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Living Labs as a Response to Desertification and Land Degradation in the Mediterranean

Youssef Nadhyf. [1], **Dhouha Ouerfelli.** [1], **Eleni Neofytou** [1], **George Themistokleous** [1], **Marinos Eliades** [1], **Ioannis Varvaris** [1]

[1] *Eratosthenes Centre of Excellence, Environment and Climate Department, Land Cluster, 3012 Limassol, Cyprus*

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Desertification and land degradation are among the most pressing and irreversible environmental threats facing the planet[1]. Degraded and desertified land loses its productive capacity over decades or centuries, stripping entire landscapes of their ability to support biodiversity, agriculture, and human settlement[2]. Globally, up to **40% of the Earth's land surface is already degraded, directly affecting nearly half of humanity**[3]. The processes driving this crisis, soil organic carbon depletion, loss of vegetation cover, structural collapse of topsoil, salinisation, and irreversible erosion, are accelerating under compounding pressures of unsustainable land use and climate change[4]. The European Court of Auditors (ECA) Special Report on desertification[5] and the EC Impact Assessment[6] document a stark trajectory: the share of Southern, Central, and Eastern European lands at High or Very High risk rose from 14% in 2008 to 25% in 2017. **The European Commission identifies Mediterranean countries as facing the highest desertification risk within the EU, with up to 44% of Spain, 33% of Portugal, and nearly 20% of Greece and Italy at high risk of soil erosion alone**[5]. Across the Mediterranean, desertification is driven by land abandonment, overgrazing, deforestation, and intensive cultivation, which together degrade soil structure, deplete organic matter, and expose bare soils to accelerating erosion[7]. The Union for the Mediterranean highlights North Africa (NA) as a prime example of severe ongoing desertification, soil loss, and land degradation, which are displacing rural communities, agricultural productivity, and food systems at the regional scale. Over 60% of EU soils are already in an unhealthy condition [8], and without fundamental changes in land management and monitoring, the trajectory indicates to further, largely irreversible loss.

Reversing land degradation and desertification requires fundamentally different ways of co-producing, testing, and scaling solutions with the people whose livelihoods depend on the land. Conventional, top-down research transfer has repeatedly failed to deliver lasting change at the landscape level. The EU Soil Strategy for 2030 establishes healthy soils by 2050 as an overarching goal, while the EU Mission "A Soil Deal for Europe" explicitly identifies 100 Living Labs (LLs) and lighthouses as a central delivery instrument by 2030[8].

NEMESIS

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The EU Directive on Soil Monitoring and Resilience (Directive 2025/2360, in force December 2025) establishes the first-ever harmonized EU-wide framework for assessing soil health across Member states, while the UNCCD Land Degradation Neutrality targets define an urgent global mandate for measurable restoration action [9]. In this context, Living Labs serve as *real-life innovation environments where researchers, land users, policymakers, and civil society co-*design, test, and refine sustainable land management practices iteratively, improving solution relevance, stakeholder co-ownership, and long-term adoption [10,11].

Nemesis (GA 101219087, Horizon Europe) is coordinated by Eratosthenes Centre of Excellence alongside 36 partners, establishing a transnational LL network across Cyprus, France, Italy, Spain, and Tunisia/Algeria, with 60 experimental sites operational and additional sites to be integrated through Open Calls. **The shared main objective across all sites is to combat desertification, with site-specific objectives defined per site based on Soil Health Descriptors: conserving soil organic carbon stocks; reducing soil pollution and enhancing restoration; preventing erosion; improving soil structure and biodiversity; improving soil literacy in society; and reducing the EU's global footprint on soils, particularly critical in the North African (NA) context, where EU consumption patterns drive cross-border land degradation pressure. Nemesis integrates advanced Earth Observation with ground measurements to monitor soil health and track desertification dynamics, with particular attention to low-cost, affordable technologies ensuring long-term sustainability and replicability across the diverse settings of the Mediterranean.** LL governance, harmonisation protocols, training programmes, structured stakeholder feedback loops, and social and policy innovation are central to the project's design.

Nemesis demonstrates that the LL model is uniquely positioned to address the complexity of desertification and land degradation. It simultaneously generates rigorous, place-based evidence, builds lasting stakeholder ownership, and produces harmonised data that feeds directly into European and global soil policy frameworks. Spanning the Mediterranean, the project translates an urgent environmental mandate into durable, community-embedded action, establishing a replicable model that Europe and Africa can build on together.

NEMESIS

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