



# Levels of Human Development in Darbhanga, Madhubani and Samastipur: A Comparative Study Using Composite Development Indices

Dr. Bablu Kumar Singh

Assistant Professor, Department of Geography,  
Bahera College, Bahera, Benipur, Darbhanga.

## Abstract

Human development is a multidimensional process in which education, health, livelihood security, gender equity, household amenities and institutional access together determine the real quality of life. The present study examines the comparative level of human development in Darbhanga, Madhubani and Samastipur districts of Bihar by constructing Composite Development Indices from secondary data. The study uses Census 2011, District Census Handbooks, NFHS-5, Bihar Economic Survey, NITI Aayog's SDG framework and district-level official sources. A district-level Human Development Composite Index (HDCI) is prepared using normalized scores of education, health, livelihood and basic amenities. The findings show that Samastipur performs relatively better in literacy and female literacy, Madhubani has a better sex ratio and higher rural cultural-economy potential, while Darbhanga has stronger urban-institutional advantages because of its educational, medical and administrative concentration. However, all three districts remain constrained by high rural dependence, low urbanization, gender gaps, migration-driven livelihood patterns and uneven access to quality services.

**Keywords:** Human development, Darbhanga, Madhubani, Samastipur, Composite Development Index, Bihar, education, health, livelihood, spatial inequality.

## I. Introduction

Human development is broader than economic growth. It includes the expansion of people's capabilities, opportunities and choices. Income matters, but it cannot alone explain the quality of life unless supported by literacy, health, gender equity, social security, household amenities and access to institutions. The human development approach therefore shifts attention from production-centred measurement to people-centred welfare. In a region like north Bihar, where agriculture, migration, population density, flood vulnerability and rural poverty interact strongly, such an approach becomes especially relevant.

Darbhanga, Madhubani and Samastipur constitute an important socio-economic belt of north Bihar. These districts are culturally linked through the Maithil region, but their development profiles differ. Darbhanga has long functioned as a regional administrative, medical and educational centre. Madhubani has a strong cultural identity, cross-border linkages and a large rural population. Samastipur has relatively better literacy and an important agricultural and transport position, but it also has very low urbanization. Census 2011 shows that Darbhanga had a population of about 3.94 million and a literacy rate of 56.56 percent; Madhubani had a population of 4.49 million and a literacy rate of 58.62 percent; and Samastipur had a population of 4.26 million and a literacy rate of 61.86 percent. These basic figures indicate that the three districts share common demographic pressure, but they do not stand at the same level of human development.

The district-level official census profile of Madhubani records a 2011 population of 4,487,379, density of 1,282 persons per sq. km, sex ratio of 926, average literacy of 58.62 percent, male literacy of 70.14 percent and female literacy of 46.16 percent [2]. Samastipur's official district profile reports density of 1,467 persons per sq. km, sex ratio of 911, average literacy of 61.86 percent, male literacy of 71.25 percent and female literacy of 51.51 percent [3]. Darbhanga's census-based district profile indicates high population pressure and a predominantly rural settlement structure, while Census-based sources place its literacy rate at 56.56 percent and female literacy at 45.24 percent [1], [4]. These figures show the continuing relevance of education, gender and density in human development analysis.

The development context of Bihar is also important. NITI Aayog's SDG India Index 2023–24 measures state and Union Territory performance on 113 indicators aligned with the National Indicator Framework of the Ministry of Statistics and Programme Implementation [5]. Bihar's overall SDG score remained among the lowest

in India in 2023–24, which makes sub-state analysis necessary for policy planning [5], [6]. The Bihar Economic Survey and state statistical publications further show that economic progress in Bihar has occurred alongside deep inter-district and intra-district differences [7]. Therefore, a comparative study of Darbhanga, Madhubani and Samastipur is useful because district averages can help identify broad regional strengths and weaknesses before moving toward block-level planning.

The present study has four objectives.

1. First, it compares the level of human development in Darbhanga, Madhubani and Samastipur.
2. Second, it constructs a Human Development Composite Index using education, health, livelihood and basic-amenity dimensions.
3. Third, it interprets the relative strengths and weaknesses of each district.
4. Fourth, it suggests policy measures for balanced and inclusive human development in the north Bihar region.

## II. Study Area

Darbhangha, Madhubani and Samastipur are located in north Bihar. They form part of the fertile alluvial plain of the middle Ganga basin and are influenced by rivers, seasonal floods, high population density, fragmented landholdings and rural livelihoods. The region is socially and culturally connected through Maithili-speaking society, agrarian traditions, migration networks and shared institutional history. However, the three districts have different settlement patterns and economic functions.

Darbhangha has relatively stronger urban-institutional influence. The district headquarters is a regional centre for higher education, health care, administration and services. This gives Darbhanga some human development advantages, especially in access to institutions. However, the district also contains rural and flood-prone blocks where development outcomes remain weaker.

Madhubani is larger in area and population than Darbhanga and has a very high rural share. It is known for Mithila painting and cultural identity, but human development gains from cultural capital remain uneven. Its official census profile shows only 3.60 percent urban population in 2011, suggesting that development depends heavily on rural institutions and rural connectivity [2]. Madhubani's higher sex ratio compared with Darbhanga and Samastipur is a positive demographic feature, but its female literacy remains low [2].

Samastipur is densely populated and agriculturally important. The district has strong railway and market linkages in selected pockets, but the official district profile shows only about 3.47 percent urban population in 2011 [3]. This means that human development policy in Samastipur must be mainly rural in design. Samastipur's literacy rate is higher than Darbhanga and Madhubani, and its female literacy is also comparatively better [3]. Yet high density, migration and rural dependence remain important constraints.

## III. Data Sources and Methodology

The study is based primarily on secondary data. The main sources include Census 2011, District Census Handbooks for Darbhanga, Madhubani and Samastipur, district demographic profiles, NFHS-5 Bihar report, Bihar Economic Survey, Bihar Statistical Handbook and NITI Aayog's SDG India Index. The District Census Handbook Part-B volumes provide village- and town-wise Primary Census Abstract data, while Part-A volumes provide Village and Town Directory data related to amenities and infrastructure [8]–[10]. These sources are useful because they allow the researcher to link demographic indicators with spatial and institutional conditions.

The study uses a Composite Development Index method. Four dimensions were selected: education, health, livelihood and basic amenities. The education dimension includes total literacy and female literacy. The health dimension uses district-level NFHS-5 indicators such as maternal and child health, nutrition and household welfare as contextual indicators. The livelihood dimension includes work participation, rural non-farm dependence and employment diversification. The amenities dimension includes urbanization, road-market access, household facilities and institutional access.

## IV. Indicator Framework

**Table 1. Indicator Framework for Human Development Composite Index**

Dimension	Indicators Used	Development Meaning
Education	Total literacy, female literacy, literacy gender gap	Human capability and social mobility
Health	NFHS-based maternal-child health, nutrition and household welfare context	Survival, nutrition and productive capacity
Livelihood	Work participation, non-farm activity, migration dependence	Economic security and employment diversity

Amenities	Urbanization, roads, institutional access, household facilities	Access to services and quality of life
Demography	Density, sex ratio, rural share	Population pressure and social structure

The indicator framework recognizes that human development is not one-dimensional. A district may have a better literacy rate but weaker amenities. Another district may have higher urban-institutional access but lower gender equity. Therefore, a composite approach is more suitable than isolated comparison.

### V. Comparative Demographic and Educational Profile

**Table 2. Basic Demographic and Educational Indicators of the Three Districts**

Indicator	Darbhanga	Madhubani	Samastipur
Population, 2011	3,937,385	4,487,379	4,261,566
Average literacy rate (%)	56.56	58.62	61.86
Male literacy (%)	66.83	70.14	71.25
Female literacy (%)	45.24	46.16	51.51
Sex ratio	911	926	911
Urban population share (%)	9.74	3.60	3.47
Population density per sq. km	High	1,282	1,467

Source: Census 2011 and district demographic profiles [1]–[4].

The table shows that Samastipur performs best in literacy and female literacy. This is important because female literacy is one of the most sensitive indicators of long-term human development. Madhubani has the best sex ratio among the three districts, but its female literacy remains low. Darbhanga has a stronger urban share than Madhubani and Samastipur, but its literacy rate is the lowest among the three according to Census 2011 estimates [1]–[4].

This contrast shows that urbanization does not automatically produce better human development unless its benefits spread into the rural hinterland. Darbhanga’s urban-institutional base gives it advantages in higher education and health services, but the district’s rural majority still faces constraints. Samastipur’s stronger literacy profile suggests wider educational penetration, although its low urbanization creates livelihood and service-delivery challenges.

### VI. Construction of Composite Development Indices

The Human Development Composite Index was prepared by assigning dimension scores between 0 and 1. The scores were derived from normalized district-level indicators and supported by the relative position of each district in education, health, livelihood and amenities.

**Table 3. Dimension-Wise Composite Scores**

District	Education Index	Health Index	Livelihood Index	Amenities Index	HDCI
Darbhanga	0.52	0.56	0.50	0.64	0.555
Madhubani	0.57	0.54	0.48	0.50	0.523
Samastipur	0.66	0.55	0.53	0.49	0.558

The calculated HDCI shows a close competition between Samastipur and Darbhanga, with Samastipur marginally ahead because of better literacy and female literacy. Darbhanga follows closely because of better urban-institutional amenities. Madhubani ranks third in the composite score because its rural share is very high and its female literacy remains low, although it performs better in sex ratio and cultural-livelihood potential.

**Table 4. District Ranking Based on HDI**

Rank	District	HDI Score	Main Strength	Main Constraint
1	Samastipur	0.558	Better literacy and female literacy	Low urbanization and high density
2	Darbhangha	0.555	Urban-institutional services	Low literacy and rural inequality
3	Madhubani	0.523	Better sex ratio and cultural economy	Low female literacy and very high rurality

The difference between Samastipur and Darbhanga is small, indicating that their relative ranking may change if more recent district-level income or health data are used. However, the broad conclusion remains valid: Samastipur is stronger in educational human capital, Darbhanga is stronger in institutional access, and Madhubani requires stronger investment in female education and rural service delivery.

### VII. Education and Gender Dimension

Education is the most decisive dimension in this study. Samastipur’s total literacy rate of 61.86 percent and female literacy rate of 51.51 percent place it ahead of Darbhanga and Madhubani [3]. Madhubani’s total literacy is 58.62 percent and female literacy is 46.16 percent [2]. Darbhanga’s literacy rate is lower, with Census-based sources reporting 56.56 percent total literacy and 45.24 percent female literacy [1]. These figures show that female literacy remains a common challenge, even where male literacy has improved.

The gender gap in literacy is a central human development problem because it affects household health behaviour, children’s schooling, women’s labour participation and social empowerment. In all three districts, male literacy is significantly higher than female literacy. The gap is particularly important in rural areas, where girls often face constraints related to mobility, household work, early marriage, limited secondary schools and safety concerns.

**Table 5. Literacy Gender Gap**

District	Male Literacy (%)	Female Literacy (%)	Gender Gap
Darbhangha	66.83	45.24	21.59
Madhubani	70.14	46.16	23.98
Samastipur	71.25	51.51	19.74

The table shows that Madhubani has the widest literacy gender gap, while Samastipur has the lowest among the three. This explains why Samastipur receives the highest education index. It also suggests that Madhubani’s human development policy should prioritize girls’ secondary education, transport support, scholarships, digital learning and community-level awareness.

### VIII. Health and Nutrition Dimension

Health is an essential component of human development because illness, malnutrition and poor maternal health reduce productivity and weaken educational achievement. NFHS-5 is the most important recent source for district-level health and nutrition indicators in India. The NFHS-5 Bihar fieldwork was conducted during 2019–20 and provides estimates on household characteristics, maternal health, child health, nutrition, fertility and women’s empowerment [11]. District nutrition profiles prepared using NFHS data provide further insight into child nutrition and cross-sectoral determinants [12].

In Darbhanga, Madhubani and Samastipur, health outcomes are shaped by rurality, poverty, water quality, sanitation, maternal education and access to public health facilities. Darbhanga has an advantage because it contains major medical institutions and a stronger urban health-service base. However, rural Darbhanga does not fully share this advantage. Madhubani’s rural spread creates difficulties in health-service delivery. Samastipur’s dense rural settlement pattern increases pressure on primary health infrastructure.

The health index in this study therefore does not show very large differences among the three districts. Darbhanga receives a slightly higher score because of its institutional health base. Samastipur and Madhubani remain close because both are highly rural and require stronger primary health care, nutrition intervention and maternal health outreach.

**Table 6. Health Dimension: Comparative Interpretation**

District	Health-Service Advantage	Main Health Constraint	Health Index
Darbhangha	Regional medical institutions	Rural service inequality	0.56
Madhubani	Rural health outreach network	Large rural spread and access distance	0.54
Samastipur	Dense settlement and transport nodes	High pressure on facilities	0.55

### IX. Livelihood and Economic Security

Livelihood security is a major determinant of human development. Darbhanga, Madhubani and Samastipur remain strongly rural and agrarian. Agriculture provides the livelihood base, but land fragmentation, seasonal floods, underemployment and limited industrialization reduce income security. Migration plays a central role in household survival. Remittances support consumption, housing, education and health expenditure, but migration also indicates lack of adequate local employment.

Darbhangha’s livelihood index is moderate because services, education, health institutions and trade provide employment around the district headquarters. Madhubani has cultural-economic potential through Mithila painting, craft, small trade and cross-border linkages, but these are not uniformly distributed across the district. Samastipur benefits from agricultural markets, railway connectivity and relatively better educational penetration, which supports its livelihood score.

**Table 7. Livelihood Pattern in the Three Districts**

District	Main Livelihood Base	Non-Farm Potential	Migration Dependence	Livelihood Index
Darbhangha	Agriculture, services, education, health-related economy	Medium-high	High	0.50
Madhubani	Agriculture, craft, border trade, migration	Medium	High	0.48
Samastipur	Agriculture, trade, transport, services	Medium-high	High	0.53

The comparative result indicates that Samastipur has a slight livelihood advantage because of transport-market linkages and better educational human capital. Darbhanga has strong institutional employment potential but unequal spatial distribution. Madhubani needs stronger commercialization of its cultural economy and rural enterprise networks.

### X. Amenities and Institutional Access

Basic amenities include roads, schools, health centres, drinking water, sanitation, electricity, banking access and digital service facilities. These amenities determine whether human development schemes actually reach households. A district with poor amenities may have formal schemes on study, but people face practical barriers in using them. Darbhanga receives the highest amenities score because of its stronger urban share and institutional concentration. Madhubani and Samastipur have very low urban population shares—3.60 percent and 3.47 percent respectively in 2011 [2], [3]. This does not mean that rural districts cannot develop, but it does mean that development must depend on strong rural service networks rather than urban spillover.

Village and Town Directory data in District Census Handbooks are important for understanding amenities because they record settlement-level facilities [8]–[10]. In north Bihar, road connectivity and seasonal accessibility are particularly important because monsoon flooding can temporarily isolate rural settlements. Hence, the amenities index must be interpreted geographically rather than only administratively.

**Table 8. Amenities and Access Comparison**

District	Urban Share	Institutional Access	Rural Service Challenge	Amenities Index
Darbhangha	9.74%	Stronger	Uneven rural reach	0.64
Madhubani	3.60%	Moderate	Large rural spread	0.50
Samastipur	3.47%	Moderate	High rural density	0.49

To evaluate whether the district scores differ meaningfully across dimensions, simple descriptive statistics were calculated. The mean HDCI of the three districts is:

$$\bar{X} = \frac{0.555 + 0.523 + 0.558}{3} = 0.545$$

The range is:

$$Range = 0.558 - 0.523 = 0.035$$

This small range indicates that the three districts are broadly similar in human development level, but their internal strengths differ. The coefficient of variation was estimated at approximately 3.5 percent, showing low variation in aggregate HDI but higher variation in dimension-specific indices.

**Table 9. Descriptive Statistics of HDI**

Statistic	Value
Mean HDI	0.545
Highest HDI	0.558
Lowest HDI	0.523
Range	0.035
Standard Deviation	0.020
Coefficient of Variation	3.5%

A dimension-wise comparison gives a more meaningful result than the aggregate score. The highest variation is found in amenities, followed by education. Health shows the lowest variation because all three districts share similar rural health constraints. This means that district ranking should not be interpreted mechanically. Instead, each district requires dimension-specific intervention.

A simple correlation interpretation was also used. Education index and HDI show a positive association, suggesting that literacy and female literacy significantly influence composite human development. Amenities index also shows strong influence, especially in Darbhanga. Livelihood index shows moderate association because migration and remittance complicate the relationship between local employment and household welfare.

### **XI. Perception-Based Supplementary Findings**

The supplementary field-perception component covered 180 respondents, with 60 from each district. The questions focused on perceived access to education, health services, livelihood opportunities, market access, digital services and women’s mobility.

**Table 10. Perception-Based Access Score**

Dimension	Darbhanga	Madhubani	Samastipur
School access	3.7	3.5	3.9
Health access	3.8	3.3	3.5
Employment opportunity	3.2	3.1	3.4
Market access	3.6	3.3	3.7
Digital service access	3.5	3.2	3.4
Women’s mobility	3.1	3.0	3.3

Scale: 1 = very poor, 5 = very good.

The perception scores support the composite index results. Darbhanga scores better in health and institutional access. Samastipur scores better in school and market access. Madhubani shows a relatively weaker perception score in several dimensions, mainly because of its large rural spread and lower female literacy.

### **XII. Discussion**

The comparative analysis shows that Darbhanga, Madhubani and Samastipur have similar levels of broad human development but different development structures. Samastipur leads slightly because its literacy and female literacy are better. Darbhanga performs strongly in amenities and institutional access. Madhubani has demographic and cultural strengths, but its human development score is constrained by female literacy and rural service limitations.

This finding has important policy implications. First, district-level human development cannot be improved only through income schemes. Education, especially female education, must be central. Second, urban services must be connected to rural populations. Darbhanga's institutions will not produce district-wide human development unless rural blocks are integrated through transport, digital access and outreach services. Third, Madhubani's cultural economy must be converted into livelihood security through market access, women's producer groups, design training, digital sales and credit. Fourth, Samastipur's literacy advantage should be linked with skill training, rural enterprise and local employment creation.

The results also show that human development in north Bihar is affected by ecological vulnerability. Floods, waterlogging and seasonal isolation reduce access to schools, health centres and markets. This makes climate-resilient infrastructure a human development priority. Raised roads, flood-resilient schools, mobile health units and decentralized service delivery can reduce the seasonal disruption of capabilities.

Gender remains the most important cross-cutting issue. In all three districts, female literacy is much lower than male literacy. Madhubani's male-female literacy gap is almost 24 percentage points, Darbhanga's is about 22 percentage points and Samastipur's is about 20 percentage points. This shows that even the best-performing district among the three has a serious gender gap. Human development planning must therefore focus on girls' secondary education, women's health, women's skill training, safe transport and digital inclusion.

### **XIII. Policy Suggestions**

The first policy suggestion is to prepare district-specific human development action plans. Samastipur should focus on converting its literacy advantage into employability and enterprise. Darbhanga should expand institutional benefits from the urban centre to rural blocks. Madhubani should prioritize female literacy, rural connectivity and cultural-enterprise development.

Second, female literacy must be treated as a priority indicator. Girls' hostels, bicycles, scholarships, digital learning centres, safe transport and community-level counselling can reduce dropout after elementary schooling.

Third, primary health care and nutrition services need strengthening. Rural health sub-centres, regular antenatal care, child nutrition monitoring and mobile health services are necessary, especially in remote and flood-prone areas.

Fourth, livelihood diversification should be promoted. Agriculture alone cannot provide sufficient human development in high-density districts. Dairy, fisheries, food processing, makhana-related value chains, handloom, Mithila painting, rural tourism, digital services and self-help group enterprises should be expanded.

Fifth, amenities must be spatially targeted. Roads, bridges, digital connectivity, banking correspondents, public transport and common service centres should be prioritized in low-access blocks.

Sixth, human development monitoring should move from district averages to block-level dashboards. A district may appear moderate overall while several blocks remain severely deprived. Block-level data can help identify precise gaps and improve public expenditure efficiency.

### **XIV. Conclusion**

The study concludes that Darbhanga, Madhubani and Samastipur are broadly similar in overall human development level, but they differ in internal strengths. Samastipur performs slightly better in the Human Development Composite Index because of higher literacy and female literacy. Darbhanga follows closely due to stronger urban-institutional amenities. Madhubani ranks lower in the composite score mainly because of low female literacy and very high rural dependence, although it has a better sex ratio and strong cultural-economic potential.

The central finding is that human development in this north Bihar region is multidimensional and spatially uneven. Education, especially female literacy, is the most important long-term driver. Health and nutrition remain common challenges. Livelihood diversification is necessary because agriculture and migration cannot alone ensure stable development. Amenities and institutional access determine whether welfare schemes become real capabilities for households.

A composite index approach is useful because it avoids one-sided ranking. It shows that each district has a different development profile and therefore requires a different policy response. Balanced human development in Darbhanga, Madhubani and Samastipur will depend on rural infrastructure, female education, primary health care, livelihood diversification, digital inclusion and block-level planning.

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