

The potential of Korean vegetated coastal ecosystems for greenhouse gas abatement through blue carbon management

Heung-Sik Park^{1*} Gon-Tak Yun² Jae-Won Yoo³, Yoon-Chil Kim¹,

¹Korea Institute of Ocean Science & Tech.

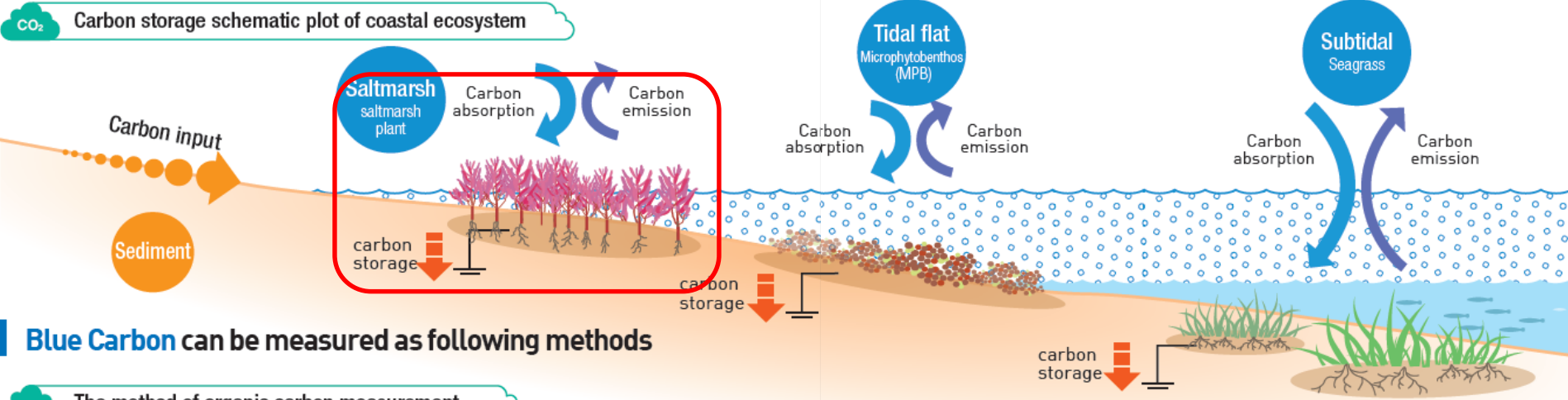
² Benthos Research Center

³Korea Institute of Coastal Ecology Inc.

Contents

- **01. Introduction to Blue carbon studies in Korea**
- **02. Carbon measurement on salt marshes**
- **03. Summary**
- **and.. Discussion and suggestion**

How does the marine ecosystem absorb carbon?



Blue Carbon can be measured as following methods

The method of organic carbon measurement

There are two type of blue carbon storage by sequestration, vegetated and unvegetated area



- **Potential carbon storage** in Korea can be composed to salt marsh , sea grass and tidal flats, there is no mangrove

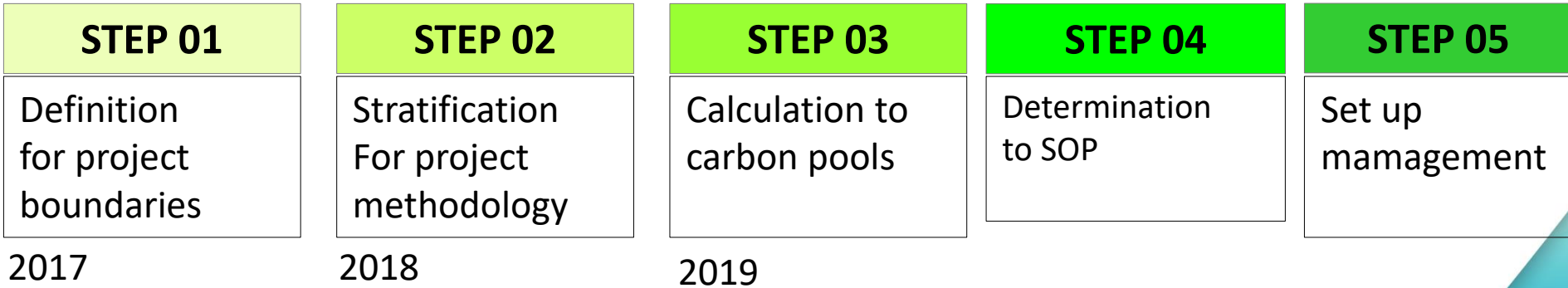
Planning to Blue Carbon assessment



The Planning process;

- Conception
- Carbon pool field sampling and laboratory analysis
- Calculation for scaling up carbon stocks to project area
- Expansion to carbon stock (rehabilitation and restoration)

Steps to preparing a measurement plan



Study sites

CO₂ Site for Blue Carbon

Establishment of a blue carbon production system and its management direction by understanding the blue carbon Korean coasts with a focus on southwestern coasts where tidal flats having high of blue carbon potential sequestraion

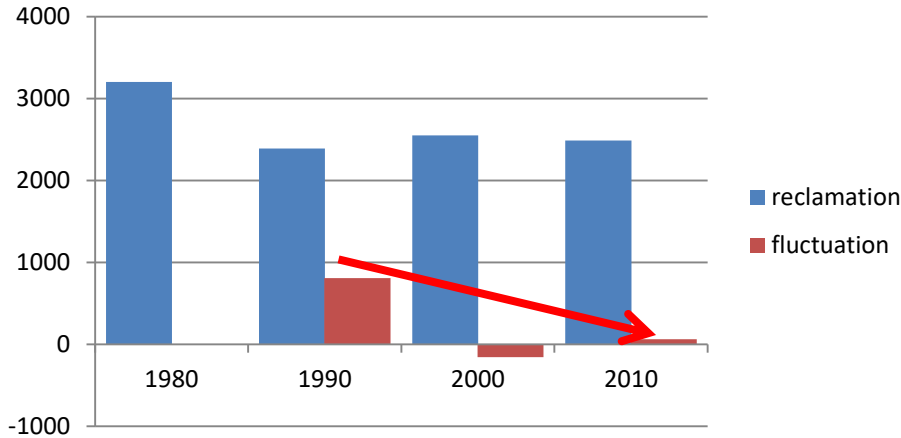
Q Current status of Korean blue carbon

Korean blue carbon focuses on the current status of salt marsh and seagrass vegetation in addition to the carbon deposition that occurs in our wide tidal flats.



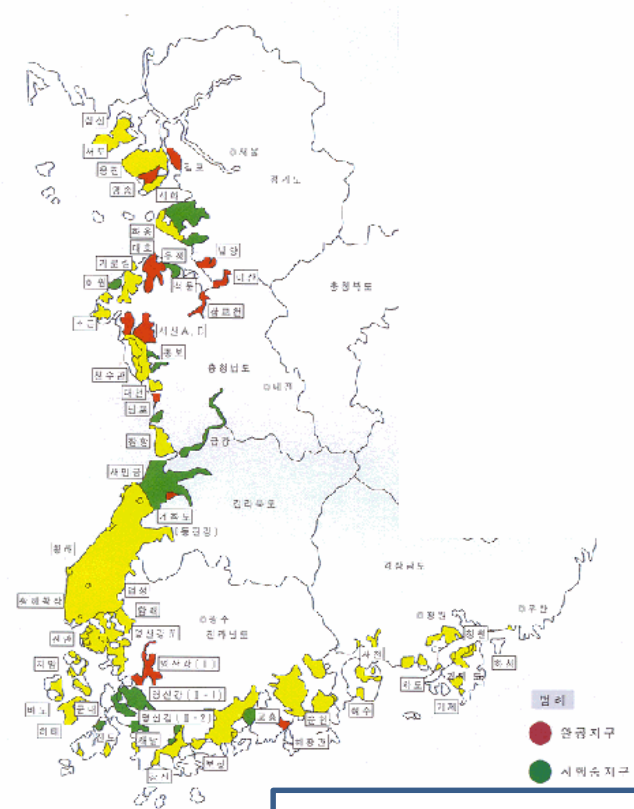
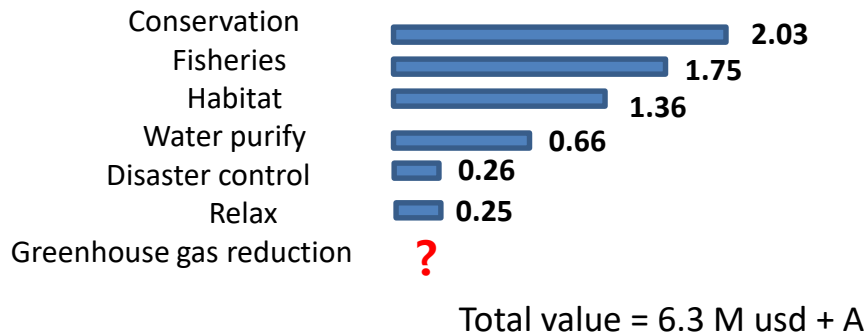
Total of 25 area sampled

03 Currently situation on tidal flats in Korea



About 810 km² of tidal flats have been reclaimed for 30 yr

Calculated economic value of tidal flats (M usd/km²)



- Reclaimed until 2010
- Plan to reclaim

03 Carbon measurement on tidal marsh



Tidal Salt marsh carbon pools

Total of 95 species of salt marsh identified around Korea
It depend on the various environmental factors such as salinity, elevation etc



03 Carbon measurement on tidal marsh



Phragmites australis (a perennial plant)

Cosmopolitan species – world wide

Living in estuary, super-littoral tidal area

Community by roots

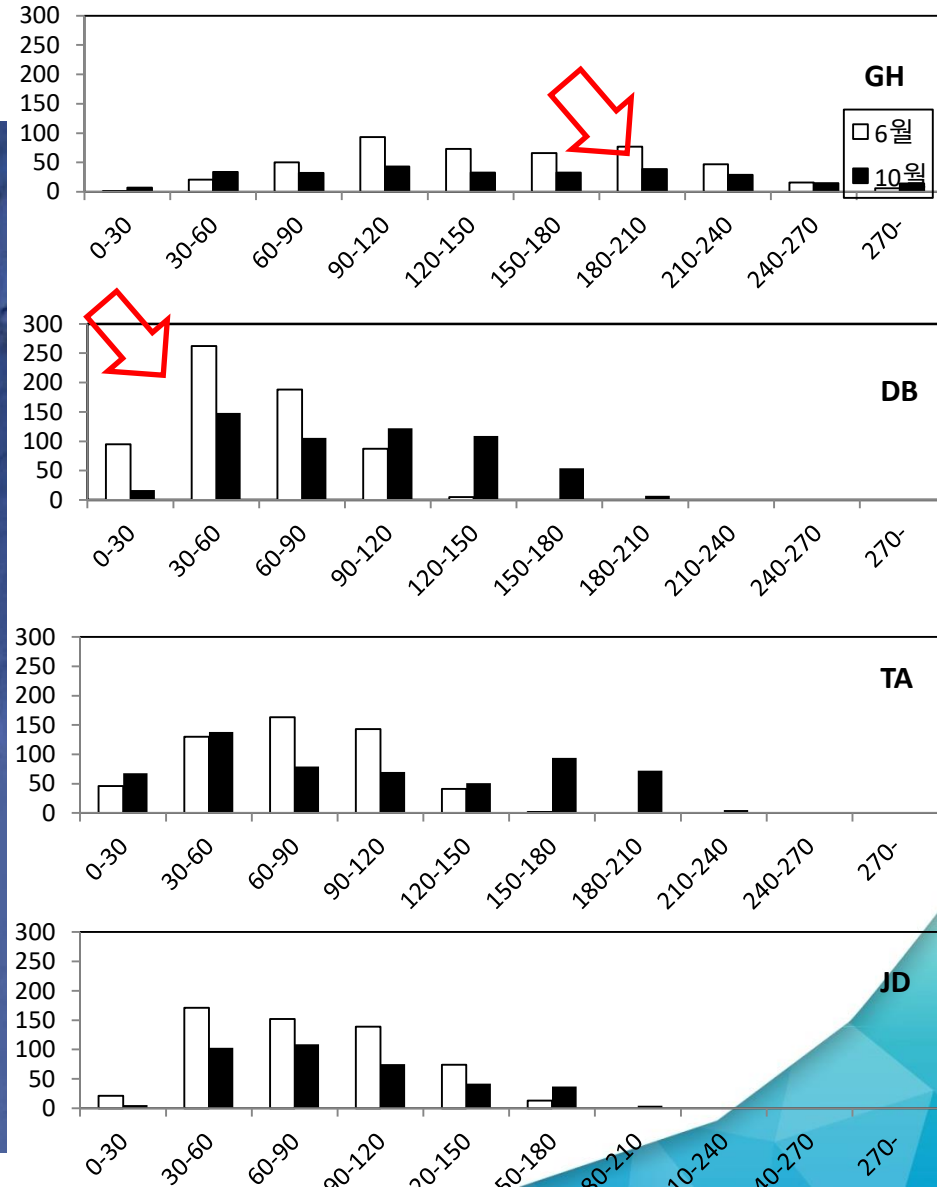
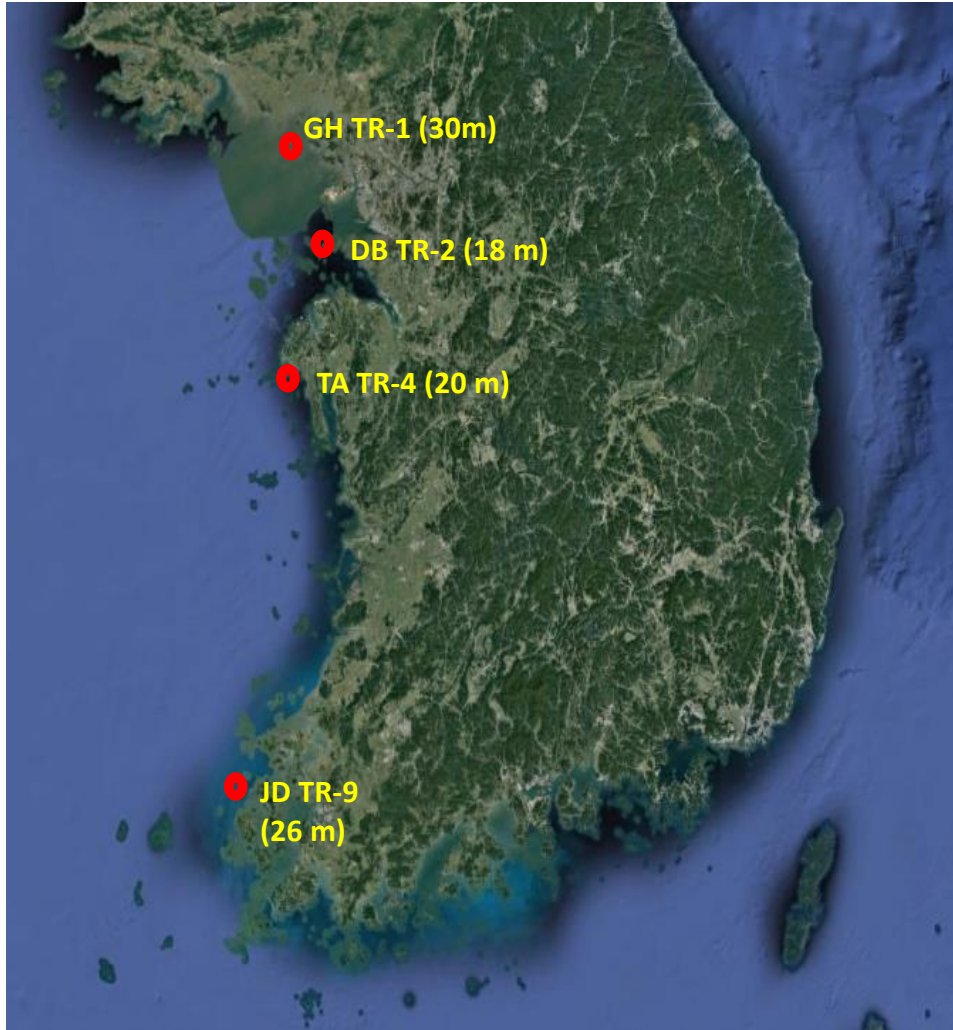
1-3m length, growing for summer season only



03 Carbon measurement on tidal marsh

Phragmites australis

A different growth pattern on each area



03 Carbon measurement on tidal marsh



Phragmites australis

localty		Mean DWt (gDWt/m ²)	Mean Den. (ind./m ²)	Size(ha)	Standing crop (ton/ha)
GH	Kanghwa	1417.5	185	30.8	436.6
DB	Daebu	710.4	306	33.3	236.6
TA	Taeon	799.2	275	7.5	59.9
SS	Seosan	693.9	243	3.5	24.3
BI	Biin	318.4	144	11.3	35.9
JD	Jeungdo	239.0	239	22.4	53.5



Total area of west coast – 430 ha

Total area of Southern coast – 4800 ha

Total of carbon standing crop
calculated to = 3,900 tonC/yr?+A

47,000 \$/yr + A

03 Carbon measurement on tidal marsh



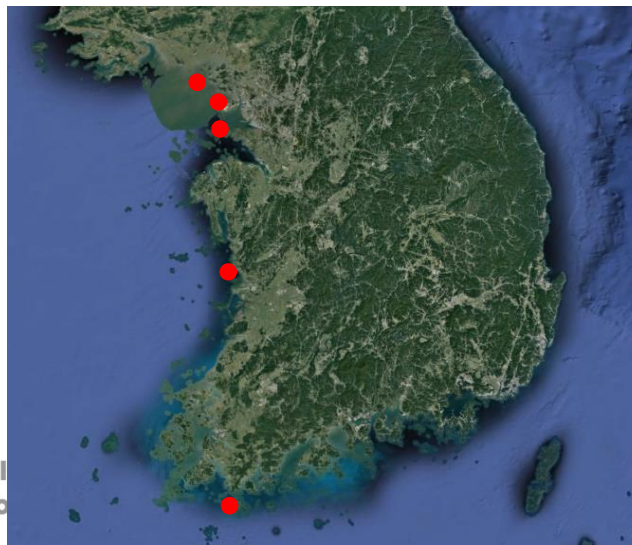
Spartina anglica

Syn. Spartina townsendii

Com. cordgrass, English cordgrass, rice grass, saltmarsh grass

Originated by southern coast of England
Immigrated to China and Korea
Founded in 2010 Kanghwa Island in Korea

Designated to Harmful alien biota in 2016
Starting to removal activities from 2017 by Gov.



03 Carbon measurement on tidal marsh



Spartina anglica



About 1.2 ha covered in upper tidal area
Be expanded gradually on the spatial scale annually
Intrude to *Suaeda* and *Phragmites* community

Before weed



weeding



After 2-month



03 Carbon measurement on tidal marsh



Spartina anglica

Comparison to the standing crop in south Ganghwa Island

Species	density (no. stem/m ²)	Mean length (cm)	Biomass stem/root (gWWt/m ²)	Standing crop (Mg/ha)
P. australia	326	96.7	1,716/798	25.14
Cord grass	334	43.0	1,544/2,192	37.36
S.japonica	167	15.8	112/18	1.03

Check point

Alien species?-Yes / Harmful biota? - now designated but..

Is it affected to benthic community? – maybe.

03 Carbon measurement on tidal marsh

Suaeda Japonica

Living in East Asia (Yellow Sea)
An annual plant
Aggregated on high tidal area

Distributed on mud tidal flats in Kyunggi-Bay
Well protected by inaccessible space



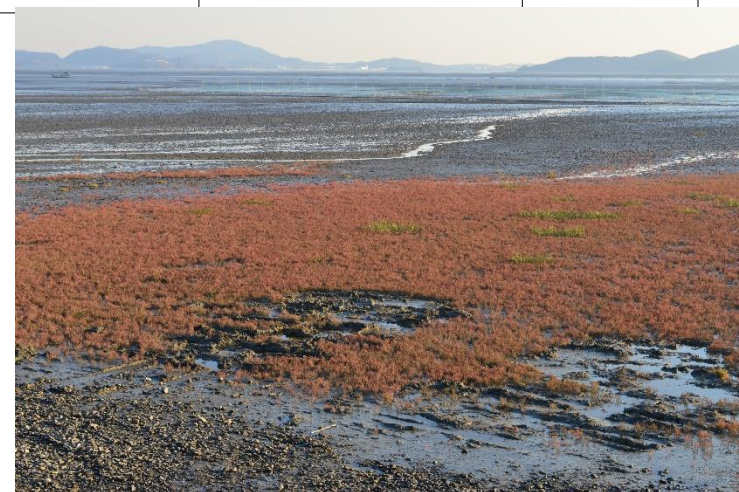
03 Carbon measurement on tidal marsh

Suaeda Japonica

Total calculated area of salt marshes at each region

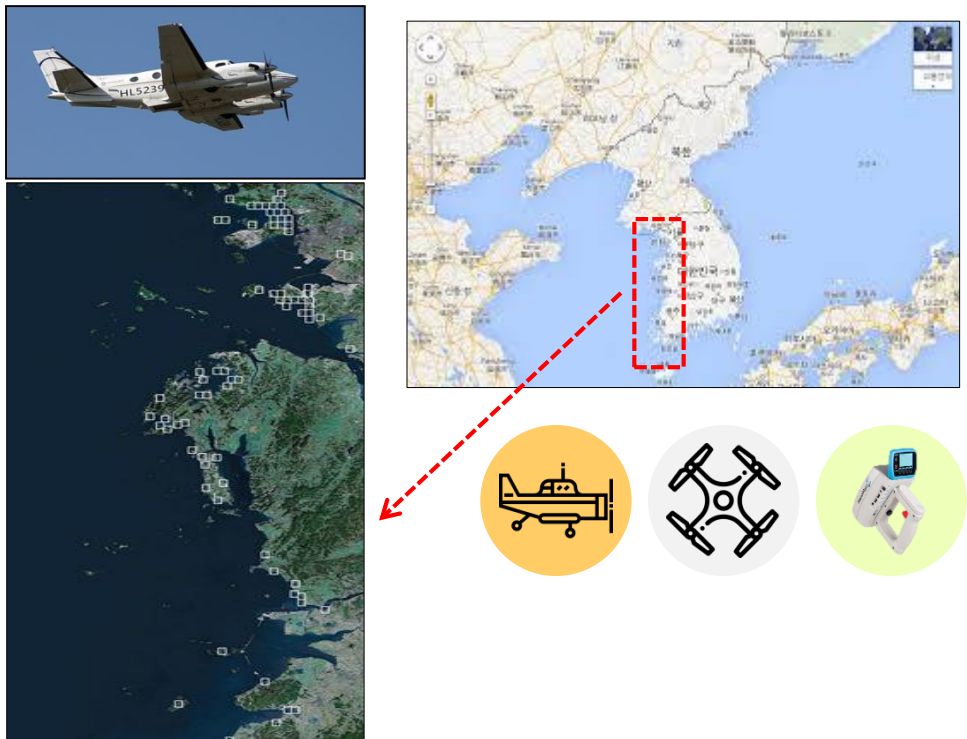
species	Inchon	Kyunggi	Chungcheong	Jenna(w)	Jeonla (s)	%
<i>S.japonica</i>	416	53	5	2	1	83.5
<i>P.australis</i>	14	24	13			5.8
<i>S.anglica</i>	1					
Micel.	4	19	5	1	4	0.7
total	435	96	23	3	5	100.0

Dominated by a huge space than any other halo-plant
 Low standing crop comparing to reed and cord grass
 Available to plantation



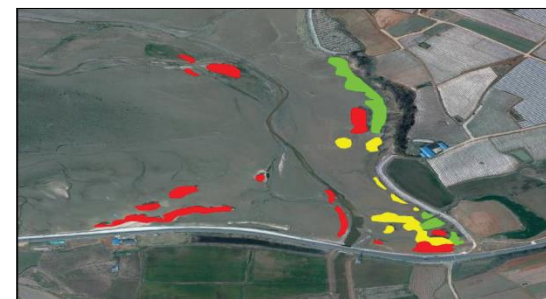
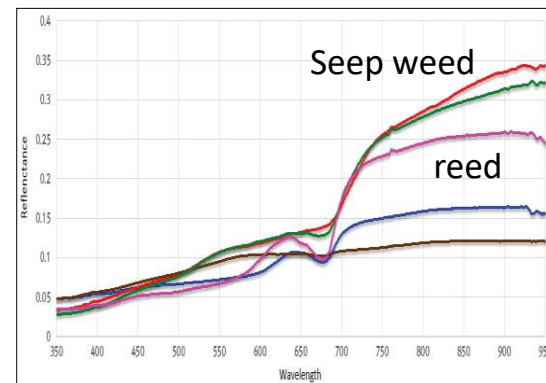
03 Carbon measurement on tidal marsh Large scale measurement

- Low altitude photographing using Ultra spectro-radiometer



Total of 4 family levels including reed, cord grass and seep weed be identified on the image

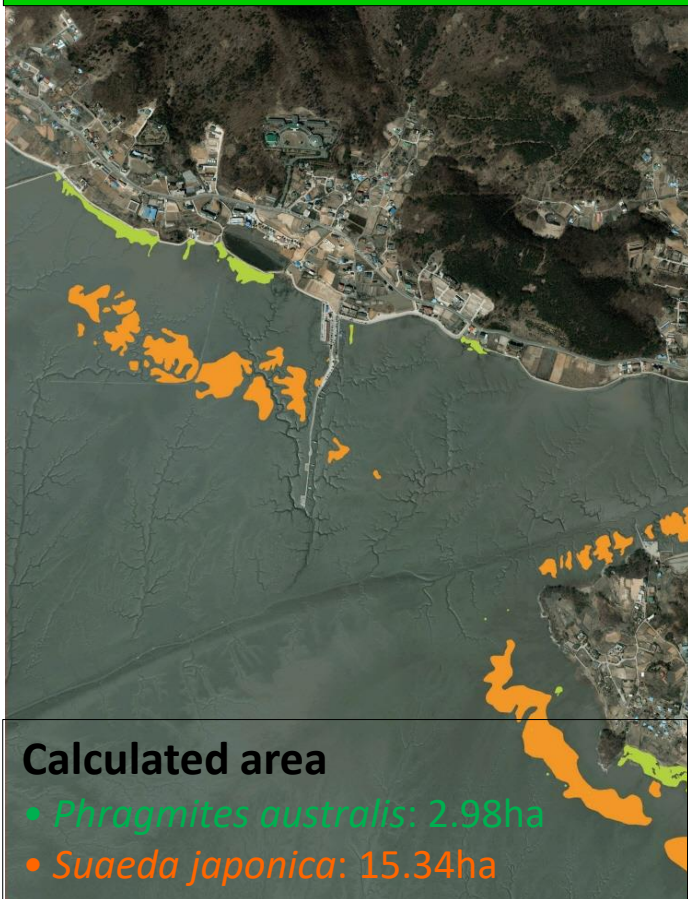
- Light emission analyzing and Identification



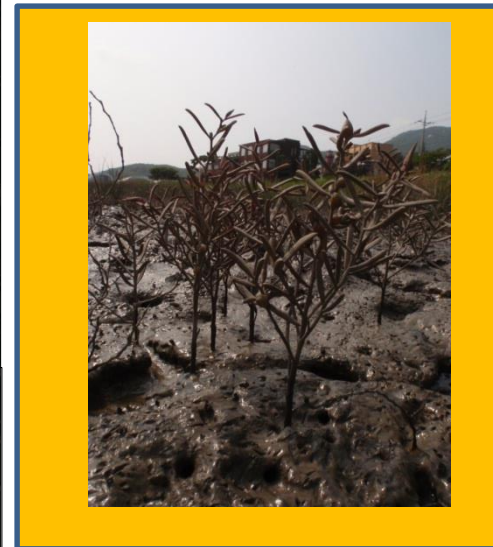
03 Carbon measurement on tidal marsh

Large scale measurement

West coast of Korea



Southern coast



To calculate spatial area based on density at each species

03 Carbon measurement on tidal marsh



Tidal Salt marsh carbon pools result by pilot study (2017)

Summarized standing crop on major tidal marshes on south coast of Kanghwa Isl.

Species	density (no. stem/m ²)	Mean length (cm)	Biomass stem/root (gWWt/m ²)	Standing crop (Mg/ha)	Carbon stock range (IPCC 2013) (Mg/ha)
Reed	326	96.7	1,716/798	25.14	Salt marshes (16-122)
Cord grass	334	43.0	1,544/2,192	37.36	
Seep weed	167	15.8	112/18	1.03	



REED
Phragmites australis



Cord grass
Spartina Anglica



Seepweed
Suaeda japonica

Determining the carbon pool in tidal salt marsh referred by BCI



Discussion



For the future

- What scales up on carbon pools on the coasts in Korea?
- Which is the best method for calculate the carbon storage considering to economic value?
- How can be expanded the Blue Carbon for the future ?

And ...

- To advance blue carbon introducing into carbon market
- To developed tidal wetland and seagrass restoration
- To join with national partners to identify opportunities to incorporate blue carbon benefits into international policies and regulations concerning to coastal restoration efforts.
 - Blue Carbon Initiative, Blue Carbon Partnership



Tidal salt marshes in Korea

