Rural Development Trajectories in Eastern India: Empirical Insights from Purba Medinipur District, West Bengal

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Abstract

This study examines the socio-economic conditions and infrastructural access of rural households in Purba Medinipur district, West Bengal, through a detailed field survey conducted across 33 villages in 11 administrative blocks between November 2024 and June 2025. A total of 825 households, representing a population of 2,540 individuals, were surveyed using a structured questionnaire and purposive sampling method. The research adopts a mixed-method approach, combining quantitative analysis of household-level indicators with qualitative thematic interpretation based on field observations.

The findings reveal significant advancements in areas such as electrification (97.69%), private toilet usage (97.69%), and mobile phone penetration (98.33%). However, the study also highlights critical gaps in waste collection services, drainage infrastructure, access to clean water, and the availability of modern appliances such as refrigerators and computers. The use of traditional fuels persists in many homes despite a growing shift towards LPG. Based on the results, the study recommends targeted interventions to strengthen sanitation, promote clean energy, improve digital access, and expand sustainable infrastructure through decentralized planning.

This research provides valuable, ground-level insights for policymakers, development practitioners, and local governance bodies seeking to promote inclusive and sustainable rural development.

Keywords: Amenities, Rural Development, Rural Infrastructures, Socio-economic Status, West Bengal, India

1. Introduction

Rural infrastructure and basic household amenities play a crucial role in determining the quality of life and socio-economic well-being of communities (World Bank, 2019). In developing countries like India, the disparities between urban and rural areas in terms of access to essential services—such as housing, sanitation, electricity, drinking water, and technology—remain a significant challenge despite targeted government interventions and development schemes (Planning Commission, 2014). These gaps not only affect public health and economic opportunities but also hinder progress toward achieving the Sustainable Development Goals (SDGs), particularly those related to clean water and sanitation (Goal 6), affordable and clean energy (Goal 7), and sustainable communities (Goal 11) (UNDP, 2020).

West Bengal, with its diverse rural population and mixed socio-economic landscape, presents a unique case for examining the ground realities of rural development. Among its districts, Purba Medinipur stands out for its agricultural base, expanding semi-urban clusters, and ongoing infrastructural transitions. While previous studies have focused broadly on state or national trends, there is a paucity of micro-level research that captures the household-level infrastructure gaps and socio-economic dynamics within specific districts like Purba Medinipur.

This study seeks to fill that gap by evaluating key indicators such as housing type, sanitation practices, drinking water sources, electricity access, cooking fuel use, and ownership of electronic gadgets and vehicles. Conducted across 33 villages in 11 administrative blocks of the district, the study provides an empirical understanding of the living conditions of 825 households representing a population of 2,540 individuals. By using both quantitative and qualitative methods, the research aims to generate context-specific insights and offer practical policy recommendations to address the observed disparities.

In light of India's commitment to rural development and digital inclusion, this study serves as a timely contribution to grassroots planning and decentralized governance. It highlights the need for targeted interventions to ensure equitable access to infrastructure and resources for rural households, contributing to a more resilient, inclusive, and sustainable development trajectory.

2. Objectives of the Study:

The primary objective of this study is to assess the socio-economic and infrastructural living conditions of households within the surveyed area. The study aims to gain a comprehensive understanding of access to essential services, housing quality, and the level of technological integration. Specifically, the objectives are:

1. To examine housing ownership and quality, identifying the prevalence of pucca, semi-pucca, and kutcha houses, and assessing the overall stability and durability of residential structures.

2. To evaluate access to basic utilities and infrastructure, including electricity, drainage systems, and waste collection facilities, with attention to disparities in service availability.

3. To analyze sanitation and hygiene conditions, focusing on the type of toilet facilities used (private, community, or open defecation) and the sources of drinking water (piped, community taps, or tube wells).

4. To study cooking energy patterns among households by identifying the primary and secondary fuels used, and evaluating the transition from traditional to clean energy sources.

5. To investigate the penetration of electronic appliances and vehicles, highlighting the degree of technological adoption in communication, entertainment, and transportation.

6. To identify gaps in infrastructure and amenities that could impact health, economic mobility, and quality of life, to inform policy recommendations and targeted interventions.

By achieving these objectives, the study seeks to provide data-driven insights that contribute to sustainable development planning and improved living standards in the region.

3. Methodology of the Study:

The present study was conducted to assess the socio-economic and infrastructural conditions of households in Purba Medinipur district, West Bengal, using a mixed-method approach that combined quantitative household surveys with qualitative field observations. The survey was carried out in two phases—between November and December 2024 and January–June 2025—across 33 villages from 11 administrative blocks: Haldia, Sutahata, Tamluk, Nandigram I & II, Khejuri I & II, Moyna, Bhagawanpur I & II, and Mahisadal, with three villages selected from each block.

Employing a stratified purposive sampling method, 25 households per village were surveyed, resulting in a total sample of 825 households, representing a population of 2,540 individuals. Data was collected through structured questionnaires via face-to-face interviews, covering variables such as housing, sanitation, electricity, drinking water, cooking fuel, electronic gadgets, and transportation access. In addition to statistical analysis, qualitative insights were gathered through field notes, informal conversations, and observational checklists, which were analyzed using thematic analysis to interpret patterns, lived experiences, and contextual nuances. This combined methodology ensured a holistic understanding of rural infrastructure and living standards in the district.

4. Demographic Profile of the Studied Population:

A detailed demographic profile of the studied population was developed based on age, sex, and caste characteristics. This stratification aids in understanding the representativeness and diversity of the sample, and in ensuring robust and inclusive analytical outcomes.

Table 1:
Demographic Distribution of the Studied Population

Category	Subcategory	Percentage (%)
Age Group	0–6 years	7.01%
	7–14 years	12.52%
	15–18 years	7.95%
	19–21 years	7.13%
	22–25 years	8.82%
	26–35 years	18.90%
	36–50 years	25.59%
	51–60 years	7.68%

	Above 60 years	*4.41%*
Sex	*Male*	*51.42%*
	Female	*48.58%*
Caste	*Scheduled Caste (SC)*	*14.78%*
	Scheduled Tribe (ST)	*0.51%*
	Other Backward Classes-A (OBC-A)	*0.51%*
	Other Backward Classes-B (OBC-B)	*2.19%*
	Unreserved/General	*82.01%*

The age-wise analysis showed that the largest proportion of the studied population (25.59%) was between 36 and 50 years, indicating a mature and economically active demographic. This was followed by individuals aged 26 to 35 years (18.90%) and school-aged children in the 7–14 years bracket (12.52%).

In terms of sex distribution, the population was nearly balanced, with males forming 51.42% and females comprising 48.58%, ensuring gender inclusivity in representation.

Regarding caste stratification, the data indicated that 82.01% of respondents belonged to the Unreserved/General category, while 14.78% were from Scheduled Castes (SC). Scheduled Tribes (ST) and OBC-A had the lowest representation (0.51% each), and OBC-B made up 2.19% of the population. This distribution reflects a majority representation of the general caste group, with relatively smaller inclusion of historically marginalized communities.

5. Findings and Discussion:

5.1. Status of House Ownership:

Figure 01 presents the distribution of house ownership among respondents in percentage terms. A predominant majority, 96.66%, reported living in their own houses, whereas only 3.34% were residing in rented accommodations. This data indicates a high rate of homeownership within the sample population, reflecting either socio-economic stability or cultural inclinations toward property ownership.
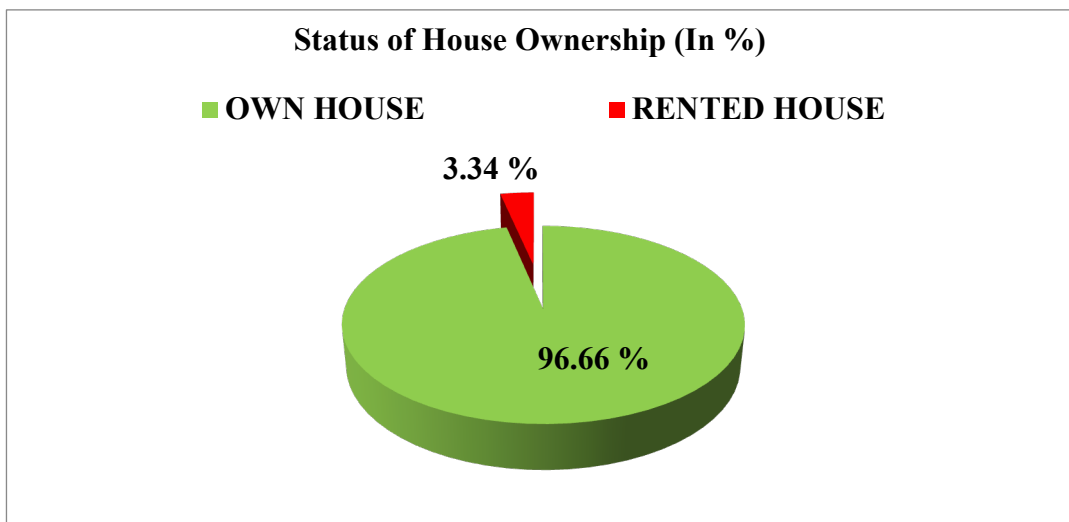
Figure 01: Status of House Ownership

5.2. Type of House:

*The percentage distribution of different types of houses among the surveyed population is depicted in Figure 02. A majority of respondents, **54.24%**, reside in **pucca houses**, indicating access to fully permanent, durable structures. **33.68%** live in **semi-pucca houses**, which are partially permanent and typically built with a mix of temporary and permanent materials. Meanwhile, **12.08%** inhabitants **live in kutcha houses**, constructed from temporary materials such as mud or thatch. This distribution reflects a relatively high level of housing stability, though a significant portion still lives in less durable housing conditions.*
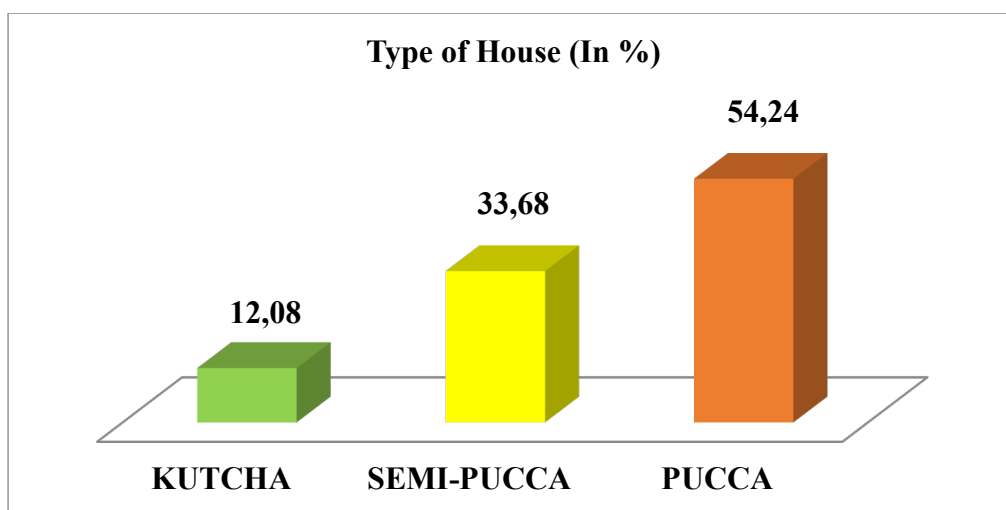
Type of House (In %)

Figure 02: Type of House

6. Waste Collection Systems:

Figure 03 illustrates the prevalence of different types of waste collection systems in percentage terms. An overwhelming majority, **98.84%**, of the population reported having **no waste collection system** in place. In contrast, only **0.77%** utilize a **common point** collection method, and a mere **0.39%** benefit from **doorstep collection** services. These findings highlight a severe lack of formal waste management infrastructure in the surveyed area, pointing to potential public health and environmental concerns due to improper waste disposal practices.
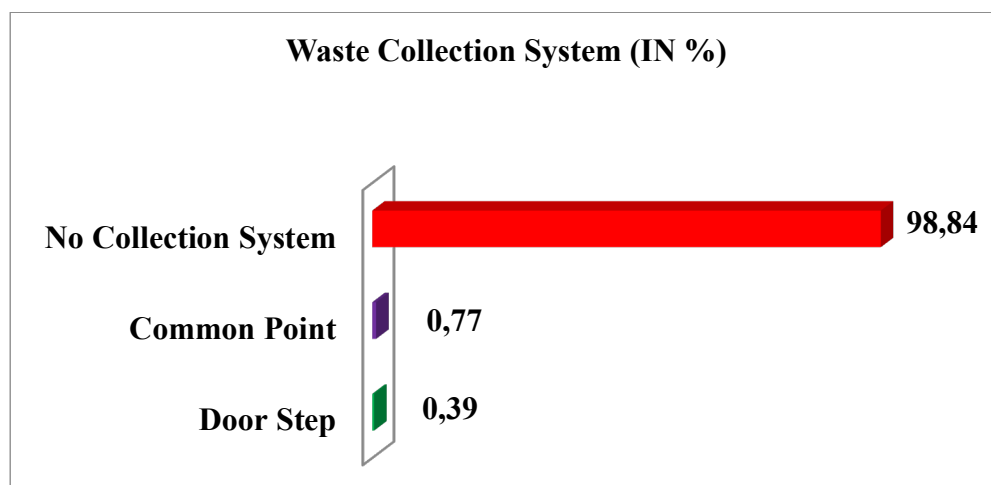

Figure 03: Waste Collection System

7. Drainage Systems Connected to Households:

*Figure 04 presents data on the type of drainage systems connected to households. A significant portion, **57.20%**, of homes reported having **no drainage system.** Meanwhile, **23.39%** of houses are linked to a **covered drainage system**, and **19.41%** rely on an **open drainage system**. This distribution indicates a notable gap in basic sanitation infrastructure, with the majority of residences lacking even a rudimentary drainage connection.*


Pattern of Drainage System Linked to House (In %)

■ COVERED   ■ OPEN   ■ NONE

23.39%

57.20%

19.41%
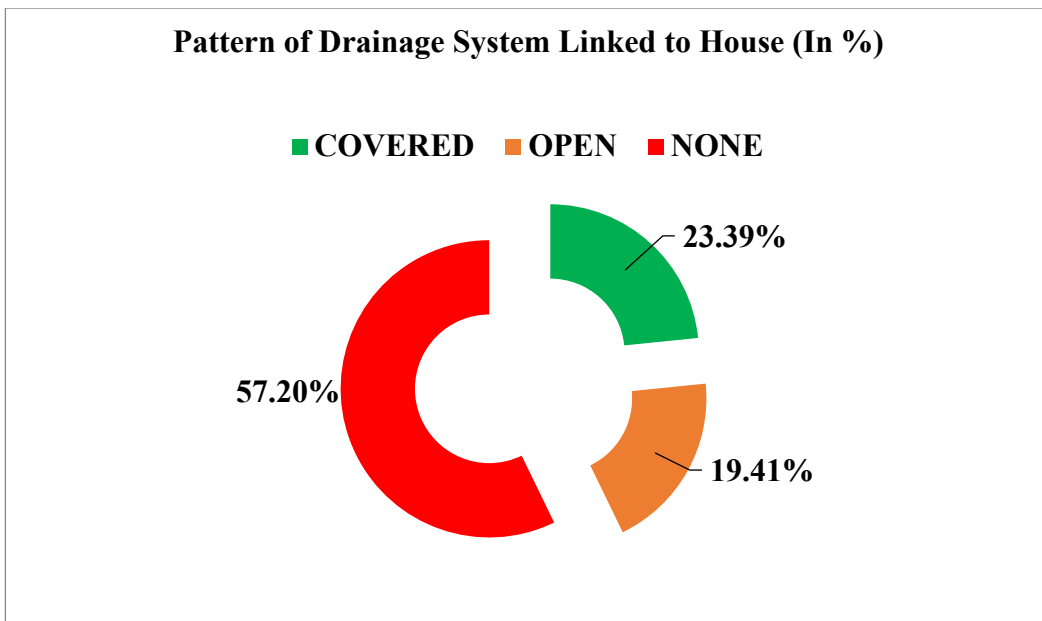
Figure 04: Pattern of Drainage System Linked to House

8. Privy Usage:

*The data on privy usage indicates a high prevalence of private sanitation facilities among households. Specifically, **97.69%** of households reported using **private toilets**, while **2.19%** rely on **community latrines**, and only **0.13%** engage in **open defecation**. These figures highlight substantial sanitation coverage and suggest successful adoption of individual household latrines.*

Status of Privy Used (In %)

97,69

2,19

0,13

PRIVATE COMMUNITY OPEN DEFECATION
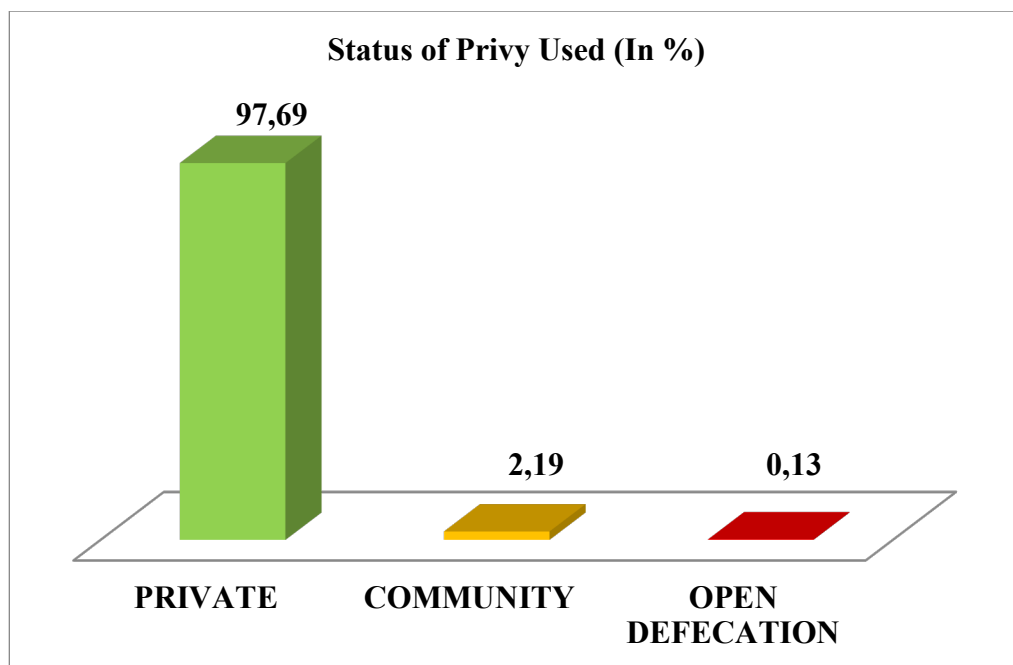
Figure 05: Status of Privy Used

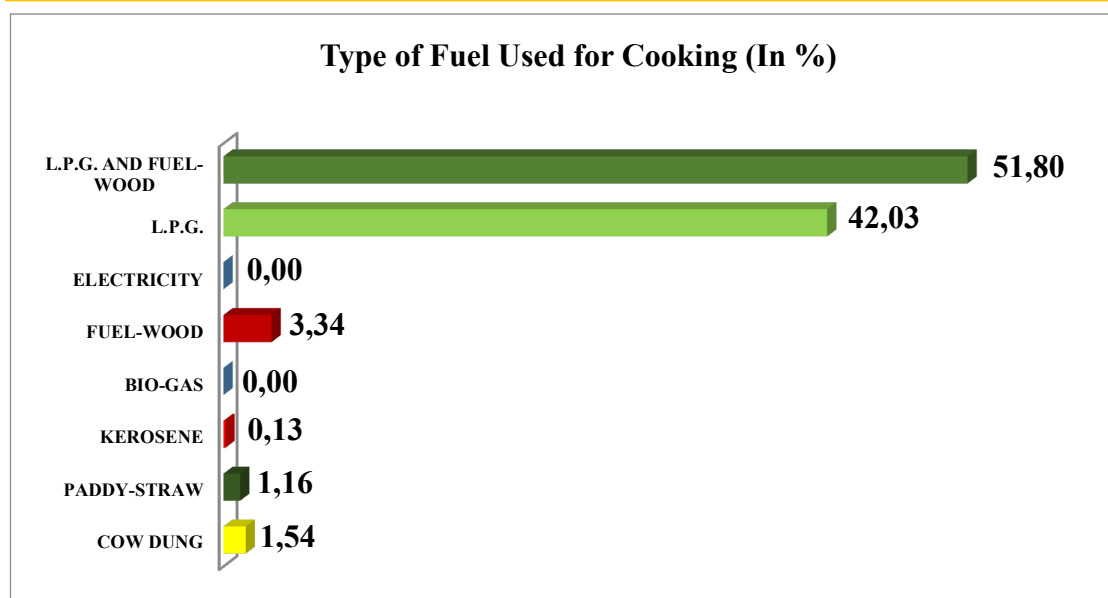### 9. Households have Access to Electricity:

The data reveals that **97.69%** of households have access to **electricity**, while only **2.31%** lack this essential service. This high electrification rate indicates significant infrastructure penetration and suggests improved living standards and connectivity across the surveyed population.

Availability of Electricity Connection in House (In %)

■ YES   ■ NO

2.31%

97.69%
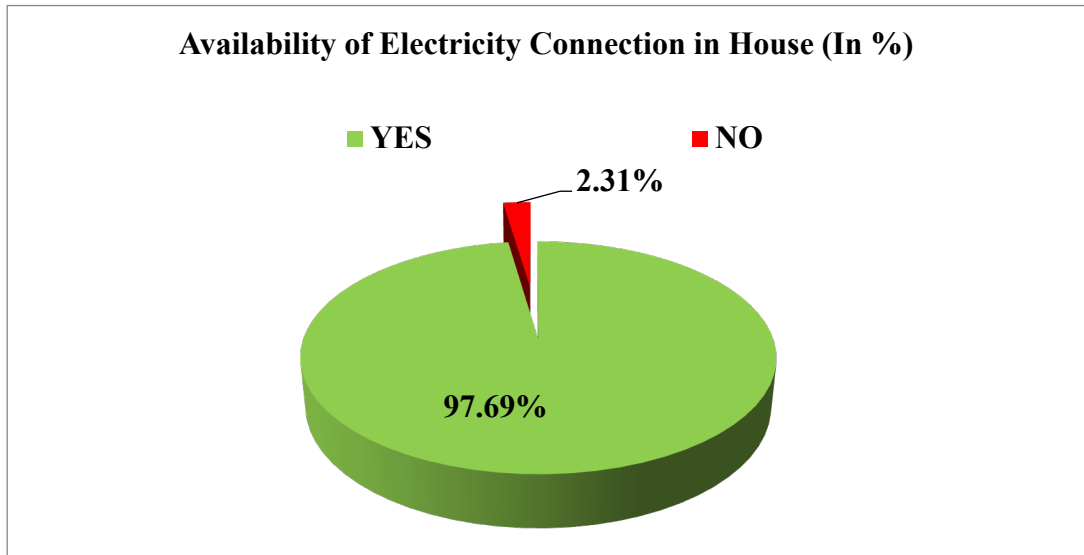
Figure 06: Availability of Electricity Connection in House

10. Type of Fuel Used for Cooking:

The data on **fuel used for cooking** highlights a diverse energy usage pattern among households. A majority, **51.80%**, use a combination of **LPG and fuel-wood**, reflecting a transitional phase between traditional and modern energy sources. Sole use of **LPG** is also significant at **42.03%**, indicating a strong shift towards cleaner fuel. In contrast, traditional fuels such as **fuel-wood (3.34%), cow dung (1.54%)**, and **paddy straw (1.16%)** are used by a much smaller proportion. Notably, **biogas and electricity** are not used at all, and **kerosene** accounts for only **0.13%**, suggesting a near phase-out of older, polluting fuels. This data reflects progress in clean energy adoption while also revealing the coexistence of multiple fuel sources in domestic settings.

Type of Fuel Used for Cooking (In %)

Fuel Type	Value
L.P.G. AND FUEL-WOOD	51,80
L.P.G.	42,03
ELECTRICITY	0,00
FUEL-WOOD	3,34
BIO-GAS	0,00
KEROSENE	0,13
PADDY-STRAW	1,16
COW DUNG	1,54

Figure 07: Type of Fuel Used for Cooking
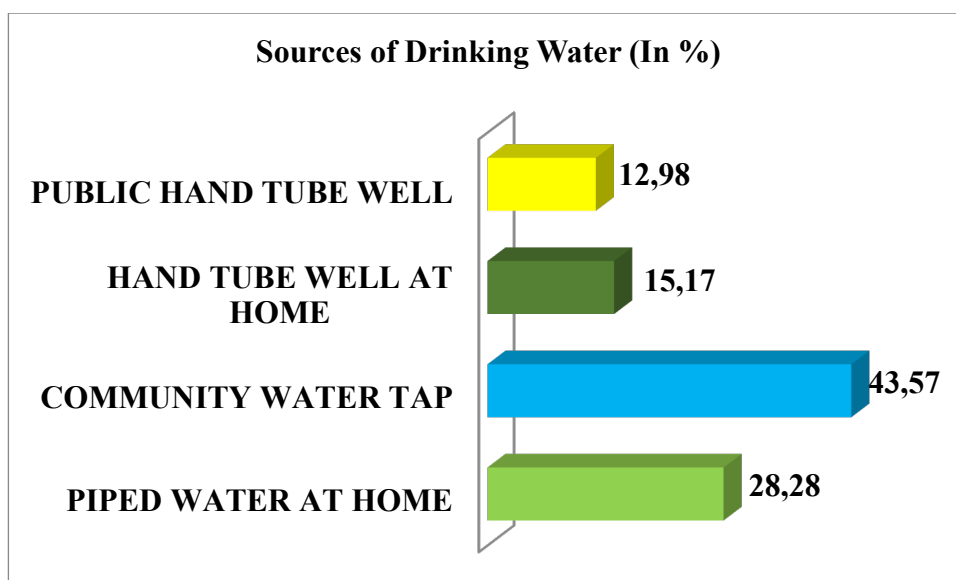
11. Electronic Gadgets and Vehicle Usage:

The data on **electronic gadgets and vehicle usage** presents a clear picture of household accessibility to modern amenities. **Mobile phones (98.33%)** and **electric fans (97.69%)** show near-universal penetration, indicating high reliance on essential communication and cooling appliances. **Television ownership is also substantial (66.45%)**, reflecting significant media access. However, ownership of **computers/laptops (4.24%)**, **air conditioners (1.41%)**, and **radios (4.11%)** remains limited, suggesting either affordability issues or shifting preferences in technology. In terms of water and food preservation, **water purifiers (18.77%)** and **refrigerators (30.33%)** are present in fewer homes, pointing to partial access to clean water and food safety technologies. Regarding transport, **bicycles (93.06%)** dominate as the most common vehicle, followed by **bikes (44.73%)**, while **four-wheelers (0.90%)** remain rare, indicating a reliance on economical and accessible modes of transportation. Overall, the data reflect a blend of technological integration and socio-economic constraints in household amenities.

Table 2:
Using of Electronic Gadgets and Vehicle

Type of Electronic Gadgets/ Vehicle	Yes (In %)	No (In %)
Radio	4.11	95.89
Television	66.45	33.55
Mobile Phone	98.33	1.67
Computer/ Laptop	4.24	95.76
Electric Fan	97.69	2.31
Water Purifier	18.77	81.23
Refrigerator	30.33	69.67
Bicycle	93.06	6.94
Bike	44.73	55.27
Four Wheelers	0.90	99.10
Air Conditioner	1.41	98.59

12. Sources of Drinking Water:

The data on **sources of drinking water** reveals a reliance on shared and semi-private water infrastructure among households. The most common source is the **community water tap**, used by **43.57%** of households, indicating substantial dependence on public water distribution systems. **Piped water at home** is available to **28.28%** of households, signifying a notable but still limited penetration of in-house water access, which is crucial for hygiene and convenience. In contrast, **hand tube wells at home (15.17%)** and **public hand tube wells (12.98%)** continue to serve as vital sources, especially in areas where piped water systems are inadequate or absent. Overall, the figures suggest progress toward household water connectivity, though a significant portion of the population still depends on shared and traditional sources.

Sources of Drinking Water (In %)

PUBLIC HAND TUBE WELL — 12,98

HAND TUBE WELL AT HOME — 15,17

COMMUNITY WATER TAP — 43,57

PIPED WATER AT HOME — 28,28

Figure 08: Sources of Drinking Water

13. Major Findings of the Study:

The study presents a detailed analysis of household living conditions, access to infrastructure, and resource usage across the surveyed population. The major findings are summarized as follows:

1. **High Rate of Home Ownership**: An overwhelming 96.66% of households reside in their own homes, indicating strong residential stability and possibly reflecting cultural or economic factors that favour homeownership.

2. **Housing Quality**: The majority of households (54.24%) live in pucca houses, suggesting a fair level of structural security. However, 33.68% still reside in semi-pucca and 12.08% in kutcha houses, highlighting the persistence of substandard housing among a portion of the population.

3. **Poor Waste Management Infrastructure**: A staggering 98.84% of households lack any formal waste collection system, underscoring a critical deficiency in public sanitation services. Only 0.39% benefit from doorstep collection.

4. **Inadequate Drainage Systems**: 57.20% of households have no drainage connection. Covered and open drainage systems serve 23.39% and 19.41%, respectively, indicating limited infrastructure for wastewater management.

5. ***Widespread Access to Sanitation Facilities****: 97.69% of households use private toilets, with minimal reliance on community latrines (2.19%) and negligible open defecation (0.13%), reflecting substantial progress in sanitation coverage.*

6. ***High Electrification Rate****: Access to electricity is nearly universal, with 97.69% of households connected to the grid. Only 2.31% remain without electricity, suggesting successful rural or regional electrification programs.*

7. ***Fuel Use for Cooking****: A majority (51.80%) use a combination of LPG and fuel-wood, while 42.03% rely solely on LPG. Traditional fuels like cow dung, paddy straw, and fuel-wood are used by a minority, and biogas and electricity are not used at all, signalling partial adoption of clean cooking energy.*

8. ***Technology and Appliance Use****:*
   - *Mobile phones (98.33%) and electric fans (97.69%) are the most commonly used gadgets.*
   - *Ownership of televisions (66.45%) and bicycles (93.06%) is substantial.*
   - *Devices like computers/laptops (4.24%), refrigerators (30.33%), and air conditioners (1.41%) remain limited, reflecting digital and technological divides.*

9. ***Limited Use of Advanced Water Purification****: Only 18.77% of households use water purifiers, pointing to possible concerns around water quality and public health.*

10. ***Sources of Drinking Water****: The majority rely on community water taps (43.57%), with 28.28% having piped water at home. The remaining households use either private or public hand tube wells, suggesting partial advancement in water access infrastructure.*

14. Recommendations:

To improve the overall living conditions, infrastructure, and quality of life in the surveyed area, the following recommendations are proposed:

1. ***Enhance Waste Management Infrastructure***
   - *Establish formal waste collection systems, especially doorstep services, to reduce unsanitary disposal practices.*
   - *Promote community-level awareness and segregation initiatives to manage solid waste more sustainably.*

2. ***Upgrade Drainage Facilities***

- *Prioritize investment in covered drainage systems to reduce waterlogging and disease outbreaks.*
- *Encourage public-private partnerships (PPPs) for rapid infrastructure deployment in underserved areas.*

3. **Improve Housing Quality**
   - *Implement subsidy schemes or low-interest loans for upgrading kutcha and semi-pucca homes to pucca houses.*
   - *Encourage the use of eco-friendly and durable construction materials.*

4. **Expand Clean Cooking Energy Access**
   - *Increase subsidies or financial incentives for LPG connections to encourage complete transition away from traditional fuels.*
   - *Promote awareness of the health risks associated with biomass and kerosene use.*

5. **Promote Water Purification and Safe Drinking Practices**
   - *Introduce low-cost water purifiers for low-income households.*
   - *Improve water supply quality, especially in areas dependent on community taps and hand tube wells.*

6. **Bridge the Digital Divide**
   - *Launch digital literacy programmes and provide affordable internet-enabled devices, particularly in households without computers or internet access.*
   - *Partner with NGOs and tech companies to expand access to digital education and services.*

7. **Strengthen Sanitation Coverage and Sustainability**
   - *Continue reinforcing the use of private toilets while improving the maintenance of community latrines.*
   - *Integrate sanitation with wastewater management to ensure a comprehensive hygiene system.*

8. **Promote Eco-Friendly Transportation**
   - *Support the use of bicycles through safe cycling infrastructure and community bike-sharing programs.*
   - *Encourage the adoption of electric two-wheelers as a sustainable alternative to fuel-based vehicles.*

9. **Targeted Electrification & Appliance Support**
   - *Ensure the remaining 2.31% without electricity are included in electrification efforts.*

- *Introduce micro-financing or subsidy models to improve household access to appliances such as refrigerators, air conditioners, and water purifiers.*

10. Integrated Rural/Urban Development Planning

- *Use these findings to inform state-level or regional development policies that address housing, infrastructure, health, and environment in a unified framework.*

15. Conclusion:

This study offers a comprehensive insight into the socio-economic conditions and infrastructural realities of rural households in Purba Medinipur district, West Bengal, based on primary data collected from 825 households across 33 villages in 11 blocks. The findings reveal significant progress in several areas, such as high rates of homeownership, widespread access to electricity, and increased adoption of private sanitation facilities. Moreover, the extensive use of mobile phones and LPG indicates a growing shift toward modernization in household amenities and energy use.

However, the study also uncovers persistent infrastructural gaps—particularly in waste management, drainage systems, safe drinking water access, and the availability of water purifiers and essential household appliances. Despite high electrification, the limited presence of computers, refrigerators, and air conditioners reflects underlying economic constraints and digital disparity. Additionally, a heavy reliance on community water sources and mixed fuel usage for cooking suggests that the transition toward clean, self-sustained household services is still incomplete.

The recommendations put forward—including improvements in waste disposal systems, expansion of drainage networks, promotion of clean energy and digital inclusion, and better access to water and sanitation—are critical for guiding policy formulation and implementation. These interventions must be integrated with participatory planning and supported by local governance mechanisms to ensure equity and sustainability.

In conclusion, while rural households in Purba Medinipur exhibit resilience and gradual infrastructural advancement, targeted efforts are required to bridge remaining gaps. The study underscores the need for data-driven, decentralized development planning that prioritizes essential services, empowers communities, and paves the way for inclusive and sustainable rural transformation.

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