Bridging Global Language Models and Local Spatial Data: The JackDaw Approach to Context-Aware Agriculture and Rural Planning

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Vision of the project

PoliRuralPlus shows that **rural-urban linkages are key to integrated regional development**.

By combining digital tools, inclusive governance, and local innovation, the project **tackles regional challenges while fostering climate resilience and sustainable growth** across Europe.

Each pilot acts as a scalable model, proving how **collaboration and integration unlock regional potential.**

Some key facts

- Looking for **operational solution**

- Apologize to conference audience, that we are using **more engineering approach instead of pure research**

- Step by step **building complex solution**
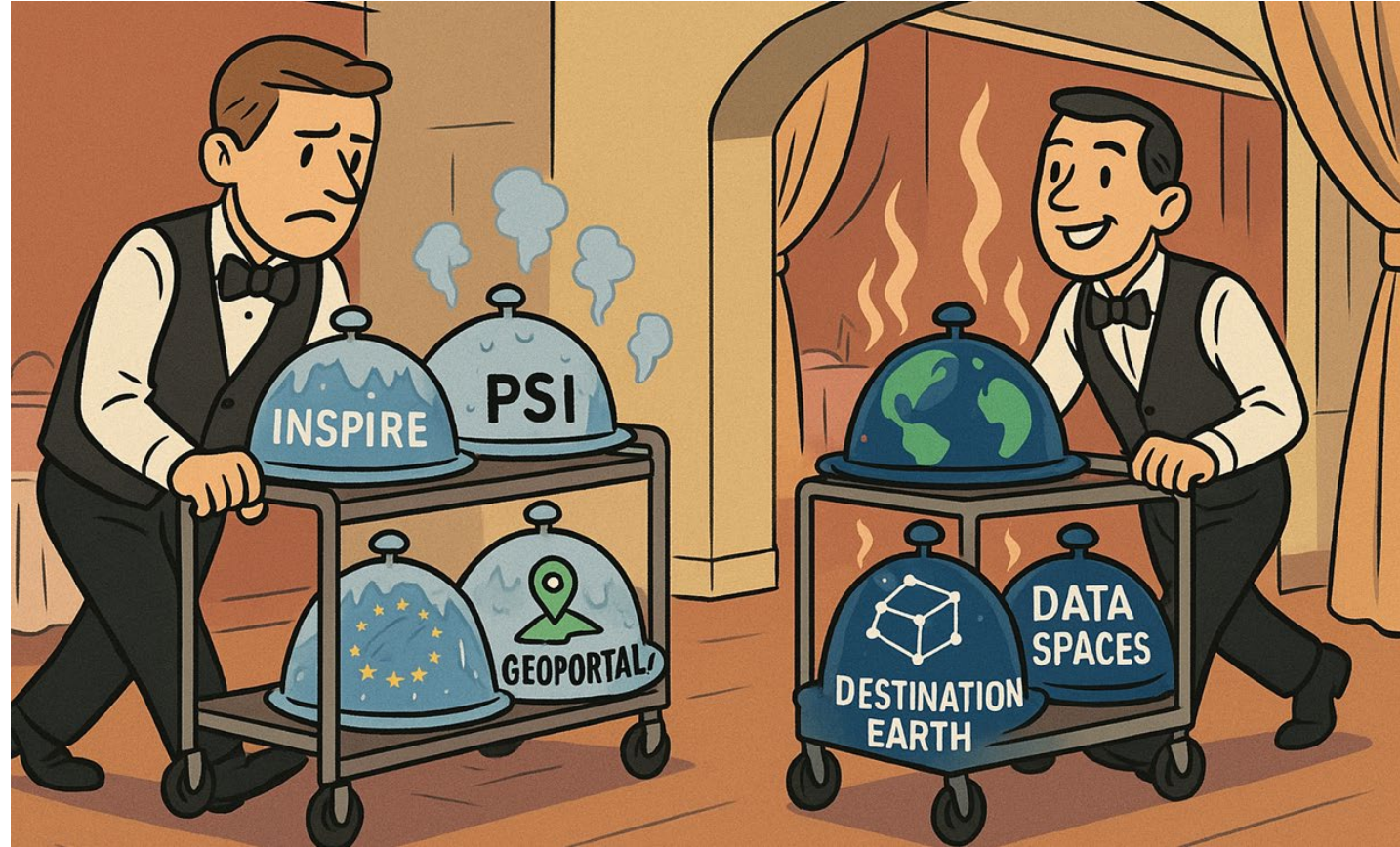
- Focus on **GeoAI**

Make geo great… again…?

Many **concepts that never matured** to serve their intended audience have already become **outdated** at funding agencies and on the conference trail
- **Out with the old**
- **In with the renamed**

A significant **loss**!

Strong need to push forward and build on existing results!

Steps

- Data management
- JackDaw with ChatGPT
- Integration of textual RAGs
- Testing of textual RAGs with OS LLMs
- Testing full JackDaw with OS LLMs
- Transferring vector data into RAG
- Transferring Raster data into RAG
- Vision is in future to trained LLMs by spatial data

..... but

- Idea is not to have GeoLLM solving all but **more solutions targeted on specific problems**
- **Small effective solutions**
- Main requirements on **LLM to solve communication**

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Fostering Sustainable, Balanced, Equitable, Place-based and Inclusive Development of Rural-Urban Co... ... hanced Attractivenes Mapping ToolBox

PoliRuralPlus builds on the successful results that the preceeding PoliRural project provided for rural regions. In PoliRuralPlus, we want to address the research agenda established by PoliRural and broaden our foresight, planning and development scope to regions that include both urban and rural areas, and anything in between.

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Druby kultur   Farmy dle výměry   HILUCS 100

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☑ mimoprodukční plocha
☑ jiná kultura

100 km

CCSS

Why grid data sets?
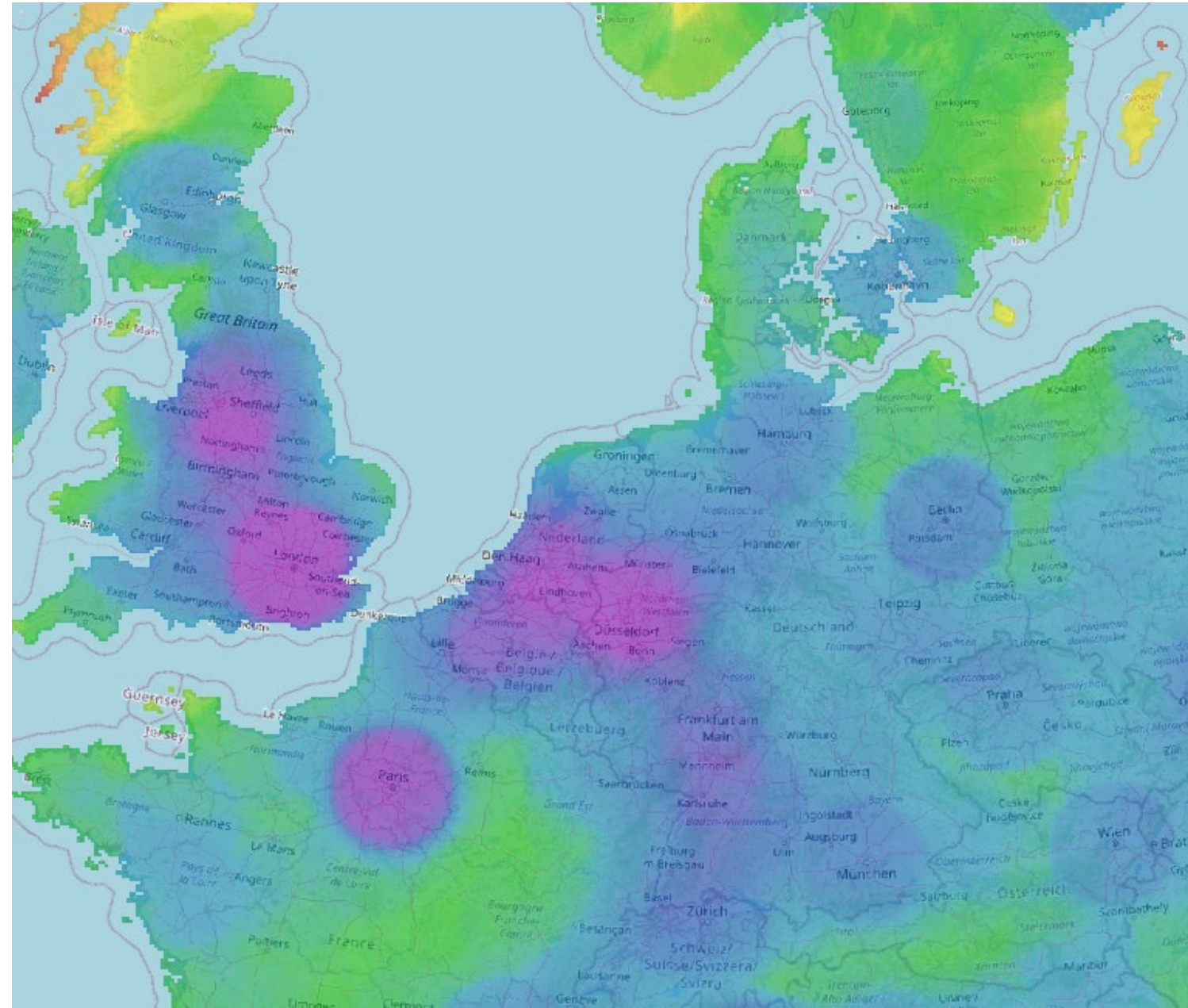
Grids for Spatial Analytics

Vectors: detailed analysis

Grids: efficient for large-area, high-level assessments

Enable complex queries and contextual insights at scale (e.g. market size within 2h drive)

Produce multiple open-access datasets integrated into our analytical and knowledge tools
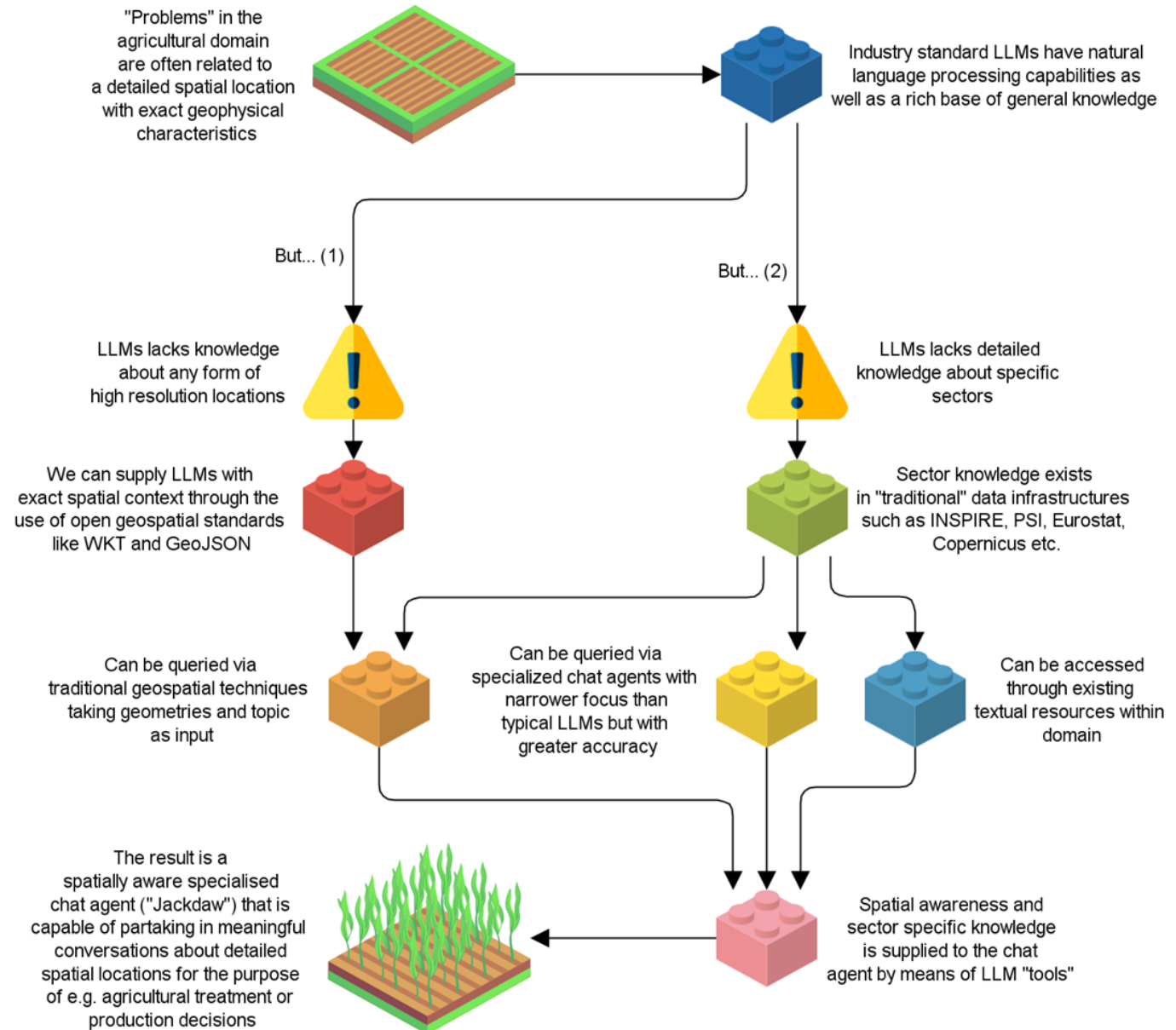
Jackdaw

The challenge

- We wish to make it possible for people to **talk to LLMs about "their" locations**
- In the context of rural development decisions
- In the context of agricultural decisions

Where the Advisor brings in relevant topics, **Jackdaw brings in relevant spatial data** so that a conversation can be led not only in the context of relevant topics but of actual, spatial context

A challenge to build on, reuse and capitalise on existing EU investments in data infrastructure

https://jackdaw.avinet.no/

"Problems" in the agricultural domain are often related to a detailed spatial location with exact geophysical characteristics

Industry standard LLMs have natural language processing capabilities as well as a rich base of general knowledge

But... (1)

But... (2)

LLMs lacks knowledge about any form of high resolution locations

LLMs lacks detailed knowledge about specific sectors

We can supply LLMs with exact spatial context through the use of open geospatial standards like WKT and GeoJSON

Sector knowledge exists in "traditional" data infrastructures such as INSPIRE, PSI, Eurostat, Copernicus etc.

Can be queried via traditional geospatial techniques taking geometries and topic as input

Can be queried via specialized chat agents with narrower focus than typical LLMs but with greater accuracy

Can be accessed through existing textual resources within domain

The result is a spatially aware specialised chat agent ("Jackdaw") that is capable of partaking in meaningful conversations about detailed spatial locations for the purpose of e.g. agricultural treatment or production decisions

Spatial awareness and sector specific knowledge is supplied to the chat agent by means of LLM "tools"

How it works

Orchestration of data sources, agents, tools and a generic LLM through a multi-step process

Context augmentation prior to asking the original question

Optimization of queries on large spatial datasets through generation of rasters

Making «Jackdaw» an expert in e.g. spatial and socio-economic characteristics

Giving the conversations knowledge of meteorology, climate, soil, terrain, assets, dangers etc.
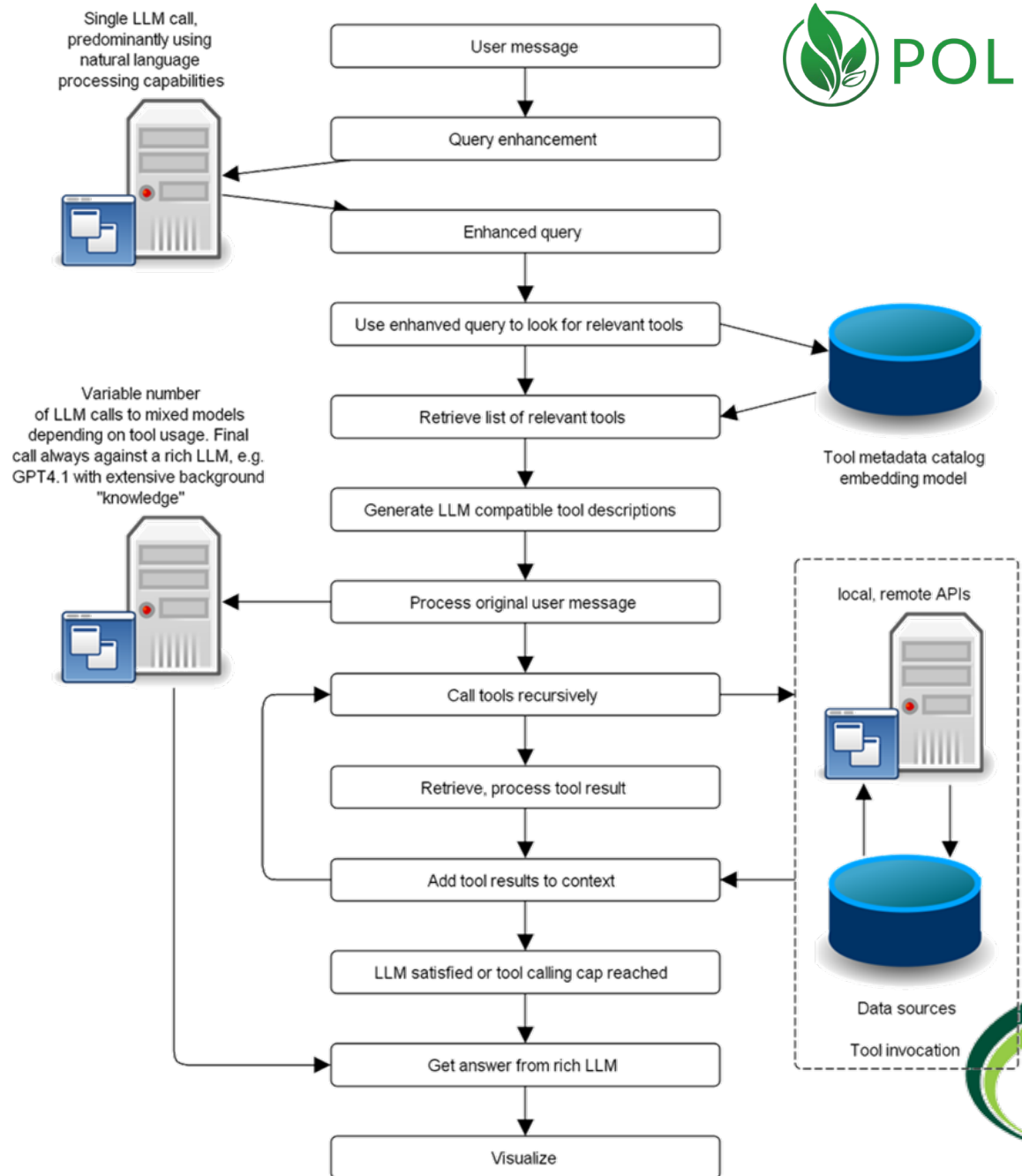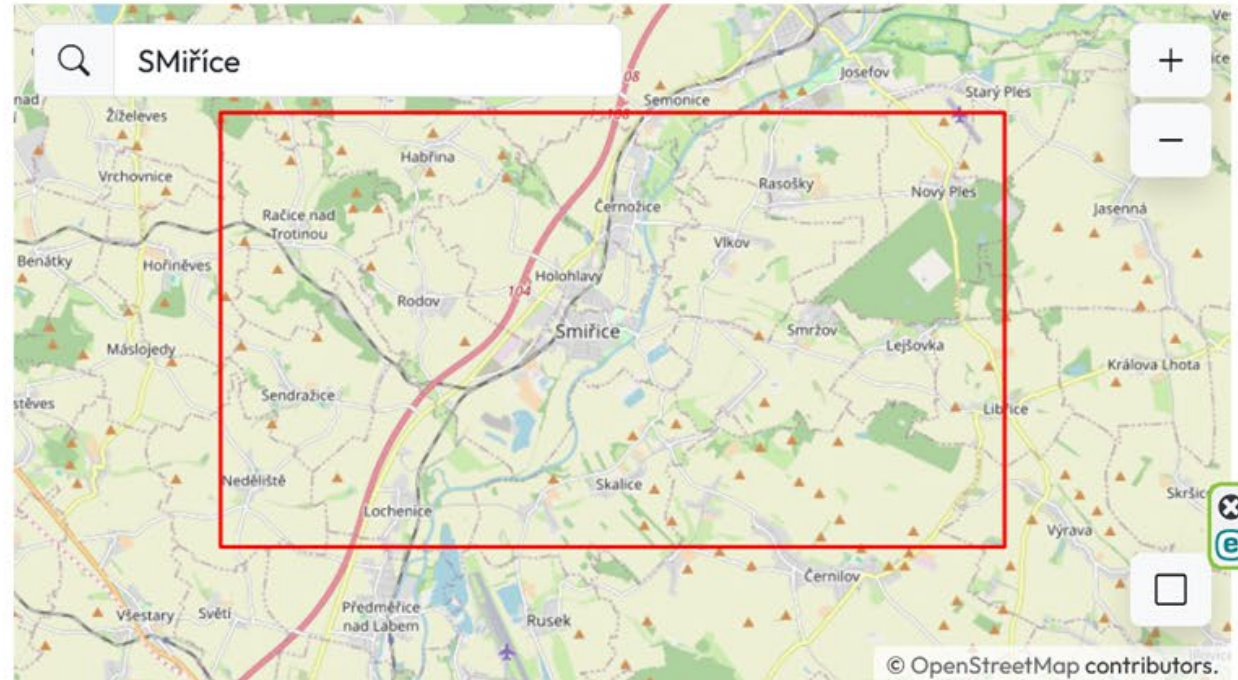
The development of agritourism in this area presents both significant opportunities and challenges. By leveraging its strengths, addressing weaknesses, and capitalizing on emerging trends, the region can enhance its agritourism potential. Strategic planning, investment in infrastructure, and effective marketing will be essential to attract visitors and create a sustainable agritourism model.

Draw an area in the map and ask a question…

Sample 1: Area characteristics   Sample 2: Food production

SMiřice

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JACKDAW
Just-in-time AI Coordinator for Knowledge Discovery and Analytics on a World-scale

JACKDAW:

Based on the land cover and land use information retrieved for the specified area, here are the conditions that affect agriculture production:

1. **Agricultural Land Availability**: The area has a significant portion of agricultural land (81.12% of total area), which is favorable for crop cultivation.

2. **Land Use Balance**: While there's a high concentration of agricultural use (81.12%), other uses like residential and forestry areas are present, suggesting a balanced ecosystem that supports sustainable agriculture practices.

3. **Small Zone Characteristics**:
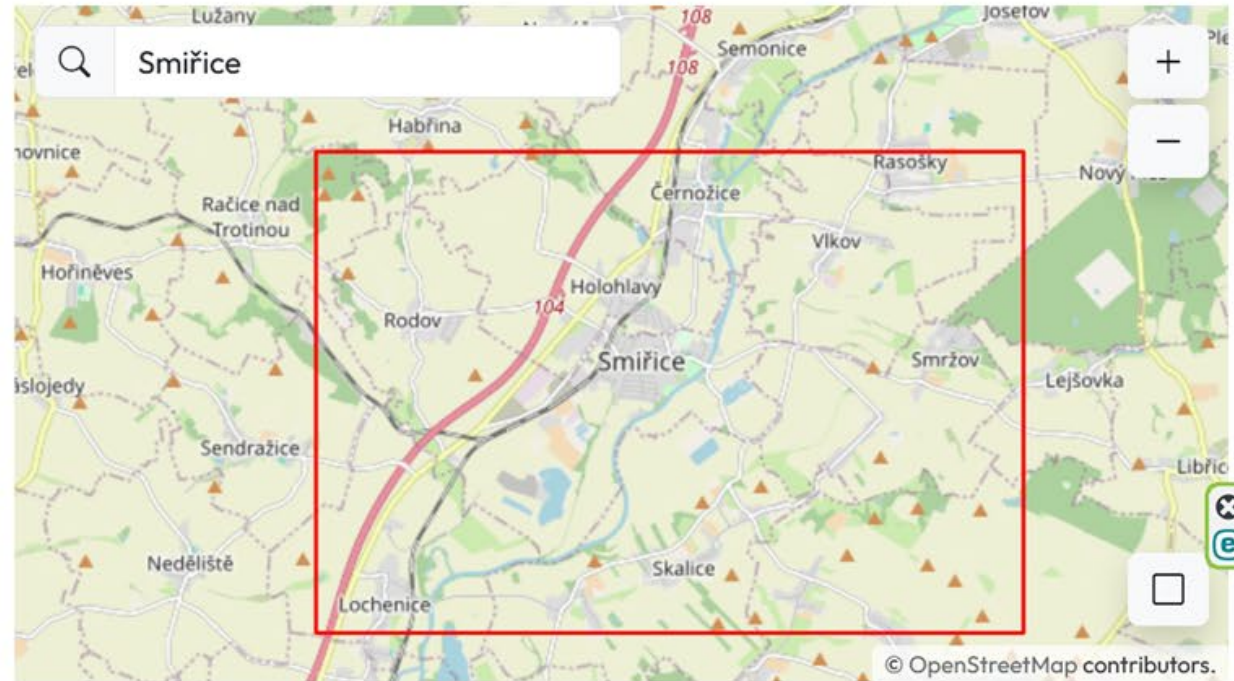
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RAG System

Tell me what are pr

cogito:3b

cogito:8b

cogito:14b

mistral

gemma3:1b

gemma3:4b

gemma3n:e4b

deepseek-r1:8b

deepseek-r1:14b

qwen3:0.6b

qwen3:1.7b

qwen3:4b

gpt-oss

Based on the provided context, I could not find explicit information about the priority investments or initiatives in Klatovo region. The documents mention various strategic plans and initiatives, such as sustainable rural development, innovation hubs, and workforce strengthening, but they do not

Ask a question...

Deep Think

Translate

Language

ar

Available Models

Select Ollama Model

cogito:14b ⌄

Available Features

```
▼ [
    0 : "Kochánov"
    1 :
    "Bystřice pod
    Lopeníkem"
    2 :
    "Bystřice nad
    Pernštejnem"
    3 : "Vidim"
    4 : "Divoky"
```

3. Bílek (Polygon)

4. Počátky (Polygon)

5. Marieves (Polygon)

6. Dobkov (Polygon)

Note: There are also several unnamed polygons in the context, but since they don't have specific names, I've excluded them from this list.

🗺️ Map Visualization

Ask about nearby geographic features...

Thank you for your attention!

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