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<u>**Research Paper**</u>

Economic Significance of the Pradhan Mantri Gram Sadak Yojana (PMGSY) in Uttarakhand.

Mahesh Upadhyay* **and Deepti Kamal Joshi**
Assistant Professor, Department of Development Studies, Uttarakhand Open University, Haldwani, Nainital, Uttarakhand.

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Corresponding Author:
Mahesh Upadhyay

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ABSTRACT

Rural road connectivity serves as one of the central inputs to rural development by lowering transport costs, increasing access to markets, and improving access to health, education, and non-farm opportunities. The Pradhan Mantri Gram Sadak Yojana (PMGSY), launched in 2000, is India's flagship rural connectivity programme. This paper assesses the economic implications of PMGSY in Uttarakhand, a Himalayan state where isolated, widespread habitation and steep terrain—coupled with frequent geohazards—necessitate connectivity and render it expensive. Through an examination of PMGSY documentation at the national and state level, recent impacts assessments of the programme, and a review of local news accounts at the district scale in Uttarakhand, the achievements of the programme (including recent annual construction), map economic pathways (market linkages, tourism, non-farm employment, social services) were documented, and implementation hurdles (landslides, construction delays, deferred maintenance) were identified. Illustrative case studies at the district level (Bageshwar/Kapkot; Almora region) were considered, based on local reporting and sharing empirical designs and policy recommendations tailored to the Himalayan context. Overall, PMGSY noticeably improved connectivity in Uttarakhand (state-reported construction of hundreds of kilometres of new roadway in recent years) and provided critical pathways for agricultural commercialization and tourism and livelihoods, but enduring economic benefits and maintenance sustainability will depend on in-use lifecycle maintenance financing, disaster-resilient engineered infrastructure, and connecting economic pathways between settlements and tourists/markets.

1. Introduction

Roads are a vital part of public infrastructure, reducing travel times and lowering transport costs, allowing producers and consumers to connect and transact more easily. In India, the Pradhan Mantri Gram Sadak Yojana (PMGSY) was initiated in 2000 to connect unconnected rural habitations by providing all-weather motorable road access and, as the programme matured, to upgrade and strengthen rural road networks. The programme has become a prominent, nationwide programme and is still a key instrument of rural development planning (pmgsy.nic.in). A special case is the state of Uttarakhand. Established in 2000, the state's geography is dominated by mountains, with villages dispersed in valleys and slopes, agriculture is largely horticultural and dairy-based, and the state's economy is based strongly on pilgrimage and nature-based tourism. Reliable road links are a critical need for the geography to achieve market access for perishable products, allow medical evacuations to take place without delays, facilitate tourism flows into the state, and diversify livelihood opportunities. At the same time, the Himalayan context elevates construction and lifecycle costs: flash floods, landslides and slope failures are

*Author can be contacted at: Department of Foreign Languages, Banaras Hindu University, Uttar Pradesh, India.

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common occurrences that can quickly lead to the destruction of road investment when mediocre design and/or maintenance are involved. Recently funded PMGSY activity in Uttarakhand (as part of Hanif's PMGSY programme expansion under PMGSY-IV) has illustrated the programme's breadth of influence, along with the difficulties of maintaining benefits in mountain contexts, through local and regional examples of the urgency of incomplete construction work (ETInfra.com).

This paper responds to the question: What is the economic value of PMGSY in Uttarakhand, and what design of programme and policy measures can contribute to turning road investments into sustained economic benefits? The rest of the paper includes: (i) a conceptual and empirical review of how rural roads affect rural economies, (ii) relevant state- and district-level data and case study related to the Kapkot Block of Bageshwar, (iii) proposed empirical approaches to estimating impacts in Uttarakhand, and (iv) policy recommendations.

2. Conceptual Framework and Literature Review

2.1 Conceptual Channels Linking Roads and Economic Outcomes:

Roads influence rural economies through various channels:

1. Market Access and Price Transmission: Lower transport costs and decreased travel time heighten the ability of producers—particularly of perishables such as horticulture and dairy—to reach markets quickly. Consequently, this means less spoilage of products and more options for buyers.

2. Non-Farm Diversification: Increased connectivity allows for more tourism services, local retail, transport, and small businesses to successfully operate, creating non-farm incomes.

3. Labour Mobility and Wages: Roads assist in creating a wider labour market, stimulating wage work or seasonal employment by residents, as well as facilitating the movement and inflow of labour and supplies.

4. Social Services and Human Capital: Improved road access may increase the use of schools and clinics, as well as emergency-based access, ultimately improving long-term human capital outcomes.

5. Resilience and Risk: Well-designed roads support both rapid disaster response as well as economic resilience; poorly-designed roads can increase erosion and slope instability, thereby threatening lifestyles and livelihoods.

2.2 Empirical Literature Highlights:

The Pradhan Mantri Gram Sadak Yojana (PMGSY) has been regularly known as one of the largest rural infrastructure programmes in the world. National and international evaluations, including the World Bank, receive strong evidence that the PMGSY contributed to better connectivity from villages, better access to markets, health care and education. In many areas of rural India, all-weather roads introduced fast travel times, inexpensive travel time, and participation in economic life. Nonetheless, scholars point out that while there was always increased access and mobility from the scheme, the actual scale of improvements to income and consumption varied across regions and socio-economic groups (World Bank, 2021).

Recently, work by Asher and Novosad (2019) and others provides strong causal evidence from quasi-experimental studies. These papers justify increases in non-farm employment and diversification of households' income-generating activities as rural roads were introduced. Furthermore, these papers find that rural roads increased farmgate prices, which they attribute to enhanced bargaining power and increased integration with local markets, although this appears to be uneven. In fact, subsequent studies find that villages near markets, or those that previously produced an agricultural surplus before the introduction of additional roads, tend to experience the greatest benefits, while villages that were more isolated and had weak demand linkages experience little benefit from travelling via roads.

Other researchers (Shamdasani, 2018) give weight to the agricultural channel of impact in their conclusions. Improved road connectivity facilitates diversification to higher-value crops such as fruits and vegetables, especially when combined with credit and extension services. In places like Uttarakhand, where there is potential for horticulture and dairy, PMGSY roads can help farmers reduce post-harvest losses and strengthen supply chains. Nevertheless, without complementary investments in cold chains, storage, and marketing infrastructure, any growth in income would be limited in the long run. In this sense, roads are an enabling factor rather than a necessary and sufficient pathway to agricultural transformation.

Roads are an important enabler of social and human capital beyond agriculture. Studies show that villages where new roads are built under PMGSY had higher school attendance rates, were better able to access health care facilities, and, in particular, maternal and child health services (World Bank 2021). Road investment, connecting people to work in the new economy, is a potential avenue; in the short run, road connectivity decreases distress migration when wages[2] increase and agricultural work is available. In the long run, road connectivity can also promote outmigration by reducing transportation costs. For Uttarakhand, this dual pathway is relevant to both the context and the ongoing impact of rural-to-urban migration.

Despite these advancements, the literature cautions about complications with implementation and sustainability. Mountain states like Uttarakhand have ongoing landslides, flooding, and snowfall that damage rural roads and shorten their functional lifespan. The International Labour Organization (ILO, 2020) emphasizes that maintenance is "the Achilles' heel of PMGSY", as lack of maintenance funding can quickly erode connectivity benefits. Environmental risks were noted as well, and road expansion in fragile Himalayan ecosystems raises concerns about deforestation, slope instability, and disaster preparedness.

In summary, the academic consensus is that PMGSY has provided significant socio-economic benefits throughout India, and in hill states, PMGSY's significance is transformative, as it breaks isolation. However, the evidence also demonstrates that roads alone cannot ensure sustained economic growth. Asher and Novosad highlight labour reallocation, Shamdasani emphasizes agricultural diversification, and the World Bank underlines health and education benefits. The literature suggests that roads in Uttarakhand need development to be accompanied by the promotion of tourism-based investments, horticultural value chains, and resilient engineering practices to maximize roads' developmental significance.

2.3 Mountain-specific Considerations for Uttarakhand

The costs of construction and maintenance per kilometre of road for mountain roads are higher; slope stabilization, drainage, and geoengineering solutions are typical requirements. Opportunities for perishable-horticulture producers and dairy chains can be maximized: even a small gain in reliability or travel time can accommodate extra loads and produce value from foods that would otherwise spoil. However, the increased risk of damage triggered by monsoons and landslides makes it likely that the benefits will be temporary if there is insufficient capacity for increased maintenance. Recent policy documents for Uttarakhand highlight the need for specialised maintenance protocols and hazard-resilient designs (pmgsy.nic.in).

3. PMGSY in Uttarakhand: Scale, Recent Activity and Institutional Arrangements

3.1 National and State-scale Indicators.

Since 2000, at the national level, PMGSY has either constructed or connected and upgraded hundreds of thousands of kilometres of rural roads leading to and serving to connect a very large number of habitations typically defined by PMGSY as remote rural village locations. There are cumulative reporting metrics available nationally from national PMGSY documents and dashboards, for example, the PMGSY Annual Report (2023-24) and the OMMS dashboards report national progress and time series reporting on road length sanctioned and constructed roads, habitation targeted and connected, and expenditure (pmgsy.nic.in).

In the state of Uttarakhand, there have been formal PMGSY clearance and sanction letters issued for the state (PMGSY-III and batch approvals for 2023-24) that are publicly available; these clearance letters list roads that have submitted proposals for funding approval, and allowed for funding based on previous comprehensive review processes, to approve complete project-level development and funding. The clearance letters also define project road length, and project batches are listed in the clearance letters that provide operations projects information at the level of the proposal. The state of Uttarakhand has reported outputs of construction in recent years; media reporting and state documents report construction of 814 km of PMGSY roads in Uttarakhand from the financial year 2024-25 (state reporting provided in local press proceeds), and additionally the state is expanding pre-empowered committee size from individual housing applications to large scale planning/completion capacity of 8,750 km of PMGSY in the state that will target difficult or remote Himalayan villagers. These cited figures suggest there is an active current expansion phase and are related to last mile connectivity and supporting development in the state.

3.2 Maintenance Policy for Uttarakhand

State PMGSY maintenance guidance and policy notes, specific to Uttarakhand, note that maintaining hill roads requires either a dedicated fund, or specific contractual arrangements in other cases. Uttarakhand PMGSY maintenance guidance is available as a PDF showing specific responsibilities, payment mechanisms, and special technical instructions applying to hill roads. Institutional arrangements typically involve state PWD or URRDA (Uttarakhand Rural Roads Development Agency) coordinating central releases with local executing agencies (pmgsy.nic.in).

4. District-level Examples and Local Evidence.

4.1 Bageshwar–Kapkot Block: Long Promised Improvements and Lack of Connectivity

a. District/Block Profile

Kapkot block, located in the Bageshwar district of Uttarakhand, is a remote hilly geographical area of steep terrain that has limited connectivity, as historically the district has experienced poor infrastructural development. Villages located within the block, such as Dharamghar and Majkhet, have historically faced deficits in road infrastructure, which has hindered them from accessing basic essential services, such as health care, education, and markets. Because of prolonged isolation, there appears to have been the erosion of socio-economics and reports of high out-migration of households in search of alternative livelihood strategies (The Times of India, 2025).

b. PMGSY Projects in Kapkot

Two major road projects under the Pradhan Mantri Gram Sadak Yojana (PMGSY) have been sanctioned and tendered in the Kapkot block:

1. Bageshwar Kapkot Motor Road (Km 18 to Lilly) - This is a new road project that was sanctioned under Batch I in the 2016-17 programme with a sanctioned length of 11.970 km. This project was sanctioned through the Ministry of Rural Development (MoRD) guidelines, which describe the cost-sharing implications for central and state governments as part of normal PMGSY project delivery (S3WaaS).

2. UT0267 Kapkot Sama Tejam MR (Km 57 to Badipaniyali MR Stage-II) - This project was tendered in approximately September 2020 with a contract value of ₹1,82,20,000 (pmgsytenders.gov.in). Stage-II of this MR is a continuation project named to support and implement critical components of rural connectivity in Kapkot.

While evidence of government commitment through sanctioned projects exists, applications for much-needed rural road projects have lagged, resulting in many projects being stalled and/or partially implemented.

c. Implementation Timeline and Stat**us**

The Kapkot MR Road (Km 18 to Lilly) was approved in 2016–17 under PMGSY Batch I, and as per the official national and state PMGSY databases, the sanctioned stage is marked as 'New,' indicating it has had limited or no completed work (S3WaaS). The tender for Sama Tejam MR Km 57 to Badipaniyali MR Stage-II, published in 2020, indicates that some action was taken to continue construction on this road. However, field reports and news reports indicate that significant portions of these roads are still not completed, and gaps in connectivity infrastructure remain.

d. Socio-Economic Context and Observed Impacts

Many villages in Kapkot have grappled with limited access to health services, educational facilities, and markets due to poor roads. The Times of India (2025) states that the Dharamghar–Majkhet link road was sanctioned in 2016 under PMGSY with an allocation of close to ₹9 crore and is largely incomplete. As a result, many residents have to walk long distances to receive health services, causing delays for pregnant women and other patients who require timely access to health support. In addition, this report mentions that the delay in completing the road has resulted in a significant out-migration of persons, estimating that as many as 70% of households have left the village in search of better opportunities. The incomplete status of the 11.970 km road to Lilly limits expected benefits in market access, income generation, and social services. Travel times remain high, the frequency of market and health visits is reduced, and the costs of transportation are elevated. These factors collectively constrain the potential economic and social gains envisioned under PMGSY.

e. Constraints and Challenges

In Kapkot, several challenges have impeded the successful execution of PMGSY roads:

- Delays by contractors and incomplete projects: There are projects in different stages, including Stage-II, that have not been completed in their entirety.
- Inefficiencies in execution: Projects often have large budgets allocated to them, but have moved slowly from year to year.
- Vulnerability to weather and environmental conditions: Heavy rain and landslides often destroy parts of roads while they are under construction, resulting in connectivity issues.
- Gaps in infrastructure, which sometimes involve fully built roads without bridges or connections to other roads.

These challenges illustrate the complexities involved in executing large rural infrastructure projects in hilly, remote areas such as Kapkot.

f. Policy Responses and Community Action

In light of extended delays, another renewed effort has been initiated to move forward with road construction. The tender for Sama Tejam MR Stage-II (₹1.82 crores) speaks directly to continued government efforts to close key gaps in connectivity (pmgsytenders.gov.in). Local panchayats and residents have also initiated petitions and organized protests to draw attention from the administration, encouraging the administration to create estimates for repair and completion of work (The Times of India, 2025). These efforts demonstrate local agency and the mobilization of community engagement to promote accountability and progress in rural infrastructure development across the region.

4.2 Bageshwar and Surrounding Hill Corridors: Landslides and Seasonal Disruption

Landslides associated with the monsoon season are a frequent phenomenon in Bageshwar district, which restricts access to main constraints and impacts rural roads, further weakening rural connectivity in high rainfall. Less assurance of access to markets and an increase in transportation risk premiums occur for traders and buyers, which combine to de-incentivise the practice of sourcing produce directly from remote villages during the Monsoon months. There is a need for PMGSY investment in the areas mentioned, specifically the design (adequate drainage, slope stabilization, and retaining structures) and rapid response to maintenance, for roads to generate economic benefits year-round (The Times of India).

4.3 Recent Outputs at the State-level: Construction for FY2024-25 and Plans for PMGSY-IV

As per news reports and the state briefing note in FY2024-25, there were over 814 km of PMGSY roads constructed in Uttarakhand; the state has conducted its surveys and is preparing for a PMGSY-IV period for the backlog of remote Himalayan habitations remaining (state-wide target ~8750 km), mirroring the remaining gaps. Successful outcomes, if built for resilience and maintenance, could be transformational to the access of hundreds of villages. Furthermore, it has a significantly large expectation for maintenance (Garhwal Post).

5. Key Constraints and Implementation Failures Observed in Uttarakhand.

According to documents from the state and data posted by the district, the limitations on benefits provided by these roads include the following:

1. Partial work and delays: approved roads may remain unbuilt for extended periods of time (Kapkot), preventing access to benefits, while also nudging people to consider out-migration alternatives (The Times of India).
2. Bridges and last-mile bottlenecks: roads without bridges cannot be accessed due to safety issues; in Bageshwar, the road construction remained unbuilt and essentially ineffective, without a viable bridge (The Times of India).
3. Monsoon vulnerability and landslides: rural roads experience multiple washouts and landslides due to heavy rain events, requiring frequent repair and greatly increasing lifecycle costs (Almora reports; The Times of India).
4. Maintenance financing and capacity: Uttarakhand-specific maintenance policy documents mention requirements for both a maintenance fund with a predictable stream of revenue as well as a contracted arrangement to address inherent maintenance complexities; maintenance is often unpredictable, and roads rapidly deteriorate (pmgsy.nic.in).
5. Environmental trade-offs: Road alignments without adequate slope treatment and protection increase erosion and negatively impact terraces and forest cover, and create potentially negative externalities.

6. Policy Recommendations.
1. Lifecycle budgeting and dedicated maintenance funds: design multi-year maintenance budgets for hill roads and develop five-year maintenance contracts, if possible, in partnership with construction contracts (as already advised in central guidance Plan B and which is also state maintenance policy). This will prevent roads from deteriorating early and maximize the return on previous investment (pmgsy.nic.in).
2. Disaster-resilient engineering standards: require slope stabilization, drainage improvements, biotechnical engineering techniques, and geotextiles for all PMGSY works produced in hill districts, and create a catalogue of proven designs for implementation in local geology (pmgsy.nic.in).
3. Finish last-mile links (bridges and culverts) in packages: provide road and bridge as the deliverable so that a road is usable upon completion—prevent fragmentation of funding that leaves critical links uncompleted, which creates continuing isolation. Recent Bageshwar cases highlight the human cost of leaving bridges critical for travel incomplete (The Times of India).
4. Connections to market infrastructure and cold chains: connect road investment to collection centres, milk chiller units, cold storage for fruits, and targeted extension, to help farmers to benefit from the value of their perishable produce.
5. Use tourism investments with environmental protections: use connectivity to expand sustainable tourism, but carry out studies on carrying capacity, waste management plans, and benefit sharing with local communities. This will not be achieved if environmental degradation occurs.
6.Increase local oversight and grievance redress: strengthen the supervision role of gram panchayats, require project timelines and contractor details to be publicized, and ensure an emergency repair program can respond quickly during the monsoon.
7.Frequent assessment and sentinel monitoring: conduct periodic impact assessments in sentinel districts (through traffic counters, short-duration household panels, and monthly mandi prices) to discover the possible fade out of benefits and make adjustments to align (pmgsy.nic.in).

7. Conclusion

PMGSY could be a transformative tool for Uttarakhand's rural economy, linking high-value horticulture and dairy markets, enabling non-farm employment related to tourism, and increasing access to education and health services. Recent state activity (hundreds of kilometres constructed in FY2024-25 and plans under PMGSY-IV) suggests renewed focus on addressing connectivity gaps. However, district-level reporting from Bageshwar and other hill districts demonstrates that unfinished work, bridge bottlenecks, and damage from the monsoon could negate any returns. It will be necessary for policymakers to ensure lifecycle maintenance financing, adopt mountain-specific engineering guidelines, complete essential last-mile connectivity, and link roads to market and tourism infrastructure to translate PMGSY investments into sustainable economic outcomes in Uttarakhand. Robust district-level monitoring and targeted impact evaluations will be important to document realised benefits and to improve future implementation.

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