Assessment of Sargassum Activity in the Florida Keys & the Impact on Monroe County’s Economy

Executive Summary

Evaluation of Tourism Disruption, Economic Impact & the Cost-Benefit of Sargassum Mitigation
Sargassum and its Growing Regional Impact

- Over time Sargassum has become significantly more abundant in the Western Atlantic, throughout the Caribbean and along the Florida Straights with significant strandings in the Keys occurring in 2014, 2015, 2018 and 2019. Policymakers in Florida, Mexico and numerous island throughout the Caribbean have faced the significant challenge of dealing with sargassum and its disruption to their tourism industries.

- **Sargassum has a number of potentially negative consequences for visitors to the Keys**: (1) it can releasing noxious smells as it decomposes on the beaches and shorelines; (2) it can trap trash in the water that ultimately ends up on the beaches creating a negative environment for beachgoers; (3) Decomposing sargassum can lower oxygen levels in the water and lead to the death of marine wildlife including coral; (4) Sargassum rafts in canals and along the coast can impede the navigation of boats and their fishing gear; (5) The hydrogen sulfide released by the decomposing material trapped in sargassum is also corrosive to metals and can damage coastal infrastructure and potentially to lead to skin and eye irritation, headaches and nausea.

- **These impacts on tourism should be carefully considered give the importance of Travel & Tourism to the Monroe County economy**: In 2018, $2.4 billion was spent by visitors to the Florida Keys and more than $1.8 billion was retained in the local economy providing revenue for businesses, supporting jobs for residents and generating tax revenue for local governments. Tourism is the largest employer in Monroe County, supporting 26,500 jobs, representing about 44% of total county employment. Travel & Tourism in the Keys also generated more than $492 million in state and local taxes in 2018. In the absence of tourism, county taxing authorities would need to generate an average of $3,750 in additional taxes from each of the county’s 30,200 households to maintain the annual level of receipts.

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What are the Approaches, Considerations & Costs of Sargassum Management?

- The potential sargassum mitigation approaches for the Keys run the gamut in terms of cost and scope. Primary mitigation approaches include:
  1. **Manual Clean-up**: This method requires paid or volunteer labor and the use of hand-held tools such as rakes, shoves, wheelbarrows or nets to collect and remove sargassum from water or beach areas.
  2. **Machine Beach Clean-up**: Several motorized harvesting tools such as mechanical rakes and sifters/screens are available commercially for cleaning beaches. Removing large quantities of sargassum requires the use of motorized equipment which is usually powered by tractors which either tow the collection equipment or have the equipment built in.
  3. **Containment Booms for In-water Mitigation**: Containment booms are floating barriers of varying length, height and material that are placed temporarily in the water to block or contain floating trash, debris or oil spills.
  4. **Harvesting at Sea with Boats/Barges**: Collection can be performed in the water with boats and barges that capture the sargassum and transport it onto the boat through a conveyor belt. Some of these boats also have capture nets to collect the sargassum.

- Numerous factors come into play when determining if and how to control sargassum in a destination. Considerations need to be given to (1) the unpredictable nature of sargassum strandings, (2) safety of residents, workers and visitors, (3) environmental impacts and (4) the economic impacts of lost tourism activity.

- During the sargassum bloom of 2018 (the worst year on record for sargassum), Federal, State and municipal authorities in Mexico spent an estimated $17.2 million on removal and mitigation. In 2019, sargassum was once again overabundant prompting the Federal Environmental Agency (SEMARNAT) to develop a multi-pronged plan that involved (1) using radar and satellite images to track the movement of sargassum, (2) purchasing boats to remove sargassum from the sea, (3) installing 13,000 feet of containment barriers to prevent sargassum from reaching the hardest hit beaches and (4) purchasing additional equipment for beach removal. A total of $52 million was budgeted for the plan.

- The 2018 influx also led the French government to direct $3.5 million (USD) to sargassum clean-up efforts in Martinique and another $10 million (USD) to efforts in Guadeloupe. The Global Tourism Resilience and Crisis Management Centre (GTRCM) reported that the sargassum clean-up costs in the Caribbean following the 2018 bloom would surpass $120 million (USD).
How is Florida Keys Tourism Sector & The Monroe County Economy Impacted by Sargassum?

- Nearly **one out of 10** visitors feel there is a 75% chance or greater that they would either cancel their trip to the Keys or reschedule to another destination given the presence of sargassum.
- While there are some differences in visitor sentiment between demographics and activity participation, the range is fairly small with the **percentage of “at risk” trips due to sargassum ranging between 5% and 10%** among various visitor cohorts.
- By utilizing our visitor model for the Florida Keys, we were able to isolate the historical impact of sargassum on room demand. The model estimates that **for every 1% change in sargassum tonnage, we can expect a .09% decrease in room demand**.
- The two separate analyses **give us a defensible range of potential impacts in Florida Keys visitation and the Monroe County economic given a severe sargassum stranding** (one comparable to 2018). These ranges along with a “midpoint scenario” are highlighted below.

<table>
<thead>
<tr>
<th></th>
<th>Regression Model Severe Scenario</th>
<th>Survey (Visitor Intentions) Severe Scenario*</th>
<th>Severe Scenario (Midpoint of Estimates)</th>
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</thead>
<tbody>
<tr>
<td>Total Visitor Volume</td>
<td>-4,648</td>
<td>-108,897</td>
<td>-56,773</td>
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<tr>
<td>Total Visitor Spending</td>
<td>-$2,187,075</td>
<td>-$51,245,547</td>
<td>-$26,716,311</td>
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<td>Economic Impact (GDP)</td>
<td>-$1,637,988</td>
<td>-$38,379,840</td>
<td>$20,008,914</td>
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<tr>
<td>Wages</td>
<td>-$856,604</td>
<td>-$20,071,173</td>
<td>-$10,463,889</td>
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<tr>
<td>Jobs</td>
<td>-24</td>
<td>-563</td>
<td>-294</td>
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<tr>
<td>Tax Receipts Total</td>
<td>-$445,835</td>
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<td>Tax Receipts Federal</td>
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<tr>
<td>Tax Receipts State and Local</td>
<td>-$231,122</td>
<td>-$5,415,434</td>
<td>-$2,823,278</td>
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</tbody>
</table>
Final Considerations

The economic impact (lost value added) from a severe sargassum year is estimated at $20 million in our midpoint estimate, which would lead to a nearly $3 million decline in state and local tax collections and 300 lost jobs in Monroe County. From an ROI standpoint, it is important to weigh this impact against the estimated cost of mitigation, which we estimate to be between $3.4 million and $17.8 million. Along with these cost considerations there are a number of other factors that should be considered as well:

1. Does the scientific community expect the sargassum problem to improve, stay the same or get worse in the Florida Keys?
2. Can a long-run strategy be put into place that amortizes the cost of mitigation over a longer period of time?
3. This assessment focuses only on the tourism impacts of sargassum. What are the other negative implications or externalities that could be associated with sargassum activity (e.g., environmental, health, others)?
4. Can other stakeholders (private or public) at a local, state or federal level be engaged to provide additional resources towards mitigation?
5. Are there longer-run impacts that might not be included in our model? For example, could there be increasing reports of sargassum in the Keys through social or traditional media that leads to more negative sentiment that compound impacts to visitor demand?
Appendix I: Florida Keys Visitor Demand Regression Model Results

Regression Modeling Helps to Isolate the Incremental Impacts of Sargassum

Visitor perceptions can give us an estimate of expected changes in booking intentions due to sargassum; however, these reported intentions don’t always align with actual behavior. In order to understand sargassum’s impact on visitation, we must also isolate other factors that can influence travel demand. To help us with this task we built a linear regression model. Historical room demand in the Keys (monthly periodicity from 2011-2019) was used as the dependent variable in the model. The model tested numerous predictor variables and their influence on overall room demand over time. Being able to account for the variables that tend to drive visitor demand allows us to quantify the incremental impact that sargassum activity has had on overall demand over the period.

This assessment requires us to test numerous “driver” variables and their overall influence on room demand in the Keys in a search for the best “fit” model (i.e., the one that is most predictive of actual room demand in the Keys). The chart at upper right show comparisons of our final modeled room demand over time (fitted) with actual room demand over time (actual). The chart at bottom right graphs the residuals from the model (i.e., the differences between actual and fitted result over time).
Appendix II: Florida Keys Visitor Demand Regression Model Output

Equation: FLK_VIS_DEM24  Workfile: FLK VISITOR DEMAND...

Dependent Variable: LOG(FL_KEYSDEM_SA)
Method: Least Squares
Date: 07/30/20  Time: 08:24
Sample (adjusted): 2011M03 2019M01
Included observations: 95 after adjustments

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
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<tbody>
<tr>
<td>C</td>
<td>6.897941</td>
<td>0.687133</td>
<td>10.03873</td>
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<td>LOG(ORIGIN_GDP(-2))</td>
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<td>LOG(ADR_PER DEM)</td>
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<td>LOG(SARG_AREA(-1))</td>
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<td>IRMA</td>
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<td>TIME=2016.83</td>
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<td>0.045488</td>
<td>-1.875593</td>
<td>0.0640</td>
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</tbody>
</table>

- R-squared: 0.535492
- Mean dependent var: 12.25385
- Adjusted R-squared: 0.509397
- S.D. dependent var: 0.064047
- S.E. of regression: 0.044861
- Akaike info criterion: -3.309429
- Sum squared resid: 0.179112
- Schwarz criterion: -3.148131
- Log likelihood: 163.1979
- Hannan-Quinn criter.: -3.244253
- F-statistic: 20.52015
- Durbin-Watson stat: 1.964530
- Prob(F-statistic): 0.000000
Appendix III: Additional Citations


