

Local Action Groups as Facilitators of the Smart Village Concept: Infrastructure, Digital Connectivity and Human Capital in Rural Bulgaria

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Abstract: This paper examines the role of Local Action Groups (LAGs) in advancing the smart village concept and improving access to services and infrastructure in rural Bulgaria under the LEADER/Community-Led Local Development (CLLD) approach. Drawing on a survey of 321 rural residents and 15 in-depth interviews with LAG directors, the study identifies persistent deficits in transport connectivity, digital infrastructure, and communal services, and examines the risk of reducing “smart village” to a purely technological exercise, detached from local economic and organizational realities. The findings show that LAGs are well positioned to act as coordinators between municipalities, businesses, and communities, but that their effectiveness depends on stronger organizational capacity and closer integration between infrastructure, digital literacy, and human capital support.

Keywords: LEADER; Community-Led Local Development (CLLD); Local Action Groups; smart village; rural infrastructure; digital connectivity; regional development

1. INTRODUCTION

Access to services and infrastructure is a critical determinant of the economic activity, social sustainability, and demographic viability of rural areas. In Bulgaria, deficits in transport connectivity, digital infrastructure, and communal services remain systemic, disproportionately affecting the quality of life of rural populations and constraining opportunities for entrepreneurship and employment. These deficits are not primarily the result of an absence of policies or public investment, but of their fragmentation, uneven territorial distribution, and weak coordination at the local level.

Within this context, the concept of the “smart village” has gained prominence in European rural development policy as a framework for integrating digital innovation, social solutions, and new governance models in support of sustainable local development [1]. In Bulgaria, however, the application of the concept remains at an early stage, with a persistent risk of reducing it to a purely technological component, detached from broader organizational and economic logic.

Local Action Groups (LAGs), as the operational core of the LEADER/CLLD approach [2], occupy a potentially decisive position in this process. Beyond their conventional role in administering project funding, LAGs possess the local knowledge, partnership structures, and convening capacity to function as coordinators between municipalities, businesses, civil society organizations, and educational institutions in the implementation of smart village initiatives.

This paper examines the role that LAGs can and do play in advancing the smart village concept and improving access to services and infrastructure in rural Bulgaria. It draws on empirical evidence from a broader study on the functioning of the LEADER/CLLD approach in Bulgaria, combining survey data on rural residents’ perceptions with in-depth qualitative evidence from LAG directors. The paper aims to identify the structural barriers that limit infrastructure and digital development in rural areas, and to clarify the conditions under which LAGs can function as effective facilitators of a genuinely integrated smart village approach, rather than administrators of isolated technological interventions.

2. LITERATURE REVIEW

2.1 LEADER/CLLD as a decentralized instrument of rural governance

The institutional effectiveness of the LEADER/CLLD approach has been the subject of sustained academic interest. Ray [2] defines LEADER as a “laboratory” for rural development, an experimental model whose added value stems from the bottom-up principle and from the capacity of local partnerships to generate endogenous development rather than

implement externally designed solutions. Dax and Oedl-Wieser [3] link the institutional autonomy of Local Action Groups to their capacity to generate genuine territorial development, arguing that LAGs function effectively only when they operate as substantive partnership structures rather than as a mere distribution channel for public funds. This literature establishes the conceptual basis for treating LAGs not simply as administrative intermediaries, but as potential agents of broader territorial transformation — a role directly relevant to the implementation of the smart village concept examined in this paper.

2.2 Regional development and territorial policy in Bulgaria

The Bulgarian regional policy literature provides important context for understanding the structural constraints facing infrastructure and service delivery in rural areas. Petrov [4] offers a foundational analysis of the institutional and normative framework of regional policy in Bulgaria and the European Union, highlighting the persistent tension between the sectoral logic of national administration and the territorial logic required for genuinely integrated regional development — a tension that closely parallels the institutional dynamics identified in the present study with respect to infrastructure and service coordination. Tsonkov and Petrov [5] extend this analysis to the broader set of global challenges confronting regional policy, including demographic decline, growing territorial disparities, and the need for governance models capable of adapting to rapidly changing socio-economic conditions in peripheral areas. Petrov and Tsonkov [6] examine trends in the regional development of medium-sized municipalities with a population between 10 and 50 thousand in Eastern Bulgaria, providing empirical evidence that disparities in access to services and infrastructure are closely linked to settlement size and proximity to regional centers — a pattern consistent with the infrastructure deficits identified among the rural municipalities examined in this study. Most directly relevant to the present analysis, Borisov, Petrov, and Tsonkov [7] propose integration perspectives for improving regional policy in rural areas of Bulgaria, arguing that the effectiveness of rural development interventions depends on overcoming the fragmentation between infrastructure, economic, and social policy instruments. This conclusion directly supports the central argument developed in this paper: that isolated, single-sector interventions — whether infrastructural or technological — are structurally limited in their capacity to generate sustainable territorial development, and that integration across sectors and levels of governance is a precondition for effectiveness.

2.3 The smart village concept in European rural policy

The concept of the “smart village” was formally introduced into European rural development policy through the European Commission’s 2017 EU Action for Smart Villages [1], which framed the concept as a means of enhancing traditional and new rural networks and services through digital technologies, innovation, and the better use of local knowledge, while explicitly avoiding a one-size-fits-all approach. Subsequent policy work under the European Network for Rural Development emphasized the connection between smart villages and the LEADER approach, positioning LAGs as natural vehicles for the concept’s implementation at the local level. Despite this policy framing, the literature reviewed above on LAG institutional autonomy [3] and on the integration deficits of Bulgarian regional policy [7] suggests that the practical application of the smart village concept in a context such as Bulgaria’s is likely to face the same structural obstacles — fragmentation, weak coordination, and limited institutional capacity — that constrain rural development policy more broadly. This paper examines empirically whether, and under what conditions, these obstacles are overcome in practice.

3. METHODS AND MATERIALS

The study is based on a combination of quantitative and qualitative methods. The quantitative component draws on a structured survey conducted among 321 residents of rural municipalities across Bulgaria, examining perceptions of access to services, infrastructure, and the LEADER/CLLD approach. The qualitative component is based on 15 in-depth interviews conducted with directors of Local Action Groups (LAGs) across different regions of Bulgaria (Northern, Southern, Central, and North-Western), focusing on their experience in coordinating infrastructure, digital connectivity, and human capital initiatives at the local level. Interview data were analyzed thematically to identify recurring patterns regarding infrastructure barriers, the practical application of the smart village concept, and the organizational role of LAGs. Survey and interview findings were triangulated to assess the consistency between residents’ perceptions and LAG directors’ operational experience. Table 1 summarizes the principal themes identified through this analysis.

Theme	Manifestation	Illustrative evidence
Transport connectivity	Poor road conditions raise costs and deter suppliers and investors	“Suppliers refuse to come regularly because of the road... it makes us uncompetitive.” (LAG director, Central Bulgaria)
Digital infrastructure	Unstable or absent internet access limits e-commerce and remote work	“There are villages without stable internet. How can you develop online services or remote work?” (LAG director, Southern Bulgaria)

Communal infrastructure	Depreciated water, sanitation, and energy networks raise production costs	Cited across territories as a determinant of investment attractiveness for processing and tourism enterprises
Technological reductionism	“Smart village” reduced to isolated technology purchases without organizational change	“We buy equipment, build a website, but if there is no one to maintain and use it, the effect is minimal.” (LAG director, Southern Bulgaria)
Human capital	Outmigration and ageing limit labor supply more severely than funding constraints	“We can secure a project, but there is no one to do the work. The people are not there.” (LAG director, North-Western Bulgaria)

Table 1. Summary of identified infrastructure and governance themes.

4. RESULTS

4.1 Transport, digital, and communal infrastructure deficits

The survey and interview data converge on three principal infrastructure deficits affecting rural areas in Bulgaria: transport connectivity, digital infrastructure, and communal services (water supply, energy efficiency, sanitation).

Transport connectivity emerged as a direct constraint on economic activity. LAG directors described how poor road conditions discourage suppliers and investors from engaging with local businesses. As one LAG director from Central Bulgaria noted: “We have a processing enterprise, but suppliers refuse to come regularly because of the road. This increases our costs and makes us uncompetitive.”

Digital infrastructure was identified as a structural limitation on economic diversification. Despite national progress in connectivity, many rural settlements continue to lack stable internet access, which constrains e-commerce, remote work, and digital entrepreneurship. A LAG director from Southern Bulgaria observed: “We talk about digitalization, but there are villages without stable internet. How can you develop online services or remote work?”

Communal infrastructure — including water supply, sanitation, and energy efficiency — was found to directly affect production costs and investment attractiveness. Depreciated infrastructure networks and high operating costs increase the cost base of local production and reduce the territory’s attractiveness to investors. For processing and manufacturing enterprises, as well as for tourism operators, the quality of basic infrastructure was consistently described as a determining factor of competitiveness.

4.2 The economic logic of infrastructure prioritization and the evaluation gap

Beyond the identification of specific deficits, the data point to a broader problem in how infrastructure investment is prioritized and evaluated. Infrastructure interventions in rural areas are traditionally treated as a basic public responsibility aimed at improving living conditions. Within local development strategies, however, respondents and interviewees consistently framed infrastructure not merely as a social service, but as a strategic economic instrument. Isolated infrastructure investments, implemented without a clear link to the economic profile of the territory, were repeatedly described as producing a limited and short-term effect, without generating sustainable development.

The central question emerging from the data is therefore not whether to invest in infrastructure, but how, and according to what economic logic, investments should be prioritized. In a number of cases, public resources were reported to be directed toward highly visible projects with limited economic effect, while investment in transport connectivity, logistical access, digital infrastructure, and basic communal networks was seen as having a potential multiplier effect on the local economy.

A related constraint concerns the absence of systematic evaluation of the economic return of infrastructure projects. Interviewees noted that interventions are frequently assessed according to the degree of implementation or fund absorption, rather than their long-term impact on the local economy — their capacity to generate employment, attract private investment, or sustain themselves in maintenance and management once external funding ends. The absence of such evaluation carries the risk of building infrastructure with insufficient economic effect, or with future maintenance costs exceeding local capacity.

4.3 The need for multi-fund and cross-sectoral integration

A recurring finding across the interviews is that infrastructure interventions rarely achieve a sustainable effect when implemented in isolation from other economic and social measures. Directors pointed to a lack of synchronization between different funds and programmes, which results in parallel investments without a strategic connection between them. Integrating infrastructure, economic, and social measures within local development strategies was seen as a

precondition for a cumulative territorial effect — one requiring coordination between municipalities, LAGs, and managing authorities, as well as a clear definition of priorities according to the economic profile of each territory.

4.4 The smart village concept in practice: the risk of technological reductionism

Interview data reveal a consistent risk of what can be termed technological reductionism — the tendency to reduce the smart village concept to the deployment of digital platforms or isolated technological solutions, without a corresponding change in local organizational and economic logic. As one LAG director from Northern Bulgaria put it: “We talk about a ‘smart village’, but if there are no people and no economy, what will a platform do? You need content first, then technology.” A director from Southern Bulgaria echoed this: “We buy equipment, build a website, but if there is no one to maintain and use it, the effect is minimal.”

A further condition for sustainable application of the concept concerns scale. Overly complex, capital-intensive, or technologically demanding solutions were repeatedly described as unsustainable in small settlements with limited human and financial resources. Interviewees favored the incremental introduction of scalable solutions adapted to local conditions, encompassing not only digital services but also organizational innovations — shared services, cooperative models, community-based initiatives, and local mutual-support networks.

4.5 The coordinating role of Local Action Groups

Across the interviews, LAG directors consistently positioned themselves — or saw the potential for LAGs to position themselves — as coordinators and facilitators among municipalities, businesses, civil society organizations, and educational institutions in the implementation of smart village initiatives. This mediating function was described as particularly important in an environment characterized by limited administrative and expert capacity at the municipal level.

4.6 Human capital as a precondition for effective interventions

Interview data highlight that the absence of economically active residents, rather than the absence of funding, is frequently perceived as the more binding constraint on rural development. A LAG director from North-Western Bulgaria noted: “We can secure a project, but there is no one to do the work. The people are not there, and the young ones are leaving.” Directors also emphasized the need to move from passive social support toward activating economic policy: “Giving aid does not solve the problem. There needs to be work, even if small, but steady” (LAG director, Southern Bulgaria).

5. DISCUSSION

The findings indicate that infrastructure deficits in Bulgarian rural areas function as more than a social welfare concern; they constitute a direct economic constraint on entrepreneurship, investment attractiveness, and territorial competitiveness. Isolated infrastructure investments, disconnected from the economic profile of the territory, tend to produce limited and short-term effects, reinforcing the case for treating infrastructure as a strategic economic instrument rather than a self-contained public expenditure. This finding echoes the integration argument advanced by Borisov, Petrov, and Tsonkov [7] at the level of national regional policy, and confirms its relevance at the more granular level of individual rural territories and LAG-administered strategies.

The evidence on technological reductionism suggests that the smart village concept, as currently applied in Bulgaria, risks remaining a formal label rather than a genuine framework for territorial transformation. Its effective implementation requires integration between digital infrastructure, human capital, entrepreneurship, and institutional coordination — a combination that isolated technological interventions cannot deliver on their own. The absence of systematic economic-return evaluation for infrastructure projects compounds this risk, since it removes the feedback mechanism through which ineffective, purely technological interventions might otherwise be identified and corrected.

Within this context, LAGs emerge as a structurally well-positioned, if currently underutilized, coordinating actor. Their partnership-based governance model and local embeddedness — consistent with the institutional-autonomy argument of Dax and Oedl-Wieser [3] — give them a comparative advantage in mobilizing the cross-sectoral cooperation that smart village implementation requires. Realizing this potential, however, depends on conditions identified in the empirical evidence: strengthening the organizational and expert capacity of LAGs beyond their conventional administrative function; adapting smart village interventions to the scale and resource base of individual territories; and embedding infrastructure and technology investment within a clear, evaluable economic logic rather than treating fund absorption as an end in itself.

The findings further confirm that human capital constraints impose an upper limit on the transformative potential of infrastructure and digital investment. Demographic decline and the outmigration of the economically active population — a trend also documented at the broader regional level by Tsonkov and Petrov [5] and Petrov and Tsonkov [6] — mean that even well-designed infrastructure and digital interventions risk producing a stabilizing, rather than transformative,

effect in the most peripheral territories. This underscores the need to embed human capital support — including entrepreneurial skills training and support for the economic integration of vulnerable groups — directly within local development strategies, rather than treating it as a secondary social component.

6. CONCLUSION

This study shows that the effectiveness of the smart village concept in rural Bulgaria depends not on the availability of digital technology, but on the extent to which infrastructure, digital connectivity, and human capital interventions are integrated within a coherent local economic strategy, and evaluated according to their actual economic return rather than their degree of fund absorption. Local Action Groups, through their partnership-based governance structure and local knowledge, are positioned to play a decisive coordinating role in this process, provided their organizational capacity is strengthened, their mandate extended beyond conventional project administration, and their work better synchronized with the wider regional development framework documented in the Bulgarian regional policy literature. Overcoming technological reductionism and building a genuinely integrated approach to rural service access and territorial transformation therefore requires not primarily new technology, but a reconfiguration of local and regional coordination mechanisms in which LAGs can act as facilitators rather than administrators.

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Not applicable.

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