

Bridging digital Territorial Intelligence and Community-Based Biodiversity Stewardship in Rural Tourism: Evidence from Two Model European Projects FOR Sustainable Tourism

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ABSTRACT

Rural regions across Europe hold significant biodiversity, agroecological knowledge, and cultural heritage assets that remain largely invisible to formal biodiversity monitoring systems and disconnected from mainstream tourism markets. This paper presents two complementary transnational initiatives, first described at BEeS 2026 (The LifeWatch ERIC Biodiversity and Ecosystem eScience Conference, Plovdiv, Bulgaria, 7–10 July 2026), that use digital innovation and community-based self-assessment to help close this gap: 1. The Baltic-to-Balkan (B2B) Green Corridor connects rural tourism SMEs across Bulgaria, Czechia, Estonia, Finland, Lithuania, Romania, and Sweden through a GeoAI platform combining large language models, geospatial data, GIS tools, and retrieval-augmented generation; these elements enabling multilingual discovery of tourism assets, thematic clustering of natural and cultural resources, identification of under-visited territories, and integration of sustainability indicators aligned with the EU Twin Transition agenda. 2. The Living Ruralities Villages Route, piloted across Bulgaria, Greece, Ireland, and Italy, applies the ECO-SEAL framework—a progressive sustainability self-assessment and peer-learning tool — to generate structured, FAIR-compatible data on biodiversity awareness, local sourcing, water stewardship, waste reduction, and ecosystem-sensitive visitor management among rural tourism operators. Read together, the two initiatives illustrate complementary top-down (geospatial, AI-driven territorial intelligence) and bottom-up (community-generated stewardship data) pathways to addressing Europe's rural, community-scale biodiversity data gap, with clear potential for integration into research infrastructures such as LifeWatch ERIC. The paper discusses the conceptual and methodological convergence of the two approaches, their current stage of piloting rather than full-scale deployment, and the governance, data-quality, and scalability considerations that would need to be addressed before their outputs could be considered a mature contribution to the European biodiversity data ecosystem.

Keywords: Rural Tourism, Biodiversity Stewardship, Geoai, Territorial Intelligence, Fair Data, Lifewatch Eric, Sustainability Certification, Twin Transition, Erasmus+, Smart Specialization

Introduction

European rural regions present a persistent paradox: territories rich in biodiversity, cultural heritage, gastronomy, and nature-based experience routinely remain invisible to international visitors, disconnected from mainstream tourism markets, and — separately, but relatedly — absent from the formal infrastructures that monitor and report on European biodiversity. The European Commission's Biodiversity Strategy for 2030 and the EU's broader Twin Transition (decarbonization and digitalization)

agenda both call for better, more granular evidence of ecological condition and stewardship practice at exactly the community scale where this gap is widest.

This manuscript synthesizes two oral presentations delivered at BEeS 2026 — The LifeWatch ERIC Biodiversity and Ecosystem eScience Conference (Plovdiv, Bulgaria, 7–10 July 2026) — that approach this paradox from two complementary angles. The first, presented by Yoanna Ivanova from Regional Cluster North-East, describes the Baltic-to-Balkan Green Corridor, a GeoAI-enabled digital platform for territorial intelligence and destination management across seven EU countries. The second, presented by Valentin Lazarov, National Association of Municipal Clerks,

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describes the Living Ruralities Villages Route, a community-based biodiversity stewardship and self-assessment mechanism piloted across four EU member states. Presented independently at the same conference, the two initiatives share a common instrument — the ECO-SEAL sustainability framework — as well as a common structural target: closing Europe's rural, community-scale biodiversity data gap.

This paper asks three questions. First, how do digital territorial intelligence and community-based self-assessment each contribute to closing this data gap? Second, where do the two approaches converge methodologically, and what does that convergence suggest about their combined potential? Third, what would need to be true — in terms of data governance, validation, and infrastructure — before either initiative's outputs could be integrated into European research infrastructures such as LifeWatch ERIC?

The Rural Biodiversity Data Gap

Europe's biodiversity monitoring effort is concentrated in protected areas, formal research sites, and urban or peri-urban networks. Rural landscapes and communities — despite holding significant landscape biodiversity, agroecological knowledge systems, short food-supply chains, ecological and cultural heritage, and community stewardship traditions — remain largely unreported. What is missing from the record is not the underlying ecological or practice-based knowledge itself, but its participation in biodiversity governance frameworks, sustainability certification schemes, EU research infrastructure networks, FAIR-compatible ecological datasets, and the free circulation of locally embedded knowledge across the European Research Area. This gap speaks directly to the ambitions of the Rural Pact, the EU's participation, networking and governance framework to amplify rural voices, enable collaboration and turn local commitments into action. Rural communities should not participate only as sites where biodiversity is observed or policies are implemented, they should be recognized as knowledge holders and partners in environmental governance. Connecting locally-embedded ecological knowledge and stewardship practices with biodiversity monitoring, FAIR data infrastructures, certification systems and research networks would give practical effect to the Rural Pact. It would make rural contributions visible, enable knowledge exchange across territories and strengthen the capacity of communities to influence the decisions affecting their landscapes. In this way, rural biodiversity monitoring becomes more than a scientific exercise: it becomes a mechanism for building stronger, connected, resilient and prosperous rural areas. This framing is consistent with FAIR data principles, which underpin LifeWatch ERIC's own data-infrastructure mission, and with the competence dimensions set out in the European Commission's GreenComp sustainability framework [1,2]. Both case studies below can be read as attempts to generate exactly this kind of structured, comparable, community-scale evidence.

Case study #1: The Baltic-to-Balkan Green Corridor for Sustainable Tourism

The Baltic-to-Balkan (B2B) Green Corridor, funded under the EU's Single Market Programme (SMP COSME), connects rural tourism SMEs across Bulgaria, Czechia, Estonia, Finland, Lithuania, Romania, and Sweden into a digitally enabled, sustainability-driven tourism ecosystem. At its core is a GeoAI

platform combining large language models, geospatial data, GIS tools, and retrieval-augmented generation to enable natural-language interaction with territorial information. Built on innovation funded by Horizon Europe and drawing on the European GeoLLM community, the platform is designed to convert complex spatial datasets into destination intelligence accessible to Destination Management Organisations (DMOs), Business Support Organisations (BSOs), and tourism businesses without advanced technical expertise. Within the corridor, GeoAI supports four functions: multilingual discovery of tourism assets and SMEs, thematic clustering of cultural, natural, and tourism resources, identification of under-visited territories to encourage visitor dispersal, and integration of sustainability indicators aligned with the Twin Transition agenda and the project's own ECO-SEAL framework. These functions are supported by a Progressive Web App marketplace, Community of Practice learning pathways, micro-credentials, and a Financial Support to Third Parties (FSTP) cascade-funding mechanism intended to lower the barrier for individual SMEs to adopt data-driven destination management. The presentation by Regional Cluster North-East is explicit that the initiative is offered as best practice for replication to other bioeconomy regions, smart specialization strategies, and European Research Infrastructure communities.

Case study #2: The Living Ruralities Villages Route and the ECO-SEAL framework

The second case study centers on ECO-SEAL, a progressive sustainability peer-learning framework developed to help rural operator perform a sustainability self-assessment across five domains: biodiversity awareness (documenting local biodiversity presence and practice), local sourcing (short food-supply chain documentation and improvement), water stewardship (monitoring and reducing water impact), waste reduction (structured waste auditing and circular practice), and ecosystem-sensitive visitor management (protecting sensitive habitats and species from tourism pressure). The framework was proposed to be scaled transnationally through the Living Ruralities Villages Route in Bulgaria, Greece, Ireland, and Italy, and involving tourism SMEs (documenting and improving sustainability practice), municipalities (anchoring governance, land-use records, and community participation), and DMOs (coordinating territorial branding, visitor flows, and cross-border knowledge exchange). NAMC's presentation framed the resulting datasets as a FAIR-compatible contribution to Europe's agricultural biodiversity data ecosystem: structured, comparable, community-scale data on land-use practice, stewardship behavior, and ecosystem interaction that, at present, does not exist in any European research or open-science repository at this geographic granularity, particularly in peripheral rural regions. The presentation explicitly a proposal to integrate ECO-SEAL data into LifeWatch ERIC that would contribute structured biodiversity practice data from rural tourism SMEs, peer-reviewed self-assessed sustainability indicators, transnational comparability across the four piloting member states, community-level agroecological knowledge records, and a scalable methodology for further rural territories. LifeWatch ERIC, in turn, would gain a data layer of community-based rural tourism ecosystems, granular geographic coverage in less-monitored regions, living-lab infrastructure for ongoing data collection, a connection to Erasmus+ and wider European research networks, and a new partnership model combining municipalities, tourism operators, and research infrastructure.

Synthesis: Convergent Pathways to a Shared Data Gap

Presented independently at the BEes event, the two case studies nonetheless converge on the same underlying instrument and the same structural target. Both explicitly reference the ECO-SEAL framework: the B2B Green Corridor integrates ECO-SEAL-aligned sustainability indicators into its GeoAI discovery and clustering layer, while the Living Ruralities Villages Route generates the underlying ECO-SEAL self-assessment data. This suggests a natural, though as yet untested, complementarity — a GeoAI territorial-intelligence layer capable of discovering, clustering, and surfacing exactly the kind of community-generated sustainability data that ECO-SEAL is designed to produce [3].

Geographically, the two initiatives together span ten touchpoints across nine EU countries (Bulgaria, Czechia, Estonia, Finland, Lithuania, Romania, and Sweden via the B2B Green Corridor, Bulgaria, Greece, Ireland, and Italy via the Living Ruralities Villages Route), with Bulgaria common to both. Both target the same structural gap identified above: rural, peripheral, community-scale biodiversity and sustainability-practice data that current EU monitoring and research infrastructure does not reach. Read together, the two case studies point toward a two-layer model for mobilizing this data — community self-assessment generating the underlying evidence, and GeoAI-enabled territorial intelligence making that evidence discoverable, comparable, and actionable for DMOs, municipalities, and, potentially, research infrastructures such as LifeWatch ERIC [4].

Discussion

The principal contribution suggested by these two case studies is methodological: routes by which rural tourism ecosystems, rather than being a peripheral concern for biodiversity policy, become an active mechanism for generating exactly the community-scale evidence that European biodiversity governance currently lacks. This reframes rural tourism SMEs, municipalities, and DMOs not merely as beneficiaries of sustainability certification, but as potential data contributors to the wider European biodiversity data ecosystem and, by extension, to instruments such as the EU Biodiversity Strategy for 2030 and national and regional smart specialization strategies. Several limitations should be stated plainly, consistent with how both presentations frame their own work. Both initiatives are at a conceptual and pilot stage rather than a validated, at-scale deployment: the B2B Green Corridor is explicitly described as a conceptual transnational prototype, while the Living Villages Route presentation states directly that the underlying land-use, stewardship, and ecosystem-interaction data referenced do not yet exist in any European research or open-science repository. Self-assessed ECO-SEAL indicators, while structured and FAIR-compatible by design, are self-reported by participating operators and would benefit from independent validation or spot-checking before being treated as equivalent to instrument-measured biodiversity data.

Data governance deserves particular attention. The B2B Green Corridor's ambitions are described as "sovereignty-respecting", achieving this across seven-plus countries and multiple SME operators will require explicit agreement on data ownership, access

rights, and interoperability standards — most plausibly through alignment with FAIR principles and, where relevant, the European Open Science Cloud (EOSC) — before cross-border pooling of geospatial and community-generated data could proceed at the scale either presentation envisions. Any future integration with LifeWatch ERIC would need its own dedicated agreement on data standards, hosting, and long-term stewardship responsibility.

Recommendations

The Baltic-to-Balkan Green Corridor and the Living Ruralities Villages Route converge on a shared framework (ECO-SEAL) and a shared aim: mobilizing rural tourism ecosystems as a source of community-scale biodiversity and sustainability-practice data that current European monitoring infrastructure does not reach. A five, next-step recommendation is presented: (1) a formal scoping dialogue between the two project consortia and LifeWatch ERIC on data standards, hosting, and governance, (2) a joint proof-of-concept pairing the GeoAI discovery layer with ECO-SEAL-generated data in the Bulgarian territories common to both initiatives, (3) development of independent validation protocols for self-assessed ECO-SEAL indicators, (4) continued FSTP-funded onboarding of rural SMEs to broaden geographic and sample coverage, and (5) early alignment of any future data-collection phase with FAIR and EOSC standards, to ensure the resulting datasets are usable by European research infrastructure from the outset rather than retrofitted to it.

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Conflicts of Interest

The authors declare no conflicts of interest. Organizations represented by all authors are independent Civil Society organizations constituted as non-profit entities.

Data availability Statement

This is a synthesis and conceptual manuscript. No new primary dataset was generated or analyzed for this paper.

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