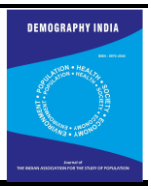
**Demography India**
A Journal of Indian Association of Study of Population
Journal Homepage: https://demographyindia.iasp.ac.in/




# Measuring Residential Segregation in Urban Bihar: A Spatiotemporal Analysis

Ajay Paswan[1] and Manendra Kumar[2]*

**Abstract**

Caste, an important feature of Hindu social order, has been regarded as an essential factor of social and spatial segregation in India. The study aims to measure the residential segregation by caste and socio-economic status using dissimilarity index in five largest cities of Bihar that are Patna, Gaya, Bhagalpur, Muzaffarpur and Darbhanga using data from census of India, 2001, 2011. The study also examines the temporal change in residential segregation from 2001 to 2011. The findings of the study suggest that the cities in Bihar experience residential segregation based on caste and socio-economic status; however, caste was found to be playing a greater role in determining segregation than socio-economic status. The degree of residential segregation by caste has shown a rising trend in all cities except Bhagalpur.

***Keywords***

Caste, Dissimilarity Index, Residential Segregation, Socio-economic status

*Corresponding Author
[1] *Assistant Professor, Department of Geography, Ram Lakhan Singh Yadav College, Bettiah, B. R. A. Bihar University, Muzaffarpur, Bihar. Email- Id: ajaypaswan.jnu@gmail.com*
[2] *PhD Scholar, Discipline of Geography, School of Sciences, Indira Gandhi National Open University, New Delhi. Email-Id: manendradaya@gmail.com*

## Introduction

India is known for its vast diversity in terms of caste, religion, ethnicity, culture, languages, etc. apart from its rich physical diversity. The Indian economy has experienced noticeable growth since independence, especially in the last two decades. It can also be argued that economic progress has loosened the caste relationships to some extent (Mitra, et al., 2009). However, Caste in urban India continues to shape location of residence, schooling decisions, educational outcomes and likelihood of securing jobs (Ayyar, 2013). Many recent studies argue that caste as well as religion are determining factors of social association in urban spaces and cause residential/spatial segregation (Vithayathil, 2012; Chaoudhary, et al., 2020; Khairkar, 2008; Ahmad, 1999; Sidhvani, 2015; Haque, 2016; Chandhoke, 2009; Dupont, 2004). A recent study of eight big cities of India finds that the historically disadvantaged caste used to live in Slums. The segregation is found to be prominent for both, people with low and high status.

Segregation can be defined as it is an action or state of setting someone or something apart from others, for example, the segregation of pupils with learning difficulties. Segregation can be seen as the enforced separation of different racial groups in a country, community, or establishment, for example, an official policy of racial segregation (Anax, 2004). As Dictionary of Human Geography states, the phenomenon of segregation is said to occur when two or more groups occupy different spaces within the same city, region or even state (Gregory, et al., 2009). It further mentions segregation can arise from discriminatory forces outside a group and or from social organization and the predilections of the group itself. As racial segregation persisted in the U.S., which negatively affected the lives of Blacks and non-Whites. Similarly, the caste system in India has long been cited as a source of inequality and social and spatial segregation.

Segregation exists in the form of opportunities and resources which are unevenly distributed in space; some neighbourhoods have safer streets, higher home values, better services, more effective schools, more supportive peer environments than others (Massey, 2001; Massey, 2003; Parham, 2012). Black segregation has produced unusual concentrations of poverty among Blacks. However, in another study, it has been found that Black-White segregation is declining fairly consistently for most metropolitan cities, Hispanic- White segregation is on increase for about half of the cities, in case of Asian white, and it is declining (Frey, et al., 2000). In the U.S., whites rapidly leave neighbourhoods after black population reaches a certain threshold and former avoid integrated neighbourhoods but also racially mixed school districts or municipalities (Boustan, 2011).

## Residential Segregation in Urban India

There have been some important studies on spatial/residential segregation in cities of India. Mehta's studies on residential segregation in Pune (1968, 1969), found that residential segregation was highest in the case of groups on either end of the spectrum, both on the basis of caste and socio-economic status (Mehta, 1968; Mehta, 1969; Chkraborty, 2013). The degree of segregation increased from 1822 to 1937 between Brahmins and depressed classes.

The author's findings also suggest that rich and upper caste Hindus are more likely to concentrate in a centralized manner and the disadvantaged tend to decentralize (Mehta, 1968; Mehta, 1969). Singh (1987) examined the spatial segregation in Varanasi in terms of caste, religion and language, largely in cultural framework (Singh, 1987).

Ahmad (1999) in his very significant work "Social Geography" argues that the residential housing in urban neighbourhoods is the continuation of rural model- separate quarters for different castes (Ahmad,1999). He gives examples of different towns of Western Uttar Pradesh such as Mathura, Moradabad, Bareilly, Badaun and Firozabad, where separate *Mohallas* for different Hindu castes is common. Muslims live in separate *Mohalla* in a traditional set ups, there are separate residential quarters for Brahmins (e.g., *Mohalla* Chauban in Firozabad) Vaishyas, blacksmiths, weavers, washermen, tailors, and other artisan castes. The lower castes such as sweepers and the Kanjars generally live in the periphery of the towns (Ahmad,1999).

Dumont (2004) in her primary work in Delhi (Mayur Vihar- Trilokpuri) argues that the composition of the population residing in different types of settlements cannot be explained merely by income differentials, the social networks based on caste, religion, professional occupation and geographical origin also play their role in favouring residential clustering in more or less exclusive manner- and hence in generating segregation (Dupont, 2004).

Khairkar (2008) has examined the clustering of population based on language in Pune. According to the author the prime reasons for segregation are security, cultural affinity, and a sense of identity preservation (Khairkar, 2008). Shaban (2008) argues that neoliberal policies and deepening social and economic divide are primary reasons for the exacerbation of crimes and social conflict in the cities such as Mumbai (Shaban, 2008). Sidhvani (2015) finds that there is significant segregation by caste and also by living conditions (Sidhvani, 2015). The proportion of population of SC and STs in the wards is highly correlated with access to public, private and luxury goods (Sidhvani, 2015). It also finds that a medium to strong negative correlation between the proportion of SC-ST and access to in-house drinking water across wards in Chennai and Kolkata, a moderately high negative correlation between the proportion of SC-STs and access to in-house latrines in Pune, Bangalore (Bengaluru) , Chennai, Jaipur, Ahmedabad and Mumbai and moderate to strong negative correlation between the proportion of SCs/STs and the ownership of two-wheelers in Pune, Chennai, Ahmedabad, Delhi and Mumbai (Sidhvani, 2015).

Chandhoke (2009) also finds the spatial segregation on the basis of religion and caste in different parts of Ahmedabad (Chandhoke, 2009). Haque (2016) studies the spatial segregation in urban West Bengal and finds out caste based segregation overpowers socio-economic status based segregation (Haque, 2016). Choudhary et al., (2020), in his study in Varanasi, finds that factors like caste, income, religion, language and place of origin have created a segregated urban community in the city of Banaras (Chaoudhary, et al., 2020; Eck, 1983; Singh, 1990).

**In the Context of Bihar**

Bihar is no exception to other states in terms of prevalence of rigid caste based society. The evidence of bondage labour in the state was not an ancient practice, which reflects the worst form of caste based oppression. The acute level of landlessness among the oppressed in Bihar is not a hidden truth today which is an outcome of caste inequality. Poverty and backwardness compel people of Bihar to migrate to big cities. The big urban centres like Mumbai, Delhi, Chennai etc., do not seem to provide adequate safeguard against poverty and misery as it became evident during Corona induced lockdown and the large number of people who faced the brunt of it were from Bihar and Uttar Pradesh. The residential clustering of people with lower economic and social status becomes visible in the form of Jhuggi-Slum and Bastis in Urban Centres. The caste based division at the level of settlement and places is prevalent everywhere. Caste based atrocities and communal tension between communities are evident as daily newspapers of Bihar are filled with such reports and it is also true for the rest of India.

Urbanization is seen as an emancipatory agent which has potentials to minimize the impact of caste and reduce social tension and caste based discrimination. Dr. B.R. Ambedkar, who played significant role in writing the constitution of India and was the first law minister of independent India, suggested Dalits to leave villages and asked them to stay in cities as villages were den of caste atrocities then. Urban centres were symbols of modernity and liberation that certainly benefited the lower caste to a great extent. But the sad reality is caste has made space in urban centres as well and impacting our every aspect of life. Residential segregation on the basis of caste indicates the same in Indian cities. Bihar is one of the least urbanised states in India. Only 11.30% of its population lives in urban areas, which is quite lower than the national average of 31.16%. The capital Patna is a lone million city (16.84 lakh) of state.

There are several studies on residential segregation in different cities in India, however, no study has been found on the cities of Bihar. Therefore, this study attempts to fill this research gap and undertakes to study the spatial segregation based on caste and socio-economic status in major cities of Bihar. In this background, it is important to study whether Indian cities are affected by caste based residential segregation or not and if yes, to inquire, to what extent it has developed. This study will help urban planners and policy makers to frame the policy in the favour of residential integration of different excluded communities' particularly low income groups and scheduled castes and scheduled tribes.

The objective of the study is to examine the levels of residential segregation by caste and socio-economic status in five major cities of Bihar and analyse its temporal pattern.

**Data Source and Methodology**

The data for the study has been sourced from the census of India, 2001 and 2011. Index of Dissimilarity by caste and socio-economic status has been calculated for all five major cities of Bihar that are Patna, Muzaffarpur, Darbhanga, Gaya and Bhagalpur. The study uses ward level census data of 2001 and 2011 for all these five major cities. Two social categories were formed, one is SC-ST population and second is Non SC-ST population to analyse

caste based residential segregation. Number of male literate population has been taken as a proxy indicator of socio-economic status and it has been compared with the number of male illiterate population to analyse residential segregation by socio-economic status for each city. Moreover, it was examined to see whether residential segregation by caste is greater than the residential segregation based on socioeconomic status.

The SC-ST population has been considered as one caste group as both social groups have been excluded and discriminated against and they have been provided similar constitutional rights in the form of affirmative action policies. Moreover, the population of scheduled tribes in different wards are less in number. Rest of the population other than SC-ST have been considered as Non-SC-ST caste groups.

Male literacy has been considered as a measure of socio-economic status. As women in many parts of India in general and Bihar in particular are less likely to achieve higher levels in education.

The paper only focuses on caste and socio-economic status to study the residential segregation, though residential segregation can also occur based on religion, which has been highlighted in previous literature. The paper purposefully selects caste and socioeconomic status as parameters only to make the study more precise and focused.

**Dissimilarity Index**

Index of Dissimilarity has been calculated to examine residential segregation. Duncan Dissimilarity index was used for this study which was developed by Otis Dudley Duncan and Beverly Duncan in 1955. It measures how evenly one social group is spread out geographically against another social group. Dissimilarity index (DI) varies from 0 to 100. 0 indicates complete integration whereas 100 indicates complete segregation. The DI value between 0 to 30, 31 to 60 and 61 to 100 has been characterized as low, moderate and high levels of residential segregation respectively. Index of Dissimilarity indicates the percentage of either sub-group (e.g., SC-ST and Non-SC-ST) who would have to move to another ward in order for both sub-groups to be distributed evenly to achieve complete integration (Green).

The formula to calculate the dissimilarity index is:

$$D = \frac{1}{2}\sum_{i=1}^{n} \left| \frac{P_{1i}}{P_1} - \frac{P_{2i}}{P_2} \right|$$

Where, D = Dissimilarity Index
P1i = SC-ST population in a particular ward
P1 = Total SC-ST population in all the ward in a city
P2i = Non-SC-ST population in a particular ward
P2 = Total Non-SC-ST population in all the ward in a city
For a city with N wards
i = 1,2…..N.

**The following steps were undertaken to calculate the Dissimilarity index:**

**Step 1**: Collection of data of SC-ST population and Non-SC-ST population at ward level.

**Step 2**: Calculating the proportion of SC-ST population in a particular ward to the total SC-ST population in all the wards in a city and the same was applied for Non-SC-ST population.

**Step 3**: Finding out the absolute differences between the proportion of SC-ST population and Non-SC-ST population for each ward in a city.

**Step 4**: Adding the absolute difference value for all wards and dividing it by 2.

**Step 5**: Multiplying the Sum value with 100 to get a Dissimilarity Index.

Similar steps have been followed to calculate dissimilarity index by education as well by analysing two groups: Male Literate and Male Illiterate.

## Results and Discussion

**Table 1** Total Population, Total SC-ST Population & Percentage of SC-ST Population in five largest cities, 2011

| City | Population | SC-ST Population | Share of SC-ST Population in Percentage |
|---|---|---|---|
| Patna | 1684222 | 157015 | 9.32 |
| Gaya | 468614 | 46845 | 19.33 |
| Bhagalpur | 400146 | 33742 | 9.48 |
| Muzaffarpur | 354462 | 28654 | 28.41 |
| Darbhanga | 296039 | 30754 | 10.72 |

*Source- Calculated by the Authors using Census of India, 2011*

Table 1 shows the total population, SC-ST population and share of SC-ST population in all five major cities of Bihar. The population is highest in Patna city followed by Gaya city, Bhagalpur city, Muzaffarpur city and lowest is in Darbhanga city. All these five cities of Bihar are Municipal Corporation (Table 1). Municipal Corporations in India are local government bodies that administer urban areas. These local urban bodies are responsible for providing services such as healthcare, education, housing, and transport by collecting property tax and financial support from the government. Census of India, 2011 classifies cities and towns in six categories based on their population size. All these five cities of Bihar are characterized as Class 1 city as their population is more than 1 lakh (Table 1). The share of SC-ST population is highest in Muzaffarpur city and lowest in Patna city.

**Table 2** Share of Male Population and Literate Male in five largest cities of Bihar

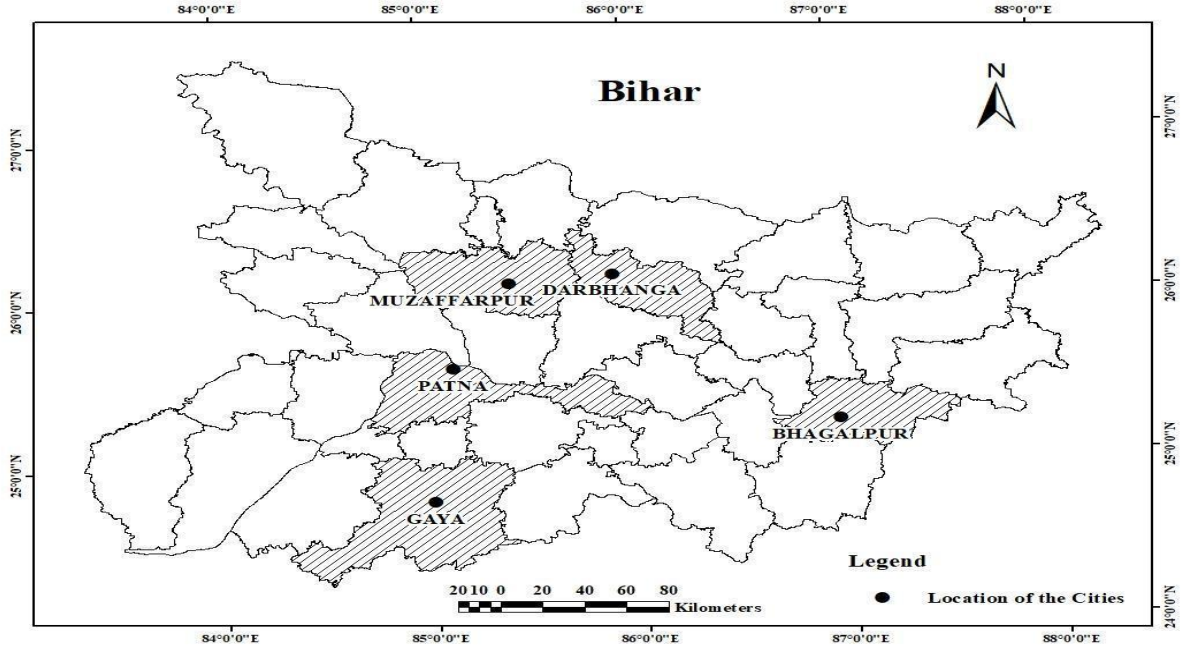
| City | Share of Male Population (Percentage) | Literate Male (Percentage) |
|---|---|---|
| Patna | 53.04 | 76.76 |
| Gaya | 52.73 | 75.12 |
| Bhagalpur | 53.18 | 72.12 |
| Muzaffarpur | 52.91 | 75.69 |
| Darbhanga | 52.57 | 73.63 |

*Source- Calculated by the Authors using Census of India, 2011*

Table 2 shows the percentage of literate male in all five cities. The percentage of literate male is highest in Patna city followed by Muzaffarpur city, Gaya city,

Darbhanga city and lowest is in Bhagalpur city. The share of male population is around 52-53 percent in all the five cities.

Patna city is located in the central part of Bihar. Muzaffarpur is located in north-eastern, Darbhanga in north-central, Gaya is in south-western and Bhagalpur is in south-eastern part of the state (Fig. 1).




*Sources: Prepared by the Authors, 2024*

**Figure 1** Location of the Cities in Bihar

## Residential Segregation in Bihar

**Table 3** Dissimilarity Index (DI) by Caste and Socio-economic Status

| City | Dissimilarity Index by Caste | | Dissimilarity Index by Socio-economic status | |
|---|---|---|---|---|
| | Year | | Year | |
| | 2001 | 2011 | 2001 | 2011 |
| Muzaffarpur | 18.99 | 28.41 | 12.14 | 15.37 |
| Darbhanga | 31.92 | 34 | 14.30 | 14.28 |
| Patna | 16.57 | 24.22 | 14.31 | 14.61 |
| Gaya | 31.45 | 37.12 | 14.69 | 13.83 |
| Bhagalpur | 25.70 | 25.65 | 16.39 | 17.19 |

*Source- Calculated by the Authors using Census of India, 2001, 2011.*

***Residential Segregation by Caste***

Table 3 shows dissimilarity index by caste and education across five major cities of Bihar in 2001 and 2011. The highest residential segregation by caste was found in Gaya city with a DI value of 37.12 in the year 2011. The residential segregation by caste in Gaya city has increased from 2001 which could be a matter of concern for social scientists. The lowest residential segregation was found in Patna city with a DI value of 24.22 in the year 2011 and the data shows an increasing trend from the year 2001. The four cities namely Muzaffarpur, Darbhanga, Patna and Gaya show an increasing trend of DI from year 2001 to 2011 except Bhagalpur city where DI value shows a minor decline. The highest growth in residential segregation by caste has been observed in Muzaffarpur city. The level of residential segregation of Scheduled Caste and Scheduled Tribe is low in all four cities except Gaya where it can be described as moderate. Table 3 clearly shows that Scheduled Caste and Scheduled Tribe experience residential segregation against Non-SC-ST in all five major cities of Bihar to a varying degree.

*Residential Segregation by Education*

It can be clearly observed from table 3 that the degree of residential segregation by education is relatively lower than the caste in all five major cities. Therefore, it can be concluded that caste plays a greater role than socio-economic status in shaping residential segregation in five major cities (Muzaffarpur, Darbhanga, Patna, Gaya, Bhagalpur) of Bihar. The residential segregation on the basis of education was observed highest in Bhagalpur city and lowest in Gaya city in the year 2011. Residential segregation on the basis of education shows an increasing trend from 2001 to 2011 in Muzaffarpur city, Bhagalpur city and Patna city and declining trend in Gaya city and Darbhanga city. The level of residential segregation by education in these five cities can be characterised as low. It can be concluded that the population with low educational status experience residential segregation against those with relatively better educational status in these five major cities of Bihar.

Caste remains a rigid social structure in India. The concept of Purity and Pollution still governs caste based exclusion. Even educated Dalits face caste based exclusion in modern days, which clearly explains why residential segregation based on caste is higher compared to socio-economic status. Dr. Ambedkar was denied rented accommodation solely because of his caste, despite being a highly educated person. Additionally, cities have caste-based residential pockets because they have historically evolved from villages mostly.

**Conclusion**

Caste remains a strong social factor in shaping urbanisation in India. In our study we find that for each city caste induced residential segregation is greater than the segregation caused by socio-economic status (education). The residential landscape of villages in India has been controlled by caste historically, it continues to shape the residential space of cities of India in general and Bihar in particular. The rising trend in residential segregation in the cities from 2001 to 2011 is a matter of concern for policy makers and social scientists. To have a formidable and sustainable urban planning we must have less segregated and evenly distributed cities by population. There is no place for caste and its discriminatory principles in modern day especially in urban areas which are

hubs of productivity and development because caste goes against the principle of equality, justice and freedom. We as a nation need to curtail residential segregation as Bihar is in nascent stage of urbanization, otherwise it will continue to grow and may cause social distress in future. Residential segregation can promote disparity and poverty. Poor health, pollution are also strongly linked with residential segregation. Hence, it is evident that residential segregation can cause underdevelopment and backwardness. The area of study of residential/spatial segregation in urban India is not a new field of research in social sciences but very surprisingly very less research has been done seeing the diversity of our country. To understand residential segregation in a city, a historical study of settlements can be done. Another extension of research on caste based residential segregation may include comparative study of cities. The ethnography study based on qualitative surveys of cities and urban areas may give insight into the current scenario of residential segregation experienced by cities.

**Acknowledgment**

The authors are grateful to all anonymous reviewers for their valuable comments and suggestions that helped improve this paper.

**References**

Ahmad, A. (1999). *Social Geography*. Jaipur: Rawat Publications.

Anax, A. (2004). Ethnic Segregation and Ghettos: *A companion to Urban Economics,* an undergraduate reader. Arnott, R, Macmillen, D: Blackwell Publishers.

Ayyar, V. (2013). Caste and Gender in a Mumbai Resettlement Site. *Economic and Political Weekly, 48(18),* 44-55. https://www.jstor.org/stable/23527308

Boustan, L. P. (2011). *Racial Residential Segregation in American Cities.* Oxford University Press.

Burgess, E. W. (1925). Residential Segregation in American Cities. *The Annals of the American Academy of Political and Social Science, 140(1),* 105-115. https://doi.org/10.1177/000271622814000115.

Chandhoke, N. (2009). Civil society in conflict cities. *Economic and Political Weekly, 44(44),* 99-108. https://www.epw.in/journal/2009/44/special-articles/civil-society-conflict-cities.html.

Chaoudhary B. K., Sinha, S., & Rana, M. J. (2020). Spatial segregation in Varanasi: caste and religion based exclusion/inclusion across municipal wards. *Transactions, 42(1),* 21-34. https://iigeo.org/wp-content/uploads/2020/08/Transaction-42-1-2.pdf.

Chkraborty, S. (2013). Occupational Gender segregation in India. Reserchjournali's *Journal of Economics, 1(2),* 1-31. https://researchjournali.com/pdf/173.pdf

Dupont, V. (2004). Socio-spatial differentiation and residential segregation in Delhi: a question of scale? *Geoforum, 35(2),* 157-175. https://www.researchgate.net/publication/222829958_Socio-spatial_differentiation_and_residential_segregation_in_Delhi_A_question_of_scale.

Eck, D. L. (1983). *Banaras: A city of light. India*: Penguin.

Frey, W. H., & Mayers, D. (2005). Racial segregation in U.S. metropolitan Areas and cities, 1990-2000: Patterns Trends and Explanations. research report. *Population Study Centre.* University of Michigan. https://www.researchgate.net/publication/252956857_Racial_Segregation_in_US_Metropolitan_Areas_and_Cities_1990-2000_Patterns_Trends_and_Explanations.

Gregory, D., Jhonston, R., Pratt, G., Watta, M. J., & Whatmore, S. (2009). *The Dictionary of Human Geography (Edition 5th).* United

Kingdom: Wiley-Blackwell https://s3.amazonaws.com/arena-attachments/293183/0e6f92cc7302976ef7c9f27cb6604b3f.pdf.

Haque, I. (2016). Discriminated Urban Spaces: A Study of Spatial Segregation in Urban West Bengal. *Economic and Political Weekly, 51(46),* 41-50. https://www.epw.in/journal/2016/46/special-articles/discriminated-urban-spaces.html.

Green, R. D. The Dissimilarity Index: A Tutorial. https://coascenters.howard.edu/dissimilarity-index-tutorial

Khairkar, V. P. (2008). Segregation of Migrants Groups in Pune City, India. *The Anthropologist, 10(2),* 155-61. https://www.researchgate.net/publication/268374703_Segregation_of_Migrants_Groups_in_Pune_City_India.

Mitra, A., Kumar, R., & Kumar, S. (2009). Social and Economic Inequalities: Contemporary Significance of Caste in India. *Economic and Political Weekly, 44(50),* 55-63. https://www.epw.in/journal/2009/50/special-articles/social-and-economic-inequalities-contemporary-significance-caste.

Massey, D. S. (2001). Residential segregation Neighbourhood conditions in US Metropolitan Areas: *America Becoming: Racial Trends and their consequences (Vol. 1).* Washington, D.C.: National Academy Press.

Massey, D. S., & Mary, J. F. (2003). American Apartheid: Segregation and the making the underclass. *Cambridge: Harvard University Press.*

Mehta, S. K. (1968). Pattern of Residence in Poona (India) by Income, Education and Occupation. *American Journal of Sociology, 73(4),* 496-508. https://link.springer.com/article/10.2307/2060091.

Mehta, S. K. (1969). Pattern of Residence in Poona, India, By Caste and Religion: 1822-1965. *Demography, 6(4),* 473-491. https://link.springer.com/article/10.2307/2060091

Parham, E. D. (2012). *The Segregated classes: spatial and social Relationships in slums*. Eighth International Space Syntax Symposium, Santiago de Chile. http://sss8.cl/8150.pdf.

Shaban, A. (2008). Ghettoization, Crime and Punishment in Mumbai. *Economic and Political Weekly, 44(33),* 68-73. https://www.epw.in/journal/2008/33/notes/ghettoisation-crime-and-punishment-mumbai.html.

Sidhvani, P. (2015). Spatial inequalities in Big Indian cities. *Economic and Political Weekly, 50(22),* 55-62. https://www.epw.in/journal/2015/22/review-urban-affairs-review-issues/spatial-inequalities-big-indian-cities.html.

Singh, P. B. (1990). Literary images, cultural symbols and intimate sensing: The Ganga river in Varanasi. *The National Geographical Journal of India, 36(12),* 117-128. https://www.researchgate.net/publication/320098068_082-90_Singh_Rana_PB_1990_Literary_images_cultural_symbols_and_intimate_sensing_The_Ganga_river_in_Varanasi_The_National_Geographical_Journal_of_India_NGSI_BHU_Varanasi_vol_36_1_2_March-June_117_128.

Singh, R. L. (1987). Morphogenesis of Varanasi and its Environmental Management. Dyte VS, Diddle J, Jog SR, Patil C. *Explorations in Tropics.* Pune: Prof. K.R. Dikshit Felicitation Volume Committee.

Vithayathil, T., & Singh, G. (2012). Spaces of Discrimination: Residential Segregation in Indian cities. *Economic and Political Weekly, 44(37),* 60-66. https://www.epw.in/journal/2012/37/special-articles/spaces-discrimination.html.