



ENHANCE CALL

Financial Support for Third Parties

Final Report Part A (Public)

*SYLVAN-AI: The Chat-Enabled
Forest Manager, powered by JackDaw GeoAI*

PoliRuralPlus has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101136910.

Disclaimer

Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Research Executive Agency (REA).

Neither the European Union nor the granting authority can be held responsible for them.



**Funded by
the European Union**



Project title	SYLVAN-AI: The Chat-Enabled Forest Manager, powered by JackDaw GeoAI
Project short name	SYLVAN-AI
Country / Region	The Netherlands, Delft
Organisation	Sylvanity B.V.
Author(s)	Amir Abbas Zadpoor, Fatemeh Torabi Kachousangi
Submission date	28 August 2026
Version	2.0

Table of Contents

Executive Summary	6
1. Project Overview	7
1.1. Context and rationale	7
1.2. Alignment with the Enhance Call objectives	8
1.3. Use case and target users	8
1.4. Role of the JackDaw GeoAI chatbot	9
1.5. The solution in brief	9
2. Progress Against Objectives and Work Plan	10
2.1. Objectives and expected outputs (from the approved proposal)	10
2.2. Implementation against the approved work plan.....	11
2.2.1. Phase 1: Setup and data harmonisation	11
2.2.2. Phase 2: Internal stress-testing	11
2.2.3. Phase 3: Live validation cycles	11
2.2.4. Phase 4: Analysis and reporting	12
2.3. Use case and testing context.....	12
2.4. JackDaw application and validation	12
2.4.1. Functionalities, data and results	12
2.4.2. Main issues identified	12
2.5. Feedback and iterative improvements	13
2.6. Deviations from the work plan and corrective actions.....	13
3. Solution Developed and Technical Results	13
3.1. The developed application.....	13
3.1.1. The primary output.....	13
3.1.2. User experience and guided journeys	14
3.1.3. The interactive map and result layers.....	14
3.1.4. The chat pipeline	15
3.1.5. In-built Validation Survey.....	16
3.2. Integration with JackDaw	24
3.2.1. The hybrid retrieval engine	24
3.2.2. Trust, safety and data protection	24
3.3. Technical maturity and performance.....	25
3.4. Architecture and technology stack	25
3.5. Access.....	25
3.6. Key technologies, standards and interoperability.....	25

4.	Integration and Contribution to PoliRuralPlus	26
4.1.	Data generated and used.....	26
4.2.	Integration into the PoliRuralPlus ecosystem.....	26
4.3.	Contribution to shared datasets and knowledge	26
4.4.	Feedback and hardening backlog for JackDaw	27
4.5.	Synergies with other projects and initiatives.....	27
4.6.	Alignment with European data and policy frameworks.....	27
4.7.	Exploitation and continuity	27
4.8.	Reusability and interoperability	27
5.	Stakeholder Engagement and User Involvement.....	28
5.1.	Stakeholder groups involved	28
5.1.1.	Forest owners and owner associations	28
5.1.2.	Municipal planners and public officials.....	28
5.1.3.	Environmental NGOs and civil-society organisations.....	28
5.1.4.	PoliRuralPlus consortium and JackDaw development team.....	29
5.2.	Engagement methods.....	29
5.2.1.	Outreach by Email and Contact Form.....	29
5.2.2.	Workshop A: Presentation at the PoliRuralPlus JackDaw Code Camp.....	30
5.2.3.	Workshop B: Hands-On Validation of JackDaw GeoAI	30
5.3.	Feedback received and how it influenced the work	31
5.3.1.	Feedback and results of Outreach by Email and Contact Form.....	31
5.3.2.	Feedback and results of Workshop A: PoliRuralPlus JackDaw Code Camp	31
5.3.3.	Feedback and results of Workshop B: Hands-On Validation Session.....	32
5.4.	Evidence of usability and acceptance.....	32
6.	Communication, Dissemination and Visibility.....	33
6.1.	News articles	34
6.2.	Blog posts	37
6.3.	Social media posts	38
6.4.	Events, demonstrations and presentations.....	41
6.5.	Links to public materials	41
6.6.	Compliance with EU funding visibility requirements.....	42
7.	Impact Assessment.....	42
7.1.	Achieved impacts	42
7.2.	Evidence and indicators.....	42
7.3.	Contribution to PoliRuralPlus KPIs	43
7.4.	New European Bauhaus reflection	43

8. Challenges, Risks and Lessons Learned	43
8.1. Key challenges encountered	43
8.1.1. Challenges during development	43
8.1.2. Challenges in dissemination.....	44
8.2. Risk-mitigation actions.....	44
8.2.1. Mitigating development challenges and risks	44
8.2.2. Mitigating dissemination challenges and risks	45
8.3. Lessons learned	45
8.3.1. Technical lessons	45
8.3.2. Organisational lessons.....	45
8.3.3. Stakeholder-related lessons.....	45
8.4. Recommendations for future projects or scaling.....	46
9. Sustainability, Replicability and Next Steps.....	46
9.1. Sustainability of results	46
9.2. Replication potential.....	47
9.3. Scalability	47
9.4. Exploitation opportunities	47
9.5. Contribution to future PoliRuralPlus development	47
10. Conclusions.....	48
10.1. Overall assessment	48
10.2. Key achievements.....	48
10.3. Strategic value	48
Annex A: PoliRuralPlus Technical Validation Questionnaire.....	50
Annex B: Demonstrating Added Value of SYLVAN-AI for Decision-Making (Objective 3)	55
B1. The Objective	55
B2. Method and Assumptions.....	55
B3. The Five Success Cases.....	56
B4. Aggregate Result	62
B5. Verification and Data Provenance (reality check)	62

Executive Summary

SYLVAN-AI is a chat-enabled forest manager that puts the PoliRuralPlus JackDaw tool-using GeoLLM behind a single conversational interface. It was selected under the PoliRuralPlus Enhance Open Call (Horizon Europe Grant Agreement No 101136910) to validate JackDaw in a real, high-complexity European domain, forestry, over a six-month action.

Europe's forests are largely managed by small-scale owners who lack the GIS tools or training to meet EUDR and Green Deal reporting obligations. The spatial data needed to manage a forest plot exists, cadastre, Natura 2000, terrain, soil, fire risk, land cover, but is scattered across separate national geoportals. SYLVAN-AI removes that barrier: a user draws a plot on a map and asks, in plain language, "Are there Natura 2000 areas on my land?" or "What should I plant here?", and receives a spatially accurate, source-cited answer in seconds.

The project delivered a working, publicly accessible platform (<https://sylvan-ai.com>), secured behind PoliRuralPlus single sign-on. Its defining technical contribution is a hybrid retrieval design: JackDaw's GeoLLM reasoning and tools are combined with a purpose-built local PostGIS grounding layer holding 265 GB of standardised EU geodata, 442.3 million cadastral parcels across 27 countries, EEA Natura 2000 (27,173 sites), Copernicus DEM GLO-30 terrain, ISRIC SoilGrids, NASA GFWED fire-weather, Copernicus CORINE Land Cover 2018 and its 2012–2018 change layer, and a newly integrated national Czech forest typology (949,358 site polygons, 2.72 million hectares). Every drawn-parcel query is grounded in exact spatial data, and a no-hallucination guardrail forces the assistant to say "I don't have data for this area" rather than invent a value.

Five guided user journeys, the Compliant Owner, Climate-Aware Planner, Investor, Conservationist and Carbon Estimator, are live in the product, each mapped to a real forestry decision. A built-in validation framework (standardised PoliRuralPlus form with System Usability Scale scoring, an accuracy-audit dashboard, a Golden-Set benchmark harness and session recording) instruments the platform for rigorous, comparable evaluation. GDPR is addressed by design: personal data is stripped at the input boundary before any text reaches the language model.

The action met its core objectives and validated them directly with stakeholders: overall, a mean of 84.4 against the project's target of 70, no answers judged incorrect and no critical hallucinations in the accuracy checks, and a self-reported reduction in time-to-insight of roughly 90% against a 50% target. Reception was consistently positive, including direct feedback from the stakeholders. Annex B documents five success cases in Czech, Greek, French, German and Spanish forests, each benchmarked step by step against the public geoportals a user would otherwise have to consult: about 296 minutes of work by traditional means against roughly 11 minutes in SYLVAN-AI, a time-to-insight reduction of some 96% with every individual case above 90%, far beyond the 50% target. The work also produced concrete, actionable feedback to the JackDaw team through a systematic endpoint audit, converted into an itemised hardening backlog, and demonstrated a resilient architecture that degrades gracefully when upstream services are unavailable. SYLVAN-AI shows that conversational, grounded GeoAI is a credible route to democratising spatial intelligence for the people who manage Europe's land, while advancing the New European Bauhaus values of sustainability, inclusion and aesthetics and aligning with the EU Deforestation Regulation and Green Deal.

1. Project Overview

1.1. Context and rationale

A large share of Europe's forests is managed by small-scale, non-professional owners and by under-resourced municipal bodies. They face rising reporting and compliance demands (EU Deforestation Regulation, Green Deal, Natura 2000) but rarely have the GIS skills, software licenses or time to operate professional geospatial tools. Meanwhile, high-quality spatial intelligence, i.e. Copernicus products, cadaster, protected-area registers, digital terrain and soil models is abundant, standardized and, for the most part, openly licensed. The value is stranded: it exists, but it does not reach the rural forestry interface. A single practical decision ("can I harvest this stand?") today means cross-referencing cadaster, Natura 2000, slope and fire-risk maps across three or four separate geoportals, each with its own login, projection and query language. In forestry this fragmentation is particularly costly, because operational and regulatory questions are inherently spatial and time-sensitive: the same parcel may at once be subject to habitat protection, slope-related harvesting limits and seasonal fire restrictions. Consolidating these layers behind a single, conversational entry point therefore turns a slow, expert-only workflow into an immediate answer that any owner or municipal officer can obtain and act upon. Precisely because a single decision requires checking several geoportals in turn, there is a real need for one platform that can provide the right answer quickly, accurately and in a user-friendly environment. This is the rationale behind developing SYLVAN-AI: to enhance the existing PoliRuralPlus technical ecosystem, and JackDaw in particular, and to use them to answer this need. Figure 1-1 provides an overview of the SYLVAN-AI chat interface with an interactive map view.

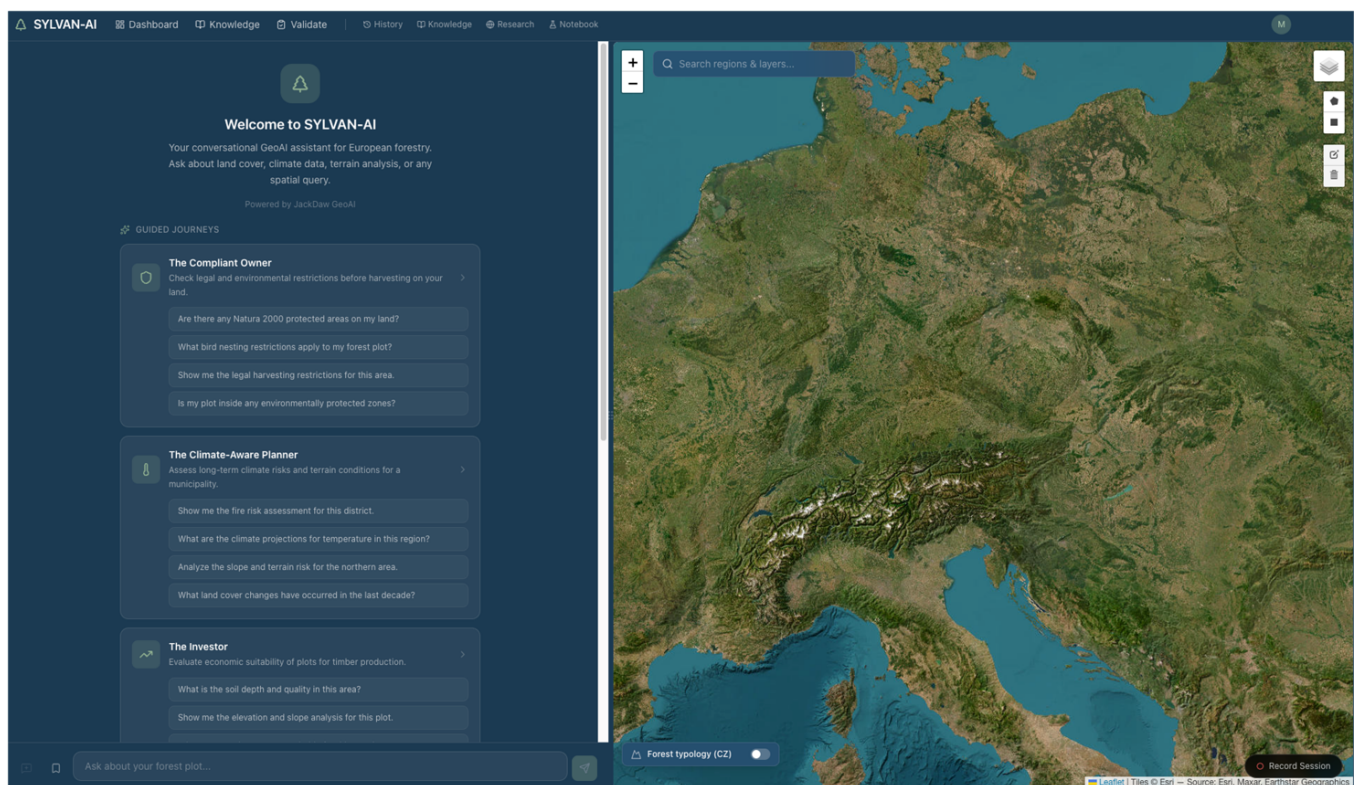


Figure 1-1: SYLVAN-AI chat interface with interactive map view

1.2. Alignment with the Enhance Call objectives

The Enhance Call asked third parties to validate and extend the PoliRuralPlus technical ecosystem, and JackDaw in particular, in real use cases. SYLVAN-AI addresses this directly by taking JackDaw's tool-using GeoLLM into forestry, one of the most data-intensive and spatially complex rural domains. The project was designed from the outset around the ecosystem's RAG/GeoRAG paradigm and PoliRuralPlus single sign-on.

In doing so, the project fulfils the Call's core intent on three levels. It validates JackDaw's GeoAI approach against a demanding, real-world forestry use case rather than a synthetic demonstration; it extends the ecosystem with new grounding layers, tools and a production-grade interface that other partners can reuse; and it feeds the resulting data, feedback and lessons back into PoliRuralPlus, strengthening the shared platform for the third parties that follow. Alignment is therefore not only thematic but operational, measured against the Call's own criteria of validation, extension and reuse.

1.3. Use case and target users

The selected use case is a conversational forest manager: a chat-plus-map dashboard that replaces complex GIS interfaces with natural-language dialogue, so that the people who manage Europe's forests can finally use the data generated about their land.

SYLVAN-AI turns these needs into five designed use cases, presented in the interface as guided journeys. Each journey pairs a user role with a concrete task and a set of ready-made starter questions, so that a new user can begin productive work without any GIS knowledge:

- **The Compliant Owner:** check legal and environmental restrictions before harvesting on a plot, such as Natura 2000 designations, bird-nesting periods and other legal harvesting limits.
- **The Climate-Aware Planner:** assess long-term climate risks and terrain conditions for a municipality, including fire-risk assessment, temperature projections and slope analysis.
- **The Investor:** evaluate the economic suitability of plots for timber production, from soil depth and quality to elevation, slope and the most suitable tree species.
- **The Conservationist:** verify protected-area boundaries and species safeguards on behalf of an environmental NGO, listing protected habitats and documented species for a selected area.
- **The Carbon Estimator:** assess current forest cover, recent land-cover change and afforestation potential for carbon planning, including where and on which soils new planting is best suited.

The guided journeys are starting points rather than constraints. At any moment the user can also type a free-form question directly into the chat and receive the same grounded, location-specific answers, so the tool is never limited to the pre-designed scenarios.

In terms of target users, these journeys are designed around three primary stakeholder groups. (A) Forest owners and owner associations are served most directly by the Compliant Owner and Investor journeys; (B) municipal planners and public officials by the Climate-Aware Planner; and (C) environmental NGOs and civil-society organisations by the Conservationist. The Carbon Estimator cuts across all three, extending the tool to land-use and climate-finance audiences concerned with afforestation and carbon planning. Figure 1-2 shows the overview of the five designed guided journeys and the free-form chat available in the SYLVAN-AI interface.

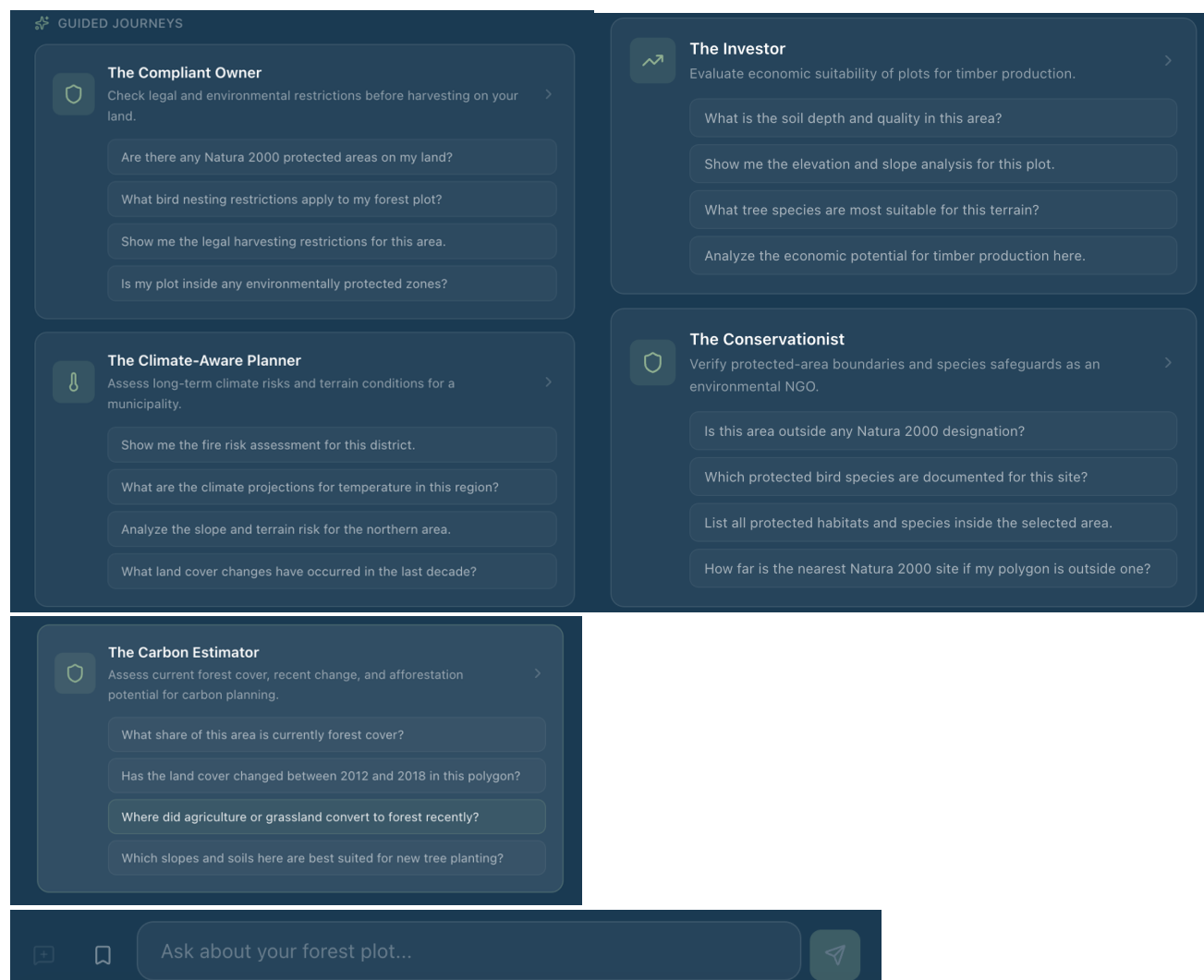


Figure 1-2: Overview of the five designed guided journeys and the free-form chat available in the SYLVAN-AI interface.

1.4. Role of the JackDaw GeoAI chatbot

JackDaw is the GeoLLM under test and the reasoning engine of the solution. SYLVAN-AI puts it behind a single conversational interface, calling its streaming chat and spatial tools, terrain, climate, land cover, points of interest and administrative units, and grounding every answer in real geodata. In practice, JackDaw performs the interpretation and orchestration that turn a plain-language request into a sequence of spatial operations: it parses the user's intent, selects the appropriate tools, retrieves the relevant layers and composes a grounded, human-readable answer. SYLVAN-AI supplies the surrounding application logic, session management, the map view, the guided journeys and a local PostGIS grounding layer that complements JackDaw's hosted tools so that answers stay spatially accurate and traceable even when a hosted endpoint is degraded, while the analytical reasoning remains JackDaw's. This division of labour keeps the chatbot at the centre of the solution and allows the ecosystem's GeoAI capabilities to be tested, extended and, where useful, reused by other partners.

1.5. The solution in brief

SYLVAN-AI is a production web application, publicly accessible at <https://sylvan-ai.com> and secured with PoliRuralPlus single sign-on, that turns a task normally requiring a Geographic Information System and several

separate map portals into a single conversation. Its interface is a three-pane dashboard (a knowledge and tools sidebar on the left, a plain-language chat in the centre, and an interactive map on the right), so a user can point at a piece of land and simply ask about it in everyday language, receiving spatially accurate, source-cited answers in seconds. No installation, GIS training or specialist software is required, and work begins immediately on desktop or, in a stacked layout, on smaller screens.

The map, built on Leaflet with OpenStreetMap and satellite base layers, lets the user pan, zoom, search for a named region and draw an area of interest as a polygon or rectangle. That drawn geometry becomes the spatial context for the whole conversation: every subsequent question is answered about that exact area, and tool results are rendered back onto the map as coloured layers that the view auto-fits.

Behind the interface sits a hybrid retrieval architecture in which each question is routed by intent both to JackDaw's tool-using GeoLLM and, in parallel, to a purpose-built 265 GB local PostGIS grounding layer of standardised European geodata (cadastral parcels covering 442 million parcels across 27 countries, EEA Natura 2000 sites and species, Copernicus terrain and CORINE land cover, ISRIC soil, NASA fire-weather and the Czech forest typology), so that answers combine JackDaw's reasoning with exact, verifiable spatial facts drawn from the selected area. Trustworthiness is protected by three safeguards: a no-hallucination guardrail that reports missing data rather than inventing a value, source citation on every grounded answer, and a 0–100% confidence indicator that the user can expand to see how the answer was grounded. Personal data typed into the chat (e-mails, phone numbers, tax IDs and similar) is stripped at the input boundary before any text reaches the model, addressing GDPR by design.

Five ready-made guided journeys (the Compliant Owner, the Climate-Aware Planner, the Investor, the Conservationist and the Carbon Estimator) package the most common forestry decisions into sets of example questions, so that even a first-time user can produce a useful result within minutes. Around the chat, a Knowledge Hub, a Lab Notebook, a Web Research tool, Saved Prompts and Word export extend the workflow, while a built-in session recorder and an in-app standardised PoliRuralPlus validation form (including System Usability Scale scoring and per-answer accuracy counts) collect comparable evaluation data from testers.

The entire solution runs as a single, EU-hosted, GDPR-by-design instance. Because it is built on standardised, openly licensed European datasets and its journeys are region-neutral, the same application can be pointed at any European region without per-region software changes, a property that underpins the transferability of the workflow to further PoliRuralPlus pilots.

2. Progress Against Objectives and Work Plan

2.1. Objectives and expected outputs (from the approved proposal)

The project is driven by four specific, relevant objectives:

Objective 1: Technical Validation in a High-Complexity Domain. To successfully deploy JackDaw to handle a custom dataset comprising at least five distinct geospatial layers (cadaster, Natura 2000 protected areas, slope/terrain models, fire risk indices, and soil suitability maps). The objective is to achieve a "Prompt Success Rate" of 80% or higher, meaning that for 80% of natural language queries regarding these layers, JackDaw retrieves the correct spatial attribute without hallucination. This directly validates the tool's robustness in a technical environment far more demanding than basic tourism or points-of-interest queries.

Objective 2: User-Centric Usability Assessment. To have engaged 5-10 distinct rural stakeholders (comprising small forest owners, municipal planners, and NGO representatives) in active testing sessions. The intention is to measure usability not just by participation, but by the System Usability Scale (SUS), aiming for an average score of above 70 (considered "Good").

Objective 3: Demonstrating Added Value for Decision Making. To produce 5-10 documented "Success Cases" where JackDaw provided information that would have otherwise taken the user significantly longer to find or required external consultancy. We will measure this by comparing the "Time-to-Insight" using JackDaw versus traditional methods (e.g., searching geoportals or PDF maps), aiming to demonstrate a time reduction of at least 50%. This objective validates the economic and efficiency impact of the tool.

Objective 4: Strategic Replicability Planning. To deliver a comprehensive "Transferability Roadmap" that maps the SYLVAN-AI workflow to at least two other PoliRuralPlus pilot regions (e.g., the Vidzeme region in Latvia for bioeconomy planning or the Central Greece region for agritourism). This roadmap will identify the specific datasets required to replicate our forest management use case in these new territories, ensuring the project leaves a lasting legacy beyond the funding period.

2.2. Implementation against the approved work plan

The six-month action was executed in four phases, all of which were carried out. Development was continuous and version-controlled (121 commits between 24 February and 4 July 2026 in the private repository github.com/amiracoder/sylvan-ai).

2.2.1. Phase 1: Setup and data harmonisation

From February to March, the team configured JackDaw access and PoliRuralPlus OAuth2 single sign-on, stood up the production stack on the target cloud infrastructure, and began cleaning and loading the core geospatial layers into the local PostGIS grounding database. This phase also defined the evaluation "Golden Set", a curated collection of test questions and known-correct answers used throughout the project to benchmark accuracy and catch regressions before each release. Status: achieved.

2.2.2. Phase 2: Internal stress-testing

Running from April to May, this phase combined internal alpha testing with iterative prompt refinement, informed by a full audit of JackDaw's hosted endpoints to understand their reliability under sustained use. In parallel, the local data foundation was expanded from an initial pilot footprint to 27 cadastral countries and seven grounding layers, giving the platform pan-European spatial coverage well beyond the original single-country scope. During this period, the team also reached out to several major stakeholders to disseminate the project and recruit early testers, selecting participants from forest owners, environmental NGOs and municipal planners so that feedback would represent all three target user groups from the outset. Status: achieved.

2.2.3. Phase 3: Live validation cycles

Between May and July, validation moved from internal testing to structured live cycles with real users: each of the five guided journeys was tested in turn, testers completed the standardised validation form, and a subset took part in think-aloud sessions to surface usability issues that quantitative scores alone would miss. An accuracy-audit dashboard tracked correctness across sessions in real time. The work was also presented at the PoliRuralPlus JackDaw Code Camp (Workshop A: Athens, online session, 17 June 2026) and Workshop B as discussed in Chapter 5. Annex B also presents five documented success cases from forests across the parts of Europe that SYLVAN-AI covers, evidencing Objective 3. The Transferability Roadmap that maps the SYLVAN-AI workflow to two further PoliRuralPlus pilot regions, Vidzeme in Latvia and Central Greece, is presented in Section 4.5 and developed further in Section 9.2. Status: achieved.

2.2.4. Phase 4: Analysis and reporting

In July, the team synthesised the validation evidence gathered across the previous phases, reviewed performance against the project's KPIs, drafted the Transferability Roadmap for future pilot regions, and prepared this final report. Status: achieved.

2.3. Use case and testing context

The use cases and testing context described in this section correspond to Phase 2, Internal stress-testing (see §2.2.2), the period in which the platform was exercised end-to-end by the internal team before any external validation began. Testing followed a structured 10-part test plan (v3) that walked through every layer of the application in sequence: sign-in and PoliRuralPlus authentication, the three-pane dashboard, each of the five guided journeys in turn, the interactive map (area-of-interest drawing, overlays and auto-fit), core chat features (streaming responses, source citation, the confidence indicator), the sidebar panels, the Knowledge Hub, application settings, the session-recording mechanism, and the standardised validation form itself. Each part of the plan was designed to surface a different class of failure, from authentication and data-loading errors to incorrect tool routing and ungrounded answers. A typical test session ran 45 to 60 minutes in a standard browser with a live PoliRuralPlus login, exercised against the full production data footprint of 27 cadastral countries and 442.3 million parcels, so that the stress test reflected real operating conditions rather than a reduced sample environment.

2.4. JackDaw application and validation

2.4.1. Functionalities, data and results

SYLVAN-AI wires JackDaw's streaming chat endpoint (POST /chat/v2/chat/stream, with a non-streaming fallback for clients or networks that cannot sustain a persistent connection) directly into the conversational interface, so that answers begin rendering token by token rather than after a long wait. Around that core chat capability, the application calls JackDaw's spatial tool suite: terrain (gisco-eudem, exposing slope, aspect, digital elevation model and terrain ruggedness index), climate (WorldClim, for long-run temperature and precipitation normals), land cover (GLCC), points of interest (SPOI) and administrative units (NUTS3/LAU, resolvable both by name and by geometry so a user can ask about "this municipality" while looking at the map).

Authentication is split by sensitivity: client-credentials tokens cover the public tools that do not touch personal or restricted data, while user-scoped tokens, issued through PoliRuralPlus single sign-on, are required for secured endpoints, so that access rights follow the individual user rather than the application as a whole.

Testing under the Phase 2 stress-testing programme (§2.2.2) confirmed that this wiring holds up in practice. The streaming chat, terrain, climate, land-cover, SPOI and administrative-unit endpoints all returned correct data and integrated cleanly, meaning that JackDaw's raw tool output was mapped through to the interface without malformed responses, missing fields or silent truncation. Where a user had drawn a geometry on the map, the resulting grounded answers were spatially accurate and consistently source-cited, giving testers a way to verify each claim against the underlying dataset rather than trusting the model's output on faith. Critically, the local grounding layer (§3.7) kept all five guided journeys fully functional end-to-end even when a hosted JackDaw endpoint was slow or briefly unavailable, since the platform could fall back to its own PostGIS-backed data for the affected question type.

2.4.2. Main issues identified

A systematic endpoint audit conducted in April 2026, covering every hosted JackDaw service that SYLVAN-AI depends on, found that several of them had degraded or changed behaviour since the integration was first built, well before any of it was visible to end users. The audit exercised each endpoint under realistic load and logged response codes, latency and payload shape so that genuine service failures could be distinguished from configuration drift on

the SYLVAN-AI side. The findings below cover the most significant issues uncovered, each documented with its observed status and the corresponding SYLVAN-AI response.

Several read-only proxies had stopped returning usable data: the Eurostat demography and business proxies returned 502 errors, the Magpie catalogue search returned 500, and ETOPO5 returned empty payloads instead of elevation data. More seriously, the service-registry endpoint, which the application used to discover which tools were currently live, had been removed entirely and returned 404, forcing SYLVAN-AI to fall back to a hard-coded tool list until the registry's replacement could be identified. The admin-units WKT lookup, used to resolve administrative boundaries to geometry, had also been silently renamed upstream with no deprecation notice, breaking any code that still called it by its original path.

There was another main issue which due to its sensitivity, is described in Part B of the final Report with the same section number.

Each of these findings, together with its resolution or workaround, is tracked in the endpoint-hardening backlog referenced in §2.6.

2.5. Feedback and iterative improvements

Tester feedback in April drove a round of UI/UX fixes and the closing of five proposal-text gaps: the no-hallucination guardrail, input-boundary PII stripping, CORINE land-cover change, and two additional journeys (Conservationist, Carbon Estimator). Suggested enhancements to JackDaw were compiled: rotate and revoke the leaked OpenAI key and sanitise upstream error bodies; restore the Vulture and Eurostat endpoints or document their retirement; and publish endpoint-rename changelogs to avoid silent breakage.

2.6. Deviations from the work plan and corrective actions

The principal deviation was external: several hosted JackDaw endpoints on which the original plan relied were unstable or withdrawn during the action. The reason was upstream (provider-side) service degradation, not project execution. The corrective action was architectural, SYLVAN-AI built its own local PostGIS grounding layer and made every hosted-data feature degrade gracefully (neutral “temporarily unavailable” notes instead of errors), added request timeouts and a local SQLite mirror for the Lab Notebook and chat history, and redacted secrets from upstream error bodies in-flight. The impact on objectives was neutral-to-positive: core journeys remained fully functional, the solution became markedly more resilient, and the audit itself became a valuable contribution back to the ecosystem. A late-breaking login timeout (a slow Vulture profile call blocking the OAuth callback) was diagnosed and fixed by capping the call so sign-in can never be blocked.

3. Solution Developed and Technical Results

3.1. The developed application

3.1.1. The primary output

The primary output of the action is SYLVAN-AI, a production web application deployed at <https://sylvan-ai.com> and available to any authorised user with a PoliRuralPlus account. It is a conversational GeoAI assistant for European forestry: instead of operating a Geographic Information System, the user draws a plot on an interactive map and asks about it in plain language, and the application returns spatially accurate, source-cited answers within seconds. The interface is organised as a three-pane dashboard, a knowledge and tools sidebar, a central chat, and an interactive map with a landing page, single sign-on and a responsive layout that stacks vertically on smaller screens. Everything

runs in the browser; there is nothing for the user to install, license or configure. Figure 1-1 provides an overview of the SYLVAN-AI chat interface with an interactive map view.

3.1.2. User experience and guided journeys

The application is deliberately designed for non-experts. Five ready-made guided journeys, i.e. the Compliant Owner, the Climate-Aware Planner, the Investor, the Conservationist and the Carbon Estimator encapsulate the most common forestry decisions as sets of example questions, so that a first-time user can obtain a useful, grounded result within minutes of signing in. Figure 1-2 shows the overview of the five designed guided journeys available in the SYLVAN-AI interface.

Around the chat, a Knowledge Hub provides a document library, semantic search and an ask-your-knowledge-base mode; a Lab Notebook stores field observations; a Web Research tool gathers external context; Saved Prompts accelerate repeat queries; conversations can be exported to a Microsoft Word document; and a session recorder logs interaction events for think-aloud usability studies. Results of spatial tools are drawn back onto the map as coloured layers that the view auto-fits, and a Region Information panel surfaces tabbed indicators for a selected administrative area. Figure 3-1 shows the overview of the features available in the SYLVAN-AI interface.

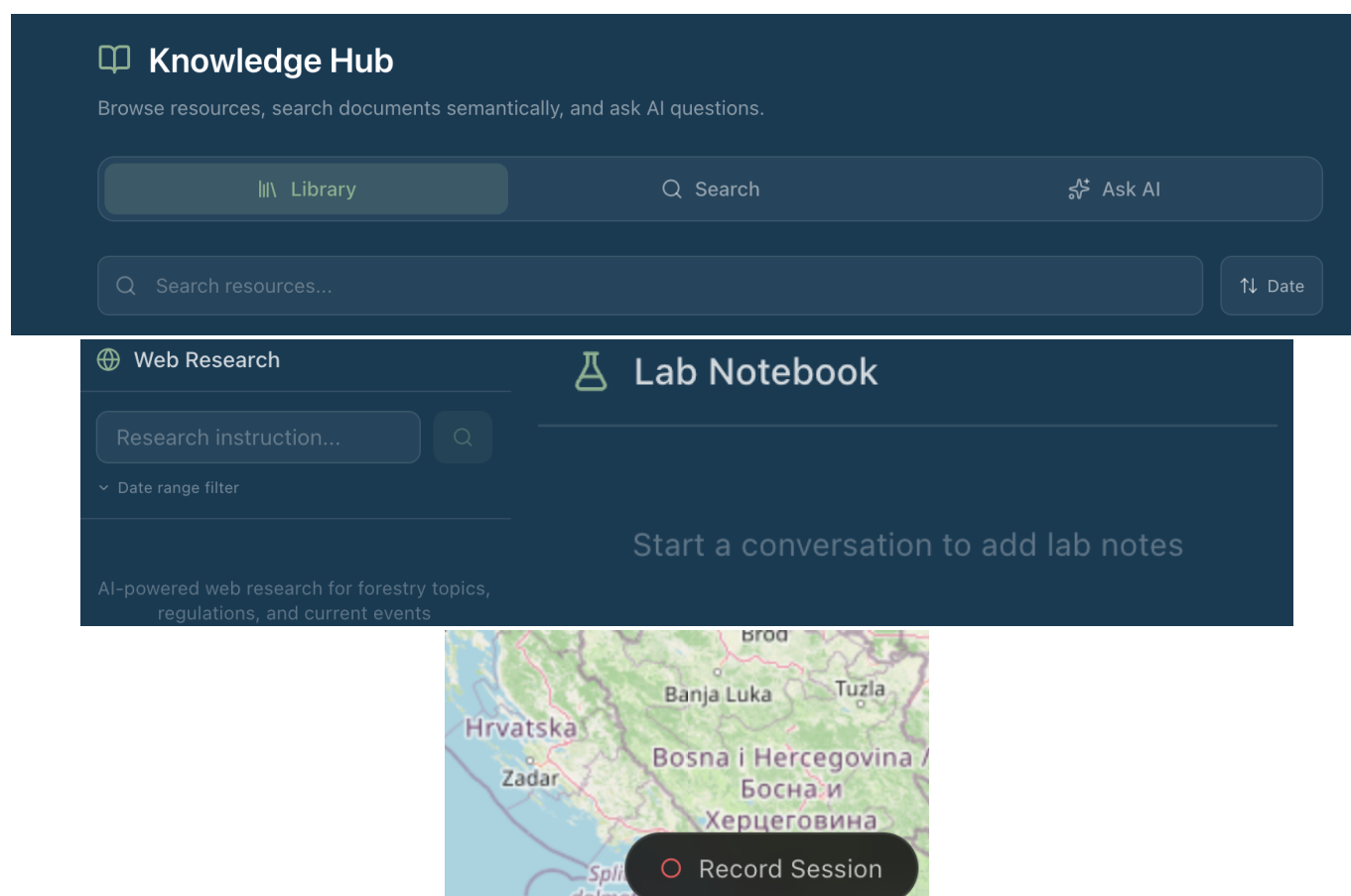


Figure 3-1: Features of SYLVAN-AI

3.1.3. The interactive map and result layers

The map is more than a way to pick coordinates; it is a first-class part of the analysis. Built on Leaflet, it offers OpenStreetMap and satellite base layers, a search bar that navigates to named regions, and drawing tools for polygons and rectangles. Once an area is drawn, a geometry indicator appears in the chat so the user always knows which area

the conversation refers to, and the drawn shape is reused for every subsequent question until it is cleared or replaced. When a spatial tool produces a result, the corresponding features are rendered back onto the map as styled layers and the view zooms to fit them, so the answer can be read both as text and as a picture. A Region Information panel provides tabbed demography, business, innovation, forest-type and policy indicators for a selected administrative unit. Figure 3-2 shows the interactive map in the SYLVAN-AI interface.

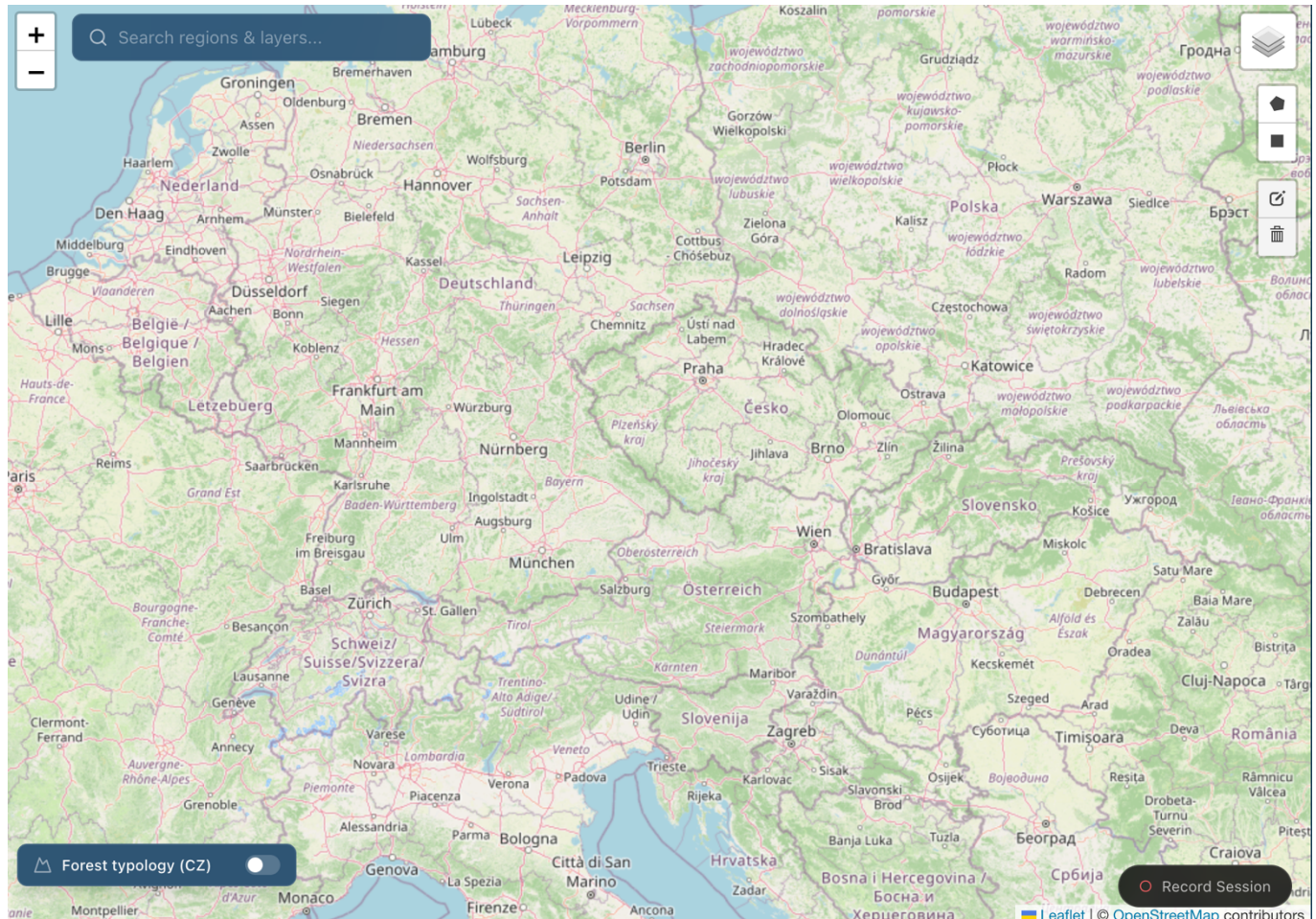


Figure 3-2: Interactive Map of SYLVAN-AI

3.1.4. The chat pipeline

A single chat request passes through a well-defined pipeline before an answer is produced. The user's message is first scanned and any personal data is stripped at the input boundary. The latest message is then analysed for spatial intent and, if the user has drawn an area, the application reverse-geocodes it to the intersecting administrative (NUTS3) regions and runs the matching local grounding queries. The resulting facts are injected into the model's context as labelled system information, alongside the no-hallucination guardrail whenever an intent returned no data. The request is then streamed to JackDaw's chat endpoint; if the stream returns an immediate error, the application transparently falls back to the non-streaming endpoint and reconstructs the response. Throughout, the sources and latency of the local grounding are surfaced to the interface, so the provenance of each answer is visible to the user. Figure 1-2 shows the free form chat place available in the SYLVAN-AI interface.

3.1.5. In-built Validation Survey

Validation is a survey built into the application itself, so that evidence is captured while a tester is still in the session. The form (as shown in the next pages) is a five-step wizard. The first step records who the tester is: stakeholder group (forest owner or association, municipal planner, environmental NGO), self-assessed experience level from beginner to expert, and region. The second records the session: session type (Workshop A, Workshop B or remote testing), the guided journey tested, and a query-accuracy assessment in which the tester counts the queries tried and how many were correct, partially correct or incorrect, together with any critical hallucinations, defined in the form as responses that presented fabricated data as fact. The third step is the standard ten-item System Usability Scale, each statement rated from strongly disagree to strongly agree. The fourth covers impact: minutes to reach an insight with SYLVAN-AI against the estimated time by traditional methods, the most useful feature, the biggest frustration, a willingness-to-recommend score from 1 to 10, and free-text comments. The final step presents the calculated SUS score with its letter grade alongside a full summary of the answers for confirmation before submission, and every submission notifies the project team automatically. Figure 3-3 shows the in-built validation survey of SYLVAN-AI.

 **SYLVAN-AI Validation Survey**

PoliRuralPlus Enhance Call — Workshop Feedback

About You

Testing Session

Usability Scale

Impact

Review

About You

Help us understand your background so we can contextualize your feedback.

Stakeholder Group

☐ Forest Owner / Association

☐ Municipal Planner

☐ Environmental NGO

Experience Level

☐ Beginner — new to GIS / forest data

☐ Intermediate — some prior experience

☐ Expert — regular professional use

Region

e.g. Bavaria, Troms, Castilla y Leon...

< Back

Step 1 of 5

Next >

Figure 3-3: SYLVAN-AI Validation Survey

 **SYLVAN-AI Validation Survey**

PoliRuralPlus Enhance Call — Workshop Feedback

About You

Testing Session

Usability Scale

Impact

Review

Testing Session

Tell us about the session you just completed.

Session Type

☐ Workshop A — Physical

☐ Workshop B — Hybrid

☐ Remote Testing

Journey Tested

☐ The Compliant Owner

☐ The Climate-Aware Planner

☐ The Investor

☐ Other

Query Accuracy Assessment

Queries Tested	Correct
Partially Correct	Incorrect

Critical Hallucinations Found

Responses where the system presented fabricated data as fact

< Back

Step 2 of 5

Next >

Figure 3-3: SYLVAN-AI Validation Survey - continued

 **SYLVAN-AI Validation Survey**

PoliRuralPlus Enhance Call — Workshop Feedback

About You

Testing Session

Usability Scale

Impact

Review

System Usability Scale

Rate each statement from 1 (Strongly Disagree) to 5 (Strongly Agree).

1 I think that I would like to use this system frequently.

1

2

3

4

5

Strongly DisagreeStrongly Agree

2 I found the system unnecessarily complex.

1

2

3

4

5

Strongly DisagreeStrongly Agree

3 I thought the system was easy to use.

1

2

3

4

5

Strongly DisagreeStrongly Agree

4 I think that I would need the support of a technical person to be able to use this system.

1

2

3

4

5

Strongly DisagreeStrongly Agree

5 I found the various functions in this system were well integrated.

1

2

3

4

5

Strongly DisagreeStrongly Agree

Figure 3-3: SYLVAN-AI Validation Survey - continued

6

I thought there was too much inconsistency in this system.

1

2

3

4

5

Strongly Disagree

Strongly Agree

7

I would imagine that most people would learn to use this system very quickly.

1

2

3

4

5

Strongly Disagree

Strongly Agree

8

I found the system very cumbersome to use.

1

2

3

4

5

Strongly Disagree

Strongly Agree

9

I felt very confident using the system.

1

2

3

4

5

Strongly Disagree

Strongly Agree

10

I needed to learn a lot of things before I could get going with this system.

1

2

3

4

5

Strongly Disagree

Strongly Agree

< Back

Step 3 of 5

Next >

Figure 3-3: SYLVAN-AI Validation Survey - continued

 **SYLVAN-AI Validation Survey**

PoliRuralPlus Enhance Call — Workshop Feedback

About You

Testing Session

Usability Scale

Impact

Review

Impact Assessment

Help us measure the practical value of SYLVAN-AI for your work.

Time Comparison

Time using SYLVAN-AI (min)

Minutes to reach your insight

Traditional methods (min)

Estimated time without AI

Most Useful Feature

What capability was most valuable to you?

Biggest Frustration

What was the most frustrating aspect?

How likely are you to recommend SYLVAN-AI? (1-10)

1

2

3

4

5

6

7

8

9

10

Not at all likely

Extremely likely

Additional Comments

Anything else you'd like to share...

< Back

Step 4 of 5

Next >

Figure 3-3: SYLVAN-AI Validation Survey - continued

21/63

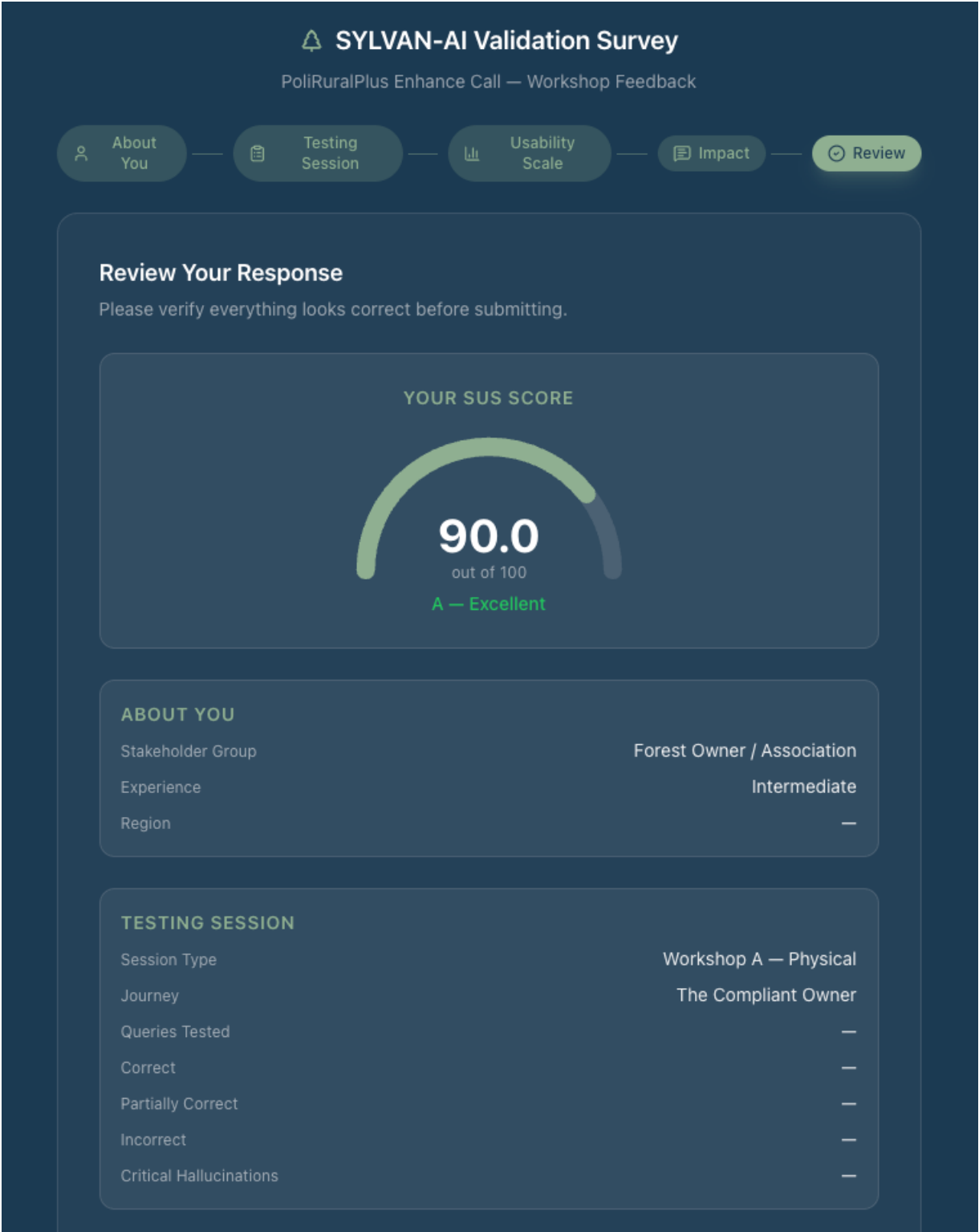


Figure 3-3: SYLVAN-AI Validation Survey - continued

ABOUT YOU

Stakeholder Group	Forest Owner / Association
Experience	Intermediate
Region	—

TESTING SESSION

Session Type	Workshop A — Physical
Journey	The Compliant Owner
Queries Tested	—
Correct	—
Partially Correct	—
Incorrect	—
Critical Hallucinations	—

SUS RESPONSES

1. I think that I would like to use this system frequently.	5
2. I found the system unnecessarily complex.	2
3. I thought the system was easy to use.	5
4. I think that I would need the support of a technical person to be able to use this system.	2
5. I found the various functions in this system were well integrated.	5
6. I thought there was too much inconsistency in this system.	1
7. I would imagine that most people would learn to use this system very quickly.	5
8. I found the system very cumbersome to use.	2
9. I felt very confident using the system.	5
10. I needed to learn a lot of things before I could get going with this system.	2

IMPACT ASSESSMENT

Time with SYLVAN-AI	—
Traditional methods	—
Would Recommend (NPS)	7 / 10

[< Back](#)

Step 5 of 5

[Submit](#)

Figure 3-3: SYLVAN-AI Validation Survey - continued

3.2. Integration with JackDaw

JackDaw is integrated as the reasoning engine and a primary provider of spatial tools. The chat pipeline calls JackDaw’s streaming chat endpoint (with a non-streaming fallback if the stream errors) together with its terrain, climate, land-cover, points-of-interest and administrative-unit tools. A dedicated client attaches the correct OAuth2 token to each call that is a user token for secured endpoints and a client-credentials token for public ones and enforces a request timeout so that a slow upstream can never hang the application, and redacts any secrets that upstream error bodies might echo back. The application was also systematically audited against the full JackDaw surface, which both hardened the integration and produced concrete, actionable feedback for the JackDaw team (see Sections 2 and 4).

3.2.1. The hybrid retrieval engine

The defining technical contribution of the project is a hybrid retrieval architecture that combines JackDaw’s hosted intelligence with a purpose-built local grounding layer. When a question arrives, an intent router inspects it and, in parallel, dispatches the relevant queries: to JackDaw’s tool-using GeoLLM on one side, and to a 265 GB local PostGIS database of standardised European geodata on the other. The local layer answers seven classes of question that are protected areas, terrain, soil, fire weather, cadastre, land cover and forest typology while using deterministic spatial SQL evaluated against the exact geometry the user drew. Both sources are merged into the model’s context, so a single answer can weave together JackDaw’s reasoning with precise, verifiable facts for the selected area. This design is also what makes the solution resilient: when a hosted JackDaw data service is temporarily unavailable, the local grounding layer keeps the five core journeys fully functional, and the failure is surfaced as a neutral notice rather than an error.

3.2.2. Trust, safety and data protection

Because a confident wrong answer on a spatial question is the most damaging failure mode for a grounded GeoAI, three safeguards are built in. A no-hallucination guardrail detects when the user has asked about a topic for which the local layer returned no data and instructs the model to answer honestly (“I don’t have data for this area”) rather than invent a value or extrapolate from neighbouring regions. Every grounded answer cites the data sources that informed it. And a 0–100% confidence indicator accompanies each answer, which the user can expand to see precisely which signals that is a drawn geometry, the number of tools that returned data, the depth of reasoning and is contributed to the score. Figure 3-4 shows the confidence indicator and its details. For data protection, personal data typed into the chat (e-mail addresses, phone numbers, tax and ID numbers, IBANs, card numbers and personal-name patterns) is stripped at the input boundary before any text reaches the language model or is persisted, so that conversation logs contain only the redacted form.

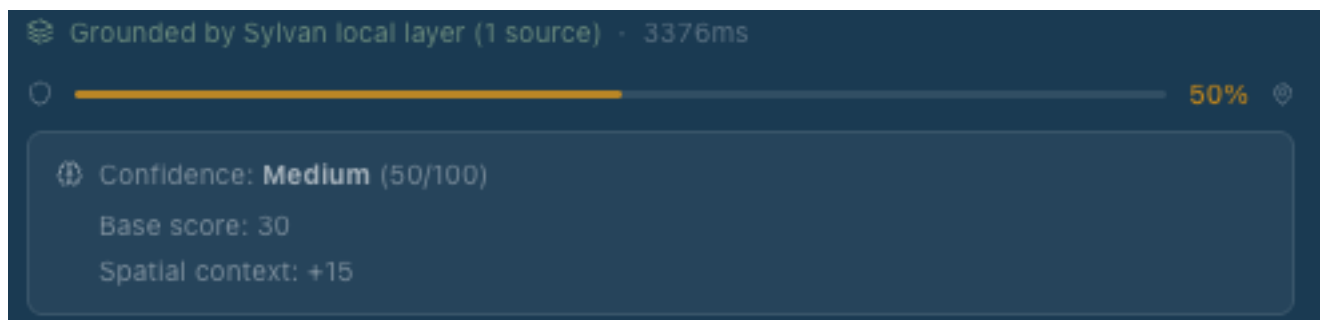


Figure 3-4: SYLVAN-AI Confidence Indicator

3.3. Technical maturity and performance

The solution is a validated pilot running in production, not a prototype. All five guided journeys work end-to-end; the platform is live, secured behind single sign-on, containerised and monitored; and the entire data foundation is loaded, indexed and query-ready. Performance is well within interactive limits: forest-typology parcel queries return in roughly 80–210 milliseconds, cadastral point-in-parcel queries in roughly 200–800 milliseconds, and the streamed chat begins responding within a few seconds. The application degrades gracefully under upstream failure, showing neutral notices instead of errors, and never exposes stack traces or secrets to the user. It has been deployed and re-deployed many times over the course of the action through a repeatable build-and-release process, and its health is continuously checked so that any container failure is detected and the service restarted automatically. In short, the maturity level is that of a working, publicly accessible service that has been used by real testers, rather than a laboratory demonstration.

3.4. Architecture and technology stack

The front end is built with Next.js and React in TypeScript, styled with Tailwind CSS, using Leaflet with drawing controls for the map, Zustand for state management, and a three.js visualisation on the landing page. Authentication uses Auth.js with a custom PoliRuralPlus OAuth2 provider. The grounding engine is a local-context module with seven intent detectors, each backed by a PostGIS query and injected into the chat as labelled system context, together with the no-hallucination guardrail and the input-boundary PII stripping. Data is stored in PostgreSQL with the PostGIS extension on EU-hosted infrastructure, containerised and served behind a reverse proxy. Application-level state, i.e. validation responses, audit reviews, benchmark runs, session recordings, chat history and lab-notebook entries is held in a lightweight embedded database, and every submitted evaluation now triggers an automatic e-mail notification to the project team.

More detailed information due to its sensitivity, is described in Part B of the final Report with the same section number.

3.5. Access

SYLVAN-AI is deployed and usable today; the channel below give access to the live platform:

Live application: <https://sylvan-ai.com>; sign in with a PoliRuralPlus account. More detailed information due to its sensitivity, is described in Part B of the final Report with the same section number.

3.6. Key technologies, standards and interoperability

Interoperability rests on open European and international standards. Every geospatial layer is reprojected to a common coordinate reference system (EPSG:4326) for uniform querying. Data is acquired and harmonised through INSPIRE (the Cadastral Parcels theme is an EU High-Value Dataset), OGC web services (WFS 2.0 and OGC API – Features), and standard formats including GML, NetCDF and Cloud-Optimized GeoTIFF. Identity and access use OAuth2 (with token introspection). The chat agent additionally supports Model Context Protocol (MCP) servers, so that external tools can be connected to extend its capabilities. Data models follow the schemas of the source authorities, i.e. the European Environment Agency, the Copernicus programme, ISRIC, NASA, the national cadastral registers and the Czech forest-management institute (ÚHÚL) and is harmonised into a single unified schema for the cross-country cadastre.

There are seven grounding layers (local PostGIS):

- **Cadastral parcels:** 442,337,382 parcels across 27 countries, exposed through a single unified view over 41 national and regional tables (all German federal states except Bavaria).

- **Natura 2000 (EEA, end-2024):** 27,173 protected-site polygons, 337,157 protected-species records and 151,473 habitat records.
- **Terrain (Copernicus DEM GLO-30, ~30 m):** elevation, with slope, aspect and terrain-ruggedness computed at query time.
- **Soil (ISRIC SoilGrids 2.0, 0–5 cm):** pH, organic carbon, clay, sand and bulk density.
- **Fire weather (NASA GFWED):** the Fire Weather Index with Canadian danger classes, for seasonal fire-risk assessment.
- **Land cover (Copernicus CORINE 2018 + 2012–2018 change):** 1.98 million land-cover polygons and 171,072 change polygons.
- **Czech forest typology (ÚHÚL, valid 1 January 2025):** 949,358 forest-site polygons over 2.72 million hectares, decoding vegetation zone, edaphic category and target species that is a new grounding layer built during the action.

4. Integration and Contribution to PoliRuralPlus

4.1. Data generated and used

The action assembled, harmonised and now hosts a 265 GB pan-European geospatial foundation comprising the seven grounding layers described in Section 3. Beyond consuming existing open data, the project generated new, reusable assets: a fully integrated national Czech forest-typology grounding layer that is decoding forest site types, vegetation zones, edaphic (soil-moisture) categories and target management sets, with English-language decoding for a non-Czech audience together with reproducible, country-by-country data loaders and a documented data-provenance register that records the source, licence, vintage and coverage of every layer. At the application level, the platform generates structured evidence of use: standardised validation-form responses (with System Usability Scale scores), accuracy-audit reviews, Golden-Set benchmark runs and session recordings, all of which can be exported for analysis.

4.2. Integration into the PoliRuralPlus ecosystem

SYLVAN-AI is embedded in the PoliRuralPlus ecosystem in three concrete ways. First, it uses JackDaw as its reasoning engine and a primary tool provider, exercising the ecosystem's tool-using GeoLLM in a demanding, real-world domain. Second, it authenticates every user through PoliRuralPlus single sign-on, so that the same identities used across the ecosystem grant access to the application. Third, it adopts and extends the ecosystem's RAG/GeoRAG paradigm: JackDaw's semantic tool retrieval is complemented by deterministic, geometry-keyed spatial retrieval from the local layer, and the consortium's standardised validation methodology is operationalised directly inside the product through the in-app evaluation form and the accuracy-audit and KPI dashboards.

4.3. Contribution to shared datasets and knowledge

The project returns several reusable contributions to the wider ecosystem. The first is the harmonisation of 442 million cadastral parcels across 27 countries into a single, consistently projected schema behind one query interface that is a substantial, standards-based European asset that abstracts away the differences between national cadastral systems. The second is the Czech forest-typology grounding layer, a forestry-specific dataset that JackDaw did not previously expose and that can inform silvicultural decisions across the country. The third is the outcome of a rigorous, systematic audit of the JackDaw endpoint surface (detailed below). Together these mean the action gives back more than it consumes: harmonised data, a new domain layer, and concrete engineering feedback.

4.4. Feedback and hardening backlog for JackDaw

A distinctive contribution of the action is the structured feedback returned to the JackDaw team. Over the course of the project the full endpoint surface was audited repeatedly, and the findings were compiled into a concrete hardening backlog: hosted data endpoints that had been silently renamed (and against which the client was therefore failing), Eurostat-backed services returning proxy errors, a catalogue-search service failing on every query, a policy-advisor endpoint whose upstream error echoed a live third-party API key, and a profile endpoint that failed only after roughly sixty seconds and could therefore block the sign-in flow. For each finding, SYLVAN-AI implemented a client-side mitigation which are graceful degradation, request timeouts, secret redaction, or a non-blocking call and recommended an upstream remedy. This audit is directly useful to the ecosystem: it converts one third party's real-world usage into an actionable list of improvements for JackDaw's stability and security.

4.5. Synergies with other projects and initiatives

A Transferability Roadmap connects the SYLVAN-AI workflow to two further PoliRuralPlus pilot regions i.e. Vidzeme in Latvia, with a forest-bioeconomy emphasis, and Central Greece (Sterea Ellada), with a wildfire-safety and agritourism emphasis where each paired with a regional research institution to provide scientific credibility. Because the underlying data layers are drawn from pan-European programmes, the solution also aligns with initiatives beyond PoliRuralPlus that rely on the same authoritative sources, and its region-neutral design means those synergies require no additional engineering to realise.

4.6. Alignment with European data and policy frameworks

Every layer in the grounding foundation is drawn from an authoritative European or international programme which are Copernicus, the European Environment Agency, the INSPIRE High-Value Datasets, ISRIC, NASA and national cadastral and forestry authorities and is reprojected to a common coordinate reference system for consistent use. This anchors the solution firmly within the European spatial-data landscape and aligns it with the policy agendas it is meant to serve: the EU Deforestation Regulation and Green Deal reporting obligations that small forest owners struggle to meet, the Natura 2000 and biodiversity frameworks for conservation compliance, and the wider drive to make high-value public data genuinely usable. Because the application consumes these datasets in their standard forms, any update the source authorities publish can be re-ingested through the documented loaders, keeping the tool current with the ecosystem it belongs to.

4.7. Exploitation and continuity

The contribution is designed to outlast the funding period. The application runs as a single low-cost instance on standard cloud infrastructure, built entirely on openly licensed data and open-source software, so there is no per-region fork to maintain and the only recurring cost of a new deployment is local-language translation. The documented loaders and the provenance register keep every layer refreshable as the source authorities publish updates. For the consortium this means the harmonised data foundation, the new forest-typology layer, the transferability roadmap and the JackDaw hardening backlog remain available and reusable; for Sylvanity it establishes a commercial pathway to a grounded-GeoAI forestry decision-support service, with the standardised European data foundation as its differentiator and translation plus training as the service layer.

4.8. Reusability and interoperability

The solution is engineered for reuse. Because every layer is built on EU-standard, openly licensed data and the application code is region-neutral, replicating the workflow in a new pilot requires no software branch: a new region

needs only a boundary polygon, a set of localised strings and a handful of region-specific example queries. The single unified cadastre view abstracts 27 national cadastral systems behind one query point; the five guided journeys are defined once and deployed everywhere unchanged; and the seven grounding layers already span the Union. Interoperability with other tools is provided through open standards (OGC services, INSPIRE, OAuth2) and through Model Context Protocol support, which allows external tool servers to be connected to the assistant. The result is a framework that other PoliRuralPlus partners can adopt and extend rather than rebuild.

5. Stakeholder Engagement and User Involvement

5.1. Stakeholder groups involved

Stakeholder engagement for SYLVAN-AI reached four stakeholder groups:

- (A) forest owners and owner associations,
- (B) municipal planners and public officials,
- (C) environmental NGOs and civil-society organisations.

In addition to above three primary stakeholders, the PoliRuralPlus consortium and JackDaw development team is also another potential stakeholder that we wanted to involve. This mix grounds the tool in real use cases, ensures policy relevance and adoption, and provides conservation validation.

5.1.1. Forest owners and owner associations

It is anticipated that forest owners and their associations to be the main target group of users of SYLVAN-AI. The four reached organisations are:

- Confederation of European Forest Owners (CEPF-EU), a Brussels-based EU umbrella body reached through its secretariat and policy officers;
- Natuurmonumenten, one of the Netherlands' largest private nature and forest managers;
- LandschappenNL, the umbrella body for the Dutch provincial landscape organisations;
- Federatie Particulier Grondbezit, representing private Dutch forest and landowners.

5.1.2. Municipal planners and public officials

This reached stakeholder group comprised three Dutch municipalities:

- Gemeente Ede,
- Gemeente Apeldoorn
- Gemeente Utrechtse Heuvelrug,

Each contacted through their public administration channels.

5.1.3. Environmental NGOs and civil-society organisations

This reached stakeholder group comprised two organisations:

- natur&ëmwelt, a Luxembourg-based environmental NGO,
- European Forest Institute (EFI), a pan-European research institute

5.1.4. PoliRuralPlus consortium and JackDaw development team

A fourth stakeholder group, distinct from the external users above, was the wider PoliRuralPlus consortium itself: the JackDaw development team, other project partners, and researchers and innovators from synergy projects.

5.2. Engagement methods

5.2.1. Outreach by Email and Contact Form

Stakeholders were engaged directly by the project team through publicly available contact channels: primarily email for forest-owner associations and NGOs, and public web contact forms for municipalities. Each message was sent personally by a named team member.

Each outreach message followed a consistent structure. It opened by introducing the SYLVAN-AI project as a Horizon Europe initiative funded under the PoliRuralPlus grant, then framed the problem in terms the recipient would recognise for environmental NGOs, for instance, the difficulty of turning complex spatial datasets, such as Natura 2000 boundaries, fire-risk indices and cadastral maps, into evidence-based decisions without specialist GIS training or costly external consultants. It then introduced JackDaw, the GeoAI tool under validation, and its ability, via the SYLVAN-AI platform, to answer natural-language questions. The message requested for a short 30-minute call to demonstrate the tool and discuss participation of the stakeholder in the planned workshops. Table 5-1 presents the list of stakeholders outreached by email or contact form. Detailed information of stakeholders is presented in Part B of the report due to personal data within the meaning of the GDPR.

Table 5-1 List of Stakeholders outreached by email or contact form

No.	Organization	Category	country
1	CEPF-EU – Confederation of European Forest Owners	Forest Owners	EU (BE)
2	CEPF-EU – Confederation of European Forest Owners	Forest Owners	EU (BE)
3	CEPF-EU – Confederation of European Forest Owners	Forest Owners	EU (BE)
4	Natuurmonumenten	Forest Owners	NL
5	Natuurmonumenten	Forest Owners	NL
6	LandschappenNL	Forest Owners	NL
7	Federatie Particulier Grondbezit	Forest Owners	NL
8	natur&ëmwelt	NGO	LU
9	European Forest Institute (EFI)	NGO	EU
10	European Forest Institute (EFI)	NGO	EU
11	Gemeente Ede	Municipal Planners	NL
12	Gemeente Apeldoorn	Municipal Planners	NL
13	Gemeente Utrechtse Heuvelrug	Municipal Planners	NL

5.2.2. Workshop A: Presentation at the PoliRuralPlus JackDaw Code Camp

Beyond direct outreach to forest owners, municipalities and NGOs, the project team also delivered Workshop A by engaging the wider PoliRuralPlus consortium directly, presenting SYLVAN-AI at the PoliRuralPlus JackDaw Code Camp in Athens (online session, 17 June 2026) as shown on Figure 5-1. Workshop A combined a structured presentation with a live demonstration of the platform at <https://sylvan-ai.com>, covering the challenge SYLVAN-AI addresses (the digital gap between rich European geodata and the small-scale forest owners who need it), the solution and its five guided journeys, the hybrid retrieval architecture and technology stack behind it, and the validation framework and KPI targets used to assess it.

Workshop A closed with an honest account of the project's technical, operational and compliance risks and how each is mitigated, and an explicit invitation to the consortium to collaborate further: connecting SYLVAN-AI with other pilots' data owners, sharing JackDaw's MCP-server roadmap, and co-defining reference use cases that could be validated jointly. This directly informed the project's Transferability Roadmap, which proposes adapting the SYLVAN-AI workflow to the Vidzeme (Latvia) and Central Greece pilot regions.



Figure 5-1 Workshop A: Presentation at the PoliRuralPlus JackDaw Code Camp

5.2.3. Workshop B: Hands-On Validation of JackDaw GeoAI

Workshop B was the project's second stakeholder workshop: a hands-on validation session for the JackDaw GeoAI LLM, scheduled for Tuesday, 28 July 2026, 14:00 to 15:00 CET and hosted online via Microsoft Teams. It was announced publicly through the project's LinkedIn channel, through posts to relevant LinkedIn and Reddit groups and communities, and through personal e-mails to individual stakeholders.

The session was structured as guided self-service rather than as a demonstration. After a short recap of SYLVAN-AI and its main features, participants were invited to create their own account and to begin working with the live platform immediately, using the five guided journeys (the Compliant Owner, the Climate-Aware Planner, the Investor, the

Conservationist and the Carbon Estimator) as entry points into real forest-management scenarios, and sharing practical feedback as they worked.

In the closing part of the session, every participant completed the in-app validation form and submitted a System Usability Scale (SUS) score, so that the workshop produced the same instrumented evidence as the rest of the validation programme and could be measured against the project targets. The feedback and results are reported in Section 5.3.3.

5.3. Feedback received and how it influenced the work

5.3.1. Feedback and results of Outreach by Email and Contact Form

From the thirteen contacts made through email or contact-form outreach, two resulted in meetings: with European Forest Institute (EFI) and with Federatie Particulier Grondbezit. The names are reported in Part B with the same section number for GDPR compliance. The remaining contacts either did not reply, or, like the municipalities of Ede and Apeldoorn, stated that they are not interested.

During the meeting with European Forest Institute (EFI), they found SYLVAN-AI a very interesting product; however, during the meeting and testing of the tool, his main comment was that similar questions and results could be obtained using frontier LLMs such as DeepSeek or ChatGPT. They nonetheless agreed to investigate possibility to allocate a timeslot to present SYLVAN-AI at EFI's annual conference, to be held in London in October 2026.

The representative of Federatie Particulier Grondbezit was also very positive about the platform during the meeting with her. It is now an ongoing action to arrange a separate session with them to as part of continues dissemination of SYLVAN-AI.

5.3.2. Feedback and results of Workshop A: PoliRuralPlus JackDaw Code Camp

SYLVAN-AI's presentation was received as part of the Code Camp's second-day programme of project presentations and knowledge exchange, held alongside other Cascade Funding and synergy projects, where the shared focus was on comparing progress and identifying interoperability and reuse opportunities across the wider ecosystem. Feedback centred less on any single feature of the interface and more on fit: attendees engaged with how SYLVAN-AI's hybrid retrieval architecture and local grounding layer could be reused by other JackDaw-based pilots, and the explicit invitation to connect with other pilots' data owners and co-define reference use cases was taken up as a starting point for follow-on discussion. The presentation also fed into the event's third day, when teams reconvened for demonstrations and a joint evaluation of the most promising outcomes across the Code Camp.

The main feedback and result from Workshop A came through one of the key participants, Karel Charvát, Project Manager and Representative of Plan4all within GEO. After the Code Camp, he tested SYLVAN-AI and confirmed via email that he found it a very interesting product. He also provided the Czech national forest typology dataset (ÚHÚL, valid 1 January 2025: 949,358 forest-site polygons over 2.72 million hectares, decoding vegetation zone, edaphic category and target species), which the team integrated into SYLVAN-AI as a toggleable overlay on the map, becoming the platform's seventh grounding layer. He then connected the project team to Karel Charvát jr, Project Manager at the Czech Centre for Science and Society, for a dedicated validation session held remotely on 15 July 2026.

Over roughly 55 minutes, Karel Charvát jr tested SYLVAN-AI against a location in Czech Republic (detailed information in Part B, with the same section number), working through the Compliant Owner, Investor and Climate-Aware Planner journeys across around seven or eight questions. His feedback was largely positive: he judged the answers correct or partly correct throughout with no critical hallucinations, and specifically praised the platform for stating when it lacked the data to answer rather than guessing. He identified one inconsistency worth fixing, where one answer stated Natura 2000 data was unavailable while a related answer computed proximity to the nearest Natura 2000 site, and flagged it for the team to trace to either JackDaw or SYLVAN-AI's own logic. His main substantive gap was the absence of national and local legal context: Czech protected-area categories, harvesting regulations and

bird-nesting rules are governed by national legislation that is not yet part of the grounding layer, and he suggested that this, together with sharper country-specific tailoring of the climate and fire-risk content (he noted a reference to coastal risk that does not apply to landlocked Czech Republic), was the clearest next step. He recommended prioritising deep, legislation-backed coverage of one or two pilot countries before expanding EU-wide. He completed the standardised PoliRuralPlus validation form, self-identifying as an intermediate GIS-capable user, and the session produced a System Usability Scale score of 72.5.

5.3.3. Feedback and results of Workshop B: Hands-On Validation Session

Workshop B was attended by five participants, three of whom completed the in-app validation form on 28 July 2026. The results exceeded the project targets. The four System Usability Scale scores were 72.5, 80, 97.5 and 100 (mean 87.5, against a target of SUS > 70) and willingness to recommend averaged 9.0 out of 10. Of nine answers checked for accuracy, none was incorrect and none was a critical hallucination (target below 5%), with one answer in the Investor session flagged as only partially complete. Self-reported time-to-insight fell from 80 to 8 minutes in total, a reduction of roughly 90% against a 50% target.

Participants singled out region selection with follow-up questions as the most useful feature and described the interface as user-friendly, well-organised and well-illustrated; one noted that it was useful for beginners as well as experts, confirming the non-expert design intent set out in Section 3.1.2. No frustrations were recorded.

5.4. Evidence of usability and acceptance

Usability and acceptance were not established through a single survey exercise but built up gradually, through a sequence of encounters in which stakeholders used SYLVAN-AI themselves. Each of the engagement routes described above contributed a different kind of evidence: the outreach campaign showed which audiences recognised the problem the platform sets out to solve, the Code Camp presentation tested the concept in front of an expert technical audience, and the two hands-on sessions placed the working platform in the hands of real users exploring their own regions and their own questions. Because every session was closed with the same in-app validation form, the resulting picture is coherent even though participants differed in country, sector and level of GIS experience.

The consistent message from that testing is that the platform is usable without training. Every participant was able to create an account, select a region and reach a meaningful answer within the session, in most cases within a few minutes, and the usability scores recorded across the sessions remained above the project's target throughout, averaging well into the range normally treated as good to excellent. Participants described the interface as clear, well organised and well illustrated, and one self-declared beginner observed that it was useful for non-experts as much as for specialists. What was praised most often was not a single feature but the working pattern the platform makes possible, namely selecting an area and then continuing conversationally with follow-up questions, which is precisely the behaviour the guided journeys were designed to encourage.

Just as important for acceptance is that users came away trusting the answers. Across the validated sessions no answer was found to be incorrect and no critical hallucination was recorded, and the few reservations raised concerned completeness rather than correctness. Testers singled out the platform's willingness to state openly when it lacked the data to answer, instead of offering a plausible guess, as a specific reason for confidence. Taken together with the substantial reduction in time-to-insight that participants reported, comparing a few minutes in SYLVAN-AI with the better part of an hour of conventional geoportal work, this is the clearest indication that the tool delivers on its central promise: dependable spatial insight for people without GIS training.

Acceptance is further visible in the commitments stakeholders made after testing rather than in scores alone: a national forest typology dataset offered by a consortium partner and subsequently integrated as an additional grounding layer, an agreement to explore presenting the platform at a European research institute's annual conference, and a request from a landowner federation for a further dedicated session. These observations are carried forward into the lessons learned and next steps in Sections 8 and 9, where deeper legislation-backed coverage of a small number of pilot countries is proposed as the priority before wider expansion.

6. GDPR and Data Protection Compliance

SYLVAN-AI was designed and operated in full compliance with the EU General Data Protection Regulation (Regulation (EU) 2016/679, “GDPR”). Sylvania B.V. acted as the data controller for the personal data processed during the pilot and applied the GDPR principles of lawfulness, fairness and transparency, purpose limitation, data minimisation, accuracy, storage limitation, and integrity and confidentiality throughout.

6.1. Personal data collected

Three categories of individuals were involved, and only the minimum personal data necessary was collected for each. (i) Workshop and focus-group participants and the stakeholders approached for testing: name, organisation and professional contact details, used solely to arrange and conduct the sessions. (ii) Survey and validation-form respondents: their stakeholder group, experience level, region and free-text feedback, recorded against an anonymous identifier rather than a name or e-mail address. (iii) Pilot users of the live platform: authenticated through PoliRuralPlus single sign-on, with SYLVAN-AI retaining only an opaque user identifier and no names or passwords. No special categories of personal data within the meaning of Article 9 GDPR were collected. In addition, the platform database retains each user’s chat conversation history, i.e. their questions and the assistant’s answers keyed to the same opaque identifier; because personal data is stripped from chat input before it is stored, these records contain no direct identifiers such as names or e-mail addresses.

6.2. Lawful basis and consent

Processing for research participation, workshops, testing and feedback was based on the participants’ informed consent (Article 6(1)(a) GDPR). Before any session, participants were briefed on the purpose of the pilot, the data that would be collected, how it would be used and how long it would be kept, and on their rights; their consent which was including consent for any think-aloud session recording, was obtained and recorded. Access to the live platform is based on the user’s own account and use of the service. Consent could be withdrawn at any time without detriment.

6.3. Data protection by design in the platform

Data protection is built into the product itself. Personal data that a user might type into the chat, e.g. e-mail addresses, telephone numbers, tax and identity numbers, IBANs, payment-card numbers and personal-name patterns are detected and stripped at the input boundary before any text reaches the AI model or is stored, so that the conversation logs contain only the redacted form. Evaluation data (validation responses and interaction recordings) is stored against anonymous identifiers and contains no direct identifiers. In this way the personal data actually processed is minimised to the smallest amount necessary.

6.4. Processing, storage and archival

All personal data was processed and stored on EU-hosted, access-controlled infrastructure. The identifying records which are the participant and stakeholder contact list and the recorded consents, are held securely and internally by Sylvania B.V., separately from the aggregated evaluation data, and are not published. Data is retained only for as long as necessary to conduct the pilot and complete this reporting, after which identifying records are securely archived or deleted in line with the storage-limitation principle; anonymised evaluation data, which no longer identifies individuals, may be kept for the project record.

6.5. Data-subject rights

Participants were informed of, and can exercise, their rights under the GDPR i.e. access, rectification, erasure, restriction of processing, objection, data portability and withdrawal of consent by contacting Sylvania B.V. Such requests are handled without undue delay.

6.6. Confirmation

Sylvania B.V. confirms that all relevant consents were obtained and are safely stored internally, and that all personal data relating to workshop and focus-group participants, survey respondents and pilot users was collected, processed and archived in full compliance with the GDPR. No personal data is disclosed in this public report: every figure and finding presented here is aggregated and anonymised. Any confidential detail necessary for verification which is including the internal handling of the stakeholder contact list, is provided in the confidential Part B of this report.

7. Communication, Dissemination and Visibility

All visual elements used across these outputs are institutional graphics and interface screenshots rather than personal photography, and each output acknowledges PoliRuralPlus and Horizon Europe funding per the visibility requirements in §6.5.

7.1. News articles

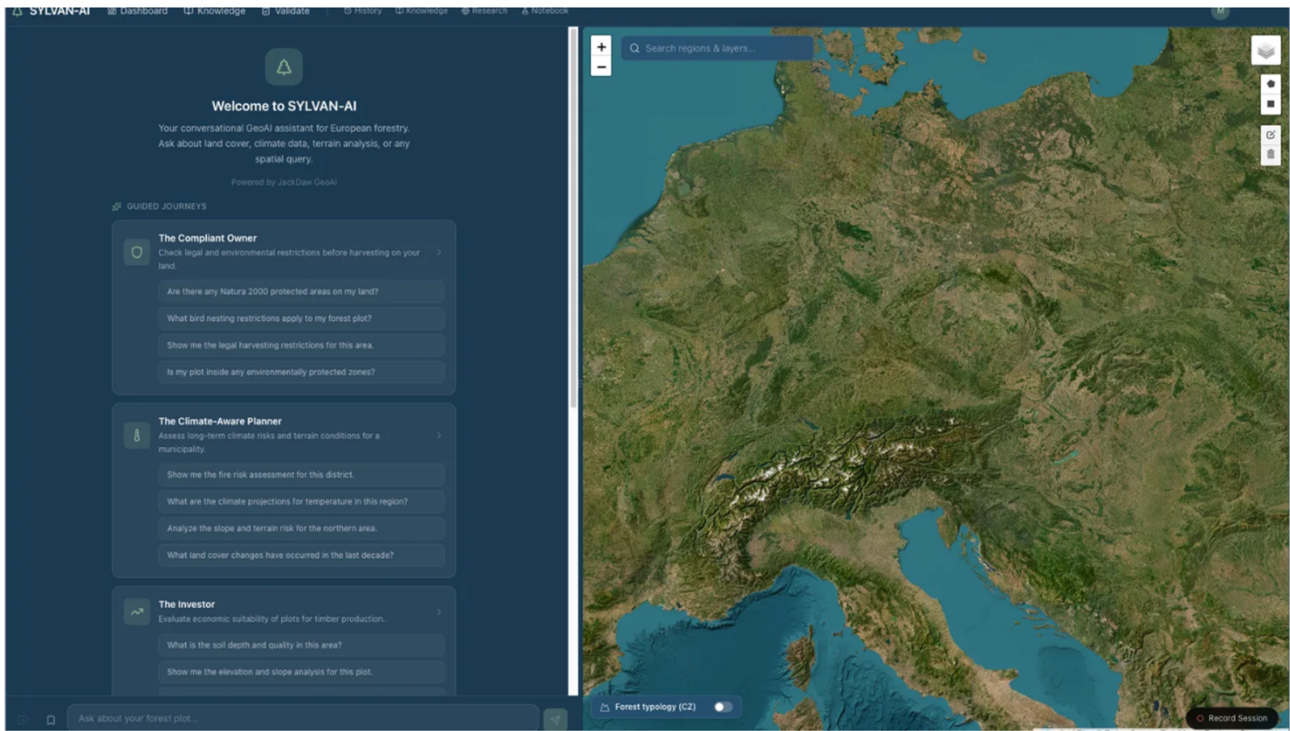
The required news article is satisfied twice over:

- An institutional announcement, “SYLVAN-AI Is Launched,” was published on the PoliRuralPlus news site on 10 July 2026:
<https://www.poliruralplus.eu/news/sylvan-ai-is-launched/>

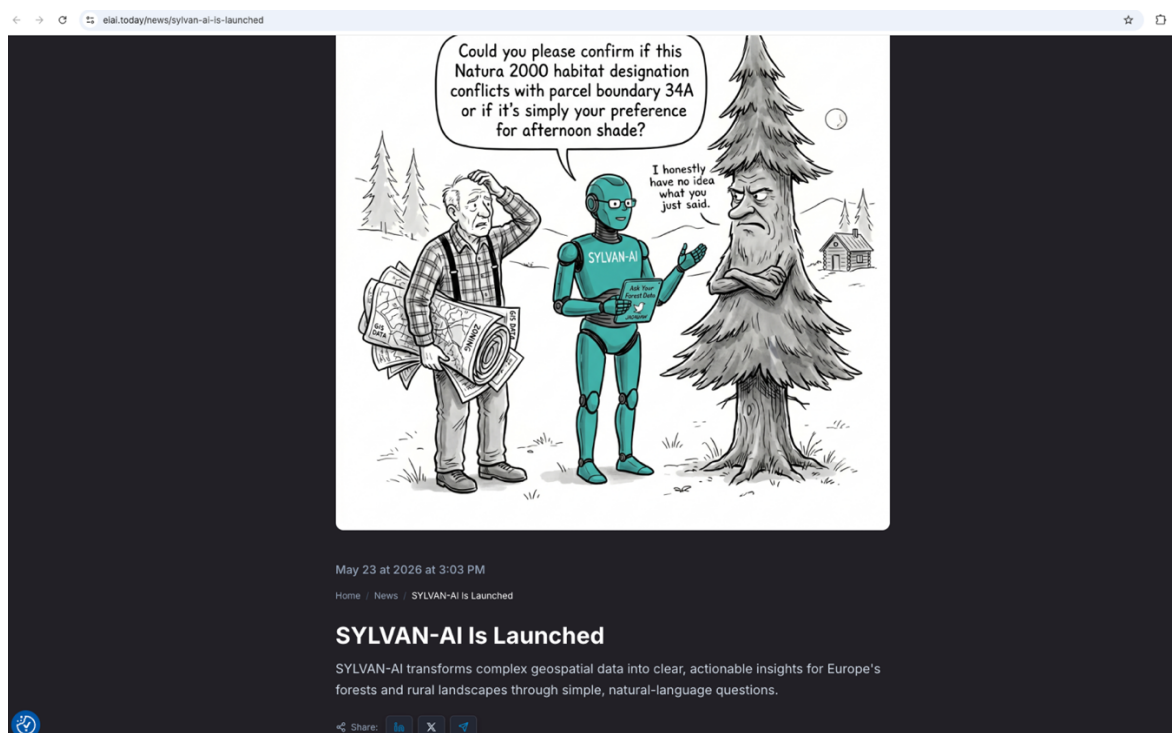
SYLVAN-AI Is Launched

SYLVAN-AI transforms complex geospatial data into clear, actionable insights for Europe's forests and rural landscapes through simple, natural-language questions.

Sylvanity B.V. • 10 Jul 2026



- The launch was also published by the news website of Sylvanitiy B.V., eiai.today on 23 May 2026:
<https://eiai.today/news/sylvan-ai-is-launched>



Managing Europe's forests requires navigating vast amounts of complex geospatial data, a process that typically demands specialized GIS expertise and a significant time investment. To solve this industry bottleneck, Netherlands-based Sylvanitiy B.V. has officially introduced SYLVAN-AI.

Billed as the "Chat-Enabled Forest Manager," the new platform is powered by cutting-edge GeoAI and the JackDaw conversational agent. Instead of toggling between multiple datasets and platforms, land managers, NGOs, and spatial planners can now interact with integrated spatial intelligence using plain language. For instance, users can seamlessly ask, "What environmental restrictions apply to this area?" to receive immediate, actionable insights.

The innovation has already gained significant European recognition following its recent selection in the PoliRuralPlus Enhance Call, which supports the validation of this technology across diverse European regions.

By reducing the time-to-insight from days to mere minutes, SYLVAN-AI aims to make evidence-based policy and sustainable land-use planning more accessible for decision-makers.

For a closer look at how this technology works, review the attached pamphlet or explore the platform directly at www.sylvan-ai.com.

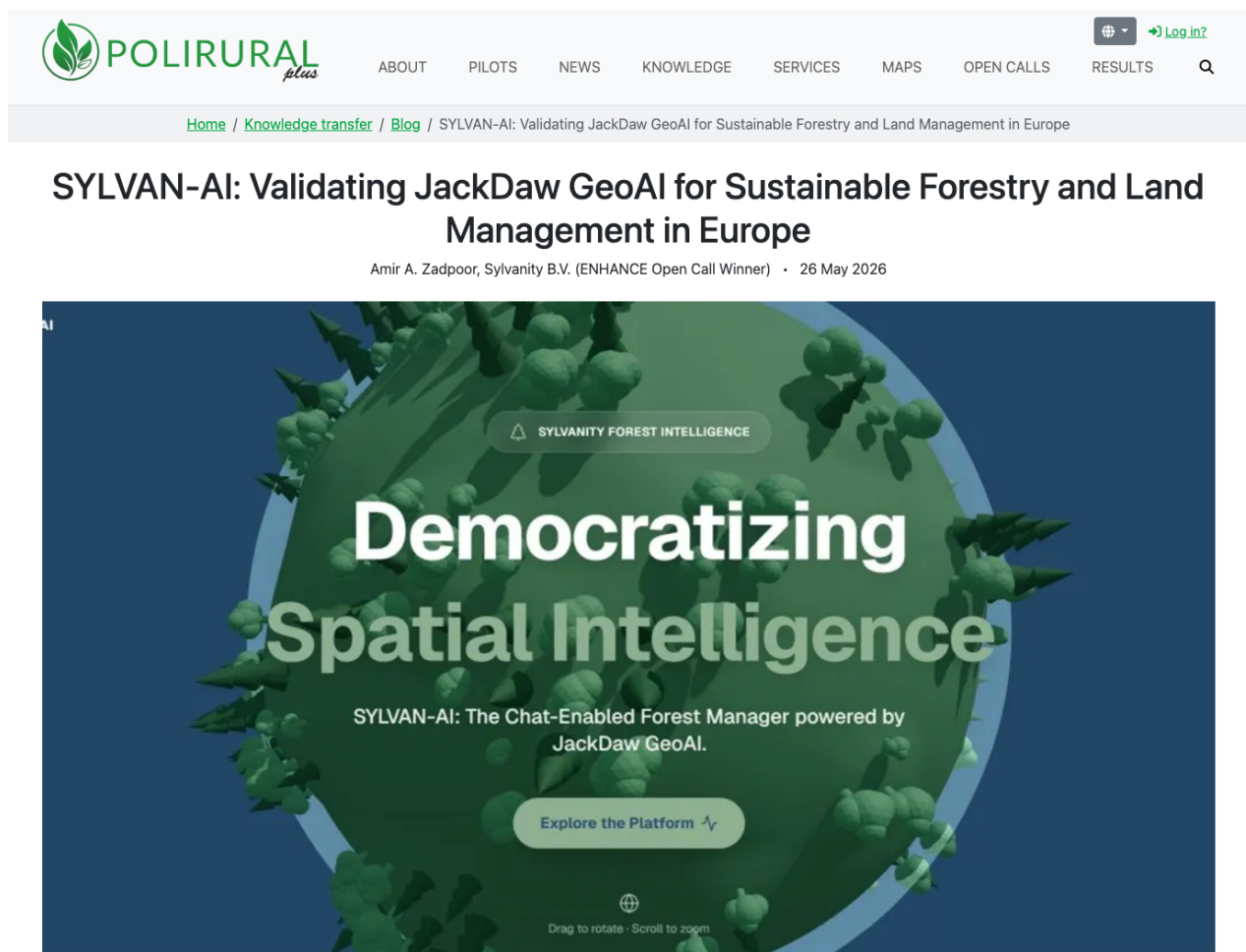
PoliRuralPlus has received funding from the European Union's Horizon Europe research and innovation programme under Grant Agreement No. 101136910. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

7.2. Blog posts

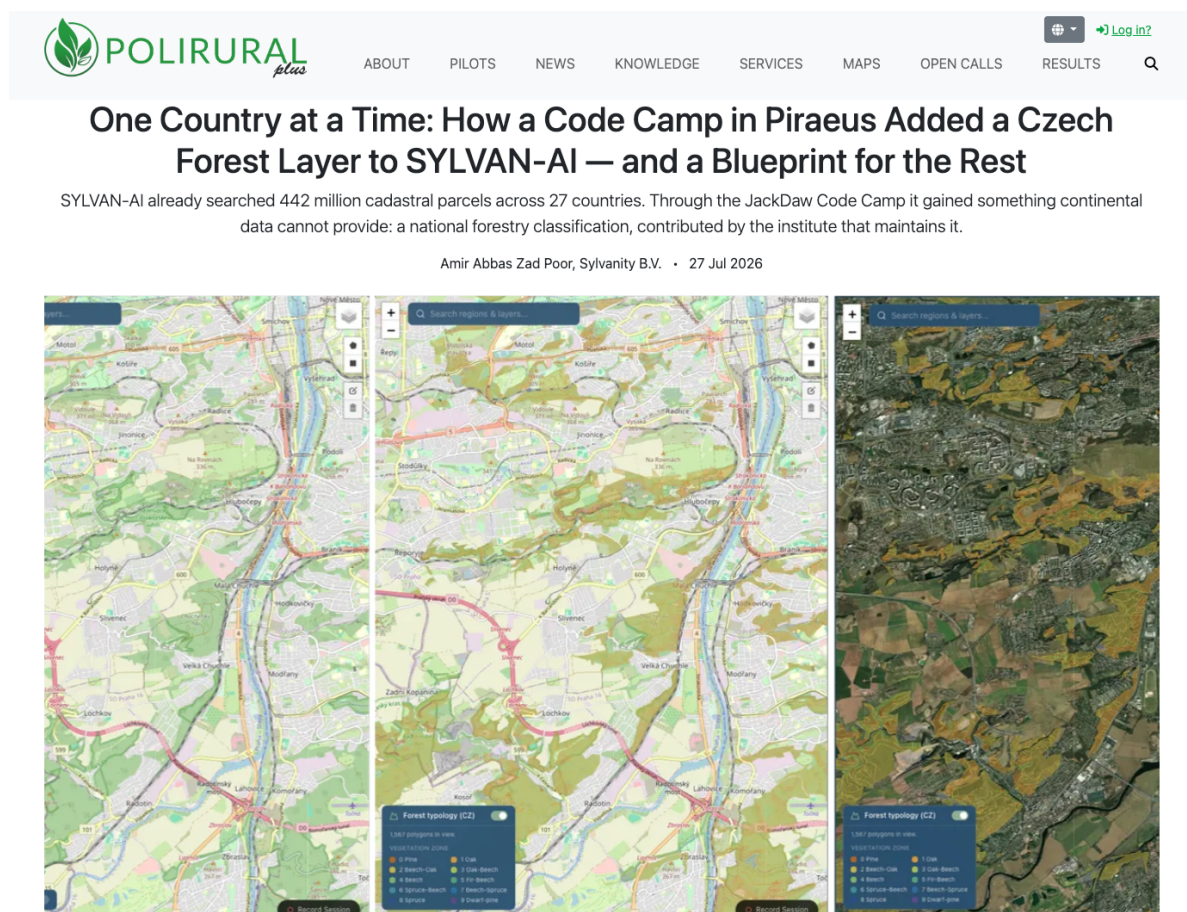
The required blog posts is satisfied twice over:

- The first PoliRuralPlus blog post was published on 26 May 2026, “SYLVAN-AI: Validating JackDaw GeoAI for Sustainable Forestry and Land Management in Europe”:

<https://www.poliruralplus.eu/knowledge-transfer/blog/sylvan-ai-validating-jackdaw-geoai-for-sustainable-forestry-and-land-management-in-europe/>



- The second PoliRuralPlus blog post was published on 27 July 2026, “One Country at a Time: How a Code Camp in Piraeus Added a Czech Forest Layer to SYLVAN-AI, and a Blueprint for the Rest”:
<https://www.poliruralplus.eu/knowledge-transfer/blog/one-country-at-a-time-how-a-code-camp-in-piraeus-added-a-czech-forest-layer-to-sylvan-ai-and-a-blueprint-for-the-rest/>



7.3. Social media posts

Beyond formal news articles and blog posts, social media was used to reach practitioner and consortium audiences directly and in near real time. Social-media summaries have been issued on Sylvaniti B.V. LinkedIn page and Reddit relevant communities:

- A launch-stage on LinkedIn post sharing the SYLVAN-AI announcement on 20 June 2026:
<https://www.linkedin.com/feed/update/urn:li:activity:7463942095951679502>



SylvanAI B.V.

385 followers

3mo • Edited •



Meet SYLVAN-AI: The Chat-Enabled Forest Manager

Developed by SylvanAI B.V. and supported by our selection in the [#PoliRuralPlus](#) Enhance Call, SYLVAN-AI is validating the power of JackDaw AI agent across diverse European regions to support sustainable rural development.

Europe's forests generate complex data that usually requires specialist GIS expertise to understand. SYLVAN-AI changes this by allowing you to interact with spatial information through simple, natural-language questions.

Check out the attached pamphlet to see how we are transforming complex geospatial data into clear insights for decision-makers in forestry and land management.

Visit, sign up, and explore: www.sylvan-ai.com

"PoliRuralPlus has received funding from the European Union's Horizon Europe research and innovation programme under Grant Agreement No. 101136910. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency. Neither the European Union nor the granting authority can be held responsible for them."

[#SylvanAI](#) [#PoliRuralPlus](#) [#GeoAI](#) [#SustainableForestry](#) [#JackDaw](#)
[#SylvanBV](#) [#GIS](#) [#ForestManagement](#)

SYLVAN-AI | 1 page

SYLVAN-AI
Where Artificial Intelligence Meets Sustainable Forestry

Transforming complex geospatial data into clear, actionable insights for Europe's forests and rural landscapes.

From Data Complexity to Natural Conversation
Europe's forests generate vast amounts of information, from satellite imagery and land-use records to biodiversity maps and protected-area datasets. Yet accessing meaningful insights often requires specialist GIS expertise and significant time investment.

SYLVAN-AI, developed by **SylvanAI B.V.** (Netherlands), was created to change that reality. Building upon cutting-edge GeoAI technologies and the conversational capabilities of the **JackDaw** generative AI agent, SYLVAN-AI enables users to interact with complex spatial information through simple, natural-language questions.

The innovation recently received significant European recognition through its selection in the **PoliRuralPlus Enhance Call**, supporting the validation of JackDaw across diverse European regions and demonstrating the potential of AI-powered decision support for sustainable rural development.

POLIRURAL
plus

JACKDAW

SylvanAI B.V.

WHO IS IT FOR?
Designed for Decision-Makers in Forestry & Land Management

Forest Owners: Quickly understand land conditions, opportunities, restrictions, and management scenarios.

Spatial & Rural Planners: Access integrated environmental intelligence without navigating multiple GIS systems.

Environmental NGOs: Explore biodiversity, conservation areas, ecological risks, and restoration opportunities.

Public Authorities & Regional Agencies: Support evidence-based policy and sustainable land-use planning with accessible geospatial insights.

THE CORE SOLUTION
The Chat-Enabled Forest Manager

Imagine asking:

- "Which protected habitats overlap with my forest parcels?"
- "What environmental restrictions apply to this area?"
- "Which locations offer the best opportunities for restoration?"

Instead of searching through multiple GIS platforms and datasets, users ask questions in plain language.

The SYLVAN-AI Dashboard combines satellite observations, cadastral information, environmental layers, and protected area datasets into a single conversational interface powered by advanced GeoAI technology.

Significant reduction in time-to-insight	Easier access to advanced geo AI	Improved transparency and understanding	Transferable Roadmap for Europe
Why SYLVAN-AI?	✓ Ask Questions Naturally: No specialist GIS knowledge required, simply chat with your data.	✓ Integrated Spatial Intelligence: Combine satellite imagery, cadastral records, environmental datasets, and protected area information in one place.	✓ Accelerated Decision-Making: Move from data discovery to actionable insight in minutes rather than days.
	✓ Scalable Across Europe: Built to support diverse forestry and rural management contexts through a replicable European framework.		

EXPERIENCE THE FUTURE OF FORESTRY INTELLIGENCE

VISIT, SIGN UP & EXPLORE:
www.sylvan-ai.com

- A LinkedIn post announcing Workshop B, the hands-on validation session on 11 July 2026:
<https://www.linkedin.com/feed/update/urn:li:activity:7482149617476857856>



Sylvanity B.V.
385 followers
1mo • Edited • 

...

Join our 2nd SYLVAN-AI workshop (Free) for a hands-on validation of the JackDaw GeoAI LLM!

We will explore real forest management scenarios and gather your practical feedback on the tool's clarity, usefulness, and trust.

SYLVAN-AI is developed by Sylvanity B.V. and supported by our selection in [#PoliRuralPlus](#) Enhance Call, SYLVAN-AI is validating the power of JackDaw AI agent across diverse European regions to support sustainable rural development.

Event details:

Date: Tuesday, 28 July 2026

Time: 2:00 PM - 3:00 PM (CET)

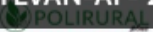
Format: Online via Microsoft Teams :

<https://lnkd.in/esgf8gUX>

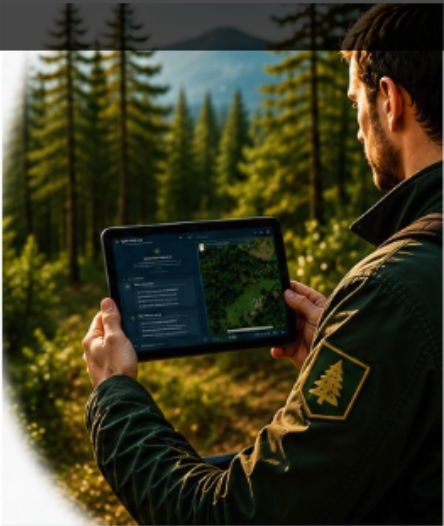
Register here: <https://lnkd.in/eVhSvJtG>

PoliRuralPlus has received funding from the European Union's Horizon Europe research and innovation programme under Grant Agreement No. 101136910. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

[#GeoAI](#) [#ForestManagement](#) [#SylvanAI](#) [#Innovation](#) [#Forestry](#) [#JackDaw](#)



SYLVAN-AI - 2nd Workshop · 1 page



SYLVAN-AI

2nd Workshop

Hands-on validation of JackDaw GeoAI LLM

Test SYLVAN-AI and give your feedback

Join us for the second SYLVAN-AI workshop to test JackDaw, explore forest management scenarios and share practical feedback on the tool.

**WHAT TO EXPECT**

- ✓ Hands-on testing of SYLVAN-AI
- ✓ Real forest management scenarios
- ✓ Feedback on clarity, usefulness and trust

Registration link:

**Date:**

Tuesday, 28 July 2026

**Time:**

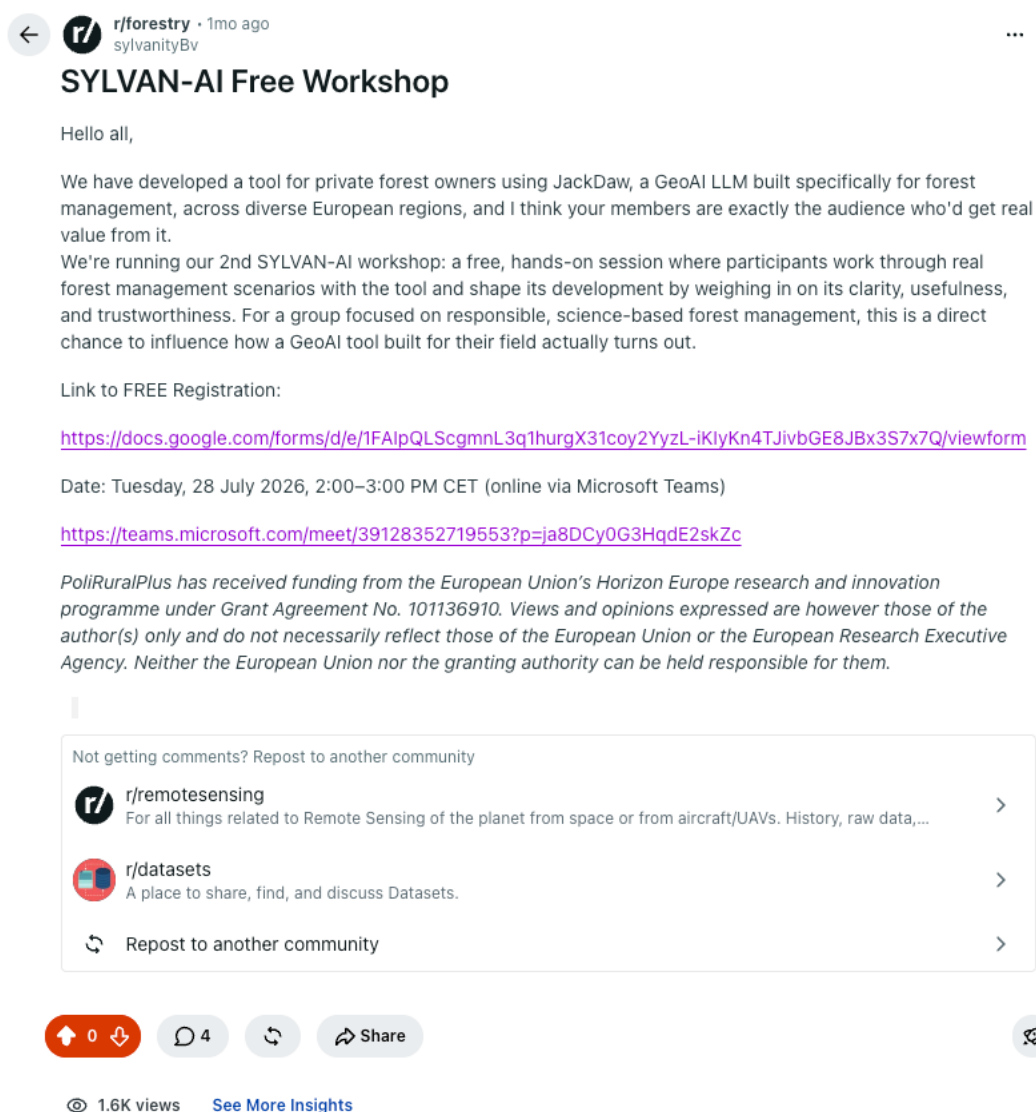
2:00 PM - 3:00 PM (CET)

**Format:**

Online via Microsoft Teams

- A Reddit post in the community of forestry announcing Workshop B, the hands-on validation session on 11 July 2026:

https://www.reddit.com/r/forestry/comments/1v0mtfq/sylvanai_free_workshop/



7.4. Events, demonstrations and presentations

In addition to written and online materials, SYLVAN-AI was presented and demonstrated directly to stakeholders across a series of in-person and online events:

- PoliRuralPlus JackDaw Code Camp, Piraeus/Athens (16–18 June 2026): presentation and live demonstration of the platform and its hybrid grounding architecture (Workshop A, §5.2.2).
- Direct stakeholder demonstrations: the platform was presented to the Federatie Particulier Grondbezit and the European Forest Institute (EFI) ahead of their respective validation sessions (§5.2.1, §5.3.1).
- Workshop B, Hands-On Validation of JackDaw GeoAI, online via Microsoft Teams (scheduled 28 July 2026): live testing and feedback session

7.5. Links to public materials

For ease of reference, the key public-facing resources described throughout this section are consolidated below:

- Live platform: <https://sylvan-ai.com/>
- Organisation: <https://sylvanity.eu/eu-projects/sylvan-ai>

7.6. Compliance with EU funding visibility requirements

The landing page and all reporting acknowledge that the project has received funding from the European Union's Horizon Europe programme as part of PoliRuralPlus, with the standard disclaimer that views expressed are the author's only and do not necessarily reflect those of the European Union or the granting authority.

8. Impact Assessment

8.1. Achieved impacts

The project was designed and carried out to help answer some of the main practical problems that land and forest owners face in effectively managing their properties, above all the need for easy access to the data required for sound decision-making, brought together in one platform. SYLVAN-AI goal is to create measurable impacts across five dimensions: technical, social, economic, environmental and policy.

On the technical side, the project has delivered a functional, grounded conversational GeoAI validated in a high-complexity domain, backed by 265 GB of standardised EU geodata and a no-hallucination guardrail designed to keep the critical-error rate below 5%.

Socially, spatial intelligence is now accessible to non-experts, including small forest owners, municipal staff and NGOs, through plain-language dialogue that lowers the skills barrier which has traditionally excluded them from digital forestry.

Economically, a decision that previously required cross-referencing three to four geoportals over hours or days can now be reached in a single conversation of minutes, against a target of at least 50% reduction in time-to-insight.

Environmentally, the tool supports sustainable forest management, EUDR and Green Deal reporting, protected-area compliance, and afforestation and carbon-potential assessment.

From a policy perspective, it provides grounded decision support for planners and conservation oversight, offering honest coverage reporting rather than confident guesses.

8.2. Evidence and indicators

The qualitative reception of SYLVAN-AI has been consistently positive wherever and whenever it has been presented. At the PoliRuralPlus JackDaw Code Camp, Karel Charvát, Project Manager and Representative of Plan4all within GEO, described the platform as a very interesting product after testing it, went on to contribute the Czech national forest typology dataset as a new grounding layer, and connected the team to a further validator, Karel Charvát jr. That session judged SYLVAN-AI's answers correct or partly correct throughout, with no critical hallucinations, specifically praising the platform for stating when it lacked the data to answer rather than guessing, and returned a System Usability Scale score of 72.5, above the project's target of 70. Direct outreach produced the same pattern: European Forest Institute and Federatie Particulier Grondbezit both found the platform very interesting, agreeing to present SYLVAN-AI at EFI's annual conference in October 2026. This consistent reception across code camps, direct demonstrations and outreach meetings points to strong stakeholder acceptance of the tool's core value proposition.

Workshop B, the hands-on validation session of 28 July 2026, added the first multi-participant measurements. Returning System Usability Scale scores a mean of 87.5 and well above the target of 70, and rating their willingness to recommend the platform at 7, 10 and 10 on a scale of 0 to 10. Nine answers were checked for accuracy across the

three sessions: none was judged incorrect and no critical hallucination was recorded, with a single answer flagged as only partially complete. Self-reported time-to-insight fell from 80 minutes by conventional means to 8 minutes in total, a reduction of roughly 90% against the 50% target. Participants named region selection with conversational follow-up as the most useful capability and described the interface as user-friendly, well organised and well illustrated.

8.3. Contribution to PoliRuralPlus KPIs

SYLVAN-AI operationalises the objective of cross-disciplinary collaboration and data-space leverage by turning 265 GB of previously siloed EU geodata into a single conversational access point. It advances the PoliRuralPlus objective of contributing to the European Green Deal by supporting EUDR and Green Deal reporting, protected-area compliance and sustainable forest management directly in-product. It also contributes to the PoliRuralPlus objective of expanding business and innovation opportunities in rural areas by giving forest owners a faster, lower-cost route to the decisions that drive land-management investment. Beyond these mappings, SYLVAN-AI contributes a validated third-party use case for JackDaw, a reusable pan-European data foundation, a new domain grounding layer, and actionable technical feedback, all supporting the ecosystem's maturation and uptake.

8.4. New European Bauhaus reflection

The New European Bauhaus (NEB) is the European Commission's initiative to connect the European Green Deal to people's everyday lives through three core values: sustainability, aesthetics and inclusion, pursued through a participatory, multi-level and transdisciplinary approach. This section reflects on how SYLVAN-AI addressed each value, both in the process by which the platform was built and in the outcome ultimately delivered.

In terms of sustainability, the process treated environmental cost as a design constraint from the outset, building EU-hosted, GDPR-compliant infrastructure and a preference for efficient local grounding over redundant computation into the architecture rather than retrofitting it. In outcome, the delivered platform actively promotes sustainable land management, giving forest owners the evidence base to make decisions that support responsible stewardship of EU forest resources.

In terms of inclusion, the process tested the platform directly with the non-expert users it was built for, forest owners, municipal staff and NGO representatives, through the workshops and validation sessions described in §5.2 and §5.3, and their feedback shaped its plain-language, region-neutral design. In outcome, the tool is translation-ready for any Member State and deliberately degrades honestly, stating what it does not know rather than excluding users through a technical failure, so non-experts remain inside the conversation rather than being gatekept by GIS expertise.

In terms of aesthetics, the process iterated the interface against real user feedback, including the System Usability Scale scoring described in §5.4, rather than designing it in isolation, so usability and visual clarity were validated rather than assumed. In outcome, a clean, calm map-and-chat interface makes complex geospatial reasoning approachable and even pleasant to use, embodying the NEB principle that functional public-good tools should also be well-crafted and welcoming.

9. Challenges, Risks and Lessons Learned

9.1. Key challenges encountered

9.1.1. Challenges during development

Development challenges centered on the reliability of the third-party services the platform depends on, the risk of a confident-but-wrong answer from a spatial-reasoning tool, the handling of personal data users might type into the

chat, and the sheer heterogeneity of the underlying geospatial data. Each is set out below, together with how it surfaced.

- Upstream service instability: a systematic endpoint audit in April 2026 found that several hosted JackDaw services SYLVAN-AI depends on had degraded, been withdrawn or silently renamed since integration, well before the problems were visible to end users. The Eurostat demography and business proxies returned 502 errors, the Magpie catalogue search returned 500, and ETOPO5 returned empty payloads instead of elevation data; the service-registry endpoint used to discover which tools were live was removed entirely (404), forcing a fallback to a hard-coded tool list, and the admin-units WKT lookup was silently renamed without a deprecation notice. Most seriously, the policy-advisor endpoint's error body echoed an upstream API key verbatim, and the Vulture family's profile endpoints took roughly 60 seconds to fail rather than erroring out quickly, intermittently blocking sign-in.
- Hallucination risk: a confident wrong answer on a spatial question is the single most damaging failure mode for a grounded GeoAI, so the platform could not rely on the underlying language model's default tendency to extrapolate or guess when local data was missing or incomplete; it had to be constrained to recognise the limits of its own knowledge and say so honestly.
- GDPR/PII: users may type personal data into the chat, including names, e-mail addresses, phone numbers, tax and ID numbers, IBANs and card numbers, none of which the platform may pass to the language model or retain in conversation logs.
- Data coverage and harmonisation at scale: assembling the project's 265 GB pan-European geospatial foundation meant integrating 27 national cadastral systems and multiple Copernicus/EEA/ISRIC products, each arriving with different schemas, projections and access methods, and reconciling them into a single, queryable layer.

9.1.2. Challenges in dissemination

The main dissemination challenge was less technical than behavioural: reaching and holding the attention of the stakeholders the platform is meant to serve.

- Stakeholder fatigue: rural stakeholders are project-fatigued from years of EU pilot, survey and consultation activity, which made recruitment for validation sessions and completion of feedback forms harder to secure than the workplan assumed.

9.2. Risk-mitigation actions

9.2.1. Mitigating development challenges and risks

Each development challenge in §8.1.1 was met with a corresponding mitigation, set out below in the same order.

- Upstream service instability: the local PostGIS grounding layer removed the single-point dependency on hosted tools, all hosted-data features degrade gracefully to neutral notes rather than failing outright, request timeouts and a 4-second cap on the sign-in profile call prevent upstream slowness from blocking the app, and secrets are redacted from error bodies in-flight.
- Hallucination risk: a no-hallucination guardrail and a 0–100 confidence score constrain and expose answer reliability, so the platform states what it does not know rather than guessing.
- GDPR/PII: personal data is stripped at the input boundary before any text reaches the model or is persisted.
- Data coverage and harmonisation at scale: per-country loaders and EPSG:4326 normalisation harmonise the disparate national and pan-European datasets into a single queryable layer.

9.2.2. Mitigating dissemination challenges and risks

The dissemination challenge in §8.1.2 was addressed through recruitment design combined with multi-channel outreach, drawing on every practical channel available to the team. To counter stakeholder fatigue and secure participation, the team used all available outreach routes, sending personal emails and using public contact forms (§5.2.1), participating in and presenting at conferences such as the PoliRuralPlus JackDaw Code Camp (§5.2.2), organising an online validation webinar (§5.2.3, Workshop B), messaging forestry groups directly on LinkedIn, posting in relevant Reddit communities, and drawing on team members' own personal and professional networks to reach forest owners, municipal planners and NGOs directly. Workshops were also framed as digital-skills training rather than project consultations.

9.3. Lessons learned

The lessons that emerged from building and validating SYLVAN-AI fall into three categories: technical, organisational and stakeholder-related. Each is set out below, together with why it matters for future JackDaw-based deployments.

9.3.1. Technical lessons

The clearest technical lesson concerns how to ground a GeoAI reliably, rather than how to make it sound convincing.

- Deterministic spatial SQL over semantic retrieval: for geometry-keyed questions, such as protected areas, terrain, soil, fire weather, cadastre, land cover and forest typology, deterministic spatial SQL evaluated against the exact geometry the user drew (§3.2.1) is more accurate and more trustworthy than vector or semantic retrieval, which can return a plausible but imprecise match.
- Resilience through hybrid grounding: a resilient product cannot depend on a single external API. The hybrid retrieval architecture, which pairs JackDaw's hosted intelligence with the local PostGIS grounding layer (§3.2.1), meant that when a hosted service was temporarily unavailable the five core journeys stayed fully functional, with the failure surfaced as a neutral notice rather than an error.

9.3.2. Organisational lessons

The main organisational lesson was about timing: catching upstream fragility early is far cheaper than discovering it in front of a stakeholder.

- Early, repeated endpoint audits: the systematic endpoint audit run in April 2026 (§2.4.2), which uncovered failures across the Eurostat, Magpie, ETOPO5, service-registry, admin-units and policy-advisor endpoints before they were visible to end users, showed that a systematic audit, run early and repeated regularly, turns upstream fragility into actionable engineering feedback and protects the delivery timeline, rather than into last-minute firefighting.

9.3.3. Stakeholder-related lessons

The clearest stakeholder-related lesson was that honesty about the tool's limits is itself a trust-building feature, not a weakness to hide.

- Honest "no data here" responses build more trust with domain experts than plausible but unverifiable answers, a pattern confirmed directly in validation: Karel Charvát jr, testing the platform against real plots, specifically praised it for stating when it lacked the data to answer rather than guessing (§5.3, §7.2).

9.4. Recommendations for future projects or scaling

Above mentioned lessons translate into seven concrete recommendations for future JackDaw-based deployments and for scaling SYLVAN-AI itself, spanning technical design, platform operations and the underlying knowledge base.

1. Design for graceful degradation from day one: build every feature so that a temporarily unavailable upstream service degrades to a neutral notice rather than a hard failure, instead of retrofitting resilience after an outage has already affected a stakeholder demo.
2. Keep a local grounding layer for mission-critical facts: for the classes of question, protected areas, terrain, soil, fire weather, cadastre, land cover and forest typology, that the platform must answer reliably, hold the authoritative data locally rather than depending entirely on a hosted third-party service.
3. Publish endpoint changelogs and rotate credentials promptly: on the provider side, any change to a hosted endpoint's availability, schema or naming should be published proactively, and credentials should be rotated on a fixed schedule rather than only after an incident.
4. Restore or formally retire the Vulture and Eurostat endpoints identified as failing in the April 2026 audit (§2.4.2), so integrators are not left depending on services that no longer work.
5. Sanitise upstream error bodies so that a failing service can never leak a credential, such as the API key exposed by the policy-advisor endpoint during the audit, back to the client.
6. Expose a stable, versioned tool contract for JackDaw's hosted services, so that a schema or naming change is a documented version bump rather than a silent break.
7. Collect and integrate country-specific supplementary data via knowledge graphs and ontologies: the experience of Karel Charvát contributing the Czech national forest typology dataset (§7.2) showed the value of country-level data that goes beyond the pan-European baseline, whether regulatory text, topology and land-classification schemes, or other locally held datasets. Sylvania B.V. already has the capability to add and integrate this kind of data into SYLVAN-AI using knowledge-graph and ontology techniques; doing so systematically, country by country, would substantially reduce hallucination risk while adding a large and valuable source of grounded local knowledge to the platform.

10. Sustainability, Replicability and Next Steps

10.1. Sustainability of results

SYLVAN-AI is engineered to remain operational, and cheap to operate, long after the funding period ends, for the following reasons:

- Lean, self-contained infrastructure: the platform runs as a single production instance, a Dockerised stack of the Next.js/React application, PostgreSQL 16 with the PostGIS 3.4 extension holding the 265 GB EU-standard geodata foundation, and an Nginx reverse proxy behind Cloudflare, all on one EU-hosted virtual machine.
- Open-source, no licence fees: the stack is built entirely on openly licensed data and open-source software, with no proprietary licence fees to renew.
- No per-region fork: because the platform does not need to be forked for each new deployment, the only recurring cost of onboarding a new region is local-language translation.
- Data stays current: the data-provenance register, together with documented, reproducible loaders, keeps every layer refreshable as source authorities publish updates, so the platform does not silently go stale once the project team moves on.

10.2. Replication potential

Replication is not theoretical: the Transferability Roadmap already sets out a six-week rollout playbook and two fully worked regional adaptations. Vidzeme in Latvia, with a forest-bioeconomy emphasis, and Central Greece (Sterea Ellada), with a wildfire-safety and agritourism emphasis, each specify the local datasets required, the stakeholders to target, which of the five guided journeys to foreground, and a region-specific Golden Set for validation, with each region paired with a regional research institution to provide scientific credibility. Because the five journeys and seven grounding layers were built region-neutral and pan-European from the outset, this same workflow replicates to any EU member state by supplying a boundary polygon and a set of localised strings, without a software branch or a rewrite.

10.3. Scalability

Scale is built into the data model, not bolted on afterwards, for the following reasons:

- Pan-European foundation: the platform already stands on a 27-country, 442-million-parcel cadastral foundation and seven pan-European grounding layers.
- Unified data access: a single `cadaster_eu` view abstracts away the 27 underlying national systems, so scaling horizontally to further pilots requires no code rewrite, only a new boundary polygon against the same template journeys.
- Open interoperability: external tools and data connect through open standards, OGC services, INSPIRE, OAuth2, and Model Context Protocol support for further tool servers, so the platform can absorb new capabilities without a rebuild.
- Incremental national layers: national domain layers, such as the Czech forest typology contributed during validation (§7.2), can already be added incrementally using the documented loader pattern.
- Knowledge-graph pathway: the knowledge-graph and ontology approach recommended in §8.4 would extend this further, turning country-by-country regulatory and classification data into additional grounding layers at scale rather than one-off additions.

10.4. Exploitation opportunities

PoliRuralPlus is the initial go-to-market channel and pilot footprint, but the exploitation path extends well beyond it. SYLVAN-AI directly can be exploited as a commercial forestry decision-support service, with the harmonised, openly licensed EU data foundation and the grounded-GeoAI architecture as its core differentiators against generic chatbot competitors, and translation plus stakeholder training as the service layer built on top of a low-cost, single-instance infrastructure. The harmonised data foundation, the new forest-typology layer, the Transferability Roadmap and the JackDaw hardening backlog all remain available and reusable assets.

10.5. Contribution to future PoliRuralPlus development

The action leaves PoliRuralPlus with more than a working pilot: it returns a validated third-party use case for JackDaw, a reusable pan-European data foundation, a new domain grounding layer, a living Transferability Roadmap, and a concrete, itemised endpoint-hardening backlog, renamed and proxy-failing hosted endpoints, a catalogue-search service failing on every query, a policy-advisor endpoint that leaked a live API key in its error response, and a profile endpoint that could block sign-in for roughly sixty seconds, each paired with the client-side mitigation SYLVAN-AI had to build around it. Converting one third party's real-world usage into an actionable list of JackDaw stability and security fixes is itself a durable contribution to the ecosystem's next iteration, and the knowledge-graph and ontology approach proposed in §8.4 offers a concrete next step for how future PoliRuralPlus actions could keep extending JackDaw's grounding layer country by country.

11. Conclusions

11.1. Overall assessment

SYLVAN-AI successfully delivered a working, publicly accessible, grounded conversational GeoAI for European forestry, validating JackDaw in one of the most data-intensive rural domains it has yet been tested against. Against the four objectives set out in the approved proposal, technical validation across five geospatial layers, user-centric usability testing with SUS scoring, demonstrated added value through faster time-to-insight, and a strategic replicability roadmap, the action delivered a functioning product, real stakeholder validation and a route to replication, turning the fragmented, geoportal-by-geoportal decision process described in §1.1 into a single conversational entry point. The action met its core objectives, insulated itself effectively against upstream instability through the hybrid retrieval architecture and a systematic endpoint-hardening effort, and produced both a strong demonstrator and a set of durable, reusable assets for the wider PoliRuralPlus ecosystem.

11.2. Key achievements

- A live platform (<https://sylvan-ai.com>) behind PoliRuralPlus single sign-on, with five functional guided journeys.
- A 265 GB, seven-layer EU grounding foundation including 442.3 million cadastral parcels across 27 countries and a new national Czech forest typology (949,358 polygons), assembled from harmonised Copernicus, INSPIRE and national data sources.
- A hybrid retrieval architecture fusing JackDaw's hosted tools with local PostGIS grounding, protected by a no-hallucination guardrail with a 0–100 confidence score and input-boundary PII stripping, so the platform keeps answering even when an upstream service fails.
- A built-in validation framework (standardised form with SUS, accuracy audit, Golden-Set benchmark, session recording) and a systematic JackDaw endpoint audit that turned real-world usage into a concrete hardening backlog for the wider ecosystem.
- A Transferability Roadmap to the Vidzeme (Latvia, forest-bioeconomy) and Central Greece (wildfire-safety and agritourism) pilots, each with local datasets, stakeholder targeting and a region-specific Golden Set already defined.
- Consistently positive stakeholder reception, with a mean SUS of 87.5 against the project's target of 70, no incorrect answers or critical hallucinations in the accuracy checks, a time-to-insight reduction of roughly 90% reported in Workshop B, and direct positive feedback from involved stakeholders.

11.3. Strategic value

The results show that conversational, grounded GeoAI is a credible route to democratising spatial intelligence for the people who manage Europe's land: replicable across member states via the Transferability Roadmap, resilient to upstream change through its hybrid grounding architecture, and aligned with EUDR, Green Deal and New European Bauhaus objectives. Because it runs on a single, low-cost, open-source infrastructure with no proprietary licence fees and no per-region fork to maintain, the platform's value extends well beyond the funding period: as a reusable framework and a validated contribution to the PoliRuralPlus ecosystem, as a commercial forestry decision-support service Sylvania B.V. can take to market directly, and as a growing, country-by-country knowledge base if the knowledge-graph and ontology approach proposed in §8.4 is pursued.

Annexes

Annex A: PoliRuralPlus Technical Validation Questionnaire

Validation of PoliRuralPlus Technical Ecosystem Concepts, Tools & Components.

Questions can be given as simple statements or sentences where suitable. It is not necessary to provide a comprehensive text. Where the question is irrelevant to the project, state **N/A**.

The technologies covered under this questionnaire include:

- Jackdaw GeoAI chatbot
- PoliRuralPlus Advisor
- RAG/GeoRAG
- Vulture
- Data harmonization tools and pipelines
- Data publishing concept

Participation in Webinars (initial Training Sessions)

1. Which PoliRuralPlus technical sessions did members of your project attend or review recordings of? Indicate: Attended live / Watched recording / Not reviewed.

Response: The team reviewed the JackDaw and PoliRuralPlus technical materials and the API documentation, and participated in the PoliRuralPlus JackDaw Code Camp (Athens, online session, 17 June 2026).

2. Which sessions were most relevant to your project?

Response: The JackDaw GeoAI chatbot, RAG/GeoRAG and data-publishing sessions were most relevant, as SYLVAN-AI is built directly on JackDaw's tool-using GeoLLM and grounding paradigm.

Awareness and Understanding of the PoliRuralPlus Ecosystem

3. Were you aware of the Jackdaw ecosystem and related tools before participating in the cascade funding activities in PoliRuralPlus?

Response: Awareness came through the Enhance Open Call; the team engaged deeply with JackDaw during the action, integrating it as the core reasoning engine.

4. Which ecosystem components are you familiar with

Response: JackDaw GeoAI chatbot (streaming chat and spatial tools), RAG/GeoRAG, Vulture (chat history, lab notebook, profile, resources), the PoliRuralPlus OAuth2 identity provider, admin-units, and the Eurostat/attractiveness/policy-advisor data services.

5. Briefly describe how you understand the purpose of the Jackdaw ecosystem within PoliRuralPlus.

Response: JackDaw is the PoliRuralPlus engineering platform for tool-using GeoLLMs, combining large language models with geospatial dataset discovery and retrieval so that AI outputs are grounded in real data, spatial constraints and traceable processes.

Actual Testing or Validation

6. Did your project test or experiment with any ecosystem technologies?

Response: Yes. JackDaw and several ecosystem components were tested extensively, both through internal stress-testing and through a production application used in structured validation sessions.

7. Which components were actively validated in your project work?

Response: Actively validated: JackDaw streaming/non-streaming chat; terrain (gisco-eudem), climate (WorldClim), land cover (GLCC), SPOI and admin-units tools; PoliRuralPlus OAuth2 SSO. Also exercised and audited: demography/business, policy-advisor, Magpie, service-registry, ETOPO5 and the Vulture family.

8. Describe how the technologies were tested (internal testing, integration, stakeholder demos, pilot studies, evaluation exercises).

Response: Internal testing and a full endpoint audit; integration into a production application; stakeholder demonstrations and guided-journey pilot sessions; two structured validation sessions with external stakeholders (15 July 2026, and Workshop B on 28 July 2026 with participants testing the live platform themselves); and an accuracy-audit and Golden-Set benchmark instrumented inside the product.

Technical Implementation

9. Did you implement or configure any of the technologies provided in the form of services, custom plugins/services, local deployment, RAG/GeoRAG pipelines, data harmonization workflows, data cubes, pipelines, or data publishing?

Response: Yes. We integrated JackDaw as a service (chat + tools) via API, implemented PoliRuralPlus OAuth2 SSO, built a custom hybrid RAG/GeoRAG pipeline (JackDaw tools plus a local PostGIS grounding layer), and performed large-scale data harmonisation and publishing.

10. If yes, describe the technical architecture used (local deployment, cloud deployment, integration with existing systems, API-based integration).

Response: Containerised cloud deployment on EU-hosted infrastructure (application, PostGIS database and reverse proxy). API-based integration with JackDaw using OAuth2 client-credentials and user tokens. A local-context engine detects seven spatial intents and runs deterministic PostGIS queries that are injected into the JackDaw chat context, alongside a no-hallucination guardrail and input-boundary PII stripping.

11. Did you develop new services or extensions? If yes, describe.

Response: Yes: a hybrid local-grounding engine (seven intents over 265 GB of PostGIS geodata); a new national Czech forest-typology grounding layer with a Region-panel tab and a viewport-tiled map overlay; a validation/accuracy-audit/benchmark suite; and reproducible country data loaders.

Use Cases and Policy Applications

12. In which domain did you apply Jackdaw ecosystem technologies (e.g., rural planning, agriculture, land management, climate monitoring, policy analysis, community participation, state your own sector as you see fit)?

Response: Forestry and rural land management, spanning land management, climate/fire monitoring, conservation compliance and policy-relevant decision support.

13. Did the tools support policy intelligence or decision-making processes?

Response: Yes. The tool supports decision-making for forest owners, municipal planners and NGOs, e.g. protected-area compliance (Natura 2000), fire-risk assessment, land-cover change and afforestation potential.

14. Did you use any of the technologies provided to analyse policy scenarios?

Response: Partly. Natura 2000 overlap/negation and land-cover-change analyses support regulatory scenarios (EUDR, Green Deal, protected-area rules); the hosted policy-advisor endpoint was audited but found degraded and handled gracefully.

15. Did you use any of the provided concepts for collaborative planning or stakeholder interaction?

Response: The platform supports stakeholder interaction through guided journeys, a shared conversational interface and a validation instrument; collaborative planning is a natural next step.

16. Did you experiment with RAG or GeoRAG approaches for knowledge retrieval?

Response: Yes, extensively. SYLVAN-AI implements a hybrid GeoRAG: JackDaw's semantic tool retrieval combined with deterministic, geometry-keyed spatial retrieval from a local PostGIS layer, chosen because exact spatial intersection is more accurate than vector similarity for geometry-keyed data.

Data and Knowledge Integration

17. Did your project publish any datasets?

Response: The project harmonised and hosts a large pan-European geodata foundation and produced a new integrated Czech forest-typology grounding layer plus a documented provenance register; these are reusable assets rather than a public open-data release under this action.

18. Did you perform data harmonization to make datasets compatible with the ecosystem?

Response: Yes, at scale: 27 national cadastral systems and multiple Copernicus/EEA/ISRIC/NASA products were reprojected to EPSG:4326, normalised to a common schema (a unified cadaster_eu view over 41 tables), and made queryable through one interface.

19. Did you create or use centrality datasets for rural network analysis?

Response: No centrality/network-analysis datasets were used in this action; the focus was spatial grounding for forestry decisions.

20. Did you use the data cube or centrality measures approaches to process spatial or temporal data?

Response: No; the project used PostGIS spatial queries (vector and raster) rather than the data-cube or centrality approaches.

Evaluation and Feedback

21. What aspects of the technologies worked well?

Response: JackDaw's streaming chat and its terrain, climate, land-cover, SPOI and admin-unit tools worked well and integrated cleanly; the GeoRAG paradigm and PoliRuralPlus SSO were a good fit; grounded answers with drawn geometry were spatially accurate and traceable, with no incorrect answers and no critical hallucinations recorded across the validated sessions.

22. What limitations or challenges did you encounter?

Response: Several hosted endpoints were degraded, withdrawn or silently renamed (Eurostat demography/business 502; policy-advisor 500 with a leaked OpenAI key; Magpie 500; service-registry 404; ETOPO5 empty; Vulture unreliable, with the profile call taking ~60 s to fail and once blocking sign-in). We mitigated all of these locally.

23. Did stakeholders or users provide feedback during testing? Summarize key insights.

Response: Yes. Early tester feedback drove UI/UX improvements and the addition of five features (no-hallucination guardrail, PII stripping, land-cover change, and the Conservationist and Carbon Estimator journeys). Testers valued getting multi-portal answers in a single conversation and the honest reporting of coverage gaps. Across the two structured validation sessions, validation forms returned System Usability Scale scores with overall a mean of 84.4 against a target of 70, no incorrect answers and no critical hallucinations, and a time-to-insight reduction of roughly 90%. Region selection with conversational follow-up was named the most useful capability, while the main substantive gap identified was the absence of national and local legal context. Consortium and outreach feedback ran in the same direction: the Code Camp contact tested the platform independently and contributed the Czech national forest typology dataset that became the seventh grounding layer, the European Forest Institute agreed to explore a presentation slot at its annual conference in October 2026, and Federatie Particulier Grondbezit requested a follow-up session.

Evidence of Validation

24. Provide evidence if available (screenshots, demo videos, reports, evaluation results, prototypes, repositories – you may paste text or images here, supply links for documents or videos or web resources).

Response: Evidence includes:

- the live platform at <https://sylvan-ai.com> (PoliRuralPlus login);
- the private repository github.com/amiracoder/sylvan-ai;
- the in-app validation forms completed submissions from the two validation sessions, one is copied here:

A new evaluation form was submitted on SYLVAN-AI.

Submitted: 2026-07-15T11:58:53.100Z

Response ID: 4

User: 3d3914bc-ce87-4b6b-b9d1-baa176e4587c

Stakeholder: forest_owner (intermediate)

Region: Czech republic, The area of Interest is MATějov in Žďár nad Sázavou district.

Session type: remote

Journey tested: other

SUS score: 72.5

Would recommend (0–10): 7

Accuracy: 7 tested — 5 correct, 2 partial, 0 incorrect, 0 critical hallucination(s)

Time-to-insight: 0 min vs 0 min traditional

SUS answers (q1–q10): 4, 2, 4, 2, 4, 2, 4, 2, 4, 3

Most useful: Ability to get answers relevant for my area of interest based on natural language.

Biggest frustration: Missing data sets and legislation context to get some more complex answers.

Comments: I think the system has very good potential but it need more data and context (like legislation related to forestry) to give answers which help to solve practical problems

- The accuracy-audit and benchmark dashboards; the documented endpoint audit; the data-provenance register;

- the Code Camp presentation; and further the two published PoliRuralPlus blog posts (26 May 2026 and 27 July 2026):
 - The first PoliRuralPlus blog post was published on 26 May 2026, “SYLVAN-AI: Validating JackDaw GeoAI for Sustainable Forestry and Land Management in Europe”:
<https://www.poliruralplus.eu/knowledge-transfer/blog/sylvan-ai-validating-jackdaw-geoai-for-sustainable-forestry-and-land-management-in-europe/>
 - The second PoliRuralPlus blog post was published on 27 July 2026, “One Country at a Time: How a Code Camp in Piraeus Added a Czech Forest Layer to SYLVAN-AI, and a Blueprint for the Rest”:
<https://www.poliruralplus.eu/knowledge-transfer/blog/one-country-at-a-time-how-a-code-camp-in-piraeus-added-a-czech-forest-layer-to-sylvan-ai-and-a-blueprint-for-the-rest/>

Future Potential

25. Would you consider continuing to use technologies like the PoliRuralPlus ecosystem after the project? (yes, no, why/why not)

Response: Yes. The ecosystem is a strong fit for grounded GeoAI applications; we intend to continue using and extending it, replicate to further pilot regions, and exploit the platform commercially, provided the hosted endpoints are stabilised.

26. Which of the components you have used or assessed have the highest potential for further exploitation?

Response: Highest exploitation potential: the JackDaw GeoAI chatbot and the RAG/GeoRAG paradigm, complemented by local spatial grounding; PoliRuralPlus SSO; and the data-harmonisation/publishing pipeline.

27. What improvements would make the ecosystem more useful?

Response: Stabilise and version the hosted endpoints (restore or formally retire Vulture and the Eurostat proxies); sanitise upstream error bodies and rotate the leaked provider key; publish endpoint-rename changelogs; and offer a documented, low-friction path to ingest custom regional layers into JackDaw’s retrieval.

Annex B: Demonstrating Added Value of SYLVAN-AI for Decision-Making (Objective 3)

B1. The Objective

This annex provides the evidence required to demonstrate that Objective 3 of the SYLVAN-AI project has been achieved. The objective, as stated in the approved proposal, is:

Objective 3: To produce 5-10 documented "Success Cases" where JackDaw provided information that would have otherwise taken the user significantly longer to find or required external consultancy. We will measure this by comparing the "Time-to-Insight" using JackDaw versus traditional methods (e.g., searching geoportals or PDF maps), aiming to demonstrate a time reduction of at least 50%. This objective validates the economic and efficiency impact of the tool.

Below we present five documented success cases from forests across the parts of Europe that SYLVAN-AI covers. Each case takes a real question that a forest owner or planner needs answered, and compares (a) obtaining the answer with SYLVAN-AI against (b) obtaining the same answer through the traditional route of searching official geoportals and reading map/PDF documents. For the traditional route we set out the concrete steps a typical, non-expert small-scale forest owner would have to take, assign a reasonable time to each step, and aggregate.

B2. Method and Assumptions

Who is the user?

The reference user is a typical small-scale forest owner or a municipal officer with ordinary computer skills but no GIS training, the exact audience the project targets, and the audience for whom the data is otherwise hard to reach. Times assume this user, working carefully but without specialist tools.

How the two routes are timed

- SYLVAN-AI route: the user signs in once with a PoliRuralPlus account, draws the plot on the map (~30–60 s), types a plain-language question (~15 s), and reads the grounded, source-cited answer (~20–40 s). A full grounded answer therefore takes roughly 2 minutes from an active session; follow-up questions about the same plot take seconds because the area is already drawn.
- Traditional route: the user must find the plot on an official cadastre portal, open one or more separate thematic geoportals (protected areas, terrain, soil, fire, land cover), visually reconcile maps that do not share a common parcel overlay or projection, read the relevant map legends or PDF data forms, and compile the result by hand.

Why the two routes reach the same facts

SYLVAN-AI is grounded in the same authoritative datasets that the public geoportals expose: EEA Natura 2000 (end-2024), Copernicus DEM GLO-30, ISRIC SoilGrids, NASA GFWED / EFFIS fire weather, Copernicus CORINE Land Cover, national cadastres, and the ÚHÚL Czech forest typology. The two routes therefore arrive at the same underlying data, the only difference is the effort required to obtain it. This is what makes the comparison fair.

On the numbers

The per-step times are transparent, reasoned estimates, not stopwatch measurements; they are deliberately kept conservative for the traditional route. As shown in Section B4, the conclusion is robust: even if every traditional estimate were halved and every SYLVAN-AI time doubled, the time reduction would still far exceed the 50% target.

B3. The Five Success Cases

Success Case 1: Natura 2000 compliance before harvesting

Location: A private forest plot in the Šumava (Bohemian Forest), Czech Republic.

User / journey: Forest owner, “The Compliant Owner”.

Data used: Cadastre · Natura 2000 sites, protected species and habitats.

Question: “Is my forest plot inside a Natura 2000 site, and which protected species and habitats are recorded there?”

With SYLVAN-AI: the owner draws the plot and asks the question. In one grounded answer the assistant lists the overlapping Natura 2000 site(s) with their codes and overlap area, the protected bird and other species recorded for those sites, and (if the plot is outside) the nearest site and its distance. Estimated time: ~2 minutes. Figure B-1 shows the performance of SYLVAN-AI for the success case 1.

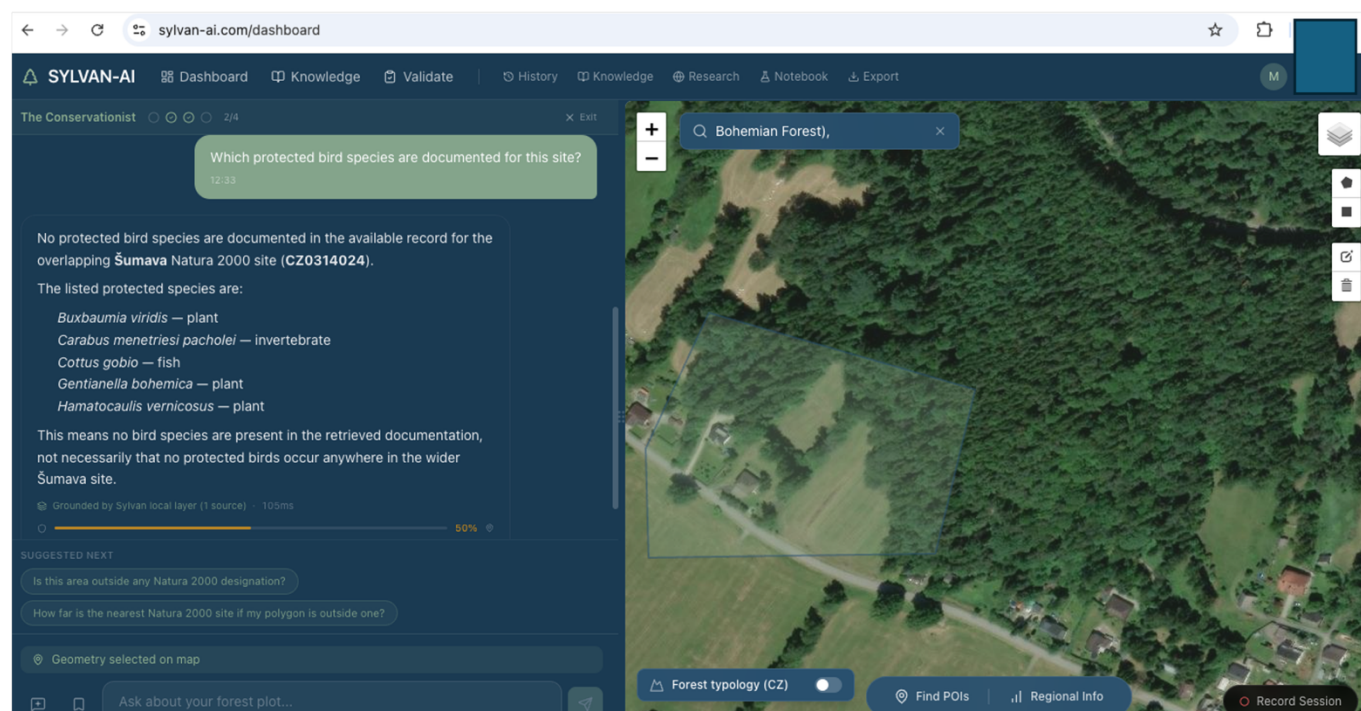


Figure B-1 SYLVAN-AI Performance – Success Case 1

Finding the answer for Success Case 1 requires as a minimum the time and effort as shown in Table B-1.

Table B-1 Traditional Methode - Time and Effort for Succes Case 1

Step a forest owner must take	Real tool / geoportal	Est. time
Find the plot and its exact location / parcel number	ČÚZK — Nahlížení do katastru nemovitostí (nahliznidokn.cuzk.gov.cz)	12 min
Find whether the plot overlaps a Natura 2000 site and identify the site code	EEA Natura 2000 Viewer (natura2000.eea.europa.eu)	12 min
Reconcile the two maps by eye (no shared parcel overlay / different systems)	Both portals, side by side	8 min
Open the site's Standard Data Form and read the protected species and habitats	Natura 2000 Standard Data Form (PDF, per site)	18 min
Cross-check national protected-area designations and compile the answer	AOPK ČR nature-protection portal (drusop.nature.cz)	10 min
Total traditional method		60 min

Result:Traditional method $\approx$ 60 minSYLVAN-AI $\approx$ 2 minTime saved $\approx$ 58 min $\rightarrow$ **97% reduction in time-to-insight.****Success Case 2: Summer fire risk and terrain for a district****Location:** A forested slope on the island of Evia (Euboea), Central Greece, a region hit by major wildfires in 2021.**User / journey:** Municipal planner — “The Climate-Aware Planner”.**Data used:** Fire Weather Index (FWI) · terrain (elevation, slope, ruggedness).**Question:** “What is the summer fire-weather risk here, and how steep and high is the terrain?”

With SYLVAN-AI: the planner draws the area and asks. The assistant returns the latest and summer-peak Fire Weather Index with its danger class, plus mean/min/max elevation and mean/maximum slope for the exact area, in a single grounded answer. Estimated time: $\sim$ 2 minutes. Figure B-2 shows the performance of SYLVAN-AI for the success case 2.

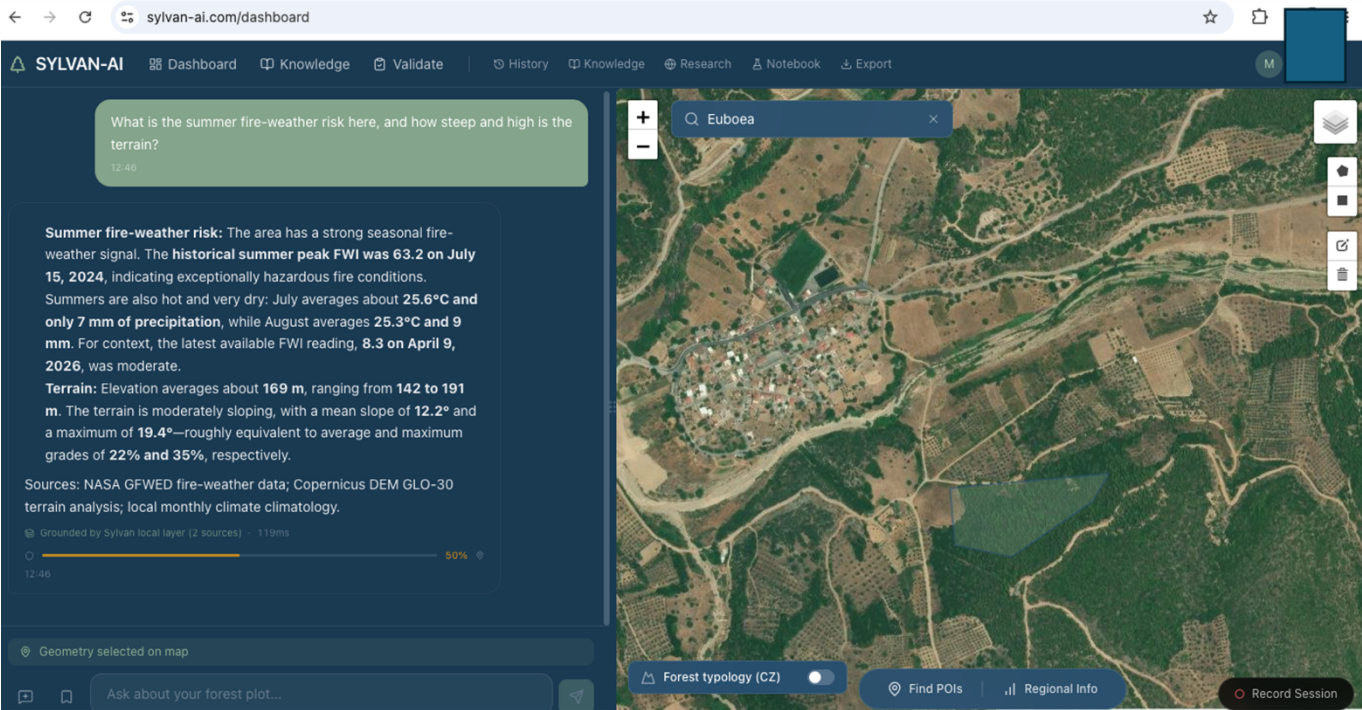


Figure B-2 SYLVAN-AI Performance – Success Case 2

Finding the answer for Success Case 2 requires as a minimum the time and effort as shown in Table B-2.

Table B-2 Traditional Method - Time and Effort for Success Case 2

Step a forest owner must take	Real tool / geoportal	Est. time
Locate the plot / coordinates on a Greek cadastre or topographic base map	Hellenic Cadastre (ktimatologio.gr) / topographic map	12 min
Read the Fire Weather Index / fire-danger value at the location and judge the seasonal peak	EFFIS — European Forest Fire Information System (effis.jrc.ec.europa.eu)	15 min
Obtain elevation and estimate slope from a digital elevation model / profile tool	Copernicus DEM / national elevation viewer (manual slope estimate)	18 min
Interpret and combine fire and terrain into one assessment	By hand	8 min
Total traditional method		53 min

Result:

Traditional method ≈ 53 min

SYLVAN-AI ≈ 2 min

Time saved ≈ 51 min → 96% reduction in time-to-insight.

Success Case 3: Soil, slope and species suitability for planting

Location: A plot in the Morvan (Burgundy), France — a working forestry region known for Douglas-fir plantations.

User / journey: Investor / owner , “The Investor”.

Data used: Soil (pH, texture) · terrain (elevation, slope) · species suitability.

Question: “What is the soil pH and texture here and how steep is the slope, is the plot suitable for Douglas fir?”

With SYLVAN-AI: the owner draws the plot and asks. The assistant returns soil pH, organic carbon, clay and sand content and bulk density (from SoilGrids), together with elevation and slope, and combines them into a grounded

suitability statement for the species. Estimated time: ~2.5 minutes (question plus one follow-up). Figure B-3 shows the performance of SYLVAN-AI for the success case 3.

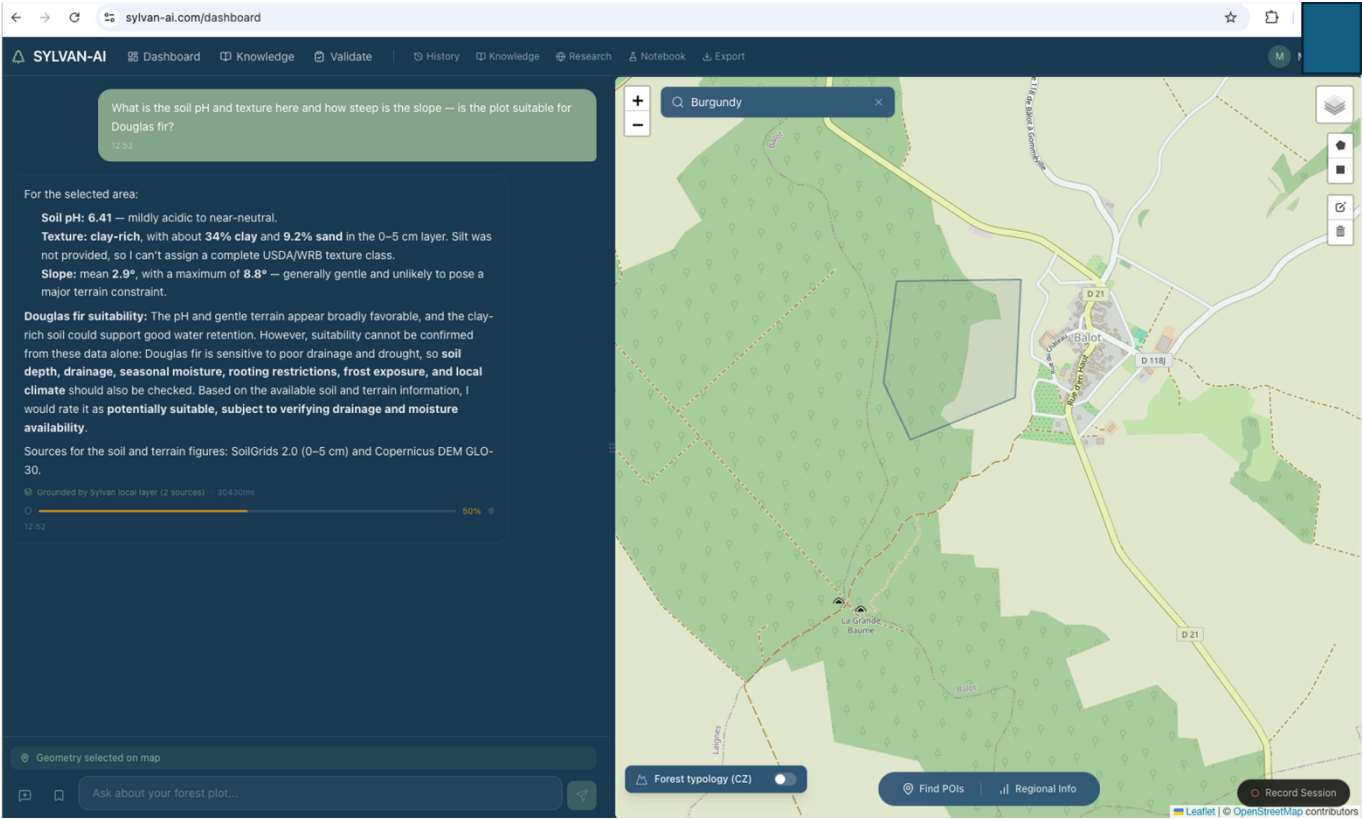


Figure B-3 SYLVAN-AI Performance – Success Case 3

Finding the answer for Success Case 3 requires as a minimum the time and effort as shown in Table B-3.

Table B-3 Traditional Method - Time and Effort for Success Case 3

Step a forest owner must take	Real tool / geoportal	Est. time
Find the parcel and its coordinates	cadastre.data.gouv.fr / Géoportail — parcelles cadastrales (geoportail.gouv.fr)	10 min
Read soil pH and texture at the location from a soil map / raster	ESDAC (esdac.jrc.ec.europa.eu) or ISRIC SoilGrids (soilgrids.org)	20 min
Obtain elevation and slope from an elevation profile tool	Géoportail / cartes.gouv.fr (altimetric profile)	15 min
Check Douglas-fir autecology (pH, texture, slope requirements) against the site	Regional silviculture / species-autecology guide (PDF)	15 min
Compile the suitability conclusion	By hand	8 min
Total traditional method		68 min

Result:

Traditional method ≈ 68 min

SYLVAN-AI ≈ 2.5 min

Time saved ≈ 65.5 min → 96% reduction in time-to-insight.

Success Case 4: Confirming a plot is outside protected zones

Location: A parcel in the Schwarzwald (Black Forest), Baden-Württemberg, Germany.

User / journey: Environmental NGO / owner , “The Conservationist”.

Data used: Cadastre · Natura 2000 / FFH protected areas (spatial-negation query).

Question: “Is this parcel outside any Natura 2000 designation, and how far is the nearest protected site?”

With SYLVAN-AI: the user draws the parcel and asks. The assistant confirms whether the parcel overlaps any Natura 2000 site and, when it does not, reports the nearest site and its distance in kilometres, the “spatial negation” query that is slow and error-prone by hand. Estimated time: ~2 minutes. Figure B-4 shows the performance of SYLVAN-AI for the success case 4.

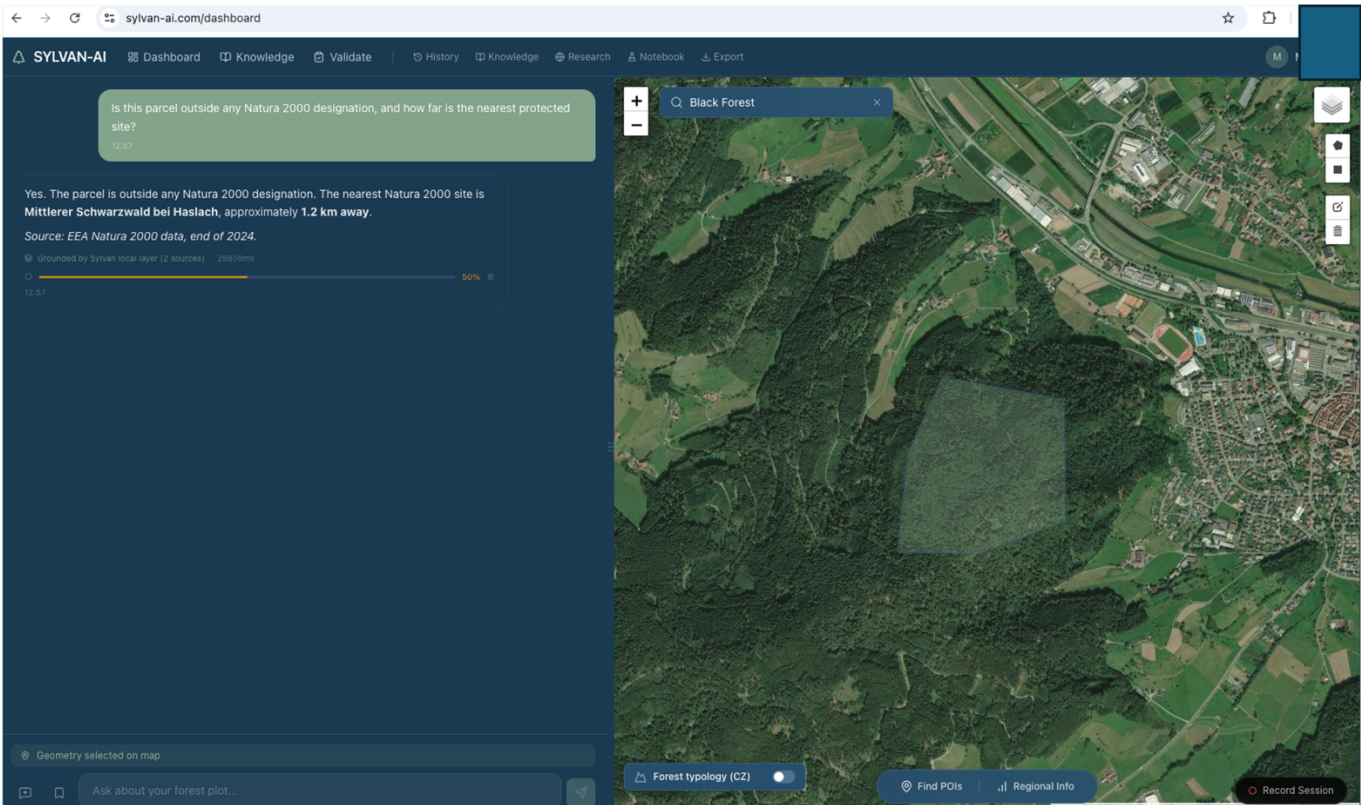


Figure B-4 SYLVAN-AI Performance – Success Case 4

Finding the answer for Success Case 4 requires as a minimum the time and effort as shown in Table B-4.

Table B-4 Traditional Method - Time and Effort for Success Case 4

Step a forest owner must take	Real tool / geoportal	Est. time
Find the parcel boundary	Geoportal Baden-Württemberg (geoportal-bw.de) / ALKIS cadastre	12 min
Overlay protected areas and check for any overlap with the parcel	LUBW Daten- und Kartendienst — Schutzgebiete/FFH (udo.lubw.baden-wuerttemberg.de)	15 min
Measure the distance from the parcel to the nearest protected site	Same portal, manual measure tool	12 min
Cross-check the European Natura 2000 designation	EEA Natura 2000 Viewer (natura2000.eea.europa.eu)	8 min
Compile the confirmation	By hand	6 min
Total traditional method		53 min

Result:

Traditional method $\approx$ 53 min

SYLVAN-AI $\approx$ 2 min

Time saved $\approx$ 51 min $\rightarrow$ 96% reduction in time-to-insight.

Success Case 5: Forest cover and land-cover change for carbon planning

Location: A mixed forest / farmland area in Galicia, north-west Spain.

User / journey: Carbon / land-use analyst, “The Carbon Estimator”.

Data used: CORINE Land Cover 2018 · CORINE land-cover change 2012–2018.

Question: “What share of this area is forest, and how did the land cover change between 2012 and 2018?”

With SYLVAN-AI: the analyst draws the area and asks. The assistant returns the forest share (CORINE forest classes) and the dominant land-cover categories, then, on a follow-up, the total area changed between 2012 and 2018 with the top transitions. Estimated time: $\sim$ 2.5 minutes. Figure B-5 shows the performance of SYLVAN-AI for the success case 5.

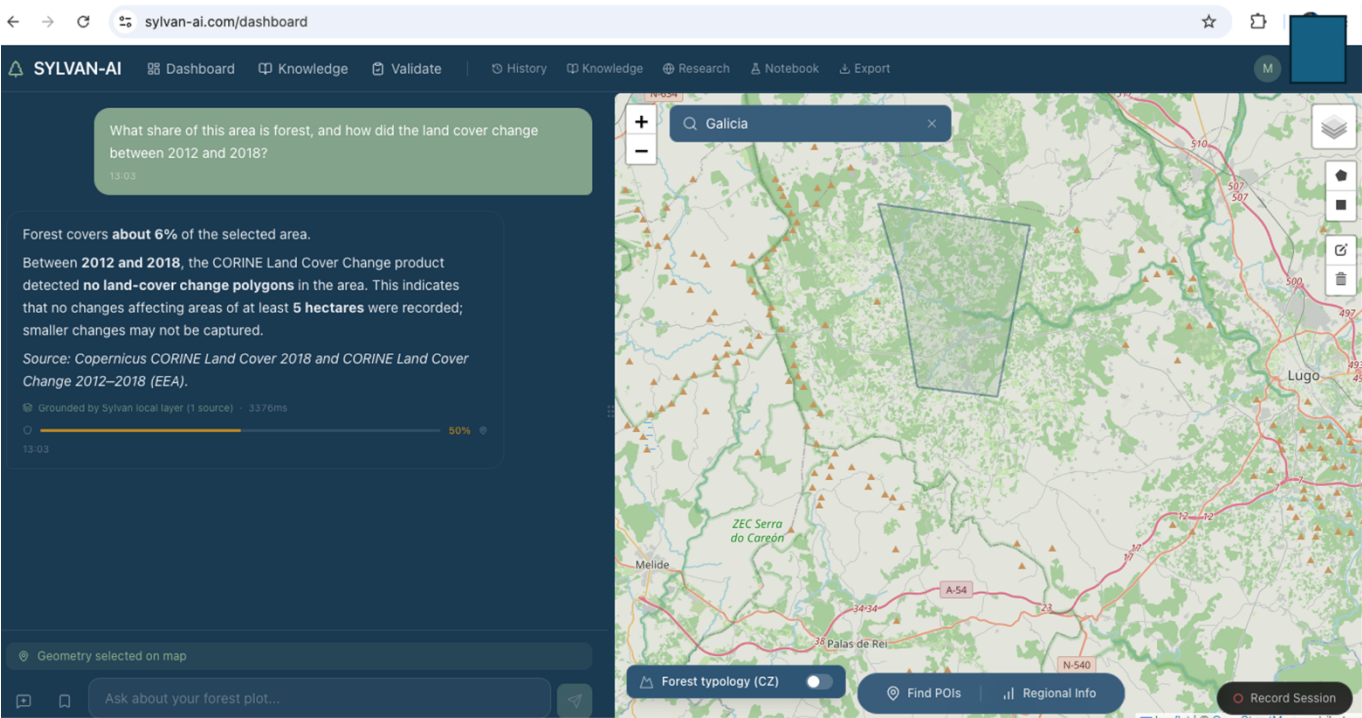


Figure B-5 SYLVAN-AI Performance – Success Case 5

Finding the answer for Success Case 5 requires as a minimum the time and effort as shown in Table B-5.

Table B-5 Traditional Method - Time and Effort for Success Case 5

Step a forest owner must take	Real tool / geoportal	Est. time
Locate the area / parcels	Sede Electrónica del Catastro (sedecatastro.gob.es) / SIGPAC	10 min
Read the current CORINE Land Cover 2018 classes and estimate the forest share	Copernicus CORINE viewer (land.copernicus.eu/en/map-viewer)	15 min
Load the 2012–2018 change layer and identify the transitions in the area	Copernicus CORINE Land Cover Change 2012–2018	15 min
Estimate areas / forest percentage by hand (the viewer gives no per-plot area)	Manual measurement / calculation	15 min
Compile forest cover and change summary	By hand	7 min
Total — traditional method		62 min

Result:Traditional method $\approx$ 62 minSYLVAN-AI $\approx$ 2.5 min**Time saved $\approx$ 59.5 min $\rightarrow$ 96% reduction in time-to-insight.**

B4. Aggregate Result

Across the five documented success cases, the traditional route totals about 296 minutes ($\approx$ 4.9 hours) of a forest owner's time, while SYLVAN-AI answers the same five questions in about 11 minutes, an overall time-to-insight reduction of roughly 96%. Every individual case exceeds 90%, far above the 50% target set in Objective 3. Table B-6 shows the aggregated results.

Table B-6 Aggregated Comparison Results – Traditional Methode vs. SYLVAN-AI Performance

Success case	Traditional (min)	SYLVAN-AI (min)	Saved (min)	Reduction
1 · Natura 2000 compliance (Šumava, CZ)	60	2	58	97%
2 · Fire risk & terrain (Evia, GR)	53	2	51	96%
3 · Soil, slope & species (Morvan, FR)	68	2.5	65.5	96%
4 · Protected-zone check (Schwarzwald, DE)	53	2	51	96%
5 · Forest cover & change (Galicia, ES)	62	2.5	59.5	96%
TOTAL (5 cases)	296	11	285	96%

Robustness (sensitivity check)

The conclusion does not depend on optimistic assumptions. If the traditional estimates were halved (a fast, GIS-literate user) and the SYLVAN-AI times doubled, the aggregate would be 148 minutes versus 22 minutes which is still an $\sim$ 85% reduction, comfortably above the 50% threshold. The economic and efficiency value is therefore demonstrated with a wide margin.

B5. Verification and Data Provenance (reality check)

To ensure this evidence is real and not illustrative, the following were checked:

- SYLVAN-AI's capabilities used in each case are features actually deployed in the live platform (grounded chat with drawn geometry, and the Natura 2000, terrain, soil, fire, land-cover, cadastre and Czech forest-typology grounding layers).

- Coverage of each location was confirmed against the live SYLVAN-AI database (27-country cadastre incl. Czechia, France, Baden-Württemberg and Spain; pan-European Natura 2000, terrain, soil, fire and land cover; Czech forest typology).
- Every geoportal named in the traditional workflows is a real, public service, verified in July 2026 (URLs listed below).
- The forest locations are all real, well-known forest areas within the covered countries.
- The step times are transparent assumptions for a non-expert user; the $\geq 50\%$ target is met even under the conservative sensitivity check above.

Geoportals and data sources cited (verified July 2026)

- EEA Natura 2000 Network Viewer + Standard Data Forms: <https://natura2000.eea.europa.eu/>
- EFFIS, European Forest Fire Information System (Fire Weather Index): <https://effis.jrc.ec.europa.eu/>
- ČÚZK, Nahlížení do katastru nemovitostí (Czech cadastre): <https://nahliznidokn.cuzk.gov.cz/>
- ÚHÚL, forest typology / Regional Plans of Forest Development (OPRL): <https://geoportal.uhul.cz/mapy/MapyOprl.html>
- ESDAC, European Soil Data Centre (JRC): <https://esdac.jrc.ec.europa.eu/>
- ISRIC, SoilGrids: <https://soilgrids.org/>
- France, Géoportail / cadastre.data.gouv.fr / cartes.gouv.fr: <https://www.geoportail.gouv.fr/>
- Germany (BW), LUBW Daten- und Kartendienst (Schutzgebiete/FFH): <https://udo.lubw.baden-wuerttemberg.de/public/p/alleSchutzgebiete>
- Spain, Sede Electrónica del Catastro: <https://www.sedecatastro.gob.es/>
- Copernicus CORINE Land Cover, data viewer: <https://land.copernicus.eu/en/map-viewer>