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Soil Monitor: an advanced and freely accesible platform to challenge soil sealing in Italy

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Soil sealing is known to be one of the most serious soil degradation processes since it greatly disturbs or removes essential ecosystem services. Although important policy documents (Roadmap to a Resource Efficient in Europe, SDG'S) promise to mitigate this problem, there are still no signs of change and today soil sealing continues to increase globally. We believe an immediate action is required to reduce the distance between the grand policy declarations and the poor availability of operational – and scientifically robust – tools to challenge soil sealing. These tools must be able to support the decisions made by people who manage and control the soil sealing, namely urban and landscape planning professionals and authorities.
In this contribution, we demonstrate that soil sealing can be effectively challenged by the implementation of a dedicated Geospatial Cyberinfrastructure. The platform we are developing – named Soil Monitor – is at now a well-functioning prototype freely available at http://www.soilmonitor.it/. It has been developed by research scientists coming from different disciplines. The national authority for environmental protection (ISPRA) provided the dataset while INU (Italian association of urban planners) tested the soil sealing and the urban planning indicators. More generally, Soil Monitor has been designed to support the Italian policy documents connected to soil sealing: AS 1181, AS 2383, L. 22 May 2015, n. 68; L. 28 December, n. 221). Thus, it connects many different soil sealing aspects including science, community, policy and economy.
Soil Monitor performs geospatial computation in real-time to support the decision making in the landscape planning. This aims at measuring soil sealing in order to mitigate it and in particular at recognizing actions to achieve the land degradation neutrality. The web platform covers the entire Italy, even though it is "Country-agnostic". Data are processed at a very high spatial resolution (10-20 m), which is a "must" for effective landscape planning. Computation is designed to be highly scalable enabling real time responses over a customised range of spatial extents and high-demand calculations are embedded by means of advanced parallel codes running fast on GPUs (Graphical Processing Units). For any Italian area of interest drawn or selected by the user the analysis includes real time quantification of (i) land use changes at different times (ii) rural landscape fragmentation, (iii) loss of ecosystem services after new urbanisation, (iv) potential impact of new green corridors. A library of parallel routines based on the CUDA (Computing Unified Device Architecture) framework is going to be built which enables the easy implementation of new indicators for measuring land state and degradation.