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Blue carbon and Living Shorelines in Korea

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Ministry of Oceans And Fisheries

Blue Carbon Research Center

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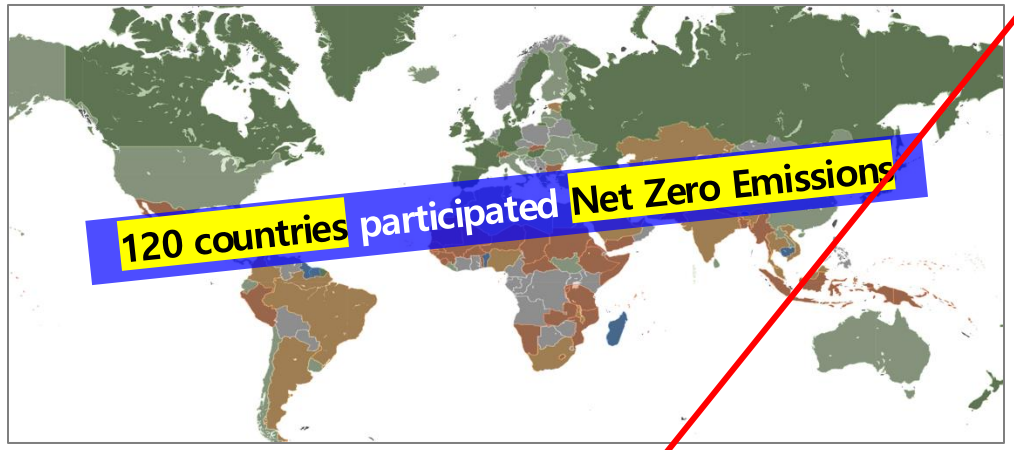
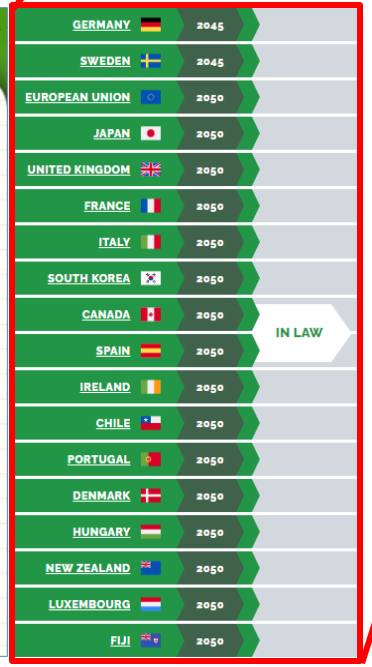
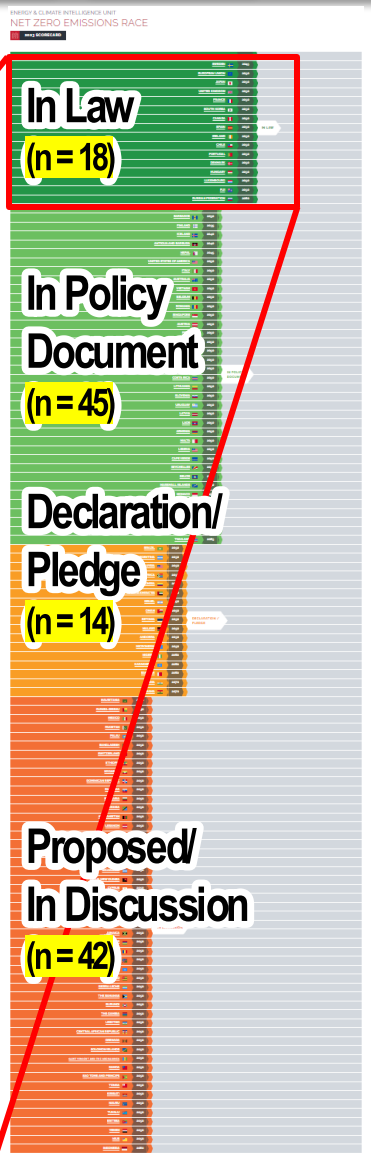
1. Backgrounds

Net Zero Emissions Race(NDC & Net-Zero): K-MOF challenged Negative Emissions



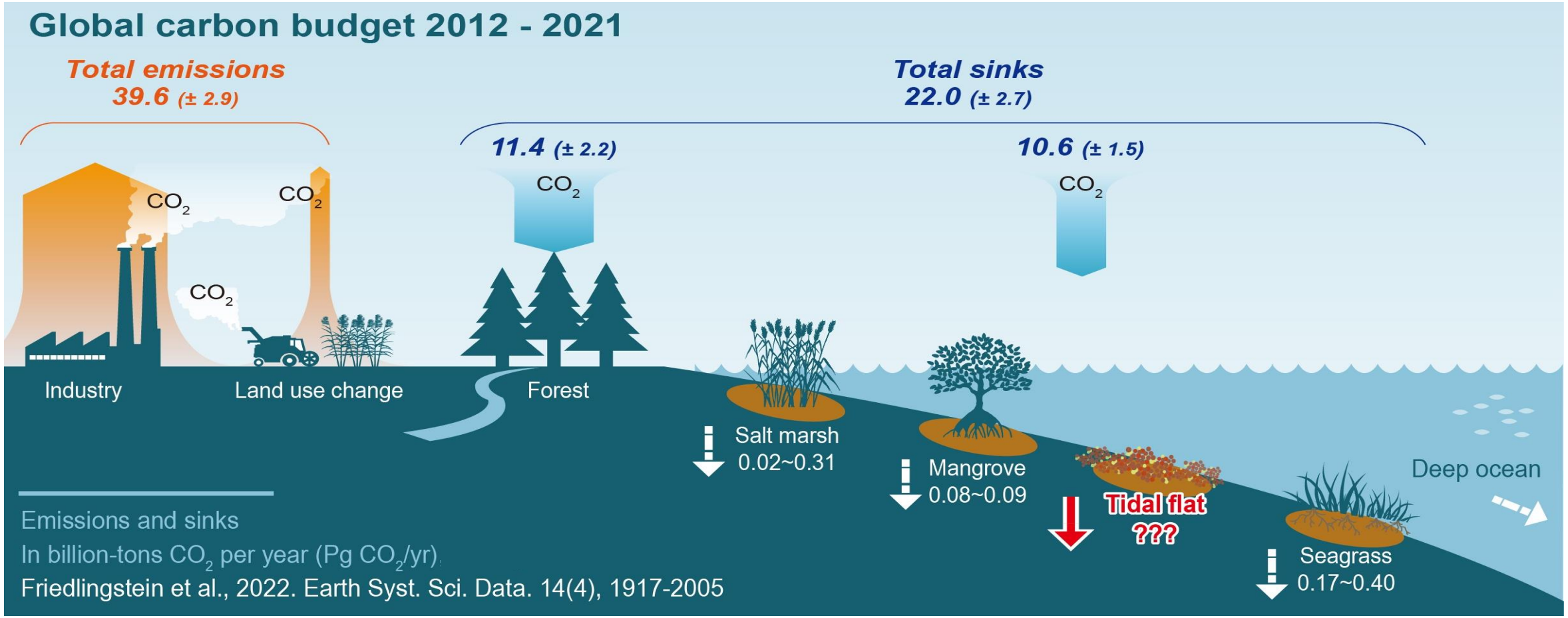




1. Backgrounds

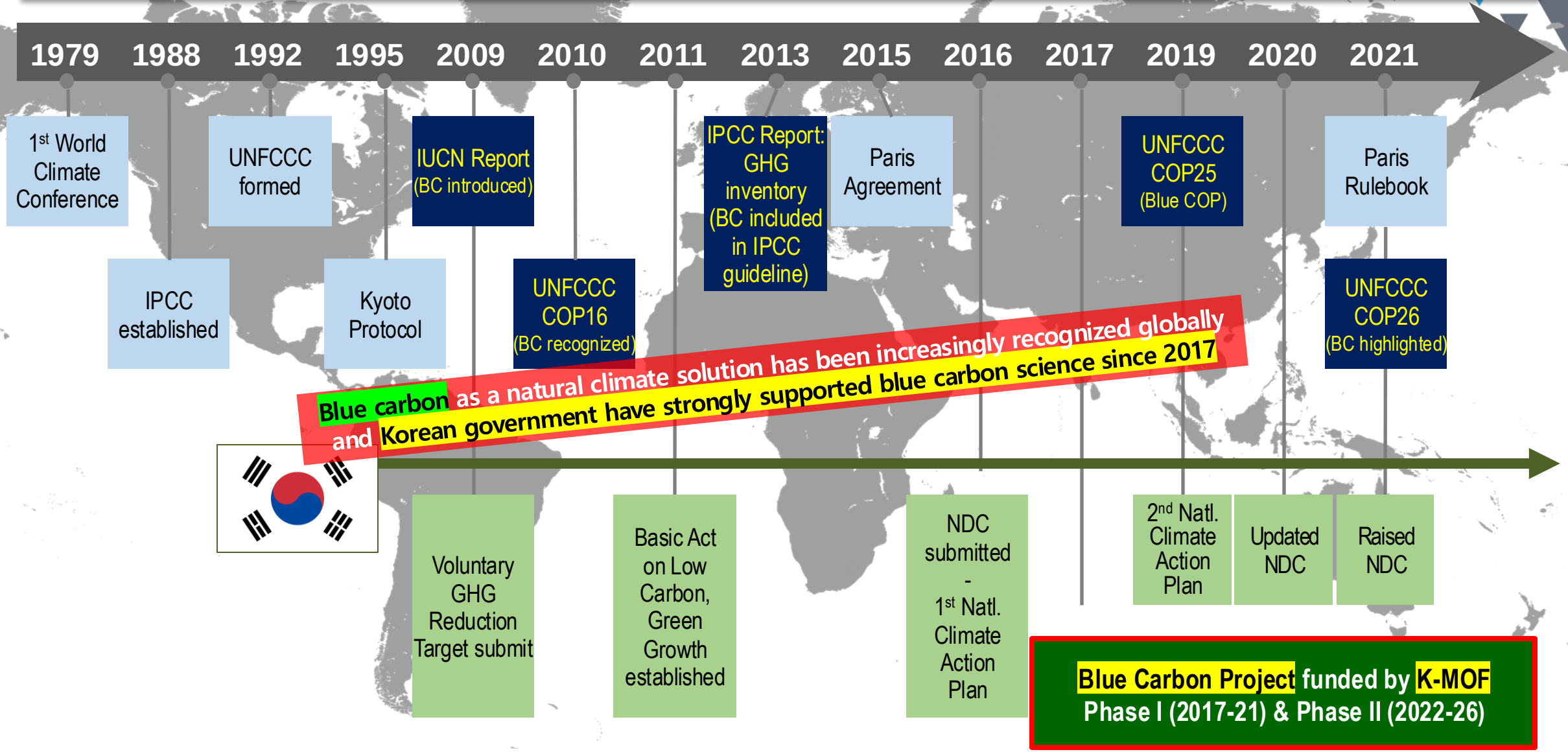
The Importance of the Ocean in Response to Climate Change

- Global carbon budget (2012-2021, 10yr average): CO_2 emissions vs. CO_2 Sinks
- CO_2 emissions: ~39.6 Pg yr^{-1}, Sinks: ~22.0 Pg yr^{-1} (Green C 11.4 Pg yr^{-1} ≈ Blue C 10.6 Pg yr^{-1})



1. Backgrounds

Blue Carbon Science in a Global Window of Climate Change



Blue Carbon Project funded by K-MOF
Phase I (2017-21) & Phase II (2022-26)

2. Korean Blue Carbon Science

Phase-I (2017-2021): $8 million dollars

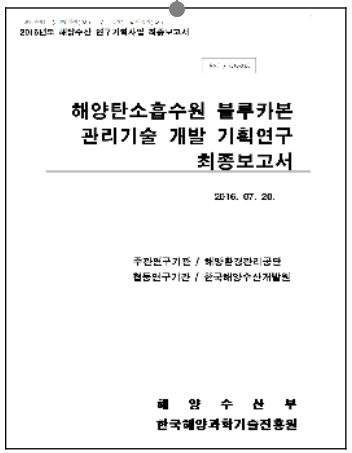
Blue Carbon Project: Phase-I

2016

Development of Blue Carbon Management

Research planning

(KOEM)



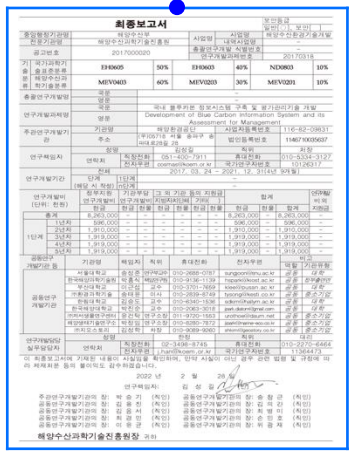
2017-21

Blue Carbon Project (phase-I)

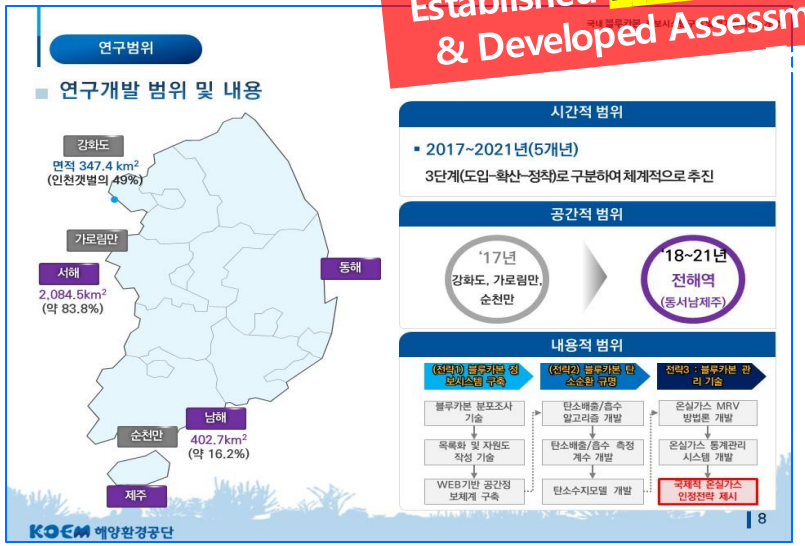
→ Completed

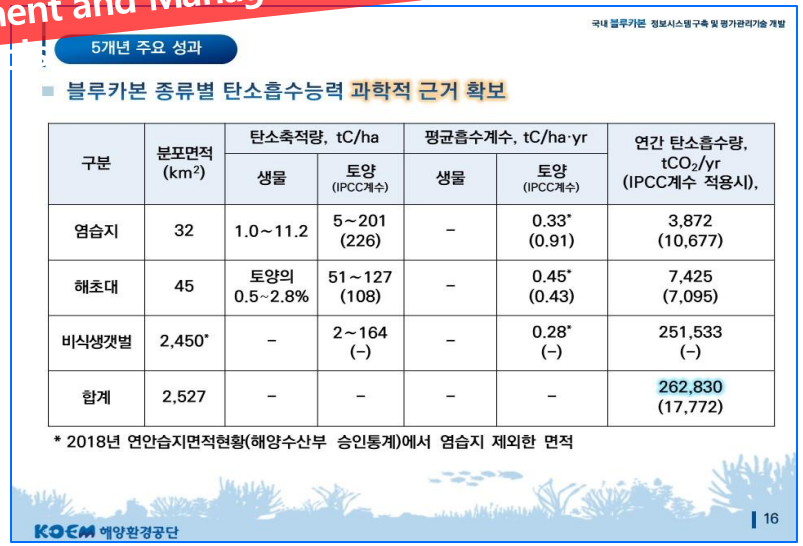
(2017-21)

(KOEM)



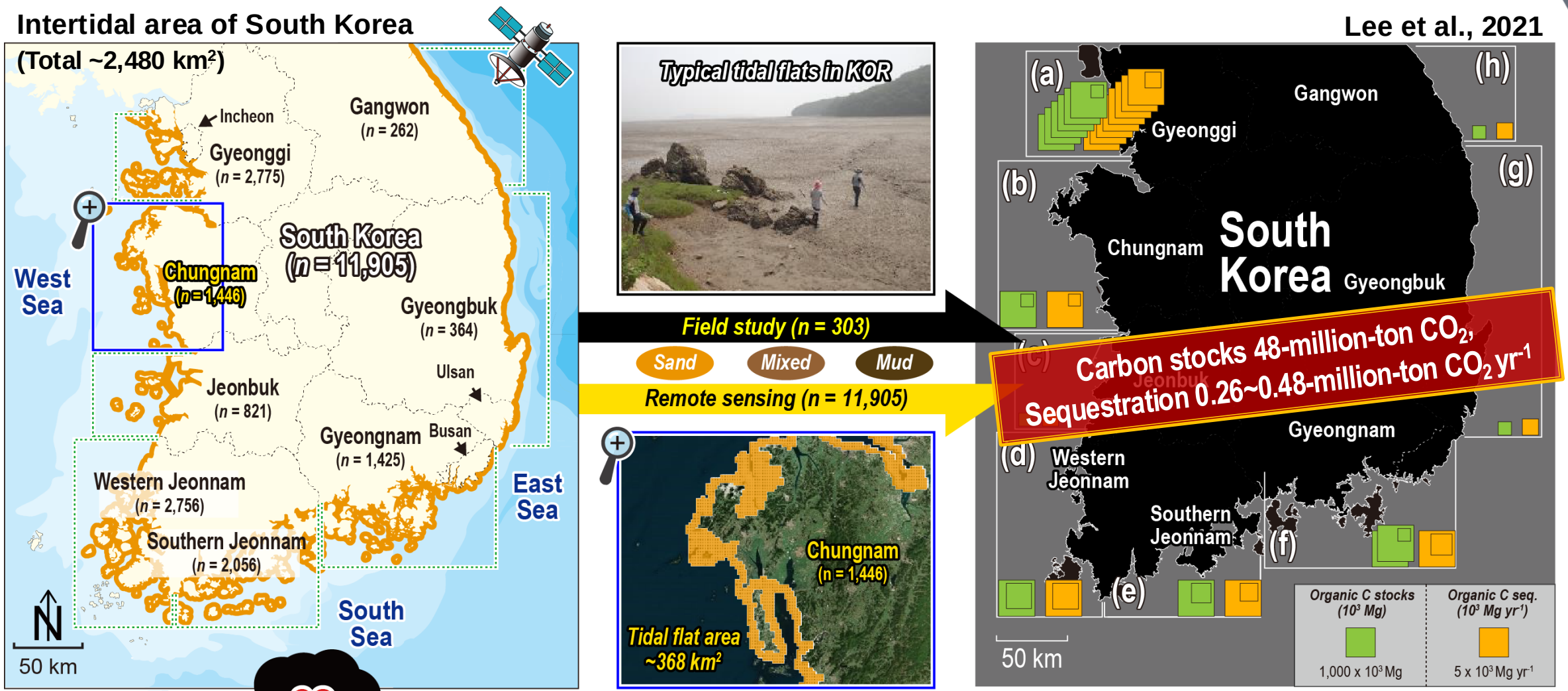
Established K-Blue Carbon Information System & Developed Assessment and Management





2. Korean Blue Carbon Science

Phase-I (2017-2021)



Tidal flats can absorb CO_2, which generates 110,000~200,000 cars a year!!

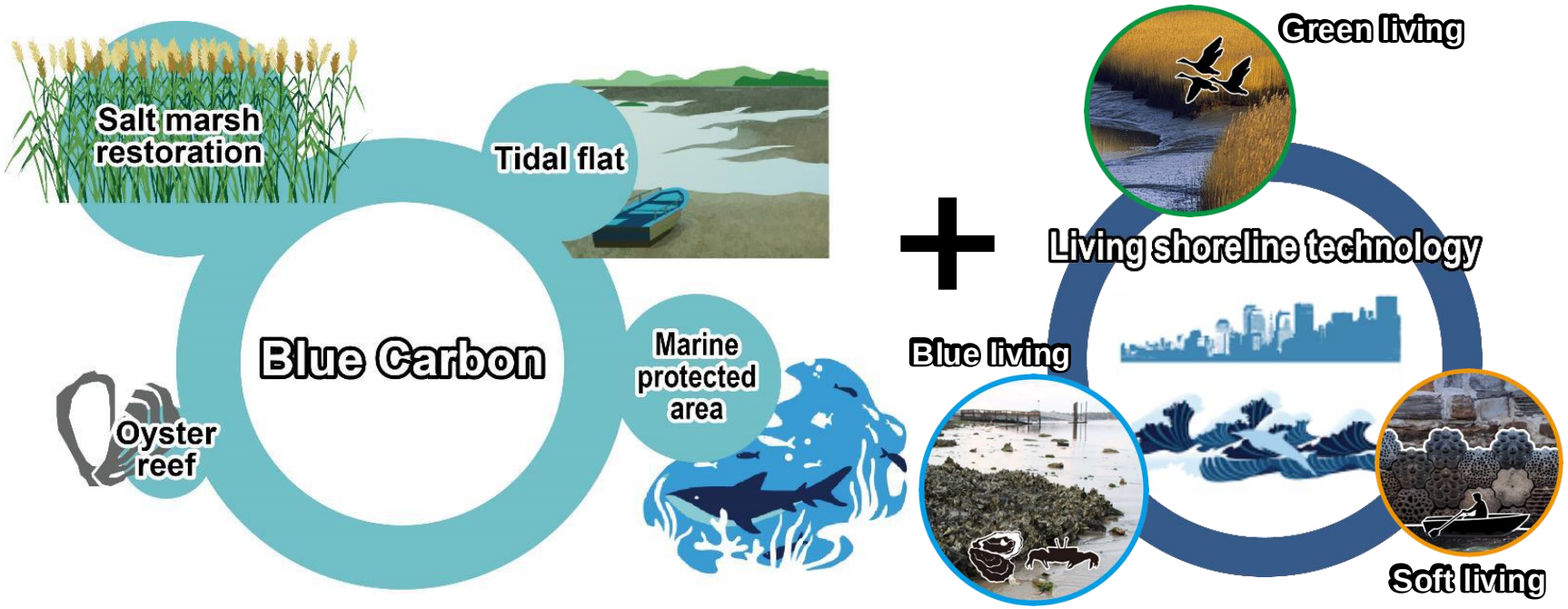
2. Korean Blue Carbon Science

Phase-II (2022-2026): $40 million dollars

Blue Carbon Project: Phase-II

2021	2022-26
R&D strategies for climate change Research planning (SNU)	Blue Carbon Project (phase-II) → On going('22~26) (SNU)
Living shoreline Research planning (SNU)	
블루카본 기반 기후변화 적응형 해안조성기술개발 사업 기획연구 - 본 보고서 - 2021. 9. 9. 서울대학교 산학협력단	Blue Carbon Research Center

[Title] Development of living shoreline technology based on blue carbon science toward climate change adaptation



The project aims to support net-zero by 2050 through
1) Enhancement & Excavation of blue carbon
2) Construction & management of living shoreline technology

2. Korean Blue Carbon Science

Phase-II (2022-2026): Objectives, contents, and expected outcomes

Research objectives

Aimed to develop techniques on enhancement of "blue carbon resources" and apply in situ along the coasts of Korea using the "living shoreline techniques" towards "carbon neutrality"

Major expected outcomes

- **Blue Carbon Map of Tidal flats**
  - Excavation of new carbon reduction resources
  - New Blue Carbon absorption/emission factors
  - Inclusion of information about tidal flat area (>80%)
- **International network operation (IPCC, COP, etc.)**
- **Development of Living shoreline technology**
  - Test-bed demonstration & Guidelines suggestion
  - Technical guidelines for Living shoreline
  - Announcement of coastal management

Three major subjects & research contents

Subject 1

1. Enhancement & Excavation of Blue Carbon

1.1. Identification of carbon cycle in tidal flats
1.2. Excavation of new carbon reduction resources
1.3. Development of remote sensing technology
1.4. Construction of Blue Carbon database
1.5. Reinforcement of international network

Subject 2

2. Construction of Living Shoreline

2.1. Development of Living shoreline technology
2.2. Analysis of Living shoreline effects
2.3. Test-bed operation & Technology demonstration

Subject 3

3. Management of Blue Carbon & Living Shoreline

3.1. Enactment of Law & System
3.2. Reinforcement of business in local government

3. Key Findings & Discussion

Criteria for Inclusion as Actionable Blue Caron Ecosystems

Category	Habitat type	Blue Carbon Criteria (Adapted from Lovelock & Duarte, 2019; Pidgeon et al., 2021)					
		Large scale of GHG removals or emissions	Long-term storage of fixed CO_2	Carbon loss by anthropogenic impacts	Practical management to reduce emission	Included in IPCC GHG accounting guidelines	Alignment with other policies
Actionable Blue Carbon Ecosystems for Mitigation	Mangrove	YES	YES	YES	YES	YES	YES
	Salt marsh	YES	YES	YES	YES	YES	YES
	Seagrass	YES	YES	YES	YES	YES	YES
Emerging Blue Carbon Ecosystems	Tidal flat	?	?	YES	?	NO	YES
	Benthic sediment	?	YES	YES	?	NO	?
	Macroalgae	YES	YES	YES	YES	NO	YES
Other Ocean Ecosystems (Not actionable)	Coral reef	NO	NO	NO	NO	NO	YES
	Oyster reef	NO	?	NO	NO	NO	YES
	Phytoplankton	YES	?	?	NO	NO	NO
	Fish	NO	NO	NO	NO	NO	YES

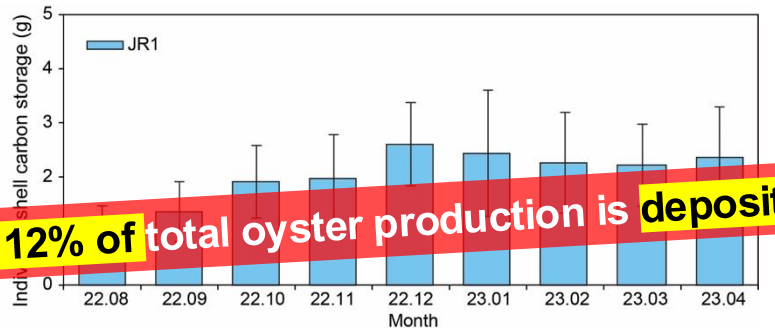
3. Key Findings & Discussion

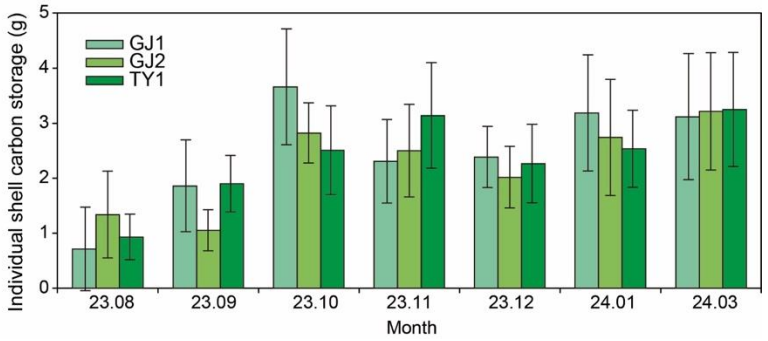
Criteria for Inclusion as Actionable Blue Caron Ecosystems

Category	Habitat type	Blue Carbon Criteria (Adapted from Lovelock & Duarte, 2019; Pidgeon et al., 2021)					
		Large scale of GHG removals or emissions	Long-term storage of fixed CO_2	Carbon loss by anthropogenic impacts	Practical management to reduce emission	Included in IPCC GHG accounting guidelines	Alignment with other policies
Emerging Blue Carbon Ecosystems	Oyster reef	NO	?	NO	NO	NO	YES

Jansen & Bogaart et al., 2020_Wageningen

Organic & Inorganic carbon content





about 12% of total oyster production is deposited as carbon

3. Key Findings & Discussion

Enhancement of Tidal flat BC: Practical management to carbon reduction

Living Shoreline (Green, Blue, Soft) Test-beds Construction & Monitoring Schedule

① Green Living Test-bed 1	
Construction	Oct. 2022
Monitoring	Oct. 2022 ~ Jul. 2023 (10 month)
Location	Daebu, Gyeonggi, South Korea
② Green Living Test-bed 1	
Construction	Jun. 2023
Monitoring	Jun. 2023 ~ Dec. 2026 (43 month)
Location	Seocheon, Chungnam, South Korea
③ Blue Living Test-bed	
Construction	Oct. 2023
Monitoring	Oct. 2023 ~ Dec. 2026 (39 month)
Location	Gangjin, Jeonnam, South Korea
④ Soft Living Test-bed 1	
Construction	Nov. 2022
Monitoring	Nov. 2022 ~ Nov. 2024 (24 month)
Location	Busan, South Korea
⑤ Soft Living Test-bed 2	
Construction	Nov. 2023
Monitoring	Nov. 2023 ~ Dec. 2026 (38 month)
Location	Pohang, Gyeongbuk, South Korea


Green Living Pilot Test-bed


Green Living Test-bed


Blue Living Test-bed


Soft Living Test-bed

3. Key Findings & Discussion

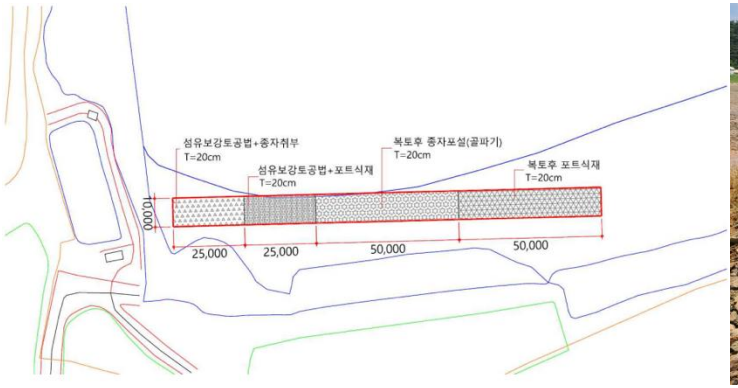
Enhancement of Tidal flat BC: Practical management to carbon reduction

① Green Living Test-bed 1
(Location: Daebu; Monitoring: Oct. 2022 ~ Jul. 2023, 10 month)

Before

After

② Green Living Test-bed 2
(Location: Seocheon; Monitoring: Jun. 2023 ~ Dec. 2026, 43 month)

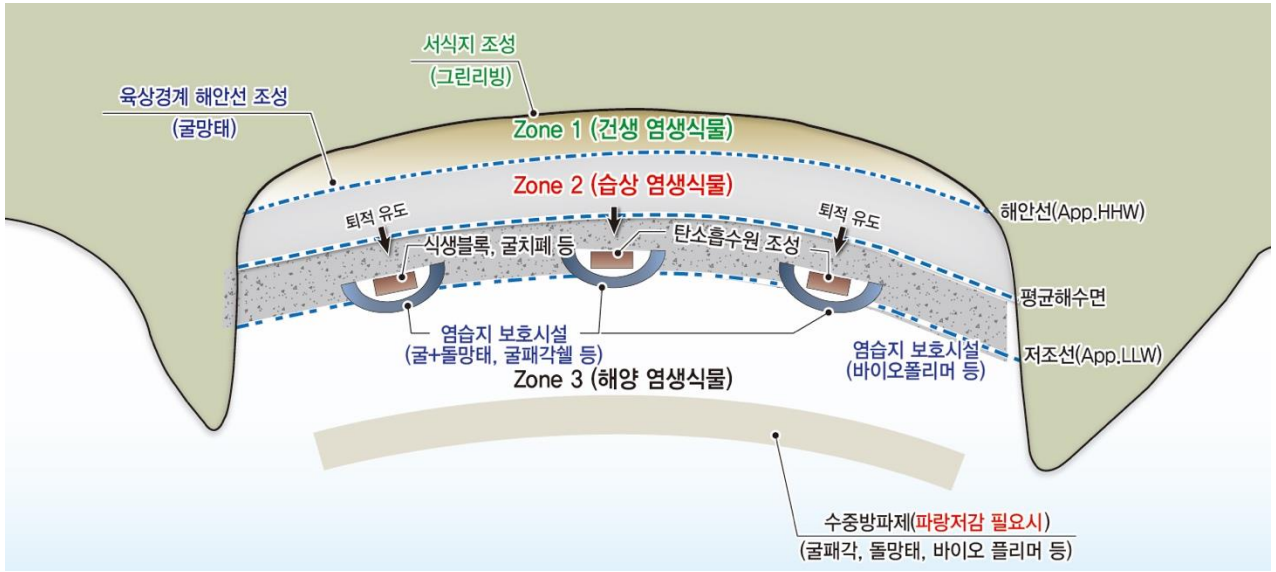


3. Key Findings & Discussion

Enhancement of Tidal flat BC: Practical management to carbon reduction

③ Blue Living Test-bed

(Location: Gangjin; Monitoring: Oct. 2023 ~ Dec. 2026, 39 month)

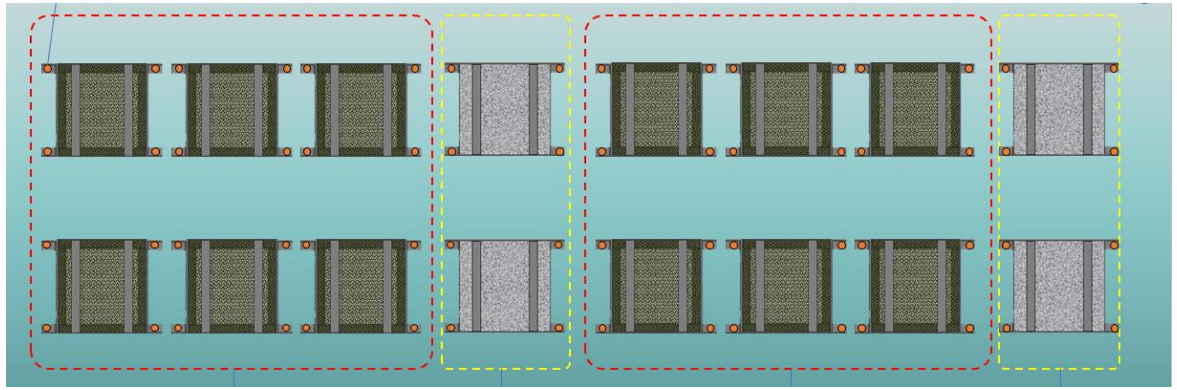


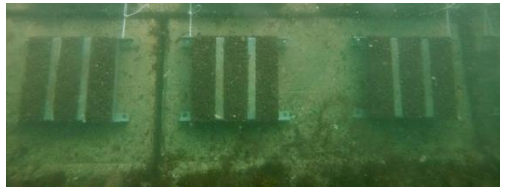
3. Key Findings & Discussion

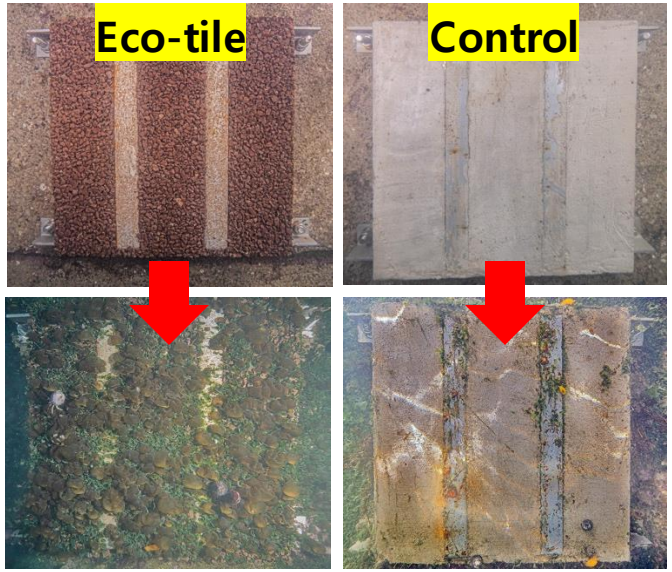
Enhancement of Tidal flat BC: Practical management to carbon reduction

④ Soft Living Test-bed 1

(Location: Busan; Monitoring: Nov. 2022 ~ Nov. 2024 24 month)

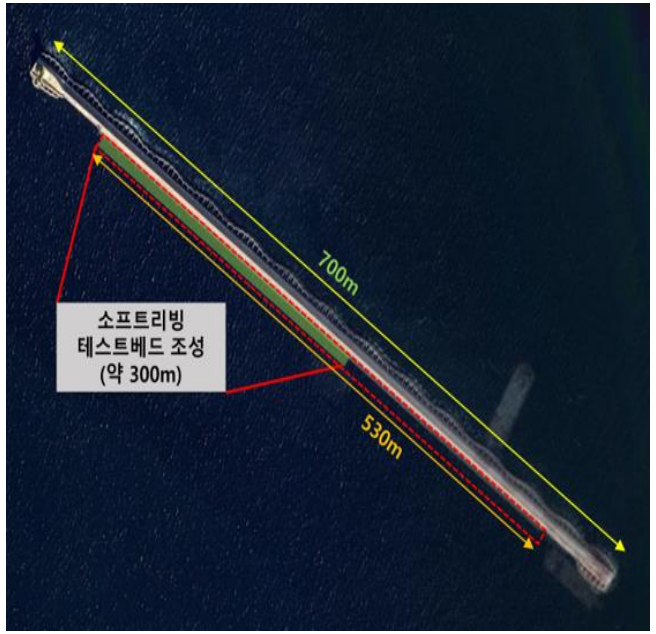


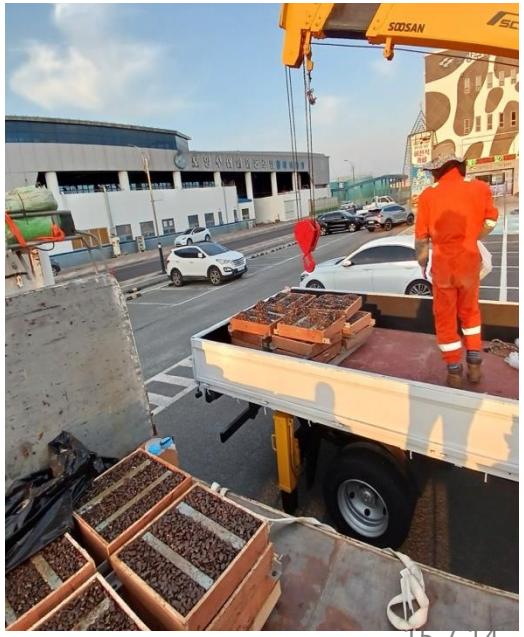




⑤ Soft Living Test-bed 2

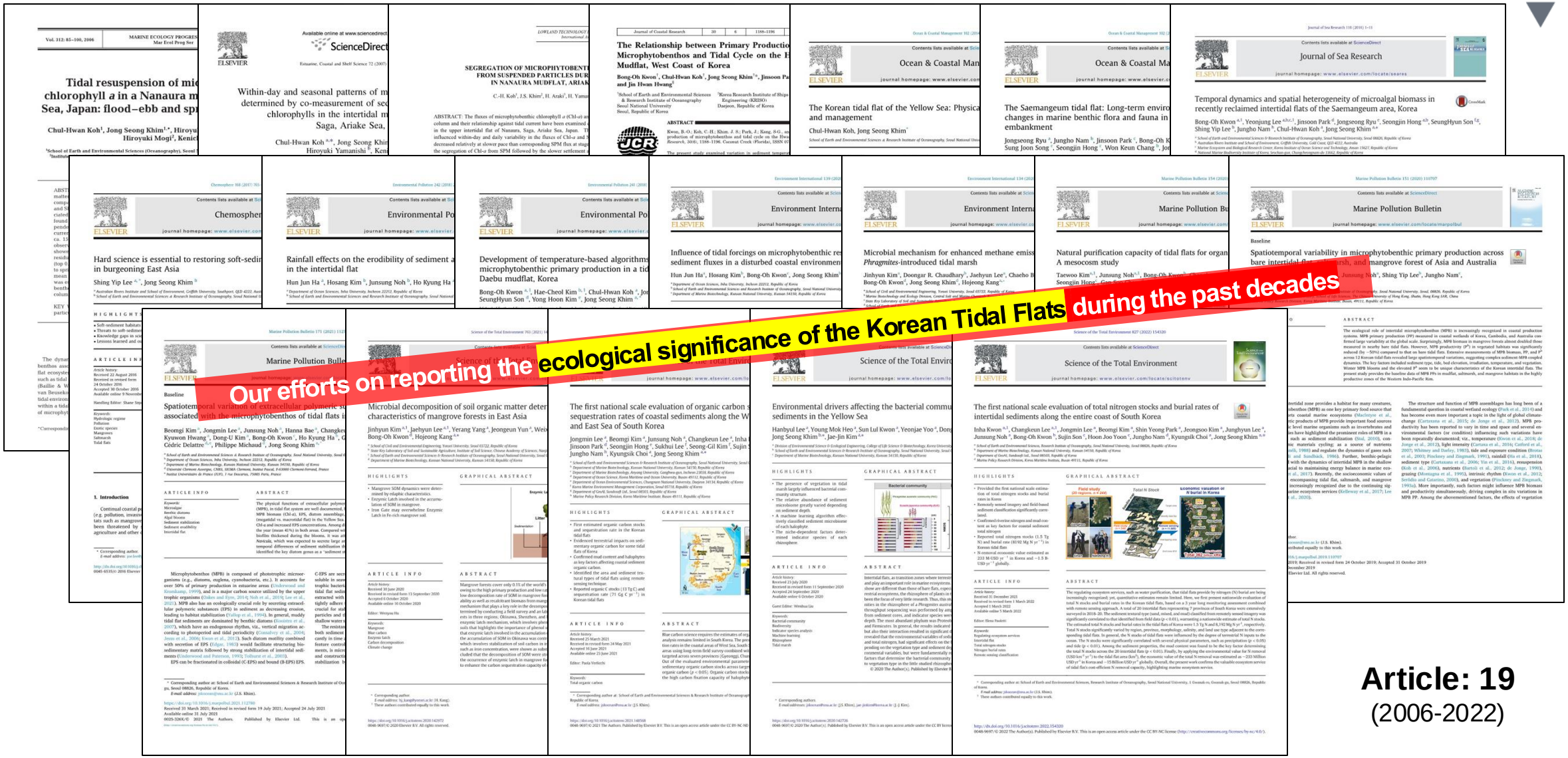
(Location: Pohang; Monitoring: Nov. 2023 ~ Dec. 2026, 38 month)





4. Remarks

Published Works since 2000s



Article: 19
(2006-2022)

Thank you for listening!

Ministry of Oceans And Fisheries

Blue Carbon Research Center