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BACKGROUND: According to the UNCCD, Greece has a marked problem of desertification over large areas. Unfortunately, the breadth, complexity and dynamism of the desertification process has so far precluded the development of a comprehensive model and methods of assessment and monitoring have involved the use of indicators. The most frequently applied indicator-based system for assessing LDD in the Mediterranean is the Environmentally Sensitive Area Index (ESAI) framework (Kosmas et al., 1999), mainly due to its simplicity in model building as well as its flexibility in the use of relevant variables as indicators.

To modify and improve the standard ESAI method that can be used to monitor the dynamic nature of environmental sensitivity of Mediterranean environments to land degradation and desertification.

AREA OF STUDY: the 73 sub-municipalities of the Island of Lesvos (Greece)

Lesvos is an island of Greece in the Aegean Sea, in the eastern Mediterranean. It covers an area of 1,633 km². Maximum altitude of 947 m. Climate is characterised by strong seasonal and spatial variations of rainfall and high and low temperatures between minimum and maximum daily temperatures.

DATA & METHODS

Estimation of 21 indicators belonging to 5 main environmental Quality Indices related with: Climate, Vegetation, Soil, Groundwater, Socio-economic characteristics Indicators were standardized from 1 (=least significant) to 6 (=most significant) according to the ESAI scheme (Tables 1-5).

According to the ESAI, the Quality Indices are estimated as follows:

CQI = rainfall * aridity + aspect + drought res. + erosion prot. + fire risk + plant cover, etc, etc...

Final Environmental Sensitive Area Index is then estimated as follows: (Figure 1)

ESAI = (CQI * VQI * SQI * GQI / SEQI)½

ESAI widely used, BUT:

• The ESAI assumes that all indicators used in the system are equally important and hence, assigns an equal weight (+1.0) to all them

• This issue has been identified as a potential flaw of the ESAI approach and was addressed initially by Salvati & Zitti (2009)

• We employ a modification of the ESAI that combines the multivariate analytical framework suggested by Salvati and Zitti (2009). Multiway Data Analysis (MDA) The freely available R-package P-Tak (Leibovici, 2010) was used to implement the multivariate, multitemporal analysis. The weights were computed for each indicator i by multiplying the contribution of each indicator to the m most important (i.e. explaining >10% of total variance) factorial axes by their proportion of explained variance (for further details see Salvati and Zitti, 2009).

RESULTS (Figure 2), Discussion

Agreements

Both methods of estimating the indicator weights agree in that:

• Vast majority of island: fragile or critically sensitive

• Most critical areas are in the western part. In agreement with Kosmas et al. (1999), Symeonakis et al. (2014)

• The eastern part of the island is degrading fast

Disagreements

When the MDA weighing scheme is applied:

• In 1990 (Figure 2a), a large number of municipalities in the western and central part of the island appear as Critical rather than a Fragile state, as in the case of the equal weights (Figure 2a)

• In 2000 (Figure 2e), a number of municipalities in the eastern part of the island appear to be in a Critical rather than a Fragile state, as in the case of the equal weights (Figure 2b)

• In 2000, the entire Peninsula of Amali, south of the capital of the island (Mylline, Figure 2e), appears to degrading to a Critical state, due to vegetation and climatic factors as well as the growth in human population.

Validation

Field validation is currently carried out to identify which method produces more reliable results.