Supplementary Material

List of abbreviations in this study and their full names

Terminology	Abbreviation	Full name
Organic pollutants	VOCs	Volatile organic compounds
	SVOCs	Semi-volatile organic pollutants
	TPHs	Total petroleum hydrocarbons
	PAHs	Polycyclic aromatic hydrocarbons
	BTEX	Benzene, toluene, ethylbenzene, and xylene
	DEHP	Di(2-ethylhexyl) phthalate
	BaA	Benzo(a)anthracene
	BbF	Benzo(b)fluoranthene
	1,2-DCP	1,2-dichloropropane
Analysis instrument	GC-MS	Gas chromatography – mass spectrometry
	GC-FID	Gas chromatography-flame ionization detection
Spatial analysis method	IDW	Inverse distance weighting
Risk assessment	MEEPRC	The Ministry of Ecology and Environment of the People's Republic of China
	OISER	Oral ingestion soil exposure route
	DCSER	Dermal contact with soil exposure route
	PISER	Inhalation of contaminated soil particles exposure route
	$IIVER_1$	Inhalation of indoor contaminant vapors from soil exposure route
	$IIVER_2$	Inhalation of indoor contaminant vapors from groundwater exposure route
	CR	Cancer risk
	HQ	Hazard quotient
	CR_T	Total cancer risk
	THI	Total hazard index

Text S1 Health risks calculation algorithm (MEEPRC, 2019)

A Exposure pathway and volatility factor calculation equations

The exposure pathways included oral ingestion soil exposure route (OISER), dermal contact with soil exposure route (DCSER), inhalation of fugitive soil particles exposure route (PISER), and inhalation indoor vapor from subsurface exposure route ($IIVER_1$) and from groundwater route ($IIVER_2$) that humans may be potentially exposed to.

The exposure doses for the 5 pathways under sensitive land use were calculated using Eqs. (S1)–(S5). Under non-sensitive land use, the exposure dose is considered for adults only.

1) Exposure rate (cancer risk) through oral ingestion of soil ($OISER_{ca}$):

$$OISER_{ca}=\frac{\left(\frac{OSIR_{c}\times ED_{c}\times EF_{c}}{BW_{c}}+\frac{OSIR_{a}\times ED_{a}\times EF_{a}}{BW_{a}}\right)\times ABS_{o}}{AT_{ca}}\times 10^{-6} \quad , \quad (S1)$$

2) Exposure rate (cancer risk) through dermal contact of soil ($DCSER_{ca}$):

$$DCSER_{ca}=\left(\frac{SAE_{c}\times SSAR_{c}\times EF_{c}\times ED_{c}\times E_{v}\times ABS_{d}}{BW_{c}\times AT_{ca}}+\frac{SAE_{a}\times SSAR_{a}\times EF_{a}\times ED_{a}\times E_{v}\times ABS_{d}}{BW_{a}\times AT_{ca}}\right)\times 10^{-6} \quad , \quad (S2)$$

3) Exposure rate (cancer risk) through inhalation of soil particles ($PISER_{ca}$):

$$PISER_{ca}=PM_{10}\times PIAF\times\left(\frac{DAIR_{c}\times ED_{c}\times\left(f_{spo}\times EFO_{c}+f_{spi}\times EFI_{c}\right)}{BW_{c}\times AT_{ca}}+\frac{DAIR_{a}\times ED_{a}\times\left(f_{spo}\times EFO_{a}+f_{spi}\times EFI_{a}\right)}{BW_{a}\times AT_{ca}}\right)\times 10^{-6} \quad , \quad (S3)$$

4) Exposure rate (cancer risk) through inhalation of pollutant vapors in indoor air emitted from subsurface soil ($IIVER_{ca1}$):

$$IIVER_{ca_1}=VF_{subia}\times\left(\frac{DAIR_{a}\times ED_{a}\times EFI_{a}}{BW_{a}\times AT_{ca}}+\frac{DDAIR_{c}\times ED_{c}\times EFI_{c}}{BW_{c}\times AT_{ca}}\right) \quad , \quad (S4)$$

5) Exposure rate (cancer risk) through inhalation of pollutant vapors in indoor air emitted from groundwater ($IIVER_{ca2}$):

$$IIVER_{ca_2}=VF_{gwia}\times\left(\frac{DAIR_{a}\times ED_{a}\times EFI_{a}}{BW_{a}\times AT_{ca}}+\frac{DDAIR_{c}\times ED_{c}\times EFI_{c}}{BW_{c}\times AT_{ca}}\right) \quad , \quad (S5)$$

where the subscript “c” indicates children and the subscript “a” indicates adults; *OSIR* is daily soil intake rates through oral ingestion (mg/d); *ED* is the exposure duration (a); *EF* is the exposure frequency (d/a); *BW* is the average bodyweight (kg); ABS_o is the oral ingestion absorption factor (unitless); AT_{ca} is the average time for carcinogenic effects (d); PM10 is the content of inhalable particulate matter in the ambient air (mg/m^3); PLAF is the retention fraction of the inhaled particulates in the body (dimensionless); *DAIR* is the daily air inhalation rate (m^3/d); f_{spo} and f_{spi} are the fraction of soil-borne particulates in the outdoor and indoor air, respectively, (unitless); *EFO and EFI* are outdoor and indoor exposure frequency (d/a); *SAE* is the exposed skin surface area (cm^2); *SSAR* is the skin adherence factor (mg/cm^2); E_v is the daily exposure frequency of dermal contact event (times/d); ABS_d is dermal absorption factor (unitless); VF_{subia} is the subsurface soil to enclosed space volatilization factor (kg/m^3); VF_{gwia} is the groundwater to enclosed space volatilization factor (kg/m^3).

The subsurface soil to indoor volatilization factor (VF_{subia}) was calculated using Eq. (S6):

$$VF_{\text{subia}}=\frac{\frac{H\rho_s}{(\theta_w+k_s\rho_s\times H\theta_a)}\times(\frac{D_s^{eff}/L_s}{L_B\times ER})}{1+\frac{D_s^{eff}/L_s}{L_B\times ER}+\frac{D_s^{eff}/L_s}{(D_{crack}^{eff}/L_{crack})\times\eta}}\times 10^3 \quad , \qquad (S6)$$

The groundwater to indoor volatilization factor (VF_{gwia}) was calculated using Eq. (S7):

$$VF_{gwia}=\frac{H\times(\frac{D_s^{eff}/L_{gw}}{L_B\times ER})}{1+\frac{D_s^{eff}/L_{gw}}{L_B\times ER}+\frac{D_s^{eff}/L_{gw}}{(D_{crack}^{eff}/L_{crack})\times\eta}}\times 10^3 \quad , \qquad (S7)$$

where k_s is the soil-water partition coefficient (L/kg); ρ_s is the soil particle density (kg/L); H is the dimensionless Henry's law constant (unitless); D_s^{eff} is the effective diffusivity in the vadose zone soils (cm^2/s); $L_s$is the thickness of surface soil (cm); $L_B$is the volume/infiltration area ratio of enclosed space, (cm); L_{gw} is the depth of groundwater(cm); ER is the enclosed-space air exchange rate (d^{-1}); $D_{crack}^{eff}$is the effective diffusivity in the cracks of foundations (cm^2/s); L_{crack} is the enclosed space foundation or wall thickness (cm); η is the areal fraction of cracks in foundations/walls (unitless).

B Calculation of toxicological parameters for pollutants

Calculations of slope factors (SF_{i}) (kg·day/mg) and reference dose (RfD_{i}) (mg/kg·day) for inhalation exposure routes (Eqs. (S8) and (S9)):

$$SF_{\text{i}}=\frac{IUR\times BW}{DAIR} \quad , \qquad (S8)$$

$$RfD_i=\frac{DIAR\times RfC}{BW} \quad , \qquad (S9)$$

Calculations of slope factors (SF_{d}) (kg·day/mg) and reference dose (RfD_{d}) (mg/kg·day) for dermal contact exposure routes (Eqs. (S10) and (S11)):

$$SF_{\text{d}}=\frac{SF_{\text{o}}}{ABS_{\text{gi}}} \quad , \qquad (S10)$$

$$RfD_{\text{d}}=\frac{RfD_{\text{o}}}{ABS_{\text{gi}}} \quad , \qquad (S11)$$

where IUR is inhalation unit risk (m^3/mg), ABS_{gi} is gastrointestinal absorption factor (unitless), and SF_{o} and RfD_{o} are cancer slope factor and reference dose for oral ingestion exposure routes, respectively. The values of those toxicological parameters of pollutants can be found in Table S2.

C Calculation of cancer and non-cancer risks through different exposure routes

cancer risks calculated through

1) Oral ingestion of soil (CRois):

$$CR_{ois}=OISER_{ca}\times C_{sur}\times SF_o \quad , \qquad (S12)$$

2) Dermal contact of soil (CRdcs):

$$CR_{dcs}=DCSER_{ca}\times C_{sur}\times SF_d \quad , \qquad (S13)$$

3) Inhalation of soil particles (CR_{pis}):

$$CR_{pis}=PISER_{ca}\times C_{sur}\times SF_i \quad , \qquad (S14)$$

4) Inhalation of indoor vapors from subsurface soil (CR_{iiv1}):

$$CR_{iiv1}=IIVER_{ca1}\times C_{sub}\times SF_i \quad , \qquad (S15)$$

5) Inhalation of indoor vapors from groudwater (CR_{iiv2}):

$$CR_{iiv2}=IIVER_{ca2}\times C_{gw}\times SF_i \quad , \qquad (S16)$$

In Eqs. (S12)–(S16), C_{sur} (mg/kg), C_{sub} (mg/kg), and C_{gw} (mg/L) are pollutant concentrations in surficial soil, subsurface soil, and groundwater, respectively. Total cancer risk (CR_T) is calculated as the sum of cancer risks calculated using Eqs. (S12)–(S16).

Non-cancer risks calculated through

1) Oral ingestion of soil (HQ_{ois}):

$$HQ_{ois}=\frac{OISER_{nc}\times C_{sur}}{RfD_o\times SAF} \quad , \qquad (S17)$$

2) Dermal contact of soil (HQ_{dcs}):

$$HQ_{dcs}=\frac{DCSER_{nc}\times C_{sur}}{RfD_d\times SAF} \quad , \qquad (S18)$$

3) Inhalation of soil particles (HQ_{pis}):

$$HQ_{dcs}=\frac{PISER_{nc}\times C_{sur}}{RfD_i\times SAF} \quad , \qquad (S19)$$

4) Inhalation of indoor vapors from groundwater (HQ_{iiv1}):

$$HQ_{iiv1}=\frac{IIVER_{nc1}\times C_{sub}}{RfD_i\times SAF} \quad , \qquad (S20)$$

5) Inhalation of indoor vapors from groundwater (HQ_{iiv2}):

$$HQ_{iiv1}=\frac{IIVER_{nc2}\times C_{gw}}{RfD_i\times SAF} \quad , \qquad (S21)$$

where SAF is the soil allocation factor (unitless).

The total non-cancer risk presented by a hazard index (*HI*) is calculated as the sum of the non-cancer risks calculated using Eqs. (S17)–(S21).

D Calculation of risk control values for characteristic pollutants in soil and groundwater

1) Calculated cancer risk control value of soil pollutants based on the combined carcinogenic effects through 4 soil exposure pathways (RCV_S, mg/kg):

$$RCV_s=\frac{ACR}{OISER_{ca}\times SF_o+DCSER_{ca}\times SF_d+(PISER_{ca}+IIVER_{ca1})\times SF_i} \quad , \qquad (S22)$$

2) Calculated non-cancer risk control value of soil pollutants (HCV_S, mg/kg):

$$RCV_s=\frac{AHQ\times SAF}{\frac{OISER_{nc}}{RfD_o}+\frac{DCSER_{nc}}{RfD_d}+\frac{(PISER_{nc}+IIVER_{nc1})}{RfD_i}} , \quad (S23)$$

3) Calculated cancer risk control value of groundwater pollutants (RCV_G, mg/L):

$$RCV_G=\frac{ACR}{IIVER_{ca2}\times SF_i} , \quad (S24)$$

4) Non-cancer risk control values of contaminants in groundwater (HCV_G, mg/L):

$$RCV_G=\frac{AHQ\times SAF\times RfD_i}{IIVER_{nc2}} , \quad (S25)$$

In Eqs. (S22)–(S25), ACR and AHQ are acceptable carcinogenic and non-carcinogenic risk, respectively.

Table S1 The screening values and recoveries of pollutants in soil.

Pollutants	CAS	Screening value (mg/kg) [a)]		LOD (mg/kg)	Average recovery (%)	Range (mg/kg)	Median (mg/kg)
		Sensitive land	Non-sensitive land				
Chloromethane	74-87-3	12	37	1.0×10^{-3}	94.3	ND	ND
Vinyl chloride	75-01-4	0.12	0.43	1.0×10^{-3}	98.4	ND	ND
Dichloroethylene, 1,1-	75-35-4	12	66	1.0×10^{-3}	101	ND	ND
Methylene Chloride	75-09-2	94	616	1.5×10^{-3}	105	ND–0.058	1.50×10^{-2}
Dichloroethylene, 1,2-trans-	156-60-5	10	54	1.4×10^{-3}	98.1	ND	ND
Dichloroethane, 1,1-	75-34-3	3	9	1.2×10^{-3}	105	ND–0.009	8.25×10^{-3}
Dichloroethylene, 1,2-cis-	156-59-2	66	596	1.3×10^{-3}	105	ND–0.01	1.00×10^{-2}
Chloroform	67-66-3	0.3	0.9	1.1×10^{-3}	108	ND–0.036	1.18×10^{-2}
Trichlorothane, 1,1,1-	71-55-6	701	840	1.3×10^{-3}	90.7	ND	ND
Carbon tetrachloride	56-23-5	0.9	2.8	1.3×10^{-3}	99.7	ND	ND
Benzene	71-43-2	1	4	1.9×10^{-3}	112	ND–3.04	5.12×10^{-2}
Trichloroethylene	79-01-6	0.7	2.8	1.2×10^{-3}	100	ND–0.012	1.07×10^{-2}
Dichloropropane, 1,2-	78-87-5	1	5	1.1×10^{-3}	103	ND–0.009	8.15×10^{-3}
Toluene	108-88-3	1200	1200	1.3×10^{-3}	97.0	ND–6.89	3.82×10^{-2}
Trichlorothane, 1,1,2-	79-00-5	0.6	2.8	1.2×10^{-3}	100	ND	ND
Tetrachloroethylene	127-18-4	11	53	1.4×10^{-3}	109	ND	ND
Chlorobenzene	108-90-7	68	270	1.2×10^{-3}	91.1	ND–0.079	5.19×10^{-2}
Tetrachloroethane, 1,1,1,2-	630-20-6	2.6	10	1.2×10^{-3}	87.5	ND	ND
Ethylbenzene	100-41-4	7.2	28	1.2×10^{-3}	112	ND–20.8	3.10×10^{-2}
Xylene, p- + Xylene, m-	106-42-3 108-38-3	163	570	1.2×10^{-3}	107	ND–68.3	3.13×10^{-2}
Xylene, o-	95-47-6	222	640	1.2×10^{-3}	108	ND–36.4	3.27×10^{-2}
Styrene	100-42-5	1290	1290	1.1×10^{-3}	117	ND–0.04	3.43×10^{-2}
Tetrachloroethane, 1,1,2,2-	79-34-5	1.6	6.8	1.2×10^{-3}	96.1	ND–0.01	1.01×10^{-2}
Trichloropropane, 1,2,3-	96-18-4	0.05	0.5	1.2×10^{-3}	94.3	ND–0.018	1.39×10^{-2}
Dichlorobenzene, 1,4-	106-46-7	5.6	20	1.5×10^{-3}	100	ND–0.1	8.40×10^{-3}
Dichlorobenzene, 1,2-	95-50-1	560	560	1.5×10^{-3}	99.4	ND–0.033	1.89×10^{-2}
DEHP	117-81-7	42	121	0.1	82.6	ND–92.9	0.30
Chlorophenol, 2-	95-57-8	250	2256	0.06	78.7	ND	ND
Nitrobenzene	98-95-3	34	76	0.09	78.1	ND–16.3	1.63
Naphthalene	91-20-3	25	70	0.09	79.9	ND–0.15	0.12
Chrysene	218-01-9	490	1293	0.1	77.6	ND–0.4	0.20
Benzo(a)anthracene	56-55-3	5.5	15	0.1	84.7	ND–0.3	0.20
Benzo(a)pyrene	50-32-8	0.55	1.5	0.1	81.3	ND–0.2	0.20
Benzo(b)fluoranthene	205-99-2	5.5	15	0.2	80.4	ND–0.6	0.25
Benzo(k)fluoranthene	207-08-9	55	151	0.1	82.1	ND–0.2	0.10
Dibenzo (a, h) anthracene	53-70-3	0.55	1.5	0.1	79.0	ND	ND
Indeno(1,2,3-cd) pyrene	193-39-5	5.5	15	0.1	84.5	ND–0.3	0.30

Notes: a) Contamination screening guideline values for sensitive and non-sensitive lands listed in Risk Screening Guideline Values for Soil Contamination (HJ25.3-2019).

Table S2 Physicochemical and toxicological properties of critical pollutants.

Contaminants	H'	D_a (cm^2 /s)	D_w (cm^2 /s)	K_{oc} (cm^3 /g)	S (mg/L)	SF_o (kg·d/mg)	IUR (m^3/mg)	RfD_o (mg/kg·d)	RfC (mg/kg·d)	ABS_{gi}	ABS_d
Benzene	0.227	0.0895	1.03×10^{-5}	145.8	1790	0.055	0.0078	0.004	0.03	1	–
Toluene	0.271	0.0778	9.20×10^{-6}	234	526	–	–	0.08	5	1	–
Ethylbenzene	0.322	0.0685	8.46×10^{-6}	446	169	0.011	0.0025	0.1	1	1	–
1,2-DCP	0.115	0.0733	9.73×10^{-6}	60.7	2800	0.037	0.037	0.04	0.004	1	–
BaA	4.91×10^{-4}	0.0261	6.75×10^{-6}	177000	0.0094	0.1	0.06	–	–	1	0.13
BbF	2.69×10^{-5}	0.0476	5.56×10^{-6}	599000	0.0015	0.1	0.06	–	–	1	0.13
DEHP	1.10×10^{-5}	0.0173	4.18×10^{-6}	120000	0.27	0.014	0.0024	0.02	–	1	0.1

Notes: H' = Henry's law constant; D_a = diffusion coefficient of air contaminant in air; D_w = diffusion coefficient of contaminant in water; S = water solubility; SF_o = cancer slope factor (oral); IUR = inhalation unit risk; RfD_o = reference dose (oral); RfC = reference concentration; ABS_{gi} = fraction of contaminant absorbed in gastrointestinal tract (unitless); ABS_d = fraction of contaminant absorbed through dermal contact (unitless); "–" denotes "not applicable." Data are from "MEEPRC (2019) Technical guidelines for risk assessment of soil contamination of land for construction.

Table S3 Exposure factors used for the sensitive and non-sensitive land evaluations of the industrial park.

Definitions	Units	Sensitive land		Non-sensitive land
		Children	Adult	Adult
BW	kg	19.2	61.8	61.8
EF	d/a	350	350	250
ED	a	6	24	25
EFI	d/a	262.5	262.5	187.5
EFO	mg/d	87.5	87.5	62.5
DAIR	m^3/d	7.5	14.5	14.5
OSIR	mg/d	200	100	100
AF	mg/cm^2	0.2	0.2	0.07
SER	unitless	0.36	0.32	0.18
SSAR	mg/cm^2	0.2	0.07	0.07
H	cm	113.15	161.5	161.5
t	h	0.5	0.5	0.5
ABSo	unitless	1		1
ATca	day	27740		27740
Ev	times/d	1		1
fspi	unitless	0.8		0.8
fspo	unitless	0.5		0.5
SAF	unitless	0.5		0.5
WAF	unitless	0.5		0.5
PIAF	unitless	0.75		0.75

Table S4 The screening values and recoveries of pollutants in groundwater.

Pollutants	CAS	Screening value [a, b, c] (mg/L)	LOD (mg/L)	Average recovery (%)	Range (mg/L)	Median (mg/L)
Chloromethane	74-87-3	/	4.9×10^{-4}	101.4	ND	ND
Vinyl chloride	75-01-4	0.09	1.5×10^{-3}	96.6	ND	ND
Acetone	67-64-1	2.2[c)]	1.5×10^{-3}	106	ND–8.15	4.25
Dichloroethylene, 1,1-	75-35-4	0.06	1.2×10^{-3}	105	ND	ND
Methylene Chloride	75-09-02	0.5	1.0×10^{-3}	121	ND	ND
Dichloroethylene, 1,2-trans-	156-60-5	0.06	1.1×10^{-3}	117	ND	ND
Dichloroethane, 1,1-	75-34-3	0.23	1.2×10^{-3}	111	ND	ND
Methyl Ethyl Ketone (2-Butanone)	78-93-3	7.1[c)]	7×10^{-4}	112	ND–4.68	2.37
Dichloroethylene, 1,2-cis-	156-59-2	0.06	1.2×10^{-3}	115	ND	ND
Chloroform	67-66-3	0.3	1.4×10^{-3}	111	ND	ND
Trichlorothane, 1,1,1-	71-55-6	4	1.4×10^{-3}	112	ND	ND
Carbon tetrachloride	56-23-5	0.05	1.5×10^{-3}	112	ND	ND
Dichloroethane, 1,1-	75-34-3	0.04	1.4×10^{-3}	107	ND	ND
Benzene	71-43-2	0.12	1.4×10^{-3}	112	ND–2.42×10^{-3}	2.42×10^{-3}
Trichloroethylene	79-01-6	0.21	1.2×10^{-3}	110	ND	ND
Dichloropropane, 1,2-	78-87-5	0.06	1.2×10^{-3}	112	ND–7.98×10^{-1}	7.98×10^{-1}
Toluene	108-88-3	1.4	1.4×10^{-3}	118	ND–1.56	7.86×10^{-1}
Trichlorothane, 1,1,2-	79-00-5	0.06	1.5×10^{-3}	110	ND	ND
Tetrachloroethylene	127-18-4	0.3	1.2×10^{-3}	112	ND–7.90×10^{-2}	5.19×10^{-2}
Chlorobenzene	108-90-7	0.6	1.0×10^{-3}	116	ND	ND
Tetrachloroethane, 1,1,1,2-	630-20-6	0.14	1.5×10^{-3}	106	ND	ND
Ethylbenzene	100-41-4	0.6	8×10^{-4}	118	ND–68.3	3.13×10^{-2}
Xylene, p- + Xylene, m-	106-42-3 108-38-3	1	2.2×10^{-3}	119	ND–1.01×10^{-2}	7.92×10^{-2}
Xylene, o-	95-47-6	1	1.4×10^{-3}	115	ND–5.60×10^{-2}	4.66×10^{-2}
Styrene	100-42-5	0.04	6×10^{-4}	115	ND	ND
Tetrachloroethane, 1,1,2,2-	79-34-5	0.04	1.1×10^{-3}	108	ND	ND
Trichloropropane, 1,2,3-	96-18-4	0.0012	1.2×10^{-3}	119	ND	ND
Dichlorobenzene, 1,4-	106-46-7	0.6	8×10^{-4}	119	ND	ND
Dichlorobenzene, 1,2-	95-50-1	2	8×10^{-4}	118	ND	ND
DEHP	117-81-7	0.3	3.0×10^{-3}	94.3	ND–2.03×10^{-2}	5.31×10^{-3}
Chlorophenol, 2-	95-57-8	2.2	1.1×10^{-3}	93.3	ND	ND
Nitrobenzene	98-95-3	2	4.0×10^{-5}	81.9	ND	ND
Naphthalene	91-20-3	0.6	1.1×10^{-5}	93.9	ND–1.11×10^{-2}	1.07×10^{-4}
Chrysene	218-01-9	0.48	8×10^{-6}	88.4	ND–7.64×10^{-4}	2.90×10^{-5}
Benzo(a)anthracene	56-55-3	0.0048	7×10^{-6}	82.9	ND–1.11×10^{-2}	7.62×10^{-3}
Benzo(a)pyrene	50-32-8	0.0005	4×10^{-6}	86.1	ND–1.40×10^{-4}	1.08×10^{-4}
Benzo(b)fluoranthene	205-99-2	0.008	3×10^{-6}	89.6	ND–3.44×10^{-2}	2.71×10^{-4}
Benzo(k)fluoranthene	207-08-9	0.048	4×10^{-6}	102	ND–3.67×10^{-4}	3.70×10^{-5}
Dibenzo(a, h)anthracene	53-70-3	0.00048	3×10^{-6}	96.6	ND–2.50×10^{-5}	1.90×10^{-5}
Indeno(1,2,3-cd)pyrene	193-39-5	0.0048	3×10^{-6}	93.7	ND	ND

Notes: a) Standard for groundwater quality (GB/T 14848-2017, Class IV); b) Shanghai construction land soil contamination survey, risk assessment, risk control and remediation program preparation, risk control and remediation effect assessment of additional provisions (for trial implementation); c) Surface water environmental quality standards (GB 3838-2002) (Centralized living drinking water surface water source standard limits).

Table S5 Comparison concentrations of characteristic pollutants in soil and groundwater.

Organic pollutants	Location	Environmental media	Levels	References
TPHs	Zhejiang, China	Soil	ND–9980 mg/kg	This study
	Lanzhou, China Contaminated site (3.0×10^5 m^2)	Soil	ND–62490 mg/kg	(Sun et al., 2022)
	Qinghai, China Oilfield (oil production well)	Soil	439–9400 mg/kg	(Geng et al., 2022)
	SW Iran Industrial soil samples	Soil	1.2–11000 mg/kg	(Ashjar et al., 2021)
	Tianjin, China Oil field	Soil	59–2260 mg/kg	(Meng et al., 2021)
Benzene	Zhejiang, China	Soil Groundwater	ND–3.04 mg/kg ND–2.42 μg/L	This study
	North-east China	Groundwater	3.28–53.27 μg/L	(Wu et al., 2021)
	Chongqing, China An organic chemical industry	Groundwater	ND–12100 μg/L	(Liu et al., 2016)
	North China Abandoned petrochemical site	Soil	0.001–0.587 mg/kg	(Zhang et al., 2014)
DEHP	Zhejiang, China	Soil Groundwater	ND–92.2 mg/kg ND–20.3 μg/L	This study
	Guangzhou, China	Soil	0–14698 mg/kg	(Zheng et al., 2022)
	Hebei, China	Groundwater	2.6–9 μg/L	(Kang et al., 2017)
	Barcelona, Spain	Groundwater	ND–5.661 μg/L	(Lopez-Roldan et al., 2004)
	Xiangyang, China Electronics manufacturing area	Soil	2.24–153 mg/kg	(Wu et al., 2015)
1,2-DCP	Zhejiang, China	Groundwater	ND–798 μg/L	This study
	Netherlands	Groundwater	ND–165 μg/L	(Leistra and Boesten, 1989)

Table S6 Probability distribution for the exposure parameters.

Definition	units	Distributions	Probability distribution values		References
			Children	Adults	
AT_{ca}	d	Log-normal	m = 18621, s = 1.1		(Zhang et al., 2020)
BW	kg	Log-normal	m = 16.68, s = 1.48	m = 59.78, s = 1.07	
DAIR	m^3/d	Uniform	(4.7, 6.4)	(11.8, 16.7)	
ED	a	Uniform	(0, 11)	(0, 52)	
SSAR	mg/cm^2	Log-normal	m = 0.04, s = 3.41	m = 0.02, s = 2.67	
EF	d/a	Uniform	(350, 365)		
OSIR	mg/d	Triangular	103 (66, 161)	30(4, 52)	(Zheng et al., 2020)
EFI	d/a	Triangular	314. 6 (104, 347.7)		(MEEPRC, 2013)
EFO	d/a	Triangular	45. 9 (36.5, 213)		

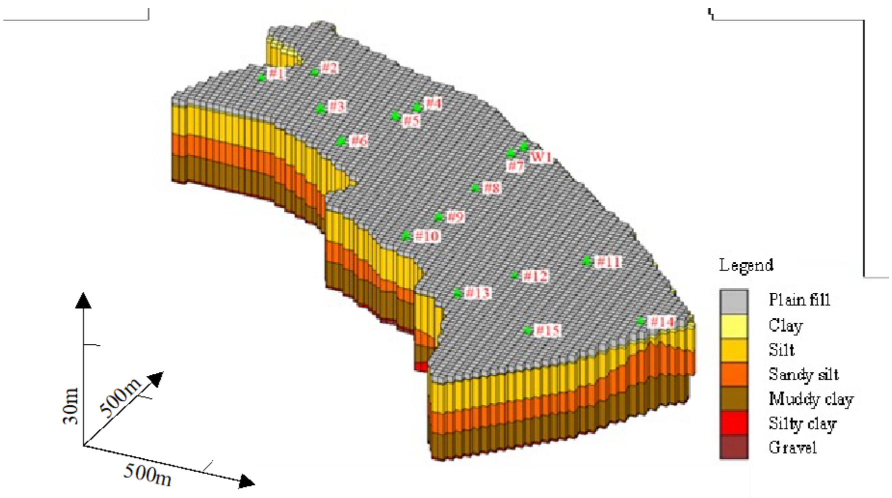

Fig. S1 The geological structure of the industrial park.

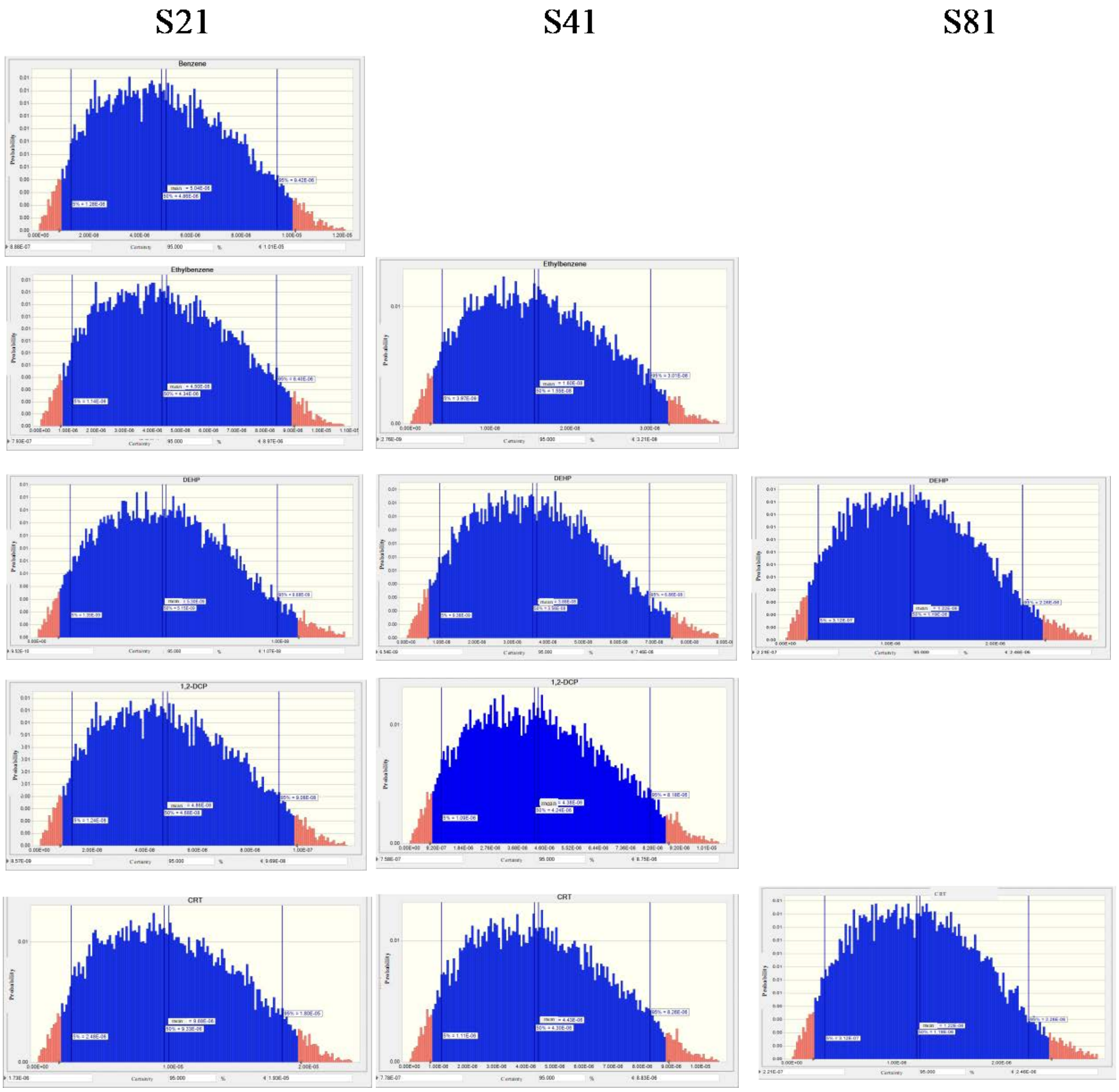

Fig. S2 Uncertainty of cancer risk induced by characteristic pollutants at different sites.

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