

Balancing regional land-use objectives: indicators and measurement frameworks

The EU's movement towards a climate-neutral, resilient, and restorative economy is a significant impetus for change that will alter land management practices and compliance standards across the continent. Land use as a primary contributor to changes in land cover makes it essential to understand how various environmental and socio-economic drivers operate in distinct territorial and institutional environments in order to design effective land management, governance, and Nature-based Solutions (NbS) responses. Based on a comparative analysis of legal documents, planning instruments, and institutional frameworks, five diverse case studies (LandShift's Living Spaces in Greece, Italy, France, Poland, and Ukraine) reveal clear differences in legal systems, regulatory clarity, institutional capacities, and the integration of NbS-oriented approaches within territorial planning processes. At the same time, it is increasingly evident that there is a common imperative to better harmonize land-use decisions with EU environmental and climate objectives to advance sustainable development and ecosystem resilience. All five Living Spaces, defined here as local case study areas within the LandShift project, integrate environmental considerations into their planning regulations, including mechanisms designed to protect vital natural landscapes and ecosystems and support the implementation of NBS for climate adaptation, biodiversity enhancement, soil restoration, and sustainable land management. Nevertheless, there is significant variation among the five cases in terms of decentralization, legal fragmentation, institutional coordination, and the operational integration of NBS across governance levels. The national legal frameworks also show substantial disparities in their structure, coherence, and interpretation of planning instruments, leading to gaps and inconsistencies that affect the capacity of each Living Space to contribute to EU objectives, including those articulated in the EU Soil Strategy for 2030, the amended European Union LULUCF Regulation, the EU Strategy on Climate Adaptation, the New European Bauhaus initiative, and broader ecosystem restoration and climate resilience agendas.

Indicators for Balanced Regional Land Use

Balancing regional land-use objectives requires measurable indicators capable of capturing environmental, economic, and social dimensions. LandShift identifies several key indicator categories, indicatively as below:

Climate and Carbon Indicators

- Net greenhouse gas removals from LULUCF.
- Biogenic emissions from agriculture.
- Carbon sequestration capacity.
- Soil organic carbon levels.

These indicators support the EU objective of achieving 310 million tonnes of net CO₂ removals by 2030 through land-based actions.

Biodiversity and Ecosystem Indicators

- Ecosystem resilience.
- Habitat connectivity.
- Landscape ecological integrity.
- Biodiversity conservation status.

LandShift applies landscape ecological assessment models to evaluate land-cover dynamics and ecosystem functionality across multiple scales.

Governance and Participation Indicators

- Stakeholder engagement levels.
- Community co-governance participation.
- Acceptance of NbS.
- Policy integration effectiveness.

LandShift's Policy and Community Labs are designed to ensure inclusive governance and co-creation of regional strategies.



Socio-Economic Indicators

- Employment and income in rural regions.
- Agricultural productivity.
- Food provision capacity.
- Demographic trends.
- Equality and community well-being indicators.

LandShift emphasizes that land-use trajectories strongly influence local livelihoods, market conditions, and regional socio-economic stability.

Measurement Frameworks

- **Monitoring, Reporting, and Verification (MRV):** LandShift develops robust MRV systems supported by Analysis-Ready Data, Earth Observation technologies, and AI-driven analytics.
- **Multi-Criteria Decision Analysis:** The framework assigns different weights to regional priorities and compares alternative land-use scenarios using transparent dashboards for decision-makers.
- **Living Spaces and Regional Modeling:** This regionalized approach allows tailored strategies rather than applying uniform policy solutions across Europe.

Contribution of LandShift to the Challenge

LandShift plays a vital role in working toward a balance in regional land-use objectives. Based on its methodological approach, the project, apart from promoting data-driven land management, encourages integrated assessments by associating climate, biodiversity, agricultural, and socio-economic indicators within a single framework. Preliminary evidence suggests that the project enhances regional governance through co-creation processes that involve local authorities, researchers, land managers, and communities. However, the extent of this enhancement may vary depending on local institutional contexts, stakeholder engagement quality, and the specific governance challenges within each Living Space. Further empirical validation would be needed to confirm the generalizability of these outcomes.

Keywords

Balanced land use, EU and Regional objectives, Indicators, Measurement frameworks, New European Bauhaus

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