

Supplementary Information

A unifying modelling of multiple land degradation pathways in Europe

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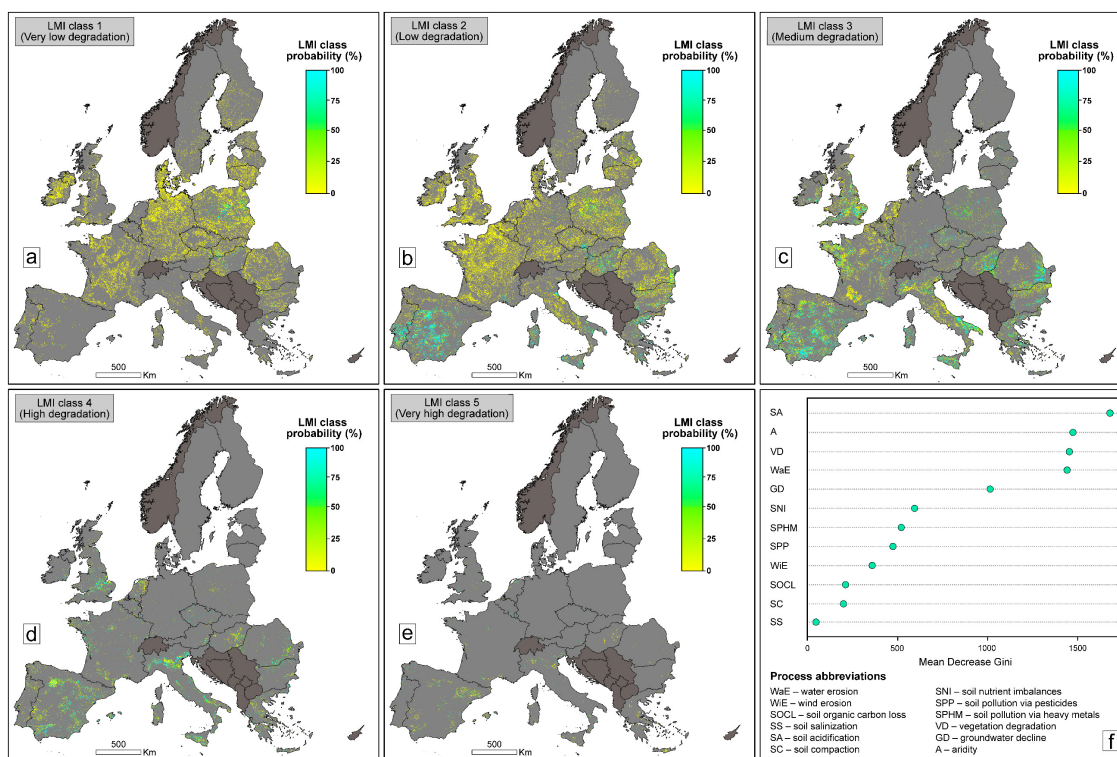
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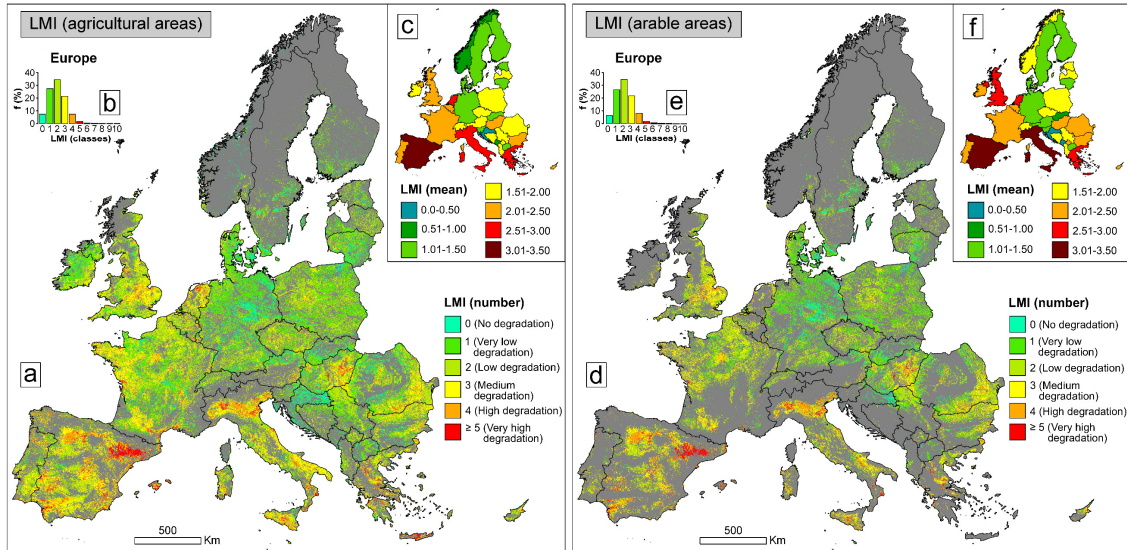
Supplementary Figures (1–4)

Supplementary Tables (1–13)

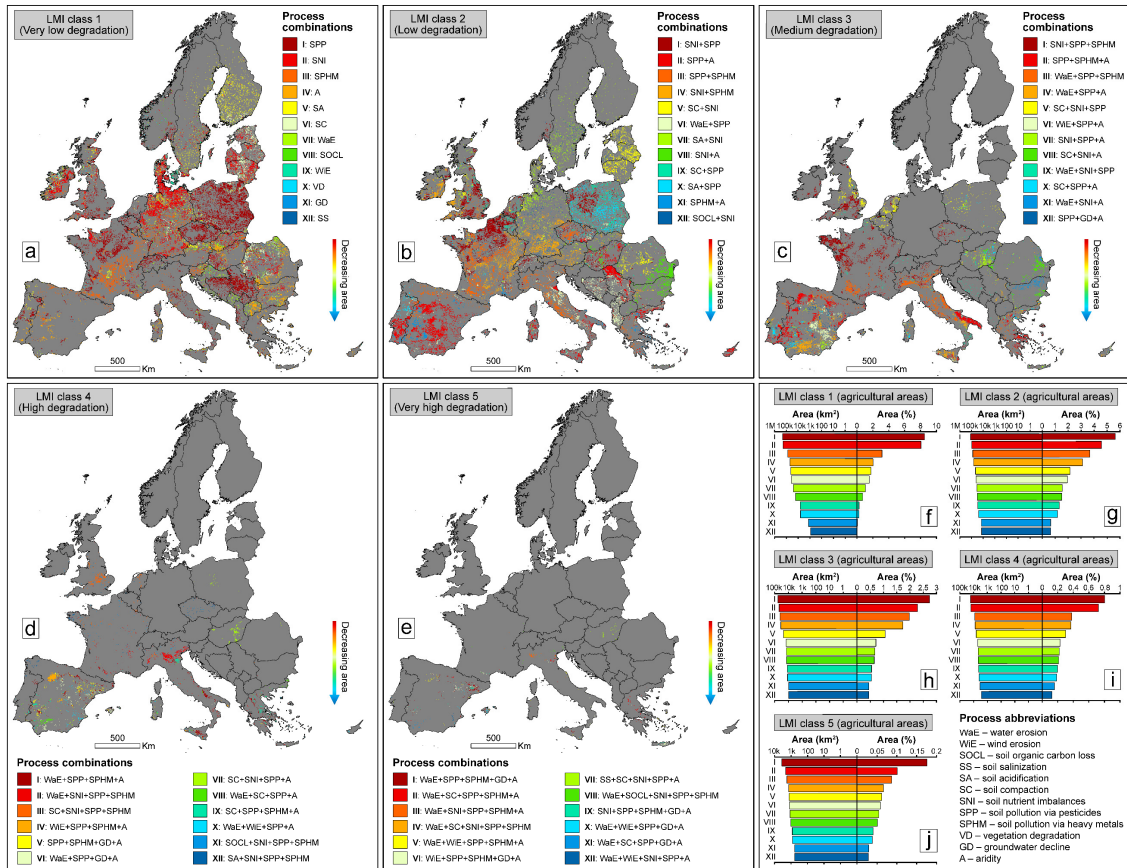
Supplementary Figures



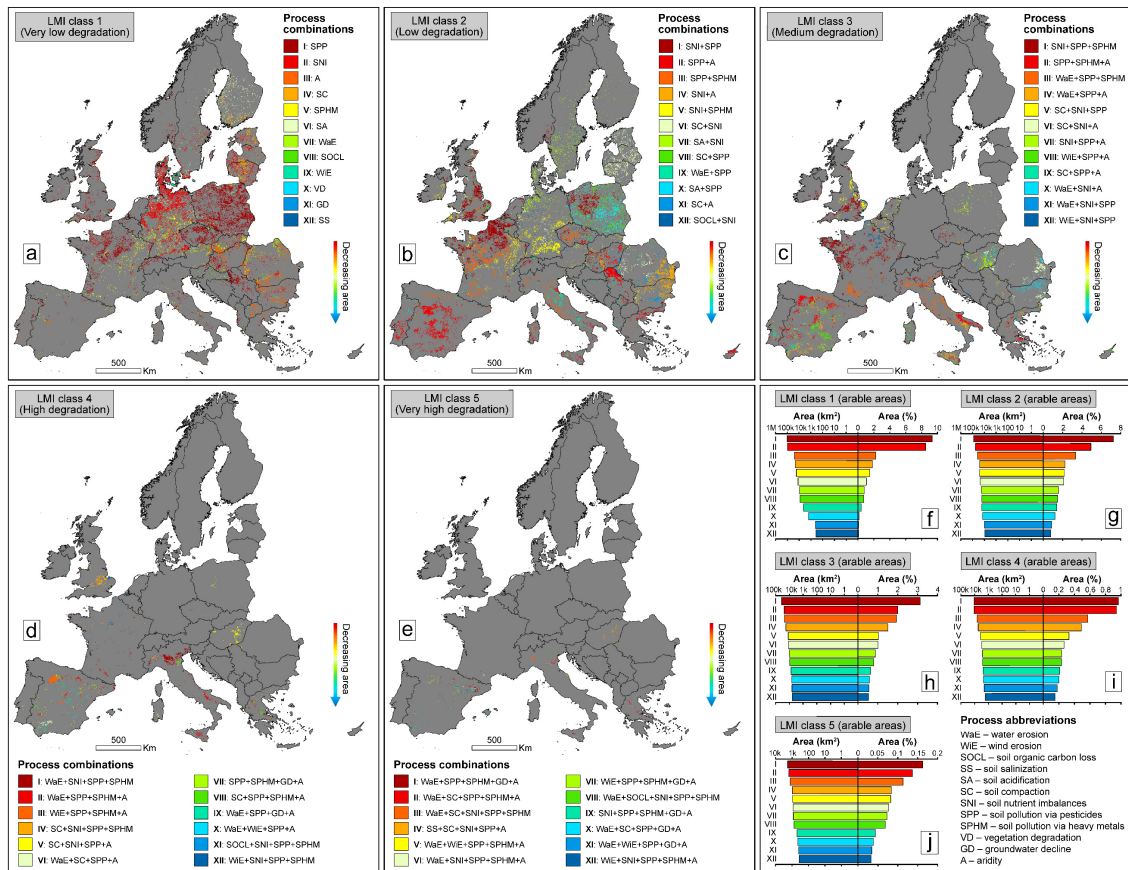
Supplementary Fig. 1. Uncertainty and sensitivity of LMI results in Europe. **a–e**, Spatial distribution of uncertainty presented as probability (%) for LMI classes 1–5. **f**, Covariates used in applying the RF model, in order to predict uncertainties of LMI classes and provide a sensitivity analysis. Notes: probability (a–e) ranges from 0 (low) to 100 (high), and was obtained by applying a RF classification model (1,000 decision trees and 20 repetitions); covariates were used in the RF classification model for predicting with which probability a pixel falls within a given LMI class; covariate importance is expressed by the Mean Decrease Gini, which is a measure of how each input variable contributes in the prediction of LMI classes; the higher the value of mean decrease Gini coefficient, the higher the importance of the variable in the model is, thus reflecting the sensitivity of each variable for predicting LMI classes; RF means Random Forest, while LMI is the acronym for Land Multi-degradation Index.



Supplementary Fig. 2. Spatial pattern of land multi-degradation in Europe (all 40 investigated countries). **a**, Spatial distribution of LMI values (number of co-occurring processes) in agricultural landscapes. **b**, Histogram of LMI values for European agricultural lands. **c**, Average number of co-occurring processes in agricultural environments of continental countries. **d**, Spatial distribution of LMI values (number of co-occurring processes) in arable landscapes. **e**, Histogram of LMI values for European arable lands. **f**, Average number of co-occurring processes in arable environments of continental countries. Notes: light grey highlights non-agricultural/non-arable lands; compared to Fig. 2, the LMI values are spatialized here for all analysed states, considering that in some cases with incomplete data (Norway, Switzerland, Balkan countries, Cyprus and Malta) we still used a large number of process databases (9–10 input layers out of 12) in computing LMI (see *Methods*); consequently, LMI still has the potential to provide a good/very good picture of land degradation in these particular countries, even if their LMI values should be interpreted with some caution; LMI is the acronym for Land Multi-degradation Index; the source data for the graphs in this figure are provided as a Source Data file.



Supplementary Fig. 3. Spatial pattern of interacting convergent processes in agricultural environments of Europe (all 40 investigated countries). **a–e**, Spatial distribution of the dominant (most frequent) co-occurring process types (combinations) in LMI agricultural classes 1 (a), 2 (b), 3 (c), 4 (d) and 5 (e). **f–j**, Absolute and percentage-based (% of the total continental agricultural lands) spatial footprint of the dominant co-occurring process types in LMI agricultural classes 1 (f), 2 (g), 3 (h), 4 (i) and 5 (j). Notes: in order to simplify the mapping of process combinations (which are very numerous for each LMI class, except for class 1), in this figure the twelve most important types of co-occurring processes in Europe were selected, which, in terms of area, cumulatively account for at least 50% of all LMI class combinations; to better highlight the mapped process combinations, pixel size was increased to 5 km × 5 km, but the quantification of process combination areas (in km² and %) was done using the original data resolution of 500 m × 500 m; compared to Fig. 3, the process combinations are spatialized here for all analysed states, considering that in some cases with incomplete data (Norway, Switzerland, Balkan countries, Cyprus and Malta) we still used a large number of process databases (9–10 input layers out of 12) in computing LMI (see *Methods*); consequently, LMI still has the potential to provide a good/very good picture of land degradation in these particular countries, even if their LMI combinations should be interpreted with some caution; LMI is the acronym for Land Multi-degradation Index; the source data for the graphs in this figure are provided as a Source Data file.



Supplementary Fig. 4. Spatial pattern of interacting convergent processes in arable environments of Europe (all 40 investigated countries). **a–e**, Spatial distribution of the dominant (most frequent) co-occurring process types (combinations) in LMI arable classes 1 (a), 2 (b), 3 (c), 4 (d) and 5 (e). **f–j**, Absolute and percentage-based (% of the total continental arable lands) spatial footprint of the dominant co-occurring process types in LMI classes 1 (f), 2 (g), 3 (h), 4 (i) and 5 (j). Notes: in order to simplify the mapping of process combinations (which are very numerous for each LMI class, except for class 1), in this figure the twelve most important types of co-occurring processes in Europe were selected, which, in terms of area, cumulatively account for at least 50% of all LMI class combinations; to better highlight the mapped process combinations, pixel size was increased to 5 km × 5 km, but the quantification of process combination areas (in km² and %) was done using the original data resolution of 500 m × 500 m; compared to Fig. 4, the process combinations are spatialized here for all analysed states, considering that in some cases with incomplete data (Norway, Switzerland, Balkan countries, Cyprus and Malta) we still used a large number of process databases (9–10 input layers out of 12) in computing LMI (see *Methods*); consequently, LMI still has the potential to provide a good/very good picture of land degradation in these particular countries, even if their LMI combinations should be interpreted with some caution; LMI is the acronym for Land Multi-degradation Index; the source data for the graphs in this figure are provided as a Source Data file.

Supplementary Tables

Supplementary Table 1. Spatial extent (in km² and %) of LMI classes in agricultural/arable environments of Europe (all 40 investigated countries)

No.	LMI classes (number of co-occurring processes)	Agricultural lands		Arable lands	
		km ²	%	km ²	%
1	No degradation (0) ^a	143,626	6.84	71,196	6.23
2	Very low degradation (1)	577,279	27.50	304,105	26.60
3	Low degradation (2)	727,147	34.65	395,940	34.64
4	Medium degradation (3)	451,213	21.50	249,178	21.80
5	High degradation (4)	156,170	7.44	95,169	8.33
6	Very high degradation (≥ 5) ^b	43,473	2.07	27,562	2.40

Notes: a – agricultural/arable lands unaffected by degradation processes; b – most frequently five concurrent processes, according to the LMI histograms for agricultural/arable areas (Supplementary Fig. 2b,e); % – the percentage-based area of the number of convergent processes (0, 1, 2, 3, 4, ≥ 5), related to the absolute area of continental agricultural (2,098,907 km²)/arable (1,143,149 km²) lands; compared to Table 1, these European statistics are extracted here based on LMI data from all analysed states, considering that in some cases with incomplete data (Norway, Switzerland, Balkan countries, Cyprus and Malta) we still used a large number of process databases (9–10 input layers out of 12) in computing LMI (see *Methods*); consequently, LMI still has the potential to provide a good/very good pan-European picture of land degradation, even if it includes these particular countries, where LMI data should be interpreted with some caution.

Supplementary Table 2. Spatial extent (in km² and %) of agricultural areas and of convergent land degradation processes in agricultural environments of all 40 European countries

No. ^a	Countries	Land use Agric. lands (km ²)	LMI classification (number of convergent land degradation processes)					
			No degradation	Very low degradation	Low degradation	Medium degradation	High degradation	Very high degradation
			0 (%) ^b	1 (%)	2 (%)	3 (%)	4 (%)	≥5 (%) ^c
1	Norway	15,599	40.99	30.97	19.53	7.35	1.09	0.06
2	Finland	27,555	10.64	58.70	25.78	4.60	0.27	0.01
3	Sweden	39,387	20.72	37.86	32.60	8.36	0.45	0.01
4	UK	136,186	3.68	18.46	37.26	29.95	9.57	1.08
5	Estonia	14,331	9.88	43.07	38.63	7.99	0.43	0.01
6	Latvia	25,624	5.13	37.65	50.25	6.72	0.24	0.01
7	Denmark	31,455	19.66	50.49	23.34	5.62	0.86	0.03
8	Lithuania	38,026	17.07	49.00	30.04	3.76	0.14	0.01
9	Ireland	47,011	11.09	41.65	33.25	11.80	2.03	0.18
10	Poland	183,873	3.50	45.94	39.58	9.64	1.28	0.06
11	Germany	204,657	16.81	48.01	28.32	6.22	0.62	0.02
12	Netherlands	23,710	0.43	6.32	30.80	42.08	17.09	3.28
13	Belgium	17,485	1.16	12.35	50.22	26.36	8.49	1.42
14	France	323,179	2.83	23.76	42.02	25.08	5.44	0.87
15	Czechia	44,715	0.71	32.60	41.94	19.95	4.48	0.33
16	Luxembourg	1373	6.83	25.09	34.10	23.43	8.70	1.84
17	Slovakia	22,942	23.65	51.39	21.33	3.42	0.20	0.01
18	Romania	134,879	8.66	25.25	37.52	21.96	5.88	0.72
19	Hungary	60,556	6.09	21.22	32.87	26.21	11.04	2.58
20	Austria	26,700	14.12	30.57	32.08	17.16	5.20	0.86
21	Switzerland	11,408	5.76	37.58	41.29	13.76	1.58	0.03
22	Liechtenstein	31	0.00	18.03	55.74	25.41	0.82	0.00
23	Italy	156,241	1.08	8.69	27.95	38.98	19.22	4.08
24	Slovenia	6878	15.17	44.45	32.21	7.40	0.72	0.05
25	Croatia	22,131	66.18	29.66	4.00	0.15	<0.01	0.00
26	Serbia	42,506	1.81	41.44	48.89	7.57	0.27	0.01
27	Bulgaria	58,104	5.23	22.97	39.26	26.48	5.52	0.55
28	BH	17,141	3.36	44.30	40.61	11.42	0.30	0.00
29	Spain	242,902	0.37	4.70	27.92	37.24	20.09	9.69
30	San Marino	42	0.00	20.24	72.62	7.14	0.00	0.00
31	Montenegro	2182	38.62	56.50	4.81	0.07	0.00	0.00
32	Kosovo	4152	0.52	26.46	55.42	16.46	1.10	0.04
33	Monaco	1	66.67	33.33	0.00	0.00	0.00	0.00
34	Portugal	43,622	3.46	12.68	40.95	31.66	9.48	1.78
35	Albania	7978	4.05	25.45	64.33	5.87	0.29	0.00
36	Macedonia	9131	14.20	59.83	22.57	3.35	0.04	0.00
37	Greece	50,641	1.60	11.38	28.64	32.12	18.66	7.60
38	Andorra	1	0.00	50.00	50.00	0.00	0.00	0.00
39	Cyprus	4422	0.79	10.96	51.73	27.67	6.52	2.33
40	Malta	158	0.63	11.59	39.52	38.25	9.37	0.63

Notes: a – the countries are listed in this table (and in the following ones) from north to south, considering the maximum latitude values (in a descending order) of their northern limits; b – agricultural lands unaffected by degradation processes; c – most frequently five co-occurring processes, according to the LMI histogram for agricultural areas (Supplementary Fig. 2b); % – the percentage-based area of the number of convergent processes (0, 1, 2, 3, 4, ≥5), related to the absolute area of national agricultural lands; abbreviations: UK – United Kingdom; BH – Bosnia and Herzegovina; Agric. – Agricultural; LMI statistics should be interpreted with some caution within several European countries (Norway, Switzerland, Balkan countries, Cyprus and Malta), where 9–10 of the 12 input geospatial databases (Fig. 1) were available for LMI computation.

Supplementary Table 3. Spatial extent (in km² and %) of arable areas and of convergent land degradation processes in arable environments of all 40 European countries

No.	Countries	Land use Arable lands (km ²)	LMI classification (number of convergent land degradation processes)					
			No degradation	Very low degradation	Low degradation	Medium degradation	High degradation	Very high degradation
			0 (%) ^a	1 (%)	2 (%)	3 (%)	4 (%)	≥5 (%) ^b
1	Norway	5601	15.71	33.11	34.93	14.23	1.92	0.11
2	Finland	16,634	11.61	54.00	28.37	5.65	0.36	0.01
3	Sweden	29,875	23.35	33.84	33.25	9.04	0.50	0.01
4	UK	66,324	1.53	10.65	36.91	37.07	12.68	1.16
5	Estonia	6881	6.55	45.41	39.65	7.96	0.43	0.01
6	Latvia	12,121	5.33	40.37	46.69	7.25	0.37	0.01
7	Denmark	26,332	17.32	51.50	24.24	5.98	0.93	0.03
8	Lithuania	22,573	16.17	46.09	33.52	4.10	0.11	0.01
9	Ireland	3171	2.66	15.15	34.34	35.20	11.26	1.39
10	Poland	133,594	3.57	48.42	39.12	7.96	0.90	0.03
11	Germany	135,683	17.73	50.08	26.36	5.35	0.47	0.01
12	Netherlands	7253	0.44	8.69	35.75	41.10	12.96	1.05
13	Belgium	6734	0.30	6.95	60.83	24.27	6.84	0.81
14	France	153,900	1.29	16.73	45.07	29.82	6.19	0.90
15	Czechia	28,736	0.38	35.26	42.65	18.00	3.47	0.24
16	Luxembourg	459	6.65	28.74	33.86	21.70	7.47	1.58
17	Slovakia	15,765	25.92	52.19	18.96	2.78	0.15	0.01
18	Romania	86,225	5.39	21.63	39.75	25.40	6.99	0.84
19	Hungary	47,318	6.20	20.70	32.53	26.37	11.51	2.69
20	Austria	13,005	18.61	36.49	27.15	12.73	4.40	0.62
21	Switzerland	5954	2.63	32.39	46.08	16.65	2.20	0.06
22	Liechtenstein	23	0.00	16.13	59.14	24.73	0.00	0.00
23	Italy	83,054	0.65	5.25	22.55	39.35	26.34	5.86
24	Slovenia	1066	20.62	37.45	30.55	10.02	1.24	0.12
25	Croatia	6180	67.10	29.19	3.53	0.16	0.02	0.00
26	Serbia	21,368	1.10	26.94	63.51	8.14	0.31	0.01
27	Bulgaria	39,186	2.06	19.45	41.14	30.17	6.51	0.67
28	BH	1869	4.29	40.88	39.55	14.82	0.45	0.00
29	Spain	126,868	0.18	2.35	25.29	36.00	23.43	12.76
30	San Marino	20	0.00	10.00	81.25	8.75	0.00	0.00
31	Montenegro	7	57.14	35.71	7.14	0.00	0.00	0.00
32	Kosovo	1279	0.27	17.54	54.04	26.00	2.09	0.06
33	Monaco	-	-	-	-	-	-	-
34	Portugal	9795	1.38	11.12	42.20	32.55	9.91	2.84
35	Albania	2126	6.48	38.15	45.71	8.92	0.73	0.00
36	Macedonia	2761	9.65	74.72	14.18	1.44	<0.01	0.00
37	Greece	20,827	0.31	7.90	30.15	34.53	20.79	6.31
38	Andorra	-	-	-	-	-	-	-
39	Cyprus	2577	0.63	7.07	56.17	26.68	5.96	3.49
40	Malta	7	0.00	25.93	48.15	25.93	0.00	0.00

Notes: a – arable lands unaffected by degradation processes; b – most frequently five co-occurring processes, according to the LMI histogram for arable areas (Supplementary Fig. 2e); % – the percentage-based area of the number of convergent processes (0, 1, 2, 3, 4, ≥5), related to the absolute area of national arable lands; country abbreviations: UK – United Kingdom; BH – Bosnia and Herzegovina; the countries without values (Monaco and Andorra) do not hold any arable lands; LMI statistics should be interpreted with some caution within several European countries (Norway, Switzerland, Balkan countries, Cyprus and Malta), where 9–10 of the 12 input geospatial databases (Fig. 1) were available for LMI computation.

Supplementary Table 4. Spatial extent (%) of process types featured in LMI class 1, in agricultural environments of all 40 European countries

No.	Countries	Area (%) of process types for LMI class 1 (very low degradation) ^a											
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1	Norway	9.01	6.77	0.00	0.01	0.13	0.00	3.61	4.71	0.61	5.86	0.27	0.00
2	Finland	0.03	1.41	0.00	0.00	41.47	13.79	0.01	1.26	0.53	0.18	0.01	0.00
3	Sweden	0.00	16.61	0.00	0.07	14.49	0.01	0.12	3.00	2.93	0.65	0.00	0.00
4	UK	3.61	10.22	1.13	0.01	1.64	0.47	0.07	0.22	0.37	0.71	0.00	0.00
5	Estonia	0.11	16.66	0.00	0.00	1.59	23.25	0.01	1.13	0.13	0.18	0.00	0.00
6	Latvia	0.04	26.62	0.00	0.00	0.53	9.68	0.01	0.49	0.14	0.14	0.00	0.00
7	Denmark	0.00	32.89	0.00	0.03	3.05	2.30	0.19	1.26	10.31	0.45	0.00	0.00
8	Lithuania	0.53	31.18	0.13	0.00	1.17	14.61	0.01	0.50	0.01	0.86	0.00	0.00
9	Ireland	0.87	25.73	5.00	0.00	3.87	2.47	0.28	0.24	0.35	2.84	0.00	0.00
10	Poland	42.51	0.82	0.14	0.02	0.77	1.43	0.04	0.19	0.01	0.01	0.00	0.00
11	Germany	0.03	33.39	6.44	0.37	3.26	1.19	0.44	2.67	0.11	0.12	0.00	0.00
12	Netherlands	2.76	2.81	0.06	0.00	0.10	0.41	0.00	0.11	0.05	0.01	0.01	0.00
13	Belgium	10.63	0.34	0.31	0.00	0.59	0.17	0.04	0.08	0.00	0.18	0.00	0.00
14	France	8.38	2.86	11.12	0.07	0.52	0.11	0.28	0.18	0.01	0.12	0.04	0.06
15	Czechia	31.17	0.71	0.14	0.09	0.36	0.00	0.05	0.08	0.00	0.00	0.00	0.00
16	Luxembourg	0.11	6.10	13.84	0.00	1.44	0.00	1.31	0.82	0.00	1.47	0.00	0.00
17	Slovakia	0.09	20.11	4.80	13.48	0.90	0.29	6.91	3.79	0.00	0.19	0.03	0.80
18	Romania	0.90	6.29	0.33	6.14	0.63	6.04	3.14	1.20	0.00	0.11	0.33	0.14
19	Hungary	7.79	5.66	0.11	5.06	0.01	0.58	1.29	0.62	0.00	0.05	0.00	0.05
20	Austria	0.15	5.96	6.48	4.89	4.69	0.91	5.33	2.02	0.00	0.01	0.00	0.13
21	Switzerland	31.43	2.00	0.12	0.00	0.00	0.00	2.91	0.82	0.00	0.26	0.02	0.00
22	Liechtenstein	18.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	Italy	4.17	0.15	1.44	2.04	0.00	0.03	0.51	0.15	0.02	0.07	0.11	0.00
24	Slovenia	0.00	3.06	27.49	0.00	2.85	2.15	6.84	1.93	0.00	0.03	0.07	0.03
25	Croatia	0.92	3.83	0.12	0.08	0.02	0.01	20.66	2.84	0.05	0.93	0.20	0.00
26	Serbia	40.13	0.11	0.00	0.72	0.00	0.00	0.40	0.04	0.00	0.00	0.04	0.00
27	Bulgaria	0.52	5.00	0.83	13.11	0.15	0.53	2.50	0.08	0.00	0.01	0.22	0.02
28	BH	42.10	0.47	0.00	0.00	0.00	0.00	1.58	0.09	0.00	0.04	0.01	0.00
29	Spain	0.75	0.03	1.50	2.06	0.17	0.02	0.09	0.02	0.00	0.02	0.04	0.00
30	San Marino	20.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	Montenegro	0.40	0.69	0.00	0.00	0.00	0.00	54.02	0.68	0.00	0.70	0.02	0.00
32	Kosovo	24.78	0.01	0.00	0.87	0.00	0.00	0.75	0.03	0.00	0.02	0.00	0.00
33	Monaco	0.00	0.00	33.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34	Portugal	7.96	0.01	0.25	3.09	0.94	0.00	0.06	0.16	0.00	0.14	0.01	0.06
35	Albania	21.34	0.24	0.00	0.02	0.00	0.00	3.74	0.02	0.00	0.09	0.01	0.00
36	Macedonia	0.46	1.44	0.00	44.44	0.00	0.00	13.13	0.25	0.00	0.09	0.03	0.00
37	Greece	1.76	0.02	1.87	6.93	0.00	0.14	0.39	0.03	0.04	0.08	0.07	0.04
38	Andorra	0.00	0.00	0.00	0.00	0.00	0.00	50.00	0.00	0.00	0.00	0.00	0.00
39	Cyprus	0.45	0.00	0.00	10.04	0.00	0.01	0.03	0.01	0.40	0.02	0.01	0.00
40	Malta	0.00	0.00	0.00	10.63	0.00	0.00	0.32	0.00	0.00	0.00	0.63	0.00

Notes: a – LMI class 1 strictly includes the twelve processes (I–XII) that act singularly (Supplementary Fig. 3a) and not synergistically in the degradation of agricultural lands: I (SPP), II (SNI), III (SPHM), IV (A), V (SA), VI (SC), VII (WaE), VIII (SOCL), IX (WiE), X (VD), XI (GD), XII (SS); these processes were organised from I to XII according to the descending order of their areas at continental level (Supplementary Fig. 3a,f), which does not necessarily apply nationally; process abbreviations: WaE – water erosion, WiE – wind erosion, SOCL – soil organic carbon loss, SS – soil salinization, SA – soil acidification, SC – soil compaction, SNI – soil nutrient imbalances, SPP – soil pollution via pesticides, SPHM – soil pollution via heavy metals, VD – vegetation degradation, GD – groundwater decline, A – aridity; country abbreviations: UK – United Kingdom, BH – Bosnia and Herzegovina; % – the percentage-based area of the processes, related to the absolute area of the countries' agricultural lands (which can be found in Supplementary Table 2); LMI statistics should be interpreted with some caution within several European countries (Norway, Switzerland, Balkan countries, Cyprus and Malta), where 9–10 of the 12 input geospatial databases (Fig. 1) were available for LMI computation.

Supplementary Table 5. Spatial extent (%) of process types (combinations) featured in LMI class 2, in agricultural environments of all 40 European countries

No.	Countries	Area (%) of 12 major process types for LMI class 2 (low degradation) ^a											
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1	Norway	7.68	0.00	0.00	0.00	0.00	1.29	0.01	0.00	0.00	0.00	0.00	1.96
2	Finland	0.00	0.00	0.00	0.00	0.00	1.21	0.00	5.40	0.00	0.00	0.05	0.22
3	Sweden	0.00	0.00	0.00	0.01	0.00	0.00	20.27	0.01	0.00	0.00	0.00	4.78
4	UK	16.99	0.00	2.34	4.80	2.05	0.11	2.28	0.01	1.54	0.55	0.00	0.30
5	Estonia	0.03	0.00	0.00	0.00	29.14	0.00	1.32	0.00	0.09	0.01	0.00	2.64
6	Latvia	0.06	0.00	0.00	0.00	43.17	0.00	1.74	0.00	0.01	0.00	0.00	2.82
7	Denmark	0.00	0.00	0.00	0.04	4.50	0.00	6.08	0.00	0.00	0.00	0.00	0.92
8	Lithuania	0.37	0.00	0.00	1.05	23.13	0.00	1.27	0.00	0.27	0.03	0.00	0.65
9	Ireland	3.48	0.00	0.97	14.63	1.34	0.06	0.84	0.00	0.00	0.17	0.00	0.31
10	Poland	12.65	0.38	0.16	0.01	0.26	1.35	0.13	0.03	11.10	10.53	0.00	0.04
11	Germany	0.07	0.00	0.03	10.13	2.53	0.01	6.67	0.11	0.02	0.01	0.05	3.41
12	Netherlands	19.61	0.00	0.25	0.39	2.45	0.02	0.37	0.00	4.03	0.91	0.00	0.31
13	Belgium	36.49	0.00	0.40	0.19	0.06	0.21	0.46	0.00	6.80	1.39	0.00	0.02
14	France	13.07	0.04	13.03	7.48	0.07	0.90	0.16	0.02	0.25	0.28	0.42	0.14
15	Czechia	10.42	3.11	14.72	0.14	0.00	4.48	0.32	0.05	1.22	2.36	0.02	0.07
16	Luxembourg	0.00	0.00	0.09	10.63	0.00	0.82	0.56	0.00	0.00	0.04	0.00	0.49
17	Slovakia	0.24	0.07	0.02	3.96	0.19	2.99	2.85	3.08	0.00	0.02	0.00	2.34
18	Romania	0.41	0.30	0.01	0.22	6.20	0.69	0.35	11.80	0.39	0.03	0.03	0.48
19	Hungary	6.68	10.90	0.04	0.07	0.55	0.00	0.02	4.89	1.11	0.00	0.00	0.51
20	Austria	0.04	0.06	0.04	13.15	1.30	5.74	2.03	1.52	0.01	0.01	0.48	0.68
21	Switzerland	19.05	0.00	0.15	0.10	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.29
22	Liechtenstein	28.69	0.00	0.00	0.00	0.00	4.10	0.00	0.00	0.00	0.00	0.00	0.00
23	Italy	0.99	5.96	9.53	0.26	0.00	0.00	0.00	0.20	0.24	0.00	0.79	0.02
24	Slovenia	0.00	0.00	0.17	1.78	0.25	0.00	0.83	0.00	0.00	0.00	0.00	0.36
25	Croatia	0.04	0.01	0.00	0.01	0.00	0.47	0.00	0.00	0.01	0.00	0.00	0.19
26	Serbia	2.01	32.29	0.00	0.00	0.00	13.30	0.00	0.09	0.00	0.00	0.00	0.00
27	Bulgaria	0.23	0.24	0.03	1.69	0.74	0.31	0.05	17.37	0.01	0.02	0.21	0.10
28	BH	6.62	0.00	0.00	0.00	0.00	31.16	0.00	0.00	0.00	0.00	0.00	0.00
29	Spain	0.03	18.33	2.38	0.16	0.00	0.70	0.01	0.05	0.00	0.21	3.15	0.00
30	San Marino	0.00	0.00	1.79	0.00	0.00	70.83	0.00	0.00	0.00	0.00	0.00	0.00
31	Montenegro	0.01	0.00	0.00	0.00	0.00	1.76	0.00	0.00	0.00	0.00	0.00	0.02
32	Kosovo	0.28	14.72	0.00	0.00	0.00	39.04	0.00	0.21	0.00	0.00	0.00	0.00
33	Monaco	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34	Portugal	0.20	25.94	3.45	0.00	0.00	1.74	0.01	0.11	0.00	4.03	1.56	0.01
35	Albania	6.27	1.26	0.00	0.00	0.00	55.87	0.00	0.00	0.00	0.00	0.00	0.00
36	Macedonia	0.00	0.37	0.00	0.00	0.00	0.51	0.00	5.60	0.00	0.00	0.00	0.00
37	Greece	0.14	11.00	4.57	0.02	0.01	1.07	0.00	0.47	0.13	0.00	5.42	0.00
38	Andorra	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
39	Cyprus	0.00	39.47	0.00	0.00	0.00	0.42	0.00	0.53	0.00	0.00	0.00	0.00
40	Malta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes: a – in this table, the most important (frequent) twelve types of co-occurring processes (I–XII) in Europe were selected (Supplementary Fig. 3b), which, in terms of area, cumulatively account for at least 50% of the LMI class 2: I (SNI + SPP), II (SPP + A), III (SPP + SPHM), IV (SNI + SPHM), V (SC + SNI), VI (WaE + SPP), VII (SA + SNI), VIII (SNI + A), IX (SC + SPP), X (SA + SPP), XI (SPHM + A), XII (SOCL + SNI); these types (combinations) of processes were organised from I to XII according to the descending order of their areas at continental level (Supplementary Fig. 3b,g), which does not necessarily apply nationally; process abbreviations: WaE – water erosion, SOCL – soil organic carbon loss, SA – soil acidification, SC – soil compaction, SNI – soil nutrient imbalances, SPP – soil pollution via pesticides, SPHM – soil pollution via heavy metals, A – aridity; country abbreviations: UK – United Kingdom, BH – Bosnia and Herzegovina; % – the percentage-based area of the types of convergent processes, related to the absolute area of the countries' agricultural lands (which can be found in Supplementary Table 2); LMI statistics should be interpreted with some caution within several European countries (Norway, Switzerland, Balkan countries, Cyprus and Malta), where 9–10 of the 12 input geospatial databases (Fig. 1) were available for LMI computation.

Supplementary Table 6. Spatial extent (%) of process types (combinations) featured in LMI class 3, in agricultural environments of all 40 European countries

No. ^a	Countries	Area (%) of 12 major process types for LMI class 3 (medium degradation) ^b											
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1	Norway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.01	0.00	0.00	0.00
2	Finland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Sweden	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	UK	8.92	0.01	0.08	0.00	5.64	0.00	0.01	0.00	0.72	0.00	0.00	0.00
5	Estonia	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Latvia	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	Denmark	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	Lithuania	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	Ireland	4.92	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.28	0.00	0.00	0.00
10	Poland	0.01	0.00	0.01	0.00	2.89	0.00	0.67	0.03	0.09	0.45	0.00	0.00
11	Germany	0.02	0.00	0.01	0.00	0.15	0.00	0.00	0.06	0.00	0.00	0.00	0.00
12	Netherlands	3.58	0.00	0.00	0.00	21.96	0.00	0.00	0.00	0.08	0.00	0.00	0.00
13	Belgium	0.33	0.00	0.01	0.00	11.75	0.00	0.00	0.00	0.58	0.00	0.00	0.00
14	France	10.68	0.32	3.92	0.01	0.19	0.00	0.01	0.00	0.87	0.00	0.00	0.00
15	Czechia	5.38	0.51	1.66	0.78	0.18	0.00	0.78	0.00	1.21	0.01	0.01	0.00
16	Luxembourg	0.27	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	Slovakia	0.02	0.00	0.00	0.00	0.01	0.00	0.05	0.25	0.06	0.01	0.13	0.00
18	Romania	0.01	0.00	0.00	0.19	0.21	0.00	0.10	6.86	0.18	0.12	1.72	0.01
19	Hungary	0.03	0.01	0.00	0.42	0.80	0.01	11.04	2.92	1.31	4.75	0.30	0.01
20	Austria	0.04	0.04	0.01	0.01	0.03	0.00	0.04	0.04	0.01	0.00	0.35	0.00
21	Switzerland	0.12	0.00	0.08	0.00	0.00	0.00	0.00	0.00	7.27	0.00	0.00	0.00
22	Liechtenstein	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.82	0.00	0.00	0.00
23	Italy	3.02	7.88	13.64	5.13	0.06	0.75	0.39	0.00	1.66	0.51	0.15	0.46
24	Slovenia	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	Croatia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
26	Serbia	0.00	0.00	0.00	4.54	0.01	0.00	1.23	0.00	0.56	0.01	0.01	0.28
27	Bulgaria	0.05	0.00	0.01	0.14	0.01	0.00	0.55	3.81	0.09	0.01	10.62	0.00
28	BH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.51	0.00	0.00	0.00
29	Spain	0.11	10.53	1.50	8.42	0.00	5.37	1.21	0.01	0.01	1.51	0.01	3.05
30	San Marino	0.00	0.00	6.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	Montenegro	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	Kosovo	0.00	0.00	0.00	12.76	0.00	0.00	0.84	0.00	0.76	0.00	0.03	0.03
33	Monaco	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34	Portugal	0.06	8.54	1.43	4.06	0.00	0.32	0.85	0.02	0.03	4.58	0.01	1.72
35	Albania	0.00	0.00	0.01	2.06	0.00	0.00	0.20	0.00	2.57	0.00	0.00	0.00
36	Macedonia	0.00	0.00	0.00	0.33	0.00	0.00	0.02	0.00	0.03	0.01	2.55	0.00
37	Greece	0.20	9.82	4.30	4.05	0.00	0.27	1.30	0.11	0.04	1.92	0.16	0.11
38	Andorra	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
39	Cyprus	0.00	0.00	0.00	6.88	0.00	9.97	1.48	0.00	0.00	0.01	0.02	4.58
40	Malta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.79	0.00

Notes: a – in this table, the most important (frequent) twelve types of co-occurring processes (I–XII) in Europe were selected (Supplementary Fig. 3c), which, in terms of area, cumulatively account for at least 50% of the LMI class 3: I (SNI + SPP + SPHM), II (SPP + SPHM + A), III (WaE + SPP + SPHM), IV (WaE + SPP + A), V (SC + SNI + SPP), VI (WiE + SPP + A), VII (SNI + SPP + A), VIII (SC + SNI + A), IX (WaE + SNI + SPP), X (SC + SPP + A), XI (WaE + SNI + A), XII (SPP + GD + A); these types (combinations) of processes were organised from I to XII according to the descending order of their areas at continental level (Supplementary Fig. 3c,h), which does not necessarily apply nationally; process abbreviations: WaE – water erosion, WiE – wind erosion, SC – soil compaction, SNI – soil nutrient imbalances, SPP – soil pollution via pesticides, SPHM – soil pollution via heavy metals, GD – groundwater decline, A – aridity; country abbreviations: UK – United Kingdom, BH – Bosnia and Herzegovina; % – the percentage-based area of the types of convergent processes, related to the absolute area of the countries' agricultural lands (which can be found in Supplementary Table 2); LMI statistics should be interpreted with some caution within several European countries (Norway, Switzerland, Balkan countries, Cyprus and Malta), where 9–10 of the 12 input geospatial databases (Fig. 1) were available for LMI computation.

Supplementary Table 7. Spatial extent (%) of process types (combinations) featured in LMI class 4, in agricultural environments of all 40 European countries

No.	Countries	Area (%) of 12 major process types for LMI class 4 (high degradation) ^a											
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1	Norway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Finland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Sweden	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	UK	0.00	0.33	3.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	0.16
5	Estonia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Latvia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	Denmark	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	Lithuania	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	Ireland	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.04
10	Poland	0.00	0.00	0.00	0.00	0.00	0.00	0.42	0.00	0.00	0.00	0.00	0.01
11	Germany	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
12	Netherlands	0.00	0.00	2.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.71
13	Belgium	0.00	0.01	1.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.16
14	France	0.22	1.13	0.34	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.49	0.32
15	Czechia	0.07	0.51	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	1.60
16	Luxembourg	0.00	0.02	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
17	Slovakia	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01
18	Romania	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.04	0.00	0.00	0.00	0.00
19	Hungary	0.00	0.00	0.01	0.00	0.00	0.00	5.45	0.02	0.02	0.00	0.00	0.00
20	Austria	0.00	0.01	0.03	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.01
21	Switzerland	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00
22	Liechtenstein	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	Italy	3.79	6.61	0.35	0.46	0.18	0.29	0.03	0.37	0.70	0.36	0.36	0.01
24	Slovenia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	Croatia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	Serbia	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00
27	Bulgaria	0.00	0.01	0.02	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00
28	BH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	Spain	2.64	0.08	0.00	2.85	2.27	1.74	0.10	1.17	0.55	1.29	0.01	0.15
30	San Marino	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	Montenegro	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	Kosovo	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00
33	Monaco	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34	Portugal	1.64	0.02	0.00	0.05	0.74	0.16	0.15	0.56	0.40	0.16	0.02	0.13
35	Albania	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
36	Macedonia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
37	Greece	6.08	0.37	0.01	0.22	0.28	0.08	0.10	1.43	2.98	0.16	0.00	0.00
38	Andorra	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
39	Cyprus	0.00	0.00	0.00	0.00	0.00	0.21	0.01	0.00	0.00	2.53	0.00	0.00
40	Malta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes: a – in this table, the most important (frequent) twelve types of co-occurring processes (I–XII) in Europe were selected (Supplementary Fig. 3d), which, in terms of area, cumulatively account for at least 50% of the LMI class 4: I (WaE + SPP + SPHM + A), II (WaE + SNI + SPP + SPHM), III (SC + SNI + SPP + SPHM), IV (WiE + SPP + SPHM + A), V (SPP + SPHM + GD + A), VI (WaE + SPP + GD + A), VII (SC + SNI + SPP + A), VIII (WaE + SC + SPP + A), IX (SC + SPP + SPHM + A), X (WaE + WiE + SPP + A), XI (SOCL + SNI + SPP + SPHM), XII (SA + SNI + SPP + SPHM); these types (combinations) of processes were organised from I to XII according to the descending order of their areas at continental level (Supplementary Fig. 3d,i), which does not necessarily apply nationally; process abbreviations: WaE – water erosion, WiE – wind erosion, SOCL – soil organic carbon loss, SA – soil acidification, SC – soil compaction, SNI – soil nutrient imbalances, SPP – soil pollution via pesticides, SPHM – soil pollution via heavy metals, GD – groundwater decline, A – aridity; country abbreviations: UK – United Kingdom, BH – Bosnia and Herzegovina; % – the percentage-based area of the types of convergent processes, related to the absolute area of the countries' agricultural lands (which can be found in Supplementary Table 2); LMI statistics should be interpreted with some caution within several European countries (Norway, Switzerland, Balkan countries, Cyprus and Malta), where 9–10 of the 12 input geospatial databases (Fig. 1) were available for LMI computation.

Supplementary Table 8. Spatial extent (%) of process types (combinations) featured in LMI class 5, in agricultural environments of all 40 European countries

No.	Countries	Area (%) of 12 major process types for LMI class 5 (very high degradation) ^a											
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1	Norway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Finland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Sweden	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	UK	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
5	Estonia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Latvia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	Denmark	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	Lithuania	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	Ireland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
10	Poland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	Germany	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	Netherlands	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	Belgium	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	France	0.02	0.00	0.07	0.03	0.00	0.00	0.00	0.05	0.02	0.00	0.00	0.00
15	Czechia	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00
16	Luxembourg	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	Slovakia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	Romania	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
19	Hungary	0.00	0.00	0.00	0.00	0.00	0.00	1.80	0.00	0.00	0.00	0.00	0.00
20	Austria	0.00	0.00	0.00	0.02	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00
21	Switzerland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	Liechtenstein	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	Italy	0.23	0.46	0.28	0.78	0.20	0.01	0.01	0.55	0.01	0.02	0.02	0.05
24	Slovenia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	Croatia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	Serbia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	Bulgaria	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	BH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	Spain	1.29	0.13	0.24	0.00	0.37	0.50	0.00	0.01	0.25	0.32	0.23	0.19
30	San Marino	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	Montenegro	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	Kosovo	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33	Monaco	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34	Portugal	0.08	0.05	0.03	0.00	0.01	0.00	0.08	0.01	0.00	0.00	0.01	0.02
35	Albania	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
36	Macedonia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
37	Greece	0.29	2.13	1.16	0.04	0.17	0.00	0.00	0.00	0.32	0.01	0.03	0.10
38	Andorra	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
39	Cyprus	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.11	0.00	0.01
40	Malta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes: a – in this table, the most important (frequent) twelve types of co-occurring processes (I–XII) in Europe were selected (Supplementary Fig. 3e), which, in terms of area, cumulatively account for at least 50% of the LMI class 5: I (WaE + SPP + SPHM + GD + A), II (WaE + SC + SPP + SPHM + A), III (WaE + SNI + SPP + SPHM + A), IV (WaE + SC + SNI + SPP + SPHM), V (WaE + WiE + SPP + SPHM + A), VI (WiE + SPP + SPHM + GD + A), VII (SS + SC + SNI + SPP + A), VIII (WaE + SOCL + SNI + SPP + SPHM), IX (SNI + SPP + SPHM + GD + A), X (WaE + WiE + SPP + GD + A), XI (WaE + SC + SPP + GD + A), XII (WaE + WiE + SNI + SPP + A); these types (combinations) of processes were organised from I to XII according to the descending order of their areas at continental level (Supplementary Fig. 3e,j), which does not necessarily apply nationally; process abbreviations: WaE – water erosion, WiE – wind erosion, SOCL – soil organic carbon loss, SS – soil salinization, SC – soil compaction, SNI – soil nutrient imbalances, SPP – soil pollution via pesticides, SPHM – soil pollution via heavy metals, GD – groundwater decline, A – aridity; country abbreviations: UK – United Kingdom, BH – Bosnia and Herzegovina; % – the percentage-based area of the types of convergent processes, related to the absolute area of the countries' agricultural lands (which can be found in Supplementary Table 2); LMI statistics should be interpreted with some caution within several European countries (Norway, Switzerland, Balkan countries, Cyprus and Malta), where 9–10 of the 12 input geospatial databases (Fig. 1) were available for LMI computation.

Supplementary Table 9. Spatial extent (%) of process types featured in LMI class 1, in arable environments of all 40 European countries

No.	Countries	Area (%) of process types for LMI class 1 (very low degradation) ^a											
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1	Norway	9.94	16.55	0.00	0.00	0.00	0.08	1.39	2.73	0.33	2.02	0.06	0.00
2	Finland	0.03	2.10	0.00	18.54	0.00	31.00	0.01	1.62	0.53	0.17	0.01	0.00
3	Sweden	0.00	19.15	0.04	0.00	0.00	7.11	0.12	3.37	3.28	0.77	0.00	0.00
4	UK	2.82	6.07	0.01	0.27	0.50	0.31	0.04	0.14	0.26	0.23	0.00	0.00
5	Estonia	0.02	17.15	0.00	27.06	0.00	0.12	0.01	0.71	0.05	0.27	0.00	0.00
6	Latvia	0.01	28.47	0.00	11.05	0.00	0.08	0.01	0.34	0.18	0.22	0.00	0.00
7	Denmark	0.00	34.95	0.03	1.95	0.00	2.31	0.16	1.05	10.65	0.40	0.00	0.00
8	Lithuania	0.43	24.46	0.00	19.45	0.07	0.25	0.00	0.22	0.01	1.20	0.00	0.00
9	Ireland	1.06	8.92	0.00	0.00	3.76	0.08	0.26	0.24	0.09	0.73	0.00	0.00
10	Poland	45.65	0.61	0.02	1.22	0.15	0.52	0.05	0.19	0.01	0.01	0.00	0.00
11	Germany	0.02	37.96	0.40	1.21	5.43	1.97	0.43	2.47	0.12	0.08	0.00	0.00
12	Netherlands	1.81	6.60	0.00	0.07	0.00	0.01	0.00	0.06	0.12	0.02	0.00	0.00
13	Belgium	6.74	0.14	0.00	0.03	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
14	France	10.15	2.25	0.02	0.06	3.78	0.06	0.13	0.12	0.01	0.09	0.03	0.03
15	Czechia	34.77	0.17	0.12	0.00	0.07	0.04	0.04	0.05	0.00	0.00	0.00	0.00
16	Luxembourg	0.11	7.47	0.00	0.00	16.19	1.42	1.42	1.09	0.00	1.04	0.00	0.00
17	Slovakia	0.08	14.58	18.13	0.38	5.20	0.05	8.71	4.04	0.00	0.22	0.03	0.78
18	Romania	0.72	3.37	7.28	6.05	0.07	0.03	2.72	0.92	0.00	0.12	0.22	0.15
19	Hungary	7.78	4.61	5.60	0.59	0.12	0.00	1.40	0.49	0.00	0.06	0.00	0.05
20	Austria	0.25	6.10	9.15	1.12	6.29	2.27	8.35	2.84	0.00	0.02	0.01	0.09
21	Switzerland	28.79	1.48	0.00	0.00	0.06	0.00	1.22	0.79	0.00	0.05	0.00	0.00
22	Liechtenstein	16.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	Italy	2.77	0.07	1.33	0.04	0.47	0.00	0.35	0.07	0.03	0.04	0.07	0.00
24	Slovenia	0.00	11.54	0.00	2.96	8.66	3.38	7.74	3.07	0.00	0.05	0.05	0.00
25	Croatia	1.94	1.75	0.06	0.01	0.06	0.03	21.63	2.10	0.00	1.16	0.45	0.00
26	Serbia	25.65	0.15	0.93	0.00	0.00	0.00	0.14	0.02	0.00	0.00	0.06	0.00
27	Bulgaria	0.05	3.85	13.69	0.30	0.12	0.00	1.25	0.04	0.00	0.01	0.09	0.03
28	BH	38.64	0.44	0.00	0.00	0.00	0.00	1.52	0.19	0.00	0.07	0.01	0.00
29	Spain	0.56	0.01	1.09	0.01	0.54	0.05	0.06	0.01	0.00	0.00	0.01	0.00
30	San Marino	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	Montenegro	0.00	0.00	0.00	0.00	0.00	0.00	14.29	7.14	0.00	14.29	0.00	0.00
32	Kosovo	15.05	0.00	2.03	0.00	0.00	0.00	0.45	0.00	0.00	0.00	0.00	0.00
33	Monaco	-	-	-	-	-	-	-	-	-	-	-	-
34	Portugal	6.86	0.01	3.52	0.00	0.11	0.47	0.02	0.10	0.00	0.04	0.00	0.00
35	Albania	34.27	0.31	0.07	0.00	0.00	0.00	3.35	0.01	0.00	0.13	0.01	0.00
36	Macedonia	0.13	0.27	69.35	0.00	0.00	0.00	4.70	0.16	0.00	0.11	0.00	0.00
37	Greece	1.19	0.01	6.11	0.06	0.36	0.00	0.08	0.01	0.02	0.00	0.01	0.04
38	Andorra	-	-	-	-	-	-	-	-	-	-	-	-
39	Cyprus	0.12	0.00	6.55	0.00	0.00	0.00	0.01	0.01	0.37	0.01	0.01	0.00
40	Malta	0.00	0.00	22.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.70	0.00

Notes: a – LMI class 1 strictly includes the twelve processes (I–XII) that act singularly (Supplementary Fig. 4a) and not synergistically in the degradation of arable lands: I (SPP), II (SNI), III (A), IV (SC), V (SPHM), VI (SA), VII (WaE), VIII (SOCL), IX (WiE), X (VD), XI (GD), XII (SS); these processes were organised from I to XII according to the descending order of their areas at continental level (Supplementary Fig. 4a,f), which does not necessarily apply nationally; process abbreviations: WaE – water erosion, WiE – wind erosion, SOCL – soil organic carbon loss, SS – soil salinization, SA – soil acidification, SC – soil compaction, SNI – soil nutrient imbalances, SPP – soil pollution via pesticides, SPHM – soil pollution via heavy metals, VD – vegetation degradation, GD – groundwater decline, A – aridity; country abbreviations: UK – United Kingdom, BH – Bosnia and Herzegovina; % – the percentage-based area of the processes, related to the absolute area of the countries' arable lands (which can be found in Supplementary Table 3); the countries without values (Monaco and Andorra) do not hold any arable lands; LMI statistics should be interpreted with some caution within several European countries (Norway, Switzerland, Balkan countries, Cyprus and Malta), where 9–10 of the 12 input geospatial databases (Fig. 1) were available for LMI computation.

Supplementary Table 10. Spatial extent (%) of process types (combinations) featured in LMI class 2, in arable environments of all 40 European countries

No.	Countries	Area (%) of 12 major process types for LMI class 2 (low degradation) ^a											
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1	Norway	20.39	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.80	0.00	0.00	5.04
2	Finland	0.00	0.00	0.00	0.00	0.00	1.85	7.22	0.00	0.00	0.05	0.00	0.32
3	Sweden	0.00	0.00	0.00	0.01	0.01	0.00	20.71	0.00	0.00	0.00	0.00	5.46
4	UK	24.17	0.00	2.15	0.02	2.34	1.27	0.67	1.86	0.11	0.25	0.00	0.25
5	Estonia	0.00	0.00	0.00	0.00	0.00	31.29	0.82	0.08	0.00	0.00	0.00	2.43
6	Latvia	0.02	0.00	0.00	0.00	0.00	40.09	0.93	0.01	0.00	0.00	0.00	2.86
7	Denmark	0.00	0.00	0.00	0.00	0.04	4.81	6.48	0.00	0.00	0.00	0.00	1.00
8	Lithuania	0.20	0.00	0.00	0.00	0.66	27.56	0.57	0.24	0.00	0.01	0.00	0.32
9	Ireland	4.72	0.00	3.41	0.00	18.95	0.01	0.20	0.00	0.06	0.01	0.00	0.60
10	Poland	14.56	0.37	0.16	0.03	0.01	0.14	0.06	9.92	1.49	9.52	0.03	0.03
11	Germany	0.09	0.00	0.02	0.07	10.18	2.74	5.39	0.02	0.01	0.00	0.19	3.71
12	Netherlands	27.01	0.00	0.27	0.00	0.61	1.74	0.01	1.20	0.01	0.54	0.00	0.61
13	Belgium	54.16	0.00	0.15	0.00	0.03	0.01	0.07	4.43	0.12	0.33	0.00	0.02
14	France	20.28	0.01	14.97	0.00	4.55	0.03	0.05	0.21	0.97	0.13	0.00	0.13
15	Czechia	9.83	4.31	14.77	0.06	0.03	0.00	0.06	1.81	5.14	1.21	0.00	0.03
16	Luxembourg	0.00	0.00	0.11	0.00	11.12	0.00	0.55	0.00	0.00	0.00	0.00	0.60
17	Slovakia	0.16	0.10	0.02	3.80	2.34	0.21	0.96	0.00	0.06	0.00	0.52	1.75
18	Romania	0.26	0.38	0.01	15.72	0.05	4.45	0.02	0.35	0.50	0.00	5.67	0.35
19	Hungary	5.59	11.61	0.04	5.14	0.06	0.42	0.01	1.06	1.67	0.00	3.61	0.31
20	Austria	0.06	0.11	0.07	2.85	4.18	0.69	1.61	0.01	0.02	0.01	0.17	0.77
21	Switzerland	22.91	0.01	0.13	0.00	0.03	0.00	0.00	0.01	14.37	0.03	0.00	0.30
22	Liechtenstein	35.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	Italy	0.87	5.19	7.01	0.25	0.08	0.00	0.00	0.25	6.05	0.00	0.05	0.01
24	Slovenia	0.00	0.00	0.00	0.00	2.67	0.75	3.47	0.00	0.00	0.00	0.00	1.24
25	Croatia	0.09	0.04	0.00	0.00	0.02	0.00	0.00	0.01	0.99	0.00	0.00	0.06
26	Serbia	2.68	52.87	0.00	0.13	0.00	0.00	0.00	0.00	6.74	0.00	0.00	0.00
27	Bulgaria	0.15	0.13	0.01	20.20	1.07	0.52	0.01	0.00	0.02	0.00	5.30	0.08
28	BH	10.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26.22	0.00	0.00	0.00
29	Spain	0.03	19.77	2.04	0.07	0.05	0.00	0.00	0.01	0.44	0.02	0.24	0.00
30	San Marino	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	81.25	0.00	0.00	0.00
31	Montenegro	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	Kosovo	0.31	32.34	0.00	0.55	0.00	0.00	0.00	0.00	19.77	0.00	0.00	0.00
33	Monaco	-	-	-	-	-	-	-	-	-	-	-	-
34	Portugal	0.43	30.28	3.14	0.27	0.01	0.00	0.03	0.00	1.53	2.12	0.11	0.02
35	Albania	14.66	2.39	0.00	0.00	0.00	0.00	0.00	0.00	27.60	0.00	0.00	0.00
36	Macedonia	0.00	0.56	0.00	3.73	0.00	0.00	0.00	0.00	0.03	0.00	0.02	0.00
37	Greece	0.18	16.04	2.21	0.54	0.02	0.01	0.00	0.04	0.69	0.00	1.53	0.00
38	Andorra	-	-	-	-	-	-	-	-	-	-	-	-
39	Cyprus	0.00	46.13	0.00	0.81	0.00	0.00	0.00	0.00	0.05	0.00	0.01	0.00
40	Malta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes: a – in this table, the most important (frequent) twelve types of co-occurring processes (I–XII) in Europe were selected (Supplementary Fig. 4b), which, in terms of area, cumulatively account for at least 50% of the LMI class 2: I (SNI + SPP), II (SPP + A), III (SPP + SPHM), IV (SNI + A), V (SNI + SPHM), VI (SC + SNI), VII (SA + SNI), VIII (SC + SPP), IX (WaE + SPP), X (SA + SPP), XI (SC + A), XII (SOCL + SNI); these types (combinations) of processes were organised from I to XII according to the descending order of their areas at continental level (Supplementary Fig. 4b,g), which does not necessarily apply nationally; process abbreviations: WaE – water erosion, SOCL – soil organic carbon loss, SA – soil acidification, SC – soil compaction, SNI – soil nutrient imbalances, SPP – soil pollution via pesticides, SPHM – soil pollution via heavy metals, A – aridity; country abbreviations: UK – United Kingdom, BH – Bosnia and Herzegovina; % – the percentage-based area of the types of convergent processes, related to the absolute area of the countries' arable lands (which can be found in Supplementary Table 3); the countries without values (Monaco and Andorra) do not hold any arable lands; LMI statistics should be interpreted with some caution within several European countries (Norway, Switzerland, Balkan countries, Cyprus and Malta), where 9–10 of the 12 input geospatial databases (Fig. 1) were available for LMI computation.

Supplementary Table 11. Spatial extent (%) of process types (combinations) featured in LMI class 3, in arable environments of all 40 European countries

No.	Countries	Area (%) of 12 major process types for LMI class 3 (medium degradation) ^a											
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1	Norway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.29	0.24
2	Finland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Sweden	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	UK	13.32	0.01	0.07	0.00	8.57	0.01	0.03	0.00	0.00	0.00	1.08	2.58
5	Estonia	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Latvia	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	Denmark	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	Lithuania	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	Ireland	21.74	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00
10	Poland	0.01	0.00	0.01	0.00	2.20	0.01	0.81	0.00	0.32	0.00	0.09	0.11
11	Germany	0.02	0.00	0.00	0.00	0.16	0.07	0.00	0.00	0.00	0.00	0.01	0.00
12	Netherlands	8.28	0.00	0.00	0.00	13.41	0.00	0.00	0.00	0.00	0.00	0.04	7.02
13	Belgium	0.22	0.00	0.01	0.00	13.95	0.00	0.00	0.00	0.00	0.00	0.76	0.10
14	France	13.59	0.22	4.95	0.00	0.25	0.00	0.00	0.00	0.00	0.00	1.10	2.40
15	Czechia	4.45	0.71	1.63	0.91	0.26	0.00	1.06	0.00	0.01	0.01	1.17	0.00
16	Luxembourg	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	Slovakia	0.00	0.00	0.00	0.00	0.00	0.28	0.07	0.00	0.01	0.12	0.07	0.00
18	Romania	0.00	0.00	0.00	0.20	0.18	9.28	0.13	0.00	0.14	1.74	0.14	0.00
19	Hungary	0.03	0.01	0.00	0.47	0.71	3.30	11.03	0.01	5.18	0.26	1.25	0.00
20	Austria	0.03	0.09	0.01	0.02	0.03	0.08	0.08	0.00	0.00	0.52	0.00	0.00
21	Switzerland	0.14	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.53	0.00
22	Liechtenstein	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.08	0.00
23	Italy	3.81	7.06	13.08	6.37	0.11	0.00	0.49	0.76	0.61	0.17	1.80	0.02
24	Slovenia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	Croatia	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00
26	Serbia	0.00	0.00	0.00	4.24	0.00	0.00	1.88	0.00	0.02	0.00	0.39	0.00
27	Bulgaria	0.04	0.00	0.00	0.05	0.01	4.69	0.36	0.00	0.01	11.91	0.03	0.00
28	BH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.51	0.00
29	Spain	0.05	10.72	1.93	6.50	0.00	0.01	1.37	6.28	1.84	0.01	0.01	0.00
30	San Marino	0.00	0.00	8.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	Montenegro	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	Kosovo	0.00	0.00	0.00	19.73	0.00	0.00	2.21	0.00	0.00	0.10	0.94	0.00
33	Monaco	-	-	-	-	-	-	-	-	-	-	-	-
34	Portugal	0.14	8.42	0.72	4.39	0.00	0.00	1.56	0.20	6.96	0.01	0.02	0.00
35	Albania	0.00	0.00	0.01	3.17	0.00	0.00	0.68	0.00	0.00	0.00	4.28	0.00
36	Macedonia	0.00	0.00	0.00	0.43	0.00	0.00	0.00	0.00	0.01	0.46	0.00	0.00
37	Greece	0.21	10.23	2.49	5.73	0.00	0.17	1.54	0.20	3.39	0.07	0.04	0.00
38	Andorra	-	-	-	-	-	-	-	-	-	-	-	-
39	Cyprus	0.00	0.00	0.00	3.64	0.00	0.00	1.81	12.51	0.02	0.01	0.00	0.00
40	Malta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.70	0.00	0.00

Notes: a – in this table, the most important (frequent) twelve types of co-occurring processes (I–XII) in Europe were selected (Supplementary Fig. 4c), which, in terms of area, cumulatively account for at least 50% of the LMI class 3: I (SNI + SPP + SPHM), II (SPP + SPHM + A), III (WaE + SPP + SPHM), IV (WaE + SPP + A), V (SC + SNI + SPP), VI (SC + SNI + A), VII (SNI + SPP + A), VIII (WiE + SPP + A), IX (SC + SPP + A), X (WaE + SNI + A), XI (WaE + SNI + SPP), XII (WiE + SNI + SPP); these types (combinations) of processes were organised from I to XII according to the descending order of their areas at continental level (Supplementary Fig. 4c,h), which does not necessarily apply nationally; process abbreviations: WaE – water erosion, WiE – wind erosion, SC – soil compaction, SNI – soil nutrient imbalances, SPP – soil pollution via pesticides, SPHM – soil pollution via heavy metals, A – aridity; country abbreviations: UK – United Kingdom, BH – Bosnia and Herzegovina; % – the percentage-based area of the types of convergent processes, related to the absolute area of the countries' arable lands (which can be found in Supplementary Table 3); the countries without values (Monaco and Andorra) do not hold any arable lands; LMI statistics should be interpreted with some caution within several European countries (Norway, Switzerland, Balkan countries, Cyprus and Malta), where 9–10 of the 12 input geospatial databases (Fig. 1) were available for LMI computation.

Supplementary Table 12. Spatial extent (%) of process types (combinations) featured in LMI class 4, in arable environments of all 40 European countries

No.	Countries	Area (%) of 12 major process types for LMI class 4 (high degradation) ^a											
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1	Norway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Finland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Sweden	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	UK	0.46	0.00	0.00	6.29	0.00	0.00	0.00	0.00	0.00	0.00	0.68	1.16
5	Estonia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Latvia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	Denmark	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	Lithuania	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	Ireland	0.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.04	0.12
10	Poland	0.00	0.00	0.00	0.00	0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	Germany	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	Netherlands	0.00	0.00	0.00	1.02	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.77
13	Belgium	0.00	0.00	0.00	1.49	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
14	France	1.19	0.33	0.00	0.43	0.00	0.00	0.01	0.00	0.00	0.00	0.60	0.57
15	Czechia	0.40	0.06	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.52	0.00
16	Luxembourg	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.00
17	Slovakia	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	Romania	0.00	0.00	0.00	0.00	0.15	0.04	0.00	0.00	0.01	0.00	0.00	0.00
19	Hungary	0.00	0.00	0.00	0.00	6.18	0.03	0.00	0.02	0.00	0.00	0.00	0.00
20	Austria	0.02	0.00	0.00	0.02	0.01	0.01	0.00	0.02	0.00	0.00	0.00	0.00
21	Switzerland	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
22	Liechtenstein	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	Italy	10.33	5.69	0.30	0.63	0.04	0.54	0.16	1.04	0.34	0.34	0.44	0.02
24	Slovenia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	Croatia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	Serbia	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.02	0.00	0.00	0.00
27	Bulgaria	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
28	BH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	Spain	0.08	3.17	4.96	0.00	0.11	1.45	1.94	0.57	1.63	1.54	0.01	0.00
30	San Marino	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	Montenegro	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	Kosovo	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00
33	Monaco	-	-	-	-	-	-	-	-	-	-	-	-
34	Portugal	0.02	1.07	0.02	0.00	0.35	0.94	0.67	0.83	0.27	0.06	0.04	0.00
35	Albania	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
36	Macedonia	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
37	Greece	0.46	6.62	0.04	0.02	0.19	2.88	0.14	4.73	0.07	0.11	0.00	0.00
38	Andorra	-	-	-	-	-	-	-	-	-	-	-	-
39	Cyprus	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.15	1.24	0.00	0.00
40	Malta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes: a – in this table, the most important (frequent) twelve types of co-occurring processes (I–XII) in Europe were selected (Supplementary Fig. 4d), which, in terms of area, cumulatively account for at least 50% of the LMI class 4: I (WaE + SNI + SPP + SPHM), II (WaE + SPP + SPHM + A), III (WiE + SPP + SPHM + A), IV (SC + SNI + SPP + SPHM), V (SC + SNI + SPP + A), VI (WaE + SC + SPP + A), VII (SPP + SPHM + GD + A), VIII (SC + SPP + SPHM + A), IX (WaE + SPP + GD + A), X (WaE + WiE + SPP + A), XI (SOCL + SNI + SPP + SPHM), XII (WiE + SNI + SPP + SPHM); these types (combinations) of processes were organised from I to XII according to the descending order of their areas at continental level (Supplementary Fig. 4d,i), which does not necessarily apply nationally; process abbreviations: WaE – water erosion, WiE – wind erosion, SOCL – soil organic carbon loss, SC – soil compaction, SNI – soil nutrient imbalances, SPP – soil pollution via pesticides, SPHM – soil pollution via heavy metals, GD – groundwater decline, A – aridity; country abbreviations: UK – United Kingdom, BH – Bosnia and Herzegovina; % – the percentage-based area of the types of convergent processes, related to the absolute area of the countries' arable lands (which can be found in Supplementary Table 3); the countries without values (Monaco and Andorra) do not hold any arable lands; LMI statistics should be interpreted with some caution within several European countries (Norway, Switzerland, Balkan countries, Cyprus and Malta), where 9–10 of the 12 input geospatial databases (Fig. 1) were available for LMI computation.

Supplementary Table 13. Spatial extent (%) of process types (combinations) featured in LMI class 5, in arable environments of all 40 European countries

No.	Countries	Area (%) of 12 major process types for LMI class 5 (very high degradation) ^a											
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1	Norway	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Finland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	Sweden	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	UK	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01
5	Estonia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	Latvia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	Denmark	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	Lithuania	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	Ireland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00
10	Poland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	Germany	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	Netherlands	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	Belgium	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	France	0.02	0.00	0.04	0.00	0.00	0.05	0.00	0.04	0.01	0.00	0.00	0.00
15	Czechia	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.05	0.00	0.00	0.00	0.00
16	Luxembourg	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	Slovakia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	Romania	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	Hungary	0.00	0.00	0.00	1.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	Austria	0.00	0.00	0.02	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	Switzerland	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	Liechtenstein	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	Italy	0.31	0.69	1.43	0.01	0.24	0.32	0.01	0.82	0.01	0.03	0.02	0.04
24	Slovenia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	Croatia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	Serbia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	Bulgaria	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	BH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	Spain	1.21	0.18	0.00	0.00	0.58	0.38	0.66	0.01	0.38	0.31	0.30	0.26
30	San Marino	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	Montenegro	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	Kosovo	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33	Monaco	-	-	-	-	-	-	-	-	-	-	-	-
34	Portugal	0.15	0.10	0.00	0.31	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.00
35	Albania	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
36	Macedonia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
37	Greece	0.08	3.57	0.07	0.00	0.03	0.18	0.00	0.00	0.01	0.05	0.00	0.00
38	Andorra	-	-	-	-	-	-	-	-	-	-	-	-
39	Cyprus	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
40	Malta	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes: a – in this table, the most important (frequent) twelve types of co-occurring processes (I–XII) in Europe were selected (Supplementary Fig. 4e), which, in terms of area, cumulatively account for at least 50% of the LMI class 5: I (WaE + SPP + SPHM + GD + A), II (WaE + SC + SPP + SPHM + A), III (WaE + SC + SNI + SPP + SPHM), IV (SS + SC + SNI + SPP + A), V (WaE + WiE + SPP + SPHM + A), VI (WaE + SNI + SPP + SPHM + A), VII (WiE + SPP + SPHM + GD + A), VIII (WaE + SOCL + SNI + SPP + SPHM), IX (SNI + SPP + SPHM + GD + A), X (WaE + SC + SPP + GD + A), XI (WaE + WiE + SPP + GD + A), XII (WiE + SNI + SPP + SPHM + A); these types (combinations) of processes were organised from I to XII according to the descending order of their areas at continental level (Supplementary Fig. 4e.j), which does not necessarily apply nationally; process abbreviations: WaE – water erosion, WiE – wind erosion, SOCL – soil organic carbon loss, SS – soil salinization, SC – soil compaction, SNI – soil nutrient imbalances, SPP – soil pollution via pesticides, SPHM – soil pollution via heavy metals, GD – groundwater decline, A – aridity; country abbreviations: UK – United Kingdom, BH – Bosnia and Herzegovina; % – the percentage-based area of the types of convergent processes, related to the absolute area of the countries' arable lands (which can be found in Supplementary Table 3); the countries without values (Monaco and Andorra) do not hold any arable lands; LMI statistics should be interpreted with some caution within several European countries (Norway, Switzerland, Balkan countries, Cyprus and Malta), where 9–10 of the 12 input geospatial databases (Fig. 1) were available for LMI computation.