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RURAL TERRITORIES AS SUSTAINABILITY LABS: ADAPTING DIGITAL AND COMMUNITY-BASED STRATEGIES FROM CHINA TO THE EUROPEAN CONTEXT

DIEGO ACOSTA GIJÓN
University of Seville
Seville, Spain
dieacogij@alum.us.es

DANIELA-TATIANA AGHEORGHIESEI
Alexandru Ioan Cuza University of Iași
Iași, Romania
dtc@uaic.ro

OVIDIU STOICA
Alexandru Ioan Cuza University of Iași
Iași, Romania
ostoica@uaic.ro

Abstract
This paper argues that rural territories in Europe, often viewed as lagging or structurally disadvantaged, possess unique potential to serve as experimental laboratories for sustainable development. By integrating community-driven entrepreneurship, social economy practices, and digital technologies within adaptive governance frameworks, these regions can become strategic drivers of inclusive and place-based transitions. The core hypothesis builds on evidence from rural China, where digital financial inclusion, platform-based governance, and targeted investment in social infrastructure have demonstrably improved rural resilience and institutional capacity. While the Chinese model reflects a distinct sociopolitical context, its mechanisms – particularly those related to digital enablement and local participatory models – offer adaptable insights for the European Union's cohesion policy and rural innovation strategies. Through a comparative and exploratory approach, the article assesses how these tools can be recontextualized to support SDG 8 (decent work and economic growth) in Europe's rural peripheries. It proposes that rural areas, when supported by appropriate infrastructure and participatory governance models, can actively shape sustainable futures – moving from recipients of top-down development to co-creators of territorial resilience, economic justice, and socio-ecological regeneration.
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1. INTRODUCTION

The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, establishes a global framework of 17 Sustainable Development Goals (SDGs) that aim to end poverty, protect the planet, and ensure prosperity for all. Among these, SDG 8 – Decent Work and Economic Growth – stands out as both tangible and operationalizable at local levels, particularly in rural and structurally disadvantaged territories.

Rural areas across Europe face persistent challenges: demographic shrinkage, aging populations, depopulation, and limited access to digital, financial, and social infrastructure. However, these same territories also hold transformative potential. As noted by Shabbir (2023), SDG 8 is the most frequently addressed goal in academic literature on sustainable entrepreneurship, indicating its practical value for activating local economies and social resilience.

The capacity to localize SDG 8 depends not only on access to resources, but also on governance models that enable innovation, inclusion, and feedback. According to Francisco and Linnér (2023), governance for sustainable development has evolved into a multi-actor, multi-level, and ideationally contested space. Their analysis reveals how institutions like the European Union, the United Nations, and the World Economic Forum embed competing visions of sustainability – ranging from ecological modernization to digital techno-solutionism. In this context, rural territories become testbeds where global agendas meet practical implementation through local initiatives, with varying levels of alignment and tension.

This paper advances the hypothesis that rural territories can act as sustainability laboratories – spaces where community-based entrepreneurship, digital innovation, and adaptive governance converge to localize SDG 8. To support this claim, we draw on empirical evidence from rural China, where digital financial inclusion and e-governance have measurably improved economic resilience and local institutional capacity (Xia *et al.,* 2022; He, 2024). These strategies, although developed under different political and cultural conditions, offer valuable mechanisms that can be selectively adapted to the European context.

At the same time, a comparative perspective is essential. Rural innovation in Europe is often framed through Smart Specialisation Strategies (RIS3), yet recent research suggests these strategies risk policy mimicry and fail to reflect local assets and needs (Pylak *et al.,* 2025). Addressing this gap requires models that not only introduce innovation into rural areas, but also position them as generators of new models of inclusive development.

This article is structured as follows:

- Section 2 examines how SDG 8 serves as a strategic entry point for territorial sustainability, particularly through sustainable entrepreneurship.

- Section 3 analyzes the rural digitalization and governance experience in China, offering causal insights.
- Section 4 explores how these mechanisms might be adapted to Europe, with attention to ethical, institutional, and regulatory contexts.
- Section 5 presents a model conceptualizing rural territories as innovation labs.
- Section 6 is composed of policy recommendations based on the previous findings of sections 1 to 5.
- The article concludes by reaffirming the strategic value of rural areas as active agents in delivering the SDGs.

By combining empirical evidence, policy analysis, and comparative governance theory, this paper aims to move beyond abstract principles and provide concrete pathways for embedding SDG 8 in rural territorial strategies.

2. SDG 8 AND RURAL TERRITORIES: ENTREPRENEURSHIP AS A STRATEGIC LEVER

SDG 8 – Decent Work and Economic Growth – aims to promote inclusive and sustainable economic growth, full and productive employment, and decent work for all. While frequently framed at the macroeconomic or national level, this goal can be operationalized effectively in rural settings, particularly through sustainable entrepreneurship and local economic development. In structurally disadvantaged territories, SDG 8 provides a pragmatic entry point into the broader sustainability agenda.

Rural areas often face overlapping structural constraints: limited access to jobs, low levels of business density, brain drain, and weak service provision. In such contexts, promoting entrepreneurship – especially of a social and community-oriented nature – has the potential to activate local capacities, retain youth and women, and rebuild economic circuits that are often externally dependent. As noted by Shabbir (2023), SDG 8 is the most prevalent SDG in sustainable entrepreneurship literature, appearing in 224 peer-reviewed articles over the last two decades. This suggests not only its relevance, but also its practicality as a focus of territorial policy.

Shabbir's bibliometric review identifies five major thematic clusters where SDG 8 is engaged:

1. Social innovation – including cooperative enterprises and civic platforms
2. Sustainability in SMEs – integrating environmental and social goals
3. Community empowerment – building economic agency from the ground up
4. Entrepreneurial education – capacity-building to overcome skill gaps
5. Green employment – creating low-carbon, resource-efficient livelihoods.

These categories overlap directly with rural policy objectives in many EU regions. For example, LEADER and Smart Villages initiatives support similar values, but often lack a strategic link to SDG frameworks, making results difficult

to measure and scale. Embedding SDG 8 explicitly into rural development programming could therefore enhance policy coherence and attract both domestic and EU funding mechanisms.

Another central dimension of SDG 8 in rural areas is financial inclusion, which is necessary for entrepreneurship to take root. In emerging economies, access to digital financial services has been shown to reduce informal borrowing, increase savings, and improve household investment decisions (Pooja and Shashidhar, 2024). Although their study focuses on rural India, the mechanisms involved – such as digital banking apps and mobile transaction platforms – are increasingly relevant in EU rural regions where bank branches are closing and financial services are being restructured.

Yet, access alone is insufficient. For SDG 8 to become an engine of local transformation, it must be embedded within participatory and adaptive governance systems that recognize rural actors as co-producers of policy, not mere beneficiaries. As Mittelstadt (2019) argues in the context of digital ethics, principles without pathways to implementation risk remaining aspirational. This insight applies equally to SDG implementation: operationalizing goals like SDG 8 in rural areas requires tools, actors, and territorially responsive policies.

3. DIGITAL GOVERNANCE AND FINANCIAL INCLUSION IN RURAL CHINA: EVIDENCE AND MECHANISMS

In contexts of territorial underdevelopment, particularly in rural regions characterized by infrastructural scarcity and institutional dispersion, the deployment of digital systems offers not merely a technological solution but a reconfiguration of the governance apparatus itself. Empirical data from the Chinese rural transformation process illustrate how the alignment of digital public infrastructure with localized administrative logics has generated observable improvements in both governance efficiency and household-level resilience. This section reconstructs the causal architecture of that transformation, identifying its relevant mechanisms and boundary conditions.

Between 2011 and 2020, provincial data across 30 Chinese administrative units demonstrated a consistent and statistically significant relationship between digital economic capacity and local governance performance. The operationalization of a Digital Economy Index, correlated with a composite Rural Governance Index, produced an estimated elasticity of +0.42 (Xia *et al.,* 2022). These results are not incidental; they emerge from systemic integration of mobile-based service platforms, digitized administrative workflows, and real-time feedback mechanisms that recalibrate institutional responsiveness.

Of particular interest is the asymmetric benefit distribution observed across provinces. Underdeveloped western regions, such as Gansu and Yunnan, recorded disproportionately large gains in governance indicators, suggesting a compensatory effect where digital infrastructure operates as an institutional equalizer. This dynamic supports the premise advanced by Gasser and Almeida (2017), in which technical, legal, and social subsystems are layered to stabilize and legitimate complex governance ecosystems. The Chinese case exhibits precisely this layering, albeit within a high-coordination policy regime.

At the microeconomic level, the expansion of digital financial services further consolidates the model. He (2024), using a high-resolution panel dataset comprising 43,320 rural households, established a strong positive correlation between access to digital financial instruments and asset diversification outcomes. A one-unit increase in digital inclusion corresponds to a 0.38-point rise in household diversification, controlling for income, region, and education level. The operational mechanisms here are multifactorial: enhanced liquidity management, reduced dependence on informal credit, and increased capacity for forward investment, particularly in non-subsistence domains such as education and durable goods.

This outcome profile finds corroboration in comparative empirical contexts. As seen in rural India, the adoption of digital financial platforms shows similar trajectory patterns, with trust and perceived system reliability emerging as critical adoption variables (Pooja and Shashidhar, 2024). When examined jointly, these cases delineate a functional infrastructure wherein digital systems operate not as ancillary support but as structural enablers of financial agency and territorial resilience.

However, effectiveness is conditional upon systemic embedding. As emphasized in ethical analyses of digital infrastructures (Mittelstadt, 2019), principles of inclusion and fairness must be operationalized through practices that are embedded in governance logics. In China, this embedding is achieved via policy integration and administrative mandates, not participatory mechanisms. While this may contrast with normative models of democratic accountability, the functional outcome remains empirically valid.

Trust dynamics also merit attention. Laux (2024) underlines the fragility of digitally mediated decision-making in environments where institutional legitimacy is contested. In China, trust appears to be derivative – earned through system efficacy rather than inherent through procedural legitimacy. This inversion may not be replicable in Europe, but it offers a counterfactual model for how outcomes-based legitimacy can be constructed in rural development strategies.

Finally, the ethical divergence between collectivist and individualist data cultures (Fung and Etienne, 2023) does not invalidate technical mechanism transfer. As Morley *et al.* (2020) argue, the central challenge in AI and digital ethics is methodological: to develop tools that translate principle into practice. From this perspective, China's rural digitalization offers less a normative template

than a functional archetype – one that demonstrates how digital architectures can recalibrate local economies, administrative capacities, and household-level economic behavior under constrained conditions.

4. OPPORTUNITIES FOR EUROPE: MECHANISM ADAPTATION AND STRUCTURAL FRICTION

The empirical architecture of China's rural digital transformation suggests a viable set of mechanisms – digital financial infrastructure, platform-mediated governance, and embedded system feedback – that can be reinterpreted within the European context. However, the transferability of such mechanisms is constrained by foundational differences in political authority, ethical framing, and regulatory design. Rather than importing institutional models, the operative question becomes how to reconstruct equivalent functionalities within the logic of European multi-level governance.

4.1. Institutional constraints and distributed authority

European territorial governance is characterized by a deliberate fragmentation of power. Competencies are dispersed across local, regional, national, and supranational levels, and the legitimacy of interventions depends not on outcome metrics alone but on procedural transparency, subsidiarity, and citizen participation. In this context, the centralized rollout model that enabled rapid scaling in China is structurally infeasible.

Yet, the European Union's own tools for experimental governance – notably the concept of regulatory sandboxes – present functional analogues. Initially applied in the fintech and AI domains, these frameworks create bounded environments for testing innovative solutions under conditional regulatory flexibility. As demonstrated by Prifti and Fosch-Villaronga (2024), such instruments allow institutional actors to balance risk, innovation, and public accountability through iterative design. Their application in rural policy domains – e.g., cooperative digital finance, data trusts for rural development, or decentralized service platforms – remains largely untapped.

Moreover, the EU's Smart Specialisation Strategy (RIS3) provides a policy vehicle for place-based innovation. However, recent evaluations suggest that the implementation of RIS3 often suffers from policy mimicry, where regions adopt strategic domains not aligned with endogenous capabilities (Pylak *et al.,* 2025). Embedding digital governance and inclusion objectives into revised RIS3 cycles could restore this alignment, especially in regions facing demographic contraction and institutional fatigue.

4.2. Data ethics and the governance of digital infrastructure

Adaptation also depends on normative compatibility. Whereas China's digital systems operate under a framework of collective utility and vertical integration, Europe requires data infrastructures that uphold individual rights, accountability, and democratic oversight. The AI Act, currently under negotiation at the EU level, exemplifies this emphasis. It introduces risk-based categorization, transparency obligations, and procedural safeguards, particularly for systems deployed in public services (Cancela-Outeda, 2024).

Such frameworks reflect a governance culture grounded in what Fung and Etienne (2023) term "ontological divergence": differing conceptions of autonomy, legitimacy, and responsibility that are not easily bridged through technical interoperability. This structural divergence, however, does not negate the possibility of functional convergence. As Morley *et al.* (2020) contend, the key lies in developing context-specific implementation tools that translate principle into practice.

European rural regions, many of which suffer from institutional thinning, could benefit from lightweight, accountable digital infrastructures that support both administrative efficiency and citizen agency. These infrastructures must be designed not only for usability but also for explainability and contestability, as outlined in Kroll's (2018) legal-technical framework for algorithmic accountability.

4.3. Experimental leverage points

The institutional diversity of the EU, often viewed as an obstacle, can also serve as an asset. Member States retain discretion in the deployment of cohesion policy funds, digital transformation strategies, and rural development programs under the Common Agricultural Policy (CAP). This multilevel flexibility allows for the creation of territorially embedded pilots where digital financial services, participatory governance tools, and social economy platforms can be trialed.

Additionally, initiatives such as the Digital Europe Programme, InvestEU, and the Just Transition Mechanism offer financial and technical frameworks that could be harnessed to implement these models. The lack of structured coordination across these funding streams currently inhibits their territorial impact; however, a SDG-aligned programming framework could provide the necessary strategic coherence.

Finally, the role of trust-building institutions cannot be overstated. Laux (2024) demonstrates that digital governance systems lacking embedded trust mechanisms often generate democratic fatigue and resistance. In rural settings – where institutional memory, proximity, and civic expectations differ markedly from urban areas – trust must be constructed through situated functionality. That is, legitimacy emerges from repeated encounters with effective and explainable services, not merely from formal guarantees.

5. RURAL LABS FOR SUSTAINABILITY: A FUNCTIONAL MODEL FOR TERRITORIAL INNOVATION

Drawing from the empirical patterns analyzed in the preceding sections, this paper proposes a model of rural laboratories for sustainability as an operational framework to localize SDG 8 and its cross-sectoral synergies. The model is structured according to an Inputs–Processes–Outputs (IPO) architecture, allowing for analytical clarity, functional modularity, and policy adaptability. Each component is derived from the causal pathways observed in the Chinese experience and adapted to the normative and institutional environment of the European Union.

5.1. Inputs: enabling conditions and strategic assets

The input dimension of the model encompasses the initial territorial resources, institutional conditions, and technical infrastructures required to initiate transformation. These include:

- *Digital access infrastructure*: broadband connectivity, mobile penetration, and platform interoperability.
- *Local institutional capacity*: administrative competence at municipal level, especially in terms of digital service delivery.
- *Financial inclusion mechanisms*: integration of digital financial tools (e-wallets, microloans, savings platforms) into rural economic ecosystems.
- *Community-based organizations*: cooperatives, NGOs, and rural innovation hubs with capacity for collective mobilization.
- Strategic alignment with EU policy instruments: access to funds via CAP, Digital Europe, Just Transition Mechanism, and RIS3 (Pylak *et al.,* 2025).

These inputs must be assessed through territorial diagnostics, incorporating not only infrastructure metrics but also relational indicators, such as trust in local institutions (Laux, 2024) and civic organizational density.

5.2. Processes: mechanisms of governance and transformation

The process layer focuses on the intermediate mechanisms that convert latent capacities into systemic change. It is here that the core functional logic of the model is activated. Key processes include:

- *Platformization of rural public services:* implementation of mobile-accessible portals for administrative procedures, service tracking, and citizen feedback loops (Xia *et al.,* 2022).
- *Territorial sandboxes*: spatially bounded zones for experimentation in digital governance and inclusive entrepreneurship, modeled after European regulatory sandboxes (Prifti and Fosch-Villaronga, 2024).
- *Data-informed participatory governance*: mechanisms for local data collection and community engagement in planning and evaluation,

compliant with the EU AI Act's risk and transparency mandates (Cancela-Outeda, 2024).

- *Financial empowerment loops*: integration of digital financial inclusion into local economic cycles, enabling capital recirculation, asset diversification, and productive investment (He, 2024).
- *Ethical alignment and explainability*: design of systems with embedded contestability and clarity of function, in line with accountability architectures (Kroll, 2018; Morley *et al.,* 2020).

5.3. Outputs: transformation indicators and feedback dynamics

The output dimension captures the observable changes generated by the system and the feedback mechanisms that sustain adaptive governance. Key outputs include:

- *Improved governance scores*: increased efficiency, transparency, and trust at municipal and regional levels.
- *Inclusive economic activity*: rise in rural entrepreneurship, particularly among women and youth; reduction in underemployment.
- *Social infrastructure density*: expansion of community-led initiatives and co-produced services.
- Territorial resilience metrics: reduced outmigration, improved income stability, and diversified household asset profiles (Shabbir, 2023; He, 2024).
- *Cross-SDG spillover effects*: progress in SDG 4 (education), SDG 9 (infrastructure), and SDG 11 (inclusive communities) via SDG 8 activation.

A key component of this design is the existence of embedded feedback loops – data collection, participatory evaluation, iterative design – that allow for systemic learning and recalibration over time.

6. POLICY RECOMMENDATIONS: STRUCTURING TERRITORIAL TRANSITIONS THROUGH ADAPTIVE GOVERNANCE

Translating the Rural Labs model into actionable policy requires a multi-scalar strategy that activates institutional leverage at local, national, and supranational levels. The following recommendations are structured according to the architecture defined in the preceding section – mapping inputs, processes, and outputs to policy instruments, funding mechanisms, and regulatory frameworks within the EU.

6.1. Strengthening territorial inputs through strategic alignment

European rural territories exhibit heterogeneous configurations of digital infrastructure, institutional capacity, and civic capital. In order to develop a coherent and effective strategy, policymakers must:

- *Integrate SDG 8 benchmarks into RIS3 renewal cycles*, ensuring that regional innovation strategies reflect endogenous capacities and sustainability criteria rather than sectoral mimicry (Pylak *et al.,* 2025).
- *Target digital infrastructure funding* (e.g., from the Digital Europe Programme) toward underserved rural regions using a multidimensional vulnerability index that includes digital poverty, financial exclusion, and demographic fragility.
- *Incentivize partnerships between municipalities, local enterprises, and third-sector actors*, using LEADER and CAP Pillar II instruments to support pre-competitive social innovation infrastructures.
- *Promote digital financial literacy* through regional operational programs, particularly among women, youth, and elderly rural populations, creating preconditions for inclusive entrepreneurship.

6.2. Embedding experimental governance processes

Processes represent the core transformation engine. They must be anchored in institutional frameworks that enable experimentation without compromising accountability. To this end:

- *Deploy territorial regulatory sandboxes*, managed by national or regional authorities, to pilot digital platforms for rural governance, financial services, or participatory planning. These should follow the logic of the AI Act's risk-based classification and integrate dynamic monitoring protocols (Cancela-Outeda, 2024; Prifti and Fosch-Villaronga, 2024).
- *Enable data sovereignty and explainability at the local level,* by promoting the use of open-source technologies and community-owned data infrastructures. This mitigates dependency on opaque platforms and reinforces trust, in line with recommendations from Kroll (2018) and Laux (2024).
- *Standardize cross-sectoral evaluation frameworks* to assess the territorial impact of digital policies across SDG indicators, facilitating horizontal learning among regions and EU-level reporting coherence.

6.3. Structuring feedback loops and reinforcing outcome accountability

Output effectiveness must be institutionalized through feedback channels that ensure system learning, social legitimacy, and adaptive correction. Recommended actions include:

- *Mandate participatory impact evaluations* for all major rural digitalization projects funded under the CAP and cohesion policy, involving local stakeholders in ex-ante, mid-term, and ex-post assessments.

- *Incorporate SDG-based performance indicators i*nto EU rural policy programming, not as aspirational goals but as operational benchmarks tied to funding disbursement and renewal cycles.
- *Develop territorial observatories for digital transformation*, based in rural universities or innovation centers, tasked with monitoring implementation fidelity, local acceptance, and equity effects over time.

A key component of this design is the existence of embedded feedback loops – data collection, participatory evaluation, iterative design – that allow for systemic learning and recalibration over time.

7. CONCLUSION

This paper has explored the hypothesis that rural territories, often perceived through the lens of structural deficits, can be repositioned as active laboratories for sustainability-oriented transformation. Through a comparative analysis of China's rural governance and digital inclusion strategies, and a critical evaluation of their transferability to the European context, we have constructed a functional model – the Rural Lab – capable of translating the principles embedded in SDG 8 into territorially grounded policy instruments.

The evidence presented confirms that under certain enabling conditions, digital platforms can enhance governance responsiveness, expand financial agency, and foster inclusive economic activity even in resource-constrained rural settings. In the Chinese case, digital transformation was not merely a technological upgrade but a system-level reconfiguration of local-state relations, service provision, and citizen interaction. While institutional asymmetries make direct replication infeasible, the underlying mechanisms – platformization, inclusion, feedback – can be selectively reengineered within the normative and legal architectures of the European Union.

The European governance landscape, characterized by multilevel authority and normative commitments to individual rights and procedural legitimacy, introduces both complexity and opportunity. Rather than a barrier, this polycentric structure allows for distributed experimentation, modular innovation, and regionally tailored policy pathways. The Rural Lab model proposed here is designed to operate within that structure, aligning with existing policy frameworks such as RIS3, the CAP, the Digital Europe Programme, and the AI Act.

Crucially, this model emphasizes not only the technical deployment of digital systems but also their institutional and ethical integration. Trust, transparency, and citizen co-production are not ancillary considerations but structural prerequisites for sustainable policy impact. The transition from input conditions to measurable outputs must be mediated by governance processes that are both adaptive and anchored in territorial diagnostics, participatory design, and embedded feedback mechanisms.

What emerges is a redefinition of the rural not as a space to be "modernized" from the outside, but as a site of innovation in its own right – capable of generating governance models, technological adaptations, and social infrastructures with relevance beyond its geographic boundaries. In this sense, rural Europe can become a strategic vector in the broader project of sustainable transition, particularly as the EU seeks to reconcile cohesion policy, digitalization, and climate goals under a unified development vision.

Future research should expand the empirical base of this approach, testing the model across diverse territorial settings and exploring its interaction with sectoral policies such as education, health, and energy. Likewise, longitudinal evaluation will be essential to assess not only initial uptake but also system durability and social impact.

In repositioning rural territories as experimental ecosystems for sustainability, the challenge is no longer one of technical capacity, but of institutional imagination. This paper has aimed to contribute to that reimagining, providing both a conceptual framework and a set of policy orientations to advance a new phase of territorial integration within the logic of the 2030 Agenda.

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