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What GeoLLMs can bring to biodiversity and climate insight

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From Isolation to Integration: A New Era for Geospatial Intelligence

For decades, geospatial information lived in its own world — powerful, precise, yet often disconnected from the broader IT and AI ecosystems.

But today, that boundary is dissolving.

The rise of GeoLLMs marks a turning point — bringing together the depth of geospatial data with the breadth of language-based reasoning, unlocking new insights for biodiversity and climate understanding.

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Integration Is the Future: Uniting All Data for Smarter Decisions

The future of climate, biodiversity, and many other domains lies in the **seamless integration of all forms of data**.

Structured Data
— such as maps, sensor grids, and databases — provides precision.

Unstructured Data
— text, images, audio, and video — provides context and meaning.

Together, they form a single decision-making space where GeoLLMs can reason, interpret, and generate holistic insights.

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From AI Revolution to GeoLLM Evolution: The Path to JackDaw

The AI landscape has changed dramatically since ChatGPT.

Today, language models are reasoning engines linking meaning across domains.

AI Revolution

To keep pace, we must bring the geospatial dimension into this new ecosystem.

JackDaw

That's why we began developing **JackDaw** — our concept for an effective, integrated GeoLLM solution.

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JackDaw: Building the Foundation for Intelligent GeoLLMs

Unified Interface

Bridges global and local LLMs through a standard interface for true geospatial and AI integration.

Smart Guidance

Introduces semantically enriched metadata to guide LLMs toward toward the *right* data and services.

Connecting Intelligence

Connects language models with domain-specific specific knowledge, geospatial services, and multimedia analytics.

Geospatial Insight

GeoRAG & Data Cube provide powerful access to vector and raster data for actionable insight.

New JackDaw Metadata and Catalogue: Intelligence Between Data and AI

Spatial Data & Tools
Connects datasets, services, and analytical tools.

JackDaw Metadata & Catalogue
Bridge for semantically rich metadata and standard protocols.

Human Decision-Making
Enabling AI-driven ecosystem for smarter decisions.

Creates an integrated ecosystem where global and local LLMs can access structured and unstructured data through one intelligent, standardized interface.

How to Write Services for JackDaw

Service as a Tool

In JackDaw, every service is a tool — a function that extends the LLM's ability to act on data.

Standard Interface

Tools connect JackDaw to spatial and analytical services through a standard interface.

MCP & Spatial Reasoning

Using the Model Context Protocol (MCP) and semantically rich metadata, anyone can create or publish tools that let JackDaw perform real-world spatial reasoning, analysis, or data discovery.

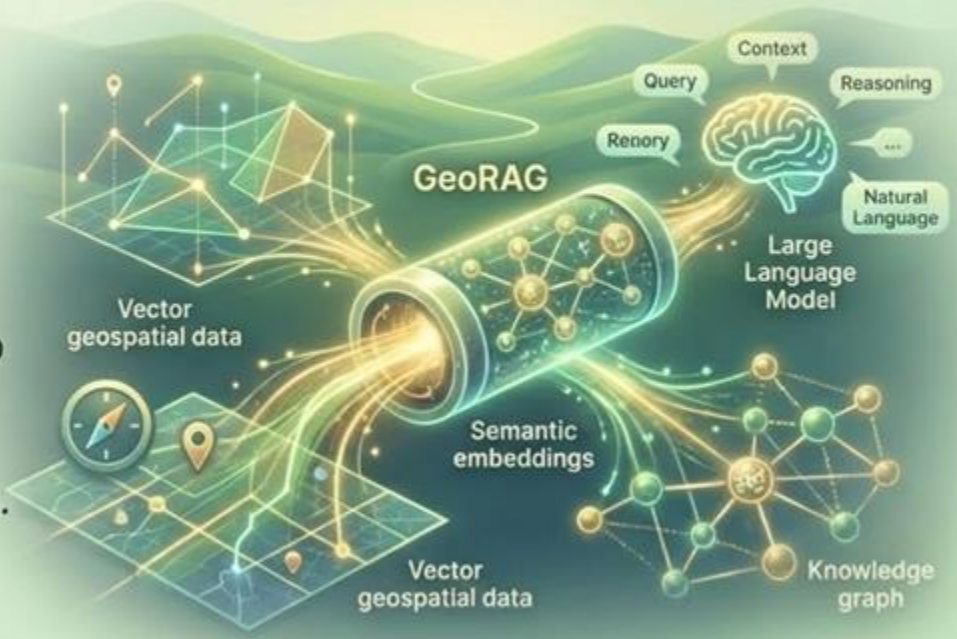
Data Cubes: The Analytical Core of JackDaw

Data Cubes organize spatial and temporal information into a unified, multi-dimensional structure — enabling real-time analytics and insight generation across space, time, and thematic dimensions.

In JackDaw, they serve as a core building block for scalable, high-performance environmental and rural intelligence.

GeoRAG: Bringing Vector Intelligence to LLMs

GeoRAG transforms vector geospatial data into semantic embeddings — enabling Large Language Models to understand, search, and reason about geographic features.



It bridges geometry with meaning, allowing queries that combine spatial context and natural language.

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Join the Journey — GeoLLMs for a Smarter Planet

The JackDaw concept and its core technologies — Metadata & Catalogue, Services, Data Cube, and GeoRAG — are being developed in cooperation with **PoliRuralPlus** and **FOCAL**.

Our shared goal: to build the next generation of **GeoLLM-based intelligence** for biodiversity, climate, and sustainable regional development.

LEARN MORE

- Learn more through our **webinars** and video library:
- www.poliruralplus.eu/news/
- www.poliruralplus.eu/knowledge-transfer/education-videos/
- YouTube – PoliRuralPlus Channel

COLLABORATE

Want to collaborate?

Join us at the **PoliRuralPlus CodeCamp** – January 2026

(Details coming soon on our website and social media)

Acknowledgment and Project References

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  Integrating foresight, geospatial intelligence, and AI to support **rural policy innovation** and attractiveness across Europe.

- **BioCLIMA** – HORIZON-CL6-2023-CLIMATE-01-4 (Grant Agreement No. 101135471)
  Advancing **climate adaptation and biodiversity integration** through **digital and AI-enabled decision-support systems**.

- **FOCAL** – HORIZON-CL6-2023-GOVERNANCE-01-4 (Grant Agreement No. 101135285)
  Fostering collaborative environmental intelligence and open data ecosystems for sustainable land and water management.

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