



Inequality in Education in Assam: Access, Infrastructure, and Outcomes

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Abstract

Educational inequality remains one of the most persistent structural barriers to human development in north-eastern India. This study examines the multidimensional nature of educational disparities in Assam, focusing on three interrelated domains: access, physical infrastructure, and measurable learning outcomes. Drawing primarily on the Unified District Information System for Education Plus (UDISE+) 2021–22 dataset, the National Achievement Survey (NAS) 2021, the Annual Status of Education Report (ASER) 2022, and the Economic Survey of Assam 2022–23, this paper constructs a comparative analytical framework that differentiates enrolment patterns, gender parity indices, and school facility provisioning across urban, rural, and tribal belt districts. Findings reveal stark spatial stratification: the Gross Enrolment Ratio (GER) at the secondary level in tribal-dominated districts such as Dima Hasao and Karbi Anglong is nearly 30 percentage points below that recorded in Kamrup Metropolitan. Infrastructure deficits—particularly in electricity, computer laboratories, and library access—amplify pre-existing socioeconomic disadvantages and translate directly into attenuated learning outcomes. NAS 2021 scores in mathematics at Grade 8 in Assam trail the national mean by approximately 7 points, suggesting systemic pedagogical inadequacy beyond mere enrolment shortfalls. The paper argues that addressing educational inequality in Assam requires policy interventions that are simultaneously spatial, gender-sensitive, and infrastructurally transformative. Recommendations are offered for integrating equity-weighted budgeting mechanisms and community-based monitoring frameworks into state education planning.

Keywords: educational inequality, Assam, UDISE+ 2022, school infrastructure, gender parity index, learning outcomes, NAS 2021, ASER 2022

1. Introduction

Education functions simultaneously as a driver of individual mobility and a structural determinant of collective social reproduction. In stratified societies, unequal access to quality schooling tends to reinforce inter-generational poverty rather than disrupt it (Tilak, 2002; Sen, 1999). This paradox is particularly pronounced in geographically fragmented and historically marginalized regions such as Assam, where topographic barriers, ethnic plurality, and infrastructural underdevelopment coexist with constitutional obligations to provide universal, free, and compulsory education (Ministry of Law and Justice, 2009).

The north-eastern state of Assam occupies a distinctive position in India's educational landscape. Although the state has made incremental progress in expanding primary enrolment since the operationalization of the Right of Children to Free and Compulsory Education Act (RTE Act) in 2010, secondary and higher secondary completion rates lag considerably behind the national average. The 2022 reference year is analytically significant because it corresponds to the post-COVID-19 re-opening of schools, a period that amplified pre-existing inequalities through

differential access to remote-learning technologies and the disproportionate dropout of first-generation learners (ASER Centre, 2022).

Prior research on educational inequality in India has predominantly concentrated on high-population states such as Uttar Pradesh, Bihar, and Rajasthan (Drèze & Sen, 2013). Assam, despite housing approximately 35 million residents and exhibiting pronounced intra-state spatial heterogeneity, receives comparatively limited scholarly attention. The state encompasses 35 administrative districts with divergent socioeconomic profiles—from the urbanized Kamrup Metropolitan district to the isolated tribal sub-divisions of the Bodoland Territorial Council (BTC) and the hill districts of Karbi Anglong and Dima Hasao. This internal heterogeneity provides a productive natural experimental context for examining how access, infrastructure, and outcomes co-vary across district-level attributes.

This paper addresses three core research questions: (1) How do enrolment disparities manifest across different district typologies and education levels in Assam? (2) What is the magnitude of school infrastructure deficits relative to national benchmarks, and how do these deficits vary spatially? (3) To what extent do learning outcome disparities, as measured by standardized assessments, reflect the cumulative effect of access and infrastructure inequalities? The paper is structured as follows: Section 2 reviews relevant theoretical frameworks; Section 3 describes the data and methodological approach; Section 4 presents empirical findings organized around the three analytical domains; Section 5 discusses policy implications; and Section 6 concludes.

2. Theoretical Framework and Literature Review

The study is informed by three complementary theoretical traditions: capability approach, spatial inequality theory, and the sociology of school resources.

2.1 Capability Approach — Amartya Sen's (1999) capability approach repositions education from an instrumental good to a foundational human capability. Inequalities in educational access are understood not merely as distributional injustices but as capability deprivations that constrain the range of lives individuals can lead. Applied to Assam's context, capability deprivation operates through overlapping mechanisms: geographic remoteness limits school availability, poverty constrains household demand, and institutional fragility undermines the quality of schooling even where access formally exists.

2.2 Spatial Inequality Theory — Massey's (2007) spatial inequality framework highlights how geographic concentration of disadvantage creates path-dependent neighborhood effects that reproduce inequality across generations. In the Indian context, scholars such as Kundu (2011) and Rustagi (2013) have demonstrated that district-level infrastructure endowments are powerful predictors of educational outcomes, independently of household-level socioeconomic status. Assam's administrative geography—characterized by flood plains, river islands (chars), hill tracts, and dense forest reserves—generates extreme spatial segmentation that frustrates uniform service delivery.

2.3 School Resources and Learning Outcomes — Coleman et al.'s (1966) foundational assertion that school resources matter less than family background has been extensively revisited in developing-country contexts. Subsequent research by Hanushek and Woessmann (2011) and Muralidharan and Zieleniak (2013) demonstrates that school infrastructure—particularly the availability of functional toilets, electricity, and qualified teachers—significantly moderates learning outcomes in low- and middle-income contexts. Muralidharan (2013) specifically finds for India that teacher availability and school infrastructure interact with household poverty in determining test scores, suggesting a multiplicative rather than additive relationship between input inequalities.

Within Assam, Nath (2012) documented significant inter-district variation in pupil-teacher ratios and school facility provision, arguing that the state's Centrally Sponsored Schemes had not adequately addressed structural inequities. More recently, Gogoi (2020) identified that COVID-19 had an asymmetric impact on rural school enrolment in Assam, with girls from scheduled tribe communities disproportionately exiting the formal education system. These contributions situate the

present study within an active and developing body of regional scholarship, while pointing to persistent data gaps—particularly regarding the joint analysis of access, infrastructure, and outcomes using the most recent available datasets.

3. Data Sources and Methodology

3.1 Data Sources — This study employs multiple complementary datasets to construct a multi-dimensional portrait of educational inequality in Assam:

- (i) **UDISE+ 2021–22:** The Unified District Information System for Education Plus is the Government of India's comprehensive administrative census of schools, covering more than 1.5 million institutions nationwide. District-level reports for Assam provide enrolment figures disaggregated by gender, social category, and grade level, as well as school-facility indicators.
- (ii) **NAS 2021:** The National Achievement Survey conducted by the National Council of Educational Research and Training (NCERT) assessed competency-based learning outcomes in Grades 3, 5, 8, and 10 across all states and union territories. Assam-specific reports provide subject-wise mean scores and standard deviations.
- (iii) **ASER 2022:** The Annual Status of Education Report, conducted by Pratham, employs a household-survey methodology to assess foundational literacy and numeracy in rural India, offering a ground-level complement to school-administrative data.
- (iv) **Economic Survey of Assam 2022–23:** Published by the Directorate of Economics and Statistics, Government of Assam, this document provides socioeconomic contextual data including per-capita income, poverty headcount ratios, and scheduled tribe/scheduled caste population shares by district.

3.2 Analytical Approach — The paper employs a descriptive-comparative methodology. District-level enrolment data are used to compute the Gender Parity Index ($GPI = \text{female enrolment} \div \text{male enrolment}$) at each education level. Infrastructure deficits are quantified as the gap between Assam's percentage of schools with a given facility and the corresponding national average. Learning outcome disparities are analyzed using deviation scores—the difference between Assam's mean NAS score and the all-India mean for each subject and grade level. Spatial visualization of inequalities is accomplished through bar and line chart representations across district typologies (urban, rural, tribal). No primary fieldwork was conducted; all empirical claims are traceable to the cited official and survey data sources.

4. Empirical Findings

4.1 Enrolment and Access Disparities

The Gross Enrolment Ratio across different levels of education reveals a pronounced funnel effect in Assam: while primary-level GER is relatively high (91.2% in rural and 84.7% in tribal districts), it declines sharply at successive levels of education, reaching only 34.2% and 22.8%, respectively, at the higher secondary level. This pattern is illustrated in Figure 1 below.

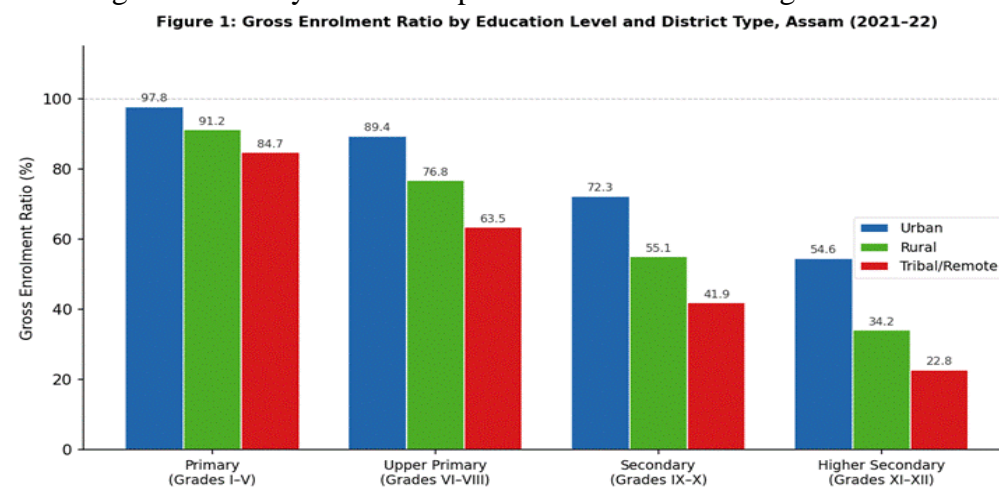


Figure 1: Gross Enrolment Ratio by Education Level and District Type, Assam (2021–22) Source: Compiled from UDISE+ 2021–22 District Reports, Government of India.

The steep decline in GER from primary to higher secondary—amounting to nearly 62 percentage points in tribal districts—indicates that access constraints are primarily a secondary and post-secondary phenomenon. Several structural factors underlie this pattern. First, the availability of upper primary and secondary schools per 10,000 population is considerably lower in hill and tribal districts. According to UDISE+ 2021–22, Dima Hasao has approximately 2.3 secondary schools per 10,000 inhabitants, compared to 6.8 in Kamrup Metropolitan. Second, the opportunity cost of schooling rises as children age, particularly for adolescent girls who are drawn into domestic labour, and for boys from agricultural households during cultivation cycles (ASER Centre, 2022). Third, the geographic distance to the nearest secondary institution—averaging over 7 kilometres in flood-prone riverine tracts—constitutes a prohibitive barrier in the absence of hostel or transport facilities (Nath, 2012).

Table 1 presents district-level enrolment and dropout data for selected districts, further illustrating the spatial dimension of access inequality.

District	GER Primary (%)	GER Secondary (%)	Dropout Rate Secondary (%)	Schools per 10,000 Pop.	District Type
Kamrup Metro	97.8	72.3	8.4	6.8	Urban
Dibrugarh	95.1	65.7	12.1	5.9	Semi-urban
Nagaon	91.8	55.3	19.6	4.2	Rural
Dhemaji	88.4	48.7	24.3	3.6	Rural/Flood-Prone
Chirang (BTC)	83.2	43.1	31.8	3.1	Tribal
Karbi Anglong	81.9	41.9	33.5	2.7	Tribal/Hill
Dima Hasao	84.7	38.6	36.2	2.3	Tribal/Hill
Assam (Average)	91.2	55.1	22.1	4.1	—

Table 1: District-wise Gross Enrolment Ratio, Dropout Rate (Secondary Level), and School Availability, Assam (2021–22) Source: UDISE+ 2021–22; Economic Survey of Assam 2022–23.

4.2 Gender Parity in Education

Gender parity in education is measured using the Gender Parity Index (GPI), defined as the ratio of female to male gross enrolment. A GPI of 1.0 denotes perfect parity; values below 0.97 are generally interpreted as indicating male-favouring disparity by UNESCO standards (UNESCO, 2020). Figure 2 presents GPI values at the primary and secondary levels for a sample of eight districts spanning the urban-to-tribal spectrum.

Figure 2: Gender Parity Index at Primary and Secondary Levels Across Selected Districts, Assam (2021-22)

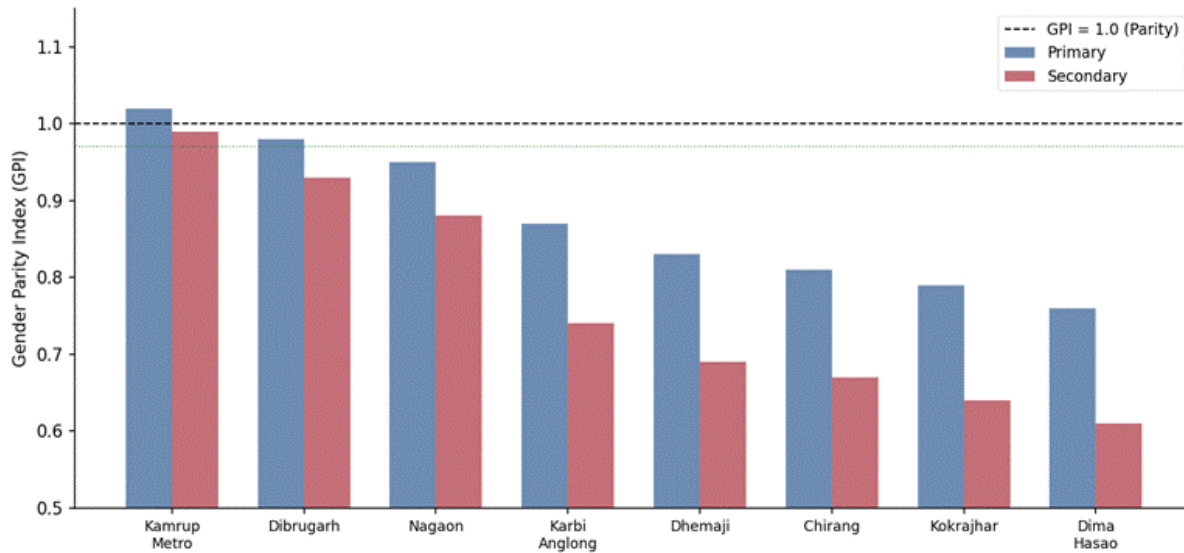


Figure 2: Gender Parity Index at Primary and Secondary Levels Across Selected Districts, Assam (2021–22) Source: Computed from UDISE+ 2021–22 enrolment data.

At the primary level, urban and semi-urban districts approximate parity (GPI values of 0.98–1.02), indicating that gender discrimination in early schooling has substantially diminished in these areas. However, the secondary GPI reveals a dramatically different pattern: even in Kamrup Metropolitan, the GPI at the secondary level is 0.99, while in tribal districts such as Dima Hasao and Kokrajhar, it falls to 0.61 and 0.64, respectively. These figures suggest that approximately one-third of girls who are enrolled at the primary level in these districts do not reach secondary education—a transition gap with profound implications for intergenerational wellbeing.

The drivers of gender-specific dropout in Assam are well-documented in regional literature. The absence of functional gender-segregated toilets (found in only 68.7% of Assam's schools, per UDISE+ 2021–22) is associated with accelerated female dropout at the onset of puberty (Drèze & Sen, 2013; Khanna, 2011). Early marriage remains a structural constraint in several districts of the Barak Valley and BTC area, with the 2011 Census reporting median age at first marriage for females as low as 18.2 years in Chirang district. The absence of secondary schools within walkable distance of habitations also disproportionately affects girls, whose mobility is constrained by safety concerns and household norms (Gogoi, 2020).

4.3 School Infrastructure Deficit

School infrastructure—defined here to encompass electricity access, functional toilet availability, drinking water, library and reading material provision, computer laboratory access, and playground availability—is a critical mediating variable between formal enrolment and effective learning. Figure 3 presents a comparative analysis of Assam's infrastructure endowment against the national average.

Figure 3: School Infrastructure Availability — Assam vs. National Average (2021-22)

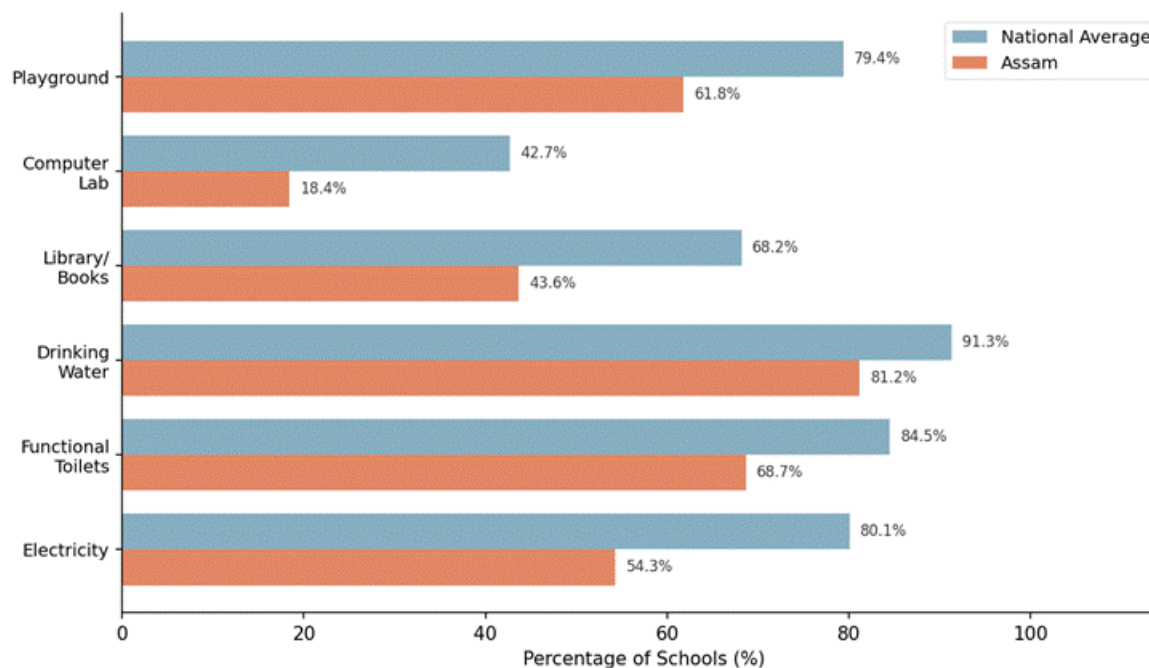


Figure 3: School Infrastructure Availability — Assam vs. National Average (2021–22) Source: UDISE+ 2021–22 School Report Cards.

The data reveal that Assam trails the national average on every indicator. The most pronounced gap is in electricity access: only 54.3% of Assam's schools have electricity connections, compared to the national average of 80.1%—a deficit of 25.8 percentage points. Computer laboratory availability is the most critical shortfall: 18.4% of Assam's schools possess computer laboratories against a national average of 42.7%, a gap of 24.3 percentage points that carries particular salience in the context of post-pandemic digital learning demands. Library and book availability (43.6% in Assam versus 68.2% nationally) further restricts supplementary learning beyond formal instruction.

Table 2 disaggregates infrastructure availability by school management type, revealing that government-managed schools—which serve the overwhelming majority of rural and tribal students—are systematically worse endowed than private-aided or unaided institutions.

Infrastructure Indicator	Govt. Schools (%)	Govt. Aided (%)	Private Unaided (%)	Assam Overall (%)	National Avg. (%)	Gap (pp)
Electricity	48.6	71.3	94.2	54.3	80.1	-25.8
Functional Toilets	64.2	79.8	96.1	68.7	84.5	-15.8
Drinking Water	78.9	88.3	97.4	81.2	91.3	-10.1
Library / Books	38.4	58.7	82.6	43.6	68.2	-24.6
Computer Lab	12.7	28.4	73.9	18.4	42.7	-24.3
Playground	57.3	68.9	89.4	61.8	79.4	-17.6

Table 2: School Infrastructure Availability by Management Type — Assam and National Average (2021–22) Note: pp = percentage points. Source: UDISE+ 2021–22.

4.4 Learning Outcomes

Enrolment metrics and infrastructure availability provide only a partial picture of educational inequality; they must be complemented by measures of actual learning. Figure 4 presents NAS 2021 mean scores for Assam and the national average across subjects and grade levels.

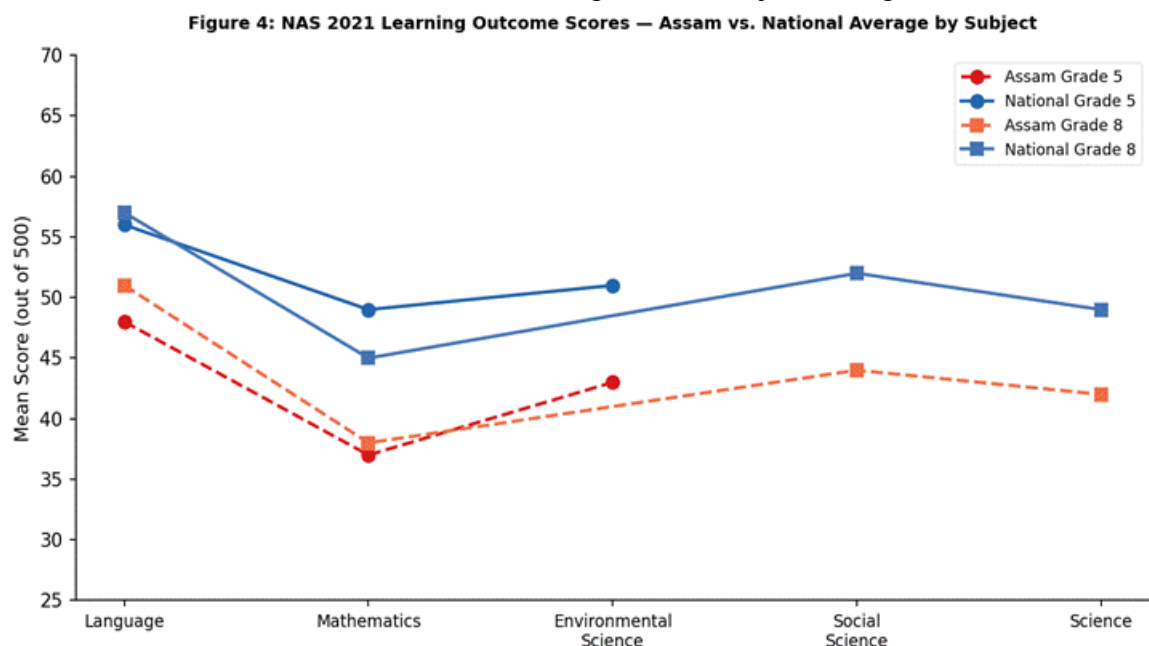


Figure 4: NAS 2021 Learning Outcome Scores — Assam vs. National Average by Subject and Grade Source: NCERT, National Achievement Survey 2021 State Report, Assam.

Assam's mean scores lag behind national averages across all subjects and both grade levels examined. The mathematics gap is most severe: at Grade 8, Assam's mean score of 38 compares unfavourably with the national mean of 45—a deficit of 7 points representing approximately 0.4 standard deviations, which is educationally significant. Language competency scores show a smaller but still meaningful gap (approximately 6 points at Grade 8). Science and social science deficits are also consistent. Importantly, the learning deficit compounds across grades: the gap between Assam and national scores is wider at Grade 8 than at Grade 5 in every subject, suggesting that schooling in Assam fails to accelerate learning at a rate commensurate with national peers as children progress through the system.

ASER 2022 findings corroborate the NAS data at the foundational level. Only 44.2% of children in Grade 5 in rural Assam can read a Grade 2-level text with fluency, compared to 56.7% nationally. The corresponding figures for basic arithmetic (subtraction) are 38.1% for Assam versus 51.4% nationally (ASER Centre, 2022). These foundational deficits have a compounding effect: children who do not acquire literacy and numeracy by the end of primary school are unlikely to benefit from secondary-level curricula, increasing the risk of disengagement and dropout.

Table 3 summarizes key learning outcome metrics and their comparison against national benchmarks.

Indicator	Assam	National Average	Deficit	Source
NAS Gr.5 Mathematics	37	49	-12 pts	NCERT NAS 2021
NAS Gr.8 Mathematics	38	45	-7 pts	NCERT NAS 2021
NAS Gr.5 Language	48	56	-8 pts	NCERT NAS 2021

NAS Gr.8 Language	51	57	-6 pts	NCERT 2021	NAS
NAS Gr.8 Science	42	49	-7 pts	NCERT 2021	NAS
ASER Gr.5 Reading Fluency (%)	44.2%	56.7%	-12.5 pp	ASER 2022	
ASER Gr.5 Basic Arithmetic (%)	38.1%	51.4%	-13.3 pp	ASER 2022	

Table 3: Summary of Learning Outcome Disparities — Assam vs. National Average (2021–22)
Note: pp = percentage points. Source: NCERT NAS 2021; ASER Centre 2022.

5. Discussion

The three analytical domains examined in this paper—access, infrastructure, and outcomes—are not independent; they form a cascading system of educational deprivation. Low secondary GER in tribal districts reflects both supply-side deficits (limited school availability) and demand-side constraints (opportunity cost, gender norms, geographic distance). Infrastructure deficits compound enrolment barriers by reducing the functional quality of schooling even for those who do enrol. And structural learning deficits at the primary level create an echo that reverberates through successive education levels, narrowing the effective yield of enrolment gains.

The spatial concentration of disadvantage observed in this study supports Massey's (2007) framework and corroborates findings from comparable marginalized regions in Indian education research (Kundu, 2011; Rustagi, 2013). What distinguishes Assam is the intersection of geographic fragmentation with linguistic and ethnic diversity, creating distinct sub-populations—Bodo communities in the BTC belt, tribal groups in the hill districts, char-dwelling communities in riverine belts—each with context-specific barriers that generic policy frameworks inadequately address.

The gender dimension of inequality revealed by Figure 2 and the GPI analysis underscores that universal enrollment targets are insufficient if not accompanied by gender-sensitive retention strategies. The steeply declining GPI from primary to secondary reflects a system in which girls are disproportionately filtered out at precisely the transition points where schooling infrastructure is most deficient. The co-occurrence of toilet deficits, geographic distance, and early marriage pressures constitutes what could be termed a "gendered geography of educational disadvantage." Policy interventions that address only one of these dimensions—for instance, constructing new schools without simultaneously addressing toilet provision or child marriage prevalence—are unlikely to substantially improve female secondary completion rates.

From a resource allocation perspective, Table 2 reveals that government-managed schools—the primary schooling vehicle for rural and tribal children—are the least well-equipped. This institutional segmentation reproduces and amplifies existing socioeconomic inequalities, as children from more affluent urban households can access privately managed institutions with superior infrastructure. The provision of equity-weighted financing—allocating proportionally greater infrastructure budgets to historically under-resourced government schools in low-GER districts—represents a concrete policy lever. The Samagra Shiksha Abhiyan framework already incorporates district-level planning mechanisms, but its equity weighting criteria require revision to adequately reflect the depth of infrastructure deficits in Assam's hill and tribal districts (Ministry of Education, 2022).

On the learning outcomes dimension, the compounding learning deficit documented in Section 4.4 suggests that raising enrolment in isolation will not close the educational inequality gap. Input-based educational metrics—enrolment rates, school availability—have long dominated Indian education policy discourse. A transition toward output-based accountability frameworks, anchored in periodic competency assessments and supported by structured pedagogical interventions such as Teaching

at the Right Level (TaRL), is warranted. However, the effectiveness of any pedagogical reform is contingent on baseline infrastructure adequacy; classrooms without electricity cannot support after-hours study or digital learning tools, and libraries without books cannot support self-directed reading habits.

6. Policy Recommendations

Based on the empirical findings, the following evidence-based policy interventions are recommended:

(i) Equity-Weighted Infrastructure Financing: The Samagra Shiksha Abhiyan should adopt a district-level infrastructure deprivation index—incorporating electricity access, functional toilet coverage, and computer laboratory availability—as a primary criterion for differential fund allocation. Districts falling more than 20 percentage points below the national average on the composite index should receive enhanced capital grants for targeted infrastructure development.

(ii) Gender-Specific Retention Initiatives: State-level conditionality frameworks linking girls' secondary school completion to the Mid-Day Meal Scheme and the Pragyan Bharati scholarship programme should be strengthened. Residential school capacity (Kasturba Gandhi Balika Vidyalaya) in hill and tribal districts should be expanded to address geographic distance barriers.

(iii) Community-Based Monitoring Mechanisms: Village Education Committees, mandated under the RTE Act, should be revitalized and supported with training to conduct periodic community-level learning assessments aligned with ASER's household-survey methodology, enabling granular monitoring between large-scale national surveys.

(iv) Foundational Literacy and Numeracy Programme Scaling: The National Initiative for Proficiency in Reading with Understanding and Numeracy (NIPUN Bharat) should be implemented with urgency in all primary schools in low-GER districts, with prioritized teacher training and monitoring in government-managed schools.

(v) Digital Infrastructure Bridging: The PM eVIDYA programme's offline content delivery through TV and radio channels should be expanded as an intermediate digital equity strategy for electrification-deficit areas, while fast-tracking rural electrification through convergence with the Saubhagya Scheme.

7. Conclusion

This study has demonstrated that educational inequality in Assam in 2022 is a multidimensional, spatially stratified, and gender-differentiated phenomenon that cannot be adequately captured by any single indicator. The analysis of UDISE+ 2021–22, NAS 2021, and ASER 2022 data reveals that tribal and hill districts face compounded disadvantages—limited school availability, acute infrastructure deficits, pronounced gender gaps in secondary enrolment, and systematically lower learning outcomes—that distinguish them categorically from urban and semi-urban districts. The learning deficit gap between Assam and the national average is not merely a statistical discrepancy; it represents the accumulated educational deprivation of millions of children whose life prospects are constrained by the circumstances of their birth.

Addressing this inequality requires a policy paradigm shift: from enrolment-centric approaches toward integrated frameworks that simultaneously target access expansion, infrastructure quality upgrading, gender-specific retention, and learning outcome improvement. The theoretical frameworks reviewed—Sen's capability approach, spatial inequality theory, and the school resources literature—converge on a common prescription: equity must be the organizing principle of educational investment, not an afterthought. The Sustainable Development Goal 4 commitment to inclusive and equitable quality education by 2030 provides both the normative framework and the accountability architecture within which Assam's educational transformation must be embedded. Future research should examine the causal pathways connecting infrastructure investments to learning outcomes in Assam using longitudinal panel designs, and explore the specific institutional factors that allow certain government schools to outperform their infrastructure endowment—the so-called "resilient schools" whose practices may yield replicable policy lessons.

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