

# Land cover and climatic conditions as potential drivers of the raccoon (*Procyon lotor*) distribution in North America and Europe

Sarah Cunze, Sven Klimpel, Judith Kochmann

Supplementary Material

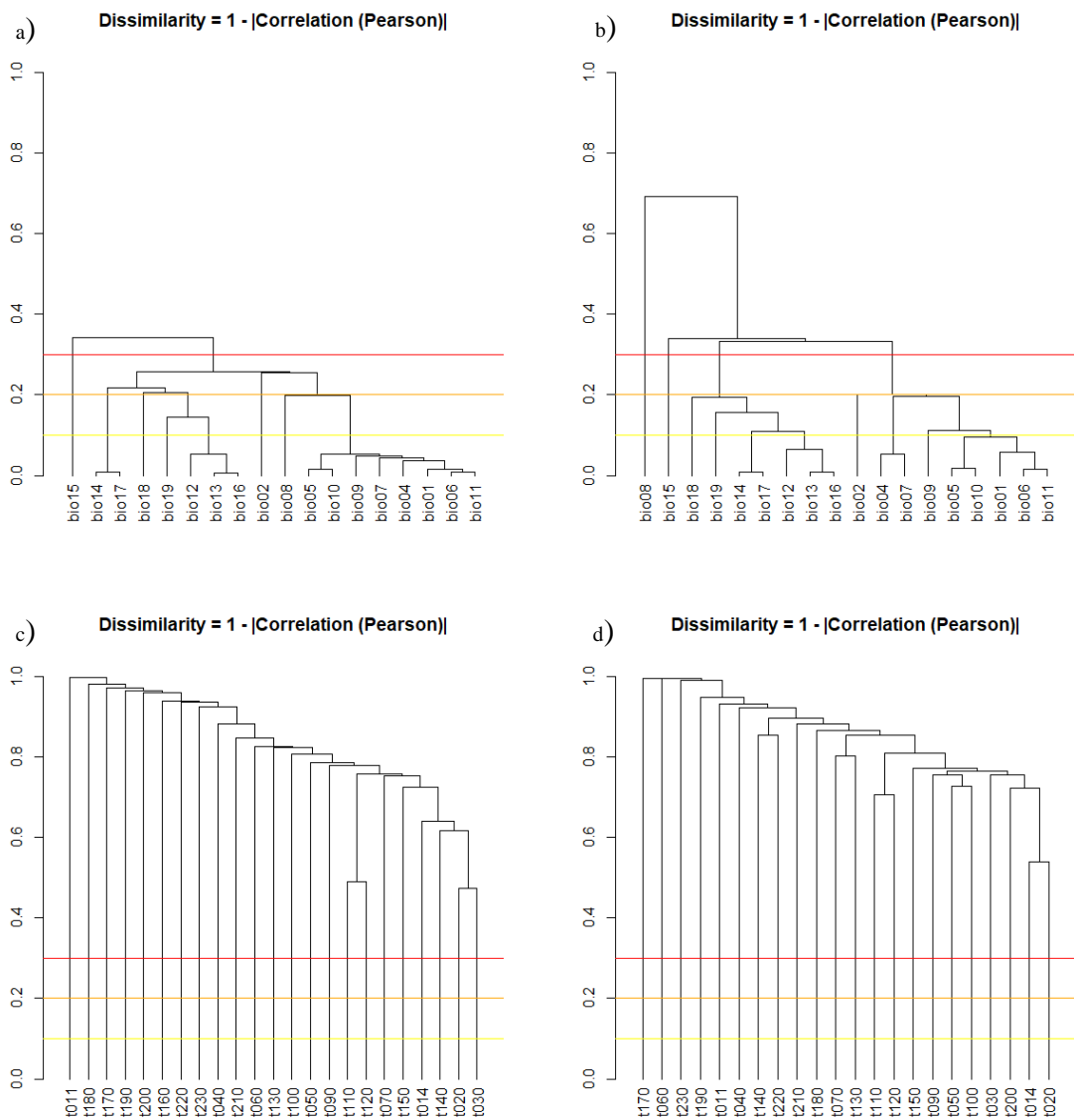


Figure S1: Correlation dendrograms a) for the bioclimatic variables in North America, b) for the bioclimatic variables in Europe, c) for the land cover variables in North America and d) for the landcover variables in Europe (single linkage).

# Land cover and climatic conditions as potential drivers of the raccoon (*Procyon lotor*) distribution in North America and Europe

Sarah Cunze, Sven Klimpel, Judith Kochmann

Supplementary Material

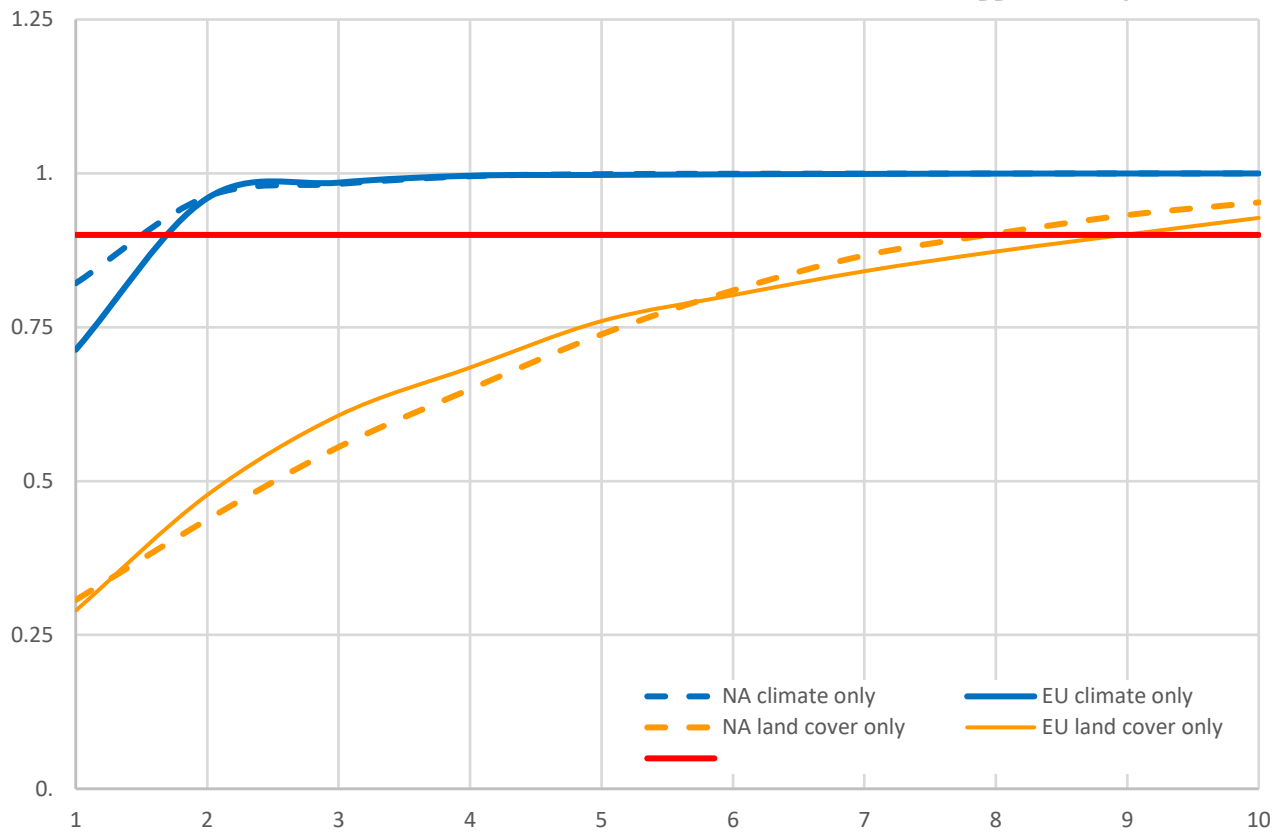


Figure S2: Cumulative proportion of variance explained by the respective number of PC variables. Climate only models in blue and land cover only models in orange, the curves for the North American models are displayed as dashed lines, the curves for the European models as solid lines. The threshold of 0.9 is displayed as red line (90% of total variance is explained).

# Land cover and climatic conditions as potential drivers of the raccoon (*Procyon lotor*) distribution in North America and Europe

Sarah Cunze, Sven Klimpel, Judith Kochmann

Supplementary Material

Table S1: Results of the PCAs. Standard deviation, proportion of explained variances and cumulated explained variances for the first ten PC-Axes (PC<sub>i</sub>). The cells where the cumulative proportion exceeds the threshold of 0.9 are highlighted.

NA climate only

Importance of components:	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10
Standard deviation	716.54	296.72	113.00	88.40	45.20	20.30	13.80	10.50	7.54	5.15
Proportion of Variance	0.82	0.14	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Cumulative Proportion	0.82	0.96	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00

EU climate only

Importance of components:	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10
Standard deviation	379.27	222.79	71.47	47.61	15.92	14.10	11.30	10.41	5.74	4.03
Proportion of Variance	0.71	0.25	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Cumulative Proportion	0.71	0.96	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00

NA land cover only

Importance of components:	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10
Standard deviation	38.27	24.96	23.73	21.17	20.64	18.44	16.46	13.02	12.02	9.90
Proportion of Variance	0.31	0.13	0.12	0.09	0.09	0.07	0.06	0.04	0.03	0.02
Cumulative Proportion	0.31	0.44	0.56	0.65	0.74	0.81	0.87	0.90	0.93	0.95

EU land cover only

Importance of components:	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10
Standard deviation	37.10	29.87	24.79	19.23	18.94	14.16	13.60	12.31	11.49	11.30
Proportion of Variance	0.29	0.19	0.13	0.08	0.08	0.04	0.04	0.03	0.03	0.03
Cumulative Proportion	0.29	0.48	0.61	0.68	0.76	0.80	0.84	0.87	0.90	0.93

# Land cover and climatic conditions as potential drivers of the raccoon (*Procyon lotor*) distribution in North America and Europe

Sarah Cunze, Sven Klimpel, Judith Kochmann

Supplementary Material

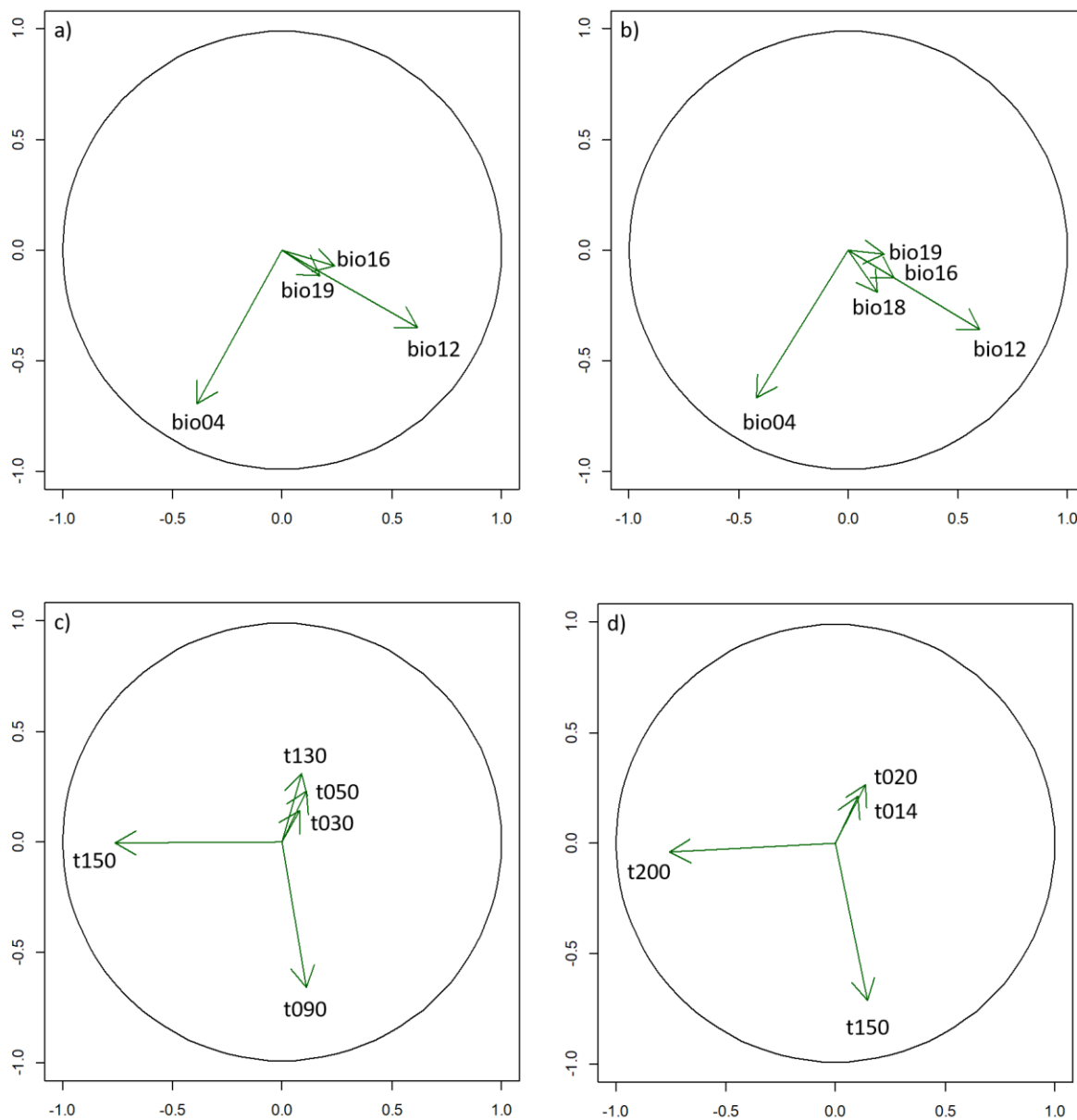


Figure S3: PCA loading plots for a) the PCA over the bioclim variables in North America, b) the PCA over bioclim variables in Europe, c) the PCA over land cover variables in North America and d) the PCA over landcover variables in Europe. See table S2 a-d for the loading values. For clarity, we only show variables with a vector length greater than 0.2.

# Land cover and climatic conditions as potential drivers of the raccoon (*Procyon lotor*) distribution in North America and Europe

Sarah Cunze, Sven Klimpel, Judith Kochmann

Supplementary Material

Table S2a: PCA loading of the original bioclim variables on the two first PCA axes included in the climate only model for North America. PCA loads with high absolute values are highlighted.

		PC1	PC2
bio01	annual mean temperature	0.01	0.02
bio02	mean diurnal range	0	0.01
bio03	isothermality	0.02	0.04
bio04	temperature seasonality	-0.5	-0.9
bio05	max temperature of warmest month	0.01	0.01
bio06	min temperature of coldest month	0.02	0.03
bio07	temperature annual range	-0	-0
bio08	mean temperature of wettest quarter	0	0.01
bio09	mean temperature of driest	0.02	0.03
bio10	mean temperature of warmest quarter	0.01	0.01
bio11	mean temperature of coldest quarter	0.02	0.03
bio12	annual precipitation	0.77	-0.4
bio13	precipitation of wettest month	0.11	-0
bio14	precipitation of driest month	0.02	-0
bio15	precipitation seasonality	-0	0.02
bio16	precipitation of wettest quarter	0.3	-0.1
bio17	precipitation of driest quarter	0.08	-0.1
bio18	precipitation of warmest quarter	0.13	-0.1
bio19	precipitation of coldest quarter	0.22	-0.1

# Land cover and climatic conditions as potential drivers of the raccoon (*Procyon lotor*) distribution in North America and Europe

Sarah Cunze, Sven Klimpel, Judith Kochmann

Supplementary Material

Table S2b: PCA loading of the original bioclim variables on the two first PCA axes included in the climate only model for Europe.

		PC1	PC2
bio01	annual mean temperature	0.00	0.02
bio02	mean diurnal range	0.00	0.00
bio03	isothermality	0.00	0.02
bio04	temperature seasonality	-0.52	-0.84
bio05	max temperature of warmest month	-0.01	0.01
bio06	min temperature of coldest month	0.01	0.03
bio07	temperature annual range	-0.02	-0.02
bio08	mean temperature of wettest quarter	0.00	0.00
bio09	mean temperature of driest	0.00	0.05
bio10	mean temperature of warmest quarter	-0.01	0.01
bio11	mean temperature of coldest quarter	0.01	0.03
bio12	annual precipitation	0.75	-0.45
bio13	precipitation of wettest month	0.09	-0.06
bio14	precipitation of driest month	0.04	-0.03
bio15	precipitation seasonality	-0.01	0.04
bio16	precipitation of wettest quarter	0.26	-0.16
bio17	precipitation of driest quarter	0.12	-0.08
bio18	precipitation of warmest quarter	0.17	-0.24
bio19	precipitation of coldest quarter	0.20	-0.02

# Land cover and climatic conditions as potential drivers of the raccoon (*Procyon lotor*) distribution in North America and Europe

Sarah Cunze, Sven Klimpel, Judith Kochmann

Supplementary Material

Table S2c: PCA loading of the original land cover variables on the eight first PCA axes included in the landcover only model for North America.

		PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8
t011	Post-flooding or irrigated croplands (or aquatic)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t014	Rain fed croplands	0.02	0.03	0.00	-0.06	-0.02	0.01	0.00	0.06
t020	Mosaic cropland (50-70%) / vegetation (grassland/shrubland/forest) (20-50%)	0.02	0.04	0.00	-0.10	-0.03	0.02	-0.01	0.10
t030	Mosaic vegetation (grassland/shrubland/forest) (50-70%) / cropland (20-50%)	0.10	0.18	0.02	-0.33	-0.15	0.06	0.05	0.40
t040	Closed to open (>15%) broadleaved evergreen or semi-deciduous forest (>5m)	0.04	0.04	-0.01	-0.12	0.01	0.08	-0.91	0.05
t050	Closed (>40%) broad-leaved deciduous forest (>5m)	0.14	0.29	0.61	0.50	-0.09	0.39	0.10	0.11
t060	Open (15-40%) broad-leaved deciduous forest/woodland (>5m)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01
t070	Closed (>40%) needle-leaved evergreen forest (>5m)	0.13	0.00	0.23	0.15	0.02	-0.89	0.03	0.18
t090	Open (15-40%) needle-leaved deciduous or evergreen forest (>5m)	0.14	-0.82	-0.14	0.19	-0.24	0.16	0.09	0.26
t100	Closed to open (>15%) mixed broadleaved and needle-leaved forest (>5m)	0.06	-0.11	0.07	0.11	-0.03	-0.08	-0.02	-0.75
t110	Mosaic forest or shrubland (50-70%) / grassland (20-50%)	0.03	-0.02	-0.05	-0.11	-0.07	0.03	0.06	-0.31
t120	Mosaic grassland (50-70%) / forest or shrubland (20-50%)	0.02	-0.05	-0.04	-0.06	-0.06	0.04	0.04	-0.21
t130	Closed to open (>15%) (broadleaved or needle-leaved, evergreen or deciduous) shrubland (<5m)	0.11	0.39	-0.74	0.44	0.00	0.01	0.09	0.07
t140	Closed to open (>15%) herbaceous vegetation (grassland, savannas or lichens/mosses)	0.10	0.16	0.00	-0.56	-0.24	0.07	0.33	-0.05
t150	Sparse (<15%) vegetation	-0.95	-0.01	0.02	0.07	-0.05	-0.02	0.05	0.07
t160	Closed to open (>15%) broad-leaved forest regularly flooded (semi-permanently or temporarily) - Fresh or brackish water	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0.00
t170	Closed (>40%) broad-leaved forest or shrubland permanently flooded - Saline or brackish water	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
t180	Closed to open (>15%) grassland or woody vegetation on regularly flooded or waterlogged soil - Fresh, brackish or saline water	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t190	Artificial surfaces and associated areas (Urban areas >50%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t200	Bare areas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t210	Water bodies	0.05	-0.12	0.02	-0.11	0.92	0.12	0.14	0.07
t220	Permanent snow and ice	0.00	0.00	0.00	-0.01	0.01	0.00	-0.02	-0.04
t230	no data	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

# Land cover and climatic conditions as potential drivers of the raccoon (*Procyon lotor*) distribution in North America and Europe

Sarah Cunze, Sven Klimpel, Judith Kochmann

Supplementary Material

Table S2d: PCA loading of the original landcover variables on the nine PCA axes included in the landcover only model for Europe.

		PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9
t011	Post-flooding or irrigated croplands (or aquatic)	0.00	0.01	0.01	0.02	0.02	0.14	0.23	0.32	0.68
t014	Rain fed croplands	0.13	0.26	-0.37	-0.23	0.04	-0.67	0.41	-0.18	-0.03
t020	Mosaic cropland (50-70%) / vegetation (grassland/shrubland/forest) (20-50%)	0.17	0.33	-0.47	-0.25	0.01	0.13	-0.67	0.18	0.03
t030	Mosaic vegetation (grassland/shrubland/forest) (50-70%) / cropland (20-50%)	0.07	0.08	-0.18	-0.03	-0.01	0.61	0.23	-0.56	-0.19
t040	Closed to open (>15%) broadleaved evergreen or semi-deciduous forest (>5m)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t050	Closed (>40%) broad-leaved deciduous forest (>5m)	0.10	0.13	0.14	0.53	-0.58	-0.21	-0.20	-0.25	-0.02
t060	Open (15-40%) broad-leaved deciduous forest/woodland (>5m)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t070	Closed (>40%) needle-leaved evergreen forest (>5m)	0.02	0.02	0.01	0.04	-0.02	0.05	0.01	0.09	0.03
t090	Open (15-40%) needle-leaved deciduous or evergreen forest (>5m)	0.10	0.00	0.66	-0.59	0.07	-0.09	-0.18	-0.24	0.02
t100	Closed to open (>15%) mixed broadleaved and needle-leaved forest (>5m)	0.06	0.05	0.25	0.08	-0.21	-0.06	-0.10	0.23	0.05
t110	Mosaic forest or shrubland (50-70%) / grassland (20-50%)	0.02	-0.01	0.04	0.00	0.00	0.05	0.07	0.03	-0.01
t120	Mosaic grassland (50-70%) / forest or shrubland (20-50%)	0.03	0.01	0.05	0.02	-0.04	0.03	0.06	-0.06	-0.02
t130	Closed to open (>15%) (broadleaved or needle-leaved, evergreen or deciduous) shrubland (<5m)	0.01	0.01	-0.01	0.01	0.00	0.07	0.03	-0.01	-0.01
t140	Closed to open (>15%) herbaceous vegetation (grassland, savannas or lichens/mosses)	-0.01	0.02	0.01	0.04	0.01	0.18	0.29	0.11	0.15
t150	Sparse (<15%) vegetation	0.18	-0.89	-0.26	-0.06	-0.05	-0.12	-0.13	-0.07	0.01
t170	Closed (>40%) broad-leaved forest or shrubland permanently flooded - Saline or brackish water	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t180	Closed to open (>15%) grassland or woody vegetation on regularly flooded or waterlogged soil - Fresh, brackish or saline water	0.03	-0.02	0.08	-0.01	0.00	0.06	0.18	0.54	-0.69
t190	Artificial surfaces and associated areas (Urban areas >50%)	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.01
t200	Bare areas	-0.94	-0.05	-0.09	-0.07	-0.04	-0.08	-0.12	-0.07	-0.03
t210	Water bodies	0.04	0.03	0.12	0.48	0.78	-0.14	-0.19	-0.12	-0.03
t220	Permanent snow and ice	0.00	0.00	0.01	0.01	0.01	0.04	0.07	0.05	0.03
t230	no data	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00