



Comparison of national and regional assessments of soil loss rate by water erosion: an application to the Tuscany region (Italy).

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Soil erosion, in its various forms, has been identified as one of the major soil threats worldwide because it is one of the most significant forms of land degradation (soil truncation, loss of fertility, slope instability, etc.) and loss of soil-based ecosystem services; causing irreversible effects on the poorly renewable soil resource. The Revised Universal Soil Loss Equation (RUSLE) is one of the most widespread adopted empirical model approaches for assessing long-term average soil loss rate by water erosion. The assessed soil loss rate is an indicator that describes (or measures) the state of the soil erosion in a specific area (field, catchment, region, country) which we are interested in. The quality of this indicator relies on the scale which it represents and its required data. Many European countries, such as Italy, do not have harmonised national soil erosion databases at the different scales required by decision makers (regional, provincial, local) and national scale assessments have been carried out using EU data (JRC 2015, LUCAS 2018). However, national scale assessments are not often coherent with the more detailed information available at regional scale for some Italian regions in which RUSLE based potential soil erosion maps have been produced. Although it would be predictable, it is of particular interest to assess how reliable a national scale assessment can be in providing information on the state of soil erosion at a regional scale. A regional soil database is available for the Tuscany region (IT) and it is suitable for soil erosion assessment at regional scale. In this context, within the framework of the EJP SOIL project SERENA, the study was aimed at comparing three RUSLE applications carried out i) at regional scale by means of the available regional soil/climate/digital terrain model data; ii) at national scale by means of the same datasets upscaled at country level; iii) at national scale based on datasets actually available for all the Italian territory.

This scale effect is likely due to 2 components. First, the spatial density and quality of the observations needed to estimate the RUSLE factors. To this regard, soil and climate data quality and availability are usually higher for small territories than for the whole national territory. Secondly, the reference scale adopted for the aggregation and spatialization of the data, which is particularly important for the LS factor. These two reasons lead to a lower reliability of the RUSLE applications at national scale as compared to a regional one. The assessment at the regional scale of the soil loss rate using the Tuscany Region dataset was used as reference to evaluate the results obtained with the other two datasets at the same regional scale. Such comparisons were made

using both the differences among the erosion maps, and through statistical indices that measure the deviations between the reference map and the other spatial products.