

Governing co-creation through adaptive governance and business models for sustainable Living Labs

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Living Labs (LLs) are increasingly recognised as a leading model for co-creating solutions to complex sustainability challenges, from soil health restoration to climate adaptation [1]. Yet a LL is only as effective as the structure that steers it: governance. **Governance comprises the set of arrangements through which LL members take decisions, share resources and coordinate actions**, and has been identified as a core factor in whether a LL delivers lasting impact or dissolves once its initial research funding ends [1]. LLs are increasingly understood as adaptive intermediary structures whose governance must evolve together with the maturity of the surrounding innovation ecosystem, rather than being fixed from birth [2]. Where a LL brings together public authorities, research organisations, businesses and citizens – the four “helixes” of a **Quadruple-Helix arrangement** – experience across Europe shows that balanced participation does not emerge on its own: it requires roles, decision rules and communication routines that are deliberately designed, tested and revised as the partnership matures [3]. Inclusive and transparently governed LLs are also better positioned to deliver outcomes that are fair to the communities whose land, water and livelihoods are directly affected [4].

Governance, however, is only half of the equation. **A business model gives the LL an explicit, shared answer to three questions: what value is created and for whom** (e.g., decision-ready evidence for policymakers, tested practices for farmers, data or services for technology providers); **who contributes what** – funding, in-kind resources, infrastructure, data, time – and **who is responsible for stewarding it**; and which funding or revenue routes (public programmes, service contracts, membership fees, follow-on projects) can sustain the LL once project funding ends. Evidence across Europe confirms that continuity depends less on any single funding source than on diversified contributions and clearly owned routines [5,6]; without this explicit business-model thinking, even a well-governed LL risks losing the momentum that its governance worked to build.

These principles are increasingly being put into practice by transnational networks of soil health Living Labs launched under the EU Mission “A Soil Deal for Europe”, which identifies 100 LLs and lighthouses as its central delivery instrument by 2030 – the Nemesis project envisions being an instrumental contributor to this network of autonomous, locally rooted Living Labs that combat desertification and land degradation through co-created, context-specific solutions.

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Governance and business-model design are, in this context, treated as core activities in their own right, on equal footing with scientific monitoring and stakeholder engagement. A recurring practice across such networks is to **offer each LL a choice between five recognised governance models**, assessed through a common lens covering stakeholder coverage, resourcing, decision-making, communication and long-term sustainability risk: (1) **Quadruple-Helix**, in which public authorities, research/academia, the private sector and citizens/society – the four helixes – are all structurally represented and share decision-making; (2) **public-authority-driven**, anchored by a public body; (3) **private/provider-driven**, anchored by an SME or service provider; (4) **research-driven**, anchored by a university or research organisation; and (5) **citizen/community-driven**, anchored by civil-society actors.

Which model a LL picks is a function of what its ecosystem most needs at its current stage of maturity. A LL leans public-authority-driven when institutional adoption, regulatory alignment or a direct route to policy is the binding constraint; private/provider-driven when execution speed and service delivery matter most; research-driven when methodological rigour and credible evidence are central to the LL's purpose; and citizen/community-driven when local legitimacy, trust and behavioural uptake are the decisive success factors. **The Quadruple-Helix model is put forward as the preferred reference**, in line with European Network of Living Labs (ENoLL) principles, **because it structurally balances all four helixes and is therefore the most resilient to any single stakeholder group's interests dominating** – though it also carries the highest coordination burden, and a LL whose local partnership does not yet cover all four helixes may adopt one of the other models, or an adapted quadruple arrangement, while the missing helix is addressed over time.

Governance choices are, in turn, matched with concrete business-model planning: each LL needs to identify who is responsible for stakeholder engagement and data stewardship, which services are worth continuing beyond the project's lifetime, and which of the funding or revenue routes described above best fit its own context. Taken together, these choices are what will determine whether soil health Living Labs become lasting, community-embedded models rather than short-lived pilots.

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