

P-ISSN: 2706-7483
E-ISSN: 2706-7491
NAAS Rating (2026): 4.5
IJGGE 2026; 8(4): 01-06
www.geojournal.net
Received: 04-01-2026
Accepted: 07-02-2026

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Political reservation and socio-economic development: A spatial analysis of scheduled tribe population of selected assembly constituencies in Rajasthan

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DOI: <https://doi.org/10.22271/27067483.2026.v8.i4a.499>

Abstract

The constitution of India under article 332 has provided reservation for Scheduled Tribes in State Assembly. But even after 70 year of independence its impact on socio-economic development of ST population remain negligible. This study uses a comparative approach to examine the socio-economic consequences of political reservation in three ACs of Rajasthan. The three AC in Rajasthan: two ST-reserved constituencies (Rajgarh-Laxmangarh and Kushalgarh) and one unreserved constituency (Deoli-Uniara). In this study villages having populations above 25 percent ST are selected. To analyse the data, factor analysis using Principal Component Analysis (PCA) with Varimax rotation was applied to identify underlying development dimensions. The result finds three primary factors: socio-economic development and living standards, modernization and advanced asset ownership, and demographic structure with gender balance. Regional comparisons were also assessed through factor scores to determine disparity in development outcomes. Thus, study contributes in understanding the spatial distribution of development disparities. It also evaluates the effectiveness of reservation policies in promoting equitable development among ST populations.

Keywords: Political reservation, scheduled tribes, socio-economic development, factor analysis, spatial analysis

Introduction

The political representation of historically marginalized communities has been a fundamental concern in India since Independence and to ensure their political representation the reservation of seats for Scheduled Tribes (STs) in State Legislative Assemblies under Article 332 of the Constitution was envisaged. This measure seen as a corrective mechanism to address historical political exclusion and socio-economic deprivation of marginalized communities (Duflo, 2005) ^[1]. The reservation was not only expected to ensuring presence of tribal representatives in states assembly but also facilitate inclusive governance and region-specific developmental needs. But, after seven decades of Independence political reservation and socio-economic advancement in tribal regions remains contested and uneven.

In this context, electoral delimitation process plays key role in shaping political representation as delimitation determines not only the size and boundaries of constituencies but also their social composition, settlement structure, and administrative reach (Morrill, 2018; Prescott, 2017) ^[8]. In tribal area this process often brings together heterogeneous spaces along with homogenous cluster. These cluster varying in term of connectivity, infrastructure, and access to public services. The outcome of development of reserved ACs should understood not only by peoples electoral participation rather it should look at deep socio-economic and demographic factors as well ACs geographical settings.

In India most of research focus on leadership and electoral participation but not at the underlaying geography and socio-economic structure of the region. Although these research provided valuable insights into political inclusion of marginalised people. However, limited attention has been paid to the spatial and socio-economic consequences of reservation at the constituency level. There is a paucity of empirical work that to compares reserved and unreserved constituencies. This gap is evident in Rajasthan, where regional disparities are more pronounced. The state has one of the largest concentrations of tribal population in western India.

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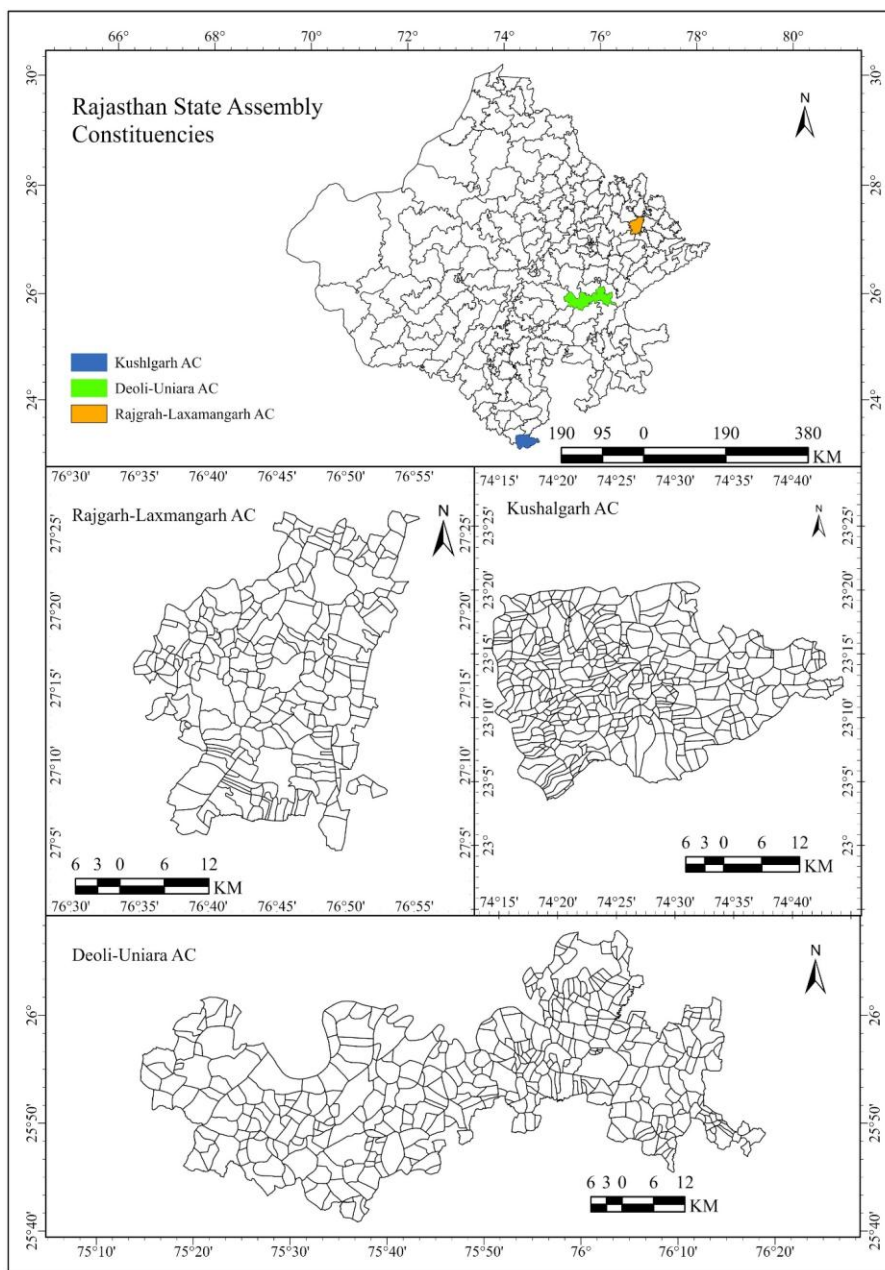
In Rajasthan, tribal regions range from relatively accessible and semi-urbanised areas in the north-east to remote, forested and predominantly rural tracts in the south.

In this context, this study examines whether political reservation have translated into improved socio-economic conditions in tribal constituencies. It also analyse that whether development outcomes continue to be shaped primarily by geography and infrastructural integration by comparing reserved and unreserved constituency. Three Assembly Constituencies (ACs) are selected with contrasting social composition and locational characteristics. This study adopts a comparative geographical approach to assess patterns of inequality rather than relying on single indicators. To capture the complex and interrelated dimensions of

development, study uses factor analysis as the principal analytical tool.

Study Area

The present study have been selected three ACs: Rajgarh-Laxmangarh (ST reserved), Deoli-Uniara (unreserved), and Kushalgarh (ST reserved). These AC are chosen to represent contrasting geographical settings and social compositions. Rajgarh-Laxmangarh is located in north-eastern Rajasthan and represents a mixed social constituency with moderate tribal concentration and relatively better connectivity while Deoli-Uniara, situated in the central part, is unreserved characterised by a heterogeneous population structure.



Source: Survey of India, Census of India, 2011

Fig 1: Location map of Three ACs in Rajasthan

In contrast, Kushalgarh lies in southern Rajasthan and forms part of the core tribal belt, with an overwhelmingly ST population, rugged terrain, and a predominantly rural settlement pattern.

Despite having comparable population sizes, these ACs differ sharply in terms of literacy levels, gender composition, infrastructure availability, and access to public services.

Data Sources and Methodology

This study adopted a quantitative cum comparative methods based on secondary data to analyse the overall socio-economic and demographic similarities and disparity across three ACs.

Data Sources

Demographic and socio-economic indicators are derived from the Census of India 2011, it provides the most comprehensive and standardised dataset at the constituency and village levels. In addition, constituency-level data on education, health facilities, drinking water, sanitation, electricity, household assets, transport, and market access were obtained from IndiaStat publications and related government statistical compendia. Other data regarding reservation status and constituency boundaries were drawn from the Delimitation of Parliamentary and Assembly Constituencies Order, 2008. The Census 2011 is the principal demographic source is the most recent decennial dataset that aligns with the current delimitation framework.

To understand socio-economic development level, a set of variable are selected from demographic, social, and infrastructural aspect. It includes variable such as total literacy rate, male and female literacy, sex-ratio, child sex-ratio, access to educational institutions, health infrastructure, drinking water sources, sanitation facilities, electricity for domestic and productive use, ownership of household assets, banking access, and transport connectivity etc.

The village constitutes the primary unit of analysis. Villages are filtered using the following criterion:

$$ST\ Share_i = \left(\frac{ST\ Population_i}{Total\ Population_i} \right) \times 100$$

Only villages satisfying ST population above 25 percent are retained for analysis. This threshold ensures that tribal-dominated contexts and avoids dilution of results due to socially heterogeneous settlements.

Data Analysis

A comparative geographical approach is used to examine similarities and differences among two ST reserved ACs and one unreserved AC. This assessment allows that whether political reservation leads to improved development outcomes, or observed variations are better explained by geographical and infrastructural factors.

To eliminate effect of differing units of measurement and scale all variables are standardised as:

$$Z_{ij} = \frac{X_{ij} - \bar{X}_j}{\sigma_j}$$

where:

X_{ij} = value of variable j for village

$\bar{X}_j$ = mean of variable j

σ_j = standard deviation of variable j

It ensures that each variable contributes equally to the analysis and prevents variables with larger numerical ranges from influencing the results.

After standardisation of all variable, factor analysis is used in IBM SPSS software to identify the underlying dimensions that structure socio-economic and demographic variation across three ACs. Principal Component Analysis (PCA) is used for factor extraction, then Varimax rotation to improve interpretability of the outcomes. The reason of using factor analysis is due to the fact that factor analysis reduces a large set of correlated variables into a smaller number of independent factors. The each factor represents a distinct dimension of development.

However, before factor extraction, the suitability of data is checked for factor analysis using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's Test of Sphericity.

The KMO value obtained is well above the acceptable threshold, indicating strong inter-correlations among variables and confirming that the dataset is appropriate (Table 1).

Table 1: Suitability of Data

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.889
Bartlett's Test of Sphericity	Approx. Chi-Square	4560.113
	df	105
	Sig.	0.000

Source: Calculated by Author

While Bartlett's Test is statistically significant. Thus, rejects the null hypothesis that the correlation matrix is an identity matrix.

The number of factors is determined by Kaiser's criterion. This criteria considers only those components having eigenvalues above one as significant.

Results

Factors Extraction and Variance

As presented in table 2, three components satisfied above mentioned criterion of eigenvalues of above one. The first component recorded an eigenvalue of 5.773 and explained 38.49 percent of the total variance, indicating that it represents the most dominant dimension of variation among the selected variables. The second component had an eigenvalue of 1.586, accounting for 10.58 percent of the variance, while the third component, with an eigenvalue of 1.105, contributed 7.37 percent of the variance.

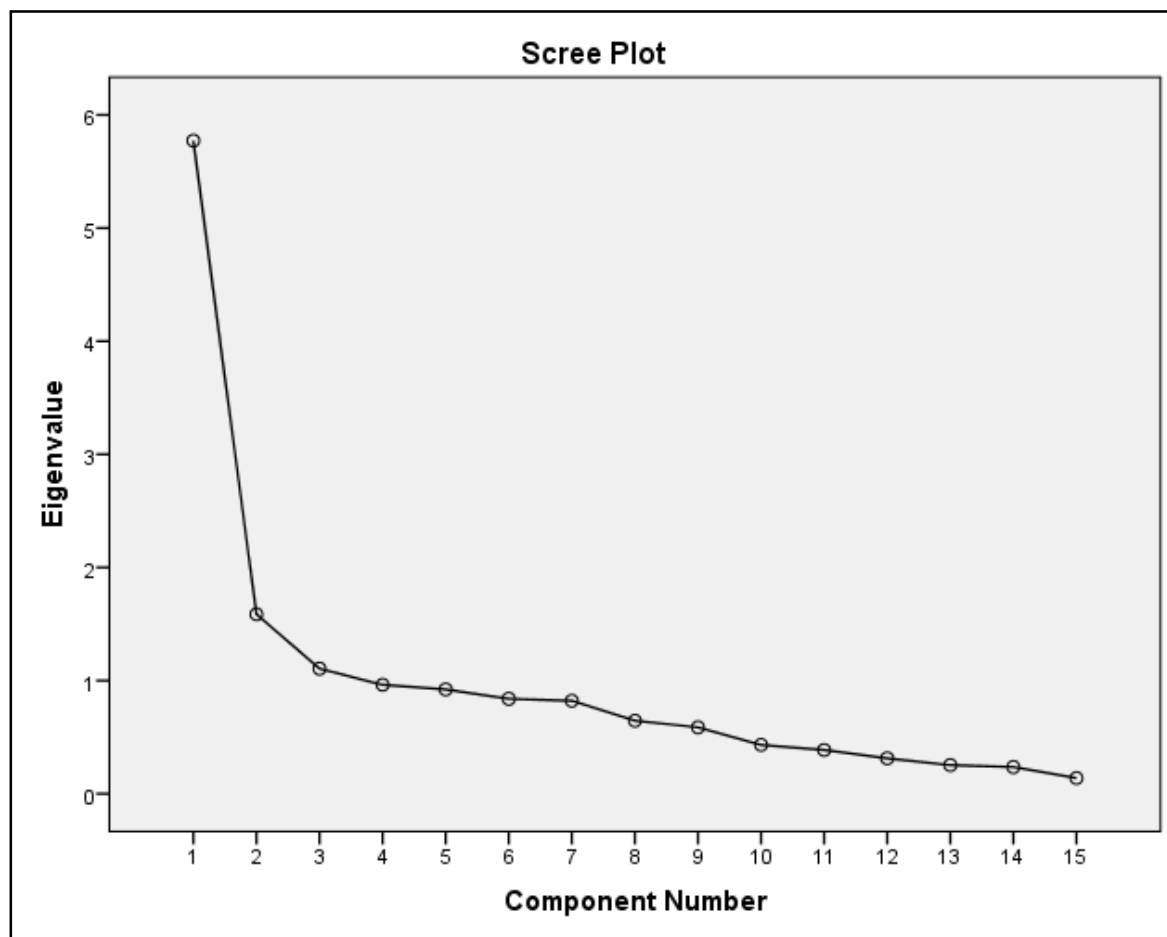
Based on the calculation and scree plot, three factors account around 56.43% of the total variance in the data. In socio-economic and geographical research multiple complex indicators are analysed, so a cumulative variance above 50% is considered satisfactory. As above 50% variance indicate a substantial condensation of information into a smaller number of meaningful factors.

In the calculation Varimax rotation is applied to ensure statistical interpretability of the result. After Varimax rotation the variance are more evenly distributed in three factors. The rotated solution shows first factor accounts for 33.12%, the second for 12.50%, and the third 10.81% of the total variance. Although cumulative explanatory power remains unchanged at 56.43%. This balanced distribution shows that each extracted factor significantly represents the underlying structure of socio-economic and demographic conditions across the study area.

Table 2: Extraction of Factors

Component	Total Variance Explained								
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative%	Total	% of Variance	Cumulative%	Total	% of Variance	Cumulative%
1	5.773	38.486	38.486	5.773	38.486	38.486	4.968	33.12	33.12
2	1.586	10.575	49.061	1.586	10.575	49.061	1.875	12.498	45.618
3	1.105	7.368	56.429	1.105	7.368	56.429	1.622	10.811	56.429
4	0.963	6.417	62.846						
5	0.922	6.146	68.993						
6	0.839	5.591	74.584						
7	0.822	5.48	80.064						
8	0.645	4.303	84.367						
9	0.586	3.91	88.277						
10	0.431	2.876	91.153						
11	0.387	2.58	93.733						
12	0.313	2.087	95.82						
13	0.253	1.684	97.504						
14	0.236	1.574	99.078						
15	0.138	0.922	100						

Source: Calculated by Author

**Fig 2:** Scree Plot Showing Eigenvalues of Principal Components**Rotated Component Matrix**

The Varimax rotated component matrix presents the factor loadings of each standardized variable on the three extracted components. Loadings of 0.30 and above were considered significant for interpretation, as they indicate a strong association between a variable and a given factor. Based on this criterion, three distinct and conceptually meaningful factors emerged.

Factor 1: Socio-Economic Development and Living Standard

Factor 1 consists of a multitude of variables with high positive loadings. These include the ownership of bicycles (0.829), scooters or motorcycles (0.829), mobile phones (0.823), availability of electricity for lighting (0.788), availability of television (0.784), ownership of radio or transistors (0.726), and total literacy rate (0.697).

Table 3: Rotated Component Matrix

Extraction of Factors Variable	Factors		
	1	2	3
Households having bicycle	0.829		
Households having scooter/motorcycle/moped	0.829		
Households having mobile phone (only)	0.823		
Households with electricity for lighting	0.788		
Households having television	0.784	0.433	
Households having radio/transistor	0.726		
Total literates	0.697		
Drinking water source near premises	0.416	-0.34	
Households availing banking services	0.378	-0.319	
Households having TV, computer, mobile and scooter/car		0.573	
Households using treated tap water for drinking		0.569	
Households having car/jeep/van	0.419	0.522	
Households having both telephone and mobile		0.495	
Child sex-ratio			0.864
Sex-ratio			0.834

Source: Calculated by Author

Additionally, moderate positive loadings are given to distance to sources of drinking water (0.416), car or jeep ownership (0.419), and access to banking services (0.378). Overall these variables are indicative of educational attainment, access to basic infrastructure, communications, transport assets, and financial inclusion. This clustering of variables indicates that Factor 1 is representative of the overall socio-economic condition and quality of life for households. Regions that score high on Factor 1 demonstrate a higher standard of living, higher level of material well-being, and increased access to basic services. Therefore, Factor 1 is labelled as Socio-economic Development and Living Standard Factor.

Factor 2: Modernization and Advanced Asset Ownership

The second factor is primarily characterized by a large loadings of the composite modern asset ownership in the form of modern technology, such as televisions, computers, mobile phones, and scooters or vehicles (0.573); the use of treated tap water as the primary drinking water source (0.569); ownership of either a car or a jeep (0.522); and the presence of a television (0.433). The second factor reflects a higher order of development and is indicative of modernisation, improved economic capacity, and improved infrastructure to support use of public utilities. Treated water supply and higher-order consumer assets indicate that development has progressed beyond subsistence-level amenities. So the second factor is referred to as the Modern Infrastructure and Economic Advancement Factor.

Factor 3: Demographic Structure and Gender Balance

The third factor exhibits substantial positive loadings on both the child sex-ratio (0.864) and the overall sex-ratio (0.834). These variables serve as direct indicators of the demographic composition and gender balance within the population. This factor encapsulates social conditions pertaining to population structure, cultural practices, and the demographic health of the region. Therefore, it is designated as the “Demographic Structure and Gender Balance Factor.”

Three separate variables have been identified through the process of factor analysis based on the demographic and

socioeconomic characteristics of the study areas. These include socio-economic development and standard of living (education; access to infrastructure; household assets; financial inclusion); the presence of modern infrastructure and economic development (higher quality of facilities and modernization); and demographic structure/gender balance (population and gender equity). Together, these three variables constitute a powerful method for analysing the socioeconomic patterns within the assembled dataset and provide a rich and thorough basis for examining the degree of regional differences between assembly constituencies.

Regional Comparison Based on Factor Scores

The spatial disparities among three ACs is measured using mean factor scores. The mean factor score is calculated for each extracted factor by regression method. The factor scores are standardized with a mean of zero and a standard deviation of one. The positive values show above-average performance, while negative values indicate below-average level.

Table 4: Regional Comparison Based on Factor Scores

ACs		Factor 1	Factor 2	Factor 3
Rajgarh-Laxmangarh	Mean	1.136	0.753	-0.346
	N	115	115	115
	Std. Deviation	0.670	1.199	0.700
Deoli-Uniara	Mean	0.798	-0.166	-0.228
	N	166	166	166
	Std. Deviation	0.754	1.186	1.042
Kushalgarh	Mean	-0.680	-0.153	0.201
	N	387	387	387
	Std. Deviation	0.481	0.705	1.010

Source: Calculated by Author

Factor 1: Socio-Economic Development and Living Standard

The mean factor score for Rajgarh-Laxmangarh is 1.136, which is higher than the overall mean thus it demonstrates the highest level of socio-economic development across three ACs. This is evident as high level of literacy rates, access to electricity, ownership of household assets, and access to basic services. Deoli-Uniara AC demonstrate a moderately positive score of 0.798. It indicate a relatively developed socio-economic condition, lower than Rajgarh-Laxmangarh AC. In Kushalgarh compare to other two AC presents a negative score of -0.680, indicate lower living standards, limited asset ownership, and weaker access to infrastructure and services. Thus, the spatial pattern reveals higher level of socio-economic development in Rajgarh-Laxmangarh, followed by Deoli-Uniara, while Kushalgarh remains relatively underdeveloped.

Factor 2: Modern Infrastructure and Economic Advancement

The second factor, Rajgarh-Laxmangarh shows high positive mean score of 0.753, it highlights higher infrastructural facilities, treated water supply, and other household assets. In contrast, both Deoli-Uniara (-0.166) and Kushalgarh (-0.153) present slightly negative scores, indicating relatively lower levels of modernization and infrastructural development within these constituencies. This underscores a pronounced regional disparity, with modern infrastructure being predominantly concentrated in Rajgarh-Laxmangarh.

Factor 3: Demographic Structure and Gender Balance

The third factor exhibits a divergent spatial pattern. Kushalgarh registers a positive score of 0.201, signifying a relatively superior demographic balance and more favorable sex-ratio conditions. In contrast, Rajgarh-Laxmangarh (-0.346) and Deoli-Uniara (-0.228) display negative values, indicating comparatively lower gender balance in these regions. This suggests that although Kushalgarh lags in socio-economic and infrastructural development, it demonstrates relatively better performance in demographic and social structure.

The factor score analysis indicates significant spatial disparities among the three assembly constituencies. Rajgarh-Laxmangarh is identified as the most developed area in terms of socio-economic conditions and infrastructural advancement. Deoli-Uniara holds an intermediate status with moderate levels of development. Conversely, Kushalgarh remains relatively underdeveloped in economic and infrastructural aspects, although it exhibits a comparatively better demographic balance.

The findings suggest a polarized pattern of regional development, characterized by the concentration of economic growth and modernization in specific constituencies, while others continue to encounter developmental challenges. The identified factors thus offer a comprehensive framework for understanding the multidimensional nature of regional disparities within the study area.

Conclusion

The overall assessment of the political evolution and socio-economic-demographic conditions of Rajgarh-Laxmangarh, Deoli-Uniara, and Kushalgarh AC's with specific focus on the implications of reservation and delimitation for Scheduled Tribe populations. The analysis clearly demonstrates that while reservation has ensured numerical political representation, it has not produced uniform or automatic socio-economic advancement. Analysis shows a spatial gradient emerge across the three constituencies, shaped primarily by geography, settlement pattern, administrative reach, and infrastructural connectivity rather than by reservation status alone.

As Kushalgarh, despite being the most demographically homogeneous and overwhelmingly ST-dominated constituency, continues to experience acute deficits in literacy, electricity use, asset ownership, mobility, and access to treated water. At the same time, it displays the most favourable sex-ratio and child sex-ratio, reflecting the resilience of tribal social structures and relatively weaker patriarchal pressures. Rajgarh-Laxmangarh and Deoli-Uniara(Unreserved), though socially more heterogeneous, show comparatively better educational outcomes, infrastructure access, and economic integration due to proximity to urban centres and transport corridors, albeit with sharper gender disparities.

Overall, the findings underscore a central conclusion that, political reservation alone does not guarantee substantive development outcomes. Socio-economic progress in tribal areas is mediated by spatial context and institutional accessibility. The three constituencies thus represent different positions along a continuum of tribal integration and development, offering critical insight into the limits and possibilities of reservation as a tool for social transformation.

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