



Optimising the weighting of the water retention index using sensitivity analysis

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A robust composite indicator was developed to assess the capacity of the landscape to regulate and retain water passing through it at Pan-European scale. The “Water Retention Index” (WRI) takes into account the role of interception by vegetation, the water-holding capacity of the soil, and the relative capacity of the bedrock to allow percolation of water, as well as the influence of soil sealing and slope gradient. A delicate issue in composite indicators is however the relative weighting of each variable used in the indicator – strong correlations and skewness are known to cause unequal influence of the input variables, even though the weighting coefficients are equal (Paruolo et al, 2013). To understand the effects of the weightings in the WRI, penalised splines were used to calculate the first order sensitivity index of each variable used in the construction of the WRI, allowing the true influence of each input to be determined. Furthermore, the weighting coefficients were optimised using an iterative nonlinear algorithm to find the coefficients which resulted in the most equal influence of each input to the indicator. In principle, this approach can be used to improve the weighting of many different kinds of composite indicator, the results of which are often used as the basis for important policy decisions at the European level.

Paruolo, Paolo, Michaela Saisana, and Andrea Saltelli. "Ratings and rankings: voodoo or science?." *Journal of the Royal Statistical Society: Series A (Statistics in Society)* 176.3 (2013): 609-634.