



**SustainaBlue**

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# Blue Carbon Sequestration

Module 4: Climate Change and Ocean Health

Duration: 1 Hour



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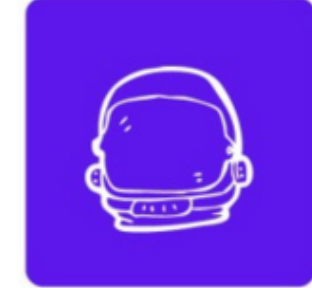


# PROJECT PARTNERS

## Malaysia



## Indonesia



## Greece

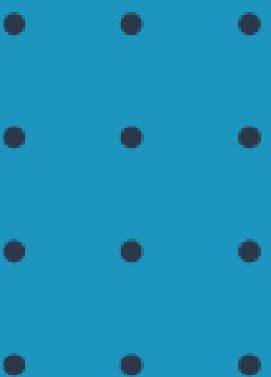


## Cyprus



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# Blue Carbon

The coastal vegetation ecosystems disproportionately for their substantial contribution to global carbon sequestration (Ocean carbon sink).

- Coastal ecosystems, like tropical forests and peatlands, serve as examples of how nature can be used to strengthen climate change mitigation initiatives.



Tidal Marshes 🔍



Mangroves 🔍



Seagrasses 🔍



## I.E. Mangroves

- It play an important role in capturing, transforming, and storing CO<sub>2</sub> in the atmosphere into coastal sediments, displacing organic carbon from the coastal zone to the offshores and the ocean.



Mangroves also help in preventing storms, hurricanes, coastal erosion, and tidal waves.

### Threats

- By **natural and anthropogenic activities** such as urbanization, pollution, aquaculture and tourism, and overexploitation of timber, fish, crustaceans and shellfish
- Approximately **50%** of the world's **mangrove forests** have disappeared over the past 50 years



# Mangroves

Mangroves are among the most carbon-rich ecosystems in the tropics. Mangroves account for approximately 3% of carbon sequestered by the world's tropical forests.

- Simple scaling up of the mean carbon burial rate equates to a global carbon sequestration rate of 13.53 Gt year<sup>-1</sup>.
- Potential for significant GHG emissions if the high per-hectare carbon stocks of mangroves are disturbed.

Clearing  
Conversion to industrial  
estates/aquaculture  
Changes in drainage patterns

Losses of mangroves lead to **dramatic changes in soil chemistry and** usually result in **rapid emission rates of GHGs**, especially CO<sub>2</sub>.

(Source: Alongi, 2012)



# Mangroves and Conservation

1

## Community-based Conservation

- Community-based marine and coastal management makes a significant for the preservation
- Various marine managed zones in the Pacific Islands region now span over 30,000 km<sup>2</sup>.

2

## Funding Support and Policy Integration

- Demand for carbon credits that can be obtained through targeted restoration projects
- Potential to create national blue carbon programs which will help reduce climate change in the world.

3

## Mangroves Restoration

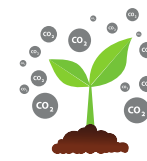
- Serves as a strategy to protect the ecosystem's economic benefits as well as its ecological functions
- Including environmental mitigation, responsible utilization of mangrove products, habitat, and coastal food sources

(Source: Choudhary et al., 2024)



# Case Study: Futian Mangrove reserve in Shenzhen

- The primary carbon pools monitored were aboveground biomass, underground biomass, and soil organic carbon pools, excluding dead wood and litter carbon pools



## Carbon Benefits of Futian Reserve

- The carbon density in the Futian National Mangrove Nature Reserve was  $416.362 \pm 5.579 \text{ tCO}_2\text{e/ha}$  in 2020.
- Biomass carbon storage increased from 33,927.996 tCO<sub>2</sub>e in 2017 to 52,482.43 tCO<sub>2</sub>e in 2020.
- It showed a carbon benefit of 3.87 tCO<sub>2</sub>e/ha.a, 1.8 times greater than a large-scale project in Zhanjiang.

(Source: Li et al., 2025)



Estimate **Blue Carbon Potential**  
of a Local Mangrove Area



Identify **Threats** and  
**Restoration Opportunities**



Share a **Short Audit Summary** with Class







# SUMMARY

- Blue carbon ecosystem can be referred as Mangroves, tidal marshes, and seagrasses that they accommodate **large carbon stocks**, enable long-term carbon storage, have the capacity to control greenhouse gas emissions and possess the potential to reduce the rise in atmospheric CO<sub>2</sub> levels.
- Mangroves play an important role in **capturing, transforming, and storing CO<sub>2</sub>** in the atmosphere **into coastal sediments** for a long time, displacing organic carbon from the coastal zone to the offshores and the ocean.
- The mitigation of mangroves may be included in efforts to establish a worldwide market opportunity for Reduced Emissions from Deforestation and Degradation (REDD+2), for example: **Community-based conservation, Funding support and policy integration, and Mangroves restoration.**




# References

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# THANK YOU

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