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## EMBEDDEDNESS OF THE ROSE OIL AND ITS DERIVATIVES IN THE FOOD SYSTEMS OF PLOVDIV REGION

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### Abstract

Bulgarian rose oil is a unique high-value product with deep cultural, economic, and ecological significance. Besides its paramount importance as a fragrance ingredient in the perfume industry this study also explores its role as an embedded element in regional food systems, linking traditional practices, cultural heritage, and modern economic development. A mixed-methods approach was used, including literature review, field surveys, and interviews with key stakeholders as well as an analysis of national and international market trends. Findings indicate that rose oil production is deeply rooted in the Rose Valley region of Bulgaria, with climate, soil, and traditional methods contributing to the distinctive quality of the oil. The sector provides substantial economic benefits by supporting rural employment, small and medium enterprises, and international exports. Regulatory frameworks, particularly the Bulgarian Rose Act, ensure quality control, traceability, and sustainability across both cosmetic and food products derived from rose processing. Moreover, family run operations and long-standing traditions promote social cohesion and the preservation of local knowledge. This paper highlights the dual role of rose oil as a cultural and economic asset, emphasizing its potential for innovation in sustainable food systems. Strategies integrating heritage preservation, market expansion, and regulatory support are essential for maintaining competitiveness and environmental stewardship. The study underlines the importance Bulgarian rose oil and other flower components also as a model for an embedded food system that harmonizes tradition, sustainability, and economic development.

**Keywords:** Bulgarian rose oil, circular economy, cultural heritage, embedded food system, Rose Valley, sustainable food systems

### INTRODUCTION

Bulgarian rose oil represents one of the most emblematic products of national cultural and economic identity. Extracted from *Rosa damascena Mill.*, it is globally acknowledged for its exceptional aromatic composition and high purity. The Kazanlak and Karlovo valleys, situated within the Plovdiv region, form the

geographical and historical core of rose cultivation, where specific pedoclimatic conditions and artisanal expertise have evolved into a unique territorial heritage.

The oil-bearing rose is deeply embedded in Bulgaria's agrarian, social, and cultural landscapes, linking agricultural practice with ritualized traditions and community identity. The Rose Festival of Kazanlak epitomizes this symbiosis, transforming agricultural production into a vehicle for cultural tourism, local branding, and regional cohesion.

Beyond its symbolic and cultural dimensions, rose oil production serves as a pillar of rural livelihoods, generating employment, stimulating Small and Medium Enterprise (SME) activity, and contributing to national export revenues. Traditionally valued in perfumery and cosmetics, rose oil and its derivatives have recently gained attention for their culinary, nutraceutical, and therapeutic applications, reflecting the sector's adaptability to emerging markets and consumer trends.

This paper explores the embeddedness of the rose oil sector within the regional food systems of the Plovdiv region. Embeddedness, as conceptualized in socio-economic theory (Polanyi, 1944; Hinrichs, 2000), refers to the extent to which economic activities are intertwined with social institutions, cultural norms, and ecological systems. Applying this framework allows for a comprehensive understanding of how traditional agricultural products such as rose oil sustain both economic performance and socio-cultural integrity.

Bulgarian rose oil, derived from *Rosa damascena Mill.*, is a hallmark of Bulgaria's cultural and economic identity. The Kazanlak and Karlovo valleys - Rozovata Dolina (The Bulgarian Rose Valley), form the heart of global rose cultivation, where favorable agro-climatic conditions and artisanal distillation techniques produce essential oil of unmatched aromatic quality (Popova et al., 2020).

As indicated above the rose oil sector intertwines agriculture, cultural heritage, and rural livelihoods. The Rose Festival of Kazanlak, a UNESCO-recognized cultural event, exemplifies the fusion of economic production with intangible heritage and local identity (Stoyanova, 2019). Beyond perfumery, the industry is diversifying into food, nutraceutical, and wellness markets, aligning with trends in multifunctional agriculture and sustainable rural development (Ilieva & Marinov, 2022).

This study explores the embeddedness of rose oil and its derivatives within the food systems of the Plovdiv region. The concept of *embeddedness* (Polanyi, 1944) frames economic activities as socially and culturally situated. Contemporary food systems research (Hinrichs, 2000; Sonnino & Marsden, 2006) extends this notion to include governance, environmental, and territorial interconnections.

Applying this framework, the research examines how rose oil production integrates cultural heritage, economic viability, and environmental sustainability, contributing to both regional identity and global market competitiveness.

The main aim of the study is to examine the embeddedness of rose oil and its derivatives within the regional food systems of the Plovdiv region by analyzing sectoral structure, value chain dynamics, governance arrangements, and sustainability challenges. Specifically, the study objectives are to:

- (1) assess the historical, cultural, and economic significance of rose oil.
- (2) analyze its integration into contemporary food systems and value chains;

(3) evaluate the legal and institutional frameworks shaping production and market access;

(4) identify key environmental, social, and economic risks; and

(5) formulate strategic recommendations for enhancing innovation, cooperation, and resilience in the sector.

### **Conceptualizing Embeddedness in Agri-Food Systems**

The idea of embeddedness, introduced by Polanyi (1944), challenges the separation of the economy from social relations. Later adapted to food systems (Hinrichs, 2000; Murdoch, 2000), it emphasizes that agri-food networks are shaped by social trust, territorial identity, and governance structures.

Marsden, Banks, and Bristow (2000) further distinguished between *social*, *territorial*, and *network embeddedness*, explaining how local food systems foster economic resilience and ecological integrity. Sonnino and Marsden (2006) highlight that embeddedness is not static but evolves through innovation, policy, and market interactions.

In the Bulgarian context, embeddedness has become central to understanding rural transformations, where traditional sectors such as rose oil production navigate globalization pressures while maintaining localized value systems (Bachev, 2019).

### **Rose Oil as a Territorial Product**

The Bulgarian rose (*Rosa damascena Mill.*) is historically rooted in the Rose Valley, with documented cultivation since the 17th century (Tasheva & Kostova, 2017). The region's specific microclimate and soil composition produce oil of distinct chemical and olfactory characteristics, recognized internationally as "Bulgarian Rose Oil" (Popova et al., 2020).

Since 2014, the product has held EU Protected Geographical Indication (PGI) status, securing its authenticity and enhancing traceability (European Commission, 2014). The Rose Act (2020) further institutionalized quality standards, registration procedures, and sustainability requirements (Ministry of Agriculture, 2021).

Again, scholars have noted that the rose oil industry exemplifies territorial embeddedness linking cultural identity, economic activity, and environmental adaptation (Ilieva & Marinov, 2022). It contributes to rural diversification through employment, tourism, and high-value exports (Atanasova et al., 2021).

## **MATERIALS AND METHODS**

### **Research Design**

The study adopts a qualitative territorial case study design to examine the embeddedness of rose oil and its derivatives within the regional food systems of the Plovdiv region. The research is grounded in the theoretical framework of embeddedness and sustainable food system governance and applies a diagnostic and interpretative analytical approach rather than causal measurement.

The territorial case study approach is particularly suitable for analyzing traditional high-value products whose economic performance is closely linked to cultural heritage, institutional frameworks, and environmental conditions.

### **Data Sources**

The analysis draws on data sources to ensure analytical depth and triangulation: (1) Literature and Policy Review: Peer-reviewed academic publications, national and EU policy documents, legal acts, statistical reports, and historical sources were reviewed to contextualize the evolution, regulation, and economic role of rose oil production; (2) Comparative Insights: Selected international examples were used as contextual benchmarks to situate Bulgarian practices within global rose oil markets.

## **RESULTS AND DISCUSSION**

### **Current State of Play**

In 2024, Bulgaria harvested approximately 10,335 tons of oil-bearing roses, marking a 10% increase from 2023. The sector includes 3,000 registered growers and 53 distilleries across 17 administrative regions, with the districts of Plovdiv, Stara Zagora, and Pazardzhik forming the production nucleus.

The industry has maintained its Protected Geographical Indication (PGI) status since 2014, ensuring traceability, origin authenticity, and adherence to territorial based production methods. This institutional recognition reinforces Bulgaria's global leadership in rose oil quality and strengthens consumer confidence.

However, structural weaknesses remain. The sector faces low blossom prices, aging plantations, and uneven quality control, while abandoned fields reflect declining profitability among smallholders. These dynamics threaten both economic sustainability and generational renewal.

### **Embeddedness in circular economy and regional food systems**

Rose oil production in the Plovdiv region exemplifies territorial embeddedness, combining economic functions with socio cultural value. Strong horizontal and vertical linkages among farmers, processors, cooperatives, and institutions will facilitate resource sharing and innovation.

The integration of rose oil into local gastronomy and agrotourism via rose-flavored jams, teas, liqueurs, and desserts ensures local circulation and accessibility, reinforcing its role within regional food identities. Direct producer consumer relationships through markets, festivals, and farm-based sales embody the principles of short supply chains and relational trust (Marsden et al., 2000).

At the institutional level, public policies and rural development programs provide structural support for modernization, environmental protection, and marketing. Production practices increasingly reflect agroecological awareness, integrating organic cultivation, biodiversity conservation, and soil regeneration.

Community engagement and heritage initiatives have increased public awareness and local defense of rose-based products, while interregional and EU partnerships foster knowledge exchange and resilience across territories.

### **Legal and Regulatory Framework**

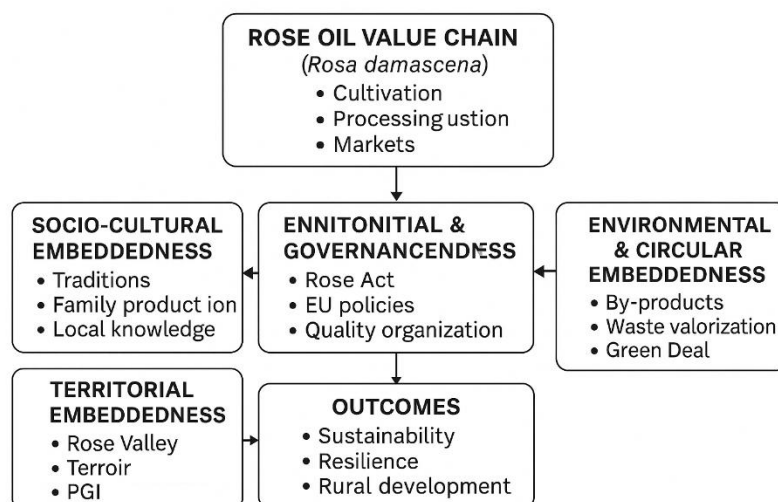
The Bulgarian Rose Act (2020) provides the main governance mechanism for the sector. It establishes obligations for registration, cultivation, harvest management, and traceability, ensuring legal recognition and product authenticity.

Despite notable regulatory advancements, significant implementation challenges persist. Limited institutional capacity and uneven enforcement continue to impede the establishment of uniform quality control across the sector. Developing a more integrated regulatory framework one that combines public oversight with structured producer self regulation could substantially enhance both transparency and market competitiveness. In this context, a more active and operational role of the *Consultative Council on the Rose*, as established under Article 7 of the Rose Act, would be instrumental in strengthening policy coordination and ensuring the consistent application of quality standards.

On the other hand, the Act covers food grade derivatives (rose jam, syrups, teas, confectionery), which represents an important expansion toward cross sectoral food system integration.

### Value Chain and Quality Assurance

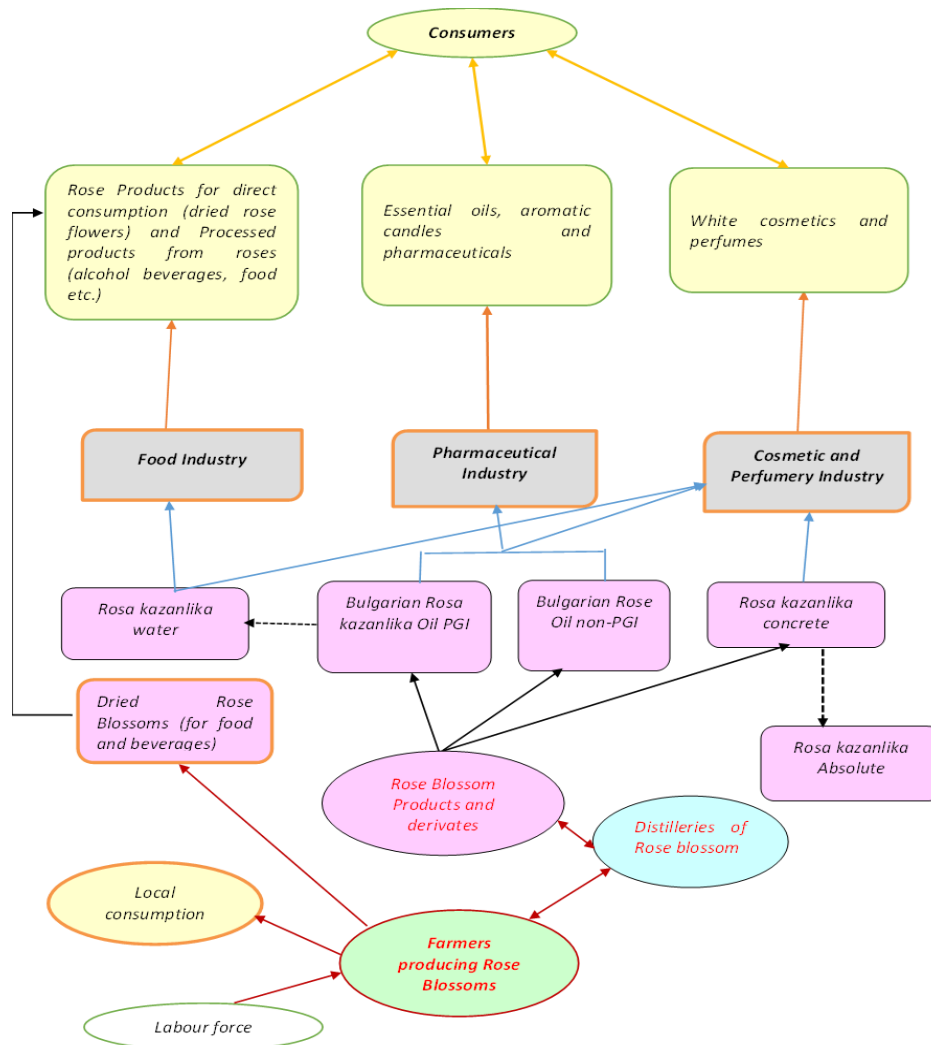
Bulgarian rose oil remains the international benchmark for quality, characterized by a unique balance of phenylethyl alcohol, citronellol, and geraniol compounds. The PGI certification underpins traceability and terroir based branding, linking environmental conditions with product reputation.



**Figure 1:** Rose oil value chain

Source: Own Survey

The figures illustrate how the rose oil production sector in the Plovdiv region is shaped by the interaction of several interconnected dimensions rather than by market forces alone. It shows that rose oil production is embedded in local traditions, family based farming, and accumulated knowledge, which influence production practices and the continuity of the sector. At the same time, territorial factors such as the Rose Valley's natural conditions and the Protected Geographical Indication link product quality to place, reinforcing both market value and regional identity. These social and territorial elements explain why rose oil production remains closely tied to specific local contexts and cannot be easily relocated or standardized.



**Figure 2:** Production interlinks and embeddedness of the Rose products  
*Source: Own survey*

In addition, the figure highlights the role of institutions, economic organization, and environmental practices in sustaining the value chain. Regulatory frameworks such as the Rose Act and EU policies shape quality standards and market access, while economic embeddedness reflects the importance of SMEs, exports, and existing structural weaknesses such as fragmentation and price volatility. Environmental and circular economy elements, including by-product utilization and waste valorisation, further support sustainability objectives. Together, these interacting dimensions lead to outcomes such as greater resilience, sustainability, and rural development, showing that the performance of the rose oil sector depends on balanced and coordinated embeddedness across all areas.

Figure 2 illustrates a color coded arrow system to distinguish between different types of relationships and flows within the *Rosa kazanika* value chain. Each arrow colour represents a specific functional linkage, enabling a clearer interpretation of material movements, processing pathways, and market connections.

Red arrows represent primary production and local embeddedness linkages. These arrows connect the labour force and local consumption to farmers producing rose blossoms, highlighting the social and economic foundations of rose cultivation. Red arrows also link farmers to distilleries and to dried rose blossom production, indicating the initial flow of raw agricultural material into either industrial processing or short, locally oriented value chains. Overall, red arrows emphasize the territorially embedded and labor intensive nature of primary production.

Blue arrows denote industrial input and inter-sectoral flows. These arrows link rose blossom derivatives such as rose water, Bulgarian Rosa kazanika oil (PGI and non-PGI), rose concrete, and rose absolute to the food, pharmaceutical, and cosmetic/perfumery industries. Blue arrows illustrate how processed rose products function as intermediate inputs within downstream industries, reflecting technological transformation, standardization, and integration into broader industrial value chains.

Orange arrows indicate processing to product transitions and industrial outputs. These arrows connect industries to specific product categories, such as essential oils, aromatic candles, pharmaceuticals, dried and processed rose products, cosmetics, and perfumes. They represent the stage at which industrial inputs are converted into market ready goods and emphasize the accumulation of value through processing and formulation.

Yellow arrows signify final consumption and market delivery. These arrows link product categories to consumers, representing the ultimate flow of goods to end users. Yellow arrows capture both domestic and international consumption and symbolize demand driven dynamics that shape production and processing decisions across the entire value chain.

Taken together, the color coded arrows provide a visual representation of the layered structure of the *Rosa kazanika* value chain.

Red arrows emphasize local embeddedness and primary production, blue arrows highlight industrial interconnections, orange arrows represent value-adding processing stages, and yellow arrows depict final market consumption. This color differentiation enhances analytical clarity by distinguishing between social, industrial, and market based relationships within a single integrated system.

Nonetheless, several weaknesses constrain value chain efficiency:

**Price volatility undermines producer income stability**, particularly in sectors with high dependence on export markets and seasonal production, such as Bulgaria's rose oil industry. Fluctuating international demand, variable input costs, and the growing presence of foreign intermediaries have intensified producers' exposure to market uncertainty. These dynamics not only compress profit margins but also weaken the long-term sustainability of small and medium sized enterprises within the sector. The absence of consistent state support mechanisms further amplifies vulnerability, leaving producers reliant on volatile global prices and short-term contractual arrangements.

**Fragmented smallholdings impede collective marketing**, limiting the capacity of producers to achieve economies of scale and negotiate favorable market conditions. The predominance of small, individually managed farms hinders coordinated supply, uniform quality assurance, and collective branding initiatives. This structural fragmentation weakens bargaining power across the value chain and restricts access to export markets that demand consistent volumes and standardized quality. Strengthening producer cooperatives and fostering horizontal integration are therefore essential for enhancing market efficiency, increasing price stability, and improving the overall competitiveness of Bulgaria's rose oil sector.

**Aging plantations and limited replanting investment threaten yield potential**, posing a structural challenge to the long term viability of Bulgaria's rose oil industry. The progressive decline in plant productivity, combined with insufficient renewal of cultivation areas, leads to lower yields and diminished essential oil content. Limited access to financial instruments, coupled with inadequate state support for replanting programs, further constrains producers' capacity to modernize and adapt to evolving climatic and market conditions. Without targeted investment in rejuvenation and sustainable agronomic practices, the sector risks a gradual erosion of both production volume and product quality, undermining its competitive advantage in global markets.

**Uneven quality control risks market dilution**, particularly in high-value niche sectors such as Bulgaria's rose oil industry. Inconsistent application of production standards and the absence of uniform certification mechanisms weaken brand integrity and reduce consumer trust in product authenticity. Such disparities in quality undermine the competitive advantage traditionally associated with Bulgarian rose oil, allowing lower-grade or counterfeit products to enter export markets. The resulting erosion of reputation not only depresses average market prices but also constrains the sector's capacity for sustainable growth and international differentiation.

Overcoming these weaknesses requires strategic interventions centered on cooperative integration, quality standardization, and the implementation of digital traceability systems, which are vital for sustaining Bulgaria's global leadership. At present, no support program is available from the State Fund Agriculture.

#### **Major Challenges and Risks**

The rose oil sector faces multidimensional vulnerabilities:

- ✓ Climatic Risks: Frosts, hail, and heatwaves increasingly disrupt flowering and oil yield.
- ✓ Labor Constraints: Manual harvesting remains labor-intensive and time-sensitive, deterring workforce participation.
- ✓ Market Instability: Price fluctuations and international competition (Turkey, Morocco, Iran) create market insecurity.
- ✓ Structural Deficiencies: Small producers often lack access to credit, equipment, and cooperative platforms.
- ✓ Regulatory Weaknesses: Inadequate enforcement of the Rose Act undermines quality consistency and transparency.

These factors collectively threaten sectoral resilience and underscore the need for integrated policy and institutional reform.

#### **Rose Oil Derivatives and the Circular Economy**

Rose oil production demonstrates strong potential for circular economy integration. Secondary products including rose absolute, concrete, wax, hydrosol, and bioactive extracts extend value creation across the food, cosmetic, and pharmaceutical sectors.

Residues are repurposed as compost, natural dyes, and functional food ingredients, illustrating environmental efficiency and alignment with EU Green Deal and Farm to Fork strategies. Collaborative innovation among farmers, technologists, and research institutions will support local entrepreneurship and cross-sectoral sustainability.

#### **Family Production and Cultural Continuity**

Family-run enterprises remain the socio-cultural nucleus of the rose oil industry. The intergenerational transmission of expertise especially manual harvesting and distillation techniques preserves artisanal quality and intangible heritage. These practices contribute to social cohesion, rural vitality, and consumer trust, reinforcing the embedded nature of rose oil within the region's identity. Local festivals, educational initiatives, and gastronomic tourism further strengthen community based valorization.

#### **Sustainability, Innovation, and Future Developments**

The sector increasingly embraces sustainability-oriented innovation, integrating organic cultivation, eco-certification, and digital monitoring. Rose oil and its derivatives are now applied in functional foods, nutraceuticals, cosmeceuticals, and wellness products, expanding market opportunities and reinforcing intersectoral embeddedness.

To secure long term resilience, the following strategic directions should be prioritized:

1. Strengthen producer cooperation and supply chain integration;
2. Expand rose oil's application within food systems and regional gastronomy;
3. Enhance quality assurance and digital traceability systems;
4. Support research and innovation for climate-resilient cultivation;
5. Diversify marketing and export strategies to ensure competitiveness.

These measures collectively contribute to a more resilient, sustainable, and knowledge driven rose oil sector, capable of maintaining global prestige while deepening local embeddedness.

### **CONCLUSIONS**

Bulgarian rose oil exemplifies an embedded and multifunctional food system that harmonizes cultural heritage, economic development, and environmental sustainability. Rooted in centuries of tradition, its production reflects the deep connection between local communities, regional identity, and natural ecosystems. Beyond its cultural symbolism, the rose oil sector plays a pivotal role in rural employment, particularly for women and seasonal workers, while fostering

intergenerational transmission of artisanal knowledge and reinforcing social cohesion in the Rose Valley and surrounding regions.

The sector's economic significance extends from smallholder farmers to export-oriented enterprises, supporting the diversification of rural economies and strengthening Bulgaria's position in international markets. Through its dual identity as both a cultural emblem and a commercially valuable product Bulgarian rose oil bridges the gap between traditional craftsmanship and modern enterprise.

Comprehensive regulatory frameworks, notably the Bulgarian Rose Act, safeguard the product authenticity, quality assurance, and traceability across both the food and cosmetic sectors. This legislation not only upholds high production standards but also reinforces Bulgaria's reputation for excellence, enabling producers to access premium global markets and protect geographical indications (GIs) that certify origin and integrity.

In addition, the broad range of rose derived products and by products including rose water, jams, liqueurs, syrups, teas, confectionery, essential oil derivatives, and even nutraceutical and cosmeceutical applications illustrate the diversification and adaptability of the sector. Such innovation enhances value creation, reduces waste through circular production systems, and aligns with EU sustainability goals under the Green Deal and the Farm to Fork Strategy.

Looking ahead, significant opportunities exist to expand domestic consumption, enhance regional branding, and integrate innovative rose-based food products into both national and international markets. Encouraging organic cultivation, ecocertification, and short supply chains could further strengthen the ecological and economic sustainability of the sector. Strategic collaboration among producers, policymakers, and research institutions may also enhance competitiveness and knowledge transfer, ensuring that tradition evolves in tandem with innovation.

Ultimately, Bulgarian rose oil serves as a model for how a traditional agricultural product can be successfully embedded into modern food systems, balancing heritage preservation, technological advancement, and market competitiveness. It demonstrates that the safeguarding of cultural heritage and the pursuit of economic modernization are not mutually exclusive but mutually reinforcing pathways toward sustainable regional development and resilient local economies.

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