

Polycyclic aromatic hydrocarbon in urban soils of the Eastern European megalopolis: distribution, source identification and cancer risk evaluation

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Table S1. Soil guideline values for PAHs established in some countries, mg·kg⁻¹

	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(ghi)perylene	Chrysene	Dibenz(ah)anthracene	Fluoranthene	Fluorene	Indeno(123-cd)pyrene	Naphthalene	Phenanthrene	Pyrene	PAH (total)
CCME	Residential / Parkland															
				1	0.7	1			1			1	0.6	5	10	
	Industrial / Commercial															
				10	0.7	10			10			10	22	50	100	
US EPA	Agricultural															
				0.1	0.1	0.1			0.1			0.1	0.1	0.1	0.1	
	Residential (combined exposure)															
	3,700		22,000	0.62	0.062	0.62		62	0.062	2,300	2,700	0.62	56		2,300	
NZMfE	Industrial (combined exposure)															
	29,000		240,000	2.1	0.21	2.1		211	0.21	22,000	26,000	2.1	190		29,000	
	Residential (calculated mean values for all soil types at 0-1 m depth)															
				0.27	0.27	0.27		0.27	0.27			0.27	64		1600 ^a	
DME	Industrial / Commercial (calculated mean values for all soil types at 0-1 m depth)															
				11 ^a	11 ^a	11 ^a		11 ^a	11 ^a			11 ^a	143 ^a			
	Agricultural (calculated mean values for all soil types at 0-1 m depth)															
				0.027	0.027	0.027		0.027	0.027			0.027	7.2		160 ^a	
NL	Soil Quality Criteria (Human Health Risk)															
					0.1				0.1							1.5
	Soil Quality Criteria (Ecological Risk)															
FME					0.1											1
	Maximum Permissible Concentrations (MPCs) for PAHs (from Kalf et al., 1997)															
			0.12	0.25	0.26		7.5	10.7		2.6		5.9	0.14	0.51		
GFME	Threshold value															
	1			1	0.2	1				1			1	1		15
	Lower guideline value															
	5 (e)			5 (e)	2 (t)	5 (e)				5 (e)			5 (e)	5 (e)		30 (e)
	Higher guideline value															
RF	15 (e)			15 (e)	15 (e)	15 (e)				15 (e)			15 (e)	15 (e)		100 (e)
	Precautionary soil threshold values of organic pollutants / Soil organic matter (SOM) > 8 % (BBodSchV, 1999)															
					1											10
RF	Precautionary soil threshold values of organic pollutants / Soil organic matter (SOM) ≤ 8 %															
					0.3											3
	Maximum Permissible Concentrations (MPCs)															
					0.02											

CCME – Canadian Council of Ministers of the Environment; US EPA – United States Environmental Protection Agency; NZMfE – Ministry for the Environment of New Zealand; DME – Danish Ministry of the Environment; NL – Netherlands Ministry of Infrastructure and Environment; FME – Finnish Ministry of the Environment; GFME – German Federal Ministry for the Environment; RF – Ministry of Natural Resources and Environment of the Russian Federation. ^a – marked values are likely correspond to concentrations associated with formation of a residual separate phase. (e) – calculations are based on ecological risk. (t) – calculations are based on health risk.

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Table S2. PAH molecular ratios with end member values

Molecular ratio	Value range	PAH origin	Reference
ANT/(ANT+PHE)	<0.10	Petroleum/petrogenic source	Yunker et al. (2002)
	>0.10	Combustion	
FLT/(FLT+PYR)	<0.40	Petroleum/petrogenic source	Yunker et al. (2002)
	0.40-0.50	Gasoline, diesel and crude oil combustion, cars and diesel trucks	
	>0.50	Grass, coal and wood combustion	
BaA/(BaA+CHR)	<0.20	Petroleum/petrogenic source	Yunker et al. (2002)
	0.20-0.35	Petroleum/petrogenic source or combustion	
	0.35-0.50	Combustion	
	>0.50	Grass, coal and wood combustion	
IPY/(IPY+BPE)	<0.20	Petroleum/petrogenic source	Yunker et al. (2002)
	0.20-0.50	Liquid fossil fuel (vehicle and crude oil) combustion	
	>0.50	Grass, wood and coal combustion	
BaP/BPE	<0.60	Non-traffic sources	Pandey et al. (1999)
	>0.60	Traffic sources	
CombPAH ^a / ΣPAH	<0.30	Petroleum/petrogenic source	Hwang et al. (2003)
	0.30-0.70	Petroleum/petrogenic source or combustion	
	>0.70	Combustion dominated source	

^aCombPAH – combustion PAH = sum of FLT, PYR, BaA, CHR, BbF, BkF, BaP, IPY and BPE