

## Supplementary Materials

**Table S1.** Metal and nitrogen concentrations in the moss samples of the Lower Saxony supplementary network to MM2020.

Location Category	Location	Moss Species	Aluminium (Al) mg/kg	Arsenic (As) mg/kg	Cadmium (Cd) mg/kg	Chromium (Cr) mg/kg	Copper (Cu) mg/kg	Iron (Fe) mg/kg	Nickel (Ni) mg/kg	Lead (Pb) mg/kg	Antimony (Sb) mg/kg	Vanadium (V) mg/kg	Zinc (Zn) mg/kg	Mercury (Hg) mg/kg	Nitrogen (N) Ma%
F	NI03_92	<i>Plesch</i>	74	0.03	0.18	0.68	4.38	124	0.47	1.15	0.13	0.66	39.7	0.034	1.82
T	NI03_94	<i>Plesch</i>	228	0.05	0.16	1.24	7.13	324	1.52	1.85	0.17	1.10	33.7	0.058	2.24
T	NI03_95	<i>Plesch</i>	146	0.08	0.19	0.82	7.44	198	0.97	1.19	0.15	0.71	37.1	0.044	2.22
F	NI104_88	<i>Psepur</i>	110	0.05	0.13	0.79	5.08	177	0.64	0.94	0.12	0.60	36.2	0.021	1.33
T	NI104_90	<i>Psepur</i>	159	0.05	0.11	1.00	7.13	262	1.28	1.18	0.13	0.81	54.5	0.050	1.92
T	NI104_91	<i>Psepur</i>	171	0.06	0.10	1.29	4.88	310	1.50	1.06	0.13	0.80	43.3	0.034	1.60
F	NI108_100	<i>Psepur</i>	268	0.11	0.22	1.25	11.66	244	1.53	1.94	0.17	0.78	53.7	<u>0.122</u>	3.11
T	NI108_101	<i>Psepur</i>	123	0.04	0.13	0.83	7.62	151	0.78	1.66	0.12	0.54	32.2	0.056	2.22
T	NI108_102	<i>Psepur</i>	95	0.01	0.12	0.65	6.22	105	0.77	0.70	0.11	0.33	35.8	0.036	1.98
T	NI108_98	<i>Psepur</i>	97	0.03	0.14	0.78	4.27	88	0.78	0.61	0.12	0.26	36.7	0.048	1.42
F	NI116_120	<i>Plesch</i>	169	0.06	0.07	0.97	<u>7.57</u>	210	1.34	1.17	<u>0.17</u>	0.55	31.2	0.049	1.85

T	NI116_12 2	<i>Plesch</i>	116	0.06	0.25	0.76	11.12	137	0.69	0.87	0.12	0.35	<u>62.2</u>	0.049	3.15
T	NI116_12 3	<i>Plesch</i>	348	<u>0.13</u>	0.17	1.98	7.97	359	2.10	<u>3.02</u>	0.13	1.12	37.0	0.080	2.16
F	NI117_12 3	<i>Psepur</i>	<u>3057</u>	<u>0.72</u>	<u>0.30</u>	<u>15.68</u>	5.36	<u>2327</u>	<u>7.84</u>	<u>3.13</u>	0.11	<u>6.12</u>	37.8	0.032	1.16
T	NI117_12 4	<i>Psepur</i>	194	0.11	0.22	1.32	<u>14.50</u>	282	1.29	1.77	0.16	1.02	<u>80.4</u>	<u>0.120</u>	3.29
T	NI117_12 5	<i>Psepur</i>	153	0.05	0.15	0.95	11.04	214	1.39	1.28	0.13	0.61	45.6	0.057	2.89
F	NI118_12 5	<i>Psepur</i>	631	0.19	0.08	<u>12.04</u>	3.48	536	<u>8.26</u>	1.38	0.11	1.12	24.5	0.024	1.09
T	NI118_12 7	<i>Psepur</i>	133	0.03	0.18	0.75	6.42	130	0.91	0.76	0.11	0.33	41.8	0.033	1.74
T	NI118_12 8	<i>Psepur</i>	244	0.06	0.11	1.28	5.87	259	1.26	1.37	0.13	0.67	45.6	0.051	1.46
F	NI124_13 9	<i>Plesch</i>	306	0.12	0.13	1.63	4.55	343	1.86	2.02	<u>0.21</u>	1.42	26.4	<u>0.170</u>	1.33
T	NI124_14 3	<i>Plesch</i>	256	0.07	0.10	1.58	7.23	266	2.01	1.11	0.13	0.97	39.6	0.070	1.92
F	NI130_15 7	<i>Plesch</i>	139	0.05	0.07	0.80	5.87	91	0.83	0.75	0.11	0.32	33.4	0.031	1.56

T	NI130_16 0	<i>Plesch</i>	132	0.08	0.11	0.71	6.62	141	0.71	0.66	0.11	0.77	27.1	0.035	1.57
T	NI130_16 1	<i>Plesch</i>	131	0.09	0.12	1.91	7.72	168	1.58	0.77	0.14	0.76	40.0	0.045	1.69
T	NI130_16 2	<i>Plesch</i>	296	<u>0.16</u>	0.18	<u>2.13</u>	9.60	457	1.84	1.64	0.16	<u>2.57</u>	40.8	0.079	2.50
F	NI130_16 3	<i>Plesch</i>	109	0.07	0.08	0.96	5.56	175	1.01	0.60	0.10	0.93	24.9	0.029	1.41

F = open space site; T = canopy drip site; Plesch = *Pleurozium schreberi*; Psepur = *Pseudoscleropodium purum*; underlined = outlier values; MA% = mass%.

**Table S2.** Descriptive-statistical characteristics of quantified metal and nitrogen concentrations in the moss samples from 25 sites in the Lower Saxony supplementary network to MM2020.

Element	Location Category	n	Min [µg/g]	P20 [µg/g]	P50 [µg/g]	P90 [µg/g]	P98 [µg/g]	Max [µg/g]	MW [µg/g]	SD [µg/g]	CV [%]
Al	F	9	74	104	139	1116	2669	3057	521	967	185
	T	17	95	132	159	279	331	348	188	73	39
	Total	26	74	116	156	327	1844	3057	303	573	189
As	F	9	0.02	0.03	0.05	0.29	0.63	0.71	0.14	0.22	159.19
	T	17	0.01	0.04	0.06	0.12	0.15	0.16	0.07	0.04	56.10
	Total	26	0.01	0.04	0.06	0.15	0.45	0.71	0.09	0.13	143.76
Cd	F	9	0.07	0.07	0.12	0.2	0.27	0.29	0.13	0.07	57.31
	T	17	0.09	0.11	0.14	0.21	0.23	0.24	0.15	0.05	31.08
	Total	26	0.07	0.10	0.12	0.22	0.26	0.29	0.14	0.06	39.89
Cr	F	9	0.67	0.79	0.95	12.76	15.09	15.67	3.81	5.77	151.53
	T	17	0.65	0.76	1.24	1.93	2.08	2.13	1.20	0.47	39.01
	Total	26	0.65	0.78	0.98	2.05	13.85	15.67	2.10	3.52	167.56
Cu	F	9	3.47	4.33	5.08	6.20	7.29	7.56	5.12	1.18	23.01
	T	17	4.88	6.46	7.43	11.33	13.59	14.50	8.24	2.51	30.43
	Total	26	3.47	5.08	6.87	11.07	13.08	14.5	7.16	2.60	36.33
Fe	F	9	88	111	177	894	2040	2327	452	717	159
	T	17	105	143	244	338	426	457	236	94	40
	Total	26	88	137	212	408	1431	2327	311	426	137
Hg	F	9	0.020	0.020	0.030	0.064	0.141	0.160	0.043	0.044	102.556
	T	17	0.030	0.032	0.050	0.090	0.120	0.120	0.055	0.028	51.345
	Total	26	0.020	0.030	0.040	0.095	0.140	0.160	0.051	0.034	67.299
Ni	F	9	0.47	0.72	1.01	7.91	8.18	8.25	2.55	3.14	122.87
	T	17	0.69	0.80	1.29	1.90	2.06	2.09	1.29	0.45	34.38
	Total	26	0.47	0.78	1.28	2.04	8.04	8.25	1.73	1.91	110.42
Pb	F	9	0.60	0.69	1.15	2.23	2.94	3.12	1.3	0.81	62.33
	T	17	0.66	0.79	1.19	1.89	2.67	3.01	1.34	0.60	44.77
	Total	26	0.60	0.75	1.17	1.97	3.06	3.12	1.33	0.66	50.07
Sb	F	9	0.10	0.10	0.11	0.17	0.19	0.20	0.12	0.03	27.28
	T	17	0.10	0.12	0.13	0.16	0.16	0.16	0.13	0.02	13.93
	Total	26	0.10	0.11	0.12	0.16	0.18	0.20	0.13	0.02	18.90
V	F	9	0.26	0.46	0.66	2.36	5.36	6.11	1.33	1.83	137.79
	T	17	0.32	0.55	0.76	1.10	2.11	2.57	0.83	0.51	61.18

	Total	26	0.26	0.54	0.76	1.27	4.34	6.11	1.01	1.14	113.29
Zn	F	9	24.52	25.82	33.36	38.21	39.43	39.73	32.32	5.84	18.05
	T	17	27.10	36.02	40.8	57.59	74.54	80.35	44.14	12.77	28.93
	Total	26	24.52	32.17	37.44	54.08	71.28	80.35	40.05	12.17	30.38
			Min [Ma%]	P20 [Ma%]	P50 [Ma%]	P90 [Ma%]	P98 [Ma%]	Max [Ma%]	MW [Ma%]	SD [Ma%]	CV [%]
N	F	9	1.09	1.26	1.41	1.83	1.85	1.85	1.44	0.26	18.25
	T	17	1.46	1.7	2.16	3.13	3.25	3.29	2.22	0.58	26.38
	Total	26	1.09	1.42	1.83	3.00	3.22	3.29	1.95	0.62	31.73

F = open land area; T = canopy drips area; n = sample size; P20 = 20th percentile; P50 = 50th percentile; P90 = 90th percentile; P98 = 98th percentile; MW = arithmetic mean; SD = standard deviation; CV = relative coefficient of variation; Ma% = mass%.

**Table S3.** Element- and site-specific comparison of the median values of neighbouring open land and canopy drips sites in the Lower Saxony supplementary network to MM2020.

Element	Location Combination	n	Median (T)	Median (F)	Ratio (T/F)
Al	TF	20	156 µg/g	124 µg/g	1.26
As	TF	20	0.06 µg/g	0.04 µg/g	1.44
Cd	TF	20	0.14 µg/g	0.10 µg/g	1.35 *
Cr	TF	20	1.25 µg/g	0.88 µg/g	1.42
Cu	TF	20	7.53 µg/g	5.22 µg/g	1.44 ***
Fe	TF	20	229 µg/g	175 µg/g	1.31
Hg	TF	20	0.045 µg/g	0.030 µg/g	1.50 ***
Ni	TF	20	1.33 µg/g	0.92 µg/g	1.46
Pb	TF	20	1.18 µg/g	0.94 µg/g	1.26
Sb	TF	20	0.13 µg/g	0.11 µg/g	1.18 *
V	TF	20	0.76 µg/g	0.63 µg/g	1.21
Zn	TF	20	40.41 µg/g	33.36 µg/g	1.21 ***
N	TF	20	2.07 Ma%	1.42 Ma%	1.46 ***

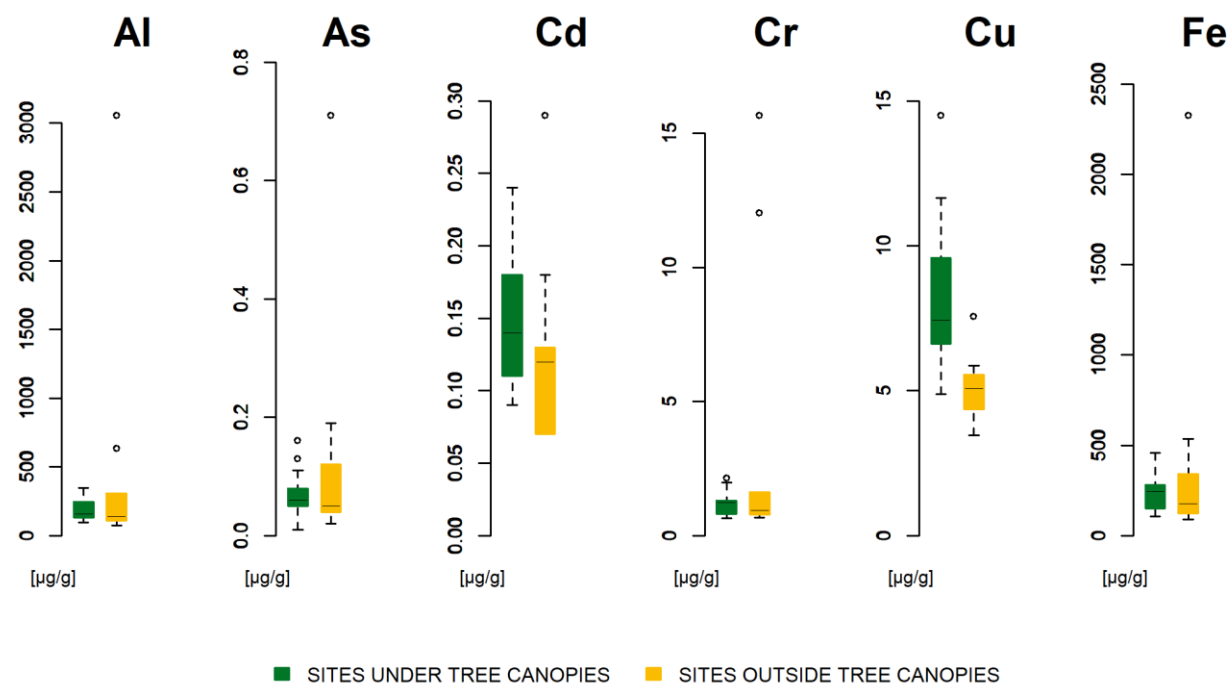
T = canopy drip site, F = open land site; n = sample size; Ma% = mass%; \*\*\* =  $p \leq 0.01$  (very significant); \*\* =  $p \leq 0.05$  (significant); \* =  $p \leq 0.1$  (weakly significant)

**Table S4.** Element- and site-specific comparison of the median values of neighbouring open land and canopy drip sites (without outliers) in the Lower Saxony supplementary network to MM2020.

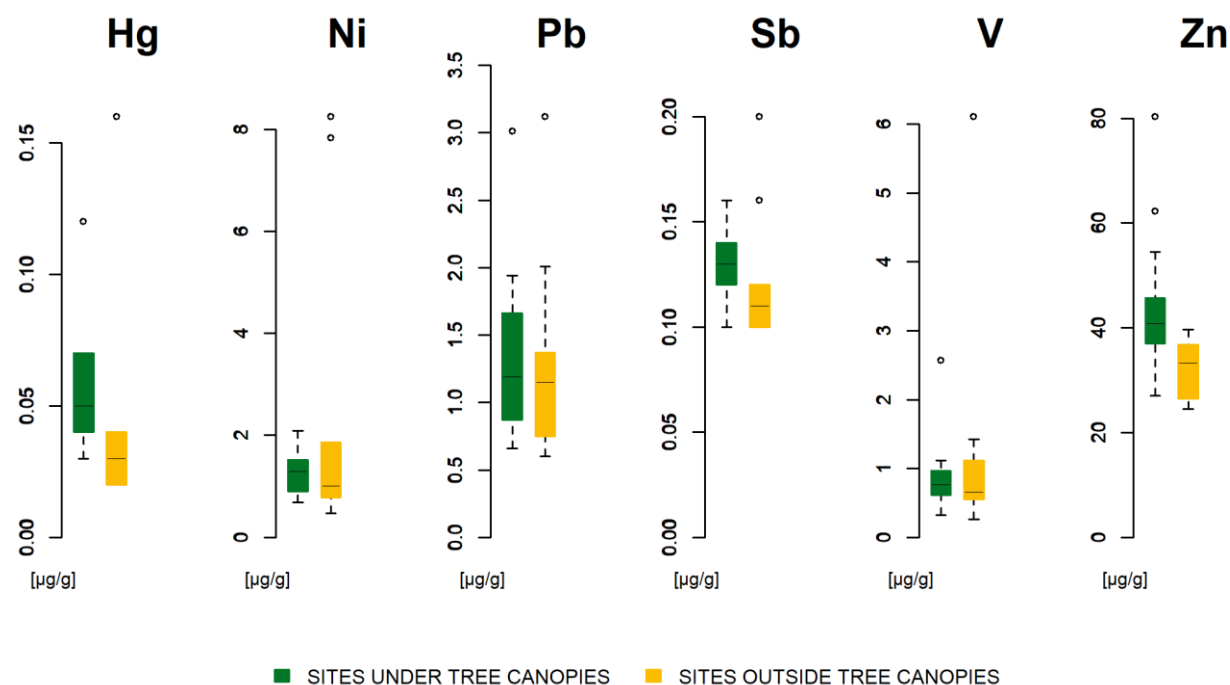
Element	Location Combination	n	Median (T)	Median (F)	Ratio (T/F)
Al	TF	20	156 µg/g	109 µg/g	1.43 **
As	TF	17	0.06 µg/g	0.04 µg/g	1.50
Cd	TF	20	0.14 µg/g	0.08 µg/g	1.69 ***
Cr	TF	18	1.12 µg/g	0.80 µg/g	1.40 *
Cu	TF	19	7.43 µg/g	5.08 µg/g	1.46 ***
Fe	TF	20	229 µg/g	175 µg/g	1.31
Hg	TF	18	0.04 µg/g	0.03 µg/g	1.33 ***
Ni	TF	20	1.33 µg/g	0.82 µg/g	1.63 ***
Pb	TF	19	1.17 µg/g	0.84 µg/g	1.38
Sb	TF	20	0.13 µg/g	0.11 µg/g	1.18 ***
V	TF	18	0.76 µg/g	0.60 µg/g	1.26
Zn	TF	18	40.41 µg/g	33.36 µg/g	1.20 ***

N	TF	20	2.07 Ma%	1.42 Ma%	1.46 ***
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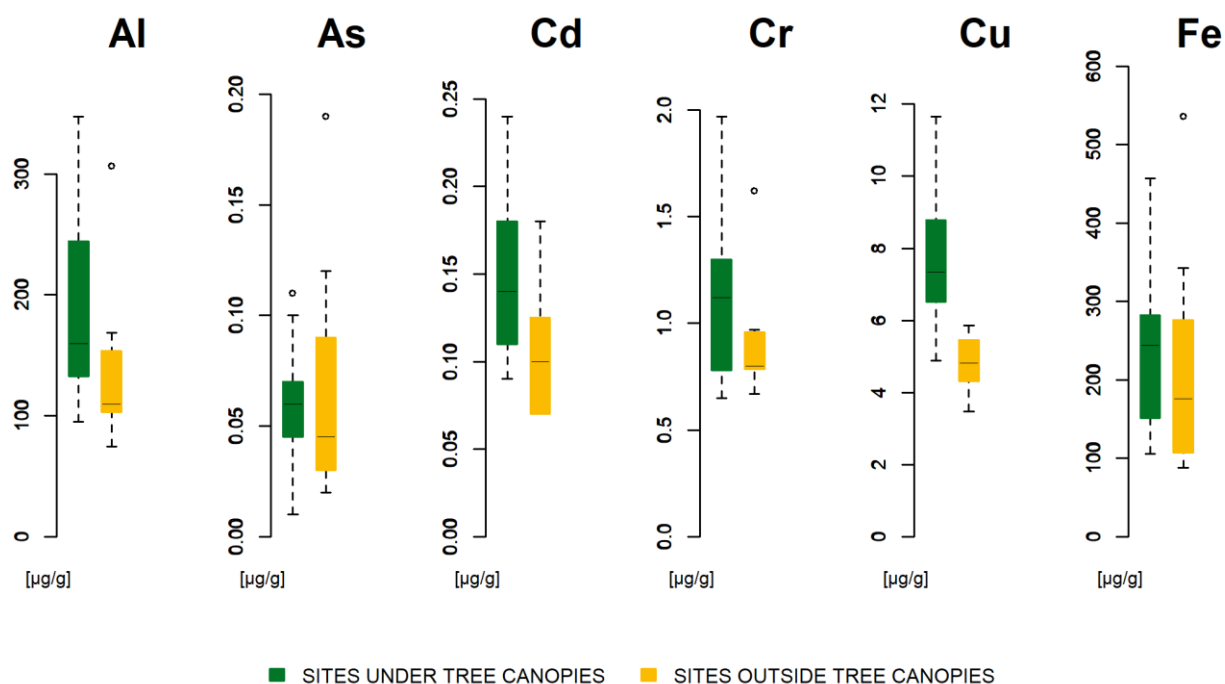
T = canopy drip site, F = open land site; n = sample size; Ma% = mass%; \*\*\* =  $p \leq 0.01$  (very significant); \*\* =  $p \leq 0.05$  (significant); \* =  $p \leq 0.1$  (weakly significant)



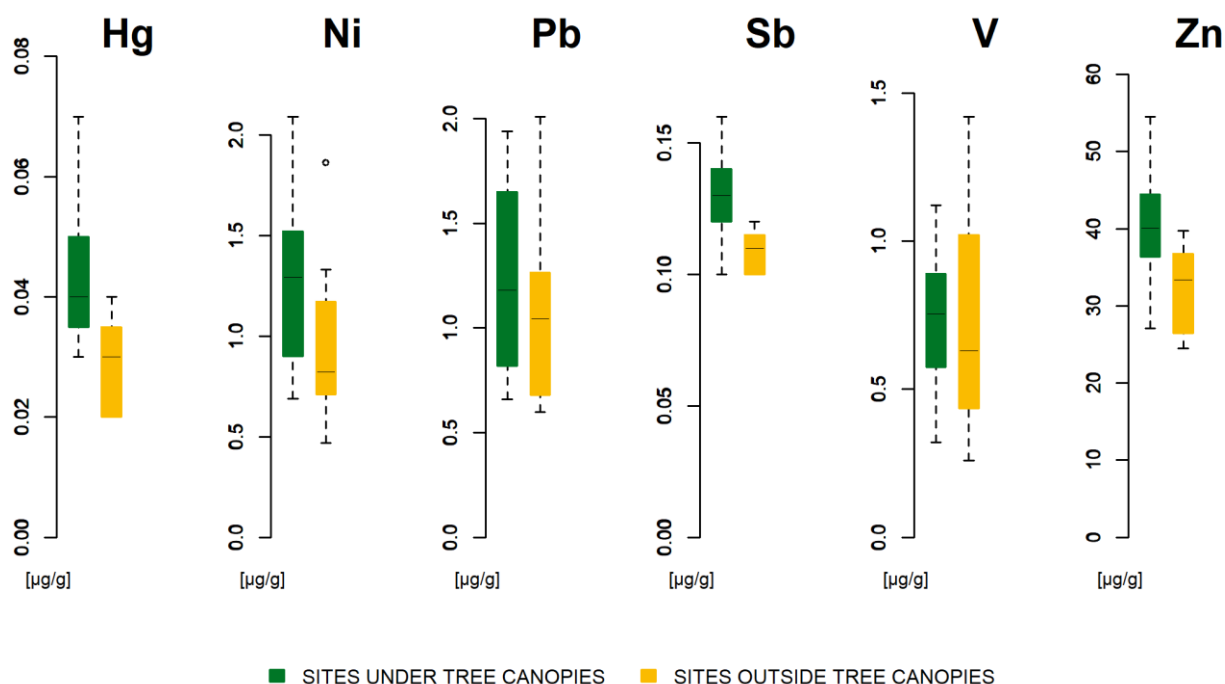
**Figure S1.** Distributions of the concentrations of Al, As, Cd, Cr, Cu and Fe in the moss samples of the Lower Saxony supplementary network to MM2020.



**Figure S2.** Distributions of the concentrations of Hg, Ni, Pb, Sb, V and Zn in the moss samples of the Lower Saxony supplementary network to MM2020.



**Figure S3.** Distributions of the concentrations of Al, As, Cd, Cr, Cu and Fe in the moss samples of the Lower Saxony supplementary network to MM2020 (without outlier values).



**Figure S4.** Distributions of the concentrations of Hg, Ni, Pb, Sb, V and Zn in the moss samples of the Lower Saxony supplementary network to MM2020 (without outlier values).



**Table S5.** Correlation coefficients (Pearson, Spearman) for the relationship between the quotients of the element contents in the mosses and the quotients of the examined vegetation structure measures (only significant correlations  $\geq 0.4$  are shown).

Element	Vegetation Structure Measure	n	Rp		rplog		rs	
Al	sLAI.lu	32	0.65	***	0.65	***	0.70	***
	wLAI.lu	32	0.67	***	0.66	***	0.69	***
	sLAI.veg	32	0.64	***	0.63	***	0.63	***
	wLAI.veg	32	0.69	***	0.67	***	0.67	***
	sLAI.spec	32	0.84	***	0.80	***	0.76	***
	wLAI.spec	32	0.85	***	0.81	***	0.77	***
Cd	sLAI.lu	36	0.45	***	0.48	***	0.45	***
	wLAI.lu	36	0.59	***	0.61	***	0.63	***
	sLAI.veg	36	0.60	***	0.62	***	0.63	***
	wLAI.veg	36	0.55	***	0.58	***	0.60	***
	sLAI.spec	36	0.48	***	0.52	***	0.67	***
	wLAI.spec	36	0.51	***	0.54	***	0.66	***
Cr	sLAI.lu	28	0.46	***	0.48	***	0.47	***
	wLAI.lu	28	0.46	***	0.49	***	0.39	**
	sLAI.spec	28	0.57	***	0.58	***	0.60	***
	wLAI.spec	28	0.47	***	0.48	***	0.47	***
Cu	sLAI.lu	34	0.52	***	0.59	***	0.66	***
	wLAI.lu	34	0.85	***	0.86	***	0.85	***
	sLAI.veg	34	0.81	***	0.84	***	0.82	***
	wLAI.veg	34	0.80	***	0.83	***	0.81	***
	sLAI.spec	34	0.90	***	0.90	***	0.92	***
	wLAI.spec	34	0.88	***	0.87	***	0.90	***
Fe	sLAI.lu	36	0.21		0.26		0.41	***
	wLAI.lu	36	0.40	**	0.36	**	0.49	***
	sLAI.veg	36	0.38	**	0.34	**	0.43	***
	wLAI.veg	36	0.40	***	0.36	**	0.46	***
	sLAI.spec	36	0.52	***	0.48	***	0.50	***
	wLAI.spec	36	0.52	***	0.48	***	0.53	***
Hg	sLAI.lu	34	0.57	***	0.60	***	0.66	***
	wLAI.lu	34	0.62	***	0.67	***	0.61	***
	sLAI.veg	34	0.59	***	0.64	***	0.61	***
	wLAI.veg	34	0.60	***	0.65	***	0.62	***
	sLAI.spec	34	0.66	***	0.69	***	0.78	***

	wLAI.spec	34	0.64	***	0.66	***	0.76	***
Ni	sLAI.lu	32	0.53	***	0.52	***	0.55	***
	wLAI.lu	32	0.56	***	0.57	***	0.54	***
	sLAI.veg	32	0.54	***	0.53	***	0.54	***
	wLAI.veg	32	0.58	***	0.59	***	0.59	***
	sLAI.spec	32	0.75	***	0.73	***	0.71	***
	wLAI.spec	32	0.69	***	0.67	***	0.65	***
Pb	sLAI.lu	34	0.31	*	0.36	**	0.46	***
	wLAI.lu	34	0.47	***	0.45	***	0.48	***
	sLAI.veg	34	0.40	**	0.40	**	0.40	**
	wLAI.veg	34	0.42	***	0.42	***	0.42	***
	sLAI.spec	34	0.61	***	0.58	***	0.52	***
	wLAI.spec	34	0.64	***	0.61	***	0.56	***
Sb	sLAI.lu	34	0.60	***	0.65	***	0.66	***
	wLAI.lu	34	0.75	***	0.77	***	0.69	***
	sLAI.veg	34	0.74	***	0.77	***	0.73	***
	wLAI.veg	34	0.74	***	0.77	***	0.73	***
	sLAI.spec	34	0.80	***	0.82	***	0.84	***
	wLAI.spec	34	0.78	***	0.80	***	0.84	***
V	sLAI.spec	32	0.41	**	0.38	**	0.36	**
	wLAI.spec	32	0.42	**	0.39	**	0.40	**
Zn	sLAI.lu	36	0.34	**	0.40	**	0.44	***
	wLAI.lu	36	0.46	***	0.52	***	0.38	**
	sLAI.veg	36	0.47	***	0.52	***	0.45	***
	wLAI.veg	36	0.46	***	0.51	***	0.44	***
	sLAI.spec	36	0.46	***	0.50	***	0.59	***
	wLAI.spec	36	0.40	**	0.42	***	0.50	***
N	sLAI.lu	40	0.42	***	0.51	***	0.66	***
	wLAI.lu	40	0.74	***	0.75	***	0.79	***
	sLAI.veg	40	0.73	***	0.75	***	0.82	***
	wLAI.veg	40	0.73	***	0.75	***	0.81	***
	sLAI.spec	40	0.87	***	0.84	***	0.87	***
	wLAI.spec	40	0.86	***	0.83	***	0.86	***

sLAI.lu = land-use specific simple leaf area index; wLAI.lu = land-use specific and cover weighted leaf area index; sLAI.veg = vegetation specific simple leaf area index; wLAI.veg = vegetation specific and cover weighted leaf area index; sLAI.spec = tree species specific simple leaf area index; wLAI.spec = tree species-specific and cover-weighted leaf area index; n = sample size; rp = correlation coefficient (Pearson); rlogp = correlation coefficient (Pearson) calculated with log-transformed vegetation parameters; rs = correlation coefficient (Spearman); \*\*\* =  $p \leq 0.01$  (very significant); \*\* =  $p \leq 0.05$  (significant); \* =  $p \leq 0.1$  (weakly significant); bold = vegetation structure measure with the comparatively highest correlation coefficients.

**Table S6.** Characteristics and goodness-of-fit measures of the regression models for the relationship between the quotients of the element contents in mosses and the quotients of the simple tree species-specific leaf area index.

Element	n	Vegetation Structure Measure	a	b	RSE	R <sup>2</sup>	Adj. R <sup>2</sup>	Pseudo R <sup>2</sup>
Al	32	sLAI.spec ***	1.2432	-0.1776	0.39	0.71	0.70	0.69
As_	30	sLAI.spec *	0.9851	0.4071	1.42	0.10	0.07	0.10
Cd	36	sLAI.spec ***	0.6895	0.4138	0.62	0.23	0.21	0.31
Cr	28	sLAI.spec ***	0.6111	0.4423	0.43	0.32	0.29	0.47
Cu	34	sLAI.spec ***	0.9164	0.1012	0.25	0.82	0.81	0.88
Fe	36	sLAI.spec ***	1.1376	0.0737	0.92	0.27	0.24	0.36
Hg	34	sLAI.spec ***	0.9259	0.1594	0.54	0.43	0.41	0.59
Ni	32	sLAI.spec ***	1.1084	-0.0177	0.48	0.57	0.55	0.60
Pb	34	sLAI.spec ***	0.8505	0.2287	0.55	0.37	0.35	0.44
Sb	34	sLAI.spec ***	0.3245	0.6565	0.15	0.64	0.63	0.70
V	32	sLAI.spec **	0.6692	0.4851	0.72	0.16	0.14	0.16
Zn	36	sLAI.spec ***	0.2910	0.7279	0.31	0.21	0.19	0.31
N	40	sLAI.spec ***	0.8532	0.1572	0.28	0.75	0.75	0.75

sLAI.spec = tree species-specific simple leaf area index; n = sample size; a = slope of the regression line; b = intercept of the regression line; RSE = residual standard error; R<sup>2</sup> = coefficient of determination; Adj. R<sup>2</sup> = corrected coefficient of determination; Pseudo R<sup>2</sup> = pseudo coefficient of determination; bold = regression models with Pseudo R<sup>2</sup> > 0.5