

Supplementary material (S2) - Relocalization scenario's impact on the landscape's ecological value

Supplementary Material S2 provides further information on the ecological sustainability of the potential foodshed relocalization scenario. Our goal was to assess the scenario's impact on the ecological value of the landscape by exploring land use change dynamics and landscape indicators proxies of heterogeneity in both the EDM and the HNVf (type 1 and 2). The assessment focused on agrarian land use classes (temporary crops, permanent crops, pastures and multiple agrosilvopastoral uses) and the additional land use class, designated globally as "forests and other usages". The latter encompasses the COS2018 reclassified class "Forests, shrubs and vegetation" (see Table S1b) concerning the baseline analysis; and for the relocalization scenario to the set of the following classes: "nature conservation areas", "conservation forestry", "vegetation with conservation value" and "woodland and shrubland". Table S2a shows the land use classes equivalence between the two timelines (COS2018 vs. relocalization scenario).

Table S2a. Land use classes topic of analysis regarding the relocalization scenario's impact on the ecological value of the landscape and classes equivalence between the baseline (COS2018) and the relocalization scenario.

| Land use | COS2018 reclassified | Relocalization scenario |
|---------------------------------|--------------------------------|------------------------------------|
| Agrarian use | Temporary crops | Temporary crops |
| | Permanent crops | Permanent crops |
| | Pastures | Pastures |
| | Multiple agrosilvopastoral use | Multiple agrosilvopastoral use |
| Forests and other usages | Forests, shrubs and vegetation | Nature conservation areas |
| | | Conservation forestry |
| | | Vegetation with conservation value |
| | | Woodland and shrubland |

The analysis of the spatio-temporal changes in land use was conducted on raster cartography (25m pixel) using the Combine tool (Spatial Analyst) and Structured Query Language (SQL), depicting the land use transitions between the two timelines in the EDM and both the HNVf1 and HNVf2. The following table and figures reflect the quantitative assessment regarding changes in the surface area and conversion dynamics between the two land use classes (i.e., agrarian use and forest and other usages).

Table S2b. Quantitative analysis of land use changes (i.e., agrarian use and forests and other usages) proposed by the relocalization scenario in regards to the baseline (COS2018), in both the EDM and the HNVf (1 and 2).

| | | COS2018 | | Relocalization scenario | | Changes (Scenario vs COS2018) | |
|---------------------------------|-------|-----------|------|-------------------------|------|-------------------------------|-------|
| | | Area (ha) | (%)* | Area (ha) | (%)* | Area (ha) | (%)* |
| Agrarian use | | | | | | | |
| | EDM | 198,925.2 | 22,7 | 359,759.5 | 41.0 | 160,834.3 | 18.3 |
| | HNVf1 | 8298.3 | 9,2 | 33,823.1 | 37.5 | 25,524.9 | 28.3 |
| | HNVf2 | 18,251.1 | 88,7 | 16,533.4 | 80.3 | -1717.6 | -8.3 |
| Forests and other usages | | | | | | | |
| | EDM | 538,011.3 | 61.3 | 365,283.7 | 41.6 | -172,727.6 | -19.7 |
| | HNVf1 | 80,258.1 | 89.1 | 54,330.9 | 60.3 | -25,927.2 | -28.8 |
| | HNVf2 | 1612.9 | 7.8 | 2864.9 | 13.9 | 1252.0 | 6.1 |

* Concerning the total area: EDM=877,236.5 ha; HNVf1 = 90,113.6 ha; HNVf2 = 20,581.2 ha).

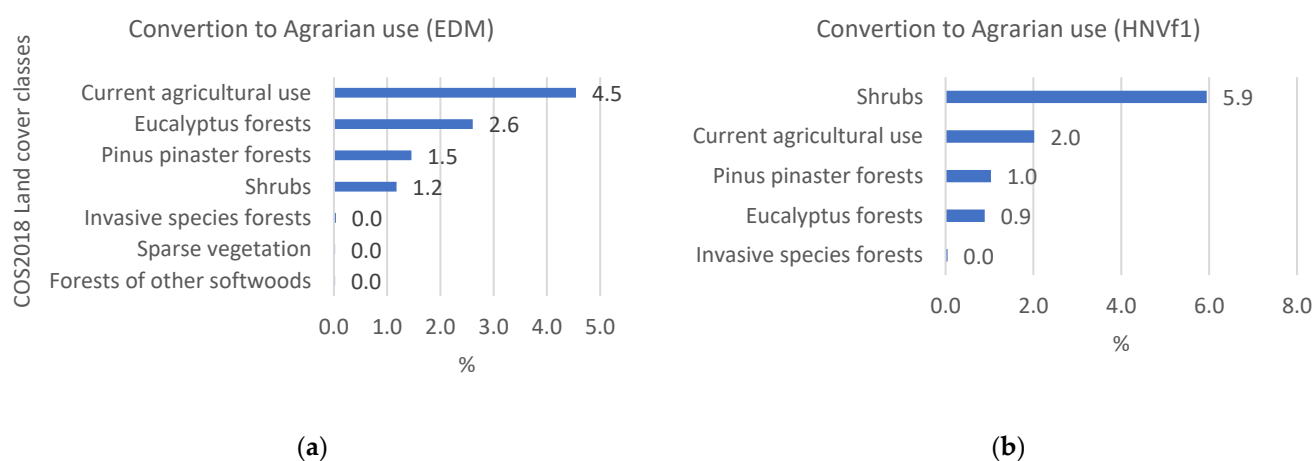


Figure S2a. Percentage (%) of conversion to agrarian use in the relocation scenario from the different land cover classes of the COS18 at both: (a) EDM; and (b) HNVf1.

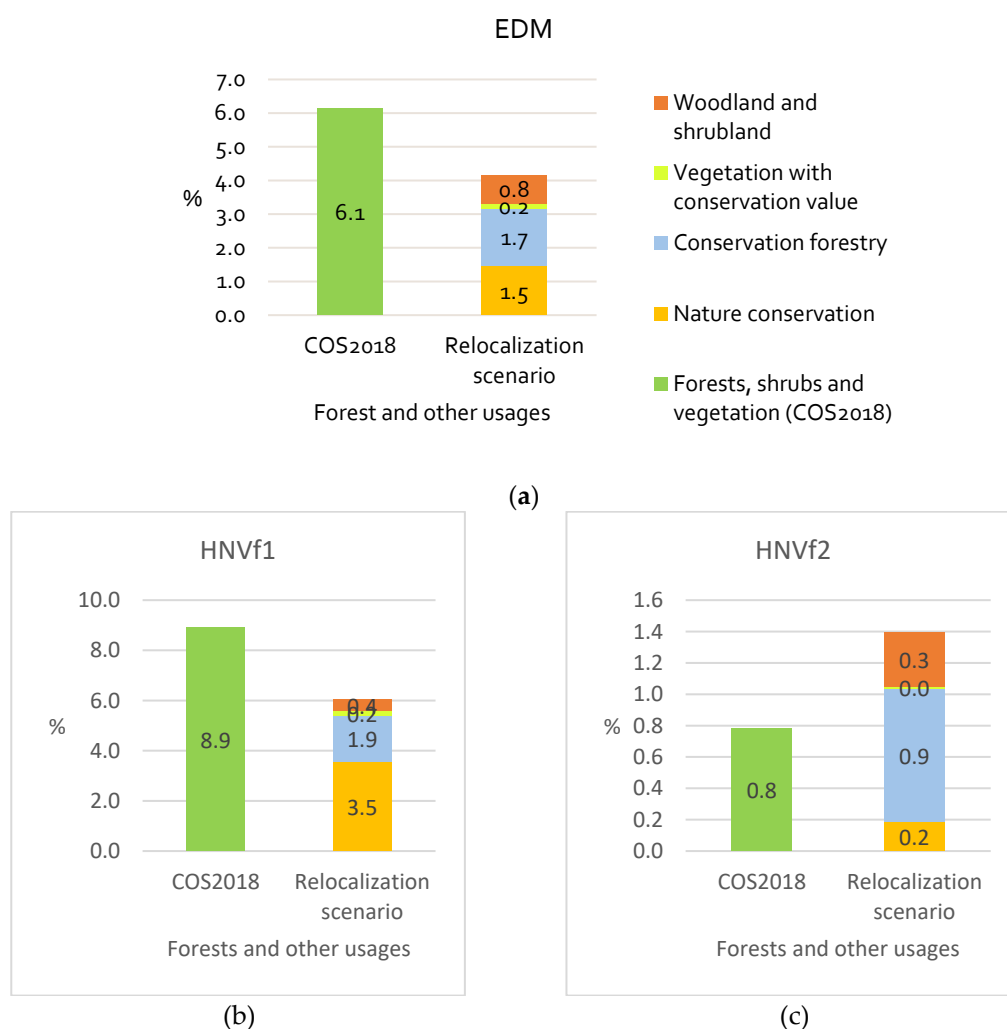


Figure S2b. Comparative composition and distribution of the group "forest and other usages" in the COS2018 and in the relocation scenario at the: (a) EDM; (b) HNVf1; and (c) HNVf2.

Finally, we address the landscape heterogeneity by assessing landscape structure changes resulting from the relocation scenario. The identification of landscape metrics that can be used as indicators or proxies of heterogeneity and biodiversity is a current

topic of broad interest in ecology. Here we selected three metrics related to composition (SDI, SEI and NumP) and another three connected to configuration (MPS, MSI and ED), guided by correlation analysis. Afterwards, the metrics were computed in vector format maps, at landscape and class level, for both COS2018 cartography and the relocalization scenario, at the scale of the EDM and the HNVf1 and HNVf2.

Table S2c. presents the used metrics regarding some of their most important features and table S2d. displays the computed metrics result at the landscape level.

Table S2c. Selected landscape metrics proxies of heterogeneity computed with Patch Analyst in ArcGIS [1].

| Group | Abbreviation | Name | Unit | Description |
|-------------|--------------|---------------------------|--------------|--|
| Area | CA | Class area | Hectare (ha) | Total area of the class; represents the sum of all the patches of a given land use class. |
| | | | | |
| Composition | SEI* | Shannon's evenness index | - | Measure of the patch distribution (regular or irregular) in the area. It equals zero when the patch distribution is low and approaches 1 when the patch distribution becomes more even (i.e., values close to 1 indicate a regular patch distribution) |
| | SDI* | Shannon's diversity index | - | Relative measure of patch diversity in the landscape. |
| | | | | |
| Size | NumP | Number of patches | - | Patch total number; expresses the total number of patches per land use class. |
| | MPS | Mean patch size | Hectare (ha) | Expresses the average patch size per land use class. |
| | ED | Edge density | m/ha | Expresses the relationship between each class perimeter by the total area of the landscape. |
| Shape | | | | Refers to the complexity of the patch shape. The metric performs the sum of the perimeter of all patches and divides by the square of the area of the use class. |
| | MSI | Mean shape index | - | Shape complexity MSI is equal to 1 when all patches are circular (for polygons), and it increases with increasing patch shape irregularity |

* Note: SDI and SEI are only calculated at landscape level.

Table S2d. Landscape metrics results for both COS2018 and the relocation scenario at the EDM and the HNVf (1 and 2) (SDI: Shannon's diversity index; SEI: Shannon's evenness index; MSI: Mean shape indicator; ED: Edge density; MPS: Mean patch size, NumP: Number of patches; TLA: Total land area)

| | SDI | SEI | MSI | ED | MPS | NumP | TLA |
|------------------------|-----|-----|-----|-------|-----|-----------|-----------|
| Landscape_EDM | | | | | | | |
| COS2018 | 1.2 | 0.5 | 1.9 | 212.3 | 8.1 | 108,371.0 | 877,236.5 |
| Scenario | 2.1 | 0.8 | 1.6 | 249.9 | 3.4 | 257,257.0 | 877,236.5 |
| Landscape_HNVf1 | | | | | | | |
| COS2018 | 0.5 | 0.2 | 2.6 | 298.2 | 2.5 | 35,687.0 | 90,100.3 |
| Scenario | 1.8 | 0.7 | 2.0 | 332.2 | 1.8 | 51,243.0 | 90,100.3 |
| Landscape_HNVf2 | | | | | | | |
| COS2018 | 1.4 | 0.6 | 2.6 | 524.7 | 1.2 | 17,498.0 | 20,587.0 |
| Scenario | 1.7 | 0.7 | 2.1 | 585.9 | 0.8 | 27,035.0 | 20,587.0 |

References

1. Rempel RS, Kaukinen D, Carr AP. Patch Analyst and Patch Grid. Thunder Bay; 2012.