

Appendix 3 | ES bundles and drivers

ES bundles

To understand how ES and their drivers spatially associate at the landscape scale, we performed a clustering analysis with PCA scores of significant PCA axes. For this we tested different clustering algorithms and numbers of cluster and we presented validation measures results (Table A3.1). For the selected cluster results we present the mean values of each ES for each bundle (Table A3.2) and the mean values of the PC scores for each bundle (Table A3.3).

Table A3.1 – Validation measure results for tested clustering algorithms and numbers of clusters.

Cluster algorithm	Validation measure	Number of clusters				
		2	3	4	5	6
Hierarchical	Silhouette	0.28	0.23	0.24	0.22	0.23
	FOM	1.20	1.19	1.17	1.16	1.15
Kmeans	Silhouette	0.31	0.27	0.30	0.28	0.28
	FOM	1.20	1.20	1.18	1.17	1.15
Diana	Silhouette	0.33	0.31	0.26	0.27	0.24
	FOM	1.20	1.19	1.18	1.18	1.18
Model	Silhouette	0.28	0.24	0.18	0.15	0.17
	FOM	1.20	1.18	1.17	1.16	1.15
Sota	Silhouette	0.29	0.25	0.25	0.24	0.21
	FOM	1.20	1.19	1.19	1.18	1.18
Pam	Silhouette	0.31	0.27	0.27	0.27	0.25
	FOM	1.20	1.19	1.18	1.17	1.15
Clara	Silhouette	0.31	0.27	0.25	0.23	0.20
	FOM	1.20	1.19	1.18	1.17	1.15
Agnes	Silhouette	0.30	0.25	0.27	0.26	0.24
	FOM	1.20	1.20	1.18	1.17	1.16

Table A3.2 – Mean values of ES indicator delivery for each bundle resulting from clustering analyses, grouped by type of ES.

Bundle	Regulation			Production		Cultural	Biodiversity	
	Carbseq	ErsPr	Pollin	FoodCrops	Wine	Cattle	NatT	FarmBirds
1	0.67	0.55	0.33	1.09	1.19	-0.17	0.56	0.00
2	-0.27	-0.68	-0.38	-0.34	-0.45	-0.16	-0.25	-0.69
3	0.81	1.23	-0.06	-0.04	-0.27	1.06	-0.33	-0.27
4	-0.60	-0.24	0.27	-0.34	-0.15	-0.28	0.10	1.00

Table A3.3 – Mean values of PC score for each bundle resulting from clustering analyses.

Cluster	PC1	PC2	PC3
1	0.65	-1.53	-0.80
2	1.85	0.15	0.53
3	-1.05	-0.24	0.61
4	-0.39	1.04	-0.68

Drivers behind bundles of ES

A multinomial logit model was run on ES bundles to identify the most important drivers of the spatial pattern observed in the distribution of ES bundle. The analysis calculated the log-odds (the log of the odds ratio) of a parish assigned to a bundle (e.g. bundle 1) changing to a different bundle (e.g. bundle 2) as a function of predictor variables (Table A3.4). Because multinomial logit model identifies drivers' coefficients associated with changes in the classification of bundle of ES (e.g. bundle 1 to 2), drivers that were significant and consistent (i.e. showed positive or negative statistically significant results consistently) in 3 or more changes (out of possible 3, e.g. in bundle 1,3,4) to a specific bundle (e.g. bundle 2) were considered relevant for the determination of the later bundle.

Table A3.4. Estimated model coefficients and standard errors (in parentheses) for changes in the classification of parishes in ecosystem service (ES) bundles, in response to individual ES drivers. Significance at $p < 0.05$ denoted by * and at $p < 0.01$ by **.

	(Intercept)	SEI	ED	FarmerN	Farmsize	SpInd	ProdValue
2 -> 1	-0.05(0.14)	0.62(0.14)**	0.38(0.13)**	0.64(0.12)**	1.30(0.58)*	-0.68(0.61)	-0.67(0.15)**
3 -> 1	-0.47(0.15)**	-0.05(0.14)	0.87(0.12)**	1.04(0.13)**	0.40(0.33)	-0.97(0.62)	1.80(0.27)**
4 -> 1	-0.91(0.12)**	0.55(0.13)**	0.47(0.12)**	1.85(0.13)**	1.1(0.37)**	-0.68(0.61)	0.21(0.16)
1 -> 2	0.05(0.14)	-0.62(0.14)**	-0.38(0.13)**	-0.64(0.12)**	-1.30(0.58)*	0.68(0.61)	0.67(0.15)**
3 -> 2	-0.42(0.13)**	-0.67(0.13)**	0.49(0.13)**	0.40 (0.14)**	-0.91(0.52)	-0.29(0.32)	2.47(0.27)**
4 -> 2	-0.85(0.11)**	-0.07(0.12)	0.09(0.12)	1.21(0.14)**	-0.20(0.51)	0.00 (0.24)	0.88(0.14)**
1 -> 3	0.47(0.15)**	0.05(0.14)	-0.87(0.12)**	-1.04(0.13)**	-0.40(0.33)	0.97(0.62)	-1.80(0.27)**
2 -> 3	0.42(0.13)**	0.68(0.13)**	-0.49(0.13)**	-0.40 (0.14)**	0.91(0.52)	0.29(0.32)	-2.48(0.27)**
4 -> 3	-0.43(0.11)**	0.61(0.1)**	-0.40(0.09)**	0.81(0.12)**	0.71(0.22)**	0.29(0.28)	-1.59(0.26)**
1 -> 4	0.91(0.12)**	-0.55(0.13)**	-0.47(0.12)**	-1.85(0.13)**	-1.1(0.37)**	0.68(0.61)	-0.21(0.16)
2 -> 4	0.85(0.11)**	0.07 (0.12)	-0.09(0.12)	-1.21(0.14)**	0.20(0.52)	0.00 (0.24)	-0.88(0.14)**
3 -> 4	0.43(0.11)**	-0.61(0.1)**	0.40(0.09)**	-0.81(0.12)**	-0.71(0.22)**	-0.29(0.28)	1.59(0.26)**