Sustainable Sargassum Management in Anguilla, British Virgin Islands and Montserrat

Communications and Engagement Strategy

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Cover photo: Sargassum on the beach in Anguilla. Credit: Department of Natural Resources, Anguilla

TABLE OF CONTENTS

1 INTRODUCTION

Since 2011, sargassum influxes have been affecting the Caribbean region, becoming a recurring threat over recent years in the Eastern Caribbean, including in Anguilla, Montserrat and the Virgin Islands, UK. These influxes have resulted in increasingly negative ecological and socio-economic impacts including biodiversity loss in coastal and marine ecosystems; health impacts associated with emissions of hydrogen sulphide and ammonia; and socio-economic and livelihood impacts in the tourism, fisheries and marine transport sectors. The project, "Sustainable sargassum management in Anguilla, British Virgin Islands and Montserrat" aims to implement a participatory and multi-level approach to manage sargassum influxes to protect and enhance coastal and marine biodiversity and associated livelihoods. It is being implemented from 2021-2024 by the Caribbean Natural Resources Institute (CANARI) in collaboration with Department of Natural Resources – Anguilla, Ministry of Natural Resources, Labour and Immigration – Virgin Islands, Department of Environment – Montserrat, Centre for Resource Management and Environmental Studies (CERMES) of the University of the West Indies, and the Organisation of Eastern Caribbean States (OECS) Commission. It is funded by a grant from the Darwin Initiative.

One of the project's objectives is to assess the communication patterns, practices, and preferences to determine the most suitable products and pathways for adding to the knowledge on Sargassum. This was done by collecting data on residents, tourism workers, and fisherfolk in affected communities in Anguilla, Montserrat and the Virgin Islands through a knowledge, attitudes, and practices (KAP) survey conducted by the Caribbean Natural Resources Institute (CANARI) between March and September 2022. The scoping reports developed under the project for each territory also informed the development of this Project Communications and Engagement Strategy.

This strategy identifies the target groups, and describes the key messages to be shared, based on the characteristics of each group. It defines the preferred channels that will be used to communicate with the target groups within the two communities. It also includes desired outcomes and pathways for engagement of target stakeholders.

2 METHODOLOGY

The design of this Communications and Engagement Strategy is based primarily on the findings of two project activities:

- **A comprehensive desk review and scoping** to identify key stakeholders and the impacts of Sargassum influxes on tourism, fisheries and other key sectors.
- The design and implementation of **a knowledge, attitudes and practices (KAP) survey** in August to September 2022 in target communities in each of the territories to gather baseline data on stakeholders' knowledge and preferences related to Sargassum influxes, the impacts and management and adaptation. See Appendix 1 for the questionnaire. See Appendices 2-4 for the findings from the KAP surveys in Anguilla, the Virgin Islands and Montserrat.

The final draft Communications and Engagement Strategy was further reviewed and validated by key stakeholders in virtual workshops held on January 24-26, 2023 for each of the territories. Stakeholders were also invited to share written comments on the final draft up to February 2023. The Strategy was finalised based on stakeholders' inputs.

2.1 Key KAP Survey Findings

The preliminary findings from the KAP survey on which this Strategy is based were as follows:

1. **Respondents were somewhat knowledgeable about Sargassum, its ecological value, causes of Sargassum influxes and some of its uses.**
    - They identified climate change, including warmer ocean temperatures, as causes of Sargassum influxes.
    - Respondents from the majority of communities indicated that Sargassum mats serve as habitat/refuge of juvenile fish and of adult fish and other marine organisms.
    - About 60% of all respondents across Anguilla, Montserrat and the Virgin Islands acknowledged Sargassum's potential agricultural use.

2. **Respondents from all target communities are unsure about some aspects of Sargassum, its attributes, uses and how it can be handled.**
    - They were uncertain of its potential use in sectors such as pharmaceuticals, cosmetics, or biofuels.
    - Respondents from across Anguilla, Montserrat and Virgin Islands also demonstrated uncertainty about:
        - whether influxes can be forecasted;
        - if the seaweed can thrive in a freshwater environment; and
        - the ecological impact of heavy machinery used during Sargassum clean-up activities.

3. **Respondents from Anguilla, Montserrat and the Virgin Islands are willing to ignore good practices for Sargassum treatment and removal to avoid/mitigate what they consider negative impacts of Sargassum's presence in their communities.**
    - Despite being aware of several good practices in dealing with Sargassum, such as moving small or moderate amounts by hand or light equipment to avoid beach damage, approximately 50% of the respondents across all target communities still wanted the Sargassum removed quickly by bobcats and other large equipment so that it would not pile up and cause odours and other problems.
    - Only 45% of the respondents are aware that Sargassum could be collected at sea, or knew that Sargassum should be left on the beach if it was not used by locals or tourists.

4. **Respondents lack clarity about who is responsible for the management of and dissemination of key information about Sargassum locally and territory-wide.**
    - More than a third of the survey respondents in Anguilla and the Virgin Islands stated that they were unsure which groups were responsible for activities such as providing information to the community about Sargassum, creating Sargassum products, conducting related research, and preparing Sargassum management plans.
    - However, in Montserrat, the majority of respondents (76%) felt that responsibility for the above activities at the community and territorial levels rested with the Government of Montserrat. They also identified the private sector as having a responsibility in relation to creating Sargassum products (67.9%).
    - Knowledge regarding responsibilities for Sargassum at the territorial level reflected perspectives of the community level responsibilities.

5. **Respondents have mixed thoughts and feelings about Sargassum, in many cases viewing it as both a resource and a problem.**
    - 55% of respondents across Anguilla, Montserrat and the Virgin Islands indicated that they see Sargassum as both a resource and a problem.
    - Only 32.6% of respondents indicated that they see Sargassum solely as a problem.

6. **The majority of the respondents in target communities across Anguilla, Montserrat and the Virgin Islands experienced negative impacts from Sargassum influxes, including health problems, economic and livelihood losses, etc.**
    - Health impacts were noted in communities surveyed, including reports of rash, headaches, and respiratory/breathing problems.
    - Economic losses, hardship and impacts on livelihoods reported were as follows:
        - Fisherfolk experience engine entanglement or damage, restricted movement, and decreased catch.
        - Over a third of the tourism workers who were surveyed cited unsightly beaches and decline in tourist visitors and increased costs for replacement of tarnished metal objects at properties, because of Sargassum influxes. This was particularly true of Anguilla and the Virgin Islands, which are heavily dependent on beach tourism.
    - Within the wider community, the most common impacts highlighted were the inability to participate in leisure activities on the beach and loss of access to the beach or jetty because of influxes.

7. **Most of the respondents (78%) stated that they want to be regularly informed about Sargassum and Sargassum-related news via social media, mobile apps, radio and face-to-face meetings with experts.**

Overall, the KAP findings indicated that awareness of Sargassum is high, and there is some knowledge of its origins, benefits and uses and good practices for its removal in the target communities. However, the application of good practices for removal is notably insufficient/low and there are mixed feelings and stigma related to using Sargassum as a resource based on respondents' personal experiences. The project communication strategy therefore focuses primarily on:

1. education about Sargassum and its benefits;
2. influencing attitudes or shifting perspectives on Sargassum as a resource; and,
3. encouraging/stimulating good practices with respect to removal and repurposing of Sargassum.

3 COMMUNICATION STRATEGY

3.1 Communication Goal and Objectives

The main goal of the communication strategy is to "**enhance stakeholders' knowledge to appropriately respond and adapt to Sargassum influxes with good practices**." To this end, the strategy seeks to achieve the following desired outcomes:

1. Coastal residents, and by extension most of the wider public in Anguilla, Montserrat and the Virgin Islands have an increased and clearer understanding of Sargassum including its origins, ecological value, uses, bloom prediction and beach removal practices.
2. Coastal residents' awareness and embrace of appropriate coping strategies for dealing with Sargassum influxes is greatly improved.
3. Coastal residents become knowledgeable about Sargassum-related opportunities and the benefits of those opportunities to them personally, and develop a willingness to take advantage of those opportunities.

3.2 Key Principles Underlying the Strategy

1. Communication must be continuous, consistent and coherent to achieve significant and sustained impact.
2. Whenever possible, communication activities should build on synergies to increase impact and reduce costs, e.g., make use of existing products that convey the same messages, tap into existing communication channels that reach the target audience(s), and cultivate implementing partnerships.
3. Messages must be crafted for/adapted to the specific target audience and disseminated through its preferred communication channels.
4. Cultivation of influential "champions" and message multipliers can reinforce and amplify these messages.
5. The communication campaign and related messages must be culturally relevant and relatable for target audiences; it should use accessible, familiar language and wherever and whenever possible, be representative of the local and regional culture and context.
6. The strategy must be underpinned by effective monitoring and feedback mechanisms to facilitate adaptiveness and fine-tuning as new issues or research findings emerge.

3.3 Key Communication Messages

Key overall messages have been developed linked to the three primary focal points of the communication strategy: *education about Sargassum and its benefits; influencing attitudes/shifting perspectives on Sargassum as a resource; and, encouraging/stimulating good practices with respect to removal and repurposing of Sargassum*. See Table 1.

An overarching campaign titled "Rise Above Sargassum!" is proposed. The underlying idea of this campaign is to acknowledge the negative feelings/distaste for sargassum throughout communities in Anguilla, BVI and Montserrat, while acknowledging that Sargassum can be leveraged as a resource. The overarching campaign theme/idea can be supported by three targeted mini campaigns with specific taglines, one for each focal area, as outlined in Table 1.

Table 1: Key Communication Messages Categorised by Focal Area

Focal Area	Objective/Desired Outcome	Key Messages	Proposed Campaign Tagline
Education and awareness about Sargassum and its benefits.	Coastal residents in the three territories have an increased and clearer understanding of Sargassum including its origin, ecological value, uses, bloom prediction and beach removal practices.	Sargassum is here. With it, has come different fish to our waters, safe havens for species that have been endangered in the past, the opportunity to explore its value to our local industries, a chance to start anew if we dare! When it comes to Sargassum, one thing is certain: you have questions. There are answers! Be open to exploring them.	Rethink, Re-educate, Reimagine: Let's Rise Above Sargassum!
Influencing attitudes/shifting perspectives on Sargassum as a resource.	Coastal residents in the three territories become knowledgeable about Sargassum-related opportunities and the benefits of those opportunities to them personally and develop a strong willingness to take advantage of those opportunities.	Fellow islanders have already turned Sargassum from an obstacle to an opportunity in the area of agriculture. We can explore doing the same in our own industries! We can shore up our livelihoods with what's washed ashore, if we're willing to learn more and explore.	Understand, Innovate, Act: Let's Rise Above Sargassum!
Encouraging/stimulating good practices with respect to removal and repurposing of Sargassum.	Coastal residents' awareness and embrace of appropriate coping strategies for dealing with Sargassum influxes is greatly improved.	Sargassum is manageable, if we are adaptable. If you see small amounts of Sargassum on the beach and it's not in your way, let it stay.	Embrace, Adapt, Emerge: Let's Rise Above Sargassum!

3.4 Target Audiences

The target audiences for this communication strategy are comprised of:

1. Coastal residents affected by Sargassum influxes

2. Fisherfolk affected by Sargassum influxes
3. Tourism enterprises affected by Sargassum influxes
4. Coastal managers that support coastal residents, fisherfolk and tourism enterprises to monitor and manage Sargassum influxes, including:
    - Government agencies
    - Civil society organisations
    - Academic and research organisations

3.5 Communication Tactics, Tools, Products and Dissemination Channels

The strategy focuses mainly on tailored communication to specific target groups. However, since these include the use of mass media and social media, the strategy should also create and maintain a general awareness of the issues in the wider society.

A longer-term campaign of 15 months has been envisioned and the tactics, tools, products and dissemination channels below take that into consideration, along with budget and time constraints. Therefore, in each target community, priority will have to be given to the activities that can be completed within the budget and timeframe as well as that use the tools and channels most preferred by community residents based on stakeholder inputs and the "Key KAP Survey Findings" outlined in Section 2.1.

1. Face-to-face/in-person events:
    - Existing Sargassum-related community meetings and workshops
    - Innovation workshop series: "From Obstacle to Opportunity: Are we equipped to rise above Sargassum?" (Part 1: for fisherfolk; Part 2: for coastal residents; Part 3: for tourism workers/operators) tackling their concerns directly and guiding them through innovative solutions to their Sargassum-related woes. Each part could include a demonstration of a new/not previously embraced way of handling Sargassum and turning it into something useful/sellable, etc.)
    - "Rise Above Sargassum! Around Town": a series of Sargassum expert/champion-facilitated town hall meetings to allow residents an opportunity to vent and feel heard and engage on the possibilities of charting a way forward that embraces Sargassum, including developing community-driven plans for key affected areas.
    - Community film screenings (of films/videos from the territories and wider Caribbean) and chats about taking something considered a nuisance and turning it into an opportunity. This would spark discussion on what is possible with respect to Sargassum.

2. Electronic communications/social media:
    - Social media video (reel) and image campaigns
    - Text message/WhatsApp information-sharing campaign (electronic bulletins on sargassum forecasts, short videos, news articles)

3. Audio-visual communications:
    - "Rise Above Sargassum Shorts": a series of film/video shorts; some possible titles "Sargassum: Wah Name Dat?" (Exploring basic information about Sargassum, its origins and impacts locally and regionally—this can also be explored via person-

on-the-street gameshow-type interviews with the host sharing facts after each guest answers questions); "Rise Above Sargassum: from Obstacle to Opportunity?" (Exploring the benefits of Sargassum to coastal communities Caribbean-wide)
- "Rising Above Sargassum! Stories" - Radio interviews with champions and influencers (potentially who represent key management agencies and local CSOs/NGOs managing sargassum) as well as people who attended workshops and have begun to embrace the shift in mindset

3. Print communications:
   - Case studies of existing local/regional initiatives (should be heavily stylised/made eye-catching and language simplified if required to be relatable/approachable)
   - Eastern Caribbean Subregional Sargassum Outlook bulletin and summary infographics (shorter cliff notes style accompaniments/guides for the bulletin)
   - Best practice guides, handbooks and toolkits for coping with and repurposing Sargassum (for fisherfolk and tourism workers/operators) that are tailored to local context, eye-catching, easy to read and easy to follow, including about coping strategies and economic possibilities of Sargassum in the Caribbean

3.6 Timeframe for Implementation

The communication strategy is designed to be implemented over a period of 15 months. This is based on the rationale that only a sustained and comprehensive communication campaign over more than a year is likely to pique people's interest in the short-term and leverage that to impart knowledge-long term; challenge people's previously held/entrenched negative beliefs (and personal experiences); prove the value of Sargassum as a resource through demonstration; instigate lasting changes in behaviour with respect to removal and repurposing of Sargassum; and, change perspectives with respect to Sargassum's overall value among coastal residents and wider public.

A longer campaign will also facilitate effective evaluation of qualitative outcomes (what changed in people's KAP and why) as opposed to just the usual short-term quantitative evaluation of outputs (how many people attended the meeting, participated in training, accessed the website etc.).

3.7 Monitoring and Evaluation

Qualitative and quantitative indicators should be developed for all communication activities and then monitored and evaluated at the following levels:

- Continuous monitoring of outputs and short-term outcome indicators:
  - quantitative assessment of programme and project outputs, e.g., number of communication activities, products, social media views, etc;
  - qualitative assessment of short-term outcomes that are within the project coordinating team's control, such as measurable changes in people's knowledge as a result of communication and training activities (e.g., based on workshop evaluation forms; comparison of baseline and post-project KAP assessments);
  - documentation and dissemination of lessons learnt;

    - adaptation of communication strategy and/or programme/project communication plans as necessary.

- End of communication strategy evaluation of long-term impact:
    - qualitative, participatory evaluation of achievement of or progress towards the goals/desired impacts of the strategy e.g., uptake of key messages as reflected by changes in target audiences' attitudes and practices;
    - documentation and dissemination of lessons learnt;
    - adaptation of communication strategy and/or plans as necessary;
    - development of new communication strategy based on experiences.

4 COMMUNICATION STRATEGY AT-A-GLANCE

Table 2: Communication strategy including key messages, sub-messages, products and dissemination channels

Goal/Desired Outcome	**Target Audience(s)**	**Messages**		**Product(s)**	**Dissemination Channel (s):** apply to all target groups unless otherwise indicated in parenthesis.
		Key Messages:	**Sub Messages**		
Coastal residents in the three territories have an increased and clearer understanding of Sargassum including its origin, ecological value, uses, bloom prediction and beach removal practices.	All target groups	Sargassum is here. With it, has come different fish to our waters, safe havens for species that have been endangered in the past, the opportunity to explore its value to our local industries, a chance to start anew if we dare! When it comes to Sargassum, one thing is certain: you have questions. There are answers! Be open to exploring them. Tagline: Rethink, Re-educate, Reimagine: Let's Rise Above Sargassum!	The main causes of the massive Sargassum influx events in the Caribbean are climate and currents; runoff from activities such as mining, agriculture, logging. Sargassum creates an environment for young fish to thrive. Sargassum is a natural home or habitat for many types of marine life (fish, sea turtles, crabs, shrimp, marine birds, etc.). Sargassum can be used to make products for daily life and use, including:	1. Video and film shorts 2. First-hand stories 3. Table cards and posters	Face to face events, specifically: • Community-directed planning meetings ***(Coastal resident community leaders, Fisher folk, Tourism operators)*** • Public film screening and chat • Local champions/experts/ supporters via walkabouts Audio-visual communications/traditional media: • TV news/morning show segment(s) – ***(Older coastal residents, Fisherfolk, Tourism operators)*** • TV: community ads • Electronic advertising billboards in key public areas/target communities

Goal/Desired Outcome	Target Audience(s)	Messages		Product(s)	Dissemination Channel (s): apply to all target groups unless otherwise indicated in parenthesis.
		Key Messages:	**Sub Messages**		
			-fertiliser for decorative plants[1] -beauty products Sargassum can be used as a biofuel (like biogas or biodiesel which are gases and fuels that are made from vegetable oil, animal fat, or recycled cooking grease). Sargassum can be used in the production of fabrics and dyes to make clothes. It can also be used as a material for shoe soles. Sargassum can be used in the construction industry to make building materials, such as resins, foam boards, plastic sheeting, particleboards, slabs, bricks, bio-asphalt and even in furniture.		Electronic communications/social media, specifically: • WhatsApp ***(Older coastal residents Fisherfolk, Tourism operators)*** • Instagram and TikTok posts and targeted direct messages ***(Post-secondary and Secondary students)*** Other channels, specifically: • Local restaurants/food stalls/small shops

[1] Recent research suggests that crops grown in soil enriched with sargassum may have higher levels of toxic heavy metals and semi-metals, like arsenic and cadmium, and therefore sargassum should not be used as fertilizer for crops for consumption or animal feed until further research. See https://www.dcbd.nl/author/jessica-johnson and https://edepot.wur.nl/543797.

Goal/Desired Outcome	**Target Audience(s)**	**Messages**		**Product(s)**	**Dissemination Channel (s):** apply to all target groups unless otherwise indicated in parenthesis.
		<u>Key Messages</u>:	**<u>Sub Messages</u>**		
Coastal residents in the three territories become knowledgeable about Sargassum-related opportunities and the benefits of those opportunities to them personally and develop a strong willingness to take advantage of those opportunities.	All target groups	Fellow islanders have already turned Sargassum from an obstacle to an opportunity in the area of agriculture. We can explore doing the same in our own industries! We can shore up our livelihoods with what's washed ashore, if we're willing to learn more and explore. Tagline: Understand, Innovate, Act: Let's Rise Above Sargassum!	Sargassum can be used to make products for daily life and use, including: -fertiliser for decorative crops[1] -beauty products Sargassum can be used as a biofuel (like biogas or biodiesel which are gases and fuels that are made from vegetable oil, animal fat, or recycled cooking grease). Sargassum can be used in the production of fabrics and dyes to make clothes. It can also be used as a material for shoe soles. Sargassum can be used in the construction industry to make building materials, such as resins, foam boards, plastic sheeting, particleboards, slabs, bricks, bio-asphalt and even in furniture.	1. Reel videos (30 seconds to 1 minute) 2. Campaign graphics/images /print materials 3. First-hand stories 4. Interviews 5. Sargassum-specific toolkits and handbooks about economic possibilities: a. tailored to general coastal residents in the local community b. tailored to fisherfolk in the local community	Electronic communications/social media, specifically: • TikTok ***(Post-secondary and Secondary students)*** • WhatsApp **(*Fisherfolk, Tourism operators)*** • Facebook ***(Older coastal residents. Fisherfolk, Tourism operators)*** • Instagram Audio-visual communications/traditional media, specifically: • TV news/morning show segment(s) – ***(Older coastal residents, Fisher folk, Tourism operators)*** • TV: community ads • Electronic advertising billboards in key public areas/target communities

Goal/Desired Outcome	Target Audience(s)	Messages		Product(s)	Dissemination Channel (s): apply to all target groups unless otherwise indicated in parenthesis.
		Key Messages:	**Sub Messages**		
			There are other uses for Sargassum that are still being studied and explored. We can be a part of that exploration and experimentation.	c. tailored to tourism workers/operators/business leads 6. Aesthetically pleasing case studies. 7. Interviews w/ local and regional early adopters (Regional Sargassum Action Learning Network members and/or entrepreneurs using Sargassum to develop fertilizer(s) locally)	
Coastal residents' awareness and embrace of appropriate coping strategies for dealing with	All target groups	Sargassum is manageable, if we are adaptable. If you see small amounts of Sargassum on the beach and it's not in your way, let it stay.	For small or moderate amounts, Sargassum should be removed by hand or by light equipment that cannot damage the beach	1. Interviews w/ local and regional early adopters 2. Bulletins and accompanying guides	Electronic communications/social media, specifically: • WhatsApp ***(Older coastal residents, Fisher folk, Tourism operators)***

Goal/Desired Outcome	**Target Audience(s)**	**Messages**		**Product(s)**	**Dissemination Channel (s):** apply to all target groups unless otherwise indicated in parenthesis.
		Key Messages:	**Sub Messages**		
Sargassum influxes is greatly improved.		Tagline: Embrace, Adapt, Emerge: Let's Rise Above Sargassum!	If the Sargassum is located on beaches that are not used by locals or tourists, it should be left on the beach If there are only small amounts of Sargassum, it should be left on the beach. (If it does not pose an ecological threat.) The Ministry of Natural Resources/ Department of Natural Resources/ Department of Environment organises regular beach clean-up groups to manage mild influxes. Larger influxes are managed by the national disaster offices and relevant ministry. Beaches closest to populations are	3. Graphics/images 4. Best practice guides for handling and repurposing Sargassum 5. Sargassum-specific toolkits and handbooks about coping strategies	• Text messages ***(Older coastal residents, Fisher folk, Tourism operators)*** Face to face events, specifically: • Community rallies and events featuring local champions ***(Secondary and Post-secondary students)*** • Beach clean-ups using best practices ***(Coastal residents, fisherfolk, tour operators, secondary and post-secondary students)*** • TV news/morning show segment(s) • TV: community ads

Goal/Desired Outcome	Target Audience(s)	Messages		Product(s)	Dissemination Channel (s): apply to all target groups unless otherwise indicated in parenthesis.
		Key Messages:	**Sub Messages**		
			prioritised for cleaning.		

5 ENGAGEMENT STRATEGY

The overall process of stakeholder engagement that will be used in implementation of project activities by CANARI and our partners is shown in Figure 1.

The process for stakeholder engagement is based upon the following assumptions:

- Key stakeholders must have a say in the process to ensure quality, credibility and usefulness of outputs.
- Stakeholder participation includes the promise that their contribution will influence the final outputs and outcomes.
- Stakeholder participation in the process will build buy-in and commitment to uptake of outputs and inform their efforts to adapt and build resilience to climate change.

The main categories of stakeholders targeted under this engagement strategy include:

- government agencies of the three territories countries, Anguilla, Montserrat and the Virgin Islands
- regional and international inter-governmental organisations working on fisheries, tourism, climate change and disaster management, including sargassum management
- civil society organisations (CSOs)[2] (international, regional and national level CSOs)
- the private sector (namely fisherfolk and tourism workers and enterprises [including recreational fisheries companies, dive operators, etc])
- academia and research institutions (University of West Indies, national level institutes and vocational schools in the three territories and foreign universities conducting sargassum-related research)
- coastal and fishing communities including target communities affected by Sargassum influxes in the three territories
- Darwin Plus and other funders and development partners supporting the project and broader sargassum management in the Caribbean

These stakeholders have been identified at two levels:

- Primary – those stakeholders that will be most affected by the project outcomes as they stand to benefit directly.
- Secondary – those stakeholders that have an interest in the project outcomes, because while they are not able to benefit directly, the work and activities of the primary stakeholders can complement their agendas at sub-national (local/community), national, sub-regional or regional levels. These secondary stakeholders are "indirectly affected" by the outcomes.

[2] CANARI defines civil society organisations (CSOs) as non-profit, non-governmental organisations operating at international, regional, national or local levels. They include non-governmental organisations (NGOs) and community-based organisations (CBOs). They may be formal organisations or informal groups. Media and academia are considered separately.

Figure 1: Key steps in idealised stakeholder participation process[3]

[3] Adapted from: CANARI. 2011. *Facilitating participatory natural resource management: A toolkit for Caribbean managers.* Laventille: CANARI.

The type of participation and mechanisms that will be used for different categories of stakeholders to engage in Component 1 are shown in Table 3. In summary, these are:

- Engagement in field activities (e.g. beach clean-ups, drone monitoring, etc.) and piloting sargassum management solutions in the three territoties
- Interviews by telephone, Skype or face-to-face
- Community focus groups and meetings
- National and regional workshops and virtual meetings under the Darwin Plus project
- Opportunistic face-to-face and virtual engagement
- Browser-based editing of documents on collaborative software (e.g. GoogleDocs)

Table 3: Mechanisms for participation

Type of stakeholder	**Desired outcome of engagement**	**Mechanisms that will be used**
PRIMARY STAKEHOLDERS		
Lead government agencies responsible for sargassum management in the three territories	Input into and review of: • Scoping reports, including site profiles, on sargassum influxes, their impacts and management practices in Anguilla, Montserrat and the Virgin Islands • KAP survey findings for Anguilla, Montserrat and the Virgin Islands • Design and implementation of participatory research and monitoring framework for Anguilla, Montserrat and the Virgin Islands • Design and roll-out of knowledge and communication products and related activities • Needs for and experiences with management and use of sargassum, especially in the fisheries and tourism sectors • Identification of potential opportunities for improved management structures at local and territorial levels • Identification of potential opportunities for collection and	Engagement of key partners through the Project Steering Committee
Other project implementing partners		Engagement of key partners, CSOs, fisherfolk and their organisations, tourism operators in the virtual Regional Sargassum Action Learning Network
Target coastal communities		Consultations with target communities via KAP surveys, community focus groups and meetings
Fisherfolk and tourism workers/operators		
UWI and national level academic/research institutes		Engagement of target communities in field activities and piloting management solutions
		National workshops and other opportunistic virtual and/or

	use of sargassum to create alternative local livelihoods and enterprises	face-to-face meetings with national focal points and implementing partners Web-based sharing and browser-based editing of documents on collaborative software (e.g. GoogleDocs) Targeted outreach by email to request feedback and formal endorsement of project outputs
SECONDARY STAKEHOLDERS		
Regional and international inter-governmental agencies	Input of information on: • Regional experiences with management and use of sargassum, especially in the fisheries and tourism sectors • Potential opportunities for contribution to capacity building, action learning and knowledge sharing on current initiatives, priorities and best practices for sargassum management • Identification of various field guides/toolkits and methods/tools used • Identification of potential opportunities for collection and use of sargassum to create alternative local livelihoods and enterprises	Interviews if needed to supplement scoping to map existing stakeholders, interests, initiatives and priorities Engagement in the virtual Regional Sargassum Action Learning Network Opportunistic engagement at regional meetings
International CSOs		
Private sector within fisheries and tourism sectors		
Other academic and research institutes		
Funders and development partners		

Appendix 1. KAP Survey Questionnaire

Sustainable Sargassum Management in Anguilla, British Virgin Islands and Montserrat Project

Knowledge, Attitudes and Practices Survey

Survey ID: _____

Enumerator: _____

Date: _____

Place/Community: _____

Start time: _____

End time: _____

Duration: _____

Introduction

Thank you for participating. My name is **[INSERT NAME HERE**] and I am calling on behalf of the Sustainable Sargassum Management in Anguilla, BVI and Montserrat Project--a project being carried out by the Caribbean Natural Resources Institute (CANARI) and local partners. The part of the project I am working on and would like your assistance with is a brief survey that aims to get an idea or understanding of what people in your community think and feel about "sargassum seaweed". The survey is three parts and will take around 30 minutes in total to complete. All of your survey answers will be kept confidential and anonymous. However, if you indicate that you wish to participate in the project further, we will retain your name and contact information.

Part 1. Knowledge, Attitudes and Practices related to sargassum (or [insert colloquial name here])

[Approximate time required: 30 minutes]

Knowledge

1. Are you familiar with sargassum and its presence on some of the nation's beaches/part of the coastline in recent years?
    a. Yes
    b. No

2. In your view, which of the following causes the large quantities of sargassum that we have been experiencing in the Caribbean Sea and on the shorelines? Select all that apply.
    a. Pollution in the water
    b. Warmer temperatures in the water
    c. Agricultural runoff and/or fertilizers in the water
    d. Hurricanes and tropical storms
    e. Climate change
    f. It is just a natural occurrence
    g. Other (please specify)

3. Based on what you know or have heard about sargassum, which of the following statements are true?
    a. Sargassum creates an environment for young fish to thrive (i.e. a nursery for young fish)
    b. Sargassum that comes to the Caribbean was formed in an area between West Africa and Northeast Brazil (known as the North Equatorial Recirculation Region (NERR))
    c. Sargassum that comes to the Caribbean is from the Sargasso Sea
    d. Sargassum has no practical uses
    e. Sargassum is a natural home or habitat for many types of marine life (fish, sea turtles, crabs, shrimp, marine birds, etc.)
    f. Sargassum can be used to make products such as fertilizer for crops
    g. Sargassum can thrive in freshwater

h. Sargassum can be used to make medicinal products (pharmaceuticals)
i. Sargassum can be used to make beauty products
j. Sargassum can be used as a bio-fuels (like biogas or biodiesel which are gasses and fuels that are made from vegetable oil, animal fat, or recycled cooking grease)
k. The arrival of sargassum cannot be predicted by scientists
l. Using heavy machinery (e.g. bob-cats) to remove sargassum on turtle nesting beaches is okay and/or recommended

4. What work do you do?

5. What sectors are you currently engaged in?

6. Have you been affected by the presence of sargassum in the community you live or work in? If so, how? Within each category select all that apply. [*This question is meant to apply ONLY to the respondent and what he/she experienced. Enumerators will not read the "choices," but tick all that apply for the sector indicated in responses to 4 and 5 above*]

Health problems:1. Headaches ☐; 2. Nausea/Dizziness ☐; 3. Earaches/infections ☐; 4. Insomnia/Not able to sleep ☐; 5. Loss of appetite ☐;
Respiratory/breathing problems ☐; 7. Rash ☐; 8. Other ☐ (Specify)_____9. Do not know ☐; 10. None ☐; 11. Refused to answer ☐

Fishing problems [for fisherfolk only]: 1. Lost lures ☐; 2. Engine entanglement ☐; 3. Engine damage ☐; 4. Net entanglement ☐; 5. Net damage ☐; 6. Fishpot damage☐; 7. Restricted movement ☐; 8. Change in fishing spots ☐; 9. Increased distance in travel ☐; 10. Increased fuel consumption ☐; 11. Health effects ☐; 12. Decreased catch (quantity) ☐; 13. Change in fish species caught ☐; 14. Change in fish sizes caught ☐; 15. Decreased fish sales ☐; 16. Decreased income ☐; 17. Decreased fishing time ☐; 18 Other ☐: (Specify)_____19. Do not know ☐; 20. None ☐; 21. Refused to answer ☐

Tourism problems [for tourism operators only]: 1. Inability to participate in work-related activities on the beach, including: tour boating, sport boat operations, commercial/professional fishing ☐; 2. loss of clients ☐; 3. Increased costs to transport clients to different/unaffected beaches ☐; 4. Location no longer appealing/attractive to potential clients ☐; 5. Increased costs for removal and disposal of sargassum from beach ☐; 6. Increased costs for replacement of tarnished metal objects at properties ☐; 7. Increased costs for public relations campaigns to attract, educate and reassure clients during seasonal influxes ☐; 8. Other ☐ (Specify)_____ 9. Do not know ☐; 10. None ☐; 11.Refused to answer ☐

Community problems[for community respondents only]: 1. Loss of access to the beach or jetty ☐; 2. Inability to participate in leisure activities on the beach, including: recreational fishing, sports on the sand, watersports, gatherings, etc. ☐; 3. Tarnishing of metal objects and jewelry in homes ☐; 4. Other ☐ (please specify:_____); 5. Do not know ☐; 6. None ☐; 7. Refused to answer ☐

7. Which of the following are good practices for dealing with Sargassum that washes ashore on the beach and coastal areas? Select all that apply. *(All options should be read)*
    a. Sargassum should be removed quickly by bob-cats and other large equipment so that it cannot pile up and cause odours and other problems
    b. If there are only small amounts of Sargassum, it should be left on the beach
    c. If the sargassum is located on beaches that are not used by locals or tourists, it should be left on the beach
    d. Where possible, sargassum should be collected at sea before it reaches the shore
    e. For small or moderate amounts, sargassum should be removed by hand or by light equipment that cannot damage the beach

8. Which agencies/groups (government, private sector and CSO/NGO) are responsible for the following Sargassum related activities **in your community**? Please list the agencies/groups next to each activity. [*Enumerator to indicate: Not applicable (i.e. No responsible agency/group); Do not Know; No response*]
    a. Clean up of the beach/shoreline_____
    b. Providing information to your community about Sargassum _____
    c. Creating products from the Sargassum _____

d. Conducting research on Sargassum_____
e. Preparing Sargassum policies _____
f. Preparing Sargassum management plans _____

9. Which agencies/groups (government, private sector and CSO/NGO) are responsible for the following Sargassum related activities **in your country**? Please list the agencies/groups next to each activity. [*Enumerator to indicate: Not applicable (i.e. No responsible agency/group); Do not Know; No response*]
    a. Clean up of the beach/shoreline _____
    b. Providing information to the public about Sargassum _____
    c. Creating products from the Sargassum _____
    d. Conducting research on Sargassum _____
    e. Preparing Sargassum policies _____
    f. Preparing Sargassum management plans_____

Attitudes

10. A) How do you feel about sargassum washing up on local shores in your community and/or where you work?

11. How much of a threat has sargassum posed to your livelihood/ability to make a living? Using a scale from 0-5, please indicate how much sargassum has impacted your livelihood. [*All options should be read*]
    a. 0: no threat whatsoever ☐
    b. 1: mild inconvenience (causes a slight delay in engaging in activities related to work) ☐
    c. 2: inconvenience (It makes trying to do the job significantly harder than it normally would be) ☐
    d. 3: extreme inconvenience/nuisance (I have to take extraordinary measures to complete my work and earn) ☐
    e. 4: viable threat (has had a noticeable impact on my ability to work and earn by affecting my ability to show up to work and complete the job as I normally would causing missed days and missed income/earnings) ☐
    f. 5: extreme threat (has made it impossible for me to work for extended periods forcing me to try other things to make a living) ☐

12. A) How have you been involved in making decisions on addressing/treating and managing the influxes of sargassum in your community? Please give us a couple of examples.

    B) Choose a number which best represents your level of involvement between 0 to 5, with 0 being no involvement in consultations, decision-making or management at all and 5 being high involvement in decision-making, providing input on management actions, development of plans, sitting on taskforces or committees etc.

    a. 0 ☐
    b. 1 ☐
    c. 2 ☐
    d. 3 ☐
    e. 4 ☐
    f. 5 ☐

13. Do you see Sargassum as:
    a. A resource (go to 14) ☐
    b. A problem (go to 15) ☐
    c. Both a resource and a problem (go to 14 and 15) ☐

14. If you see Sargassum as a resource how would you like to see it used in your community?

15. If you see Sargassum as a problem, would you be interested in learning about ways that you and your community can cope with the influxes/presence of sargassum?
    a. Yes ☐

b. No ☐
c. Not sure ☐

Practices

16. How, if at all, have you and members of your community been coping with the influxes/invasion of sargassum when they occur?

17. Have you or anyone in your community found uses for sargassum?
    a. If yes, can you please describe those uses?

18. Have you received any training in relation to Sargassum?
    a. Yes (go to 19) ☐
    b. No (go to 20) ☐

19. If yes, in what aspects have you been trained, when and by whom? _____

20. Would you like to receive training/more training in relation to sargassum?
    a. Yes ☐ – please describe in what aspects
    b. No ☐

21. Have you attended any community or national consultations/meetings on sargassum and its impacts?
    a. If yes, please tell us what you learned from/got out of that experience?

b. If not, would you be willing to and what would you hope to learn or get out of it?

22. What, if anything else, would you like to share about your first-hand experience with sargassum?

Part 2. General and sargassum-specific communication preferences

[Approximate time required: 15 minutes]

23. How do residents share community information with each other? [*Enumerators will not read the "choices," but tick all that apply*]
    a. __Newspapers
    b. __Social Media (i.e. Facebook, Twitter, Instagram, TikTok etc.)
    c. __Online Publications (Blogs, Magazines)
    d. __Radio
    e. __Mobile Apps/Text Messaging (WhatsApp, Marco Polo)
    f. __Television
    g. __Face-to-face meetings with presentations from experts
    h. __Virtual meetings with presentations from experts
    i. __Edutainment (theatre, songs etc.)
    j. __Word of Mouth
    k. __Other (specify what):_____

24. What do you use as your main source of information to stay up to date on national news? [*Enumerators will not read the "choices," but tick all that apply*]

a. __Newspapers
b. __Social Media (i.e. Facebook, Twitter, Instagram, TikTok etc.)
c. __Online Publications (Blogs, Magazines)
d. __Radio
e. __Mobile Apps/Text Messaging (WhatsApp, Marco Polo)
f. __Television
g. __Face-to-face meetings with presentations from experts
h. __Virtual meetings with presentations from experts
i. __Edutainment (theatre, songs etc.)
j. __Word of Mouth
k. __Other (specify what)

25. How regularly, if at all, do you share information about news you've heard or received with others in your community? at work? with relatives?

26. What would inspire or move you to share information about sargassum you've heard or received with others?

27. How have you generally stayed informed about sargassum, its presence and when it may show up in the past?
    a. __Newspapers
    b. __Social Media (i.e. Facebook, Twitter, Instagram, TikTock etc.)
    c. __Online Publications (Blogs, Magazines)
    d. __Radio
    e. __Mobile Apps/Text Messaging (WhatsApp, Marco Polo)
    f. __Television
    g. __Face-to-face meetings with presentations from experts

h. __Virtual meetings with presentations from experts
i. __Edutainment (theatre, songs etc.)
j. __Other (specify what)

28. What would you consider a credible and reliable source of information on sargassum, its presence and its impact on the communities you live and work in?

29. Do you want to be regularly informed about sargassum and sargassum-related news?
    - If not, why not?

    - If so, how? Specifically, please indicate how you would prefer to be informed about sargassum and sargassum-related news information:

a. __Newspapers
b. __Social Media (i.e. Facebook, Twitter, Instagram, TikTok etc.)
c. __Online Publications (Blogs, Magazines)
d. __Radio
e. __Mobile Apps/Text Messaging (WhatsApp, Marco Polo)
f. __Television
g. __Face-to-face meetings with presentations from experts
h. __Virtual meetings with presentations from experts
i. __Edutainment (theatre, songs etc.)
j. __Other (specify what)

30. Would you like to be included in new initiatives/programmes to address/treat sargassum locally?

a. Yes
b. No
c. If yes, to what extent? Select/indicate all that apply.
    I. Receive information about the results of initiatives/programmes
    II. Participate in meetings and workshops
    III. Apply techniques/skills learned at meetings and workshops in a hands-on engagement

31. You said that you wanted to be trained or participate in consultations about Sargassum. Please give us your contact details so we can include you in future activities.

Part 3. About the respondent (demographic data)

[Approximate time required 5 minutes]

32. What is your gender?
    a. Man
    b. Woman
    c. Other (Please specify:_____)
    d. Prefer not to say

33. Of the following, which age group do you fall into?
    a. 18-25 years old
    b. 26-35 years old
    c. 36-45 years old
    d. 46-59 years old
    e. 60+ years old

34. What is the highest level of formal education you have completed? (Enumerators will not read the "choices," but tick the one that apply)
    a. No formal education
    b. Some primary school
    c. Primary school certificate
    d. Some secondary school
    e. Secondary school certificate
    f. Some technical/vocational school
    g. Technical/vocational school diploma/certificate
    h. Some university
    i. University degree/diploma
    j. Some graduate study
    k. Graduate degree/diploma

35. What community do you live in?

36. What community do you work in?

End of survey

Appendices 2-4:

Reports of Knowledge, Attitudes and Practices Survey

in Anguilla, Virgin Islands and Montserrat

March 1, 2023

TABLE OF CONTENTS

LIST OF FIGURES AND TABLES

List of Figures

List of Tables

APPENDIX 2:

REPORT OF KNOWLEDGE, ATTITUDES AND PRACTICES SURVEY IN ANGUILLA

1. INTRODUCTION

Since 2011, sargassum influxes have been affecting the Caribbean region, becoming a recurring threat over recent years in the Eastern Caribbean, including in Anguilla, Montserrat and the Virgin Islands, UK. These influxes have resulted in increasingly negative ecological and socio-economic impacts including biodiversity loss in coastal and marine ecosystems; health impacts associated with emissions of hydrogen sulphide and ammonia; and socio-economic and livelihood impacts in the tourism, fisheries and marine transport sectors. In particular, the threat of sargassum influxes to the livelihoods of fishing communities, and those involved in coastal tourism and related businesses, has triggered much concern about the capacities of these stakeholders to cope and adapt to what is now considered the 'new normal' (JICA and CRFM 2019). For instance, floating sargassum mats have made access to boats, and transit to and from fishing grounds difficult, more time-consuming, and sometimes even impossible (Oxenford et al. 2019). They have also disrupted coastal activities, ruining aesthetics, and ultimately resulting in visitor cancellations, declines in bookings and lower tourism earnings (Cox et al. 2019).

At the same time, there is rapidly growing interest across the region aimed at turning this threat into an opportunity. That is, utilising stranded sargassum as a raw material for various products. This can potentially support economic diversification and increase the resilience of coastal communities impacted by sargassum influxes (Agbayani and Toledo 2008).

The project, "Sustainable sargassum management in Anguilla, British Virgin Islands and Montserrat" aims to implement a participatory and multi-level approach to manage sargassum influxes to protect and enhance coastal and marine biodiversity and associated livelihoods. It is being implemented from 2021-2024 by the Caribbean Natural Resources Institute (CANARI) in collaboration with Department of Natural Resources – Anguilla, Ministry of Natural Resources, Labour and Immigration – Virgin Islands, Department of Environment – Montserrat, Centre for Resource Management and Environmental Studies (CERMES) of the University of the West Indies, and the Organisation of Eastern Caribbean States (OECS) Commission. It is funded by a grant from the Darwin Initiative.

One of the project's objectives is to improve management by engaging with and building the knowledge and capacities of key institutions and stakeholders, including fisherfolk, tourism operators and coastal and marine resource managers, in the three territories. This report represents an analysis of the coastal stakeholders who have been affected by sargassum influxes in Anguilla. It is based on the results of Knowledge, Attitudes and Practices (KAP) surveys conducted by CANARI between March and September 2022.

a. Objectives

The objectives of the KAP surveys in Anguilla were:

1. to assess the knowledge, attitudes, and practices of stakeholders in the target communities with respect to sargassum influxes;
2. to confirm the most frequently cited impacts of sargassum influxes by coastal stakeholders;

3. to identify the coping strategies employed by coastal stakeholders to manage sargassum influxes; and
4. to determine potential project interventions that can enhance coastal stakeholders' capacity to manage and adapt to sargassum influxes.

2. METHODOLOGY

KAP surveys are a research method used to collect both quantitative and qualitative data. The surveys were conducted by CANARI, with technical guidance form CERMES, via the phone or online communication platforms such as Skype with respondents in the target communities in Anguilla. In a few cases where COVID-19 protocols allowed, face-to-face interviews were undertaken. The surveys took place from August 10, 2022 to September 30, 2022.

In terms of the questions, the survey was designed using a mix of simple, easy-to-understand open and close-ended questions that were divided into three sections—Section 1: knowledge, attitudes and practises related to Sargassum; Section 2: general and Sargassum-specific communications; and Section 3: demographics (see Appendix 1). This breakdown and question format was agreed upon for the following reasons:

1. It was important to the overall project goal to extract as much information as possible about individual community members' (including resource users and other affected people) experience with sargassum and related influxes in a one-step, one-on-one interaction.
2. Experience on similar projects led to concerns that literacy and common negative personal experiences with schooling and related associations could present real, relevant challenges and barriers to community member participation in a self-administered, close-ended question-based survey instrument, including:
    a. likening the survey to a test/exam and declining to participate as a result
    b. not being able to read and understand what is being asked
    c. an inability to understand the unstated nuances/intention of the questions and therefore, not providing enough depth in answers or providing answers that are not of quality.
3. Demographic data was included in the last section to ensure none of the questions about formal education or occupation served as a barrier to respondents' willingness to participate in the survey further.

The three main groups of stakeholders targeted for the KAP survey were: fisherfolk/fisheries operators; tourism-related businesses/operators; and community members in the target communities. The criteria for selecting target communities were as follows:

- have a history of impacts from sargassum strandings;
- have livelihoods that are heavily dependent on ecosystem services.
- have data and information available, as well as synergies with other projects in which CANARI and/or our partners are involved;
- have already made various attempts, or are potential areas to be targeted, for managing and dealing with sargassum.

Table 4 outlines the key target communities across Anguilla.

Table 4: Target communities in Anguilla

Target Community/Area
Blowing point
Forest Bay
Island Harbour
Sandy Hill

To determine the sample of the livelihood-related groups, contact was made with the Department of Natural Resources (DNR) and local mobilisers to obtain an estimate of the number of fisherfolk and tourism enterprises operating in the targeted areas, since there is no formal register of all operators by location. Using the Raosoft Sample Size Calculator, the sample size for fisherfolk and tourism operators was calculated based on a 95% confidence level and a 20% margin of error.

The survey instrument was piloted, and subsequently amended, prior to being administered in Anguilla from August 1-10, 2022. Responses were entered in Microsoft Excel to facilitate statistical analysis. In total 75 surveys were completed, 12 in Blowing Point, 13 in Forest Bay, 38 in Island Harbour and 12 in Sandy Hill.

a. Limitations

There were a few challenges and limitations in conducting the KAP surveys. Firstly, while it was expected that the survey would be completed within a month, a longer timeframe was required for enumerators to effectively mobilise stakeholders and conduct phone or in-person interviews. The reasons for this included the ongoing COVID-19 pandemic and difficulties in reaching certain stakeholders, such as fisherfolk who spend long periods at sea. In addition, most questions on the KAP survey were open-ended, and so time had to be allocated to data entry and coding (standardisation) and data quality checks.

3. SITE PROFILES

Pelagic sargassum influxes have affected mainly the east and south coasts of Anguilla and its cays, and have become an annual occurrence since 2011, with 2011, 2015 and 2018 being the years with the most severe impacts. While there are number of coastal communities that are vulnerable, the scoping study conducted for this project indicated that the communities around Blowing Point, Forest Bay, Island Harbour and Sandy Hill Bay have been some of the most impacted to date due to sargassum accumulating on beaches, relatively dense populations and their residents being engaged in the vulnerable fisheries and tourism sectors (CANARI and CERMES, 2022).

a. Blowing Point

Blowing Point, which is located on the southern coast of Anguilla, is a highly developed area and the site of the main ferry terminal for passenger ferries from St. Martin to Anguilla. It is one of three official ports of entry. Residential housing and villas are located behind the beach, but particularly to the west of the ferry terminal. Local residents use Blowing Point Bay for beach walking and swimming. In the past, the area was heavily used when the dolphinarium was in operation, but the dolphinarium has been closed since the passage of Hurricane Irma in 2017. Behind the eastern side of the beach, there is a wetland system, which is important for foraging shore birds.

Blowing Point Bay is significantly and routinely impacted by sargassum events, with inundations being substantial particularly during June - August. Sargassum influxes have so far been managed by the Sargassum Management Taskforce which has overseen the use of heavy equipment to remove sargassum that has accumulated on the beach in 2018. Beach clean-ups by community groups are also organised on occasion to remove flotsam and jetsam that often washes onshore.

b. Forest Bay

Forest Bay is a small coastal community on the south central coast of Anguilla. It has a number of fishers and a landing dock for a limited number of fishing boats. There is also collection of conchs to the east of Forest Bay. Local residents use Forest Bay for beach walking, experiential learning opportunities and swimming on occasion.

The bay is lined by sloping hills and iron shores to the east and west of the sandy beach. There is a wetland system behind the western side of the beach, which is categorised as an Important Bird and Biodiversity Area. Foraging green sea turtles and nesting green and hawksbill turtles are also found.

Forest Bay is significantly and routinely impacted by sargassum events, with inundations being substantial throughout the year, but lasting for longer during June to August. The strong stench from decomposing sargassum blows downwind and towards residential areas. Though not a main nesting sea turtle beach, sea turtles are affected by the extreme depth of sargassum accumulation which may prevent nesting activity as well as hatchlings' ability to successfully crawl to the ocean following nest emergence. Extensive sand mining is also compromising the integrity of the beach.

Community members have organised large beach clean-ups in the past, including the use of heavy equipment. More recently, beach clean-ups for sargassum are smaller-scale.

c. Island Harbour

Island Harbour, which is located on the north eastern coast, is the largest fishing community and the main fishing landing site in Anguilla. Local residents use Island Harbour's white sand beach for recreational swimming, as well as patronise its restaurants and bars. Island Harbour also hosts the annual Festival del Mar, a boat race, drawing thousands of people (locals and visitors).

There is limited coastal vegetation, which is almost exclusively comprised of palm and seagrape trees. However, there are extensive seagrass beds in the bay that are important for foraging juvenile green turtles. There are also foraging shore birds and seabirds present, and a coral patch reef that protects the bay although live coral cover is poor. The eastern end of Island Harbour's bay marks the boundary of the Shoal Bay – Island Harbour Marine Park which extends west through to Shoal Bay East.

Island Harbour is routinely impacted by sargassum events, which can occur year-round. Mats of sargassum can stay on the surface of the water for days before being deposited on the beach, surrounding and impacting fishers' boats and engines as they attempt to the leave the bay. These influxes are managed, in part, by the local community through routine beach clean-up activities.

d. Sandy Hill

Sandy Hill is a coastal community on the south eastern coast of Anguilla. It has a privately-owned beach. However, landowners allow access to the beach by locals and visitors, which frequent for recreational activities including picnics, beach walking, snorkeling, diving and swimming. Dive operators use the bay as site for in-water PADI certification training due to the bay's sheltered and calmer waters.

The Bay is lined by sloping hills and iron shores to the east and west. Coastal vegetation was severely impacted by Hurricane Irma in 2017 and is slowly recovering. A small patch reef exists within and just outside of bay. There is also sea turtle nesting activity with green and hawksbill turtles.

Sandy Hill is significantly and routinely impacted by sargassum events, with significant inundations occurring throughout the year. Though not a main nesting sea turtle beach, sea turtles are affected by the extreme depth of sargassum accumulation which may prevent nesting activity as well as hatchlings' ability to successfully crawl to the ocean following nest emergence. A local community group regularly organises and conducts clean-ups to remove sargassum when the volume of accumulation ranges from moderate to extremely high.

4. COASTAL STAKEHOLDER ASSESSMENT

A total of 75 community members across the target communities completed the KAP survey in Anguilla. 54.7% of respondents were male, and 45.3% were female. 24% of the respondents were 35 years of age or younger, 32% were between 36-45 years, 28% were 46-59 years and 13.3% were 60 years or older. Also, 1.3% were educated up to primary level, 48% were educated up to secondary level, 13.3% had technical and vocational training and 37.3% had university education. Most of the respondents worked in the tourism sector (30.8%), with 26.2% working in fisheries, 10.8% in education and the remainder in construction, health, the public service and other sectors (e.g. environmental and marine resource management).

Overall, the respondents in the four communities demonstrated a good understanding of some aspects of sargassum influx events. For example, they identified climate change and warmer ocean temperatures as causes of Sargassum influxes (**Figure 2**). They were aware that sargassum mats served as habitat/refuge for juvenile fish (40% of respondents), and adult fish and other marine organisms (44%), and further acknowledged its potential for agricultural use as fertilizer (77.3%) and a biofuel (46.7%) (Figure 3). However, they were not aware about the origins in the North Equatorial Recirculation Region (NERR) (65.3%) or its potential use in sectors such as pharmaceuticals (76%) or cosmetics (73.3%). Respondents also were not aware about whether influxes can be forecasted (86.7%), if the seaweed can thrive in a freshwater environment (97.3%), and the ecological impact of heavy machinery use during sargassum clean-up activities (93.3%).

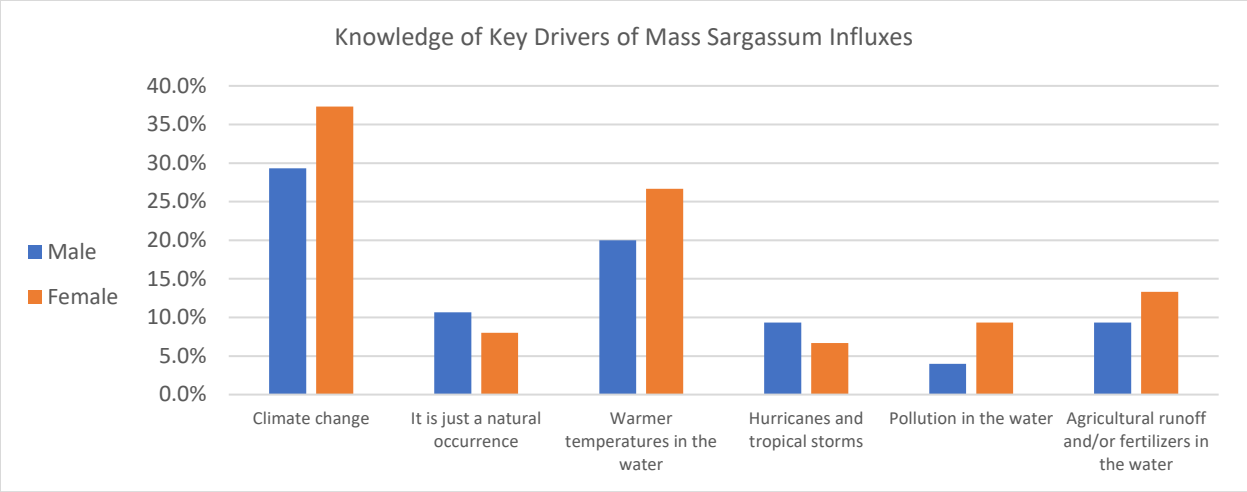

Figure 2. Knowledge of key drivers (percentage of respondents responding 'Yes'). N= 75

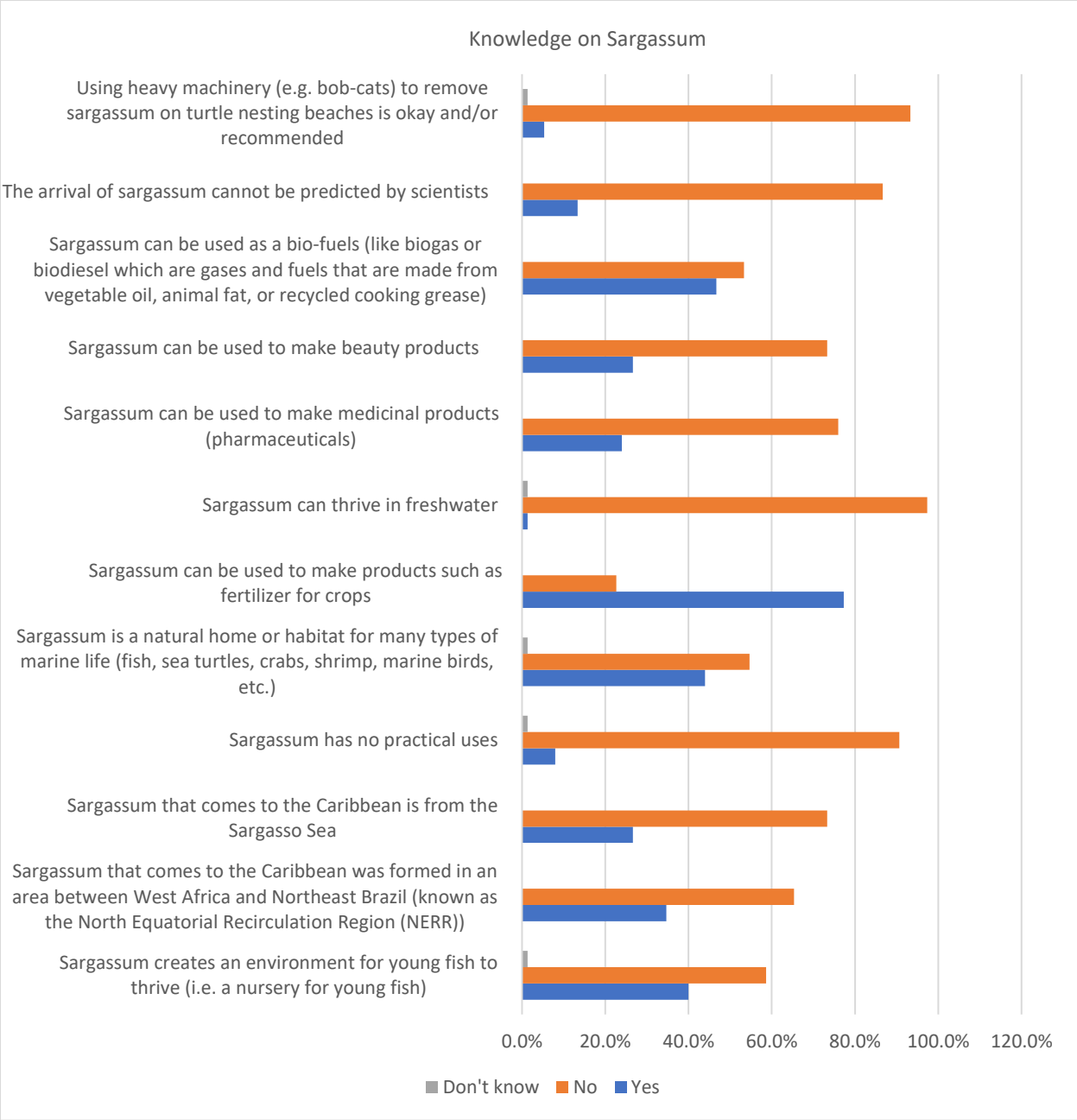

Figure 3. Knowledge on ecology, origin and uses of sargassum (percentage of respondents responding 'Yes', 'No' and 'Don't know'). N= 75

Despite being aware of several good practices in dealing with sargassum, such as moving small or moderate amounts by hand or light equipment to avoid beach damage (64%), as much as 30.7% of the respondents across the target communities still wanted the sargassum removed quickly by bobcats and other large equipment so that it cannot pile up and cause odours and other problems. In addition, only 46.7% of the respondents were aware that sargassum could be collected at sea and 50.7% of the sample were aware that sargassum, when located on beaches not used by locals or tourists, should be left on the beach.

Knowledge about management responsibilities for sargassum at the community and national levels was somewhat limited. The majority of respondents stated that responsibility for cleaning up the beach after influx events rested with the community (41.3%) and the Government of Anguilla (36%) at the community level. However, more than a third of the sample stated that they were unsure or didn't know which groups were responsible for other activities such as providing information to the community about sargassum (30.7%), creating sargassum products (30.7%), conducting related research (26.7%), preparing policies (28%) and preparing sargassum management plans (24%). Their knowledge regarding responsibilities for sargassum at the national level reflected their perspective of the community level responsibilities. The majority identified the community (41.3%) and Government of Anguilla (36%) as the groups responsible for cleaning up the beach after influxes.

a. Summary impacts of sargassum influx events in target communities

As part of the KAP study, coastal stakeholders were asked about the impacts of sargassum influxes on their communities and livelihoods. From the responses, it was clear that all persons surveyed were in some way affected by sargassum's presence. Impacts described ranged from health-related problems to fishing and community-related challenges. The following sub-sections categorise the various impacts experienced.

i. Community-related Impacts

Within the wider community, the most common impacts highlighted across the target communities were the inability to participate in leisure activities on the beach (53.3% of respondents), loss of access to the beach or jetty because of influxes (24%), and other (14.7%). See **Table 5**.

Table 5: Community-related impacts due to sargassum reported by respondents

Impacts	Percentages	
	Male (41 respondents)	**Female (34 respondents)**
Inability to participate in leisure activities on the beach, including recreational fishing, sports on the sand, water sports, gatherings, etc.	53.7%	52.9%
Loss of access to the beach or jetty	26.8%	20.6%
Tarnishing of metal objects and jewellery in homes	1.9%	8.8%
Do not know/None	19.5%	20.6%
Other	14.6%	14.7%

ii. Health-related impacts

There were several reports of health impacts, with other effects being the most frequent (26.7% of respondents) followed by rash (6.7%), nausea/dizziness (5.3%), headaches (4%), respiratory problems (4%), insomnia (2.7%), ear aches/infections (1.3%). However, almost a half of the sample reported health-related impacts as none or not applicable (49.3%). See **Table 6**.

Table 6: Health-related impacts due to sargassum reported by respondents

Impacts	Percentages	
	Male (41 respondents)	**Female (34 respondents)**
Headaches	2.4%	5.9%

Impacts	Percentages	
	Male (41 respondents)	Female (34 respondents)
Nausea/dizziness	2.4%	8.8%
Rash	9.8%	2.9%
Respiratory/breathing problems	2.4%	5.9%
Insomnia/not able to sleep	2.4%	2.9%
Ear aches/infections	2.4%	0.0%
None	48.8%	50.0%

iii. Fishing-related impacts

Fisherfolk and other fisheries-related stakeholders (N=17) across the target communities noted a range of impacts due to influx events. The majority of them reported engine entanglement (52.9%) or engine damage (11.8%), restricted movement (17.6%), and change in fishing spots (17.6%). About 12% of fisherfolk also reported net entanglement, fish pot damage and decreased fish sales. Other responses included decreased quantity of catch (5.9%) and increased distance to travel (5.9%). See Table 7.

Table 7: Fishing-related impacts due to sargassum reported by fisheries-related respondents

Challenges	Percentages	
	Male (17 respondents)	Female (0 respondents)
Engine entanglement	52.9%	0.0%
Engine damage	11.8%	0.0%
Net entanglement	11.8%	0.0%
Net damage	0%	0.0%
Decreased income	0%	0.0%
Decreased fish sales	11.8%	0.0%
Lost lures	0%	0.0%
Increased distance to travel	5.9%	0.0%
Decreased fishing time	0%	0.0%
Decreased catch (quantity)	5.9%	0.0%
Increased fuel consumption	0%	0.0%
Change in fish size caught	0%	0.0%
Restricted movement	17.6%	0.0%
Change in fishing spots	17.6%	0.0%
Change in species caught	11.8%	0.0%
Fish pot damage	11.8%	0.0%
Health effects	0.0%	0.0%
Do not know/None	0.0%	0.0%

iv. Tourism-related impacts

Tourism operators and other related stakeholders (N=20) experienced a range of impacts from influx events as well. The majority of these stakeholders reported location no longer appealing/attractive to potential clients (20%) and inability to participate in work-related activities on the beach, including tour boating, sport boat operations, commercial/professional fishing (15%). Other responses were increased costs for removal and disposal of sargassum from beach (10%) and increased costs to transport clients to different/unaffected beaches (5%). See **Table 8**.

Table 8: Tourism-related impacts due to sargassum reported by respondents

Impacts	Percentages	
	Male (10 respondents)	**Female (10 respondents)**
Location no longer appealing/attractive to potential clients	30%	10%
Inability to participate in work-related activities on the beach, including tour boating, sport boat operations, commercial/professional fishing	30%	0.0%
Increased costs for removal and disposal of sargassum from beach	10%	10%
Increased costs to transport clients to different/unaffected beaches	10%	0.0%
Increased costs for replacement of tarnished metal objects at properties	0.0%	0.0%
Loss of clients	0.0%	0.0%
Increased costs for public relations campaigns to attract, educate and reassure clients during seasonal influxes	0.0%	0.0%
None/No response	10%	20%

b. Perceptions & Coping Strategies

Interestingly, the majority of respondents perceived sargassum as both a resource and problem across the target communities (64%). 29% of respondents saw it solely as a problem, and only 7% saw it as a resource. See **Figure 4**. Of those who saw sargassum as a resource, 80% were aware of/interested in its use as a fertiliser/in agriculture. Of those who saw it as a problem, 64% were interested in learning about ways to cope with or use sargassum.

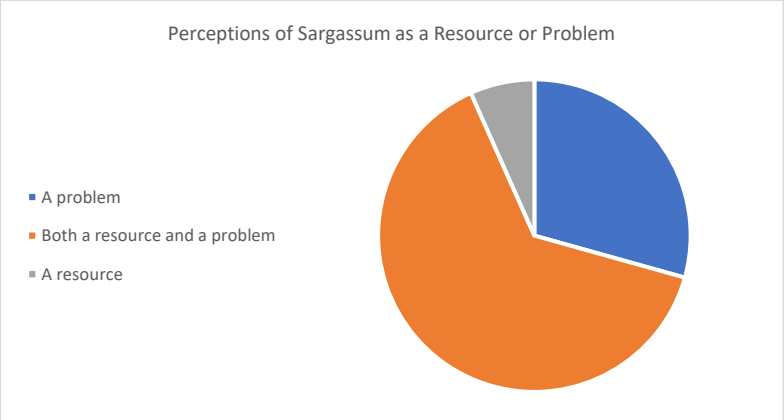

Figure 4. Respondents' perceptions of sargassum as a resource or problem. N = 75

A variety of coping mechanisms were identified by respondents across the target communities (see **Figure 5**). The largest proportion of respondents stated that they were involved in beach clean ups (44%) to address the local impacts of sargassum influxes. Others reported "dealing" with sargassum (21.3%) or "letting it be" (2.7%), which suggests that no specific action has been taken to address the sargassum's negative impacts, or "avoiding" the influxes (6.7%). 4% of respondents stated that "not much can be done" to cope with the sargassum influxes.

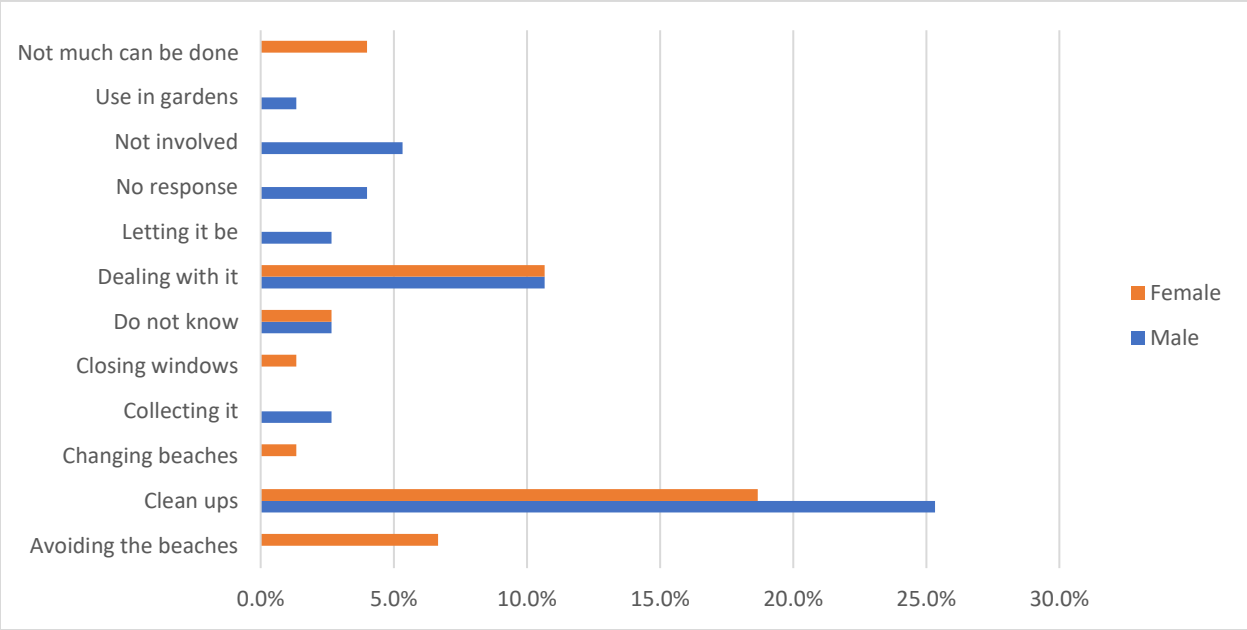

Figure 5. Coping mechanisms identified by respondents. N = 75

c. Stakeholder Interest & Involvement in Management

When asked about their involvement in making decisions on addressing/treating and managing the sargassum influxes in their community, only 2.7% of the respondents stated that they have been involved in stakeholder consultations at community or national levels. However, a number were involved in beach cleans ups (44%) and exploring uses for sargassum, especially as a compost/fertiliser (58.7%). Respondents were further asked to rate their level of involvement on a Likert scale from 0 to 5, with 0 indicating no involvement and 5 indicating very high involvement (See **Table 9**). Those persons who had been engaged, 10.7%, rated their level of involvement as low to high; with a score of one being most frequently selected (5.2%).

Table 9: Level of involvement in decision making reported by respondents. N=75

Respondents	*No involvement*				*High involvement*		No response	TOTAL
	0	1	2	3	4	5		
Number of respondents								
Male	37	1	0	0	2	1	0	**41**
Female	30	3	0	0	0	1	2	**36**
Percentage of respondents								
Male	48.1%	1.3%	0.0%	0.0%	2.6%	1.3%	0.0%	**53.2%**
Female	39.0%	3.9%	0.0%	0.0%	0.0%	1.3%	2.6%	**46.8%**
TOTAL	**87.0%**	**5.2%**	**0.0%**	**0.0%**	**2.6%**	**2.6%**	**2.6%**	**100.0%**

Respondents expressed interest in being engaged in sargassum management and decision making moving forward. 41.3% of respondents said that they would be willing to attend community or national consultations/meetings on sargassum and its impacts, and 49.3% expressed interest in training activities, especially focused on management of sargassum and how to use sargassum for alternate livelihoods to generate income.

d. Communication Preferences

In addition, 64% of respondents want to be regularly informed about sargassum and sargassum-related news. Preferences for how respondents would like to be informed or provided with sargassum-related information are outlined by gender in Figure 6, with social media (60.4%), mobile apps/text messaging (29.2%), other (e.g. email, phone calls) (27.1%) and radio (18.8%) being the top preferences for both males and females.

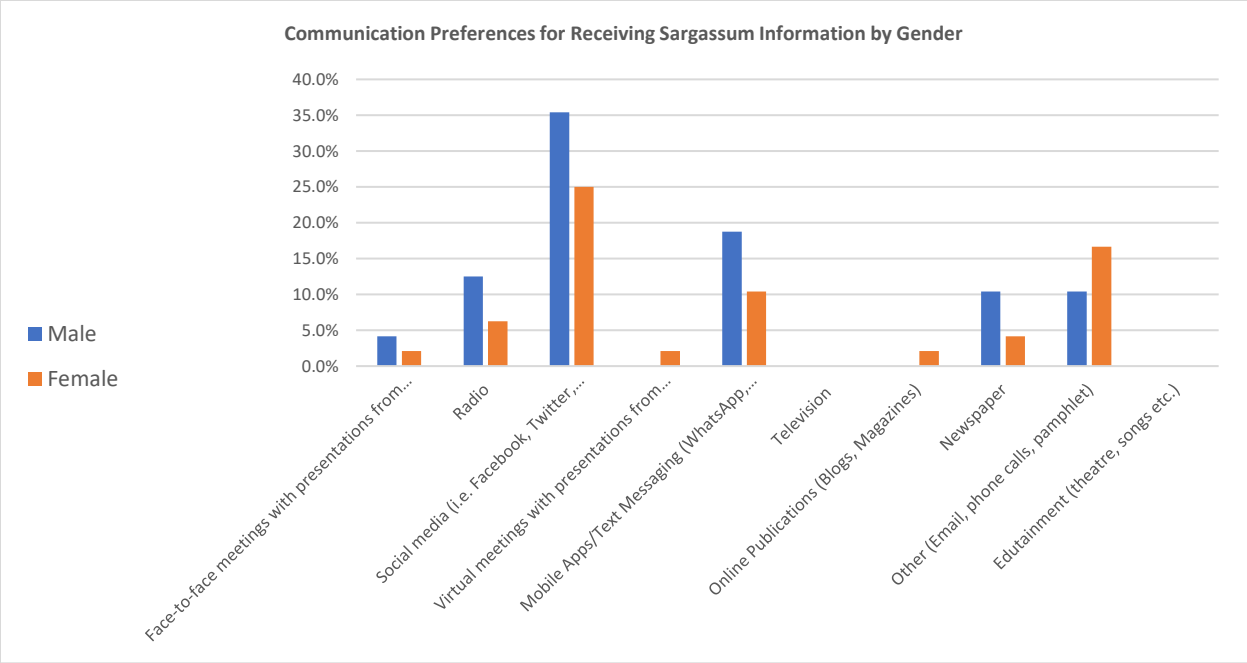

Figure 6. Respondents' preferences for how to receive sargassum-related information and news by gender (percentage of respondents who said 'Yes' to receiving information). N=48

Preferences for how respondents would like to be informed or provided with sargassum-related information are outlined by age group in Figure 7. For 18-35 year olds, mobile apps/text messaging (15%), social media (10%) and other (e.g. email, phone calls) (4%) were the top preferences. For 36-45 year olds, social media (25%), other (e.g. email, phone calls) (6%), newspapers (2%), online publications (2%) and mobile apps/text messaging (2%) were the top preferences. For 46-59 year olds, social media (21%), other (e.g. email, phone calls) (10%), newspapers (10%) and radio (10%) were the top preferences. Whereas, for respondents 60 years and over, other (e.g. email, phone calls) (6%), mobile apps/text messaging (6%), social media (4%) and radio (4%) were the top preferences.

In terms of credible and reliable sources of sargassum-related information, 40% of respondents identified Government agencies (specifically the Department of Natural Resources), 26.6% identified reputable newspapers and radio broadcasts/shows (e.g. on Radio Anguilla, Kool FM, NBR Grace FM, etc.), and 12% identified Anguilla National Trust and other NGOs as sources.

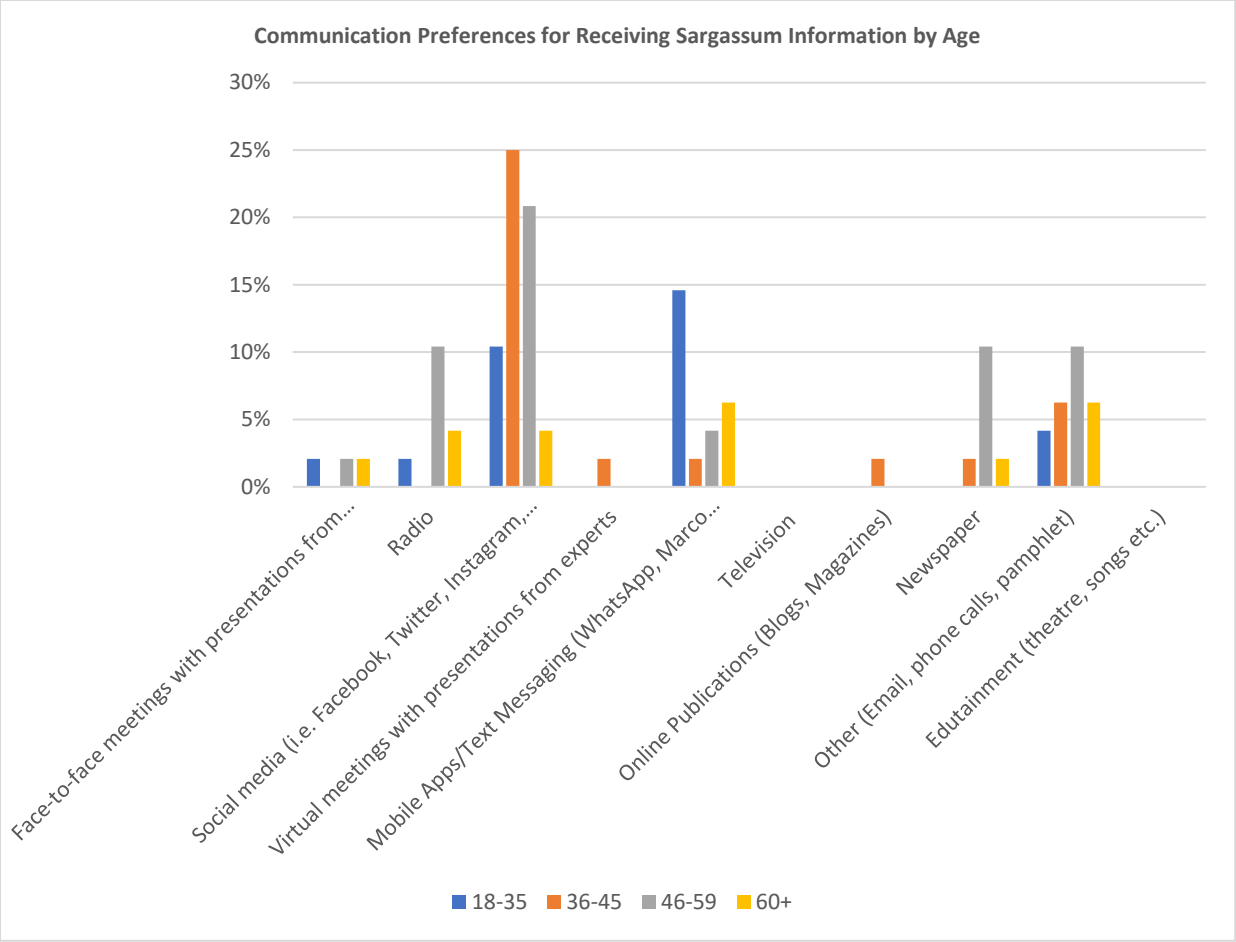

Figure 7. Respondents' preferences for how to receive sargassum-related information and news by age (percentage of respondents who said 'Yes' to receiving information). N=48

5. INTERVENTIONS TO IMPROVE ADAPTATION TO SARGASSUM INFLUXES

The KAP surveys revealed that more needs to be done to improve coastal communities' knowledge about sargassum in Anguilla, in terms of origin, uses, and ecological importance. There was also inconsistent knowledge of good practices for the removal of sargassum stranded on beaches. Under the Darwin Plus project, "Sustainable sargassum management in Anguilla, British Virgin Islands and Montserrat", CANARI, DNR and our partners intend to improve stakeholder knowledge by producing and disseminating communication products, publications, and user-friendly tools on sargassum and its biodiversity, good practices for managing influx events, coping strategies, as well as uses of sargassum for household and business enterprise opportunities. By showcasing how to better manage or adapt to influx events and the ways in which sargassum can be transformed into opportunities, the project can help dispel some of the existing negative perceptions and attitudes towards the seaweed.

Community stakeholders further reported very limited involvement in decision-making about sargassum management. Given that coastal residents, fisherfolk and tourism operators are on the frontline when there is an influx event, it is important that they are engaged as part of a participatory and multi-level

approach to sustainably manage and adapt to sargassum influxes and provided opportunities to share their experiences and collaborate on solutions.

To enable this, a communication and engagement strategy has been developed for the project. Targeted messages and/or content will be shared with fisherfolk and tourism operators that advise on how to minimise the negative impacts of influxes on their livelihoods and potential uses for livelihood and enterprise opportunities. The project will also host a number of activities to foster a participatory process, including through a community of practice, capacity building of fisherfolk, tourism operators and management agencies and enhancing collaboration.

6. REFERENCES

Agbayani, R. and Toledo, J. 2008. Institutional Capacity Development for Sustainable Aquaculture and Fisheries: Strategic Partnership with Local Institutions. Fisheries for global welfare and environment: Memorial book of the 5th World Fisheries Congress. 435-448.

CANARI and CERMES. 2022. Scoping Report on Sargassum Influxes in Anguilla. Prepared under the project, Sustainable Sargassum Management in Anguilla, British Virgin Islands and Montserrat.

Cox, S., H.A. Oxenford and P. McConney. 2019. Summary report on the review of draft national Sargassum plans for four countries Eastern Caribbean. Report prepared for the Climate Change Adaptation in the Eastern Caribbean Fisheries Sector (CC4FISH) Project of the Food and Agriculture Organization (FAO) and the Global Environment Facility (GEF). Centre for Resource Management and Environmental Studies, University of the West Indies, Cave Hill Campus, Barbados. 20 pp.

Japan International Cooperation Agency (JICA) and Caribbean Regional Fisheries Mechanism (CRFM). 2019. Final Report: Fact-Finding Survey Regarding the Influx and Impacts of Sargassum Seaweed in the Caribbean Region. Caribbean Regional Fisheries Mechanism: Belize City, Belize, 2019; 83 pp.

Oxenford, H.A., D. Johnson, S-A. Cox and J. Franks. 2019. Report on the Relationships between Sargassum Events, Oceanic variables and Dolphinfish and Flyingfish Fisheries. Centre for Resource Management and Environmental Studies, University of the West Indies, Cave Hill Campus. Bridgetown: Barbados. 32 pp.

APPENDIX 3:

REPORT OF KNOWLEDGE, ATTITUDES AND PRACTICES SURVEY IN THE VIRGIN ISLANDS, UK

1. INTRODUCTION

Since 2011, sargassum influxes have been affecting the Caribbean region, becoming a recurring threat over recent years in the Eastern Caribbean, including in Anguilla, Montserrat and the Virgin Islands, UK. These influxes have resulted in increasingly negative ecological and socio-economic impacts including biodiversity loss in coastal and marine ecosystems; health impacts associated with emissions of hydrogen sulphide and ammonia; and socio-economic and livelihood impacts in the tourism, fisheries and marine transport sectors. In particular, the threat of sargassum influxes to the livelihoods of fishing communities, and those involved in coastal tourism and related businesses, has triggered much concern about the capacities of these stakeholders to cope and adapt to what is now considered the 'new normal' (JICA and CRFM 2019). For instance, floating sargassum mats have made access to boats, and transit to and from fishing grounds difficult, more time-consuming, and sometimes even impossible (Oxenford et al. 2019). They have also disrupted coastal activities, ruining aesthetics, and ultimately resulting in visitor cancellations, declines in bookings and lower tourism earnings (Cox et al. 2019).

At the same time, there is a rapidly growing interest across the region aimed at turning this threat into an opportunity. That is, utilising stranded sargassum as a raw material for various products. This can potentially support economic diversification and increase the resilience of coastal communities impacted by sargassum influxes (Agbayani and Toledo 2008).

The project, "Sustainable sargassum management in Anguilla, British Virgin Islands and Montserrat" aims to implement a participatory and multi-level approach to manage sargassum influxes to protect and enhance coastal and marine biodiversity and associated livelihoods. It is being implemented from 2021-2024 by the Caribbean Natural Resources Institute (CANARI) in collaboration with Department of Natural Resources – Anguilla, Ministry of Natural Resources, Labour and Immigration – Virgin Islands, Department of Environment – Montserrat, Centre for Resource Management and Environmental Studies (CERMES) of the University of the West Indies, and the Organisation of Eastern Caribbean States (OECS) Commission. It is funded by a grant from the Darwin Initiative.

One of the project's objectives is to improve management by engaging with and building the knowledge and capacities of key institutions and stakeholders, including fisherfolk, tourism operators and coastal and marine resource managers, in the three territories. This report represents an analysis of the coastal stakeholders who have been affected by sargassum influxes in the Virgin Islands, UK. It is based on the results of Knowledge, Attitudes and Practices (KAP) surveys conducted by CANARI between March and September 2022.

a. Objectives

The objectives of the KAP surveys in the Virgin Islands were:

5. to assess the knowledge, attitudes, and practices of stakeholders in the target communities with respect to sargassum influxes;
6. to confirm the most frequently cited impacts of sargassum influxes by coastal stakeholders;

7. to identify the coping strategies employed by coastal stakeholders to manage sargassum influxes; and
8. to determine potential project interventions that can enhance coastal stakeholders' capacity to manage and adapt to sargassum influxes.

2. METHODOLOGY

KAP surveys are a research method used to collect both quantitative and qualitative data. The surveys were conducted by CANARI, with technical guidance form CERMES, via the phone or online communication platforms such as Skype with respondents in the target communities in the Virgin Islands. In a few cases where COVID-19 protocols allowed, face-to-face interviews were undertaken. The surveys took place from August 15, 2022 to September 30, 2022.

In terms of the questions, the survey was designed using a mix of simple, easy-to-understand open and close-ended questions that were divided into three sections—Section 1: knowledge, attitudes and practises related to Sargassum; Section 2: general and Sargassum-specific communications; and Section 3: demographics (see Appendix 1). This breakdown and question format was agreed upon for the following reasons:

4. It was important to the overall project goal to extract as much information as possible about individual community members' (including resource users and other affected people) experience with sargassum and related influxes in a one-step, one-on-one interaction.
5. Experience on similar projects led to concerns that literacy and common negative personal experiences with schooling and related associations could present real, relevant challenges and barriers to community member participation in a self-administered, close-ended question-based survey instrument, including:
    a. likening the survey to a test/exam and declining to participate as a result
    b. not being able to read and understand what is being asked
    c. an inability to understand the unstated nuances/intention of the questions and therefore, not providing enough depth in answers or providing answers that are not of quality.
6. Demographic data was included in the last section to ensure none of the questions about formal education or occupation served as a barrier to respondents' willingness to participate in the survey further.

The three main groups of stakeholders targeted for the KAP survey were: fisherfolk/fisheries operators; tourism-related businesses/operators; and community members in the target communities. The criteria for selecting target communities were as follows:

- have a history of impacts from sargassum strandings;
- have livelihoods that are heavily dependent on ecosystem services.
- have data and information available, as well as synergies with other projects in which CANARI and/or our partners are involved;
- have already made various attempts, or are potential areas to be targeted, for managing and dealing with sargassum.

Table 10 outlines the key target communities across the Virgin Islands.

Table 10: Target communities in the Virgin Islands, UK

Island	Target Community/Area

Anegada	Setting Point and surrounding communities*
Tortola	Road Town harbour and surrounding communities
Virgin Gorda	Handsome Bay and surrounding communities

*Note that, due to the small size of Anegada, all communities/settlements were relevant for the study

To determine the sample of the livelihood-related groups, contact was made with the Ministry of Natural Resources, Labour and Immigration (MNRLI) and a local mobiliser to obtain an estimate of the number of fisherfolk and tourism enterprises operating in the targeted areas, since there is no formal register of all operators by location. Using the Raosoft Sample Size Calculator, the sample size for fisherfolk and tourism operators was calculated based on a 95% confidence level and a 20% margin of error.

The survey instrument was piloted, and subsequently amended, prior to being administered in the Virgin Islands during the week of August 14, 2022. Responses were entered in Microsoft Excel to facilitate statistical analysis. In total 72 surveys were completed, 13 in Anegada, 41 around Road Town, Tortola and 18 around Handsome Bay, Virgin Gorda.

a. Limitations

There were a few challenges and limitations in conducting the KAP surveys. Firstly, while it was expected that the survey would be completed within a month, a longer timeframe was required for enumerators to effectively mobilise stakeholders and conduct phone and in-person interviews. The reasons for this included the ongoing COVID-19 pandemic and difficulties in reaching certain stakeholders, such as fisherfolk who spend long periods at sea. In addition, most questions on the KAP survey were open-ended, and so time had to be allocated to data entry and coding (standardisation) and data quality checks.

3. SITE PROFILES

Pelagic sargassum influxes have affected mainly the east and south coasts of the islands that form the territory, and have become an annual occurrence since 2011, with 2011, 2015 and 2018 being the years with the most severe impacts. While there are number of coastal communities along the east coast of the islands, the scoping study conducted for this project indicated that the communities around Setting Point, Anegada, Road Town harbour, Tortola and Handsome Bay, Virgin Gorda have been some of the most impacted to date due to sargassum accumulating on beaches, relatively dense populations and their residents being engaged in the vulnerable fisheries and tourism sectors (CANARI and CERMES, 2022).

a. Setting Point, Anegada

With the passing of Hurricane Dorian, Anegada island experienced a massive influx of sargassum. However, influxes are usually more episodic. The main threats are to beach tourism and ecologically sensitive areas, including extensive coastal fringing mangroves on the island's south coast and Horseshoe Reef, one of the Caribbean's largest barrier reefs, that extends outward from Anegada to the south east. Setting Point is the most heavily settled area, with a fishing wharf and number of active fishers, numerous small tourist-related businesses, and a mooring field which provides access for visiting charter yachts. It is also the main point of access in Anegada to the inter-island ferry terminal and

barges. Although influxes may only be episodic, Setting Point and the wider island are very vulnerable due to the high economic reliance on beach tourism and fishing.

b. Road Town, Tortola

Road town is a commercial centre on the largest island, Tortola, in the Virgin Islands. It is also an active domestic and international seaport and ferry terminal for passenger ferries to/from Anegada, Virgin Gorda and the U.S. Virgin Islands. The greater Road Town area is heavily developed. Road Town harbour has received large volumes of sargassum since 2011. This can clog the port/ ferry terminal and the decomposing sargassum releases pungent hydrogen sulphide gas that causes a stench and health and other impacts. With the Road Town ferry terminal as a main port of entry for many visitors, there is concern about these impacts, especially as it is often visitors' first impression of the Virgin Islands.

While there are few noteworthy ecological features, fringing coastal mangroves do still exist. These mangroves were badly damaged during Hurricanes Irma and Maria and there are ongoing efforts to restore degraded sites. Sargassum inundations can smother and kill the young newly-planted seedlings.

The Government of the Virgin Islands has supported clean up initiatives, which involves heavy equipment to clean the port/ ferry terminal. As such, there is not much potential for smaller-scale community-based clean up efforts.

c. Handsome Bay, Virgin Gorda

Handsome Bay is primarily a residential area situated along the southern coast of Virgin Gorda. Recreational use of this beach is mainly by locals who live on or near the bay, some residents report spearfishing in this area. The bay, which is exposed to the Atlantic Ocean to the east, receives large amounts Sargassum yearly, and often is the first location to indicate the arrival of Sargassum in mass quantities for the Virgin Islands. Initially, Sargassum was manually/mechanically removed from the bay and transported to dumps by trucks with oversight from the MNRLI . Due to the damage to the beaches, the method has been revised. The current solution is to pile the Sargassum onto the beach and bury it beneath the soil and sand on the beach. As the Sargassum decomposes, the piles offer protection from storm surges and act as buffers for the beach. In terms of community involvement, there are small-scale beach clean ups done by a local environmental youth advocacy group, Green Sprouts. Some notable impacts of the sargassum influxes include:

- There was one instance in which Sargassum clogged the intake pipe of the desalination plant. The facility was in operational for nearly a year. The pipe has been extended further out to prevent this (Interview, Hon. Vincent Wheatley, April 2, 2022).
- One resident with a severe respiratory disease had to be repeatedly sent to the clinic. Her physician has recommended that she move from her home.

4. COASTAL STAKEHOLDER ASSESSMENT

A total of 72 community members across the target communities completed the KAP survey in the Virgin Islands. 73.6% of respondents were male, and 26.4% were female. 12.5% of the respondents were 35 years of age or younger, 18.1% were between 36-45 years, 36.1% were 46-59 years and 33.3% were 60 years or older. Also, 7% were educated up to primary level, 30.6% were educated up to secondary

level, 22.2% had technical and vocational training and 37.5% had university education and 2.7% gave no response. Notably, most of the respondents educated up to primary level were from Anegada. Most of the respondents worked in the tourism sector (33%), with 28.6% working in construction, 19% in agriculture and fisheries and the remainder in education, health and the public service.

Overall, the respondents in the three communities demonstrated a good understanding of some aspects of Sargassum influx events. For example, they identified climate change and warmer ocean temperatures as causes of Sargassum influxes (**Figure 8**). They were aware that sargassum mats served as habitat/refuge for juvenile fish (36.1% of respondents), and adult fish and other marine organisms (66.7%), and further acknowledged its potential for agricultural use as fertilizer (62.5%) (Figure 9). However, they were unsure about the origins in the North Equatorial Recirculation Region (NERR) (62.5%) and its potential use in sectors such as pharmaceuticals (88.9%), cosmetics (87.5%) or as biofuel (66.7%). Respondents also demonstrated uncertainty about whether influxes can be forecasted (66.7%), if the seaweed can thrive in a freshwater environment (93.1%), and the ecological impact of heavy machinery use during sargassum clean-up activities (93.1%).

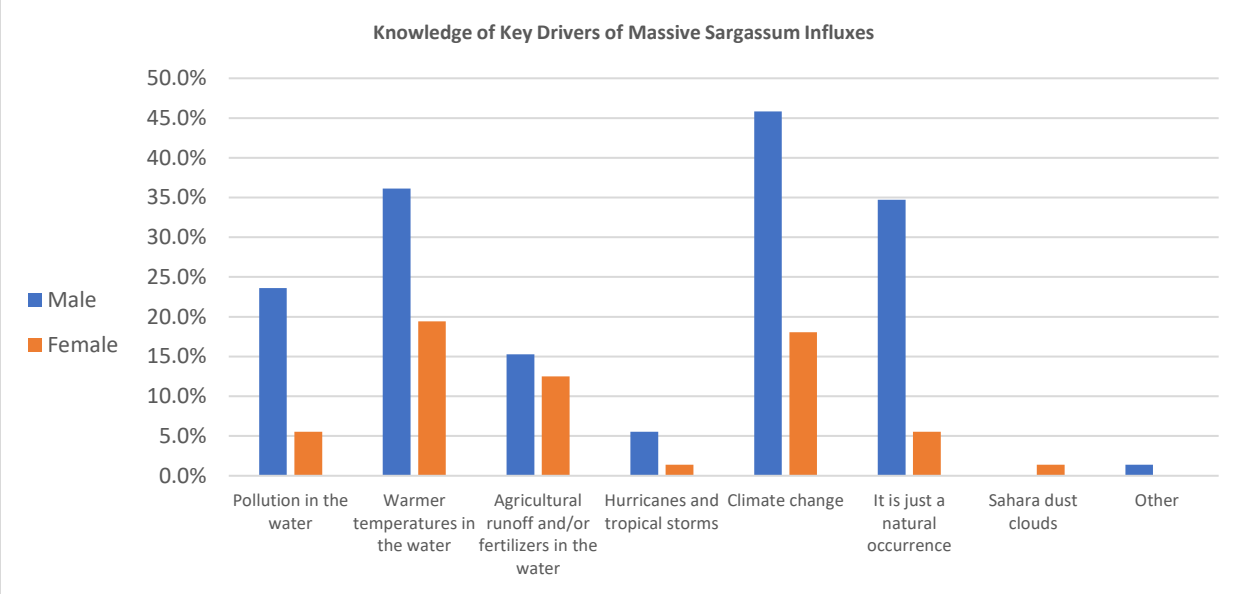

Figure 8. Knowledge of key drivers (percentage of respondents responding 'Yes') N= 72

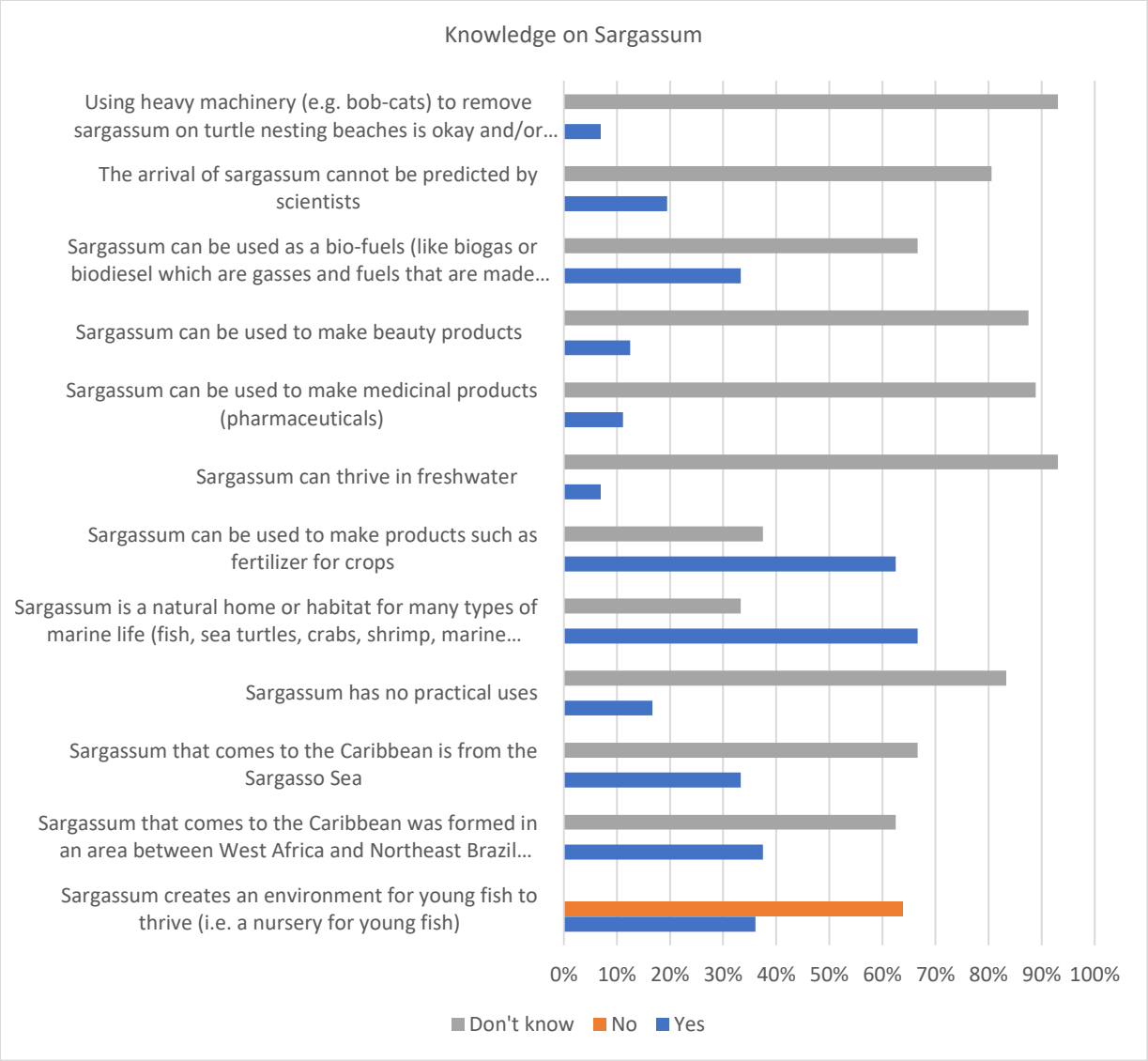

Figure 9. Knowledge on ecology, origin and uses of sargassum (percentage of respondents responding 'Yes', 'No' and 'Don't know'). N = 72

Despite being aware of several good practices in dealing with sargassum, such as moving small or moderate amounts by hand or light equipment to avoid beach damage (72.2%), as much as 57% of the respondents across the target communities still wanted the sargassum removed quickly by bobcats and other large equipment so that it cannot pile up and cause odours and other problems. In addition, only 48.6% of the respondents were aware that sargassum could be collected at sea and 40.3% of the sample were aware that sargassum, when located on beaches not used by locals or tourists, should be left on the beach.

Knowledge about management responsibilities for sargassum at the community and national levels was somewhat limited at all sites. The majority of respondents stated that responsibility for cleaning up the beach after influx events rested with the local representative/council for the Government of Virgin Islands at the community level. However, more than a third of the sample stated that they were unsure

or didn't know which groups were responsible for other activities such as providing information to the community about Sargassum (33.4%), creating Sargassum products (68%), conducting related research (20.8%), preparing policies (20.8%) and preparing sargassum management plans (13.9%). There were also about 40% of respondents who gave no response. Their knowledge regarding responsibilities for sargassum at the national level reflected their perspective of the community level responsibilities. The majority identified the Government of Virgin Islands, in particular the MNRLI, as the organisation responsible for cleaning up the beach after influxes (54.2%), although 33% did not know which agency was responsible for the remaining tasks or gave no response.

a. Summary impacts of sargassum influx events in target communities

As part of the KAP study, coastal stakeholders were asked about the impacts of sargassum influxes on their communities and livelihoods. From the responses, it was clear that all persons surveyed were in some way affected by sargassum's presence. Impacts described ranged from health-related problems to fishing and community-related challenges. The following sub-sections categorise the various impacts experienced.

i. Community-related Impacts

Within the wider community, the most common impacts highlighted across the target communities were the loss of access to the beach or jetty because of influxes (66.7% of respondents), the inability to participate in leisure activities on the beach (52.8%), and the tarnishing of metal objects and jewellery in homes (44%). See **Table 11**.

Table 11: Community-related impacts due to sargassum reported by respondents

Impacts	Percentages	
	Male (53 respondents)	**Female (19 respondents)**
Loss of access to the beach or jetty	69.8%	57.9%
Inability to participate in leisure activities on the beach, including recreational fishing, sports on the sand, water sports, gatherings, etc.	49.1%	63.2%
Tarnishing of metal objects and jewellery in homes	49.1%	36.8%
Loss of wildlife	1.9%	0.0%
Other	1.9%	5.3%

ii. Health-related impacts

There were several reports of health impacts, with headaches being the most frequent (18.1% of respondents) followed by nausea/dizziness (15.3%), rash (12.5%), respiratory problems (11.1%), insomnia (6.9%), irritating smell (6.9%), ear aches/infections (2.8%), burns eyes (1.4%) and loss of appetite (1.4%). However, over a third of the sample reported health-related impacts as none or not applicable (37.5%). See **Table 12**.

Table 12: Health-related impacts due to sargassum reported by respondents

Impacts	Percentages	
	Male (53 respondents)	Female (19 respondents)
Headaches	22.6%	5.3%
Nausea/dizziness	17%	10.5%
Rash	9.4%	21.1%
Respiratory/breathing problems	15.1%	0.0%
Insomnia/not able to sleep	11.3%	0.0%
Irritating smell	7.5%	5.3%
Ear aches/infections	7.1%	0.0%
Burns eyes	3.8%	0.0%
Loss of appetite	3.8%	0.0%

iii. Fishing-related impacts

Fisherfolk and other fisheries-related stakeholders (N=19) across the target communities noted a range of impacts due to influx events. The majority of them reported engine entanglement (89.5%) or engine damage (68%), net entanglement or damage (52.6%), decreased income (63.2%) and decreased fish sales (63.2%). 36.8% of fisherfolk reported lost lures. About a quarter of fisherfolk also reported increased distance to travel, increased fuel consumption, decreased fishing time, decreased quantity of catch, change in fish size caught and restricted movement. Other responses included change in fishing spots (15.8%), change in species caught (10.5%), fish pot damage (5.3%), and health effects (5.3%). See **Table 13**.

Table 13: Fishing-related impacts due to sargassum reported by fisheries-related respondents

Challenges	Percentages	
	Male (17 respondents)	Female (2 respondents)
Engine entanglement	88.2%	50.0%
Engine damage	76.5%	0.0%
Net entanglement	41.2%	0.0%
Net damage	17.6%	0.0%
Decreased income	35.3%	0.0%
Decreased fish sales	35.3%	0.0%
Lost lures	35.3%	50.0%
Increased distance to travel	29.4%	0.0%
Decreased fishing time	29.4%	0.0%
Decreased catch (quantity)	23.5%	0.0%
Increased fuel consumption	23.5%	0.0%
Change in fish size caught	23.5%	0.0%
Restricted movement	23.5%	0.0%
Change in fishing spots	17.6%	0.0%
Change in species caught	11.8%	0.0%

Challenges	Percentages	
	Male (17 respondents)	Female (2 respondents)
Fish pot damage	5.9%	0.0%
Health effects	5.9%	0.0%

iv. Tourism-related impacts

Tourism operators and other related stakeholders (N=33) experienced a range of impacts from influx events as well. The majority of these stakeholders reported inability to participate in work-related activities on the beach, including tour boating, sport boat operations, commercial/professional fishing (60.6%). Other common responses were increased costs for removal and disposal of sargassum from beach (45.5%), location no longer appealing/attractive to potential clients (42.4%), increased costs to transport clients to different/unaffected beaches (42.4%), increased costs for replacement of tarnished metal objects at properties (36.4%) and loss of clients (30.3%). See **Table 14**.

Table 14: Tourism-related impacts due to sargassum reported by respondents

Impacts	Percentages	
	Male (25 respondents)	Female (8 respondents)
Inability to participate in work-related activities on the beach, including tour boating, sport boat operations, commercial/professional fishing	68%	37.5%
Increased costs for removal and disposal of sargassum from beach	48%	37.5%
Location no longer appealing/attractive to potential clients	48%	25%
Increased costs to transport clients to different/unaffected beaches	48%	25%
Increased costs for replacement of tarnished metal objects at properties	40%	25%
Loss of clients	28%	37.5%
Increased costs for public relations campaigns to attract, educate and reassure clients during seasonal influxes	12%	12.5%
Increased costs for repairing damaged equipment such as filters, strainers freezers, A/C, main engine and generators	0.0%	12.5%
Loss of beaches (the better beaches are on the north. The accumulation is on the south)	4.0%	0.0%
Reduced swimming areas	4.0%	0.0%

b. Perceptions & Coping Strategies

The majority of respondents perceived sargassum as both a resource and problem across the target communities (51.4%). 41.7% of respondents saw it solely as a problem, and only 5.6% saw it as a resource. See **Figure 10**. Of those who saw it as a problem, 58% were interested in learning about ways to cope with or use sargassum. Of those who saw sargassum as a resource, 44% were aware of/interested in its use as a fertiliser/in agriculture, 6.7% were aware of its use as a biofuel and 13% were aware of various uses.

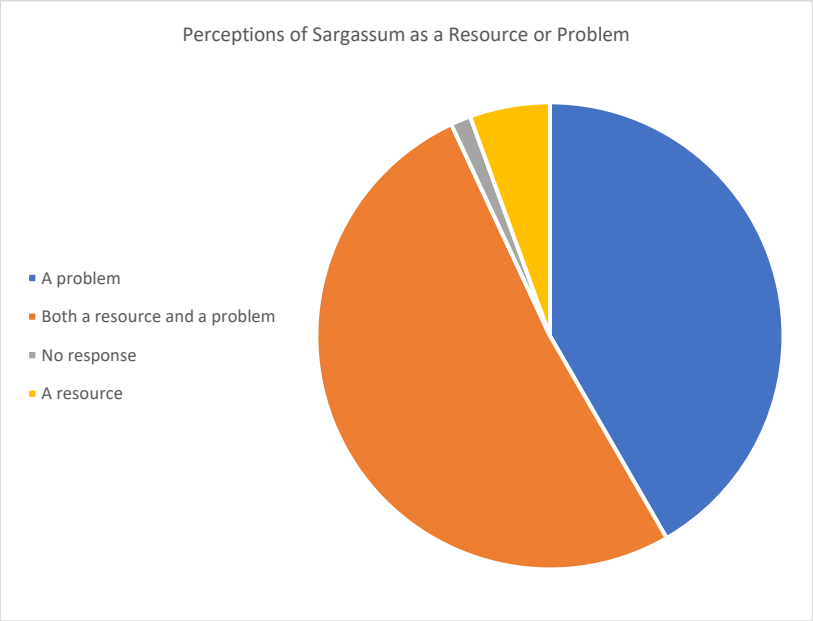

Figure 10. Respondents' perceptions of sargassum as a resource or problem. N = 72

A variety of coping mechanisms were identified by respondents across the target communities (see **Figure 11**). The largest proportion of respondents stated that they were involved in beach clean ups (25%) to address the local impacts of sargassum influxes. Others reported "living" with sargassum (20.8%), which suggests that no action has been taken to address the sargassum's negative impacts, or "avoiding" or "working around" the influxes (15.3%), where they continue to work as best as they can despite the impacts. Notably, 9.7% of respondents stated that they were simply not coping with the sargassum influxes.

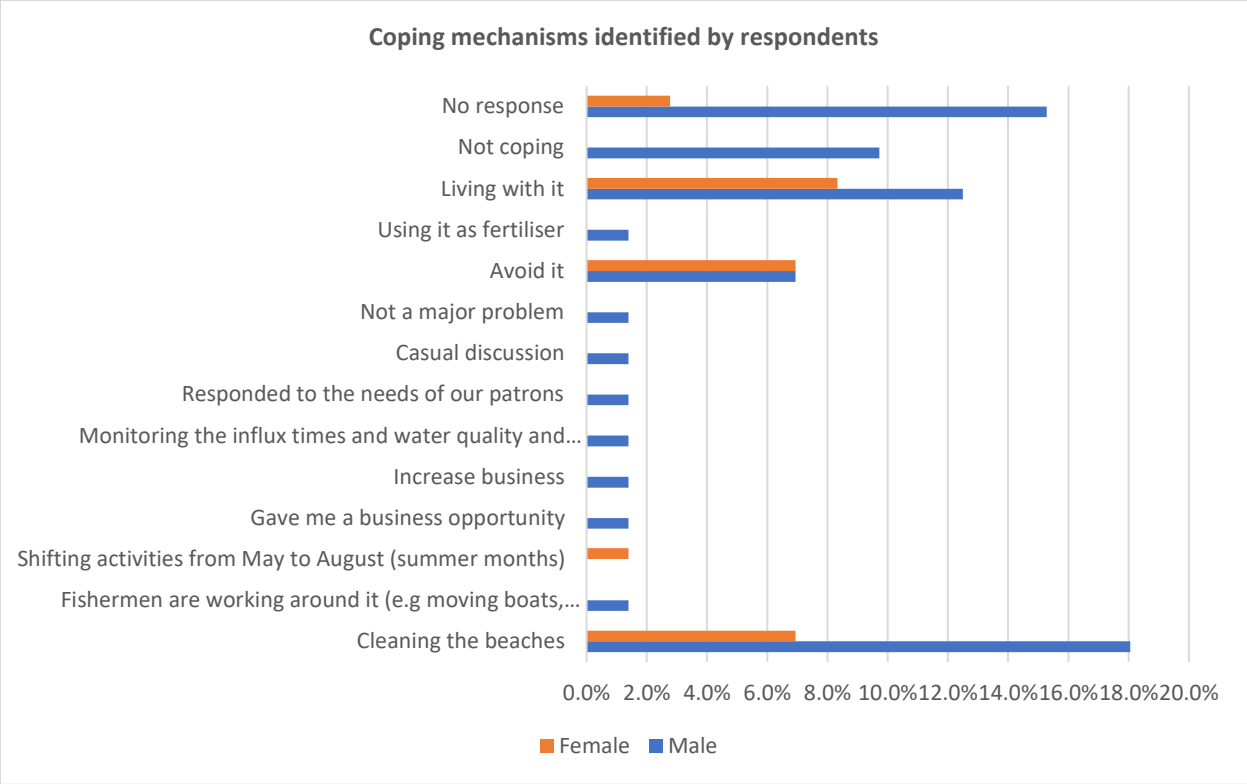

Figure 11. Coping mechanisms identified by respondents. N = 72

c. Stakeholder Interest & Involvement in Management

When asked about their involvement in making decisions on addressing/treating and managing the sargassum influxes in their community, only 6.9% of the respondents stated that they have been involved in stakeholder consultations. However, a number were involved in beach cleans ups (25%) and exploring uses for sargassum, especially as a compost/fertiliser (18%). Respondents were further asked to rate their level of involvement on a Likert scale from 0 to 5, with 0 indicating no involvement and 5 indicating very high involvement (See **Table 15**). Those persons who had been engaged, 54.2%, rated their level of involvement as low to moderate; with a score of one being most selected (23.6%).

Table 15: Level of involvement in decision making reported by respondents. N=72

Respondents	*No involvement*				*High involvement*		No response	TOTAL
	0	1	2	3	4	5		
Number of respondents								
Male	23	13	8	7	0	1	1	**53**
Female	10	4	3	1	0	1	0	**19**
Percentage of respondents								
Male	31.9%	18.1%	11.1%	9.7%	0.0%	1.4%	1.4%	**73.6%**
Female	13.9%	5.6%	4.2%	1.4%	0.0%	1.4%	0.0%	**26.4%**
TOTAL	**45.8%**	**23.6%**	**15.3%**	**11.1%**	**0.0%**	**2.8%**	**1.4%**	**100.0%**

Respondents expressed interest in being engaged in sargassum management and decision making

moving forward. 44.4% of respondents said that they would be willing to attend community or national consultations/meetings on sargassum and its impacts, and 62.5% expressed interest in training activities, especially focused on how to effectively clean up and dispose of stranded sargassum and how to use sargassum for alternate livelihoods to generate income.

d. Communication Preferences

83.3% of respondents want to be regularly informed about sargassum and sargassum-related news. Their preferences for how they would like to be informed or provided with sargassum-related information are outlined by gender in Figure 12, with social media (61.7%), radio (53.3%), mobile apps/text messaging (41.7%) and online publications (41.7%) being the top preferences for both males and females.

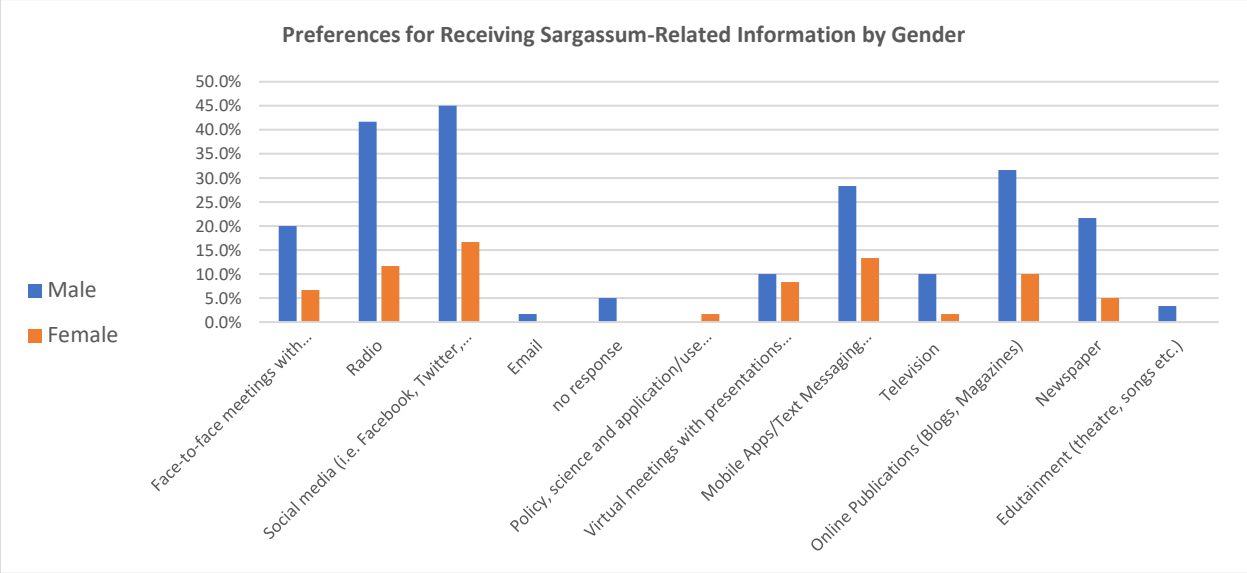

Figure 12. Respondents' preferences for how to receive sargssum-related information and news (percentage of respondents responding 'Yes' to receiving information). N=60

Preferences for how respondents would like to be informed or provided with sargassum-related information are outlined by age group in Figure 13. For 18-35 year olds, social media (10%), mobile apps/text messaging (6.7%) and online publications (e.g. blogs, magazines) (6.7%) were the top preferences. Similarly, for 36-45 year olds, social media (13%), mobile apps/text messaging (10%), online publications (e.g. blogs, magazines) (10%) as well as radio (8%) were the top preferences. For 46-59 year olds, social media (23.3%), radio (21.7%), mobile apps/text messaging (15%) and online publications (e.g. blogs, magazines) (13.3%) were the top preferences. For respondents over 60 years, face-to-face meetings with presentations from experts (26.7%), radio (20%), social media (15%), online publications (e.g. blogs, magazines) (11.7%) and newspapers (11.7%) were the top preferences.

In terms of credible and reliable sources of sargassum-related information, 40.3% of respondents identified the Government Information Service/government agencies and officials and 19.4% identified

scientists/technical experts and their publications as sources across the target communities. Only 2.8% of respondents identified non-governmental organisations (NGOs) or educational institutions as information sources.

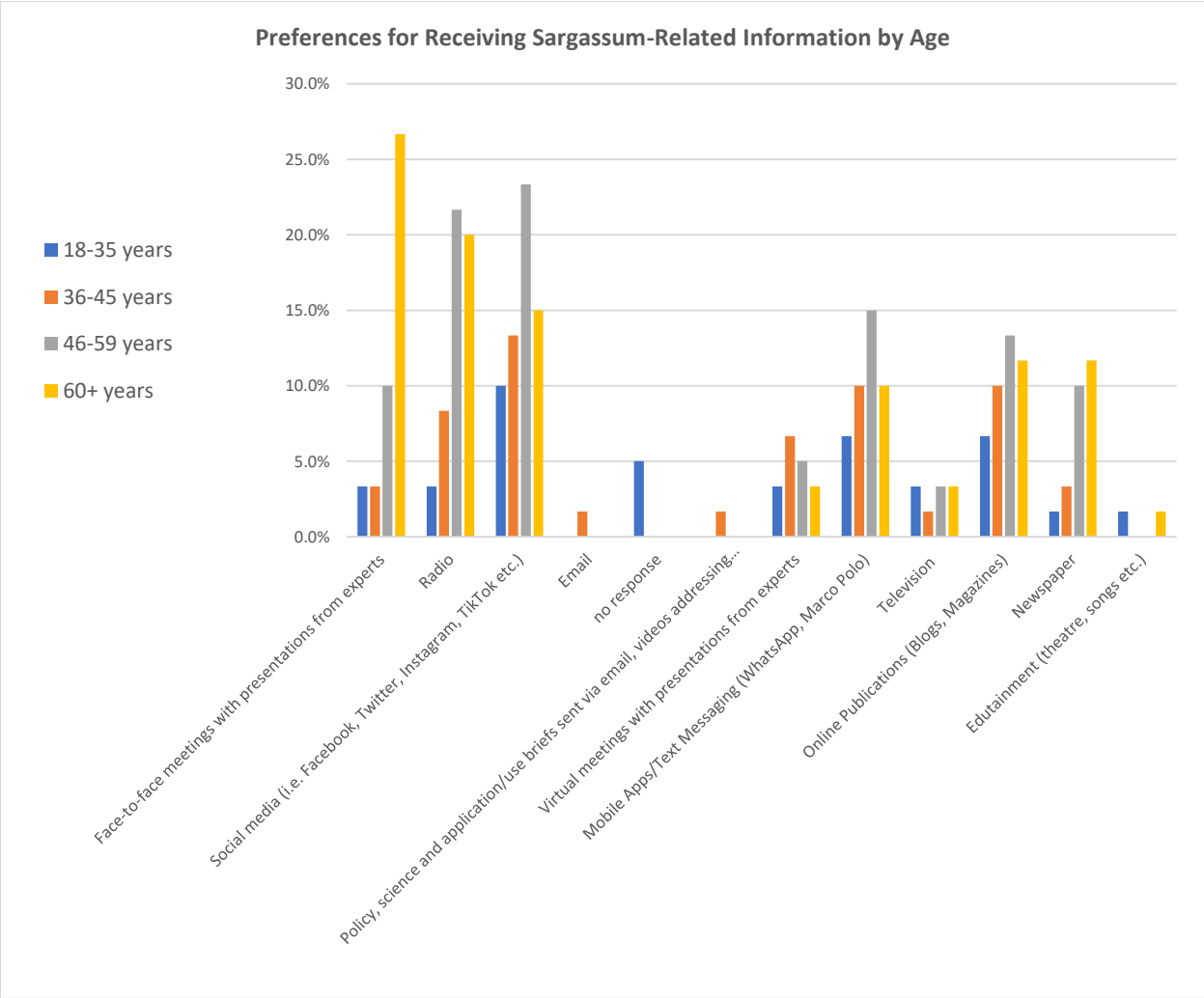

Figure 13. Respondents' preferences for how to receive sargassum-related information and news by age (percentage of respondents responding 'Yes' to receiving information). N= 60

5. INTERVENTIONS TO IMPROVE ADAPTATION TO SARGASSUM INFLUXES

The KAP surveys revealed that more needs to be done to improve coastal communities' knowledge about sargassum in the Virgin Islands, in terms of origin, uses, and ecological importance. There was also inconsistent knowledge of good practices for the removal of sargassum stranded on beaches. Under the Darwin Plus project, "Sustainable sargassum management in Anguilla, British Virgin Islands and Montserrat", CANARI, MNRLI and our partners intend to improve stakeholder knowledge by producing and disseminating communication products, publications, and user-friendly tools on sargassum and its biodiversity, good practices for managing influx events, coping strategies, as well as uses of sargassum for household and business enterprise opportunities. By showcasing how to better manage or adapt to

influx events and the ways in which sargassum can be transformed into opportunities, the project can help dispel some of the existing negative perceptions and attitudes towards the seaweed.

Community stakeholders further reported very limited involvement in decision-making about sargassum management. Given that coastal residents, fisherfolk and tourism operators are on the frontline when there is an influx event, it is important that they are engaged as part of a participatory and multi-level approach to sustainably manage and adapt to sargassum influxes and provided opportunities to share their experiences and collaborate on solutions.

To enable this, a communication and engagement strategy has been developed for the project. Targeted messages and/or content will be shared with fisherfolk and tourism operators that advise on how to minimise the negative impacts of influxes on their livelihoods and potential uses for livelihood and enterprise opportunities. The project will also host a number of activities to foster a participatory process, including through a community of practice, capacity building of fisherfolk, tourism operators and management agencies and enhancing collaboration.

6. REFERENCES

Agbayani, R. and Toledo, J. 2008. Institutional Capacity Development for Sustainable Aquaculture and Fisheries: Strategic Partnership with Local Institutions. Fisheries for global welfare and environment: Memorial book of the 5th World Fisheries Congress. 435-448.

CANARI and CERMES. 2022. Scoping Report on Sargassum Influxes in the Virgin Islands. Prepared under the project, Sustainable Sargassum Management in Anguilla, British Virgin Islands and Montserrat.

Cox, S., H.A. Oxenford and P. McConney. 2019. Summary report on the review of draft national Sargassum plans for four countries Eastern Caribbean. Report prepared for the Climate Change Adaptation in the Eastern Caribbean Fisheries Sector (CC4FISH) Project of the Food and Agriculture Organization (FAO) and the Global Environment Facility (GEF). Centre for Resource Management and Environmental Studies, University of the West Indies, Cave Hill Campus, Barbados. 20 pp.

Japan International Cooperation Agency (JICA) and Caribbean Regional Fisheries Mechanism (CRFM). 2019. Final Report: Fact-Finding Survey Regarding the Influx and Impacts of Sargassum Seaweed in the Caribbean Region. Caribbean Regional Fisheries Mechanism: Belize City, Belize, 2019; 83 pp.

Oxenford, H.A., D. Johnson, S-A. Cox and J. Franks. 2019. Report on the Relationships between Sargassum Events, Oceanic variables and Dolphinfish and Flyingfish Fisheries. Centre for Resource Management and Environmental Studies, University of the West Indies, Cave Hill Campus. Bridgetown: Barbados. 32 pp.

APPENDIX 4:

REPORT OF KNOWLEDGE, ATTITUDES AND PRACTICES SURVEY IN MONTSERRAT

1. INTRODUCTION

Since 2011, sargassum influxes have been affecting the Caribbean region, becoming a recurring threat over recent years in the Eastern Caribbean, including in Anguilla, Montserrat and the Virgin Islands, UK. These influxes have resulted in increasingly negative ecological and socio-economic impacts including biodiversity loss in coastal and marine ecosystems; health impacts associated with emissions of hydrogen sulphide and ammonia; and socio-economic and livelihood impacts in the tourism, fisheries and marine transport sectors. In particular, the threat of sargassum influxes to the livelihoods of fishing communities, and those involved in coastal tourism and related businesses, has triggered much concern about the capacities of these stakeholders to cope and adapt to what is now considered the 'new normal' (JICA and CRFM 2019). For instance, floating sargassum mats have made access to boats, and transit to and from fishing grounds difficult, more time-consuming, and sometimes even impossible (Oxenford et al. 2019). They have also disrupted coastal activities, ruining aesthetics, and ultimately resulting in visitor cancellations, declines in bookings and lower tourism earnings (Cox et al. 2019).

At the same time, there is rapidly growing interest across the region aimed at turning this threat into an opportunity. That is, utilising stranded sargassum as a raw material for various products. This can potentially support economic diversification and increase the resilience of coastal communities impacted by sargassum influxes (Agbayani and Toledo 2008).

The project, "Sustainable sargassum management in Anguilla, British Virgin Islands and Montserrat" aims to implement a participatory and multi-level approach to manage sargassum influxes to protect and enhance coastal and marine biodiversity and associated livelihoods. It is being implemented from 2021-2024 by the Caribbean Natural Resources Institute (CANARI) in collaboration with Department of Natural Resources – Anguilla, Ministry of Natural Resources, Labour and Immigration – Virgin Islands, Department of Environment – Montserrat, Centre for Resource Management and Environmental Studies (CERMES) of the University of the West Indies, and the Organisation of Eastern Caribbean States (OECS) Commission. It is funded by a grant from the Darwin Initiative.

One of the project's objectives is to improve management by engaging with and building the knowledge and capacities of key institutions and stakeholders, including fisherfolk, tourism operators and coastal and marine resource managers, in the three territories. This report represents an analysis of the coastal stakeholders who have been affected by sargassum influxes in Montserrat. It is based on the results of Knowledge, Attitudes and Practices (KAP) surveys conducted by CANARI between March and September 2022.

a. Objectives

The objectives of the KAP surveys in Montserrat were:

9. to assess the knowledge, attitudes, and practices of stakeholders in the target communities with respect to sargassum influxes;
10. to confirm the most frequently cited impacts of sargassum influxes by coastal stakeholders;

11. to identify the coping strategies employed by coastal stakeholders to manage sargassum influxes; and
12. to determine potential project interventions that can enhance coastal stakeholders' capacity to manage and adapt to sargassum influxes.

2. METHODOLOGY

KAP surveys are a research method used to collect both quantitative and qualitative data. The surveys were conducted by CANARI, with technical guidance form CERMES, via the phone or online communication platforms such as Skype with respondents in the target communities in Montserrat. In a few cases where COVID-19 protocols allowed, face-to-face interviews were undertaken. The surveys took place from August 22, 2022 to September 30, 2022.

In terms of the questions, the survey was designed using a mix of simple, easy-to-understand open and close-ended questions that were divided into three sections—Section 1: knowledge, attitudes and practises related to Sargassum; Section 2: general and Sargassum-specific communications; and Section 3: demographics (see Appendix 1). This breakdown and question format was agreed upon for the following reasons:

7. It was important to the overall project goal to extract as much information as possible about individual community members' (including resource users and other affected people) experience with sargassum and related influxes in a one-step, one-on-one interaction.
8. Experience on similar projects led to concerns that literacy and common negative personal experiences with schooling and related associations could present real, relevant challenges and barriers to community member participation in a self-administered, close-ended question-based survey instrument, including:
    a. likening the survey to a test/exam and declining to participate as a result
    b. not being able to read and understand what is being asked
    c. an inability to understand the unstated nuances/intention of the questions and therefore, not providing enough depth in answers or providing answers that are not of quality.
9. Demographic data was included in the last section to ensure none of the questions about formal education or occupation served as a barrier to respondents' willingness to participate in the survey further.

The three main groups of stakeholders targeted for the KAP survey were: fisherfolk/fisheries operators; tourism-related businesses/operators; and community members in the target communities. The criteria for selecting target communities were as follows:

- have a history of impacts from sargassum strandings;
- have livelihoods that are heavily dependent on ecosystem services.
- have data and information available, as well as synergies with other projects in which CANARI and/or our partners are involved;
- have already made various attempts, or are potential areas to be targeted, for managing and dealing with sargassum.

Table **16** outlines the key target communities across Montserrat.

Table 16: Target communities in Montserrat

Target Community/Area
Davy Hill/ Little Bay
Lookout
Manjack/ Brades
Woodlands and nearby communities (Salem and St. Peter's)

To determine the sample of the livelihood-related groups, contact was made with the Department of Environment (DOE) and local mobiliser to obtain an estimate of the number of fisherfolk and tourism enterprises operating in the targeted areas, since there is no formal register of all operators by location. Using the Raosoft Sample Size Calculator, the sample size for fisherfolk and tourism operators was calculated based on a 95% confidence level and a 20% margin of error.

The survey instrument was piloted, and subsequently amended, prior to being administered in Montserrat from August 15-22, 2022. Responses were entered in Microsoft Excel to facilitate statistical analysis. In total 56 surveys were completed, 10 in Davy Hill/Little Bay, 13 in Lookout, 8 in Manjack/Brades and 23 in Woodlands/Salem/St. Peter's.

a. Limitations

There were a few challenges and limitations in conducting the KAP surveys. Firstly, while it was expected that the survey would be completed within a month, a longer timeframe was required for enumerators to effectively mobilise stakeholders and conduct phone/online interviews. The reasons for this included the ongoing COVID-19 pandemic and difficulties in reaching certain stakeholders, such as fisherfolk who spend long periods at sea. In addition, several questions on the KAP survey were open-ended, and so time had to be allocated to data entry and coding (standardisation) and data quality checks.

3. SITE PROFILES

Pelagic sargassum influxes have affected mainly the north and east coasts of Montserrat, and have become an annual occurrence since 2011, with 2011, 2015 and 2018 being the years with the most severe impacts. The scoping study conducted for this project indicated that the communities around Lookout (near Marguerita Beach) on the east coast, along with Davy Hill and Brades (near Carr's Bay) and Woodlands, Salem and St. Peter's (near Woodlands Beach and Bunkum's Bay) on the north west coast, have been some of the most impacted to date. This is due to sargassum accumulating on beaches, relatively dense populations and their residents being engaged in the vulnerable fisheries and tourism sectors (CANARI and CERMES, 2022).

a. Lookout

Lookout is a small community located uphill from Marguerita Beach on the north east coast of Montserrat. It is largely residential with residents involved in a mix of livelihoods, including in the public service, fisheries and tourism sectors. There are also a number of retirees. The beach is used for artisanal shore fishing and beachcombing by local artisans for art/craft. It is also of ecological importance for the field study of highly protected migratory birds.

Marguerita Beach has been one of the most significantly impacted areas since mass sargassum influxes began in 2011. Sargassum is trapped within the freshwater pond, rapidly decomposing and the smell of

rotting sargassum is carried upwind, affecting the nearby community. The beach is not used for recreational purposes and, therefore, has not been prioritised for clean ups. Once sargassum comes into the bay, because of the presence of sand berms on the beach, the sargassum cannot be removed naturally.

As the volumes have generally been high, manual cleaning is difficult and ineffective without significant manpower, especially as sargassum is mixed with high quantities of plastic debris. Local community groups have done clean ups on this beach.

b. Davy Hill/ Little Bay

Davy Hill and Little Bay are small communities on the north west coast of Montserrat near to Carr's Bay. Both are largely residential with residents involved in a mix of livelihoods, including in agriculture and fisheries, tourism and the public service sectors. There are also a number of retirees.

Carr's Bay is one of Montserrat's most used recreational beaches. Cruise ship guests often spend the day on this beach. The Montserrat Port Authority is located nearby at approximately 1.3 km northwest. The area is also popular with shore fishers and birders as it provides good bird watching for pelicans, boobies, frigate birds and possibly red-billed tropic birds, and there are remnants of a wetland. As such, there are a number of bars and restaurants/food stalls alongside the beach. Additionally, Carr's Bay is one of two beaches where permission can be granted for sand removal for concrete and building material.

Carr's Bay is one of the areas significantly impacted by mass sargassum influxes. It is regularly maintained by the Montserrat Tourism Division due to its significance for recreation and tourism. Without human intervention, the slight sloping nature of the beach also allows for the seaweed to be washed out to sea or buried.

c. Brades

Brades is the site of the new capital and the commercial centre of Montserrat. It is located on the north west coast to the south of Carr's Bay. It is the site of key government buildings and businesses. There is also residential housing in the area. Residents are engaged in a mix of livelihoods, including in the fisheries, tourism and the public service sectors.

There is limited coastal vegetation, as the coastline is predominantly cliffs, at Brades. The area is closely linked to Carr's Bay, which is significantly impacted by mass sargassum influxes. As noted above, this bay is regularly maintained by the Montserrat Tourism Division due to its significance for recreation and tourism.

d. Woodlands

Woodlands is an affluent residential community on the north west coast of Montserrat. The main livelihoods are linked to the tourism and service sectors. In the nearby and less affluent communities of Salem and St. Peter's, there are a greater mix of livelihoods, including in construction, fisheries, tourism and the public service sectors. Seining and pot fishers operate in this area.

Woodlands Beach is one of Montserrat's most used recreational beaches. It has a mix of sandy and rocky shoreline, and also is the location of an artificial reef. Cruise ship guests often spend the day on this beach and are treated to lunch and entertainment in the shaded event space. It is also a sea turtle nesting beach, and a popular site for turtle watching.

Woodlands Beach has been significantly impacted by sargassum influxes. However, most of the sargassum tends to stay out at sea or settle within the reef. Once sargassum comes into the beach, because of high wave energy, it is removed naturally and the excess influx is washed onshore. Being one of the island's key beach and turtle conservation attractions, the beach is maintained by both the Montserrat Tourism Division and Montserrat National Trust.

4. COASTAL STAKEHOLDER ASSESSMENT

A total of 56 community members across the target communities completed the KAP survey in Montserrat. 76.8% of respondents were male, and 23.2% were female. 14.3% of the respondents were 35 years of age or younger, 16.1% were between 36-45 years, 44.6% were 46-59 years and 25% were 60 years or older. Also, 16.1% were educated up to primary level, 41.1% were educated up to secondary level, 23.2% had technical and vocational training and 19.7% had university education. Most of the respondents worked in the public service and service sectors (48.2%), with 16.1% working in tourism, 12.5% in construction, 7.1% in fisheries, and the remainder in agriculture and other sectors (e.g. environmental and marine resource management). Notably, 8.9% of respondents were retirees not engaged in any sector.

Overall, the respondents in the four communities demonstrated a good understanding of some aspects of sargassum influx events. For example, they identified climate change and warmer ocean temperatures as causes of sargassum influxes (**Figure 14**). They were aware that sargassum mats served as habitat/refuge for juvenile fish (51.8% of respondents) and adult fish and other marine organisms (67.9%) (Figure 15). However, they were uncertain about the origins in the North Equatorial Recirculation Region (NERR) (39.3%) or its potential use in sectors such as pharmaceuticals (55.4%) and cosmetics (60.7%) or as a biofuel (71.4%). Respondents also were not sure about whether influxes can be forecasted (55.4%), if the seaweed can thrive in a freshwater environment (67.9%), and the ecological impact of heavy machinery use during sargassum clean-up activities (51.8%).

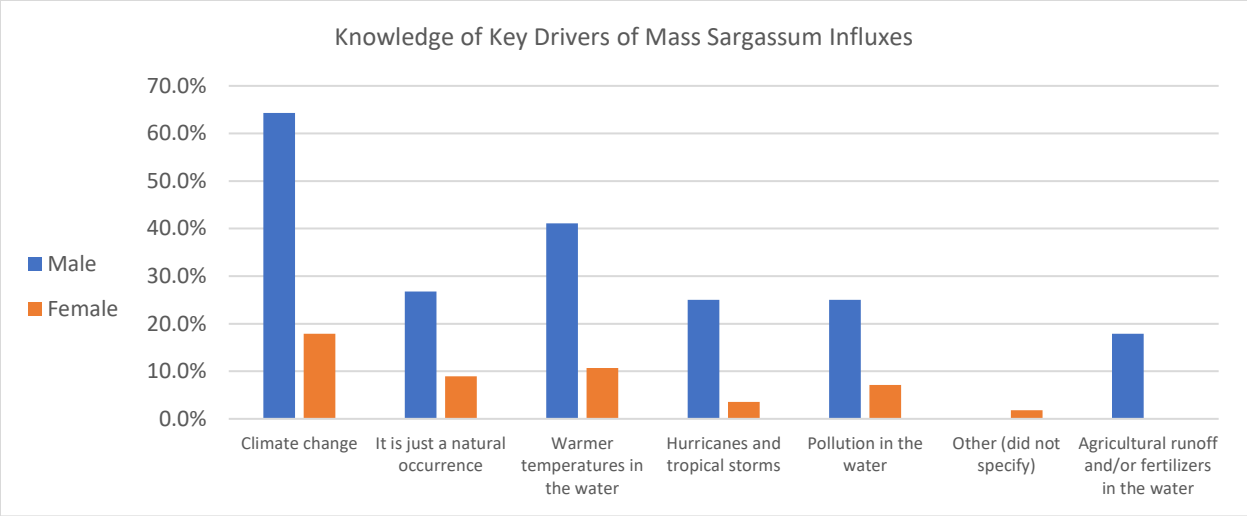

Figure 14. Knowledge of key drivers (percentage of respondents responding 'Yes'). N= 56

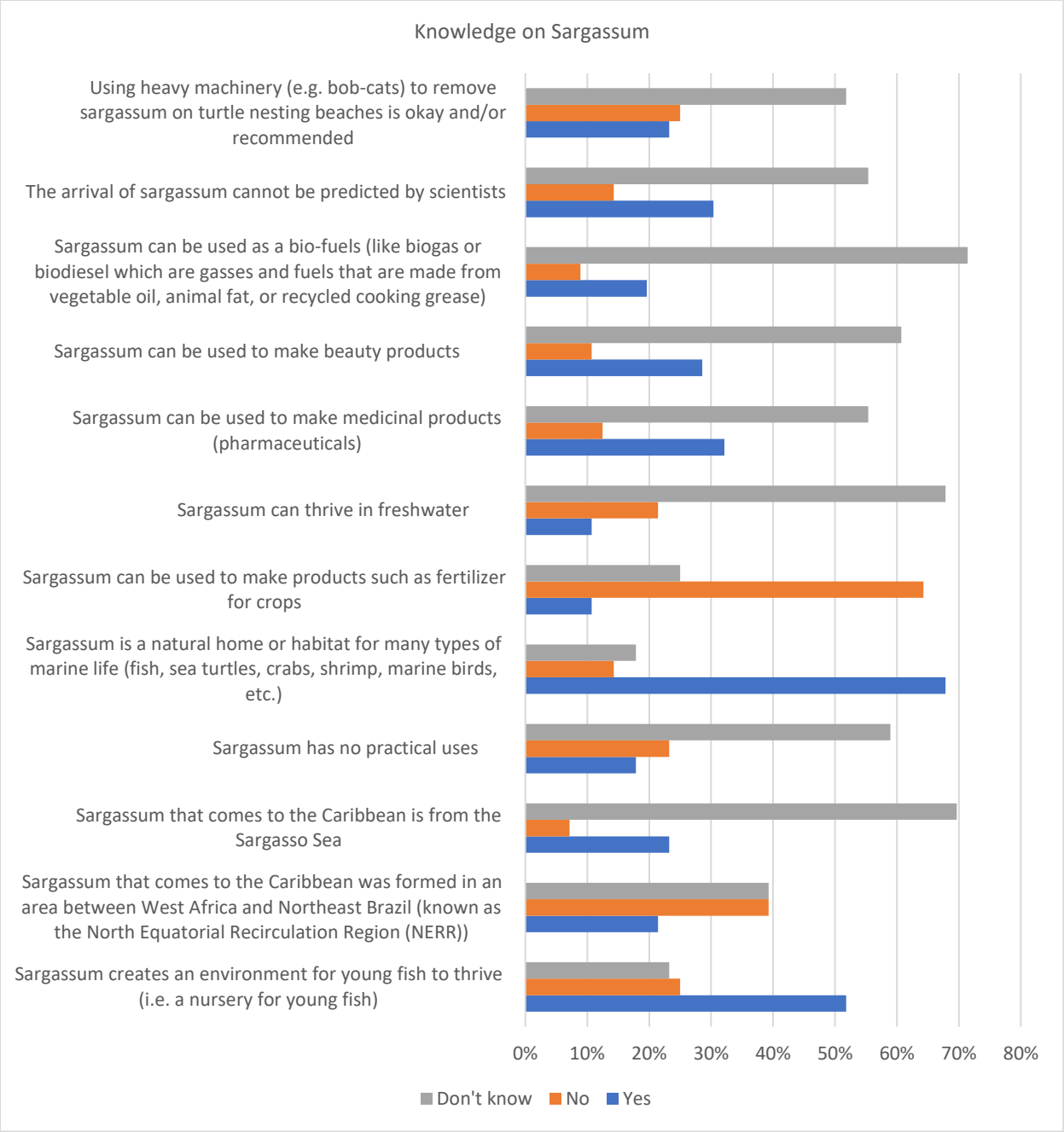

Figure 15. Knowledge on ecology, origins and uses of sargassum (percentage of respondents responding 'Yes', 'No' or 'Don't know'). N = 56

Despite being aware of several good practices in dealing with sargassum, such as moving small or moderate amounts by hand or light equipment to avoid beach damage (75%), as much as 50% of the respondents across the target communities still wanted the sargassum removed quickly by bobcats and other large equipment so that it cannot pile up and cause odours and other problems. In addition, only 42.9% of the sample were aware that sargassum, when located on beaches not used by locals or tourists, should be left on the beach.

Knowledge about management responsibilities for sargassum at the community and national levels was somewhat limited. The majority of respondents stated that responsibility for cleaning up the beach after influx events (67.9%), providing information about influxes (71.4%), conducting research (75%) and developing management plans (89.3%) at the community level rested with the Government of Montserrat. However, more than two thirds of the sample stated that the private sector had a role and responsibility in creating sargassum products (67.9%). Their knowledge regarding responsibilities for sargassum at the national level reflected their perspective of the community level responsibilities. The majority identified the Government of Montserrat as responsible for cleaning up the beach after influxes, providing information to communities, conducting research and developing sargassum policies and plans at the national level.

a. Summary impacts of sargassum influx events in target communities

As part of the KAP study, coastal stakeholders were asked about the impacts of sargassum influxes on their communities and livelihoods. From the responses, it was clear that all persons surveyed were in some way affected by sargassum's presence. Impacts described ranged from health-related problems to fishing and community-related challenges. The following sub-sections categorise the various impacts experienced.

i. Community-related Impacts

Within the wider community, the most common impacts highlighted across the target communities were the loss of access to the beach or jetty because of influxes (23.2%) and inability to participate in leisure activities on the beach (21.4%). Notably, over half of the sample gave no response (57.1%). See **Table 17**.

Table 17: Community-related impacts due to sargassum reported by respondents

Impacts	Percentages	
	Male (43 respondents)	Female (13 respondents)
Loss of access to the beach or jetty	18.6%	38.5%
Inability to participate in leisure activities on the beach, including recreational fishing, sports on the sand, water sports, gatherings, etc.	16.3%	38.5%
Tarnishing of metal objects and jewellery in homes	0.0%	0.0%
No response	65.1%	30.7%

ii. Health-related impacts

There were few reports of health impacts, such as rash (2.2%). However, the majority of the sample reported health-related impacts as none or not applicable (97.8%). See **Table 18**.

Table 18: Health-related impacts due to sargassum reported by respondents

Impacts	Percentages	
	Male (36 respondents)	Female (9 respondents)
Rash	2.8%	0.0%
Headaches	0.0%	0.0%
Nausea/dizziness	0.0%	0.0%

Impacts	Percentages	
	Male (36 respondents)	Female (9 respondents)
Respiratory/breathing problems	0.0%	0.0%
Insomnia/not able to sleep	0.0%	0.0%
Ear aches/infections	0.0%	0.0%
None/ No response	97.2%	100%

iii. Fishing-related impacts

Fisherfolk and fisheries-related stakeholders (N=22) across the target communities noted a range of impacts due to influx events. The majority of them reported engine entanglement (72.7%) or engine damage (22.7%), decreased fishing time (63.6%), decreased quantity of catch (50%), increased distance to travel (50%) and decreased income (50%). A number of fisherfolk also reported change in fishing spots (45.5%), increased fuel consumption (40.9%), net entanglement (40.9%) and damage (36.4%), change in species caught (40.9%) and decreased fish sales (40.9%). See **Table 19**.

Table 19: Fishing-related impacts due to sargassum reported by fisheries-related respondents

Challenges	Percentages	
	Male (21 respondents)	Female (1 respondent)
Engine entanglement	76.1%	0.0%
Engine damage	23.8%	0.0%
Decreased fishing time	66.7%	0.0%
Decreased catch (quantity)	52.4%	0.0%
Increased distance to travel	47.6%	100.0%
Decreased income	47.6%	100.0%
Net entanglement	42.9%	0.0%
Net damage	38.1%	0.0%
Decreased fish sales	42.9%	0.0%
Lost lures	23.8%	0.0%
Increased fuel consumption	47.6%	0.0%
Change in fish size caught	9.5%	0.0%
Restricted movement	28.6%	0.0%
Change in fishing spots	47.6%	0.0%
Change in species caught	38.1%	100.0%
Fish pot damage	14.3%	0.0%
Health effects	19.0%	0.0%
Do not know/None	0.0%	0.0%

iv. Tourism-related impacts

Tourism operators and other related stakeholders (N=10) experienced a range of impacts from influx events as well. The majority of these stakeholders reported location no longer appealing/attractive to

potential clients (70%) and inability to participate in work-related activities on the beach, including tour boating, sport boat operations, commercial/professional fishing (50%). Other responses were increased costs for removal and disposal of sargassum from beach (40%), increased costs to transport clients to different/unaffected beaches (30%) and loss of clients (30%). See **Table 20**.

Table 20: Tourism-related impacts due to sargassum reported by respondents

Impacts	Percentages	
	Male (7 respondents)	**Female (3 respondents)**
Location no longer appealing/attractive to potential clients	71.4%	66.7%
Inability to participate in work-related activities on the beach, including tour boating, sport boat operations, commercial/professional fishing	57.1%	33.3%
Increased costs for removal and disposal of sargassum from beach	28.6%	66.7%
Increased costs to transport clients to different/unaffected beaches	28.6%	33.3%
Increased costs for replacement of tarnished metal objects at properties	0.0%	0.0%
Loss of clients	28.6%	33.3%
Increased costs for public relations campaigns to attract, educate and reassure clients during seasonal influxes	14.3%	33.3%
None	0.0%	0.0%

b. Perceptions & Coping Strategies

Half of all respondents perceived sargassum as both a resource and problem across the target communities. Whereas 27% of respondents saw it solely as a problem, and 23% saw it as a resource. See **Figure 16**. Of those who saw sargassum as a resource, 83% were aware of/interested in its use as a fertiliser/in agriculture, 14.6% were interested in various uses including to help earn an income and 7.3% were interested in its use in beauty products. Of those who saw it as a problem, 84% were interested in learning about ways to cope with or use sargassum.

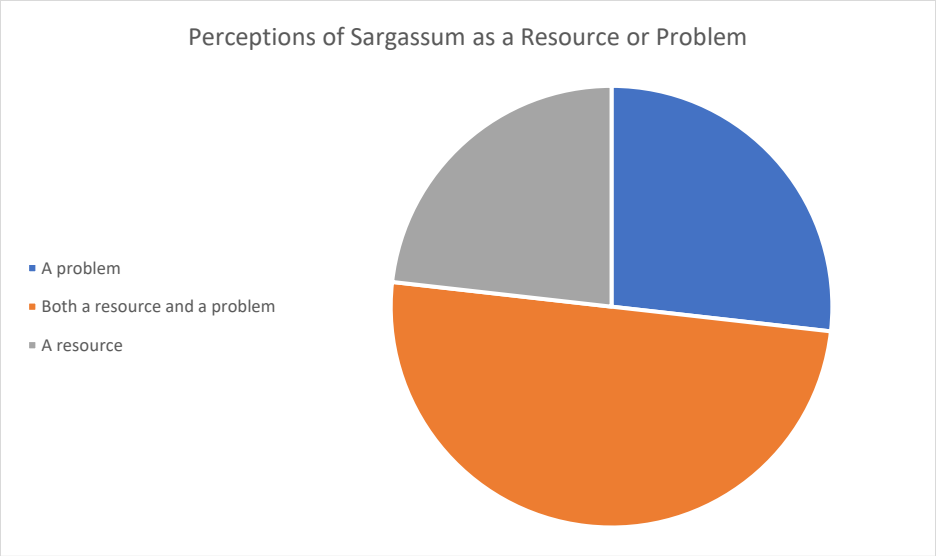

Figure 16. Respondents' perceptions of sargassum as a resource or problem. N = 56

A variety of coping strategies were identified by respondents across the target communities (see **Figure 17**). The largest proportion of respondents stated that they were "living with sargassum" (25%), which suggests that no specific action has been taken to address the sargassum's negative impacts. Fisherfolk and tourism operators also noted working around it despite the impacts. A number of respondents also noted little to no effects or need to cope with the influxes (21.4%). Notably, 5.4% of respondents stated that they were "not coping" with the sargassum influxes.

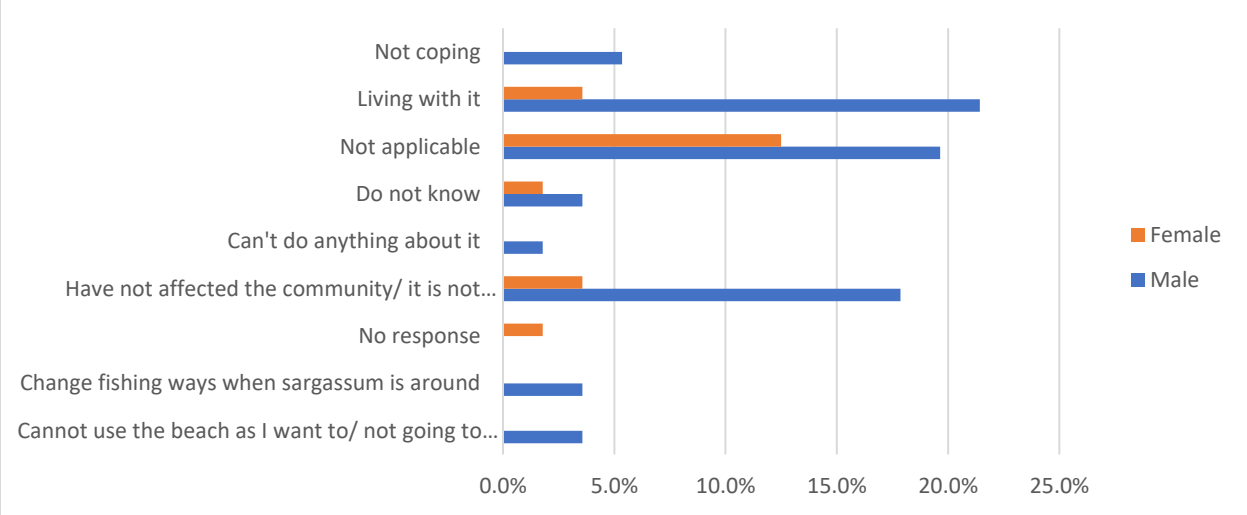

Figure 17. Coping mechanisms identified by respondents. N = 56

c. Stakeholder Interest & Involvement in Management

When asked about their involvement in making decisions on addressing/treating and managing the sargassum influxes in their community, only 7.1% of the respondents stated that they have been involved in stakeholder consultations at community or national levels. However, a number were aware of and exploring uses for sargassum, especially as a compost/fertiliser (32.1%). Respondents were further asked to rate their level of involvement on a Likert scale from 0 to 5, with 0 indicating no involvement and 5 indicating very high involvement (See **Table 21**). Those persons who had been engaged, 14.3%, rated their level of involvement as low to medium; with a score of one being most selected (5.4%).

Table 21: Level of involvement in decision making reported by respondents. N=56

Respondents	*No involvement*					*High involvement*	No response	TOTAL
	0	1	2	3	4	5		
Number of respondents								
Male	36	3	1	0	2	0	1	**43**
Female	12	0	0	1	0	0	0	**13**
Percentage of respondents								
Male	64.3%	5.4%	1.8%	0.0%	3.6%	0.0%	1.8%	**76.8%**
Female	21.4%	0.0%	0.0%	1.8%	0.0%	0.0%	0.0%	**23.2%**
TOTAL	**85.7%**	**5.4%**	**1.8%**	**1.8%**	**3.6%**	**0.0%**	**1.8%**	**100.0%**

Respondents expressed interest in being engaged in sargassum management and decision making moving forward. 45% of respondents said that they would be willing to attend community or national consultations/meetings on sargassum and its impacts, and 71.5% expressed interest in training activities, especially focused on management of sargassum and how to use sargassum for alternate livelihoods to generate income.

d. Communication Preferences

In addition, 87.5% of respondents want to be regularly informed about sargassum and sargassum-related news. Their preferences for how they would like to be informed or provided with sargassum-related information are outlined by gender in Figure 18, with radio, (75.5%), social media (63.3%), mobile apps/text messaging (e.g. Whatsapp) (36.7%) being the top preferences for both males and females.

Preferences for how respondents would like to be informed or provided with sargassum-related information are shown by age group in Figure 19. For 18-35 year olds, social media (12%), radio (10%) and face-to-face meetings with presentations from experts (8%) were the top preferences. For 36-45 year olds, radio (14%), social media (10%) and mobile apps/text messaging (10%) were the top preferences. Similarly, for 46-59 year olds, radio (30.6%), social media (28.6%) and mobile apps/text messaging (16.3%) were the top preferences. For respondents 60 years and over, radio (20.4%), social media (12%), face-to-face meetings with presentations from experts (6%) and mobile apps/text messaging (6%) were the top preferences.

In terms of credible and reliable sources of sargassum-related information, 51.8% of respondents identified radio broadcasts/shows from reputable stations (including government-owned stations like

ZJB Radio Montserrat), 8.9% identified government agencies and officials, and 7.1% identified non-governmental organisations as sources.

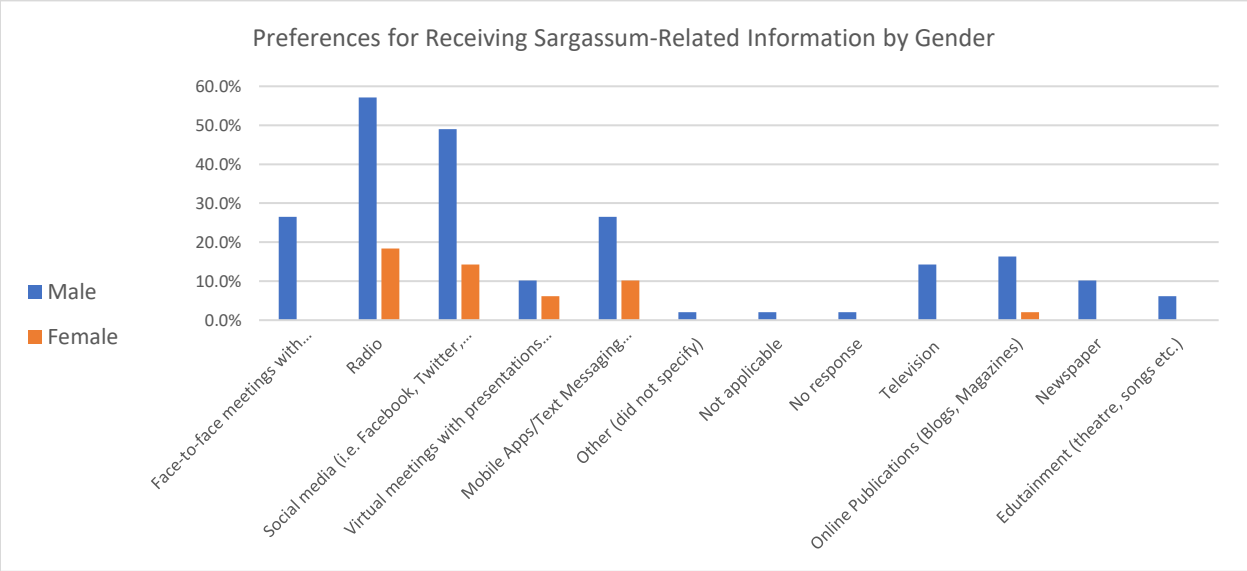

Figure 18. Respondents' preferences for how to receive sargassum-related information and news (percentage of respondents who said 'Yes' to receiving information). N=49

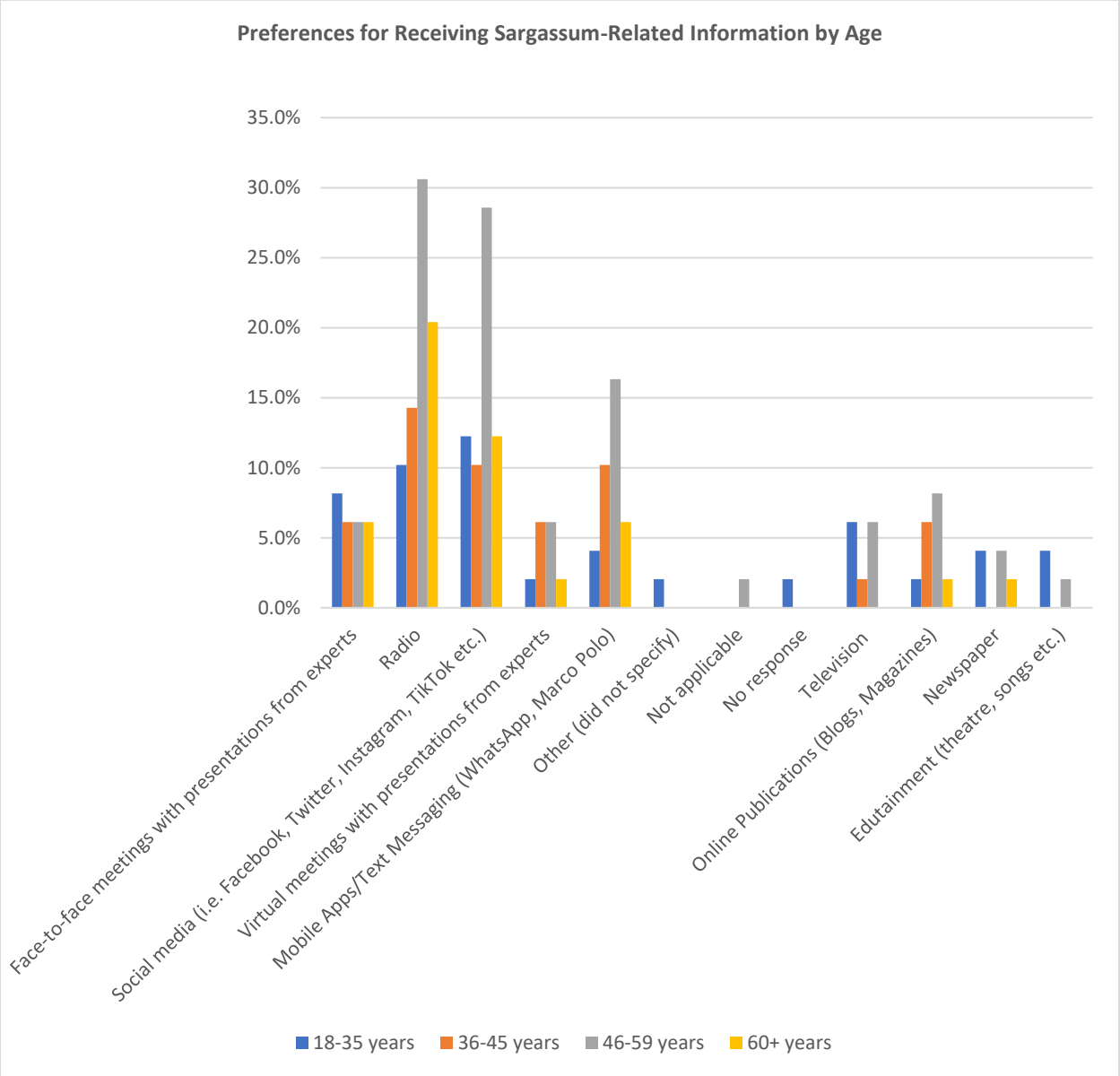

Figure 19. Respondents' preferences for how to receive sargassum-related information and news by age (percentage of respondents who said 'Yes' to receiving information). N=49

5. INTERVENTIONS TO IMPROVE ADAPTATION TO SARGASSUM INFLUXES

The KAP surveys revealed that more needs to be done to improve coastal communities' knowledge about sargassum in Montserrat, in terms of origin and uses. There was also inconsistent knowledge of good practices for the removal of sargassum stranded on beaches. Under the Darwin Plus project, "Sustainable sargassum management in Anguilla, British Virgin Islands and Montserrat", CANARI, DOE and our partners intend to improve stakeholder knowledge by producing and disseminating communication products, publications, and user-friendly tools on sargassum and its biodiversity, good practices for managing influx events, coping strategies, as well as uses of sargassum for household and

business enterprise opportunities. By showcasing how to better manage or adapt to influx events and the ways in which sargassum can be transformed into opportunities, the project can help dispel some of the existing negative perceptions and attitudes towards the seaweed.

Community stakeholders further reported very limited involvement in decision-making about sargassum management. Given that coastal residents, fisherfolk and tourism operators are on the frontline when there is an influx event, it is important that they are engaged as part of a participatory and multi-level approach to sustainably manage and adapt to sargassum influxes and provided opportunities to share their experiences and collaborate on solutions.

To enable this, a communication and engagement strategy has been developed for the project. Targeted messages and/or content will be shared with fisherfolk and tourism operators that advise on how to minimise the negative impacts of influxes on their livelihoods and potential uses for livelihood and enterprise opportunities. The project will also host a number of activities to foster a participatory process, including through a community of practice, capacity building of fisherfolk, tourism operators and management agencies and enhancing collaboration.

6. REFERENCES

Agbayani, R. and Toledo, J. 2008. Institutional Capacity Development for Sustainable Aquaculture and Fisheries: Strategic Partnership with Local Institutions. Fisheries for global welfare and environment: Memorial book of the 5th World Fisheries Congress. 435-448.

CANARI and CERMES. 2022. Scoping Report on Sargassum Influxes in Montserrat. Prepared under the project, Sustainable Sargassum Management in Anguilla, British Virgin Islands and Montserrat.

Cox, S., H.A. Oxenford and P. McConney. 2019. Summary report on the review of draft national Sargassum plans for four countries Eastern Caribbean. Report prepared for the Climate Change Adaptation in the Eastern Caribbean Fisheries Sector (CC4FISH) Project of the Food and Agriculture Organization (FAO) and the Global Environment Facility (GEF). Centre for Resource Management and Environmental Studies, University of the West Indies, Cave Hill Campus, Barbados. 20 pp.

Japan International Cooperation Agency (JICA) and Caribbean Regional Fisheries Mechanism (CRFM). 2019. Final Report: Fact-Finding Survey Regarding the Influx and Impacts of Sargassum Seaweed in the Caribbean Region. Caribbean Regional Fisheries Mechanism: Belize City, Belize, 2019; 83 pp.

Oxenford, H.A., D. Johnson, S-A. Cox and J. Franks. 2019. Report on the Relationships between Sargassum Events, Oceanic variables and Dolphinfish and Flyingfish Fisheries. Centre for Resource Management and Environmental Studies, University of the West Indies, Cave Hill Campus. Bridgetown: Barbados. 32 pp.