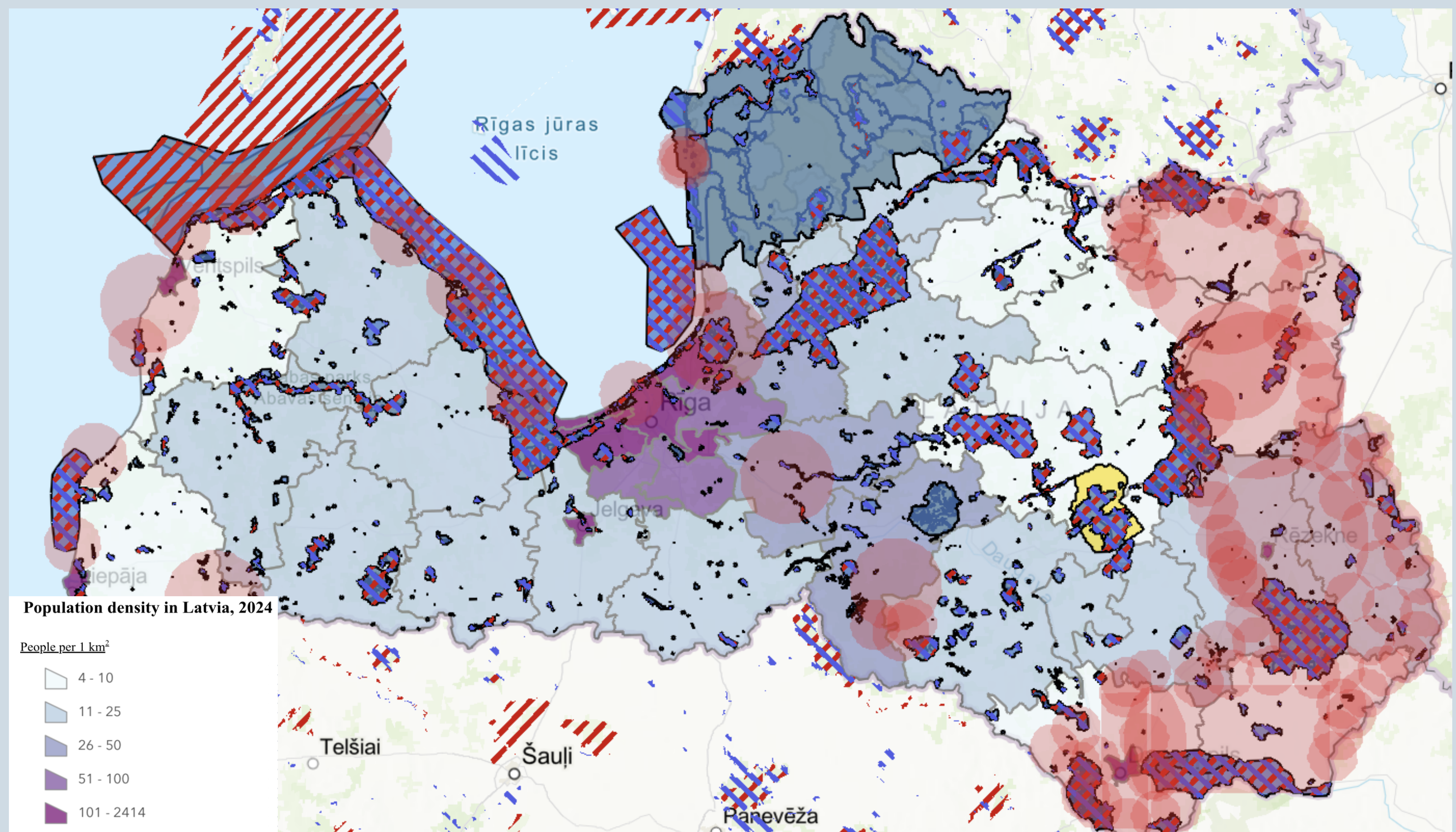


Zemgale region identified as Latvia's optimal site for energy hub placement

Zemgale region is most suitable region for the energy island sectional approach, which creates possibility to highly increase energy independence of the region and possibly reduce the energy price for the consumers.

Jelgava city and surrounding region has the highest potential in Latvia, based on the research data.



Energy hub implementation potential in Latvia, based on GIS analysis

Introduction

Rising energy demand, CO₂ emissions and fossil fuel depletion demand a fundamental shift towards innovative multi-energy solutions.

The Energy Hub (EH) concept integrates electricity, heat and gas within multi-energy systems (MES), enabling surplus renewables to be converted into heat or green hydrogen on-site.

This study investigates EH implementation potential in Latvia through European comparative analysis and GIS spatial modelling.

Technical parameters

Parameter	Value	Unit
Response time (electrolysers)	< 1	sec
Response time (batteries)	< 500	msec
Free capacity	1–10	MW
Energy density	150–300	kWh/m ²
Capacity per capita	1.5–2.5	kW/person
Flexibility coefficient	0.5–0.8	—
H ₂ utilisation efficiency	0.85–0.9	—
Grid loss reduction	5–12	%
Primary energy savings	15–30	%
Autonomy degree (AD)	64–92	%

GIS layering structure

Weighted overlay GIS analysis in ArcGIS Online, integrating wind speed potential, population density, electricity grid proximity, and exclusion zones (Prohibited natural territories, Natura 2000, NBS military areas) identifies Zemgale region, specifically Jelgava municipality, as the highest-suitability location for first-generation energy hub deployment in Latvia. The region combines favorable wind resources, accessible high-voltage grid infrastructure, sufficient population density to justify district heating integration, and relatively low coverage of protected area restrictions.

Conclusions and Recommendations

Storage integration is the primary driver of EH autonomy. Systems with thermal or electrochemical storage achieve 64–92% autonomy vs. 30–40% without storage.

First-generation EH deployment should prioritise wind integration + district heating network modernisation as the lowest risk, highest impact pathway to decarbonisation aligned with National Energetic & Climate Plan and the European Green Deal.

Latvia lacks the P2X subsidies and simplified wind permitting that make Danish and German energy hubs competitive. Targeted policy reform is the key prerequisite for deployment.

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