Advancing Land Degradation Assessment and Restoration Planning in the Mediterranean through the LanDS Toolbox

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The Mediterranean region faces critical challenges related to land degradation, requiring innovative and harmonized approaches for assessment and restoration. To address these challenges, the Land Degradation Decision-Support Toolbox (LanDS) has been developed as part of the REACT4MED project (https://react4med.eu/), funded by PRIMA (https://prima-med.org/). LanDS serves as a comprehensive and adaptable platform designed to evaluate land degradation and assess the impacts of restoration measures across diverse Mediterranean contexts.

LanDS exemplifies a novel approach to combating land degradation by bridging scientific research and practical application, promoting sustainable development, and supporting climate adaptation efforts in the Mediterranean region.

The toolbox integrates five core components:

- **Geo-referenced Data Repository**: a centralized knowledge base that aggregates site-specific data and resources from the project's ecosystem restoration living labs, alongside broader datasets from global and regional repositories and satellite-based indices.
- **Data Viewer**: a suite of interactive visual analytics tools enabling effective data visualisation, sharing among project partners and stakeholders, and monitoring of restoration actions.
- **Indicators Library**: a modular and adaptable code library offering a wide array of indicators supporting analysis and comparisons across different spatial and temporal scales, drawn from an extensive dataset built from global repositories and project's data.
- **Machine-Learning-Based Procedure**: a cutting-edge tool designed to identify and map potentially suitable areas for upscaling and outscaling restoration measures across the Mediterranean region.
- **Interactive Web Dashboard**: a user-friendly interface that delivers harmonized assessments of land degradation and evaluates the effectiveness and impact of the project's restoration measures, while supporting dissemination of project findings.

By synthesizing knowledge from global and regional datasets with insights from living labs in pilot areas, LanDS facilitates informed decision-making for land restoration and sustainable resource management. The platform fosters the development of policy recommendations and investment opportunities aimed at addressing land degradation in the Mediterranean. Further, it enables

policymakers, stakeholders, and private actors to identify investments opportunities based on maximum cost-effectiveness and impact criteria.

Built on an open-source technology stack, the LanDS toolbox ensures accessibility and transparency and is freely available at http://lands.soft-water.it.