

Supplementary Information for

**Remediation technologies of contaminated sites in China:
Application and spatial clustering characteristics**

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Figures

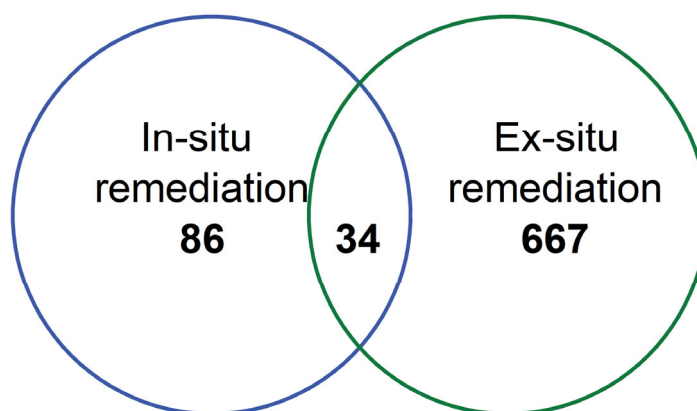


Figure S1 Summary of in-situ and ex-situ remediation methods used in contaminated land.

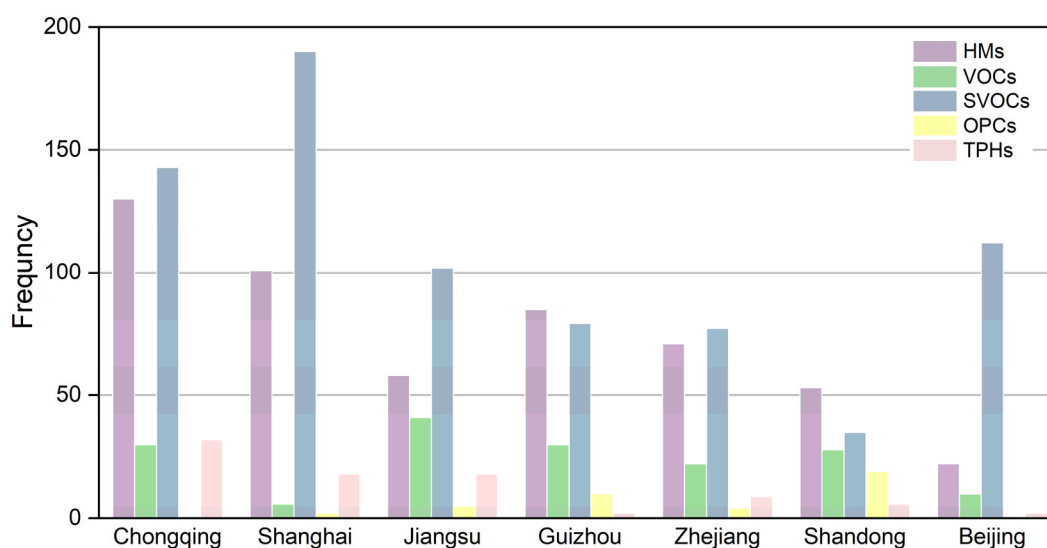


Figure S2 The occurrence of target pollutants at contaminated sites within the major provinces (municipalities) of Chongqing, Shanghai, Jiangsu, Guizhou, Zhejiang, Shandong, and Beijing. The distribution of these five categories of pollutants (HMs, VOCs, SVOCs, OPCs, and TPHs) exhibits significant variations among the provinces (municipalities).

Tables

Table S1 Frequency and rates of application of the 10 remediation technologies

Remediation technologies	Abbreviation	Number	Percentage
Cement Kiln Co-processing	CKCP	893	43.88%
Chemical Oxidization/Reduction	CO/CR	463	22.75%
Thermal Desorption	TR	274	13.46%
Solidification and Stabilization	S/S	269	13.22%
Soil Washing	SW	78	3.83%
mechanical soil aeration	MSA	20	0.98%
Bioremediation	BR	15	0.74%
Excavation and Landfill	EL	14	0.69%
Incineration Remediation	IR	6	0.29%
Soil Vapor Extraction	SVE	3	0.15%

Table S2 Abbreviations and frequency of concerned pollutants in contaminated sites. The pollutants were classified into five categories: heavy metals (HMs), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), organic pesticide contaminants (OPCs), and total petroleum hydrocarbons (TPHs).

Contaminant	Abbreviation	Type	Number
Vanadium	V	HMs	13
Cobalt	Co	HMs	25
Antimony	Sb	HMs	32
Hexavalent chromium	Cr(VI)	HMs	51
Cadmium	Cd	HMs	57
Mercury	Hg	HMs	59
Copper	Cu	HMs	78
Lead	Pb	HMs	93
Nickel	Ni	HMs	115
Arsenic	As	HMs	186
Methylbenzene	MB	VOCs	6
1,1,2-Trichloroethane	1,1,2-TCA	VOCs	7
M-xylene and P-xylene	MX-PX	VOCs	8
Tetrachloromethane	CTT	VOCs	8
Chlorobenzene	CB	VOCs	9
Vinyl chloride	VC	VOCs	13
Ethylbenzene	EB	VOCs	16
Trichloroethylene	TCE	VOCs	20

1,2-Dichloroethane	1,2-DCA	VOCs	21
1,2,3-Trichloropropane	1,2,3-TCP	VOCs	24
Chloroform	CF	VOCs	28
Benzene	BE	VOCs	68
Nitrobenzene	NB	SVOCs	7
Aniline	AN	SVOCs	10
Chrysene	CH	SVOCs	16
Naphthalene	NPH	SVOCs	30
Benzo[k]fluoranthene	BkF	SVOCs	42
Indeno[1,2,3-cd]Pyrene	IP	SVOCs	117
Benzo[a]anthracene	BaA	SVOCs	144
Benzo[b]fluorathene	BbF	SVOCs	154
Dibenz[a,h]anthracene	DBA	SVOCs	170
Benzo[a]pyrene	BaP	SVOCs	261
DDT	DDT	OPCs	4
p,p'-DDD	p,p'-DDD	OPCs	5
p,p'-DDE	p,p'-DDE	OPCs	5
γ -BHC	γ -BHC	OPCs	8
α -BHC	α -BHC	OPCs	12
β -BHC	β -BHC	OPCs	12
Hexachlorobenzene	HCB	OPCs	20
Total Petroleum hydrocarbon (C10-C40)	TPHs	TPHs	110

Table S3 Applications rate of remediation technologies in different provinces (municipalities).

Province (municipality)	CKCP	CO/CR	TR	S/S	SW	MSA	BR	EL	IR	SVE
Chongqing	27.21%	8.64%	8.36%	8.55%	3.85%		13.33%	7.14%		
Shanghai		41.68%	6.18%	14.13%	78.21%	25.00%			16.67%	66.67%
Jiangsu	13.33%	6.48%	15.27%	10.78%		10.00%		14.29%		
Guizhou	19.71%	1.08%	5.82%	3.35%						
Zhejiang	4.93%	8.86%	17.09%	15.61%	1.28%	5.00%		7.14%	83.33%	33.33%
Shandong	9.74%	7.13%	1.45%	5.95%		5.00%				
Beijing	12.21%	3.24%	5.45%	0.37%			40.00%			
Liaoning	2.35%	1.51%	16.73%	5.95%	7.69%	5.00%	20.00%			
Tianjin	1.90%	3.67%	8.00%	0.74%						
Guangdong		1.73%	4.00%	10.04%		10.00%				
Hebei	1.23%	5.62%				25.00%		14.29%		
Hunan	0.34%	1.51%	0.36%	11.15%		0.00%	13.33%			
Shanxi	1.79%	1.51%	5.82%			15.00%				
Hubei	2.02%	2.59%	0.36%	3.35%						
Sichuan	1.01%	2.16%	1.09%	2.97%	8.97%					
Anhui	1.68%	0.00%	2.55%					14.29%		
Guangxi		0.43%	1.45%	2.97%				14.29%		
Fujian	0.56%			1.49%						
Jiangxi		0.86%		1.49%						
Gansu		1.30%		0.37%						
Yunan				0.37%				28.57%		
Jilin				0.37%			13.33%			