The Grassroots Practice of Integrated Urban-Rural Transportation Self-Assessment Achieving a 5A Rating and the Pathways for Enhancing Logistics Efficiency

---A Case Study of Qingyuan County, Zhejiang Province

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Abstract: Urban-rural integrated transport is a foundational infrastructure undertaking for advancing rural revitalisation, facilitating the circulation of goods and capital between urban and rural areas, and realising common prosperity. Drawing on Qingyuan County's practice of achieving the highest 5A rating in the provincial urban-rural integrated transport self-assessment for three consecutive years (2022–2025), this paper examines three core modules: rural road network development, passenger-freight-postal (PFP) integration, and digitised maintenance management. It analyses the collaborative logic underpinning these modules and situates the self-assessment instrument within a performance management framework. Findings indicate that the self-assessment mechanism functions not merely as an external verification tool but as an internal management engine driving county-level transport from "accessibility" to "efficiency". Through cross-departmental collaboration, data-driven decision-making, and a sustainable safeguard system, the county has achieved a reduction of over 30% in last-mile logistics costs and an improvement of one to two days in urban-rural circulation efficiency. The paper further identifies three structural constraints and proposes four optimisation pathways — encompassing e-commerce and PFP linkage, data platform integration, grassroots talent development, and conversion of assessment findings into governance action — offering a replicable model for similar mountainous counties.

Index Terms — *urban-rural integrated transport; passenger-freight-postal integration; logistics efficiency; rural revitalisation; 5A-rating self-assessment; performance management*

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1. Introduction

Urban-rural transport is a foundational, pioneering, and service-oriented sector underpinning national economic and social development. The Outline for Building a Strong Transport Nation (2019) explicitly calls for advancing high-quality development of 'Four Good Rural Roads' and achieving equitable provision of public transport services between urban and rural areas, while prioritising the flow of factors between urban and rural areas. Against this backdrop, the development of urban-rural integrated transport has advanced beyond the infrastructure phase of 'building roads' to a systemic governance phase encompassing 'using roads well, managing roads well, and moving goods efficiently'.

Qingyuan County is located in the south-western part of Zhejiang Province. As a typical mountainous county characterised by complex terrain and a dispersed population, it has historically faced considerable infrastructure deficits. Addressing the 'last-mile' challenge in rural logistics — reducing circulation costs of agricultural products moving to markets (upstream) and industrial goods reaching rural consumers (downstream) — has long been the central challenge confronting local transport authorities. Qingyuan also produces distinctive agricultural goods, including shiitake mushrooms and sweet mandarin citrus, with strong regional identity and market potential. Building an efficient rural logistics system is therefore both a livelihood project and a strategic measure to enhance the county's industrial competitiveness.

From 2022 to 2025, the author served as lead coordinator for the urban-rural integrated transport self-assessment at the Qingyuan County Transport Bureau for three consecutive years. This entailed annually coordinating multiple agencies — including the Housing and Urban-Rural Development Bureau, the Traffic Police Brigade, the Postal Administration, the County Bus Company, and the Bureau's own Safety, Maintenance, and Engineering divisions — to complete a comprehensive evaluation covering five dimensions: rural road construction, PFP integration, maintenance informatisation, passenger transport informatisation, and organisational safeguards, comprising 21 primary indicators. The county achieved the provincial 5A rating for three consecutive years.

This paper contributes at three levels. First, it provides a detailed case record — grounded in first-hand operational data — of a mountainous county's pursuit of urban-rural transport integration. Second, it analyses the self-assessment instrument within a performance

management framework, extracting a management logic characterised as ‘assessment-driven construction, assessment-driven reform, assessment-driven optimisation’. Third, it identifies structural constraints and proposes actionable optimisation pathways. The paper proceeds as follows: Section 2 reviews theoretical foundations and policy background; Section 3 profiles Qingyuan County; Section 4 analyses the three core modules; Section 5 elaborates the self-assessment management logic; Section 6 discusses constraints and optimisation pathways; Section 7 concludes.

2. Theoretical Foundations and Policy Background

2.1 Economic Effects of Rural Transport Infrastructure: A Literature Review

The growth-promoting effects of transport infrastructure on rural economic development have been extensively documented in both domestic and international scholarship. From the perspective of spatial economics, reducing transport costs effectively narrows the price gap between farm-gate and urban markets and enhances the mobility of rural production factors. New economic geography theory further posits that improving connectivity between peripheral and core areas generates agglomeration benefits while enabling rural areas to specialise in sectors of comparative advantage.

In the Chinese context, a substantial body of empirical research has established a significant positive correlation between rural road investment and the growth of farmers' incomes. However, Liu (2022) notes that road construction in isolation yields only partial welfare gains — in the absence of complementary logistics nodes and service networks, smallholder farmers remain unable to access reliable delivery services at affordable costs. This finding provides a theoretical foundation for the PFP integration model: the integration of logistics infrastructure is an indispensable complement to physical connectivity if that connectivity is to generate economic returns.

2.2 The Institutional Logic of the 5A Rating Self-Assessment Framework

Zhejiang Province's urban-rural integrated transport assessment system employs a tiered scoring structure, with 5A as the highest rating. Pursuant to the Zhejiang Provincial Urban-Rural Integrated Transport Development Level Assessment Rules (2021), the assessment framework

encompasses five dimensions — infrastructure construction, service coverage, logistics integration, maintenance governance, and organisational safeguards — comprising 21 primary indicators in total. The institutional design of this framework is simultaneously diagnostic and developmental: each indicator carries an improvement benchmark, guiding counties to pursue progressively higher standards rather than settling for mere compliance.

This mechanism aligns with the broader performance management (绩效考核) orientation in China's public administration reform, whereby quantitative indicators align local departmental conduct with national policy objectives. Within the transport sector, performance assessment has been applied to 'Four Good Rural Roads' development, rural passenger transport, and rural logistics network integration. Qingyuan County's experience demonstrates that the self-assessment framework can transcend external compliance assurance to function as an internal management tool driving continuous improvement.

2.3 Passenger-Freight-Postal Integration: The Economic Rationale for Institutional Innovation

Passenger-Freight-Postal (PFP) Integration is a distinctively Chinese institutional innovation whose economic rationale is rooted in the cost structure of rural transport markets. Low passenger density and long operating distances on rural routes render the unit costs of dedicated freight services prohibitively high, often making them commercially unviable in remote administrative villages. By permitting passenger buses to carry postal parcels in underutilised cargo holds, the PFP model distributes fixed costs across multiple service streams, fundamentally improving the economic viability of rural routes.

Wang (2022) estimates that a mature PFP integration model can reduce last-mile delivery costs by 25–35%, closely aligning with the 30%-plus cost reduction figure documented in Qingyuan County's self-assessment data. The value of this institutional innovation lies not only in cost reduction but in providing an endogenous solution — one independent of subsidy dependence — to the long-standing challenge of sustainable last-mile service delivery in remote villages.

3. Research Context: Qingyuan County Profile

Qingyuan County has a total area of approximately 1,898 square kilometres, with mountainous and hilly terrain accounting for over 87% of the land area. The county encompasses 19 townships and more than 400 administrative villages, with a permanent resident population of approximately 200,000. Settlement patterns are highly dispersed, with a significant proportion of natural villages accessible only via narrow single-lane roads. The dominant agricultural industries are Qingyuan shiitake mushrooms — a geographically indicated product with substantial value-added and export potential — and sweet mandarin citrus, which has recorded strong sales performance on e-commerce platforms in recent years. This industrial structure means that an efficient rural logistics system is both a livelihood necessity and a direct determinant of the county's primary sector competitiveness.

Prior to the systematic advancement of transport integration, rural logistics in Qingyuan was characterised by high costs, long delivery times, and incomplete coverage. Agricultural products typically passed through multiple layers of intermediaries before reaching urban markets, with each layer adding costs and reducing freshness. The rural delivery of consumer goods and agricultural inputs was similarly slow and expensive, constraining household consumption capacity and productive investment. Transport integration was therefore conceived from the outset as a two-directional intervention: reducing the cost of 'getting mountain products out' and opening channels for 'getting quality goods in'.

The Qingyuan County Transport Bureau assumed a cross-system coordination role in integration work, operating along four principal lines: road network governance (coordinating the Engineering Division and Housing Bureau), safety management (coordinating the Traffic Police Brigade and Safety Division), transport logistics (coordinating the Postal Administration and Bus Company), and maintenance management (coordinating the Maintenance Division and Finance Bureau). The annual self-assessment cycle served as the core institutional mechanism for synchronising these four lines of work, ensuring the consistency of performance data, and converting findings into management actions.

4. Practical Pathways and Collaborative Logic of the Three Core Modules

4.1 Rural Road Network Development: Consolidating the Physical Foundation

The road network constitutes the physical substrate of transport integration and the foundational prerequisite for both PFP integration and maintenance informatisation. Qingyuan County adheres to the principle of balancing 'construction, management, maintenance, and operation', sustaining investment in rural road development and embedding road network construction within a broader governance system rather than treating it as a simple engineering task.

4.1.1 Road Network Structural Optimisation

Targeting the goals of ‘external connectivity and internal accessibility, village connection and township circulation’, the county has prioritised upgrading county and township roads and hardening roads to natural villages. Core metrics including rural road mileage, proportion of classified roads, and the rate of administrative villages served by buses all met or exceeded provincial standards. Road surfacing works — converting dirt tracks into concrete or asphalt surfaces — are especially critical as the prerequisite for all-weather access and for reducing vehicle wear. Between 2022 and 2025, the county completed surfacing works on hundreds of kilometres of village roads, enabling dozens of remote natural villages to achieve all-weather accessibility.

4.1.2 Safety Protection Infrastructure

The safety challenges of mountainous roads are pronounced, manifesting in steep gradients, sharp bends, and sections near cliffs and waterways. Qingyuan County has integrated safety facility construction into all road construction and reconstruction projects, including crash barriers on cliff-edge and waterside sections, hazard warning signs at dangerous intersections, and speed bumps at village entrances. Safety infrastructure installation is incorporated as an independent self-assessment indicator, institutionalising accountability for safety investment. Treating protective infrastructure as an intrinsic component of road quality — rather than an optional add-on — is a defining feature of Qingyuan’s road governance philosophy.

4.1.3 Cross-Departmental Coordination Mechanisms

Rural road network governance involves at least four principal actors: the Engineering Division (project construction), the Housing Bureau (urban road network), the Traffic Police Brigade (safety facilities and accident data), and the Maintenance Division (road condition management). In successive annual self-assessment processes, the author led the establishment

of a standardised data collection mechanism based on ‘a single set of data’, providing all units in advance with unified indicator definitions, measurement standards, and reporting protocols. This eliminated inconsistencies arising from differing departmental interpretations and promoted the institutionalisation of routine inter-departmental working relationships.

4.2 Passenger-Freight-Postal Integration: Activating Existing Resources

PFP Integration is the module of greatest institutional innovation significance in Qingyuan's integrated transport practice. Its core logic is to replace incremental infrastructure investment with the optimised allocation of existing resources: by integrating the unused carrying capacity of passenger bus routes with the last-mile delivery needs of postal and courier services, the unit fixed costs of rural logistics are fundamentally reduced.

4.2.1 Integration of Transport Carriers

Utilising the city-village bus routes operated by the County Bus Company, parcels from postal and courier services are loaded in bus cargo holds or underutilised seats, achieving 'freight-on-passenger' operations. For remote administrative villages with minimal parcel volumes, bus drivers assume responsibility for parcel collection and delivery, fully replacing dedicated freight vehicles and minimising empty-run rates. Operational data indicate that integrated last-mile delivery costs have decreased by over 30% compared to the pre-integration period, and delivery frequency has risen from once every two to three days to daily coverage. For time-sensitive fresh agricultural produce, this improvement carries direct economic value.

4.2.2 A Three-Tier Logistics Node System

Underpinning vehicle-level integration is a three-tier logistics node architecture: a county-level common distribution platform (leveraging the passenger terminal or postal distribution centre), township-level comprehensive transport service stations (adapted from transport management stations or postal sub-offices), and village-level service points (integrating rural convenience stores, village committee premises, and similar facilities). This architecture maximises utilisation of existing physical assets, avoiding duplicate investment in dedicated logistics facilities at each tier. Village-level service points require only modest equipment, signage, and operational training, and can be managed part-time by local residents, ensuring financial sustainability.

4.2.3 Information System Interoperability

The self-assessment framework designates ‘passenger transport informatisation level’ as an independent indicator, recognising information flow quality as a critical determinant of PFP operational effectiveness. Qingyuan County has achieved basic data connectivity between its bus dispatch system and postal logistics system via the transport information platform, enabling real-time queries on parcel status and bus arrival times. Nevertheless, ‘data silo’ issues persist among the maintenance informatisation platform, bus dispatch platform, and postal logistics platform, with no cross-platform integration of road condition, vehicle, and parcel data yet achieved. This gap has been identified as a priority for the next phase of technology investment.

4.3 Maintenance Informatisation: Building Long-Term Operational Safeguards

The adage 'three parts construction, seven parts maintenance' underscores that maintenance quality is the fundamental guarantee of sustained road network performance and the basic precondition for reliable PFP integration operations. Qingyuan County has pioneered the digital transformation of rural road maintenance, organically combining digital tools with fiscal safeguard mechanisms in its institutional design.

4.3.1 Digital Asset Records

Leveraging the highway maintenance management platform, the county has implemented ‘one record per road’ dynamic asset management for all rural roads, recording pavement condition, bridge ratings, drainage facility status, safety infrastructure inventories, and historical maintenance records. Records are updated in real time following maintenance operations and periodic condition assessments. The Maintenance Division uses these digital records to generate road condition reports with temporal and spatial dimensions, supporting proactive preventive maintenance and pre-empting cost escalation from deferred defect treatment — substantially enhancing the accuracy and accountability of performance reporting compared to paper-based systems.

4.3.2 Intelligent Inspection and Closed-Loop Work Order Management

Maintenance inspection has been upgraded from paper-based recording to a digital tracking system using mobile applications and vehicle-mounted GPS. Inspectors record patrol routes, photograph and upload defects, and geolocate problem types via dedicated mobile apps.

The system automatically generates work orders dispatched to the responsible maintenance station; personnel must upload post-remediation photographs before an order can be closed, creating a complete loop from ‘identifying problems’ to ‘verifying remediation’. This mechanism has resolved the disconnection between defect reporting and follow-through that plagued paper-based systems, ensuring traceable records for every pavement issue.

4.3.3 Institutionalised Fiscal Safeguards

Qingyuan County has incorporated rural road maintenance funding into the county-level fiscal budget and established a dynamic adjustment mechanism tied to maintenance mileage and road condition ratings. This arrangement avoids the common problem of maintenance funding shortfalls and progressive road surface deterioration caused by budget volatility or competing priorities. The self-assessment framework’s explicit requirement for ‘organisational and financial safeguards’ provides external accountability for the fiscal commitment to maintenance, reinforcing the stability of this mechanism.

5. The Logic of Efficiency Enhancement through Self-Assessment as a Management Tool

5.1 From Compliance Orientation to Continuous Improvement: A Conceptual Transformation

The common failure mode of performance assessment mechanisms is the 'compliance trap': assessed entities concentrate effort on producing materials that demonstrate compliance rather than driving substantive service improvements, with the conclusion of assessment marking the end of work. Three years of practice in Qingyuan County demonstrate that this failure mode is not inevitable. The critical question is whether the assessed organisation treats assessment outcomes as the terminus of an improvement cycle or as the starting point for a new round of enhancement actions.

In Qingyuan's institutional arrangement, each complete assessment cycle concludes with a cross-departmental review meeting led by the coordinating department. The meeting systematically analyses weaknesses and deduction risk points across all 21 indicators and incorporates identified issues into the subsequent year's work plan, specifying responsible units,

completion timelines, and acceptance criteria. This four-stage closed-loop mechanism — 'assess, review, plan, act' — ensures that assessment momentum is not extinguished at the end of each assessment cycle but is continuously converted into an organisational driver of improvement.

A concrete illustration: in one assessment cycle, data analysis revealed that although PFP coverage in remote administrative villages met provincial standards, actual operating costs were significantly higher than in better-connected villages, with the cost-reduction effects of last-mile integration not fully realised. This finding triggered a targeted push in the following year to expand village-level service point coverage, yielding improvements in both coverage and cost-effectiveness in subsequent assessments. In this way, the assessment framework functioned as a precision diagnostic tool, directing limited resources towards areas of highest marginal return.

5.2 The Institutional Design of Feedback Loop Architecture

The value of the self-assessment management tool derives fundamentally from the feedback loop it constructs between performance data and management decisions. This loop can be formalised as a four-stage dynamic system: Stage 1 — data collection and indicator scoring; Stage 2 — gap analysis and root cause identification; Stage 3 — targeted intervention design; Stage 4 — outcome monitoring and effect evaluation. Information generated at each stage feeds into the next, creating a self-reinforcing cycle in which 'current performance shapes future action, and current action shapes future performance'.

The analytical value of this feedback loop increases over time. A single year’s assessment can only identify current gaps; it cannot distinguish structural deficiencies (requiring sustained investment) from episodic problems (self-resolving). Qingyuan County’s three years of continuous data provide a richer foundation: consistently improving indicators signal that existing interventions are effective; improvement followed by a plateau suggests diminishing returns or new constraints; persistent stagnation points to structural obstacles unaddressed by current approaches. Such longitudinal comparison deepens diagnostic value in ways a single assessment cycle cannot.

5.3 Cross-Departmental Collaboration: The Institutional Conditions for Self-Assessment Success

Urban-rural transport integration is fundamentally a multi-departmental challenge. The

assessment of Qingyuan County's 21 indicators involves at least eight government departments and operating entities; any single weak link depresses the overall score, and — more importantly — any gap in service creates an actual service void in the integrated transport system. Cross-departmental collaboration is therefore simultaneously a governance challenge and an analytical advantage: the integrated assessment framework renders inter-departmental interdependencies visible and measurable in ways that intra-departmental performance systems cannot achieve.

Across three years of practice, three institutional mechanisms proved critical to cross-departmental collaboration: first, initiating data coordination meetings two months before the annual assessment, ensuring all departments understood their reporting responsibilities; second, developing standardised reporting protocols with uniform definitions and measurement standards for shared indicators such as ‘proportion of administrative villages served by buses’ and ‘maintained mileage’, eliminating interpretive ambiguity; and third, instituting a meeting minutes system to confirm data standards and assign accountability in writing, creating a traceable accountability chain.

These mechanisms generated positive spillovers beyond the assessment process itself. Cross-departmental working relationships established during data collection gradually evolved into routine collaborative arrangements in day-to-day management. Several connections forged through assessment coordination have matured into stable institutional mechanisms for joint problem-solving — suggesting that a well-designed performance assessment framework can not only measure collaboration but actively strengthen collaborative capacity.

6. Existing Constraints and Optimisation Pathways

6.1 Major Structural Constraints

Achieving the 5A rating for three consecutive years positions Qingyuan County at the forefront of provincial urban-rural transport integration. However, operational data reveal three structural constraints that limit the sustainability and scalability of the current model.

First, the financial sustainability of PFP integration operations in remote administrative villages. Parcel volumes on remote routes are insufficient to offset the marginal handling costs incurred by drivers and the infrastructure investment in village-level service points. Current

operations in practice rely on cross-subsidisation from more economically viable routes. As rural e-commerce growth slows, the sustainability of cross-subsidisation narrows, and service coverage in the most remote villages faces substantive pressure to contract.

Second, insufficient information system integration constrains systemic operational optimisation. The ‘data silo’ problem among the maintenance informatisation platform, bus dispatch platform, and postal logistics platform remains unresolved. Transport management personnel lack a system-wide operational view and cannot perform cross-platform correlation analysis of road condition, vehicle, and parcel data, impeding system-level optimisation.

Third, operational capacity varies considerably across township transport service stations. Some township stations operate in a standardised, proactive manner; others are understaffed or managed by personnel without a professional logistics background, generating noticeable service quality disparities within the county. These disparities are not yet adequately reflected in the current assessment framework, which relies primarily on aggregate indicators.

6.2 Optimisation Pathways for the Next Phase

6.2.1 Deepening the 'E-Commerce + PFP' Linkage Model

The most feasible near-term pathway for addressing PFP financial sustainability in remote villages is to link the PFP network directly with local agricultural e-commerce. Qingyuan shiitake mushrooms and sweet mandarin citrus have a stable national e-commerce market; the core bottleneck is the excessive first-mile collection and out-of-village shipping costs for remote smallholder farmers. An ‘e-commerce + PFP’ model — aggregating smallholder shipments at village-level service points, consolidating transit at township service stations, and forwarding goods to the county-level distribution hub via PFP bus routes — would improve outbound cargo utilisation rates and revenue per kilometre on rural routes, providing a more stable commercial basis for remote village services.

6.2.2 Advancing 'Three-Platform Integration' for Data

The recommended pathway for real-time data exchange among the maintenance informatisation, bus dispatch, and postal logistics platforms is API-layer integration, which avoids wholesale system replacement while delivering core integration benefits at lower cost and disruption. The resulting unified dashboard would enable management personnel to monitor road

conditions, vehicle locations, and parcel status via a single interface. As data accumulate, this integration would also underpin advanced applications including predictive maintenance scheduling, route optimisation, and capacity allocation.

6.2.3 Strengthening Grassroots Operational Talent Development

The operational capability of township transport service stations is a decisive variable in PFP network effectiveness, yet station personnel have yet to be incorporated into any systematic training framework. It is recommended that station managers be enrolled in training programmes covering PFP operations, information system usage, and safety standards, leveraging the transport industry vocational skills platform for which the author is responsible. Peer learning through cross-visits or experience-sharing activities organised alongside the annual self-assessment cycle would further accelerate the diffusion of best practices across the township network.

6.2.4 Strengthening the Governance Conversion of Self-Assessment Findings

At present, self-assessment results serve primarily as planning references within the Transport Bureau and have not been embedded in the broader county government governance structure. It is recommended that core integrated transport indicators be incorporated into the county's annual rural revitalisation assessment system, raising the governance weight of transport performance and incentivising broader departmental participation. Simultaneously, weak areas identified through self-assessment should be channelled into a project pipeline, prioritised in budget preparation and applications for higher-level special funds, realising the complete conversion chain: 'assessment identifies problems → project-based solutions → resource commitment'.

7. Conclusion

Qingyuan County's achievement of the 5A highest rating for three consecutive years in urban-rural integrated transport is the systematic product of the coordinated operation of three core modules: rural road network development, PFP integration, and maintenance informatisation. Practice has confirmed that road network development is foundational, addressing 'can connectivity be achieved?'; PFP integration is pivotal, addressing 'can operations

be economically viable?'; and maintenance informatisation is the safeguard, addressing 'can performance be sustained?'. The three modules are mutually reinforcing and indispensable; a weakness in any dimension creates an actual service gap within the integrated transport system.

This paper makes three theoretical contributions. First, it provides a detailed grassroots case record of county-level urban-rural transport integration grounded in first-hand operational data, filling a gap in the literature at the level of operational documentation. Second, it analyses the self-assessment mechanism within a performance management framework, extracting the four-stage closed-loop logic of ‘assess, review, plan, act’ and clarifying the conditions under which self-assessment becomes an engine of continuous improvement rather than a compliance exercise. Third, by identifying three structural constraints and proposing four optimisation pathways, it furnishes actionable policy recommendations for the next phase of development.

The broader implications of the Qingyuan case for similar mountainous counties lie in a key insight: the upgrade from ‘accessibility’ to ‘efficiency’ is not primarily a question of capital investment scale or technological sophistication, but of governance quality — specifically, the degree to which cross-departmental collaboration is institutionalised, the capacity to convert performance data into management decisions, and the resilience to sustain improvement momentum across planning cycles. These governance capabilities, once built through systematic institutional construction, constitute a durable competitive advantage in county-level transport modernisation.

As a grassroots transport management practitioner, the author will continue to deepen cross-departmental collaboration, strengthen data-driven decision-making, and advance Qingyuan County’s urban-rural transport integration beyond the 5A baseline towards high-quality development, contributing practical models to transport modernisation in mountainous counties.

References

[1] Ministry of Transport of the People's Republic of China. (2016). Guiding opinions on accelerating the development of urban-rural integrated transport. [Policy Document].

[2] Zhejiang Provincial Department of Transport. (2021). Detailed rules for the assessment of urban-rural

integrated transport development level in Zhejiang Province. [Policy Document].

[3] Liu, M. (2022). Logistics infrastructure integration and income growth in mountainous rural areas: Evidence from Zhejiang Province. Rural Studies, 89, 145–157.

[4] Wang, X. (2022). Research on pathways for cost reduction and efficiency improvement in rural logistics under the passenger-freight-postal integration development model. Logistics Technology and Application, (8), 112–116.

[5] Shi, X., et al. (2018). Research on the relationship between road investment and farmers' income growth. China Rural Economy, (3), 45–58.

[6] Liu, X. (2019). Advancing high-quality development of 'Four Good Rural Roads' to serve the rural revitalisation strategy. Transport Research, (5), 1–6.

[7] Qingyuan County Transport Bureau. (2025). Qingyuan County urban-rural integrated transport self-assessment report (2022–2025). [Internal Report].

[8] Fan, S., & Chan-Kang, C. (2005). Road development, economic growth, and poverty in China. IFPRI Research Report No. 138. Washington, D.C.: International Food Policy Research Institute.

[9] Krugman, P. (1991). Increasing returns and economic geography. Journal of Political Economy, 99(3), 483–499.

[10] Limão, N., & Venables, A. J. (2001). Infrastructure, geographical disadvantage, transport costs, and trade. World Bank Economic Review, 15(3), 451–479.

[11] Wang, X. (2022). Cost reduction and efficiency improvement in rural logistics under the passenger-freight-postal integration model. Logistics Technology and Application, (8), 112–116.

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