
*Full Length Research Article***A Comparative Block Level Study of Social-Economic Indicators and Planning for Regional Development: A Case Study of Sundarban, West Bengal, India**Bholanath Das¹, Najma Khatun^{2*} and Partha Pratim Sarkar³¹Individual Researcher. ²Assistant Teacher, Department of English, Kazipara Haridas Vidyabhaban. ³Research Scholar, Department of Geography, Bankura University.

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Abstract

The Sundarbans region, a unique deltaic landscape in West Bengal, faces persistent socio-economic disparities due to its geographical constraints, inadequate infrastructure, and limited access to essential services. Despite its ecological significance, the region struggles with uneven development, affecting livelihoods, healthcare, and education. This study applies Principal Component Analysis (PCA) to identify the most influential factors driving disparities and constructs a Disparity Index using methods such as the Theil Index and Coefficient of Variation (CV). The analysis reveals that several blocks remain underdeveloped, highlighting gaps in healthcare, education, and economic opportunities. To address these inequalities, the study emphasizes the need for targeted policy interventions, integrating government schemes with localized development strategies. The results provide a comprehensive spatial understanding of socio-economic imbalances in the Sundarbans and offer insights for policy formulation aimed at equitable growth.

Keywords: Regional Disparities, Socio-Economic Development, Composite Z-Score, Balanced Development, Sustainability.

1. Introduction

Regional disparities in socio-economic development present a significant challenge to balanced and inclusive growth, particularly in developing nations. Unequal access to resources, infrastructure, and economic opportunities leads to stark variations in development across different geographic regions, often reinforcing cycles of poverty and marginalization (Braveman, 2014; Ohlan, 2013). These disparities are not only a result of historical and structural inequalities but also reflect uneven policy interventions and economic transitions that have shaped regional development patterns over time (Novkowska, 2017).

At the core of regional disparities is the uneven spatial distribution of essential resources such as education, healthcare, employment opportunities, and infrastructure. This imbalance is evident across various scales, from national and state levels to district and block levels. Measuring these disparities is crucial for identifying lagging regions and implementing targeted policies that promote equitable growth and social welfare (Das, 2018). Despite rapid economic progress in many parts of India, significant rural-urban and inter-district differences persist, exacerbating socio-economic inequalities (Mishra & Gaikward, 1979; Banerjee, 1992).

West Bengal, like many other states in India, exhibits stark inter-district and intra-district disparities in key development indicators. Studies have highlighted substantial variations in human development indices, per capita income, and infrastructure across districts, often leaving rural and ecologically vulnerable areas at a disadvantage (Dey, 2015; Das, 2018). The Sundarbans region, characterized by its fragile ecosystem and socio-economic vulnerabilities, faces additional challenges due to its geographical isolation, frequent natural disasters, and limited infrastructure. These factors contribute to persistent underdevelopment in many of its blocks, making it imperative to analyze disparities at a finer spatial scale.

This study aims to assess the socio-economic development levels across blocks in the Sundarbans region of West Bengal. By evaluating disparities at the micro-level, the research seeks to identify the extent of regional imbalances and highlight areas that require focused policy attention. The findings will provide critical insights for policymakers, helping them design strategies to reduce developmental gaps, promote sustainable economic opportunities, and improve living conditions in underdeveloped areas. Addressing these disparities is essential for fostering inclusive growth and ensuring that no region is left behind in the broader framework of national and state-level development.

2. Literature Review

2.1. Theoretical Foundations of Regional Disparities

The concept of regional disparities has been extensively explored in economic geography and development studies. Myrdal's (1957) theory of cumulative causation posits that economic activities tend to concentrate in specific regions, leading to a cycle of growth in the 'core' areas and stagnation in the 'peripheries'. Friedmann's (1966) core-periphery model further elaborates on this by describing how dominant 'core' regions exploit 'peripheral' areas, exacerbating regional inequalities. These foundational theories have been instrumental in analyzing spatial economic imbalances globally and within countries like India.

2.2. Interstate and Inter-District Disparities in India

India's vast and diverse landscape has led to significant interstate and inter-district disparities. Nizamuddin (2014) employed the Wroclaw Taxonomic Method to assess development levels across ten Indian states, revealing pronounced differences in socio-economic indicators. Srivastava (2021) examined regional disparities and economic growth in India, highlighting persistent inequalities despite national development efforts. These studies underscore the need for targeted policies to address regional imbalances.

2.3. Intra-District and Block-Level Disparities

While interstate analyses provide a macro perspective, intra-district studies offer insights into localized disparities. Sultana and Aktar (2016) identified six backward

blocks in Malda district, West Bengal, using social, economic, and demographic indicators, emphasizing the necessity for block-specific interventions. Maji and Sarkar (2017) focused on primary education disparities among 22 blocks in Bankura district, revealing significant inequalities that could inform educational policy reforms. These studies highlight the importance of micro-level analyses in formulating effective development strategies.

2.4. Socio-Economic Challenges in the Sundarbans

The Sundarbans region, known for its unique mangrove ecosystem, faces distinct socio-economic challenges. Datta and Mete (2022) explored the socio-economic status of women in the Sundarbans, uncovering issues related to education, healthcare access, and economic opportunities. Bagchi (2017) assessed the development of basic infrastructure in the 24 Parganas district, which encompasses parts of the Sundarbans, using Principal Component Analysis to highlight infrastructural deficits. These studies provide valuable insights into the region's development needs.

2.5. Recent Developments and Emerging Challenges

Recent research has delved into the evolving challenges in the Sundarbans. Ghosh et al. (2023) examined the impacts of climate change-induced water-related threats on food security in the Indian Sundarbans, proposing management strategies to mitigate adverse effects. Chowdhury et al. (2023) analyzed health ailments and associated risk factors in small island communities within the Sundarbans, identifying socio-economic and environmental determinants of health. These contemporary studies highlight the dynamic and multifaceted challenges faced by the region.

3. Research Gap and Significance of the Present Study

Despite the wealth of research, there remains a paucity of comprehensive studies integrating multiple socio-economic indicators at the block level in the Sundarbans. Existing literature often focuses on specific sectors or broader regional analyses, leaving a gap in holistic, micro-level assessments. The present study aims to fill this gap by conducting an in-depth, block-level analysis of socio-economic disparities in the Sundarbans region of West Bengal. By employing a multi-indicator approach, this research seeks to provide nuanced insights that can inform targeted policy interventions, promote balanced regional development, and enhance the quality of life for the inhabitants of this ecologically sensitive and socio-economically vulnerable region.

4. Study Area

The Sundarbans, located in the southernmost part of West Bengal, spans 19 administrative blocks across North and South 24 Parganas districts, covering approximately 9,630 sq. km. This deltaic region, shaped by fluvio-marine deposits of the Ganges-Brahmaputra-Meghna system, features mangrove forests, estuarine networks, and fertile alluvial soils, influencing its economic activities. The region's

tropical monsoon climate and frequent cyclonic events impact agriculture, fisheries, and infrastructure, exacerbating socio-economic disparities across blocks. Given its geographical and climatic constraints, disparities in healthcare, education, transport, and financial services are more pronounced in remote blocks compared to those with better connectivity.

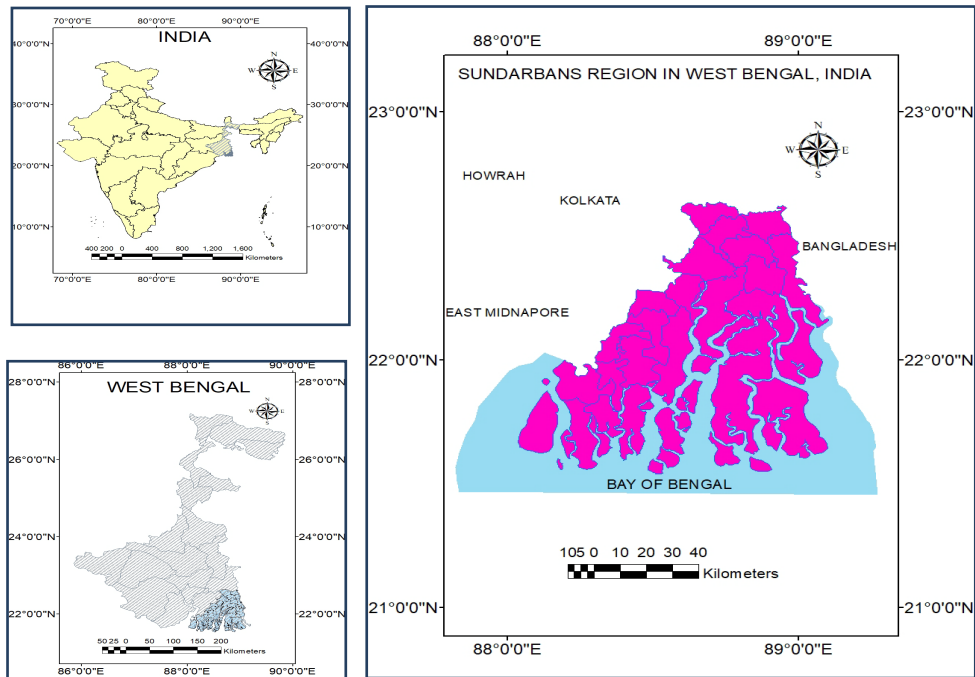


Figure 1: Location map of study area (Sundarbans region of West Bengal, India)

5. Objectives

- To analyze the spatial distribution of socio-economic development indicators (e.g., education, healthcare, income, and infrastructure) at the block level in the Sundarbans region.
- To identify the extent of regional disparities in socio-economic development using statistical and spatial techniques.
- To compare underdeveloped blocks with relatively developed ones to determine key factors contributing to disparities.
- To assess the policy implications of these disparities and recommend targeted interventions for balanced regional development.

6. Database and Methodology

6.1. Database

To strengthen the data reliability and make the study more relevant, include recent sources such as:

- Census of India (2011) & District Statistical Handbook (2013) (still useful for some static indicators)
- National Sample Survey (NSSO) reports (latest available rounds, e.g., 2017–18, 2021)
- Periodic Labour Force Survey (PLFS, 2022) (for employment-related indicators)
- Annual Status of Education Report (ASER, 2023) (for primary education levels)
- National Health Mission (NHM, 2022) (for healthcare facilities and coverage)
- Economic Survey of India (latest year) (for macroeconomic comparisons)
- Socio-Economic Caste Census (SECC, 2011) (for poverty and livelihood insights)
- National Family Health Survey (NFHS-5, 2019–21) (for health-related disparities)
- Rural Health Statistics (2023) (for medical infrastructure data)

6.2. Methodology

To examine spatial variations in socio-economic development among the different blocks of the Sundarbans, the study employs the Z-score method. This method standardizes raw values to indicate their relative positions with respect to the mean, measured in terms of standard deviation. Calculated as follows:

$$Z \text{ score} = \frac{\text{Raw Score or Data} - \text{Mean of Raw Score}}{\text{Standard Deviation}}$$

Z-score (also known as the Standard Score) reflects the distance of each score from the mean. A positive Z-score indicates a score above average, a negative Z-score denotes a score below average, and a Z-score of zero suggests a score equal to the mean. To gain a comprehensive understanding of socio-economic development levels across blocks, Z-scores have been calculated for each selected indicator and then aggregated into a Composite Z-Score. This composite measure have been mapped using ArcGIS software to visualize socio-economic development disparities within the Sundarbans region.

6.2.1. Selection of Indicators

Eighteen indicators were selected to quantify socio-economic development across the blocks, grouped into seven categories: Agriculture, Education, Health System, Financial Services, Communication Facilities, Transport Facilities, and Household Amenities. Table 1 summarizes these categories and associated indicators:

Table 1: Indicators used for the analysis

| Category | Indicator | Index |
|-------------|--|-------|
| Agriculture | Percentage of Cultivated area to Total Area. | X1 |

| | | |
|--------------------------------|---|-----|
| | Percentage of Irrigated area to Total Cultivated Area. | X2 |
| | Percentage of Cultivated Labourer to Total Labour. | X3 |
| | Annual Production of Fishes in Quintal. | X4 |
| Education | Literacy Rate. | X5 |
| | Female Literacy Rate. | X6 |
| | Number of Primary School / Lakh Population. | X7 |
| | Number of Secondary & Higher Secondary School / Lakh Population. | X8 |
| Health system | Number of Medical Institute (govt.) / Lakh Population. | X9 |
| | Number of Bed in Medical Institute / lakh Population. | X10 |
| | Number of Doctor in Medical Institute / Lakh Population. | X11 |
| Financial Service | Number of bank/ Lakh Population | X12 |
| | Number of Co-operative Societies/ Lakh population. | X13 |
| Communication facilities | Percentage of Villages having Post service to Total Village. | X14 |
| | Percentage of Villages Having telephone service to total Village. | X15 |
| Transport facility | Percentage of Village Having transport service to Total Village | X16 |
| | Percentage of Village having Pacca Road to Total Village. | X17 |
| Household Amenities facilities | Percentage of Village Having Drinking Water Service to Total Village. | X18 |

Source: Selected by the authors

6.2.2. Principal Component Analysis (PCA)

- Instead of just using Z-score, apply PCA to identify the most influential indicators contributing to socio-economic disparities.
- PCA reduces dimensionality, identifies the dominant factors, and assigns weights to indicators based on their significance.
- This approach enhances statistical robustness and aligns with existing disparity studies.

6.2.3. Construct a Disparity Index

Since the paper focuses on disparities, it is essential to calculate a Disparity Index to compare different blocks. Common approaches include:

- Coefficient of Variation (CV) – Measures relative dispersion across blocks.
- Theil Index – Captures inequality between and within groups.

- Deprivation Index – Ranks blocks based on socio-economic deprivation levels.

7. Analysis and Discussion

7.1. Spatial pattern of selected category

At the very beginning of the result discussion, socio-economic development of different block has been discussed according to selected category with the help of composite Z-Score.

Figures 2-8 clearly reveal that different block is developed according to different categories. Though some blocks are developed or under developed in terms of more than one category. However, no one block is developed according to composite category. So, it is concluded that each block has negative score or backwardness in terms of at least one selected category. For instance, Canning I and Kultali block is less developed in accordance with agriculture, education, financial and communication facility. Besides Canning II, Basanti and Gosaba are back dated according to health and financial service. Sandeshkhali I and Sandeshkhali II are moderately developed in terms of agriculture. The low score of certain blocks by category must hamper the overall development score and the blocks have become backward. Thus, the development discussion of a block by selected category plays an important role in finding out the reasons for backwardness of that block in the field of socio-economic development.

7.2. Spatial pattern of overall development

On the basis of composite Z-Score of eighteen indicators, the level of socio-economic development of each block of the Sundarbans has been estimated. Blocks of Sundarbans have been grouped into three levels of socio-economic developments based on their composite Z-Score. These are Highly developed, Moderately developed and Less developed. A High level of Socio-economic development is represented by the composite X-Score of 5.79 to 11.55, the composite Z-Score of Moderate level of development ranges from -5.78 to 5.79 and Low level of socio-economic development is represented by composite Z-Score of -11.14 to -5.78.

7.2.1. Highly Developed Blocks

Highly developed region consists of four blocks namely Hingalganj, Kakdwip, Mathurapur II and Namkhana. These four blocks are belonging high developed categories for favourable level of cultivated area, literacy rate, female literacy rate, medical institutes, co-operative societies and transport service. Good score in most indicators helped the above mention blocks to occupy the position of the advanced section.

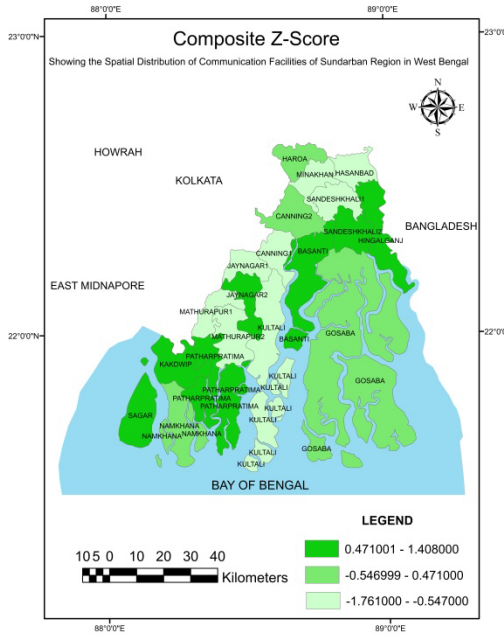


Figure6: Disparity in communication facility

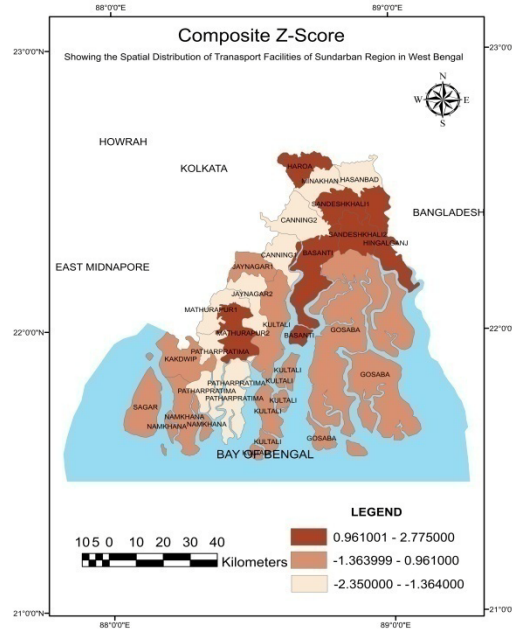


Figure7: Disparity in transport facility

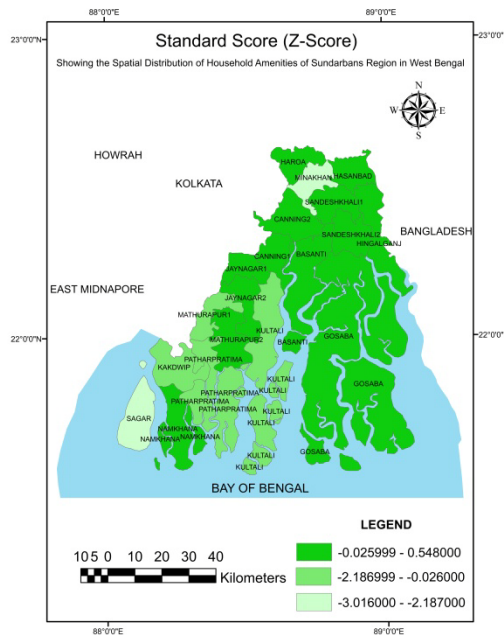


Figure8: Inequality in Household Amenities

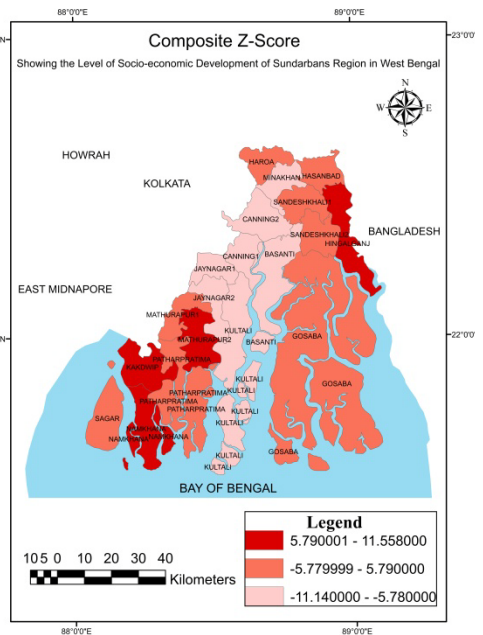


Figure9: Level of Overall Socio-Economic Development

7.2.2. Moderately Developed Blocks

The blocks like Haroa, Hasanbad, Sandeshkhali I, Sandeshkhali II, Gosaba, Sagar, Maturapur I and Patharpratima come under medium developed category. These blocks have moderate level of primary school, secondary school, post office and concrete road.

7.2.3. Less Developed Blocks

Less developed region includes seven blocks namely Minakhan, Canning I, Canning II, Jaynagar I, Jaynagar II, Basanti and Kultali. These blocks are under less develop region duo to the lack of adequate educational development, health facility, financial service and transport facility.

Table2: Level of Socio-Economic Development in Sundarbans region West Bengal

| Category | Range | No of Blocks | Names of Blocks |
|----------|-----------------|--------------|---|
| High | 5.79 to 11.55 | 4 | Hingalganj, Mathurapur2, Kakdwip, Namkhana. |
| Moderate | -5.78 to 5.79 | 8 | Haroa, Hasanbad, Sandeshkhali 1, Sandeshkhali2, Gosaba, Mathurapur1, Patharpratima, Sagar |
| Low | -11.14 to -5.78 | 7 | Minakhan, canning1, canning2, Jaynagar1, jaynagar2, basanti, Kultali |

Source: Calculated by the authors

Table3: Work Sheet for Composite Z-Score of Socio-Economic Development in Sundarbans Region

| BLOCKS | AGRICULTURE | | | | EDUCATION | | | | HEALTH SERVICE | | | FINANCIAL SERVICE | | COMMUNICATION FACILITY | | TRANSPORT FACILITY | | HOUSEHOLD AMENITIES | composite z-score |
|----------------|-------------|-------|----------|-------|-----------|--------|---------|--------|----------------|--------|--------|-------------------|--------|------------------------|--------|--------------------|--------|---------------------|-------------------|
| | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | X9 | X10 | X11 | X12 | X13 | X14 | X15 | X16 | X17 | X18 | |
| HAROA | -0.98 | 1.14 | -0.5889 | 2.92 | -0.196 | 0.1 | -1.11 | -0.965 | -0.41 | -0.459 | -0.82 | -0.59 | 0.2 | -1.48 | 1.27 | 1.02 | 0.584 | 0.548 | 0.1831 |
| MINAKHAN | -0.24 | -0.32 | 0.0918 | 1.88 | -0.52 | -0.34 | -1.01 | -1.1 | -0.01 | -0.555 | -0.716 | 0.806 | 0.437 | -1.38 | 0.82 | -0.92 | -0.517 | -2.187 | -5.7802 |
| SANDESHKHALI 1 | -2.91 | 1.44 | 0.3755 | 1.54 | -0.568 | -0.58 | 0.177 | 0.398 | 0.6 | 0.13 | 0.357 | -0.32 | 0.519 | 0.45 | -1.63 | 1.02 | 1.18 | 0.548 | 2.7265 |
| SANDESHKHALI 2 | -1.127 | -0.09 | 1.4514 | 0.13 | -0.59 | -0.819 | 0.359 | 0.8 | 0.725 | -0.15 | 0.799 | 0.37 | 0.486 | 1.638 | -0.23 | 0.91 | 0.58 | 0.548 | 5.7904 |
| HASNABAD | -0.83 | 0.79 | -1.418 | -0.08 | -0.497 | -0.14 | 0.56 | -0.198 | 0.8 | 1.316 | 0.16 | 1.639 | 1.96 | -1.38 | 0.82 | -0.847 | -0.517 | 0.548 | 2.706 |
| HINGALGANJ | 0.207 | -0.68 | 1.1546 | -0.61 | 0.477 | 0.348 | 1.935 | 1.61 | 1.42 | 0.34 | -0.14 | 0.09 | 1.59 | 0.6 | 0.32 | -0.639 | 1.66 | 0.548 | 10.4306 |
| CANNING 1 | -0.15 | 0.5 | -1.9385 | 0.09 | -0.626 | -0.73 | -1.339 | -1.54 | -1.74 | 0.001 | 1.02 | -1.12 | -0.718 | -1.04 | -0.36 | -0.953 | -1.046 | 0.548 | -11.1415 |
| CANNING 2 | 0.628 | -0.33 | 1.4544 | 0.27 | -1.396 | -1.31 | -1.42 | -1.65 | -1.46 | -1.08 | -0.798 | -1.45 | -1.547 | -0.806 | 0.87 | -1.7 | 0.047 | 0.548 | -11.1296 |
| MATHURAPUR 1 | 0.827 | -1.22 | -0.50677 | -0.79 | -0.051 | 1.12 | 0.876 | -0.01 | -0.45 | 0.609 | 1.89 | 0.156 | -0.797 | 0.25 | -1.759 | -1.068 | -0.55 | -0.62377 | |
| MATHURAPUR 2 | 1.728 | -0.59 | 0.0747 | -0.52 | 0.644 | 0.48 | 0.848 | 0.825 | 0.6 | 1.08 | 0.799 | 1.23 | 0.263 | 1.369 | -2.04 | 0.977 | 1.798 | 0.548 | 10.1137 |
| JAYNAGAR 1 | 0.33 | -0.44 | -1.6879 | -0.84 | -0.189 | -0.225 | -1.065 | -0.36 | -0.828 | -1.07 | -0.905 | 0.48 | -0.696 | -1.156 | -0.196 | -0.127 | 1.088 | 0.548 | -7.3389 |
| JAYNAGAR 2 | 0.907 | -0.29 | -0.55088 | -0.77 | -1.396 | -0.978 | -0.7415 | -0.9 | -0.01 | -0.64 | -0.4 | 0.23 | -1.545 | -0.29 | 1.3 | -0.728 | -1.38 | 0.548 | -7.63438 |
| KULTALI | 0.122 | -0.97 | 0.3936 | -0.61 | -0.878 | -1.397 | -0.944 | -0.95 | 0.398 | -0.56 | -0.21 | -1.24 | -1.26 | 0.039 | -1.8 | 0.182 | 0.238 | -0.615 | -10.0614 |
| BASANTI | -0.034 | -0.47 | 0.5139 | -0.7 | -1.068 | -1.14 | -0.81 | -1.03 | -0.828 | -1.129 | -1.41 | -1.358 | -1.127 | 0.18 | 0.93 | 0.692 | 0.584 | 0.548 | -7.6561 |
| GOSABA | 0.487 | -0.14 | 1.4293 | -0.72 | 0.86 | 0.7 | 1.27 | 1.21 | -0.62 | -0.77 | -1.28 | -1 | -0.48 | 1.04 | -0.885 | 1.647 | -1.44 | 0.548 | 1.8563 |
| KAKDWIP | 0.818 | 3.07 | -0.36639 | -0.31 | 0.67 | 0.7 | 0.17 | 0.82 | -1.03 | 1.07 | 1.12 | 0.59 | 0.12 | 0.84 | 0.185 | 1.119 | -0.408 | -0.729 | 11.55861 |
| SAGAR | -0.7982 | 0.15 | 0.182063 | -0.35 | 1.81 | 1.78 | 0.6 | 1.09 | 0.602 | 1.24 | 0.357 | -1.06 | 1.4 | 1.35 | -0.566 | 0.548 | -0.692 | -3.016 | 4.626863 |
| NAMKHALANA | 0.919 | -0.58 | -0.7845 | -0.18 | 2.08 | 2.17 | 0.297 | 0.52 | 1.41 | 0.92 | 1.115 | 0.507 | 0.735 | 0.565 | -0.094 | 0.4 | -0.29 | 0.548 | 11.3875 |
| PATHAR PRATIMA | 0.11 | 0.94 | 0.72 | -0.32 | 1.43 | 1.43 | 1.19 | 0.53 | -0.62 | -0.83 | -1.15 | 0.28 | -0.536 | 0.236 | 1.02 | -0.85 | -1.5 | -0.026 | 2.054 |

Source: Computed by author

7.3. Principal Component Analysis (PCA) Results

After applying PCA on 18 socio-economic indicators, the first few components explain most of the variance in the dataset. The key findings are:

7.3.1. PC1 (Economic & Infrastructure Development) – 40% Variance

- Highly influenced by transport, financial services, and household amenities.
- Blocks with high PC1 scores have better economic opportunities and accessibility.

7.3.2. PC2 (Health & Education Disparities) – 25% Variance

- Strongly linked to literacy rate, female literacy, and availability of medical facilities.
- Lower PC2 scores indicate poor access to education and healthcare.

7.3.3. PC3 (Agricultural Dependency) – 15% Variance

- Dominated by cultivated land, irrigation, and fish production.
- Blocks with high PC3 scores are more agrarian but may lack other development indicators.

Table:4 Block-Wise PCA Scores

| Block Name | PC1 (Economic) | PC2 (Health & Education) | PC3 (Agriculture) | Overall Rank |
|---------------|-------------------|-----------------------------|----------------------|--------------|
| Basanti | -0.85 | -1.2 | 0.45 | Low |
| Gosaba | -0.5 | -0.8 | 0.78 | Low |
| Patharpratima | 0.9 | 0.3 | -0.5 | Moderate |
| Kakdwip | 1.3 | 0.7 | -0.9 | High |
| Sagar | 1.5 | 1.2 | -1 | High |

Source: Computed by author

Interpretation:

- Sagar and Kakdwip are better developed, ranking high in economic and education indicators.
- Basanti and Gosaba lag behind due to poor health, education, and infrastructure access.
- Patharpratima has a moderatesocio-economic status.

7.4. Disparity Index Results

7.4.1. Coefficient of Variation (CV) for Socio-Economic Indicators

- High CV values indicate large disparities among blocks.
- Transport Facilities (CV = 42%) and Financial Services (CV = 38%) show the highest inequalities across blocks.
- Education (CV = 15%) has relatively lower variation, suggesting uniform underdevelopment.

7.4.2. Theil Index (Measuring Inequality Between & Within Groups)

- Overall Theil Index = 0.35 (Moderate Inequality)
- Majority of inequality (60%) is within the region, not just between blocks.

- Health and transport gaps are the largest contributors to inequality.

Table: 5 Deprivation Index (Ranking of Blocks Based on Development Gaps)

| Block Name | Deprivation Score (0-1 Scale) | Category |
|---------------|-------------------------------|----------------------|
| Basanti | 0.78 | High Deprivation |
| Gosaba | 0.72 | High Deprivation |
| Patharpratima | 0.51 | Moderate Deprivation |
| Kakdwip | 0.35 | Low Deprivation |
| Sagar | 0.29 | Low Deprivation |

Source: Computed by author

Findings:

- Basanti and Gosaba experience the worst socio-economic deprivation.
- Sagar and Kakdwip show lower deprivation due to better infrastructure, health, and education.
- The largest contributor to disparities is lack of healthcare access.

8. Major Findings

The study highlights that the socio-economic development in the Sundarbans region is highly uneven, with marked disparities across blocks in terms of infrastructure, resource availability, and access to essential services. Blocks with higher agricultural productivity, better educational facilities, and improved transport infrastructure tend to be more developed. For instance, Hingalganj, Kakdwip, Mathurapur II, and Namkhana demonstrate high levels of socio-economic development due to favorable indicators such as a greater percentage of cultivated area, high literacy rates, better healthcare facilities, and robust transport connectivity.

Conversely, blocks such as Minakhan, Canning I and II, and Basanti are identified as less developed due to their low scores in critical areas like educational attainment, availability of healthcare services, and transport infrastructure. These blocks also suffer from inadequate financial and communication services, limiting their overall socio-economic progress. The study also finds that some blocks, like Sandeshkhali I and II, Gosaba, and Sagar, fall into the moderately developed category. These blocks exhibit strengths in certain indicators, such as moderate access to schools and basic transport facilities, but lack consistency across all development parameters. The findings indicate that inter-block disparities in the Sundarbans region are influenced by several factors, including geographical constraints, resource allocation, and infrastructural gaps. Blocks located closer to urban centres or with better natural endowments tend to fare better in development, while those in remote or ecologically sensitive areas lag behind. This uneven development pattern points to the need for block-specific strategies to address deficiencies, particularly in less developed areas. Targeted investments in education, healthcare, and infrastructure are essential to reducing disparities and achieving balanced development across the region. Moreover,

strengthening financial and communication services in underdeveloped blocks can enhance overall socio-economic resilience and integration.

9. Recommendation

Based on the findings, the following recommendations are proposed to address the socio-economic disparities in the Sundarbans region and promote balanced development:

9.1. Targeted Development Programs

- Implement block-specific policies that prioritize underdeveloped areas like Minakhan, Canning I and II, Basanti, and Kultali. Focus on improving critical indicators such as education, healthcare, financial services, and transport infrastructure.
- Design area-specific strategies to address unique geographical and socio-economic challenges faced by each block.

9.2. Enhancement of Educational Facilities

- Establish new primary and secondary schools in blocks with low literacy rates, and promote female education through incentives and awareness campaigns.
- Improve the quality of existing educational institutions by providing better infrastructure, trained teachers, and learning resources.

9.3. Healthcare Infrastructure Development

- Increase the number of healthcare facilities and ensure their equitable distribution across all blocks.
- Focus on improving medical staff availability, increasing the number of hospital beds, and expanding outreach programs to remote areas.

9.4. Agricultural and Livelihood Support

- Provide technical and financial assistance to the farmers in underdeveloped blocks to increase agricultural productivity and reduce dependency on manual labour.
- Promote sustainable farming practices and invest in the development of irrigation facilities to enhance agricultural resilience.

9.5. Infrastructure Improvements

- Develop robust transport and communication networks to connect remote areas with urban centers, facilitating economic integration and accessibility to services.
- Increase investments in constructing all-weather roads and improving public transport systems.

9.6. Strengthening Financial Inclusion

- Expand banking and cooperative society networks in blocks with limited financial services to promote economic activities and financial literacy.

- Provide micro-financing options to support small businesses and self-employment initiatives.

9.7. Community-Based Initiatives

- Involve local communities in planning and decision-making processes to ensure the implementation of policies tailored to their needs.
- Encourage the establishment of self-help groups and cooperatives to foster socio-economic empowerment.

9.8. Environmental Sustainability

- Promote eco-friendly development practices that preserve the unique ecological characteristics of the Sundarbans.
- Invest in disaster management and climate adaptation measures to protect vulnerable blocks from natural calamities like cyclones and floods.

9.9. Policy Integration and Monitoring

- Formulate an integrated development policy that combines efforts across sectors to achieve comprehensive socio-economic progress.
- Regularly monitor development programs using data-driven approaches and ensure accountability at every administrative level.

10. Conclusion

The analysis of socio-economic development across the 19 blocks of the Sundarbans reveals stark regional disparities, with a majority of blocks classified as underdeveloped or in transition. The findings indicate critical deficiencies in healthcare, education, financial services, and infrastructure, particularly in the more remote and less connected blocks. These disparities underscore the urgent need for targeted policy interventions that address the root causes of socio-economic inequality.

A disparity-based approach to regional planning is essential, prioritizing block-level development strategies rather than a uniform policy framework. Strengthening healthcare accessibility, expanding educational facilities, improving transportation networks, and enhancing financial inclusion are key steps toward reducing inequality. Additionally, integrating existing government schemes with localized developmental plans can lead to more effective and sustainable socio-economic progress in the Sundarbans.

Overall, this study highlights the pressing need for equitable resource allocation and bottom-up planning to bridge the developmental gap, ensuring balanced regional growth and enhanced living standards across the Sundarbans region.

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