European Union

SARGASSUM: A GROWING CHALLENGE BEING ADDRESSED THROUGH THE GEO

The GEO Blue Planet initiative helps authorities in Martinique to use Copernicus to address challenges related to sargassum, supporting timely and coordinated monitoring, to protect ecosystems, safeguard public health and support local economies

THE CHALLENGE

Sargassum is a type of large brown seaweed that floats freely on the ocean surface. Unlike most marine plants, it does not attach to the seabed but instead forms drifting mats that provide habitat and food for marine species such as fish, crabs, and sea turtles. In the open ocean, these ecosystems play an important ecological role, supporting biodiversity and contributing to nutrient cycling. However, since 2011, unusually large blooms of sargassum have emerged as a major environmental and economic challenge across the Caribbean, the Gulf of Mexico, and West Africa. Transported by ocean currents, vast quantities accumulate along coastlines, forming dense deposits on beaches. The French overseas territories of Guadeloupe and Martinique are among the most affected.

Between 2018 and 2022, the presence of sargassum in waters around Guadeloupe increased by 67%. In Martinique, approximately 70 km of coastline across 9 of 34 communes are heavily impacted, while in Guadeloupe, 14 of 32 communes are affected, covering around 83 km of coastline. Beyond its direct nuisance, excessive sargassum accumulation disrupts coastal ecosystems. It blocks sunlight needed by seagrass, smothers coral reefs, and reduces oxygen levels in nearshore waters, leading to fish mortality and broader ecological degradation. Onshore, it affects tourism, fisheries, and local businesses, while governments incur substantial and recurring clean-up costs.

Changes in ocean circulation and wind patterns around 2010, associated with the North Atlantic Oscillation, appear to have altered the transport pathways of sargassum. This contributed to the formation of a new accumulation zone in the tropical Atlantic -often referred to as the “Great Atlantic Sargassum Belt”- from which seaweed is transported toward affected coastlines.

While climate variability, nutrient inputs, and ocean warming are all considered contributing factors, the drivers of sargassum growth and its strong year-to-year variability remain incompletely understood. This scientific uncertainty makes monitoring and forecasting particularly important contributing to a developing body of knowledge.

Current mitigation strategies include:

- Beach clean-up operations, which are costly and labour-intensive
- Offshore barriers and booms, which intercept sargassum before landfall
- Exploration of reuse (“valorisation”], including fertilisers, biofuels, and construction materials

However, these approaches are most effective when supported by timely and accurate information on sargassum location, movement, and expected landfall such as that provided by the Sargassum Information Hub.

More information on **www.sebs360.eu**

HOW SATELLITES CAN HELP

Monitoring sargassum at scale relies on satellite Earth Observation combined with oceanographic modelling. Sensors onboard missions such as Sentinel-3 detect the spectral signature of floating sargassum, enabling near real-time mapping of its distribution across the Atlantic. These observations are integrated with:

- ocean current models
- wind data
- sea surface temperature
- nutrient indicators

to produce forecasts of transport drift pathways and coastal landings.

Satellite data are complemented by in-situ observations (e.g., drones, field surveys), improving accuracy and validation. Forecasts are provided by MeteoFrance (as well as Mercator Ocean, CLS and NOAA) at multiple time horizons (e.g., 3, 7, and 14 days), allowing authorities to prepare and respond effectively.

The Sargassum Information Hub is an international platform designed to support monitoring, forecasting, and knowledge sharing. Developed through collaboration between organizations[1] including GEO Blue Planet, UNESCO-IOCARIBE, UNEP Cartagena convention, Copernicus Marine Services, University of South Florida (USA) and Secihti (Mexico), it provides a centralized access point for data and tools.

key features include:

- Near real-time satellite-based monitoring
- Forecast bulletins and early-warning systems
- Regional data integration and visualization tools
- Case studies and best practices

A key strength of the Hub is its collaborative governance, bringing together scientists, policymakers, and users, including industry stakeholders. Its independence from national approval processes allows it to respond quickly to user needs.

By linking science, policy, and operations, the Hub enables a more coordinated and proactive response to sargassum events. Further, future developments to understand better more localised volumes of Sargassum could lead to better management and mitigation of the impacts.

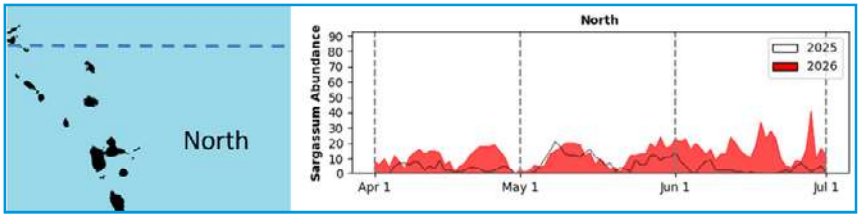

Figure 1: Sargassum forecast in the Northern part of Martinique

The satellite data

The Sentinel-3 satellite mission is Copernicus workhorse for global monitoring and for understanding large-scale global dynamics. With a suite of cutting-edge instruments (an optical imager, a thermal imager and an altimeter), Sentinel-3 measures systematically Earth's oceans, land, rivers and lakes, land ice, sea-ice and atmosphere, to monitor and understand long term and large-scale global dynamics. The three instruments work in synergy to support better understanding and monitoring the dynamics of the main climatic phenomena at global scale.

Copernicus Sentinels data are available under an open and free data policy.

Sentinel data can be accessed at

https://dataspace.copernicus.eu

More info:

https://sentinels.copernicus.eu

The GEO Work Programme Activity

GEO Blue Planet is an international initiative under the Group on Earth Observations (GEO). GEO Blue Planet aims to advance sustainable ocean and coastal management through the development and use of ocean and coastal observations for the benefit of society. Its scope encompasses global efforts to address key marine challenges, including pollution, climate adaptation, biodiversity conservation, and sustainable fisheries. By supporting the integration of satellite, in situ, and model-based data, GEO Blue Planet helps make comprehensive ocean information accessible to policymakers, researchers, and communities.

https://geoblueplanet.org

1 - For a full list of partners, see https://sargassumhub.org/about-us/

Figure 2: St Felix le Gossier, Guadeloupe. SIPA, AP Images.

WHO IS CONCERNED?

Sargassum affects a wide range of stakeholders. Coastal communities face health risks and loss of income; tourism operators and fisheries experience declining activity; and public authorities bear the financial burden of response and mitigation. Environmental agencies are concerned about long-term ecosystem impacts, while national governments and international organizations must address the crossborder nature of the problem.

The Groupement d'Interet Public (GIP) Sargasses Martinique is in charge of preventing and monitoring sargassum influxes. It is supported by the ADEME (Agence de l'Environnement et de la Maitrise Energie in Martinique), which plays a strategic and technical support role in addressing the sargassum problem, focusing on environmental management, innovation, and long-term solutions rather than direct operational clean-up. The ADEME provides expertise to support sustainable, safe, and economically viable management of sargassum, particularly in areas such as treatment, valorisation, environmental protection, and knowledge development.

Whilst the direct consequences of Sargassum landing on the shore of an island must be dealt with by the local authorities, because sargassum is transported across ocean basins, no single country can address the overall problem alone. Effective management requires regional coordination, shared data, and common operational approaches. The Sargassum Information Hub aids co-operation between the countries concerned by providing a common operational picture on a wider scale.

The Primary Users

The GIP (Groupement d'Interet Public) Sargasses Martinique is the central coordinating body in Martinique for the prevention, monitoring, and management of sargassum influxes. It was created to bring together public authorities, technical agencies, and local stakeholders under a single operational framework. Its main role is to coordinate and implement a structured, island-wide response to sargassum, moving beyond fragmented local actions toward a strategic and anticipatory approach.

Other GIP's play similar roles in France and French Overseas territories.

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https://www.martinique.gouv.fr/index.php/Services-de-l-Etat/Prefecture-et-sous-prefectures/Sous-prefecture-du-Marin/Gestion-des-algues-SARGASSES

WHAT ARE THE BENEFITS?

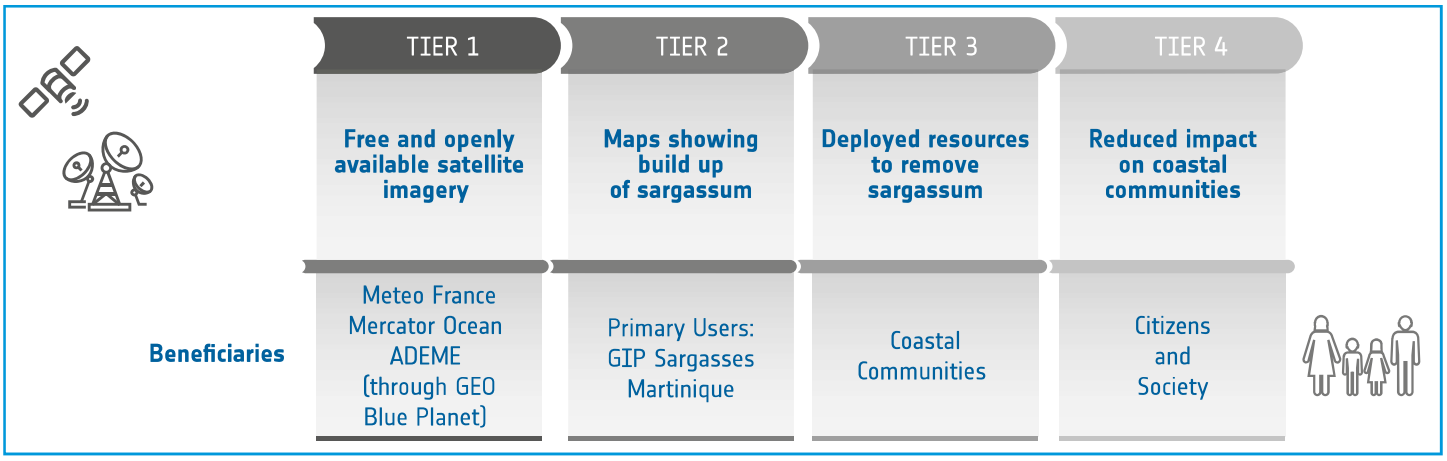


Figure 3: Value chain of the main stakeholders and beneficiaries

Improved monitoring and forecasting enable more efficient and targeted responses, generating measurable benefits, including:

- **Reduced Clean-up and Infrastructure Costs**: forecasting allows authorities to deploy resources more efficiently, reducing unnecessary clean-up operations and optimising the placement of barriers. With barrier installation costs ranging from €200 to €750 per metre, even modest improvements in deployment efficiency can generate significant savings.
- **Protection of Tourism and Local Economies**: by reducing the volume and duration of coastal accumulations, improved response helps maintain beach quality and visitor numbers, protecting local businesses and employment.
- **Reduced Equipment Damage**: lower exposure to hydrogen sulphide reduces corrosion of infrastructure such as refrigeration and air-conditioning systems, lowering maintenance and replacement costs.
- **Improved Public Health Outcomes**: faster removal of sargassum reduces gas emissions, lowering health risks and associated healthcare costs.
- **Enabling Valorisation Opportunities**: forecasting enables earlier interception of fresher sargassum, increasing its suitability for reuse in agriculture, energy production, or materials-potentially transforming a waste management problem into an economic resource.
- **Regional Coordination and Efficiency**: shared information facilitates international cooperation between islands and countries, enabling resource sharing and coordinated responses.
- **Improved Understanding of Sargassum**: Detecting, modelling and forecasting of floating Sargassum are essential for advancing research and designing effective integrated risk management, mitigation and adaptation strategies.

The aforementioned report estimated losses in 2015 to Guadeloupe of $5.7m over a 6-month period. The GDP of the island is around $9b of which tourism contributes around 5-10%. If losses are estimated at 11.6%[2] this suggests an annual hit to the GDP of around $50-100m. If we assume similar impacts across multiple, Caribbean islands, annual regional losses could plausibly reach hundreds of millions of dollars. Even a 10-20% reduction in impacts through improved forecasting could generate multi-million-dollar annual savings. If the regional impact is taken as a conservative $50m-$100m per annum, then $5-20m of avoided losses could be foreseen alongside other, non-monetised benefits to public health, infrastructure protection and environment preservation.

2 - L'invasion des sargasses — Quels impacts économiques sur les entreprises du littoral en Guadeloupe ? (2015) https://sargcoop.org/wp-content/uploads/2015/12/CCIG_1.pdf

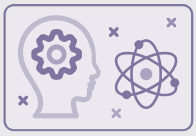
The key benefits can be summarised as follows:

Economic

Economic impacts are significant. A 2015 survey by the Guadeloupe Chamber of Commerce[3] estimated losses of $5.7 million in just six months, with one-third of coastal businesses affected. Tourism declines, increased maintenance costs (notably corrosion of air-conditioning systems), and disruptions to fisheries all contribute to these losses. This is re-enforced in a 2026 research paper on the economic impact in Mexico[4] which, through measuring nightlight levels, estimates that the presence of Sargassum in urban/tourist areas reduces local domestic product by 11.6%.

Environmental

Sargassum accumulation degrades coastal ecosystems, affecting mangroves, seagrass beds, coral reefs, and marine fauna, including turtle nesting sites. These impacts propagate through the marine food chain.



Scientific/Knowledge

By linking science, policy, and operations, the Hub enables a more coordinated and proactive response to sargassum events. Further, future developments to understand better more localised volumes of Sargassum could lead to better management and mitigation of the impacts.

Societal

Decomposing sargassum releases hydrogen sulphide and ammonia gases, which can cause eye and skin irritation and respiratory problems. Vulnerable populations-including children, the elderly, and those with pre-existing conditions-are particularly at risk. In severe cases, evacuation may be required.

EXTENDED IMPACT

Extending the view beyond the local economies and coastal communities, dealing with Sargassum is an international issue. Sargassum intersects with several international frameworks:

- Under the United Nations Convention on the Law of the Sea, states have obligations to protect the marine environment and cooperate on transboundary issues.
- The Convention on Biological Diversity highlights the need to balance ecosystem protection with impact mitigation.
- Regional agreements such as the Cartagena Convention provide a basis for coordinated monitoring and response.
- The issue also aligns with the Paris Agreement and the Sustainable Development Goals, particularly SDG 14 (Life Below Water).

Information for the Hub helps monitor these conventions as well as supporting further research into how best to reduce and/or process the Sargassum weed.

Figure 4: Washing ashore: Sargassum Information Hub.

3 - Échouements de sargasses sur les côtes de Martinique et Guadeloupe :état des lieux 2024, published by the Ministry de la transition Ecologique, de l'energie, du climat et de la prevention des risques. https://www.ecologie.gouv.fr/sites/default/files/publications/thema_essentiel_33_echouements_sargasses_octobre2024.pdf

4 - The economic impact of Sargassum: Evidence from the Mexican coast. Schling et al. Ecological Economics, March 2026. https://www.sciencedirect.com/science/article/pii/S092180092500360X

ABOUT THE PROJECT

The SeBS4GEO project is a spin-off of the Sentinel Benefits Study [SeBS] and is conducted by EARS([European Association of Remote Sensing Companies] for the European Space Agency [ESA]. The project has the goal to support the GEO Work Programme Activities to showcase their benefits derived from the use of Sentinel data. The study cases contribute to the development and consolidation of the GEOValue GEO EO Impact Assessment Toolkit [GIAT].

"The Sargassum service helps us understand where we should focus our scarce island resources to clean up sensitive coastal areas and beaches. As a result we can reduce the impact on citizens and tourists alike as well as protecting the sensitive coastal environment"

Frederick VOYER
GIP Sargasses, Martinique

We acknowledge that the understanding of the case was supported by discussions with Audrey Hasson from GEO Blue Planet, Charlotte Gully from ADEME and Frederick Voyer from GIP Sargasses Martinique. We thank them for their valuable insights and availability.

Do you know an interesting case demonstrating the benefits derived from the use of Sentinels data?

Email info@earsc.org

More Information on Sentinels Benefits Studies:

www.sebs360.eu

European Union

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The views expressed in this study cannot be taken to reflect the official position of the EU or of ESA.