Food and Agriculture Organization of the United Nations

Report of the vulnerability and capacity assessments in coastal and fishing communities in Saint Kitts and Nevis

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 2022

Required citation:
Granderson, A. and Ramkissoon, C. 2022. *Report of the vulnerability and capacity assessments in coastal and fishing communities in Saint Kitts and Nevis*. Rome, FAO. https://doi.org/10.4060/cb7303en

ISBN 978-92-5-135162-8

Preparation of this document

This publication is an output of the ***Climate Change Adaptation in the Eastern Caribbean Fisheries Sector Project (CC4FISH)*** which is being implemented by the Food and Agriculture Organization of the United Nations (FAO) and the national fisheries authorities from the seven project countries: Antigua and Barbuda, Dominica, Grenada, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines and Trinidad and Tobago, with funding from the Global Environment Facility (GEF). The Caribbean Natural Resources Institute (CANARI) was contracted by FAO to undertake the regional implementation of vulnerability and capacity assessments (VCAs) under the CC4FISH project.

Abstract

This report presents the main findings and recommendations from a vulnerability and capacity assessment (VCA) of coastal and fishing communities in Saint Kitts and Nevis. The overall goal of the assessment was to improve understanding of local climate change impacts and vulnerabilities for effective adaptation in the fisheries sector. It utilised three tools: participatory photo-journaling, semi-structured interviews and value chain analysis for data collection, and engaged a wide range of stakeholders to ensure a participatory process. Based on the assessment, a range of climate-related hazards have begun to impact the communities, including: coastal erosion and flooding due to sea level rise, storms and storm surges; rainfall variability and extremes leading to inland flooding; and sargassum seaweed influxes. Adaptation actions were also identified to address these hazards. These included: building the adaptive capacity of fisherfolk; strengthening fisherfolk organisations such as co-operatives; improving access to services and infrastructure; improving coordination among civil society and the public and private sector to better support communities; and protecting critical coastal and marine ecosystems that support fisheries and other economic sectors like tourism.

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Acknowledgements

The lead authors from CANARI would like to thank the Department of Marine Resources, Saint Kitts and Nevis for their support in conducting the VCAs and invaluable contribution to this report. We would also like to thank Orisia Williams, Catherine Forbes and the field teams and participants from the three coastal and fishing communities, Dieppe Bay and Sandy Point in Saint Kitts and Newcastle in Nevis for generously giving of their time and sharing their knowledge and perspectives as part of the VCAs.

Technical review was provided by Iris Monnereau, FAO CC4FISH Project Coordinator. The final document was reviewed by Juan Vilata, FAO CC4FISH Knowledge and Communications Management Consultant**.** The map of Saint Kitts and Nevis was developed by Marygrace Balinos Castor (GIS Specialist, FAO-RLC).

Abbreviations and acronyms

CANARI	Caribbean Natural Resources Institute
CC4FISH	Climate Change Adaptation in the Eastern Caribbean Fisheries Sector Project
CCA	climate change adaptation
CCCCC	Caribbean Community Climate Change Centre
CDB	Caribbean Development Bank
CERMES	Centre for Resource Management and Environmental Studies – University of the West Indies
COVID-19	coronavirus disease 2019
CNFO	Caribbean Network of Fisherfolk Organisations
CPACC	Caribbean Planning for Adaptation to Global Climate Change Project
CRFM	Caribbean Regional Fisheries Mechanism
CSO	civil society organizations
DMR	Department of Marine Resources, Saint Kitts and Nevis
EAF	ecosystem approach to fisheries
ECMMAN	Climate Resilient Eastern Caribbean Marine Managed Areas Network Project
EEZ	exclusive economic zone
FAD	fish aggregating device
FAO	Food and Agriculture Organization of the United Nations
FORCE	Future of Reefs in a Changing Environment project
GEF	Global Environment Facility
GDP	gross domestic product
GIS	Geographic Information System
ICT	information and communications technology
ICZM	Integrated Coastal Zone Management
IFRC	International Federation of the Red Cross and Red Crescent Societies
IICA	Inter-American Institute for Cooperation on Agriculture
IPCC	Intergovernmental Panel on Climate Change
MMA	marine managed area
NEMA	National Emergency Management Agency, Saint Kitts and Nevis
SIDS	small island developing states
SLR	sea level rise
SST	sea surface temperature
VCA	vulnerability and capacity assessment
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar
WHO	World Health Organization
XCD	Eastern Caribbean Dollars

Executive summary

Caribbean Natural Resources Institute (CANARI) provided technical assistance to the Food and Agriculture Organization of the United Nations (FAO) to undertake the regional implementation of a vulnerability and capacity assessment (VCA) under the Climate Change Adaptation in the Eastern Caribbean Fisheries Sector Project (CC4FISH). CC4FISH has been implemented over the period 2017-2021 by FAO and the national fisheries authorities from the seven project countries, Antigua and Barbuda, Dominica, Grenada, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines and Trinidad and Tobago, with funding from the Global Environment Facility (GEF). CANARI's work under CC4FISH focused on implementing VCAs in coastal and fishing communities in the following target countries: Grenada, Saint Kitts and Nevis, and Trinidad and Tobago. It contributed directly to achievement of the outcomes under CC4FISH Component 1: *Increased awareness and understanding of climate change impacts and vulnerability for effective climate change adaptation (CCA) in the fisheries and aquaculture sector* as well as informed implementation of the other CC4FISH project components.

This report presents the main findings and recommendations from the VCA in Saint Kitts and Nevis. CANARI worked with the Department of Marine Resources (DMR) and CC4FISH National Project Coordinator in Saint Kitts and Nevis to conduct the VCAs in three coastal and fishing communities: Dieppe Bay and Sandy Point in Saint Kitts, and Newcastle in Nevis.

The overall goal of the assessments was to engage target coastal and fishing community stakeholders to improve understanding of local climate change impacts and vulnerabilities for effective adaptation and resilience building in the fisheries sector. The specific objectives of the VCAs were to:

- share and integrate local knowledge and perspectives to assess the key impacts and vulnerabilities related to climate change in target communities, especially for the fisheries sector and related livelihoods;
- identify priorities for adaptation in the fisheries of the target communities; and
- build local capacity to conduct a VCA and improve understanding of the local impacts, vulnerabilities and strategies to adapt to climate change.

The VCAs utilised three tools: participatory photo-journaling, semi-structured interviews and value chain analysis for data collection and analysis. A wide range of stakeholders were actively engaged in the VCA tools within each target coastal and fishing community, including fisherfolk and their organizations, other community groups, residents and local government agencies, to ensure a participatory process in assessing key vulnerabilities and priorities for action.

Key findings and recommendations

The VCAs highlighted a range of climate change and related hazards that have begun to trigger biophysical and socio-economic impacts on the target coastal and fishing communities in Saint Kitts and Nevis, including:

- More frequent and intense storms and rough seas leading to loss or damage of key infrastructure, including fish landing sites, markets and other facilities.
- Coastal erosion and flooding due to sea level rise (SLR), more intense and frequent storms and associated storm surge which poses a significant risk to low-lying coastal areas such as beaches and coastal cliffs.

- Sargassum seaweed influxes that inundate beaches and nearshore areas and damage fishing gear and boat engines as well as having impacts on the health of fisherfolk and other coastal and marine resource users.
- Inland flooding that affects community settlements and agricultural lands, increases sedimentation in the coastal zone and damages infrastructure.

These climate change-related hazards are compounded by existing pressures. These pressures include: land-based activities such as sand-mining and pollution from agricultural sources or poor waste management practices (e.g. dumping of garbage on coastlines), which have an impact on coastal and marine resources; unsustainable fishing practices; and health risks such as the COVID-19 pandemic[1]. In addition, socio-economic pressures including crime and drug use, youth delinquency, unemployment and poor access to services and infrastructure within the target coastal and fishing communities in Saint Kitts and Nevis add further complexity.

The adaptation priorities identified across the target coastal and fishing communities include the following:

1. Build the adaptive capacity of fisherfolk through improvements to facilities, enhancing organizational capacity of fisherfolk organizations (e.g. fisherfolk co-operatives) to effectively function and play a role in resilience building, and enhancing access to resources, training and other support to strengthen fisheries-based livelihoods.
2. Strengthen collaboration and coordinated action among the various agencies, in particular the DMR, Department of Environment, National Emergency Management Agency (NEMA), and other civil society and private sector stakeholders to address vulnerabilities and impacts in target communities, to better ensure support, resources and engagement of communities in actions to improve fisheries livelihoods and resilience (e.g. for sufficient manpower to effectively address sargassum influxes on local beaches and fish landing sites).
3. Protect critical coastal and marine biodiversity and ecosystems that support fisheries and other economic sectors like tourism, including by improving monitoring and enforcement of regulations to manage and protect these resources from unsustainable and extractive uses.

Further policy recommendations based on the VCA for moving forward and ensuring mainstreaming of CCA into fisheries governance and management in Saint Kitts and Nevis include to:

- Ensure community priorities are linked into local development plans and sectoral and national policies and programmes to support adaptation and build local resilience via an inclusive and 'bottom up' approach. This will ensure that these plans and programmes have local buy-in and are realistic and appropriate to local-level situations.
- Strengthen key government agencies, in particular the DMR, to better provide climate information services and technical assistance to fisherfolk for adaptation in the fisheries sector.
- Integrate CCA and disaster risk management considerations into fisheries management plans and policies to effectively address extreme climate events and reduce losses from climate-related hazards. This includes taking into account of the comprehensive disaster management approach within any national fisheries management plan or adaptation plan and investments in early warning systems, safety at sea, climate-smart technologies, insurance and social protection schemes for fisherfolk and their assets.

[1] The COVID-19 pandemic or coronavirus pandemic, is an ongoing global pandemic caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and declared a pandemic by the World Health Organisation (WHO) in March 2020.

- Expand application of the ecosystem approach to fisheries (EAF) as part of the overall approach to build resilience to climate change and other existing pressures within coastal and fishing communities and the wider fisheries sector. EAF recognises that fisheries are social-ecological systems, and so an integrated approach is needed to fisheries management to ensure ecological integrity, human well-being and good governance. EAF also seeks to manage uncertainty and address hazards and their impacts at the appropriate scale. While EAF has already been integrated into recent fisheries sector policies and plans in Saint Kitts and Nevis, it needs to a focus in implementation across projects and initiatives.

1. Introduction

Understanding vulnerabilities to climate change and variability is a critical first step towards successfully adapting and building resilience. Assessment studies indicate that the Caribbean region is one of the most vulnerable regions in the world to the impacts of climate change and variability, and highlight that the fisheries sector in Caribbean small island developing states (SIDS) is more vulnerable than in other SIDS and particularly the Eastern Caribbean fisheries sector (Monnereau *et al.,* 2015). However, there remains insufficient understanding and awareness of the current and potential impacts of climate change and how this drives vulnerabilities within the Eastern Caribbean fisheries sector at the local to regional levels to enable adaptation. The challenges related to this include:

- limited coverage of the fisheries sector in existing vulnerability assessments; and
- limited understanding of local level situations and variability by site within countries to assess vulnerability and allow design of appropriate, location-specific adaptation strategies.

Vulnerability and capacity assessments (VCAs) have been recognised as an important tool for supporting the diagnosis of the specific areas of vulnerability at the local level and determining what actions can be taken to address them. VCAs are an important means to establish who and what is vulnerable to the impacts of climate change and identify potential adaptation measures at the local level. VCAs are also acknowledged as an important entry point for informing efforts to mainstream adaptation and disaster risk management into the fisheries sector and wider development agenda nationally and regionally. Coastal communities and fisherfolk (men and women involved in all aspects of the sector) are particularly vulnerable to these climate change impacts as they are dependent on the fisheries sector for food security, livelihoods and household income. However, at present, there is a fairly ad hoc approach to assessing the vulnerability of coastal and fishing communities that limits understanding of how to effectively adapt to climate change.

CANARI provided technical assistance to FAO to undertake the regional implementation of VCAs under the CC4FISH project. The project aims to increase resilience and reduce vulnerability to climate change impacts in the Eastern Caribbean fisheries sector through introduction of adaptation measures in fisheries management and capacity building of fisherfolk and aquaculturists. It is being implemented from 2017-2021 by FAO and the national fisheries authorities from the seven project countries, Antigua and Barbuda, Dominica, Grenada, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines and Trinidad and Tobago, with funding from GEF.

The VCA work focused on coastal and fishing communities in the following target countries: Grenada, Saint Kitts and Nevis, and Trinidad and Tobago. It contributed directly to achievement of the outcomes under CC4FISH Component 1: *Increased awareness and understanding of climate change impacts and vulnerability for effective adaptation in the fisheries and aquaculture sector* as well as informed implementation of the other CC4FISH project components.

Under the project, CANARI and the DMR in Saint Kitts and Nevis conducted VCAs from February to December 2020 in three coastal and fishing communities: Dieppe Bay and Sandy Point in Saint Kitts, and Newcastle in Nevis.

The overall goal of the assessments was to engage target coastal and fishing community stakeholders to improve understanding of local climate change impacts and vulnerabilities for effective adaptation and resilience building in the fisheries sector. The specific objectives of the VCAs were to:

- share and integrate local knowledge and perspectives to assess the key impacts and vulnerabilities related to climate change in target communities, especially for the fisheries sector and related livelihoods;
- identify priorities for adaptation in the fisheries of the target communities; and
- build local capacity to conduct a VCA and improve understanding of the local impacts, vulnerabilities and strategies to adapt to climate change.

This report presents the main findings and recommendations from the VCAs in each target community in Saint Kitts and Nevis.

2. Country overview

2.1 Context

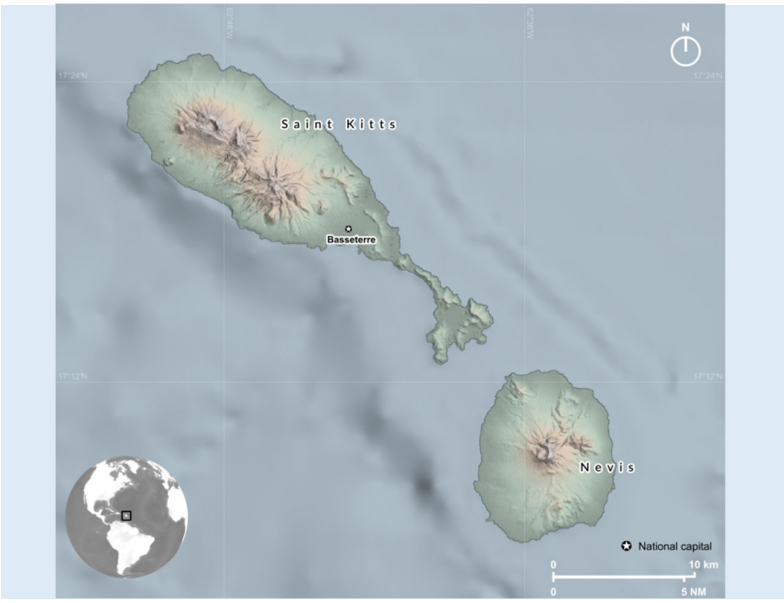
Saint Kitts and Nevis is a sovereign, democratic federal state comprised of two islands of the Lesser Antilles in the Caribbean Sea (Photo 1). Saint Kitts, the larger island, covers an area of 176 km^2 (Government of Saint Kitts and Nevis, 2015a). Nevis is almost circular in shape with an area of 93 km^2 (Government of Saint Kitts and Nevis, 2015a). The combined area of the islands is approximately 269 km^2. The two-island nation is volcanic in origin, with centrally located mountain peaks covered with secondary tropical forest in each island. The islands are separated by a channel approximately 3 km wide known as *'The Narrows'* which is of conservation importance (Government of Saint Kitts and Nevis, 2015a). Coastal and marine ecosystems include mangroves, freshwater and salt ponds, seagrass beds and fringing and deep submerged coral reefs along the north and south west and east coasts. The ocean shelf of the islands is small at approximately 742 km^2 but the exclusive economic zone of the country is extensive at 10 206 km^2 (Government of Saint Kitts and Nevis, 2015a). Given the location of Saint Kitts and Nevis at the southern edge of the Atlantic hurricane belt, it typically experiences tropical cyclones and hurricanes from June to November. The country is considered water-scarce, particularly Nevis, and relies heavily on spring-fed aquifers (Government of Saint Kitts and Nevis, 2015a). Rainfall which is strongly related to altitude ranges from around 800 mm to 1 600 mm annually (Government of Saint Kitts and Nevis, 2015a).

According to the last 2011 census, the total population of Saint Kitts and Nevis is 46 398 (34 983 in Saint Kitts and 11 415 in Nevis) (Government of Saint Kitts and Nevis, 2014). In both islands, over 60 percent of the population is concentrated in the capital and surrounding suburban areas that are located in flat coastal areas (Government of Saint Kitts and Nevis, 2014). The capital of Saint Kitts is Basseterre and the capital of Nevis is Charlestown. The remaining population resides in villages generally located along the main coastal roads of each island. The pattern of development, with over 90 percent of physical infrastructure in the coastal zone including settlements, government buildings and utilities, makes both islands significantly vulnerable to coastal threats (Government of Saint Kitts and Nevis, 2015a).

While the economy of Saint Kitts and Nevis was based on the sugar industry until 2005, the main economic activity is now centred on tourism (Government of Saint Kitts and Nevis, 2015a). The direct contribution of tourism to gross domestic product (GDP) was Eastern Caribbean Dollars (XCD) 129.5 million or 6.2 percent of total GDP in 2013, and was projected to rise by 6.3 percent per annum from 2014-2024 (Government of Saint Kitts and Nevis, 2015a). The financial services sector including offshore banking, construction and export-oriented manufacturing are significant and growing sectors

(Government of Saint Kitts and Nevis, 2015a)[2]. Commercial and artisanal fisheries are also an important local food-source and provider of employment and income opportunities.

Photo 1. Map of Saint Kitts and Nevis



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3. Climate change impacts and trends in Saint Kitts and Nevis

Climate change is expected to compound the effects of natural climate variability and create new challenges for SIDS like Saint Kitts and Nevis. Climate modelling projections[3] in the Government of Saint Kitts and Nevis (2015a) suggest the following:

- **Air temperatures:** Annual mean air temperatures are expected to increase for Saint Kitts and Nevis under all model scenarios ranging from an increase of 0.66˚C by 2020 to 2.99˚C by 2100, relative to the 1983-1999 average.
- **Rainfall:** Model projections indicate an overall decrease in annual rainfall in Saint Kitts and Nevis, ranging from 3 percent and 48 percent during the twenty-first century, with significant reductions in the wet season from May to November under all scenarios.
- **Sea surface temperatures (SSTs):** Model projections indicate a steady increase of 0.02˚C annually during the period 2000-2030, followed by a sharp increase of about 0.05˚C annually from 2030 to 2100.
- **SLR:** Sea level in the vicinity of Saint Kitts and Nevis is projected to rise steadily by about 0.3 m to 1.2 m by 2100 under various emission scenarios.

[2] The outlook for Saint Kitts and Nevis has become clouded by the COVID-19 pandemic. Tourism and construction activity were both expected to be buoyant. However, since March 2020 the tourism sector has seen mass cancellations. Construction activity has slowed, and government finances have come under increasing pressure according to CDB (2020).

[3] Projections for the analysis are based on the Direct Area Climate Model (Charlery and Nurse 2010). Further details are provided in Saint Kitts and Nevis' Second National Communication to the UNFCCC.

- **Tropical storms and hurricanes:** North Atlantic tropical storms and hurricanes appear to have increased in intensity over the last 30 years. Observed and projected increases in SSTs indicate potential for continuing increases in hurricane activity and model projections indicate that this may occur through increases in intensity of events but not necessarily through increases in frequency of storms.

Based on these projections, climate change is likely to impact adversely on biodiversity, food, energy and water security, human health, physical infrastructure as well as economic development centred on tourism.

The fisheries sector itself in Saint Kitts and Nevis is vulnerable to climate change impacts (Government of Saint Kitts and Nevis, 2015a; Monnereau and Oxford, 2017). Potential negative impacts include loss and alteration of key fisheries habitats, such as mangroves and coral reefs, smaller and less-diverse fish stocks and coral bleaching as a result of increasing SSTs, shifts in tidal patterns, intensified hurricane activity and SLR (Monnereau and Oxford, 2017). In many instances, these will place additional stresses on fisheries that are already stressed from unsustainable fishing practices and habitat loss. Evidence of stress on the nearshore water environment of Saint Kitts and Nevis is manifested in the following signs: deterioration of water quality; accelerated coastal and beach erosion; depleted fish stocks; coral bleaching affecting star coral, fire coral, elkhorn coral, soft coral and anemones; and black band disease affecting brain and star coral, sea plumes and sea fans (OAS, 2013; FAO, 2016). Apart from having to adapt to altered conditions such as changes in fish stock distribution and abundance, fishers will also face higher risks to personal safety as well as vessels due to extreme weather conditions (Monnereau and Oxford, 2017).

Tropical storms and hurricanes pose a significant threat to key infrastructure and the coastal and marine habitats important for fisheries owing to the location of Saint Kitts and Nevis in the hurricane belt. For example, Hurricanes Maria and Irma impacted local landing sites in Basseterre, Old Road Town, Sandy Point, Dieppe Bay and others, and caused damages to the Old Road Fisheries Complex in 2017 (Government of Saint Kitts and Nevis, 2018; Photo 2). In the future, climate change is expected to result in substantial losses in the fisheries and marine sectors. By 2050, estimated losses from the effect of SLR and coral reef decline on coastal lands is projected to amount to between USD 832 – 1 026.4 million (ECLAC, 2011a, 2011b).

Photo 2. Sandy Point fish landing site after Hurricane Irma in 2017

Since 2011, fisheries stakeholders have noted wide concern about the increasing negative impacts on fishing and aquaculture activities, with the mass movements of pelagic sargassum plaguing the eastern and southern Caribbean (Oxenford *et al*., 2019). There are implications to both the fisheries and tourism sectors in Saint Kitts and Nevis. Increased sargassum influxes have been noted to clog landing sites and cause damage to boat engines and gear, as well as clog intake pipes to artificial ponds used for aquaculture (Government of Saint Kitts and Nevis, 2018). The stranding of sargassum on beaches (Photo 3) is unsightly and poses a major expense and logistical challenge for governments who opt to collect and dispose of the Sargassum. There are also possible health risks associated with the decomposition of sargassum in large quantities, which releases hydrogen sulfide gas and may cause effects such as nausea, tearing of the eyes, headaches and respiratory issues (Doyle and Franks, 2015a).

Photo 3. Sargassum washes up on the beach in Saint Kitts

In addition to climate change, other notable challenges facing fisheries in Saint Kitts and Nevis include:

- **Unsustainable fishing practices and high fishing pressure:** Decline in fish catches in recent years have been related to use of smaller size fishing mesh than the legally regulated size mesh of 1.5 inches (3.8 cm) to catch fish (Government of Saint Kitts and Nevis, 2013). Consequently, juvenile fish are caught, resulting in reduced reproduction rate (growth overfishing) of the fish stock. Additional issues include overfishing of important reef fish such as parrotfish, and illegal, unreported and unregulated (IUU) fishing by vessels that operate in areas outside of the national exclusive economic zone (EEZ) (Government of Saint Kitts and Nevis, 2015b). These vessels currently are not subject to any specific national fisheries legislation, including conservation and management measures.
- **Lack of effective management measures:** Notably, important and valuable fishery resources, in particular queen conch, Caribbean spiny lobster and reef fish such as parrotfish[4], require rebuilding through effective management measures. This is however constrained by outdated fisheries management plans, which do not incorporate co-management or EAF, inadequate monitoring, surveillance and law enforcement, and lack of proper data collection system and the ability to assess stocks.

[4] The Saint Kitts and Nevis Coral Reef Report Card 2016 noted fewer large parrotfish; reduced numbers was also linked to algal overgrowth covering corals.

- **Habitat degradation, including from fishing pressure, coastal development and poor land use practices leading pollution and sedimentation:** Approximately 77 percent of the coral reefs around Saint Kitts and Nevis are estimated to be facing high threats, specifically from fishing pressure, inland pollution and sedimentation and coastal development (Burke *et al.,* 2011). Mangroves and sea grass beds have also been affected by coastal development, such as those in the south east peninsula of Saint Kitts.
- The **influx of invasive species including lionfish** compound climate-related impacts.

4. Assessing vulnerability and adaptation capacity to climate change

Recognising that fisheries are linked social-ecological systems, understanding and assessing vulnerabilities should consider ecological vulnerability alongside socio-economic vulnerability of fisheries in relation to climate change and their linkages (FAO, 2015). Vulnerability to climate change is commonly defined as "*the degree to which a system is susceptible to, or unable to cope with, the adverse effects of climate change, including climate variability and extremes*" (IPCC, 2007, 2014). The Intergovernmental Panel on Climate Change (IPCC) identifies three components of vulnerability to climate change: exposure, sensitivity and adaptive capacity[5]. These components have become crucial in understanding and assessing vulnerability in different contexts. See Box 1 for definitions for the components of vulnerability.

Box 1. Key components of vulnerability

Box 1. Key components of vulnerability

Exposure refers to 'the nature and degree to which a system is exposed to significant climatic variations'. It is denoted by the presence of people, livelihoods, species or ecosystems, infrastructure or economic, social or cultural assets in places and settings that could be adversely affected.

Sensitivity refers 'to the degree to which a system is affected, either adversely or beneficially, by climate-related stimuli'. More specifically, it is the degree to which biophysical, social and economic conditions are likely to be influenced by stressors or hazards due to climate change including beneficial and harmful effects. The effect may be direct (e.g. a change in fisheries productivity in response to a change in the mean, range, or variability of SST) or indirect (e.g. damages caused by an increase in the frequency of coastal flooding due to SLR).

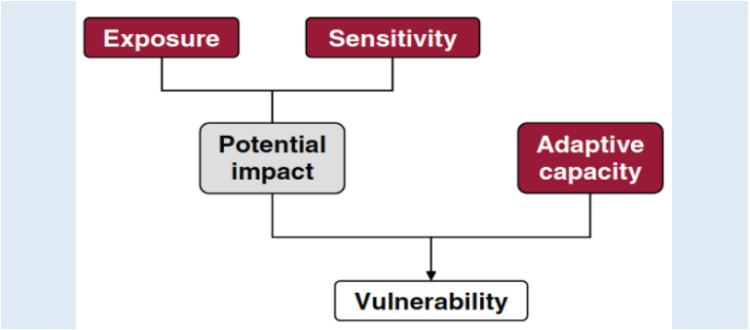
Adaptive capacity refers to 'the ability of a system to adjust to climate change – including climate variability and extremes – to moderate potential damages, to take advantage of opportunities, or to cope with the consequences'. It is context-specific as it is strongly influenced by culture, education, health, institutions and socio-economic factors.

Source: adapted from IPCC 2007, 2014.

[5] In the Fifth IPCC Assessment Report (AR5) in 2014, the conceptualisation of vulnerability was altered from the framework outlined in the 2001 and 2007 assessment reports, with a greater focus on climate risk management. However, the original conceptual framework continues to be widely used and form the basis of vulnerability assessments in a range of sectors (e.g. Monnereau *et al*., 2015; FAO and CIFOR, 2019).

These components of vulnerability - exposure, sensitivity and adaptive capacity- are interdependent (Figure 1). Vulnerability is seen as a function of potential impacts due to exposure to climate hazards and sensitivity of the system to these hazards, and the adaptive capacity of the system to adapt and address the potential impacts of climate change. The drivers of vulnerability are therefore, not considered to be climate change alone, but interactions between wider contextual conditions and multiple processes of change (O'Brien *et al.,* 2007; Monnereau *et al*., 2015).

Figure 1. IPCC framework for conceptualising vulnerability to climate change © IPCC 2007



Understanding vulnerability is critical for adaptation and building resilience to climate change. Adaptation involves adjustments in natural or human systems in response to actual or potential climatic changes to moderate harm or to take advantage of new opportunities (IPCC, 2007, 2014). Whereas, resilience refers to the ability of a system to absorb, withstand and recover from disturbances and stressors while maintaining its structure and functions, and incorporates characteristics such as adaptability, learning and self-organization (Walker *et al*., 2004). Through understanding and assessing vulnerability to climate change, ways to adapt and build resilience can be identified through reducing exposure and sensitivity to hazards (e.g. coastal defences or relocation away from coast) and building adaptive capacity to deal with hazards (e.g. livelihood diversification).

Saint Kitts and Nevis has been involved in a number of vulnerability assessments under various projects such as the Climate Resilient Eastern Caribbean Marine Managed Areas Network (ECMMAN) Project[6], the CARIBSAVE Climate Risk Atlas (CARIBSAVE, 2012a, 2012b), Caribbean Planning for Adaptation to Global Climate Change (CPACC) Project (CCCCC, 2014) and Red Cross-led VCAs in specific communities[7]. While some VCAs have targeted fishing communities, such as Dieppe Bay, Newtown, Basseterre and Old Road, these assessments generally do not cover specific community-level vulnerabilities related to climate change or the fisheries sector. Assessments are needed to meet the specific needs of the fisheries sector and enhance understanding of local-level situations to enable the design of appropriate, location-specific adaptation strategies. This includes the integration of ecological and socio-economic dimensions and priorities and consideration of fisheries-based livelihoods in a more comprehensive manner.

[6] See https://www.international-climate-initiative.com/en/details/project/climateresilient-eastern-caribbean-marine-managed-areas-network-ecmman-12_IV+_012-343

[7] See http://vcarepository.info/find

5. Approach and methodology

VCAs are one of the prominent and widely used approaches that allow for an integrated and participatory approach to assess vulnerability and capacity to adapt to climate change at the community level. Originally developed and promoted by the International Federation of Red Cross and Red Crescent Societies (IFRC), VCAs involve a process of participatory investigation designed to assess, analyse and address the major risks affecting communities in a timely manner (IFRC, 2014). A participatory approach allows a deeper understanding of people's vulnerability and the issues that affect them and empowers communities to identify their own needs, priorities and what they can do to address them (IFRC, 2014).

The VCAs aimed to be participatory and sought to actively engage community stakeholders to capture local knowledge and practices related to climate change vulnerabilities and priorities for adaptation, with a focus on the fisheries sector. Target community stakeholders included fisherfolk and their organizations, other coastal and marine resource users, community groups including church, women and youth groups, local enterprises and local government representatives. The VCAs built on existing technical assessments of coastal vulnerability, climate change and disaster risks in Saint Kitts and Nevis.

5.1 Selecting the target communities

The VCAs targeted coastal and fishing communities in Saint Kitts and Nevis, which were selected in collaboration with DMR and the CC4FISH National Project Coordinator based on the following criteria:

- dependence on fisheries and marine resources for local economy and livelihoods (i.e. one of main sources of household income);
- high level of impact and frequency of past climate and disaster events (e.g. hurricanes and storm surge, coastal erosion, coral bleaching and flooding);
- identified as priorities or hotspots to target for reducing coastal vulnerability to climate change and disasters in national assessments or reports;
- information is available to facilitate VCA (e.g. desk studies and technical assessments);
- pre-existing relationships with CANARI, FAO or national fisheries authorities that will facilitate fieldwork; and
- local community partners, such as fisherfolk organizations and other civil society organizations, have capacity to engage in and support VCA work.

The other factors considered in the selection process included:

- an expressed need or interest from community in reducing its vulnerability to climate change and disasters, but no in-depth VCA has yet been undertaken;
- high unemployment and poverty levels (i.e. lack of alternatives for employment and income);
- remoteness (i.e. limits communications, transport and access to critical services); and
- coastal location and geomorphology which is highly exposed and sensitive to the impacts from climate change and related disasters (e.g. erodible soil/rock base, proximity to estuary, located on cliffs or spits, etc.).

From this selection process, three coastal and fishing communities were selected: Dieppe Bay and Sandy Point in Saint Kitts, and Newcastle in Nevis.

5.2 Scoping analysis

A scoping analysis of the selected communities was undertaken based on a comprehensive desk review of published and unpublished literature, technical reports and project documents related to coastal vulnerability, climate change and disaster risk management in Saint Kitts and Nevis and, particularly, the selected communities. Additional fisheries data and inputs from DMR and the CC4FISH National Project Coordinator were also used to complement findings from the desk review. These findings were collated to better understand the local context for the selected coastal and fishing communities and guide selection of the relevant VCA tools and engagement of key community stakeholders, such as fisherfolk and their organizations, local government and civil society partners engaged in fisheries and coastal and marine management. Findings from previous vulnerability assessments, and any existing or recent initiatives, were also summarized to provide a basis for the VCAs to build on and identify key information gaps to be filled.

5.3 Selected methods and tools

The following tools were utilised in conducting VCAs in the selected target coastal and fishing communities in Saint Kitts and Nevis, based on the approach outlined in the VCA Toolkit (FAO and CANARI, 2021) developed under CC4FISH, to allow for a combination of spatial, socio-economic and institutional assessment of their vulnerabilities:

Participatory photo-journaling (integrating rapid community mapping): This tool was used to assess biophysical and spatial vulnerability with the target communities. It sought to bring together stakeholders in a participatory process to map their communities and take photographs at selected sites that are organised to tell the story of climate change vulnerabilities and priorities for adaptation in the communities. The objective was to identify key hazards and coping or adaptation strategies and capture local opinions, concerns and recommendations. The photo-journals produced also served as a tool for climate change awareness raising and advocacy.

Semi-structured interviews: This involved targeted interviews to help gain insights from key informants, including community leaders and fisherfolk with specialised knowledge or needs within the fisheries sector. These focused on gathering information related to climate-related hazards and other issues affecting the community, stakeholder relationships and dynamics, local institutions and decision making on management of fisheries and other resources. With open-ended questions, these interviews allowed for more dialogue and flexibility in approach.

Value chain analysis: This tool was used to systematically assess how climate change impacts on fisheries-related enterprises in the target communities, from harvesting to processing to marketing and sales, and determine actions that can be taken to reduce these impacts and add value to their fish products. This provided a more in-depth understanding of vulnerabilities across key fisheries value chains and potential adaptation actions for fisheries enterprises.

These tools were selected based on the local context, key information gaps, existing capacities within the field team and the target communities, and the available resources and timeframe. The specific steps involved in applying these tools are outlined in the VCA Toolkit developed under the CC4FISH project. Table 1 provides a brief overview of each VCA tool, its advantages and challenges and the resources required.

Table 1. Overview of selected tools

Tool	Description	Advantages and challenges	Resources/skills needed
Participatory photo-journaling	Participatory photo-journaling is a useful tool to document local impacts, perspectives and practices related to climate change and share these with a wide audience. It involves taking photographs (photos) that are then organized in a particular sequence to tell the story of climate change vulnerabilities and priorities for action in a given area or sector. The photos can be used to highlight aspects of vulnerability including exposure, sensitivity and adaptive capacity to different climate-related hazards. The community decides what they want to show and how they want to show it. The process is participatory, including development of a story board, capturing still shots and drafting captions that describe the images and convey messages about a specific issue and the desired actions. The emphasis here is not to create a professional product but rather to let the photo-journal be the 'voice' of the community. The final product can be an electronic or printed copy of the photo-journal.	**Advantages:** • useful to document local realities and concerns • photo-journals are an effective communications product for awareness raising or advocacy • flexible and can be integrated with other tools (e.g. community mapping, interviews etc.) • fairly rapid (can be conducted in one to five days) **Challenges:** • elderly or less tech savvy persons, who are not comfortable using cameras or smart phones, can be marginalized • requires access to cameras or smart phones, which is fairly costly • difficult to document less tangible issues facing communities such as attitudes, conflicts and institutions	• facilitation skills to guide photo-journaling exercise • photography skills • camera or smartphone and memory card • compute or laptop and projector • underwater case (if collecting photos underwater)
Rapid community mapping	Community mapping is used to gather and interpret spatial and/or biophysical information about vulnerability to climate change. This tool can be used to identify and document locations of key areas impacted by, or at risk from climate hazards, including settlements/populations, infrastructure, livelihood activities and natural resources in the community. It can also be used to identify key assets and services that enable adaptation to climate change. Community mapping can be a simple exercise where, for example, participants draw a rough map on a sheet of paper or it can be more detailed involving maps drawn to scale.	**Advantages:** • useful to capture spatial information about who and what is vulnerable • low cost and rapid (can be conducted in 2-3 hours) • does not require special expertise • maps can be displayed and serve as communications product • flexible and can be integrated with other tools (e.g. photo-journaling, interviews etc.)	• facilitation skills to guide mapping exercise • spatial knowledge of area • base maps and transparencies/tracing paper (if drawing to scale)

Tool	Description	Advantages and challenges	Resources/skills needed
		Challenges: • map's quality dependent on type of stakeholders involved in process, and their knowledge of the community • difficult to document less tangible issues facing communities such as attitudes, conflicts and institutions	
Semi-structured (key informant) interviews	Semi-structured interviews are used to collect qualitative data and allow for more in-depth exploration and discussion of local perceptions and the economic, political and socio-cultural factors shaping vulnerability to climate change. They are best used to gain insights from key informants, such as fisherfolk and community leaders, with specialized knowledge or needs within a community or its fishery sector. Semi-structured interviews involve open-ended questions. The interviewer is encouraged to probe responses in order to get to the root causes of the vulnerabilities and to better understand priorities for adaptation.	**Advantages:** • useful tool to capture cultural, socio-economic and political issues within community • flexible and can integrate other vca tools (e.g. mapping, participatory photo-journaling and livelihood analysis) **Challenges:** • requires detailed stakeholder analysis to identify key informants • requires trained and experienced persons to effectively design and conduct interviews • takes one to two weeks	• training and skills in interviewing • interview guide/questions
Value chain analysis	Value chain analysis provides an opportunity to assess how climate change affects fisheries-related and other enterprises in the community. The components of vulnerability - exposure, sensitivity and adaptive capacity - can be systematically assessed at each step in the value chain. Strategies to reduce vulnerability and add value to the enterprise's product/service can then be identified for each step of the value chain.	**Advantages:** • useful tool to understand vulnerabilities related to fisheries enterprises and livelihoods **Challenges:** • requires expertise in small business development and value chains • takes three days to one week	• facilitation skills to guide value chain analysis • expertise in small business development and value chains

Source: CANARI (2020).

5.4 Field teams and fieldwork activities

The VCAs in the three target communities were conducted from February to December 2020 by field teams of three to four persons trained as part of the VCA training workshop, November 18-19, 2019 in Basseterre, Saint Kitts and Nevis (CANARI 2020). These field teams collectively encompassed a mix of competencies, including in climate change, fisheries and socio-economic and community development, to ensure a holistic approach and effective implementation of the VCAs. The field teams included:

- the CC4FISH National Project Coordinator;
- fisheries officers and data collectors from the DMR in both Saint Kitts and Nevis that work in the target communities;
- district officers from NEMA with responsibility for the target communities;
- fisherfolk leaders from active fisherfolk organizations in the target communities, including the Capisterre Fishing Marketing Supply Cooperative in Dieppe Bay and Newcastle Bay Foundation in Newcastle;
- other civil society representatives which work on climate change and disaster resilience and coastal and marine conservation issues in the target communities; and
- a small business development expert to support value chain analysis.

A listing of the field teams in each community can be found in Appendix 1.

Participatory photo-journaling and rapid community mapping were conducted in combination by the field team in half-day workshops with the target communities (see **Table 2** for details). In each case, based on inputs and gaps identified by participants, further fieldwork was conducted over a period of one to two weeks for capturing additional photos to include in the photo-journals. Field teams also conducted 20-25 key informant interviews in each of the target communities over two to four week periods. The key informant interviews targeted fisherfolk leaders, experienced fishers and fish processors, leaders of women and youth groups, local government representatives and other important resource users such as farmers, dive and tour operators, hoteliers and seamoss producers.

Finally, a consultant with expertise in small business development and the CC4FISH NPC conducted value chain analysis with members involved in the main fishing enterprise/activity for each target community. One to two half-day focus groups were facilitated to firstly develop and then to analyse the relevant fisheries value chains with stakeholders in terms of vulnerability to climate change and potential actions and priorities for adaptation. See **Table 3** for details.

Table 2. Summary of community workshops held to conduct community mapping and participatory photo-journaling

Community	Workshop venue	Workshop dates	Number of participants
Dieppe Bay, Saint Kitts	Temple Church Meeting center, Dieppe Bay	25 February 2020	Total: 11 (8 males and 3 females)
Newcastle, Nevis	Franklyn Browne Community Center, Newcastle	12 October 2020	Total: 15 (13 males and 2 females)
Sandy Point, Saint Kitts	Link Up Bar, Fig Tree, Sandy Point	4 December 2020	Total: 15 (14 males and 1 female)

Source: CANARI (2020).

Photo 4. Stakeholders in Dieppe Bay, February 2020

Fisherfolk and other community stakeholders in workshop activity to map community vulnerabilities to climate change, February 2020

Photo 5. Stakeholders in Newcastle, Nevis, October 2020

Fisherfolk and other community stakeholders engage in community mapping (left) and photo-journaling (right) at workshop, October 2020

Table 3. Summary of value chain analysis workshops

Community	Workshop venue	Workshop dates	Number of participants (by gender)
Dieppe Bay, Saint Kitts	Temple Church, Dieppe Bay, Saint Kitts	29 August 2020 and 12 September 2020	Total: 12 (9 males and 3 females)
Newcastle, Nevis	Franklyn Browne Community Centre, Nevis	15 November 2020 and 22 November 2020	Total: 28 (25 males and 3 females)
Sandy Point, Saint Kitts	Link Up Bar, Sandy Point, Saint Kitts	5 December 2020	Total: 9 (all males)

Source: CANARI (2020).

Photo 6. Dieppe Bay, Saint Kitts, August-September 2020

Participants work on developing fisheries value chains (left) and analysing fisheries value chains (right) in Dieppe Bay, Saint Kitts, August-September 2020

Photo 7. Newcastle, Nevis, November 2020

Fisherfolk and other community stakeholders in Newcastle, Nevis, engage in value chain analysis workshop, November 2020

5.5 Limitations

While the VCAs successfully engaged a wide range of stakeholders, including fishers and fisherfolk organizations in all three communities, local government representatives, women's groups, village councils, and target community residents, there were limitations to the process. The COVID-19 pandemic led to delays in completion of in-person workshops and interviews in order to abide by social distancing measures. Initially, VCA tools were to be executed within the timeframe January to April 2020. However, following the declaration of the COVID-19 pandemic in March 2020 by the World Health Organization (WHO), in-person workshops and other field activities were postponed until August 2020. In applying each of the VCA tools noted above, the local field teams followed the applicable COVID-19 protocols in Saint Kitts and Nevis (e.g. related to social distancing, wearing of masks and regular sanitising).

6. Findings of the vulnerability and capacity assessments

This section presents the summary of results for VCAs done in the three target coastal and fishing communities: Dieppe Bay and Sandy Point in Saint Kitts, and Newcastle in Nevis. Results and findings from the three VCA tools are presented, detailing key climate change impacts and vulnerabilities and adaptation strategies and priorities identified by community stakeholders using a participatory process.

6.1 Dieppe Bay

6.1.1 Overview of community

An overview of the Dieppe Bay community is provided below, including the fisheries context, geography, demographic, socio-economic activities and findings from previous assessments in the area of relevance to climate change.

Photo 8. Aerial view of Dieppe Bay fish landing site

Box 2. Dieppe, Saint Kitts

Dieppe Bay, Saint Kitts
Dieppe Bay is one of the main fish landing sites in Saint Kitts. It is the most northerly of all the landing sites and is unique in that it is the only landing site that is protected by a reef. This site has the largest annual landings of lobsters in Saint Kitts (FAO, 2016). Dieppe Bay town is historically significant as it is the site of the first European settlement in the eastern Caribbean, a French colony established in 1538 that was destroyed by the Spanish just two weeks after its founding. The area is also well known for its large coral reef ecosystem and was once home to a busy port situated along the harbour. The fishing community is made up of approximately 125 fishers and 17 fishing vessels[8]. Fishers from neighbouring communities such as Saint Pauls, Parson Ground, Newton Ground and Saddlers also land their fish at the Dieppe Bay fish landing site. The most popular catches are lobster, dolphinfish, wahoo and various reef fish. Fishers and women in their households usually conduct roadside sale of fish. There is the Capisterre Fishing Marketing Supply Cooperative; however, it is not fully operational as its building was destroyed during the passage of Hurricane Irma in 2017[9] and has not been rebuilt.

[8] Information provided by the Department of Marine Resources Saint Kitts and Nevis, 2020.

[9] Ibid.

Geography

Dieppe Bay is a coastal and fishing community located in the island's north east end within the parish of Saint John Capisterre, the second largest parish on Saint Kitts. It is approximately 20 km from the capital, Basseterre. Geographically, it is situated along the north Atlantic coast of the island of Saint Kitts which typically experiences higher wave action that the Caribbean side. However, large offshore reef formations almost completely surround Dieppe Bay beach, giving it strong protection against heavy wave action and creating the island's safest natural harbour. The community is one of several that lie on coastal plains at the base of Mount Liamuiga, the highest point on the island of Saint Kitts and a dormant volcano. The island's main road which runs along the coast crosses through the community.

Demographic information

According to 2011 census data, Dieppe Bay town had a population of 464 persons (240 males and 264 females). The majority are of African descent (Government of Saint Kitts and Nevis, 2011). Approximately 57 percent of the population have attained secondary level education and above (Government of Saint Kitts and Nevis).

Socio-economic activities

- Fishing is of high local importance in the community. The rich reefs of Dieppe are a major local fishing ground. Community members are active in nearshore fishing, specifically line fishing, freediving (e.g. for lobster or to spearfish) and trap fishing. On a broader scale, Dieppe Bay is famous for its lobster landings.
- Tourism is also an important socio-economic activity. Due to the reefs in the area, the beach is popular for swimming and snorkelling. Local beach restaurants and bars provide popular recreation and lookout points for tourists and sightseers. The area was also the target of development in the past with the addition of the Beaumont Park Racetrack in 2009 (currently not operational) and Beaumont Park later being included as a government approved real estate project for Citizenship-by-Investment.

The main employer in the wider parish is agriculture. The fertile slopes of Mount Liamuiga are home to many small farms and a wide variety of tropical fruits are grown for local consumption, such as avocado, banana, breadfruit, mango, papaya and sugar apple. Sugar cane was grown a key crop in the past; the area has a number of abandoned sugar cane estates.

Past assessments

- A VCA was conducted in this community in 2010 by the Saint Kitts and Nevis Red Cross Society (IFRC, 2021). The assessment noted flooding and coastal erosion as key local hazards affecting the community, along with broader threats from hurricanes, and seismic hazards (volcanoes and earthquakes). In terms of community resources and capacities, the assessment notably identified the fishing cooperative as the main emergency shelter (though in disrepair) and the fishing fleet as a source of alternative transport if road access became blocked.
- Dieppe Bay was also a target community under the Future of Reefs in a Changing Environment (FORCE) project for which components of the work was relevant for assessing coastal/fisheries vulnerability (Peterson *et al.*, 2014). The assessment included developing a historical timeline of key events and changes related to the community and adjacent coral reef. Participants noted impacts including declines in certain types of fish catch due to weather phenomenon such as El Niño, extreme storms (e.g. Hurricane Hugo in 1989 damaging parts of the coral reefs and associated fishing grounds), and increased sedimentation from land-based activities such as construction of a horse racing track and from abandoned sugar cane estates (Peterson *et al.*, 2014).

6.1.2 Key climate change impacts and vulnerabilities

The specific findings from the applications of the three VCA tools are detailed as follows.

Photo-journaling findings

Participants in the photo-journaling exercise, which integrated community mapping, were able to identify climate-related issues as well as broader fisheries and socio-economic issues affecting the community. For Dieppe Bay, these factors are closely related, especially given its reliance on fishing activities. In the photo-journal, participants highlighted that the entire community, including residential homes, community buildings (e.g. businesses and schools), other physical assets such as the fish landing site and fishing cooperative building that is currently damaged from recent hurricanes and road infrastructure, is highly exposed given its geographical location on the windward coast and proximity to the sea (i.e. there is little or no setback).

They also noted that protective measures have also been deteriorating and need attention, including a retaining wall which has been impacted over time by sea level rise, rough seas and strong ocean currents. In addition, severe coastal erosion from storm surges and strong ocean currents was highlighted as a key issue leading to siltation of and the decline in the health of the adjacent coral reef which is a key resource for the fishing community, serves to stabilise the coastline and is recognised more broadly as a unique coral reef ecosystem for Saint Kitts. Other climate-related issues highlighted in the photo-journal were sargassum influxes which were noted to damage boat engines and gear.

Photo 9. Dieppe Bay Co-op

The fishing cooperative building in Dieppe Bay damaged by Hurricane Irma in 2017 ©CANARI (2020)

Participants highlighted that the re-building and re-purposing of the Capisterre Fishing Marketing Supply Cooperative building is a high priority, with potential to improve fishing livelihoods in Dieppe Bay and enhance adaptive capacity and overall resilience of households who mainly rely on fishing for their incomes. The building is not only key for fishing but a social space for the wider community and previously served as a hurricane shelter. Additionally, assistance for the construction of a ramp or jetty was noted as being critical not only for enhancing fishing activity but for supporting fishers to more easily haul and secure boats during storms and hurricanes.

The rebuilding of the retaining wall was identified as a priority to continue to offer protection to community infrastructure and address impacts of coastal erosion and flooding. Participants also noted the need for a boulder wall near ghauts draining into the sea, to act as a catchment to reduce siltation of the nearby reefs. Assistance with sargassum management was another priority area to help build resilience. The full photo-journal can be accessed in Appendix 4.

Photo 10. Portion of the retaining wall along Dieppe Bay about to fall

Key informant interview findings

Key informants included 14 fisherfolk, nine additional persons with more broad knowledge of the community and four NEMA district coordinators. All of the participants including fisherfolk interviewed were over 40 years of age. Approximately 80 percent of the fisherfolk interviewed have been fishing for more than 20 years.

The key climate-related changes and impacts noted by fisherfolk were as follows:

- Fisherfolk noted changes in weather and climate patterns over time, including stronger hurricanes and storms and rougher seas (experienced for longer periods) which curtail fishing activity, destroy gear such as bottom traps and cause damage to key habitats such as coral reefs. Due to the increased incidence and unpredictability of bad weather, fishers also have safety issues at sea, reduced fishing time, and extra costs to haul vessels onshore.
- Shifts in tidal patterns and stronger opposing currents limit fishers' ability to get to key fishing grounds on the reefs. This has resulted in loss of gear such as pots which often disappear with strong currents. Fishers also felt that warmer than usual waters could possibly affect the movement and migration of fish.
- Sargassum influxes cause damage to boats and gear and was noted to affect different types of fishing including trap fishing by filling traps and blocking lobsters from entry, and line fishing by causing lines to float instead of remaining submerged for bottom fishing. Sargassum also hinders access to the reefs and passage to back to shore. Decomposing sargassum also creates a highly unpleasant smell and affects aesthetic value of the coastal zone for fisherfolk and other users living near or utilizing the coastline.

Although changes in fishing habits were partly attributed to response to climatic changes, several other factors were identified by informants, including the degradation of key fishing habitats from human activity. This degradation is related to increased fishing pressure and increased run-off from agricultural

and other lands contributing to sedimentation of the nearshore areas, resulting in reefs being stifled and covered by increased amounts of algae. The key informants from the wider community additionally shared the perception there was now less and smaller pot/reef fish (e.g. doctor fish, grunts and lobster) being caught and sold. This was potentially related to certain fishing practices, such as divers using spearguns[10] and the design of pots to catch lobster and fish that do not include escape hatches for non-target fish. The above has led to changes in fishing habits as summarised in Table 4.

Table 4. Summary of changes in fishing habits, Dieppe Bay

Type/species of fish caught	Fisherfolk generally noted there was little change in the species of fish still caught, however they noted a decline in numbers over time, of certain species such as snapper (e.g. silk, red and yellow snappers), dolphinfish, herring, butterfish and species targeted via fish pots/traps in general. Certain species such as dolphinfish were also noted as being smaller in size.
Type of gear	Fisherfolk utilised a number of fishing methods including trap and pot fishing, line fishing and spear fishing and trolling for coastal and ocean pelagics as well as lobster. In general, the gear used has remained the same, including lines, spears, hooks, cable and spread nets to catch bait. However, it was notable that smaller mesh sizes were being used (noted in other reports as a concern for sustainable fisheries management as more juvenile fish being caught and resulting in increased fishing pressure). Due to lack of FADs, more emphasis was being placed on nearshore fishing which also adds fishing pressure.
Location of fishing grounds	Several interviewees noted having to go further out to catch fish since they began fishing to date. It was noted that fish appear to be moving away from regular fishing grounds. In particular, fishing grounds related to the coral reef were being impacted by erosion and covered in sand and increased amounts of algae, so that fishers had to find new spots to fish. It was also highlighted that the weather played a role in determining which fishing grounds were being used.
Fishing effort (e.g. how often go out, how many pots or lines used, use of FADs)	Interviewees noted that there was a general reduction in fishing time including due to storms and extreme weather and rough seas which affect ability to go out to fish, as well as sargassum which affects boats and gear. There is increased fishing effort and use of fuel with fishers having to go further out to catch fish as a result of impacts to key fishing grounds (e.g. coral reefs), and movement of fish away from regular fishing grounds due to changing conditions.
Fishing seasons	Changes in the fishing seasons for specific species, such as dolphinfish from December to a later time of the year was noted, as well as other changes related to time of day (e.g. fish now caught more easily on mornings than afternoons).
Landing sites and facilities	Little changes were noted to the landing site except for increased storm surges; The damaged and degraded reef ecosystem could have affected its protective function making the area more susceptible to impact from surges and coastal erosion.

Key informants from the wider community and NEMA additionally noted impacts to agriculture and tourism, especially from hurricanes and extreme weather such as heavy rainfall and drought. They noted reduced ability to use the sea for recreational activities and restricted use of the beach due to rough ocean currents and erosion. Broader problems which were also noted include: lack of attention by government/policy makers concerning development of the area; pollution related to improper waste management (e.g. dumping along the coast and in the sea); drug and alcohol abuse; and limited cohesiveness and general interest of community members to pursue improvements.

[10] The DMR noted spear fishing is not illegal; however, fishers are required to have a permit.

Fisherfolk informants identified a range of responses in terms of dealing with impacts from climate-related hazards, including adjusting their fishing activities (i.e. avoiding/doing less fishing when conditions are bad), moving into related livelihood activities such as building fish pots, boat repairs or alternative livelihoods such as farming, plumbing and carpentry to make up for the loss of income. They also noted the Capisterre Fishing Marketing Supply Cooperative is not currently active and, even if fisherfolk considered joining, damage to its building presents a barrier to reactivating its work. Apart from individual measures taken to secure property from storms, and decisions to avoid hazardous conditions such as rough seas, responses from the wider community indicated little capacity or effort to self-mobilise and a reliance on government to initiate interventions. NEMA and the local Red Cross Society were acknowledged as alternative sources of support on the ground. NEMA has conducted assessments on community vulnerability. The Red Cross has organised clean-ups in collaboration with other stakeholders such as universities.

The priorities for adaptation identified by informants, which generally reflect the findings from the other VCA tools, include:

- Rebuilding the fishing cooperative building and strengthening the fishing co-operative.
- Improving other fisheries infrastructure and inputs to fishing, such as construction of a jetty and ensuring easy access to gas and different types of fishing equipment and gear which are affordable and good quality. This may also help reduce reliance on one type of fishing method.
- Reconstructing the retaining wall to address coastal erosion.
- Diversifying fishing techniques including greater use of FADs so fishers can access more reliable catch, and exploration of alternative sustainable livelihoods.
- Restoring the nearby coral reef.
- Improving sargassum management including financial assistance and equipment to clear sargassum from beaches.
- Implementing education and awareness campaigns on pollution, including its impacts and proper waste management and regular coastal cleanups.

Value chain analysis findings

In addition to the photo-journaling and interviews, fisherfolk participated in value chain analysis workshops to develop and analyse key fisheries value chains to assess climate change vulnerability, and to determine appropriate strategies to help 'climate proof' the value chains. Two value chains were identified as being relevant for the community: the fisheries for lobster and pelagic fish (See Tables 5 and 6).

Overall, the following climate-related hazards were identified by the participants as having an impact on these two value chains:

- Hurricanes, storms and storm surges and rough seas, which cause flooding, coastal erosion and direct damage to or loss of fisheries infrastructure and key coastal and marine habitats and affect safety at sea and fishers' ability to go out to fish.
- Extreme weather conditions that lead to both intense rainfall resulting in flooding and power supply disruptions to processing or market operations and droughts or dry spells contributing to unreliable water supply.
- Influx of sargassum which often results in reduced ability to fish, as well as increased expenses and fishing effort as it damages boat engines and gear and clogs landing sites causing difficulty in getting boats into the water at times.

- Changes in ocean conditions (e.g. strong ocean currents, warmer waters, and siltation or pollution from flooding on land) leading to reduction in catch and loss or degradation of key marine habitats such as coral reefs.

The other challenges affecting the two fisheries value chains include:

- lack of storage and processing facility (as the cooperative building is damaged);
- lack of access to affordable financing;
- limited training and equipment for fish processing;
- heavy dependence on the tourist season to fetch a good price as well as unfair price competition as not all fishers willing to sell at the same price; and
- inability to meet the demand for local fish due to contributing factors noted above.

The priorities for building resilience and adding value to these value chains and related enterprises include:

- The restoration and proper outfitting of the cooperative building including via pooling of fisherfolk resources (e.g. financial and labor) where possible and approaching the government through the DMR for assistance. Key equipment such as a generator and water tanks, ice machine and freezer, as well as proper tools such as slicers, smoker, sealer, labelling machine were specifically identified needs for improving storage, processing and marketing abilities.
- The increased involvement of fisherfolk in the area in the cooperative, which is necessary to grow the organization and members to collectively reap benefits.
- The exploration of training opportunities for fisherfolk and community members in areas such as smoking, salting and filleting so that they can add value.
- The active marketing of fisheries products via more engagement in activities such as fish or lobster festivals at least once per month (Photo 11). For example, this has been initiated with the group securing a partnership with Vibes Beach Bar on the Frigate Bay Strip to host monthly activities based on the value chain analysis.

Photo 11. Dieppe Bay Fishers Lobster Fest

Fisherfolk participating in the Dieppe Bay Fishers Lobster Fest in collaboration with the Vibes Beach Bar on the Frigate Bay Strip, as part of the drive to further market their catch/products

Table 5. Dieppe Bay value chain for the Caribbean spiny lobster

LOBSTER	INPUTS	PRODUCTION	PROCESSING & DISTRIBUTION	MARKETING	CONSUMERS
VALUE CHAIN	Boat and engine, fuel, gears, traps, crew, bait, scuba equipment, storage (cooler, ice)	Transport from landing site to sale outlets	Transporting, cleaning, weighing, packaging, pricing	WhatsApp, Facebook, word of mouth, business cards, flyers, weekend fish fry	Restaurants, bars, hotels, general public
VULNERABILITIES	i) Sargassum gets caught boat engines, and make it difficult to get the boats into the water at times ii) Hurricanes and storms affect the fishers' ability to go to sea. Loss of electricity during storm/hurricane events affects proper storage. iii) Hurricanes, storms and sea surges cause erosion to the beach and contribute to flooding which result in silt and mud entering the sea and damaging the reefs, a habitat for the lobster	i) Cooperative building was extensively damaged by hurricanes and is now unusable leaving fishers with no storage or processing facility ii) Heavy rains cause erosion of roads making it difficult to transport products iii) Pricing competition created among fishers	i) A lack of training in areas such as pricing, packaging and labelling techniques ii)Lack of labelling and packaging equipment iii)Adverse weather and flooding from hurricanes cause damage to storage and processing facility and fluctuation in electricity which damages equipment	i)Adverse weather conditions causes frequent interruptions to the internet service thus leaving the fishers with limited measures to advertise and market their products	i) Demand for lobster depends heavily on the tourism industry which can be affected by natural hazards ii) Storms and hurricanes affect the electricity supply which affects storage and processing, and can reduce supply
RESILIENCE BUILDING STRATEGIES	i) Explore ways of utilizing the sargassum which can be an added source of income ii) Purchase of a generator or solar system (back-up power supply) iii) Carry out regular clean-up of water ways that lead to the beach iv) Look into the purchase of a refrigerated vehicle	i) Engage in frequent village and beach clean-ups to ensure water courses are kept clear ii) Restore the cooperative building using better storm and hurricane construction methods and materials. iii) Provide training workshop on pricing iv) Establish delivery prices based on distance covered	i) Purchase processing machines such as sealing and packaging and labelling machine ii) Explore ways of adding value to the raw product e.g. sealed packages of lobster chunks iii) Purchase of generator or solar powered system	i) Partner with restaurants, and bars to host Lobster Fest (this was started with Vibes Beach Bar shortly after the workshop) ii) Identify specific restaurants and hotels to sell to (started with Boozy Beach Bar) iii) Create flyers that can be disseminated in hard copy as well as on social media	i) Explore pricing and marketing strategies just for locals which are geared to maintaining sales during the tourism off-season

Source: CANARI (2020).

Table 6. Dieppe Bay pelagic fish value chain

PELAGIC	INPUTS	PRODUCTION	PROCESSING & DISTRIBUTION	MARKETING	CONSUMERS
VALUE CHAIN	Boat and engine, fuel, hooks & lines, traps, crew, bait, FAD, water, electricity storage (cooler, ice)	Cleaning, frying, grilling, smoking, salting, slicing and filleting	Transporting, cleaning, weighing, packaging, pricing	WhatsApp, Facebook, word of mouth, business cards, flyers, weekend fish fry	Restaurants, bars, hotels, general public
VULNERABILITIES	i) Sargassum gets caught boat engines, and make it difficult to get the boats into the water at times ii) Hurricanes and storms affect the fishers' ability to go to sea. iii) Damage to storage facility due to storms and hurricanes and related flooding. Loss of electricity during these events also affects proper storage. iv) Hurricanes/storms cause erosion to the beach	i) Lack of a proper facility that can be used to clean, store or process the catch ii) Heavy dependence on government supplied water and electricity which is not very reliable iii) The catch by fishers is very unreliable (variable amounts)	i) A lack of training in areas such as pricing and other packaging and labelling techniques ii) Lack of labelling and packaging equipment iii) Adverse weather and flooding from hurricanes cause damage to storage and processing facility and fluctuation in electricity which damages equipment	i) Adverse weather conditions cause frequent interruptions to the internet service thus leaving the fishers with limited measures to advertise and market their products	i) Demand for fish is greater than the supply ii) Hurricanes, storms, bad weather adversely affects the number of persons wanting to purchase fish
RESILIENCE BUILDING STRATEGIES	i) Explore ways of harvesting rainwater (storage tank, cistern) ii) Build or dig trenches that can assist in channelling water during flooding iii) Explore ways of utilizing the sargassum which can be an added source of income iv) Purchase of generator or solar powered system	i) Restore the cooperative building using better storm and hurricane construction methods and materials. ii) Invest in water harvesting methods and back-up power supply	i) Purchase processing machines such as sealing, packaging and labelling machine ii) Explore ways of adding value to the raw product e.g. sealed packages of fish fillet and fish slices iii) Purchase of generator or solar powered system	i) Partner with restaurants, and bars to host Fish Fry (this was started with Vibes Beach Bar shortly after the workshop) ii) Identify specific restaurants and hotels to sell to.	i) Invest in boats that can carry out deeper sea fishing i.e. equipped with the facilities so that they can stay at sea longer

Source: CANARI (2020).

Summary of findings

A summary of the key climate change impacts and vulnerabilities is outlined in Table 7, along with key priorities for adaptation, identified by the Dieppe Bay stakeholders.

Table 7. Key climate change impacts, vulnerabilities and adaptation priorities identified by Dieppe Bay stakeholders using the VCA tools

Climate-related hazards	Key impacts	Vulnerable groups and areas	Priorities for adaptation
Coastal and marine biodiversity and ecosystems			
• Hurricanes and tropical storms • Storm surges • Sargassum influx	• Coastal erosion driven by storms and storm surges impact the coastal spit and headlands (western end) and also result in loss of sandy beach (habitat for sea turtles). • Intensified coastal erosion due to strong ocean currents, hurricane and storm activity and storm surges contribute to siltation of the coral reef off Dieppe Bay. Flooding from these events cause silt and mud to enter the sea and damage the reefs, which are important habitat for lobster. • Marine ecosystem i.e. unique coral reef habitat with healthy elkhorn and staghorn corals off Dieppe Bay impacted by influx of sargassum. • Hurricane and storm activity has caused physical breakage and damage to parts of the coral reef e.g. extreme storms such as Hurricane Hugo damaged parts of the reef and associated fishing grounds in 1989.	• The coastline extent of Dieppe Bay including the exposed spit, beach and beach vegetation. • The coral reef off of Dieppe Bay, which is important as fish and lobster habitat. • Fisherfolk dependent on the coral reef for fishing livelihoods. • Vulnerable groups such as the elderly (many fishers fall into older age groups) or disabled persons.	**Protection of the coral reef**, including through regular clean-up of watercourses leading to the beach and construction of a preventative wall made of boulders to reduce siltation and pollution and further destruction of the reefs. **Reconstruction of the retaining seawall** protecting the community **Improvements in fisheries infrastructure to enhance both fishing activities and hurricane preparedness** – rebuilding and retrofitting, and hurricane proofing of the fishing cooperative building and a ramp or jetty to assist fishers to pull up and secure boats quickly and easily **Improving reliability of electricity and water supply for fisheries operations** – exploring rainwater harvesting, investing in storage tank, cistern, and purchase
Livelihoods and socio-economic practices			
• Hurricanes/tropical storms • Storm surge • Rough seas • Heavy rainfall • Dry spells/drought • Sargassum influx	• Damage to the fisheries cooperative building by hurricane Irma in 2017 has negatively impacted fisheries operations; fisherfolk do not have adequate storage or processing facility. • Hurricanes and storms also reduce fishers' ability to go to sea (i.e. less fishing days and increased risk to safety at sea). This reduces their ability to earn an income.	• Fisherfolk (e.g. boat owners, fishers, vendors, processors) in Dieppe Bay and their households and family members dependent on their income. • Small business owners (e.g. beach restaurants or bars) who may see declines in business due	

Climate-related hazards	Key impacts	Vulnerable groups and areas	Priorities for adaptation
	• Disruptions to fishing operations, safety at sea concerns and decline in income due to rougher sea conditions and sargassum influx. • Increased impact and likelihood of damage to fishing boats and gear, and vital fisheries sector infrastructure (e.g. landing site) due to rougher seas, storm surge and sargassum influx. • Reduced employment opportunities in alternative sectors (i.e. tourism or recreational services) due to coastal erosion affecting beaches and coastal infrastructure. • Dry spells and periods of drought result in unreliable water supply, which is needed for fishing operations, particularly in production and processing. In addition, fluctuations or loss of electricity during hurricanes or storm events affects storage and processing operations and results in damages to equipment.	to property damages incurred from storm winds, coastal erosion and flooding. • Recreational users of the beach, which are popular for swimming and snorkeling), affected by sargassum influxes. • Tourism and recreational activity employees (e.g. tour guides who may benefit from local tourism to the area), affected by beach erosion and loss, damage to coastline and deterioration in aesthetic appeal. • Business owners and self-employed community members who operate small shops and food spots and earn an income through catering to recreational and tourism activities patrons.	of back-up power supply - generator or solar powered system. See bullets above **Sargassum management** including exploring opportunities for utilizing the sargassum which can be an added source of income **Implementation of community flood management measures** – improving drainage via building trenches that can assist in channeling water
Settlements and infrastructure			
• Hurricanes/tropical storms • Storm surge • Heavy rainfall	• Hurricanes have directly caused damage to key fisheries infrastructure (e.g. the fisheries cooperative building which is now unusable); fisherfolk have no adequate storage or processing facility. • Coastal erosion of the Dieppe Bay spit and the western end of Dieppe Bay including due to storm activity or surges and rough seas has created greater exposure for the fishing boats anchored in the more sheltered eastern beach. • Retaining wall along the eastern coast of Dieppe Bay impacted by	• Fish landing site and the eastern beach area where fishers anchor their boats and fisheries infrastructure such as the fishing cooperative located along the coastline. • Residential homes and other key community infrastructure such as the school, churches and small local businesses such as bars and small shops along Dieppe Bay at risk to damages from surges, coastal erosion	

Climate-related hazards	Key impacts	Vulnerable groups and areas	Priorities for adaptation
	rough seas and coastal erosion over time. ● Extreme weather - heavy rainfall and storm surges lead to flooding and contribute to erosion of and damage to community roads. This affects mobility of community residents and ability of fisherfolk to transport catch. ● Property damage to residential and commercial buildings.	and direct impacts from storm winds. ● Residents living directly on or near the coast in Dieppe Bay (e.g. Chapple Street), north of Beaumont racing track and newer residences at Beaumont housing development affected by storm surges and flooding.	

6.2 Sandy Point

6.2.1 Overview of community

An overview of the Sandy Point community is provided below, including the fisheries context of the community, geography, demographics, socio-economic activities, and previous assessments in the area of relevance to climate change.

Photo 12. View of the coastline in Sandy Point

Box 3. Sandy Point Saint Kitts

Sandy Point, Saint Kitts

Sandy Point is one of five major fish landing sites in Saint Kitts and the second largest town on the island after the capital, Basseterre (FAO, 2016). It was also of commercial significance in the past as the first major seaport on the island of Saint Kitts. In addition, it bears historical significance due to the nearby Brimstone Hill Fortress - the largest fortress ever built in the Eastern Caribbean by the British – that was constructed to defend the town's port and the downhill fortress of Fort Charles.

Though it is noted as a key landing site, the area consists of 12 registered vessels[11], mainly using nets, traps and hand lines. There are approximately 85 registered fishers[12]. Popular species caught include a number of reef fish, such as snapper and hind, and pelagic fish, such as gar, dolphinfish, marlin and tuna (FAO, 2016). Fisherfolk in Sandy Point also catch shellfish and have been supplying bars and local food vendors in Sandy Point[13]. Notably, the high demand and low supply of fish has led fishers to mostly target their community and neighbouring communities. There is currently no fishing complex within the community itself, although plans had been put forward to construct one in the past (e.g. Japan International Cooperation Agency, 2005).

Geography

Sandy Point is located on the north west coast of Saint Kitts in the parish of Saint Anne approximately 16km from the capital, Basseterre. It lies on gently sloping coastal plains and includes several popular black sand beaches such as Pump Bay and Belle Tete.

[11] Information provided by the Department of Marine Resources administrative records.

[12] Ibid.

[13] Information provided by business development consultant Catherine Forbes, from value chain analysis workshops in Sandy Point in 2020.

Other neighbouring communities such as Fig Tree, La Vallée, and Sir Gillee's are suburbs of the town. The island main road passes through the town and it is also traversed by the Sandy Point Ghaut, an ill-defined ravine near the fort at Brimstone Hill Road. The area is noted for its coastal ecosystems, which support fishing and tourism livelihoods. There are well developed but smaller coral reefs, which are highly diverse with many mountainous star corals. Small (white) mangrove stands and some of the most important sea grass communities in Saint Kitts are situated around the Sandy Point area (The Nature Conservancy, 2016).

Demographic information

Sandy Point town was estimated to have a population of around 2 626 persons (Government of Saint Kitts and Nevis, 2011). Historically the area was populated by both the British and French, as well as African slaves.

Socio-economic activities

- Manufacturing is a key economic activity in Sandy Point. In particular it is home to one of the oldest manufacturing operations in Saint Kitts and Nevis - a factory owned by Harowe Servo Controls which manufactures electrical equipment for the factory automation and aerospace markets and feedback devices for medical equipment. The company is the main employer in the parish with direct employment of over 205 persons, of which more than 95 percent were women (Saint Kitts and Nevis Information Service, 2014), and the largest industrial area outside of Basseterre.
- Tourism is the other main employer for the parish. The Sandy Point has a rich history and many of the nation's premier historical sites are located there, such as Brimstone Hill Fortress National Park (a UNESCO World Heritage site), Fort Charles and several warehouse building ruins from the time of the Dutch tobacco trade. Offshore, just west of Sandy Point town, lies the Sandy Point National Marine Park that is noted as one of the premier dive sites in the Eastern Caribbean. Sandy Point's Pump Bay is noted as one of the Caribbean's best black sand beaches.
- Fishing is of local importance in the community and is supported by the rich reefs and fish nurseries, including mangroves and seagrass. Fish caught are mainly sold locally to the community or neighbouring communities. More recently, fisherfolk have been catching and providing shellfish for local food businesses.[14]

Past assessments

There are no known VCAs targeting Sandy Point in particular. However, assessments for Saint Kitts are generally applicable, but not focused on the fisheries sector.

6.2.2 Key climate change impacts and vulnerabilities

The specific findings from the applications of the three VCA tools are detailed in this section.

Photo-journaling findings

Participants in the photo-journaling exercise, which integrated community mapping, were able to identify both climate-related and broader issues affecting the community. The key climate-related issues highlighted include past impacts from hurricanes and storms which caused damage and destruction of key fisheries infrastructure such as the cooperative building and pier. These have clearly hampered the vibrancy of fisheries-related livelihoods and activities in the area as the cooperative building was used by fisherfolk as a storage facility, for sale of fishing gear and fish products, and as a space for community meetings. Destruction of the pier in the 1990s by hurricanes and storms has led to difficulties by fisherfolk in prepping their boats and removing fish catch when they return from sea. In addition, coastal erosion was flagged as a key issue (Photo 13), especially in the popular Pump Bay area that serves as the landing site for Sandy Point fishers. Coastal erosion is causing loss of coastal land and shrinkage of the beach, which has led to practical challenges for fisherfolk in hauling boats in

[14] Information provided by business development consultant Catherine Forbes, from value chain analysis workshops in Sandy Point in 2020.

for repairs and effectively moving and securing them during bad weather. This is further complicated by the absence of a ramp.

Photo 13. Eroded coastline in the Pump Bay area, Sandy Point, Saint Kitts

Photo 13. Eroded coastline in the Pump Bay area, Sandy Point, Saint Kitts

Apart from the above, participants highlighted sand mining as a non-climate related issue, which has had harmful impacts on livelihoods, coastal ecosystems and marine life, and could exacerbate any climate-related impacts. Legal and illegal sand mining at Belle Tete, in particular, was noted to contribute to erosion and loss of the beach used by Sandy Point fisherfolk. Notably, sand mining activity resulted in changes to beach profiles already threatened by coastal erosion. For example, participants noted that the profile of the beach prior to sand mining provided a natural breakaway which slowed down the ocean currents and protected Pump Bay from the north draught.

The illegal sanding mining at Belle Tete also threatens sea turtle nesting sites due to movement of heavy vehicles on the beach that can run over turtle nests and kill turtles. This has resulted in fishers being forced to seek fishing grounds further out at additional costs to them.

Overall, it was felt that the impacts from the hazards highlighted above, hurricanes, coastal erosion and sand mining affected the fishing grounds so that fisherfolk were now unable to catch sprats and bait fish in plentiful amounts as in the past. The full photo-journal can be accessed in Appendix 4.

Key informant interview findings

Key informants included nine experienced fishers with over 20 years of experience and eight other participants with significant local knowledge from the wider community. They highlighted key changes in weather and climate patterns over time that affected fisherfolk, as well as the broader community, including:

- Hurricanes/storms that destroyed fisheries infrastructure, caused shoreline damage and affected important coastal and marine ecosystems including coral reefs and seagrass beds which are fish nurseries and feeding grounds. Storms also caused damage to housing, particularly loss of roofs due to strong winds in the past.
- SLR contributes to coastal erosion and changing coastline, including loss of coastal land and further impacts to fishing activity and coastal infrastructure such as roads, housing and small businesses on the coast.
- More frequent rough seas and storm surges lead to a reduction in fishing days and thus income earned through fishing.
- Sargassum blocks access to the reef and causes damage to boat engines and gear such as trolling lines. It also reduces viable catch as it blocks fish pots/traps and weighs down nets, making retrieving fish caught in them difficult.

- Changing and unpredictable rainfall patterns were noted, with both periods of heavy rainfall affecting ability to fish, as well as dry spells. Longer periods of drought were also noted to affect other sectors such as agriculture and water supply for the community.

Broader issues facing the community were identified as sand mining and pollution from land-based activities which affect the health of the offshore reefs and seagrass beds, and social issues such as high drug use. Table 8 outlines changes in fishing habits in the Sandy Point area, related to the above, as noted by key fisherfolk informants.

Table 8. Summary of changes in fishing habits, Sandy Point

Species of fish caught	Fisherfolk noted changes in the species as well as reduced quantities of fish (e.g. yellowfin tuna and mackerel) being caught from the past to present. Other species caught in greater quantities in the past include cobbler, catfish, moonshine and gar. Other community members also noted reduced catch by fisherfolk.
Type of gear	A variety of fishing gear is still used, with a few changes in gear type over time. More fish pots and traps were being used, as well as spear guns. However nets and line fishing remained common.
Location of fishing grounds	It was noted fish were no longer plentiful in the nearshore areas and vicinity of the landing site (e.g. at Paradise Reef and Belle Tete area). The contributing factors include overfishing, coastal erosion and sand mining, increased run off from land-based activities (including chemicals from sugarcane industry) resulting in pollution and sedimentation of the nearshore fishing grounds. Fisherfolk noted having to go further out to fish due to these factors, as reef fish were migrating further away from the coast. Fishers also had to dive deeper to catch conch.
Fishing effort	In general, fishing activity has declined compared to the past due to changes to the declining health of nearshore fishing grounds affecting the quantity of fish caught, more severe weather, rougher sea conditions and influxes of sargassum which prevented fishers from going out and reduce fishing time and income. However, more time was being spent at sea per trip, given changes in fishing grounds and having to go further out. Gear such as fish pots and traps were noted as being damaged or lost during bad weather. In response, several fishers increased the number of traps and pots to ensure more reliable and bigger catch.
Fishing seasons	Fishing seasons were generally from February to December, however it was noted that more fish were being caught in the warmer months of June to August.
landing sites and facilities	The Sandy Point landing site has been affected by significant coastal erosion resulting in loss of beach and shoreline; it was noted that the loss seems to be occurring at a faster rate. In addition, the site has suffered damage to facilities and infrastructure such as the pier and cooperative building from hurricanes and storms over time.

Source: CANARI (2020).

In terms of dealing with these impacts, especially related to changes in weather and climate, the actions have been reactive. For example, fisherfolk removing boats and gear such as traps from the sea during storms and rough seas, placement of rocks on the coastline to reduce erosion or community members and small businesses such as bars engaging in coastal clean-ups to address marine pollution and prevent further damage to the coral reefs. In addition, informants noted recent efforts by the co-operative to reorganise themselves and becoming active as they have been inactive for more than ten years. This was generally noted as having potential to help address the issues facing fisherfolk more

cohesively, however there were concerns about the level interest of fisherfolk in participating due to lack of trust among members and transparency around financial management.

The informants identified the following priorities for adaptation, which generally reflect the findings from the other VCA tools:

- Regulating sand mining in the area (i.e. via managing extractive uses). This was a very high priority for both fisherfolk and the wider community.
- Improving fisheries infrastructure, including rebuilding the fishing co-operative building or establishing a fishing complex with proper facilities to accommodate storage, processing and sale of fish, rebuilding the pier to help with unloading and installing a ramp to help with hauling in and docking boats.
- Re-establishing the fishing co-operative and building the capacity of its leaders and members to support future adjustments, including training for fisherfolk in the requisite knowledge and skills to manage fishing and the co-operative as a business.
- Providing additional financial support for fisherfolk to access upgraded fishing gear and equipment and stronger engines to withstand the impacts of rough seas and stronger ocean currents.
- Protecting the coastline via infrastructural improvements such as construction of a stone barrier wall or breakwater to reduce coastline erosion and loss of sand.
- Improving drainage in the community via more regular clean-ups, maintenance of ghauts that traverse the community, and exploring options to channel the flow in a different direction to prevent pollution and further sand erosion.
- Increasing community education and awareness on climate change.

The government in particular was recognised as having a key role in providing financial and technical support, implementing and enforcing policies to protect the environment and working together with the community to understand and address climate change. It was felt that CSOs could complement this by helping to raise awareness and further educate the community on climate change impacts and solutions for the fisheries sector and wider community and engage them in practical actions such as clean ups. Private sector was seen as a source of financial support and incentives for encouraging more sustainable behaviour (e.g. better waste management practices, co-funding community projects and supporting work of environmental groups).

Value chain analysis findings

In addition to the photo-journaling and interviews, fisherfolk participated in value chain analysis to identify and analyse the value chain for reef-trap fishing in Sandy Point to assess climate change vulnerability and to determine appropriate strategies to help 'climate proof' the value chains. See Table 9 for the full value chain analysis results.

The following climate-related hazards were identified by participants as having an impact on their reef-trap fishing value chain:

- hurricanes, storms and storm surges which cause direct damage to or loss of fisheries infrastructure and fishing gear, affect safety at sea and reef fishers' ability to go out to fish, and cause power disruptions which affect processing operations on land;
- coastal erosion and flooding that increases sedimentation in nearshore areas, contributing to degradation of coral reefs and seagrass beds that are key ecosystems for reef fisheries;

- changes in ocean conditions, including stronger ocean currents and warmer waters affecting movement of fish; and
- sargassum influxes impacting boats and gear and access to fishing grounds.

The other challenges impacting the value chain include:

- lack of a dedicated space with storage and processing facilities, and limited equipment (e.g. slicers, smoker) and training in fish processing to create value added fish products;
- de-registration of the fishing cooperative due to inactivity over the years was cited as contributing to decline in overall ability to achieve full business potential due to absence of support of a more organised group which can lobby for improvements, particularly inputs to fishing (e.g. access to better priced equipment);
- limited access to affordable financing;
- increased pollution from land-based sources resulting in degradation of coral reefs and consequent reduction in catch; and
- inability to meet the local demand for fish (including due to contributing factors noted above).

Based on the above, identified priorities for building resilience and adding value to reef-trap fisheries value chain include:

- The restoration and proper outfitting of the co-operative building, as well as construction of a boat ramp and jetty to better support fishing activities, with financial assistance through the DMR and the Department of Cooperatives. Key equipment such as a generator, water tanks, ice machine and freezer and proper tools such as slicers, smoker, sealer and labelling machine were specifically identified needs for improving storage, processing and marketing abilities.
- The re-establishment of the cooperative as a main body representing fisherfolk in the community and as a more efficient and effective approach to advocate for benefits such as access to (life and boat) insurance, low interest loans, more affordable and higher quality equipment.
- The exploration of training opportunities for fishers and community members in areas such as smoking, salting, filleting so that they can add value, as well as training for fisherfolk in small business development so that they can better manage their activities and can be more profitable.

Table 9. Value chain analysis of reef-trap fishery, Sandy Point

REEF/TRAP	INPUTS	PRODUCTION	PROCESSING & DISTRIBUTION	MARKETING	CONSUMERS
VALUE CHAIN	Boat and engine, fuel, gears, traps, crew, bait, scuba equipment, storage (cooler, ice)	Transport fish to consumers Clean fish Store on ice	Package fish in plastic bags Weigh fish Price fish (clean/unclean) Slice fish with hacksaw	WhatsApp, Facebook Word of mouth Phone calls	Restaurants, bars, hotels, general public
VULNERABILITIES	i) The influx of Sargassum gets caught in boat engines ii) Hurricanes and storms cause loss of fish traps, and damage to or loss of boats iii) Warmer than usual ocean temperatures affects movement of fish and therefore catch (type, quantity) iv) Increased flooding from storms and sea surges cause silt and mud to enter the sea and damage the reefs v) Theft of fish traps by other fishers vi) High cost of fishing material and equipment. vii) Lack of ability to obtain low interest rate loans	i) Cooperative building was extensively damaged by hurricanes and is now unusable leaving fishers with no storage or processing facility ii) Power outages during storms/bad weather which causes spoilage of fish iii) The quantity of catch by fishers is very unreliable	i) A lack of training in areas such as packaging and labelling techniques ii) Lack of labelling and packaging equipment iii) Hurricane and storm events, adverse weather and flooding pose potential risk to any future storage and processing facilities iv) Frequent fluctuation in electricity which result in damage to equipment	i) Poor, unreliable internet service preventing fishers from contacting customers	i) The demand for fish is usually greater than the fishers are able to supply ii) Storms and hurricanes affecting electricity supply and operation of hotels and restaurants can lead to reduced demand for fish
RESILIENCE BUILDING STRATEGIES	i) Explore ways of utilizing the sargassum which can be an added source of income ii) Conduct regular clean-up of water ways that lead to the beach. Manage waste including by	i) Engage in frequent village and beach clean-ups to ensure water courses are kept clear ii) Restore co-operative building using better storm	i) Purchase processing machines such as sealing and packaging and labelling machine ii) Explore additions ways of adding value to the raw	i) Partner with restaurants and bars along the Pump Bay strip to host fish fry events	i) Invest in boats and fishing equipment and safety gears that would enable the fishers to engage in deep sea fishing and

REEF/TRAP	INPUTS	PRODUCTION	PROCESSING & DISTRIBUTION	MARKETING	CONSUMERS
	reducing use of plastics. iii) Plant more trees along the Pump Bay strip to stabilise coastline and reduce loss of sand	and hurricane construction methods and materials. iii) Purchase of generator or solar powered system (back-up power supply) iv) Conduct training in fish processing techniques v) Establish delivery prices based on distance covered	product e.g. sealed packages of fish fillet and fish slices iii) Purchase of generator or solar system	ii) Create flyers that can be disburse in hard copy as well as on social media	also stay out longer

Source: CANARI (2020).

Summary of findings

A summary of the key climate change impacts and vulnerabilities is outlined in Table 10, along with key priorities for adaptation, identified by the Sandy Point stakeholders.

Table 10. Key climate change impacts, vulnerabilities and adaptation priorities identified by Sandy Point stakeholders using the VCA tools

Climate-related hazards	Key impacts	Vulnerable groups and areas	Priorities for adaptation
Coastal and marine biodiversity and ecosystems			
• Hurricanes and storms • SLR and high tides • Sargassum influx • Warmer waters	• Hurricane and storm activity cause shoreline damage and affects coastal ecosystems (reefs, seagrass) which provide protective function and are important as fish nurseries. • SLR and more frequent high tides contribute to coastal erosion and shoreline shrinkage and loss • Marine ecosystem (i.e. coral reef and seagrass habitats off Sandy Point impacted by influx of sargassum). • Warmer waters result in movement of fish away from usual fishing grounds; resulting in changing catch and coral bleaching in some areas. • Flooding from extreme weather and hurricanes contributes to increased run-off and siltation of reefs.	• Beaches in Sandy Point - Pump Bay affected by coastal erosion and especially Belle Tete Bay - vulnerable to accelerated coastal erosion due to sand mining practices. • Turtle nesting sites (at named beaches above) affected by erosion and sand mining. • Coral reefs and seagrass beds offshore Sandy Point area affected by pollution, siltation and damage from hurricanes. In addition, coral bleaching at Paradise Beach, Belle Tete in Sandy Point. • Fisherfolk dependent on healthy coral reefs for their livelihoods. • Tourists and recreational users affected by beach loss and loss of healthy coral reef for diving.	**Regulation of sand mining** including via implementation and enforcement of appropriate policies and laws **Improvements to drainage in the community** - including maintenance of ghauts and regular clean ups to reduce siltation and pollution of fishing grounds **Improving fisheries infrastructure –** rebuilding the fishing co-operative building; a fishing complex with proper facilities to accommodate storage, processing and sale of fish; as well as rebuilding the pier to help with unloading and a ramp to help with pulling and docking boats.
Livelihoods and socio-economic practices			
• Hurricanes and storms • Storm surges • Rough seas • SLR and high tides	• Hurricanes and more frequent bad weather create safety at sea concerns, reduce fishing days and often result in damage to boats and loss	• Fisherfolk affected by inability to fish due to extreme weather, rough sea conditions, or sargassum influxes, or faced with increased	**Re-establishing the fishing co-operative** for collective benefits (e.g. training for fisherfolk to improve business

Climate-related hazards	Key impacts	Vulnerable groups and areas	Priorities for adaptation
• Sargassum influx • Drought/dry spells	of gear e.g. fish pots and traps. • More frequent rough seas and storm surges also lead to a reduction in fishing days and thus income earned through fishing. • SLR and more frequent high tides contribute to coastal erosion and shorelines shrinkage/loss; narrow shoreline makes it difficult to haul boats for repairs and secure them during rough weather conditions. • Sargassum hinders fishing activity - blocks access to the reef and causes damage to boat engines and gear, reduces catch quantities by blocking fish pots and traps and weighing down nets, and creates health hazard. • Dry spells and longer periods of drought affect farming livelihoods. Reduced water supply poses challenge for fish processing activities.	expenses to repair or replace equipment/gear. • Vulnerable groups within the community such as the elderly and disabled, especially within fisherfolk households. • Consumers of fish products affected by declines in catch. • Tourist sites and small businesses dependent on beach visitors (e.g. beach bars and restaurants), historical sites which may be damaged by storms and extreme weather or affected by coastal erosion or sargassum. • Other key businesses and employers in the community located near to the coast (e.g. electrical equipment manufacturing like Harowe Servo) may be impacted by strong winds and storm surges from storm activity. • Natural resource users, like those dependent on nature-based livelihoods (e.g. fisherfolk, farmers and ecotourism operators) affected by damage to resources from storms, erosion or sargassum influxes, or reduced water supply for farming and fish processing due to prolonged drought.	skills and support for accessing upgraded fishing gear) **Coastline protection** via infrastructural improvements such as construction of a stone barrier wall or breakwater to help reduce coastline erosion, shrinkage and loss of sand **Increased community education and awareness on climate change**
Settlements and infrastructure			

Climate-related hazards	Key impacts	Vulnerable groups and areas	Priorities for adaptation
● Hurricanes and storms ● Sea level rose and high tides ● Storm surges ● Sargassum influx	● Hurricane and storm activity destroyed fisheries infrastructure in the past – co-operative building and pier as well as resulted in loss of roofs in residential homes. ● SLR and more frequent high tides contribute to coastal erosion and shorelines shrinkage, impacting coastal infrastructure such as roads, residences and small businesses. ● Sargassum influxes pose a health hazard to residents living near or on the coast.	● Landing site for Sandy Point fishers - Pump Bay strip and Belle Tete Bay. ● Portions of the island main road near or passing through Sandy Point, which may be affected by storm surges and coastal erosion and affect mobility and access. ● Fisheries infrastructure along the coast. Fishing cooperative building and pier destroyed but any new structures may again be at risk from hurricanes or extreme weather and affected by coastal erosion. ● Residential homes, small businesses including beach bars and snackettes, guesthouses, community gathering places such as churches, Sandy Point recreation ground etc. near or directly on the coast. ● Households located along the coastline with vulnerable persons such as the poor, elderly and disabled.	

Source: CANARI (2020).

6.3 Newcastle

6.3.1 Overview of community

An overview of the Newcastle community in Nevis is provided below, including the fisheries context of the community, geography, demographics, socio-economic activities, and previous assessments in the area of relevance to climate change.

Box 4. Newcastle, Nevis

Newcastle, Nevis

Newcastle is one of the major landing sites in Nevis, alongside Charlestown and Indian Castle Bay (FAO, 2016). The community is dependent on fisheries and includes approximately 44 registered fishers and 11 registered fishing vessels at this site[15]. As a landing site, Newcastle sees more varied catches than elsewhere in Nevis. Vessels based here use inter alia handlines for demersals and net fishing for coastal pelagics. As a result of increasingly smaller catches, fishers have begun using FADs which are now the main fishing method. They also engage in other methods such as long line, gill net, and hand line, with a few fishers also doing spear fishing[16]. Fish species caught include yellowtail snapper, hind, parrotfish, grouper, doctorfish, grunt, welchman and black tip shark (FAO, 2016).

There is no processing facility in Newcastle, but they may sell any surplus to the Nevis Fishermen's Marketing and Supply Co-operative based in Charlestown. Fish are usually sold as caught.

There are a few active community groups, including the Newcastle Bay Foundation that was established primarily to help the Newcastle Bay community, especially fishers, come together to be more effectively involved in decisions regarding the establishment of the MMA in The Narrows. It also provides the organizational structure for members of the community to become more engaged in sustainability initiatives.

Geography

Newcastle village is located on the northern coast of the island of Nevis and is the capital of Saint James Windward Parish. The community is close to the Narrows – a strait separating the islands of Saint Kitts and Nevis which is rich in biodiversity and of high socio-economic value. The Narrows-Newcastle Bay area has also been the focus for development of a co-management model with government and local CSOs such as the Caribbean Sustainable Education and Awareness Organization and Newcastle Bay Foundation. Notably, in 2016, the Saint Kitts and Nevis Marine Management Area was established, with the Narrows earmarked as a conservation zone (Government of Saint Kitts and Nevis, 2018).

Demographic information

According to 2011 census data, Newcastle has a total population of 419 people. The majority are of African descent (Government of Saint Kitts and Nevis, 2011). Newcastle itself is made up of three communities with population breakdown as follows: Nisbett Settlement (total population 179, Shaws Road, and the main Newcastle area (Government of Saint Kitts and Nevis, 2011).

Socio-economic activities

- The main economic activities are tourism, especially beach tourism, and fishing. Like the rest of Nevis, tourism is the largest employer with about 1 500 persons employed in 2015 accounting for 25 percent of the employment on the Island (Government of Saint Kitts and Nevis, 2015a).
- The fisheries sector, while small-scale in terms of individual operations, is an important component of the local economy with the quality of seafood being one of the many tourism attractions.
- While Charlestown is the main service centre on the island, Newcastle is one of two secondary centres. It has a range of services relating to education, health and community support and retail

[15] Information provided by the DMR, 2021.

[16] Ibid.

offerings. There are several businesses in the area, including restaurants and hotels, as well as the island's airport.

- Newcastle was identified in the Nevis Physical Development Plan 2008 as a target for a more detailed Physical Action Plan to guide development opportunities, protect key assets and to assist with implementation.

Past Assessments

There are no known VCAs targeting Newcastle in particular. However, assessments for Nevis are generally applicable, although they do not specifically focus on fisheries.

6.3.2 Key climate change impacts and vulnerabilities

The specific findings from the applications of the three VCA tools are detailed as follows.

Photo-journaling findings

In the photo-journaling exercise, which integrated community mapping, participants identified both climate-related issues affecting fisheries and the wider community, as well as broader issues related to land use practices affecting coastal and marine sustainability.

Coastal erosion was a key issue identified as impacting the Newcastle Bay landing site, which is used by fishers from both Newcastle and Long Haul Bay. In addition, it was noted that the landing site is highly exposed and vulnerable to storms and hurricanes, which destroyed the original pier, lockers and storage sheds used by fisherfolk in the past. The re-building of the pier was listed as a key need for fishers and the wider community in the photo-journal as it was important for the use of fishers and for recreational activities.

Notably, participants highlighted concerted actions to address some of these issues through the Newcastle Bay Foundation in the photo-journal. This included the building of sturdy containers to be used as lockers for the fishers with funding from the United Nations Development Programme/GEF Small Grant Programme. However, it was noted that further assistance was required for the building of a ramp to assist with pulling up of boats especially in bad weather, more storage units and a fish processing facility (with storage for fish). These would help to secure fishing livelihoods and improve adaptive capacity.

Photo 14. Newcastle Bay

The landing site at Newcastle Bay (left) and destroyed pier at Newcastle Bay which was impacted by past hurricanes in Nevis (right)

The increase of sargassum influxes was another key issue identified. The photo-journal highlighted how sargassum prevents local fisherfolk from going out to fish as it clogs the landing site and hinders access to finishing grounds, causes damage to fishing gear and boat engines and blocks fish traps. The presence of the sargassum also disturbs fishing grounds nurseries and threatens biodiversity in the area. For example, it was noted that sargassum can contribute to depletion of oxygen available for corals and seagrass, affecting fish habitat and stifling fishes and smaller species. Further, piles of decaying sargassum on the coast (e.g. at Herberts beach) cause a stench which can be smelt up to two miles inland, thus affecting tourists and businesses in the area. The development of a sargassum management plan was clearly identified as a priority for Newcastle.

Other key concerns highlighted in the photo-journal revolved around current land-practices affecting coastal and marine resources important for fishing, as well as proposed developments which have potential to cause further adverse impacts on fisheries in the area. It was highlighted that the ghauts traversing the community were the source of high amounts of sediments being washed to sea and impacting negatively on the coral reefs and fishing grounds. Government's proposal to extend the Vance W. Amory International Airport was also a concern as it was felt that this construction would lead to further run-off and sedimentation and further damage the reefs and fishing grounds. It was recommended that the building of a catchment to collect pollutants and runoff from the ghauts should be considered to help reduce sediment loads reaching the coast. The full photo-journal can be accessed in Appendix 4.

Photo 15. Newcastle Nevis

Run-off from canals contribute to siltation of coral reefs and seagrass beds in Newcastle, Nevis

Key informant interview findings

Key informants included five experienced fisherfolk particularly from the Newcastle Bay Foundation (involved in fishing for over 30 years) and ten additional persons, including tourism operators, other small business owners and members of women's groups and other community groups. All of the participants including fisherfolk interviewed were over 40 years of age.

Fisherfolk and other community informants noted changes in weather and climate patterns over time including:

- storms and rough seas, as well as related storm surges, which exacerbate coastal erosion, cause damage to fishing gear and fishing grounds (coral reef and seagrass beds) and result in loss of fishing days;
- changes in tidal conditions, particularly higher tides, also exacerbate coastal erosion and flooding;
- sargassum influxes that damage fishing gear and traps, and has been known to stop boat engines, endangering the lives of fishermen at sea; and
- changes to ocean conditions (e.g. warmer waters contribute to movement of fish away from typical fishing grounds and nearshore areas resulting in reduction in catch and increase in fishing effort).

Community informants additionally noted the occurrence of flash flooding and drought which seemed to occur more frequently and for prolonged periods. Changing weather and climate were also linked to impacts on tourism and agriculture. Other key concerns focused on land-based activities, such as dumping of garbage, and land development, such as the proposed airport expansion, as well as the overall impact of the COVID-19 pandemic on the socio-economic well-being of the community. Social factors, such as increased crime, limited community cohesion and limited activities and opportunities to actively engage youth or the elderly, have also made the community increasingly sensitive to impacts from hazards and other shocks. Table 11 summarises the changes in fishing habits due to climate change and other issues affecting the community.

Table 11. Summary of changes in fishing habits, Newcastle

Type/species of fish caught	Fisherfolk noted the same species, however smaller sizes and also fewer fish i.e. less diversity, were now being caught (e.g. grouper, red hind, gar, grunts and doctor fish). Certain species were no longer seen (e.g. goat fish, pond bass and snook) which other fish feed on.
Type of gear	In general, mostly the same gear was being utilised, such as traps/pots and lines. In addition, some fishers were starting to use other techniques such as trolling, or more advanced equipment such as GPS and depth sounders to increase their catch.
Location of fishing grounds	Some shifts in the fishing grounds were noted from the north coast at Newcastle, off the coast of neighbouring Saint Kitts, and in the Narrows and off of Booby Island. Fisherfolk noted fuel savings as a reason for shifting fishing to Booby Island. In general, it was also noted that fishing was possibly taking place further away from the shore because of overfishing, as well as warmer waters causing fish to move and fishing activity to extend further offshore. Feeding grounds of some fish, such as crayfish, also changed.
Fishing effort (e.g. how often go out, how many pots/lines used, use of FADs)	In general fishing activities are carried out two to three times per week. It was noted in some instances that not enough fish was being caught to sustain multiple trips to sea; as such, fishers often need to find land-based employment to meet financial obligations.
Fishing seasons	Changes to regular fishing seasons were observed, including due to the weather, as well as the role of oceans currents in shifting sand to productive areas.
Landing sites and facilities	It was noted that the location of the landing site remained the same, but facilities (e.g. for storage) were in need of improvements.

Source: CANARI (2020).

Fisherfolk informants noted a range of strategies to deal with climate-related impacts, including adjusting their fishing activities (i.e. avoiding or fishing less when ocean conditions are not safe), moving to different fishing grounds, increasing the time spent at sea, and upgrading vessels,

equipment and fishing techniques. There are efforts being made currently to form a fishing co-operative for Newcastle and nearby Long Haul Bay fishers, as one measure to ensure fisherfolk interests are represented. Other strategies taken by the wider community to adapt to the identified impacts include community clean-ups for sargassum influxes and to help manage flooding and siltation problems, increased attention to weather forecasts and embarking on various methods of retrofitting their homes for hurricane preparedness (e.g. putting up storm shutters and reinforcing roofs and windows) or even moving further inland to avoid coastal erosion and flooding. In terms of managing drought, residents practice water conservation measures and have invested in rainwater harvesting systems and cisterns, like other communities in Nevis.

From the interviews, the priorities for adaptation include:

- Improving fisheries facilities (e.g. proper storage, reliable power supply) to more adequately support business activities. Currently some fishers utilize facilities at the Nevis Fishermen's Cooperative.
- Training fisherfolk to use new equipment and tools for fish processing, which can add value.
- Rebuilding of the pier which was damaged by impacts of numerous storms.
- Increasing community awareness on climate change including via awareness and education campaigns.
- Constructing a breakwater to reduce coastal erosion.
- Managing flooding and related siltation of coral reef and seagrass beds, including via clean-ups of water courses and beaches, and construction of a catchment at the outlet of the ghaut that deposits into the sea.
- Implementing coastal zone management measures which minimise large developments near the coastline and which seek to enforce sustainable use of coastal and marine resources (e.g. preventing reef degradation and overfishing).

National and local government were identified as a having a key role in: implementing relevant policies (e.g. for coastal zone/environmental protection); providing needed funding or concessions for initiatives; and supporting/investing in alternative livelihood initiatives such as aquaponics. One recommendation was for government to create a fund to support climate change adaptation for fisheries and to enhance wider community resilience. CSOs, including the Newcastle Bay Foundation, Red Cross Society and local disaster management body were noted as being critical for helping to mobilise the community, raising awareness of climate change vulnerabilities and impacts, and providing this local knowledge to decision makers, as well as assisting with fundraising. It was felt that the business sector could strengthen its role by supporting local (i.e. buying local fish versus importing), providing financial support to vulnerable households where feasible, and investing in solutions which may provide long-term benefit such as improving water storage.

Value chain analysis findings

In addition to the photo-journaling and interviews, fisherfolk from Newcastle and neighbouring Long Haul participated in value chain analysis to develop and analyse reef and pelagic fisheries value chains that are important for the area. Notably, several of the fishers were immigrants from the Dominican Republic and largely Spanish-speaking. See Tables 12 and 13 for the full value chain analysis results.

The following climate-related hazards were noted as impacting on the two value chains:

- The influx of sargassum which affects boats, engines and gear leading to reduced ability to fish and earn income.
- Hurricanes, storms and storm surges, and rough seas causing safety at sea concerns and loss in fishing days, creating secondary hazards such as flooding and exacerbating coastal erosion.

Hurricanes and storms also impact storage and fish processing operations by disrupting power and water supply.
- Changing ocean conditions, including stronger ocean currents, warmer waters, and increased siltation and pollution linked to flooding on land, which was noted as a contributor to degradation of the fishing grounds and reduction in catch.
- Extreme rainfall events which also lead to flooding.

The other challenges faced by the fisherfolk include: the lack of storage facilities; limited training and equipment for fish processing; and lack of access to affordable financing to support improvements in fishing as a business. In general, many fishers only fish part-time (one to two days per week) and therefore the supply certainly does not meet the demand for local fish, and there is significant room for growth in fishing activities.

A number of strategies to build resilience and add value to the reef and pelagic fisheries value chains were identified as a priority by fisherfolk, including:
- Exploring training opportunities for fishers and processors and vendors in areas such as smoking, salting, filleting, etc. so that they can add value. Notably, the DMR or other organizations conducting training will have to consider the specific language needs of the immigrant fishers.
- Acquiring proper or upgraded tools (e.g. slicer, smoker, sealer, labelling machine) that can enhance processing and production efficiency.
- Improving storage, production and processing aspects via acquisition of equipment to enhance and make operations more sustainable and resilient to disruptions (e.g. ice machine and freezer, generator and water tanks).
- Improving the marketing and sales of their fish products.

Financial support from the government and local banks and lenders was identified as critical for achieving the above.

Table 12. Newcastle value chain for reef fish

	INPUTS	PRODUCTION	PROCESSING & DISTRIBUTION	MARKETING	CONSUMERS
VALUE CHAIN	Boat and engine, fuel, gears, traps, crew, bait, storage (cooler, ice)	Transport from landing site to local fish market Place at home on ice until customers come to collect	Transporting, weighing, placing in plastic bags, pricing	WhatsApp, Facebook, word of mouth, blowing of the conch shell	Restaurants, bars, hotels, general public
VULNERABILITIES	i) The influx of sargassum gets caught in boat engines and also makes it difficult to get boats into the water at times. ii) Hurricanes and storms affect the fishers' ability to go to sea. Hurricanes also often result in power disruptions which affects storage. They also cause erosion to the beach. iii) Storms and sea surges lead to flooding which contributes to excess silt and mud entering the sea and damaging the reefs.	i) Limited storage facilities are available thus not all fishers have a place to store their equipment and sell their fish. ii) Power disruptions affect the ready availability of ice. iii) Heavy rains cause erosion and damage to roads, affecting mobility and access, and making it difficult to transport fish.	i) Fishers do not catch adequate quantities of fish to process (fishing is done on a part-time basis). ii) Lack of interest from the fishers to engage in processing, labelling. iii) No electricity supply is available at the storage site.	i) Adverse weather conditions cause frequent interruptions to the internet service thus leaving the fishers with limited measures to market their products more widely.	i) Part-time fishing results in not enough fish being available to meet customer demand. ii) Storms and hurricanes affecting electricity supply and operation of hotels and restaurants can lead to reduced demand for fish. iii) Storms and bad weather negatively impacts on the number of persons wanting to purchase.
RESILIENCE BUILDING STRATEGIES	i) Explore ways of utilizing the sargassum which can be an added source of income ii) Purchase of generator or solar powered system as a back-up supply iii) Conduct regular clean-up of water ways that lead to the beach iv) Explore options for purchasing a refrigerated vehicle	i) Engage in frequent village and beach clean-ups to ensure water courses are kept clear ii) Acquire more storage containers so that fishers can have a place to store gears, coolers, sell fish, etc.	i) Conduct further training sessions to promote understanding of the value chain and how fishers can use it to improve their livelihoods ii) Purchase of a generator or solar powered system	i) Create flyers that can be disseminated in hard copy as well as on social media	i) Hold sensitization workshops which are geared at helping fishers to see fishing as a viable business not just a hobby

Source: CANARI (2020).

Table 13. Newcastle value chain for pelagic fish[17]

	INPUTS	PRODUCTION	PROCESSING & DISTRIBUTION	MARKETING	CONSUMERS
VALUE CHAIN	Boat and engine, fuel, hooks & lines, traps, crew, bait, FAD, water, electricity, storage (cooler, ice)	Cleaning, frying, grilling, smoking, slicing/ filleting	Transporting, cleaning, weighing, packaging, pricing	WhatsApp, Facebook, word of mouth, business cards, blowing of conch shell	Restaurants, bars, hotels, general public
VULNERABILITIES	i) Sargassum gets caught in boat engines and also make it difficult to get boats into the water at times. ii) Hurricanes and storms affect the fishers' ability to go to sea. Hurricanes also often result in power disruptions which affects storage. They also cause erosion to the beach. iii) Storms and sea surges lead to flooding which contributes to excess silt and mud entering the sea and damaging the reefs.	i) Lack of a proper facility that can be used to clean, store or process the catch. ii) Heavy dependence on government supplied water and electricity which is not very reliable. iii) The catch quantities by fishers is variable/very unreliable.	i) A lack of training in areas such as pricing and other packaging and labelling techniques. ii) A lack of labelling and packaging equipment. iii) No electricity supply is available at the storage site.	i) Adverse weather conditions cause frequent interruptions to the internet service thus leaving the fishers with limited measures to market their products. ii) A language barrier for Spanish-speaking immigrant fishers.	i) The demand for fish is greater than the supply. ii) Storms and hurricanes adversely impact on the number of persons wanting to purchase.
RESILIENCE BUILDING STRATEGIES	i) Explore ways of harvesting rainwater (storage tank, cistern) ii) Build or dig trenches that can assist in channelling water during flooding iii) Explore ways of utilizing the sargassum which can be an added source of income iv) Purchase of generator or solar power system	i) Acquire additional storage facility so that the fishers can have a place to store, process their fish. ii) Invest in rainwater harvesting methods and back-up power supply	i) Purchase processing machines such as sealing or packaging and labelling machine ii) Explore additional ways of adding value to the raw product (e.g. sealed packages of various cuts of fish) iii) Purchase of generator or solar power system iv) Conduct training in Spanish so that they can benefit from the appropriate use of technology	i) Create marketing tools in both English and Spanish ii) Identify specific restaurants and hotels to target for sales	i) Invest in boats for deep sea fishing and equipped with the facilities so that they can stay at sea longer ii) Analyse available data to ascertain demand patterns

Source: CANARI (2020).

[17] Note pelagic fishing in Newcastle is done mostly by the immigrants from Dominican Republic, and not by local Nevisian fishers/members of the Newcastle Bay Foundation.

Summary of findings

A summary of the key climate change impacts and vulnerabilities is outlined in Table 14, along with key priorities for adaptation, identified by the Newcastle stakeholders.

Table 14. Key climate change impacts and vulnerabilities identified by Newcastle stakeholders using VCA tools

Climate change hazards	Key climate change impacts	Vulnerable groups and areas	Priorities for adaptation
Coastal and marine biodiversity and ecosystems			
• hurricanes and storms • storm surges • sargassum influx • warming oceans	• Marine ecosystems affected by sargassum influx - contributes to depletion of oxygen levels for the corals and seagrass bed, affecting fish habitat and stifling fishes and smaller species. • Sargassum clogs beaches, and piles of decaying sargassum result in reduced access and enjoyment of the beach. • Warming oceans lead to shifts in fish populations. • Flooding events from storms/extreme rainfall contribute to increased siltation/pollution of the fishing grounds and degradation of coastal habitats.	• The areas of conservation importance within the Narrows. • Coral reef and seagrass beds offshore Newcastle Bay important as fish nurseries and fishing grounds. • Beaches (e.g. Herbert's Beach) in Newcastle Bay area affected by sargassum influxes. • Fisherfolk from Newcastle Bay and Long Haul Bay dependent on the reefs for fishing. • Tourists/recreational users of the beaches and reefs.	**Improving fisheries facilities** (e.g. proper storage, power supply) and re-building of the pier and a ramp to more adequately support business activities **Training fisherfolk in skills to improve their business and for adaptation** e.g. enhance abilities to use modern equipment, FADs **Increasing community awareness on climate change** including via awareness/education campaigns and through community groups Putting measures in place to reduce or arrest coastal erosion, including **construction of a breakwater** **Managing flooding and related siltation of coral reef/seagrass beds**, including via cleanups of water courses and beaches, and construction of a catchment at the outlet of the culvert that deposits into the sea **Implementation of**
Livelihoods and socio-economic practices			
• hurricanes and storms • storm surges • rough seas • sargassum influx • strong ocean currents, warmer waters • flash flooding • drought	• Damage to the landing site and pier at Newcastle Bay from past hurricanes and storms, and coastal erosion. • Storms and hurricanes result in loss of fishing days and can affect water and electricity supply at the Nevis Fishermen's Co-operative in Charlestown, which some fishers use, given lack of amenities at the landing site in Newcastle. • Storms and rough seas, as well as related storm surges and high tide conditions exacerbate coastal erosion, cause damage to fishing gear and fishing grounds (coral reef and seagrass beds) and result in loss of fishing days. • Sargassum damages gear and gets into traps, and has been known to stop engines, endangering the lives of fishermen at sea.	• Fisherfolk from Newcastle Bay and Long Haul Bay who use the landing site/facilities at Newcastle. • Businesses (e.g. hotels/guesthouses, restaurants and eco and dive tourism operators) in the Newcastle area and surrounding communities who rely on the beaches and reefs, and local supply of fish. • Local consumers who are unable to get reliable supply of fish. • Spanish-speaking immigrant fishers who may not have access to benefits such as insurance or other means of protection of income.	

Climate change hazards	Key climate change impacts	Vulnerable groups and areas	Priorities for adaptation
	• Changes to ocean conditions (e.g. warmer waters) contribute to movement of fish away from typical fishing grounds and nearshore areas and thus a reduction in catch and increased in fishing effort. • Excessive siltation of coral reefs and seagrass beds due to flooding impacts fish catch. • Drought affects water supply making fish storage and processing more difficult and reducing supply for the community at large.	• Fisherfolk households which do not have an alternate source of income.	**coastal zone management measures** which minimise large developments near the coastline and which seek to enforce sustainable use of coastal/marine resources e.g. preventing reef degradation and overfishing
Settlements and infrastructure			
• hurricanes and storms • storm surges • rough seas / high tides • sargassum influx	• Hurricanes/storms and coastal erosion impacting the landing site. • Sargassum causes a health hazard for the community due to the hydrogen sulfide gas released from decomposing piles on the beach. • Potential impact to key infrastructure such as the airport and roads next to the coast from hurricanes and coastal erosion.	• Newcastle Bay landing site (including lockers and storage sheds), pier and local fish markets located on the coastline. • Fisherfolk households, including of Spanish-speaking immigrants. • Area of the Newcastle Bay community which may be affected by proposed development activity such as the extension of the current airport. • Key infrastructure, including the airport and roads along the coastline. • Businesses including hotels/guesthouses, restaurants which may be affected by hurricanes and impact of sargassum near their activities.	

Source: CANARI (2020).

7. Key vulnerabilities and priorities for adaptation

The VCAs highlighted a range of climate change and related hazards that have begun to trigger biophysical and socio-economic impacts on the target coastal and fishing communities in Saint Kitts and Nevis, including:

- More frequent and intense storms and rough seas leading to loss or damage of key infrastructure, including fish landing sites, markets and other facilities.
- Coastal erosion and flooding due to SLR, more intense and frequent storms and associated storm surge which poses a significant risk to low-lying coastal areas such as beaches and coastal cliffs.
- Sargassum seaweed influxes that inundate beaches and nearshore areas and damage fishing gear and boat engines as well as having impacts on the health of fisherfolk and other coastal and marine resource users.
- Inland flooding that affects community settlements and agricultural land, increases sedimentation in the coastal zone and damages infrastructure.

These climate change-related hazards are compounded by existing pressures. These pressures include: land-based activities such as sand-mining and pollution from agricultural sources or poor waste management practices (e.g. dumping of garbage on coastlines), which have an impact on coastal and marine resources; unsustainable fishing practices; and health risks such as the COVID-19 pandemic.

In addition to existing pressures on fisheries and coastal and marine resources, socio-economic pressures create an added dimension to shaping vulnerabilities and capacity to adapt including crime and drug use, youth delinquency, unemployment and poor access to services and infrastructure within the target coastal and fishing communities in Saint Kitts and Nevis. On top of these, COVID-19 has also laid bare inequities and is expected to exacerbate socio-economic vulnerabilities for many artisanal fishing communities (IDB, 2020).

The key priorities for CCA in the fisheries sector are as follow:

- **Build the adaptive capacity of fisherfolk and coastal communities** through:
    - improving (rebuilding, upgrading, retrofitting) fisheries infrastructure and facilities to better withstand extreme weather events (e.g. hurricanes and storms) and more fully support fishing and related activities (across the value chain) as a priority economic activity in the target communities;
    - re-establishing fisherfolk organizations (e.g. co-operatives) or strengthening other organizations interested in fisherfolk. Linked to this could be a number of measures for collective benefit of fisherfolk that would enhance adaptive capacity and overall resilience (e.g. improved access to resources such as storage and processing facilities run by cooperatives and access to group-based benefits and insurance to cover costs of damage and loss of boats, gear and other equipment); and
    - training and support to fisherfolk in skills to improve their small businesses and for adaptation, including a focus on promoting adoption of sustainable fishing practices, identifying and implementing climate proofing measures for different aspects of their fishing business, promoting safety at sea, using new technologies to adapt as well as potentially develop the sector (e.g. climate-smart FADs), and exploring value-added products.

- **Strengthen coordinated action across key government agencies**, in particular DMR, Department of Environment and NEMA, to address climate change vulnerabilities and adapt in the target communities, and on a national scale. This includes:
    - improving financial and technical support, including appropriate staffing and equipment for infrastructural improvements including to fisheries infrastructure or facilities, and for addressing mass sargassum influxes, coastal erosion and drainage and siltation issues.
    - improving consultation and dialogue with the target communities for collaborative action towards more effective coastal zone management to address flooding, sand-mining and other developments that threaten the communities and ecosystems they depend on for fishing and other livelihoods.
    - improving monitoring and enforcement of policies and laws relating to sustainable fisheries management, as well as development planning and environmental management.
    - improving awareness of and support for proper waste disposal mechanisms (e.g. via provision of bins and more regular waste collection)
    - improving local disaster resilience via continued awareness raising, assessments, introduction of coordinated early warning systems, and supporting community-based measures.
    - improving social/community development services which take into account the importance of fisheries livelihoods in the communities and need to build climate resilience as well as address wider social problems (e.g. assessing socio-economic wellbeing including changes due COVID-19, introducing alternative livelihood options, etc.)
- **Protect critical coastal and marine biodiversity and ecosystems that support fisheries and other key economic sectors** like tourism, including by improving monitoring and enforcement of regulations to manage and protect these resources from unsustainable and extractive uses.

In addition, addressing the above priorities should take into consideration active engagement, inputs and local knowledge of the communities wherever relevant and feasible. Additionally, employing community residents to help undertake government-led adaptation interventions may offer benefits by providing alternative income sources for vulnerable groups, such as fisherfolk, likely to experience economic loss and property damage as a result of climate change impacts.

8. Conclusions and recommendations

Climate change poses a significant threat to coastal and fishing communities in the Eastern Caribbean region, including in Saint Kitts and Nevis. Assessing vulnerability to the impacts of climate change is vital to guide decision-making and ensure that efforts to mainstream CCA into fisheries governance and management reflect both national and local and community level perspectives.

Using VCA tools, key impacts and vulnerabilities to climate change and related hazards on the coastal and fishing communities targeted for CCA were identified using a participatory, multi-stakeholder process. This process ensured active participation from fisherfolk and other resource users, community residents and other CSOs that may not typically be engaged in decision-making and enabled local and scientific knowledge to be incorporated into the assessment to identify key vulnerabilities and priorities for CCA.

From the process, several common priorities were highlighted: building the adaptive capacity of fisherfolk through various means (training, resources, facilities/equipment, organizational capacity strengthening); strengthening the coordination of stakeholders and recognising the multi-dimensional approach that is needed to addressing vulnerability in the fisheries sector; and effective management and protection of critical coastal and marine biodiversity and ecosystems that support fisheries and other economic sectors.

Related to these priorities, a number of key policy recommendations for moving forward and ensuring mainstreaming of CCA into fisheries governance and management in Saint Kitts and Nevis were identified, including to:

- **Ensure community priorities are linked into local development plans and sectoral and national policies and programmes to support adaptation and build local resilience via an inclusive and 'bottom up' approach**. This will ensure that these plans and programmes have local buy-in and are realistic and appropriate to local-level situations.
- **Strengthen key government agencies, in particular the DMR**, to better provide climate information services and technical assistance to fisherfolk for adaptation in the fisheries sector.
- **Integrate CCA and disaster risk management considerations into fisheries management plans and policies to effectively address extreme climate events and reduce losses** from climate-related hazards. This includes taking into account of the comprehensive disaster management approach within any national fisheries management plan or adaptation plan and investments in early warning systems, safety at sea, climate-smart technologies, insurance and social protection schemes for fisherfolk and their assets.
- **Expand the application of EAF as part of the overall approach to build resilience to climate change and other existing pressures** within coastal and fishing communities and the wider fisheries sector. EAF recognises that fisheries are social-ecological systems, and so an integrated approach is needed to fisheries management to ensure ecological integrity, human well-being and good governance. EAF also seeks to manage uncertainty and address hazards and their impacts at the appropriate scale. While EAF has already been integrated into recent fisheries sector policies and plans, it needs to a focus in implementation across projects and initiatives.

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Appendix 1: Target coastal and fishing communities field team list for Saint Kitts and Nevis

	First and Last Name	Organization	Position/Title
Dieppe Bay Field Team			
1.	Orisia Williams	FAO	National Project Coordinator
2.	Nikkita Browne	Department of Marine Resources	GIS Officer
3.	Thrizen Leader	Department of Marine Resources	Fisheries Officer
4.	Teshan Woodley	Department of Marine Resources	Fisheries Officer
Sandy Point Field Team			
1.	Orisia Williams	FAO	National Project Coordinator
2.	Nikkita Browne	Department of Marine Resources	GIS Officer
3.	J.C. Browne	N/A	Field Assistant
4.	Uze-lyn Richards-Browne	N/A	Field Assistant
Newcastle Field Team			
1.	Orisia Williams	FAO	National Project Coordinator
2.	Glennis David	Newcastle Bay Foundation	President
3.	Randy Morton	Department of Marine Resources	Marine Officer

Appendix 2: Participants' list for VCA workshops and key interviews in Saint Kitts and Nevis

Dieppe Bay

Community mapping and photo-journaling participants, Dieppe Bay, Saint Kitts, July-October, 2020

	First and Last name	Organization	Position/Title
1.	Gustave Liburd		Fisher/ Mason
2.	Kester Douglas		Fisher
3.	Richard Dorsette		Fisher
4.	Iroy Marshall		Fisher
5.	Lorna Warner	Dieppe Bay Fisherman's Co-operative	Interim leader
6.	Duane Mills		Fisher
7.	Melaney Pollack		Fisher
8.	Derrick Huggins		Fisher
9.	Samuel Maynard		Fisher
10.	Jessica Pollack		Fisher

Value chain analysis workshop participants, Dieppe Bay, Saint Kitts, August-September, 2020

	First and Last name	Organization	Position/Title
1.	Gustave Liburd		Fisher/ Mason
2.	Kester Douglas		Fisher
3.	Richard Dorsette		Fisher
4.	Iroy Marshall		Fisher
5.	Lorna Warner	Dieppe Bay Fisherman's Co-operative	Interim leader
6.	Duane Mills		Fisher
7.	Melaney Pollack		Fisher
8.	Derrick Huggins		Fisher
9.	Samuel Maynard		Fisher
10.	Wilfred Benjamin		Fisher
11.	Elvis Maloney		Fisher
12.	Jessica Pollack		Fisher

Participants in key informant interviews, Dieppe Bay:

	First and Last name	Organization	Position/Title
Fisherfolk interviewees			
1.	Gustave Liburd		Fisher/ Mason
2.	Kester Douglas		Fisher
3.	Richard Dorsette		Fisher
4.	Lorna Warner	Dieppe Bay Fisherman's Co-operative	Interim leader
5.	Melaney Pollack		Fisher
6.	Derrick Huggins		Fisher
7.	Samuel Maynard	Dieppe Bay Fisherman's Co-operative	Fisher
8.	Elvis Maloney		
9.	James Lennox Richardson		Fisher
10.	Solisi Desmond		Fisher, Prison Officer
11.	Kenneth		Fisher
12.	Jason Phipps		Fisher – reef, lobster
13.	Carlston Warner		Fisher
14.	Cluvis Whattley		Fisher
General interviewees			
15.	Marc Williams		Community member
16.	Lynn Browne		Community member
17.	Dave Martin		Restaurant/Bar owner
18.	Edwin Douglas		Craft vendor, community member
19.	Clint Elliot		Painter, community member
20.	Desmond Matthew		Community member
21.	Latrelle Warner		Community member
22.	Neville Liburd		Community member
23.	N/a		Community member
Focus Group – NEMA participants			
24.	Hazel May Richards		NEMA District Officer
25.	Mary-Ann Browne		NEMA District Officer
26.	Terry Morris		NEMA District Officer
27.	Joseph Richardson		NEMA District Officer

Sandy Point

Community mapping and photo-journaling workshop, Sandy Point, Saint Kitts, 19 and 28 November 2020

	First and Last Name	Position/Title
1.	Ray Liddie	Fisher
2.	Ralph Wilkins	Fisher
3.	Wingrove Lake	Fisher
4.	Evinton Farrell	Chairman of fisherfolk co-op
5.	Engelbert Pyke	
6.	Jermaine Browne	
7.	Calvin Belle	
8.	Kareem Jerold	
9.	Kelly Wilkins	
10.	Dennis Hendrickson	
11.	Keith Farrell	
12.	Larry Liddie	
13.	Allan Hazel	Fisher
14.	Joseph Williams	
15.	Kyle Jones	Fisher

Value chain analysis workshop participants, Sandy Point, Saint Kitts, 5 December 2020

	First and Last Name	Position/Title
1.	Roy Liddie	Fisher
2.	Wingrove Lake	Fisher
3.	Evinton Farrell	Fisher
4.	Allan Hazel	Fisher
5.	Calvern Gift	Fisher
6.	Damian Richardson	Fisher
7.	Jeff Belle	Fisher
8.	Denver Farrell	Fisher
9.	Kyle Jones	Fisher

Participants in key informant interviews, Sandy Point:

	First and Last Name	**Position/Title**
1.	Jeff Belle	Fisher
2.	Kyle Jones	Fisher
3.	Warren Wilkins	Fisher
4.	Ralph Wilkins	Chairman of fisherfolk co-op
5.	Alphonso Dedusa	Fisher
6.	Troy Bassue	Fisher
7.	W. Williams	Fisher
8.	Nikkite	Fisher
9.	Wingrove Lake	Fisher
10.	Caslyn Wilkins	Coastguard officer
11.	Ijaz Francis	Officer
12.	Unknown	Shop owner
13.	Unknown	Maintenance supervisor
14.	Che-Raina Walker	Public works officer
15.	Robeldo Glasgow	Entrepreneur
16.	Bruce Rogers	Bar owner at landing site
17.	Ian Dasent	Resident

Newcastle

Community mapping and photo-journaling workshop participants, Newcastle, Nevis, October-November, 2020

	First and Last Name
1.	Delroy Prentice
2.	Dania Modesto
3.	Veo Mates
4.	Damian Modesto
5.	Michael Henville
6.	Corrine Hodge
7.	Kenny Hobson
8.	Janice Daniel-Hodge
9.	Bernard Hendrickson
10.	Dennis Small
11.	Laughton France
12.	Silvester Huggins
13.	Claude Nisbette
14.	Glennis David
15.	Derrick Didder

Value chain analysis workshop participants, Newcastle, Nevis, 15-22 November2020

	First and Last Name	Position/Title
1.	Raymond Brantley	Fisher
2.	Bernard Hendrickson	Fisher
3.	Beverson Cozier	Fisher
4.	Omari Jeffers	Fisher
5.	Terrence Jeffers	Fisher
6.	Teran Wallace	Fisher
7.	Samuel Blake	Fisher
8.	Clayton Daniel	Fisher
9.	Kenny Hobson	Fisher
10.	Comrie Hodge	Fisher
11.	Dave Mills	Fisher
12.	Glennis David	Fisher, President Newcastle Bay Foundation

13.	Clive W. Perkins	Fisher
14.	Ramon Varquez	Fisher
15.	Krancigoo Mateo	Fisher
16.	Jose Nisbett	Fisher
17.	Sewdino Eusebio	Fisher
18.	Dania Nisbett-Modesto	Fisher
19.	Damion Modesto	Fisher
20.	Juan Modesto	Fisher
21.	Juan Nisbett	Fisher
22.	Carlyle Clarke	Fisher
23.	Leon Diddier	Fisher
24.	Umara Domes	Fisher
25.	Makimo Nisbett	Fisher
26.	Kurvin France	Fisher
27.	St. Clair Wallace	Fisher
28.	Janice Daniel-Hodge	

Participants in key informant interviews, Newcastle Bay:

	First and Last Name	**Organization**	**Position/Title**
1.	Glennis David	Newcastle Bay Foundation	Fisher, President Newcastle Bay Foundation
2.	Franklyn David	Newcastle Bay Foundation	
3.	Ronald Cozier	Newcastle Bay Foundation	
4.	G. Hicks	Newcastle Bay Foundation	
5.	Claude Nisbett	Newcastle Bay Foundation	
6.	Janice Daniel Hoyte	Newcastle Bay Foundation	
7.	Vincent Perkins	Island water Sports	
8.	Delroy Prentice	Air Saint Kitts	Fisher, Mechanic
9.	Ermileta Elliot		
10.	Ray Brantley	Newcastle Bay Foundation	
11.	Pearline Neale	Guest house owner	
12.	David Griffin	Massage therapist	
13.	Bernard Hendrickson	Newcastle Bay Foundation	
14.	Carole Jeffers	Hope group, CEM women's group, Brick community group	
15.	Auleen David Breedy	Small business owner	

Appendix 3: Key informant interview questions

Interview Questions – Fisherfolk

1. How long have you been involved in fishing? What type of fishing do you do?

2. Have your fishing habits changed since you started fishing? If so, how?
   Probe to see if changes in following:
   - Type/species of fish caught
   - Type of gear
   - Fishing effort (e.g. how often go out, how many pots/lines used, use of FADs)
   - Location of fishing grounds
   - Fishing seasons
   - Landing sites and facilities

3. What are the reasons for these changes in fishing habits?

4. Have you noticed any changes in weather and climate patterns in areas where you live or fish? If so, can you describe the impacts on you/your livelihood?
   Probe for the following:
   - Changes in high tides or sea levels? What have been the impacts?
   - Changes in storms or rougher seas? What have been the impacts?
   - Changes in ocean temperature or currents? What have been the impacts?
   - Changes in sargassum seaweed? What have been the impacts?
   - Changes in rainfall? What have been the impacts?

5. How have you and other fisherfolk in your community been dealing with these impacts from changes in weather and climate?

6. Are there any local groups or other organizations working to address these problems in your community? If so, how?

7. Are you a member of the fisherfolk co-op or association in your community? Do you see a role for it in helping you and other fisherfolk address the problems you mentioned?
   Probe for any conflicts:
   - Have there been any issues between the co-op and independent fishers?
   - Have there been any issues between co-op and other community groups?

8. A national plan and various projects for addressing climate change (changes in weather and climate) and related impacts on the fisheries sector are being developed.
   a) What are the main problems/impacts that you would like to see addressed?
   b) What do you think would be most useful in helping the community, especially fisherfolk, to address these impacts?

Interview Questions – General

1. What do you see as the main problems affecting this community?

2. Are you aware of any impacts from climate change (or changing weather patterns) in this community? If so, can you describe these impacts and how you are affected?
   Prompts:
   - Are livelihoods been impacted by any changes in weather and climate (e.g. fishing, farming, tourism)?
   - Have you noticed any changes and impacts on the coastline (e.g. from higher tides or sea levels, stronger storms and storm surge, rougher seas)?
   - Have you noticed any changes and impacts on fisheries and marine areas (e.g. fish catch, type of species bought and sold, fishing practices, coral reefs and seagrass beds)?

3. What are the different ways in which you and other people in the community deal/have dealt with these impacts (e.g. coastal erosion, flooding of rivers, stronger storms and hurricanes, rough seas or coral bleaching)?

4. Are there any local community groups or other groups working to address these impacts of climate change (or changing weather patterns)? If so, how?
   Prompts:
   - What about the village council?
   - Is there local Red cross group or disaster management committee active in the community?
   - Is there any cooperation among the different groups being impacted by climate change or organizations working on climate change?

5. What do you see as priorities for taking action to address the impacts of climate change (or changing weather patterns)?

6. a) What resources does your community currently have to plan and implement these actions?
   c) What other resources would they need?

7. What barriers are there to effective community cooperation and action to address climate change (or changing weather patterns)?

8. What role do you see for these groups in supporting your community to address climate change (or changing weather patterns):
   a) Government (national and local)?
   b) National non-governmental organizations (NGOs), like National Trust?
   c) Businesses/Private sector

This report presents the main findings and recommendations from a vulnerability and capacity assessment (VCA) of coastal and fishing communities in Saint Kitts and Nevis. The overall goal of the assessment was to improve understanding of local climate change impacts and vulnerabilities for effective adaptation in the fisheries sector. It utilised three tools: participatory photo-journaling, semi-structured interviews and value chain analysis for data collection, and engaged a wide range of stakeholders to ensure a participatory process. Based on the assessment, a range of climate-related hazards have begun to impact the communities, including: coastal erosion and flooding due to sea level rise, storms and storm surges; rainfall variability and extremes leading to inland flooding; and sargassum seaweed influxes. Adaptation actions were also identified to address these hazards. These included: building the adaptive capacity of fisherfolk; strengthening fisherfolk organisations such as co-operatives; improving access to services and infrastructure; improving coordination among civil society and the public and private sector to better support communities; and protecting critical coastal and marine ecosystems that support fisheries and other economic sectors like tourism.

ISBN 978-92-5-135162-8

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CB7303EN/1/07.22