Supplementary Text S1. Economic costs of substrate amendment.

Economic costs include material costs. Thus, the economic cost is determined as follows:

$$\text{Economic cost} = \text{Material cost} * m / A \quad \text{(S1)}$$

Where Material cost is the unit price of substrate material per unit quality, ¥ ·kg^{-1}; m is the quality of the required material, kg; A is the area of the substrate being processed, m^{-2}. The calculation applies to the improvement of the surface soil layer to a depth of 10 cm within this area.

After estimation, the economic costs of the 40% maifan stone and 10% Fe-C system are 129.6 and 63 ¥ ·m^{-2}.

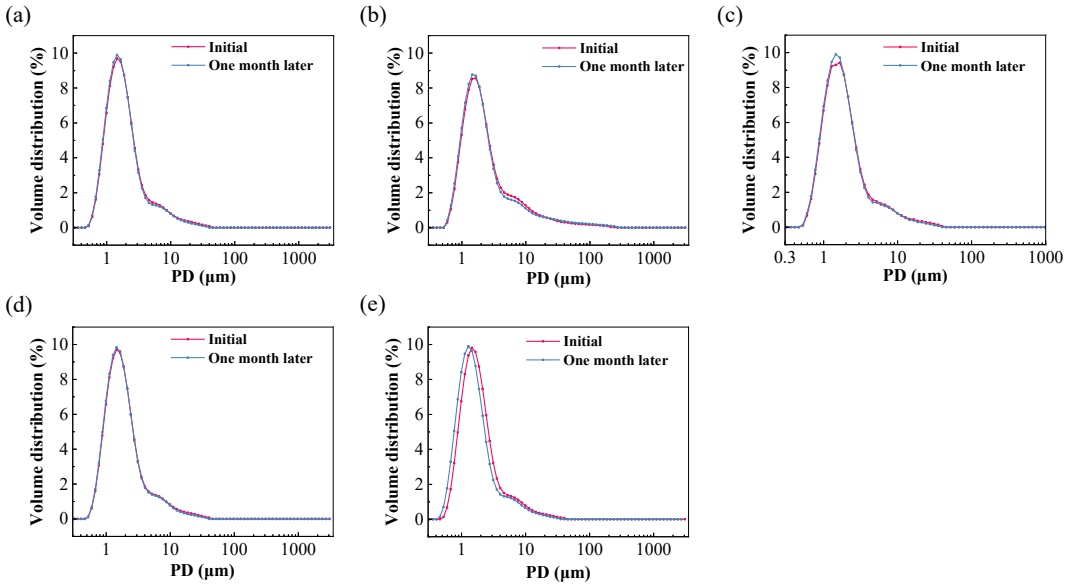
Supplementary Table S1. Chemicals.

Chemicals	Purity	Manufacturers
Sulfuric acid (H_2SO_4)	98%	Aladdin, China
Hydrogen peroxide solution (H_2O_2)	30%	Aladdin, China
sodium tetraphenylborate($(C_6H_5)_4BNa$)	99.5%	Merck, Germany
Ethylenediaminetetraacetic acid (EDTA)	99.5%	Aladdin, China
Phenolphthalein	98%	Aladdin, China
Sodium hydroxide (NaOH)	98%	Aladdin, China
Hydrochloric acid (HCl)	37%	Sinopharm, China
Potassium persulfate ($K_2S_2O_8$)	99%	Aladdin, China
Ascorbic acid ($C_6H_8O_6$)	99%	Aladdin, China
Manganese sand	/	Zhejiang Songkang Environmental Protection Technology Co., Ltd
Iron-carbon filler	/	Henan Nuoyue Environmental Protection Technology Co., Ltd
Bentonite	/	Wenzhou Junyi Building Materials Co., Ltd
Vermiculite	/	Lishui Lvyexianzheng Horticulture Co., Ltd
Maifan stone	/	Weifang Huiyi Trading Co., Ltd

Supplementary Table S2. Performance comparison between 40% maifan stone and other advanced substrate amendment systems.

Material	TN Removal Rate	TP Removal Rate	Other Removal Rate	Reference
40% maifan stone	**77%**	**73%**	**82% (TK Removal Rate)**	**This work**
MFC-CW + FR (MgAl-LDHs)	**68.0%**	**71.4%**	/	[1]
Manganese sand-enhanced CWs	**25.3%**	**97.00 %**	**/**	[2]
PSM (Palygorskite Self-assembled Composite Material)	**58.1%**	**85%**	**66.4% (NH_4^+-N Removal Rate)**	[3]
CW-I SYSTEM	**93.4%**	**22.2%**	**67.1% (NO_3^--N Removal Rate)**	[4]

Supplementary Figure S1. Representative photographs showcasing the coastal wetland experimental setup and the morphology of the test plants (*Kandelia obovata*).



Supplementary Figure S2. Pore size distribution of doping substrates. (a) Manganese sand; (b) Maifan stone; (c) Bentonite; (d) Iron-carbon; (e) Vermiculite.

References

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