

Summary report on the review of draft national sargassum plans for four countries in the Eastern Caribbean

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by
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Cover photograph: Skeete's Bay, Barbados. Courtesy of BlueGreen Initiative.

Abstract

Since 2011 historically unprecedented influxes of thousands of tons of pelagic sargassum seaweed have impacted the large marine ecosystems of the Caribbean Sea. Typical quantities of sargassum benefit biodiversity and human use. However, the unpredictable timing, frequency, extent and severity of massive sargassum influxes constitute a natural hazard with potential for disaster. This has caused consternation among coastal and marine state, non-state and private sector stakeholders about adaptive capacity in fisheries and tourism. Sargassum has filled coastal waters and beaches frequented by tourists and locals, resulting in reduced fisheries and tourism income, and additional spending on cleaning beaches with heavy machinery that causes ecological damage and beach erosion. There has been significant reduction in catches of some pelagic fishes and health impacts from exposure to hydrogen sulphide from decaying sargassum. The severity of impacts, and how stakeholders may adapt, needs to be better understood to inform fisheries and tourism policy and management. This report summarises feedback on existing draft management plans prepared by the fisheries authorities in four countries in the Eastern Caribbean (Grenada, St. Kitts and Nevis, St. Lucia and St. Vincent and the Grenadines). We offer practical guidance in the form of an appropriate framework for revising existing draft management plans that acknowledges the potential threat as well as potential opportunity of sargassum influxes. This will help to inform how to build the capacity of stakeholders to respond and adapt over the long-term to sargassum influxes, and enhance the growing community of practice for management to support innovation for enterprise sustainability.

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Introduction

In 2011, 2014-2015, 2018 and currently in 2019, thousands of tons of pelagic Sargassum seaweed (*Sargassum natans* and *S. fluitans*), referred to as 'influxes', have piled up to 3 metres thick on beaches and in the nearshore waters of many states and territories in the Caribbean. These events have triggered much consternation regionally about capacities to predict, cope and adapt, and about the long-term implications for the fisheries and tourism sectors especially, given that such events seem to be a 'new normal' due in part to climate change and variability (Marechal et al. 2017). Adequate planning for sargassum influxes is a concern of the Food and Agriculture Organization (FAO) and the Global Environment Facility (GEF) through the project on Climate Change Adaption in the Eastern Caribbean Fisheries Sector (CC4FISH) that includes seven countries in this sub-region. The University of the West Indies (UWI) through its Centre for Resource Management and Environmental Studies (CERMES) at the Cave Hill Campus in Barbados is assisting CC4FISH with sargassum research and response.

It is against this backdrop that the CC4FISH project supported the development of the first draft sargassum management plans in a number of participating Eastern Caribbean countries. Subsequently under the second Letter of Agreement (LOA) with CERMES these were submitted for review and comment under CC4FISH Component 1 Output 1.1.2. to "review draft national sargassum management plans for 5 countries". Four plans were received. In this report, following review, we propose practical guidance through the design of an appropriate framework for reshaping the existing draft sargassum management plans to ensure that they better address long-term adaptation and resilience to climate change. It is anticipated that this guidance will promote adaptive action from local to regional levels, through the implementation of management plans that treat sargassum as both a potential opportunity, and a potential threat.

Impacts, opportunities and interventions

Discussions on marine and coastal policy, management, and science and technology at local, national and regional levels have considered how to deal with sargassum influxes. This has included considering sargassum as a raw material for new industry offering innovation and entrepreneurship opportunities. Sargassum is also being considered as a new natural hazard with potential for disaster. Negative impacts are broad-based and include issues of biodiversity loss, coastal management challenges, fisheries and tourism livelihoods, loss of foreign exchange earnings, costs of clean-up, and public health threats.

Tourism is vulnerable to external shocks that negatively impact market performance and threaten market stability. Sargassum seaweed has been described by the UWI Vice-Chancellor, Sir Hilary Beckles, as "the greatest single threat to the Caribbean's tourism industry" (Merco Press 2015). Islands have reported vacation cancellations and drops in tourist arrivals during periods of influx (Louime et al. 2017). Property values have decreased and investment prospects have declined due to the smell and appearance of the beach. Staff layoffs have reduced economic benefits from the tourism sector to host communities (Barbados Advocate 2017). In the fisheries sector, there have been significant reduction in catches of commercially important pelagic fishes and disruption of fishing activities that have severely impacted

fisherfolk (Ramlogan et al. 2017, Oxenford et al. 2019a, Johnson et al. in press). Health impacts from exposure to hydrogen sulphide from decaying wet sargassum trapped along shorelines, is a concern for coastal residents, especially in windward facing bays where conditions can become intolerable (Louime et al. 2017).

The extent of the influxes (in time, area and volume,) and their wide ranging impacts, were so unexpected that science and management are currently lagging behind. The severity of these impacts, and how stakeholders are, or could be, coping and adapting, needs to be much better understood to inform long-term interventions in fisheries, tourism, agriculture, health, manufacturing, energy and other sectors. In view of the critical regional importance of sustainable fisheries to livelihoods, efforts to better understand underlying mechanisms associated with sargassum influxes and landings are requisite to the development of adaptive measures. This also holds true for tourism which is the main foreign exchange source for the region, providing approximately 33% of GDP, and up to 77% in some countries of the Caribbean Tourism Organization (Antigua Observer 2015). Research on modelling sargassum influx events to enable better prediction is underway in the Caribbean (e.g. Franks et al. 2016, Wang and Hu 2017, Marechal et al. 2017, Johnson and Franks 2019, Cox and Oxenford 2019), but what is now needed is much more research on appropriate responses, and how to incorporate science and local knowledge into this action.

On a positive note, sargassum influxes have also motivated interventions to support entrepreneurship and innovation in the agriculture sector in which sargassum can be an input for solid or liquid fertiliser (Hinds et al. 2016, Daniel et al. in press). Young entrepreneurs have been funded to develop new products at small to medium scales (e.g. for bio-fuels and cosmetics), but the uncertainties of influx timing, quantity and location are constraints to major commercial enterprises. Sargassum brings with it marine life. Many small fishes, invertebrate animals and other algae are associated with sargassum, which may be a potential transport vector for introducing exotic species (Martinelli et al. 2017). There has been an increase in landings of immature dolphinfish and some other pelagic fishes (e.g. almaco jacks, yellow jacks and tripletails) not normally caught in any quantity (Kinch and Oxenford in press). However, overall fish landings have mostly declined, particularly for flyingfish (Johnson et al. in press), while coral reefs and associated ecosystems, and sea turtle nesting beaches, are being degraded by the decaying seaweed or clean-up operations (Louime et al. 2017).

The marine science-policy interfaces in the Wider Caribbean Region aim to inform decision-makers in the sectors of interest. Interface initiatives include: 'A Model Protocol for the Management of Extreme Accumulations of Sargassum' by the Caribbean Regional Fisheries Mechanism (CRFM 2016); 'Sargassum - a Resource Guide for the Caribbean' from the Caribbean Alliance for Sustainable Tourism and the Caribbean Hotel and Tourism Association (CAST-CHTA 2015), and the 'Sargassum Management Brief' from the UWI Centre for Resource Management and Environmental Studies (Hinds et al. 2016) following the first regional Sargassum Symposium held at UWI in September 2015¹. A second regional Sargassum Symposium was held recently by FAO and UWI in October 2018². The Gulf and Caribbean Fisheries

¹ <https://www.cavehill.uwi.edu/cermes/projects/sargassum/2015-symposium.aspx>

² <https://www.cavehill.uwi.edu/cermes/projects/sargassum/2018-symposium.aspx>

Institute (GCFI)³ also continues to influence policy through hosting a special session on sargassum every year since 2016 at their annual science meetings. They have also produced a sargassum fact sheet (Doyle and Franks 2015) and a best practices infographic poster for the tourism sector⁴. The United Nations Environment - Caribbean Environment Programme (UNEP-CEP) also supports decision-making and adaptation in their role as the host of a sargassum communications network that facilitates knowledge sharing. The Caribbean Sea Commission organised a sargassum special session at a symposium in November 2015 (ACS-CSC 2015).

Despite these collaborative efforts, more transdisciplinary knowledge and policy coherence is urgently needed to address the hazards and services of sargassum. In this draft management plan review process we attempted to address these issues.

Review Process

Four draft sargassum management plans were developed in country and submitted to CERMES for review. These included plans for Grenada (Ince 2018), St. Kitts and Nevis (Williams 2017), St Lucia (Sealys and Felix 2017), and St. Vincent and the Grenadines (Billingy 2018). We began our review of St Kitts and Nevis plan by making detailed edits as tracked changes and providing comments, but after stopping and scanning the other plans as well we realised that this approach would not be the most useful. This was because all of the plans were early drafts, and fundamental changes in their approach and content were necessary, rather than detailed edits. Countries had closely followed the format of the model protocol for the management of extreme accumulations of sargassum (CRFM 2016). Although this protocol provides a good starting point for sargassum management planning, it does not support the formulation of a comprehensive adaptive management plan that can be altered and improved over time. Examples of some of the general comments for improving the four draft plans included:

- Simplifying and reducing the amount of ‘official reporting’ that seems to be required given the limited capacities claimed by stakeholders, unless key specific purposes are assigned to reports.
- Providing more specific guidance on how to do things that are called for in the plan such as ‘evaluating a beach’ or ‘monitoring the sargassum’ or ‘determining the water quality’, and exactly what equipment to use etc. either by appendices or by links to other resources.
- Using tables that specifically identify the issue and then provide the ‘solutions’ (management actions) which may vary according to the severity of the stranding and the sensitivity of the beach (i.e. turtle nesting site), in the same way that a Fishery Management Plan would be written.
- Giving more detail on exactly which authorities, agencies or non-governmental organisations (NGOs) need to be contacted to undertake which listed actions, including their contributions to monitoring, learning and adaptation.
- Setting out how the Sargassum Management Committee actually functions through terms of reference and operational procedures with clear information on decision-making processes.

³ <https://www.gcfi.org>

⁴ <https://www.gcfi.org/EmergingIssues/Sargassum/ONLINE-Sargassum.png>

- Ensuring that management actions actually serve the overall goal, listing clear objectives of the plan based on the issues being faced and addressing each of the issues identified and outlined.
- Considering the potentially severe impacts of both sargassum and its clean-up actions on coral and seagrass communities as well as beaches.
- Setting out the budget and other resources that might be needed to implement the stated actions and who will be responsible for providing them.

Following this review we determined that practical guidance was needed to shape the existing plans into more useful documents that could support increasing the adaptive capacity of those affected by sargassum influxes. Based on CERMES-FAO discussions as a team, it was decided that the development of a CC4FISH sargassum management plan template (FAO forthcoming) may be a useful resource for countries when developing or revising their plans. The template was the first step in guiding stakeholders through the process of developing an adaptable plan that manages sargassum as a hazard. As it relates to offering guidance for a comprehensive plan that also manages sargassum as an opportunity, CERMES and FAO held a session at the second regional sargassum symposium⁵. This session was designed to provide a dynamic learning environment for country participants. We presented a framework for an adaptable management plan (Appendix I), followed by small group discussions to facilitate learning. The notes (Appendix II) provided for the small group session were intended to guide the groups in the exchange useful information, as well as provide perspectives on key questions regarding sargassum management planning.

Plans for managing sargassum as a hazard and as an opportunity

There is a critical need for comprehensive management planning for increased resilience to and benefit from sargassum influxes. Sargassum management planning should be addressed in the context of a phenomenon that is both currently a threat and opportunity. Agile and adaptable planning is needed given the complexities of sargassum as a biological natural hazard in overwhelming amounts, with the potential to be controlled by human use (much like lionfish management planning). Sargassum spurs entrepreneurship opportunities with the ability to scale the investment to intensity and location of influxes, and beyond.

Multi-level planning and management is essential for addressing sargassum influxes. Participation of stakeholders at regional, national and community levels is integral to promoting proper governance. Inter-sectoral coordination is also essential where players from public and private sectors, civil society, academia, Intergovernmental Organisations (IGOs) etc are engaged in a dynamic process of adaptive management.

Although coastal zone features are critical to sargassum management from human perspectives, links to upper watersheds and to oceanic waters should also be taken into account. Sargassum management planning needs to focus on building resilience through adaptive capacity, while reducing maladaptation.

⁵ CERMES sargassum webpage: <https://www.cavehill.uwi.edu/cermes/projects/sargassum/2018-symposium.aspx>

Turning sargassum from being only a livelihood threat into being an opportunity, for as many people and for as much time as possible, should be an aim for coping and adaptation.

Key considerations for planning include:

- Importance of knowing and understanding the key stakeholders involved and others who are interested;
- The value of Civil Society Organisations (CSO), private sector, public and academia partnerships;
- Strategies to promote participation in governance;
- Importance of understanding value or supply chains associated with sargassum;
- The need for more socioeconomic research and initiatives to build livelihood resilience;
- The need for well-functioning national intersectoral coordination mechanisms (NICs);
- Provisions for risk reduction, emergency response and recovery;
- The need for innovative financing; and
- Planning must be scalable to be applicable and implementable at all levels.

The main elements of an adaptive management plan for sargassum should seek to foster improved resilience to sargassum influxes as well as opportunities for economic benefit. The proposed framework (Figure 1) sets out a suite of 12 priority areas for considering action and these are arranged across 3 thematic areas: (i) cross-cutting management actions, (ii) response and resilience actions, and (iii) sustainable use and benefits actions. Stakeholders should be encouraged to revise existing plans based on the proposed framework and action plan (Figure 2).



Figure 1: Proposed framework of an adaptable sargassum management plan (Source: Sabir 2018)

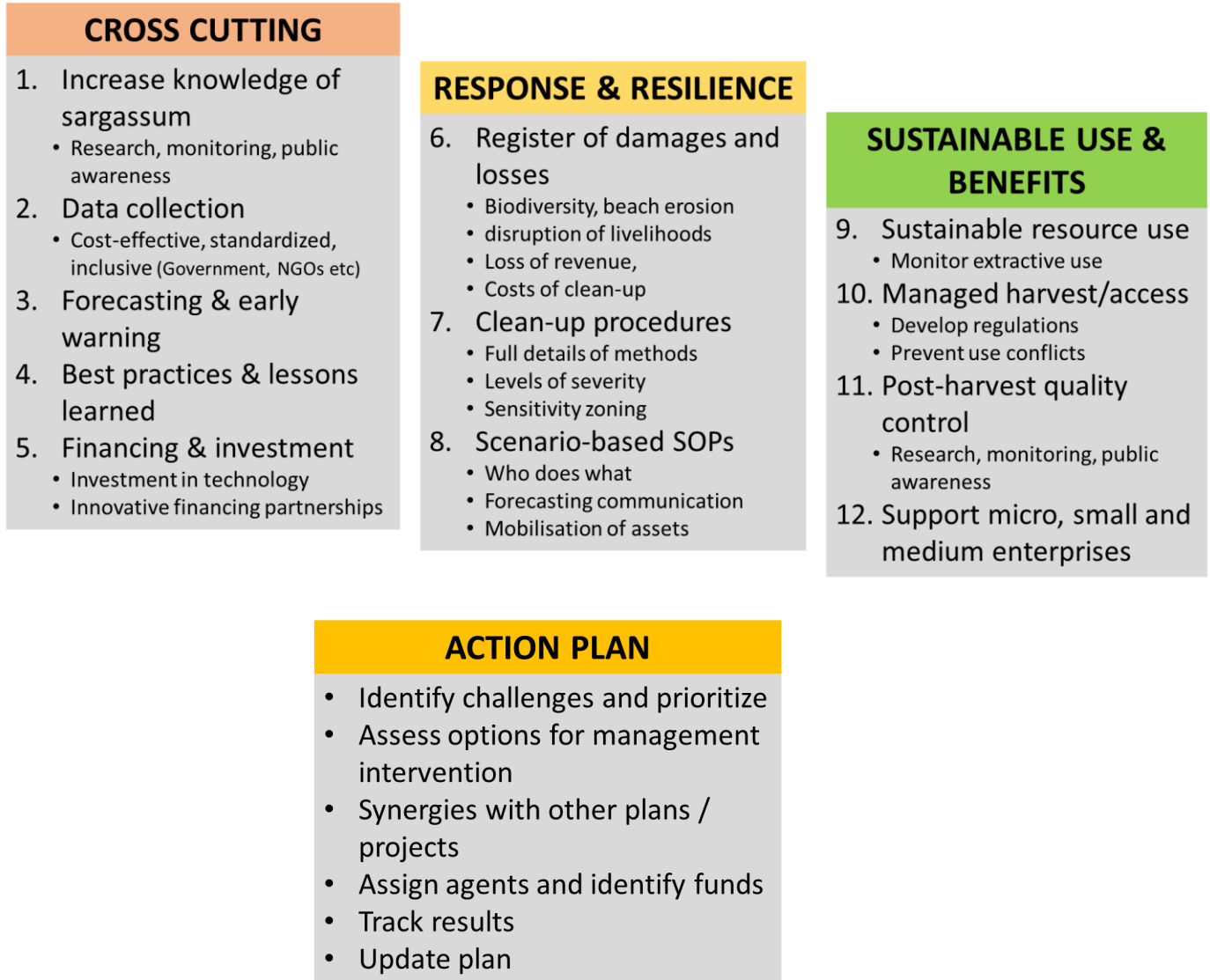


Figure 2: Management planning priority areas and action plan (Source: Oxenford et al. 2019b)

Management planning: a way forward

Going forward we recommend that countries develop or revise their plans by employing the following steps:

- Use their experiences and lessons learned,
- Use relevant existing sargassum plans etc.,
- Use good governance principles (e.g. National Inter-sectoral Coordination Mechanisms(NICs)),
- Use a disaster risk management approach,
- Use an innovation and livelihood approach,
- Use entrepreneurial product development,
- Combine these and other facets in planning, and

- Develop adaptive, multi-level, inter-sectoral plans.

Conclusion

Existing draft sargassum management plans for countries in the Eastern Caribbean lack the adaptive nature required to address sargassum as a hazard and an opportunity. This report provides general comments and guidance in the form of an appropriate framework that acknowledges the potential threat as well as potential opportunity posed by sargassum influxes. This guidance will require stakeholders to be engaged in an iterative development process where the plans are tested and revised regularly. Collaborative planning and adaptive capacity is needed for building resilience to sargassum influx events. This can be achieved through interdisciplinary discussions of an intersectoral body that contributes to the formulation of a governance structure. It is anticipated that this guidance will promote adaptive action from local to regional levels, to respond and adapt over the long-term to sargassum influxes.

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Appendices

Appendix 1: Sargassum management planning presentation slides



Outlining plans for sargassum management by the public and private sectors as well as by civil society

Sargassum Symposium 2
University of the West Indies
Cave Hill Campus, Barbados
21-22 November 2018

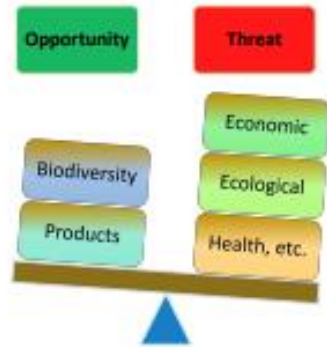
The aim of this presentation is simply to set the scene and context within which we share experiences and lessons to plan management

Using what we have learned

- Sargassum may not become a disaster • But we can learn from disaster risk management
- Sargassum is not an invasive species • But we can learn from lionfish as a new surprise
- Sargassum is not many other things • But we have experiences we can apply to address it



Balancing the planned response to sargassum as an opportunity as well as a threat



Multi-level planning and management is essential



Intersectoral coordination is essential for management



Although coastal zone features are critical to sargassum management from human perspectives, links to upper watersheds and to oceanic waters are also taken into account



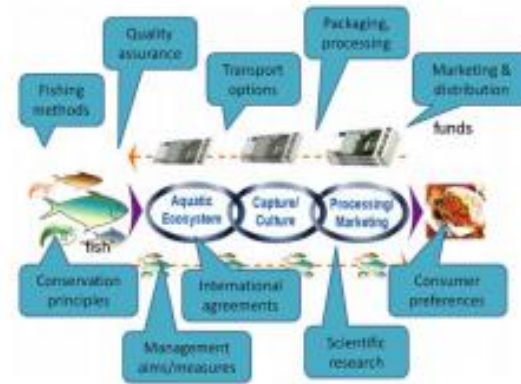
Know who are the key stakeholders...

...and who are the interested others



(Source: GCCA training presentation)

Address the entire value or supply chain in fisheries, tourism and other sectors



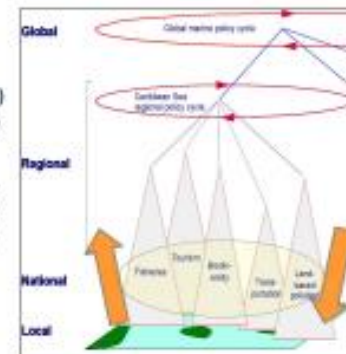
Need well-functioning national intersectoral coordination mechanisms (NICs) everywhere



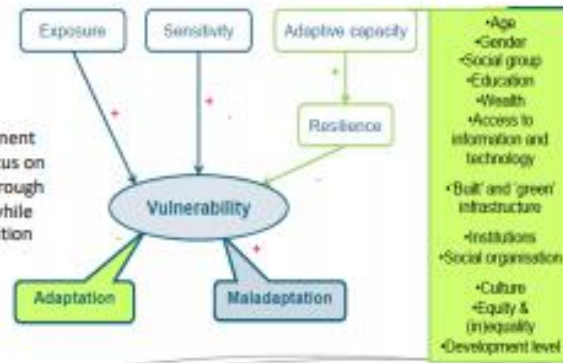
NICs are good for...

- ✓ Ecosystem approach to fisheries (EAF)
- ✓ Ecosystem based management (EBM)
- ✓ Disaster risk management (DRM)
- ✓ Climate change adaptation (CCA)
- ✓ Integrated coastal management (ICM)
- ✓ National development planning (NDP)
- ✓ Public-private partnerships (PPP)

... and sargassum too

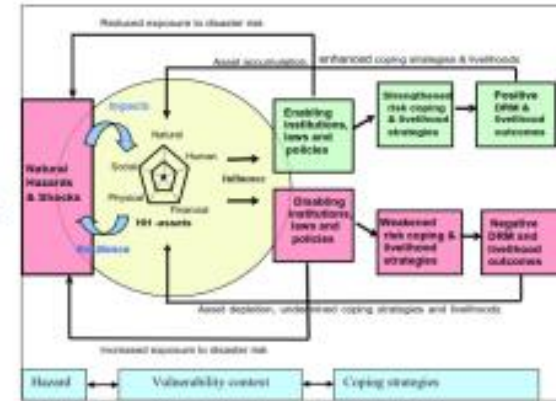


Sargassum management planning needs to focus on building resilience through adaptive capacity, while reducing maladaptation



(Source: Global Climate Change Alliance)

Turning sargassum from a being only a livelihood threat into being an opportunity, for as many people as much of the time, should be an aim ... coping → adapting



(Source: Bass and others 2008)

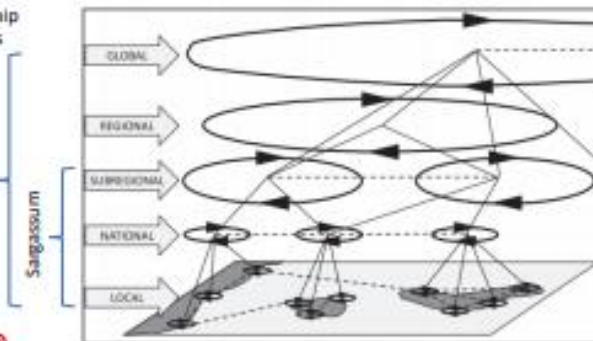
While sargassum influxes seldom result in national disasters the DRM cycle is useful for management plans, especially in recovery



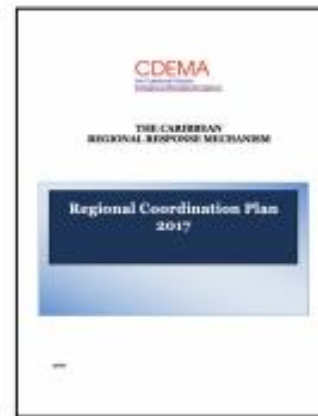
Download: <http://www.unisdr.org/we/in/press/press-releases/2011/01/2011012001>

Sargassum spurs entrepreneurship opportunities

Scaling the investment to intensity & location of influxes, and beyond



Collaborative planning and adaptive capacity for building resilience



PART 1: BASIC PLAN

1. Introduction
2. Elements of the Plan
3. Purpose
4. Objectives
5. Assumptions
6. Scope
7. Authority
8. Institutional Framework
9. Triggering Mechanism
10. Concept of Operations
 - a) Pre-influx
 - b) Influx impact
 - c) Post influx

PART 2: FUNCTIONAL ANNEXES

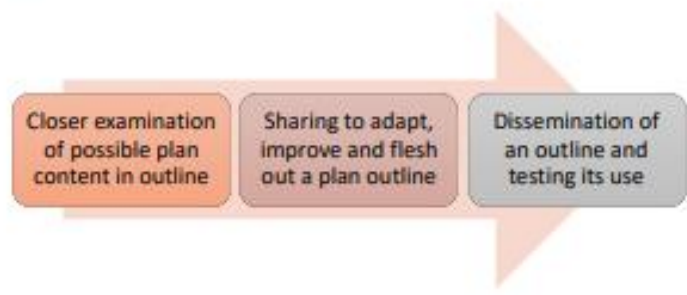
Details of operating procedures
Financial and other dimensions



Our challenge ...

- Use our experiences and lessons learned
- Use relevant existing sargassum plans etc.
- Use good governance principles (e.g. NICs)
- Use a disaster risk management approach
- Use an innovation and livelihood approach
- Use entrepreneurial product development
- Combine these and other facets in planning
- Do adaptive, multi-level, intersectoral plans

Next steps...



Management Planning for Sargassum- Resilience & Opportunities

Kareem Sabir, Research Assistant, CERMES, UWI
Sargassum Symposium 2018
November 21-22, 2018, University of the West Indies, Cave Hill

Introduction

Proposed elements for action plan:

- Building capacity for response to inundation events
- Enabling environment for livelihood opportunities
- Multiple scales of action: community > local>national>regional

About Sargassum

- Brief history of sargassum influxes
- Source, maps and movement
- Ecological and economic relevance
- State of practical applied knowledge
- Need for management planning

About this Plan

- Target audiences and main messaging
- How the management plan can be used
- Reviewing, updating, adapting the plan

Main Impacts and Challenges

- Tourism, recreation and aesthetics
- Navigation
- Fisheries
- Public Health
- Coastal ecology
- Offshore ecology

Scope

- Operable at multiple scales but scope needs to be clearly defined and agreed

Objectives

- Manage sargassum as a biological hazard (threat)
- Manage sargassum as an economic opportunity
- Links to other policies/plans and their objectives

Cross-Cutting Actions

Priority Area 1: Increase Knowledge and Understanding of Sargassum

- Research
- Monitoring
- Public awareness

Priority Area 2: Data collection and Monitoring

- Routine
- Cost-effective
- Standardized
- Inclusive (govt., community groups, researchers)

Priority Area 3: Forecasting and early warning

- Forecasts serve the purpose of increasing national capacity for response
- location and severity of sargassum on beaches and nearshore environments
- Resource users will also benefit

Priority Area 4: Best Practices and Lessons Learned

- For response and recovery (clean-up, storage/disposal etc.)
- Forums for information exchange and learning
- Promoting innovation while cautious of IP rights

Priority Area 5: Financing and Investment

- Need for innovative financing
- Partnerships and collaboration
- Investment in technology

Response and Resilience

Priority Area 6: Register of Damages and Losses

It is important to measure and document the impacts of disaster events to inform preparedness and resilience for future events. Types of damages and losses to consider recording:

- Biodiversity losses such as sea turtles, fish and cetaceans
- Damage to coastal habitats such as beach erosion, impacts to coral reefs and seagrasses
- Disruption to marine resource users (fishers, recreation, shipping)
- Losses to tourism such as cancellations etc.
- Costs of cleanup activities

Priority Area 7: Procedures and Guidelines for cleanup

- the most cost-effective methods for cleanup while being sensitive to flora, fauna and coastal property owners
- Develop guidelines for use by government agencies, private contractors, civil society groups and coastal property owners
- Restrictions on marine harvest or use of machinery?

Priority Area 8: Scenario-based SOPs for national response

Collaboratively develop, test and adapt standard operating procedures for national response which includes:

- Who initiates a national response
- Channels of communication for forecasts and early warning
- Mobilization of assets for response
- Methods for monitoring and reporting the amount removed
- Procedures for storage and/or discard

Scenarios to develop SOPs may include:

- community-level response,
- severe beach inundation requiring cleanup,
- severe inundation of bay and nearshore requiring cleanup.

Sustainable Use and Benefits

Priority Area 9: Sustainable Resource Use

- develop mechanisms to monitor extractive users and uses of sargassum
- understand who is using the resource and for what purpose to inform sustainable management.

Priority Area 10: Harvest and Managed Access

- planned and orderly harvest of the resource before user conflict and negative impacts pervade
- Land ownership rights may complicate foreshore harvest
- Fisheries regulations for marine harvest

Priority Area 11: Post-harvest and quality control

- Raise awareness of proper handling and processing of sargassum for various uses
- Assess current and evolving post-harvest activities as use opportunities for sargassum arise
- Determine ways to improve processing and handling techniques
- Develop options (training, facility investment, regulations etc.) to improve post-harvest techniques to reduce waste and improve quality
- Develop standards for quality and food safety

Priority Area 12: Supporting Micro, small and medium enterprise

- Develop the enabling environment to support livelihood opportunities from sargassum.

Response and Resilience

PA6: Register of Damages and Losses
 PA7: Procedures and Guidelines for cleanup
 PA8: Scenario-based SOPs for national response

Sustainable Use and Benefits

PA9: Sustainable Resource Use
 PA10: Harvest and Managed Access
 PA11: Post-harvest and quality control
 PA12: Supporting Micro, small and medium enterprise

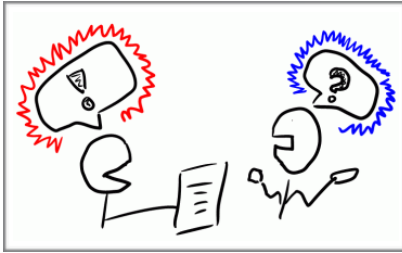
Cross-cutting Management Areas

PA1: Increase Knowledge and Understanding of Sargassum
 PA2: Data collection and Monitoring
 PA3: Forecasting and early warning
 PA4: Best Practices and Lessons Learned
 PA5: Financing and Investment

Action Plan

- Identify challenges and Prioritize
- Assess options for management intervention
- Synergies with other plans and projects
- Assign agents and identify funds
- Track results
- Information drives update of the plan

Appendix 2: Guidance notes for small group discussion on sargassum management plans



These notes are intended to guide the small groups to not only exchange useful information, but to also provide perspectives on key questions, regarding sargassum management planning. You will discuss the presentations along with your own experiences and then share with other participants a few key points learned.

Try this:

- Make your group of 5-7 people diverse so as to encourage a rich exchange
- Select a chairperson to keep the discussion focused, on track, and on time
- Select one or two note-keepers to record the key points and to share these
- Refer to some or all of the questions below as your agenda for discussion
- Use flip-chart paper, or write legibly on note paper, to record the key points
- Set out these key points as bullet phrases under the questions or headings
- At the end of the discussion agree on the **three** most critical points to share
- Ask your chair, note-taker, or other member to share the points of the group

Here are some suggested questions that you can consider. You can respond to all of them, just some, or other questions as well. There is no need for the group to reach consensus on a single response to any question. Feel free to record a range of responses if they differ among you.

1. Based on experience, **why is it important** to have a sargassum management plan?
2. What should be the top **aims or objectives** of sargassum management planning?
3. Who are most likely to be the **overlooked stakeholders** in management planning?
4. What is the **most critical information** for input into a sargassum management plan?
5. What section or **content is the most essential** in a sargassum management plan?
6. What is the **best process** (NIC or some other) for sargassum management planning?
7. How do you ensure sargassum management plans are **adaptive and kept updated**?

This is how you could lay out your flip chart paper with short headings and bullet points:

<ol style="list-style-type: none">1. How important<ul style="list-style-type: none">• Key point a• Key point b2. Aims or objectives<ul style="list-style-type: none">• Key point a• Key point b
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Record → Share → Reflect



Thanks for your
participation
in the planning!

Key points note-taking sheet

Based on experience, why is it important to have a sargassum management plan?	
What should be the top aims or objectives of sargassum management planning?	
Who are most likely to be the overlooked stakeholders in management planning?	
What is the most critical information for input into a sargassum management plan?	
What section or content is the most essential in a sargassum management plan?	
What is the best process (NIC or some other) for sargassum management planning?	
How do you ensure sargassum management plans are adaptive and kept updated ?	