<Supplementary Materials>

The first national scale evaluation of organic carbon stocks and sequestration rates of coastal sediments along the west, south, and east coasts of South Korea

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Table of Contents

Supplementary Tables

Supplementary Figures

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Table S1. Organic carbon content measured in the coastal sediments (salt marshes and bare tidal flats) of South Korea.

Location	Sampling year	Latitude	Longitude	Habitat[a]	Dominant halophyte	Core type[b]	Core depth (cm)	Organic carbon stock[c] (Mg C ha^{-1})	Ref
Ganghwa, Incheon	2017	37°36'29"N	126°23'03"E	SM	*Phragmites* sp.	M	60	**92**	**This study**
	2017			SM	*Phragmites* sp.	M	75	**80**	
	2017			SM	*Phragmites* sp.	M	80	**78**	
	2017			SM	*Phragmites* sp.	M	100	**65**	
	2017			SM	*Phragmites* sp.	M	90	**64**	
	2018			SM	*Phragmites* sp.	M	100	**96**	
	2019			SM	*Phragmites* sp.	A	70	**117**	
	2019			SM	*Phragmites* sp.	A	70	**85**	
	2020			SM	*Phragmites* sp.	A	70	**107**	
	2017	37°36'24"N	126°23'07"E	B	Bare	M	85	**44**	
	2017			B	Bare	M	50	**40**	
	2017			B	Bare	M	90	**43**	
	2018			B	Bare	M	100	**100**	
	2019			B	Bare	A	70	**97**	
	2019			B	Bare	A	70	**74**	
	2020			B	Bare	A	70	**88**	
	2017	37°35'42"N	126°27'48"E	SM	*Spartina* sp.	M	100	**62**	
	2018			SM	*Spartina* sp.	M	100	**83**	
	2019			SM	*Spartina* sp.	A	70	**77**	
	2019			SM	*Spartina* sp.	A	70	**59**	
	2020			SM	*Spartina* sp.	A	70	**100**	
	2017	37°35'39"N	126°27'52"E	B	Bare	M	60	**52**	
	2017			B	Bare	M	95	**31**	
	2018			B	Bare	M	100	**77**	
	2019			B	Bare	A	70	**46**	
	2019			B	Bare	A	70	**40**	
	2019			B	Bare	A	60	**61**	
	2020			B	Bare	A	70	**45**	
	2017	37°35'17"N	126°30'07"E	SM	*Suaeda* sp.	M	100	**161**	
	2017			SM	*Phragmites* sp.	M	70	**115**	
	2018			SM	*Suaeda* sp.	M	95	**93**	
	2019			SM	*Suaeda* sp.	A	70	**96**	
	2019			SM	*Suaeda* sp.	A	70	**68**	

Table S1. (continued).

Location	Sampling year	Latitude	Longitude	Habitat[a]	Dominant halophyte	Core type[b]	Core depth (cm)	Organic carbon stock[C] (Mg C ha^{-1})	Ref
Ganghwa, Incheon	2020	37°35'17"N	126°30'07"E	SM	*Suaeda* sp.	A	70	**94**	**This study**
	2017	37°35'21"N	126°30'12"E	B	Bare	M	100	**111**	
	2017			B	Bare	M	90	**104**	
	2017			B	Bare	M	100	**90**	
	2017			B	Bare	M	90	**82**	
	2017			B	Bare	M	100	**72**	
	2018			B	Bare	M	100	**121**	
	2019			B	Bare	A	60	**63**	
	2019			B	Bare	A	60	**67**	
	2019			B	Bare	A	60	**80**	
	2020			B	Bare	A	70	**78**	
Youngjong, Incheon	2018	37°31'50"N	126°30'13"E	SM	*Suaeda* sp.	M	100	**81**	
	2019			SM	*Suaeda* sp.	A	70	**55**	
	2018			B	Bare	M	100	**84**	
	2019			B	Bare	A	70	**82**	
Siheung, Gyeonggi	2018	37°23'40"N	126°46'16"E	SM	*Phragmites* sp.	M	100	**73**	
	2019			SM	*Phragmites* sp.	A	70	**65**	
	2018			SM	*Phragmites* sp.	M	100	**109**	
	2019			SM	*Phragmites* sp.	A	70	**58**	
	2018			B	Bare	M	100	**56**	
	2019			B	Bare	A	70	**100**	
	2018			B	Bare	M	100	**145**	
	2019			B	Bare	A	70	**56**	
Daebu, Gyeonggi	2018	37°12'49"N	126°35'21"E	SM	*Suaeda* sp.	M	100	**52**	
	2019			SM	*Suaeda* sp.	A	70	**77**	
	2018	37°15'59"N	126°33'24"E	B	Bare	M	95	**51**	
	2019			B	Bare	A	60	**65**	
	2018	37°13'02"N	126°34'34"E	SM	*Phragmites* sp.	M	95	**56**	
	2019			SM	*Phragmites* sp.	A	70	**56**	
	2018	37°16'57"N	126°34'04"E	B	Bare	M	100	**60**	
	2019			B	Bare	A	65	**95**	
Hwaseong, Gyeonggi	2018	37°03'13"N	126°45'15"E	SM	*Suaeda* sp.	M	95	**59**	
	2019			SM	*Suaeda* sp.	A	70	**77**	
	2018	37°04'19"N	126°43'48"E	B	Bare	M	100	**56**	
	2019			B	Bare	A	70	**125**	

Table S1. (continued).

Location	Sampling year	Latitude	Longitude	Habitat[a]	Dominant halophyte	Core type[b]	Core depth (cm)	Organic carbon stock[C] (Mg C ha^{-1})	Ref
Hwaseong, Gyeonggi	2018	37°09'02"N	126°41'48"E	SM	*Suaeda* sp.	M	85	**80**	**This study**
	2019			SM	*Suaeda* sp.	A	60	**52**	
	2018	37°07'03"N	126°40'57"E	B	Bare	M	85	**35**	
	2019			B	Bare	A	70	**53**	
Garolim Bay, Chungnam	2017	36°54'57"N	126°18'49"E	SM	*Suaeda* sp.	M	80	**44**	
	2017			B	Bare	M	100	**33**	
	2018			B	Bare	M	100	**36**	
	2019			SM	*Suaeda* sp.	A	60	**26**	
	2019			SM	*Suaeda* sp.	A	60	**26**	
	2019			SM	*Suaeda* sp.	A	60	**40**	
	2019			SM	*Suaeda* sp.	A	60	**37**	
	2019			B	Bare	A	60	**30**	
	2019			B	Bare	A	60	**26**	
	2019			B	Bare	A	60	**32**	
	2019			B	Bare	A	60	**14**	
	2020			SM	*Suaeda* sp.	A	45	**23**	
	2020			B	Bare	A	60	**31**	
	2017	36°52'37"N	126°21'41"E	SM	*Suaeda* sp.	M	85	**38**	
	2017			B	Bare	M	65	**28**	
	2018			B	Bare	M	100	**42**	
	2019			B	Bare	A	60	**36**	
	2020			B	Bare	A	60	**21**	
	2017	36°55'23"N	126°25'02"E	SM	*Suaeda* sp.	M	85	**25**	
	2017			B	Bare	M	100	**41**	
	2018			B	Bare	M	100	**36**	
	2019			SM	*Suaeda* sp.	A	60	**64**	
	2019			SM	*Suaeda* sp.	A	60	**39**	
	2019			SM	*Suaeda* sp.	A	60	**38**	
	2019			SM	*Suaeda* sp.	A	60	**32**	
	2019			B	Bare	A	60	**56**	
	2019			B	Bare	A	60	**57**	
	2019			B	Bare	A	60	**22**	
	2019			B	Bare	A	60	**21**	
	2020			SM	*Suaeda* sp.	A	60	**24**	
	2020			B	Bare	A	60	**22**	

Table S1. (continued).

Location	Sampling year	Latitude	Longitude	Habitat[a]	Dominant halophyte	Core type[b]	Core depth (cm)	Organic carbon stock[C] (Mg C ha^{-1})	Ref
Garolim Bay, Chungnam	2017	36°58'25"N	126°23'04"E	B	Bare	M	100	**42**	**This study**
	2017			SM	*Suaeda* sp.	M	100	**32**	
	2018			B	Bare	M	100	**39**	
	2019			B	Bare	A	60	**58**	
	2020			B	Bare	A	60	**28**	
Geunheung, Chungnam	2018	36°43'02"N	126°16'23"E	B	Bare	M	75	**22**	
	2019			B	Bare	A	60	**20**	
	2018	36°43'05"N	126°14'27"E	B	Bare	M	70	**21**	
	2019			SM	*Phragmites* sp.	A	60	**20**	
	2018	36°43'47"N	126°11'55"E	B	Bare	M	80	**47**	
	2019			B	Bare	A	60	**11**	
	2018	36°44'51"N	126°11'10"E	B	Bare	M	80	**31**	
	2019			B	Bare	A	50	**8**	
Ocheon, Chungnam	2018	36°20'43"N	126°35'09"E	B	Bare	M	70	**75**	
	2019			SM	*Phragmites* sp.	A	60	**51**	
	2018	36°26'23"N	126°31'50"E	B	Bare	M	85	**36**	
	2019			B	Bare	A	60	**18**	
	2018	36°33'07"N	126°27'51"E	B	Bare	M	75	**48**	
	2019			B	Bare	A	60	**46**	
	2018	36°34'50"N	126°27'21"E	B	Bare	M	75	**33**	
	2019			B	Bare	A	60	**26**	
Biin, Chungnam	2018	36°08'21"N	126°34'17"E	SM	*Phragmites* sp.	M	60	**20**	
	2019			SM	*Phragmites* sp.	A	60	**13**	
	2018	36°08'59"N	126°30'25"E	B	Bare	M	100	**70**	
	2019			B	Bare	A	60	**51**	
	2018	36°08'00"N	126°33'49"E	B	Bare	M	100	**45**	
	2019			B	Bare	A	60	**58**	
	2018	36°04'33"N	126°37'51"E	B	Bare	M	100	**32**	
	2019			B	Bare	A	60	**69**	
	2018	36°02'24"N	126°39'29"E	SM	*Phragmites* sp.	M	85	**63**	
	2019			SM	*Phragmites* sp.	A	60	**35**	
Seonyudo, Jeonbuk	2018	35°49'04"N	126°24'47"E	SM	*Suaeda* sp.	M	85	**16**	
	2019			SM	*Suaeda* sp.	A	60	**7**	
	2018	35°49'24"N	126°24'45"E	B	Bare	M	80	**13**	
	2019			B	Bare	A	60	**1**	

Table S1. (continued).

Location	Sampling year	Latitude	Longitude	Habitat[a]	Dominant halophyte	Core type[b]	Core depth (cm)	Organic carbon stock[C] (Mg C ha^{-1})	Ref
Seonyudo, Jeonbuk	2018	35°48'53"N	126°24'43"E	SM	*Suaeda* sp.	M	100	**19**	**This study**
	2019			SM	*Suaeda* sp.	A	60	**4**	
	2018	35°49'12"N	126°24'58"E	B	Bare	M	95	**33**	
	2019			B	Bare	A	60	**11**	
Gomso Bay, Jeonbuk	2018	35°32'14"N	126°35'47"E	SM	*Suaeda* sp.	M	100	**41**	
	2018	35°31'58"N	126°30'56"E	B	Bare	M	100	**25**	
	2018	35°32'51"N	126°40'33"E	SM	*Phragmites* sp.	M	100	**45**	
	2018	35°34'40"N	126°39'47"E	B	Bare	M	100	**41**	
Hampyeong, Jeonnam	2018	35°07'51"N	126°20'29"E	SM	*Phragmites* sp.	M	60	**33**	
	2019			SM	*Phragmites* sp.	A	70	**24**	
	2018	35°06'19"N	126°26'37"E	B	Bare	M	80	**8**	
	2019			SM	*Phragmites* sp.	A	70	**14**	
	2018	35°05'13"N	126°26'23"E	B	Bare	M	90	**7**	
	2019			B	Bare	A	60	**17**	
	2018	35°05'05"N	126°09'55"E	B	Bare	M	90	**14**	
	2019			B	Bare	A	70	**21**	
	2018	35°06'12"N	126°20'06"E	SM	*Phragmites* sp.	M	100	**32**	
	2019			SM	*Phragmites* sp.	A	70	**10**	
Sinan, Jeonnam	2018	34°58'06"N	126°10'01"E	SM	*Phragmites* sp.	M	100	**34**	
	2019			SM	*Phragmites* sp.	A	70	**46**	
	2019			SM	*Phragmites* sp.	A	70	**38**	
	2019			SM	*Phragmites* sp.	A	70	**37**	
	2019			SM	*Phragmites* sp.	A	70	**32**	
	2019			SM	*Phragmites* sp.	A	65	**24**	
	2019			SM	*Phragmites* sp.	A	65	**21**	
	2019			B	Bare	A	70	**53**	
	2019			B	Bare	A	70	**52**	
	2019			B	Bare	A	70	**47**	
	2019			B	Bare	A	70	**44**	
	2019			B	Bare	A	70	**36**	
	2019			B	Bare	A	70	**32**	
	2020			SM	*Phragmites* sp.	A	70	**54**	
	2018	34°58'06"N	126°10'01"E	B	Bare	M	100	**31**	
	2019			B	Bare	A	70	**30**	
	2020			B	Bare	A	70	**29**	

Table S1. (continued).

Location	Sampling year	Latitude	Longitude	Habitat[a]	Dominant halophyte	Core type[b]	Core depth (cm)	Organic carbon stock[C] (Mg C ha^{-1})	Ref
Sinan, Jeonnam	2018	35°00'14"N	126°09'56"E	SM	*Suaeda* sp.	M	85	**52**	**This study**
	2018			B	Bare	M	100	**45**	
	2019			SM	*Suaeda* sp.	A	70	**60**	
	2019			B	Bare	A	70	**47**	
	2020			SM	*Suaeda* sp.	A	70	**47**	
	2018	34°59'18"N	126°08'26"E	B	Bare	M	100	**27**	
	2019			B	Bare	A	70	**30**	
	2020			B	Bare	A	70	**25**	
Aphaedo, Jeonnam	2019	34°50'29"N	126°15'56"E	SM	*Phragmites* sp.	A	70	**53**	
	2019	34°50'02"N	126°20'40"E	SM	*Suaeda* sp.	A	70	**42**	
	2019	34°53'23"N	126°19'40"E	SM	*Phragmites* sp.	A	60	**31**	
	2019	34°53'08"N	126°16'46"E	B	Bare	A	70	**43**	
	2019	34°50'45"N	126°18'57"E	B	Bare	A	70	**21**	
Gangjin Bay, Jeonnam	2018	34°29'28"N	126°45'04"E	SM	*Phragmites* sp.	M	100	**67**	
	2018			B	Bare	M	100	**41**	
	2019			SM	*Phragmites* sp.	A	60	**119**	
	2019			B	Bare	A	60	**79**	
	2018	34°32'58"N	126°47'58"E	SM	*Phragmites* sp.	M	60	**98**	
	2019			SM	*Suaeda* sp.	A	60	**70**	
	2018	34°29'45"N	126°47'32"E	B	Bare	M	60	**51**	
	2019			B	Bare	A	60	**31**	
	2018	34°37'20"N	126°46'53"E	SM	*Phragmites* sp.	M	60	**91**	
	2019			SM	*Phragmites* sp.	A	60	**107**	
	2018	34°32'25"N	126°45'58"E	B	Bare	M	100	**51**	
	2019			B	Bare	A	60	**26**	
Deukryang Bay, Jeonnam	2019	34°44'32"N	127°17'48"E	SM	*Phragmites* sp.	A	60	**36**	
	2019			SM	*Phragmites* sp.	A	60	**25**	
	2019	34°40'12"N	127°17'06"E	SM	*Phragmites* sp.	A	60	**20**	
	2019	34°34'19"N	126°58'48"E	B	Bare	A	60	**40**	
	2019	34°40'51"N	127°14'07"E	B	Bare	A	60	**12**	
	2019	34°35'27"N	127°09'58"E	B	Bare	A	60	**6**	
Suncheon Bay, Jeonnam	2017	34°52'28"N	127°30'12"E	SM	*Phragmites* sp.	M	100	**80**	
	2017			SM	*Phragmites* sp.	M	60	**86**	
	2017			SM	*Phragmites* sp.	M	100	**69**	
	2018			SM	*Phragmites* sp.	M	100	**73**	

Table S1. (continued).

Location	Sampling year	Latitude	Longitude	Habitat[a]	Dominant halophyte	Core type[b]	Core depth (cm)	Organic carbon stock[C] (Mg C ha^{-1})	Ref
Suncheon Bay, Jeonnam	2019	34°52'28"N	127°30'12"E	SM	*Phragmites* sp.	A	60	**116**	**This study**
	2019			SM	*Phragmites* sp.	A	60	**122**	
	2019			SM	*Phragmites* sp.	A	60	**92**	
	2019			SM	*Phragmites* sp.	A	60	**82**	
	2019			B	Bare	A	60	**99**	
	2019			B	Bare	A	60	**89**	
	2019			B	Bare	A	60	**79**	
	2019			B	Bare	A	60	**71**	
	2020			SM	*Phragmites* sp.	A	60	**116**	
	2017	34°52'05"N	127°31'05"E	SM	*Phragmites* sp.	M	100	**106**	
	2018			SM	*Phragmites* sp.	M	85	**60**	
	2019			SM	*Phragmites* sp.	A	60	**57**	
	2019			SM	*Phragmites* sp.	A	60	**69**	
	2019			SM	*Phragmites* sp.	A	60	**87**	
	2019			SM	*Phragmites* sp.	A	60	**80**	
	2019			B	Bare	A	60	**49**	
	2019			B	Bare	A	60	**74**	
	2019			B	Bare	A	60	**64**	
	2019			B	Bare	A	60	**58**	
	2020			SM	*Phragmites* sp.	A	60	**76**	
	2017	34°50'48"N	127°29'36"E	B	Bare	M	100	**82**	
	2018			B	Bare	M	100	**70**	
	2019			B	Bare	A	60	**76**	
	2020			B	Bare	A	60	**90**	
	2017	34°51'12"N	127°31'23"E	B	Bare	M	100	**61**	
	2018			B	Bare	M	90	**61**	
	2019			B	Bare	A	60	**56**	
	2020			B	Bare	A	60	**79**	
Yeoza Bay, Jeonnam	2018	34°46'05"N	127°34'29"E	B	Bare	M	90	**72**	
	2019			B	Bare	A	60	**40**	
	2018	34°47'10"N	127°23'22"E	SM	*Phragmites* sp.	M	85	**86**	
	2019			SM	*Phragmites* sp.	A	50	**33**	
	2018	34°50'19"N	127°27'01"E	SM	*Phragmites* sp.	M	90	**72**	
	2019			SM	*Phragmites* sp.	A	60	**50**	
	2018	34°44'26"N	127°35'03"E	B	Bare	M	100	**76**	

Table S1. (continued).

Location	Sampling year	Latitude	Longitude	Habitat[a]	Dominant halophyte	Core type[b]	Core depth (cm)	Organic carbon stock[C] (Mg C ha^{-1})	Ref
Yeoza Bay, Jeonnam	2019	34°44'26"N	127°35'03"E	B	Bare	A	60	**41**	**This study**
	2018	34°50'31"N	127°32'22"E	SM	*Phragmites* sp.	M	100	**74**	
	2019			SM	*Phragmites* sp.	A	60	**95**	
	2018	34°42'20"N	127°24'10"E	B	Bare	M	60	**60**	
	2019			B	Bare	A	60	**36**	
Jinhae Bay, Gyeongnam	2018	35°02'59"N	128°22'30"E	B	Bare	M	100	**83**	
	2019			B	Bare	A	50	**25**	
	2018	35°08'50"N	128°41'26"E	B	Bare	M	40	**103**	
	2019			B	Bare	A	60	**144**	
	2018	35°05'53"N	128°26'49"E	SM	*Phragmites* sp.	M	60	**120**	
	2019			SM	*Phragmites* sp.	A	60	**139**	
	2018	35°07'11"N	128°32'14"E	B	Bare	M	60	**106**	
	2018	35°05'13"N	128°34'52"E	B	Bare	M	80	**81**	
	2019			B	Bare	A	60	**25**	
	2019	35°12'59"N	128°37'26"E	B	Bare	A	60	**101**	
Nakdong River estuary, Gyeongnam	2017	35°04'19"N	128°56'41"E	B	Bare	M	60	**17**	
	2017	35°03'37"N	128°54'41"E	B	Bare	M	100	**11**	
	2017	35°03'34"N	128°53'50"E	B	Bare	M	90	**10**	
	2017	35°03'27"N	128°56'24"E	SM	*Phragmites* sp.	M	100	**26**	
	2018			SM	*Phragmites* sp.	M	100	**26**	
	2018			B	Bare	M	100	**14**	
	2019			SM	*Phragmites* sp.	A	60	**42**	
	2019			SM	*Phragmites* sp.	A	60	**14**	
	2019			B	Bare	A	60	**53**	
	2019			B	Bare	A	60	**24**	
	2019			B	Bare	A	60	**23**	
	2019			B	Bare	A	60	**21**	
	2019			B	Bare	A	60	**29**	
	2019			B	Bare	A	60	**16**	
	2020			SM	*Phragmites* sp.	A	60	**79**	
	2020			B	Bare	A	60	**61**	
	2017	35°04'42"N	128°55'49"E	SM	*Phragmites* sp.	M	100	**49**	
	2018			SM	*Phragmites* sp.	M	100	**65**	
	2019			SM	*Phragmites* sp.	A	60	**50**	
	2020			SM	*Phragmites* sp.	A	60	**83**	

Table S1. (continued).

Location	Sampling year	Latitude	Longitude	Habitat[a]	Dominant halophyte	Core type[b]	Core depth (cm)	Organic carbon stock[C] (Mg C ha^{-1})	Ref
Nakdong River estuary, Gyeongnam	2017	35°04'06"N	128°52'22"E	SM	*Phragmites* sp.	M	90	**19**	**This study**
	2018			SM	*Phragmites* sp.	M	65	**11**	
	2018			B	Bare	M	100	**22**	
	2019			SM	*Phragmites* sp.	A	60	**39**	
	2019			SM	*Phragmites* sp.	A	60	**36**	
	2019			B	Bare	A	60	**7**	
	2019			B	Bare	A	60	**7**	
	2019			B	Bare	A	60	**5**	
	2019			B	Bare	A	60	**6**	
	2019			B	Bare	A	60	**5**	
	2019			B	Bare	A	60	**4**	
	2020			SM	*Phragmites* sp.	A	60	**38**	
	2020			B	Bare	A	60	**23**	
Uljin, Gyeongbuk	2018	36°53'03"N	129°24'58"E	B	Bare	M	60	**15**	
	2018			B	Bare	M	60	**11**	
	2018			B	Bare	M	60	**15**	
	2018	36°50'31"N	129°26'04"E	SM	*Carex* sp.	M	60	**17**	
	2018			SM	*Carex* sp.	M	60	**17**	
	2018			SM	*Carex* sp.	M	60	**16**	
	2018	36°47'03"N	129°27'56"E	B	Bare	M	60	**24**	
	2018			B	Bare	M	60	**20**	
	2018			B	Bare	M	60	**16**	
	2018	36°41'06"N	129°27'53"E	SM	*Carex* sp.	M	60	**25**	
	2018			SM	*Carex* sp.	M	60	**20**	
	2018			SM	*Carex* sp.	M	60	**19**	

[a]SM: Salt marsh, B: Bare tidal flat
[b]M: Multisampler core, A: Auger core
[c]Organic carbon stock normalized to the amount for 1 m depth

Table S2. Mean Bias Error (MBE) and Root Mean Square Error (RMSE) of the delineation results for tidal flats between the Electronic Navigational Chart (ENC) and the Ministry of Oceans and Fisheries (MOF) (Data of 2018). To evaluate the delineation results for tidal flats, 2,252 grid zones of tidal flats were selected along the west and south coasts.

	Absolute value	**Compared to area of each grid zone (%)**	**Compared to mean area of 2,252 grid zones (%)**
MBE	8,690	1.2	2.8
RMSE	56,125	7.9	18.0
Area of each grid zone	710,000 m^2	-	-
Mean area of grid zones (MOF)	307,068 m^2	-	-
Mean area of grid zones (ENC)	315,759 m^2	-	-

Table S3. The two types of coring equipment used in this study.

Coring equipment 1	Coring equipment 2
 **Multisampler core (Eijelkamp)** (Source: https://en.eijkelkamp.com)	 **Gouge auger core (Van Walt)** (Source: https://www.vanwalt.com)
Advantage • Suitable for muddy sediments (high water content) • Less disturbance on bulk density of core sediments • Less sediment compaction during sampling process	**Advantage** • Suitable for sandy sediments (hard substrate) • Demand untrained/inexperienced manpower • Specialized at coring rooted sediments in salt marsh
Disadvantage • Unsuitable for sandy sediments (hard substrate) • Demand trained/skilled manpower	**Disadvantage** • Unsuitable for muddy sediments (high water content) • More disturbance on bulk density of core sediments

Table S4. Organic carbon stock and sequestration rate in five target regions (Ganghwa, Garolim Bay, Sinan, Suncheon Bay, and Nakdong River estuary) over four years (2017 to 2020).

Location	Organic carbon stock (Mg C ha^{-1})				Organic carbon sequestration rate (Mg C ha^{-1} yr^{-1})			
	2017	2018	2019	2020	2017	2018	2019	2020
Ganghwa	77 (±8) (n = 18)	89 (±6) (n = 6)	74 (±6) (n = 14)	85 (±9) (n = 6)	0.53 (±0.05) (n = 18)	0.62 (±0.04) (n = 6)	0.51 (±0.04) (n = 14)	0.59 (±0.06) (n = 6)
Garolim Bay	35 (±2) (n = 8)	38 (±2) (n = 4)	36 (±3) (n = 18)	25 (±2) (n = 6)	0.14 (±0.01) (n = 8)	0.16 (±0.01) (n = 4)	0.15 (±0.01) (n = 18)	0.10 (±0.01) (n = 6)
Sinan[a]	-	38 (±5) (n = 5)	39 (±3) (n = 16)	39 (±7) (n = 4)		0.16 (±0.02) (n = 5)	0.16 (±0.01) (n = 16)	0.16 (±0.03) (n = 4)
Suncheon Bay	81 (±6) (n = 6)	66 (±3) (n = 4)	79 (±5) (n = 18)	84 (±4) (n = 4)	0.31 (±0.02) (n = 6)	0.25 (±0.01) (n = 4)	0.30 (±0.02) (n = 18)	0.31 (±0.01) (n = 4)
Nakdong River estuary	22 (±6) (n = 6)	28 (±8) (n = 5)	22 (±4) (n = 17)	37 (±4) (n = 5)	0.07 (±0.02) (n = 6)	0.08 (±0.03) (n = 5)	0.07 (±0.01) (n = 17)	0.09 (±0.01) (n = 5)

[a]Samples were collected from Sinan over three years (2018–2020).

Table S5. Bulk density (g cm^{-3}) of core sediments in the west, south, and east coasts of South Korea.

Sea	Region	Bulk density (g cm^{-3})		
		Sand	Mixed	Mud
West Sea	Gyeonggi (including Incheon)	1.55 (±0.03)	1.59 (±0.13)	1.25 (±0.16)
	Chungnam	1.34 (±0.16)	1.38 (±0.12)	1.28 (±0.16)
	Jeonbuk	1.53 (±0.13)	1.49 (±0.04)	1.37 (±0.08)
	Jeonnam	1.39 (±0.24)	1.30 (±0.10)	1.12 (±0.08)
South Sea	Jeonnam	1.05 (±0.07)	1.31 (±0.32)	0.86 (±0.14)
	Gyeongnam (including Busan)	1.36 (±0.06)	1.27 (±0.11)	1.00 (±0.30)
East Sea	Gyeongbuk	3.46 (±0.40)	-	-

Table S6. Coastline, tidal flat area, and salt marsh area in the West, South, and East Sea of South Korea.

Sea	Region	Coastline[a] (km)	Tidal flat area (km^2)	Salt marsh area[b] (km^2)	Ratio of salt marsh in tidal flat (%)
West Sea	Gyeonggi (including Incheon)	1,339	920	0.005	0.001
	Chungnam	1,242	378	0.007	0.002
	Jeonbuk	549	12	0.011	0.089
	Jeonnam	3,562	595	0.004	0.001
	Subtotal	**6,692**	**1,905**	**0.027**	**0.001**
South Sea	Jeonnam	3,181	281	0.031	0.011
	Gyeongnam (including Busan)	2,893	296	0.013	0.004
	Subtotal	**6,074**	**577**	**0.043**	**0.008**
East Sea	Gyeongbuk (including Ulsan)	704	6	0.007	0.110
	Gangwon	402	2	0.002	0.120
	Subtotal	**1,106**	**8**	**0.009**	**0.113**
	Total	**13,871**	**2,490**	**0.080**	**0.003**

[a]Coastline of South Korea was investigated by The Ministry of Oceans and Fisheries, 2020
[b]Lee et al. (2019)

Table S7. Mapped tidal flat area (km^2) by remote sensing classification in the West, South, and East Sea, South Korea.

Sea	Region	Tidal flat area (km^2)			
		Sand	**Mixed**	**Mud**	**Total**
West Sea	Incheon	404	202	136	742
	Gyeonggi	50	69	60	178
	Chungnam	157	143	77	378
	Jeonbuk	9	2	2	12
	Jeonnam	157	241	198	595
	Subtotal	**777**	**657**	**472**	**1,906**
South Sea	Jeonnam	31	181	68	281
	Gyeongnam	36	161	68	265
	Busan	15	15	1	31
	Subtotal	**82**	**357**	**138**	**577**
East Sea	Gangwon	2	-	-	2
	Gyeongbuk	4	-	-	4
	Ulsan	2	-	-	2
	Subtotal	**9**	-	-	**9**
	Total	**868**	**1,014**	**610**	**2,491**

Table S8. Organic carbon stock (Mg C) using mapped tidal flat area based on remote sensing classification in the West, South, and East Sea of South Korea.

Sea	Region	Organic carbon stock (Mg C)			
		Sand	**Mixed**	**Mud**	**Total**
West Sea	Incheon	2,479,324	1,362,680	1,081,781	**4,923,784**
	Gyeonggi	307,182	461,533	475,061	**1,243,775**
	Chungnam	463,978	509,401	301,036	**1,274,415**
	Jeonbuk	8,980	3,709	7,522	**20,211**
	Jeonnam	404,613	796,276	752,018	**1,952,907**
	Subtotal	**3,664,076**	**3,133,598**	**2,617,417**	**9,415,091**
South Sea	Jeonnam	57,540	1,049,983	514,461	**1,621,985**
	Gyeongnam	92,502	1,056,771	790,072	**1,939,344**
	Busan	39,450	99,965	10,519	**149,935**
	Subtotal	**189,492**	**2,206,720**	**1,315,052**	**3,711,264**
East Sea	Gangwon	4,361	-	-	**4,361**
	Gyeongbuk	8,009	-	-	**8,009**
	Ulsan	3,424	-	-	**3,424**
	Subtotal	**15,794**	-	-	**15,794**
	Total	**3,869,362**	**5,340,318**	**3,932,469**	**13,142,149**

Table S9. Organic carbon sequestration rate (Mg C yr^{-1}) using mapped tidal flats area by remote sensing classification in the West, South, and East Sea, South Korea.

Sea	Region	Organic carbon sequestration rate (Mg C yr^{-1})			
		Sand	Mixed	Mud	Total
West Sea	Incheon	17,423	9,497	7,505	**34,425**
	Gyeonggi	2,253	3,357	3,439	**9,048**
	Chungnam	1,906	2,099	1,234	**5,240**
	Jeonbuk	44	18	37	**100**
	Jeonnam	1,619	3,215	3,052	**7,886**
	Subtotal	**23,245**	**18,186**	**15,267**	**56,698**
South Sea	Jeonnam	219	4,016	1,963	**6,198**
	Gyeongnam	380	4,344	3,255	**7,979**
	Busan	119	301	32	**451**
	Subtotal	**717**	**8,661**	**5,250**	**14,629**
East Sea	Gangwon	14	-	-	**14**
	Gyeongbuk	22	-	-	**22**
	Ulsan	21	-	-	**21**
	Subtotal	**57**	-	-	**57**
	Total	**23,963**	**26,847**	**20,517**	**71,383**

Table S10. Organic carbon stock (Mg C ha^{-1}) per unit of core sediments in the West, South, and East Sea, South Korea.

Sea	Region	Organic carbon stock (Mg C ha^{-1})		
		Sand	**Mixed**	**Mud**
West Sea	Gyeonggi (including Incheon)	61.4 (±12.4)	67.3 (±25.5)	79.7 (±27.4)
	Chungnam	29.5 (±11.6)	35.5 (±16.7)	39.0 (±15.0)
	Jeonbuk	10.0 (±7.0)	22.8 (±10.9)	42.2 (±2.5)
	Jeonnam	25.8 (±17.6)	33.1 (±14.0)	38.0 (±11.7)
South Sea	Jeonnam	18.6 (±11.6)	57.9 (±30.3)	75.4 (±20.4)
	Gyeongnam (including Busan)	25.6 (±23.1)	65.8 (±34.8)	115.5 (±17.6)
East Sea	Gyeongbuk	18.1 (±4.0)	-	-

Table S11. Organic carbon content reported in the coastal sediments (salt marshes and bare tidal flats) of China.

Location	Sampling year	Latitude	Longitude	[a]Habitat	Dominant halophyte	Core depth (cm)	Organic carbon stock (Mg C ha^{-1})	[b]Organic carbon stock (Mg C ha^{-1})	Reference
Liaohe Delta, Liadong	2011	40°45'N	121°30'E	SM	*Suaeda* sp.	30	42	140	Mao et al. (2018)
	2011			SM		30	30	101	
	2011			B	Bare	30	35	116	
Dongying port, Shandong	2013	37°54'N	118°54'E	SM	*Phragmites* sp.	30	16	54	Zhao et al. (2017)
	2013			SM	*Suaeda* sp.	30	19	63	
	2013			B	Bare	30	16	55	
Yellow River Estuary, Shandong	2015	37°48'N	119°06'E	SM	*Suaeda* sp.	50	36	73	Zhao et al. (2018)
	2015			B	Bare	50	24	49	
	2014	37°47'N	119°11'E	SM	*Phragmites* sp.	10	12	116	Lu et al. (2018)
	2014			SM	*Suaeda* sp.	10	16	164	
	2014			B	Bare	10	6	61	
	2009	37°46'N	119°09'E	SM	*Suaeda* sp.	60	39	66	Mou et al. (2012)
	2009			SM	*Suaeda* sp.	60	36	60	
	2012	37°45'N	119°11'E	SM	*Phragmites* sp.	50	43	87	Wang et al. (2016)
	2012			SM	*Phragmites* sp.	50	41	83	
	2016	37°45'N	118°58'E	SM	*Phragmites* sp.	20	23	115	Tao et al. (2018)
	2008	37°42'N	119°15'E	SM	*Phragmites* sp.	40	21	52	Zhao et al. (2016)
	2008			SM	*Phragmites* sp.	40	20	49	
	2008			SM	*Phragmites* sp.	40	18	45	
	2008			SM	*Phragmites* sp.	40	16	41	
	2008			B	Bare	40	21	52	
Yancheng, Jiangsu	2011	32°36'N	119°51'E	SM	*Spartina* sp.	30	29	96	Yang et al. (2013)
	2011			SM	*Suaeda* sp.	30	16	54	
	2011			SM	*Phragmites* sp.	30	14	46	
	2011			B	Bare	30	9	30	
	2012			SM	*Spartina* sp.	30	32	108	Yang et al. (2015)
	2012			SM	*Phragmites* sp.	30	17	48	
	2012			SM	*Suaeda* sp.	30	14	56	
	2012			B	Bare	30	3	8	
	2012			SM	*Spartina* sp.	30	38	126	Yang et al. (2016)
	2012			SM	*Phragmites* sp.	30	20	56	
	2012			SM	*Suaeda* sp.	30	17	68	
	2012			B	Bare	30	4	15	
	2012			SM	*Spartina* sp.	30	38	126	Yang et al. (2017)
	2012			SM	*Spartina* sp.	30	51	170	

Table S11. Organic carbon contents reported in the coastal sediments (salt marshes and bare tidal flats) of China (continued).

Location	Sampling year	Latitude	Longitude	[a]Habitat	Dominant halophyte	Core depth (cm)	Organic carbon stock (Mg C ha^{-1})	[b]Organic carbon stock (Mg C ha^{-1})	Reference
Yancheng, Jiangsu	2012	32°36'N	119°51'E	SM	*Spartina* sp.	30	43	143	Yang et al. (2017)
	2012			SM	*Spartina* sp.	30	33	109	
	2012			B	Bare	30	4	15	
	2011	33°35'N	120°30'E	SM	*Spartina* sp.	20	22	109	Wang et al. (2013)
	2011			SM	*Spartina* sp.	20	20	102	
	2011			SM	*Spartina* sp.	20	5	25	
	2011			SM	*Spartina* sp.	20	4	19	
	2011			B	Bare	20	4	21	
	2012	32°34'N	119°48'E	SM	*Spartina* sp.	100	35	35	Liu et al. (2017)
	2012			SM	*Suaeda* sp.	100	21	21	
	2012			B	Bare	100	24	24	
	2005	32°20'N	119°29'E	SM	*Spartina* sp.	30	16	53	Zhou et al. (2015)
	2005			SM	*Phragmites* sp.	30	13	50	
	2005			SM	*Suaeda* sp.	30	15	42	
	2005			B	Bare	30	6	21	
Sheyang, Jiangsu	2011	33°30'N	120°38'E	SM	*Spartina* sp.	30	39	130	Xiang et al. (2015)
	2011			SM	*Spartina* sp.	30	29	98	
	2011			SM	*Spartina* sp.	30	25	82	
	2011			B	Bare	30	15	50	
Wanggang River Estuary, Jiangsu	2002	33°19'N	120°44'E	SM	*Spartina* sp.	20	15	77	Liu et al. (2007)
	2002	33°18'N	120°43'E	SM	*Spartina* sp.	20	11	55	
	2002	32°35'N	120°59'E	B	Bare	20	12	60	
	2002	32°36'N	120°59'E	SM	*Spartina* sp.	20	7	37	Zhou et al. (2008)
	2002			B	Bare	20	9	43	
Chongming Island, Shanghai	2013	31°30'N	121°57'E	SM	*Spartina* sp.	50	30	45	Zhang et al. (2017)
	2013			SM	*Phragmites* sp.	50	23	61	
	2013			B	Bare	50	3	5	
	2015	31°27'N	122°00'E	SM	*Spartina* sp.	50	9	18	Chen et al. (2017)
	2007	31°00'N	121°55'E	SM	*Phragmites* sp.	100	54	54	Bu et al. (2015)

[a]SM: Salt marsh, B: Bare tidal flat

[b]Organic carbon stock normalized to the amount for 1 m depth

Table S12. Results of the review on net primary production (NPP) on salt marshes, mangroves, seagrasses, and bare tidal flats of coastal ecosystems.

Habitat	Location	Net Primary Production ($g\ C\ m^{-2}\ yr^{-1}$)	Global area (km^2)	Global NPP ($Tg\ C\ yr^{-1}$)	Reference
Salt marshes	Global	1,100	22,000–400,000	20–440	Duarte et al. (2013)
	Global	1,585	300,000	475	Algoni (2014)
Mangroves	Global	1,000	137,760–152,361	140-150	Duarte et al. (2013)
	Global	652	140,000	90	Algoni (2014)
Seagrasses	Global	817	177,000–600,000	140-490	Duarte et al. (2013)
	Global	1,211	400,000	533	Algoni (2014)
Bare tidal flats	Global		128,000	11	Lin et al. (2020)
	Global		124,286–131,821		Murray et al. (2019)
	South Korea	217			Kwon et al. (2020)
	South Korea	312			Kwon et al. (2018)

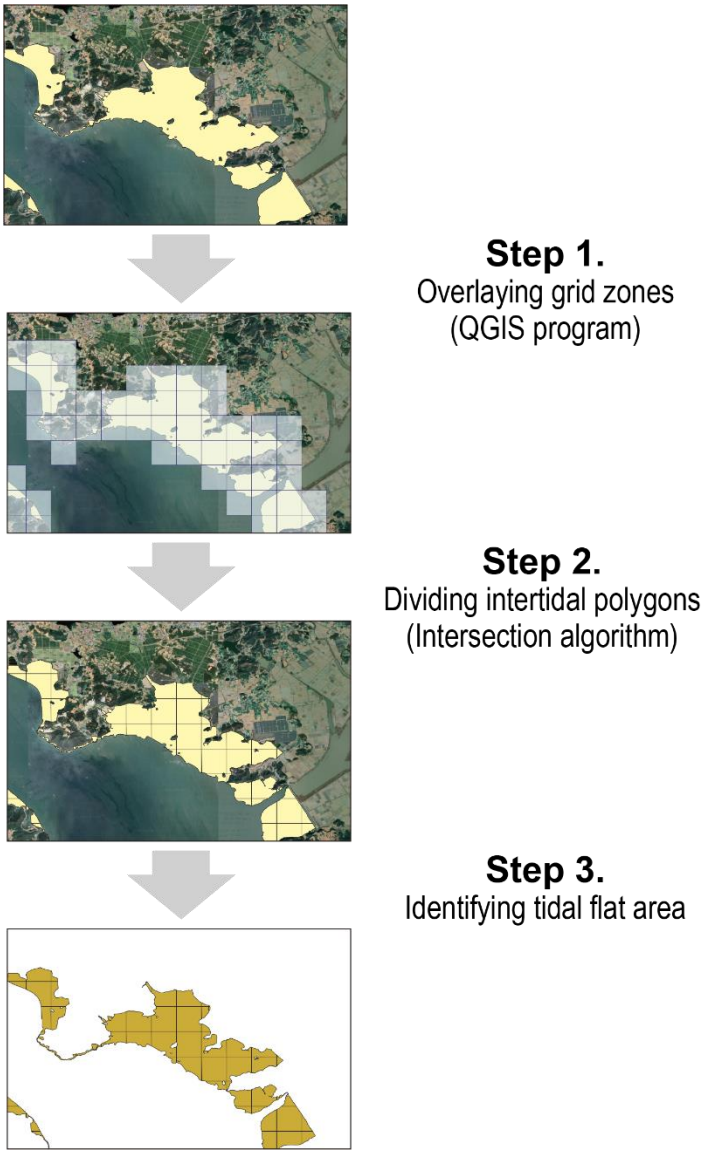

Fig. S1. The procedure of delineation of the tidal flats, performed through the QGIS analysis tool using a spatial processing algorithm.

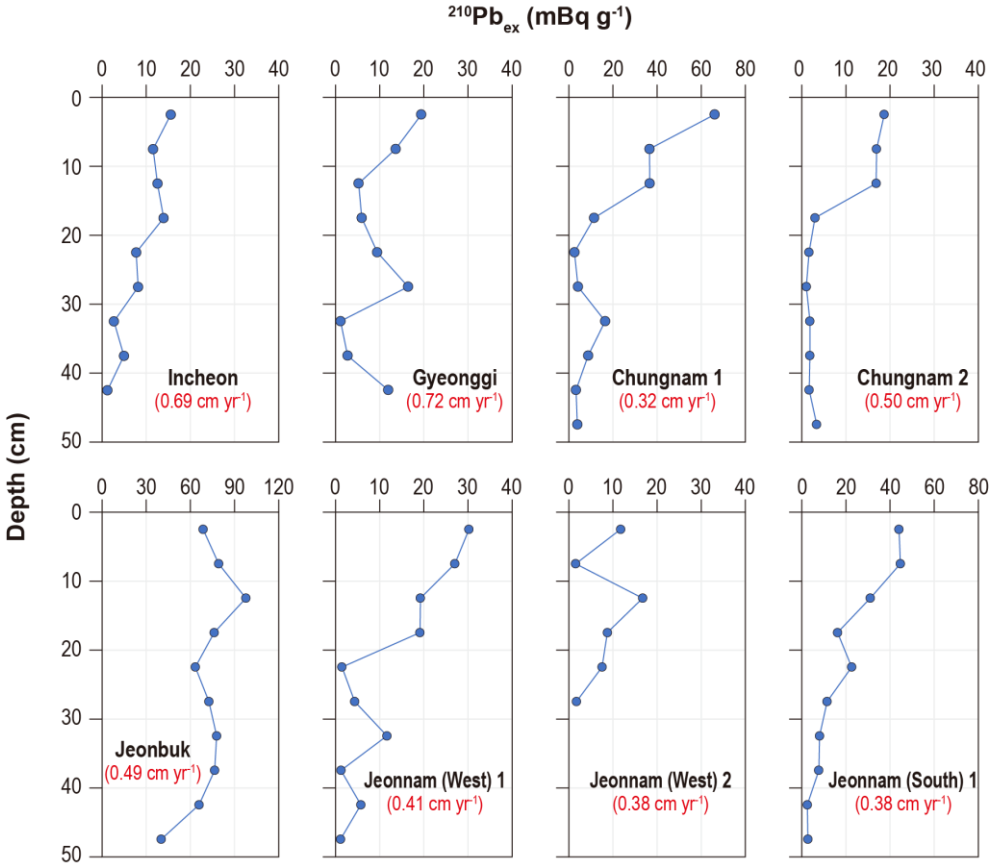

Fig. S2. Depth profiles of unsupported ^{210}Pb ($^{210}Pb_{ex}$) and sedimentation rate of core sediments at Incheon, Gyeonggi, Chungnam, Jeonbuk, Jeonnam (West), and Jeonnam (South).

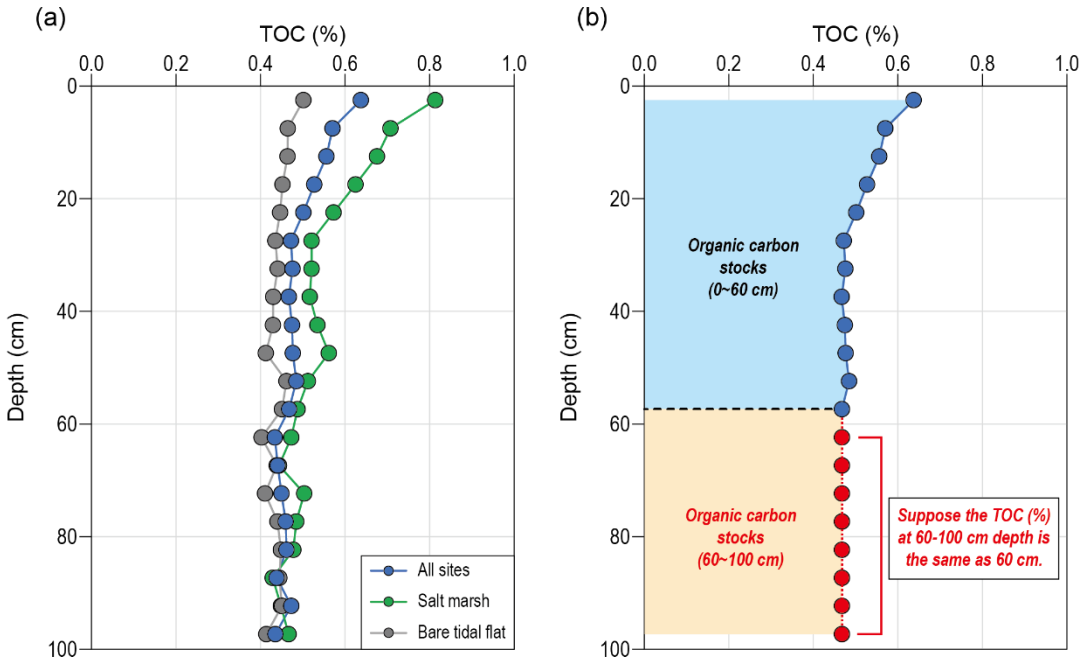

Fig. S3. (a) Mean vertical distribution of organic carbon in the core sediments at all sites, salt marshes, and bare tidal flats. (b) Normalizing method of organic carbon stock in core sediments for which core depth was <100 cm.

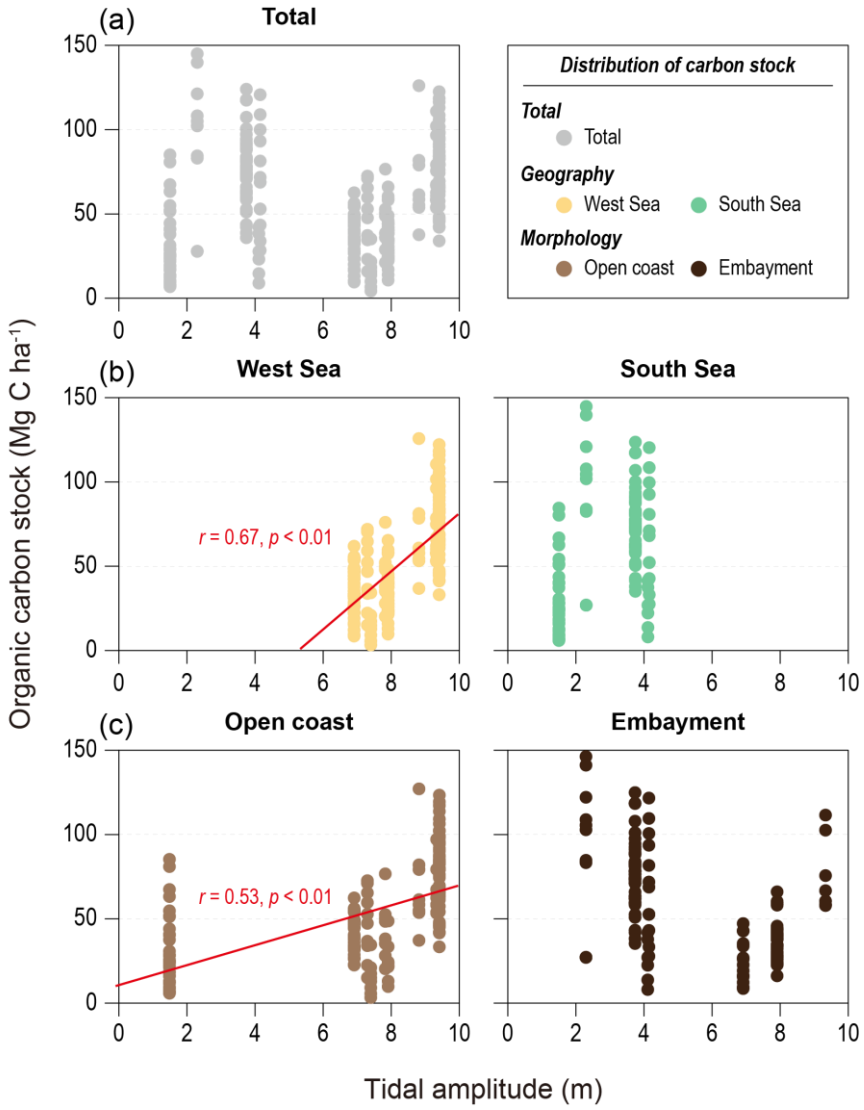

Fig. S4. Relationship between tidal amplitude and organic carbon stock in core sediments with respect to (a) total, (b) geography, and (c) morphology.

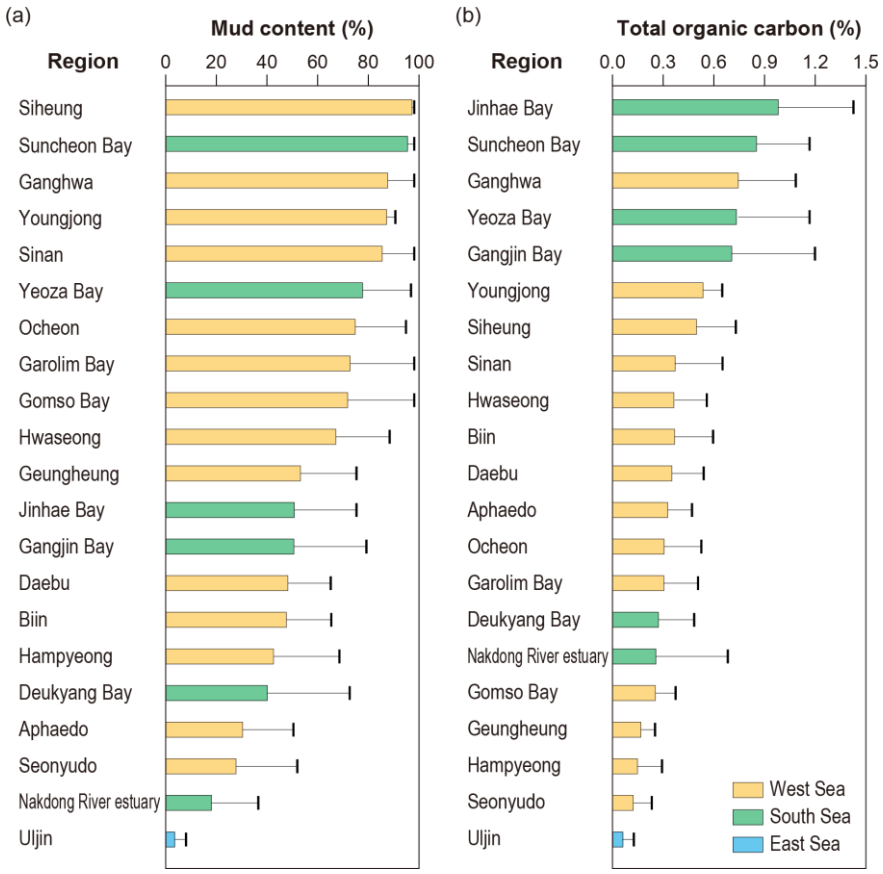

Fig. S5. Spatial distribution of (a) mud content (%) and (b) total organic carbon (%) of core sediments in 21 intertidal flats. Yellow, green, and blue bars denote at West Sea, South Sea, and East Sea, respectively.

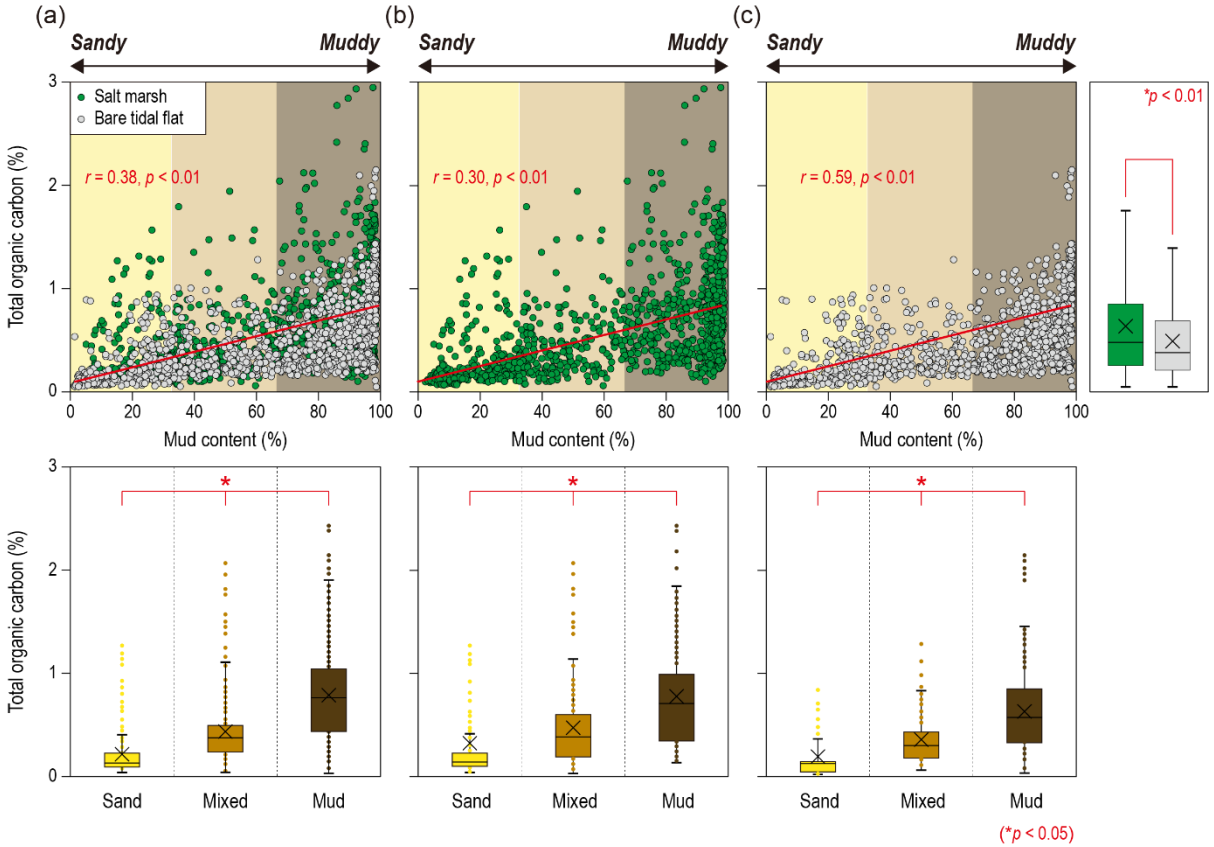

Fig. S6. Relationship between mud content and total organic carbon in core sediments of (a) total, (b) salt marshes, and (c) bare tidal flats.

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