Supplementary material (S1) - Ecologically-based landscape and foodshed planning

Supplementary Material S1 provides additional information regarding the first stage of the methodological approach. At this stage, we applied an ecologically-based landscape and foodshed planning to propose a potential foodshed relocalization scenario for the EDM. Here we present detailed information on the ecological suitability assessment, along with clarification concerning the classification criteria for grouping COS18 classes; the complementary scenarios obtained for each specific agrarian use (i.e., temporary crops, permanent crops, pastures and multiple agrosilvopastoral use); and the complete list of the database used.

1. Ecological suitability assessment

The ecological suitability (ES) was determined according to the Multi-Criteria Decision Analysis approach (MCDA) developed by Cardoso et al. [1]. This approach allowed the assessment of three ecological criteria simultaneously, namely, the soil ecological value (ev) [2], the terrain morphology (tm) [3] and the slope [4]. To this end, we used the weighted overlay tool (Spatial Analyst) by assigning weight factors to each criterion and a value scale from 1 to 5 to the different classes of each criterion, according to the following equation and table (Table S1a):

$$ES = (0{,}65 \times ev) + (0{,}20 \times slope) + (0{,}15 \times tm), \quad (1)$$

Table S1a. Criteria, classes and weight factors assigned to the ecological suitability multicriteria analysis.

Factors								**Weight (%)**
Soil ecological value	Very low	Low	Variable	High	Very high			65
Class weight (1-5)	1	2	3	4	5			
Slope (%)	0-3	3-5	5-8	8-12	12-16	16-25	>25	20
Class weight (1-5)	5	5	4	3	3	2	1	
Land morphology	Hillcrests		Wet System	Hillslopes	Wet areas	Coastal areas	Water bodies	15
Class weight (1-5)	4		5	3	0	0	0	

[1] Source: adapted from Cardoso et al. [1]

2. Agrarian use potential planning and ecological adequacy of land use

Following the land suitability mapping of the territory, we aimed to select ecologically suitable areas for agrarian land uses. To accomplish this task, we needed to establish the conditions for the land use potential planning and assess the ecological adequacy regarding the current land occupation in 2018. Therefore, it was required to rearrange and rename the classes of the land cover map for 2018 (COS2018), to ease the intended analysis (Table S1b.)

Table S1b. COS2018 level 1, 2 and 3 nomenclature and reclassification.

COS level 1	COS level 2	COS level 3	COS reclassified
Artificialised areas			Artificialised areas
Agricultural Areas	Arable land	Non-irrigated arable land	Temporary crops
		Permanently irrigated land	
		Rice fields (n.a.)	
	Permanent crops	Vineyards	Permanent crops
		Orchards	
		Olive groves	
	Heterogeneous agricultural areas	Arable land with permanent crops	Multiple agrosilvopastoral use
		Complex cultural systems	
		Agriculture with natural and semi-natural spaces	
	Protected agriculture and greenhouses	Protected agriculture and greenhouses	Protected agriculture and greenhouses
Pasture	Pasture	3.1.1 Improved pastures	Pasture
		3.1.2 Spontaneous pastures	
Agroforestry areas	Agroforestry areas	Agroforestry areas	Multiple agrosilvopastoral use
Forests	Forests	Broad-leaved forests	Forests, shrubs and vegetation
		Coniferous forests	
Scrubs	Scrubs	Scrubs	
Open spaces with little or no vegetation	Open spaces with little or no vegetation	Beaches, dunes and sandbanks	Beaches, dunes and sandbanks
		Bare rock	Bare rock
		Sparsely vegetation	Forests, shrubs and vegetation
Wetlands			Wetlands
Superficial water bodies			Water bodies

* (n.a) – not applicable in the EDM

3. Mapping the potential foodshed relocalization scenario

After identifying the ecologically suitable areas for agrarian land use, we proposed an additional forestry class for water and soil conservation (conservation forestry) to improve the relocalization scenario by safeguarding forestry resources in the territory and associated ecosystem services. Table S1c. describes the assignment criteria for this land use class, determined to obtain the maximum potential for agrarian use.

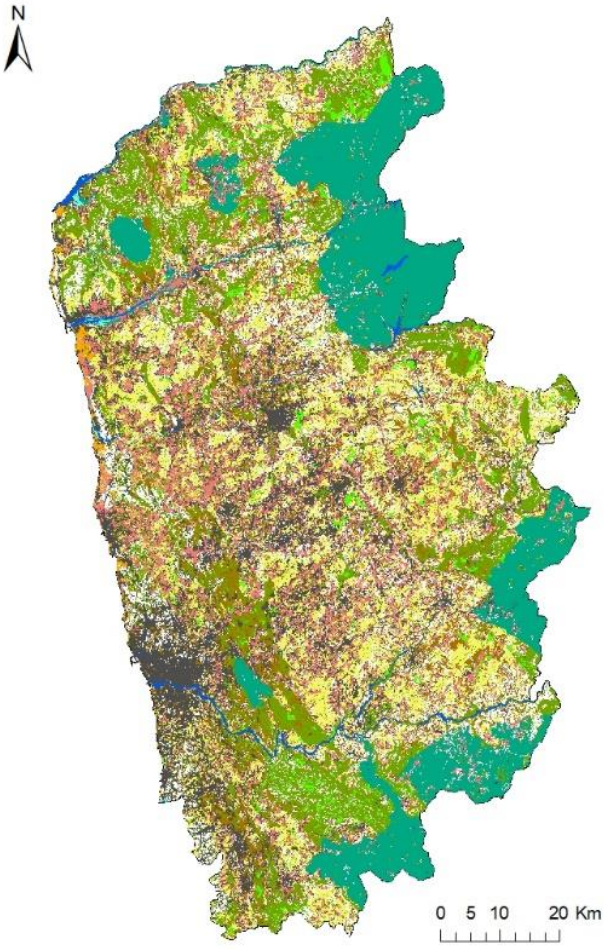
Table S1c. Landscape planning for water and soil conservation forestry.

	Soil ecological value (ev)	Slope (%)	Land morphology
Water and soil conservation forestry	1 to 5	0 to 5 or >5	Narrow hilltops*
	1	-	
	2	>=16	Hillslopes
	3 to 5	>=45	

* Narrow hilltops that simultaneously have slopes > 5% are not suitable for agriculture [5,6]; (Very low ev=1; Low ev=2; Variable ev=3; High ev=4; Very high ev=5).

Finally, complementary scenarios reflecting the ecologically suitable areas for each of the specific agrarian land uses (i.e., temporary crops, permanent crops, pastures and

multiple agrosilvopastoral use) were obtained. Overall, we depicted areas with existing agrarian use to be maintained and additional areas currently under different land uses to propose for agrarian use as shown in figure S1.a (a, b, c and d).



(**a**)

(**b**)

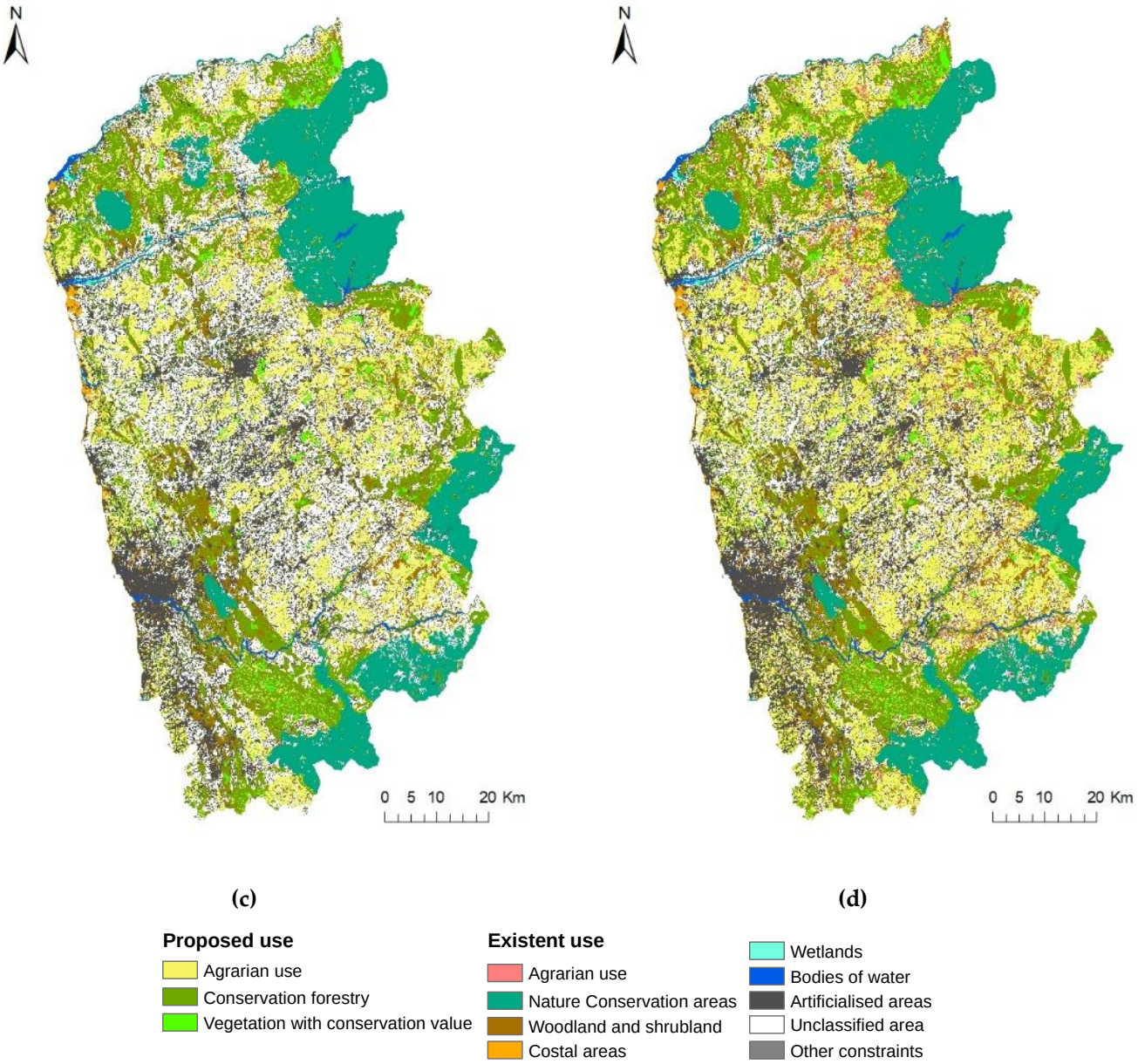


Figure S1.a. Foodshed relocalization scenario maps regarding specific agrarian usages in the EDM: (a) temporary crops; (b) permanent crops; (c) pastures; (d) multiple agrosilvopastoral use.

For the methodology presented, we employed spatial tools and approaches in Geographic Information Systems (ArcGIS 10.7) [7]. The cartographic datasets used (Table S1.d) are from the EPIC WEBGIS PORTUGAL platform; from DGT (Direcção-Geral do Território), namely, the 2019 version of the Official Administrative Map of Portugal (CAOP)[8]; and the thematic map of land use and land cover for mainland Portugal for 2018 (COS2018) [9].

Table S1.d. Database complete list.

Title	Location	Coordinate system	Scale	Spatial resolution	Reference
Official Administrative Map of Portugal (CAOP)	https://www.dgterritorio.gov.pt/cartografia/cartografia-tematica/caop	ETRS89/PT-TM06	1:25 000		[8]
Land use and land cover map for mainland Portugal for 2018 (COS2018).	https://www.dgterritorio.gov.pt/cartografia/cartografia-tematica/	ETRS89/PT-TM06	1:25 000	25 meters	[9]
Terrain morphology	http://epic-webgis-portugal.isa.ulisboa.pt/	ETRS89 / Portugal TM06 (EPSG:3763)	1:100 000	meters	[3]
Slope	http://epic-webgis-portugal.isa.ulisboa.pt/	ETRS89 / Portugal TM06 (EPSG:3763)		25 meters	[4]
Soil depth	http://epic-webgis-portugal.isa.ulisboa.pt/	ETRS89 / Portugal TM06 (EPSG:3763)	1:50 000	meters	[10]
Soil ecological value	http://epic-webgis-portugal.isa.ulisboa.pt/	ETRS89 / Portugal TM06 (EPSG:3763)	1:50 000	meters	[2]
Coastal areas	http://epic-webgis-portugal.isa.ulisboa.pt/	ETRS89 / Portugal TM06 (EPSG:3763)		meters	[11]
Natural and semi-natural vegetation from moderate to very high conservation value	http://epic-webgis-portugal.isa.ulisboa.pt/		1:100 000	meters	[12]
Rede Fundamental de Conservação da Natureza (RFCN) the National System Classified Areas (NSCA)					
National Network of Protected Areas	http://epic-webgis-portugal.isa.ulisboa.pt/	ETRS89 / Portugal TM06 (EPSG:3763)	1:25000	meters	[13]
IBAs					[14]
Council of Europe Biogenetic Reserve					[15]
UNESCO Biosphere Reserve					[16]
Ramsar Convention					[17]
Natura 2000 Network – Sites of Community Importance - (SCI's)					[18]
Natura 2000 Network – Special Protection Areas - (SPA's),					[19]
HNVf type 1 and 2	https://doi.org/10.1016/j.landurbplan.2019.103726				[20]

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