

## BIOREGION DEVELOPMENT AND STRATEGIC SPECIALIZATION: INSIGHTS FOR LATVIAN REGIONAL PLANNING

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### Abstract

Bioregions offer a means of reconciling ecological conservation with economic growth by emphasising the unique natural and cultural values of each territory. Latvia, with its diverse ecosystems and distinct cultural heritage, is well positioned to adopt bioregional strategies to enhance resilience, foster sustainable development, and increase regional competitiveness. This study examines the theoretical foundations of bioregionalism, tracing its origins and evolution as a planning tool within both European and global contexts. It highlights how bioregional structures have facilitated sustainable economic specialisation in other regions by attracting localised resources, fostering innovation in green technologies, and promoting cultural tourism. The study focuses on the Latvian context, analysing the challenges and opportunities associated with adopting bioregionalism as a complement to the country's existing administrative framework. Particular attention is given to the potential influence of bioregions on Latvia's Smart Specialisation Strategy and their role in supporting sustainable economic growth within knowledge-intensive bioeconomy sectors. A review of the existing literature identifies the key factors influencing the specialisation of rural areas, including the availability of natural resources, demographic dynamics, infrastructure development, and institutional support. The literature underscores the importance of aligning local resources with innovation-driven strategies to enhance rural competitiveness while ensuring sustainability. This alignment is particularly pertinent to bioregional planning, which integrates ecological and socio-economic dimensions to support context-specific development strategies.

**Keywords:** bioregion, smart specialization, rural development, regional planning.

### Introduction

The concept of bioregions has emerged as a transformative approach to regional planning, integrating the ecological, cultural, and economic dimensions of development (Stefanovic et al., 2023). At its core, bioregionalism promotes the idea that human activity should be harmonised with the natural environment, utilising the unique characteristics of a region's landscape, ecosystems, and cultural heritage as guiding principles for sustainable development (Dias et al., 2021). This approach not only emphasises ecological conservation (Di Veroli et al., 2024) but also seeks to foster local economic resilience, innovation, and specialisation (Bravaglieri et al., 2025) by leveraging the distinctive resources and values of each bioregion.

In recent years, bioregionalism has gained increasing attention as a framework that can offer both ecological and socio-economic benefits, particularly in the context of rural and peripheral areas (Bakker et al., 2023). These regions often face significant challenges (Casini et al., 2019), such as population decline, demographic ageing (Mattas et al., 2024), economic stagnation, and environmental degradation. Bioregional strategies provide a potential solution by promoting localised, resource-based economic activities (Olmo-García et al., 2023) while maintaining environmental integrity. By tailoring development strategies to the ecological and cultural context of a specific region, bioregionalism helps foster a deeper sense of place and identity, encouraging sustainable and balanced growth (Mazzocchi et al., 2021).

Latvia, with its rich natural resources, diverse ecosystems, and strong cultural heritage, stands at the threshold of significant transformations in regional economic planning. The country's landscape is characterised by extensive forests, fertile agricultural

land, wetlands, and coastal areas, all of which present unique opportunities for the adoption of bioregional principles. Furthermore, Latvia's historical connection to its natural environment has fostered a strong sense of environmental stewardship, which could serve as a foundation for the broader adoption of bioregional strategies.

At the same time, Latvia's transition to a knowledge-based economy, as outlined in its Smart Specialisation Strategy (Research and Innovation Strategy for Smart Specialisation - RIS3), presents both challenges and opportunities for regional planning (Smart Specialisation Strategy...). The S3 aims to enhance Latvia's economic competitiveness by focusing on knowledge-intensive sectors such as the bioeconomy, information and communication technologies (ICT), and green technologies. While these sectors hold promise for economic growth, careful consideration must be given to how local resources—both human and natural—can be effectively mobilised to foster innovation and specialisation. This is where bioregionalism emerges as a complementary approach to Latvia's S3, integrating the ecological and socio-economic dimensions of regional development.

This study explores the potential of bioregionalism as a strategic tool for sustainable rural development in Latvia. It examines how bioregional structures could be implemented within the Smart Specialisation Strategy, focusing on localised, environmentally sustainable economic sectors. The paper also discusses the broader theoretical foundations of bioregionalism, drawing on global examples to illustrate how such strategies have been applied in other parts of Europe. Finally, the study evaluates the practical implications of bioregionalism within the framework of Latvian regional planning, highlighting the challenges, opportunities, and potential benefits of integrating

bioregional principles into Latvia's development agenda.

The analysis of bioregional development is linked to the existing administrative structure of Latvia and the context of Latvia's sustainable development goals (Muska et al., 2022). This study aims to contribute to the pressing issue of sustainable regional planning in Latvia's economic development. Specifically, it seeks to deepen the understanding of how bioregionalism can serve as a framework for reconciling economic growth with environmental conservation. By doing so, the study aims to support Latvia in fostering a more resilient and sustainable future for its rural communities.

### Materials and Methods

The primary materials used in this study include academic journal articles, books related to bioregionalism, sustainable development, and regional planning. These sources provide the theoretical foundation for bioregional planning and its impact on regional economic specialisation. The methodology involved a review of literature from Europe and other regions of the world where bioregional strategies (Simon-Rojo et al., 2023) have been implemented. Additionally, data related to Latvia's Smart Specialisation Strategy, ecological resources, and demographic trends were analysed to assess the feasibility of implementing bioregional strategies in the country.

### Results and Discussion

The findings of this study reveal a range of insights regarding the potential application of the bioregional approach within the framework of regional planning in Latvia. By examining the theoretical foundations and conducting practical case studies, several key trends, challenges (Coquil et al., 2018), and opportunities influencing the implementation of bioregional strategies in Latvia have been identified. These findings not only highlight the ecological and economic potential of bioregionalism but also indicate specific factors that may affect its successful integration into Latvia's broader regional development and Smart Specialisation Strategy.

Latvia's natural conditions, characterized by extensive forests, diverse wetlands, fertile soils, and coastal ecosystems, are the basis for bioregional strategies. The potential for sustainable rural development lies in harnessing these resources in a manner that respects and enhances Latvia's ecological systems while simultaneously promoting local economic specialisation. A key aspect of this process is the recognition of the interdependence between natural capital and cultural heritage. In particular, rural areas in Latvia are closely connected to their natural surroundings, with local communities often relying on traditional sectors such as agriculture, forestry, and fisheries.

Sustainable forest management, combined with innovations in the bioeconomy, such as wood-based

bioproducts, could not only contribute to environmental conservation but also stimulate the local economy through green technologies. Similarly, Latvia's abundant water resources could serve as a foundation for the expansion of ecotourism, focusing on the conservation of biodiversity and the promotion of sustainable practices that benefit both local communities and the environment.

Furthermore, Latvia's cultural heritage, particularly in rural areas, plays a crucial role in shaping its bioregions. Traditional knowledge related to land use, local crafts, and rural customs offers unique opportunities for cultural tourism. This is in line with the broader trend of using bioregionalism to promote sustainable tourism, encouraging visitors to explore and appreciate the natural and cultural features of a region, while supporting its economic viability (Balčūne, 2022).

By incorporating these cultural elements into the bioregional planning process, Latvia can contribute to the revitalisation of its rural communities and generate new opportunities for economic growth that respect local traditions.

Latvia's Smart Specialisation Strategy (RIS3), which focuses on knowledge-intensive sectors such as the bioeconomy, digitalisation, and green technologies, aligns well with the principles of bioregionalism. Research data on projects that have received support specifically aimed at innovation indicate a strong interest among rural entrepreneurs and the successful implementation of projects. These findings provide a solid basis for optimism regarding the future transformation of rural enterprises towards green industrialisation (Veveris, 2022). By concentrating on localised resources and innovation-driven strategies, bioregions could significantly contribute to the success of Latvia's RIS3 by fostering regional specialisation in sectors that leverage both the country's natural and human resources.

One promising area for integration is the bioeconomy, a central pillar of Latvia's RIS3. The country's extensive forests, agricultural land, and natural resources create an ideal environment for biological sectors such as renewable energy, sustainable forestry, organic farming (Altieri et al., 2017), and fisheries (Eizenberga et al., 2022). Bioregionalism could help structure these industries according to the specific needs and opportunities of different ecological regions, fostering innovation in green technologies and sustainable practices. For example, local knowledge in sustainable agriculture could be utilised to develop new green technologies for organic farming, while Latvia's timber industry could focus on creating sustainable, value-added products.

Moreover, the establishment and development of bioregions could support the growth of local innovation and start-up ecosystems that reinforce these industries (Jungsberg et al., 2020). Regional business clusters, research institutions, and local authorities could collaborate to develop new technologies, products, and

services tailored to the unique ecological characteristics of each region. These regional clusters would benefit from the synergies created by localised knowledge and shared resources, promoting sustainable development and economic resilience.

**Table 1**  
*Common objectives of RIS3 and bioregions*

<i>RIS3 Objectives</i>	<i>Bioregion-specific objectives</i>
Innovation and research	Bioinnovations, organic food, green tourism
Specialization and competitiveness	Organic production, crafts, cultural economy
Sustainability and resource efficiency	Organic agriculture, green industrialization, sustainable tourism
Human capital and skills development	Bioeconomy, agricultural, tourism and cultural competences
International cooperation and export	Export of bioproducts, bioinnovations and cultural tourism

The study identifies potential innovative and sustainable concepts for local rural communities including organic production as an important element in the development of food systems.

Rural Innovation Ecosystem – a network of diverse entities—including businesses, research institutions, business support intermediaries, and individuals such as entrepreneurs, investors, policymakers, researchers, and students—engaged in collaboration and knowledge exchange. This ecosystem fosters sustainability, skill development, and economic balance while leveraging anchor institutions (Marshall & Murphy, 2021).

Smart Village – the smart village concept focuses on enhancing the potential of rural areas and their communities through the strategic and effective use of new technologies, including digital innovations. It emphasises the role of institutions, service networks, local resources, social innovation, and entrepreneurship while fostering a sustainable relationship with the surrounding environment (Bokun & Nazarko, 2023).

Startup Village – a startup village refers to a rural area—or a network of smaller settlements—that embraces innovation and entrepreneurial ambition to drive local development. It creates an enabling environment for dynamic business ecosystems, integrating innovation, market access, and external knowledge to support sustainable rural growth (Goodwin-Hawkins et al., 2023).

Rural Heritage Hub is a physical or community-based space where local stakeholders engage in knowledge exchange and collaborative initiatives. These hubs serve as focal points for community coordination, engagement, and the development of shared strategies (De Luca et al., 2021).

Living Lab – is a user-driven, open innovation environment that integrates research and innovation within real-world settings. Through co-creation and community involvement, living labs facilitate technological development and sector-specific advancements (Bacco et al., 2020).

Sustainable Communities – is a community defined by either geographical or political boundaries—united by a shared commitment to environmental stewardship and quality of life. These communities collaborate to protect natural resources and ensure long-term sustainability (Ravazzoli & Valero, 2020).

Organic farming practices promote sustainable resource use, soil fertility conservation and biodiversity protection, thus creating an ecologically balanced food production model (Guccione, 2024).

However, the potential inclusion of bioregionalism in Latvia’s RIS3 presents certain challenges. A key issue is the need for a robust institutional framework that ensures collaboration between different levels of government, local stakeholders, and businesses. While Latvia has made progress in developing its RIS3, further coordination between national and regional authorities is necessary to ensure the effective utilisation of regional resources for economic development. The first bioregion established in Gauja National Park is a successful example of how local governments and community stakeholders can work together to promote sustainable development. In this process, special attention was paid to ensuring that bioregional strategies meet the unique needs of rural communities, combining nature conservation with local business and tourism development (International forum..., 2023).

This study has identified several challenges that may hinder the effective implementation of bioregional strategies in Latvia. One of the primary obstacles is the existing administrative structure, which is largely based on political rather than ecological boundaries. The current regional division in Latvia does not always correspond to natural ecosystems, which may complicate the process of establishing bioregions. Additionally, the separation of urban and rural governance structures does not facilitate the transition towards sustainable regional development. Potential bioregions may transcend political boundaries, making it difficult to implement policies that address environmental issues at the appropriate scale.

Another challenge is the demographic shift occurring in Latvia’s rural areas. The country is experiencing significant rural depopulation, with many younger people relocating to urban centres in search of education and employment opportunities. This migration has led to an ageing population in rural regions, posing a challenge to the long-term sustainability of bioregional strategies. To counter this trend, bioregionalism must not only promote sustainable economic activities but also enhance the quality of life in rural areas (Vindevoghel, 2024), creating new economic opportunities and improving infrastructure. The success of bioregionalism in

Latvia's rural areas will depend on its ability to attract and retain young people by offering viable career prospects in green technologies, the bioeconomy, and ecotourism.

Finally, bioregionalism requires strong institutional support and active participation from local communities in planning and decision-making processes. While the Latvian government has demonstrated a commitment to fostering sustainable development, further capacity-building at the local level remains necessary. Local governments, businesses, and civil society organisations must be equipped with the tools and knowledge required to effectively design and implement bioregional strategies. This may involve providing training on sustainable resource management, fostering cross-sector collaboration, and creating incentives for businesses to adopt environmentally sustainable practices.

Although the findings of this study suggest that bioregionalism could significantly benefit Latvia's rural development, further research is needed to refine and test these concepts in practice. Future studies could focus on specific case studies of bioregional planning in Latvia, examining pilot projects that integrate ecological and economic strategies. Additionally, research could explore the potential of bioregions to foster innovation and entrepreneurship, particularly in rural areas that have traditionally been economically marginalised.

Moreover, closer collaboration between academia, policymakers, and economic sectors (Gava et al., 2025) is required to develop the frameworks necessary for the success of bioregions. Bioregional principles should be incorporated into policy-making at both national and regional levels, and long-term strategies

should be developed to promote innovation while preserving natural resources. The use of data analytics and geographic information systems (GIS) plays a major role in identifying the most promising areas for bioregional development, ensuring the integration of ecological factors into regional planning decisions.

### Conclusions

1. Bioregional strategies can effectively complement the Latvian Smart Specialisation Strategy (RIS3).
2. Bioregionalism offers strategic advantages for improving rural resilience, promoting innovation and incorporating ecological and cultural values into regional economic planning.
3. The strongest synergy between bioregionalism and knowledge-based rural development in Latvia is visible in the bioeconomy sector, sustainably using natural resources, green technologies, promoting innovation and low-carbon solutions, cultural tourism, and using heritage and identity for local community development.
4. In order to fully realise the potential of bioregionalism, institutional fragmentation, demographic decline in rural areas, structural constraints in policy coordination and resource allocation will need to be overcome.

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### References

- Altieri, M. A., Nicholls, C. I., & Montalba, R. (2017). Technological Approaches to Sustainable Agriculture at a Crossroads: An Agroecological Perspective. *Sustainability*, 9(3). <https://doi.org/10.3390/su903034>
- Bacco, M., Brunori, G., Dell'Orletta, F., & Ferrari, A. (2020). *Using NLP to support terminology extraction and domain scoping: report on the H2020 DESIRA project*. Third Workshop on Natural Language Processing for Requirements Engineering. Retrieved from: <https://doi-org.ezproxy.llu.lv/10.5281/zenodo.4285824>
- Bakker, E., Hassink, J. & van Veluw, K. (2023). The 'inner' dimension of Dutch farmers' trajectories of change: drivers, triggers and turning points for sustained agroecological practices. *Journal Agroecology and Sustainable Food Systems*, 47(5), 687-717. <https://doi.org/10.1080/21683565.2023.2180563>
- Balcune, I. (2022). *The role of the restored manor heritage in the revival of Latgale countryside*. Latgale Congress 2022. April 27-29. Retrieved from: [https://latgolyskongress.lv/wp-content/uploads/2022/05/satyslopai\\_kongress\\_brosura\\_gola\\_var.pdf](https://latgolyskongress.lv/wp-content/uploads/2022/05/satyslopai_kongress_brosura_gola_var.pdf)
- Bokun, K. & Nazarko, J. (2023). Smart villages concept — a bibliometric analysis and state-of-the-art literature review. *Progress in Planning*, 175, Article 100765. <https://doi.org/10.1016/j.progress.2023.100765>
- Bravaglieri, S., Åberg, H. E., Bertuca, A., & Luca, C. (2025). Multi-actor rural innovation ecosystems: Definition, dynamics, and spatial relations. *Journal of Rural Studies*, 114, Article 103492. <https://doi.org/10.1016/j.jrurstud.2024.103492>
- Casini, L., Boncinelli, F., Contini, C., Gerini, F., & Scozzafava, G. (2019). A Multicriteria Approach for Well-Being Assessment in Rural Areas. *Social Indicators Research*, 143(1), 411-432. <https://doi-org.ezproxy.llu.lv/10.1007/s11205-018-1978-0>
- Coquil, X., Cerf, M., Auricoste, C., Joannon, A., Barcellini, F., Cayre, P., ..., & Prost, L. (2018). Questioning the work of farmers, advisors, teachers and researchers in agro-ecological transition. *Agronomy for Sustainable Development*, 38(5), Article 47, <https://doi.org/10.1007/s13593-018-0524-4>

- De Luca, C. & López-Murcia, J. (2021). Participatory process for regenerating rural areas through heritage-led plans: the RURITAGE community-based methodology. *Sustainability*, 13(2021), 5212. <https://doi.org/10.3390/su13095212>
- Di Veroli, J. N., Peronti, B., Scognamiglio, U., Baiamonte, I., Paoletti, F., Stefanovic, L., ..., & Rossi, L. (2024). Food Waste Behaviors in Cilento Bio-District vs. National Data: Policy Insights. *Journal Frontiers in Sustainable Food Systems*, 8(2024), Article 1385700. <https://doi.org/10.3389/fsufs.2024.1385700>
- Dias, R. S., Costa, D., Correia, H. E., & Costa, C. A. (2021). Building bio-districts or eco-regions: Participative processes supported by focal groups. *Agriculture (Switzerland)*, 11(6J), Article 511. <https://doi.org/10.3390/agriculture11060511>
- Eizenberga, A., Zeverte-Rivza, S., & Auzina, A. (2022). Digital transformation for increasing the competitiveness and exportability in the enterprises of the fisheries sector. *Proceedings of the 2022 International Conference 'Economic Science for Rural Development'*, 56, 601-608, Jelgava, LLU ESAF. <https://doi.org/10.22616/ESRD.2022.56.060>
- Gava, O., Vanni, F., Schwarz, G., GuisePELLI, E., Vincent, A., Prazan, J., ..., & Povellato, A. (2025). Governance networks for agroecology transitions in rural Europe. *Journal of Rural Studies*, 114, Article 103482. <https://doi.org/10.1016/j.jrurstud.2024.103482>
- Goodwin-Hawkins, B., Guzzo, F., Martin, M., & Sasso, S. (2023). *Startup Village Conceptualization. Joint Research Centre, European Commission (2023)*. Retrieved from: <https://op.europa.eu/en/publication-detail/-/publication/172a7b96-b720-11ed-8912-01aa75ed71a1/language-en>
- Guccione, G. D., Vigano, L., & Sturla, A. (2024). Insights into the agroecological transition: the case of two Italian bio-districts. *Italian Review of Agricultural Economics*, 79(1), 97 – 111. <https://doi.org/10.36253/rea-14241>
- International forum 'Mission: Establishing a Bioregion in the Gauja National Park'* (2023). IFOAM, retrieved from: <https://www.organicseurope.bio/events/international-forum-mission-establishing-a-bioregion-in-the-gauja-national-park/>
- Jungsberg, L., Copus, A., Herslund, L. B., Nilsson, K., Perjo, L., Randall, L., & Berlina, A. (2020). Key actors in community-driven social innovation in rural areas in the Nordic countries. *Journal of Rural Studies*, 79, 276-285. <https://doi.org/10.1016/j.jrurstud.2020.08.004>
- Marshall, A. & Murphy, D. F. (2021). *Rural innovation ecosystems: thriving through diverse collaboration. Citizenship and Sustainability in Organizations*. Exploring and Spanning the Boundaries, Routledge.
- Mattas, K., Staboulis, C., Tsakiridou, E., Natos, D., Polymeros, A., Naranowski, P., ..., & Arfini, F. (2024). Facilitating generational renewal in rural areas by responding to young farmers' voices: Echoes from the Greek territory. *Journal of Rural Studies*, 112, Article 103480. <https://doi.org/10.1016/j.jrurstud.2024.103480>
- Mazzocchi, C., Orsi, L., Bergamelli, C., & Sturla, A. (2021). Bio-districts and the territory: evidence from a regression approach. *Aestium Journal*, 79(2021). <https://doi.org/10.36253/aestim-12163>
- Muska, A., Popluga, D., & Pilvere I. (2023). Assessment of the Concentration and Structure of the Bioeconomy: The Regional Approach. *Emerging Science Journal*, 7(1), 60 –77. <https://doi.org/10.28991/ESJ-2023-07-01-05>
- Olmo-García, F., Domínguez-Fabián, I., Crecente-Romero, F. J., & Val-Núñez, M. V. (2023). Determinant factors for the development of rural entrepreneurship. *Technological Forecasting & Social Change*, 191(2023), Article 122487. <https://doi.org/10.1016/j.techfore.2023.122487>
- Ravazzoli, E. & Valero, D. E. (2020). *Social innovation: an instrument to achieve the sustainable development of communities*. Sustainable Cities and Communities, Encyclopedia of the UN Sustainable Development Goals, Springer. [https://doi.org/10.1007/978-3-319-71061-7\\_108-1](https://doi.org/10.1007/978-3-319-71061-7_108-1)
- Simon-Rojo, M., Moran, A., & Giocoli, A. (2023). Urban and Territorial Planning plans from the logic of sustainable food systems [Los planes de ordenación urbana y territorial desde la lógica de sistemas alimentarios sostenibles]. *Ciudad y Territorio Estudios Territoriales*, 55(217), 873 – 882. <https://doi.org/10.37230/CyTET.2023.217.16>
- Smart Specialisation Strategy (RIS3). *Latvijas Republikas Ekonomikas ministrija* [Ministry of Economics of the Republic of Latvia]. Retrieved from: <https://www.em.gov.lv/lv/viedas-specializacijas-strategija-ris3>
- Stefanovic, L., Agbolosoo, M., & Ohemaa, A. (2023). Biodistricts as a tool to revitalize rural territories and communities: insights from the biodistrict Cilento. *Frontiers in Sustainable Food Systems*, 7, Article 1267985. <https://doi.org/10.3389/fsufs.2023.1267985>
- Veveris, A. (2022). Contribution of the rural development programme to facilitating innovation in Latvia. *Proceedings of the 2022 International Conference 'ECONOMIC SCIENCE FOR RURAL DEVELOPMENT'*, 56, Jelgava, LLU ESAF, 581-589. <https://doi.org/10.22616/ESRD.2022.56.058>
- Vindevoghel, V. (2024). Rethinking the Geography of Sustainability Transitions by Considering Human-Nature Connections in Rural Areas. *Environmental Innovation and Societal Transitions*, 51, Article 100851. <https://doi.org/10.1016/j.eist.2024.1008>
- Zeverte-Rivza, S., Girdziute, L., Parlińska, A., Rivza, P., Novikova, A., & Gudele, I. (2023). Digitalisation in bioeconomy in the Baltic States and Poland. *Sustainability*, 15(17), Article 13237. <https://doi.org/10.20944/preprints202307.1938.v1>