ /disaster recovery/ and /non-government roles/ were first employed to get a better understanding of the field, and to understand where gaps and focus had previously been given. The search engines 'google scholar' and Lund University's search engine, LUB Search, were utilized for this purpose. This broad initial research allowed the author to understand a broad range of perspectives, challenges and approaches to CCA and its implementation. It also led to the identification of key CCA and DRR frameworks and tools, in addition to peer reviewed academic journals, which were synthesized into a normative framework of components that constitute CCA measures in section 3.2.

A strategy of snowballing from article bibliographies, as well as use of articles suggested by experts in the field, were used to identify additional literature. By engaging in predatory reading strategies, key literature was organized into five synthesis matrices on: Disaster Recovery; Disaster Risk Reduction; Climate Change Adaptation; Governance and Approaches; Stakeholders; and 'Effective Adaptation Measures'. This strategy allowed the author to find similarities and differences in what both academic literature and specific tools and guidelines for CCA and DRR implementation suggested when it came to the provision of CCA measures in a cross-disciplinary and cross-sectoral approach. Through this analytical literature methodology, components of 'effective' CCA were categorized into the four focus areas of /Physical Infrastructure/ /Environment and Natural Protection/ /Social Measures and Equality/ and /Procedural Necessities/. This categorization along with actor typologies outlined in the literature, allowed the creation of a conceptual framework through which data would be analyzed (*see Chapter 3.6*).

The second literature review was on the topic of the case itself: The Bahamas, particularly Grand Bahama and Abaco. The aim of this literature review was to identify previous adaptation strategies and learn what historical, environmental, political, and socio-economic factors are present that influence existing vulnerabilities to climate change. A deep level of understanding of these contextual elements are required to understand what creates pre-existing challenges in communities to enhance adaptive capacity, in addition to understanding the socio-political landscapes and decision-making spaces in which CCA implementation can take place. This is necessary for providing context-based recommendations in the response to Research Question 3 on possible short term and long term integration of CCA and disaster recovery. This literature review employed a mixture of academic, government-provided, and grey-literature- as well as news articles. The use of grey-literature and Bahamian news-statements was necessary to follow the fast-paced governmental response and recovery efforts that have taken place in the wake of Hurricane Dorian (O'Leary, 2005). The literature was organized into a synthesis matrix composed of headings such

as /Bahamian Governance/ /History & Culture/ /Environment/ /Economy //CCA and DRR policy landscape/ and /Post-Dorian response/.

2.2.2 Semi-structured Interviews and Site Visits

Semi-structured interviews and site visits were employed to collect primary data. The author spent three and a half weeks on The Bahamas, four days in the capital Nassau and twenty-two days on Grand Bahama Island where visits were made to the most impacted settlements on East Grand Bahama, the industrial Freeport Area, and the most Northernly part of Abaco- 'Little Abaco'. The experience of being in The Bahamas for three and a half weeks[3], visiting communities, and talking to leaders and key stakeholders in their natural settings allowed the author to gain a deeper understanding of the extent of Dorian's impact and inter-actor dynamics. In addition, a three-day conference on the topic of Climate Change Resilience in the wake of Dorian was attended on Grand Bahama, during which twelve expert-led panel discussions were attended. This experience allowed the author to better understand the case at hand, the actor network, and create more appropriate and information-led interview-guidelines, as well as meet key informants who might not have been conceived of as important prior to the event.

Semi-structured and informal conversational interviews were chosen as the primary data collection strategy as this was found to be the best method to allow a complete understanding of personal experiences, opinions, and approaches to CCA to emerge from the study (Blaikie & Priest, 2019). This structure would also build-in the required level of flexibility in the research design that was needed to conduct research of this nature. Applying a semi-structured approach was then adopted to allow the author to explore tangents or leads that could arise during a conversational flow (O'Leary, 2005), and create space for new information or previously unthought of challenges or perspectives to emerge.

The purpose of the interviews with authorities, NGOs, and private sector actors was i) to understand their contributions, priorities and conceptualizations of /adaptation/ and /resilience/ after Dorian, ii) learn what components they experienced to facilitate or pose challenges to the operationalization of adaptation/resilience-building measures, iii) investigate how they worked with other actors, iv) learn what they perceived to be the greatest resident and community needs. Interview guide examples can be found in Appendix A.

It was decided to interview community leaders as 'key informants' able to represent the community's perceptions. Due to time, resource, and connection challenges, resident perspectives could not be achieved through focus groups as initially planned. This may of course be problematic as a community is not a homogenous group, and it is highly likely that leaders may not represent the opinions or experiences of all. Nevertheless, for the purpose of this study, community leader interviews were completed to i) learn about community concerns prior to and post-Dorian, ii) to learn what organizations, actors and initiatives from their perspective were facilitating a more 'resilient' recovery, and iii) to discover what needs, priorities and requirements were desired by the community. In total, five community leaders were interviewed for the study, of which two came from the same settlement. All but one community leader was male. As a result, it can be questioned whether their opinions were representative of female residents. Age and economic status of community leaders may further influence the perspectives gathered. Finally, one leader was non-Bahamian, and thus this perspective should be understood to be that of an outsider who had been adopted as a community leader and turned 'insider'.

In addition to the semi-structured interviews, the authors experience over one day of observing how two private actors, one international NGO, and one community leader assessed eighteen

3 Initial study trip duration was planned for four weeks, but due to the Covid-19 Pandemic, the trip was cut 5 days short.

houses to determine if they would be repaired or rebuilt allowed the author to engage in ten short informal conversations with residents. This experience illuminated some of the challenges faced by the most 'at risk' elderly, female and disabled residents in the recovery process. It also created a more detailed understanding of some of the ownership, insurance, and land division challenges, which in many cases validated statements made by the other actors.

Key informants were found through a combined purposive and snowball sampling methodology. Initially purposive sampling was applied to find actors involved in resilience-building measures after Dorian. As the author's host represented one of these actors and was a well-connected resident on Grand Bahama, stakeholder recommendations from this individual allowed the first two to three introductions to be made, particularly to the private sector actors. Hereafter, additional stakeholders engaged in long-term provision of resilience-building measures were found via recommendations from these initial interviews, which allowed the author to identify, according to word-of-mouth, the most influential international NGOs and community leaders. To validate the role of the community leaders, leaders who had been recommended by more than one stakeholder were chosen. However, as it was based on word-of-mouth, there is a possibility there were other influential community-leaders who were excluded from the study.

In addition to this, some local and international NGO representatives, as well as specific government agencies, were identified prior to the site visit from a thorough review of news articles, government statements, and Grand Bahama and Abaco community Facebook pages to find examples of the most long-term involved organizations who had committed to stay longer than at least six months, or who had been engaged in promoting resilience-building measures both before and after Dorian- and the government agencies that were most instrumental in the disaster-recovery process. From this review, a stakeholder synthesis-matrix was created with all the actors that had been found under the headings 'private', 'local NGO', 'International NGO', and 'Government'. This matrix was further refined as interviewees highlighted the role of new actors.

Out of the six local NGOs contacted, four responded, and thus not *all* of the most influential actors could be included, notably two quite influential local NGOs could not be interviewed. Similarly, while a greater number of influential international NGOs were found in the document review and recommended in interviews, time and resource constraints did not allow contact to be extended to all of them. Thus, while the sample provides insights into how these stakeholders work, the sample cannot be determined to represent the opinions and perspectives of all those actors encompassed under 'local NGO' 'International NGO' or 'Private Sector' headings.

From the above mentioned actor-review, the conference, and the interviews, the most influential or 'mentioned' government agencies were found to be the Disaster Reconstruction Authority (DRA), NEMA, The Ministry of Environment and Housing, Social Services, the Ministry of Transport and Tourism, the Grand Bahama Port Authority (GBPA), and the Department of Public Works- under which private energy and water utilities were found. In addition, local district councils were contacted in East Grand Bahama and Abaco, though none responded. From the full identified group, those who responded were representatives from the DRA, the Building & Development Services of The Grand Bahama Port Authority Limited, the Ministry of Environment and Housing, and the Department of Public Works.

Participants were either contacted through email, Facebook or Whatsapp- with greater response rates over Facebook and Whatsapp due to their popularity of use in The Bahamas. Ultimately, the snowballing strategy allowed for a strong representation of differing projects and perspectives on localized CCA and resilience-building needs, challenges, opportunities, and gaps. From this combined purposive and snowballing sampling, the actors highlighted in Figure 1 were interviewed:

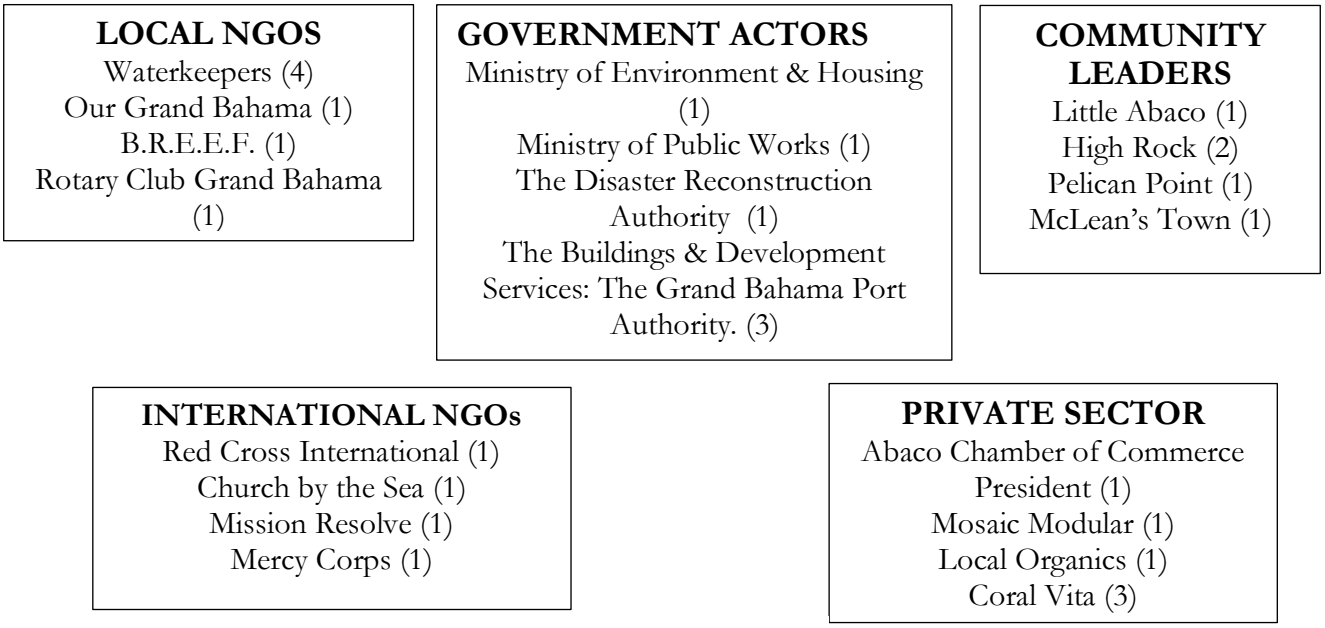


Figure 1 Interviewees

Interview Logistics

Interview lengths averaged 30min-1.5 hour. While the majority were recorded by the author's phone or laptop, two interviews were not recorded due to technical difficulties, and five interviews could not be recorded due to a perception that it would make the interviewees uncomfortable, a 'walking and talking' interview, or as requested by interviewees. When audio could not be recorded, hand-written notes were made throughout the conversation, and a detailed description of the interview and its content was recorded through hand-written notes immediately after the interview to ensure that an optimal record of the interview contents were created. In addition, due to access constraints and the visit ending sooner than expected due to the Covid-19 pandemic, six interviews were completed through the online applications 'Skype' or 'WhatsApp'. Finally, where one-on-one interviews are often argued to be the most structurally sound due to a limitation of outside influences, in two cases the organizations wanted to include two to three other field-experts for the author to get a more holistic understanding of the perspectives and activities undertaken by the organization as whole. This was deemed valuable as the goal was to understand the organization's values and perspectives in its entirety. A full breakdown of interviews, the method of recording, length, and representatives present can be seen in Appendix B.

2.3 Data Analysis

The outcome of the semi-structured interviews was either the hand-written interview content descriptions or the audio recordings. Due to the length and variety of interviews, it was determined that full audio transcriptions would allow for a more in-depth analysis. As a result, the audio recordings were either transcribed by the author through listening and typing, or in some cases through NVivo transcription software.

Following transcription, four predetermined thematic codes based on the conceptual framework in Section 3.6. were initially employed under which open coding of the data was done without predefined codes. These first five themes were 1) *'ways stakeholders contribute to CCA and resilience-building'* with the actor categories /local NGOs/ /international NGOs/ /private enterprise/ /authorities/ /community leaders/; 2) *Facilitators*; 3) *Barriers*; 4) *Gaps*; and 5) *Possible leverage points for*

more integrated Recovery and CCA in a) the short term, and b) the long term. By coding 'gaps' it was possible to benchmark against dominant CCA measures to answer Research Question 3, and find leverage points for operationalization, as suggested in Section 5.3.

In the first phase of coding, a wide range of themes were created from the data through an inductive thematic style of coding. This style was chosen to allow the findings to be more contextualized and linked to the data and phenomena itself by creating the codes from the data rather than pre-defined thematic codes established from the literature review. In the second coding phase, themes that might be similar or could be categorized into sub-themes (nodes) or perhaps even sub-nodes were created to establish the final thematic coding structure from which the findings were contrived. See coding structure in Appendix C.

The strategy allowed the research outcomes to be based on 'thick description' where context, perceptions and processes through which actor-interactions occurred, could be accounted for (Blaikie & Priest, 2019). The coding process can be viewed in Figure 2, adapted from (Blaikie & Priest, 2019).

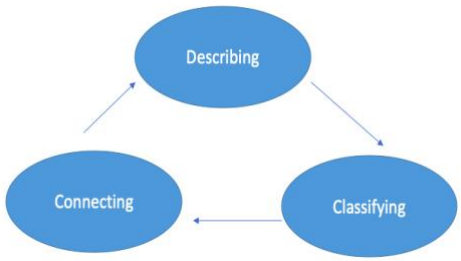


Figure 2 Open Axial Coding

2.4 Reliability, External and Internal Validity

In the conduct of social research, it is fundamental to account for possible research limitations. When engaging in case study and qualitative research designs it is particularly important to account for challenges of reliability, replication, and external and internal validity.

Replication can pose a prominent challenge in case-study designs, especially when the case timing and location can be hard to access. This was very much so in this case study on recovery and CCA in rural Bahamian communities after the impact of category 5 Hurricane Dorian. Nevertheless, careful detailing of the methodological steps undertaken, organized storage of the collected data, and the tools used to do so, may assist future authors seeking to undertake a study of this nature to replicate the methodological steps in a post-climate disaster context. This detailing further enhances the study's *reliability,* as a future researchers can follow the steps presented here and find similar results- though as mentioned, the location and timing of this case- six months after Dorian, has a significant impact on the context of data-collection, as well as stakeholder actions and perceptions. This is notably so as the policy-making process is continuously unfolding in a fast-paced environment, and stakeholder presence was similarly transient.

Internal validity refers to the degree to which the robustness of the evidence matches the claims made. It can be understood as the 'trustworthiness' of the results. In this study therefore the claims made were validated by numerous sources to insure a more internally valid outcome. These sources

comprised the wide-range of stakeholders included in the study, the extensive literature review and the use of established frameworks and theory from the CCA and DRR literature, the participation and learnings from expert-led panels at the 'Sustainable Grand Bahama Conference: Hurricane Dorian, reflecting, reimagining, rethinking', as well as observation and first-hand experience in the communities included in the study - albeit for a short duration of time. This methodological triangulation is said to create a higher degree of internal validity (Bryman, 2012). It also ensures that the concepts or themes used, more or less accurately represent what they are meant to reflect, also referred to as 'measurement validity' (Blaikie & Priest, 2019).

Finally, had more time and resources permitted, the collection of a greater amount of testimonials from the key present international NGOs Samaritan's Purse, Catholic Relief Services and Food for the Poor, as well as the local NGO HeadKnowels and The Hotel and Tourism Association, would have provided a more holistic overview of actors perspectives and opinions. Furthermore, the inclusion of 2-3 focus groups with a more varied group of community members from the settlements on East Grand Bahama and Little Abaco would have given a more extensive and well distributed understanding of the community perspectives.

This is linked to the second greatest challenge with case-study research, *external validity* - e.g. the generalizability of the case outside of the research context (Blaikie & Priest, 2019). Certainly, no other nation will have exactly the same challenges as The Bahamas in implementing CCA measures after natural disasters due to the complex nature of 'vulnerability' as a product of both cultural, socio-political, historic and power-dynamic based factors. However, as the frequency, intensity, and unpredictability of oceanic storms increase with the rising atmospheric carbon concentrations, and sea-level rise increasingly threatens coastal communities in low-lying nations, the learnings from this case may be applicable to other nations seeking to enhance resilience to climate change impacts of sea-level rise, flooding and more intense and frequent rain-fall and storm events. This will particularly be so for Nation States with low institutional capacity who struggle to implement National Adaptation Plans, where the operationalizing recommendations for implementation learned from The Bahamas may be relevant.

2.5 Authors Positionality

As mentioned, the authors position as a non-Bahamian, ethnically white, young (26 year-old) student from a wealthy country (Denmark), will have an influence on both data collection *and* interpretation. Particularly when taking a constructivist perspective on research where interviews and the dialogue produced in this process are viewed as a co-creation that arises from the interaction between interviewee and interviewer. It is therefore necessary to note that this positionality and epistemological perspective may have influenced both the data collection and data analysis process.

3 Operationalizing Climate Change Adaptation

To understand how stakeholders such as government agencies, NGOs, community leaders and private enterprise are influencing the operationalization of CCA at the community level in the wake of natural disasters in low-lying nations with low institutional capacity, it is first necessary to define what 'CCA measures' are, and what facilitates or constrains their effective operationalization. This Chapter therefore provides an overview of what peer-reviewed academic literature and international and regional institutions with specialized CCA frameworks and tools call for in the operationalization CCA and 'resilient' disaster recovery, both prior to natural disasters, and in their wake.

3.1 Defining Climate Change Adaptation

As established in Chapter 1, many CCA measures and frameworks often fail in their operationalization due to lacking attention to contextual vulnerability determinants (Alves et al., 2020; Hamza et al., 2012). This section therefore creates a necessary understanding of CCA, and how pre-existing vulnerabilities shape adaptive capacity and resilience.

CCA aims "to reduce the **vulnerability** of communities to hazards by improving the ability to **anticipate**, **resist**, and **recover from**" climate change impacts (ACT et al., 2015, p. 171). Consequently, it is first necessary to understand 'vulnerability'. In the understanding of climate change, vulnerability can be understood as the "likelihood of experiencing harm from exposure to socio-environmental stress, and from insufficient capacity to adapt to climate change"(Mason & Rigg, 2019, p. 10). According to this definition, vulnerability can be reduced either by minimizing exposure or increasing adaptive capacity (ACT et al., 2015), "the ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences" (IPCC, 2014, cited in ACT et al., 2015, p. 74.). Yet, as adaptive capacity, and also resilience, is a product of economic resources, infrastructure, technology and information, kinship networks, equity, political influence, and the institutions in which decisions are made, it is deeply connected to social vulnerabilities such as income, physical and mental health, age, gender, ability or disability, as well as the degree of dependency in the system e.g. on external products and services that could be affected by climate change; the capacity of public and private institutions to ensure 'resilient' infrastructure; as well as the health, and ability of surrounding ecosystems to perform their necessary functions under climate disruption (ACT et al., 2015; Dulal et al., 2009; Mcleod et al., 2015).

Adaptive capacity is therefore strongly connected to livelihood development in its definition as "the command an individual, family, or other social group has over an income and/or bundles of resources that can be used or exchanged to satisfy its needs. This may involve information, cultural knowledge, social networks, legal rights as well as tools, land, or other physical resources" which in many ways may determine the adaptation options available to an individual (Blaikie et al. 1994, p. 9, *cited* in Ribot, 2010). This type of vulnerability is called 'outcome vulnerability' as it is produced from the contextual social, political or cultural factors within society, also known as 'context' vulnerability determinants (Hamza et al., 2012). The relationship between 'outcome' and 'context' vulnerability can be seen in Figure 3:

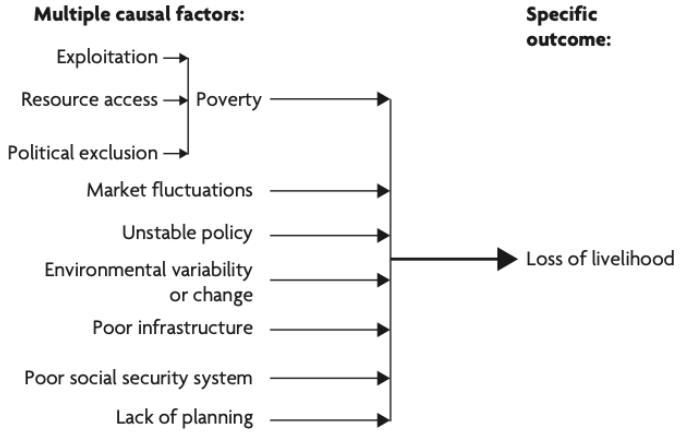
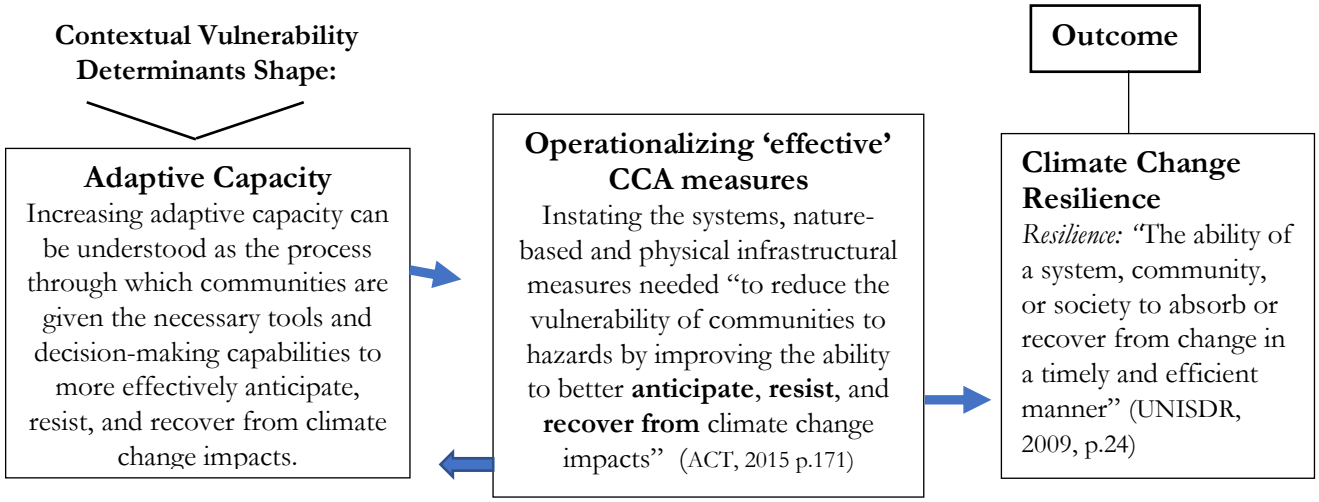


Figure 3 Context and Outcome Vulnerability (Ribot, 2010, p.52)

In this way, historical, structural, cultural, and political influences on **development**, have an enormous impact on the adaptive capacity that an individual, community, city, region, or state may hold; and it is clear that populations with lower socioeconomic standing will have less capacity to adapt than populations with higher socio-economic standing (Howard, 2018; Mason & Rigg, 2019; Ribot, 2010). Ribot (2010) and Mason & Rigg (2019) confirm this and argue that 'poverty' is one of the most significant conditions that shape adaptive capacity as 'poor' communities not only become segregated into the most exposed, climate sensitive locations, but also most likely "lack insurance, and have little influence to demand their governments provide protective infrastructure, temporary relief, or reconstruction support" (Ribot, 2010, p. 50). Consequently, 'understanding vulnerability' to climate change impacts, and therefore CCA measures, necessitates understanding the systems that produce such impacts and create 'effective' or 'ineffective' operationalization of CCA measures. *Figure 4* outlines this relationship between adaptive capacity, CCA and climate change resilience. It illustrates how adaptive capacity is shaped by factors that exacerbate vulnerability such as the degree of exposure to climate change impacts, the health of ecosystems, the financial capacity of a community, or level of equitable distribution of resources and services in a country. Therefore, by increasing adaptive capacity of the community by reducing vulnerability determinants, more effective, locally contextualized CCA measures can be operationalized. The operationalization e.g. of building stronger homes, replanting and protecting natural storm protective barriers or knowing when to 'repair', 'retreat' or 'rebuild', will build overall resilience to climate change impacts. However, the implementation of CCA measures and increasing adaptive capacity are also in many ways co-dependent, and the relationship can be seen as cyclical.



Source: Author's own conceptualization

Figure 4: Vulnerability, Adaptive Capacity, CCA and 'Resilience'

This section has provided a necessary contextual understanding of the relationship between CCA, adaptive capacity, vulnerability and resilience, and underscored the essentiality for 'effective' CCA measures to include understanding and reduction of root vulnerability determinants that create vulnerability to climate change impacts. The following section defines specific climate change adaptation measures that build adaptive capacity, reduce vulnerabilities, and ultimately may build 'resilience' to climate change impacts (*See expanded section in Appendix D).*

3.2 Defining CCA Measures

From the above understanding it is possible to outline three components of CCA measures i) social measures that enhance adaptive capacity, ii) 'grey' infrastructural measures and iii)Nature-Based Solutions (NBS). Table 1 provides an overview of specific CCA measures (*See expanded table in Appendix D*).

Table 1 Climate Change Adaptation Measures

Social CCA Measures	Grey Infrastructural Adaptation Measures	Nature-Based Solutions
Education & skill development: Natural resource management, leadership, organization, logistics, management, electrical installation, plumbing, farming, contracting etc.	**Coastal protection:** Sea-walls, jetties, gabion baskets, sea-dykes, break-waters, groynes, break walls, dune fortification.	**Coastal protection:** Wetland, coral reef, and mangrove restoration; dune restoration and vegetation fortification.
Diversification: Creating resilient, multiple, and diverse livelihood sources	**Land reclamation:** Artificial islands, coastal setbacks with e.g. 100 meter buffer zones.	**Coastal-setbacks** with green & blue zones.
Degree of self-sufficiency in energy, food, and water sources, e.g. via community-gardens, forests, fishery or farm-land management.	**Housing:** Water, wind, and heat resilient structures, elevation on pillars, hurricane shutters, multi-purpose, multi-hazard designs, modularity, space for 'short term shelter'.	**Housing:** Green roofs and walls to reduce storm run-off & cool internally.
Gender equity	**Roads:** Relocation away from coasts and flood zones, permeable and porous paving, raised bridges.	**Roads:** Greening roadsides & laneways.
Ownership: Clear land-ownership and property rights ensure a level of flexibility and security at the community level.	**Drainage and Water Management:** Construction, improvement or maintenance of dikes, sewerage and drainage systems, open water channels, and retention ponds.	**Drainage and Water Management:** Green & blue belts, retention ponds, upland forest planting and vegetation for drainage; raingardens or bioretention facilities; water recycling, reclamation or rainwater harvesting & connecting of regional water bodies.
Migration & Displacement: E.g. financial incentives for individuals who are mandated either not to rebuild a storm-damaged house, or who are given land-use restrictions due to the creation of coastal set-backs and buffer zones.	**Energy systems:** Underground wires, microgrids of solar / wind/ biomass.	**Green spaces** for temporary residence during post-disaster reconstruction.
	Waste: Separation and recycling systems facilitate recovery and leads to less build-up of waste in sewerage and drainage systems.	**Waste:** Re-use of rubble, including a greater amount of 'green material' prior to impact.

Source: Authors compilation from (ACT et al., 2015; Donovan & Mycoo, 2017; Global Commission on Adaptation, 2019; Hamza et al., 2012; Mccormick, 2020; Siegel, 2020; UN, 2015; Bavinck et al., 2015; Belding et al., 2020; Bailey et al., 2018; Buckwell et al., 2019)

These measures are aimed at the four areas of climate risk reduction, of i) reduction of hazard exposure, ii) vulnerability reduction for settlements to function with hazards taking place, iii) the preparation of response mechanisms prior to hazards and iv) effective recovery from impacts (Wamsler *cited in* McCormick, 2020). For these different measures to be affective, there is a need for all four areas of climate risk reduction to be accounted for and combined in a flexible manner.

3.2.1 Social Measures and Building Community-based Adaptive Capacity

Social measures to increase the adaptive capacity of communities are often omitted in adaptation frameworks due the complexity and challenge of illustrating how addressing them facilitates CCA (Mason & Rigg, 2019). The reason for the common exclusion, Hamza et al., (2012), p.19 argues, is because "adaptation is seen as urgent, when in reality, building resilience and the capacity to adapt is not something that can be achieved quickly [..] it necessitates education, jobs, household asset accumulation and protection, good governance and gender equality as well as qualities like 'trust' and 'self-esteem' which can take decades to build". 'Simple' social policy measures that enhance wellbeing, equality, 'trust' and livelihood standards are therefore deemed necessary (Schlosberg, Collins & Niemeyer, 2017). Dodman & Mitlin (2013) add that while high-cost physical interventions are important, stakeholders seeking to engage in CCA should not avoid lower-cost social interventions, especially as interlinked societal structures cannot be extracted from physical implementation of CCA (Wamsler et al., 2013). Chen et al. (2013) note that this must include the creation of 'soft' infrastructure in the form of new institutions that can more effectively build adaptive capacity at the community-level. Social measures to reduce vulnerability determinants such as poverty and gender inequity are therefore necessary to enhance adaptive capacity, in addition to providing manageable support and operationalization of physical and nature-based interventions (Mason & Rigg, 2019).

This necessity for cross-disciplinarity requires win-win options through measures that deliver co-benefits (Hamza et al., 2012). Examples could be the use of renewable energy installations in rural locations that lower energy prices and decrease energy-poverty, e.g. "solar irrigation pumps, domestic solar PV, clean cookstoves and biowaste could all serve the dual purpose of reducing emissions and increasing resilience" (Hamza et al., p.25). However, Hamza et al. (2012) notes that such interventions have only been small scale and tend to be enforced solely by social enterprise while lacking political support. It is argued that more appropriate qualitative indicators against which successful CCA can be measured are required for greater value to be attributed to social policy interventions aimed at enhancing adaptive capacity (Donovan & Mycoo, 2017).

The central role of 'security, trust and social cohesion' should also not be disregarded as the social ties that exist in a community, or a Nation State, to support and help one another plays a fundamental role in both the ability to coordinate CCA, and recover quickly (Hamza & Corendea, 2012; Sadri et al., 2018). However, these sources are not sufficient by themselves, and without financial support from central governments, the most exposed populations will be unable to take part in upskilling seminars and training not to mention living condition upgrades (Dodman & Mitlin, 2013; Handmer et al., 2012). Social sectors therefore require appropriate funding and coordination mechanisms to reach the most vulnerable populations, such as women, youth, elderly, and mentally or physically challenged (Dulal et al., 2009).

3.2.2 Grey Infrastructural Measures

The large majority of adaptation interventions have occurred due the 'securitization' narrative within adaptation governance in which the protection of key infrastructure such as hospitals, police stations and schools etc. is achieved through grey infrastructural solutions such as floodwalls, building at higher elevations or creating 'climate-resilient' buildings that can withstand wind and water damage (Donovan & Mycoo, 2017). Table 1 summarizes some of the key infrastructural

adaptations suggested in the categories of coastal protection; housing; roads; drainage & water; energy; waste management; and relocation.

The disadvantage to coastal 'hold the line' approaches, is the expensive nature of their upkeep and high initial installation costs (Donovan & Mycoo, 2017). They can additionally be susceptible to overtopping, and as sand can pile up on either side of the barrier, other sites can be deprived of sediment, thus affecting habitat migration and disturbing the coastal equilibrium (Donovan & Mycoo, 2017). Additionally, 'coastal squeeze' can occur, where the area of sandy beaches is reduced as a result of being trapped between immovable hard barriers and rising sea-levels (Donovan & Mycoo, 2017; Siegel, 2020). A recent study by Nunn, McNamara & McKellar (2020) found that the installation of seawalls had caused negative outcomes for land and livelihood security. As a result, Seigel (2019) argues it is essential for a team of interdisciplinary experts, including biologists, ecologists and engineers to make serious assessments of their placement before they are installed. However, Seigel (2019) also finds that other storm barriers such as dikes and breakwater have less, or no significant impacts, on organisms and biodiversity compared to seawalls, and finds that the most recent designs from The Netherlands may present more sustainable options. These include customized dikes, possibly porous sea-wall structures and new types of 'concrete', in addition to steel storm-surge barriers.

The estimated life-span of these interventions are around 50 years, though any cost calculation must also include maintenance and upkeep. In spite of high costs, these measures have been found to be essential in the protection of key assets and can be used as complementary to other adaptation measures, or one another. Seigel (2019) suggests that placing break waters further out than a sea wall, and then planting coastal forests such as mangroves or coral reefs between could be a winning combination to slow wind and inundation impacts.

3.2.3 Nature- Based Solutions to CCA

Instead of 'keeping nature out' NBS, or ecosystem-based adaptations (EbA's), are created around the concept of 'letting nature in' to reduce the extent of climate change impacts (Chelleri et al., 2015). Donovan & Mycoo (2017) argue these represent 'win-win' or 'no-regrets' solutions due to the dual benefits of strengthening ecosystem services, climate change mitigation, and social welfare benefits. The conservation of mangroves, coral reefs, and wetlands, along with the restoration of dunes and vegetation for instance slows the impact of flooding, limits coastal erosion, improves water quality and enhances local fishing by providing important habitats to wildlife. Additionally, the implementation of these measures tend to be relatively less costly than large-scale infrastructural developments such as sea-walls and dikes (Donovan & Mycoo, 2017; Mccormick, 2020). The GCA (2019) for instance estimates it is 2-3 times cheaper to restore mangrove forest than build engineering structures such as breakwaters; and that restoring upland forests and watersheds might save water utilities $890million a year in the world's 534 biggest cities. Lakes, marshes, and river floodplains have similar effects in slowing flood surges and filtering out sedimentation (Donovan & Mycoo, 2017). Unfortunately, many wetlands have been dredged to create dry land for farming or to create resorts or private beach-front property on SIDs.

An example of NBS in action is found in The Netherlands where the 2006 'Room for the River' programme was established. The policy involved the removal of inland dikes and physical flood barriers through 'de-engineering' measures to make room for water. This included digging out flood channels, raising bridges, creating new river catchment areas, as well as parks and recreational areas. The project used both hard and soft measures and necessitated the creation of urban spaces and available land to give more space for water to spread out. The result was the improved ability to cope with predicted yearly floods (Chelleri et al., 2015, GCA, 2019).

China's sponge city pilot project represents another NBS where green roofs, vegetation and permeability is integrated into the very urban fabric of city design in the aim to absorb, reuse, or capture up to 80% of stormwater run-off by 2030 (GCA, 2019). In this example water reuse and rainwater harvesting becomes a fundamental practice to ensure water security of freshwater sources. In addition, the growth of vegetation on rooftops is encouraged to reduce storm run-off and high summer temperatures, and it is estimated that Chicago's green rooftops have slowed run-off by 36% (GCA, 2019). Boojh (2012) adds that the ability to implement NBS at a localized level without large technical know-how makes them of particular value for 'rural poor' who have fewer adaptation options. However, Pearson, McNamara & Nunn (2020) suggest proceeding carefully with such framings of NBS as 'naturally' integrating local needs and knowledge, due to still limited understanding of the possible limitations involved in EbA. Additionally, while ecosystems play an essential role in creating resilience to climate change, as well as providing essential services that sustain human life such as food, clean air, and water etc., they themselves are also impacted by rising temperatures, sea-level rise and inundation (Boojh, 2012; Dodman & Mitlin, 2013). Therefore, it is essential to fundamentally protect these natural systems to protect communities.

All adaptation tools and frameworks included in this study suggest for NBS to dominate strategies for adaptation, and when grey measures are necessary, to combine the two. It is however noted that due account should be taken to installations e.g. of floodwalls and hold-the-line approaches due to possibly negative side-effects (e.g. sand-mining to build concrete structures may destabilize coastlines and make them more vulnerable to impacts), or material or energy-based lock-ins. Overall, strategies to align CCA and recovery should seek to integrate '**win-win'** options where social, environmental, and economic benefits are realized simultaneously (Donovan & Mycoo, 2017). In the climate change context, these are often options that not only serve to lower vulnerabilities and the risk of impact, but also include mitigation and social/livelihood benefits (ACT et al., 2015). Hence, understanding CCA and identifying adaptation measures that are suitable for the localized context is one thing, another is understanding how to operationalize them. The following section provides an overview of CCA operationalization.

3.3 Operationalizing Climate Change Adaptation

As mentioned earlier in this chapter, any intervention in the social, environmental, or economic systems is only as strong as the processes behind its planning and implementation (Alves et al., 2020; Chen et al., 2013). In fact, in multiple examples, poor planning and implementation has caused mal-adaptation, where adaptation measures are introduced, but end up exacerbating vulnerability, rather than building resilience (Thomas & Benjamin, 2018a). An example may be found in Georgetown Guyana where houses raised on pillars caused increased flooding downstream, highlighting the essentiality of taking multiple hazards into account and closely managing watersheds (Donovan & Mycoo, 2017). As a result, this section presents some of the challenges to operationalizing CCA measures on low-lying Nation States with low institutional capacity and highlights literature-based suggestions to facilitate the operationalization of CCA, as well as how different stakeholders may influence this provision.

3.3.1 CCA Implementation Challenges

Four central elements have been identified that create challenges to the implementation CCA in Nation States with low institutional capacity: predominantly market-based approaches, past land-use mismanagement and poor development practices, institutional shortcomings and lacking financial and technologic capacity.

Market-based Approaches to Adaptation

Mainstream approaches that have relied strongly on marked-based integration to reduce vulnerability to climate change impacts are argued to create systemic failures in which new vulnerabilities and dependencies are created that subject already 'vulnerable' communities to

'extraction-economies' or fragile international markets susceptible to shocks (Biesbroek et al., 2010; Hamza, et al., 2012; Howard, 2018; Mason & Rigg, 2019; Tanner & Allouche, 2011). Neoliberal views of 'resilience' and vulnerability reduction also adopt the notion that adaptation is an individual responsibility (Rigg & Oven, 2015), one which livelihood improvement can solve; thereby not accounting for contextual vulnerability determinants and the "power-laden structures that shape decision-making in local contexts" (Trundle et al., 2019, p. 56).

Biesbroek et al., (2010) argue the challenge when adaptation implementation is left to individuals and free markets is firstly that most individuals do not have perfect information and might therefore not be fully aware of possible climate change impacts, nor how to adapt to them. Secondly, some individuals or communities will lack the capacity, whether financial, knowledge, or skill-based, to implement adaptation options. Reliance on private insurance for damage repair from climate change induced disruptions can for instance be viewed as such a neoliberal adaptation measure (Thaler & Hartmann, 2016). The effect of this is that when damage occurs, liability is attributed to the private person whose capacity for building back resiliently, will be significantly lowered if the individual is unable to afford insurance in the first place (Thaler & Hartmann, 2016). This system creates clear favoritism of those with higher socio-economic means while creating greater obstacles for those with lower socio-economic means to recover in a resilient manner (Schlosberg et al., 2017). Thus without addressing the social, environmental and climate injustices that exist within mainstream pro-growth development agendas, adaptation interventions will not be effective (O'Brien et al., 2007).

Poor Land-use Management and Unsustainable Development Practices

In some countries with low institutional capacity, particularly in countries that have been subjected to colonization in the past, deleterious land use practices from inherited land tenure systems have created unclear property and land ownership, and poorly selected locations for urban development (Trundle et al., 2019; Ziervogel et al., 2017). This exacerbates vulnerability to systemic shocks and creates challenges for government and private actors alike in the provision of more resilient infrastructure (Donovan & Mycoo, 2017). In addition, the dominant pro-growth agenda has created an incentive for 'quick and dirty' development that does not account for the value of ecosystem services (Tanner & Allouche, 2011). A consequence has been the deterioration of natural resources that may serve as storm barriers, storm water drainage, or soil and coastal stabilization among other attributes (GCA, 2019). This is a serious challenge on SIDS where the tourism and cruise ship industries have incentivized large scale coastal construction projects for resorts and deep water harbors that negatively impact coastal resilience (Donovan & Mycoo, 2017).

Institutional Short-Comings

Low institutional capacity in the form of poor policy or legislative enforcement has resulted in many low-income communities not following building codes, in addition to poor maintenance of public infrastructure such as roads, bridges, water and energy systems, which result in the intensification of impacts from natural disaster (Donovan & Mycoo, 2017; Howard, 2018; GCA, 2019). This has also created severe challenges for the enforcement of environmental regulations to protect fisheries and biodiversity. Howard (2018) finds that these consequences are intensified on SIDS by austerity measures or structural readjustment that cut public expenditure, and create even poorer provision of basic urban services such as stormwater management and utilities; and the GCA (2019) determines 'crumbling' and entirely missing infrastructure as one of the most significant factors that exacerbate damage from extreme weather events and climate change impacts. In addition, austerity measures have been found to delay coastal protection or conservation plans, as well as shrink public sector institutions and render social policies aimed at education and livelihood improvement powerless (Hamza, et al., 2012; Ribot, 2010).

The interdisciplinary nature of CCA proves yet another obstacle as government agencies often work in silos attributed to discipline -e.g. finance, tourism, ministry, public works, etc., (Biesbroek et al., 2010; Donovan & Mycoo, 2017; Wamsler et al., 2013). It is found that such siloes may not only make it difficult to create inter-disciplinary policy frameworks, but also create unclear division of responsibility where duties and legislative jurisdictions of some agencies overlap (Howard, 2018). The GCA (2019) additionally finds that government agencies tend to lack incentives to work across institutional silos due the possible competition for resources and funding. Competition for resources or seeking 'attribution of success' can also create poor incentives for collaboration with private enterprise or other nations (GCA, 2019). Finally, two-party governance systems and the incentive for re-election has created short-termism, also called the 'tragedy of the horizon', where projects may have no more than four to five year implementation plans at most (GCA, 2019). Short-termism applies not only to governmental institutions, but also to individuals, communities and businesses alike, and causes short-sightedness to problems that require long-term sustained efforts.

Finance, Technology and Knowledge-based Resources

The fourth challenge noted by the majority or sources included in this study, is financial resources, which of course is mirrored closely in the governmental development priorities discussed above (Donovan & Mycoo, 2017; UN, 2015; GCA, 2019). SIDs and low -to middle- income nations are faced with serious financial challenges in the funding of adaptation measures as well as disaster recovery (Robinson, 2018; Thomas & Benjamin, 2018a). The inequity of this has been highlighted in climate justice literature that calls on the international community and high carbon emitters to fund adaptation and mitigation options in nations who by 'no fault of their own' face existential threats from a problem they have done little to contribute to (GCA, 2019). In addition to financial short-comings, technological short-comings and access to geospatial data collection tools may reduce the ability of SIDS to undertake environmental assessments, complete flood-risk mapping and attribute proper value to environmental safeguards when undertaking challenging development choices (Donovan & Mycoo, 2017; Howard, 2018).

Yet, overall, it is argued that the greatest barriers remain the issue that those most impacted by climate change have too little power to shape the decisions that may affect them, and the GCA (2019), p. 15, argue "without their voice, the urgency of adaptation is muted". Bearing these challenges in mind, as well as the ways context vulnerabilities shape adaptive capacity, the following section outlines how CCA can be facilitated operationally.

3.3.2 Stakeholder Roles and Responsibilities

To understand the power and policy-spaces in which adaptation measures are conceptualized and directed, it is necessary to identify what roles different stakeholders may take in its implementation (Hamza, et al., 2012). Such stakeholders include, but are not limited to, regional, central and local government agencies; private enterprise; faith-based institutions; international donors; international development agencies and climate funding bodies; regional governing bodies; local & international NGOs; knowledge creating institutions such as universities and think tanks; communities; and private citizens. However, due to the degree of influence, this study focuses mainly on the private sector, local & international NGOs, government agencies, and community leaders. These stakeholders can influence the development of CCA in a variety of ways, from knowledge-creation, livelihood support, financial and fiscal support, implementation, policy guidance, and more (Hamza & Corendea, 2012). This section details possible influences and roles different stakeholders may take, and what can facilitate more influential operationalization of CCA measures.

3.3.2.1. The Community Level

Many frameworks on CCA implementation suggest localized implementation, particularly in low-lying Nation States with low institutional capacity due to the localized nature of climate change impacts and vulnerability (Dulal et al., 2009; Ensor & Berger, 2001; Ziervogel et al., 2017; UN, 2015; GCA, 2019). In this regard, a 'community' is understood to be a group of individuals living in close geographic proximity, who share norms, values, governance structures and local resources (IFRC, 2014). This is often defined geographically in 'neighborhoods', 'settlements' or small towns/villages (Dodman & Mitlin, 2013). However, a community is not homogeneous, and adaptive capacity therefore depends not only on "access to the resources required to maximize livelihood opportunities" but also the underlying knowledge-base that allow each household to anticipate or "create new modified livelihood opportunities" (Dulal et al., 2009, p. 378).

As a result, ACT's (2015) principles for a 'climate resilient community' involves first, creation of greater public awareness of climate change impacts and 'effective' adaptation measures that can be implemented either at a household or community level. Secondly, it is suggested to increase the technical capacity to prepare and streamline science-based information on climate change risks, vulnerability, and adaptation, into development practices, planning and investment decisions; and finally, it is recommended that built, natural, and human systems are bolstered, while community partnerships with external agencies or private actors are strengthened. Donovan & Mycoo (2017) thereby call for SIDS to create a more streamlined devolution of planning from central governance to local and municipal levels. They argue this will bring urban planners and communities closer together and foster context sensitive outcomes, e.g. by quickening the approval of building permits and ensuring environmental impact assessments take place, while minimizing possibly polarizing political opinions.

Thomas & Benjamin (2019) additionally identify that 'sense of place' within a community can be a strong driver for adaptation. This was found in a case study on Ragged Island in the wake of Hurricane Irma on The Bahamas, where "the community determined that their way of life and sense of place, social cohesion and identity was worth preserving in the face of extreme impacts and continued risks of climate change" (Thomas & Benjamin, 2019, p.10). In this case, the place-based attachment was seen as a 'motivator' and 'predictor' for community engagement with CCA. As a result, it is argued that "a value-based approach to adaptation which links understanding of place, well-being and lived experience, can be an effective tool, and offer guidance for development policies" (Thomas & Benjamin, 2019, p. 10).

However, while the contextual advantage in adaptation at the community level is celebrated, it is necessary to take a nuanced approach that balances top-down structural support with building adaptive capacity at the local level (Dodman & Mitlin, 2013; Ensor & Berger, 2001). This can be carried out in a way that fosters and builds on endogenous resilience, local knowledge, and cultural experiences that enhance resilience, without placing full responsibility for adaptation at the community level, as building adaptive capacity solely at the community level fails to address structural inequities that perpetuate underdevelopment, and instead shift responsibility to the individual (Trundle et al., 2019). Dodman & Mitlin (2013) argue this is one of the biggest challenges for adaptation at the community-level, as it is impossible to tackle external vulnerability determinants at this level, and rural and marginalized communities will not be able to build adaptive capacity entirely on their own (Ribot, 2010). ACT (2015) seconds this, arguing that significant constraints in multi-level governance must be overcome for adaptive capacity and responsibility to be fostered at the community level.

Overall, these are challenging governance and development decisions that require a multitude of linked solutions. Therefore Dodman & Mitlin (2013) argue it is essential for 'effective' community-

centered adaptation to not only enlist vulnerability reducing measures but also address power and multi-level governance by building methods through which power transfer to local communities can be made from governments and international development agencies alike. The success of such a strategy was seen in Vanuatu's networked governance system where legislation was made to support the agency of community actors to engage in partnerships (Vachette, 2017). Accordingly, it is necessary for community-based decision-making capacity to be formalized into existing legislative frameworks and systems of governance, as long as first, the necessary financial resources, knowledge and skills are provided in support (Nalau et al., 2015).

Consequently, Schlosberg et al., (2017) argue that a capabilities approach to vulnerability reduction at the community level is necessary. This approach "looks not simply at distributional or procedural inequity, but also at the provision of a range of basic needs and processes necessary for citizens to construct a functioning life" (Schlosberg et al., 2017, p.414). In a capabilities approach, they argue 'justice' should include the fulfillment of a basic list of fundamental capabilities where 'injustice' is to not have access to "basic capabilities to make a life of one's choosing" (Schlosberg, et al., 2017, p.414). As a result, multiple development institutions call for socially 'just' approaches to adaptation (GCA, 2019; UNISDR, 2019). While 'justice' and 'fairness' are inherently normative concepts, in the discussion of adaptive capacity, it can be argued that the "social justice ideal of equal and fair access to rights, resources, and opportunities that reduce people's vulnerability—in part by increasing their capacity to adapt—to the consequences of climate change, with an emphasis on historically and currently marginalized groups" must prevail (Mason & Rigg, 2019, p.10). This approach follows the Rawlsian, 'justice as fairness' and 'capabilities' understanding on how responsibility and obligation should be constructed between people and society (Mason & Rigg, 2019). To achieve this at the community level, 'procedural' and 'distributive' justice are commonly used as leverage points. Procedural justice refers to equitable access to decision-making where distributive justice refers to the equitable distribution of goods and services, as well as social and economic capital required to adapt to climatic changes (Mason & Rigg, 2019).

In sum, adaptive capacity cannot be enhanced without the local level and an understanding of the contextual vulnerability determinants that shape specific local vulnerabilities. As these are often rooted in social inequity, it has been illustrated that principles of fairness in the procedures and distribution of CCA measures and adaptive capacity are fundamental when other actors seek to build community-based resilience. It has further been argued that the capabilities approach where assistance is given to build-up access to basic needs and processes necessary for constructing a functioning life, may be a more sustainable approach to creating resilience to external shocks that may come not only from climate induced disasters, but *also* unknown global challenges. The following section highlights how governmental actors, private sector entities and NGOs can influence the provision of CCA at the community level.

3.3.2.2. Government

Centralized government, and government agencies at different levels are commonly viewed as the ultimately 'responsible' agent. Yet, due to the complexities of policy implementation and institutional shortcomings in some Nation States, it is necessary to understand what government agencies can do to facilitate CCA. Donovan & Mycoo (2017) identify the role of government as "the educator, planner, regulator, enforcer and manager", and defines central government's core functions as "political representation of local populations in provincial or national decisions; strategic development planning for infrastructure, housing, land-use and allocation, and regulation of natural resources; delivery of public services; raising and managing local revenue; and the coordination of more localized development plans"(ACT, 2015, p.174).

Scholars argue governments can build greater resilience to climate change impacts by working across structural and disciplinary siloes, mainstreaming adaptation into all ministerial departments,

a devolution of planning to the local level, greater structural attention to procedural and distributive equity, and the provision of sufficient support to communities in the form of incentives, new institutional and cross-sectoral norms, working structures, and standards (ACT et al., 2015; Mcleod et al., 2015; Nalau et al., 2015; Wamsler et al., 2019). However, local governments on SIDs often lack resources and capabilities to enforce larger strategic planning such as CCA, and due to resource struggles or competition, may prioritize conventional economic development goals over "environmental challenges" (Howard, 2018; Donovan & Mycoo, 2017). Hence, it is argued that it is the role of central governments to actively incorporate communities into policy development and planning in a collaborative manner (Donovan & Mycoo, 2017).

In the provision of grey infrastructural measures as well as NBS, urban planning may play a large role, and it is necessary for government bodies to install building codes that reflect these adaptations, as well as structures that facilitate their enforcement at a local level (ACT et al., 2015; Donovan & Mycoo, 2017). Governments can also influence this process through standard-setting, which is particularly relevant for disaster recovery rebuilding standards which ought to reflect 'resilience' as a performance requirement (Hamza et al., 2012). ACT et al., (2015)'s 'Guidelines for Municipalities' notes that this can be a challenge when added to already complex urban development projects where the risk management focus was previously on liability reduction and ensuring short-term financial returns to builders and developers. Hence, new measures are needed to value properties and create revenue streams, and cities should consider how investment in adaptation measures can build attractiveness for external investors, and increase trust, and reliability in infrastructure (ACT et al., 2015).

Another important role of government is to provide domestic public funding. Donovan & Mycoo (2017) argue that this is one of the most sustainable sources of financing in SIDS and argue new state-financing mechanisms are required to support this. As a result, fiscal measures to mobilize domestic CCA funds could include[4] i) Green local fiscal policies such as 'congestion charges' on vehicles, or market incentives in the form of land-price adjustments to reduce coastal development and risk, ii) Grants, loans, and subventions from national or regional governments, e.g. compensating local governments or communities for financing ecosystem management, or iii) Revolving funds that could be found from international funding bodies or revenue streams such as Clean Development Projects.

Additionally, it is stressed that central governments of low-lying Nation States implement "smarter combinations of 'resilience tax' systems for travelers, tourists, and developers, that i.e. contribute to flooding" (GCA, 2019, p.55). These measures were included in Saint Lucia, Castries, and the World Bank (2014) found the mechanisms were useful in creating financing for long-term recovery and resilience against flooding and landslides (GCA, 2019). Fiji similarly, in 2017, introduced an Environment and Climate Adaptation Levy, which included a 10 percent tax on luxury cars and yacht charters, as well as a 10 percent income tax on 'the rich' (GCA, 2019). US$117 million has been raised from this tax so far, and spent on "renewable energy, reforestation, agricultural research, disaster relief, upgraded bridges, rural roads" and other CCA measures (GCA, 2019, p.54). The GCA (2019) suggests the success of the policy can be attributed to the prior creation of an "explicit, systematic and comprehensive adaptation plan" for which the tax was used to finance (GCA, 2019,

4 *Possible financing measures from GCA (2019), Donovan & Mycoo (2017) & ACT (2015):* Congestion charges on motor vehicles; grants, loans and subventions to local government for ecosystem management; revolving funds for clean development projects; subsidies and tax rebated to fund energy efficient buildings and green infrastructure; property taxes to reduce urban sprawl and low density development, particularly in Caribbean SIDS, though 'communal land ownership makes property tax regimes impossible' (Donovan & Mycoo, 2017, p. 177); land price adjustment to deter investors from hazard prone areas; polluter-pays charges to reduce ecosystem degradation; resilience tax systems for tourists and developers; micro-financing for households and small entrepreneurs.

p.54). Other possible domestic financing options suggested is 'micro-financing' (ACT et al., 2015). It is believed that micro-finance schemes can be particularly useful to assist small farmers or business owners, or customized schemes for poverty alleviation and adaptive capacity increasing development (ACT et al., 2015; GCA et al., 2019). This could include 'micro-credit, micro-insurance, or micro-savings' to assist those 'marginalized from formal insurance and commercial credit markets' (Donovan & Mycoo, 2017, p. 190). ACT et al. (2015), p.46, also suggests governments make greater use of 'value capture' where "special district-level taxes and community improvement fees can capture part of the value created for private owners and developers as a result of local government investments".

Yet, the challenge of private insurance remains, and the GCA (2019) & Donovan & Mycoo (2017) suggest governments should alleviate residents who are unable to afford flood or hurricane insurance through "national disaster funds, social protection programs, contingent credit lines, and sovereign and sub-sovereign insurance" (GCA, 2019, p.55), particularly for populations under the poverty line. Climate-adapted social safety nets or budget allocations may also be more suitable for residents of lower-socioeconomic means (GCA, 2019). ACT (2015) identifies possible solutions to this problem by using 'preventative' insurance measures, where payments can be made to improve a private structure prior to impacts taking place, as well as compensate for potential damage. This could also allow residents who implement risk reducing measures to get reduced insurance premiums.

Overall, the GCA (2019), p.56, argues that the public sector should lead the development of equitable and sustainable risk finance mechanisms, as "developing countries lack the data and market maturity in the private sector to develop risk finance instruments by themselves". These government-led developments of 'disaster-risk finance strategies' are deemed particularly necessary to effectively respond and build disaster-resilient recovery, as "numerous studies show the importance for recovery and poverty alleviation to ensure that cash is available soon after, or even before a disaster, and that mechanisms are in place to ensure this funding reaches the most vulnerable" (GCA, 2019, p.55).

Nevertheless, as government agencies in nations with low institutional capacity face severe policy implementation challenges, in addition to institutional corruption, there is need for "new managerial frameworks that can mobilize, through a collaborative network, private and public resources to cope with large-scale disasters" (Chen et al., 2013, p. 130).

3.3.2.3. Private Sector

Private sector actors may be able to provide more 'rapid and effective' CCA operationalization than government agencies due to quicker decision-making structures, less red-tape, bureaucracy, and political contentions (Chen et al., 2013). As a result, multiple scholars argue that public-private partnerships (PPPs) are fundamental to effectively operationalize CCA measures at the community level, particularly when Nation States have low institutional capacity and struggle with adaptation financing mechanisms (ACT et al., 2015; Chen et al., 2013; Donovan & Mycoo, 2017; UN-Habitat, 2014; Wamsler et al., 2019; UN, 2015). PPPs are "arrangements between governments and private entities where traditionally public activities are performed partially or wholly by the private sector" (Chen et al., 2013, p.131).

The Sendai Framework for Disaster Risk Reduction's 2019 performance review particularly highlight that PPPs can drive innovation, growth, and job-creation, and may also be able "to enhance the economic, social, health and cultural resilience of persons, communities, countries and their assets, as well as the environment"(UNSIDR, 2019, p.17). Hence PPPs are increasingly becoming the go-to solution for governance problems and scarce resources, and have been valued for their ability to support financing and efficiency of CCA (Chen et al., 2013). However, if funds

or resources are low, partnerships can also be based upon knowledge-exchange, network access, technical know-how or logistics and operationalization (ACT et al., 2015).

However, private sector engagement requires a strong degree of political buy-in, trust from both sides, clear roles and responsibility, as well as quantifiable targets and monitoring and evaluation systems, in addition to public incentives for investment in 'resilient infrastructure' and NBS (ACT et al., 2015; Chen et al., 2013; GCA, 2019; Hamza et al., 2012). Chen et al. (2013) finds that strong social capital and connections between e.g. community members and organizations as well as a history of successful collaboration can promote incentives for successful PPPs, though Hamza et al., (2012) also states that the large financial value for private actors to get involved in CCA and capitalize on 'resilience', should not be ignored as a facilitating factor in of itself.

Additionally, ACT et al., (2015) argues private actors should support CCA through private investment. It is argued that the value in urban areas for private actors is largely 'real estate', and as a result, improving real-estate attractiveness should be a target for private real estate investors, e.g. by supporting governments or utilities in more sustainable water, energy or waste management. However, improving local value by for instance upgrading 'drainage systems or road systems' does not provide direct investment opportunities, and as a result, CCA or resilience related projects tend to "attract private investment" through non-revenue producing projects, or larger re-development strategies for a particular locality (ACT et al., 2015).

This may also occur on a value-creation-based interest, as exemplified by the company, Beqa Adventure Divers, who in partnership with Projects Abroad, initiated a sponsorship programme to replant 33 hectares of mangrove forest per year to offset the business' carbon emissions (Pearson et al., 2020). 'Mangroves for Fiji' was based on community-capacity building and localized implementation and was delivered in cooperation with local NGOs and government partners. The result was that local mangrove planters could be established in rural villages and proceeds from planting and carbon off-setting could be used to fund local churches and family expenses.

Nevertheless, it is suggested PPPs may not automatically have the public's interests at heart, and thereby CCA benefits may be distributed inequitably (Hayllar & Wettenhall, 2010; Siemiatycki, 2011). To ensure this does not occur, it is necessary to secure that goals are aligned, and for consistent evaluation, or detailed contracts to be put in place (Chen et al., 2013). In sum, it is tentatively suggested that private actors contribute to CCA implementation via financing, value-capture, infrastructural recovery, knowledge-sharing, innovation and efficiency in execution.

3.3.2.4. NGOs

NGOs are value-based entities that seek higher aims such as 'livelihood improvement', 'child safety', 'environmental well-being', or 'humanitarian relief' (Jones et al., 2014). When Nation States have low institutional capacity, NGOs are found to possibly represent a key implementation body (Jones et al., 2014). NGOs can be local, national or international, or national/international with local membership councils (Chen et al., 2013). Hence, ACT et al., (2015) classifies NGOs as 'facilitators', able to provide technical support, sometimes finance, as well as know-how and operationalization of key resources.

Islam & Walkerden (2015), p.1707, identify possible key functions in the wake of natural disaster to include "immediate relief (food, water, medicine, household utensils), shelter (building materials, new houses), and livelihood assistance (microcredit, cropping seeds, livestock, fishing boats and nets)". Faith-based organizations have been found to provide similar support to communities post natural disaster (Chen et al., 2013). In a case-study on NGO influences on disaster recovery in Bangladesh, Islam & Waklerden (2015) found that NGOs in the wake of Cyclone Sidr were taking

over traditional roles of government by organizing relief and rebuilding for disaster victims. It was also found that they could contribute to enhancing social ties within communities by "encouraging cooperation on tasks for mutual benefit" such as supporting one another with house or boat repairs, or harvesting (Islam & Waklerden, 2015, p.1713).

However, negative influences on adaptive capacity were also found in poor coordination with residents, duplication of measures between NGOs, favoritism of some families, in addition to corruption (Islam & Waklerden, 2015). Possible dangers in the effect of 'welfare dependencies' are also found where communities grow so dependent on NGO provision of basic necessities, they do not build internal capacity to adapt to future impacts (Jones et al., 2014; Platt, 2018). Platt (2018) found this to be the case in the aftermath of a volcanic eruption in Chile, as well as in recovery from a tsunami in Thailand where residents remained reliant on NGO and government assistance for more than two years. In Platt (2018)'s study on disaster recovery in Ban Nam Khem, Thailand, it was additionally found that international, national, and government actors often duplicated efforts, so some fishermen received two to three boats, and some families two houses. The 'excess' aid resulted in internal conflicts and the attraction of outsiders seeking to receive aid benefits meant for those impacted by the storm.

This highlights possible shortcomings in *ad hoc*, unregulated NGO projects within disaster-impacted communities (Howard, 2018). Islam & Walkerdern (2015)'s findings therefore strongly suggest NGOs focus on creating more robust housing and alternative livelihood options as households were found to prefer empowerment and resilience over relief dependencies. It is therefore argued that the 'capabilities approach' to recovery and re-development is required so communities become NGO development partners, and "the NGO's aim becomes to empower the community and increase people's freedom"(Islam & Walkerden, 2015, p. 1722). It is suggested this could be operationalized by creating occupational groups to increase "community capacity to work successfully in disaster resilience and recovery" (Islam & Walkerden, 2015, p.1722). They provide the example of an NGO in Boro Tengra village, Bangladesh, that provided a pond sand filter to ensure clean and cool drinking water for the community. When the NGO was getting ready to end its operations, residents were trained in how to operate the filter and clear roles and responsibilities were set. In this case, the NGO provided technical, financial and capability-based support to enhance adaptive capacity of the community to manage the filter internally, both in the collection of financial donations from residents, and for its required maintenance (Islam & Walkerden, 2015).

Mason & Rigg (2019) support this approach noting that it can facilitate the creation of meaningful partnerships that should recognize the inherent 'values, knowledge-bases and needs' existing within the community, and allow these to further influence policy development. Large international development agencies may have similar catalyzing effects. The Global Commission for Adaptation in partnership with the World Food Programme, the Global Facility for Disaster Reduction and Recovery, and other agencies have for instance created government support structures to facilitate the integration of climate crisis risks into social protection policies (GCA, 2019).

3.3.2.1.1 Challenges with Non-Government Actors

However, non-government actors such as NGOs and the private sector may also have negative impacts on CCA or adaptive capacity. For example, over-reliance on non-government actors providing services traditionally administered by government agencies can be dangerous due to the volatility of their funding sources, *e.g.* should NGO project-support be revoked, the supported project is likely to fail (Howard, 2018; Jones et al., 2014). This uncertainty may therefore jeopardize the CCA measures that require long-term implementation plans (Howard, 2018). Tanner & Allouche (2011), additionally argue that the more actors involved in CCA, the more challenging coordination may be, due to multiple normative, and possibly conflicting, definitions of 'resilience' 'adaptation' or 'DRR'. Hamza et al (2012) add that the more actors involved, the more opportunities

for power mishandling may occur. It is argued that this can be common in 'fragile' states with low institutional capacity, where political or economic elites can be organized to give themselves greater control and access to resources, and clientelism can be fostered where "illicit, or licit money-making schemes" are developed (Hamza et al., 2012, p.2012). In the context of disaster, and disaster recovery, it is argued that such practices may become even more prevalent.

3.3.3 Operationally Facilitating Factors

To more effectively operationalize these elements procedurally, it is suggested organizations improve strategic capacity, sequencing, coordination, enforcement, and methods for evaluation and monitoring (Chelleri et al., 2015; Alves et al., 2020; Wamsler et al., 2019). Table 2 provides an overview of suggested tools to achieve this:

Table 2 Procedures that Facilitate the Operationalization of CCA

Building strategic capacity to improve the planning and implementation of CCA	Requires: i) Central political and administrative leadership in the definition of strong policy frameworks based on expert advice, and the creation of new organizations to implement them, ii) Integrated planning of development and climate change impacts founded in community contexts, iii) Societal mobilization and iv) The adoption of a learning-oriented methodology to climate change governance (Meadowcraft, 2009, cited in Alves et al., 2020, p.191).
Mainstreaming *Mainstreaming is the process of integrating CCA into all actions of an organization, making it 'common' or a 'norm' within existing working structures, mandates, policies, personnel etc. (Wamsler et al., 2019)*	Requires detailed knowledge of location-specific vulnerability-determinants of communities, and how different disciplines and sectors connect (Wamsler et al., 2013). Wamsler et al., (2019) identify six central strategies for mainstreaming nature-based solutions and CCA. They include i) **Targeted involvement of the private sector**, academia and other cities (for joint learning, assessments and project creation) to build policy support, ii) **Strategic citizen involvement**, e.g. identifying particularly knowledgeable or well-connected citizens to assist in increasing public awareness and consideration of CCA in the required activities, iii) **Altering internal cooperation and working structures** to encourage intersectional work, iv) **Outsourcing CCA implementation** by giving relevant information and advice to others (mainly citizens), and v) **Concealed science-policy integration** so CCA can be 'progressively' integrated into 'formalized planning regulations and mechanisms/tools' to ensure municipal staff and policymakers take account of it (Wamsler et al., 2019, p.4).
Coordination	1) A common understanding of adaptation actions within an organization. 2) Clear leadership roles and responsibilities. 3) Provision of an overview of internal communications structures. 4) Sufficient implementation tools and timelines in place e.g. secured financial and community-based support. This includes the process of finding synergies between adaptation actions and other development priorities, as well as identifying what staff, training for staff, infrastructure or capabilities, and community-support is required to implement and monitor the measure's effectiveness. 5) A communication strategy with tailored stakeholder involvement, as well as detailed risk analyses on potential constraints that could occur, and procedures for how to overcome them (ACT et al., 2015). 6) Community members to be central in evaluation and the process of mapping and assessing infrastructural, nature-based, and social requirements within the community (ACT et al., 2015).

Prioritization and sequencing to overcome trade-offs	Categorizations can be made based on 'no-regrets', 'low-regrets' and 'win-win' options identified by (Donovan & Mycoo, 2017), or cost-benefit analyses, vulnerability and risk analyses, or community preference-based scoring methodologies (ACT et al., 2015). Hamza et al., (2012) advises stakeholders to be careful with 'sequencing' and view it as a question of first completing the means required to meet certain ends, rather than a step-by-step process of priorities.
Persistent monitoring and evaluation to ensure maladaptation or negative side-effects do not occur	Involves creating clear objectives and targets e.g. *process-based indicators* such as "degree and quality of participant involvement", and *outcome-based indicators.* Outcome-based indicators can be a challenge as the outcome of a policy measure can be measured against a variety of success-criteria (ACT et al., 2015, p.51). In addition, these require 'evidence of change' which for some success-indicators, such as those linked to perceptions or behavioral changes, can be difficult to identify (ACT et al., 2015). There is therefore a need for well-defined qualitative and quantitative success-indicators to evaluate which adaptation measures have greater results than others.

Source: Author's own compilation

3.4 Disaster Recovery

Multiple scholars find that 'disaster', 'crisis', or 'catastrophe' provides significant opportunity for re-creation, 'build back better', and 'resilience in recovery' on the one hand, or vulnerability exacerbation on the other (Fath et al., 2015; UN, 2015). The choices made at the critical time of disaster recovery are thereby likely to pave the path towards future preparedness, ability to endure impacts, and again, recovery (UN, 2015). This process can therefore be perceived as cyclical, with the degree of 'build-back-better' or CCA measures included in both preparedness/anticipation and recovery determining the degree to which communities are able to withstand climate change impacts (Wamsler et al., 2013). Yet, this depends on how different actors can operationalize CCA measures to improve adaptive capacity at the community level. Overall, what facilitates CCA and what facilitates disaster recovery may not be entirely comparable, as one aims to recovery as quickly as possible, and the other to recovery in a manner with reduces future impacts (Platt, 2018). As there is not much literature on the integration of disaster recovery and CCA specifically, this section highlights what the disaster recovery literature stream identifies to facilitate recovery and includes reference to the few articles that include 'resilient' disaster recovery, though this of course does not automatically include the CCA measures above.

Chen et al., (2013) finds partnerships are important in this endeavor, particularly for the repair, design and rebuilding stages, and identifies eight common partnerships and influence categories outlined in Table 3:

Table 3 Stakeholder Partnerships for Recovery

Building resilience	i) *Public-private contractual partnerships for critical infrastructure:* Requires high levels of trust and good relationships.
	ii) *Public-private non-contractual partnerships for critical infrastructure:* Via provision of institutional structures and knowledge-sharing, including inter- and intra-sectoral policy dialogues.
	iii) *Government-community collaborative resilience building:* An example of collaborative community resilience from Cuba is highlighted where community-based disaster response training is provided in the early stages of schooling and continues in adult education. Disaster management is further integrated into the Civil Defense system, so local officials, health workers, and teachers have dual roles as evacuation coordinators and resilience planners. Then, every year a 2-day nation-wide hurricane-drill is enacted where community-members with dual-capacity roles, practice. This is found to successfully mainstream or 'normalize' disaster preparedness into working structures at the community level. It further enhances adaptive capacity so "when a hurricane strikes, the community structure shifts seamlessly

	from the day-to-day function to emergency disaster response measures." (Chen et al., 2013, p.135).
Responding	i)*For-profit NGOs and government partnerships*
	ii) *Government-civil society partnerships*
	iii)*Government as one of the many actors in a 'many-to-many' network partnership*- also referred to as a network-based coordination structure, or a 'web 2.0 platform' in which the government is but one of a multitude of nodes within a governing network.
Recovering	i) *Public-private partnerships for physical reconstruction* are argued to be particularly salient for engineering and construction companies due to disaster response expertise. In a review of cases from 1999-2009 by the World Economic Forum (2010), it was found that such private sector actors would commonly offer services through informal 'ad-hoc' projects, or 'pro-bono' to disaster-response agencies and larger NGOs.
	ii) *Inter-sectoral partnerships for learning*- Where partnerships become 'learning laboratories' that strengthen awareness and understanding of resilience-building and disaster response.

Source: Author adapted from Chen et al., p. 133-139

These also represent the three stages of disaster risk management as i) the developing resilience and preparedness phase when hard and soft infrastructure is to be implemented, ii) the response phase and iii) the recovery phase where build-back-better policies should be coordinated alongside humanitarian relief (Plat, 2017). Table 4 illustrates a collection of disaster recovery facilitating and constraining factors in a household specific view (Sadri et al., 2017), and the broader view of recovery and vulnerability reduction from Blaikie et al. (2003).

Table 4 Barriers and Facilitators for Disaster Recovery

Facilitates Recovery	**Constrains/slows immediate disaster recovery**
❖ Trust in government agencies. ❖ Households with dense personal networks experience quicker recovery. ❖ Greater geographical proximity to 'network partners'. ❖ More assistance from neighbors = quicker recovery. ❖ Long-term management of ecological and socio-economic necessities. ❖ Addressing challenges in multi-level governance. ❖ Including clear reasoning behind the inclusion of biodiversity conservation in reconstruction planning. ❖ Having already resolved, or resolving, property ownership uncertainty or challenges. ❖ Full participation of populations affected by the disaster in the recovery process. ❖ Inclusion of local 'ways of doing things' and local institutions in recovery planning and implementation.	❖ Greater physical damage. ❖ Higher reliance on private insurance companies. ❖ Larger households. ❖ Desire to return to the 'familiar' quickly. ❖ Decisions taken on possibly non-expert knowledge bases. ❖ Greater urbanization can cause more damage due to close-living. ❖ Lack of planning in advance can substantially delay recovery and reconstruction.

Source: Author, adapted from Sadri et al., (2018); Blaikie et al., (2003); Plat (2017) & GCA (2019)

As can be observed, there are many synergistic components between CCA, vulnerability reduction, sustainable development, and disaster recovery.

Yet, a number of 'wicked' problems are identified within disaster recovery. One of the largest queries or 'challenges' for stakeholders engaged in disaster recovery, both as a facilitator and a resident, is whether to repair, rebuild, or relocate (Platt, 2018). Platt (2018) identifies the crux of this conundrum as the desire to 'return to normal' (or to what is familiar), that incentivizes more stakeholders to facilitate (and residents to desire/demand) quick repairs rather than full rebuilds. It is argued that balancing these competing goals between 'building-back-better' vs. 'return to normal', or 'speed vs. safety' through repairs, rebuilding or relocating, is one of the main 'aims of meta decision-making', where strong support from government agencies is needed to drive resilience in recovery. This question of whether to restore livelihoods and build homes back quickly, or strengthen the overall urban environment was experienced in Chile, where residents pressed for rapid home, utility, and economic restoration; and authorities desired the implementation of more resilient urban plans (Platt, 2018). To balance interests, the authorities, in collaboration with the University of Bío Bío, created 18 plans for the most affected coastal settlements in 10 months. These plans included business restoration, rehousing of residents, the relocation of 'critical facilities' *and* the creation of a 50-80m coastal-setbacks, vegetation and tree planting, as well as the implementation of physical coastal defenses to keep residents safe from future climate change induced impacts.

Plat (2018) identifies that another 'constraint' to disaster recovery, is that first responders and individuals involved in disaster recovery are often required to make spur of the moment choices "using instinct, experience and following established protocols" (p. 390). This can make it challenging to rely on available science or 'best practice' disaster recovery implementation. With the influx of NGOs and private actors in the field, the uptake in non-expert 'high consequence' decision-making "based on incomplete or inaccurate information as well as ill-defined goals" for recovery can create poor foundations for a more 'resilient' recovery (Platt, 2018, p. 390). To avoid this, it is proposed to include 'scenario planning' as a part of disaster preparedness, so managers can practice, and by doing so, avoid making uninformed, possibly vulnerability-increasing decisions (Moats et al., 2008, *cited in* Platt, 2018). Boojh (2012) states that this should include attention to the production and impacts of poor waste-management, be guided by understanding of the local ecology and natural systems, and include attention to negative impacts of invasive species.

Boojh (2012) further emphasizes that the time of 'crisis' should be viewed as an opportunity to capitalize on CCA implementation and livelihood improvement. This may present itself as increased motivation to strengthen community and natural resilience to climate change impacts, or political attention and funding to implement these measures. Fath, Dean & Katzmair (2015) add that new systems and behaviors that emerge in a time of crisis can be catalyzing for transformation. Particularly Boojh (2012) argues that 'build-back-better' must involve livelihood improvement as well as NBS to decrease vulnerability to future disasters. It is therefore suggested that the restoration of ecosystems is prioritized in repair and rebuilding, and Boojh (2012) cautions that 'hasty' re-development or repair in the initial relief and rescue phase may cause significant environmental damage and result in detrimental impacts to ecosystem services, and overall adaptive capacity of the system.

Nevertheless, the reliance on ecosystems as 'bioshields' must not be used as the only disaster preparedness and recovery measure, as early warning systems, organized evacuation, and overall disaster preparedness are also fundamental for reducing impacts (Boojh, 2012). Hence attention to social infrastructure related to the development of internal 'self-organization' skills is necessary, and can be built by strengthening community bonds, relationships and social ties (Nakamura & Kanemasu, 2020; Sadri et al., 2018). Fath, Dean & Katzmair (2015) add that the culture and 'norms' necessary in building adaptive capacity to foster more resilient and quicker recovery must be fostered prior to impacts, requiring full life cycle consideration in the policy making process. The GCA (2019) echoes this by asserting that resilience in recovery must be included within pre-

developed recovery, and reconstruction strategies, that include contingency planning for the financing, implementation, and stakeholders included in CCA in recovery.

Lessons may be drawn from Vanuatu's networked system where a legal framework was created to provide specific assistance for the development of community partnerships between government and non-government actors, which includes mention of pre-established actor-umbrella-networks within the DRR and CCA operating procedures. These networks include a variety of NGOs, private enterprise, civil society organizations, and citizen councils. The governance framework further includes the establishment of Community Disaster Committees whose responsibility it is to implement particular CCA measures with integrated support from key government departments such as the ministry of agriculture, forestry, and education, as well as non-government actors such as NGOs or civil society groups (Vachette, 2017). It was found that the legal support for this type of collaboration fostered collaboration across silos and provided a foundation for inclusivity of actors with a range of interests and stakes. In addition, it assisted in the provision of more effective and resilient disaster recovery in the wake of Cyclone Pam, where the clear role-definitions and predefined structures for collaboration allowed stakeholders to more effectively reach vulnerable communities and provide consistent, well-coordinated support to the integration of vulnerability-reducing measures (Vachette, 2017).

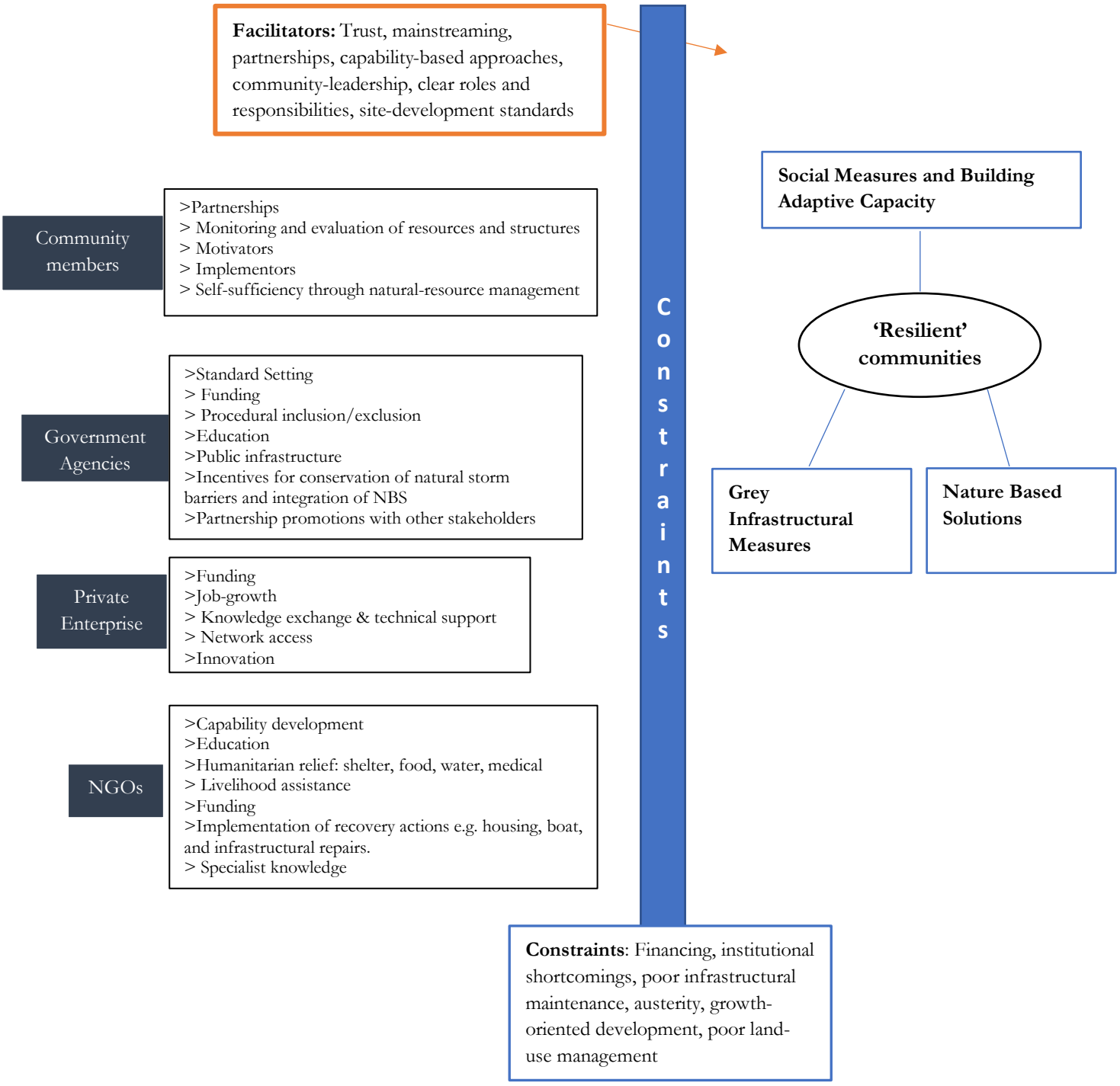
3.5 Conceptual Framework & Chapter Summary

This chapter has provided an understanding and overview over the jungle of vocabulary and concepts in the field of CCA, the context of disaster and disaster recovery, and illustrated how communities, NGOs, private enterprise, and government agencies may influence the operationalization of CCA at the community level. It has also detailed present approaches and factors, such as power-relationships and equity, that must be accounted for in the development and operationalization of CCA. In addition, the influence of crises and effective processes for disaster recovery are detailed to understand where leverage points may be found to integrate CCA measures and disaster recovery to answer Research Question 3.

This Chapter has shown that disaster recovery is a possibly significant time for implementing CCA measures, though a variety of challenges exist that may constrain this operationalization. While suggestions exist for how to implement resilience in recovery, it remains a field limited in empirical cases that account for social vulnerabilities and stakeholder roles and responsibilities in the immediate aftermath of climate change induced disruption. Additionally, as CCA is a field in which implementation faces significant challenges (Alves et al., 2020), particularly in Nations States with low institutional capacity, there is a need for investigation to learn how stakeholders can operationalize CCA measures at the community level.

The conceptual framework below summarizes the literature review findings in possible stakeholder influences, key barriers, facilitators, and CCA measures to improve 'resilience' at the community level, which the findings from The Bahamas may be analyzed against:

Figure 5 Conceptual Framework: Operationalizing CCA



Source: Author

The next chapter contextualizes CCA in The Bahamas and illustrates some of the root vulnerability determinants that must be understood and accounted for when understanding disaster impacts, building adaptive capacity, and effectively implementing CCA.

4 The Bahamas: Abaco and Grand Bahama

In order to account for how climate change impacts and the process of building adaptive capacity and implementing CCA measures is shaped by existing socio-political power dynamics as well as institutional factors, this section provides a necessary overview of key systems on The Bahamas, and particularly those of East Grand Bahama and Abaco. The section provides a more detailed understanding of the geographic, socio-political, and economic systems in The Bahamas, as well as the present response to Hurricane Dorian's impacts. This allows the following steps of the research to employ a more intimate understanding of possible underlying vulnerabilities, and what effective adaptation will necessitate within this context.

4.1 The Bahamas

The Commonwealth of The Bahamas is located in the West Atlantic Ocean with an estimated population of 392,815 (World Population Review, 2020). It consists of over 700 islands, with 30 inhabited and the large majority of residents located on New Providence (246,329), followed by Grand Bahama (population 51,368) and Abaco (population 17,224) (Government of The Bahamas (GoTB) Census, 2010). An estimated 91 percent of Bahamians are active religious participants, with dominant protestant denominations[5] (US State Department, 2008). The Bahamas is an ethnically diverse nation, and as a previous English colony, a history of racial inequity shaped the beginnings of the Bahamian State as it was largely populated by British loyalists and their slaves after the American War of Independence (Palmer, 1994). The ethnic majority on the island is therefore (85%) Afro-Bahamian, (12%) European, with a Haitian Creole community of about 80,000 (Buchan, 2000; World Population Review, 2020). While ethnic tensions have subsided, division and stigma endure between 'black' and 'white' Bahamians (Karagiannis, 2004). While this is not a study on the impacts of colonialism, it is important to recognize that colonial legacies have been found to create international dependencies and systemic vulnerabilities based on access and 'rank' (Karagiannis, 2004; Palmer 1994). It is therefore suggested that strong Bahamian reliance on imports, e.g. food, from the UK and US, exist not only due to a lack of natural resources, but also due to external dependencies nurtured under colonialism for imported manufactured goods (Palmer, 1994). See the Bahamian historical in Figure 6:

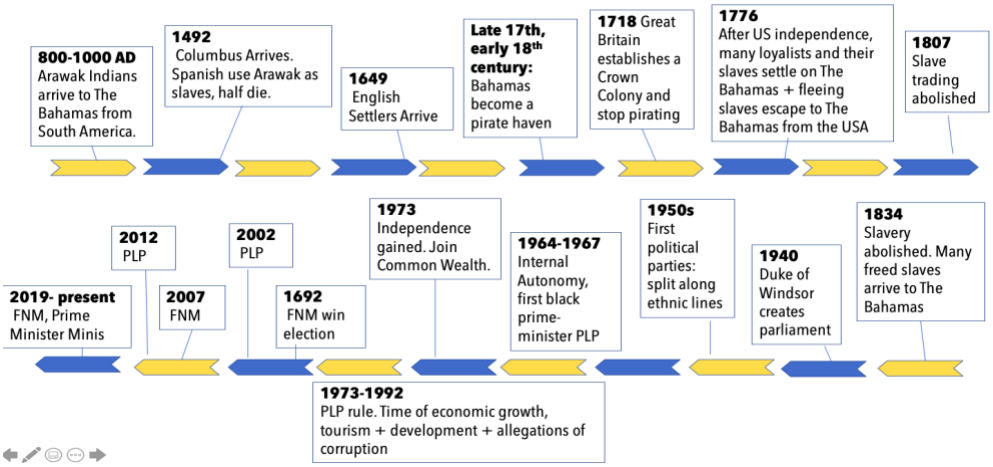


Figure 6 Bahamas historical timeline

Source: Author, adapted from Buchan, 2000

5 Denominations of Anglicanism, Baptists, Adventism, Methodism and Pentecostalism, though many also practice Catholicism, Judaism, and a minority traditional Obeah and Rastafarianism. Without an official state religion, the Bahamian state allows free religious practice. (US State Department, 2008)

With a traditional Westminster bi-cameral democracy, The Bahamas is usually governed by one of two political parties; The Free National Movement (FNM) and the Progressive Liberal Party (PLP) (Wise, 2014). This two-party system has been found to encourage short-termism in policy-making, and it has been found that projects and policies are frequently abandoned or initiated across party lines (Howard, 2018; Wise, 2014). It is suggested that party-line governance and corruption has noticeably reduced societal trust in state legislation and government institutions (Robinson, 2018)

The Bahamas are heavily reliant on tourism, and it makes up nearly 50% of the country's GDP (GoTB, 2011a). Offshore international financing, container port industry, construction, fishing, and to a lesser extent, agriculture, are also dominant economic sectors. Some argue this touristic reliance has led to a governmental prioritization of development projects and resorts over coastal and environmental protection and small scale fishing livelihoods (Buchan, 2000). This represents a challenge as the touristic value of The Bahamas is rooted in an environmentally dependent sale of 'sun, sand and sea' holidaying. Nevertheless, the development-first agenda is posing serious threats to existing storm protective barriers, such as mangroves, coral reefs and wetlands (Buchan, 2000), and in turn, fish stocks and traditional fishing livelihoods (Wise, 2014).

This is further reflected in the highly 'pro-business' governmental agenda (Karagiannis, 2004). To encourage business operation, the country has created a tax-free business set-up process in which International Business Companies (IBCs) are exempt from corporate taxes, unless revenue is locally derived (GoTB, 2011a). In addition, no corporate reporting requirements are set, and complete shareholder privacy is ensured. The only necessity is a business license, but fees are not required to receive this. Further, The Bahamas do not collect income tax, instead, state revenue comes from import tariffs, VAT, license fees, as well as property and stamp taxes (GoTB, 2011a). These structures have led to The Bahamas gaining one of the biggest GDPs in the Caribbean. Though as mentioned, GDP fails to account for income distribution, corruption, and governmental shortcomings, and the Gini Coefficient reveals The Bahamas to have one of the greatest inequitable income distributions in the Caribbean (OECD et al., 2019).

4.2 Governance Challenges and The Role of Local Government

In response to climate change threats, The Bahamas adopted the National Policy for the Adaptation to Climate Change in 2005. This was followed by the Disaster Preparedness Response Act in 2008, the 2010 Planning and Subdivision Act containing building codes and town planning standards that include storm-protective measures, and finally the National Development Plan: Vision 2040 (NDP) in 2017. The National Policy for the Adaptation to Climate Change outlines the necessity for mainstreaming climate change risks into proposed and existing planning, yet the Disaster Preparedness Response Act does not include a mention of climate change (Thomas & Benjamin, 2019). It does however provide a centralized structure for preparedness and response and establishes the National Emergency Management Agency (NEMA) which allows each district to appoint a committee with representatives from each settlement to direct the NEMA in developing locally-contextualized disaster preparedness. The degree to which this has been carried out in practice is not well documented, and Thomas & Benjamin (2019) find that while the Act focuses on Disaster Risk Response, it does not promote long-term risk reduction and planning for recovery. The National Development Plan is found to address some of these gaps via infrastructural modernizations, integrated land-use plans, hazard mapping for sustainability and recognition of the necessity for DRR and CCA in development planning and policies. However, economic growth and tourist project expansions continue to clash with coastal restoration plans (Thomas & Benjamin, 2019; Wise, 2014). Thus, while policies and frameworks have existed on The Bahamas for DRR and CCA since 2005, extreme impacts, particularly to the most vulnerable communities, persist, and the scale of impact from Hurricane Dorian suggests significant barriers to policy

implementation. Indeed, the impact of Hurricane Irma on Ragged Island in 2017 illuminated that residents had not followed building codes (Thomas & Benjamin, 2019).

Due to the spread-out geography of The Bahamian islands, policy and law enforcement has historically represented a large challenge for the central government located in the capital Nassau, New Providence (IDB, 2019). To improve this, the Local Governance Act was adopted in 1996. This created a total of 32 District Councils and smaller Townships across the inhabited islands. The goal of the Act was to allow elected local leaders to govern certain local aspects without direct central government interference.

Town Committee Responsibilities: Provide for general health and sanitation, including street cleaning, verges, drains and ditches; the collection and removal of all refuse from any private or public places; provision and upkeep of maintenance of wells, water tanks, roads signs and markings + street naming.

District Council Responsibilities: Maintenance and upkeep of public buildings, government-owned airports & terminal buildings, hospitals, clinics, boat registration, supply of public portable water by standpipes, upkeep of public school buildings and other government owned buildings, parks, grounds and beaches, roads and bridges.

Source: Authors' own, adapted from The Commonwealth Local Government Forum (CLGF) (2017)

The Ministry of Transport and Local Governance oversees the district councils and can create new local governance areas based on demographic changes. Administrative and financial management is overseen by this ministry and a government appointed district administrator. In addition, the central government continues to have final oversight over the districts, and Local Government cannot raise their own funds (CLGF, 2017). In 2017, Local Government expenditure was 0.92% of the total government budget (CLGF, 2017).

While the Local Government Act has been in place since 1999, and district councils and townships are now present on all islands outside of New Providence, the degree to which their authority is enforced has been questioned, and overall, the Bahamian governance remains very much in the hands of the Central Government and its ministries (Dames, 2020).

4.3 Grand Bahama & Abaco

Both Abaco and Grand Bahama are low-lying islands with the majority of residents living within 2km of the coast (Buchan, 2000). With shallow freshwater lenses in permeable limestone pockets, the islands have their own access to drinking water through freshwater wells (FAO, 2015). As the water table is very high, there are serious leakage and contamination threats (FAO, 2015). Due to the salinity of the soil, Grand Bahama and Abaco do not have large-scale agriculture, though Abaco does have some small-scale livestock and bigger vegetable and fruit production farming practices (FAO, 2015; Buchan, 2000).

Abaco and Grand Bahama are characterized by small settlements, resorts, second homeowner enclaves, and one or two larger port cities, Marsh Harbor on Abaco, and Freeport on Grand Bahama. Throughout these settlements the islands are host to large acreages of Caribbean Pine Forests recovering from past logging industries, palm and coconut trees, as well as the invasive Casuarina Tree; a species that increases soil erosion due to its short root systems and ability to push other more resilient species out (Buchan, 2000). The coastal areas have mangrove creeks and coral reefs, which in many areas have been covered to allow for residential developments, or are receding due to the impacts from oceanic pollution and unsustainable fishing practices including the practice of reef bleaching (Buchan, 2000). All of these factors render the coastal communities more vulnerable to climate change induced impacts.

As previously stated, Atlantic hurricanes, extreme rainfall events, possible forest fires in the dry season, and coastal erosion, as well as sea-level rise pose serious threats to the islands key economic sectors; not to mention to biodiversity, fresh water, electrical grids, and livelihoods (IDB, 2019). Man-made environmental risks have arisen on the islands from unsustainable fishing practices, dredging of canals and ports, and poor waste and water management (Buchan, 2000; FAO, 2015). In addition to this, Grand Bahama is a popular oil storage facility for oil companies seeking to import petroleum to the East Coast of the U.S. from the U.S. Gulf Coast. As a result, an Equinor oil storage facility with the capacity to store 6.75 million barrels of crude oil experienced a sizable spill of over 55,000 barrels of oil (Brumfiel & Hodges, 2019; Equinor, 2020). This illustrates how industrial allowances on The Bahamas cause greater disaster risks in the face of climatic changes.

The last 20 years have proved particularly challenging with a series of impactful hurricanes, each storm creating greater coastal erosion, salination of soil and groundwater, as well as vegetation and forest cover damage (Buchan, 2000). Thomas & Benjamin (2019) found that damages between 2015 and 2017 amounted to more than USD670 million, where damage between 1980-2012 resulted in USD 2.5 billion. For a SID, these are sizable economic impacts. The following sections highlight specific contextual details of Grand Bahama and Abaco.

4.3.1 Grand Bahama

Grand Bahama Island is the most northern island of The Bahamas, and has the second highest population in the country. Initially it only had small settlements in the East and West ends and extended areas of Caribbean Pine Forest, but in 1995 the government signed over 50.000 acres of land to Wallace Groves in order to create a Free Port and Industrial Centre through the Hawksbill Creek Agreement (GoTB, 2011b). Wallace Groves created the Grand Bahama Port Authority (GBPA) Limited, which created a growing city and industrial center that included a pharmaceutical production site, a polystyrene factory, a petroleum refinery (now closed), a major container port industry and cruise ship repair yard, as well as a quarry from the dredged out 16m deep port (GoTB, 2011b; Freeport Harbour Company, 2020). The industrial area experienced a large period of growth throughout the 1980s and 90s, but after the 2008 economic crash and severe damage from hurricane Mathew in 2016, Freeport and Grand Bahama have experienced slow growth and economic downturn, with emptying guesthouses and hotels (GoTB, 2009).

Today the container port industry is partly owned and operated by the Chinese Port and Logistics company 'Hutchison' (Freeport Habour Company, 2020). The main economic sectors of Grand Bahama are therefore industry and tourism. The entire Freeport area is governed by the Port Authority who for all intents and purposes function like a municipality, where law enforcement and VAT collection remains in the hands of The Bahamian central government, but utilities and services are provided internally (GoTB, 2011b). In addition, a subsection of the Port Authority and Hutchison Development (Bahamas) Limited have created the Grand Bahama Development Company (DEVCO). DEVCO is a land ownership and development company aiming to undertake either its own developments, joint-venture development, or the sale of land to third party developers. In total DEVCO is responsible for 75,000 acres that contains 40,000 individual lots in 45 subdivisions, as well as 10 miles of beachfront development property, and 7 miles of the seawater canal system (DEVCO, 2020).

Therefore, Grand Bahama has a mixture of Crown Land, owned by the Government, DEVCO Land, and Generational Land. Generational Land is land that has been left to a particular family at the time of decolonization. A family who lives on Generational land may therefore not have a deed to show ownership as the land has been gifted to the family name rather than a singular individual. The majority of residents in East End Settlements or 'villages' live on such Generational Land or have purchased Crown Land. Thus, Grand Bahama has a unique system of governance where the Port Authority operates the Freeport area and the Government of The Bahamas governs the East and West End. Grand Bahama therefore has two district councils, one on East Grand Bahama and one in West Grand Bahama (GoTB, 2011b). The focus of this study is the East of Grand Bahama as it remains outside of the Port Authorities jurisdiction, and because this was one of the most impacted areas from Hurricane Dorian, as well as a more socially vulnerable location prior to the hurricane. These characteristics allow the author to understand how equity concerns of socio-economics and location, as well as urban-rural divides may influence the development of adaptive capacity post-disaster.

East Grand Bahama consists of the 4 key settlements: High Rock, Pelican Point, McLeans Town, and Sweeting Cay, with smaller settlements in between (GoTB, 2011b). The settlements are largely located near the coast, with pine forests growing inland. High Rock is one of the largest settlements with nearly 3744 residents, though after Dorian, residents estimate the population has severely diminished (World Population Review, 2020). The majority of residents in High Rock commute to the Freeport area for work. Pelican Point is a smaller settlement which is made up of a combination of Bahamians and foreign second homeowners. McClean's Town and Sweetings Cay are regarded as small fishing towns with the majority of residents either working with bonefishing tourism or the lobster, conch or tilapia fishing.

4.3.2 Abaco

Unlike Grand Bahama, Abaco relies less on industrial production and more on the second homeowner market, tourism, construction and agriculture. The GoTB Website calls it the *yachtsman's paradise*, and as an initially 'white' settlement, Abaco has been referred to as 'white Abaco', as a reference to the type of development there (Palmer, 1994; GoTB, 2011c). The island has been a hotspot for celebrity holidays and wealthy American second homeowners.

The Abaconian landmass is separated into Great and Little Abaco by a small water channel, and both land masses have a large amount of smaller cays flanking the mainland (GoTB, 2011c). Due to the many Cays, there are bonefishing flats and a marlin, tilapia and sailfish fishing industry. In addition to its cays, Abaco also has extensive Pine Forests which have been hunted for wild boar and duck (GoTB, 2011c). Marsh Harbor is the commercial center of Abaco and is the location of a variety of local businesses and small scale industries. Outside of Marsh Harbor two large Haitian

shanty towns exist in areas known as 'The Mud' and 'Pidgeon Pea'. The Shanty Towns were destroyed in the Hurricane and due to the Bahamian disapproval of Haitian immigration, and the unsanitary conditions of the settlements, a six month rebuilding ban was extended to these settlements (Rolle, 2019).

Little Abaco, located in the North end of Abaco will be the closer focus on Abaco. Little Abaco is chosen for the same reasons as East Grand Bahama due to the large scale impacts from Dorian, and its status as previously settled by residents from lower socio-economic backgrounds. Little Abaco consists of mostly generational landholders and is predominantly driven by a small scale fishing industry, construction work, as well as a small-scale bar and restaurant ownership for locals and tourist visitors.

4.4 Policy Measures Implemented Post-Dorian

In the wake of Dorian, The GoTB have implemented a variety of emergency measures. An understanding of these measures must be had in order to understand the essential aspect of 'recovery', as well as what challenges or enabling factors exist in this process. This will allow the author to better understand what kind of necessities or gaps exist in the data analysis section of this paper.

Table 5 Policies and Measures Implemented in the Wake of Dorian

Special Economic Zones **Tax breaks** **Social Protection measures**	The Government of The Bahamas created a designated Disaster Zone and a Special Economic Recovery Zone around East Grand Bahama and Abaco. The Special Economic Recovery Zones were set to last 3 years. Within these zones there is "duty-free purchase of all vehicles, materials, fixtures and equipment for all business and residential construction rehabilitation efforts; waiver of business license fees, waiver of real property tax payable on eligible properties reconstructed, restored or otherwise inhabitable by October 2020; and a value-added tax (VAT) credit of up to 50 per cent on the sale of all property (given the property sale is followed immediately by some level of construction or property utilization)" (Thompson, 2020), as well as free importation of a list of approved items (GoTB, 2019). Key social protection measures include residents in rental housing being granted a 3 month rent suspension, unemployment benefit extended from 16-24 weeks, and 6 month temporary residence permits allowed for displaced Bahamians in the USA (Thompson, 2020).
Business support	To encourage recovery of Small and Medium Sized Enterprise (SMEs), the government created a $10million dollar loan guarantee and equity financing programme where Bahamian SMEs are able to secure up to $500,000 in financing to fund business restoration or new business creation through the Small Business Development Centre (SBDC) and The Bahamas Investment Authority (McKenzie, 2019). To additionally encourage business creation, a 2 day processing and no-fee business licensing process has been created. According to Prime Minister Minnis, these measures are instated to encourage the rapid development of commerce within the most affected areas (Jones, 2019).
New ministries and authorities granted extended legislative capacities	The Government of The Bahamas created the new Ministry of Disaster Preparedness, Management and Reconstruction. Through this Ministry, an allegedly non-partisan organization called the Disaster Reconstruction Authority (DRA) has been created and granted full agency for all decision-making and policy creation within the designated Disaster Zones (Disaster Reconstruction Authority Bill, 2019). The DRA has been given responsibility to coordinate with relevant Ministries, e.g. Ministry of Public Works, Environment & Housing, Social Services etc. to govern within the seven focus areas of 'Housing, Infrastructure, Economy, Education,

	Environment, Health, and Systems Strengthening' (Disaster Reconstruction Authority Bill, 2019).
Small Homes Repair Programme	The DRA launched the **Small Home Repair Programme** through which residents are eligible for up to $10,000 in purchase orders given the applicant has proof of Bahamian Citizenship, proof of property ownership, and proof of Bahamian Residency (DRA, 2020). The applicant must also have been uninsured and living in the property prior to September 1st 2020. Once a resident makes an application, the DRA sends a licensed contractor to the resident's home to create a damage assessment. On the basis of this assessment the resident may be granted a voucher for needed materials and/or labor worth $2,500 if the damage is minimal; $5,000 if the damage is medium; $7,500 for major damage; and finally $10,000 dollars for destroyed homes (DRA, 2020). Laborers, contractors, and material vendors must first be approved by the DRA, the Ministry of Public Works, or the Grand Bahama Port Authority. Before the final part of the grant is awarded, an inspector checks to ensure the voucher is spent on the house in question, assess the state of the repair or rebuild, and ensures it is in adherence to the Bahamian building code (DRA, 2020).
Town Hall Meetings	A series of townhall meetings have been held in each Disaster Zone District to inform residents about the programme, discuss the role of the DRA, and to incorporate community concerns into project and policy developments.

To this point, these are the key measures taken by The Bahamian Government. The extent to which these measures are implemented, and whether the impacted residents' needs are met, is yet to be assessed. In addition, the DRA's policy provision moves quickly, and new measures and policies are instituted on a needs-basis, or as new challenges arise. The full government response of course comes with a cost, and it is expected the government deficit will widen from an expected $7.6 billion to an estimated $8.2 billion (Thompson, 2020).

Chapter Summary

This chapter has highlighted the contextual case of The Bahamas and notably Grand Bahama and Abaco. It has sought to create a rough understanding of the history, socio-political and environmental frameworks within which adaptive capacity is to be enhanced in the wake of Hurricane Dorian. It has further illuminated the level of damage, and the government's response both before and after Dorian. This section has set the scene for a unique but representative context of many low-lying Nation States with weak institutional capacity.

5 Results

In this chapter, the research questions are answered by presenting the findings from the interviews completed with the key stakeholders identified in Chapter 3. First, the chapter illustrates roles and responsibilities of different stakeholders in recovery and the operationalization of CCA measures at the community level on Abaco and Grand Bahama. Secondly, barriers and facilitators for operationalizing CCA measures are presented. Finally, based on the results from questions one and two, it is discussed how stakeholders may better support the integration of CCA measures within disaster recovery at the community level, in the short and long term.

5.1 Stakeholder Roles and Responsibilities in Recovery and CCA Operationalization

The stakeholders included in this study were community leaders from the settlements in the East End of Grand Bahama and Little Abaco; Government representatives from the Ministry of Environment and Housing, the Ministry of Public Works, the Disaster Reconstruction Authority (DRA), and the Grand Bahama Port Authority (GBPA)'s Building & Development Services; Business owners with ties to either 'resilience' or 'recovery'; and local, as well as international NGOs. The following roles and activities were identified in the operationalization of CCA, both as outlined by other stakeholders, and based on the activities they themselves described.

Table 6 shows what roles and responsibilities community leaders, local NGOs, international NGOs, private sector actors, and governmental agencies, are taking in disaster recovery and the operationalization of CCA measures on Grand Bahama and Abaco, in the wake of Hurricane Dorian.

Table 6 Stakeholder Roles and Responsibilities in Recovery from Hurricane Dorian

	Community leaders	International NGOs	Local NGOs	Private Sector	Government Actors
Decision-making for material distribution	X	X	X		X
Material sourcing and logistics of repair		X			X
Debris removal	X		X		X
Grant provision & financing		X		X	X
Stakeholder coordinators	X	X			X
Balancing needs and requirements of community members	X	X	X		X
Prioritization and Policy development				X	X
Innovations for technology				X	
Project implementation	X	X	X		X
Education/Up-skilling		X	X	X	X
Advocacy for community needs	X	X	X		
Natural resource recovery	X		X		
Connecting stakeholders	X		X	X	

5.1.1 Community Leaders

Community leaders undertook the role of both stakeholder coordinator and material distributor. This involved directing e.g. NGOs to the most 'in-need' households, telling private actors seeking to assist in community recovery what community concerns existed and where their help could best be directed, and managing the distribution of goods and services such as rebuilding materials. In this way, they were perceived to wield power over **who** received **what**, and **when** this was received, thus possibly determining the adaptive capacity of some over others. The leaders themselves identified this as a task of 'balancing' individual and community needs; aiming to distribute materials and aid fairly. Along with this, community leaders disseminated necessary information to ensure residents were aware of the assistance provided e.g. by government agencies or NGOs. A common strategy to do this was to connect NGOs or other external actors to church leaders who were understood to be more effective in information dissemination; as well as identification of the most vulnerable residents, due to a perceived intimate knowledge of the community residents.

Community leaders additionally operated NGO services or projects. They were for instance found to operate reverse osmosis (RO) units installed by international NGOs to ensure clean water for residents in their settlements. In one example, a community leader managed a boat repair yard set up by a local NGO; and in another, a community leader was the project coordinator of six rebuilding teams for an international NGO. Responsibilities thereby included both hiring and payment-coordination of construction workers, the identification of contractors, as well as the coordination of logistics for material inflow; though the later was heavily dominated by international NGOs and the logistics of getting supplies to islands. One international NGO also noted the importance of getting project approval from informal community leaders for project development to go ahead successfully. In this way, community leaders were found to be instrumental in successful project implementation.

In addition to organization and management of the rebuilding process in collaboration with NGOs and government agents, some leaders were also influential in community advocacy by laying out plans for long-term community recovery. One leader in particular stood out due to their experience working in natural resource management at the island's botanical garden, and was planning to create a community NGO who's mission would be sustainability and 'resilient' recovery e.g. by organizing the planting of local resilient species along the communities' coastline with young 'at-risk' women, who would learn, and be a part of the process of recovering and reestablishing vegetation coverage for the community, and a new park. Other leaders similarly highlighted their role in advocacy for, or against, private developers or business interests in the area as illustrated below:

> *"And see the issue is.. the government has a tie.. Cause their goal is to never look hostile.. and forcing any company to do anything...Cause we're open for business. See the community is what needs to unite and say .. well, listen.. This is what we need..This is what needs to happen and that's how things get done..And that's why.. Like I said.. The community doesn't realize the power that they have.. Compared to the government...Cause the government has to always look sellable ..but the community, the individuals, we don't have to play cute, you know? And so that's what you see in the other communities.. cause.. You know my community is a lot more laid back [..] But the other communities, you know, they riot."(Community Leader A)"*

Finally, residents and leaders alike noted that they often independently started debris removal projects or tree and vegetation replanting on a small-scale to remove the 'eyesore' of the destruction, and 'lift the spirits' of residents. Community Leader C highlights why this is a community role:

> *Planting trees and those things are things the community can do… or like cleaning up, and all that. People think those initiatives should be paid, but in the long run they benefit people. So you just gotta do it. With the government, you have to go through too much.. It takes too long (Community Leader C)*

However, the degree of influence was found to differ sizably between settlements and leaders, often based on previous skill-sets and knowledge, as well as connections. One leader for instance had strong connections to the Deputy Minister and was therefore perceived as more effective. Nevertheless, all the identified leaders operated in an informal capacity:

> *Yea.. it's a hard job. A lot of people think i'm gettin paid..But I aint gettin one brass penny..I put in..I don't know how many countless hours in these projects..Of my own personal time..That's why I deferring to my own personal business right now, cause I'm tryin to manage for other people and dictate for other people and advocate for other people (Community Leader B)*

Thereby some leaders, e.g. who were in better financial standing, or more experienced with natural resources were evidenced to be more or less influential in the operationalization of CCA measures such as natural resource recovery and NBS. This illustrates the importance of targeting key citizens such as informal community leaders or church leaders to drive more NBS in recovery.

5.1.2 NGOs

Both local and international NGOs played a major role in the relief, rebuilding, and recovery phase after Dorian. Both assisted in the mobilization of humanitarian relief via temporary provision of shelter, water, food, clothing, generators for energy etc.; as well as the provision of materials and support for housing repairs and rebuilding. Other roles shared by local and international NGOs included community-empowerment through responsibility delegation to community leaders, and education programs, school support, and upskilling.

International NGOs

International NGOs particularly played a prominent role in largescale infrastructural recovery and operation of projects in school or hospitals, as well as housing and livelihood recovery in addition to funding and logistics. This included funding and logistics of getting materials, laborers, RO-systems, and power generators to the islands. In some cases, this allowed the transfer of more sustainable recovery methods e.g. via the donation of solar streetlamps to Abaco to provide light and minimize crime and looting at night fall. Such examples illustrated the potential for NGOs to source more sustainable materials and solutions in the phase of immediate recovery and assistance.

International NGOs additionally built adaptive capacity through livelihood recovery and empowerment. In one example this occurred through SME grants and business management education. In this project Mercy Corps, in collaboration with the GBPA, provided grants and management-based seminars for small business owners seeking to recover. Various international NGOs such as Red Cross and Water Mission also provided business restoration grants, as gratefully mentioned by private sector actors. In another example, this occurred through upskilling and encouragement for self-organization. In this case, Church by the Sea, a Florida-based NGO, had organized a locally managed repair and rebuilding project that contributed to employing and upskilling Bahamian laborers to repair and rebuild in rural settlements on Little Abaco. In this partnership the NGO sourced and provided materials and the DRA paid the laborers. The project was seen to build local capacity to rebuild, repair, and organize; as well as provide weekly cash-flow to the communities. A community leader from the settlements in which the project was placed commented that this assisted recovery while raising community spirits and bringing hope. Other leaders noted similar sentiments regarding the encouragement and assistance brought by international NGOs:

> *They (International NGOs) are the heart that's continuing this country to function right now.. If it was not for them.. You would have been in a bad mess..and you still can see.. Mind you.. It's 6 months now since the storm, and you can see the community is still not cleaned up and what not.. the government finally started cleaning it up, but we still don't have no water, no electricity.. (Community Leader B)*

International NGOs also built capacity of local NGOs, as was the case with the International Red Cross and the Bahamian Red Cross. Multiple stakeholders also mentioned the role of SBP USA, an American Hurricane & Disaster Response Organization, in educating both local and international NGOs and providing a National Public Service Announcement on how to carry out effective mold remediation. In this way, the bigger International NGOs were perceived by smaller NGOs, as well as private actors and local NGOs, as playing a role in coordination. One local NGO manager commented on the significant role of some international NGOs as coordination units that facilitated a dialogue between government and the local and international NGOs to avoid duplication of actions and improve collaboration and transparency.

Thus, while international NGOs were perceived to influence social CCA measures via livelihood support through aid and grants, as well as grey CCA measures through robust infrastructural recovery of housing and schools etc., the degree to which CCA measures, such as building long-term adaptive capacity were included in this provision varied between actors, and more often than not, was lacking. In one instance an NGO had brought in a variety of metal roofs, which were perceived by residents to be more robust in future storm events, but due to lacking knowledge in metal roof installation by the local work-force, who were accustomed to shingles, the metal roof installation was almost impossible without shipping-in international laborers. This illustrated the potentially negative role of international NGOs operating without clear understanding of local conditions. In another instance, it was suggested that NGOs may negatively influence local capacity for self-organization and adaptation through oversupply and 'doing it for them', rather than 'helping communities help themselves', thus possibly causing welfare dependencies and diminished capabilities to adapt to future impacts.

Local NGOs

The four Local NGOs in this study, Our Grand Bahama, Rotary, Waterkeepers and The Bahamas Reef Environment Educational Foundation (B.R.E.E.F), were found to influence the operationalization of CCA measures particularly via advocacy for NBS and capacity building at the community-level through upskilling and Education for Sustainable Development (ESD), in addition to providing the necessary knowledge of local environmental and social challenges and pathways to their alleviation. Their efforts in bringing awareness to the negative consequences of unsustainable development practices on The Bahamas were found to be influential in illuminating and advocating for sustainable systems and ecosystem safeguarding.

Local NGOs were additionally found to assist in mainstreaming and policy enforcement. B.R.E.E.F for instance did this by providing yearly seminars to law enforcement personnel to build awareness of sustainable fishing legislation and educate on malpractice identification and poaching in coastal zones. They also built capacity by providing education to teachers to integrate ESD into school curriculums. To date, they estimated that a teacher in each school on The Bahamas had been reached by their Teacher Training Workshops. This structure can be likened to the inter-sectoral partnerships for learning highlighted by Chen et al., (2013). Waterkeepers similarly provided free lectures to schools on the topics of climate change, and mangrove and reef significance in protecting coastlines, as well as disaster-based swimming lessons. They noted that many children, particularly from lower-income communities, feared the water and were unable to swim. They argued many lives would have been saved had a larger proportion of residents been comfortable in the water. The disaster-based swimming course was therefore catered to all children and schools to teach children in 'disaster' scenarios of e.g. a boat sinking or other survival skills in the water.

In addition, local NGOs described their roles in government consulting. The managing director of B.R.E.E.F for instance sat on several government and town planning boards, and Waterkeepers had been continuously advocating for the recently passed Environmental Protection Act and

Freedom of Information Act, though they regretted not being 'brought to the table more often'. These organizations also worked to specifically include young or at-risk community residents through ongoing empowerment programs. The Rotary 'Friends of East Grand Bahama Fisherman' program for instance brought in local boatsmen to assist in, and manage, boat repair and rebuilding to resume fishing in East Grand Bahama. Rotary additionally led big brother programs to foster local leadership; and in partnership with the international organization, SBP, had organized training and operation of a mold-remediation team of young at-risk men from East GB communities.

In the process of disaster recovery particularly, the local NGOs played a key role in relief distribution, connecting international NGOs to community leaders, and the provision of materials for rebuilding. Our Grand Bahama and Rotary for instance used their local connections and experience with disaster relief organization gained from assistance in past hurricanes to effectively reach particularly vulnerable residents.

Finally, it was found that overall protection and recovery of ecosystem services provided e.g. by mangroves and wetlands were often operationalized by local environmental NGOs, for instance via organization of waste clean-up days to remove waste from water streams and wetlands, or water quality checks to ensure waterbody health. In this way local NGOs were found to be instrumental in locally contextualizing projects that could reduce overall vulnerabilities to climate change impacts and facilitate more rapid and effective recovery by building local capabilities.

5.1.3 Private Sector

As highlighted in Chapter 3.3., the study finds that private actors were influential both through recovery funding, innovation, and a capacity to cut through bureaucratic loops.

Notably, the representatives included in this study were chosen due to their connection to 'resilience', DRR, and recovery. As a result, the enterprises strongly influenced the operationalization of CCA measures via their business aims and pilot projects; e.g. Coral Vita aimed to grow heat resistant corals, restore coral reefs, and teach tourists and school children about corals and their role in coastal protection; Mosaic Modular aimed to supply 'wind and water' resistant low-cost modular housing with multi-purpose functions adapted to community needs and culture; and Local Organics Limited: Aquaponics, aimed to provide a climate smart 'adaptable' agricultural system to enhance food security through aquaponics[6].

All these businesses could therefore influence CCA based on innovation in technological advancement, as well as innovative business models. Coral Vita for instance hoped to illustrate that a for-profit enterprise restoring coral reefs could be prosperous, and to show the place of a '*restoration economy*', in which businesses could supply ecosystem restoration to e.g. touristic enterprises that rely on ecotourism, as well as government entities or development agencies working to resist climate change impacts. Mosaic Modular similarly sought not only to provide 'climate resilient' housing, but also climate resilient community development in the form of 'community-private' partnerships, by assisting in community-led diversification and infrastructural development. In this manner, the potential for private enterprise to influence CCA measures post-disaster through business aims and motivations was substantial.

Nevertheless, in most instances described by interviewees, private sector support was carried out through charitable actions and pro-bono donations. The distribution of adaptation enhancing products or systems such as coral reef restoration and adaptable agricultural production techniques to lower-income communities, thereby largely occurred through non-profit pathways, or impact investments, where financing or donations are given in return for positive local impacts, e.g. coastal

[6]Aquaponics: A method of closed loop farming that recycles nutrients from aquaponics to plants. This uses less water, energy, and can work with crustaceans, or a multitude of freshwater fish, to create food security and minimize reliance on food importation.

protection, or livelihood securitization. Coral Vita had for instance engaged in a fiscally sponsored-project, in which other companies would benefit from funding the services provided by Coral Vita. In this example, the fiscal sponsor gets tax deductible donations to 'hire' the company to do charitable activities on their behalf. This illustrated the potential for corporate social responsibility (CSR) based projects to possibly assist in the operationalization of CCA in the wake of disaster recovery.

Finally, through funding, the private sector on The Bahamas was found to be highly influential in promoting the type, and location, of recovery projects. This was the case in a collaborative initiative between a variety of private sector actors across The Bahamas to build a showcase 'climate resilient community' on Abaco.

> *In the last two months.. we've basically tried and corralled all the NGO, and big money donors.. philanthropy, foundations.. and we're trying to put them all into sort of one focused group.. to say OK.. you got 12million, you got 15million.. you got ..150million, whatever .. we're going to come up with a plan for Abaco. We'll fund the studies, we'll fund the plan, we'll give that plan to the government and say.. here's what's been privately funded.. you don't have to do a thing.. here's our recommendations.. here's how much we will fund this.."Yes or No?".. because if you say no, you ain't getting the money.. and if you say, we don't like your plan, but we'll take your money, that's not happening either. So, the private sector , is definitely… what's going to be driving the recovery (Hutton, Abaco Chamber of Commerce).*

This ability to choose the location and direct specific recovery actions could on the one hand be beneficial to more quickly implement CCA measures, though on the other hand it could exclude locations perceived as not capable of delivering a return on investment.

5.1.4 Government Actors

Government agencies, as found in Section 3.3.2., largely played the role of 'planner', 'enforcer', and 'manager' (ACT et al., 2015). They did this through i) provision, maintenance and repair of public infrastructure, e.g. powerlines, roads, debris clean-up and waste; ii) policy and law enforcement; iii) the provision of public education and iv) public services. However, as services such as water management and energy production are outsourced to a state-owned for-profit utility monopoly on the majority of The Bahamas, Bahamas Power and Light, and a UK/Canadian owned power company on Grand Bahama, some limits to governmental influences on this 'public' service were found. Nevertheless, the government was seen to be responsible for:

1. **The roadmap to recovery: Prioritization, policy development, and implementation**

The DRA, the Ministry of Public Works, as well as the GBPA Department of Building & Development Services, were found to direct recovery prioritization, and at the time of interview, the focus was on debris removal to recover infrastructure such as roads and public buildings. While the DRA upheld the 'build back better' rhetoric, this was mainly taking place through more targeted enforcement of repairs and rebuilds to uphold existing Bahamian building codes, as well as more targeted information provision to homeowners and contractors regarding standards and procedures for housing repair and rebuilding. This was for instance achieved in the GBPA through workshops and education targeted to construction workers and contractors. In addition, widespread conversations were had on urban planning policy changes in the form of coastal set-backs, as well as alterations of the building code to include raised housing foundations. Furthermore, solutions for the designation of evacuation zones and responsibility for evacuation and displaced people was discussed as an area in need of legislative attention.

Such law and policy changes were directed by the DRA within the designated disaster zones, and externally, by the relevant government ministries. Long term CCA measures such as flood-wall or jetty installation were seen to be instigated by departments or specific units within ministries. The Coastal Unit within the Department of Works was for instance in the process of implementing four

different coastal safeguarding projects funded by the Inter-American Development Bank, one of which focused on the restoration of wetlands on Grand Bahama by relocating roads and building more bridges, e.g. making space for water. The newly rebranded 'Climate Change Unit' in the Ministry of Environment in turn was responsible for climate change negotiations on behalf of the country and drafting legislation to address climate change and other environmental impacts and concerns. The government actors were thereby responsible for prioritization and sequencing CCA measures. Exemplified is how the DRA accomplished this task:

> *So housing and shelter is important- so that's given priority.. education's important, infrastructure's important.. you know you need infrastructure before you have housing, right? So based on that priority then we determine if preference comes first.. so you know.. environment.. you need to clean up the area [..] so you can repair the infrastructure and people can get back.. (DRA)*

However, adaptive capacity building measures at the community level were not operationalized within the road mapping towards recovery to any great extent at the time of interview, and neither were NBS as 'environment' simply entailed debris removal or aesthetics. Overall, no discussion on NBS were found regarding governmental recovery priorities.

2. Approval of development projects and standard setting

Due to the extreme consequences and vulnerabilities created by unsustainable development and land-use practices on The Bahamas, the governmental influence in approval or disapproval of development projects, as well as the setting of standards to which developers are required to adhere, presented significant leverage points for the operationalization of CCA measures in recovery. This was addressed by government agents from the Ministry of Environment and Housing and the Coastal Unit at the Ministry of Works as a task of balancing the tourist economy's needs with environmental necessities. In this way, these agents played a significant role in either driving sustainable transitions, or not, by engaging in a variety of market-based or regulatory policy instruments. The Buildings and Development Services at the GBPA were for instance planning to provide special discounts e.g. in permitting fees to developers who utilized more 'green considerations' and materials in developments after Dorian.

Additionally, the authorities played a role in securing infrastructural maintenance prior to hurricane seasons. One government agent noted that while it was the responsibility of the Ministry of Works to inspect hurricane shelters prior to the season, in the aftermath, it was found that many structures were not up to standard, that building codes had not been enforced, and that more robust roof safeguards were needed.

3. Grants and funding for citizens and enterprise

In the aftermath of Dorian, Government agencies assisted in livelihood development through grant provision to homeowners through the Small Homes Repair Programme led by the DRA, as well as grants to SME's provided through the Small Business Development Centre (SBDC). The program also included business development and management workshops for residents in business prior to Dorian.

4. Stakeholder Coordination: Building partnerships & balancing needs

One of the most significant governmental roles mentioned by international NGOs and government agents was coordination of NGOs and private enterprise in recovery. This included, using Wamsler et al. (2019)'s conceptualization, the 'outsourcing' of responsibilities, e.g. of relief or energy or water provision to private sector providers or NGOs. In addition, governmental units would be responsible for inclusion, or exclusion, of stakeholders in the legislative process. It was for instance found that the DRA did not liaise with community leaders or local governmental authorities in planning recovery to a great extent.

Most governmental interviewees noted that a large task included the provision of accurate information about what documents, materials, and methods should be used in repair and recovering housing structures, both to private residents and NGOs. Additionally, government representatives mentioned the necessity to make difficult choices and trade-offs, for instance in whether to 'go for' more 'resilient' recovery, or quicker recovery:

> *The resilience questions... are one thing. And it's what level of resilience can you afford? Uhm.. if you look at like the utilities for example.. we could recover utility services.. and what that means is putting poles back.. strapping up lines so people can get back their livelihoods quicker.. but.. is that .. but how resilient is that recovery? Is recovery temporary? Does it mean you spend 30mil dollars just to get lights back on?* OR *…or do you keep that 30million dollars and find another 30million dollars to put more resilient infrastructure where the lines and stuff are burried?… but it means that you can't get back the livelihoods for 30 months? And can the country afford that you know? Those are the real considerations and the real questions.. (DRA)*

As outlined in Chapter 3, the consequences of decisions made at this stage, and the possible outcomes from the trade-offs decided upon, may have long-term consequences for more robustly tackling future climate change impacts. This illustrates that having these debates post-disaster slows down both recovery and negatively impacts the ability to operationalize CCA. It is therefore necessary for a greater degree of pre-planning and contingency.

5.2 Barriers and Facilitators

This section answers Research Question 2 and showcases the dominant barriers and facilitators in operationalizing CCA measures as identified by the stakeholders and interpreted by the author in connection to the literature review and conceptual framework.

Table 7 Barriers & Facilitators to Operationalizing CCA Measures in Disaster Recovery on Abaco and Grand Bahama

Key barriers to 'CCA' in recovery	**Key Facilitators to 'CCA' in recovery**
❖ Funding and the perceived high-cost of sustainability ❖ Centralized governance ❖ Geography & Enforcement ❖ Land Ownership ❖ Education and Skills ❖ Slow Bureaucracy and Short-termism ❖ Bad Communication: Unclear division of roles and responsibilities & poor procedural inclusion of experts and community needs ❖ Underestimation of Impacts ❖ Trauma and PTSD ❖ Market-based Approaches & Privatization of Responsibility	❖ Partnerships & Connections ❖ Community Integration ❖ Strong social networks at the community level ❖ Self-starting ❖ Grants ❖ Crisis

5.2.1 Barriers

The barriers identified were found to be a mixture of possibly harmful shared narratives and cultural challenges, as well as structural factors such as institutional and governmental capacities and structures. Possibly harmful narratives and perceptions included i) a shared perception that NBS or 'sustainable' systems and materials were particularly costly, ii) individualizing responsibility for adaptation through discourse, iii) pride, iv) mistrust and animosity between stakeholder groups, and v) underestimating impacts caused by climate disruption. Structural barriers included financing, geography, education and skills, the nature of the centralized governance system, slow bureaucracy and unclear roles and responsibilities as well as policy and law enforcement. In addition, it was

found that land titles and ownership created barriers to intervention and led to structural inequities between those with deeds and those without. Poor procedural inclusion of community leaders and local experts created further challenges in localized response. Finally, the predominantly market-based approach to recovery and adaptation, as also highlighted by Ribot, (2010) & Thaler & Hartmann (2016), led to inequitable opportunities for adaptation.

1. Funding, insurance, and the perceived high-costs of sustainability

Many actors argued that the biggest barrier to integration of CCA measures was simply lack of available funding and resources to engage in the necessary systemic transitions. This was both the case at the individual level in material choices for housing rebuilds, at the governmental level regarding the type of recovery that could be possible (*see DRA quote above*), as well as NGOs and the private sector, arguing the high costs of project completion and doing business more 'sustainably' made it impractical to do so.

> *The biggest hindrance for the DRA is.. there's no funding. The DRA has to self-fund.. we have to go out and find money internationally.. through donors, through NGOs, through governments.. because the DRA really doesn't have any money [..] I think it's going to be very difficult to get anyone to commit to funding the authority, I'm having far more success on the private sector... raising private funds.. because they don't trust the government (Hutton, Chamber of Commerce)*

However, the responses regarding funding, from nearly all interviewees, illuminated an inflated understanding that changing infrastructural systems or building back with a more nature-based or 'sustainable' focus would be more expensive and 'impractical' than building back to what was there before.

> *After the storm, they did the assessment [..] They're planning solar in each community to generate the power.. But I know from day one.. the solar was gonna be more expensive than they thought.. and 2 months after, exactly what I said.. They realized it was more expensive, it would have been cheaper in the long run, but up front it would have been too much money.. After every storm, you see .. we keep gettin hit, getting hit, hit, hit, hit- millions and millions of dolars for keep restoring.. you know what I'm sayin?- Just put the cables underground! But they keep sayin it'll cost more up front.. (Community Leader B)*

In one example a private actor complained the price of energy was holding back The Bahamas from being food independent, while the Local Organics Limited: Aquaponics business owner, Mr. Hall, suggested the challenge was not so much about the price of energy, but rather the misdirection of funds, and the use of outdated energy systems. He for instance argued the "$700 million" spent on importing food annually on The Bahamas could be spent on running aquaponics systems which could produce the same amount as imported for lower running costs. The Ministry of Works interviewee additionally noted that the biggest complaint they received from developers was the price of environmental impacts assessments, which he argued in reality only accounts for about 10 percent of the property itself. Thus, while initial investment costs certainly could be a barrier, the long term e.g. energy security, and avoided rebuilding costs in future storms could be an incentive to invest in these systems while the initial systems were down. This was notable as the government had allegedly promised USD$5.6 million to one enterprise to build temporary 'dome' housing. Possibly, again, highlighting a misdirection of funds.

Finally, the high reliance on private insurance systems on The Bahamas was noted multiple times in connection to funding as the majority of residents affected by Dorian were either un-insured, or under-insured. This meant that there was either no insurance pay-out, or not nearly enough to rebuild, which led to displacement, or less robust repair jobs. It highlights the barrier of relying on private insurance systems in a time of climate change.

2. Centralized systems

Interviewees stressed that a barrier to making choices regarding local necessities was the centralized nature of decision-making structures on The Bahamas. This included both a perceived governmental preference for the Capital Island, New Providence, as well as a perception that the government had created barriers for local decision-making. The centralized energy systems were

for instance mentioned as holding residents and communities back from investing in micro grids on their own volition, as there was a common perception that it was illegal or nearly impossible to disconnect from central grids due to the for-profit nature of both the government owned Bahama Power and Light and UK/Canadian owned Grand Bahama Power Company.

This was also notable in the lacking role of local government, who very few actors mentioned. When they did, it was mostly highlighting their minimal decision-making capacities:

> *Well, I honestly.. I can't speak to what this process is now, in terms of how they communicate with the local government and keeping up with some of the structures, because it doesn't seem.... I think it's more of a... kind of like, on a fire basis ... So kind of putting out fires or whatever's urgent.. [..] But in terms of ongoing maintenance.. I'm not sure what the exact process is right now... And I think that's what we're trying to establish as a Unit..(Brown, Ministry of Works)*

However, as outlined by the Local Governance Act, local government is manded with responsibility for infrastructural maintenance. Such a misunderstanding may therefore be of high consequence if it leads to the under-maintenance that was identified as a key cause for the degree of destruction caused by Dorian. The Ministry of Environment representative provided a similar answer:

> *We don't usually work with local governments.. except when there is an issue of national importance. So after Dorian, local government had a role essentially in helping the national government to know where the people are, what areas are most impacted, and where we should be directing dollars. But the national government really stepped in and took over the process (Neely, Ministry of Environment).*

Further research would be needed to understand if these were standalone cases or if generally central ministries avoided local government engagement.

3. Geography & Enforcement

Multiple interviewees noted that the geography of the islands made it more difficult to implement and enforce policies and certain CCA measures. Challenges that were mentioned included the high water table, which interviewees felt made the discussion on drainage nearly impossible, and the dispersed nature of the islands and settlements which created barriers for assisting rural settlements, as they often became cut-off from central roads due to flooding or debris. This also complicated logistics of material in-flow to rural communities, who often experienced long wait-periods or materials arriving in an order that was counter-intuitive to the rebuilding process.

Geography was cited as one of the most common reasons for poor enforcement, e.g. of sustainable practices and building codes, which in connection to the highly centralized decision-making structures, often led to poor monitoring and maintenance of infrastructure. The representative from the Ministry of Environment argued this also made it more challenging to police unsustainable practices such as illegal cruise ship dumping, as the majority of people, technology, and institutions were on New Providence: *When the central government is made aware of these things, a lot of times, the crime has already been committed.. and people are not in the area anymore. So enforcement of the law across the country is a very hard task.. (Neely, Ministry of Environment).*

4. Slow Bureaucracy & Short-termism

Multiple interviewees highlighted the perceived slow pace of 'getting things done', often referred to as 'slow bureaucracy' or 'red tape', as a barrier to effective implementation. This echoes findings from Chapter 3, where institutional capacity was identified as a challenge to action. This for instance manifested in inappropriate payment wait-times for government sponsored activities, e.g. contractors and laborers. One leader highlighted that slow payments created an inconsistent labor and work-pace that negatively affected the ability to repair, rebuild, or remove debris. This time-gap and the desire to return to normal for those residents seeking to remain in their settlements caused many to self-start rebuilding without governmental guidance, which could result in less

robust or secure structures: *People are getting to the point now, where they're saying screw everybody.. And i'm gonna take the little that I have, and I'm gonna start.. cause they can't wait too long… (Community Leader A).*

Yet bureaucratic challenges were not just experienced by citizens, but also by governmental units seeking to implement projects. A recently hired member of the Ministry of Works noted that a 'coastal resilience' project had been tied up in various bureaucratic loops for more than 3 years, and had not broken ground.

Additionally, stakeholder experiences in project or policy shutdowns due to political short-termism heightened mistrust towards government-led projects due to the perception that such projects would only be supported for the duration of the political term; which in the case of long-term adaptation projects would be insufficient. This similarly led to some stakeholders moving to actively avoid governmental assistance in project implementation: *That's why they say you have to be careful when you start a project.[..], it has to become an independent project.. because if the Government changes, then they have the right to just drop projects.. (Int'l NGO)*

Similarly, wait times e.g. for permits and other approvals were considered to take much longer due to the highly centralized governmental structures and poor inter-ministerial collaboration, which some stakeholders mentioned required multiple permit approvals for similar activities. 'Outdated' systems were cited as a reason for some of this 'lag', and both community leaders and government actors expressed hope in an 'E-Government' project that would create more online registration opportunities to speed up permit and approval processing.

5. Coordination

Poor coordination between certain actors was not only a cause for project delay, but also poor implementation or duplication of efforts. Government representatives noted that overlapping responsibilities, or unclear division of responsibility due to 'silos', was an area that was in need of rectification. One government agent noted that they had counted over 10 departments with overlapping responsibilities for coastal management; and perceived that competition for funds and resources created a disincentive for project collaboration. This was not only cited as a challenge for government agents, but also NGOs, where duplication in efforts could lead to some residents receiving a greater degree of support than others; or, alternatively, miscommunication, in which one NGO took 'responsibility' for x amount of house repairs, but then were unable to supply the promised repairs, and another NGO or development organization needed to take over.

> *Sometimes NGO actions are not so coordinated and some double actions happen that might undermine other actions. Red Cross gave 3500 USD vouchers to boaters.. if Red cross gave them that,.. Then why should we repair the boats for free? Or who gets the money, doesn't get the repair? Or how do you coordinate that? Is it fair? (Rotary, Local NGO)*

It was further evidenced processes to operationalize CCA measures in recovery could include a greater degree of local expert input. Some expert knowledge holders such as local NGOs or residents for instance highlighted being 'left out of the decision-making' table, or not being contacted when the government initiated new projects or completed assessments. In addition, due to poor inclusion of local experts, some mismatch between community needs and government provisions was present, e.g. regarding which materials could be provided from the Small Homes Repair Programme. The DRA had allegedly sought to create community committees to include local input, though 7 months after the event, this still had not occurred.

Overall, the analysis showed a dominant perception that governmental agents and some private actors would 'talk big' but not deliver on their promises. This created diminishing trust in government bodies and strengthened community trust in international agents due to the perception that they were 'getting things done'. The findings thereby highlighted an **underlying animosity and mistrust between stakeholders**. This was noted both at an inter-ministerial level in the form of resource competition, as well as between public and private sector actors, and local and

international NGOs. This was particularly the case between the public and private sectors where mistrust and animosity had led to private sector development of the 'resilient' community project in which the private sector would fund and operate the development of a new community that could be show-cased for other low-lying Nation States vulnerable to climate change impacts. This 'resilient community' show-case dream was found to be a significant incentive for private actors' involvement in building adaptive capacity due to the perceived return on investment if the project was successful. The following excerpts portray these private-sector sentiments:

> *Cause the private sector is essentially at loggerhead with the government.. They complain that we're white.. They don't say that we're white, but that's really what their complaint is... And you know.. We got the money.. And.. We're all Bahamian underneath it all..[..] So this has to be a community-led private endeavor. So the whole point with this is that when we take it to the government.. they can't say no… (Private Enterprise)*

> *Just get the government the hell out of the way... let the private sector do what the private sector does, which is maximizing efficiency of assets.. That is not what the government does.. The government is responsible for regulating and enforcement..Totally different from maximizing productivity of assets... (Private Enterprise)*

Given the necessity for trust for successful PPPs (Chen et al., 2013), such active avoidance may present a challenge for long term successful project implementation.

Local NGOs and State, and local NGOs and international NGOs, also experienced this type of barrier founded either on animosity between actors, or mistrust. One local NGO had for instance engaged in a partnership with an international NGO who had left them with a large shipment bill they had promised to cover: "*So that was about 3800 dollars.. that now left me and my organization at a stand still… so we haven't connected with any other NGO since that.. (Our Grand Bahama, Local NGO)".*

Another group experienced that the government showed more trust and engagement with international NGOs over local NGOs.

> *It's crazy that.. someone is just coming to your country and the administration trusts them more [..] I think where we are disadvantaged... and I'm being very real here... is the fact that we are mainly black people in this organization.. and so .. you would have ..15 international NGOs that come to this island after the Hurricane, and they would have came here after we would have been doing years of work .. and they get the utmost respect, because they are caucasians…They get respect from every government agency.. every authority.. every official… and then you have.. a Bahamian owned, black majority organization.. that's doin' the same work as they would have done.. and we get the beaten.. because the same work that they're doing.. we have been doing.. but our faces aren't the color that requires them to respect us… (Waterkeepers, Local NGO)*

An example was then provided regarding the management of a water catchment system set up by an international NGO that wished to hand over operation of the project to the local NGO, Waterkeepers. However, due to governmental concerns with them, this had been held up. Similarly, a private actor noted that the Bahamian natural conservation organization, Bahamas National Trust (BNT) came from Nassau to take assessments of mangrove health and environmental damage from Dorian. When they suggested the BNT reach out to a local environmental expert, as he had already completed assessments, they non-committedly said they would, but never did. This mistrust between stakeholders seeking shared goals is likely a challenge to create meaningful long-term partnerships, and the interview excerpts highlight that some of this may stem from colonial legacies and certainly from poor past-experiences with governmental entities. It also illustrates the 'clash' between the environmental agenda as portrayed by NGOs seeking ecosystem health, and the governmental environmental agenda which was perceived as more of a 'means to an end'.

6. Land ownership

The issue of land ownership structures on The Bahamas was a reoccurring theme. It was found to increase adaptive capacity to have clear ownership rights with a deed, and to undermine it not to have clear ownership. The topic of Generational Land was therefore a common challenge for

NGOs seeking to rebuild generational housing as it was discovered far-away family members could sue for property ownership since the property is given to e.g. the generation with a specific land name. This made the provision of assistance to generational landowners a more challenging task and made them more vulnerable to climate change impacts and communal infighting as a result. This was also a challenge for developers seeking to invest in, or use land that was 'generational', as well as policy-makers hoping to implement coastal 'setbacks' or relocation strategies. It was noted by the interviewees that, in some cases, homes built on Generational Land in particular had not been continuously maintained or repaired since the 40s, and that new homes had been built 'right in the line of fire', it was just that water had not run that way for many years. The DRA also commented on this:

> *We need to take a serious look at how we zone or respond to places where they may not be the best places to build.. like right on the coast and low lying areas.. but what people don't realize is.. those are legacy properties. Ya know? Some of those properties have been in people's families for generations.. and there is, uhm.. resistance to change.. so..[..] with that resistance you just have to put them in the best construction situation as possible.. well if you are adamant that you're gonna live here.. you need to build this way.. but you know.. a category 5 storm, with a 12 foot surge.. approx. 80% of Grand Bahama would be in the flood zone.. what do you do? (DRA)*

Finally, privatization of land carrying essential island ecosystem services without requirements to sustain them was perceived to pose barriers for recovery and conservation of naturally storm protective barriers:

> *A lot of developments are going on now with removing mangrove creeks and dredging them, and filling them in.. .. cause.. one of the challenges we have is that a lot of this land is privately owned.. And uhm.. There is only so much you can tell x person who owns the property what they can do with their property.. Unless she's aware of what she's doin .. all she's lookin at is the dollar sign.. (B.R.E.E.F, local NGO)*

7. Low-skilled Workforce & 'Not Enough Labor'

Across stakeholder categories, all interviewees mentioned the issue of education and skilled labor. This occurred in a variety of ways. Firstly, the perception that contractors and laborers would 'cut corners', or simply not be skilled to the degree that they could build robust structures, was commonly cited for poor policy enforcement or unsound structures. This was perceived as a barrier for district councils, townships, or community leaders to make decisions regarding rebuilding and recovery, when expertise was lacking.

> *The primary problem would be training.. to make sure that the people that put themselves up for elections in local government and local government elections, that they understand the role of the environment, the importance of the environment, and how it should be treated.. Many people that are interested in local government, have no environmental background [..]And sometimes mistakes are made.. because that understanding is not there.. (Neely, Ministry of Environment)*

Secondly, stakeholders experienced an overall shortage of local labor in construction and management sectors, and for many NGOs this would hold up construction or local empowerment projects, as they could not find the skilled laborers needed to complete their projects. This also led to contractors and laborers raising working prices due to high demand.

The challenge with 'skilled' labor and expertise was cited as a short-coming in the education system where a local NGO argued that differential opportunities for 'good education' were present for lower socio-economic communities where classrooms could be overcrowded, and educational standards lower than in private schools. '*Not everybody is able to move through at a rate where it allows everybody to be in a position to be employable' (Local NGO).* Another community leader highlighted that poor awareness of natural resources had led to additional destruction of ecosystems, habitats, and salvageable plants due to bulldozing away 'debris', rather than investigating what this debris was made of.

The differentiation between higher educated or skilled residents clearly influenced the success of recovery project planning and implementation compared to their perception of neighbors they

mentioned in their interviews who had been unable to 'adapt' to the 'new normal' in the same way, and consequently, were depicted as having "*lost everything*".

8. Underestimation of climate change impacts

One of the most mentioned themes that arose through the results analysis was an overall underestimation or misunderstanding of the degree to which climate change will cause unpredictable impacts, in spite of a high level of perceived climate change awareness among interviewees. It was for instance often cited that Dorian had been a 'super storm', and that it hit in a completely different way than ever before *"places that had never flooded before, flooded" (Community Leader E).* Therefore, while enterprises and residents had prepared based on previous hurricane experiences, the underestimation of flooding impacts and storm surge caused a greater degree of damage. Mr. Hall describes: *And of course I had already been through five hurricanes at that point .. so it's not like I wasn't prepared for that..[..] What I didn't account for.. was the 6 feet of water.. eeeeeverything got destroyed [..] and um... it was a bit of a shock.. (Mr. Hall)*

Many suggested that *such* a storm would never hit again as it had been such an irregular experience, an 'outlier' in the Bahamian thousand year history of hurricanes. This became a commonly cited argument by all interviewees for why the impact had been so devastating. Certainly, the impact itself *was* catastrophic. However, this directed the conversation to the degree of impact, and framed the cause for slow recovery to have been solely due to impact rather than the combination between impact and pre-existing vulnerability conditions. In addition, interviewees argued many Bahamians held a 'nonchalant' attitude to hurricanes and flooding. This was argued to be a key reason why many had not evacuated or taken precautions prior to Dorian, as it was thought to be 'just another hurricane'. The immediate preparation therefore became based largely upon past experience with hurricanes which, in a time of climate change, may no longer be sufficient due to the unpredictability of climate change impacts. The DRA manager reflected:

> *they are almost like children.. you know.. each storm requires a specific response.. the thing is.. what you do is you prepare as best as you can.. you know that's all you can do.. is prepare as best as you can based on the experience of the last storm.. this means that for the next storm, you know, you evacuate.. if your house got flooded you move.. And you do this based on your experience.. no one can predict the level of storm surge, if you get a 20 foot storm.. or if the storm will be stationary over your island for 36hours.. nobody predicts those things.. so all you can do is use your past experience to prepare for your next one.. (DRA)*

The Ministry of Environment agent echoed similar reflections on the topic of displacement and noted that no experience had prepared them for the displacement, and that for future impacts, it would be necessary to better account for the costs of inter-island migration, e.g. urbanization, sheltering displaced people, waving taxes and more social service costs.

9. Trauma & PTSD

Some private developers portrayed impacted populations as 'lazy' for not building back or staying in unsafe mold and termite-ridden homes, and worried this would negatively impact the ability of a community to become attractive to tourists again, despite a multitude of opportunities to repair and get grants. On the other hand, local community leaders argued that trauma and PTSD was wide-spread, and that residents were often 'too proud' to ask for help.

> *Well.. listen man.. After going through a storm again.. The people are still so traumatized and don't have the drive to do somethin for themselves.. I'm one of the few.. But for the most people.. they don't have the drive right now.. some of the people they come in everyday to work on their house, but then they gotta drive again back to Freeport, cause the houses aren't livable.. They got mold and all kinds of stuff.. [..] so they takin it one step at a time, one day at a time. (Community Leader B)*

Some noted that NGOs had attempted to send in mental health professionals, but due to stigma and adversity to 'looking weak', not many availed of the offer. One international NGO representative also argued that an alcohol problem in some communities attributed to a lack of

information on government and NGO offers present, since this information was largely disseminated through the church, and those individuals did not attend services.

10. A predominantly market-based approach & 'individualization of responsibility'

Due to the low institutional capacity and challenge of enforcement, the approaches fostered were found to be predominantly market-led, growth-based approaches to recovery. This was therefore heavily dominated by business interests in restoring commerce and tourist economy first and foremost, without considering other possible livelihood options which may be more resilient to future systemic shocks. Some private entities sought to create a 'community business plan', centered around Airbnbs and 'climate change resilient' development projects managed by the community, though still essentially aimed at attracting tourism. This in of itself may not be a barrier, but could be a driver for CCA measure implementation; so long as the measures incentivize overall greater community benefits, and eliminate single-sector dependencies. Nevertheless, some leaders argued that marked-based approaches in the past had left them out of the recovery process and placed undue burden on residents over companies and FDI.

> *The electric company.. Freeport power.. They talkin' about all the money it'll take to put the power back..but what about all those years when you was makin millions and millions and nothin' happened? [..] Last hurricane, about 2 years ago.. They just raised the price for the Bahamian people to just shoulder and offset what they have to spend to put the poles the back[..] Now they're already asking the same people to shoulder the electric bill [..]. (Community Leader B)*

> *And in most cases uhm, in the Bahamas.. you have a history of, you know, just allowing development to come in and just do what they want ... And, just to build and then ask questions, or you know, try to patch it up later, or don't patch it up at all ... until it actually becomes a problem. (Brown, Ministry of Works)*

In the majority of interviews, a shared narrative on 'individualized responsibility' was dominant. This led to the onus for recovery, preparedness, rebuilding and 'resilience' to be delegated to the individual through discourse. This penetrated the framing of 'resilience', mostly interpreted as personal strength and capacity to persevere. Many therefore argued The Bahamians were the *most* resilient due to the ability to recover from trauma and build back time and time again.

> *We are badass… when it comes to storms, there's not much more Bahamians need to learn or go through when it comes to storms.. (Community Leader A)*

> *which is why we've been talking a lot more about being..'climate change ready' or.. Being 'fully prepared'.. like using those words where of course… it still means to be resilient, but, for a lot of us… saying to be 'resilient'.. means to do nothing .. because we already have strong people.. So..because we already strong… and strong minded or because we have dealt with so many hurricanes and survived it.. we don't see why we need to change (Waterkeepers, Local NGO)*

This illustrates the power of discourse and framing, and how this can dictate the approaches taken to CCA. Such 'privatization' or 'individualization' of responsibility for 'resilience' and 'preparedness' may be harmful to the creation of the connections necessary for operationalizing CCA social measures that build adaptive capacity. It could further immobilize the development of measures that create robust systems or tackle underlying vulnerability determinants by propagating an "*all you can do is prepare*" narrative, rather than purposefully enforcing legislation and implementing adaptable systems, certainly, to prepare, but also to adapt as a unit, rather than an individual. This additionally creates structural favoritism for residents or communities more able to 'prepare' and 'recover' due to financial status.

5.2.2 Facilitators

The most significant facilitating factors for the operationalization of CCA measures were partnerships and connections between actors, whether this was strong community interconnection, NGO-public partnerships, private-public, or community-private partnerships. Whatever the format, working with partnerships founded upon community integration and local solutions was perceived as key to effectively operationalize CCA measures at the community level.

1. Partnerships and Connections

When asked what facilitated successful partnerships, a variety of elements were discussed. These included transparency, trust, a willingness to cooperate, and pre-existing connections. This could be personal connections e.g. to investors, influential government agents, or likeminded individuals, as well as personal connections to an area. Some argued ministers from the impacted areas made a larger push for recovery than those from other areas. This was also visible in what was observed to be a somewhat differentiated attention between Grand Bahama and Abaco, as interviewees felt there were more investors who believed in potential return on investment in Abaco than on Grand Bahama. This may have led to more private sector attention to Abaco than Grand Bahama. This was also influenced by the presence of the GBPA on Grand Bahama, and a possible perception of its poor economic standing since the 2008 crash and Hurricane Mathew. The investment-potential facilitator for partnerships and private sector investment in public infrastructural recovery thus highlights the potential for private sector involvement in local value-creation.

One of the most successful international NGOs noted that the reason they had been able to build an empowerment-based model and reach the residents to the degree they had, was due to transparency, willingness to collaborate and share information and resources with government actors, while simultaneously trusting in local managers and leaders to facilitate and manage the recovery projects. The individual noted that without the level of transparency and willingness to follow local cultural norms and governmental requirements patiently, similar level of success may not have been achieved.

Multiple stakeholders additionally highlighted the role of 'WhatsApp' as *the* communication platform that allowed new partnerships to form, and for the meeting of 'unlikely bedfellows'. In one community for instance, the fact that the pastors from different churches could communicate through WhatsApp facilitated greater discussion and had arguably led to less duplication of efforts and more targeted impacts. In general, on both islands, support and direction from the churches hugely facilitated distribution and information dissemination. Other International NGOs mentioned being able to follow and coordinate actions through WhatsApp and monthly meetings.

In this respect, one international NGO, Mission Resolve, had initiated a joint response initiative founded upon experience in disaster recovery from the Florida Cays. This initiative sought to connect NGOs and government representatives under one heading to create a single donation and relief website, voice, and operation, rather than spread out uncoordinated single activities. While the joint response had successfully gathered the perceived 'key players' DRA, Mission Resolve, Bahamas Strong, Head Knowles's, UN agencies, Red Cross, and other international NGOs, the environmental advocating local NGOs and 'experts' had not been included within this voice. Instead, plans had been made to invite international scholars and experts to assist in recovery.

Nevertheless, it was mentioned that government actors actively supporting certain partnerships were important to foster project implementation. This created a type of catch-22 as there was both the perception that projects needed to be independent from government agents to achieve longevity, while there was also consensus that strong government support for projects would speed up its implementation.

> *So for too long.. we have relied so much on the government system.. and that is good that the government tried its best to maintain the balance.. but it can't do it by itself.. you know, you need NGOs .. you need other private organizations to be providing these services (Waterkeepers, Local NGO)*

2. Community Integration

Community integration and community partnerships were demonstrated as fundamental in ensuring adaptive capacity was built, and for projects to match community needs. It also led to

greater success for stakeholders seeking to build-resilience at the community level. The international NGO, Church by the Sea had created such a community-integrated project, and through this integration learned that gifting housing to residents whose homes had been destroyed caused contention among residents. Therefore, despite available funding to build new homes, the organization, after dialogue with local leaders, decided there could be better ways to support the community in its entirety. As community livelihoods were predominantly supported by fishing, and this industry had suffered a significant blow due to the destruction of fish-traps, they decided to fund and implement a community fish-trap building and placement project. This could be managed by local leaders and funded by the NGO. This project thereby show-cases an example of building adaptive capacity from local solutions, while increasing local management potential. In another example, a local leader was able to plan and implement a local planting project to clean up, remove invasive species, and plant local resilient vegetation to safeguard against erosion, flooding and protect ecosystem services. A private investor and business owner supported this project viewing it as an opportunity to increase value-capture and possibly represent an impact investment opportunity. These examples illustrate how community-integration facilitates the operationalization of CCA measures post-disaster.

While the 'going it alone' narrative could be perceived as harmful, the encouragement of local solutions at the community level through some degree of systemic decentralization and devolution, e.g. in the form of community-led microgrids, and support for local government in combination with upskilling, was perceived as a positive way to enhance adaptive capacity and counteract the negative impacts of slow bureaucracy and geographic challenges with enforcement. As these challenges had been highlighted post-Dorian, Community Leader A noted that government agencies were planning to better support community-committees going forwards:

> *.. Cause the government can request things on your behalf, but the community needs to tell the government what you want.. So to do that, you got to unite.. And this is why the government.. or our MP Turnquest.. Is pushing for the community to form its own organization, it's own community organization that can speak as one voice for the people.. . outside the government.. and of course the government is gonna work along side them and give the support they need (Community Leader A)*

An official example of this could be seen in the functioning of the GBPA Buildings & Development Services, which though operating through a private company, carried out the function of a municipality for the Port Area. This localized management structure, while controversial, presented a strong example of what decentralization and stronger local government could look like as it was experienced to be more effective in monitoring and evaluation than the central government, and to a greater degree reliant on expert-led decision making. Greater decentralization would however first necessitate strengthening of skills and education at local levels to secure capable management and mainstreaming of CCA measures.

> *local government in particular.. and some of the family Islands.. don't have the skills required to make the decisions that they make.. and so… if a mechanism of getting skilled persons in those local government ..or whatever is needed..then I think it could work (GBPA Buildings & Development Services)*

3. Strong social networks at the community level

Strong social ties within the rural settlements fostered stronger communal assistance. It was argued that these ties were the reason why few became homeless, though many lost their homes, as there was nearly always somewhere to stay, at least in the immediate aftermath of the storm. These strong community ties and familiarity within the settlements created a stronger foundation upon which activities could be integrated at the community level. It additionally deterred theft and created a safety and support base for residents to move forwards past trauma.

> *The community was cut off entirely from the main city- Freeport, and other settlements. So immediately after, we started cooking and sharing in the community. We found a cooker. We had stocked up on food and were ready to deal with what would happen after the hurricane. Everyone shared.. and we then also housed survivers who had lost everything for those first 2 weeks. (Community Leader C)*

4. Self-starting

One of the greatest underlying elements for more successful recovery was self-starting, likely the result of both the privatization of responsibility and mistrust of official governance systems. It was therefore a commonly held belief, by the majority of interviewees, that it was more effective to plan and implement as independently as possible. Mr. Hall of Local Organics for instance showcased a markedly quicker and more efficient recovery than his perception of neighboring famers. While a variety of factors likely influenced this success, such as past experience in logistics and management, the underlying factor was a willingness, and ability, to self-start, which brought greater attention to the enterprise and secured more funding through the attention. Mr. Hall additionally held a 'waste as resource' mentality in which he made use of salvaged materials, designed his system based on past hurricane learning, and took time to map out his own recovery process. Community Leader C used a similar strategy in the planning of their vegetation restoration project. In this case they stressed the necessity of doing this quietly, seeking funds from online fundraising, and when everything had been planned, organized, and funded, *then* seeking permission from the island Deputy Prime Minister. The reasoning was that any time a governmental entity would get involved in conceptual stages of planning, bureaucracy and red tape would get in the way: "*Even when you don't need anything from them, they STILL manage to make red tape..".* In this way community leaders were able to use pre-planning and self-operationalization to push forward their more long-term recovery agendas and ensure governmental support by creating finished projects that were funded and 'ready to go'.

In one settlement, the entire community gathered in the wake of Dorian and elected their own team of leaders who would coordinate the recovery response. In this way, by not waiting for encouragement from the Deputy Minister, but rather starting by themselves, they were able to create a settlement-led donation and management unit to restore the community. The presence and popularity of the community for second homeowners likely facilitated the donation campaigns.

5. Crisis

Crisis, and the result of hyper-awareness of climate change impacts was a found to be a dominant force for change, and instigator for the operationalization of CCA measures. This occurred due to the illuminating impact of Dorian which highlighted the previously poor policy enforcement, the inability of government agents alone to provide basic necessities for the response, the years of unsustainable development, and the challenge of a highly centralized governance structure. This awareness strongly facilitated changes both in governmental structures, as seen in the creation of the DRA and Ministry of Disaster Preparedness, Management and Reconstruction; and private rebuilding, as interviewees across all stakeholder categories noted they would plan differently based on the experience from Dorian.

These illuminated 'truths', for instance led government agents interviewed to reconsider how to create more 'sustainable' adaptable development. It led to community members fighting for solar and renewable energy projects, residents thinking twice about rebuilding in flood paths, and, what was stated, to be many residents double checking the work of their contractors and builders to ensure no 'corners were cut' in the provision of sound structures. Furthermore, the 'crisis' and 'disaster' highlighted the significance of natural storm barriers and essentiality for food, water, and energy security. This strongly facilitated actors to move quicker in regard to preparedness for future impacts. It also led some to refer back to what had been 'traditional' methods propagated by great grandparents such as rainwater harvesting and building on stilts. Of course, gaps remained, but the attention and illumination of some underlying vulnerability determinants, including the degree of variability and unpredictability of climate change, became clearer; and many argued this would instigate change going forwards.

5.3 Integrating Disaster Recovery and CCA Measures

To learn where disaster recovery activities and CCA measures could be integrated, it was first necessary to cross-compare present actions on disaster recovery to the CCA measures highlighted in Section 3.2. This allowed the identification of a number of gaps existing in the present response. The first section therefore highlights these gaps where the second section illuminates' spaces where they could potentially be filled.

5.3.1 Gaps

Table 8 Gaps Existing in Present Climate Change Impact Response

Planning	Lack of contingency plans
	Insufficient local government coordination/community-empowerment
Social measures / building adaptive capacity	Missing attention to social vulnerabilities to climate change impacts and their root causes
	Inadequate relief for PTSD
	Lack of pre-planning for displacement
Systems: NBS & Grey Infrastructural Systems	**Systems in need of attention:** waste, biogas, transportation systems, renewable energy, water management, cohesive coastal zone management
	Insufficient attention to natural resource management/nature-based solutions integration in recovery
	Lack of long-term securitization of food & water security

1. Planning & local government coordination

The analysis revealed that the role of contingency planning was a clear gap as there simply had been no 'resilience' in recovery strategies added prior to Dorian outside of immediate response. This was found to significantly slow down the process for recovery as the DRA, a new institution, had to both identify what their roles and responsibilities were, create the necessary infrastructure for an institution, and create policy meanwhile.

The results additionally highlighted missing local government or community-integration. Even when district councils and townships were in existence, the governmental interviewees included in the study did not mention past collaboration at a great scale prior to Dorian, and the head of the DRA argued it was local governments responsibility to get involved themselves:

> *If you're in local government and you believe in your role as assisting and helping the people you will make sure that you're involved.. you know we're saying.. don't wait on the government.. you know.. this is not our recovery, this is everybody's recovery.. (DRA)*

These gaps highlight the necessity for systemic and structural local government strengthening and incorporation as the lack of their involvement could lead to poor understanding of community needs and reinforce the historically poor policy implementation at the community level.

2. Social measures and building community-based adaptive capacity

The influence of international NGOs pertained mainly to service provision and rarely included long-term skill-building and increasing capacity for local communities to self-manage future impacts. Certainly, in unique cases, the SME business support and empowerment-based models had this effect, but overall, attention to root vulnerability determinants such as the challenges of land ownership, poor public education, and the social aspects of adaptation such as displacement and relocation was missing. This was clear in the gap in the Small Homes Repair Programme, in which only residents with 'proof of ownership' were eligible, when hundreds of properties across Grand Bahama and Little Abaco were generational, and therefore did not have deeds.

Additionally, action on trauma and PTSD was not effectively addressed, though as mental health was mentioned by stakeholders on several occasions, it was given some attention.

3. Adaptation of systems

A key gap repetitively mentioned by interviewees was the long-term inflexibility or 'rigidity' of multiple systems on The Bahamas. Notably, energy and water systems were highlighted. Poor maintenance or failure to implement 'resilient' structures left wanting systemic energy transitions and long-lasting solutions for freshwater, as many RO units were simply short-term loans from international NGOs. There were multiple policies and rhetoric regarding the necessity to build more sustainable energy systems. The power companies had tackled it by installing thicker poles spaced closer together. Yet, microgrids and buried powerlines were considered too expensive or impractical; or as some residents noted regarding microgrids; they would not be profitable for the energy companies, and therefore were not 'allowed'. Whether or not this was the case legislatively remains unclear.

Waste was additionally a sector mentioned by few, though when it was mentioned, it was described as "*an environmental hazard waiting to happen" (Hutton, Abaco Chamber of Commerce)*. It was described as so due to existing poor waste management systems prior to Dorian, as well as unsorted debris in multiple unsanitary landfill sites. While the DRA noted that effort had been made 4 months after Dorian to separate waste, this had not been enforced initially, and the result was a variety of hazardous waste piling up. Additionally, drive to remove the 'eye sore' in the communities and unawareness of waste as a possible resource, led to unnecessary landfilling of possibly valuable and reusable materials. Mr. Hall highlighted this in the reconstruction of his aquaponics facility:

> *So everyone was like… "Oh well … it's destroyed… you might as well get the bulldozer.." and I was like.. we're not getting the bulldozer to any of this stuff in the back here [..] Cause I could salvage… and I did salvage 90% of that structure.. the Styrofoam.. the trust.. boards.. cause it was all wood material, so it was all reusable.. (Mr. Hall)*

The topic of food security in the wake of Dorian was highlighted due to dependence on imports, and difficulty in getting food to the islands in its wake. Mr. Hall argued very little attention was given to integrating systems such as aquaponics or warehouse farming at a settlement or even island-based level; likely due to the perception of large initial investment costs and a dominant sentiment that 'you cannot farm on The Bahamas'.

The low prioritization of NBS, and perception that NBS would be too expensive, was identified as a significant gap in response. This was particularly the case, as the large-scale destruction could have offered opportunities to restore areas where water naturally flows and re-introduce vegetation for drainage in these spaces. Yet, the discussion on drainage in the wake of Dorian and storm water management, was not far-along. When NGOs therefore assisted the housing rebuilds and repairs, increasing drainage capacity to reduce flooding and increase run-off potential, or water redirection, was not included. It was additionally not included by DRA contractors sent to check the 'resilience' of the structures put in place. This gap therefore wasted the opportunity to rebuild and recover infrastructural assets to be more climate resilient to future impacts.

5.3.2 Short and Long-term Integration

From the above identified gaps, it is possible to make suggestions for where CCA measures and disaster recovery could possibly be integrated at the community level on Abaco and Grand Bahama.

5.3.2.1 Short Term Measures/Strategies

In the short term, six months to a year after disaster, the study highlights that coordination and adaptive capacity could be integrated by instigating locally respected leaders, or local government, as managers of certain aspects of the recovery with support from government agents, NGOs and private enterprise; as was exemplified by the Church by the Sea projects. If such management were transferred alongside organization, systems, and environmental awareness training, as well as funding, it could support community leadership and hand-over periods between for instance international NGO operations and communities, or local NGOs. The instigation of such measures could additionally strengthen future capacity for local leaders to facilitate disaster response and recovery on their own, and thereby improve coordination while integrating community needs.

The financial mechanisms highlighted by ACT (2015) and the GCA (2019) may be of service in this respect regarding e.g. micro-financing and local level value-capture. One community leader for instance noted that international NGOs could be more active in redirecting funding to support internal capacity building by using the more skilled residents, or in his case, second homeowners, to 'train' lower skilled residents, e.g. in construction management:

> *With the NGOs[..] I don't see enough money going back to local workers.. [..] They haven't established a construction company for example.. The NGOs would be better in my mind.. Saying.. Ok, -Bill- who needs a job cause he's a bone fish guy.. He's got some general construction knowledge.. So find someone like myself, someone retired.. in a position they want to be a mentor [..] and you identify a person like Bill and say.. 'Ok, we are gonna start up a construction company' and you hire the people to come and build these house, right? [..] say now you have 10 people who fly in here for 1000 dollars a ticket.. That's 10.000 dollars, if one person could have flown in and taken the 9000 dollars and give that to local labour..(Community Leader D)*

Support of this type was already present on The Bahamas through the RISE Programme and the Small Business Development Support Centre; as well as both Waterkeepers and B.R.E.E.F's educational programs. Such upskilling during disaster reconstruction could be valuable in order to use the crises as a 'learning opportunity' and as suggested, instate local experts, or if needed, bring in external experts to assist impacted residents able to work and contribute to recovery by training them in the type of recovery needed, whether this be the creation of an aquaponics facility, the restoration of storm impacted mangroves, or more robust construction techniques. Additionally, the inclusion of residents and leaders in the process of material sourcing and logistics could provide a foundation for learning that could be utilized in future events.

The policy mandates of the DRA were seen to procedurally have the ability to operationalize CCA measures in disaster recovery due to its all-encompassing responsibly for disaster recovery. The challenge however, was a shortsightedness and undervaluing, or perhaps mis-prioritization of environmental resource recovery. Nevertheless, with bureaucratic red tape removed from their operational structure, there was great opportunity for more effectively supporting and incentivizing 'win-win' adaptation solutions by creating the legislative requirements and standards to which other actors should adhere, as well necessitating a supported local management structure and integration of CCA measures in the reconstruction and recovery process. This could be the simple action, as one community member highlighted, to separate debris and pay attention to shoots that could be replanted at a later stage; rather than bulldozing it to a landfill. In this example, the leader argued a mulching machine would have made a significant difference in the immediate aftermath and debris clearing, as it would allow the settlement to utilize the seaweed and fallen trees for soil. This could in turn be utilized for restoration of soil stabilizing and drainage improving vegetation. Additionally, immediate attention to the restoration of coastal mangrove forests and upland pine forests by facilitating active maintenance, replanting, and removal of invasive species could facilitate the

natural recovery processes needed to more safely manage future flooding or storm events (Pearson et al., 2020).

In the short term, 'building-resilience' could also include greater international NGO attention to materials, possible lock-ins and sustainability in the support of housing repair and rebuilding. This could possibly occur through the provision of renewable energy sources such as domestic solar PV, solar irrigation pumps or encouragement for residents to obtain rainwater collection systems. Additionally, stakeholders could facilitate coastal setbacks for entirely destroyed areas via financial incentives, provision of deeded land, and facilitation of easy moving transitions. This process could be assisted by sectors such as social services and the DRA assisting one another in the provision of temporary housing, or hotel residence nearby, while a new property is prepared, to create minimal moving effort for those who are required to relocate some meters further inland. Such 'facilitated moves' could help elderly, single-parents, or disabled, who fear moving away from a generational property, as also evidenced by Bavinck et al., (2015).

Similarly, the private sector, with the voice to incentivize innovative approaches and direct recovery via the funding they provided could be more instrumental in pushing for certain types of recovery standards, e.g. mangrove, reef, and wetland recovery alongside porous road repairs. This type of local value-creation and investment in CCA measures could provide double-benefits to their assets and business endeavors.

The integration of CCA measures and disaster recovery in the short-term was additionally facilitated by some of the behavioral and planning changes that took place post-Dorian. Many argued that Dorian had in fact been 'a blessing' due to the influx of attention and the highlighting of gaps and barriers that was undermining resilience and adaptive capacity at the community level. It was argued that many more opportunities now existed for residents to improve livelihoods through new grant programs and upskilling opportunities.

> *I see it benefiting people who were struggling before.. Now, even if you're only a little impacted after Dorian.. You will get some kind of assistance.. Since so many organizations now are helping rebuilding and giving help.. And when you are putting up your new house and you do it correctly.. Not cheating in the rebuild, you will have a stronger house after. (Community Leader C)*

Additionally, it showed where vulnerabilities existed, e.g. in un-deeded, rural, and marginalized communities and households. In the short-term, the study therefore highlights the potential for taking a 'capabilities approach' to recovery and re-development such that communities become development partners. This reinforces the findings from Islam & Walkerden (2014) where it was found that these approaches in the phase of disaster recovery built long-term adaptive capacity to more effectively withstand future impacts and recover in a quicker manner.

5.3.2.2. Long-term

In the long term, the findings suggest that CCA and recovery integration may require government agencies to foster some degree of decentralized systems and decision-making to build a foundation of localized 'win-win' solutions.

Systems

Localized 'win-win' solutions that both reduce GHG gasses and provide measures that ensure basic necessities such as water, energy, and food when centralized systems fail, could help communities or regions better withstand and recover from extreme weather events. This could include *i) Decentralized and diversified renewable energy systems*. In rural settlements, solar powered microgrids have been found to increase the security of energy sources where centralized powerlines are susceptible to falling over and becoming disrupted in extreme weather events (Abbey et al., 2014; Belding et

al., 2020). Renewable sources are additionally found to be more resilient to economic shocks such as oil or coal price increases while providing an overall more economical energy solution for residents (Abbey et al., 2014). The transitioning to such systems while centralized systems are compromised could therefore be a significant way to create more sustainable and climate change resilient response and recovery. In the long-term creating an overall more sustainable energy mix may provide similar benefits. Other renewable energy mixes such as small scale wind, or the use of biological material e.g. washed up sea-grass or organic waste to create biogas could be an option gain energy security (Mishra et al., 2017). Finally, waste-energy incineration could possibly provide an efficient way to remove debris and provide energy to homes in the process (Portugal-Pereira & Lee, 2016), though further investigation with customized solutions would be needed. On Grand Bahama, significant opportunities were also found in an industrial symbiosis where waste-heat from one industry could power another at the industrial harbor (Jacobsen, 2006). *ii)Freshwater and food security***.** Rainwater catchment systems, rain gardens, and community operated RO systems, if necessary, could be used to secure freshwater provision. High success of rainwater catchment has for instance been found on Pacific SIDS (Bailey et al., 2018). Greywater systems and water recycling could similarly safeguard limited freshwater sources pressurized by droughts and saltwater intrusion (GCA, 2019). Regarding food security, this study illustrated the necessity for fostering local food production solutions to eliminate external dependencies that could not be held up post-natural disaster. Other studies illustrate how NBS such as community gardens could be of service in this regard (Buckwell et al., 2019). Given the soil and water limitations, community run aquaponics could be a salient solution to communities on The Bahamas, as showcased by Mr. Hall's Local Organics.

These localized solutions illustrate that diversifying and decentralizing basic necessities such as energy and food provision to some degree could facilitate more resilient underlying systemic conditions to better withstand and recover from future climate change impacts, though further research would be needed to learn which 'win-win' solutions would be appropriate given the local geographic context. Alongside some level of decentralized systems, the study highlights the strengths of investing in, and implementing NBS in the phase of disaster recovery. Long-term options could be to actively remove invasive species such as the casuarina tree, and plant soil stabilizing vegetation along coastlines. Additionally, conservation and restoration of wetlands, mangroves, and coral reefs could not only provide the ecosystem services necessary to protect against flooding and stormwater management, but also provide livelihood options by nursing healthy fish populations (Buckwell et al., 2019).

All these activities can include localized management by e.g. funding and training local managers to implement the project in coordination with expert assistance (Buckwell et al., 2019). By allowing the system to have localized management through upskilling and targeted education, they may be more likely to be consistently maintained and fixed should something break, as was found in the 'Mangroves for Fiji' project (Pearson et al., 2020). Consistent infrastructural maintenance by clearly outlining roles and responsibilities may similarly minimize infrastructural damages (GCA, 2019). However, some of these solutions may require the construction of 'wind/water-proof' storm storage facilities to store essential items such as RO systems, solar panels & batteries, flood resilient vehicles, mulching machines, and other such emergency materials that can assist in recovery.

Finally, by assisting homeowners and contractors who assess the structural soundness of homes to implement raised foundations and roof escape routes alongside more water and wind resistant materials, homes and residents could become less exposed to future damages. The impact of Dorian particularly highlighted the necessity for better roofing solutions to minimize internal flooding. Interviewees mentioned that the E-Government project had assisted in some aspects of this by both quickening approval and permit processes for housing repairs and rebuilds, and creating easy

identification of qualified contractors, as a contractor registration system had been created prior to Dorian. Further systemic updating and digitalization may therefore provide additional benefits.

Governance

In the long-term, the development of targeted contingency planning, mainstreaming, partnerships for CCA measures, and overall educational strengthening could allow greater integration of CCA measures in the phase of recovery.

The careful development of contingency planning prior to impacts e.g. for how to implement coastal set-backs or relocation for settlements, how to transition energy systems or where build-back should take place, could be used to effectively implement necessary systemic transitions as quickly as possible in the wake of natural disaster. Perhaps, where difficult trade-offs are required, the undertaking of cost-benefit analyses of various 'resilient' recovery options prior to impact could provide guidance, though further research would be needed learn about the logistics of the undertaking. Additionally, the use of strong 'process' and 'out-come' performance indicators to monitor and evaluate the projects implemented, could possibly be an effective way to encourage projects working better than others, and provide assistance to places in greater need.

Wamsler et al. (2019)'s strategies for mainstreaming may also be of assistance to policy-makers long-term. Targeted citizen involvement may be a good way for The Bahamas to create stronger community integration due to the significant influence of informal community and church leaders at the time of disaster recovery (Wamsler et al., 2019). Specifically, given their role in stakeholder coordination, it could be beneficial to target upskilling and education of these leaders on topics such as NBS and systems strengthening to allow them to direct stakeholders who come to assist them in more sustainable ways. The dominant strategy of 'outsourcing' responsibility e.g. through residential hurricane preparation plans may be less effective when there is inability to implement and enforce guidelines on a local level.

Targeted involvement of the private sector and altering internal cooperation and working structures could additionally foster more innovative solutions. As many stakeholders relied on experience to foster trust, good governance principles and incentives for cross-ministerial collaboration, government-community, or private-community, or NGO-community partnerships, could assist community leaders in gaining the resources and tools necessary for operationalizing CCA measures. The development of procedures for the integration and operation of these partnerships in the process of long-term recovery could streamline future recovery processes and reduce duplication of actions, as was the case in Vanuatu's networked governance system (Vachette, 2017).

Finally, possible solutions to target the big question of 'insurance' and the consequences of 'privatization of responsibility', could include social protection programs or preventative insurance methods. The Bahamas could be a good pilot project e.g. for a preventative insurance project where mangroves or reefs are restored prior to impacts. Additionally, governmental entities could better safeguard systems and avoid rebuilding costs after large scale natural disasters in marginalized communities of lower socioeconomic standing by not expecting these residents to be insured, and focus attention to infrastructural maintenance and CCA policy enforcement. This may require transfer of mandates and structural support to allow more effective localized enforcement. In the long term, research could explore how the narrative of '*all you can do is prepare'* can be changed to an understanding of how contextual vulnerability determinants produce lower adaptive capacity for some over others, and make coastal communities more vulnerable to climate change impacts. Widespread public understanding of this could possibly facilitate the alteration of such root vulnerability determinants. Table 9 summarizes these findings and highlights how different stakeholders may support the integration of CCA measures in the long and short term.

Table 9 Actions Stakeholders Can Take to Support the Integration of CCA measures in Disaster Recovery in the Short and Long term

	Short Term	Long Term
Government Actors	• Facilitate communication structures integrated with community support and local management entities. • Set standards for small-scale sustainable transitions and ensure they are monitored and enforced in recovery. This could include rebuilding on raised foundations, or supporting NGOs seeking to assist with solar and small scale wind-units by demanding and legislating for grid connections. • Employ a 'waste as resource' approach to debris removal, apply mulching machines to utilize fallen trees for soil. • Restore roads with porous materials, and consideration to road-side drainage opportunities. • Replant damaged soil stabilizing vegetation and mangroves.	• Focus on upskilling and supporting management at the community level, also through funding. • Implement of 'win-win' sustainable systems that also assist in disaster recovery e.g. solar microgrids and wind/wave combinations. • Support internal food security via aquaculture & warehouse farming. • Recover and replant mangroves, reefs and wetlands. • Implement green and blue belts to improve storm water drainage and ecosystem services. • Where set-backs are necessary, possibly, provide new property ownership leases for residents on generational land.
Private Sector	• Support sustainable diversified business recovery that integrates local resources and local income-sources. • Assist in financing CCA measures in recovery (see Appendix D). • Direct assistance through local entities.	• Use CSR to enhance local capacity by funding e.g. mangrove restoration projects or upskilling populations in leadership activities. • Ensure sustainable development practices are instilled that preserve ecosystem services.
International NGOs	• Ensure science-based environmental standards in recovery actions. • Empower local residents, experts, and NGOs via inclusion in direction of recovery projects and policies. • Consider material types and possible lock-ins created through material and repair provision. • Check if funding can be redirected from solely service provision to creating local ability for sustained service provision.	• Assist government entities, community leaders, local NGOs in implementing CCA measures (e.g. Appendix D). • Combine housing recovery with NBS such as green roofs, drainage canals, and 'green/blue' belts. • Assist in funding and building long-term water and energy solutions for settlements.
Local NGOs	• Engage with recovery-responsible government agencies and international NGOs to ensure local social and environmental expertise is incorporated into response. • Apply capability-based approaches to upskill and educate local residents, community leaders and developers in natural resource management. • Advocate and communicate to central government the needs of local communities.	• Build local leadership through empowerment projects for young men and women. • Assist governmental entities in building contingency plans for socially and environmentally 'resilient' recovery. • Assist community leaders in creating community-contingency plans. • Develop and nurture long term partnerships with International NGOs and Private Sector.
Community Leaders	• Create internal management structures with clearly defined roles and responsibilities for natural resource management. • Ensure equitable distribution of materials and resources used for recovery. • Advocate for ecosystem protections and community needs.	• Collaborate on community projects, e.g. maintenance of a community aquaponics facility, community garden, fish trap reinstallation. • Incentivize diversification of livelihood sources within the community. • Manage natural resources and ensure residents follow government standards e.g. via 'peer pressuring' or 'nudging'.

Source: Authors own

6 Discussion

In this chapter the findings are discussed in light of the research aim to contribute to understanding the process of operationalizing CCA measures in low-lying Nation States with fragile institutional capacity in the phase of disaster recovery.

6.1 Capability Approaches and Partnerships

This study finds that market-based approaches to CCA, funding, poor coordination between stakeholders, and centralized systems provide dominant barriers to operationalizing CCA in disaster recovery. This confirms findings outlined in Chapter 3. The results additionally identify that though climate change impact awareness may be high, it is necessary to facilitate a stronger understanding of how 'unpredictability' and alteration of 'regular' natural hazard patterns are a part of these impacts, so communities can prepare effectively. It is further necessary to foster greater understanding of vulnerability determinants so individuals do not adopt an '*all you can do is prepare*' mindset, that transfers onus to the individual rather than the state and systems which reproduce structural vulnerabilities, particularly for small, rural, coastal communities. The results highlight the essentiality of partnerships, and illustrate how cooperation founded upon trust, community-integration, transparency, and positive histories of collaboration, facilitate more effective and 'resilient' project operation. This echoes the guidelines presented by key CCA and DRR tools.

Furthermore, the results affirm the necessity for overcoming multi-level governance challenges, the limits of institutions in countries with 'fragile' institutional capacity, and the fundamental role of capacity building at the community level, both prior to, and during disaster recovery. Within this, empowerment or capability-based approaches to disaster recovery are highlighted as means to ensure project longevity within the impacted communities and facilitate autonomous project creation, particularly, as education and skills were identified as a key gap for communities to autonomously direct recovery projects. Yet, it was also discovered that many central government agents, NGOs and private actors perhaps used 'lacking education and skills' as an excuse not to engage with local government and local leaders. However, by taking the informal community leaders out of the conversation, they were likely reinforcing the missing skills and awareness, and were not seen to target the development of management skills and awareness, nor supporting this financially, as portrayed by the low funding provided to local governmental entities on The Bahamas. This illustrates that when policy-making spaces are non-inclusive, gaps often develop that reinforce structural inequities and thereby vulnerabilities- which may negatively affect future disaster-recovery efforts.

6.2 Power, Responsibility, and 'Wicked' Problems

The results highlight the essentiality of mapping stakeholders and how they are influencing, or able to drive and develop more 'climate resilient' recovery by integrating CCA measures. Through such mapping it was for instance suggested that differential attention was given by investors to Abaco vs. Grand Bahama. In this regard, the study indicates that when private actors direct development, there is a potential for it to be directed solely to locations where they perceive a positive return on investment, rather than locations perceived to be 'financial dead zones'. For equitable recovery and CCA integration, it is therefore necessary for governments to provide mechanisms for distributive justice, as some argued, possibly via value-capture or fiscally sponsored partnerships.

This exploration additionally brings to light a variety of 'wicked' problems that exist in disaster recovery, particularly in low-lying 'fragile' Nations States with low institutional capacity. It is for instance found that while government support, central state-driven development and partnerships are key for longevity and contesting contextual vulnerability determinants (Nalau et al., 2015), the

poor operation of the state alienates other stakeholders from collaboration and fosters a 'going it alone' stance, where non-government actors exclude the State, or actively seek to avoid engagement, to ensure implementation of their projects. This contradiction may pose a serious blockage to building partnerships and joint-response. This same challenge exists in the suggestion that low-lying Nation States with low institutional capacity should build networked governance systems to ensure enforcement and community integration, when fundamentally, systemic trust is missing, and active animosity perhaps even exists between stakeholders. It is therefore necessary for trust to be built, but this requires time. It requires positive experiences and promises fulfilled. Otherwise, in haste of disaster recovery, the systemic changes needed are blocked by infighting and poor coordination. A 'catch-22' can thereby be identified in these questions of responsibility.

ACT (2015) for instance define strategic development planning as a governmental responsibility, but on The Bahamas this became heavily influenced by NGOs and private sector entities. Essentially this comes down to a debate on what the role of the government should be *vs.* what the role, or purpose, of the private sector should be, and whether this is changing with climate change and the onset of a multitude of global crises. Traditionally, Hobbs 'Leviathan' argued it is necessary for the government to act as the 'watch dog', responsible for regulation, checks and balances, and the provision of public goods (Hobbes, 1968). However, on The Bahamas, NGOs and some private enterprise begin to fulfill this role in providing public goods, and in some cases fully overtaking it e.g. by designing entire community projects that include energy lines, plumbing, police stations, schools etc. The discussion regarding what the roles and responsibility *should* be are beyond the scope of this paper, but due to possibly volatile funding sources of International NGOs and private donors, there is a danger in overreliance on these actors long-term. On the other hand, the findings suggest that the unreliability of government make it paramount that communities are provided the tools to implement CCA measures post-disaster and illustrates the potential for private actors and NGOs to assist in the provision of such tools and skills, given their goals are aligned.

6.3 In Practice

In practice the findings emphasize that stronger attention to educational systems and skill-building in key sectors such as construction, natural resource management, localized energy systems, logistics, and budgeting and management in rural coastal communities could significantly increase adaptive capacity at the community level. Additionally, scenario planning and practicing roles and responsibilities in the recovery process could create practical preparedness for climate change impacts and their reduction. In combination, education and livelihood diversification could therefore be a significant leverage point for increasing adaptive capacity and operationalizing CCA measures.

The results additionally highlight that community leaders, private actors, and NGOs play central roles in driving recovery, and therefore may be able to facilitate more CCA measures in recovery by fostering a greater amount of NBS and adaptive capacity increasing projects. The analysis therefore stresses the necessity for stakeholders present at the time of disaster recovery to be aware of what contextual factors exacerbate vulnerabilities to climate change impacts prior to project initiation. In this case, it was for instance highlighted how some international NGOs faced constraints due to missing knowledge on internal community decision-making structures, the role of informal leadership, and the challenges of legacy land ownership within small rural Bahamian communities. In addition, poor understanding of local contractor skills, for instance in metal roof replacement, caused challenges that in some cases led to unfulfilled promises or the necessity to 'do it for them' by bringing in international laborers, thus ultimately lowering future ability for the communities to adapt autonomously. Practitioners must therefore 'do their homework' so to speak, to understand why, and how, to carry out successful 'resilient' recovery projects to avoid mal-adaptations, negative side-effects, or possible material lock-ins. This may be helped by facilitating

community-created contingency plans within rural coastal communities, so leaders know how to direct stakeholders seeking to assist in recovery projects.

This analysis therefore suggests that in other low-lying Nation States vulnerable to climate change impacts, NAPs, disaster preparedness planning, emergency response units, and ministries must include guidance criteria and standard-setting, a stronger degree of legislatively supported responsibility delegation to local governmental entities, and clearer role specifications to be able to utilize large scale climate change disruptions as opportunities for transformation. The findings suggest that targeted citizen and stakeholder involvement could provide key leverage points to make use of the NGO and donation influx to direct funding to projects that integrate resilience and adaptive capacity.

6.4 Concepts

From 'build-back-better', 'disaster risk reduction', 'resilient recovery' and 'building adaptive capacity' etc., there is a host of concepts and definitions that each share the similar outcome; to lessen the degree of impact by reducing vulnerabilities to climate change impacts. For practitioners seeking implementation, the wide selection of terms may pose a challenge. Additionally, as Hamza et al., (2012) argues, the more concepts and definitions, the more space for mal-interpretation and therefore differing actions.

In the long term, it is therefore paramount that the complexity of concepts in CCA, DRR and sustainable development are better linked in research, and that both conceptual and institutional siloes are broken. This can allow synergies and priorities to emerge. The role of crisis and disaster, and the awareness this creates, must therefore be used as a leverage point for systemic transitioning. To contribute to this, research institutions could more actively undertake studies that use similar approaches to the one taken in this thesis project, that integrate concepts and disciplines in a cross-sectoral manner to provide holistic understandings for stakeholders regarding what consequences or ripple-effects different development decisions may have.

6.5 Study Reflections

The raw data collection of this study took place over 3.5. weeks on Grand Bahama and Abaco six months after Hurricane Dorian. As a result, it captures the projects and choices made at the time of data collection. Due to the closeness to Dorian, it was still very much a phase of response, therefore many of the choices and plans for recovery were in planning phases, rather than being implemented at the time of data collection. As a result, there is a high likelihood that more plans were in the making that the author was unaware of. This could impact the gaps identified.

Yet, the flexible explorative case-study approach proved valuable as it allowed unexpected findings to be brought to light. The cross-sectoral nature of interviewee categories similarly proved to be a valuable choice to understand how different actor categories interacted in practice. Of course, if there had been more interviewees included in each actor category, the study could have included a better understanding of whether this was only the opinions of some, or the opinions of the entirety. Future studies should therefore more actively seek to include focus groups and possibly surveys to capture a wider range of NGO roles and responsibilities. That said, the longer semi-structured interviews included in this study were useful to identify nuances in language, perspectives, and opinions that most likely would not have been found in a survey.

7 Conclusion

In sum, by means of field study and in-depth interviews with key informants, this explorative case-study has investigated stakeholder interrelations, barriers, and facilitators along with leverage points for the operationalization of CCA measures in the phase of disaster recovery at the community level on Grand Bahama and Abaco.

The study evidences that disaster can be a catalyst for change, and that in order to ensure the implementation of CCA measures, disaster recovery *must* incorporate their operationalization. Yet, it is highlighted that this a highly complex process that includes a host of 'wicked' problems and trade-offs. Explorations from Abaco and Grand Bahama highlight that to navigate this complexity, decentralized systems with structural State support, and education and upskilling along with prior role and responsibility clarification could build adaptive capacity, and in the long term, resilience, for rural low-lying coastal communities. However, this requires governments to actively identify synergies between departments and provide incentives for cross-ministerial collaboration and create strong guidelines and goal alignment with stakeholders assisting in build-back and recovery that include a mixture of NBS, grey infrastructural measures, and social measures. The findings suggest that when Nation States face trust and enforcement challenges, facilitating community-created contingency plans within rural coastal communities prior to impact, so leaders know how to direct stakeholders seeking to assist in recovery projects, could markedly facilitate the integration of CCA and disaster recovery.

However, in countries with low institutional capacity, this is a complex challenge, and requires a range of partnership approaches. In the short term, nations must immediately create strong communication structures between international NGOs, local NGOs, community leaders and significant private entities e.g. via targeted citizen involvement. In the long term, the overlaps between sustainable development, DRR and CCA need to be bridged to a much greater extent by the entire actor network.

Future research should therefore explore how particular systems may influence the ability to better cope with, and recover from, climatic changes. Additionally, it is necessary for research to explore through practical experimentation how CCA measures such as coastal setbacks, green roofs, green and blue belts etc., can be integrated into disaster recovery processes.

Overall, Nation States must become accustomed to planning for climate change induced disruptions by mainstreaming contingency plans and view disaster as an opportunity for systemic change.

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Appendices

Appendix A: Example Interview Guideline

Pre-interview verbal consent outline:

Thanks for sitting down with me.
So, as you might already know, I am a master's student at a university in Sweden where I study Environmental Management and Policy. I am 26, and I come from Denmark.

I am here to learn about how different actors are working with the provision of Climate Change Adaptation and resilience-building on Grand Bahama after hurricane Dorian. I specifically want to hear about what projects or activities you're working with for the recovery of the islands effected, as well as your experience in the re-building process after the hurricane and understand what you think your island systems and communities need to do or receive to stand stronger in the next storm, flooding or with sea-level rise..

So for the next 40min or so I'm just gonna ask you a series of questions about what your activities after Dorian, and what you think is aiding or constraining recovery. I am really excited that you are willing and able to share your experiences with me and I think your contribution, experience- learnings from Dorian can help other people hoping to assist communities in 'resilient' disaster recovery.

If at any time you wish to leave or not answer a question, please feel free to do so. The results of this research will keep your identity completely anonymous if you would like this. I will use themes and elements from what we talk about to inform my findings which I am happy to share with you. Ideally my findings will be a series of best practices and challenges existing in build-back processes after large scale environmental disasters, and a list of recommendations or factors that could be included to make these processes more effective long-term. Do you agree to this?

Example 1: A customized variety of the below for Interview Guidelines for NGOs, Private Enterprise & Government

1	Tell me about your roles and responsibilities as a… /in this organization/
2	Tell me about your experience after Dorian, and your involvement with 'recovery'?
3	Can you take me through your usual project development process from start to finish? a. What planning criteria to do you take into account? b. What are your project priorities? c. Tell me about your monitoring and evaluation systems?
4	What are your sought out project goals?
5	What helps you reach your goals?
6	What do you find can pose barriers, or create challenges for you to reach your sought after outcomes?
7	Tell me about who is important to you to interact with or work with, in your project development and implementation process? a. Is there anything particular you think is being overlooked?
8	What does 'resilience' and 'adaptation' mean to you?

9	In your opinion, what is needed for The Bahamas to reduce future climate change impacts? - what do you think needs to happen to get there?
10	Are there any political or administrative challenges that you think are necessary to reach 'resilience' on The Bahamas?

Example 2: A customized variety of the below, for Community Leaders

1	Could you tell me more about yourself and your community
2	Before Dorian, what kind of concerns did you have in this community?
3	Tell me about your experience with the recovery process, what has your role been around here?
4	Given your experience, what do you thinks matters most to the community right now?
5	What do think are the biggest challenges to moving forwards?
6	What has been helping you in the recovery process?
7	What type of support do you think has benefited the community the most? – Do you think there are any forms of support that have been overlooked?
8	How do you think Dorian has affected the Community? a. Do you see any differences in the way community members, families, or neighbors are acting, thinking or planning for future storms?
9	In your opinion, what does the community need to stand stronger to future climate change impacts like sea-level rise, intense storms, and flooding?
10	On a scale of 1-5 how much decision making power do you feel you have?
11	If you could have your dream vision for (community name) come true, what would it look like?
12	What do you think would facilitate that vision?

Appendix B: Interview Record

Name	**Organization**	**Type**	**Record/Length**	**Date**
Kevin M. Glinton-Eco-Schools Director	The Bahamas Reef Environment Educational Foundation (B.R.E.E.F.)	NGO Local	Recorded (65min)	20/02/2020
Edward Rice (CEO)	Mosaic Modular	Private Enterprise	Notes (65min)	24/02/2020
Community Leader	Little Abaco	Community Leader	Notes (20min)	26/02/2020
Wolfgang Geiger Company President	All Bahamas Construction (ABC) Construction Company Limited	Private Enterprise	Notes (20min)	26/02/2020
James Sarles	Rotary Club Grand Bahama	NGO Local	Notes (1hour)	27/02/2020
Community Leader	High Rock	Community Leader	Notes (40min)	29/02/2020
Rashema Ingraham, Exec. Director. Liyah David, Field Studies and Monitoring Andurah Daxon, Operations/field studies assistant	Waterkeepers Bahamas	NGO Local	Recorded (1.5. hour)	02/03/2020
Amanda Martin, Director of Communications	Mission Resolve Foundation	International NGO	Recorded phone interview (35min)	03/03/2020
Rheanna Neely	Ministry of Environment and Housing, Climate Change Unit	Government	Recorded phone interview (35min)	04/03/2020
Ken Hutton, Chairman	Abaco Chamber of Commerce	Private Sector	Recorded, (1 hour)	06/03/2020
Caline G. Newton	Our Grand Bahama	Local NGO	Recorded phone interview (40min)	09/03/2020

Charles Wayne Hall	Local Organics Limited: Hydroponics-Garden of the Grove	Private Enterprise	Recorded (1.5. hour)	09/03/2020
Olethea Gardiner, Environmental Inspector Dudly Frances, Buildings Manager Mrs. Nakira Wilchcombe, Director of Building & Development Services	Buildings & Development Services The Grand Bahama Port Authority, Limited	Quasi-Governmental entity	Recorded (1hour)	10/03/2020
Sam Teicher, Founder & Chief Reef Officer	Coral Vita	Private Enterprise	Recorded, (1hour)	11/03/2020
Marie Renny	Church by The Sea	International NGO (Non-Denominational Faith-based Organization)	Face2face in one informal interview, recorded in notes +Recorded phone 45min semi-structured interview	26/02/2020 & 12/03/2020
Community Leader	Pelicans Point	Community Leader	Recorded (1 hour)	14/03/2020
Community Leader	McLean's Town	Community Leader	Recorded (1.30 hour)	14/03/2020
Community Leader	High Rock	Community Leader	Face2Face, notes (40min)	14/03/2020
Mr. John-Michael Clarke, Chairman	Disaster Reconstruction Authority	Government	Recorded phone interview (40min)	18/03/2020
Alexio Brown, Assistant Environmental Specialist	Ministry of Works, Costal Protection Unit	Government	Recorded phone (1 hour)	23/03/2020
Brandon McFarlane, Preparedness for Effective Response Delegate (PER)	International Red Cross Society	International NGO	Phone Notes (40 min)	03/04/2020

Appendix C: Coding structure

- **Roles and Responsibilities**
  - *Community Leaders*
    - Advocacy
    - Material distribution
    - First Response
    - Stakeholder coordination
    - Balancing needs
    - Hiring
    - Rebuilding
    - Information dissemination
    - Tree planting & restoring vegetation
    - Water Management
    - Project Management
  - *Government*
    - Grants and funding
    - Prioritization & Policy development
    - Implementation
    - Maintenance
    - Public Services
    - Public Education
    - Procedural inclusion or exclusion
    - Relocation
    - Stakeholder coordination
    - Standard setting
    - Upholding international conventions
    - Governance
  - *International NGOs*
    - Humanitarian Relief (Shelter, medical, food, clothing, water etc.)
    - Grants and Funding
    - Encouragement
    - Supporting Government Agendas
    - Provision of public infrastructure
    - Education
    - Local NGO Capacity Building
    - Local Empowerment and upskilling
  - *Local NGOs*
    - Humanitarian Relief (Shelter, medical, food, clothing, water etc.)
    - Local Empowerment and upskilling
    - Education for sustainable development
    - State institutional capacity building
    - Expert Knowledge
    - Advocacy
    - Youth Outreach

- Private Sector
  - Innovation in Technology and Business Models
  - Relief Funding
  - Directing Recovery
  - Connection facilitation
  - Lobbying
  - Charitable Actions
  - Upskilling

- **Facilitators**
  - Climate Change Awareness
  - Local Community Integration
    - Local Solutions
  - Partnerships
    - Reputation
    - Transparency
    - Joint Response
    - Church Membership
  - International Support
  - SDGs
  - Self-Starting
  - Governmental Project Support
  - Record Keeping
  - Community Ties
  - Technological updating

- **Barriers**
  - Coordination
  - Funding
  - Enforcement
  - Land Ownership
  - Centralized systems
  - Skilled Labor & Education
  - Pride
  - Animosity Between Actors
  - Trauma & PTSD
  - Underestimation of Impacts
  - Slow Bureaucracy
    - Overlapping ministerial responsibilities
    - Short-termism
  - Resource competition
  - Framing of 'resilience'
  - Privatization of responsibility
  - Land Ownership
    - Generational Land
  - Exclusion of Local Experts

- **Gaps**
  - Cohesive Coastal Zone Management
  - Systems resilience
    - Energy
    - Water
    - Waste
    - Food
    - Transport
  - Contingency Planning
  - Local Government
  - Displacement
  - Natural Resource Management

Gaps Continued:

- Nature-Based Solutions
- Resilience in entry points
- PTSD
- Local Capacity Building

- **Leverage points**
  - Behavioral Changes
  - Planning Changes
  - Decentralization
  - Community Leadership
  - Capability-based approaches

Appendix D: CCA Measures in Detail

Social Measures	Grey Infrastructural Adaptations	Nature- Based Solutions
Education and skills > Knowledge creation of climate change risks, the impact of unsustainable practices on risk and vulnerability creation, adaptation measures, awareness and preparedness. > Skill-building in leadership, organization, logistics, management, electrical installation, plumbing, farming and contracting. > Space for knowledge co-creation from the community-up	***Coastal Protection*** >Seawalls, sea dikes, breakwaters, 'jetties' and 'gabion baskets' - large concrete or storm structures built in the ocean to slow waves, protect from erosion, & protect against flooding from storm surges. >Storm surge barriers, Seigel (2019)	***Mangroves, wetlands, and reefs*** >Re-creation or upkeep of wetlands to drain flood waters. Ensures clean water supplies in dry seasons, and provides habitats and biodiversity hotspots, plus absorbs CO2 from the atmosphere. >Coastal forests, mangrove creeks & coral reefs slow impact of storm-surge and sea water, limit coastal erosion, improve water quality and enhance local fishing opportunities by providing important habitats to wildlife.
Diversification >The more diverse the livelihood sources, the more resilient the community. >Livelihood support in the form of a degree of self-sufficiency e.g. via stronger local and community-led natural resource management.	***Buildings and Housing*** > Water, wind, and heat resilient structures e.g. via steel, concrete, silicone mesh and other resilient materials. >Elevation on wood or concrete pilings or pillars. >Flexible, multi-hazard, and multi-use designs with e.g. storm-bunker-esque locations in schools, roof escape areas, **modularity.** >Building based on coastal hazard risk assessments plus coastal set-back requirements	***Nourishing beaches and restoring dunes*** >Dunes and healthy beaches stabilize coastlines and create wind erosion and flood barriers. However, the process of 'nourishing' beaches requires ongoing maintenance and added sediment. This should be done carefully to avoid destabilizing one area to stabilize another.
Basic needs provision and a degree of self-sufficiency >Building local capacity to provide goods required for consumption, e.g. via community-gardens, forests, fishery or farm-land management. >Increased internal capacity to manage local resources to capitalize on 'autonomous adaptation'.	***Coastal set-backs, managed realignment and 'retreat'*** >Designing coastal 'settlements' or new building locations, roads and highways with at least 100meter buffer zones- 'a coastal set-back'. >Relocation of key roads and infrastructure to higher in-land ground. >For settlements, towns, and cities that already exist within 100meters of sea-level, planned 'retreat' and managed realignment could be implemented.	***Coastal set-backs*** Coastal set-backs can also include NBS where green buffer zones are used between coastal zones and communities to minimize impacts of inundation and flood surge. Green coastal set-backs provide both environmental and economic benefits in the form of storm protection and ecosystem service bolstering. ***Create Green areas*** to be used for temporary residence during post-disaster reconstruction.

Gender Equality Tackling gender equity in decision making structures and at the household level is an essential social policy measure to allow knowledge and skill-sets of women to be utilized as an advantage.	***Storm water & Drainage*** 1. To improve drainage, account for natural watersheds. 2. When developing drainage plans for roadsides, account for carriage pathways so water can be directed to a safe place. 3. Improvement of sewerage systems, open water channels or retention ponds to which run-off can be directed. 4. Strong wastewater treatment systems may be a valuable asset in the recovery from inundation and storm-water management + protection from contamination and disease.	***Forests and native vegetation*** Reduces soil erosion, stores and regulates water-services, and provides important coastal stabilization mechanisms along coast lines.
Land/ Property Ownership Clear land-ownership and property rights ensure a level of flexibility and security at the community level.	***Drinking Water*** >Protecting available fresh-water resources from contamination or saltwater intrusion via careful continuous maintenance of freshwater wells. > Rainwater catchment and water cleaning systems. >Reverse Osmosis Desalination Units (RO units). *RO criticized due to large energy input requirements.	***Water-sheds & urban drainage*** >connection of regional water systems or multi-purpose reservoirs and water retention stations facilitates storm water drainage and protects from flooding. >permeability in all surfaces, from roads, parking lots, and walking paths *i.e.* via planting water storing vegetation. >community gardening systems increase water retention while supporting the fulfillment of basic needs. *I.E.* Dresden, is creating large-scale urban gardening networks to provide such support.
Migration and displacement > contingency plans and projects that can support 'planned retreat', or displacement in the wake of natural disasters (Thomas & Benjamin, 2018). E.g. subsidies or financial incentives for individuals who are mandated either not to rebuild a storm-damaged house, or who are given land-use restrictions due to the creation of coastal set-backs and buffer zones.	***Energy Systems*** >Decentralized micro-grids built from sustainable energy sources such as solar, wind, wave or biomass, will be more resilient in the face of extreme weather events as affected areas can retain a source of energy after natural disaster strikes, compared to centralized energy grids where power lines are susceptible to falling over, and take long periods of time to restore.	***Green and Blue Belts*** A 'belt' of either water-storing or soil-protecting vegetation; or streams, ponds and wetlands; are established between or around communities to absorb and filter excess water.
	Waste Management >To ensure clean drinking sources, clear sewerage and watersheds from waste >Preparedness plans for debris clearing and potential reuse of materials.	***Water Re-use & Water Harvesting*** Water reuse, grey water systems, and rainwater harvesting ensures security of freshwater sources.
	Maintenance & Upkeep >Continual maintenance is necessary, e.g. checking for leaks in water systems,	***Green Roofs*** >Growth of vegetation on rooftops is

	ensuring grid-lines and poles are firmly planted, monitoring structural soundness of bridges, sea-walls, dikes, and any other concrete or steel structures. *Lack of maintenance and upkeep intensifies the impacts of inundation, heat, and wind.	encouraged to reduce storm run-off and high summer temperatures. *It is estimated that Chicago's green rooftops have slowed run-off by 36% (World Commission for Adaptation, 2019).

Sources: (Abbey et al., 2014; ACT et al., 2015; Bailey et al., 2018; Bavinck et al., 2015; Belding et al., 2020; Buckwell et al., 2019; Donovan & Mycoo, 2017; Global Commission on Adaptation, 2019; Mishra et al., 2017; Portugal-Pereira & Lee, 2016)