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Bahamian Seagrass Blue Carbon

National Ecosystem Accounting of Seagrass Extent, Blue Carbon Stocks and Sequestration Potentials in The Bahamas harnessing contemporary Earth Observation advances

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Introduction

Seagrass Ecosystem = Natural Carbon Sink (Blue Carbon)

Blue Carbon can support:
- Nationally Determined Contributions
- EU Green Deal
- Sustainable Development Goals

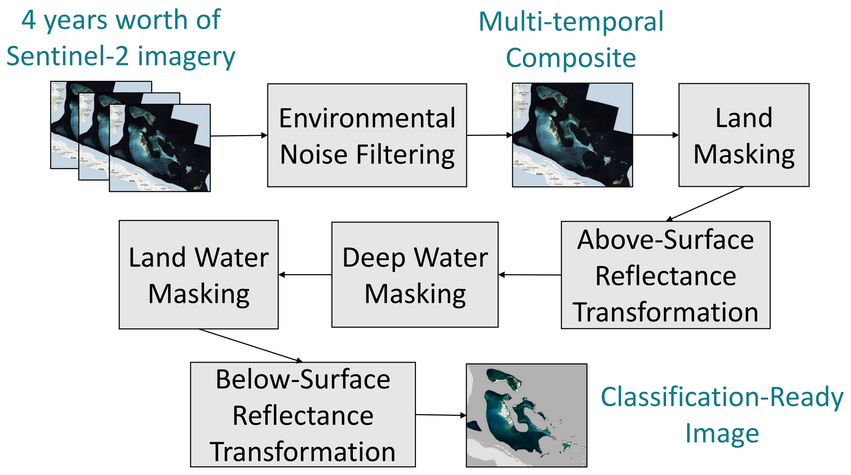
Ecosystem (Carbon) Accounting is needed for:
- Tracking changes
- Integrating measures of ecosystems with measures of economic activity

Earth Observation

is crucial for spatially explicit measures of seagrass extent & therefore carbon accounting

Methods

Image Pre-Processing



4-Class System:
- Seagrass
- Sand
- Coral
- Rock/Rubble

Classifier:
Random Forest

Input-Features:
- Bands 1-5
- GLCM
- PCA on above
- OBIA
- HSV

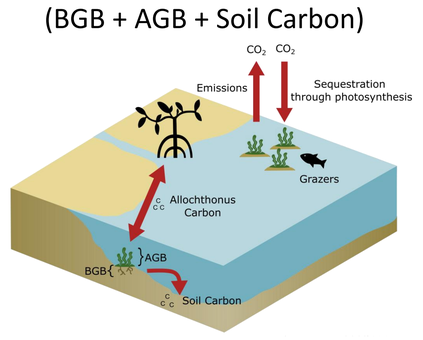
Classification

1. Hard classification on 20 models which combine different input-features
2. Soft classifications on models with Seagrass F1-scores >70%
   - Max. Extent: Seagrass most probable per pixel
   - Min. Extent: Seagrass probability >50% per pixel
3. Mode-Function on the 5 best Seagrass F1-score classifications each for the Max. and Min. Extent

Country Level Carbon Estimation

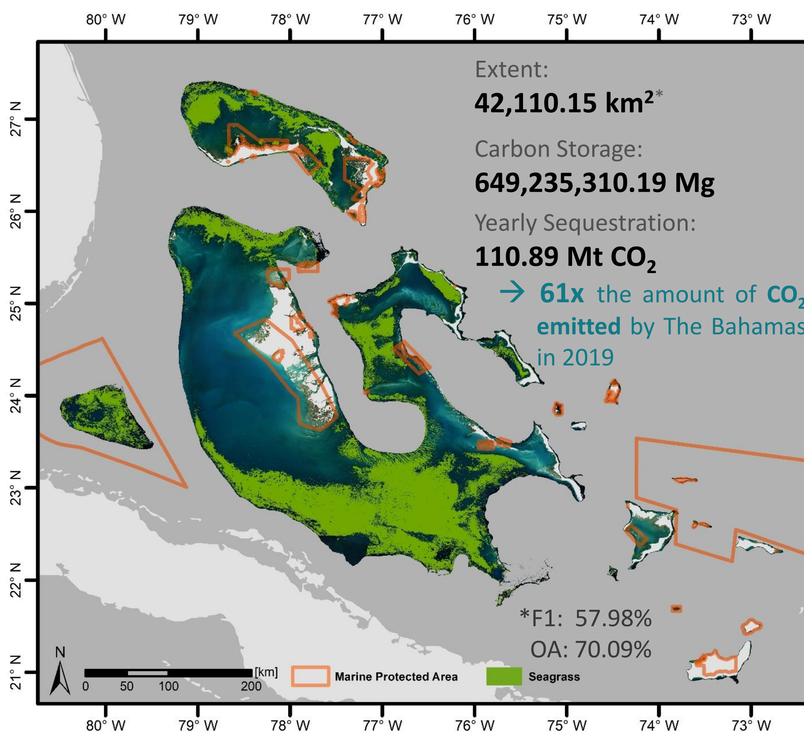
Literature review of in-situ data:
- Sequestration Rate
- Carbon Stock

(BGB + AGB + Soil Carbon)

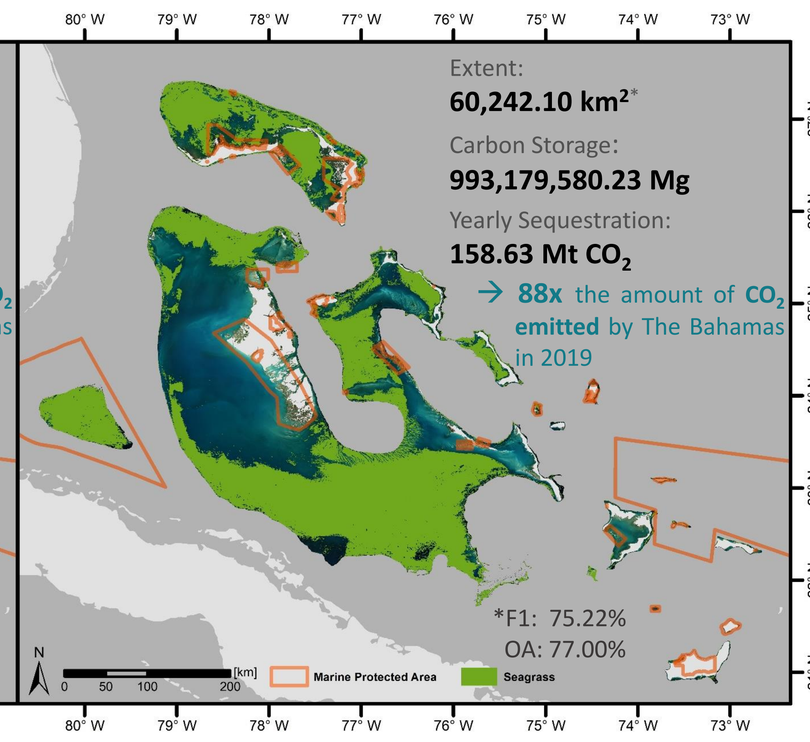


Preliminary Results & Conclusion

Minimum Extent



Maximum Extent



→ Bahamian seagrass can potentially put the country in a **carbon-neutral state**

→ **High importance** of this ecosystem for **climate change** adaptation and mitigation & its integration into national **ecosystem accounting** frameworks and **climate agendas**

→ However, only about **8%** of Bahamian seagrass meadows lie within in **Marine Protected Areas**, while this ecosystem is **degrading** at an annual rate of **7%** since 1990 (Waycott et al.,2009; Fourqurean et al., 2012)

Need for Action!

In order to preserve seagrass ecosystem services, Bahamian authorities **need to conserve and restore** this habitat

Future Steps

- Need for more spatially distributed ground truth & in-situ carbon data to tackle shallow water bias
- Segmentation based on seagrass density for more precise carbon estimations
- Use of older imagery (different satellites) to create opening and closing statements for an ecosystem accounting period
- Inclusion of pixel-based uncertainty into the classification model
- Estimation of the monetary value of Bahamian seagrass blue carbon

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