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ABSTRACT

This Knowledge, Attitudes and Practice Study (KAP Study) is a first output of Work Package 3 (WP3) of the *Fishery-Related Ecological and Socio-Economic Impact Assessments and Monitoring System* project (the project), funded under the Caribbean track of the Pilot Program on Climate Resilience (PPCR). The main purpose of the KAP Study was to measure knowledge levels, prevailing attitudes and behavioural practices relating to adaptation to climate change and disaster risk reduction among a sample of the audiences targeted for project communications activities. These audiences are fisherfolk, policy actors and other sectoral representatives that routinely interface with fisherfolk across the six countries with national PPCR initiatives. Although guided by common areas of inquiry, the KAP Study employed different approaches to reach the three audiences, with data collection taking place from June to September 2018. The primary focus of the study and related level of effort of the team was on deploying and analyzing results from 161 questionnaires directly administered to fisherfolk by trained assessors in three fishing communities: Montego Bay (Jamaica), Kingstown (St. Vincent and the Grenadines) and Roseau (Dominica). This target group was dominated by mature fishermen with some basic level of education. The Roseau (Dominica) subset was different from Montego Bay (Jamaica) and Kingstown (St Vincent and the Grenadines) subsets in that the fishing population skewed slightly younger and more educated. Secondary investigations of the KAP Study included completion of in-depth interviews with senior-level fisheries authorities in government and a self-administered online questionnaire completed or partially completed by 28 sectoral representatives in managerial-level roles. This report presents information on respondent profiles and on results related to (1) knowledge of climate change –its definition, causes, impacts and vulnerable groups; (2) attitudes on climate change as a salient issue, roles and responsibilities to address it and on satisfaction with current action; and (3) use of information and other measures to adapt to climate hazards. The KAP Study also draws together perspectives on perceived risk from climate change impacts, feasibility and importance of a range of adaptation measures and preferred communication formats and media to reach fisherfolk for climate change communications. The KAP Study ends with a discussion on key findings, conclusions and high-level recommendations to inform the Project's communication activities.

1. INTRODUCTION

Work Package 3 (WP3) of the *Fishery-Related Ecological and Socio-Economic Impact Assessments and Monitoring System* project focuses on the development of and reporting on a dynamic communications and stakeholder engagement strategy to deliver practical information on how climate change is affecting the Caribbean fisheries sector, in a manner that engages and mobilizes the diverse target populations toward strategic action. The Knowledge-Attitudes-Practice Study (KAP Study) represents the first step in the project's strategic communication and engagement process and was designed to capture fisheries stakeholders' knowledge and understanding of climate change, including its main causes and how it is impacting their livelihoods and the sector in general. This baseline assessment also gauges perceptions and attitudes toward climate change, including concern about observed changes, perceptions on differential vulnerabilities among value chain actors and the importance and perceived feasibility of various actions that can be taken to address climate change and variability in the fisheries sector. Additionally, it sheds light on barriers to climate change adaptation and disaster risk reduction, and on media use, prominence and effective ways to reach communities with key messages.

Results summarized in this KAP Study have informed the project's Stakeholder Engagement and Communications Strategy and Action Plan (SECSAP) and will continue to inform project activities across the four Work Packages in all six countries with Pilot Programme on Climate Resilience (PPCR) initiatives.[1]

1.1 Study objectives

The broad objective of the KAP Study is to measure knowledge levels, prevailing attitudes and behavioural practices relating to adaptation to climate change and disaster risk reduction (1) among fisherfolk (harvesters) in three coastal-fishing areas in Jamaica, St. Vincent and the Grenadines and Dominica; (2) among policy actors in the six PPCR countries; and (3) among sectoral representatives (government, NGO and private-sector stakeholders) in the six PPCR communities.

Specifically, the KAP Study sought to measure:

- Current levels of knowledge, attitudes, and practices of target audiences with respect to fisheries, climate change adaptation and disaster risk reduction;
- Stakeholders perceptions on the relevance and feasibility of a range of options to reduce climate change impacts in the fisheries sector (e.g., conservation and marine spatial planning, diversification of livelihoods / markets / products, optimizing fishing effort);
- Stakeholder perceptions on challenges in addressing climate change issues related to fisheries;
- The means of communication and engagement (e.g., media, artistic expression) suitable for promoting climate-smart fisheries management for enhanced community resilience.

1.2 Target audiences and research approaches

In developing KAP studies key decisions include who to target for information gathering and how. The report stemming from the Regional Planning Workshop held in Kingstown in April 2018 identified the target audiences for inclusion in the KAP Study. Members of the project Working Group[2] approved the following groups on which to centre the KAP Study and stakeholder engagement and communications activities overall (Table 1). For each target audience we determined the most effective and cost-efficient way to approach information gathering for the KAP Study. Approaches included face-to-face deployment of structured questionnaires, key-informant interviews (KIIs) via Skype and deployment of an online

[1] Caribbean countries with national PPCR initiatives are Dominica, Grenada, Haiti, Jamaica, Saint Lucia, and Saint Vincent and the Grenadines.

[2] Members of the Working Group comprised national representatives and representatives of the CRFM Secretariat, including alternates (A): Mr. Jullan DeFoe, Derrick Theophille (A), Mr. Crafton Isaac, Mr. Roger Charles, Ms. Anginette Murray, Ms. Allena Joseph, Mrs. Patricia Hubert-Medar (A), Mr. Shamal Connell, Dr. Susan Singh-Renton and Ms. June Masters (A).

survey; we collected quantitative, semi-quantitative and qualitative data. Further detail on our methods appears in Section 2.

Fisherfolk are a critical link in the fish value chain and their activities are most sensitive to climate change impacts and disaster risks. Therefore, we focused our effort and budget on ensuring the voices of fisherfolk were sufficiently represented in the KAP Study. Primary data collection in fishing communities across the 6 PPCR countries was not possible due to budget constraints. Instead we focused these efforts on the 3 pilot study sites identified and approved by the Client Task Team and the project Working Group in June 2018. These sites are: Montego Bay, Kingstown and Roseau.

The structure of the rest of this report is as follows. Section 2 describes the methods we applied in this study, including design considerations and data-collection instruments. Section 3 characterizes respondent profiles and presents results and analysis. The report concludes in Section 4 with a discussion.

Table 1: Groups we targeted through this KAP Study and approaches we used to gather information from them

Target group	Approach
Fisherfolk – harvesters, vendors, ensuring good levels of youth representation	• Questionnaire administered to 40 fisherfolk in Montego Bay (Jamaica), 60 fisherfolk in Kingstown (St. Vincent and the Grenadines) and 61 fisherfolk in and around Roseau (Dominica). Two strategies were used to sample fishers (total population sampling and maximum variance sampling). • The budgeted sample size was 150 respondents, distributed equally among the 3 fishing sites. Recruiting respondents in Montego Bay proved challenging relative to the other 2 sites. The final sample of respondents was 161, with 10 less than the target 50 for Montego Bay and 10 and 11 more for Kingstown and Roseau, respectively.
Policy actors – the CRFM Ministerial Council and Caribbean Fisheries Forum	• Key informant interviews (KII) administered over Skype or the telephone with 4 Chief Fisheries Officers (Grenada, Jamaica, Saint Lucia and St. Vincent and the Grenadines). • We submitted interview requests to all members of the CRFM Ministerial Council and the Caribbean Fisheries Forum representing the 6 PPCR countries, but secured interviews with 4 out of the 12.
Other sector representatives – technocrats, industry, NGOs	• Online survey sent to representatives of PPCR countries and the CRFM (total 13) during the project's Regional Planning Workshop in April 2018. • Online survey sent to a purposeful sample (Palinkas *et al.* 2015) of 99 managers and operators in the fisheries sector, representing government, self-employed individuals and non-governmental organizations (NGOs). • We achieved a low response rate (24%, 27 of 112), unfortunately, despite great care in designing the survey to minimize respondent burden and repeated reminders. Others have faced similar challenges in deploying KAP surveys on climate change online (Belize Environmental Technologies nd).

2. METHODS

This section summarizes our study methods. It describes the research design, including discussions on sampling, data collection and analytical aspects of quantitative and qualitative components of the study. It also outlines limitations and challenges in executing the research and related implications on the interpretation of results.

2.1 Research design and data collection

We employed a mixed-methods approach to meet the research objectives and tailor data-collection methods to target audiences (fisherfolk, policy actors and managers in the sector). This combination of methods gave the insights necessary to develop a robust stakeholder engagement and communication strategy for the project, while providing for a research plan that was feasible and cost-efficient. Our methodology involved the following:

- A fisherfolk questionnaire to capture quantitative baseline data concerning (1) knowledge of climate change (definition, cause, impacts), attitudes and practice around climate change adaptation and disaster risk reduction (DRR); (2) local observations on climate impacts and perspectives on the feasibility of options to adapt; (3) day-to-day fishing activities; and (4) media use and communications preferences.
- An online survey targeting managers (government, NGO and private) in the sector, to capture quantitative baseline data (1) on climate change knowledge, attitudes and practices related to adaptation and (2) on perspectives on the feasibility and importance of a range of options to reduce climate change impacts in the fisheries sector.
- Semi-structured interviews targeting the CRFM Ministerial Council and Caribbean Fisheries Forum ("policy actors") to learn about the knowledge, attitudes and practices around climate change, impacts on the sector, perceived urgency and challenges in responding to the changes to marine environments, the fishing industry and those who depend on it.

Fisherfolk are a key audience for outreach through project communications and engagement activities – either directly through our own efforts or indirectly via use of "amplifiers"[3]. Therefore, our level of effort and resourcing focused on this group. Results from the managers' survey and interviews with policy actors complement findings from the quantitative survey with fisherfolk. The rest of the section provides information on sampling and data collection instruments used for the research.

Sampling strategy

Fisherfolk

A KAP questionnaire was administered to fisherfolk in three fishing areas (Montego Bay, Jamaica; Kingstown, St. Vincent and the Grenadines; and Roseau, Dominica) by locally-based assessors at each site. The Social Science & Fisheries Extension Expert on the project team, Dr. Donovan Campbell, recruited two assessors from Fisheries Divisions or Universities in Jamaica, St. Vincent and the Grenadines and Dominica, respectively, and trained each group of assessors in the conduct of the questionnaire. We undertook three training sessions with field assessors on June 25, 2018 (Montego Bay), August 25, 2018 (Roseau) and September 1, 2018 (Kingstown). These sessions lasted about two hours each and covered the following topics: research objectives, the role of the field assessor, ethics and good practice in conducting interviews (see Annex 1: Agenda for training of field assessors). Training sessions also included role-playing exercises so field assessors could become familiar with the questionnaire instrument and receive critical feedback on their approach.

By necessity, the sampling strategy paid particular attention to four key principles that govern all forms of sampling (Kemper *et al*., 2003): feasibility, efficiency, possibility of drawing inferences from the data and transferability to other settings. Budget considerations limited the total number of questionnaires to be completed to 150. Within the project framework we had already selected "pilot study sites" for the exact purpose of primary data collection at the site level, among other purposes. Therefore, we focused data collection efforts at the three pilot study sites and undertook to recruit 50 fishers at each site using a purposive sampling approach guided by two associated strategies (1) total population sampling and (2) maximum variance sampling. In Montego Bay and Roseau we applied the former and in Kingstown the latter. The samples for Montego Bay and Roseau, therefore, reflect all the fishers that were available and willing to participate in the survey. In Kingstown, the number of fishers significantly exceeded resources to conduct the survey. We therefore sought to capture a cross-section of the active fishers in the area with a focus on variations according to age, fishing techniques, fishing status, location and target species. This amounted to an overall response rate of 107%, although we came in under our target for Montego Bay and over for the other two sites.

[3] Amplifiers refer to individuals, like fisheries officers, with great potential to amplify research results among their networks and constituencies.

Managers

Although fisherfolk were the main focus of primary data collection and research activities, we also deployed a self-administered survey for completion online by government, NGO and private-sector stakeholders with a role in fisheries management and related sectors (tourism, disaster risk management, and coastal zone management). We employed a stratified purposeful sample, attempting to capture differences in knowledge, attitudes, practices and perspectives between government / NGO and private-sector stakeholders. Based on extensive desk-based research, we compiled two contact lists – one per manager grouping – and distributed the online survey via email, for completion between September 11 and October 5, 2018. We sent 99 invitations to complete the online survey (68 government / NGO; 31 private sector) and received 18 completed and partially-completed surveys. To these responses we added the 8 collected through on online survey completed by fisheries liaison officers and other representatives at the project's Regional Planning Workshop in April 2018 (8 completed responses out of 13 sent). The full response rate was 24% (28 out of 112).

Policy actors

We conducted semi-structured interviews with members of the CRFM Ministerial Council and Caribbean Fisheries Forum representing PPCR countries. Our target was the full complement of 12 representatives (6 Ministers and 6 Chief Fisheries Officers) and, with the CRFM Secretariat's support, a request for participation went out on September 9, 2018, for interview completion within the following 10 days. We sent interview themes to confirmed interviewees via email. The Communications Expert on the project team, Ms. Ava-Gail Gardener, completed 4 in-depth interviews with Chief Fisheries officers and Directors of Fisheries from Grenada, Jamaica, St. Lucia, and St. Vincent and the Grenadines over Skype or telephone. Therefore, we achieved a response rate of 33% and obtained input from 4 of the 6 PPCR countries.

Data collection instruments

We prepared a series of data collection instruments tailored to the three target groups. Copies of these instruments are in Annex 2 (Data collection instruments). Despite differences in organization, number of questions, phrasing and response options, we designed these instruments to facilitate comparative analysis. Importantly, all data collection instruments included the following questions (Table 2):

Table 2: Common questions across data-collection instruments

- Please explain what you understand by the term climate change?
- What do you think are the main causes of climate change?
- How concerned are you about the impacts of climate change?
- On a scale of 1 to 5, how much would you say the following [climate hazards] have negatively affected your country's fishing area / the fisheries sector in the country / countries where you work?
- Which group(s) of fishers would you describe as being most vulnerable to the impacts of climate change in your community?
- How satisfied are you with the steps being taken to address climate change impacts on the fisheries sector?
- Who is responsible for taking action to address climate change impacts on the fisheries sector?
- What are some of the things you think fishers can do to reduce the impacts of climate change[4] on your community?
- What do you think are the best ways to provide information about climate change to fishers?

[4] The data collection instrument used with fisherfolk in the Eastern Caribbean used "impacts from hurricanes / storms" instead of climate change impacts.

2.2 Data processing and analysis

Fisherfolk

Upon completion of data collection using paper questionnaires in the field, the team performed sequential data entry of the 40, 60, and 61 questionnaires (100+ variables / questionnaire) in SPSS as well as checks for data quality (e.g., reviewing raw data when SPSS entries looked anomalous) and then exported to Excel to allow for coding of open-ended responses and data analysis by other team members. We used a consolidated dataset integrating all 161 responses to (1) provide summary statistics on demographics, local observations on climate impacts and perspectives on the feasibility of options to adapt, day-to-day fishing activities and media use and communications preferences and (2) estimate knowledge, attitude and practice scores and levels. We conducted data analysis using frequency tables and measures of association (Chi-square tests) for categorical data and correlation for interval data. Socio-demographic variables included for analysis were: age, education, registration status, employment status and length of time involved in fishing. Only 3 of 161 respondents were female, so gender-based analysis was not possible. Statistics on the relative participation of women and men in fisheries activities across the value chain in the Caribbean are scarce. Yet, anecdotal information and the few studies available suggest that fishing activity continues to be male-dominated, with low levels of participation of women in harvesting relative to women's important roles as input suppliers and in post-harvest activities, marketers and processors (CRFM, 2012; Beltran, 2017).

We estimated KAP scores guided by the approach outlined in the *Knowledge, Attitude and Practice Survey Consultancy for the Belize Marine Conservation and Climate Adaptation Project* (BET, nd), with some modifications. Table 3 outlines the indicators and related survey elements used to estimate knowledge, attitude and practice scores. The table also highlights the key assumptions and limitations in measuring each indicator. Figure 1 is a conceptual diagram showing the hierarchical relationship between assessment areas (e.g., knowledge), indicators and survey elements.

Table 3: Indicators, survey elements and rules for assigning points used to estimate composite scores for climate change knowledge, attitudes and practices of fisherfolk

Area / indicators	Survey elements (and points allocated for responses)	Assumptions and limitations
Knowledge		
Climate change knowledge	Assessed understanding of climate change based on definition provided by respondent (2=yes, 1=somewhat, 0=no / don't know)	
	Open ended question on causes of climate change (2=relevant response; 1=relevant aspects; 0=irrelevant / highly inaccurate)	
Knowledge of climate change impacts & responses	Open-ended question on environmental condition to use as example to explain climate change to peer (2=example that connects relevant physical change to biological / socio-economic impact, 1=somewhat relevant example; 0 for inaccurate example or examples of non-climate stressors)	Question not included in questionnaire used in Eastern Caribbean
	Awareness of gender-differentiated impact (2= yes, climate change affects women and men differently, 0= no or don't know)	
	Open-ended question on things fishers can do to reduce climate change impacts / hurricane impacts (2= relevant, specific action; 1= vague or general actions; 0= nothing / don't know / inaccurate)	
Awareness of current action	Open-ended question on programs or projects the government is undertaking to improve the livelihood of fishers (2=specific example; 1=generic; 0=nothing / don't know / not relevant)	
Attitudes		
On urgency &	Whether climate change is selected as among the most serious	

Area / indicators	Survey elements (and points allocated for responses)	Assumptions and limitations
importance (of addressing climate change)	problems facing fisheries (1=selected; 0=not selected)	
	Stated level of concern about the impacts of climate change (2=very concerned; 1=somewhat; 0=unconcerned)	
On roles & responsibilities	Stated level of responsibility to address climate change impacts assigned to range of stakeholder groups (maximum points for indicating all groups have major responsibility)	
On ability to act / be protected	Stated level of satisfaction with the steps being taken to address climate change impacts in the fisheries sector[5] (2=Satisfied or neutral; 1=dissatisfied; 0=very dissatisfied / don't know)	Low levels of satisfaction could reflect a sophisticated understanding of the risks versus actions taken to address them or a "gut feeling". Satisfaction indicates a feeling of sufficient action relative to the risk, but respondents could have varied appreciations of risk and actions. The question focuses on how respondents *feel* about actions being taken.
	Whether anyone reached out to help respondent after the recent storm hit (2=yes; 0=no)	Questions only pertain to questionnaire used in Eastern Caribbean. The assumption is that assistance / social safety nets help people become whole again after an event like a hurricane
	Ease of getting extra cash to pay for damages after a storm (2=very easy, easy; 1=neutral, difficult; 0=very difficult)	
	Ability to depend on close family/friends if respondent needs extra help after a storm (2=yes, 0=no)	
Practice		
On adaptation & disaster risk reduction	• Open-ended question on actions by the community to deal with climate change (2=specific, relevant action; 1=generic; 0=nothing / don't know / not relevant) • Open-ended question on actions taken by respondent upon finding out about imminent storm (2=specific, relevant action; 1=generic; 0=nothing / don't know / not relevant)	Questionnaire for Montego Bay Questionnaire for use in Eastern Caribbean
	Whether respondent had an emergency kit and other protection supplies when the recent storm hit (2=yes; 0=no)	Questions only pertain to questionnaire used in Eastern Caribbean. Although Jamaica and Haiti have been adversely affected by hurricanes in the recent past (especially 2016's Hurricane Matthew) this series of questions focused on the recent storms that affected the Eastern Caribbean. Stated levels of concern are indirect measures of practice since respondents were told to think about actions taken and outcomes related to the recent storms (2017 and 2018).
	Whether the respondent had ever received training in how to manage disaster risk (2=yes; 0=no)	
	Whether the respondent has insurance to protect their home or property from damage (2=yes; 0=no)	
	Stated level of concern over current level of preparedness (2=very little, little, neutral; 0=concern, serious concern)	
	Stated level of concern over preparedness of neighbours (2=very little, little, neutral; 0=concern, serious concern)	
On use of information	Stated interest in receiving more information about the impact of climate change on fisheries in respondent's country/community (2=yes; 0=no, don't know, no answer)	Assumes interest in receiving information would translate into actual uptake.[6]

[5] Steps taken could be by the individual, community or government.

[6] There can be gaps between people' stated intentions and action but this gap is mitigated when individuals receive information or plan out implementation: when, where and how to do something (e.g., Wieber et al., 2015). In this case, it was clear that the Project team would be providing the climate change information to respondents via the communication channels they had self-identified as most effective.

Area / indicators	Survey elements (and points allocated for responses)	Assumptions and limitations
	Information sources through which respondent found out about the recent storm (2=consulted at least three sources likely to carry official warnings; 1= consulted at least one source likely to carry official information + trusted, informal source; 0=one informal source, no sources, no answer)	Question only pertain to questionnaire used in Eastern Caribbean. Internet and social media were included as response options. But these media could both transmit official information and misinformation.

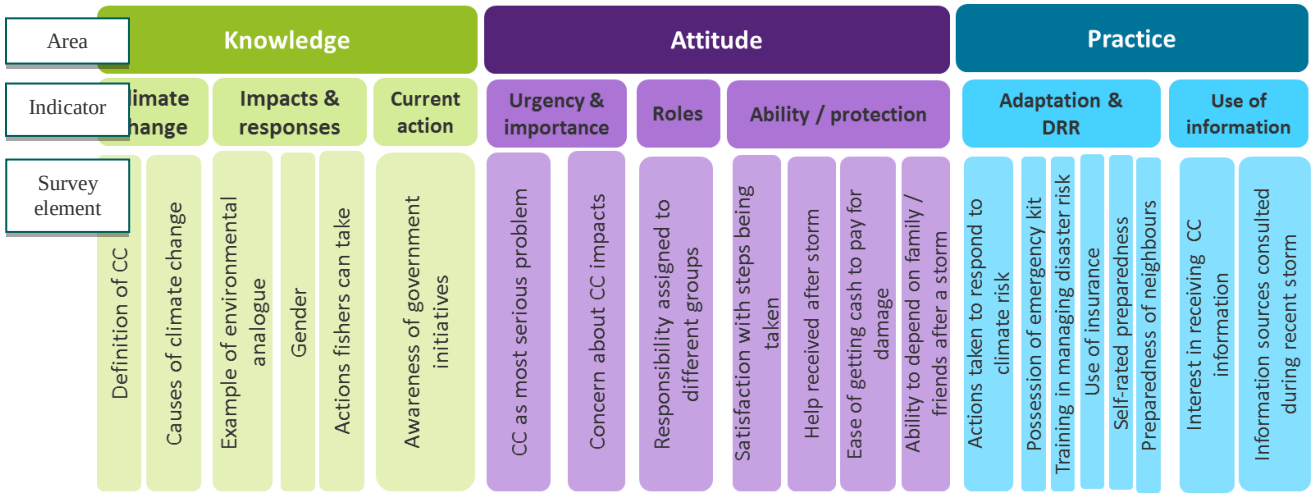

Figure 1: Hierarchy of areas (e.g., knowledge), indicators (e.g., climate change) and survey elements (e.g., definition of climate change) used to estimate scores at the individual-respondent level, site level and across all three fishing sites

By allocating scores according to the point system outlined in Table, we estimated a composite knowledge score, attitude score and practice score for each respondent, expressed as a percentage. Figure 2 below is screenshot to illustrate how responses to survey elements are assigned points, summed for each indicator and expressed as a score in percentages by dividing assigned points by total possible points. In some cases total possible points vary by fishing site, mirroring the variation in survey questions explained in Table 3. Composite knowledge scores (%) per respondent are averages of underlying indicator scores. We treated blank responses in one of two ways. If all survey elements pertaining to indicators of knowledge, attitude or practice were blank for a given respondent we removed that respondent's record (row) from the dataset. If some survey elements were complete we retained the respondent's record and assigned the minimum points possible for blank survey elements. With this rule we assume that fisherfolk declined to answer questions if they did not know the answer or were not interested in the issue being discussed. Since field assessors were specifically trained to encourage fisherfolk to complete all questions in the questionnaire and to ensure fisherfolk understood what was being asked of them we consider it unlikely for non-responses to signify a lack of understanding of the question.

Country	ID	Q_DefCC	Points	Q_Causes_CC	Points	Climate Change Points	% Score	Q_EnvSituation	Points	Q_CC Consequences	Points	Q_Gender Diff	Points	Q_CanDo Hurricane	Points	Q_CanDo CCImpacts	Points	Impacts & Responses Points	% Score	Q_Govt	Points	Current Action Points	% Score	Knowle Score
JAM	M1	Yes	2	Burning of foss	2	4	100%	Cutting dc	0	If there is no fis	0	No	0			Stay Aware	1	1	13%				0%	38%
JAM	M2	Yes	2	The use of foss	1	3	75%	The burni	0	A couple more c	0	No	0			Dispose garb	1	1	13%	None	0	0	0%	29%
JAM	M3	Somewhat	1	Depletion of th	0	1	25%			Fish stock deple	1	No	0			Seek more in	2	3	38%	None	0	0	0%	21%
JAM	M4	No	0			0	0%			Fishing grownds	1	Not applica	0			Try to live m	1	2	25%				0%	8%
JAM	M5	Somewhat	1	Man using up t	0	1	25%			Fish will be mov	2	No	0			Be more env	1	3	38%	Not so sur	0	0	0%	21%
JAM	M6	No	0	Carbondioxide	0	0	0%			Low fish stock	1	No	0			Make the cc	1	2	25%				0%	8%
JAM	M7	Yes	2	Development l	0	2	50%	The buildi	0	Less fish. less fis	1	No	0			Nothing mor	0	1	13%				0%	21%
JAM	M8	Somewhat	1			1	25%			Fish getting hare	1	Yes	2			Make fishers	2	5	63%	None	0	0	0%	29%
JAM	M9	Yes	2	Global warmin	0	2	50%					Yes	2					2	25%	None	0	0	0%	25%
JAM	M10	Yes	2			2	50%			Soon there will	1	Not applica	0			Seek more k	1	2	25%	None	0	0	0%	25%
JAM	M11	Yes	2	Burning of foss	1	3	75%	The tides	1	The warmer the	2	No	0			All we can d	1	4	50%	Don't kno	0	0	0%	42%
JAM	M12	Yes	2	Distruction of t	0	2	50%	Becasue o	2	Extreme low fis	1	No	0			Educate ours	2	5	63%	None	0	0	0%	38%
JAM	M13	Yes	2	Cutting of tree	1	3	75%	Recent de	0	Unstable weath	1	No	0			Proper- disp	1	2	25%	eu aids	1	1	50%	50%
JAM	M14	Yes	2	Cutting down t	1	3	75%	Hotel buil	0	Soon and Soon t	1	No	0			Head weath	2	3	38%	None	0	0	0%	38%
JAM	M15	Somewhat	1	ManKind	0	1	25%			Waters will bec	2	No	0			Heed to earl	2	4	50%	None	0	0	0%	25%
JAM	M16	Somewhat	1	Distruction of t	0	1	25%	The lack o	2	Fish grounds are	1	No	0			Fishers need	2	5	63%				0%	29%
JAM	M17	Yes	2	ManKind	0	2	50%			Waters will bec	2	No	0			Heed to earl	2	4	50%	None	0	0	0%	33%
JAM	M19	Somewhat	1	Temperature g	0	1	25%	Example r	1			Yes	2			Speak about	2	5	63%	None	0	0	0%	29%
JAM	M20	Yes	2	Large factories	0	2	50%			Infom fisherme	0	Not sure/d	0					0	0%	Nothing	0	0	0%	17%
JAM	M21	Yes	2	The many thing	0	2	50%	The eriosi	1	The hurricane th	2	No	0			Basically we	1	4	50%	Dont't kno	0	0	0%	33%
JAM	M22	Yes	2	Pollution	0	2	50%	Prolong h	0	Depends on hov	2	Not sure/d	0			Dispose of th	1	3	38%	Nothing	0	0	0%	29%
JAM	M23	No	0	Not sure	0	0	0%	Erosion of	2	When hurricane	2	Not sure/d	0			Not sure	0	4	50%	None	0	0	0%	17%
JAM	M24	No	0	Cause from glo	0	0	0%	Example t	0	Sooner or later t	1	Not sure/d	0			Pay attentio	1	2	25%	Nothimg	0	0	0%	8%
JAM	M25	No	0	Too much pollu	0	0	0%			Bad practices of	0	Not sure/d	0			Very little th	0	0	0%	None	0	0	0%	0%
JAM	M26	Somewhat	1	The heap of fir	0	1	25%					No	0					0	0%	None	0	0	0%	8%

Figure 2: Screenshot of worksheet to calculate the composite knowledge score per respondent, as an average of three scores for each of the underlying indicators (climate change knowledge; impacts & responses; awareness of current action). Responses to each survey element are allocated points and then added. A percentage score for each indicator is then calculated by dividing the points allocated over total possible points.

We use descriptive statistics – box and whisker plots specifically – to characterize the set of Knowledge, Attitude and Practice scores across all fisherfolk and for fisherfolk from each fishing site. In the box plots used, the cross (+) represents the mean (average) value, and the line inside the box represents the median value (see Figure 3). The ends of the box represent the upper and lower quartiles. The ends of the box whiskers represent the minimum and maximum values, respectively, excluding outliers. Any point outside the whiskers can be considered an outlier (usually shown as a point).[7] The spacing across quartiles is indicative of the spread and skewness of the data. The length of the box and whiskers is indicative of the spread in the data, so that a short plot indicates very little change or variability in the variable being shown.

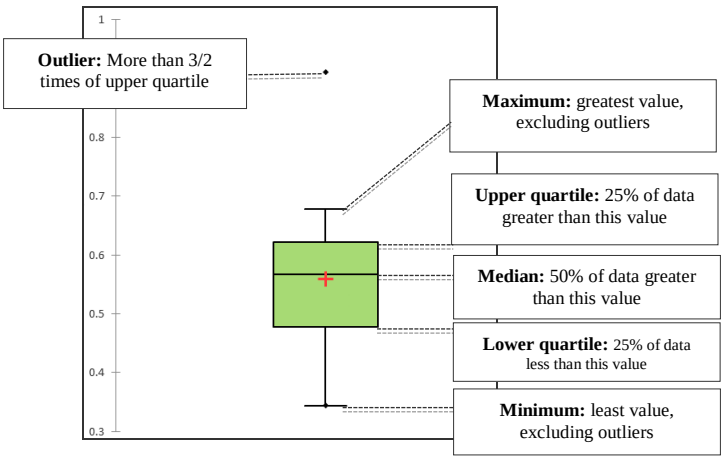

Figure 3: Example of a box and whisker plot

Section 3 reports *indicator* scores pertaining to knowledge, attitudes and practice, per fishing site. It also reports median values of *composite scores for the areas* of knowledge, attitudes and practice, per fishing site. With this approach, comparisons can be drawn across target audiences (in this study) and over time if the same or a very similar survey instrument is used.

Managers

We exported online results from the SurveyMonkey platform to an Excel workbook. A majority of survey questions were close-ended (27 out of 32), requiring no to minimal transformation for analysis. For the few open-ended questions, we reviewed the content in detail and applied open coding first, developing a framework for each question iteratively and deductively.

Despite the low response rate for this stakeholder group, we estimated knowledge, attitude and practice (KAP) scores and statistics in case we could draw out any useful patterns and further questions to explore through other project activities. KAP scores and statistics for this dataset are only indicative. We applied a parallel approach to determining KAP scores for Managers as we did for fisherfolk, with some differences in underlying survey elements. Table 4 outlines the indicators and related online survey elements used to estimate knowledge, attitude and practice scores.

Table 4: Indicators, survey elements and rules for assigning points used to estimate composite scores for climate change knowledge, attitudes and practices of managers

Area / indicators	Survey elements (points allocated for responses)	Assumptions and limitations
Knowledge		
Climate change knowledge	Open ended question on the definition of climate change (2=reference to change in atmospheric variables and temporal aspect; 1=has accurate elements; 0=wrong or not relevant)	
	Causes of climate change (2=selects burning of fossil fuels, land clearing and industrial emissions; 1=selects one to two right	

[7] Additional background on box and whisker plots, including rules for defining outliers, is available here: https://www.sfu.ca/~jackd/Stat203_2011/Wk02_1_Full.pdf

Area / indicators	Survey elements (points allocated for responses)	Assumptions and limitations
	options; 0=selects wrong answers, don't know, no answer)	
Knowledge of climate change impacts & responses	Open-ended question on consequences to the fisheries sector of climate change impacts (2=all three examples are accurate; 1=mentions 1 accurate example OR has a mistake among two to three examples; 0=all else)	
	Awareness of gender-differentiated impact (2= yes, climate change affects women and men differently, 0= no or don't know)	
	Open-ended question on climate-change related messages to highlight to small-scale fishers (2=all three examples are accurate; 1=mentions 1 accurate example OR has a mistake among two to three examples; 0=all else)	
Awareness of current action	Open-ended question on government programs or projects the government is undertaking to reduce the impacts of climate change and extreme weather on the fisheries sector (2=specific climate change adaptation examples; 1=fisheries management examples that build resilience, or only one adaptation example; 0=all else)	
	Awareness of CRFM PPCR project (2=yes, 0=no)	
Attitudes		
On urgency & importance (of addressing climate change)	Stated level of concern over threats to the fisheries sector (1=climate change is scored 5; 0=all else)	
	Stated level of concern about the impacts of climate change (2=very concerned; 1=somewhat; 0=unconcerned)	
On roles & responsibilities	Stakeholder groups mainly responsible for addressing climate change in the fisheries sector (2=everyone selected; 1=three or more groups selected; 0=all else)	
	Stated level of responsibility to address climate change impacts assigned to range of stakeholder groups (maximum points for indicating all groups have major responsibility)	
On ability to act / be protected	Stated level of satisfaction with the steps being taken to address climate change impacts in the fisheries sector (2=Satisfied or neutral; 1=dissatisfied; 0=very dissatisfied / don't know)	Low levels of satisfaction could reflect a sophisticated understanding of the risks versus actions taken to address them or a "gut feeling". Satisfaction indicates a feeling of sufficient action relative to the risk, but respondents could have varied appreciations of risk and actions. The question focuses on how respondents *feel* about actions being taken.
Practice		
On adaptation & disaster risk reduction	• Actions people in the fisheries sector are currently taking to deal with climate change (maximum points for indicating all actions being taken) • Open-ended question on actions people in the fisheries sector are currently taking to deal with climate change (2= relevant, specific action; 1= vague or general actions; 0= nothing / don't know)	Survey deployed in September 2018 Survey deployed in April 2018
	Whether respondent currently incorporates climate change into strategic or operational decisions (2=yes; 0=no)	
	Open ended question on strategies and operational measures to consider to reduce the impacts of climate change on the fisheries sector in the country / countries where respondents work (2= relevant, specific action; 1= general environmental initiatives,	

Area / indicators	Survey elements (points allocated for responses)	Assumptions and limitations
	things to address non-climate stressors; 0= all else)	
On use of information	Sources respondent consults to get information related to climate change (2= consults CRFM and 5Cs; 1=consults more than one source; 0=all else)	

Policy Actors

The project team's Communication Expert took detailed notes while conducting interviews. Promptly after interviews she cleaned the raw notes to eliminate any shorthand and grammatical/spelling mistakes. We took the resulting 4 interview grids with responses and sorted the qualitative data in one Word document, separated into themes that largely mirror frameworks used for fisherfolk and managers:

- Climate change knowledge
  - Definition
  - Causes
- Attitudes
  - On roles and responsibilities for addressing climate change in the fisheries sector
  - On levels of capacity relative to risk
- Practice
  - Enabling policy
  - Potential measures to reduce risk and future impacts of climate change
  - Actions fishers can take to reduce the impacts of climate change on their communities
  - On use of information from this project
- Perceived impact of climate hazards on the fisheries sector
- Communications
  - Most effective methods for climate change communications with fisherfolk
  - Key climate change messages to impart to fisherfolk
  - Agencies to involve in a climate change awareness campaign

Our approach to data analysis and synthesis was iterative, inductive and interpretive. Our goal was to identify patterns, convergent and divergent points of view in order to (1) elucidate information needs and preferences for this important target group and (2) harness their knowledge of the sector and their constituents to inform the project's communication activities.

2.3 Limitations and challenges

The main challenges encountered in developing this KAP Study were as follows.

- Comparability within and across target stakeholder groups. Research objectives and questions were common across the three target groups but we tailored survey instruments to the audience. Also, within the fisherfolk sample we used slightly different data-collection instruments for Jamaica and for Eastern Caribbean respondents. This was because fishing activities differ across the two fishing areas, with pelagic and FAD fisheries more prominent in the Eastern Caribbean and reef fisheries in Jamaica. This influenced response options, for example, number of hours for the average fishing trip. The additional questions and focus on extreme events and storm damage in the data-collection instrument for the Eastern Caribbean stemmed from that region's recent experiences with damaging storms and the likely good recall of fisherfolk on their preparedness, perceptions and needs. Additionally, we took into account suggestions for modifications that came from representatives of the Fisheries Department during our training sessions with assessors. In fact, we used the training of field assessors as an opportunity to refine the instrument in each site. We consider not taking a "one-size fits all" approach an advantage for eliciting responses of higher quality but there were significant

challenges in harmonizing the analysis across these variable instruments. A recommendation is to invest more time up front to develop a robust and detailed indicator framework of wide applicability.

- Hurricane Isaac (September 13, 2018) delayed data collection in Dominica and was a major setback in the timely completion of the KAP Study. Recruiting fishers to reply to questionnaires was a slower effort than expected mainly due to survey fatigue. Since Hurricane Maria (September 18, 2017), the fishers have participated in numerous surveys and we needed more effort to convince them than was foreseeable. Aside from survey fatigue, the exposure of fishers in Roseau to a recent storm may have also influenced survey results, as recent experience with a threat shapes risk perception and attitudes about risk. Climate change risk and extreme weather needs to be factored into all data collection and monitoring efforts.

- We achieved low response rates from non-fisherfolk audiences and, therefore, have included cautions throughout the report on the indicative nature of responses from managers and policy actors. We consider results from fisherfolk more reliable than the other two audiences. Particularly in the Caribbean, face-to-face interviews administered by a specialist are preferred to self-administered, online formats. Budget and time constraints guided the approaches we took but a recommendation is to improve budgeting in the pre-planning stage once target audiences have been identified.

3. RESULTS

This section characterizes the set of respondents engaged in the research, examining socio-demographic and occupational attributes. It provides context through which to interpret climate change-related findings. The focus is on two target groups –fisherfolk and managers—since the group of policy actors consisted of only four individuals. This section also presents the results of research focused on climate change knowledge, attitudes and practice for our three target audiences (fisherfolk, managers and policy actors), also summarizing these groups' perspectives on observed climate change impacts on the fisheries sector, responses to these impacts and climate change communications.

3.1 Respondent profiles

Fisherfolk

Socio-demographics

The majority of fisherfolk engaged in the KAP research were male. Female fisherfolk comprised only 3 of 161 respondents. The survey focused on the direct users of the ecosystem services and females are primarily involved in post-harvest activities in the sector. Respondents in the sample had an average age of 47 years, with the sample from Dominica younger by 2 years on average. Figure 4 illustrates the age distribution of respondents by frequency, indicating a concentration of fisherfolk in our sample of about 50 years in age. Thirty three respondents were between 47 and 54 years of age. The youngest respondent was 15 and the oldest 82.

About half of the sample had primary schooling as the highest education level attained, with secondary schooling a close second (Table 5). Education levels among the three samples differed markedly, with fisherfolk in Montego Bay having completed most schooling and those in Kingstown the least.

About half of the sample is either married or common law and the other half single. Fishers in Dominica were predominantly single. The majority of respondents considered themselves the heads of their households, with two dependents, on average, although the range of dependents varied from 0 to 12.

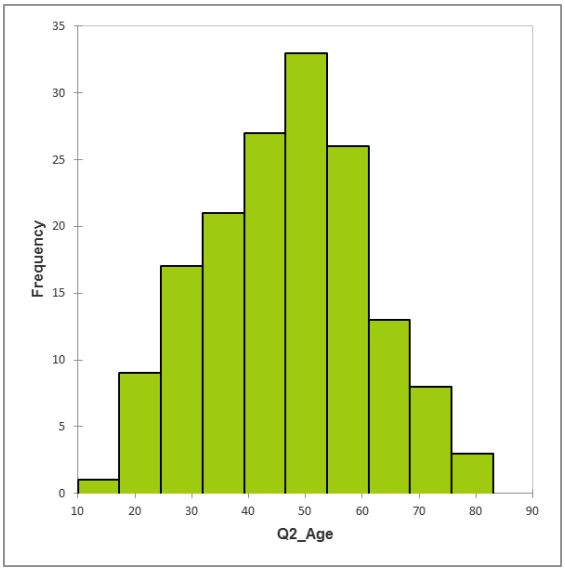

Figure 4: Age distribution of fisherfolk engaged in the KAP research (n=158). The median age is 48 and average age is 47. The age range is 15 to 82. Intervals are 7.3 years.

a) Sex		Montego Bay (JAM)		Kingstown (SVG)		Roseau (DOM)		Total	
		Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %
	Female	0	0.0%	1	1.7%	2	3.3%	3	1.9%
	Male	37	92.5%	59	98.3%	58	95.1%	154	95.7%
	N/A	3	7.5%	0	0.0%	1	1.6%	4	2.5%
	Total	40	100.0%	60	100.0%	61	100.0%	161	100.0%
b) Age		Montego Bay (JAM)		Kingstown (SVG)		Roseau (DOM)		Total	
		Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %
	30 and under	3	7.5%	5	8.3%	12	19.7%	20	12.4%
	31-45	13	32.5%	18	30.0%	19	31.1%	50	31.1%
	46-60	16	40.0%	24	40.0%	18	29.5%	58	36.0%
	Over 60	8	20.0%	13	21.7%	9	14.8%	30	18.6%
	N/A	0	0.0%	0	0.0%	3	4.9%	3	1.9%
	Total	40	100.0%	60	100.0%	61	100.0%	161	100.0%
	Average age	49		49		44		47	
c) Education		Montego Bay (JAM)		Kingstown (SVG)		Roseau (DOM)		Total	
		Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %
	No formal education	1	2.5%	2	3.3%	1	1.6%	4	2.5%
	Primary	6	15.0%	43	71.7%	27	44.3%	76	47.2%
	Secondary	25	62.5%	10	16.7%	28	45.9%	63	39.1%
	Post-secondary	4	10.0%	4	6.7%	5	8.2%	13	8.1%
	N/A	4	10.0%	1	1.7%	0	0.0%	5	3.1%
	Total	40	100.0%	60	100.0%	61	100.0%	161	100.0%
d) Marital status		Montego Bay (JAM)		Kingstown (SVG)		Roseau (DOM)		Total	
		Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %
	Common law	8	20.0%	26	43.3%	9	14.8%	43	26.7%
	Married	11	27.5%	11	18.3%	15	24.6%	37	23.0%
	Single	15	37.5%	22	36.7%	36	59.0%	73	45.3%
	N/A	6	15.0%	1	1.7%	1	1.6%	8	5.0%
	Total	40	100.0%	60	100.0%	61	100.0%	161	100.0%
e) Head of household		Montego Bay (JAM)		Kingstown (SVG)		Roseau (DOM)		Total	
		Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %
	Yes	37	92.5%	55	91.7%	53	86.9%	145	90.1%
	No	3	7.5%	5	8.3%	8	13.1%	16	9.9%
	Total	40	100.0%	60	100.0%	61	100.0%	161	100.0%

Table 5: Summary of the percentage and frequency of socio-demographics (a-e) within the sample of fisherfolk in Montego Bay (Jamaica), Kingstown (St. Vincent and the Grenadines) and Roseau (Dominica); N/A = no answer or not applicable

Fishing activities

On average, most respondents lack formal training[8] in fishing (see Table 6). However, notable differences exist among pilot study sites, with an overwhelming majority in Jamaica and St. Vincent and the Grenadines lacking formal training in fishing and a high percentage (75%) of respondents from Dominica possessing it.

Respondents' experience in fishing varies considerably. Figure 5 and Table 6 and provide information on the number of years respondents have spent fishing in the coastal area where they are located. On average, respondents have spent about 25 years fishing in the community, although the time span ranges from under a year to 63 years.

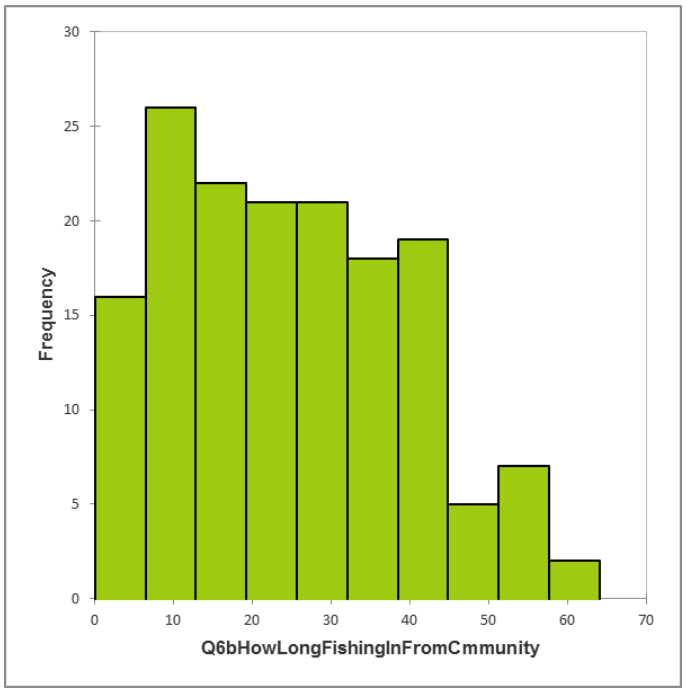

Figure 5: Distribution of the number of years spent fishing in the community where fisherfolk are located. The median number of years is 23, the average number is 25. The number of years ranges from 0 to 63. The intervals are 6.4 years.

The majority of respondents engage in fishing on a full-time basis. The percentage of part-time fishing ranges from 8% (St. Vincent and the Grenadines) to 20% (Jamaica). Part-time fishers reported a range of economic activities performed to supplement income from fishing. Many activities are allied to fishing (i.e., within the fish value chain) and predominantly in skilled trades and service sectors. Reported activities include the following:

- Skilled trades: Construction, carpentry, plumbing, auto mechanic, boat repair and maintenance
- Services: Gas pump attendant, taxi operator, water sports operator, massage therapist and domestic worker
- Other: Farmer, market vendor, small business owner and operator

[8] By formal training we refer to training received through Cooperatives, Government, NGOs in relation to respondent's fishing operations.

a) Formal training in fishing		Montego Bay (JAM)		Kingstown (SVG)		Roseau (DOM)		Total	
		Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %
	Yes	0	0.0%	7	11.7%	46	75.4%	53	32.9%
	No	39	97.5%	53	88.3%	15	24.6%	107	66.5%
	N/A	1	2.5%	0	0.0%	0	0.0%	1	0.6%
	Total	40	100.0%	60	100.0%	61	100.0%	161	100.0%
b) Years fishing in the community		Montego Bay (JAM)		Kingstown (SVG)		Roseau (DOM)		Total	
		Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %
	Up to 10	8	20.0%	8	13.3%	20	32.8%	36	22.4%
	11 to 20	9	22.5%	16	26.7%	15	24.6%	40	24.8%
	21 to 30	6	15.0%	17	28.3%	5	8.2%	28	17.4%
	31 to 45	12	30.0%	15	25.0%	13	21.3%	40	24.8%
	Over 45	3	7.5%	3	5.0%	7	11.5%	13	8.1%
	N/A	2	5.0%	1	1.7%	1	1.6%	4	2.5%
	Total	40	100.0%	60	100.0%	61	100.0%	161	100.0%
	Average # of years	26		26		23		25	
c) Fishing status		Montego Bay (JAM)		Kingstown (SVG)		Roseau (DOM)		Total	
		Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %
	Full-time	31	77.5%	55	91.7%	51	83.6%	137	85.1%
	Part-time	8	20.0%	5	8.3%	10	16.4%	23	14.3%
	N/A	1	2.5%	0	0.0%	0	0.0%	1	0.6%
	Total	40	100.0%	60	100.0%	61	100.0%	161	100.0%

Table 6: Summary of the percentage and frequency of fishing attributes (a-c) within the sample of fisherfolk in Montego Bay (Jamaica), Kingstown (St. Vincent and the Grenadines) and Roseau (Dominica); N/A = no answer or not applicable

Further characteristics of our sample of fisherfolk and their experiences and perceptions on day-to-day-fishing appear in Table 7. Throughout this section we refer to indicator values from this table by including the reference number in bolded brackets **[#]**.

The information gleaned from respondents highlights a few opportunities to improve the strength of fishing livelihoods. We asked respondents to rate their level of satisfaction on income from fishing **[1a]**, amount and type of fish caught **[1b, 1g]**, availability of fishing equipment **[1c]**, market for product **[1f]**, ability to support their family from the proceeds of fishing **[1h]**, the conditions of fishing grounds and landing sites **[1i, 1j]** and the ability to protect their livelihoods from hurricanes **[1d]**. Respondents were lukewarm about their satisfaction with five of these factors (i.e., around 50% registering satisfaction). The majority us satisfied with the types of fish being caught and are most dissatisfied with extension services **[1e]**, the market for their product **[1f]** and the condition of landing sites **[1j]**.

The majority of fisherfolk in our sample are registered fishers **[2a]** and about half own their fishing boats **[2b]**. Fishers who do not own boats get out to sea by boarding on available boats at landing sites (29 out of 79), going out fishing with a friend, family member or associate (28 out of 79); fishers also work a boat for other fishers (5 out of 79) and either borrow or rent boats (4 out of 79).

REF	Summary indicators	Definition	Unit	Fisherfolk			
				Total	Pilot study site		
					Montego Bay	Kingstown	Roseau
1	**Level of satisfaction with fishing**	Proportion of respondents who are satisfied					
1a	Income from fishing		%	50%		52%	49%
1b	Amount of fish caught		%	50%		52%	49%
1c	Availability of fishing equipment		%	24%		15%	33%
1d	Ability to protect livelihoods from hurricanes		%	41%		45%	36%
1e	Extension services		%	16%		7%	25%
1f	Market for product		%	22%		15%	30%
1g	Types of fish being caught		%	76%		72%	80%
1h	Ability to support family from fishing		%	58%		57%	59%
1i	Condition of fishing grounds		%	52%		42%	62%
1j	Condition of landing site		%	31%		22%	39%
2	**Fishing practices and preferences**						
2a	Registration	Proportion of respondents who are registered fishers	%	86%	83%	87%	87%
2b	Boat ownership	Proportion of respondents who own their fishing boats	%	50%	63%	40%	51%
2c	Days at sea - high season	Most frequently mentioned # days / week	days / week	6	5 to 6 days	7 days	5 to 6 days
2d	Days at sea - low season	Most frequently mentioned # days / week	days / week	3	1 to 2 days	3 to 4 days	3 to 4 days
2e	Duration of average trip	Most frequently mentioned # of hours / fishing trip	hours/trip	Up to 12	Up to 12	Up to 12	Up to 12
2f	Preferred time of day	Proportion of respondents that fish in the daytime	%	55%	58%	60%	48%
	Preferred species to fish						
2g	Target species #1	Most frequently mentioned target species	Group / species	Tuna			
2h	Target species #2	Second most frequently mentioned target species	Group / species	Dolphinfish			
2i	Target species #3	Third most frequently mentioned target species	Group /species	Snapper			
2j	Most practiced fishing method	Proportion and most frequently mentioned fishing method	% & fishing method	90% hook & line	83% hook & line	93% hook &line	92% hook & line
2k	Most significant buyer of fish	Proportion of respondents and most frequently mentioned buyer		71% community members	75% community members	82% fishing complex / coop	85% community members

REF	Summary indicators	Definition	Unit	Fisherfolk			
				Total	Pilot study site		
					Montego Bay	Kingstown	Roseau
2l	Diversity of buyers	Buyers for which proportion of counts is over 25%			(1) Fish vendors; (2) community members	(1) Fish vendors; (2) community members; (3) fishing complex/coop	(1) Fish vendors; (2) community members; (3) restaurants
2m	Trip expense	Average expenses per trip	EC$/trip	421	376	498	366
		Range of expenses per trip (min)		20	30	40	20
		Range of expenses per trip (max)		1880	860	1200	1880
2n	Most significant expense per trip	Most costly expense type, on average, and proportion of total expenses		Fuel 67%	Fuel 67%	Fuel 80%	Fuel 61%
3	**Perceptions on fishing performance**						
3a	Best months to fish [hook & line]	Three most frequently mentioned months	months		Jan, Feb, Sept, Oct	Feb, Jun, Jul, Aug	Jul, Aug, Sept
3b	Perceived changes in catch over fishing career	Proportion of respondents who perceived changes	%	75%	90%	50%	90%
3c	Nature of change in catch over fishing career	Most frequently mentioned type of change	Type of change	Less fish 52%			
4	**Impact of *Sargassum* on fishing**						
	Mostly positive	Proportion of respondents who reported the influx of *Sargassum* as mostly positive	%	36%		13%	58%

Table 7: Summary indicators of a range of fishing activities and factors affecting fishing for the sample of fisherfolk we engaged in KAP research in Montego Bay (Jamaica), Kingstown (St. Vincent and the Grenadines) and Roseau (Dominica)

During the high season, fishers spend an average of 6 days at sea / week **[2c]**. In the low season, the effort reduces by about half, spending an average of 3 days at sea **[2d]**. Just over half of the fisherfolk in the sample report fishing predominantly in the day time **[2f]**. Further information on the breakout across pilot study sites appears in

Annex 3: Additional information on fisherfolk activities. A majority of respondents fish for up to 12 hours daily **[2e]**. A preference for shorter trips (i.e., not multi-day) has been reported in other survey work (Beltran, 2017).

We asked fisherfolk to tell us the top species they targeted when fishing **[2g, 2h, 2i]** and about their usage of a range of fishing methods and gear types **[2j]**. With regard to target species, this was an open-ended question so responses included a combination of local and common names for fish and often were not species-specific but referred to groupings (e.g., "snappers"). Figure 6 summarizes the distribution of fish species / groups targeted by respondents in our sample. Tuna (including specific mention of yellow fin tuna, *Thunnus albacares*) and common dolphinfish (*Coryphaena hippurus*) are the types of fish most targeted by fishers in our sample, with snappers (including specific mention of queen snapper, *Etelis oculatus*) in third place. The breakout of targeted fish shown here is simply illustrative of the sample of fisherfolk operating in Montego Bay, Kingstown and Roseau as a whole. Patterns are clearer for fishing methods / gear types, where an overwhelming majority report fishing via hook and line with most frequency. Differences between Jamaican and respondents from Eastern Caribbean are evident, with fishers sampled in Montego Bay also using fish pots in a significant way (see further breakdown in Annex 3: Additional information on fisherfolk activities).

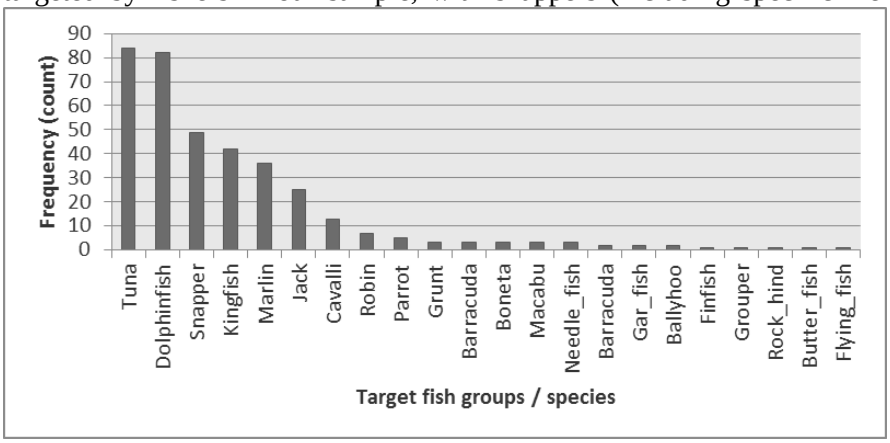

Figure 6: Target species identified by fisherfolk, ranked by frequency of response

We asked fishers a few questions on marketing and economic aspects of their fishing activities. A majority of fisherfolk sampled in Jamaica (75%) and Dominica (85%) sell their catch to community members **[2k]**. In St. Vincent and the Grenadines sales through the fishing complex occur in a significant way (about 82% of respondents). Fishers from Eastern Caribbean in our sample have a more diverse client base than fishers in Jamaica **[2l]**. At least a quarter of respondents from the Eastern Caribbean sell their catch to 3 different types of buyers, whereas Jamaican respondents only to 2. Table 7 also shows information on the cost of fishing **[2m]**. On average, fisherfolk in our sample spend about EC$421 of running costs per fishing trip, although the range spans two orders of magnitude (~EC$20 to EC$1880;

this latter value could be considered an outlier, see further descriptive statistics in Annex 3). On average, fuel expenses make up more than half the total running costs (~67%), with bait coming in second (~12%) **[2n]**.

We asked fisherfolk questions to elicit their perceptions on aspects of fishing performance, including the best months to fish and observations on changes in catch **[3a, 3b, 3c]**. In Jamaica (Montego Bay), fisherfolk responses on best months to fish using hook and line suggest a bi-modal distribution of best fishing months: January and February, then September and October (see Figure 7). In contrast, the distribution of best months to fish using hook and line gear for fisherfolk in Kingstown is more evenly distributed between January and September, with a slight peak in June and a slight decrease reported for the last calendar quarter. A majority of fisherfolk in Roseau identify July, August and September as the best months to fish using hook and line gear. In the surveyed sites, hook and line was the most common gear reported but others are in use as well (see Annex 3 for further information).

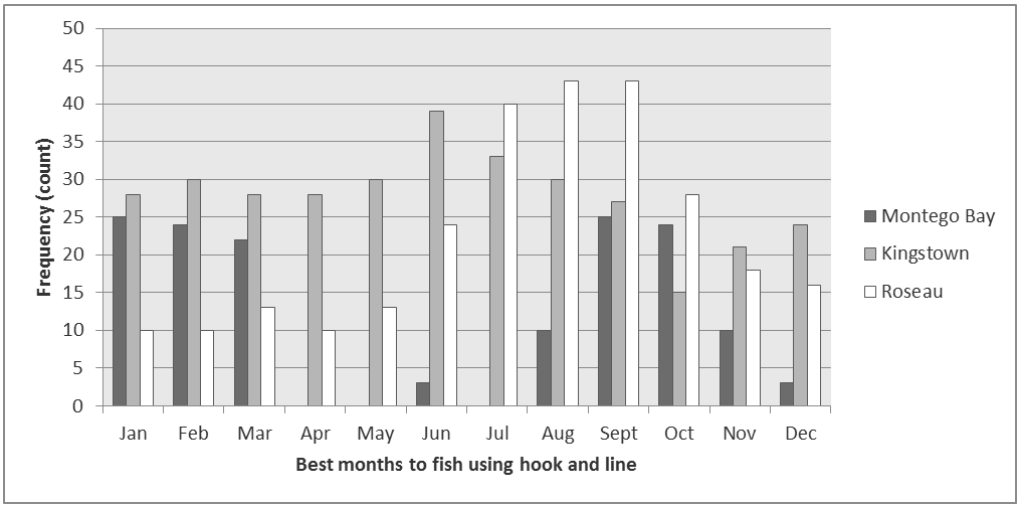

Figure 7: Best months to fish using hook and line gear, by frequency of responses by fisherfolk sampled in Montego Bay, Kingstown and Roseau

Concerning perceived changes in the amount of fish caught since starting to fish, a strong majority (90%) of fisherfolk from two of the pilot study sites (Montego Bay and Roseau) reported having seen changes, with a lower percentage reported by fisherfolk in Kingstown (50%). Figure 8 shows the direction and types of changes observed. By frequency, the most significant observed change is the reduction in fish available (60 out of 117 respondents or 51%). Fisherfolk have also observed more fish available and changes in the abundance of fish by season and location (35 out of 117 or 30%). Despite the focus of the question on harvest levels, respondents noted other changes including degradation of harvesting grounds and habitats and a more crowded economic activity.

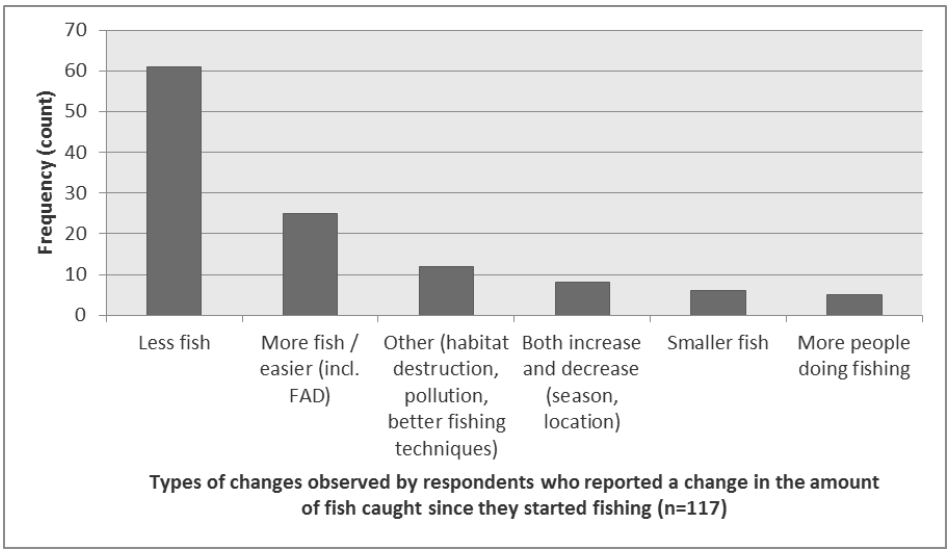

Figure 8: Direction and type of changes in the amount of fish caught observed by fisherfolk sampled in Montego Bay, Kingstown and Roseau. Note that fishers reported changes beyond the amount of catch.

The influx of *Sargassum* (*Sargassum fluitans*, *S. natans*) was an issue that was top of mind for stakeholders at the Regional Planning Workshop in April 2018. Therefore, we sought to capture (qualitatively) the impacts of the seaweed on fishing operations in Kingstown and Roseau **[4]**. On average, fishers report positive effects of *Sargassum* with slightly more frequency than negative or mixed effects. However, the differences in perspective between fishers in these two pilot sites are noteworthy, as fishers in Kingstown report mixed effects with most frequency (47%) and a majority of fishers in Roseau report positive effects (58%) (see breakout in Annex 3). Fishers observe that the presence of *Sargassum* increases the amounts of fish available and makes some species easier to access (dolphinfish and cavalli, explicitly mentioned). However, the seaweed also causes fishing lines and nets to tangle, obstructs or damages engines and equipment and requires more maintenance work on engines. A minority of fishers were neutral or not affected by *Sargassum*, with at least one mentioning that this was because of his focus on demersal fishing.

Managers

Managers who responded to the survey as part of the KAP research consisted of women and men in equal proportions (Table 8). Managers are diverse in their years of experience working in or supporting the fisheries sectors (Table 9) and, although a greater proportion of respondents reported working in Jamaica than any other PPCR country, all PPCR countries are represented (Figure 9).

Sex		Total	
		Count	Column N %
	Female	13	50%
	Male	13	50%
	Total	26	100%

Table 8: Distribution of managerial-level respondents to the online survey, by sex

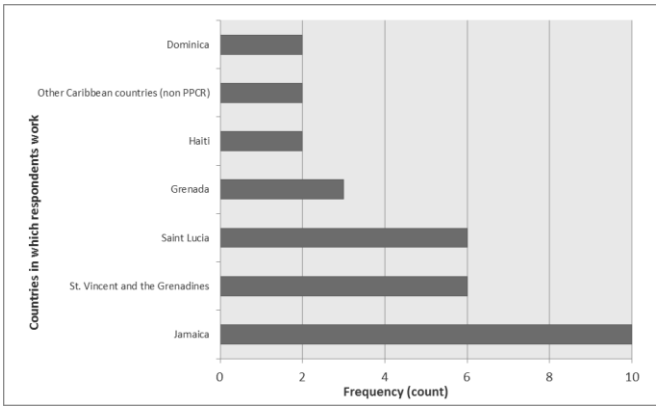

Figure 9: National representation of managerial respondents

Years working in or supporting the fisheries sector		Total	
		Count	Column N %
	2 to 5 years	6	25%
	6 to 10 years	7	29%
	11 to 15 years	4	17%
	>15 years	7	29%
	Total	24	100%

Table 9: Years of experience in the fisheries sector

Affiliation		Total	
		Count	Column N %
	National government	12	39%
	State or local government	1	4%
	Non-governmental organization	11	39%
	Private (self-employment, consulting)	4	14%
	Other (regional organization)	1	4%
	Total	28	100%

Table 10: Affiliations of managerial respondents

Most managers are public servants in national governments (12 of 28) and representative of non-governmental organizations (11 of 28) (Table 10). Respondents predominantly work in organizations responsible for natural resource management and conservation, fisheries management, marine and coastal zone management and enforcement of fisheries regulations. However, organizational responsibilities represented within the managerial sample are diverse (Figure 10). For example, the sample includes senior-level representatives from fishing cooperatives (vice president, liaison consultants) who also self-identify as fishers. Respondents reported working for the following organizations: Montego Bay Marine Park Trust, National Environment and Planning Agency (Jamaica), National Emergency Management Organization (St. Vincent and the Grenadines), White River Fish Sanctuary, The Nature Conservancy, 4BluC's (Saint Lucia), Goodwill Fishermen's Co-operative Society Limited (Saint Lucia), Bluefields Bay Fishermen's Friendly Society/Bluefields People's Community Association (Jamaica), Fisheries Division (Dominica, Jamaica, St. Vincent and the Grenadines), Fisheries Department (Haiti, Saint Lucia) and the CRFM Secretariat.

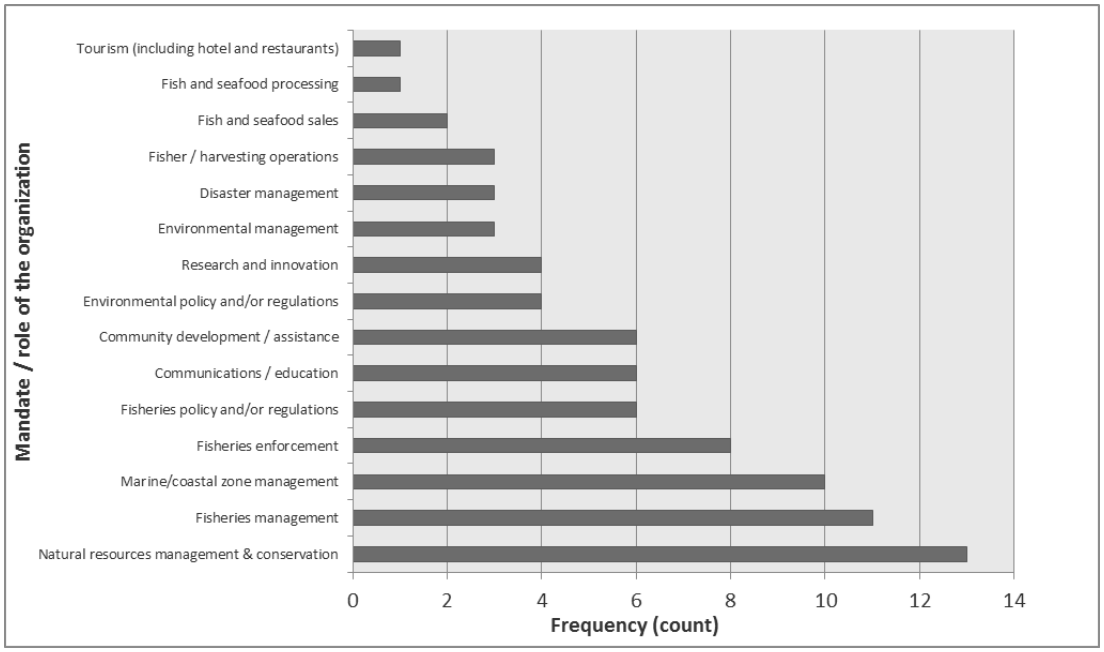

Figure 10: Distribution of managerial respondents' organizational mandates

A majority of respondents are resource managers or directors / supervisors of their work units (Figure 11). The sample also includes scientists, fishers and business owners / operators / analysts.

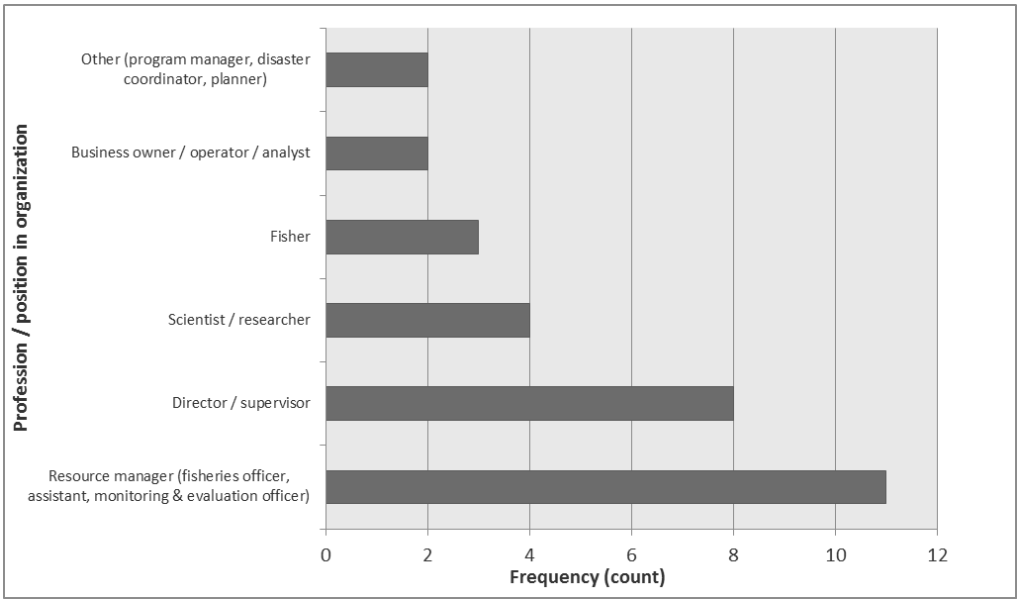

Figure 11: Distribution of managerial respondents' professions or positions within their organizations

Policy Actors

Policy Actors who we succeeded in interviewing as part of this KAP research comprised of four individuals, with women and men in equal proportions. Their organizations and designations are as follows:

- Chief Fisheries Officer, Fisheries Division, Ministry of Agriculture, Forestry, Fisheries, Rural Transformation, Industry and Labour of St. Vincent and the Grenadines;
- Director of Fisheries, Fisheries Division, Ministry of Industry, Commerce, Agriculture and Fisheries of Jamaica;
- Acting Chief Fisheries Officer, Fisheries Division, Ministry of Agriculture, Lands, Forestry, Fisheries and the Environment of Grenada;
- Chief Fisheries Officer, Fisheries Division, Ministry of Agriculture, Fisheries, Physical Planning, Natural Resources and Cooperatives of St. Lucia.

3.2 Climate change results

Fisherfolk

Table 11 is a summary of 12 indicators we considered in this research. This section of the report presents findings on each, indicating differences across pilot study sites, when warranted. Throughout this section we refer to indicator values from this table by including the reference number in bolded brackets **[#]**.

Ref	Summary indicators	Definition	Unit	Fisherfolk			
				Total	Pilot study site		
					Montego Bay	Kingstown	Roseau
	Sample size	# of fishers budgeted for sampling	n	150	50	50	50
	Response rate	% completed & partially completed surveys. It exceeds 100 in two cases since we obtained more completed surveys than was budgeted	%	107	80	120	122
1	**Average knowledge score**	Average composite knowledge score of respondents					
1a	On climate change (CC)		%	41	33	47	44
1b	On CC impacts / responses		%	47	30	59	51
1c	On current action		%	13	1	23	16
1d	Total / pilot study site		%		21	43	37
2	**Level of knowledge**	Composite knowledge score at the midpoint of the distribution of scores (median value)	%	28	21	50	28
3	**Average attitude score**	Average composite attitude score of respondents					
3a	On urgency & importance		%	59	69	50	57
3b	On roles & responsibilities		%	75	75	77	72
3c	On ability to act / be protected		%	39	24	44	48
3d	Total / pilot study site		%		56	57	59
4	**Level of positive attitude**	Composite attitude score at the midpoint of the distribution of scores (median value)	%	59	57	61	61
5	**Average practice score**	Average composite practice score of respondents					
5a	On adaptation & DRR		%	30	3	47	41
5b	On use of information		%	77	98	67	66

Ref	Summary indicators	Definition	Unit	Fisherfolk			
				Total	Pilot study site		
					Montego Bay	Kingstown	Roseau
5c	Total / pilot study site		%		51	57	54
6	**Level of desired practice**	Composite practice score at the midpoint of the distribution of scores (median value)	%	50	50	63	54
7	**Perceived impact of climate hazards**	Average significance score of respondents (5 = very significant impacts observed)					
	Hurricanes/storms		score /5	3.9	2.6	4.6	4.5
	Coastal flooding		score /5	3.5	2.2	4.2	4.1
	Coastal erosion		score /5	3.5	3.3	3.5	3.6
	Changes in ocean currents		score /5	2.8	1.9	3.1	3.3
	Coral bleaching		score /5	3.1	4.1	2.2	2.9
	Invasive species		score /5	2.5	2.0	2.7	2.7
	Fish migration		score /5	3.1	3.2	3.1	3.1
8	**Perceived <u>feasibility</u> of range of adaptation options for fishers**	Average feasibility score of respondents					
	Fish Aggregating Devices (FADS)		score /5	4.7	4.3	4.9	4.8
	Aquaculture (including mariculture)		score /5	3.1	3.0	4.1	2.2
	Sports fishing / boat tours		score /5	3.5	4.1	3.0	3.5
	Value-added processing		score /5	3.4	2.2	3.3	4.7
	Improved post-harvest management		score /5	4.0	3.0	4.3	4.7
	Target different species		score /5	3.5	3.1	3.1	4.2
	Promote different fishing methods		score /5	4.1	3.9	3.8	4.5
	Improved marketing		score /5	4.7		4.6	4.8
	Aquaponics		score /5	2.3			2.3
9	**Best ways to provide climate change information to fisherfolk**	Communication methods selected by 50% or more of respondents			Lectures / workshops 85%	Posters 65%	Lectures / workshops 62%
10	**Preferred agencies to involve in climate change awareness campaign**	Top 3 most frequently mentioned type of agency		ENV, Fisheries, All govt ministries	Env. Agency; Fisheries Dpt.; All govt ministries	Emergency Mgt. Agency; Fisheries Dpt.; All govt ministries	All govt ministries; Fisheries Dpt.; Schools
11	**Smartphone usage**	Proportion of ownership among respondents & most popular carrier	%	53%, Digicel	83%, Digicel	40%, Digicel	48%, Digicel

Ref	Summary indicators	Definition	Unit	Fisherfolk			
				Total	Pilot study site		
					Montego Bay	Kingstown	Roseau
12	**Most used social media**	Proportion of social media use and most frequently mentioned social media platform		50%, WhatsApp	45%, WhatsApp	30%, WhatsApp	74%, WhatsApp

Table 11: Summary indicators on climate change knowledge-attitudes-practice (KAP), perceived impacts and feasibility of responses and communications for fisherfolk we engaged in research in Montego Bay (Jamaica), Kingstown (St. Vincent and the Grenadines) and Roseau (Dominica)

Climate change knowledge

Figure 12 shows the distribution of composite climate change knowledge scores, expressed as a proportion of 1 instead of percentages. Fishers in Montego Bay, Kingstown and Roseau have a composite mean climate change knowledge score of 21%, 43% and 37% respectively **[1d]**. Scores for fisherfolk in Montego Bay show less of a spread than those for fisherfolk in the other two sites. Median composite scores for fisherfolk in Kingstown are highest **[2]**, indicating that a greater proportion of fisherfolk attained higher scores than their peers in the other two sites.

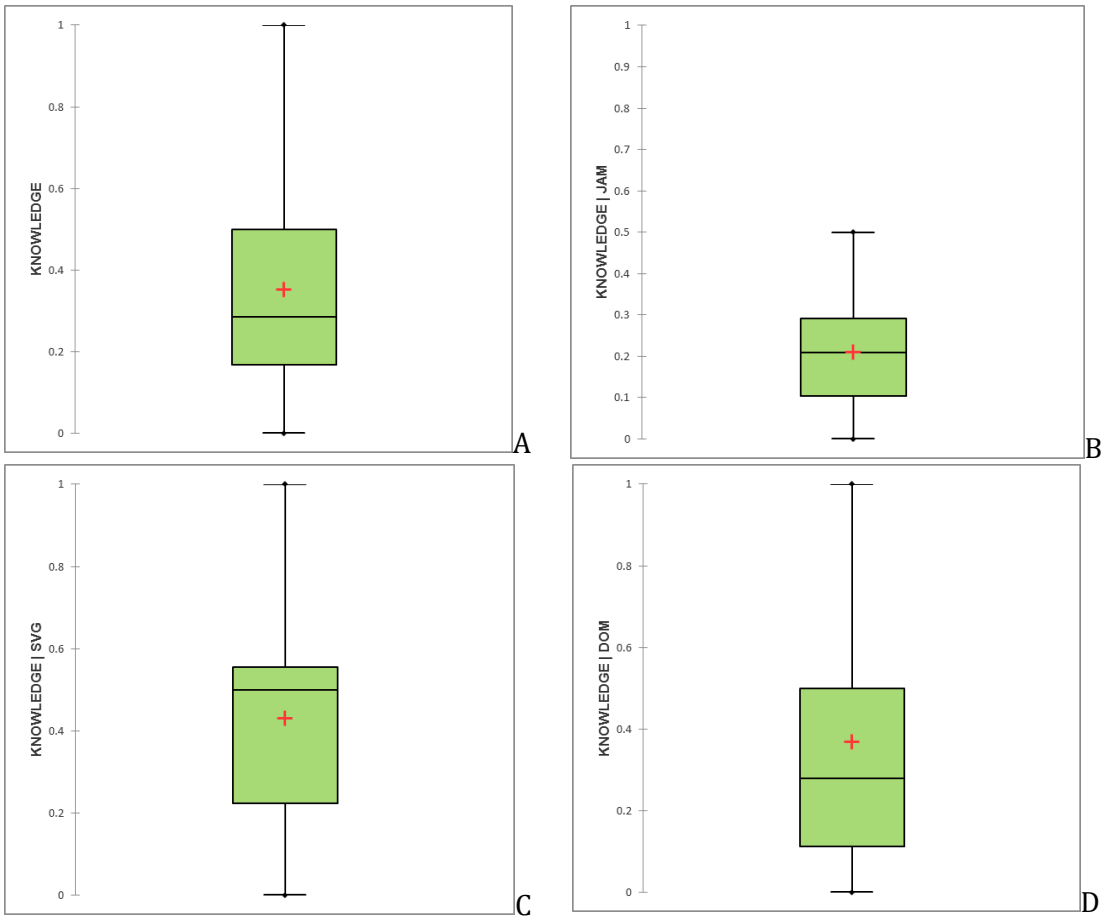

Figure 12: Boxplots showing the distribution of composite climate change knowledge scores for (a) the sample as a whole; (b) fisherfolk in Montego Bay; (c) fisherfolk in Kingstown; and (d) fisherfolk in Roseau (n=160; 39; 60; 61, respectively). Composite scores are plotted on the y-axes and expressed as a proportion of 1, such that 1 = 100%. Median values are shown by the horizontal line in the box.

Mean (average) values are shown by red crosses.

By considering the average values of underlying indicators (climate change knowledge; impacts & responses; awareness of current action) we observe the following:

Fisherfolk are more knowledgeable about climate-related impacts on fisheries and responses [1b] than they are of the causes of climate change [1a] and current government actions that could boost resilience [1c]. Patterns in understanding of climate change and its causes are similar across the three sites. Conversely, levels of knowledge of climate-related impacts, including gender-differences in vulnerability, and of relevant responses to adapt, are not as even. A greater proportion of fisherfolk in Kingstown and Roseau exhibited higher levels of knowledge in this category than fisherfolk from Montego Bay. Overall, the biggest weakness in knowledge is around actions government is taking to improve fisheries livelihoods. At least 75% of respondents either say they don't know what governments are doing or assert governments are doing nothing.

In **describing the term "climate change"** fisherfolk provided a range of responses, emphasizing different aspects of the phenomenon (e.g., global, human-caused, physical changes, biological changes, changes in seasonality, fishing impacts). Table 12 provides examples of respondents' explanations.

Montego Bay	Kingstown	Roseau
Global warming, anthropogenic • Basically global warming • Changes in the environment that is human-caused	**Physical and biological changes** • Change in the weather pattern all around the world causing change in temperatures • Changes in water temperature, bleaching of corals and, water temperature changing • Changes in sea level, increased CO_2 levels • More seaweed, sun and higher sea levels • Different fish and migration patterns and higher temperatures	**Physical and biological changes** • Climate changing over time • Weather system change • Currently climate is not the same • Change in the normal functioning of the atmosphere • Sea conditions changed cause of that • The changing in the water temperature bleaching of corals, etc.
Global phenomenon • The changes in the weather on a global scale • The different weather changes over the world		**Impacts on fishing (including harvest, marketing and consumption** • Change in texture and taste of fish
Physical changes • Changes in weather/climate patterns, different weather patterns • Change of wind pattern and currents and rainfall • More flooding and increased heat	**Seasonal variation and extremes** • Temperatures are changing seasons varying more, intense weather systems • Place hotter and more rain come in dry season	**Unpredictability and seasonal variation** • No season for anything • Unpredictable weather
Unpredictability • "Boy you cannot predict weather nowadays"	**Impacts on fishing (including harvest, marketing and consumption)** • Tides are strong and the fish season changing • Hardship and cannot go out to sea	**Other** • Disturbance in ozone layer • Events that take place after Hurricane Maria • Climate in the world is changing due to hurricane activities

Table 12: Examples of fisherfolk's responses to the question "Please explain what you understand by the term climate change?"

Explanations on what climate change means vary in nuance from "*basically global warming*" or "*changes in weather patterns*" to "*I understand that climate change comes from global warming, which causes more flooding and temperature change*". Several respondents supplied explanations that were partially accurate, demonstrating somewhat of an understanding of climate change. But 75 out of 158 respondents could not describe the term at all (see Figure 13).

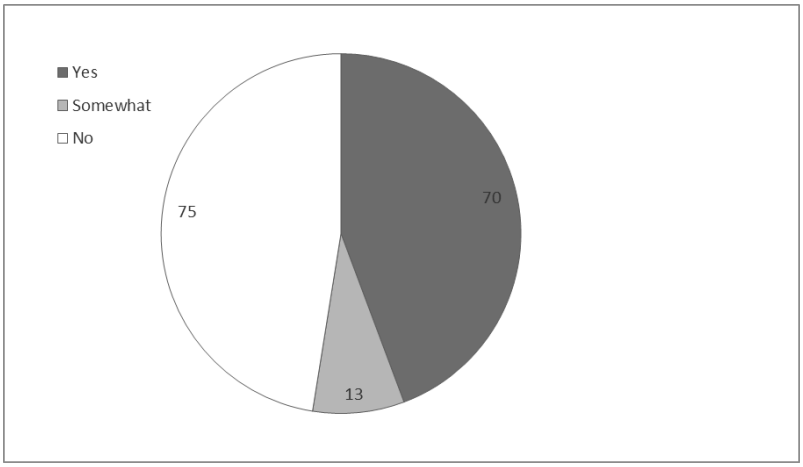

Figure 13: Assessed understanding of climate change based on respondents' explanation of the term "climate change" (Yes=provided accurate definition; somewhat=provided partially accurate answer; no=could not describe the term, description was wrong) (n=158)

We asked fisherfolk in Montego Bay about **the main causes of climate change** and their responses revealed a lack of knowledge on the issue. Only one fisher was able to articulate that anthropogenic climate change was caused by burning of fossil fuels and land clearing. As is evident from Table 13 below, fisherfolk see a connection between human activities / development and global warming, but fail to identify the specific causal mechanisms. There is also some confusion between climate change and ozone layer depletion.

Montego Bay	
Global warming • Global warming and natural causes (the moon) • Cause from global warming	**Consequence of development** • Human action • Development too close to the sea • Development by mankind • Humans using up the planet's natural resources, causing an imbalance in nature • Humanity's negative approach to the environment like cutting down trees and improper waste disposal • Pollution in the air and land • "Large factories that keep pollution waste such as chemical waste bags" • "The many things that are going up in the atmosphere and the way we are getting rid of our garbage by dumping and burning"
Emissions sources • Carbon dioxide released from factories and cars and pollution • Burning of fossil fuel, cutting down and not replanting trees	
Ozone-layer depletion • Destruction of the ozone layer by excessive carbon • Depletion of the ozone layer by gas from our waste	

Table 13: Examples of fisherfolk's responses to the question "What do you think are the main causes of climate change?"

We examined fisherfolk's understanding of climate change impacts by reviewing their examples of (1) environmental situations they would use to explain climate change to peers, (2) consequences to the fisheries sector of climate change impacts and (3) actions fishers can take to reduce the impacts of climate change. The strongest **examples of environmental situations** to use to explain climate change were ones that characterize impact pathways, such as "*fish migrating to new areas due to change temperature and ocean current*", "*usual fish stock is changing due to temperature in water*" and "*fish are in deeper water so fishermen have to travel longer distances to fish*". About a third of the sample of fisherfolk provided these types of examples. Just over a third of the sample of fisherfolk listed a change in climate condition as an example, such as "*hot weather*", "*change in ocean current*", "*stronger hurricanes*". The weakest examples in conveying the meaning of climate change were those that focused on environmental degradation caused by development, such as "*cutting down of the mangroves to build hotels and condos in vogue*", "*hotel built too close to the sea*" or "*the burning of garbage*".

We asked fisherfolk in Montego Bay about **fisheries-sector impacts of climate change**. Their responses revealed moderate knowledge on the issue and good potential to harness local observations of changes to the state and condition of fished resources. About a quarter of respondents (8 of 33 who replied to this question) drew connections between physical and biological changes, such as "*fish will be moving away from our ground to seek more [thermally] comfortable space*", and "*the hurricane that we are now having creates more damage to the reef and we see less fish*". About half of the respondents (18 of 33) simply report a decline in available fish. The rest (7 of 33) mainly refer to irresponsible fishing ("a *couple more decades of bad practices and there will be no more fish*").

Fisherfolk's responses to our question on **things fishers can do to reduce the impacts of climate change / reduce the impact of hurricanes** suggest a base level of knowledge on actions that build coping and adaptive capacity from which to build (see Table 14). The conflation between actions to address climate change impacts and general environmental actions is also apparent. This is not surprising since the portrayal of climate change as an environmental issue is longstanding. Some fisherfolk express fatalism and disempowerment through their responses. These sentiments included the following: "*all we can do is report what we see is taking place in our area*", "*nothing without the help of those in authority*", "*very little - this is bigger than them*".

Montego Bay (climate change impacts)	Kingstown and Roseau (hurricane impacts)
Information, education & communication • Information and education • Educate ourselves about climate change • Make fishers more aware of climate change • Fishers need to be provided with more information on how to help • Speak about its impact on a one to one basis	**Information, education & communication** • Communicate with each other more • Informing everyone as much as possible • Acquire knowledge and educate themselves on such occurrences • Educate themselves and be on alert all the time • Implement training programs • Implement a system to inform all fishers
Preparedness • Heed weather warning • Heed early warnings • Stay aware	**Preparedness** • Educate themselves and keep up to date on weather patterns • Have a radio or device so as to help up to date and alert • Have an emergency kit • Be aware and stock up on material, food and necessary supplies • Remove boats from coastal areas • Work together and cooperate

Montego Bay (climate change impacts)	Kingstown and Roseau (hurricane impacts)
Accountability • "Realize that all of us is going to suffer from the end result so make sure we do our little bit" • "Give more help to fishermen and become more concerned about fishermen rights" • Enforce environmental regulations	**Prevention and asset protection** • Put in place a program in hurricane disaster prevention • Ensure your fishing equipment is properly secured • Keep equipment in safety zones • Use specially-designated areas to secure boats during storms • Build resilient houses • Build sea defence wall
Environmental actions • Dispose of garbage properly • Stop dumping waste in the sea • Try to live more environmentally friendly • Be more environmentally aware • Pay attention to how we treat our beaches by keeping them clean	

Table 14: Examples of fisherfolk's responses to the question "What are some of the things you think fishers can do to reduce the impacts of climate change [hurricanes / storms] on your community?"

In addition, since climate change impacts affect women and men differently by virtue of physiology and societal roles and expectations, we explored **fisherfolk's knowledge of gender-differentiated vulnerability** to climate change. Since the sample is overwhelmingly male, these responses represent a predominantly male perspective. A majority of respondents (72% or 114 of 158) either don't see or don't know about gender-based differences. A common response is that "*climate change is a general occurrence that does not consider sex*". Nevertheless, about a quarter of respondents (39 of 158) acknowledge differences in how climate change affect men and women on the grounds of physique ("*women are unable to withstand the conditions at sea*"), stereotypes about tolerance to physical effects ("*female are more delicate and feel the effects more than males*"), women's traditional roles as fish vendors ("*less fish available for vendors if the fishers catch is low*", "*females await fish to sell*") and roles men play in society ("*men have more responsibilities*").

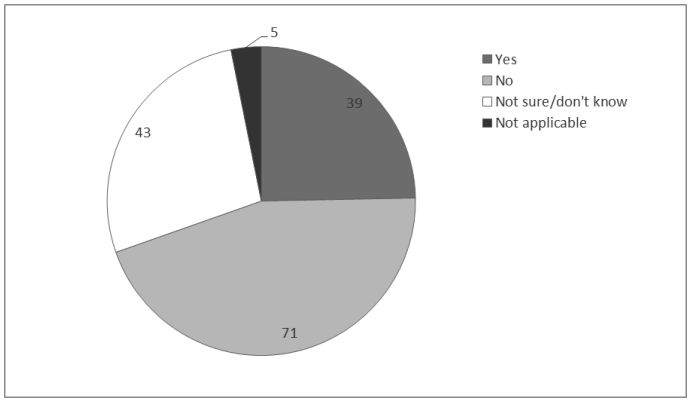

Figure 14: Fisherfolk's responses to the question "do you think climate change affects male and female fisherfolk in different ways?" (n=158)

When asked about the types of program or projects that the government was already undertaking to improve the livelihood of fishers their community, 75% of respondents said none, nothing or I don't know. The rest of fisherfolk mentioned the following types of initiatives: safety-at-sea training, implementation of FADs, construction of a building for seafood marketing, compensation after Hurricane Maria and small business loans.

Climate change attitudes

Figure 15 shows the distribution of composite climate change attitude scores for the global sample (A) and for each of the three fishing sites (B, C, D), expressed as a proportion of 1 instead of percentages. Fishers in Montego Bay, Kingstown and Roseau have a composite average attitude score of 56%, 57% and 59% respectively **[3d]**. Median composite scores for fisherfolk in Roseau are highest **[4]**, indicating that a greater proportion of fisherfolk attained higher scores than their peers in the other two sites. Composite scores for fisherfolk in Montego Bay and Roseau show less of a spread than those for fisherfolk in Kingstown.

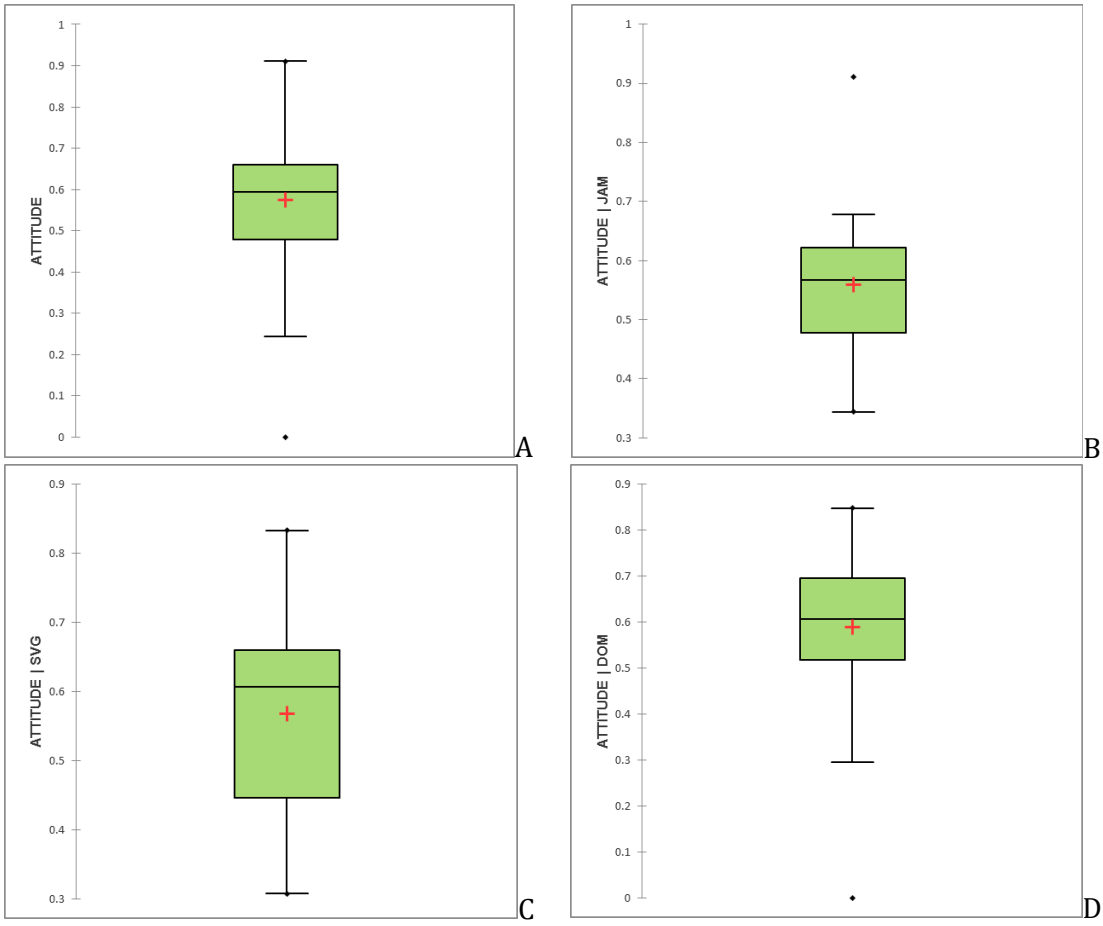

Figure 15: Boxplots showing the distribution of composite climate change attitude scores for (a) the sample as a whole; (b) fisherfolk in Montego Bay; (c) fisherfolk in Kingstown; and (d) fisherfolk in Roseau (n=161; 40; 60; 61, respectively). Composite scores are plotted on the y-axes and expressed as a proportion of 1, such that 1 = 100%. Median values are shown by the horizontal line in the box. Mean (average) values are shown by red crosses.

By considering the mean values of underlying indicators (urgency & importance; roles & responsibilities; ability to act / be protected) we observe the following:

Fisherfolk's attitudes toward shared responsibility for action [3b] are more positive than they are for problem awareness [3a] and ability to act or be protected [3c]. Attitude scores toward confidence in ability to act / be protected are spread across low and high scores, with a greater proportion of respondents in Montego Bay registering lower scores. Respondents across all study sites have a high

appreciation that action on climate change is an issue of shared responsibility. In terms of recognizing climate change as a key threat to fisheries, higher proportions of respondents in Montego Bay and Roseau register scores toward the higher end of the range than in Kingstown.

Information in Table 15 and Table 16 below sheds light on the nature of these **differences in attitudes toward climate change as a key threat**. On average, across the three pilot study sites, fishers do not see climate change as a top problem facing the fisheries sector. Day-to-day and economic issues – fuel price, market for catch and equipment cost – emerge as the most important problems. Results show important differences across sites. For example, fishers in Montego Bay see piracy and climate change as bigger problems than their peers in Kingstown and Roseau (Table 15).

Regarding stated levels of concern about the impacts of climate change, 78%, 52% and 64% of fishers from Montego Bay, Kingstown and Roseau, respectively, are "*very concerned*" (Table 16). It's worth noting that a greater proportion of fishers from Kingstown are "*somewhat concerned*" and "*unconcerned*" than fishers in the two other sites.

Problems facing the fisheries sector	Montego Bay (JAM)		Kingstown (SVG)		Roseau (DOM)		Total	
	Count N	%	Count N	%	Count N	%	Count N	%
Fuel price	35	87.5%	52	86.7%	36	59.0%	123	76.4%
Equipment cost	35	87.5%	19	31.7%	18	29.5%	72	44.7%
Market for catch	4	10.0%	46	76.7%	34	55.7%	84	52.2%
Poor fishing practices	20	50.0%	7	11.7%	5	8.2%	32	19.9%
Piracy	16	40.0%	1	1.7%	1	1.6%	18	11.2%
Climate change	12	30.0%	4	6.7%	9	14.8%	25	15.5%
Low catch	23	57.5%	17	28.3%	6	9.8%	46	28.6%
N	40	100.0%	60	100.0%	61	100.0%	161	100.0%

Table 15: Distribution of responses by fisherfolk sampled in Montego Bay, Kingstown and Roseau to the question *"what do you think are the most serious problems facing the fisheries sector today?"*

Concern about the impacts of climate change	Montego Bay (JAM)		Kingstown (SVG)		Roseau (DOM)		Total	
	Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %
Very concerned	31	77.5%	31	51.7%	39	63.9%	101	62.7%
Somewhat concerned	9	22.5%	24	40.0%	17	27.9%	50	31.1%
Unconcerned	0	0.0%	5	8.3%	4	6.6%	9	5.6%
N/A	0	0.0%	0	0.0%	1	1.6%	1	0.6%
N	40	100.0%	60	100.0%	61	100.0%	161	100.0%

Table 16: Distribution of responses by fisherfolk sampled in Montego Bay, Kingstown and Roseau to the question "How concerned are you about the impacts climate change?"

Fisherfolk acknowledge that a range of stakeholders have **responsibility for addressing climate change** (Table 17). However, according to their responses fishers tend to accord a greater degree of responsibility to external actors: industrialized countries, government officials and policymakers and the tourism sector.

Responsibility of actors along the fish value chain is seen as lowest for fish processors and highest for fisheries non-governmental organizations and fisherfolk organizations.

Responsibility for addressing climate change		Montego Bay (JAM)	Kingstown (SVG)	Roseau (DOM)	Total
		Average score	Average score	Average score	Average score
	Harvesters	3.5	2.9	3.5	3.3
	Fish processors	1.7	2.8	2.9	2.5
	Fisheries officers	4.7	4.1	4.4	4.4
	Policymakers	4.9	4.5	4.4	4.6
	Fisheries NGOs CBOs	3.0	3.9	3.5	3.5
	Private sector		4.0	3.0	3.5
	Fisherfolk organizations		4.0	4.0	4.0
	Industrialized countries		4.6	4.1	4.4
	Tourism stakeholders	4.6	4.5	3.6	4.2
	N	35	60	61	156

Table 17: Distribution of responses by fisherfolk sampled in Montego Bay, Kingstown and Roseau to the question "*How much responsibility would you say these groups have in addressing climate change impacts in the fisheries sector?*" 1=minor responsibility; 5=major responsibility

We asked fishers in Montego Bay about their **satisfaction with steps being taken to address climate change impacts** in the fisheries sector. Their responses revealed low levels of satisfaction, with no respondents expressing they were "very satisfied", about a tenth of respondents (4 of 40) "satisfied" or "neutral" and just over a quarter (11 in 40) "dissatisfied". Over half of respondents (25 of 40) either didn't know or didn't answer. Low levels of satisfaction could well relate to equivalent levels of knowledge on initiatives that are unfolding. We did not test this association explicitly due to the small sample size (and counts under 5).

We asked fishers in Kingstown and Roseau a series of questions related to recovery after a storm, including **assistance after a recent storm** and **beliefs about access to safety nets** in case they needed help. Responses indicate that the most significant contribution to coping capacity lies in the ability to lean on social safety nets. Just over half of respondents (66 of 121) stated they did have close family/friends that they could depend on if they needed extra help. Conversely, post-event assistance and access to cash savings may be harder to come by. Over half of respondents (77 of 121) claimed no one had reached out to help them after the storm hit and about half (69 of 120) would find it difficult or very difficult to get extra cash to pay for damages and losses after a storm.

Climate change practice

Figure 16 shows the distribution of composite climate change practice scores for the global sample (A) and for each of the three fishing sites (B, C, D), expressed as a proportion of 1 instead of percentages. Fishers in Montego Bay, Kingstown and Roseau have average composite practices score of 51%, 57% and 54% respectively **[6c]**. Median values of fisherfolk in Kingstown are highest **[4]**, indicating that a greater proportion of fisherfolk attained higher scores than their peers in the other two sites. Composite scores for fisherfolk in Montego Bay were estimated based on two survey elements as opposed to six, which is manifest in the peculiar distribution in Figure 16B.

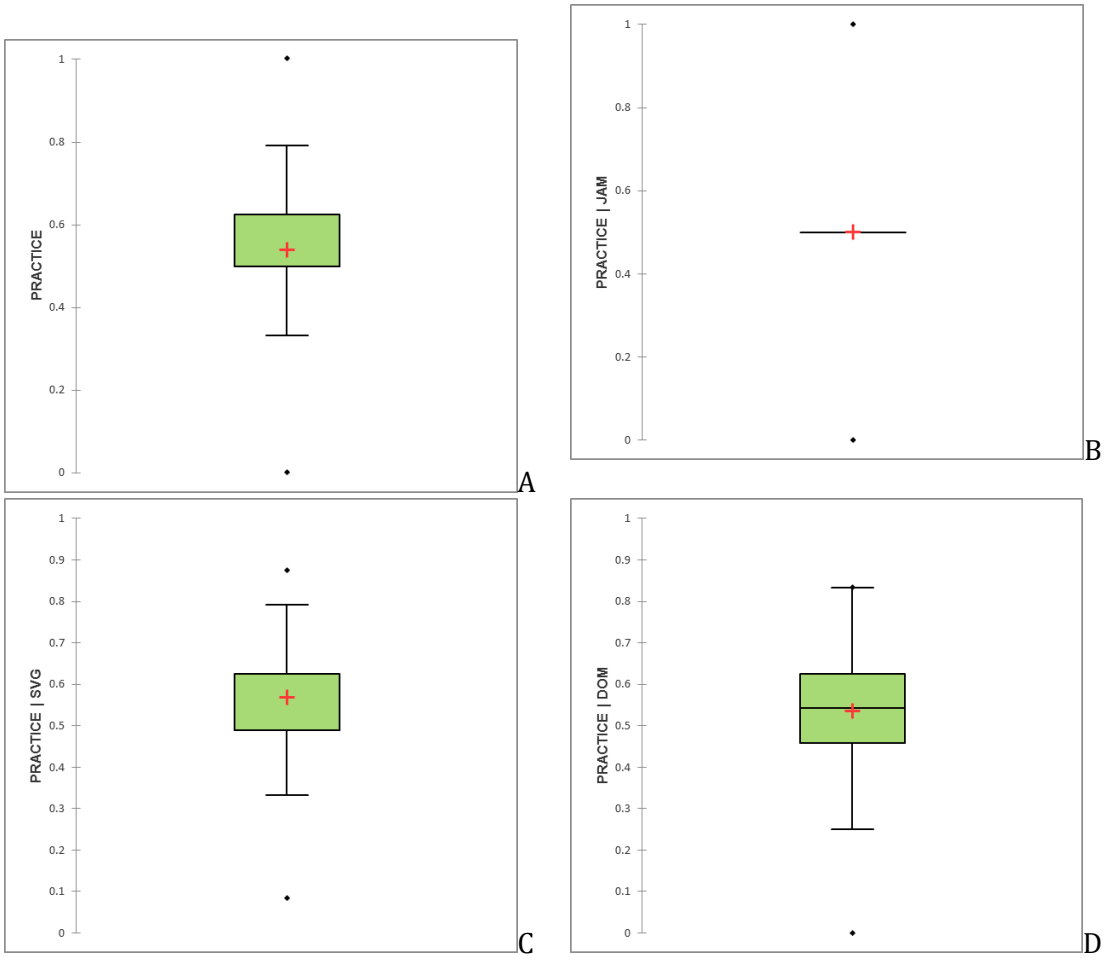

Figure 16: Boxplots showing the distribution of composite climate change practice scores for (a) the sample as a whole; (b) fisherfolk in Montego Bay; (c) fisherfolk in Kingstown; and (d) fisherfolk in Roseau (n=161; 40; 60; 61, respectively). Composite scores are plotted on the y-axes and expressed as a proportion of 1, such that 1 = 100%. Median values are shown by the horizontal line in the box. Mean (average) values are shown by red crosses.

By considering the mean values of underlying indicators (adaptation & DRR practices; use of information) we observe the following:

Fisherfolk exhibit behaviours that are helpful in adapting to climate change [6b] but report low levels of action to deal with climate change or prepare for an extreme event [6a]. A small proportion of respondents across the three sites report using desirable practices related to adaptation and disaster risk reduction (DRR). Levels of interest in climate change information exhibited opposite patterns, with a high proportion of respondents registering scores toward the high end of the range.

We explored adaptation and DRR by asking respondents in Montego Bay to relate **actions of community members to deal with climate change** and respondents in Kingstown and Roseau to tell us about **actions they took when they found out about a recent storm**. A majority of fishers in Montego Bay (29 of 40) reported no actions or actions more broadly environmental (e.g., waste reduction); the rest did not answer the question. Fishers in Kingstown and Roseau reported relevant actions to prepare in higher proportions: over three quarters of respondents (99 of 119) claimed they either secured their own or others' boats,

shifted their boats and fishing equipment to higher ground or stocked up on food, water and other essentials. A few respondents (9 of 119) either didn't have time to prepare or took no action.

Table 18 provides a breakdown of responses by fisherfolk in Kingstown and Roseau to a series of questions related to **emergency preparedness**. We used these questions as proxies to gauge practices in adaptation and DRR. Fishers' responses suggest a high level of confidence in their preparedness to deal with storms yet relatively low adoption of measures to reduce disaster risk. Levels of training in DRR and penetration of home and property insurance are particularly low.

Practices	Kingstown (SVG)		Roseau (DOM)		Total	
	Count N	Column %	Count N	Column %	Count N	Column %
Emergency kit & other protection supplies? (yes)	21	36%	20	33%	41	35%
Training in DRR? (yes)	4	7%	8	13%	12	10%
Insurance? (yes)	3	5%	7	12%	10	8%
Concern over own preparedness? (very little, little)	43	74%	33	55%	76	64%
Concern over neighbors' preparedness? (very little, little)	44	76%	34	57%	78	66%
Totals	58	100%	60	100%	118	100%

Table 18: Distribution of responses by fisherfolk sampled in Kingstown and Roseau to questions related to emergency preparedness

Fishers registered strong **interest in receiving more information about climate change impacts**. Almost all respondents (91% or 147 of 161) responded positively when asked this question. Additionally, about three quarters of respondents (72% or 117 of 161) shared their telephone number with field assessors, so that we could contact respondents about future project activities.[9] These behaviours, taken together with the examples of actions volunteered by respondents (recall examples from Table 14), suggest potential openness to climate change education and outreach.

The section on perspectives on communications explores the issue of how best to reach out to and engage fisherfolk through this project. However, we did consider results **on information sources through which fishers found out about a recent storm** (see Figure 17) as part of our assessment of climate change practice. A preferred practice is to rely on a source supplying official, reliable information, such as that provided through government-issued warnings transmitted via the radio, television and government websites. Further, consulting several sources can help triangulate conflicting information. A high percentage of respondents (70% or 85 of 121) reported finding out about the storm through the radio. And most respondents received the information from more than one source. A minority of respondents (7% or 9 of 121) either heard from only one source or didn't receive the information at all.

[9] This also served as a means of verification of completed surveys and to follow up directly with fishers if clarification is required for any response provided.

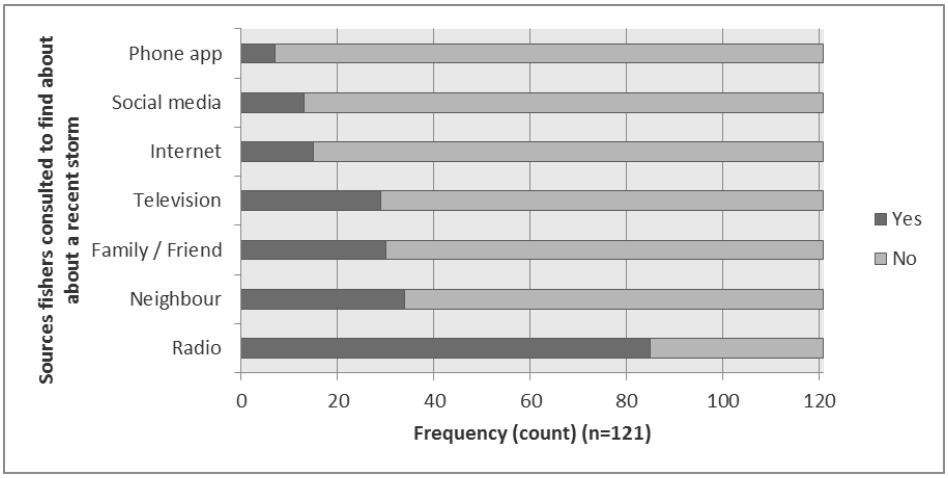

Figure 17: Responses provided by fishers in Kingstown and Roseau to the question "how did you find out about the storm?" (n=121)

Perspectives on impacts and viable responses

We asked fisherfolk about **observed impacts of climate-related hazards [7]**. Summary results are in Figure 18. From the perspective of fishers in our sample, hurricanes / storms, coastal flooding and coastal erosion have caused the most significant adverse impacts on their communities or fishing areas. Slow-onset changes like spread of invasive species and changing ocean currents have caused little impact, according to our sample of fisherfolk.

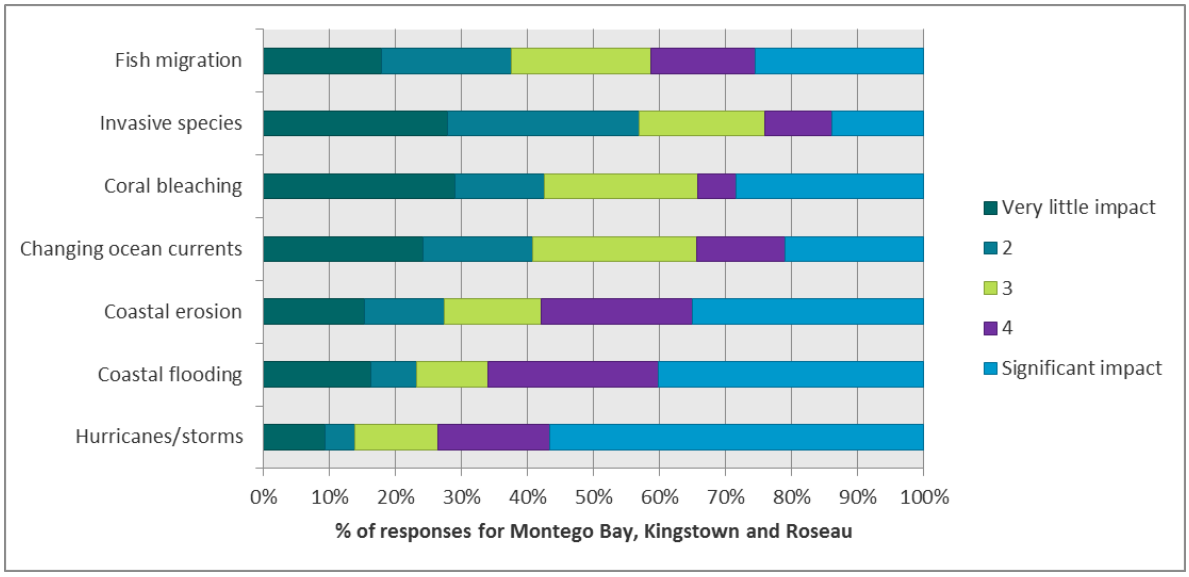

Figure 18: Combined responses provided by fishers in Montego Bay, Kingstown and Roseau to the question "on a scale of 1 to 5, how much would you say the following climate hazards have negatively affected your community / fishing area?" (n=157)

Local observations of adverse impacts of climate-related hazards differ by site **[7]**. The series of bar charts in Figure 19 below break out these local variations. Not surprisingly, fishers in Montego Bay rate coral bleaching as the climate hazard causing the most significant impact, with coastal erosion coming in second. Hurricanes / storms and coastal flooding are causes of most significant impact according to fishers Kingstown and Roseau. These differences in perspectives and experiences across sites can help

guide differentiations in communications for PPCR countries in Lesser Antilles / Eastern Caribbean compared to larger islands in the Western Caribbean.

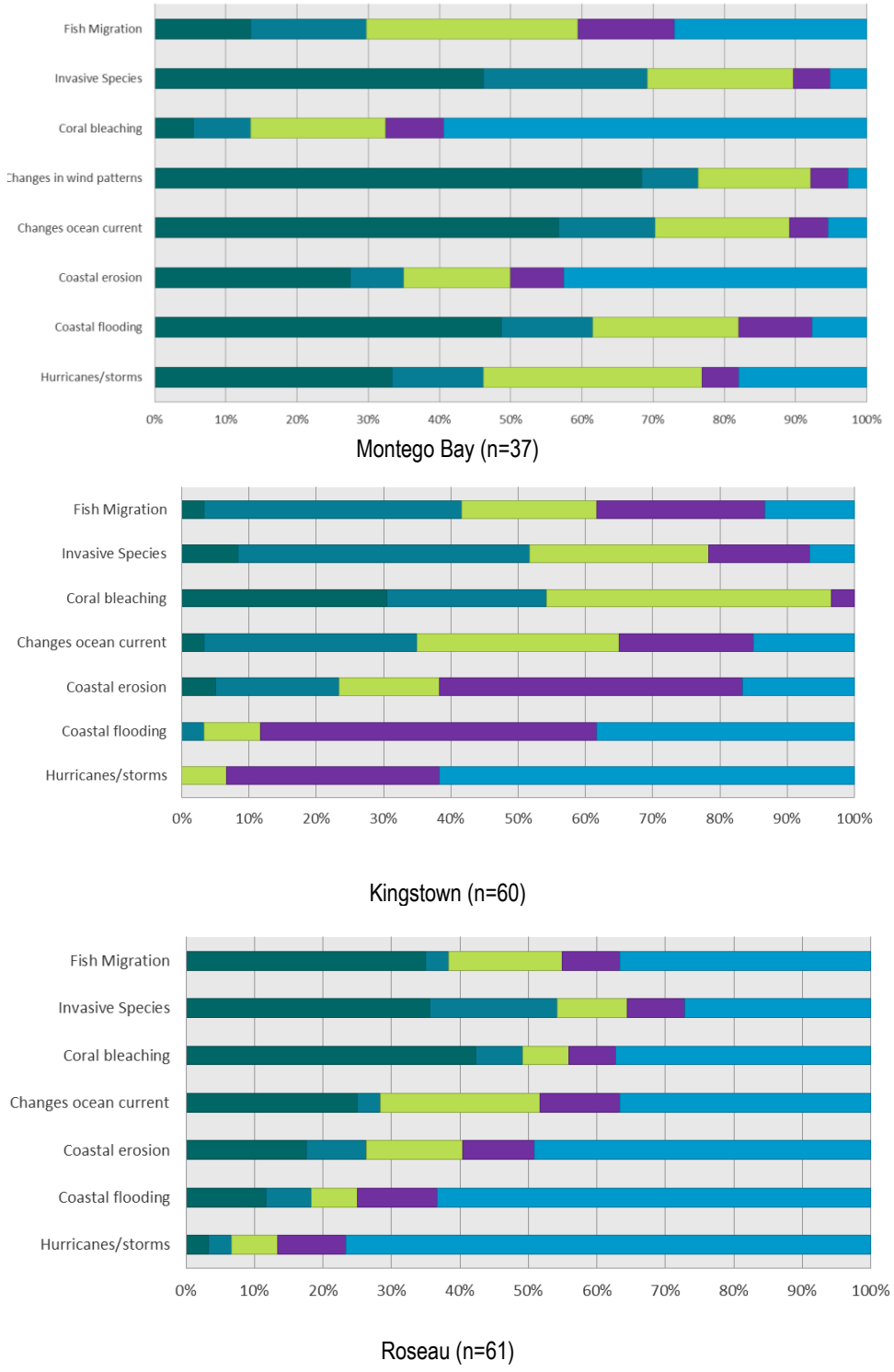

Figure19: Breakdown of responses provided by fishers in Montego Bay, Kingstown and Roseau to the question "on a scale of 1 to 5, how much would you say the following climate hazards have negatively affected your community / fishing area?" Blue = significant impact; purple=moderate impact; light green=neutral; dark blue=little impact; dark green=very little impact

We also asked fisherfolk to score **the feasibility of a range of adaptation options for fishers** on a scale of 1 to 5 (Table 19) **[8]**. On average, our sample of fishers see the use of fish aggregating devices (FADs), improved marketing, promotion of different fishing methods and improved post-harvest management (e.g., waste reduction) as the most feasible options to pursue as part of a portfolio of adaptation measures. Fishers in all sites scored FADs as highly feasible – this is the option that received highest scores. Beyond this shared view, perspectives on feasibility of options differ across sites. In Montego Bay sports-fishing / boat tours received the second-highest aggregate score, yet this option is not among the most feasible for fishers in Kingstown and Roseau. This could reflect the level of coupling of tourism activities with fisheries, which may be more strongly coupled in Montego Bay than in the two other sites. Fishers in Kingstown and Roseau show similar patterns in their ratings of most feasible options. The biggest difference is in their consideration of aquaculture.

	Perceived feasibility of range of adaptation options for fishers	Unit	Total	Montego Bay	Kingstown	Roseau
	Fish Aggregating Devices (FADS)	score /5	**4.7**	**4.3**	**4.9**	**4.8**
	Aquaculture (including mariculture)	score /5	3.1	3.0	4.1	2.2
	Sports fishing / boat tours	score /5	3.5	**4.1**	3.0	3.5
	Value-added processing	score /5	3.4	2.2	3.3	**4.7**
	Improved post-harvest management	score /5	**4.0**	3.0	**4.3**	**4.7**
	Target different species	score /5	3.5	3.1	3.1	4.2
	Promote different fishing methods	score /5	**4.1**	**3.9**	3.8	4.5
	Improved marketing	score /5	**4.7**		**4.6**	**4.8**
	Aquaponics	score /5	2.3			2.3

Table 19: Summary responses to the question "on a scale of 1 to 5, how feasible do you think the following options are?" (n=161) Note that the options "improved marketing" and "aquaponics" were not included in all survey questionnaires

Perspectives on communications

We elicited information on communication preferences and vehicles that could be most effective to reach out to fisherfolk **[9]**. When taken as a sample as a whole, fishers see face-to-face engagement through lectures and workshops as the **best way to provide climate change information to fisherfolk**. Just over half of respondents (55% or 89 of 161) marked this option as the most effective format; printed media (posters, pamphlets / brochures) follow in frequency (Table 20). The break out of responses by site suggests a low appreciation of artistic expression as an effective format and of faith-based organizations as effective vehicles for climate change communications with fisherfolk.

Best ways to provide information about climate change to fisherfolk	Montego Bay (JAM)		Kingstown (SVG)		Roseau (DOM)		Total	
	Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %
Pamphlets / brochures	14	35%	26	43%	8	13%	48	30%
Posters	10	25%	39	65%	7	11%	56	35%
Short videos	8	20%	9	15%	13	21%	30	19%
Bulletins	4	10%	9	15%	17	28%	30	19%
Lectures / workshops	34	85%	17	28%	38	62%	89	55%
Jingle	1	3%	1	2%	1	2%	3	2%
Songs	1	3%	7	12%	2	3%	10	6%
Faith-based organization	0	0%	0	0%	2	3%	2	1%
Poetry	0	0%	0	0%	0	0%	0	0%
N	40	100%	60	100%	61	100%	161	100%

Table 20: Summary responses to the question "what do you think are the most effective ways of communicating with fisherfolk in your community?" (n=161)

We further asked fishers in Montego Bay, Kingstown and Roseau for ideas on **who should be involved in climate change communications** with fisherfolk **[10]**. Table 21 shows the distribution of responses provided by fishers in the three sites. The role of government shows up strongly in these responses. About a third of respondents (32% or 51 of 161) think all ministries should be involved in general, and specifically the Fisheries Department, Emergency Management Agency and Environment Agency. Non-government actors mentioned with some frequency (a count of 5 or more across the 3 sites) include cooperatives / fishing complex, tourism operators and teachers / schools.

Agencies that should be involved in climate change communications with fisherfolk	Montego Bay (JAM)		Kingstown (SVG)		Roseau (DOM)		Total	
	Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %
Agriculture Department	2	5%	1	2%	0	0%	3	2%
Artists	0	0%	0	0%	1	2%	1	1%
Coast Guard	0	0%	1	2%	0	0%	1	1%
Cooperative / Fishing Complex	1	3%	9	15%	3	5%	13	8%
Emergency Management Agency	0	0%	27	**45%**	0	0%	27	**17%**
Environment Agency	13	**33%**	0	0%	0	0%	13	8%
Fisheries Department	10	**25%**	22	**37%**	14	**23%**	46	**29%**
Fishers	3	8%	1	2%	0	0%	4	2%
Government (all ministries)	5	**13%**	18	**30%**	28	**46%**	51	**32%**
Health Department	0	0%	0	0%	1	2%	1	1%
International Organization	0	0%	0	0%	1	2%	1	1%
Media	0	0%	0	0%	1	2%	1	1%
Weather Services	0	0%	0	0%	1	2%	1	1%
Mobile Provider	0	0%	0	0%	1	2%	1	1%
Private sector	1	3%	1	2%	0	0%	2	1%
Researchers	0	0%	0	0%	1	2%	1	1%
Teachers and Schools	1	3%	0	0%	4	**7%**	5	3%
Tourism operators (hotels, marine parks, dive shops)	5	**13%**	0	0%	0	0%	5	3%
N	40	100%	60	100%	61	100%	161	100.0%

Table 21: Summary responses to the question "please specify the stakeholders/agencies that should be involved in a climate change awareness campaign for the fishers in your community." (n=161)

To understand patterns of telecommunications and new media usage, we asked about **smartphone ownership [11]** and **use of different social media platforms [12]**. On average, half of respondents have smartphones (Table 22). Smartphone ownership is significantly higher among fishers in Montego Bay than in the other two sites, with 83%, 40% and 48% of respondents from Montego Bay, Kingstown and Roseau, respectively, responding positively to the question on smartphone ownership. The most popular mobile carrier is Digicel, with the greatest proportion of Digicel subscribers in Kingstown (see indicator [11] in Table). On average, about half of the respondents are social media users, although usage among fishers is lowest in Kingstown and highest among fishers in Roseau (Table 23). Among social media users, WhatsApp seems to be the platform most commonly used.

Smartphone ownership		Montego Bay (JAM)		Kingstown (SVG)		Roseau (DOM)		Total	
		Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %
	Yes	33	83%	24	40%	29	48%	86	53%
	Total	40	100%	60	100%	61	100%	161	100%

Table 22: Summary responses to the question "Do you have a smartphone?" (n=161)

Use of social media platforms		Montego Bay (JAM)		Kingstown (SVG)		Roseau (DOM)		Total	
		Count	%	Count	%	Count	%	Count	%
	None	22	55%	42	70%	16	26%	80	50%
	WhatsApp	12	67%	17	94%	27	60%	56	35%
	Facebook	1	6%	6	33%	18	40%	25	16%
	Snapchat	0	0%	3	17%	5	11%	8	5%
	Total	40		60		61		161	

Table 23: Summary responses to the question "Which of the following [social media platforms] do you use?" (n=161)

Linkages between variables

As an input to the design of the communications and stakeholder engagement strategy we explored patterns in knowledge, attitude and practice (KAP) scores. Figure 20 and Figure 21 show the distribution of average KAP scores by level of education (schooling) and age. Aside from sex, these are the socio-demographic variables most commonly explored to explain differences in levels of climate change knowledge, attitude and practice. Other KAP studies in the Caribbean have shown a positive correlation between education levels and climate change knowledge (e.g., PIOJ 2013). This pattern bears out in our dataset as well (Figure 20), where average composite knowledge scores are about 15 percentage points greater for fisherfolk with post-secondary education than they are for all other levels of education. Patterns in education levels and average composite scores concerning climate change attitudes and practice are less pronounced. And it stands to reason, since the formation of attitudes and behaviours are greatly influenced by experience.

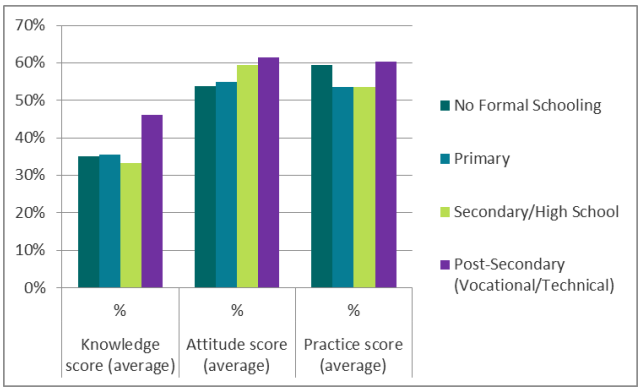

Figure 20: Relationship between level of schooling and average KAP scores (n=156)

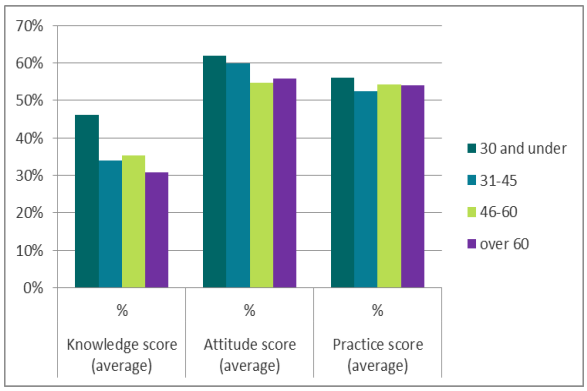

Figure 21: Relationship between age and average KAP scores (n=158)

Age arose as a factor to consider in designing and implementing communications activities during the Regional Planning Workshop in April 2018. Stakeholders at that workshop suggested that young fisherfolk, being more tech savvy, had more capacity to acquire information on climate change than older fisherfolk. They also observed that young fishers exhibited openness to embrace best practices (e.g.,

practices for safety at sea) more so than their older counterparts. Our data suggest that young fisherfolk (30 years old and less) are more knowledgeable about climate change than older cohorts; this group's average practice score is also slightly higher. Younger cohorts (30 and under, 31-45) also exhibit positive attitudes at slightly higher rates than fisherfolk over 45. Notwithstanding some of the observed patterns in the data, of 5 socio-demographic variables tested separately – age, level of schooling, fisher registration, employment status (full or part time fishing) and number of years fishing – none showed statistically-significant associations with levels of knowledge, attitude or practice.

Additional Chi-square and Pearson correlation tests revealed statistically-significant associations between the variables shown in Table 24. Three findings are worth noting and factoring into the design and implementation of our communications and stakeholder engagement strategy.

	Understanding of CC	Awareness of gendered nature of CC	Personal concern about CC	Composite practice score
Length of time spent fishing in a community		$\chi2$ (8)= 17.46, p= 0.02645		
Understanding of CC		$\chi2$ (4)= 19.87, p= 0.0005	$\chi2$ (4)= 18.68, p= 0.002	
Personal concern about CC		$\chi2$ (4)= 15.40, p= 0.0015		
Composite knowledge score			$\chi2$ (2)= 9.19, p= 0.0115	Correlation coefficient=0.373 p= < 0.0001
Composite attitude score				Correlation coefficient=0.352 p= < 0.0001
Composite practice score	$\chi2$ (2)= 13.71, p= 0.002	$\chi2$ (2)= 11.09, p= 0.004	$\chi2$ (2)= 6.42, p= 0.0345	

Table 24: Statistically-significant associations between categorical variables and correlation coefficients corresponding to interval variables

First, awareness that there are differences in how men and women are affected by climate change is influenced by fishing experience as well as understanding of, concern about and practices regarding climate change. This does not mean that fisherfolk sampled agree with or are pursuing actions toward gender equality but it does suggest an openness to accept that women and men in the fisheries sector face differentiated vulnerabilities to climate change and may respond in diverse ways (for example, due to differences in risk perception, Smith, 2018).

Second, attitudes about climate change, including levels of personal concern about impacts on the fisheries sector, are malleable in that they can be influenced by acquiring climate change knowledge and adopting desirable behaviours (from a preparedness and adaptive perspective). There is abundant literature on gaps between stated attitudes and behaviour, and whether attitudinal changes are a pre-requisite for changes in behaviour (e.g., Chaiklin 2011), which we are considering in the design of the communications and stakeholder engagement strategy.

Third, there is an intimate relationship between attitudes and practice but this relationship is complex, activating both internal (e.g., beliefs, upbringing, identity, access to information) and external (e.g., social norms) factors. One strategy that has emerged in scholarship on climate change communications is linking attitudes and behaviour through shared values (see Crompton and Lennon 2018). Raising awareness of climate change and promoting effective climate actions are a typical response to narrow the gap between perceptions and actions (e.g., Wei *et al*. 2014, in the case of health professionals). Baptiste (2018) studied factors driving climate change perceptions and behaviours among fishers in Jamaica and that research emphasized knowledge as a key driver for attitudes and behaviour. Baptiste also discussed the connection between lived experience (e.g., of negative environmental effects) and propensity to change behaviour.

Managers

Table 25 is a summary of 9 indicators we considered in this research. This section of the report presents findings on each. Because of the low response rate for this target group our approach is to identify broad patterns of potential importance for project activities instead of emphasizing quantitative aspects of the analysis. Throughout this section we refer to indicator values from this table by including the reference number in bolded brackets **[#]**.

REF	Summary indicators	Definition	Unit	Managers
				Total
	Sample size	Convenience sample, compiled database of managers [Managers]	n	112
	Response rate	Percentage of completed and partially completed surveys or interviews	%	24%
13	**Average knowledge score**	Average knowledge score of respondents		
13a	On climate change		%	63
13b	On climate change impacts / responses		%	42
13c	On current action		%	56
13d	Composite score		%	53
14	**Level of knowledge score**	Composite knowledge score at the midpoint of the distribution of scores (median value)	%	53
15	**Average attitude score**	Average attitude score of respondents		
15a	On urgency & importance		%	76
15b	On roles & responsibilities		%	59
15c	On levels of capacity relative to risk		%	83
15d	Composite score		%	73
16	**Level of positive attitude**	Composite attitude score at the midpoint of the distribution of scores (median value)	%	79
17	**Average practice score**	Average practice score of respondents		
17a	On adaptation & DRR		%	70
17b	On use of information		%	60
17c	Composite score		%	65
18	**Level of desired practice**	Composite practice score at the midpoint of the distribution of scores (median value)	%	66
19	**Perceived impact of climate hazards**	Average significance score of respondents (5 = very significant impacts observed)		
	Hurricanes/storms		score /5	3.9
	Coastal flooding		score /5	3.6
	Coastal erosion		score /5	3.9
	Changes in ocean currents		score /5	3.1

REF	Summary indicators	Definition	Unit	Managers
				Total
	Coral bleaching		score /5	3.6
	Invasive species		score /5	3.5
	Fish migration		score /5	3.5
20	**Perceived importance of options to reduce climate change impacts in the fisheries sector**	Average importance score of respondents		
	Fish Aggregating Devices (FADS)		score /5	3.2
	Aquaculture (including mariculture)		score /5	4.4
	Promote different fishing methods		score /5	4.6
	Target different species		score /5	4.0
	Value-added processing		score /5	4.3
	Improved marketing (including different species)		score /5	4.1
	Protect assets from extreme weather		score /5	4.7
	Early warning systems		score /5	4.6
	Education and awareness campaigns		score /5	4.8
	Integrate climate change risk in management plans		score /5	4.6
	Increasing uptake of insurance		score /5	4.3
21	**Best ways to provide climate change information to fisherfolk**	Communication methods selected by 50% or more of respondents		Short videos 75%; Jingle 69%; Lectures / workshops 63%; Posters 50%

Table 25: Summary indicators on climate change knowledge-attitudes-practice (KAP), perceived impacts and feasibility of responses and communications for managerial-level respondents to online surveys

Climate change knowledge

According to our analytical framework, managers have an average composite climate change knowledge score of 53% **[13d]**; the median composite score is also 53% **[14]**. By looking at average scores for underlying indicators we observed that **managers are more knowledgeable about the causes of climate change [13a] and current government actions that could boost resilience [13c] than they are of climate-related impacts on fisheries and responses [13b].** The proportion of respondents achieving low and high average scores related to current government actions is almost evenly split. Conversely, levels of knowledge of climate change and its causes and of climate-related impacts, including gender-differences in vulnerability, are not as even. More than half of respondents received an average score on understanding of climate change and its causes toward the high end of the range; conversely, only about a quarter of respondents received score toward the high end of the range on understanding of climate-related impacts.

In **describing the term "climate change"** managers tended to highlight the temporal dimension of the problem, its anthropogenic link and examples of physical and biological changes. Descriptions ranged in level of detail provided. Table 26 includes examples of respondents' explanations.

Managers
Time • Any change/deviation from the normal weather conditions over a long-term/ observation period • Change in climate over a period of time • This refers to the differences that presently occur in climatic conditions as compared to previous times in the past. For example having more intense dry periods now as opposed to past years
Greenhouse gas emissions • Change in global climate patterns due mainly to increased carbon dioxide levels from use of fossil fuels • Changes to atmosphere and ocean due to increased carbon • A change in climate patterns either local, regional and global due to the increased levels of carbon dioxide in the atmosphere and produced by the use of fossil fuels • Change in climate patterns over time attributed to the use of fossil fuels
Causal pathways • Change in climate over a period of time: increase temperatures, sea level rise, destruction of ozone layer, more intense storms and drought, which result in emergencies • The long term change in weather /climate mostly caused by anthropogenic effects resulting in the increased warming of the earth's temperature. These increased temperatures have resulting in increased sea levels, more extreme weather variations and other long term effects • Climate change is a consequence of human activities leading to CO_2 concentrations increasing into the atmosphere and increasing temperature and decreasing pH in oceans. Those physical and chemical parameters negatively affect aquatic organisms. Sea levels are also increasing. All those aspects have consequences on the food security for human and animals

Table 26: Examples of managers' responses to the question "Please explain what you understand by the term climate change?"

We asked managers about **the main causes of climate change** and the responses of about three quarters of respondents were accurate (17 of 22). The rest either attributed climate change to natural occurrences, a creator (God) or broader socio-economic phenomena like globalization or industrialization.

We examined managers' understanding of climate change impacts by reviewing their examples of (1) consequences to the fisheries sector from climate hazards and (2) key climate change-related messages to highlight to small-scale fishers. The strongest **examples of consequences to the fisheries sector from climate hazards** were ones that actually built on the climate hazards we listed to observed or potential consequences to the sector, such as "*damage to fishing vessels, equipment and docking facilities by storms or severe weather*", "*invasive species of fish and weeds that affect fish catch*" and "*traditional species are migrating because of warmer temperatures and coral bleaching*". About half of the respondents gave such examples (10 of 22). The weakest examples were overly generic (e.g., "negative economic impacts") or repetition of climate hazards listed as part of the question.

Managers' responses to our question on **key climate-change related messages to highlight to small-scale fishers** suggest a good level of knowledge on how to make the case for adaptation to fisherfolk, through framing as an economic/livelihoods issue and by sharing action-driven messages (Table 27). Responses also suggest low levels of understanding among some respondents on how climate change impacts and adaptation differ from broader issues of environmental degradation.

Managers	
Shared responsibility • Climate change is everybody's business -less fish, less catch, less money • Climate change is inevitable - everyone has a part to play	**Ecosystem-livelihood links** • The importance of coral reef health to fisheries
Responsible development and fishing • Land based pollution will affect fish population -i.e., fisherman's income • Economic importance of sustainable fishing • Stop pollution • Adopt good agricultural practices • Reduce over fishing • Pollution is destroying the fisheries habitat • Change the way they do business	**Adaptation imperative and action** • The need to adapt, re-organize and be resilient to climate change impacts • The sharing of information to the sector that shows overwhelming evidence that climate is changing • Build resilience and implement adaptations • Invest to protect livelihood, boats and gear • Work with your fisherfolk organization to make climate change-related issues such as shoreline protection, adjustments to physical fisheries infrastructure, and adjustments to fishing operations (change of boats, fishing grounds, use of renewable energy, fisher insurance) an election issue
Livelihood impacts • Livelihood impact - how climate can impact income and providing for your family • Damage to equipment and investments • Climate change is changing your catch • Show the impacts and effect on livelihoods and primary production	

Table 27: Examples of managers' responses to the question "What do you think are three key climate-change related messages to highlight to small-scale fishers in the country / countries where you work?"

Just as we did for fisherfolk, we explored **managers' knowledge of gender-differentiated vulnerability** to climate change. A majority of respondents (72% or 16 of 22) either are not sure about gender-based differences or left the question unanswered. Responses indicate some awareness of different roles between men and women in the fish value chain (e.g., "*Fish vendors are predominantly female and very important to the sales from fishers. They are also often boat owners*.").

Climate change attitudes

Managers have a composite average climate change attitude score of 73% **[15d]** and a median composite score of 77% **[16]**. In examining average values for underlying indicators we observe that **managers' attitudes toward problem awareness [15a] and capacity levels relative to risk [15c] are more positive than they are for shared responsibility for action [15b].** The proportion of respondents registering positive attitudes toward recognizing climate change as a key threat to fisheries are almost evenly split between the low and high end of the range. Respondents have a high regard for confidence in ability to act, with a strong majority of respondents achieving scores toward the high end of the range. Attitudes are least positive when it comes to recognizing that action on climate change is an issue of shared responsibility.

Information in Table 28 and Table 29 provides underlying context on **attitudes toward climate change as a key threat**. Managerial respondents to the online surveys see climate change as the top problem facing the fisheries sector, on par with pollution. Concerning stated levels of concern about the impacts of climate change, the majority of respondents (83% or 15 of 18) are "*very concerned*". These results are not surprising given the self-selection bias demonstrated by managers in responding voluntarily to this survey (i.e., managers who responded are likely to feel strongly about climate change issues to be begin with).

Problems facing the fisheries sector		Total Average score
	Climate change	4.8
	Pollution	4.8
	Depleted stocks of marine species	4.5
	Habitat loss or destruction	4.3
	Increased input and labour costs	4.3
	Invasive species	4.2
	Conflicting uses of marine and coastal resources	4.2
	Changes in consumer preferences	4.1
	Bycatch	4.0
	Conflicting regulations	3.9
	Disease	3.8

Table 28: Distribution of managerial-level responses to the question "what do you think are the most serious problems facing the fisheries sector today?" (n=10)

Concern about the impacts of climate change		Total	
		Count	Column N %
	Very concerned	15	83%
	Somewhat concerned	3	17%
	Unconcerned	0	0%
	N	18	100%

Table 29: Distribution of managerial-level responses to the question "How concerned are you about the impacts climate change?" (n=18)

Managers see a range of stakeholders as having **responsibility for addressing climate change**. The perception exists among some that government has the main responsibility for acting: 16 of 18 respondents registered this view (Table 30). When asked to rate levels of responsibility by stakeholder, managers allocated an almost equivalent level of responsibility to fisheries officers, policymakers and fisherfolk, on average (Table 31).

Main responsibility for addressing climate change in the fisheries sector		Total	
		Count	Column N %
	Government	16	89%
	Community organizations	10	56%
	Private sector	9	50%
	Citizens	6	33%
	Industrialized countries	6	33%
	Everyone	5	28%
	International NGOs	3	17%
	N	18	

Table 30: Distribution of managerial-level responses to the question "Who do you think is mainly responsible for addressing climate change in the fisheries sector?" (n=18)

Responsibility for addressing climate change		Total
		Average score
	Fisheries officers	4.1
	Policymakers	4.1
	Fisherfolk (i.e., fishers, fish vendors)	4.0
	Fisheries NGOs CBOs	3.8
	Fish processors	3.7
	Tourism stakeholders	3.5
	N	18

Table 31: Distribution of managerial-level responses to the question "How much responsibility would you say these groups have in addressing climate change impacts in the fisheries sector?" 1=minor responsibility; 5=major responsibility (n=18)

We asked managers about their satisfaction with the **steps being taken to address climate change impacts on the fisheries sector in the country / countries** where they work. Their responses revealed relatively high levels of satisfaction. Although no respondents expressed they were "very satisfied", 14 of 18 (about three quarters of respondents) were "satisfied" or "neutral". One respondent was "very dissatisfied" and provided a detailed explanation for why: "*it appears that climate change is a secondary issue and very little work is being done on the ground to combat climate change, both in terms of ensuring there is a high degree of resilience and habitats are not further degraded, but also in terms of putting in measures to combat the already apparent effects of climate. There also needs to be more emphasis placed on tracking the effects at a local level so that management of its effects can be adapted to the local/ community level situation"*.

Climate change practice

Managers have a composite average climate change practice score of 65% **[17c]** and a composite median score of 66% **[18]**. In assessing average values of underlying indicators we observe that **managers report behaviours that are helpful in adapting to climate change more often than not, including integrating climate change into strategic and operational decisions [17a] and accessing climate information from reliable sources [17b].** The proportion of respondents registering desirable practices related to adaptation and disaster risk reduction (DRR) is almost equally distributed between high and low ends of the range, with a slightly greater proportion of respondents achieving a high score. Concerning use of climate change information, a majority of respondents achieved low scores.

We explored adaptation and DRR by asking respondents to relate **actions people in the fisheries sector were undertaking to deal with climate change**, to tell us about their current practice in **incorporating climate change into strategic or operational decisions** and to **recommend strategies and operational measures to reduce the impacts of climate change** on the fisheries sector. The strongest responses were those suggesting that a portfolio of actions were being taken, from improving fisheries management (gear, training in sustainable practices), to diversifying livelihoods and operations and improving risk communication across the value chain. Seven in ten respondents claim to integrate climate change in their decisions. Further, seven in ten recommend strategies and measures that specifically address climate risk. Some of those same respondents recommend strategies to reduce non-climate stressors. A minority recommend generic practices or GHG mitigation measures. Table 32 contains examples of respondents' recommendations on future actions.

Managers	
Resource management & conservation policy instruments • Ease fishing pressure & create seasonal 'No-Take' zones • Preserve coastal areas / more sustainable development • Develop storm water/ breakwater management practices • Build sustainable infrastructures to reduce run-off waste • Manage water quality and reef protection • Habitat restoration of coastal ecosystems • Increased law support in upholding fish / wildlife laws • Strengthen coastal fish landing and processing facilities	**Fishing regulatory instruments** • More stringent enforcement capacity with adequate funding • Proper enforcement on fishery regulations • Implementation of size restrictions for reef fish • Enforceable requirements to utilize larger mesh size • Smart gears and techniques • Change in catch technique and gear
Market-based instruments • Insurance coverage for vessels and equipment • Financing mechanisms • Value chain improvements	**Information, education and communication** • Change in the culture and dependency on reef fishery • Training on alternative species or use of marine resources • Public education targeting consumers as the market is driven by their preference for size and species • Increased risk communication - information sharing and how it impacts livelihood • Increased early warning system for fishers • Increased resource valuation methods to better communicate the importance of affected ecosystems to everyday lives • Public awareness and fisher education
Institutional change and advocacy • Incorporating climate change into all project designs • Lobbying the government • Improving enforcement of legislation and fast tracking of the fisheries bill • Resilience planning • Development of a National CC Policy and Plan	**GHG mitigation and pollution abatement** • Retrofit factories to achieve cleaner emissions • Cleaner emission from vehicles • No slash and burn to clear farm land • No burning of waste

Table 32: Examples of managers' responses to the question "what strategies and operational measures do you think should be considered to reduce the impacts of climate change on the fisheries sector in the country / countries where you work?"

Mangers consult a range of **sources to get information related to climate change**. We asked managers to identify sources they used, as a close-ended question. We only received 10 responses to this question. About a third of respondents (3 of 10) indicated they turned to CRFM and the Caribbean Community Climate Change Centre (5Cs), among others. All but one respondent reported consulting more than one source of information on climate change. Overall, websites, academic literature and government / NGO reports are the top three sources selected by respondents.

Perspectives on impacts and viable responses

We asked managers about **the adverse effect to the sector of climate-related hazards [19]**. Summary results are in Figure 22. Managers rate hurricanes / storms, coral bleaching, coastal erosion and invasive species as hazards that have caused most significant impact in the countries where they work. Perspectives on ocean acidification are diverse; it received ratings at all levels of the scale and in almost equal proportions. The high level of impact registered for coral bleaching is influenced by the extent of Jamaican representation in the sample.

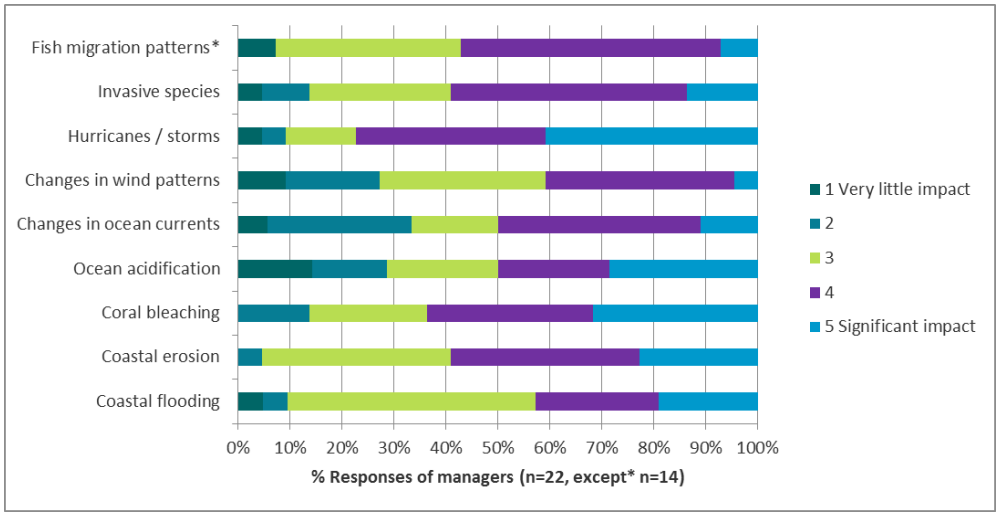

Figure 22: Responses provided by managers to the question "how much would you say the following changes have negatively affected the fisheries sector in the country / countries where you work? (Rate on a scale of 1 to 5; 1=no impact...5=extreme impact)"

We also asked managers about **their personal level of concern over climate-change related threats to the fisheries sector.** Summary results are in Figure 23. The response rate on this question was low so caution is warranted in drawing inferences. Managers are somewhat to very concerned about 5 of the 13 listed threats. These threats span ecological (biodiversity, habitat), social (food security, health) and economic (harvesting income) domains. Managers are least concerned about the increased presence of migrant fishers, business interruption and the disruption of critical services – all secondary or indirect threats from climate change.

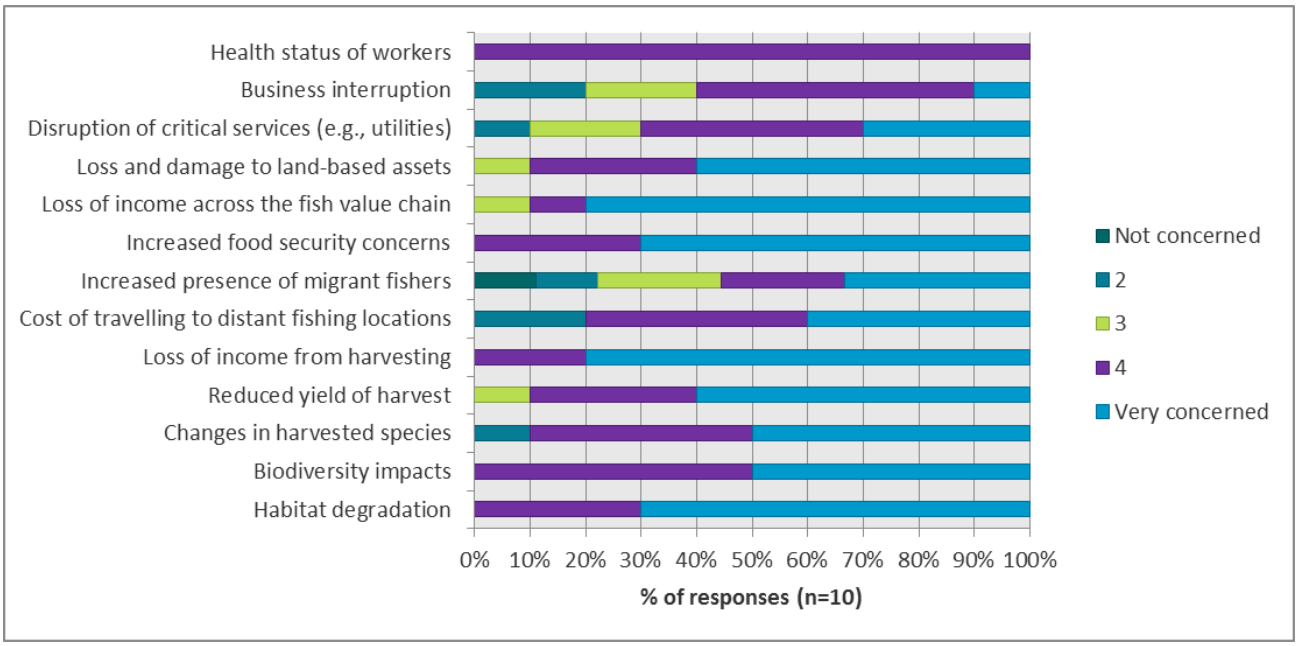

Figure 23: Responses provided by managers to the question "what is your personal level of concern about the following climate change-related threats to the fisheries sector? (Rate on a scale of 1 to 5; 1=not concerned; 5=very concerned)"

With respect to the perceived **importance of a range of adaptation options for the fisheries sector [20]** education and awareness campaigns as well as protection of assets from extreme weather received the highest average scores (Table 33). Promoting different fishing methods, early warning systems and integration of climate change into management plans were next in importance and seen as equally so. The least important option, according to average scores, was the use of FADs. This was the option considered most feasible by fisherfolk in our sample.

Perceived importance of options to reduce climate change impacts in the fisheries sector	Unit	Total
Education and awareness campaigns	score /5	4.8
Protect assets from extreme weather	score /5	4.7
Promote different fishing methods	score /5	4.6
Early warning systems	score /5	4.6
Integrate climate change risk in management plans	score /5	4.6
Aquaculture (including mariculture)	score /5	4.4
Value-added processing	score /5	4.3
Increasing uptake of insurance	score /5	4.3
Improved marketing (including different species)	score /5	4.1
Target different species	score /5	4.0
Fish Aggregating Devices (FADS)	score /5	3.2

Table 33: Summary responses by managers to the question "how important do you think the following options will be in reducing climate change impacts in the fisheries sector over the next 10 years? (Rate on a scale of 1 to 5; 1=not at all important; 5= extremely important)"

Finally, we asked managers to identify the most significant **challenges their organization faces in addressing climate change** (Figure 24). The top three challenges respondents noted relate to capacity: the cost of adapting (the implication being it's too expensive for them to adapt), insufficient staff resources and technical capacity. Managers did not register opposition from stakeholders or the public or lack of organizational leadership as challenges to action, indicating good potential to move forward if other structural (e.g., legal mandate, political will) and capacity-related assets are in place. Except for one respondent, managers do not see the lack of information on climate change (e.g., temperature trends, outputs of climate models) as a challenge to acting. Information gaps may lie in evidence that links climate change to biophysical and socio-economic shifts; half of the respondents identified lack of climate impact information as a challenge.

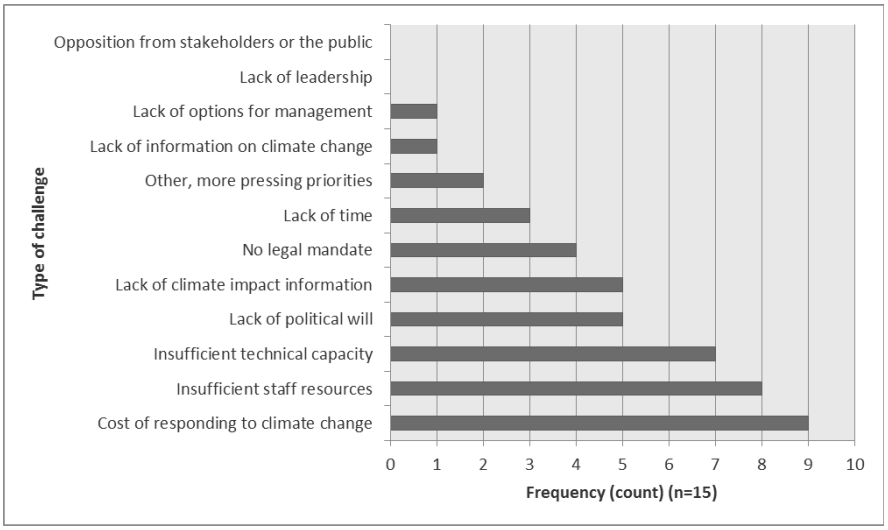

Figure 24: Responses provided by managers to the question "what challenges does your organization face in addressing climate change?"

Perspectives on communications with fisherfolk

Most managers' organizations play roles in outreach to fisherfolk or directly engage with fisherfolk. Therefore, to build on their communications experience, we asked respondents about **the most effective way of providing climate change information** to fisherfolk (Table 34) **[21]**. Overall, managers in our sample see short videos as most effective, with three quarters of respondents (75% or 12 of 16) marking this option. Jingles and face-to-face engagement through lectures and workshops follow in frequency, with over half of respondents marking these options. Half of the respondents see posters are the most effective format. As was the case with fisherfolk, artistic expression and faith-based organizations rate poorly as effective vehicles for climate change communications with fisherfolk.

Most effective ways of providing climate change information to fisherfolk		Total	
		Count	Column N %
	Short videos	12	75%
	Jingle	11	69%
	Lectures / workshops	10	63%
	Posters	8	50%
	Pamphlets / brochures	5	31%
	Faith-based organization	4	25%
	Songs	3	19%
	Poetry	1	6%
	N	16	

Table 34: Summary responses to the question "what are the best formats for providing information about climate change to fisherfolk in the country / countries where you work?" (n=16)

Further, we asked managers about the **most effective media for communications with fisherfolk** and word of mouth clearly stood out (Table 35). Radio and community meetings / workshops were next in frequency with over 60% (9 of 15) or more of respondents selecting these options. A minority of managers selected communications via text messages and newspaper as most effective media.

Most effective media to communicate with fisherfolk	Total	
	Count	Column N %
Word of mouth	14	93%
Radio	13	87%
Community meetings or workshops	9	60%
Television	7	47%
Social media (e.g., Facebook, Instagram)	4	27%
Newspaper	2	13%
Text messaging	1	7%
N	15	100%

Table 35: Summary responses to the question "what do you think are the most effective ways of communicating with fisherfolk in the country / countries where you work?" (n=15)

Policy Actors

Table 36 is a summary of 6 indicators we considered in this research. This section of the report presents findings on each. These findings stem from in-depth interviews with 4 senior-level representatives of the Caribbean Fisheries Forum and are indicative of the views of this target stakeholder group. Throughout this section we refer to indicator values from this table by including the reference number in bolded brackets **[#]**.

REF	Summary indicators	Definition	Unit	Policy actors
	Sample size	All members of the CRFM Ministerial Council and Caribbean Fisheries Forum of the 6 PPCR countries	n	12
	Response rate	Percentage of completed and partially completed surveys or interviews	%	33%
22	**Knowledge areas**	Qualitative summary of responses to related questions		
	On climate change		Qual	Definitions of climate change focus on long term changes in weather patterns and resulting effects. The cause of climate change is attributed to GHG emissions by human activities, with one exception.
	On climate change impacts / responses			
23	**Attitude areas**	Qualitative summary of responses to related questions		
	On roles & responsibilities		Qual	Unanimous in seeing adaptation as a responsibility shared by all stakeholders. Confidence in ability to act or improve the situation dampened by gaps in capacity ($, human resources), scientific understanding, monitoring and ability to detect CC signal as well as implementation of
	On levels of capacity relative to risk			

REF	Summary indicators	Definition	Unit	Policy actors
				specific measures.
24	**Practice areas**	Qualitative summary of responses to related questions		
	On adaptation & DRR		Qual	Climate change is starting to be "mainstreamed" into fisheries and aquaculture policy. Enabling tools include adaptation plans. Responsible fishing, diversification and fisher involvement in monitoring are desired practices. The expectation is to use PPCR project information as inputs to education, project finance and measuring adaptation effectiveness.
	On use of information			
25	**Perceived impact of climate hazards**	Average significance score of respondents (5 = very significant impacts observed)		
	Hurricanes/storms		score /5	4.0
	Coastal flooding		score /5	3.3
	Coastal erosion		score /5	3.5
	Changes in ocean currents		score /5	2.7
	Coral bleaching		score /5	3.3
	Invasive species		score /5	3.3
	Fish migration		score /5	2.7
26	**Best ways to provide climate change information to fisherfolk**	Communication methods selected by 50% or more of respondents		Lectures / workshops; Radio; Posters
27	**Preferred agencies to involve in climate change awareness campaign**	Top 3 most frequently mentioned type of agency		Fisheries Cooperatives; Tourism Operators; ENV/SD**

Qual=qualitative **ENV/SD=Ministries, departments and agencies with a mandate for environment and / or sustainable development. Government Fisheries Department or Units were taken as a given.

Table 36: Summary indicators on climate change knowledge-attitudes-practice (KAP), perceived impacts and communications issues analyzed from interviews with policy actors

Climate change knowledge, attitudes and practice

When asked to **describe the term "climate change"** all respondents answered accurately, although the level of detail of their responses varied. The simplest response equated climate change to the effect of global warming and the most detailed response referred to long-term changes in weather patterns and their effects. Responses to a question on the **causes of climate change** were also accurate, with the exception of one respondent who continued to mention the effects instead of focusing on human activities and greenhouse gas emissions **[22]**.

Attitudes **[23]** on **roles and responsibilities to address climate change** were shared across respondents, with a consensus view that all stakeholders played important roles. Even so, the recognition exists of the coordination or catalytic role of government. One respondent asserted that *"while government has a lead role, it needs to be supported by all other stakeholders"*.

Respondents exhibit a moderate level of **satisfaction with the steps being taken to address climate change impacts** in the fisheries sector. Reasons for this include the following:

- Gaps in project management capacity and the ability to maximize benefits flowing from regional projects
- Lack of scientific information, which is a barrier to turning uncertainty (on what to adapt to and where) into an assessment of risk
- Until recently most large adaptation projects focused on land-based sectors and problems

- Even in cases where risk and types of responses are clear, low policy and advocacy capacity slows down action

Organizational challenges in addressing fisheries adaptation stated by respondents often related to capacity (financial, human resources, implementation and research). Table 37 below highlights examples of specific organizational challenges mentioned by policy actors, many of which are common to adaptation progress generally and not unique to adaptation in the fisheries sector in the Caribbean.

Lack of awareness	• There's not sufficient recognition of climate change and its multiple impacts and risks
Insufficient staff resources and technical skills	• The biggest challenge is human resources. Climate change is a new area for the fisheries staff. • We need more training and an infusion of new persons with appropriate training.
Lack of detailed information on climate change and its impacts	• We need relevant, accurate data to be able to request funding that is earmarked for climate change projects. One of the greatest challenges is making the distinction between anthropogenic versus natural causes of impacts. • Lack of detailed information that can guide us to make informed decisions.
No legal / institutional mandate	• Climate change is not adequately mainstreamed in government, so there are a lot of gaps. • Implementation of adaptation has been slow and sporadic

Table 37: Examples of policy actors' responses to the question "What is your organization's greatest challenge in addressing climate change related to fisheries?"

We further asked respondents about **gaps / challenges in fisheries adaptation that were not being addressed**. From the perspective of policy actors we interviewed challenges that are either unaddressed or inadequately addressed include awareness of fisherfolk, lack of specificity of policy and management tools and weaknesses in status and trend and effectiveness monitoring. Table 38 highlights respondents' ideas on solutions to address these challenges.

Gaps not being addressed	Ideas on solutions
The need to increase fishers' awareness of climate change, its impacts and adaptation measures	• Improving effectiveness and efficiency of communication and transmission of messages. Time is a real challenge.
Policies do not speak specifically to climate change and therefore do not address practical processes to mitigate or adapt to climate change	• Devising practical solutions and standard arrangements, including thresholds and delineation of at-risk zones to guide wise decisions • Creating financial incentives for fishers to mitigate the risk of disaster upfront rather than wait to respond to the destruction caused by the disaster (traditional approach). Switching to proactive strategies
Research and monitoring to understand the impacts of climate change on habitat and stocks and track migration of fished species	• Establishing partnerships (e.g., with academia) as an alternative way of financing research programs for fisheries management • Strengthening institutions and ongoing staff training to improve monitoring and evaluation (M&E) capacity
We are implementing adaptation measures but have limited ways of understanding their impact / effectiveness	• Putting M&E systems in place • Improving capture of baseline information about what is happening, as a way to inform planning • Engaging fishers in supporting monitoring so as to build on their local knowledge of their environment

Table 38: Examples of policy actors' responses to the question "What are some of the gaps/ issues around climate change and fisheries that are not being addressed (adequately)?"

With respect to practices **[24]**, all countries reported **fisheries legislation and regulations that can enable adaptation**, although the degree to which these instruments specifically address climate change varies. National **climate change policies and sector-specific adaptation plans** are also referenced and all countries represented in the sample have these. Potential **measures to reduce risk and future impacts of climate change in the sector** highlighted by respondents include the following:

- Boosting research, monitoring, information and knowledge management systems, on a partnered basis
- Using the knowledge and science base to devise models that illustrate management thresholds and triggers
- Retraining fishers in safety at sea techniques to cope with rougher seas and unpredictable weather
- Climate-proofing fisheries infrastructure, vessels and equipment used for fishing
- Increasing penetration of (property) insurance among fishers
- The 30+ measures in St. Lucia's sector-specific adaptation plan

Respondents offered a number of suggestions on **things fishers could do to reduce the impacts of climate change on their communities**. Responses clustered in five themes: (1) responsible fishing, (2) organization (e.g., fishing cooperatives), (3) diversification (of species, methods), (4) optimization and improving value added and (5) informing authorities.

With regard to the **potential use of information** resulting from this project, respondents see the benefit of having access to up-to-date assessment information, but clarity on how to use the information in fisheries management is critically important.

Perspectives on impacts

We asked policy actors about **the adverse effect to the sector of climate-related hazards [25]**. Summary results are in Figure 25. Respondents rated hurricanes / storms as the hazards that have caused most significant impact in their countries. Patterns across respondents are less clear for other climate-related hazards since the summary results capture perspectives from four individuals from four different countries. For example, fish migration is an issue perceived as having caused very little too little impact AND significant impact. With their responses, policy actors expressed most uncertainty about the effect of gradual changes (ocean acidification, changes in wind patterns and ocean currents).

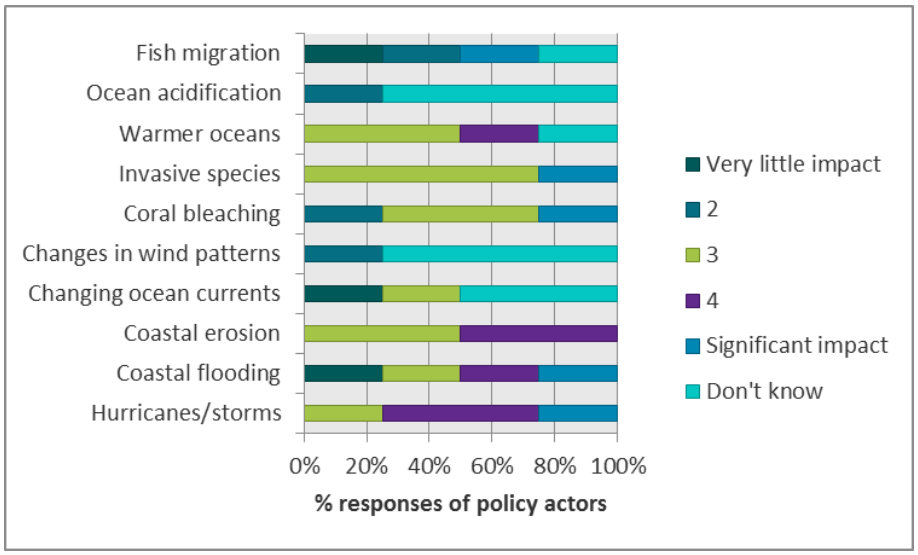

Figure 25: Responses provided by policy actors to the question "on a scale of 1 to 5, how much would you say the following climate hazards have negatively affected your community / fishing area?" (n=4)

Perspectives on communications with fisherfolk

According to policy actors, face-to-face engagement (workshops, town halls) and radio are the **best ways to reach fisherfolk to provide information on climate change [26]**. For it to be effective face-to-face engagement and training needs to "*meet fisherfolk where they are*", not be too formal and ensure fisherfolk get sufficient airtime to be able to fully express themselves. Radio use can be effective but messages need to be specific and embedded in shows that fishers like. Printed materials, like posters and pamphlets, received some mention as effective formats as well, while cautioning on the need to take literacy constraints into account.

Key climate change messages to communicate to small-scale fishers offered by policy actors include the following:

- Climate change impacts and GHG mitigation / adaptation affect them financially through their livelihoods
- Irresponsible fishing, overfishing exacerbates the impacts of climate change and that protecting species means protecting their livelihood
- Ask them to report unusual currents, color of sea water, temperature at the time fish are caught, coral bleaching events, *Sargassum* influxes and fish kills
- Fishers are a rich source of information. Capacity building should be paired with collection of traditional / local knowledge

Aside from government Fisheries Units, **agencies to involve in climate change awareness campaign [27]** include fisheries complexes / cooperatives, tourism stakeholders (hoteliers, dive associations, sports fishery operators) and government stakeholders responsible for land and watershed management or with the overall mandate for climate change.

4. DISCUSSION AND CONCLUSIONS

This section provides key findings in the context of study objectives, conclusions and recommendations for project communications.

4.1 Key findings

Knowledge, attitudes and practice

The KAP Study identified strengths and weaknesses in **knowledge of climate change**. Fisherfolk in Montego Bay (Jamaica), Roseau (Dominica) and Kingstown (Saint Vincent and the Grenadines) were more knowledgeable about impacts of, and responses to climate change on fisheries than they were of either the causes of climate change and government actions that could boost resilience.

- About a third of fisherfolk related examples of climate change impacts on fisheries consistent with impact pathways in scientific and technical studies on the issue, such as changes in fish stocks due to changes in water temperatures and fish migrating to deeper waters. Fisherfolk are observing environmental changes and in some cases can link physical / climatic changes to biological (fish) and socio-economic impact.
- About half of fisherfolk could not accurately define the term climate change, when asked.
- In Montego Bay, when asked about the main causes of climate change, fisherfolk provided responses primarily linking human development to negative environmental impacts but only one fisher (out of 40) correctly identified the cause of anthropogenic climate change. Low levels of fisherfolk awareness of the causes of climate change emphasize the importance of linking messages on adaptation and greenhouse gas mitigation.
- Fisherfolk have some awareness of actions to take to build adaptive or coping capacity, particularly when dealing with severe weather. In describing actions fishers could take to deal with climate change impacts (Montego Bay) and the impact of hurricanes (Roseau and Kingstown), information,

communication & education as well as preparedness (early warnings and awareness, in particular) were strategies mentioned by both groups.

- Awareness of the gendered nature of climate change vulnerability is low. A majority of fisherfolk (114 of 158) either did not see differences in climate change effects on male and female fisherfolk or did not know whether there were differences. It is worth noting that because our main research effort focused on harvesters, the views of female fisherfolk are largely missing in this KAP Study (outside of what was related indirectly). Statistical analysis of survey results suggests that awareness of differences in how men and women are affected by climate change is influenced by fishing experience as well as understanding of, personal concern about and practices regarding climate change.
- Overall, the biggest weakness in knowledge is around actions government is taking to improve fisheries livelihoods. At least three quarters of respondents either did know what governments were doing or asserted that governments are doing nothing. The other quarter of respondents mentioned initiatives like safety-at-sea training, implementation of FADs, construction of a building for seafood marketing, compensation after Hurricane Maria and small business loans.

Compared to fisherfolk, managers and policy actors had a good technical appreciation of the causes and definitions associated with climate change. Three quarters of managers and of policy actors provided accurate explanations of the causes of climate change. Managers showed an appreciation of the temporal dimension of the problem as well as physical and biological impacts of relevance to fisheries.

Managers' responses to our question on key climate-change related messages to highlight to small-scale fishers suggested a good level of knowledge on how to make the case for adaptation to fisherfolk, through framing as an economic / livelihoods issue and by sharing action-driven messages on shared responsibility, responsible fishing, livelihood impacts and connections to ecosystem resilience, among others.

In their responses, fisherfolk and managers alike sometimes conflated climate change impacts and broader issues of environmental degradation (e.g., improper waste disposal, ozone depletion, agricultural runoff).
Climate change attitudes differed between fisherfolk and managers / policy actors, as shown by the following key findings. However, results require careful interpretation. Measuring levels of satisfaction with action on climate change is complex because each respondent (and each affinity group of respondents) will have their own knowledge and mental model of the risks faced, relevant actions to address the risks and the effectiveness of these actions. One specific example is the question used to gauge respondents' level of satisfaction with the steps being taken to address climate change impacts in the fisheries sector. This type of question requires respondents to know about the status of climate action and contemplate the relative effectiveness of the action relative to climate risk, which they would also need to understand. The key informant interviews with policy actors were beneficial in this sense because we were able to tease out why this group was moderately satisfied.

- Fisherfolk's attitudes on climate change as a key threat are mixed. Overall, fisherfolk did not identify climate change as among the most serious problem fisherfolk are confronting today. Amongst seven possible factors that could be considered "*serious problems facing the fisheries sector*" climate change did not rank in the top three in any of the fishing areas (5th in Jamaica, 6th in SVG and 4th in Dominica). Fuel price was the top concern in all cases, which was not surprising as it was reported to account for more than half of operational costs on average. At the same time, 78%, 52% and 64% of fishers from Montego Bay, Kingstown and Roseau, respectively, stated they were "*very concerned*" about the impacts of climate change.

- Managers, in contrast to fisherfolk, generally saw climate change as the number one threat facing the fisheries sector, on par with pollution. 83% of managers stated they were "*very concerned*" about the impacts of climate change.
- Fisherfolk tend to have a defeatist attitude about what can be done. Limited evidence suggests that some fisherfolk have awareness of what to do to prepare for extreme events yet also express sentiments such as "nothing can be done".
- Fisherfolk also tend to ascribe greater responsibility for addressing climate change impacts to external actors: industrialized countries, government officials and policymakers and the tourism sector. In their survey responses managers indicated that the main responsibility for addressing climate change lies with the government. In contrast, policy actors felt that all stakeholders played important roles.
- Fisherfolk expressed low levels of satisfaction with steps being taken to address climate change impacts in the fisheries sector. A quarter of fisherfolk (of 40) from Montego Bay were "dissatisfied" with how climate change was being addressed; half either did not answer the question or stated they did not know. In Kingstown and Roseau, fisherfolk indicated that (informal) social safety nets were most important in shaping their capacity/ability to cope with natural hazards. Over half of respondents (77 of 121) claimed no one had reached out to help them after the recent storm hit and about half (69 of 120) would find it difficult or very difficult to get extra cash to pay for damages and losses after a storm.
- Compared to fisherfolk, managers across the region had higher levels of satisfaction about measures being taken to address climate change impacts in the sector. About three quarters of managers were "satisfied" with actions being taken.
- Policy actors expressed moderate levels of satisfaction with fisheries-sector action on climate change impacts, highlighting the following reasons behind this assessment: (1) gaps in project management capacity and the ability to maximize benefits flowing from regional projects; (2) a lack of scientific information, which is a barrier to turning uncertainty (on what to adapt to and where) into an assessment of risk; (3) the focus of large adaptation projects on land-based sectors until recently; (4) low policy and advocacy capacity as a barrier to action even in cases where risk and types of responses were clear.

Fisherfolk and managers reported **behaviours and practices** that are helpful in adapting to climate change and managing disaster risks. Policy actors related accomplishments in establishing an enabling environment for adaptation and demonstrated clarity in policy and management directions.

- Fisherfolk across the three study sites reported actions they or their community were taking that build capacity to adapt to climate risk. There were lower levels of community action reported in relation to climate change adaptation (Montego Bay) compared to emergency/storm preparedness (Roseau and Kingstown). We surmise that fisherfolk are more aware / clearer on actions to take to address rapid-onset events as opposed to longer-term, gradual changes in climate and biophysical conditions. Nevertheless, there is room for improvement in increasing the uptake of measures to manage rapid-onset events since fisherfolk from Roseau and Kingstown reported low adoption of measures to reduce disaster risk. Levels of training in DRR and penetration of home and property insurance are particularly low.
- Managers reported behaviours that are helpful in adapting to climate change more often than not, including integrating climate change into strategic and operational decisions and accessing climate information from reliable sources.
- Managers also provided a number of ideas on strategies and operational measures that should be considered to reduce the impacts of climate change on the fisheries sector in the country / countries where they work. Suggestions covered the gamut of policy tools including resource management & conservation policy instruments; fishing regulatory instruments; market-based instruments; institutional change and advocacy; and information, education and communication. GHG mitigation and pollution abatement were also mentioned.

- Policy actors asserted that climate change was starting to be "mainstreamed" into fisheries and aquaculture policy and that enabling tools include adaptation plans (or instruments specifically designed to manage climate change risk). Responsible fishing, diversification and fisher involvement in monitoring are desired practices. On this last point, policy actors acknowledged that fisherfolk are rich sources of local knowledge.
- Regarding the use of climate information, fishers showed openness to climate change education and outreach. They registered a strong interest in receiving more information about climate change impact, with almost all fisherfolk (91% or 147 of 161) responded positively when asked this question. Fisherfolk preferred to rely on official sources of information (e.g., government issued warnings transmitted via radio, television or online). Policy actors have clear expectations on the intended uses of information from this PPCR Project: inputs to education, project finance and measuring adaptation effectiveness.

Perceived impact of climate hazards and of the relevance and feasibility of options to reduce climate change impacts in the fisheries sector

- Climate-hazard perception varied among fisherfolk by site, with Montego Bay fishers placing more importance on coral bleaching and coastal erosion (being in a carbonate-dominated marine production area) compared to fisherfolk from Kingstown and Roseau, who generally reported hurricanes/storms, coastal flooding and coastal erosion as the most significant impacts on communities and fishing areas. Overall, slower-onset changes that require closer monitoring (e.g., invasive species; fish migration; changing currents) are not perceived to have significant impact.
- Similarly, managers reported fish migration, changes in wind and ocean patterns, and invasive species as of lower concern than hurricanes/storms, coral bleaching, ocean acidification, coastal erosion and flooding. Policy actors also expressed most uncertainty about the effect of gradual changes (ocean acidification, changes in wind patterns and ocean currents). This is not surprising since slow-onset changes, by definition, can only be detected over the long term and require sustained monitoring.
- All fisherfolk scored FADs the highest in terms of feasible adaptation options, which is in stark contrast to the rank given by the managers (lowest rated). Other highly-scored options given by fisherfolk included improved marketing, promotion of different fishing methods and improved post-harvest management. Managers rated education campaigns as well protection of assets from extreme weather with the highest average scores. Perceptions on the relative importance of adaptation options are complementary. Fisherfolk are concerned about specific technologies and assets they can use to adapt to climate change as individuals and managers may be thinking about generic and specific strategies and tactics that support adaptation at the systems-level (see Figure 26).

	Individual actor	System-level
Generic	Income level and structure, savings	Economic productivity
	Material assets	Information infrastructure
	Health status	Poverty levels
	Education levels	Economic and social inequality
	Population mobility	Transparency in governance
	Participation in social organizations	Population-level education
		Sanitation
		Health care services
		Built environment integrity
Specific	Climatic information use	Insurance provisioning systems
	Protection of private property	Early warning systems
	Climate risk insurance	Scenario development
	Adoption of technologies (e.g., crop varieties) to reduce climate impacts	Infrastructure investment
	Cultural climate prediction	Disaster planning
	Traditional risk mitigation strategies	Disaster compensation funds
		Risk mitigation planning

Figure 26: Examples of different manifestations of (adaptive) capacity at two organizational levels (Source: Eakin et al. 2014)

Perceived challenges in addressing climate change issues related to fisheries

- Policy actors and managers offered perspectives on challenges to making progress on adaptation. These included capacity gaps (e.g., management, knowledge, and weaknesses in advocacy / the quality of participation in policy development), the cost of adapting (the implication being that it is too expensive for them to adapt) and other institutional challenges, such as a lack of specificity in their policy instruments and limited ability to monitor the effectiveness of adaptation actions.
- Further, we asked policy actors about challenges that are either unaddressed or inadequately addressed and they highlighted awareness of fisherfolk, lack of specificity of policy and management tools and weaknesses in status and trend and effectiveness monitoring.

Climate change communications

- The survey confirmed that fisherfolk generally agreed that government (e.g., government ministries, environmental agencies and fisheries departments) should be involved in climate change communications. Although the role of government is clearly prominent, other key partners in information dissemination to fisherfolk include fishing cooperatives / complexes and tourism operators.
- Fishers and policy actors alike regard face-to-face engagement (e.g., workshop/lectures) as the best way to provide climate change information to fisherfolk. Printed media (posters, pamphlets/ brochures) follow in frequency. This is in contrast to the preferred communication strategy of managers, who see short videos as most effective, followed by jingles, face-to-face communications and posters. Managers did agree that word-of-mouth was the most effective means of communications with fisherfolk.
- Information on ownership and use of smartphones suggests this channel (e.g., use of WhatsApp or text messages) would be an effective way to disseminate climate change information to fisherfolk in the region. However, smartphone ownership does differ across the region, which is an important consideration in communications planning. In Montego Bay 83% of the respondents reported owning smartphones; in Kingstown and Roseau less than half of the respondents reported owning smartphones.

4.2 Conclusions and Recommendations

Table 39 presents recommendations stemming from our consideration of KAP Study results. Not all recommendations can be addressed through the project, in light of time and resources available. We identify recommendations in scope of our work program with an asterisk.

Conclusion	Recommendation	Description
Fisherfolk are observing changes in environmental conditions that are affecting fishing livelihoods. Policy actors highlight the importance of tapping into fisherfolk's local knowledge in support of the sector's adaptation. Lack of monitoring data is a challenge in making adaptation progress.	Engage fisherfolk in "citizen science" to boost the region's monitoring capacity on climate change impacts and effectiveness of adaptation measures	In the short term, assess the potential to equip a few selected fisherfolk with instruments (e.g., thermometer) and training to report key conditions observed while at sea, such as unusual currents, color of sea water, temperature at the time fish are caught, coral bleaching events, *Sargassum* influxes and fish kills.
		**In the longer term, design a monitoring program that engages a network of trained fisherfolk and leverages partnerships (e.g., with academia) as alternative ways of financing research and monitoring for fisheries management. Monitoring indicators should be regionally relevant and nationally-applicable, with sampling and data collection techniques attuned to capacities
Fisherfolk lack understanding of the causes of global climate change. Without this understanding the role of GHG mitigation is downplayed, as are fisherfolk's roles as part of the solution	Increase understanding of the global scientific basis for climate change and of the connections between GHG mitigation and adaptation responses	*Integrate messages on the causes of anthropogenic climate change alongside messages on climate change impacts and the role of adaptation and GHG mitigation
		*Infuse messages about individual's "power to act" on climate change in communications
		*Develop information, education and communication (IEC) material for use by managers for engaging with fisherfolk
Stakeholders can conflate environmental degradation and climate change issues	Clarify the relationship between environmental degradation and vulnerability to climate change impacts	*This conflation between environmental degradation and climate change is an opportunity to draw attention to "non-climate stressors" in IEC materials. Use familiar "non-climate stressors" (coastal pollution, overfishing, unplanned coastal development) to illustrate ways they can exacerbate vulnerability to climate change.
		*In IEC materials drawing attention to key linkages across sectors. In Montego Bay, for example, fisherfolk relate a deep concern about the impacts of (tourism sector) development on their fisheries livelihoods.
Responses to climate change impacts are being developed in PPCR countries and initiatives to support livelihoods of fishers are in place but awareness of these efforts among fisherfolk appears low.	Build on success stories, mini-case studies of local, national and regional strategies and actions to build climate resilience across the fisheries sector.	*Engage trusted intermediaries in delivering information to fisherfolk on government action to support climate resilience. Trusted intermediaries include fishing organizations, cooperatives, grassroots organizations and tourism operators. Any (electronic) IEC materials should be made available to this group of stakeholders for further dissemination.
		*Coordinate outreach and communications activities and products with regional and national PPCR focal points, leveraging success stories and lessons from across the region.
KAP Study results for fisherfolk do not incorporate the perspectives of female fishers.	Ensure communications activities and products are gender aware.	**Understand gender dynamics in Caribbean fisheries from secondary sources, including relative roles across the fish value chain and differences in risk perception.
		*Make special provisions for equitable (1) participation of males and females in communication activities and (2) access to project outputs. For example, in testing communications messages in focus group discussions ensure diversity in representation and lead separate all-male and all-female discussions to uncover differences in framings, examples and imagery that could work best.

Conclusion	Recommendation	Description
In understanding how to work collaboratively toward climate-smart fisheries, stakeholders could benefit from an understanding of some of the best practices and lessons in overcoming capacity and institutional barriers.	Showcase a diversity of practices and lessons from across the region and Small Island Developing States in other global regions.	**Compile good practices and lessons learned on climate adaptation of fisheries in SIDS and make these available on the Project database, taking care not to duplicate efforts of the Caribbean Community Climate Change Centre.
		*Showcase lived experiences from stakeholders at all levels in IEC materials, such as brochures and video documentaries.
		*Explore the development of IEC materials aimed at improving the capacity for advocacy among management, planning and policy professionals.
Climate change is not the most serious problem fisherfolk are confronting today.	Ensure information on climate change and adaptation strategies offer familiar messages & imagery and connect to today's issues of concern	*Develop communication strategies with familiar messages and imagery so as to develop recognizable links between the realities of fisherfolk and fishing communities and the awareness campaign.
		*Build on the key climate-change related messages for small-scale fishers that managers suggested in the KAP Study. For example, "climate change is everybody's business -less fish, less catch, less money."
		Climate-smart adaptation options put forward in IEC materials and other Project activities should build on current practice and options perceived as feasible and / or important, as indicated in the KAP Study.
Extreme weather events are more salient to fisherfolk and other stakeholders than gradual changes in climate conditions and related fisheries impacts.	Increase awareness of the short-term AND long-term implications of climate change impacts for the Caribbean fisheries sector	*Centre climate change communication on practical solutions that correspond with the current needs of fisherfolk in the region and are flexible within how these solutions can respond to climate change (i.e., avoid maladaptive practices).
		*Integrate the message that climate change is a long-term problem as a key message in communication and media campaign.
		*Integrate messages on the uncertainty of climate change projections and the importance of sustained monitoring, and of flexibility and adaptability in the long-term measures selected.
The KAP Study showed that respondents were interested in having posters and short videos to help raise awareness of climate change issues and inspire action.	Ensure the communication campaign integrates both static visuals and multi-media products, and includes a mixed dissemination strategy.	Develop posters and thematic brochures. Develop a video documentary.
The KAP Study also provided information on the best approaches to reach fisherfolk (face-to-face engagement, via smartphone).		Because of timing and budget constraints, face-to-face engagement with fisherfolk will not be possible on a large scale, which clarifies our role in producing communication packages and toolkits for others to use. Outreach to fisherfolk can be through (1) social media and direct appeal via WhatsApp or text messaged and (2) intermediaries, such as fisheries extension officers, fishing cooperatives / complexes and tourism operators.

Table 39: Recommendation matrix (* = feasibility of implementation as part of the Project's communication activities; **= possible contributions under other Project Work Packages)

As a final recommendation we advise re-using the collection instruments and methods described in this paper to replicate the KAP Study in two years (i.e., 2022). The CRFM and other project partners can also selectively draw on questions and indicators from the KAP Study to perform their own surveys in the shorter-term. Paper B in this collection provides an example of how the tools in the KAP Study can be used to assess project impacts on knowledge-attitudes-practice. Paper B summarizes project

communication activities undertaken and provides a glimpse of their short-term effects, using a simple survey instrument that includes questions from the original KAP Study to facilitate comparative analysis.

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Annex 1: Agenda for training of field assessors

1. **Introduction and project overview**

2. **Methodology, expectations and compensation**
- Research strategy
- Role of the interviewer
- Compensation

3. **Ethical considerations**
- Consent
- Confidentiality
- Anonymity
- Respect

4. **Good practices when conducting interview**
- Familiarize yourself with the questionnaire
- Do not begin the interview with personal questions
- The interview should be conversational in nature
- Ensure that the respondent feels relaxed
- Ensure that the respondent understands the question
- Legibility of hand writing
- Pay attention to different types of questions (e.g., multiple response, open-ended)
- Encourage the respondent to completes all questions

5. **Understanding the questionnaire items**

6. **Role-play exercise (mock interview)**

7. **Questions/comments about the process**

Estimated time: 1.5 to 2 hours

Annex 2: Data collection instruments

Fisherfolk survey – Montego Bay

1	INTERVIEWER:	DATE:	COMMUNITY:

SECTION 1: PERSONAL /DEMOGRAPHICS					
1. Gender	◻ Male ◻ Female		2. Age (years)		
3. Marital Status	◻ Single ◻ Married ◻ Common-law ◻ Other (specify):				
4. What is the highest level of schooling completed?	◻ Primary ◻ Post-Secondary (Vocational/technical) ◻ Secondary/High ◻ No formal schooling		4(a) Please specify the number of years in school		
5. Do you consider yourself to be the head of your household?	◻ Yes ◻ No	5(a) How many people live in your household (including you)		5(b) Number of dependents	
6. How long have you been fishing? (years)		6(a) Number of family members involved in fishing		6(b) How many years have you been fishing in or from this community?	
7. Do you consider yourself to be a...	◻ Full-time fisher ◻ Part-time fisher		7(a) If part-time, please specify other job(s)		
8. Have you ever received any formal training related to fishing?	◻ Yes ◻ No		8(a) Are you a registered fisher?	◻ Yes ◻ No	

SECTION 2: KNOWLEDGE & AWARENESS OF CLIMATE CHANGE			
9. Please explain what you understand by the term climate change?		9(a) Does the respondent have a general understanding of what climate change is?	◻ Yes (go to #10) ◻ No (please explain the concept and go to #10a)
10. What do you think are the main causes of climate change?		10(a) Please provide an example of an environmental situation in your community that you would use to explain what climate change is to a fellow fisher who is unfamiliar with the term.	
11. What do you think are the most serious problems facing the fisheries sector today?	◻ Fuel price ◻ Cost of equipment ◻ Market for catch ◻ Poor fishing practices ◻ Piracy ◻ Climate change ◻ Low catch ◻ Other:	11(a) How concerned are you about the impacts climate change?	◻ Very concerned ◻ Somewhat concerned ◻ Unconcerned
12. Which group(s) of fishers would you describe as being most vulnerable to the impacts of climate change in your community?	◻ Small-scale fishers in general ◻ Offshore fishers ◻ Older fishers ◻ Other (specify):	◻ Female fisherfolk ◻ Nearshore (inshore) fishers ◻ Younger fishers	

13. ON A SCALE OF 1 TO 5, HOW MUCH WOULD YOU SAY THE FOLLOWING HAS NEGATIVELY AFFECTED YOUR COMMUNITY/FISHING AREA?
1 = Very little impact 5 = significant impact (place a tick [✓] in the appropriate area)

CLIMATE HAZARD	Perceived Impact				
	1	2	3	4	5
13(a) Hurricanes/storms					
13(b) Coastal flooding					
13(c) Coastal erosion					
13(d) Changes ocean currents					
13(e) Changes in wind patterns					
13(f) Coral bleaching (whitening of reef)					
13(g) Invasive species (e.g. lion fish)					
13(h) Fish migration					

14. What are some of the consequences to the fisheries sector of the climate change impacts identified above?		15. What are some of the things people in your community are doing to deal with climate change or other environmental issues?	
16. Do you think climate change affects male and female fisherfolk in different ways? (explain that we consider fish vendors as well)	◻ Yes ◻ No ◻ Not sure/don't know ◻ Not applicable	16(a) If yes, please explain	

SECTION 3: CLIMATE ACTION & COMMUNICATION

2

INTERVIEWER:	DATE:	COMMUNITY:

17. What types of programmes or projects do you know about that the government is already undertaking to improve the livelihood of fishers in your community?		18. Who do you think is mainly responsible for addressing climate change in the fisheries sector?	□ Government □ Private sector □ Community organizations □ Private citizens □ Industrialized countries □ Don't know/Not sure

19. ON A SCALE OF 1 TO 5, HOW MUCH RESPONSIBILITY WOULD YOU SAY THE FOLLOWING GROUPS HAVE IN ADDRESSING CLIMATE CHANGE IMPACTS IN THE FISHERIES SECTOR:

1 = Minor responsibility 5 = Major responsibility (place a tick [✓] in the appropriate area)

STAKEHOLDERS	Perceived Responsibility				
	1	2	3	4	5
19(a) Fisherfolk (fishermen, fish vendors)					
19(b) Fish Processors –(small and large-scale)					
19(c) Fisheries office/Division					
19(d) Policymakers/ legislators					
19(e) Fisheries NGOs & CBOs (e.g. cooperative)					
19(f) Tourism stakeholders					

19. How satisfied are you with the steps being taken to address climate change impacts on the fisheries sector in your area?	□ Very dissatisfied □ Dissatisfied □ Neutral □ Satisfied □ Very Satisfied	20. What are some of the things you think fishers can do to reduce the impacts of climate change on your community?	

21. ON A SCALE OF 1 TO 5, HOW FEASIBLE DO YOU THINK THE FOLLOWING OPTIONS ARE IN TERMS OF IMPROVING THE INCOME EARNING POTENTIAL OF FISHERS?

1 = Not very feasible 5 = Very feasible (place a tick [✓] in the appropriate area)

INCOME EARNING OPTIONS	Perceived Feasibility				
	1	2	3	4	5
21(a) Fish Aggregating Devices (FADS)					
21(b) Mariculture (cultivation of marine organisms – e.g. Oysters)					
21(c) Aquaculture (fish farming)					
21(d) Sports fishing/boat tours					
21(e) Value-added/ Processing					
21(f) Improved postharvest management (preservation)					
21(g) Target different fish species					
21(h) Promote different fishing methods					

22. What do you think are the most effective ways of communicating with fisherfolk in your community?	□ Radio □ Television □ Newspaper □ Social media □ Word of mouth □ Other (specify)	23. What do you think are the best ways to provide information about climate change to fisherfolk in your community?	□ Pamphlets/Brochures □ Posters □ Short videos □ Bulletins □ Lectures/Workshops □ Jingle □ Songs/music videos □ Faith-based organization □ Poetry
24. What do you think are some of the key climate change-related messages to highlight to small-scale fishers in your community?		24(a)Please specify the stakeholders/agencies that should be involved in a climate change awareness campaign for the fishers in your community	
25. Do you have a smartphone?	□ Yes □ No	25(a) Which mobile carrier do you use?	□ Digicel □ Lime □ Both
26. Which of the following you use?	□ WhatsApp □ Facebook □ Snapchat □ Other: □ None		
27. Would you be interested in getting more information about the impact of climate change on fisheries in your country/community?		27(a) If no, why not?	

SECTION 4: FISHING ACTIVITIES

28. Are you a member of any group or organization?	□ Yes □ No	28(a) If yes, please specify	
29. How many days per week do you go to sea?	□ 1-2 day /week □ 3-4 days /week □ 5-6 days/week □ 7 days/week		
30. How long is your average fishing trip? 31.	□ 0-10 hours □ 11-23 hours □ 1-2 days □ 3-5 days □ > 5 days		

3

INTERVIEWER:	DATE:	COMMUNITY:

32. What time of the day do you fish?		◻ Night ◻ Day ◻ Both
33. What are the top 4 species that you target?	Rank	Target species
	1	
	2	
	3	
	4	
34. What fishing methods do you currently employ?	◻ Hook and line ◻ Nets ◻ Spear gun ◻ Fish pot (**how many?**_____) ◻ Other:	
35. Are you a boat owner?	◻ Yes ◻ No	34(a) If no, how do you get out to sea?
36. What type of boat do you use for fishing? (Specify boat size)		
37. Who do you sell your fish to? (Respondent can choose more than one)	◻ Fish vendors ◻ Community members ◻ Other: ◻ Hotel/Guest house ◻ Restaurant/shops	
38. In your opinion, has the amount of fish caught changed since you started fishing?	◻ Yes ◻ No ◻ Don't Know ◻ N/A	37(a) If yes, what changes have you observed?
39. Do you think that the Fish Sanctuary in the area is working well?	◻ Yes ◻ No	38(a) If no, why?
40. Are you benefiting in any way from the Fish Sanctuary?	◻ Yes ◻ No	39(a) Please explain
41. Do you think you are catching more fish because of the Fish Sanctuary?	◻ Yes ◻ No	40(a) Are you catching bigger fish because of the Fish Sanctuary? ◻ Yes ◻ No
42. Who do you think benefits most from the Fish Sanctuary?	◻ Hotels ◻ Tourist ◻ Fishers ◻ Marine Park ◻ Other:	41(a) What do you think can be done for fishers to benefit more from the fish sanctuary?

INDICATE RELEVANT MONTHS WITH A (√) FOR QUESTIONS 42 AND 43	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
43. Which months are best for the type of fishing you do? (High Season)												
Hook & Line												
Fish pots												
Nets												
Spear gun												
44. Which months are worst for the type of fishing you do? (Low Season)												
Hook & Line												
Fish pots												
Nets												
Spear gun												

45. On average, how many days per week do you go to sea during the Low Season?	◻ 1-2 day /week ◻ 3-4 days /week ◻ 5-6 days/week ◻ 7 days/week	44a) On average, how many days per week do you go to sea during the High Season ◻ 1-2 day /week ◻ 3-4 days /week ◻ 5-6 days/week ◻ 7 days/week
46. How many pounds of fish would you consider to be a good catch?	Lbs_____	45(a) When was the last time you made this catch (year)
47. On average, how much do you spend on the following per trip?	Fuel $_____ Ice $_____ Food $_____	Bait $_____ Boat rental $_____ Other (specify) $_____

CONTACT NUMBER .....

END OF QUESTIONNAIRE- THANK RESPONDENT FOR THEIR TIME.

Fisherfolk survey – Kingstown and Roseau

INTERVIEWER:	DATE:	COMMUNITY:	No.

SECTION 1: PERSONAL /DEMOGRAPHICS					
1. Gender	◻ Male ◻ Female		2. Age (years)		
3. Marital Status	◻ Single ◻ Married ◻ Common-law ◻ Other (specify):				
4. What is the highest level of schooling completed?	◻ Primary ◻ Post-Secondary (Vocational/technical) ◻ Secondary/High ◻ No formal schooling		4(a) Please specify the number of years in school		
5. Do you consider yourself to be the head of your household?	◻ Yes ◻ No	5(a) How many people live in your household (including you)		5(b) Number of dependents	
6. How long have you been fishing? (years)		6(a) Number of family members involved in fishing		6(b) How many years have you been fishing in or from this community?	
7. Do you consider yourself to be a…	◻ Full-time fisher ◻ Part-time fisher		7(a) If part-time, please specify other job(s)		
8. Have you ever received any formal training related to fishing?	◻ Yes ◻ No		8(a) Are you a registered fisher?	◻ Yes ◻ No	

SECTION 2: FISHING ACTIVITIES			
9. Are you a member of any group or organization?	◻ Yes ◻ No	9(a) If yes, please specify	
10. How many days per week do you go to sea?	◻ 1-2 day /week ◻ 3-4 days /week ◻ 5-6 days/week ◻ 7 days/week		
11. How long is your average fishing trip?	◻ 0-3 hours ◻ 4- 7 hours ◻ 8-11 hours ◻ > 12 hours		
12. What time of the day do you fish?	◻ Night ◻ Day ◻ Both		

13. What are the top 4 species that you target?	Rank	Target species	Average price per pound
	1		
	2		
	3		
	4		

14. What fishing methods do you currently employ?	◻ Hook and line ◻ Nets (how many owned?_____) ◻ Spear gun ◻ Fish pot (how many owned?_____) ◻ Other:		
15. Are you a boat owner?	◻ Yes ◻ No (go to #15a & 16)	15(a) If no, how do you get out to sea?	
16. Who is the owner of the boat?		16(a)How many people do you usually go to sea with? *(Crew size)*	
17. What type of boat do you use for fishing? *(Specify boat size)*	Type:	length (ft):	
18. Who do you sell your fish to? *(Respondent can choose more than one)*	◻ Fish vendors ◻ Community members ◻ Fishing complex/Cooperative ◻ Hotel/Guest house ◻ Restaurant/shops ◻ Other:		
19. In your opinion, has the amount of fish caught changed since you started fishing?	◻ Yes ◻ No ◻ Don't Know	19(a) If yes, what changes have you observed?	

INDICATE RELEVANT MONTHS WITH A (✓) FOR QUESTIONS 20 AND 21		Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
20. Which months are best for the type of fishing you do? (High Season)	Hook & Line												
	Fish traps												
	Nets												
	Spear gun												
21. Which months are worst for the type of fishing you do? (Low Season)	Hook & Line												
	Fish pots												
	Nets												
	Spear gun												

22. On average, how many days per week do you go to sea during the Low Season?	◻ 1-2 day /week ◻ 3-4 days /week ◻ 5-6 days/week ◻ 7 days/week	22(a) On average, how many days per week do you go to sea during the High Season	◻ 1-2 day /week ◻ 3-4 days /week ◻ 5-6 days/week ◻ 7 days/week

2

23. How many pounds of fish would you consider to be a good catch?	Lbs_____	23(a) When was the last time you made this catch (year)	
24. On average, how much do you spend on the following per trip?	Fuel $ _____ Ice $ _____ Food $ _____	Bait $ _____ Boat rental $ _____ Other (specify) $ _____	
25. What do you think are the most serious problems facing the fisheries sector today? *(Respondent can choose more than one)*	□ Fuel price □ Poor fishing practices □ Low catch	□ Cost of equipment □ Piracy □ Other:	□ Market for catch □ Climate change
26. How has the influx of seaweed (sargassum) affected your fishing?		27. What do you think should be done to reduce the impact sargassum on your community?	

SECTION 3: STORM/HURRICANES & ENVIRONMENTAL CHANGE

28. With reference to the last major storm you experienced, when did you know that it was going to hit?	□ One week before □ 3-5 days before □ 1-2 days before □ Less than 24 hours	29. How did you find out about the storm? *(Respondent can choose more than one)*	□ Radio □ Television □ Internet □ Neighbours □ Phone App □ Family/friends □ Social media □ Other _____
30. Did anyone reach out to help you after the storm hit?	□ Yes □ No	31. How long was it until you received help?	
32. Who was the help from? *(Respondent can choose more than one)*	□ Neighbours □ Government agency	□ Red Cross □ Church	□ NEMO □ Other: _____
33. What actions did you take when you found out that the storm was going to hit?			
34. How did this storm affect you? *(Respondent can choose more than one)*	□ Damage to house □ Damage to property □ Damage to fishing equipment □ Personal injury □ No major impact	35. Roughly, how much did you lose? *(Estimate dollar value of loss experienced – EC$)*	$
36. Did you experience a loss of income after the storm?	□ Yes □ No	37. How many days/weeks/months loss of income did you experiences?	
38. How did this lack of income affect your family? *(probe for impact on children schooling and change in diet)*			
39. Did you already have an emergency kit and other protection supplies *(i.e. hurricane straps) at home before the storm/hurricane?*		40. Have you ever received any training in how to manage disaster risk?	□ Yes □ No
41. Which group(s) of fishers do you think would be worse affected if a hurricanes/storms should hit your community?	□ Offshore fishers □ Older fishers	□ Nearshore (inshore) fishers □ Younger fishers	□ Other (specify):

42. ON A SCALE OF 1 TO 5, HOW MUCH WOULD YOU SAY THE FOLLOWING HAS NEGATIVELY AFFECTED YOUR COMMUNITY/FISHING AREA?
1 = Very little impact 5 = significant impact (place a tick [✓] in the appropriate area)

	Perceived Impact				
	1	2	3	4	5
42(a) Hurricanes/storms					
42(b) Coastal flooding					
42(c) Coastal erosion					
42(d) Changes ocean currents					
42(f) Coral bleaching (whitening of reef)					
42(g) Invasive species (e.g. lion fish)					
42(h) Fish migration					

43. What are some of the things you think can be done to improve the lives of fishers in your community?		43(b) What are some of the things you think fishers can do to reduce the impacts of hurricanes/storms on your community?	
44. What do you think are the most effective ways of communicating with fisherfolk in your community? *(Respondent can choose more than one)*	□ Pamphlets/Brochures □ Bulletins □ Songs/music videos □ Other	□ Posters □ Lectures/Workshops □ Faith-based organization	□ Short videos □ Jingle □ Poetry
45. Do you have a smartphone?	□ Yes □ No	45(a) Which mobile carrier do you use?	□ Digicel □ Flow
46. Which of the following do you use? *(Respondent can choose more than one)*	□ WhatsApp □ Facebook	□ Snapchat	□ None
47. What types of programmes or projects do you know about that the government is already undertaking to improve the livelihood of fishers in your community?			

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48. **Please explain what you understand by the term climate change?**		**48 (a) Does the respondent have a general understanding of what climate change is?**	□ Yes □ No *(please explain the concept to the respondent)*
49. **Please provide an example of an environmental situation in your community that you would use to explain what climate change is to a fellow fisher who is unfamiliar with the term.**			
50. **How concerned are you about the impacts climate change?**	□ Very concerned □ Somewhat concerned □ Unconcerned		

51. **ON A SCALE OF 1 TO 5, HOW MUCH RESPONSIBILITY WOULD YOU SAY THE FOLLOWING GROUPS HAVE IN ADDRESSING CLIMATE CHANGE IMPACTS IN THE FISHERIES SECTOR:**
1 = Minor responsibility 5 = Major responsibility (place a tick [√] in the appropriate area)

STAKEHOLDERS	Perceived Responsibility				
	1	2	3	4	5
51(a) Fisherfolk (fishermen, fish vendors)					
51(b) Fish Processors –(small and large-scale)					
51(c) Fisheries office/Division					
51(d) Policymakers/ legislators					
51(e) Fisheries NGOs					
51(f) Fisherfolk organization (e.g. cooperative)					
51(g) Private sector					
51(h) Industrialized countries					
51(i) Tourism stakeholders					

52. **Do you think climate change affects male and female fisherfolk in different ways?** (explain that we consider fish vendors as well)	□ Yes □ No □ Not sure/don't know □ Not applicable	**52 (a) If yes or no, please explain**	
53. **What do you think are some of the key climate change-related messages to highlight to small-scale fishers in your community?**		**53(a)Please specify the stakeholders/agencies that should be involved in a climate change awareness campaign for the fishers in your community**	
54. **Would you be interested in getting more information about the impact of climate change on fisheries in your country/community?**	□ Yes □ No	**54(a) If no, why not?**	
55. **What species of fish do you think are good for the environment?**		**55(a) Please explain how they are good for the environment?**	

SECTION 4: INSURANCE & WELLBEING

56. **Do you have insurance to protect your home or property from damage?**	□ Yes □ No (go to #62)	57. **If yes, please specify the type of insurance?**	
58. **Does your insurance company encourage you to take steps to better protect your home/property?**	□ Yes □ No	59. **If yes, please explain how**	
60. **Do you receive a benefit for employing measures to reduce disaster risk?**	□ Yes □ No	61. **If yes, please specify the benefits**	
62. **Do you have any other types of insurance?** (e.g. health, car, life, ect.)	□ Yes □ No	63. **If yes, please specify**	

ON A SCALE OF 1 TO 5, PLEASE INDICATE HOW YOU FEEL ABOUT THE FOLLOWING
1 = very little concern 5 = serious concern (place a tick [√] in the appropriate area)

	Response				
	1	2	3	4	5
64. **The chance that you will be hit by a big storm this year**					
65. **Your current level of preparedness**					
66. **The level of preparedness of your neighbors**					
67. **The damage you would experience if a hurricane were to hit next week**					

68. **If you needed extra cash after a storm, for example to pay for damages or make up for the loss of income, how easy would you it be for you to get this cash?**	□ Very easy □ Easy □ Neutral □ Difficult □ Very difficult
69. **Do you have close family/friends that you can depend on if you need extra help?**	□ Yes □ No

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70. ON A SCALE OF 1 TO 5, HOW FEASIBLE DO YOU THINK THE FOLLOWING OPTIONS ARE IN TERMS OF IMPROVING THE INCOME EARNING POTENTIAL OF FISHERS?

1 = Not very feasible 5 = Very feasible (place a tick [√] in the appropriate area)

INCOME EARNING OPTIONS	Perceived Feasibility				
	1	2	3	4	5
70(a) Fish Aggregating Devices (FADS)					
70(b) Mariculture (cultivation of marine organisms – e.g. Oysters)					
70(c) Aquaculture (fish farming)					
70(d) Sports fishing/boat tours					
70(e) Value-added/ Processing					
70(f) Improved postharvest management (preservation)					
70(g) Target different fish species					
70(h) Promote different fishing methods					
70(i) Improved marketing					

How do you currently feel about the following:

(Please indicate by placing a tick in the appropriate box and note the reason for dissatisfaction)

	Satisfied	*Neutral*	*Dissatisfied*
71. The overall Income/earnings from your fishing			
72. The amount of fish you are catching			
73. Availability of fishing equipment			
74. Your ability to protect your livelihood from hurricanes			
75. Extension service support you receive (e.g.from Fisheries Division)			
76. Market for your produce			
77. Types of fish you are catching			
78. Your ability to support your family from fishing			
79. The condition of your fishing grounds			
80. The condition of your landing site			

CONTACT NUMBER .....

Manager survey

- Please identify your affiliation. (Select all that apply): National government, State or local government, Non-governmental organization, Private consulting (e.g., consulting firm or through self-employment), Industry, Other (please specify)
- Please identify the mandate / role of your organization. (Select all that apply): Environmental policy and/or regulations, Environmental management, Natural resources management, Fisheries policy and/or regulations, Fisheries enforcement, Fisheries management, Wildlife management, Marine/coastal zone management, Disaster management, Communications / education, Community development / assistance, Research and innovation, Other (please specify)
- Please identify your profession / position type. (Select all that apply): Director / supervisor, Resource manager, Scientist / researcher, Fisher, Business owner / operator / analyst, Planner, Other (e.g., legal advisor, policy analyst, program manager)
- How long have you worked in or supported the fisheries sector?
- In which countries do you primarily work? (Select all that apply): Dominica, Grenada, Haiti, Jamaica, Saint Lucia, St. Vincent and the Grenadines, Countries in the region beyond those listed above, Countries outside of the region
- What is your gender?
- Please explain what you understand by the term climate change.
- What do you think are the main causes of climate change? (Select all that apply): Burning fuels, such as coal, petrol and natural gas; clearing forests for development; manufacturing processes; natural occurrences; creator / God; don't know; None of the above
- How much would you say the following changes have negatively affected the fisheries sector in the country / countries where you work? (Rate on a scale of 1 to 5; 1=no impact...5=extreme impact): Warmer oceans, Coastal flooding, Coastal erosion, Coral bleaching, Ocean acidification, Changes in ocean currents, Changes in wind patterns, Shifts in patterns of tropical storms Invasive species, Fish migration patterns, Disease / parasites in marine environments, Species abundance and productivity
- What are three important consequences to the fisheries sector of the climate change impacts identified above? (Provide your responses below):
- Please list up to three government projects or programs focused on reducing the impacts of climate change and extreme weather on the fisheries sector. (Provide your responses below)
- Are you aware of the regional initiative led by the Caribbean Regional Fisheries Mechanism to assess the ecological and socio-economic impact of climate change on the fisheries sector?
- Please rate your concern about the following threats to the fisheries sector (Rate on a scale of 1 to 5; 1=not concerned and 5=very concerned): Conflicting regulations, Climate change, Conflicting uses of marine and coastal resources, Bycatch, Disease, Invasive species, Pollution, Habitat loss or destruction, Depleted stocks of marine species, Increased input and labour costs, Changes in consumer preferences
- What is your personal level of concern about climate change? (Rate on a scale of 1 to 5; 1=not concerned; 5=very concerned)
- What is your personal level of concern about the following climate change-related threats to the fisheries sector? (Rate on a scale of 1 to 5; 1=not concerned; 5=very concerned): Habitat degradation, Biodiversity impacts, Changes in harvested species, Reduced yield of harvest, Loss of income from harvesting, Increased travel cost associated with travel to fishing locations, Increased presence of migrant fishers, Reduced food security / increased food security concerns, Loss of income across the fish value chain (e.g., processing or tourism), Loss and damage to land-based assets, Disruption of critical services (e.g., utilities, transportation), Business interruption, Health status of workers, Other (please specify)
- How well informed do you feel about climate change and its impacts? (Rate on a scale of 1 to 5; 1=not informed; 5=very well informed)

- How well informed do you feel about strategies and operational measures to reduce the impacts of climate change on the fisheries sector? (Rate on a scale of 1 to 5; 1=not informed; 5=very well informed)
- Which group(s) of fishers would you describe as being most threatened by the impacts of climate change in the countries where you work? (Select all that apply): Small-scale fishers, Female fisherfolk, Offshore fishers, Nearshore (inshore) fishers, Older fishers, Younger fishers, None of the above, Other (please specify)
- Who do you think is mainly responsible for addressing climate change in the fisheries sector? (Select all that apply): Government, Private sector, Community organizations, Citizens, Industrialized countries, International NGOs, Don't know / unsure, Other (please specify)
- How much responsibility would you say the following groups have in addressing climate change impacts in the fisheries sector(Rate on a scale of 1 to 5; 1=not responsible; 5=highly responsible): Fisherfolk (i.e., fishers, fish vendors), Fish processors (large and small scale), Fisheries officers, Policymakers/legislators, Fisheries NGOs & Community-based organizations, Tourism stakeholders, Other (please specify)
- How satisfied are you with the steps being taken to address climate change impacts on the fisheries sector in the country / countries in which you work? (Rate on a scale of 1 to 5; 1=very dissatisfied; 5=very satisfied). If you are very dissatisfied or very satisfied, please tell us why
- How important do you think the following options will be in reducing climate change impacts in the fisheries sector over the next 10 years? (Rate on a scale of 1 to 5; 1=not at all important; 5= extremely important): Restoring habitats (e.g., planting mangroves, coral nurseries), Improving the siting and management of marine protected areas / fish sanctuaries, Avoiding or reducing development impacts that degrade the coastal environment, Optimizing fishing effort, Fish Aggregating Devices (FADS), Using gear types that minimize damage to coral reefs and/or decrease by-catch, Harvesting alternative species, Marketing alternative species, Alternative livelihoods such as seaweed farming to reduce impact on marine resources, Enhancing value-added/ processing, Protecting fisheries equipment, facilities and assets from impacts of extreme weatherIncreasing uptake of insurance, Early warning systems, Updating management plans with information on risks from climate change impacts, Education and awareness campaigns, Other (please specify)
- Which of the following actions are people in the fisheries sector CURRENTLY taking to deal with climate change in the country / countries where you work? → Encouraging fisherfolk to comply with fisheries regulations, Encouraging fisherfolk to adopt sustainable practices (e.g., changing fishing gear to reduce by-catch or reduce damage to coral reefs), Complying with fisheries regulations, Changing fishing gear (i.e., to reduce by-catch or reduce damage to coral reefs), Participating in training / workshops for sustainable fishing, aquaculture or processing practices, Changing harvested species, Mariculture (cultivation of marine organisms), Diversifying operations (e.g., engaging in alternative livelihoods in coastal / marine zones such as tourism, aquaculture, seaweed harvest as a way to reduce stress on marine resources; increasing numbers and diversity of suppliers), Using alternative energy or fuel sources, Improving communications and risk management across the value chain, Other (please specify)
- Are you currently incorporating climate change into strategic or operational decisions?
- Where do you currently get information related to climate change? (Select all that apply): Reports - agencies, NGOs, Academic literature, Websites, Friends / colleagues, Caribbean Community Climate Change Centre, Caribbean Regional Fisheries Mechanism, Other (please specify)
- What are your organization's greatest strengths in addressing climate change? (Please focus on strengths related to the Caribbean fisheries sector)
- What challenges does your organization face in addressing climate change? (Please focus on challenges related to Caribbean fisheries): No legal mandate, Lack of political will, Lack of leadership, Insufficient staff resources, Financial costs of responding to climate change and adapting are seen as prohibitive, Lack of information on climate change, Lack of information that links climate

change to ecological or socio-economic impacts, Lack of options for management, Lack of time, Insufficient technical capacity, Other, more pressing priorities, Opposition from stakeholder groups or the public, Other (please specify)

- What strategies and operational measures do you think should be considered to reduce the impacts of climate change on the fisheries sector in the country / countries where you work? (Please list up to 5 options)
- Does your work involve significant outreach with fisherfolk?
- What do you think are the most effective ways of communicating with fisherfolk in the country / countries where you work? (Select all that apply): Radio, Television, Newspaper, Social media (e.g., Facebook, Instagram), Text messaging, Community meetings or workshops, Word of mouth, Other (please specify)
- What are the best formats for providing information about climate change to fisherfolk in the country/ countries where you work? (Select all that apply): Pamphlets/ brochures, Posters, Short videos, Lectures/ workshops, Jingles / songs, Theatre, Poetry, Faith-based organizations, Other (please specify)
- What do you think are three key climate-change related messages to highlight to small-scale fishers in the country / countries where you work?
- What are some of the barriers to communicating climate change information to fisherfolk in the country / countries where you work? (Select all that apply): Education level, Awareness, Knowledge of climate change, Belief in climate change, Access to technology, Opportunity costs for fisherfolk, Other (please specify)
- Please provide your contact information. We will not use it for any other purpose than project communication activities.
- Do you have anything else to share?

Key informant interview

QUESTIONNAIRE – CRFM Ministerial Council & Forum

PREAMBLE/ RATIONALE:

January 2018 marked the roll out of the "*Fishery-Related Ecological and Socio-Economic Impact Assessments and Monitoring System"* project. As a foundational pillar of the regional track of the Pilot Programme for Climate Resilience (PPCR), this data-driven project is focused on strengthening the information base that will lead to climate-smart planning in the fisheries and aquaculture sector in the Caribbean. This two-year project involves technical aspects: research to assess the ecological and socio-economic impacts of climate change on the sector and the development of tools to support monitoring efforts in the region. Once the assessment work and monitoring systems have been completed, the information and tools will be handed over to the CRFM Ministerial Council and Forum, and will be made available to policy makers to be integrated into a broader policy portfolio (at the Regional level as well as that of the member countries).

The project also involves a range of communications and stakeholder engagement activities to share research on the impacts of climate change in the sector and lay the groundwork for people to feel positive about responding to climate change and inclined to take part in building the sector's climate resilience. Possible response options include actions to mitigate greenhouse gas emissions to slow the rate of climate change; measures to adapt to a changing climate in order to increase society's resilience to the changes that are coming; activities to increase the public's awareness of the climate change issue; investments in monitoring and surveillance systems; and investments in research to reduce key policy-relevant uncertainties

To inform the project's communications and engagement approach a baseline study of knowledge-attitudes-and-practice (KAP) related to climate change and fisheries is being undertaken at multiple levels. We are working with 150 persons in fishing/ coastal communities in Montego Bay, Jamaica; Roseau Dominica and Kingstown, Saint Vincent to learn about their knowledge-attitudes-and practices around climate change, its impacts and the urgency of responding to the multiple challenges being faced in the Caribbean. This interview is also a critical part of the effort to develop a baseline connect the dots between what is happening in Caribbean fisheries, with the policies that are shaping the direction of the fishing industry as climate change continues to bring radical changes to our marine environment, the fishing industry and those who depend on it.

(A) PRELIMINARY QUESTIONS:
Name:
Title:
Organisation:
Country:
Contact Number:

Email:

(B) KNOWLEDGE OF CLIMATE CHANGE:

1. Please explain what you understand by the term climate change?

2. What do you think are the main causes of climate change?

3. ON A SCALE OF 1 TO 5, HOW MUCH WOULD YOU SAY THE FOLLOWING HAS NEGATIVELY AFFECTED YOUR COUNTRY'S FISHING AREA?

1 = Very little impact 5 = significant impact (place a tick [✓] in the appropriate area)

CLIMATE HAZARD	Perceived Impact				
	1	2	3	4	5
a. Hurricanes/storms					
b. Coastal flooding					
c. Coastal erosion					
d. Changes ocean currents					
e. Changes in wind patterns					
f. Coral bleaching					
g. Invasive species					
h. Warmer oceans					
i. Ocean acidification					
j. Fish migration					

4. What are some of the consequences to the fisheries sector of the climate change impacts identified above?

Hurricanes/storms
Coastal flooding
Coastal erosion
Changes ocean currents
Changes in wind patterns
Coral bleaching
Invasive species
Warmer oceans
Ocean acidification
Fish migration

5. Are you aware of the CRFM-led regional initiative to assess the impact of climate change on the fisheries sector?

6. (b) If NO, interview should explain what the project is about – goals, objectives, and probe/ try to build interest in the project

7. (c) If YES, how do you see that this project might assist you in fulfilling your mandate? Feel free to make suggestions / articulate your organization's needs.

(C) ATTITUDES RE: ORGANISATIONAL RESPONSE TO CLIMATE CHANGE:

8. What is your organisation's greatest challenge in addressing climate change related to fisheries?

9. How satisfied are you with the steps being taken to address climate change impacts on the fisheries sector?

10. What are some of the gaps/ issues around climate change and fisheries that are not being addressed (adequately)?

11. Do you have any suggestions how this/ these issue(s) could be addressed?

D. **PRACTICES AROUND CLIMATE CHANGE ADAPTATION & ROLE OF POLICY/ LEGISLATION**

12. What kind of policies/ legislation on fisheries does your country have?

13. Do any of these policies specifically address adapting to climate change, climate-related disasters and / or other forms of environmental impact?

14. What are some of the things you think can be done to reduce risk and the future impacts climate change, both events and gradual changes?

15. And who should be responsible to take action?
- Government
- Private sector
- Community organizations
- Private citizens

AUXILIARY QUESTIONS FOR CRFM FORUM MEMBERS

RE: OUTREACH TO FISHERFOLK – FROM POLICY TO PRACTICE

16. What are some of the things you think fishers can do to reduce the impacts of climate change on their communities?

17. What do you think are the most effective ways of communicating with local fishers?

e.g.
- Direct Intervention – workshops, townhall meetings
- Radio
- Television
- Printed materials
- Other

18. What do you think are the best ways to provide information about climate change to fishers?

e.g.
- Direct Intervention – workshops, townhall meetings
- Radio
- Television
- Printed materials
- Other

19. What do you think are some of the key climate change-related messages to highlight to artisanal fishers?

20. What do you think are some of the key climate change-related messages to highlight to commercial fishers/ and or processors?

21. Please specify the stakeholders/agencies that should be involved in a climate change awareness campaign targeting the fisheries sector

22. What role could the following groups play in a climate change awareness campaign targeting the fisheries sector?
    - Government
    - Private sector
    - Community organizations
    - Private citizens

Is there other any information that you would recommend/ suggest as useful for this KAP Study?

REFERENCES/ LINKS TO MATERIALS

Links to materials…

Annex 3: Additional information on fisherfolk activities

Days at sea / week - low season		Montego Bay (JAM)		Kingstown (SVG)		Roseau (DOM)		Total	
		Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %
	1-2 days	21	52.5%	13	21.7%	10	16.4%	44	27.3%
	3-4 days	14	35.0%	28	46.7%	26	42.6%	68	42.2%
	5-6 days	2	5.0%	19	31.7%	14	23.0%	35	21.7%
	7 days	1	2.5%	0	0.0%	11	18.0%	12	7.5%
	N/A	2	5.0%	0	0.0%	0	0.0%	2	1.2%
	Total	40	100.0%	60	100.0%	61	100.0%	161	100.0%

Days at sea / week - high season		Montego Bay (JAM)		Kingstown (SVG)		Roseau (DOM)		Total	
		Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %
	1-2 days	0	0.0%	1	1.7%	5	8.2%	6	3.7%
	3-4 days	5	12.5%	13	21.7%	14	23.0%	32	19.9%
	5-6 days	22	55.0%	11	18.3%	25	41.0%	58	36.0%
	7 days	9	22.5%	35	58.3%	16	26.2%	60	37.3%
	N/A	4	10.0%	0	0.0%	1	1.6%	5	3.1%
	Total	40	100.0%	60	100.0%	61	100.0%	161	100.0%

Time of day for fishing		Montego Bay (JAM)		Kingstown (SVG)		Roseau (DOM)		Total	
		Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %
	Day	23	57.5%	36	60.0%	29	47.5%	88	54.7%
	Night	3	7.5%	1	1.7%	1	1.6%	5	3.1%
	Both	5	12.5%	21	35.0%	20	32.8%	46	28.6%
	N/A	9	22.5%	2	3.3%	11	18.0%	22	13.7%
	Total	40	100.0%	60	100.0%	61	100.0%	161	100.0%

Fishing methods used	Montego Bay (JAM)		Kingstown (SVG)		Roseau (DOM)		Total	
	Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %
Hook and line	33	82.5%	56	93.3%	56	91.8%	145	90%
Nets	8	20.0%	2	3.3%	11	18.0%	21	13.0%
Spear gun	9	22.5%	1	1.7%	3	4.9%	13	8.1%
Fish pots	27	67.5%	1	1.7%	21	34.4%	49	30.4%
Total (n)	40		60		61		161	

Who fish is sold to	Montego Bay (JAM)		Kingstown (SVG)		Roseau (DOM)		Total	
	Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %
Fish vendors	11	27.5%	41	68.3%	24	39.3%	76	47%
Community members	30	75.0%	32	53.3%	52	85.2%	114	71%
Hotel / guesthouse	5	12.5%	7	11.7%	7	11.5%	19	12%
Fishing complex / coop			49	81.7%	11	18.0%	60	37%
Restaurant	16	40.0%	6	10.0%	16	26.2%	38	24%
Total (n)	40		60		61		161	

Average expenses per fishing trip	Montego Bay (JAM)	Kingstown (SVG)	Roseau (DOM)	Average
	EC$	EC$	EC$	EC$
Fuel	316	518	258	364
Ice	25	24	38	29
Food	43	32	33	36
Bait	51	72	43	55
Boat rental	35	N/A	50	43
Total expenses (average)	395	595	365	452
Total expenses (min)	32	40	20	31
Total expenses (max)	903	6,370	1,880	3,051
Total (n)	25	59	61	145

Amount of fish considered a "good" catch	Montego Bay (JAM)	Kingstown (SVG)	Roseau (DOM)	Average
	Pounds	Pounds	Pounds	Pounds
Average amount	147	816	487	483
Min amount	40	120	15	58
Max amount	500	6000	4000	3,500

Impact of *Sargassum*	Kingstown (SVG)		Roseau (DOM)		Total	
	Count	Column N %	Count	Column N %	Count	Column N %
Mostly positive	8	13%	35	58%	43	36%
Mostly negative	19	32%	15	25%	34	28%
Both positive & negative	28	47%	6	10%	34	28%
Neutral / not affected	5	8%	4	7%	9	8%
Total	60	100%	60	100.0%	120	100%

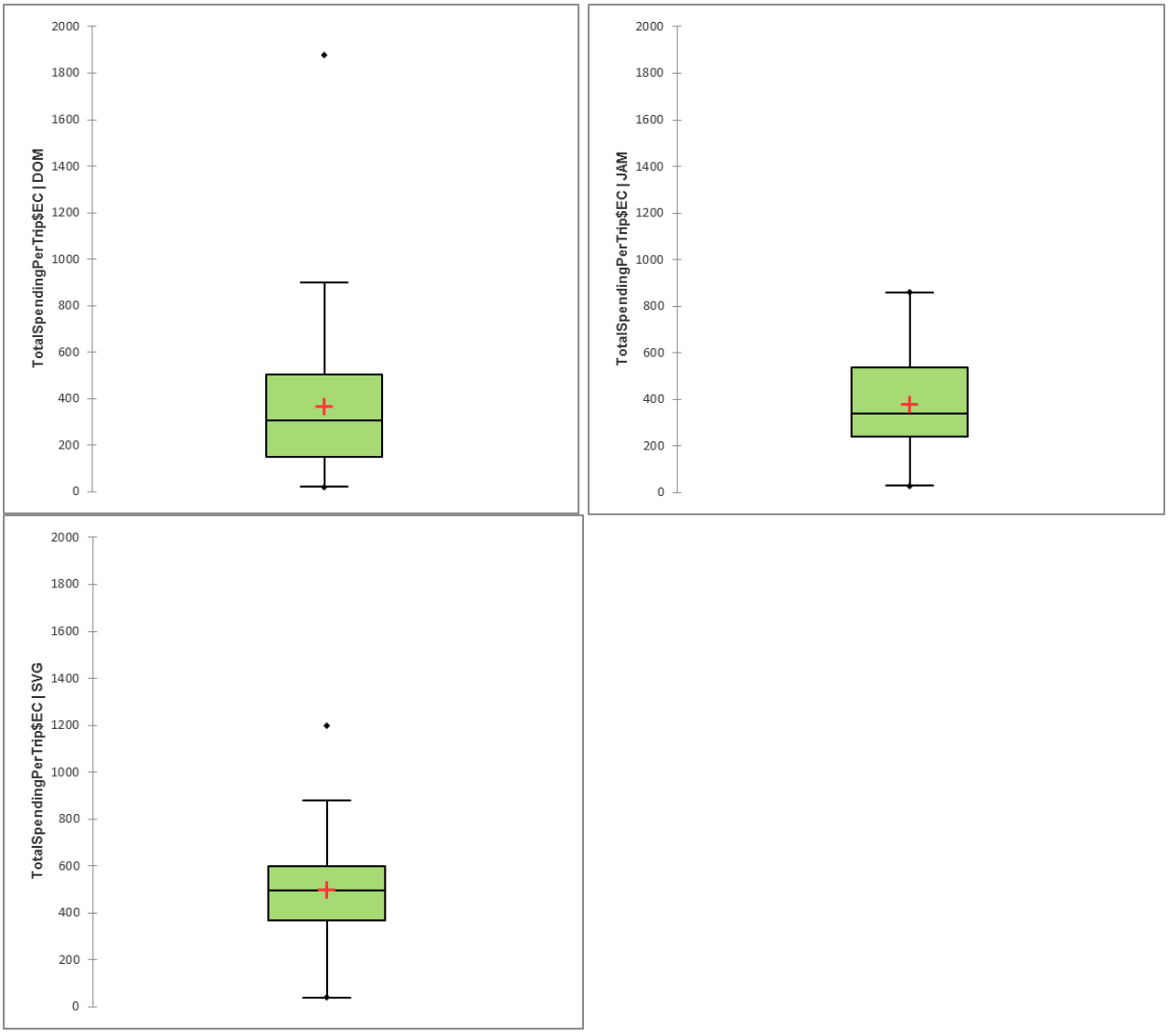

Figure 27: Boxplots showing statistics on reported total costs per trip for fisherfolk in Roseau, Montego Bay and Kingstown (n=61, 40, 60 respectively). Values are in EC$.

B: RAISING AWARENESS OF CLIMATE CHANGE, ITS IMPACTS AND WAYS TO ADAPT IN THE CARIBBEAN FISHERIS SECTOR: SHORT-TERM EFFECTS OF PROJECT COMMUNICATIONS

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ABSTRACT

Generating new information on the ecological and socio-economic impacts of climate change was among the goals of the *Fishery-Related Ecological and Socio-Economic Impact Assessments and Monitoring System* project (the project), funded under the Caribbean track of the Pilot Program on Climate Resilience (PPCR). Yet, the outputs of these detailed science assessments are of limited value unless decision makers across the fisheries sector understand the implications of the research and are motivated to act. Work Package 3 (WP3) of the project focused on communications and engagement activities, seeking to identify creative ways to communicate the science of climate change, how climate change is affecting the natural and human environment; what broad strategies are available to adapt and to make this information relevant and readily accessible to fisheries sector stakeholders. Project communications activities centred on a campaign primarily targeting fisherfolk and fisheries intermediaries (e.g., fisheries officers and managers); policymakers and the general public were secondary target audiences within the scope of the project. Undertaken between April and November 2019, the communication campaign comprised the development of posters, a video-documentary and accompanying discussion guide, outreach materials for fisheries intermediaries and press releases. Dissemination of these communication products relied on a number of channels to maximize reach cost-effectively; channels included a WhatsApp contact group and technical dispatches by the Caribbean Regional Fisheries Mechanism to country members. Throughout the campaign the project team sought to gather stakeholder feedback on the communication products and on their knowledge and attitudes toward climate change and fisheries. This feedback was provided as responses to a simple online survey. This report summarizes and discusses results from this survey, which integrates 40 surveys completed by fisherfolk and 14 by fisheries intermediaries. The chapter describes communication objectives, activities implemented and approach applied to gather feedback. It then presents results of survey analysis and key findings. The chapter ends with conclusions and recommendations for consideration as follow-up to the project. Overall, feedback from fisherfolk and fisheries intermediaries suggest that the communication products developed are relevant, salient and credible and are available for future public outreach.

1. INTRODUCTION

Communication and stakeholder engagement activities under Work Package 3 (WP3) are core to the *Fishery-Related Ecological and Socio-Economic Impact Assessments and Monitoring System* project (the project). The overall goals of WP3 are to build stakeholder awareness on the impacts of climate change and variability on the fisheries resources and sector, and to engage stakeholders in identifying feasible recommendations for climate-smart fisheries management decision-making. The project's communication and engagement process included the milestones illustrated in Figure 1, culminating in a communications campaign that took place between April and November 2019. As with all project activities, communications focused on reaching stakeholders in the six countries with PPCR initiatives.[10] Each of these milestones has corresponding reports and documentation. The KAP Study is paper A in this collection. The Stakeholder Engagement & Communications Strategy & Action Plan (SECSAP) and its corresponding report on implementation are available on the Caribbean Regional Fisheries Mechanism (CRFM) portal (http://portal.crfm.int/dataset?groups=climate-change-adaptation), as is the dissemination plan for communication products. All communication products are available on the CRFM website and portal as well.

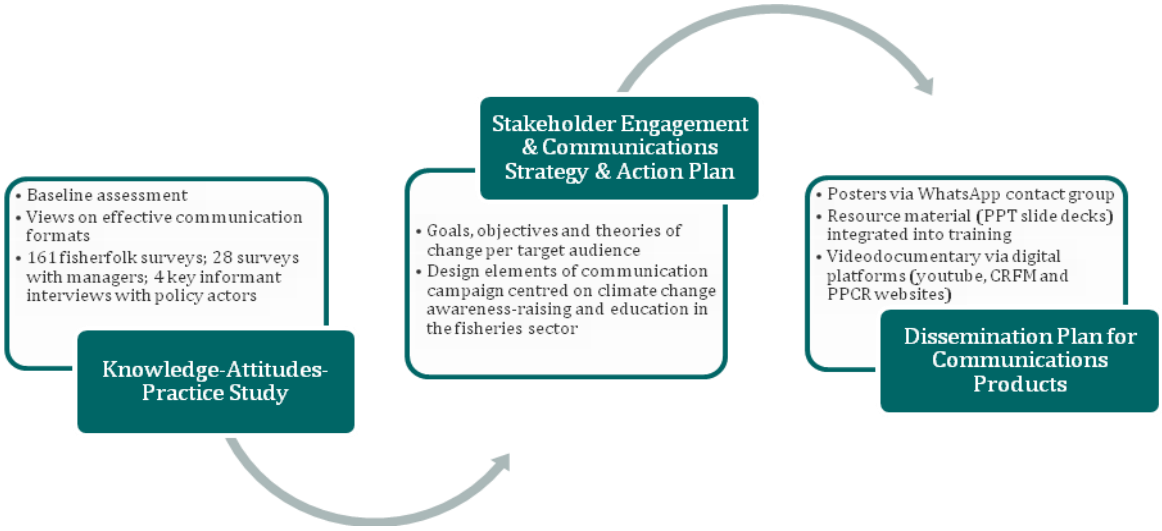

Figure 1: Research and planning that informed the project's communications campaign

The following activities were implemented as part of the communication campaign:

Table 1: Core components of the project's communication campaign

Audience and objectives	Communication activities
1. To increase knowledge among **fisherfolk** of the link between climate change adaptation and improved livelihoods prospects	• To disseminate the "Our Sea is Changing" posters via WhatsApp to a list of fisherfolk, coupled with a brief survey questionnaire to determine if and how their level of knowledge has improved • To disseminate/ publicize posters as part of CRFM activities (online and offline), and the wider PPCR Regional Communications Initiative • To announce the suite of project communications products via a news article distributed by CRFM

[10] Caribbean countries with national PPCR initiatives are Dominica, Grenada, Haiti, Jamaica, Saint Lucia, and Saint Vincent and the Grenadines.

2. To improve climate change communication and advocacy skills of **fisheries officers/ managers ("fisheries intermediaries")**	• To deliver a training module on climate communications, highlighting the suite of project communications products: posters, video documentary, Power Point modules on climate change science, vulnerability concepts, results of ecological and economic assessments of climate change impacts, results of value chain analysis
3. To increase awareness of climate impacts on fisheries and encourage greater personal and collective responsibility and action across the sector (**policymakers and general public**)	• To develop the video documentary "Fish for Today and Tomorrow" and accompanying discussion guide, making it available for viewing / downloading via YouTube, the CRFM and PPCR websites.

This document summarizes results of implementing the communication campaign. We did not conceive of this exercise as an impact evaluation, as we recognize that the reach of the communication campaign was not extensive and we did not have the time and resources available to replicate the KAP Study. What the document does is: i) report on feedback on the communication products, and ii) measures knowledge of climate change impacts, attitudes and perspectives toward climate change adaptation among fisherfolk and fisheries officers / managers ("intermediaries") in the six PPCR countries. We did not explicitly seek feedback from policymakers or the general public.

This document summarizes and discusses the following factors. Note that "F" signifies fisherfolk and "I" signifies fisheries intermediaries.

- Perceptions on the most serious problems facing the fisheries sector today (F and I)
- Understanding of the term "climate change" (F and I)
- Impressions and knowledge after seeing the Poster series (F)
- Perspectives on additional support needed to be more effective in preparing for and adapting to climate change (F)
- Impressions and attitudes after seeing the film "Fish for Today and Tomorrow" (I)
- Use of the communication products prepared through the project in engagement activities with fisherfolk (I)
- Perspectives on actions that should be taken to raise the climate awareness of fisherfolk and to build their resilience to climate impacts (I)

For each of these two target groups we developed a brief online survey, which we deployed opportunistically, taking advantage of all possible channels to reach these audiences in the time and with the resources we had available.

The structure of the rest of this report is as follows. Section 2 describes our approach to data collection, recruitment of respondents and analysis. Section 3 characterizes respondent profiles and presents results and analysis. The report concludes in Section 4 with a brief discussion and limitations of our analysis and reporting.

2. APPROACH

This section summarizes our approach to designing the online survey, recruiting survey respondents and analytical aspects of the report.

2.1 Survey design and respondent recruitment

We designed and deployed an online survey to meet the objectives of this post-campaign analysis, which involved gathering feedback on the usage of the project's communication products and capturing respondents' knowledge of climate change (definition, impacts) and attitudes around climate change adaptation. Cost-efficiency and simplicity were overriding considerations in selecting our approach, which included:

- An online survey for **fisherfolk**, with a mix of open and close-ended questions, to capture perspectives on levels of concern about climate change, knowledge of climate change and its impacts, perspectives on implications for them and additional support needed to adapt. To minimize the response burden we only included 10 questions, with 3 of them focused on obtaining personal information (country, years working as a fisher and contact information). Questions on communications products focused on the poster series.
- An online survey for **fisheries intermediaries**, with a mix of open and close-ended questions, to capture perspectives on levels of concern about climate change, knowledge of and attitude toward climate change, actual and expected uses of the communication products and views on additional awareness-raising efforts targeting fisherfolk. This online survey only included 10 questions in total, 2 of which focused on obtaining personal information (country, years working in the fisheries sector).

Dissemination of communication products to **fisherfolk** and recruitment to complete online surveys proceeded in the following way.

- We developed a WhatsApp contact group with the 72 fishers (72 out of 151) who had provided contact information during the KAP Study. Of these 72 only 44 had valid numbers in service.
- We shared links to the posters, video documentary and online survey to the WhatsApp contact group.
- In parallel, fisheries officers in two PPCR countries and the managers of a fisheries cooperative in Jamaica took ownership of the survey and made considerable efforts to recruit fishers.
- The project offered an incentive of phone credit 10 XCD or its equivalent to encourage fisherfolk to complete and submit the survey. This was a one-time credit sent to the fisher once a completed survey had been submitted, limited to one submission per phone number.
- In total, **forty (40) fishers responded to the survey**, over a period of six (6) weeks.

Dissemination of communication products to fisheries intermediaries was restricted to government **fisheries officers/ managers**. CRFM sent out a circular on September 17, 2019, to Permanent Secretaries of Ministries responsible for fisheries in PPCR countries, requesting the review of communication products and completion of communications impact surveys. The circular included a call to action for the fisheries officers to disseminate these products to their network, and specifically requested that they share the video documentary and posters with fisheries intermediaries for their review and encourage the completion of the brief online survey. In total, **twelve (12) fisheries intermediaries responded to the survey**, over a period of six (6) weeks.

Recruitment of both fisherfolk and fisheries officers / managers to complete our surveys was based on convenience sampling. This is a non-probabilistic sampling approach useful when researchers have limited resources. Criteria such as easy accessibility, geographical proximity, availability at a given time, or the willingness to participate in the study are considered in sampling (Etikan *et al*., 2016).

2.2 Data collection instruments and analysis

We prepared two versions of a similar online survey, tailored to the two target groups (fisherfolk and fisheries intermediaries). We designed these surveys to permit comparative analysis across the two groups. Additionally, we included two questions related to climate change knowledge and attitudes that allow qualitative comparisons relative to KAP Study findings (see Table 2).

Table 2: Indicators and survey elements in surveys for fisherfolk and fisheries intermediaries to explore the effect of the project communication campaign. ** Denotes elements that were included in the KAP Study

Area / indicators	Survey elements in the fisherfolk survey	Survey elements in the survey for fisheries intermediaries
Knowledge		
Climate change knowledge	**Understanding of climate change based on definition provided by respondent (2=yes, 1=somewhat, 0=no / don't know)	**Understanding of climate change based on definition provided by respondent (2=yes, 1=somewhat, 0=no / don't know)
Knowledge of climate change impacts & responses	Understanding of expected changes in fish catches in the future	
	Understanding of livelihood implications of climate change impacts on marine resources	
Attitudes		
On urgency & importance (of addressing climate change)	**Whether climate change is selected as among the most serious problems facing fisheries from a list of response options	**Whether climate change is selected as among the most serious problems facing fisheries from a list of response options
Practice		
On adaptation & disaster risk reduction	Open-ended question on actions fisherfolk can take to prepare for (and adapt to) climate change	Open-ended question on actions needed to raise the climate awareness of fisherfolk and to build their resilience to climate impacts
	Open-ended question on support needed to be more effective in preparing for and adapting to climate change	
Uptake of communication products		
On access to and use of communication products	Whether respondent has seen the poster series (yes, no)	Whether respondent has seen the video documentary (yes, no)
		Level of concern about the impacts of climate change after viewing the video documentary
		Open-ended question on salient aspects of the video documentary
		Actual and intended use of communication products for engagement with fisherfolk

We deployed the online surveys through SurveyMonkey. We exported online results to an Excel workbook. For survey questions with close-ended responses (4 out of 10 in the fisherfolk survey; 5 out of 10 in the fisheries intermediaries survey), these required no to minimal transformation for analysis. For open-ended questions, we reviewed the content in detail and either used rules to assign the response to bins created for the KAP Study or applied open coding first, developing a framework for each question iteratively and deductively. We also reported actual responses so the voice of stakeholders comes through directly.

Because of the low response rate and few questions in the survey, we did not estimate knowledge, attitude and practice (KAP) scores and statistics, as we did in the KAP Study. Instead, the focus is on reporting descriptive statistics and differences in responses based on self-identified access to the project's communication products. Where appropriate, we also compare answers provided to this survey with answers acquired through the KAP Study. This only applies to two survey elements (the ones marked with two asterisks in Table 2).

3. RESULTS

This section characterizes the fisherfolk and fisheries intermediaries who provided complete surveys, examining socio-demographic and occupational attributes. This section also presents the results of survey analysis with regard to climate change knowledge, attitudes, practice and uptake of the project's communication products.

3.1 Fisherfolk

Background

The short survey included two questions related to socio-demographics: country of residence and years spent fishing. The majority of fisherfolk responses to the survey came from Grenada (23 out of 40 or 58%) and Jamaica (8 out of 40 or 20%). We expected most responses to originate from Dominica, Jamaica and St. Vincent and the Grenadines, since the KAP survey was deployed in fishing sites in those countries and the project Communication Specialist visited a fishing community in Jamaica during the campaign. Responses from Grenada and Haiti reflect a concerted effort by fisheries liaison officers from PPCR countries to boost the response rate. Notably, we received at least one response from fisherfolk from all PPCR countries but St. Lucia (Figure 2).

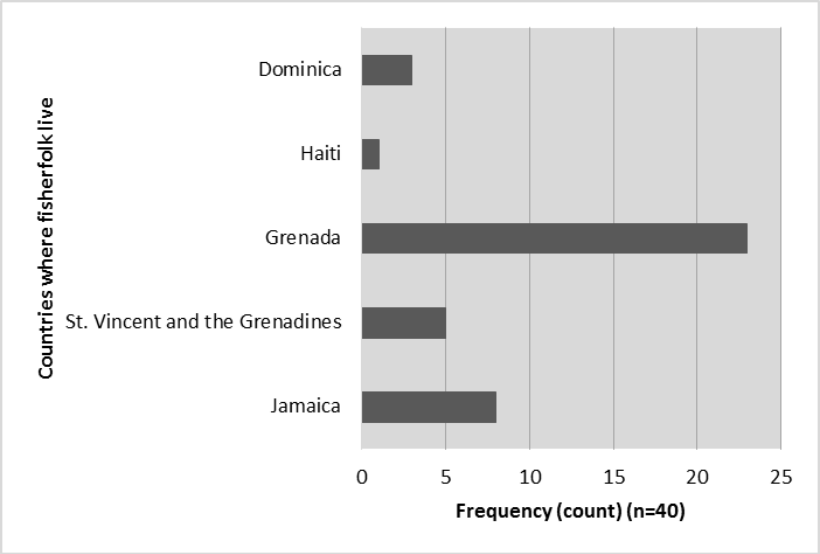

Figure 2: National representation of fisherfolk who responded to the survey. The number of responses received from Grenada reflects efforts by national fisheries officers to encourage fisherfolk participation.

Respondents' experience in fishing varies considerably. Table 3 provides information on the number of years respondents have spent fishing. On average, respondents have spent about 16 years fishing, although the length of time ranges from half a year to 40 years. Compared to the KAP Study where the average was 40 years spent fishing, fisherfolk as a group had less experience. It is likely that the group of respondents were younger as a whole than those engaged in the KAP Study as well.

Table 3: Years spent fishing. The median number of years is 15, the average number is 16. The number of years ranges from half a year to 40 years.

Years spent fishing	Total	
	Count	%
0 to 10 years	16	41
11 to 20 years	16	41
21 to 30 years	3	8
31 to 40 years	4	10
Total	39	100

Climate change knowledge, attitudes and practice

Knowledge

We asked fisherfolk what they understood by the term "climate change". In **describing the term "climate change"** fisherfolk provided varied responses, emphasizing different aspects of the phenomenon (e.g., greenhouse gas emissions, human-caused, temporal and global dimensions, physical changes and links between physical, ecological and socio-economic impacts). Table 4 provides examples of respondents' explanations.

Table 4: Examples of fisherfolk's responses to the question "Please explain what you understand by the term climate change?" (n=40)

Fisherfolk (n=40)	
Greenhouse gas emissions, causes • Because of the Carbon gases / chemical in the atmosphere and the imbalances in nature also pollution • The change in the environment as a result of pollution and global warming • That our environment is changing in a bad way because of our practices. Therefore things are not like before. So climate smart practices have to be in our fore front	**Temporal and global dimensions** • Is any change in the expected average weather over a period of time • I think it's to do with new weather patterns that last for a long period of time • Change in seasonal climate that is abnormal from historical occurrences, on a global scale. • Changes in regional and international atmospheric conditions. • Sustained weather extremes over a period of time • A change in overall climate patterns globally • Long term change in weather patterns
Physical changes • Changes in the weather patterns • Unpredictable weather patterns • Change in the weather patterns (raise in sea level, hotter summer • A change in the climate patterns • The weather is getting different • Climate change is the dramatic change in the climate patterns that was not there before	**Physical, ecological and socio-economic changes** • It is no longer business as usual. Weather patterns will change, sea conditions will change, fish patterns will change • Dramatic change in the climatic patterns e.g. stronger storms, more intense droughts, greater damage to the coral reefs due to global warming • The change that happens with the climatic patterns and affects the earth, including the oceans which is our source of sustenance • It's the average daily changing of the weather which affects the way in which we live

Explanations on what climate change means varied in nuance from "*changes in weather patterns*" to "*changes in seasonal climate that is abnormal from historical occurrences, on a global scale*". Many responses reflected the concept of a variability and unpredictability as a "new normal" that affected people's lives. Most respondents supplied explanations that were incomplete or partially accurate, demonstrating somewhat of an understanding of climate change. Only 3 of the 40 respondents could not describe the term at all (see Figure 3).

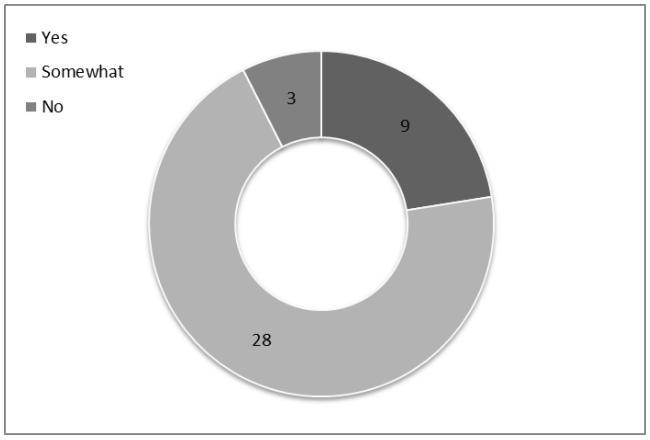

Figure 3: Assessed understanding of climate change based on respondents' explanation of the term "climate change" (Yes=provided accurate and complete definition; somewhat=provided partially accurate answer; no=could not describe the term, description was wrong) (n=40)

Based on key messages in the project's communication products, we asked fisherfolk about **expected changes in fish catch in the future**. It was a multiple choice question prompting respondents to select one option. Table 5 shows the distribution of their responses. Technically, all response options were correct. We asked fisherfolk to select one response only to try to understand the impacts that were most salient to them. Salience, in turn, has to do with the messages being clearly communicated and understood by fisherfolk. Responses suggest fisherfolk are already observing most of these changes (fish moving further offshore, to greater depths, local losses of certain species). The only response option that fisherfolk did not select frequently was the movement of fish toward higher latitudes (fish moving north). This is understandable as poleward migration of species can be a complex concept to convey through simple means such as posters.

Table 5: Distribution of responses by fisherfolk to the question "How are fish catches expected to change in the future?" (n=40)

Response	Total (n=40)	
	Count	%
Some fish may move north	2	5.0
Some fish may move further offshore	12	30.0
Some fish may go deeper seeking cooler water	11	27.5
Some types of fish may disappear	15	37.5

We asked fisherfolk to tell us how they thought these expected impacts on fish catches would **affect their ability to make a living**. Figure 4 and Figure 5 below summarize the answers received, using different formats. Both formats show that fisherfolk relate changes in species abundance and distribution to less catch, higher fishing effort, higher cost of fishing and the need to adapt. There is the overriding perception that livelihoods are threatened.

Figure 4: Word cloud generated from fisherfolk's perspectives on how climate change impacts could affect their ability to make a living

For example, one fisher responded that *"less availability of fishing bait and the large presence of Sargassum seaweed will affect the amount of fish caught"* and that changes in the ocean *"may threaten my livelihood because certain fisheries resources may no longer be available or have sufficient stocks to harvest"*. Some comments directly spoke to fishing effort and costs: "*it will be harder to go out fishing to be able to catch enough fish to help make a living"* and *"fishers will have to go further out to catch fishes due to more fuel expenses"*. A few responses related impacts on livelihoods to broader effects on health and well-being, with one fisher commenting that future changes in marine resources would affect them *"mentally, because it will be stressful if you don't have the necessities to go the distance to catch the fish, you can't feed your family."* A few other comments indicated an acknowledgement of the importance of changing marketing practices to account for shifts in the composition of catch, including educating consumers to eat fish they are not used to eating.

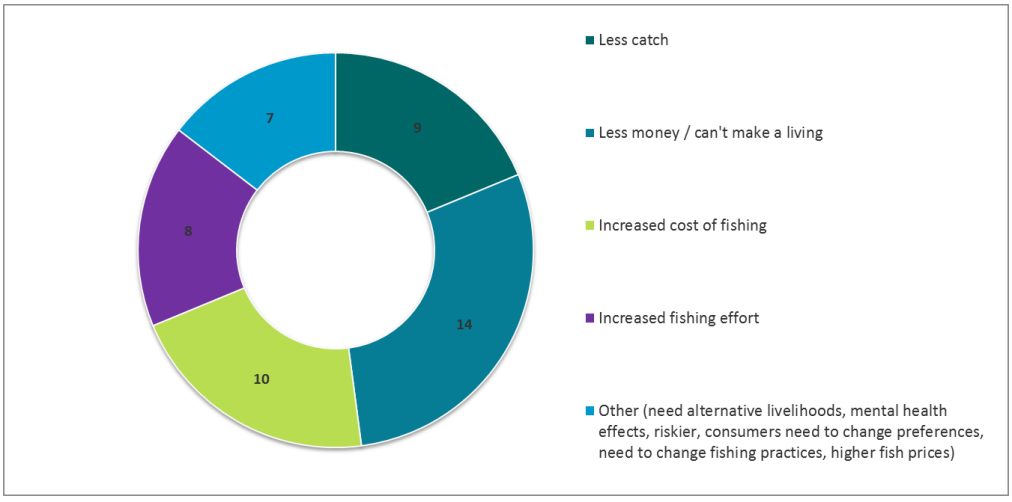

Figure 5: Synthesis of fisherfolk's responses to the question "How do think these expected changes will affect you, and your ability to make a living?" (n=39)

Attitudes

We explored attitudes on the urgency and importance of addressing climate change by asking fisherfolk to identify top threats to the sector. Fisherfolk see **climate change as the top problem facing fisheries** (Table 6) – even more of a threat than day-to-day issues like poor fishing practices, fuel prices and market for catch. 83% of respondents (33 out of 40) selected climate change as a serious problem for fisheries today.

Table 6: Distribution of responses by fisherfolk to the question "what do you think are the most serious problems facing the fisheries sector today?" (n=40)

Problems facing the fisheries sector	Total (n=40*)	
	Count	%
Climate change	33	83
Poor fishing practices	29	72
Fuel price	28	70
Equipment cost	28	70
Market for catch	28	70
Piracy	25	63

* Respondents were allowed to choose more than one response.

Practice

We explored action on adaptation and risk reduction by asking respondents **what they could do to prepare for and adapt** to expected changes in marine resources. This was an open-ended question and Figure 6 shows our synthesis of results provided. The majority of stated actions related to i) buying and using new or improved equipment (including vessels) and gear, ii) changing fishing practices (general and sustainability-focused) and iii) information and education. Encouragingly, virtually all responses were relevant actions; only two respondents stated they were unsure of what could be done and only one respondent skipped the question.

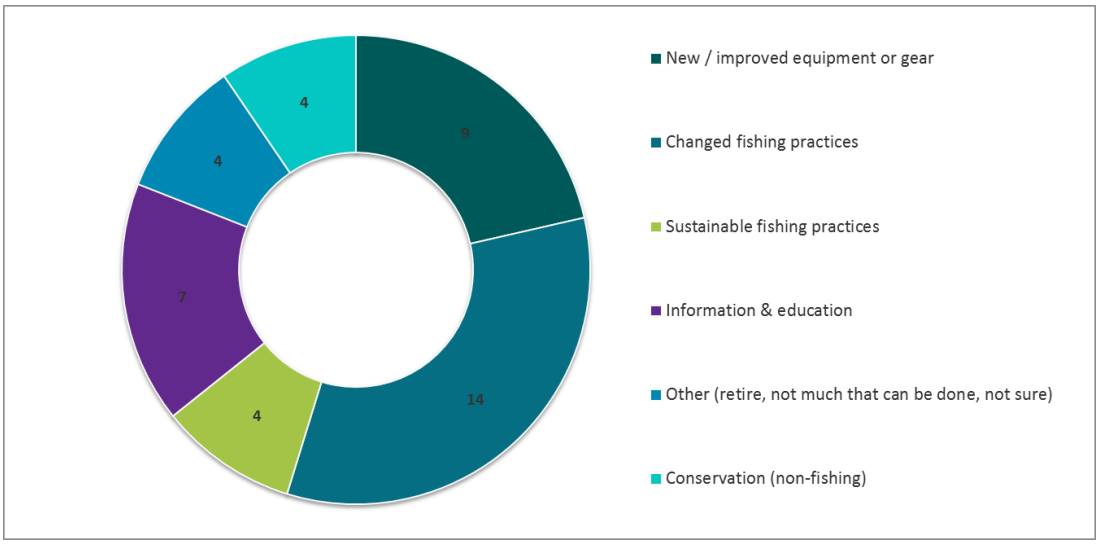

Figure 6: Synthesis of fisherfolk's responses to the question "What can you do to prepare for (and adapt to) these changes?" (n=39)

With regard to fishing equipment and gear, fisherfolk were clearly thinking about efficiency and safety. For example, one respondent stated they would *"employ better technology, e.g., 4 stroke-engines thus reducing the amount of petrol used to get to the fishing grounds".* Others stated they would "*buy a bigger boat to go further out to sea"* and *"get GPS, fish finder and [a] more efficient engine"*. Actions related to fishing practices were not specific, for the most part, but conveyed the need for adaptation, using attributes such as *"different"*, *"better"*, *"smarter"*, *"safer"* and *"more preservative"*. As for information and education, fisherfolk's responses indicated a desire to learn more about expected climate change impacts the marine environment and on species, as well as changes in the marketplace. For example, one respondent indicated the need to *"educate yourself on these changes so that you can handle the situation better"* and another wanted to *"find out about the different types of fish and make people aware of the types of fish that can be eaten"*.

We also asked respondents what **support they would need to be more effective in preparing for and adapting to climate change**. This was also an open-ended question, with Figure 7 showing our synthesis of results provided by fisherfolk. Information and education as well as financial assistance stand out as the two most frequently mentioned supports for climate change adaptation.

Information and education needs related to improving understanding i) of the link between climate change impacts and profitability, ii) of options available to adapt fishing to climate change, iii) of projected climate change impacts on specific species, iv) of better fishing methods. Targets for information sharing and education were primarily fisherfolk but also the general public.

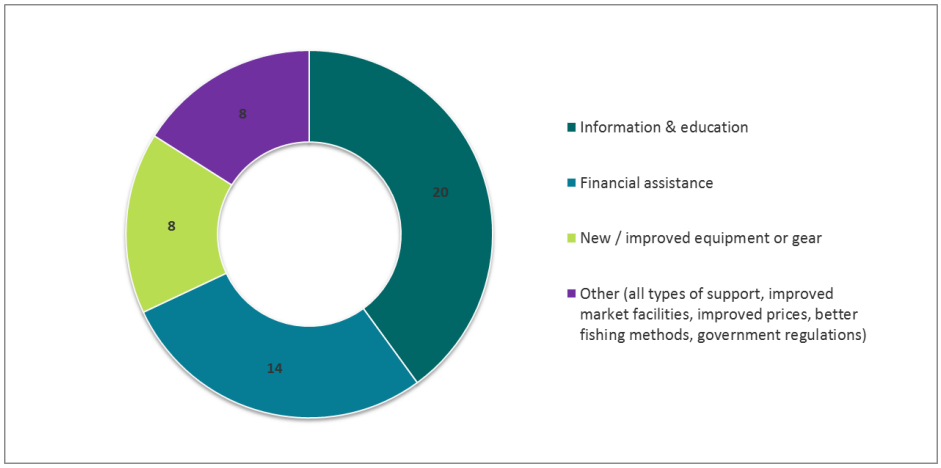

Figure 7: Synthesis of fisherfolk's responses to the question "What support would you need in order to be more effective in preparing for and adapting to climate change?" (n=39)

Responses related to financial assistance varied in their specificity, sometimes indicating actions that would be taken with the funding support and related outcomes. For example, responses included *"more subsidies on equipment"* and *"funding for FADs and other equipment to venture further to fish."* Fisherfolk also indicated the need for support in the way of new / improved equipment or gear without mentioning the link to financing. Specific types of equipment or gear mentioned included larger vessels, depth sounders, fish finders and safety equipment.

Uptake of communication products

When setting up the communications campaign we intended for responses to the online survey and access to the series of posters developed under the project to be related. That is, fisherfolk would receive a one-time credit on their cell phones as an incentive to look at the posters and complete the survey. Therefore, it is reasonable that the majority of respondent responded positively to **whether they had seen the**

posters showing climate change effects on Caribbean fisheries. As shown in Table 7, about three quarters of respondents (31 of 40) claimed to have seen the posters.

Table 7: Distribution of responses by fisherfolk to the question "Have you seen the Posters showing how climate change is expected to affect fisheries in the Caribbean?" (n=40)

Response	Count	%
Yes	31	77.5
No	9	22.5

We explored **patterns in uptake of the climate change posters** in two ways. We looked at differences in uptake of the posters by country (Figure 7) and differences in the completeness and accuracy of climate change definitions between fisherfolk who had and had not accessed the posters (Figure 8).

In relative terms, there was little difference in reported uptake of posters across respondents from Jamaica, Grenada and St. Vincent and the Grenadines. These were the countries from which most responses originated. Between 70 and 80% of fisherfolk reported having seen the posters.

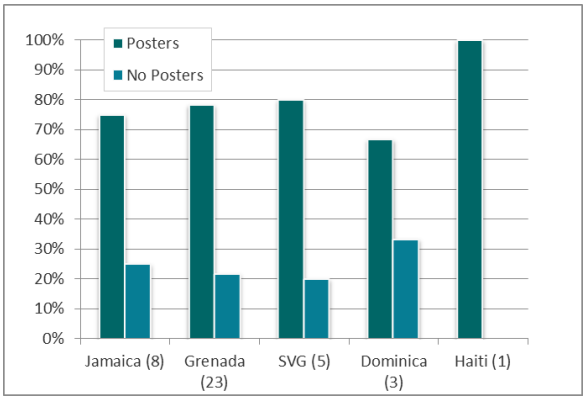

Figure 7: Proportion of respondents that accessed ("posters") and did not access posters ("no posters"), by country (n=40)

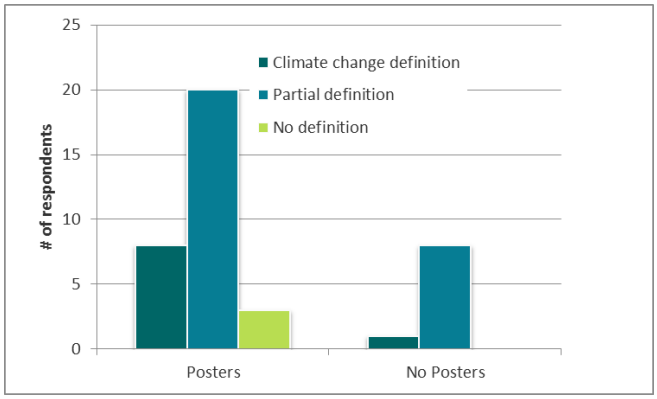

Figure 8: Number of respondents that accessed ("posters") and did not access posters ("no posters") broken down by assessed understanding of climate change based on fisherfolk's explanation of the term climate change ("climate change definition"=provided accurate and complete definition; "partial definition" =provided partially accurate answer; only 3 respondents did not provide a definition so this category was excluded from the figure)

Because fisherfolk are unlikely to have studied the posters in detail and their baseline awareness and knowledge of climate change impacts likely differed, we were not anticipating observing marked differences in understanding of climate change resulting from viewing the posters. Figure 8 shows the number of respondents who did and did not access the posters broken down by assessed understanding of climate change. We can see that respondents who accessed posters demonstrated the full range of understanding of climate change, as assessed by the climate change definition they provided. We can also see that a greater proportion of respondents providing accurate definitions of climate change accessed the posters (89%) relative to the proportion of respondents who provided a partial definition (71%). This could mean that viewing the posters was useful to reinforce understanding of climate change and its impacts or simply that respondents with a higher baseline level of understanding were more motivated to access the posters. As well, the results in Figure 8 also suggest that exposing fisherfolk to messages through posters such as ours is insufficient to raise levels of awareness of climate change and what to do

about it. The three fisherfolk whose climate change definitions were the most inaccurate / incomplete report having viewed the posters.

In any case, neither of the variables tested separately – country, quality of climate change definition— showed statistically-significant associations with having accessed the posters.

Managers (Fisheries intermediaries)

Background

Managers who replied to the survey are diverse in their **years of experience working in or supporting the fisheries sector** (Table 7) and, although a greater number of respondents reported working in Jamaica than any other PPCR country (4 out of 14), **all PPCR countries are represented** (Figure 8). Respondents predominantly work as resource managers (5 out of 12) (Figure 9), focused on marine conservation and fisheries management. The sample of respondents also includes senior fisheries officials, leaders of non-governmental organizations and project staff involved in livelihoods promotion and communications.

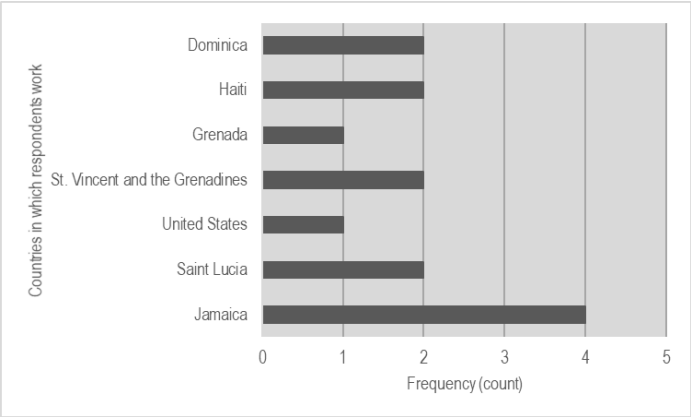

Figure 8: National representation of managerial respondents (n=14)

Table 7: Years of experience in the fisheries sector (n=12)

Years working in or supporting the fisheries sector	Total	
	Count	%
0 to 5 years	4	33.3%
6 to 10 years	3	25.0%
11 to 15 years	1	8.3%
>15 years	4	33.3%
Total Responses	12	100%

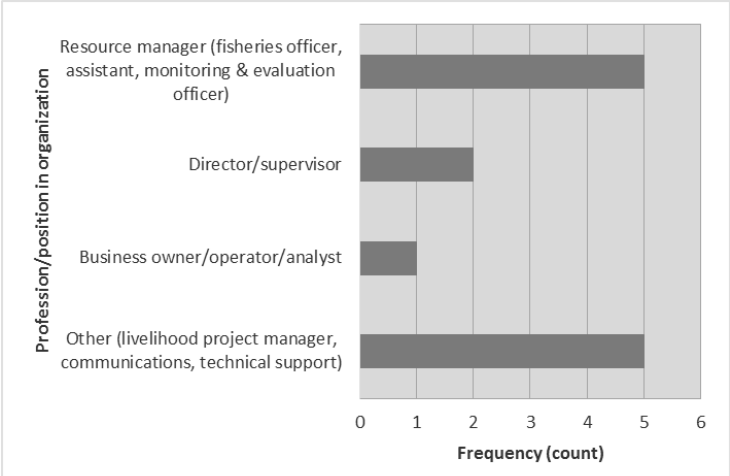

Figure 9: Affiliations of managerial respondents (n=13)

Climate change knowledge, attitudes and practice

Knowledge

We asked managers what they understood by the term "climate change". In **describing the term "climate change"** managers referred to the link between greenhouse gas emissions and changes in

atmospheric and ocean conditions, to temporal dimensions of the problem and to physical changes. Table 8 provides examples of respondents' explanations.

Table 8: Examples of managers' responses to the question "Please explain what you understand by the term climate change?"

Managers (n=14)	
Greenhouse gas emissions, causes • Accelerated change (increase) of global temperatures and other weather patterns due to anthropogenic increases in greenhouse gases in the atmosphere. • Change in the typical weather found in a place due to the dramatic increase in CO_2 emissions from human activity. This had led to an increase in the earth's temperature. It is anticipated to bring an increase in the number of intense storms, warmer seas, longer periods of drought, sea level rise and other conditions that will impact fishers • Global warming is caused by human activities which causes a change in earth natural processes	**Temporal and global dimensions** • Large scale long term shifts in the average weather patterns on a global scale • Long term overall change in weather and ocean conditions and patterns
Physical changes • Changes in weather, climate and other related atmospheric conditions that are affecting the (marine) environment.	**Physical, ecological and socio-economic changes** • Climate change is the changing of the atmosphere due to warmer temperatures that cause more intense natural disasters that can result in loss of habitats, livelihoods and lives.

Climate change definitions were accurate / complete, for the most part (see Figure 10) (7 out of 14 responses). Just under half of respondents provided partially accurate definitions and only one respondent was incorrect. Some responses indicated potential confusion between climate change and climate variability: *"the periodical change of atmospheric conditions throughout the world."*

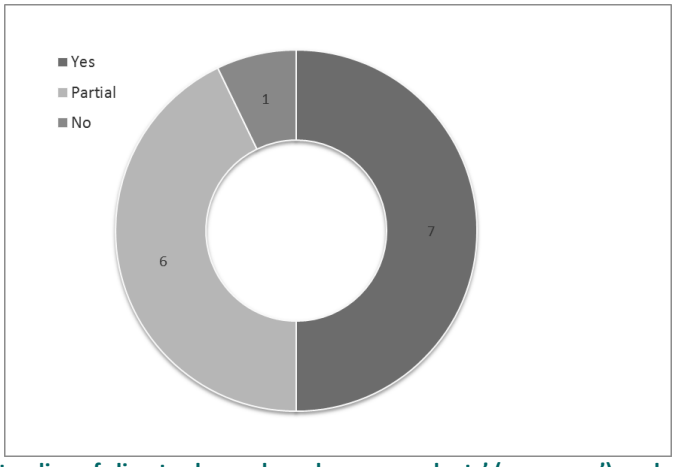

Figure 10: Assessed understanding of climate change based on respondents' (managers') explanation of the term "climate change" (Yes=provided accurate and complete definition; somewhat=provided partially accurate answer; no=could not describe the term, description was wrong) (n=14)

Attitudes

We explored attitudes on the urgency and importance of addressing climate change by asking managers to identify top threats to the sector. Managers see **climate change as the top problem facing fisheries** (Table 9), selecting this option with the same frequency as "poor fishing practices". Fuel price, cost of equipment, market for catch and piracy are significantly less of a concern for managers than climate change and poor fishing practices.

Table 9: Distribution of responses by managers to the question "what do you think are the most serious problems facing the fisheries sector today?" (n=14)

Problems facing the fisheries sector	Total (n=14*)
Climate change	6
Poor fishing practices	6
Fuel price	1
Cost of equipment	1
Market for catch	1
Piracy	0

* Respondents were allowed to choose more than one.

Practice

The survey did not explore managers' actions, behaviour or practice but sought to understand their perspectives on fisherfolk actions and needs. We asked managers **actions needed to raise the climate awareness of fisherfolk and build fisherfolk's climate resilience**. A review of managers' surveys revealed two themes in their responses: i) information sharing, education, communication and ii) engagement of fisherfolk to work on joint solutions (see Table 10). Managers suggested that the communications products generated through this project could be useful in a number of venues and with a range of audiences, not just fisherfolk.

Managers' responses also suggested they perceived fisherfolk's reluctance to change and the need to combine education and awareness with more coercive policy instruments. Importantly, one manager indicated the importance of conveying the message that fisherfolk were not alone in the need to adjust their practices.

- *"The current processes are adequate, but hindered by the mindset of fishers themselves. The continued assessment of the impacts of climate change is needed bearing in mind the resistance that may be faced but overcome with time."*

- *"Climate awareness campaigns need to be done at a national level over an extended period and become part of the school curriculum with age appropriate information at each age. Campaigns to fisher need to be sustained and relate to their everyday activities, showing the connection with impacts they may already be seeing and practical things they can do to prepare. Legislation that is climate sensitive should also be put in place and enforced to improve resilience and reduce current and future impacts not just on the fishing sector but related sectors so fishers see that they are not the only ones that have to adjust their lifestyles."*

Table 10: Examples of managers' responses to the question "What more do you think should be done to raise the climate awareness of fisherfolk and to build their resilience to climate impacts?" (n=12)

Managers (n=12)
Information-sharing / education / communication • For the Fisheries Division to share the film with all the stakeholders involved in the Industry and to also continue its public relations communication. • Educate businesses and private sector stakeholders on the economic benefits of doing something now. Continue with community education and awareness campaigns on all available media (social media, radio, TV, Newspapers, posters, schools, churches, etc. • Use these communication products at every opportunity - fisheries management meetings, fisherfolk organization meetings, other government sector meetings also should be considered. Every possible opportunity should be identified.
Engagement of fisherfolk in climate action • Ongoing dialogue on climate change and improved and collaborative fisheries and marine resource management. • Involve them in the implementation of projects that allow them to learn how they can participate in building

resilience to climate change.
- More education as well as direct climate mitigation measures (e.g. reducing emissions, reforestation), sustainable harvesting of resources, providing alternatives
- Engagement of fisherfolk in activities that reduce or offset emissions

Uptake of communications products

We asked managers about the **effect of viewing the movie "Fish for Today and Tomorrow"**. The majority of respondents (8 out of 14) had seen the movie and all of them claimed they were more concerned about climate change impacts as a result. This is a small group of respondents so we cannot make any inferences beyond what is documented here. However, the reported effect of the movie is encouraging.

Table 11: Questions and answers from managers relating to the effect of the movie "Fish for Today and Tomorrow"

Question	Response	Count	%	N
Have you seen the film "Fish for Today and Tomorrow?"	Yes	8	57	14
	No	6	43	
Did the film make you feel more concerned about the impacts of climate change?	Yes	8	80	10
	No	2*	20	

*These respondents indicated they had not seen the movie.

Managers who viewed the movie provided a range of views on its most salient aspects (see Table 12). Managers' responses indicate that the film was effective in conveying key messages emerging from project research. Among other messages, they highlighted the convergence of fishers' observations on catch, changes in availability of marine resources and some of the mechanisms available to manage risk. Importantly, managers highlighted both gradual impacts in the ocean environment and impacts from extreme events.

Table 12: Examples from manager's responses to the question "What key points stand out for you "Fish for Today and Tomorrow?" (n=7)

Managers (n=7)
• The observations of the fishers
• Fishers having to go further for their catch; fish declining as a result of overfishing, pollution and climate change
• All the fishers expressed the same concerns surrounding the fisheries.
• The importance of fish as a means of livelihood and how vulnerable the sector is to climate change.
• Ocean conditions are changing, fish species habitat suitability is changing and perhaps many fish will no longer be easily available. Fishers are already seeing the changes, and need to change their fishing techniques. The whole sector is now very vulnerable to stronger hurricanes, and we need to have risk management for our data, our buildings and equipment, our boats, our harbours.
• Availability of fisheries resources have changed owing to climate-related factors. Fishers need to change the way they are currently doing business. Storms can severely impact the ability to earn, because of loss of gear and lack of insurance. There are mechanisms developed to help fishers such as the FEWER apps. It is important to engage fishers in the process of discovering how to help themselves.

We asked managers about **actual use and plans to use the communications products** (posters, video-documentary) in their engagement with fisherfolk (see Table 13). A majority of respondents (10 out of 14) had not yet used the communications products for outreach to fisherfolk. Half of the respondents stated their intention to use both posters and the video-documentary in future engagements with fisherfolk.

Table 13: Questions and answers form managers relating to the use of communication products developed through the project for outreach with fisherfolk

Question	Response	Count	%	n
Have you used the communication products prepared through the project in your engagement activities with fisherfolk?	Yes	4	29	14
	No	10	71	
If YES, which have you used or intend to use?	Posters	3	43	7*
	Film "Fish for Today and Tomorrow"	4	57	

*Respondents who indicated they had not used communication products prepared through the project still answered this question with products they presumably intend to use in future

4. DISCUSSION AND CONCLUSIONS

This section summarizes key findings on feedback on and potential impact of the project's communication products. It also provides a qualitative comparison of measures of knowledge of climate change impacts, attitudes and perspectives toward climate change adaptation among fisherfolk and fisheries officers / managers ("fisheries intermediaries") noted in this post-communications campaign survey relative to the KAP Study.

4.1 Key findings

Implementation of the project communications campaign provided an opportunity to gauge fisherfolk and managers' climate change knowledge, attitudes and practice, explore the campaign's short-term effect on our target audiences and comment on the usefulness of the communication products beyond the lifetime of the project. It's worth noting that the effort to survey fisherfolk and managers post communications campaign was not equivalent to the effort expended during the development of the Knowledge-Attitude-Practice (KAP) Study, which was prepared as an input to the design of communication and engagement activities (Paper A of this collection). Table 14 and Table 15 contain highlights of the key results shown in Section 3, for fisherfolk and managers, respectively. The tables also include selected findings from the KAP Study, as points of comparison.

For the **fisherfolk who completed the survey**, we note the following:

- For some, understanding of climate change encompasses anthropogenic causes (GHG emissions), physical changes and the ecological and socio-economic impacts flowing from them. For others, understanding of climate change is less nuanced but their responses provide a sense that they know "things are not the same as they used to be". Interestingly, fisherfolk did not conflate climate change with general environmental degradation and pollution, which was not uncommon in the KAP Study. Compared to the sample of fisherfolk in the KAP Study this group of fisherfolk provided fewer inaccurate definitions of climate change (in percentage terms).
- Scientific findings on changes in the distribution and abundance of fish species as impacts of climate change resonate with fisherfolk. These are key messages in the video-documentary "Fish for Today and Tomorrow" (fish disappearing, moving into deeper water, further offshore) and in the series of climate change posters. An additional message in the video-documentary that is perhaps less understood or not as salient for fisherfolk is the poleward migration of species (fish moving north). This message is important to highlight and understand because it relates to the global redistribution of species, in which temperate areas can be portrayed as achieving net gains or suffering fewer losses than tropical areas, creating disparities in climate change vulnerability.
- The climate change posters emphasized the connections between changes in the sea, changes in catch and ripple effects across the seafood value chain in the Caribbean. When we asked fisherfolk about the implications on their livelihoods of climate change impacts on marine resources an overriding message was of negative effects on livelihoods, including less catch, higher costs of fishing and

increased fishing effort needed. Fisherfolk responses also raised the prospect of indirect impacts on their well-being, including mental health impacts from the inability to make a living and provide for their families. As with the question on climate change definitions, responses to the question on livelihood implications also suggested an acknowledgement or appreciation for the need to adapt.

- Perhaps because of the specific focus of the communications campaign, the messaging in the climate change posters and bias introduced through self-selection, but fisherfolk overwhelmingly (83%) considered climate change a top problem facing the fisheries sector today. In contrast, the KAP Study found that day-to-day fishing issues were more of a current problem than climate change.

Table 14: Summary indicators on fisherfolk's climate change knowledge-attitudes-practice (KAP) and of uptake of communication products

Summary indicators	Definition	Survey results	Comparison with baseline KAP (KAP Study)
Number of responses	Opportunistic sampling based on efforts by CRFM Secretariat and others to recruit fishers in the 6 PPCR countries	40	150
Knowledge areas			
On climate change	Understanding of climate change based on definition provided by respondent (2=yes, 1=somewhat, 0=no / don't know)	3 out of 40 (7.5%) could not describe the term, definition was inaccurate	75 out of 158 (47%) could not describe the term, definition was inaccurate
On climate change impacts / responses	Understanding of expected changes in fish catches in the future	Fisherfolk understand fish may disappear and follow temperature gradients into deeper water, further offshore. Poleward migration is least understood.	
	Understanding of livelihood implications of climate change impacts on marine resources	Fisherfolk understand that climate change threatens livelihoods. They connect changes in species abundance and distribution to less catch, higher fishing effort, higher cost of fishing and the need to adapt.	
Attitude areas			
On urgency & importance (of addressing climate change)	Whether climate change is selected as among the most serious problems facing fisheries from a list of response options	33 out of 40 (83%) considered climate change as a top problem facing fisheries today	25 out of 161 (15.5%) considered climate change as a top problem facing fisheries today
Practice areas			
On adaptation & disaster risk reduction	Actions fisherfolk can take to prepare for (and adapt to) climate change	Three types of actions: i) buying and using new or improved equipment (including vessels) and gear, ii) changing fishing practices (general and sustainability-focused) and iii) information and education	
	Support needed to be more effective in preparing for and adapting to climate change	Two types of support most frequently mentioned: i) information and education, ii) financial assistance	
Uptake of communication products			
On access to and use of communication products	Whether respondent has seen the poster series (yes, no)	31 of 40 (77.5%) fisherfolk had seen the project's climate change posters	

- Fisherfolk have different views on the types of actions they can take to plan for or prepare for climate change impacts, but they generally fall into three categories. i) buying and using new or improved equipment (including vessels) and gear, ii) changing fishing practices (general and sustainability-

focused) and iii) information and education. Interestingly, only a minority of fisherfolk (4 out of 40, 10%) expressed not knowing what to do or pessimism about the ability to adapt. Fisherfolk's responses suggest a potential reluctance to diversify away from fishing, as this was not an action mentioned in the set of responses. Information and education stood out as a key action fisherfolk could take to plan for or prepare for climate change impacts but also as a way to help them be more effective in preparing for and adapting to climate change.

- Fisherfolk express the need for additional information and education on the projected impacts of climate change on the ocean environment, expected impacts on specific species, viable options to adapt fishing to climate change, among other topics. Financial assistance stood out as another type of support that fisherfolk consider helpful. This includes subsidies to purchase better gear and equipment to offset the rise in the cost of fishing / increased fishing effort needed as climate change impacts intensify.

- By design, a majority of fisherfolk who responded to the survey had seen the project's climate change posters. Differences in responses on climate change knowledge between fisherfolk who had and had not seen the posters (see Figure 8) lend support to the need for multi-faceted and sustained communication. Exposing fisherfolk to posters such as ours, with messages emphasizing the impacts of climate change for fisheries and options to adapt, should be one strategy among others to raise awareness, understanding and motivation to act.

For the 14 **managers (fisheries intermediaries) who completed the survey**, we note the following:

- In describing the term climate change, managers refer to human activities and GHG emissions as the cause, changes in the ocean and atmosphere and the physical, ecological and socio-economic impacts that flow as a result. In contrast to fisherfolk, managers raise the long-term and global dimensions of the phenomenon with more frequency. Compared to managerial respondents feeding into the KAP Study, only a minority of respondents (1 out of 14) provided inaccurate climate change definition in this set of managers.
- Managers selected climate change as a top problem facing the fisheries sector today with the same frequency as poor fishing practices. In contrast, a majority (80%) of managerial respondents in the KAP Study rated climate change as a top problem for the sector. It's difficult to explain these differences since the overall composition of the managerial groups is roughly the same, in terms of affiliation and functional roles. One possible explanation is the emphasis of the project on reducing non-climate stressors on marine resources and habitats, including overfishing, as a strategy to boost resilience to climate change.
- When asked about actions that should be taken to support fisherfolk's efforts to effectively adapt to climate change managers converged with fisherfolk's own perspectives on this question –information sharing, education and communication emerged as a key area of support. Managers also highlighted the need to engage fisherfolk in the formulation and implementation of joint solutions, including reducing GHG emissions from the sector. This emphasis on collaboration or even co-management recognizes that, in order for climate resilience strategies to work, fisherfolk need to be engaged throughout the planning process.
- About half of the group of managers had accessed communication products stemming from the project. Their responses indicate that both the video-documentary and climate change posters are likely to be used in future outreach with fisherfolk, which is a positive result of our communications campaign. Managers' responses on salient aspects of the video-documentary suggest that this communication product has effective messaging on climate change impacts to the sector (both gradual and extreme events) and on the various dimensions of adaptation, including the value of fishers' observations of changes in the sea / in catch as inputs into planning, early warning systems

for fisherfolk (with FEWER mentioned specifically), resilience of infrastructure assets, and processes to co-develop adaptation solutions.

Table 15: Summary indicator on managers' (fisheries intermediaries) climate change knowledge-attitudes-practice (KAP) and of uptake of communication products

Summary indicators	Definition	Survey results	Comparison with baseline KAP (KAP Study)
Number of responses	Opportunistic sampling based on efforts by CRFM Secretariat and national fisheries officers from the 6 PPCR countries	14, all PPCR countries represented	27
Knowledge areas			
On climate change	Understanding of climate change based on definition provided by respondent (2=yes, 1=somewhat, 0=no / don't know)	1 out of 14 (7.1%) could not describe the term, definition was inaccurate	5 out of 22 (23%) could not describe the term, definition was inaccurate
Attitude areas			
On urgency & importance (of addressing climate change)	Whether climate change is selected as among the most serious problems facing fisheries from a list of response options	6 out of 14 (43%) considered climate change as a top problem facing fisheries today. "Poor fishing practices" were selected with equal frequency	8 out of 10 (80%) considered climate change as a top problem facing fisheries today
Practice areas			
On adaptation & disaster risk reduction	Actions needed to raise the climate awareness of fisherfolk and to build their resilience to climate impacts	Two types of actions: i) information sharing, education, communication and ii) engagement of fisherfolk to work on joint solutions	
Uptake of communication products			
On access to and use of communication products	Whether respondent has seen the video documentary series (yes, no)	8 of 14 (57%) managers had seen the video documentary	
	Increased concern about the impacts of climate change after viewing the video documentary (yes, no)	8 out of 8 (100%) managers who'd seen the video	
	Salient aspects of the video documentary	Fisherfolk observations on changes in catch, gradual impacts on the ocean environment and impacts from extreme events, options available to manage risk and adapt	
	Actual and intended use of communication products for engagement with fisherfolk	4 out of 10 (40%) of managers had used communication products for outreach with fisherfolk	
		3 out of 7 (43%) intend to use climate change posters in future outreach with fisherfolk 4 out of 7 (57%) intend to use the video documentary in future outreach with fisherfolk	

Conclusions and recommendations

Table 16 presents conclusions and recommendations stemming from our consideration of the post-campaign survey results. Implementation of these recommendations is beyond the scope of the project and we offer them as potential activities for follow-up by the CRFM, national fisheries departments, the Inter-American Development Bank (donor) and all stakeholder organizations engaged in our communication and engagement activities throughout the project.

Table 16: Recommendation matrix

Conclusion	Recommendation
Fisherfolk are receptive to messages on the adverse impacts of climate change on the sector and on strategies and actions to adapt their fishing practices. The communication products developed through the project resonate with fisherfolk and can, therefore, serve as educational materials for future outreach. Nevertheless, face-to-face engagement is likely the most effective format to deepen knowledge and awareness and to sustain engagement levels. Fishing organizations, cooperatives and conservation bodies (e.g., fish sanctuaries) are trusted intermediaries.	Continue promoting the project's communication products. In particular, screening of the video-documentary followed by reflection on the contents of the film holds great promise in raising awareness of key climate change issues for the sector. Facilitators can make use of the discussion guide developed for this purpose. National fisheries departments could consider creating a network of fishers recruited and trained in facilitating these guided discussions with their peers.
The communication products appear helpful in increasing fisherfolk's ability to recognize the link between climate change impacts and implications on their livelihoods and the realities of day-to-day fishing, thereby emphasizing climate change as an issue of today not tomorrow.	Printouts of the climate change posters should be distributed widely, both in places frequented by fisherfolk as well as in schools.
Whereas during the KAP Study we observed that extreme weather events were more salient to fisherfolk and other stakeholders than gradual changes in climate conditions and related fisheries impacts, survey results post communications campaign suggested an appreciation for both gradual (slow onset) climate change impacts and extreme events. This awareness is important to capitalize on and encourage dialogue and reflection on strategies to manage near-term climate-related risks and strategies to adapt to long-term changes.	Preparation for more intense/frequent extreme events and for long-term changes in the ocean environment and marine resources are both important but require different strategies and measures. Adaptation strategies and action plans for the fisheries sector should address both dimensions of climate change impact, with a focus on building resilience of ecosystems, fisherfolk livelihoods and the economic contribution of the sector to national well-being.
Fisherfolk and managers expressed the continued need to promote information sharing, education and communication (IEC) as a strategy to support effective climate change adaptation by fisherfolk. The "information-deficit" model for promoting social change has been widely discredited; therefore, additional efforts focused on IEC are likely to be most effective if coupled with measures focused on behaviour (e.g., pilot projects, showcasing successes of early adopters, peer-to-peer commitments).	Incorporate insights from behavioural sciences in the design and implementation of new measures to support adaptation to climate change in the sector. The behavioural insights toolkit includes strategies to motivate, socialize and ease the change toward more beneficial and adaptive practices (for further information, see Rare and BIT, 2019; Battista et al., 2018).
Some recognition exists among managers about the need to increase engagement with fisherfolk in the formulation and implementation of climate-smart plans and practices. Efforts in pursuit of co-development of solution or co-management of marine resources have at least two dimensions: individual actions of fisherfolk and enabling structures that need to be in place to support achievement of goals and objectives.	Existing protocols and voluntary guidelines applicable to Caribbean fisheries already emphasize the need to participatory planning and co-management with fisherfolk and other actors across the seafood value chain. Therefore, the policy guidance and commitment at certain levels in the governance structure already exist, what seems to be missing is the formal investment in implementation, particularly related to capacity and sustained commitment, to do this in practice as part of regular, supported policy and management cycles. The urgency to adapt the sector to the impacts of climate change and the potential costs of inaction increase the justification for allocating resources and attention toward more deliberate and durable engagement with fisherfolk. In particular, project research and communication activities suggest at least one key role for fisherfolk in engaging in "citizen science" to boost the region's monitoring capacity on climate change impacts and effectiveness of adaptation measures. This can include

Conclusion	Recommendation
	engaging a network of trained fisherfolk and leveraging partnerships with academia and NGOs as alternative ways of financing research and monitoring for climate-smart fisheries management. Information stemming from monitoring can then guide decisions at the individual level and inform broader community, national and regional action.
For a range of reasons, project communication and engagement efforts had gaps in the consideration of the perspectives of female fisherfolk. As well, gender-based analysis was not a central feature of our activities.	Future communication efforts should ensure that more diverse stakeholders are represented from across the value chain and that more women are included. It is also important to recognize that women continue to dominate distinct roles within the sector, with distinct perspectives. Added to this, women have their own manner of communicating, and that they can be very effective communicators/ social influencers, and in this way they can be assets if effectively recruited/ trained.

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Annex 1: Data collection instruments

FISHERIES INTERMEDIARIES

1. What country do you live in?

2. How long have you worked in the fisheries sector, and what role do you play?

3. What do you think are the most serious problems facing the fisheries sector today? (You can choose more than one)

- Fuel price
- Cost of equipment
- Market for catch
- Poor fishing practices
- Piracy
- Climate change

4. Please explain what you understand by the term "climate change"?

5. Have you seen the film "Fish for Today and Tomorrow?"
Yes
No

6. If YES, what key points stand out for you in this film?

7. Did the film make you feel more concerned about the impacts of climate change?
Yes
No

8. Have you used the communication products prepared through the project in your engagement activities with fisherfolk?
Yes
No

9. If YES, which have you used or intend to use?
Posters
Film "Fish for Today and Tomorrow"

10. What more do you think should be done to raise the climate awareness of fisherfolk and to build their resilience to climate impacts?

FISHERFOLK

1. What country do you live in?

2. How long have you been fishing?

3. What do you think is the most serious problem facing the fisheries sector today?
- Fuel price
- Cost of equipment
- Market for catch
- Poor fishing practices
- Piracy
- Climate change
- All of the above
- Other (please specify)

4. Please explain what you understand by the term "climate change"?

5. Have you seen the Posters showing how climate change is expected to affect fisheries in the Caribbean?
Yes
No

6. How are fish catches expected to change in the future?
- Some fish may move north
- Some fish may move further offshore
- Some fish may go deeper seeking cooler water
- Some types of fish may disappear

7. How do think these expected changes will affect you, and your ability to make a living?

8. What can you do to prepare for (and adapt to) these changes?

9. What support would you need in order to be more effective in preparing for and adapting to climate change?

10. To receive phone credit, please indicate your phone number (including area code) & network (Digicel or Flow):

C: ECONOMIC VALUATION OF FISHERIES INFRASTRUCTURE: AN EXPLORATORY STUDY ON VALUING ASSETS IN THE FISHING INDUSTRY OF ST. VINCENT AND THE GRENADINES

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Abstract

This study sought to examine the value of components of infrastructure within the fishing industry of St Vincent and the Grenadines. It operates within the context of disaster insurance products, such as those offered by CCRIF. This study interrogates the values of built infrastructure as well as the personal assets of fisherfolk at sites around the country. Additionally, the value of the average fishing day at various landing sites is calculated. A questionnaire was carried out on fisherfolk in various communities to gather data on their vessels and gear as well as the frequency of their fishing activity. Gear and vessel data was used to calculate the average assets of fisherfolk, while the frequency of trips was utilized, alongside catch data, to calculate the average value of a fishing day. The results showed reasonably large variations in the assets owned by fisherfolk, as well as the value of an average fishing day. Variations were correlated with type of fishing vessel and the landing site from which the fisherfolk operate. These results suggest that there exists enough diversity for further, more detailed investigation of these components of value in the fishing industry.

1. INTRODUCTION

The fishing industry represents a significant portion of the economy of St. Vincent and the Grenadines, representing 15.8 million Eastern Caribbean dollars worth of economic activity for 2018 (Statistical Office, 2018) or 0.9% of all economic activity. It employs 2500 persons (Government of St. Vincent and the Grenadines, 2018), and as such can be considered a significant employer of the labour base. The fishing industry operating locally is small scale and artisanal, using traditional gear, methods and vessels (CRFM, 2014). There are seven Fisheries Centres (Government of St. Vincent and the Grenadines, 2018) in total, which facilitate the operation of fishermen in the communities where they are located.

The fishing industry has been globally recognized as vulnerable to disasters, given that "ports, harbours and aquaculture installations are commonly situated at the interface between water bodies and land, precisely where various hydrological and meteorological disasters strike." (FAO, 2018). The fishing communities in St Vincent and the Grenadines are no exception. Both the built infrastructure, as well as the assets of individual fisherfolk, are at risk in disasters, which, as identified by Westlund *et al* (2007), "can cause tangible losses in the form of damaged and lost boats, gear, fish cages" and "destruction of infrastructure such as landing and fish processing facilities." Loss of vital infrastructure can severely impact the livelihoods of fishermen and the communities that rely on their products. Fishing infrastructure can encompass gear and equipment which are personally owned by fishermen as well as buildings and facilities that are used in these and related sector activities.

In light of the risks associated with natural disasters, the potential for financial solutions to aid in disaster recovery has been explored. Regionally, the creation of the Caribbean Catastrophe Risk Insurance Facility

(CCRIF) has led to a number of pioneer disaster risk insurance packages. Most recently, CCRIF became involved in delivery of the COAST (The Caribbean Oceans and Aquaculture Sustainability faciliTy) project, with the vision of offering a "parametric insurance product at a scale relevant to vulnerable fishing communities" (CCRIF, 2019). This product will include a livelihood protection component covering losses to fisherfolk and cooperatives, modelled on existent CCRIF micro-insurance products. A micro-insurance product of this nature is being developed for the sector, with the aim of protecting livelihoods of vulnerable individuals by compensating them for losses due to extreme weather events (CCRIF, 2017).

As with any insurance package, the assets being insured must be valued in order to scale payouts appropriately, even in the case of parametric coverage. Components of payouts that ought to be considered are the built infrastructure, in this case the Fisheries Centres, the vessels, gear and equipment owned by individual fishermen and which are essential for their daily fishing activities and the revenues that the fishermen may lose due to disruptive weather.

The intention of this work is to explore the process of valuing the aforementioned aspects of the fishing industry in the context of St Vincent and the Grenadines. In doing so, the various avenues to ascertain these values, as well as challenges faced in obtaining them are documented. As such, should a disaster risk financing program be instituted in this setting, the initial work of valuation will have a precedent in the form of this paper. Additionally, in exploring the various components of infrastructure in this setting, government agencies and policymakers are provided with insight into gaps in data. Data of this nature is essential in the event of a disaster, for instance, where compensation to fisherfolk should be given for losses incurred. As such, this study will seek to lay the groundwork for valuing the assets of fishermen (vessels, gear and equipment), the value of infrastructure at Fishing Centres and an estimation of the unit value of a fishing day.

2. METHODOLOGY

2.1 Site Selection

The sites chosen were intended to cover a wide geographic area while targeting the most active fishing complexes (Figure1). As such, four of the five chosen were among the most productive sites, according to landing data for 2018 provided by the Data Management Unit of the Fisheries Division. The sites chosen were Kingstown, Calliaqua, Barrouallie, Paget Farm (in Bequia, not shown below) and Rose Bank. The exception in this instance was the Rose Bank site, which was visited due to availability of relevant contacts and assistance from the local Fisheries Division staff. As a small, exploratory study, it was inferred that the sites chosen would offer some insight into both the diversity in fishing practices taking place in St Vincent and the Grenadines, as well as the logistical challenges that one would encounter in the event that a more comprehensive study were to be undertaken.

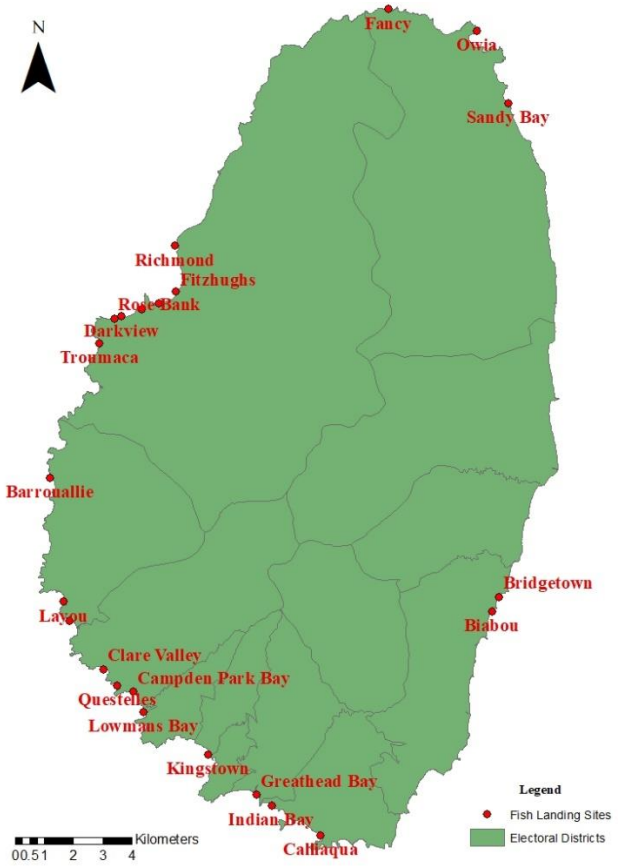

Figure 1: Map of fishing centers on mainland St Vincent

2.2 Built Infrastructure

The valuation of built infrastructure was obtained by requesting data from the Fisheries Division. They were directed to the Valuation Division of the Inland Revenue Department within the Ministry of Finance, Economic Planning, Sustainable Development and Information Technology who provided the data displayed in the Findings section.

2.3 Questionnaire

A questionnaire was implemented to gather primary data on the assets of vessel owning fishers. The questionnaire distributed (see appendix) contained relatively simple questions regarding vessel types as well as an area for description of gear used in fishing and safety equipment owned. In all instances, it was administered verbally to the informants for efficiency and accuracy. At the beginning of the questionnaire, it was confirmed verbally that the informant is a vessel owner at that site. In doing so, it was ensured that the answers given could be applicable to analysis of that site. The multiple-choice section covered the vessel type, length as well as engine information and personal data.

The second section provided a list of fishing types, and space to describe the number of, as well as dimensions, of gear used. This was more flexible on account of the varying answers which were provided. Fisherfolk used varying methods, adapting to local conditions, target fishery and personal preferences. Due to the variability in gear and gear configurations used for the differing fishing methods, a description section was included to capture the exact items comprising each piece of gear being described.

The final section offered a list of safety equipment with a sub-section to indicate the quantity owned. This was a simpler task as these items were treated as standard for the purposes of this investigation, requiring no further description.

The intention of gathering data on vessel types and engines was for broad valuations of livelihood assets to be undertaken using these simple parameters. For vessels, consultation with local providers formed the basis for the valuation. Of those, KP Marine services was the main business place consulted for information on vessels and engines. For 'speed boats' of Bequia, a local boat builder, Abraham Ollivierre, was contacted for approximate prices. Other small locally made wooden vessels were valued based on estimations provided by fishermen, usually given at $200/ft.

For fishing gear, finding common practices and items used was the first step in developing standardized gear by fishing type. This involved examination of the gear descriptions provided and locating the mode as the measure of central tendency and hence as the standard. The mode was then compared to the sale descriptions of the gear. For instance, lines were sold by the seller by 100yds, therefore if the standard length of line for trolling was found to be 300yds, then the standard price of that gear would be the cost of (3) units of line at the market price. Subsequently, the metric was applied to the outlying descriptions, so that the quantities used for calculation were multiples of the standard (mode). In the case of the prior example, if a fisherman described trolling lines which were 900yds in length, that would be counted as (3) units of trolling line.

Equipment was approached similarly to the vessel and engine data, using market prices, often at the lower end, for the equipment listed. For equipment, there were no descriptions offered, it was assumed that safety items were consistent for all respondents.

In estimating the components of each piece of gear, the descriptions and visual representations of the fisherfolk interviewed were accounted for, alongside consultation with key informants. Fisherfolk offered detail on the composition of their gear through verbal explanations or occasional presentation of the gear for inspection. Veteran fisherfolk were also helpful in providing insight into the functions of the different types of gear and how they were being used by fisherfolk. Still, there was much variability that had to be limited in order to make analysis succinct, as well as to compensate for unclear answers provided.

Value of a Fishing Day

The unit value of a fishing day was designed to provide a general estimate of the revenues generated by the average fishing vessel on a daily basis. This metric is useful for understanding the margins fisherfolk work with financially, as well as for future insurance schemes which seek to cover livelihood losses. The value itself was calculated through a series of steps. First, by finding the average value of catch per week within a year; that figure was then divided by the average estimated number of days per week based on the sampled data, to determine the average daily production at that site. Subsequently, the daily average at that site was divided by the number of vessels in operation there, providing the average revenue generated by each vessel at that site per day.

$$Weekly\ Production\ Average = \left(\frac{Total\ Production}{52}\right)$$

$$Daily\ Production\ Average = \frac{Weekly\ Production\ Average}{Average\ \#\ Days\ Fishing\ per\ week\ at\ site}$$

$$Value\ of\ Fishing\ Day = \frac{Daily\ Production\ Average}{Number\ of\ Vessels\ at\ Site}$$

In the process of this calculation, factors like diversity of vessel and fishing types, as well as individual productivity levels are not considered. As such, the crude estimate is meant only as a guide to the average

activity of fisherfolk, given that the catch data offered by the Fisheries Division was by landing site with no further differentiation.

2.4 Catch and Effort Estimation by Fisheries Division

The data obtained from the Fisheries Division of the Ministry of Agriculture, Forestry, Fisheries, Rural Transformation, Industry & Labour on the catch for the year 2018 is a product of estimation by the data unit. This is of note, given that the values provided were used in calculation of the unit value of a fishing day for each of the landing sites. See Box 1 below

Box 1: Catch and Effort Estimation Process by Fisheries Division

The catch and effort data follows a stratified sampling methodology. In this approach the sampling frame (which is all the identified fish landing sites within the country) is first partitioned into groups or strata, and the sampling is then performed separately within each stratum. This method combines the conceptual simplicity of simple random sampling with potentially significant gains in reliability.

The sampling units (landing sites) are stratified prior to sampling into three groups (primary, secondary and tertiary) based on the variables mentioned above. The technique of simple random sampling is then used to select the days of the month each landing site is sampled. Sampling is not carried out on Saturdays, Sundays and major holidays, nevertheless, every day is considered as a potential fishing day. This simplifies data analysis and does not seem to be a great source of error since fishermen fish whenever they can regardless of what day it is.

An estimate of the amount of fish landed in the country is obtained by summing the totals of all the estimates for the individual landing sites.

Source: Data Management Unit of the Fisheries Division for the CRFM Fishery Report, 2014

The estimations carried out follow the formulae:

$$Total\ Estimated\ Landings = Estimates\ (site1 + site2 + site3 + \cdots)$$

$$Estimate\ Catch\ for\ any\ site = Sum\ of\ Sampled\ weight\ x \left(\frac{\#\ fishing\ days\ in\ month}{\#\ days\ sampled}\right)$$

This formula has been sourced from Jardine & Straker, (2003), with some variables renamed for clarity.

3. RESULTS

3.1 Built Infrastructure

Table 1 below shows the data provided by the Valuation Division of the Inland Revenue Department for the fishing centres. Some data was not provided, as in the case of Kingstown and Calliaqua. Values reflect the large investments made in these buildings.

Table 1: Fishing Centres with Overall Valuations

Name of Centre	Value/$XCD
Chateaubelair	$222,000.00
Barrouallie	$329,000.00
Kingstown	$23,300,000.00
Owia	$792,000.00

3.2 Value of a Fishing Day

Table 2 shows the data calculated in determination of the average value of a daily unit of fishing. The third column of the table shows the results of the questionnaire data collected on the average number of fishing days per week. These results reflect reasonable consistency in fishing days per week, at around 5 days. The value of a fishing day indicates wide variability between sites. Notably, the case of Bequia where vessels produced an average of $897.09 daily in revenue, far ahead of the next highest sites, Kingstown and Owia, which both averaged around $160 per day.

Table 2: Values of Total Production at the landing sites chosen, estimated from the average number of fishing days and number of vessels per site and used to calculate daily average values of catch per vessel

Site	Production 2018/$XCD	Days Fished /week	Number of Vessels at Site	Daily Average Value of catch per Vessel (XCD)
Barrouallie	$ 649,861.06	6.7	49	$ 41.45
Calliaqua	$ 1,009,740.33	4.8	67	$ 65.41
Kingstown	$ 5,101,733.68	5	126	$168.71
Owia	$ 441,792.26	4.8	12	$161.47
Paget Farm	$ 9,301,047.38	5.4	40	$897.09
Rose Bank	$ 158,106.15	5	11	$59.89

3.3 Vessels

The majority of vessels (42%) were pirogues, with a sizeable number of small wooden boats, usually classified as bow & stern or simply, stern boats. Additionally, a unique field had to be created to account for vessels at the Paget Farm site, where the locally made boats were referred to as ‘speed boats’. These were generally larger than comparable mainland stern boats and used outboard engines in contrast to the often-manpowered stern boats. Most vessels were less than 30 ft in length, indicative of the small, artisanal fishing nature of the industry. The majority of vessels sampled had engines, with the exception of the double-enders. For the Sport Fisher and Tuna Longline, inboard engines were a part of the vessel cost and therefore were not recorded separately.

Table 3: Vessel types as percentage of total sample with frequency of engines per type of vessel and average values (XCD), based on sample data

Vessel Type	% of Total	% with Engines	Average Value of Engine (XCD)	Average Value of Vessel	Average Value of Engine+Vessel Assets
Boston Whaler*	3%	100%	$ 9,909.00	$ 2,400.00	$ 12,309.00
Bow & Stern	15%	80%	$ 7,861.50	$ 2,550.00	$ 8,446.13
Double Ender	12%	0%		$ 2,850.00	$ 2,850.00
Pirogue	42%	100%	$ 16,397.10	$ 53,112.86	$ 69,509.96
Speed Boat	9%	100%	$ 21,781.58	$ 26,000.00	$ 47,781.58
Sport Fisher	3%	100%		$ 80,000.00	$ 80,000.00
Stern Boat	12%	75%	$ 7,803.00	$ 2,300.00	$ 8,152.25
Tuna Longline	3%	100%		$1,020,600.00	$ 1,020,600.00

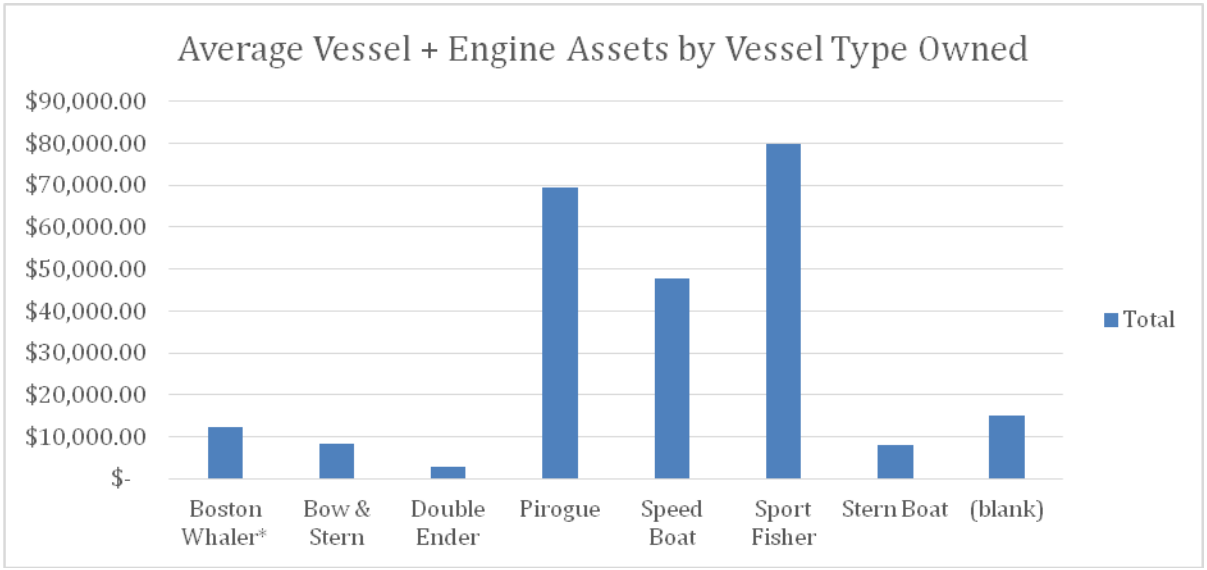

Figure 2: Average Vessel + Engine Assets by Vessel Type

The Tuna Longline vessel was excluded from figure 2 because the only Tuna Longline in the sample data had a value that was several multiples of the cost of the average boat. For scaling purposes, its exclusion was necessary. The graph shows that pirogue owners were generally investing heavily in both vessels and engines compared to other common vessel types. Additionally, speed boat owners were more likely to invest in more expensive engines than pirogue owners, with the average engine cost being $21,781.51.

3.4 Gear/Equipment

Of the list of gear and equipment reported during the fisher interviews, the majority owned a handful of select items. As such, the list below (Table 4) displays the prices for items, which were obtained for the purposes of this research. Notably, there were a handful of items which were rare in frequency and were not available locally. A record of these items is noted in the appendix. These items were not priced due to their rarity for the average fishing vessel owner, and unavailability in local markets.

Table 4: Descriptions of a unit of each gear and price

Unit of Gear	Description of Unit	Price (XCD)
Beach Seine	25 Pieces of net	$12,500.00
Lobster Pot	12 pots, created from 1 coil of wire	$ 680.00
Bottom Line	1 roll of nylon line	$ 15.00
Troll Line	100yd(300 ft) of nylon line in each of the following grades: 80lb,100lb, 120lb, 210lb, 230lb	$ 122.50
Spear Fishing	Guns + Parts	$ 575.00
Rod and Reel	1 Rod and 1 Reel	$ 85.00
Scuba Diving	1 Tank, regulator, mask, fins, snorkel and backpack	$ 2,735.00
Trammel Net	Same as Beach seine	$12,500.00
Palangue	1 black rope, 4 rolls of nylon line and 100 hooks	$ 160.00
Handline	500 yds (1500 ft) of nylon line in each of the following grades: 40lb, 60lb, 80lb, 100lb, 120lb	$ 230.00
Bottom longline	400 yds (1200ft) of nylon line at 80 lb grade	$ 32.00
Fuel Tanks	5 Gallon Tank	$ 90.00
First Aid Kit	Bandages and alcohol	$ 5.00
Lifejacket	1	$ 98.00
Compass	1	$ 590.00
Flares	4	$ 195.00
GPS	1	$ 385.00
VHF Radio	1	$ 150.00
Iceboxes	10 Gallon	$ 300.00
Flashlights	1	$ 40.00

Figure 3: Components of a palangue gear. Includes yellow and black rope, nylon lines and hooks

Figure 4 displays the frequency of gear ownership based on the sample population. Notably, various line fishing gear were the most common (83 bottom longline, 48 palangue and 26 troll lines), indicative of the most common fishing methods.

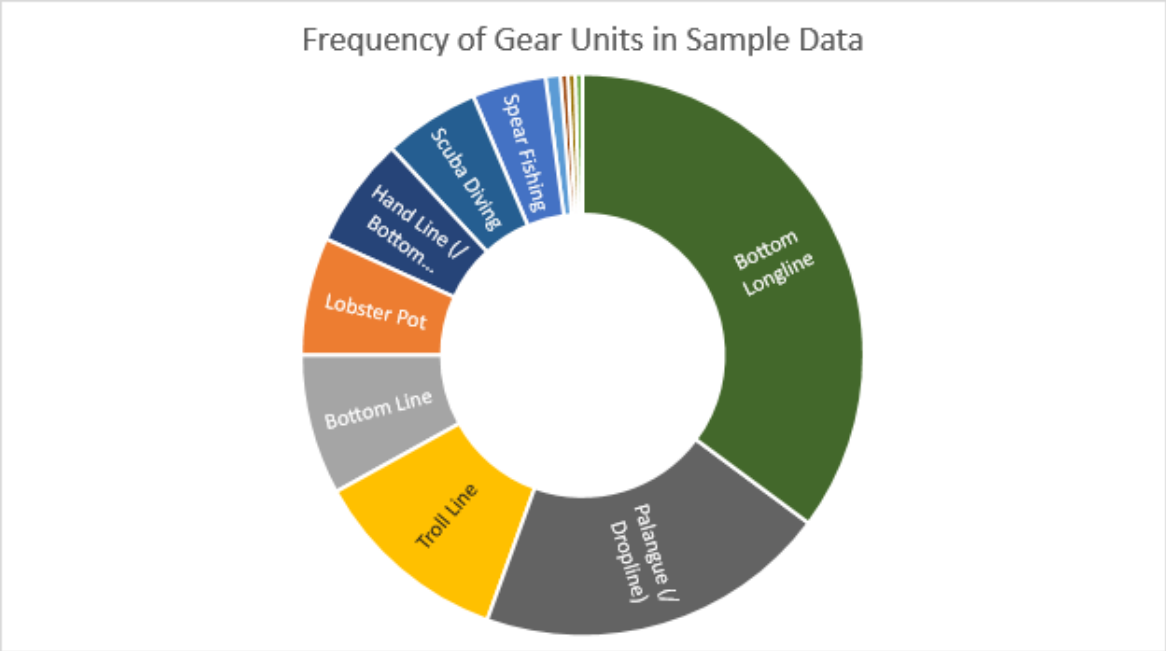

Figure 4: Frequency of each unit of gear in sample data collected from 33 vessel owners

3.5 Total Assets

In total, the following table illustrates the average value of a vessel owner's total assets by site, including vessel, engine, gear and equipment (Table 5). Notably, the Kingstown value is enhanced greatly by the Tuna Longline present there. Other observations point to a distinct gap between the assets of boat owners

of other sites, and those at Rose Bank and Barrouallie. It should also be noted that this difference is largely on account of the significantly less expensive wooden vessels (at times without engines) that operate at these sites, as opposed to the larger, engine powered vessels at other sites.

Table 5: Average Assets for each Vessel Owner at sites chosen

Site	Average of Total Assets	Average of Total Assets (excluding Tuna Longline)
Barrouallie	$9,748.13	$9,748.13
Calliaqua	$71,859.84	$71,859.84
Kingstown	$172,180.43	$65,745.86
Owia	$39,273.56	$39,273.56
Paget Farm	$56,747.47	$56,747.47
Rose Bank	$6,657.60	$6,657.60

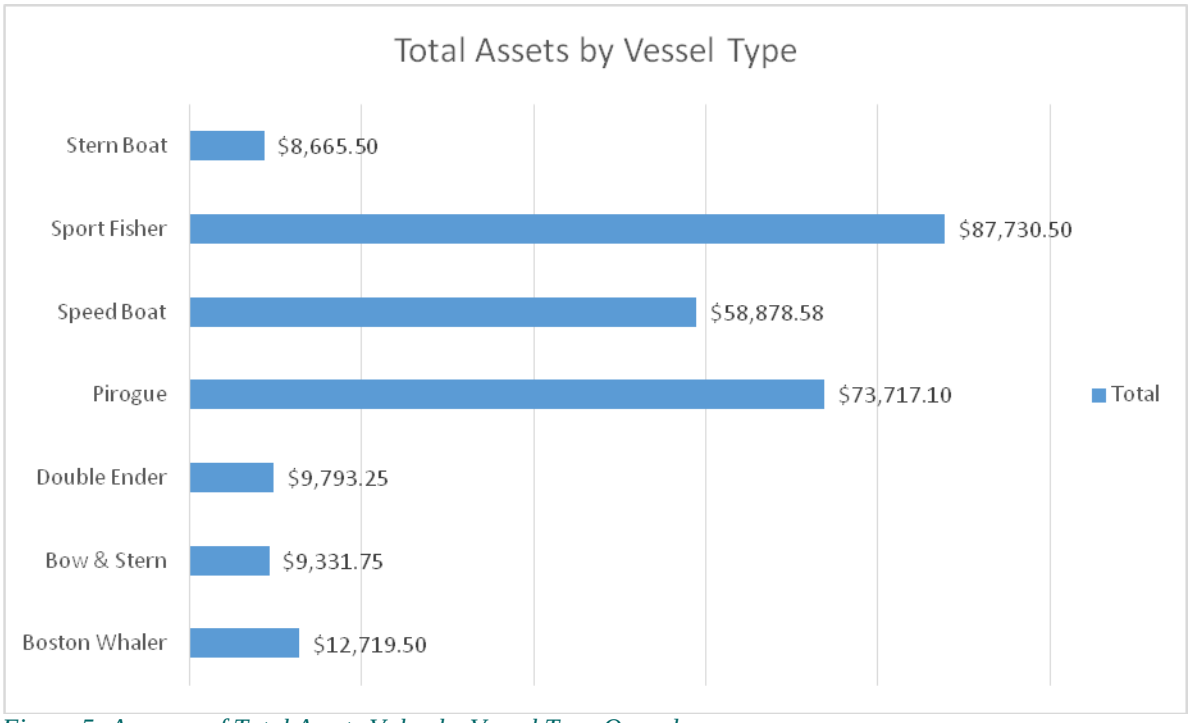

Figure 5: Average of Total Assets Value by Vessel Type Owned

Alternatively, the results may be better arranged by vessel type, as shown in Figure 5. Here, the pattern of value is very consistent with that shown in Figure 1. Pirogues and speed boats are significantly more expensive than other types of vessel and require greater investment to own. This pattern is indicative that the value of vessels and engines is the most significant point of difference in total asset values.

4. DISCUSSION

The first component to discuss is that of the unit value of a fishing day. The calculations relied on a self-reported number of fishing days per week, on catch and effort data provided by the Fisheries Division, and on the vessel numbers at each site, from the CARIFIS database (Caribbean Fisheries Information System). In estimating the number of days fished per week, fishermen described that variations in

frequency of trips were due to external factors: weather, season, fish availability. Thus, the estimates could only be taken at face value, the reality of the livelihood could not be captured in this way. Fishermen explained that for some weeks, they went out every day, while for others, they only made a single trip.

The calculations yielded a range of results, from the lowest at $41 p/day in Barrouallie, to $897 in Paget Farm. Excluding the outlier ($897) in this instance, the range is from $41 to $168 (Table 2). This variation may be indicative of a number of factors. Overall productivity may be lower at some sites than others, or variability in catch and prices obtained at the selling point may account for the differences. According to S. Jardine-Jackson (personal communication, October 8, 2019) the difference in Paget Farm is likely on account of the lobster and conch sales taking place there, which are high value and therefore enhance the value of catch at that site.

The unit value of a fishing day has applicability in the disaster risk context, where inclement weather has the potential to offset operations for days to weeks at a time, depending on the severity of the damages caused. The results here stand in contrast to data on revenues collected by Beltrán, (2017), where numbers from $320 to in excess of $1000 (USD) were identified. These differing results illustrate the need for further, more extensive work in the area of analyzing the finances of local fishing operations.

Overall, the results found in the current study should be considered with some discernment, given the broad assumptions, such as treating all vessels as equal producers, which are made in this calculation. There are a number of different types of fishing operation being undertaken in St Vincent and the Grenadines, as indicated by the different gear and vessel types owned. It should be noted that variations in the revenues generated could not be accounted for in the calculation of the average value of a fishing day. Future work on fisherfolk operations ought to do more extensive research into the pattern of fishing throughout the year to adjust for seasonal variability in fish types caught and frequency of trips. Primary data collection on earnings could also serve to enhance the accuracy of the research, given that the catch data provided for most of the sites are raised estimates.

Given that there is scarcely any other work done in this area, the results obtained here present an early foray into undertaking the comprehensive task of assigning a value to the activities of fisherfolk.

Turning away from operating costs and toward the physical, fixed infrastructure at the sites, Table 1 shows the property value for a sample of Fisheries Centres. This data indicated buildings valued in the hundreds of thousands of dollars, with the notable exception of the Kingstown centre, which was valued at $23 million EC. A number of these centres were constructed with aid from the Japanese government, which is a major concern if they were to be damaged. There is no clear way to determine whether or not local government would be able to fund reconstruction of these sites in the event of a disaster. It is safe to say that based on these figures it would be no easy task. Unfortunately, the data provided did not offer any detail into the items at the sites, or if the values included things beyond the buildings present. Additionally, the limited availability of accurate, detailed reports on the value of these buildings significantly curtailed any deeper analysis of this component of the fishing industry. While the data provided was limited in scope, these assets are undoubtedly essential to fishing operations and would be costly to replace.

On the scale of the individual vessel owner, the questionnaire data offers insight. The vessels used by the fisherfolk are mostly small boats, the majority of which were under 30 ft, with many of such being under 20 ft long. Wooden vessels described as “stern boats”, “bow and stern” or “boston whaler” were the cheapest to procure, operating with small engines or often without any. Pirogues, the most common type of boat, were significantly more expensive, indicating a marked investment by vessel owners. As things currently stand, there is no insurance offered on island to fishermen, irrespective of vessel type.

Findings highlighted that the average fisherman owning a pirogue (the most common type of vessel) invested almost $70,000 EC into his vessel and engine. The sizeable investment is perhaps most vivid when contrasted with the average daily revenues, which must then be shared between co-workers and used for maintenance. The calculation of the profit margins are not within the bounds of this study, however, it deserves mention that at $160 per day, the average fisherman with a 5 day work week only generates $3200 EC in a month, meaning that these assets are worth almost 22 months of revenue. Considering the operating costs of a fishing operation, saving to buy a new vessel and engine would likely take even longer than 21 months.

Notably, there was a case of a fisherman out of work upon loss of his vessel due to high tides. Understandably, he has not since been able to replace it due to lack of capital. This case speaks to the urgent need for insurance of these assets given the high vulnerability of the fishing industry.

Fisherfolk also owned a variety of gear and equipment, dictated by vessel type, type of fishing and personal preferences. Significant investments were made by a small number of fishers in specific gear for specialty fishing types, such as beach seine nets, which costs approximately $12500 (Table 3) to assemble. On the other hand, most fishermen stuck to simple, cost-effective gear, relying most heavily on line fishing gear, as shown in Figure 2.

It is significant to mention that there were a number of challenges faced in collection of the gear and equipment data for the questionnaire. Generally, fishermen were relying on memory at the time and often required significant guesswork and estimation to provide answers. Considering this, they provided varying degrees of detail in response to questions about gear type.

On a more conceptual level, paucity of understanding project goal was an issue. Many fishers initially gave information about the items that are carried out daily as opposed to an account of all the items that they own. Clarification on this point was necessary in many instances. Even when requesting total assets, many interviewees had difficulty in recalling all the assets, due to reliance on memory and an ever-changing combination of fishing gear apparatus. Different seasons and types of fishing require different gear, many of which were not in use at the time of the interview and posed a challenge for fisherfolk to recall. Furthermore, wear and tear on gear mean that these are not fixed at any given time. Fishermen often change lines with regularity so estimations of ownership must be understood within the context of an operation that is ongoing and not static. It is safe to assume that there exist gaps in the data collected in this regard.

Notwithstanding the limitations of these initial findings, it can be concluded that there exists great variation and diversity in this component of fishermen's assets, even among those using similar vessel types. For the intentions of this investigation, this finding highlights that fishing operations cannot be easily mapped in the same way that conventional business operations can be analyzed.

Deducing a reasonable range for the average gear and equipment is not possible based on the sample data obtained, but may be possible in future work, which collects a larger sample dataset. In addition, there is potential for further study in the rate of return on these investments based on fishing type.

In total, the assets owned by the fisherfolk interviewed lend to some interesting conclusions. Firstly, and notably, sites tend to have common vessel ownership patterns. As such, sites where pirogues are common reflect that in the average assets owned. Secondly, the vessel type owned makes the overwhelming difference in total assets, given that it requires the largest capital investment for any operation. This suggests that financial schemes aiming to cover losses by fisherfolk could stratify them by vessel type owned.

The highly variable nature of the industry, as is accounted for in this explorative study, deserves further interrogation. Fishermen undertake significant financial risk by investing in essential assets for their operations. That being said, there exists significantly different levels of investment within the small, artisanal industry present in St Vincent and the Grenadines. Aiming to capture their operations, incomes and assets requires significantly more work than could be facilitated in this small research project. As part of an industry directly on the front lines of climate change, with such an important role to play in regional food security, the valuation of fisheries infrastructure and assets is deserving of further research efforts.

4.1 Limitations

The initial intent of this study was to use existing data sources, like the CARIFIS database, to deduce complete asset ownership in St. Vincent and the Grenadines. This could not be completed, on account of the difficulty in using this database and the uncertainty about the accuracy of data extracted. The lack of detail in the CARIFIS database meant that items like gear and safety equipment were not captured for all entries. In light of those issues, the decision was taken to collect sample data instead, with the bounds of the study restricted to an exploration only.

Further logistics related challenges punctuated the data collection process. Unreliable road systems on the Leeward side of the island meant that heavy rains prevented visitation during the short allowance period for field work. Lastly, it should be noted that some fishermen were reluctant to share information and harbor ill feelings toward data collection due to prior issues with other data collection efforts.

4.2 Recommendations

For a study that seeks further detail for asset valuation, it is imperative that relationships are cultivated with local fishermen at the site(s) of interest. Additionally, asset depreciation should be factored in if the valuations are to represent the actual state of the items as opposed to relying on the market price alone. A more expansive study should also include a fully formed metric for data collection on gear, as opposed to allowing for free form descriptions of the gear.

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APPENDIX A: QUESTIONNAIRE

Date: / /19

A. Questionnaire

Please write your name and vessel ID:
NAME: _____
VESSEL ID: _____

How many days per week do you fish?
6 ☐ 5 ☐ 4 ☐ Less than 4 ☐

What type of vessel do you use in your fishing operation?
Bow&Stern ☐ Canoe ☐ Double Ender ☐ Pirogue ☐
Whaler ☐ Tuna Longline ☐ Sport Fisher ☐ Stern Boat ☐
Other ☐

What is the length of your vessel?
Under 20 ft ☐ 20-33ft ☐ 33-46ft ☐ 47-80ft ☐

What type of engine do you use on your vessel (select all that apply)?
Inboard ☐ Outboard ☐
Gas ☐ Diesel ☐

What is the Horsepower(HP) of your engine?
_____

Which of the following gear do you own as a part of your fishing operation?

GEAR	Quantity	Dimensions
Beach Seine		
Fish Pot		
Lobster Pot		
Gill Net		
Bottom Line		
Troll Line		
Trot Line		
Crab Trap		
Cast Net		

Spear Fishing		
Rod And Reel		
Skin Diving		
By Hand		
Scuba Diving		
Trammel Net		
Pots		
Purse Seine		
Dip Net		
Scoop		
Palangue (/Dropline)		
Harpoon		
Hand Line (/Bottom/Driftline)		
Pole & Line		
Longline Or Surf Line		
Bottom Longline		
Vertical Longline		
Hooka		
Trawl		
Pin Seine		
Chinese Seine		
Cadell		
Dropline		
Ztrap		
Jackpot		
Bankline		
China Net		
Sprat Net		
Driftline		
Fuel Tank(s)		

Which of the following pieces of equipment do you own as part of your fishing operation?

Apart from the ones identified above, are there any other assets that are a component of your operations? If so, please describe in detail.

_____

_____

APPENDIX B: LIST OF GEAR WHICH WERE NOT COUNTED

B. List of Gear Which Were Not Counted

Item	Frequency in sample data	Explanation for Absence
Cadell	1	Not available in market
Handmade Sails	7	Not available in market
Handmade Bailers	30	Not available in market
Handmade Oars/Paddles	26	Not available in market
Handmade Lobster Jigs	3	Not available in market
Radar Systems	1	Part of boat (Tuna Longline)
Binoculars	1	Not available in market
Anchors	25	Not available in market
Fire Extinguisher	1	Not available in market
Harpoon	1	Not available in market
Life Buoys	1	Part of Boat