J Data Sci. Info. Citation Studies., 2025; 4(3):400-407.
https://www.jcitation.org

Research Article

Spatial Vulnerability in Weavers Settlement in India: A Bibliometric Study

Ar. Nupur[1,*], Mayank Mathur[1], Ruchita Gupta[2]

[1]Department of Physical Planning, School of Planning and Architecture, 4-Block-B, Indraprastha Estate, New Delhi, INDIA.
[2]Department of Housing, School of Planning and Architecture, 4-Block-B, Indraprastha Estate, New Delhi, INDIA.

ABSTRACT

Handloom weaving is a time-honored tradition in India. Once, all textile production relied solely on handlooms, but today it faces stiff competition from power looms in domestic and global markets. The Government of India, through various initiatives and programs under the Ministry of MSME and the Made in India campaign, is focusing on modernising the handloom sector and supporting weavers. They recognise the importance of promoting handloom at both national and international levels to maintain its market presence, given its unique, inimitable identity as a craft passed down through generations. This labour-intensive industry can contribute to achieving the Sustainable Development Goals and the 169 targets set by the United Nations. Studies from international journals, the International Labour Organisation, handloom census reports, and national journals reveal that handloom weaving workers are home-based workers, as noted in the fourth handloom census. This craft is a family tradition, typically practiced within homes. Weavers require more space than other home-based workers due to the need to set up looms. Women, part of the informal labour sector, also play a role in handloom production by preparing threads for weaving, often using kitchen space and thus compromising cooking areas. Researchers have not sufficiently addressed the spatial challenges faced by weavers, as the minimum area recommended by various government schemes does not accurately reflect their needs. As a result, they often have to manage with limited living and kitchen space. Weavers also face respiratory issues due to thread particles and inadequate ventilation within congested settlements, leading to PM2.5 and PM10 exposure. Overcrowding and lack of ventilation, especially in unplanned settlements of weavers, make them more vulnerable and bear the largest exposure burden to indoor air pollution. In urban areas, traffic congestion can occur when threads are straightened on roads, or children's play areas are restricted when this is done in parks, causing social vulnerability for children and traffic problems. Rural handloom weavers may be more disadvantaged than their urban counterparts in accessing raw materials and marketing their products. So, there is a need to have the spatial aspect as one of the parameters to study the vulnerability of handloom weavers, other than economic factors that impact the social, health, and environmental aspects.

Keywords: Handloom Weaving, Home-Based Workers, Household Weavers, Spatial Vulnerability, Vulnerability Assessment, Bibliometrics, India.

Correspondence:
Ms. Ar. Nupur
Department of Physical Planning, School of Planning and Architecture, 4-Block-B, Indraprastha Estate, New Delhi, INDIA.
Email: nupur.phd312pp22@spa.ac.in

Received: 21-10-2025;
Revised: 14-11-2025;
Accepted: 09-12-2025.

INTRODUCTION

Handloom weaving, one of India's oldest crafts, holds significant cultural, social, and economic value. The livelihoods of millions depend on it, yet the sector faces increasing threats from mechanisation, urbanisation, and policy neglect. This section introduces the central argument: that spatial vulnerability is a major yet overlooked determinant of weavers' well-being: and outlines the study's objectives and scope.

DOI: 10.5530/jcitation.20250260

Publishing Partner : Manuscript Technomedia. [www.mstechnomedia.com]

The Handloom (Reservation of Articles for Production) Act, 1985, defines a handloom as any loom other than a power loom and aims to protect the interests of traditional weavers. According to the Handloom Census Handbook (*Fourth All India Handloom Census*, 2021), handlooms are simple, manually operated machines, and weaving involves multiple stages within the textile value chain. About 3.5 million people are engaged in India's handloom sector, with 3.1 million directly involved in weaving. Roughly 50% of production uses pit looms, which require specific spatial conditions such as non-concrete floors to maintain suitable temperatures and reduce health risks.

Figure 1 shows major weaving clusters across India, with both the number of weavers and their share of the local workforce. Banaras (1,00,000 weavers, 75%), Paithan (45,984, 70%), and

Pochampalli (15,000, 83%) are the most significant hubs, while Yeola (3,900, 77%) and Nuapatna (5,000, 29%) reflect smaller but highly dependent weaving communities. In contrast, Kamrup (50,685, 3%) and Kayyalagudem (35,383, 7%) have large numbers but low proportional reliance on weaving.

Literature Review and Conceptual Background

Existing literature reveals that while socio-economic and gender-based vulnerabilities are well-documented, spatial and environmental factors remain underexplored. Studies by (Ahmed & Sheereen, 2022; Effat *et al.*, 2022; Nupur, 2018), underscore how inadequate housing, poor infrastructure, and settlement congestion compound occupational risks. This section synthesises global and Indian research to establish a conceptual framework linking spatial form and vulnerability.

Researches on Handloom

A Google Scholar scan indicates a sharp rise in research on handloom weavers after 2013. Most studies emphasise socio-economic and environmental issues; relatively few address workspaces or housing design, as shown in Figure 2. Figure 2 shows a chronological analysis (1995–2023) of references on handloom weavers across five categories: socio-economic, health hazards, housing conditions, environmental impact, and workspace. Socio-economic and environmental issues dominate in recent years, health hazards have gained importance post-2013, housing conditions remain moderately studied, while workspace issues continue to receive minimal attention.

Chronological analysis of studies on handloom weavers

Since 1986, scholars have focused largely on economic vulnerability, as shown in Figure 3. Figure 3 traces key issues faced by handloom weavers over time. Despite weaving being home-based, few studies analyse spatial vulnerability at both settlement and dwelling-unit levels. Only a limited number consider how weaving affects infrastructure, housing, and environmental conditions.

Handloom as per weavers and experts/activists

Handloom weaving in India remains predominantly home-based, with spatial needs varying by product type : about 1.2 × 1.5 m for sarees and up to 2.4 × 3 m for carpets. Most weavers operate from rural areas due to the availability of space and lower costs, while urban congestion limits home-based weaving in cities. However, in some regions like Maheshwar (Madhya Pradesh), weaving is also found in urban settings.

Regional insights

- Odisha and Madhya Pradesh: Significant handloom activity with strong district identities.
- West Bengal and Assam: Predominantly rural, with weaving often secondary to agriculture; women form the majority of the workforce.
- Uttar Pradesh: Home-based carpet weaving is common in rural areas.
- Key challenges include competition from power looms, dependence on government stipends, limited market access, and economic insecurity. While India's rich handloom heritage offers potential, economic vulnerability continues to threaten the sustainability of the sector.

Analysis of Research paper on Handloom weavers at National and State level

India is the fifth-largest textile exporter with export value ~US$36.4 billion (Wazir Advisors, 2019). Invest India projects the garments and textile industry to reach US$300 billion by 2024–25, potentially benefiting SME/MSME enterprises. Uttar Pradesh accounts for 12% of India's MSMEs and is a major textile hub (India Brand Equity Foundation). The state has over 250,000 handloom weavers operating about 110,000 handlooms in clusters formed over centuries. Varanasi and Mubarakpur are renowned for high-quality silk sarees (The Handloom, Power-loom, Silk, Textile and Garmenting Policy, 2017). Weaving is male-dominated (approximately 98%), but entire households participate; women and children assist with pre-loom and post-loom work. According to WIEGO Annual Report, 2020, home-based workers constitute 44.4% of total employment in relevant industries (down 8% from 2011 to 2018). The Ministry of Labour notes that home-based workers often earn below subsistence levels. The Fourth All India Handloom Census records 190,957 handloom workers in Uttar Pradesh; 35,000 weavers/ beneficiaries received Handloom Marketing Assistance in the previous three years(Fourth All India Handloom Census, 2021). A total of 149,429 weavers and organisations are registered on the GeM portal (Ministry of Textiles, 2022). The SMARTH scheme supports skilling and upskilling. The state's vision aligns with UN Resolution 70/1 (2030 Agenda) on sustainable development (United Nations Agenda for Sustainable Development, 2015).

Housing Vulnerability Scenario

At an aggregate level, 61.2% of the weaver households live in Kuccha homes, while only 18.4% live in pucca structures, as shown in Table 1. Table 1 shows the distribution of dwelling unit ownership in rural and urban areas. In rural regions, the majority of households (94.8% or 26,06,735) live in owned houses, while only 3.8% (1,04,189) live in rented homes and 1.4% (37,521) fall under other arrangements. In urban areas, ownership is lower at 80.3% (3,18,435), with a much higher share of rented dwellings (17.6% or 69,749), and 2.1% (8,210) in the "others" category. Overall, across both rural and urban India, 93% of households

own their dwelling units (29,25,170 in number), 5.5% live in rented homes (1,73,938), and 1.5% (45,731) fall into other arrangements, out of a total of 31,44,839 households.

Assam has the largest concentration of weavers and allied workers (1,283,881; Fourth Handloom Census 2019–20). Varanasi houses 100,000+ weavers: about 67% of Uttar Pradesh's total. The city is renowned for fine silk and Banarasi sarees; more than half of its working population is engaged in silk weaving (Saha & Sen, 2016). Weaving is typically conducted within households, and most Varanasi weavers are Momin Ansari Muslims. Despite numerous schemes, weavers' conditions remain vulnerable. About 2% of the city's population is employed in household manufacturing (Census 2011). The average slum household size is 6.2 (Rajiv Awas Yojan 2009). Many identified slums have 50–70% bunkers. Working conditions are often unhygienic due to poor ventilation and limited sunlight.

Neglect and inadequate maintenance lead to relocation, particularly from dilapidated or semi-pucca housing. Water seepage frequently accumulates in loom pits within work areas. High plot coverage (>90%) reduces circulation space and daylight, increasing indoor pollution and disease risks. Subdivision of family plots lowers per-capita habitable area; domestic net space per person often falls to 1.6–2.6 m^2. Due to insufficient space, adult males may sleep in loom rooms.

Inference: Entire families participate in weaving within the home; weaving often occurs across multiple floors. More than 61% of weavers live in slum-like conditions.

Economic Vulnerability of Varanasi Weavers

In urban areas, nearly 51% of weavers are self-employed. A majority (66.3%) of households earn less than ₹5,000 per month (Fourth All India Handloom Census, 2019–20). Historically, workers migrated to Varanasi from Bihar and West Bengal; today, Varanasi weavers migrate to Surat and Bengaluru for livelihoods. They often leave inundated or uninhabitable homes (Times of India, 2019). Online markets are saturated with knock-offs falsely advertised as handwoven or pure silk (Umang Agarwal, Holy Weavers). The City Development Plan (2011–31) does not specifically address housing for home-based marginalised weavers, and data on weaving workers are missing. Remote-sensing categorizes flood risk in Varanasi from low to high. Despite government efforts, many weavers report being idle for weeks due to flooding. Government programs for Eastern Uttar Pradesh's handloom sector suffer from implementation gaps (Hussain, 2016). While the policy goal emphasizes eco-friendly development, incentives often favor power looms using artificial silk. As others argue, "Until we properly define home-based workers, their labor will be ignored."

Health Vulnerability of Handloom Weavers

A study of rural Assam (Sualkuchi block) highlights the profound impact of employment and working conditions on health equity. Effective interventions to prevent occupational diseases include source encapsulation, ventilation, noise control, safer chemical substitution, ergonomic furniture, and improved work organisation. National roadmaps should scale access to essential prevention and control services for occupational and work-related diseases, with realistic coverage targets consistent with local traditions.

Environmental vulnerability of Handloom Weavers

Water: Dwelling units (DUs) engaged in dyeing often discharge effluents into open drains, contaminating groundwater and hand-pump supplies.

Air and ventilation: Many workspaces lack ventilation; continuous work in dim light strains eyesight. Poor air circulation eases disease transmission and raises health risks.

Noise: Increased power-loom use elevates noise exposure.

Dust/fibers: High concentrations of suspended fabric dust and fiber fly pose serious health hazards.

METHODOLOGY

This study employs a mixed-methods design integrating bibliometric analysis and qualitative content review. Data sources include Google Scholar, Scopus, government reports, and NGO publications. VOSviewer software was used for keyword co-occurrence mapping, revealing thematic clusters across 134 validated studies. Semi-structured interviews with weavers and entrepreneurs provided ground-level validation. The methodology aligns with PRISMA guidelines to ensure systematic selection and analysis.

Parameters to study home-based workers, as per researchers

Handloom weaving is a home-based activity. So, there is a need to go through research done on home-based. 50 papers related to home-based business were taken into consideration, and the parameters were extracted. Selection of papers done on the basis of references used by IIHS and WEIGO (Sohane *et al.*, 2021).

Major emphasis on the spatial aspect by the researchers working on Home-based workers, as shown in Figure 4, which shows how different categories of issues (housing, social, health, infrastructure, economic, spatial) are connected to specific research themes, and how these are documented in literature and policy reports over time.

Existing parameters to know the vulnerability: Government Stakeholders

After going through different government stakeholders (that are Habitat III, World Health Organisation, International Labour Organisation, Ministry of Textiles, and National Urban Health Mission) to know the existing parameters for assessing vulnerability index, it was concluded that no consideration was given to spatial aspects, which play a major role in the case of home-based activity (especially Handloom weaving).

Analysis of international and national agencies on handloom weavers and home-based workers

ILO: Talks more on the economic aspects of home-based workers at the international level.

Ministry of MSME: Does not consider the informal sector.

Ministry of Labour: Covers economic interventions and social security of unorganized workers and bonded labour.

Ministry of Housing and Urban Affairs: Housing and infrastructure upgradation for slums, which does not include home-based workers.

Ministry of Textiles: Interventions are proposed for the economic upliftment of marginalised weavers, yet the criteria for determining marginalisation are not clearly defined. In the case of housing, the discussion is limited to structural vulnerability: categorised as kutcha, pucca, or semi-pucca: without addressing spatial configuration at the household or neighbourhood level, nor considering the health or micro-environmental impacts of weaving activities.

NSSO: It talks about the economic aspect.

UN-Habitat: Talks about the Right to Indigenous peoples 2007.

NGOs: Are working for the rural handloom weaver's economic and social aspects.

So, the parameters on which national stakeholders are working for handloom weavers are *Skill upgradation, marketing, social security, workshed, and quality of life.*

Parameters to study Urban Vulnerability

Methodological approaches adopted to select parameters

Social, Shelter, environmental, and economic are the broad parameters for assessing Urban Vulnerability, conclusion based on Figure 5. The timeline in Figure 5 tracks the evolution from decision-making models (AHP) to global urban agendas, showing how urban inequality, health, housing, and infrastructure challenges have been progressively integrated into policy and research.

Parameter to study vulnerability in rural areas to improve the Quality of life

Spatial impact study in Urban and rural context

Dimension AI is used as a database, and the Sustainable Development Goals as an area to cross-check the need for studying spatial concern through PRISMA, for space impact in the rural-urban context. I have not gone into detail of 134 references (other than 150 references) and done PRISMA to have an idea of the researchers focus in the case of rural areas.

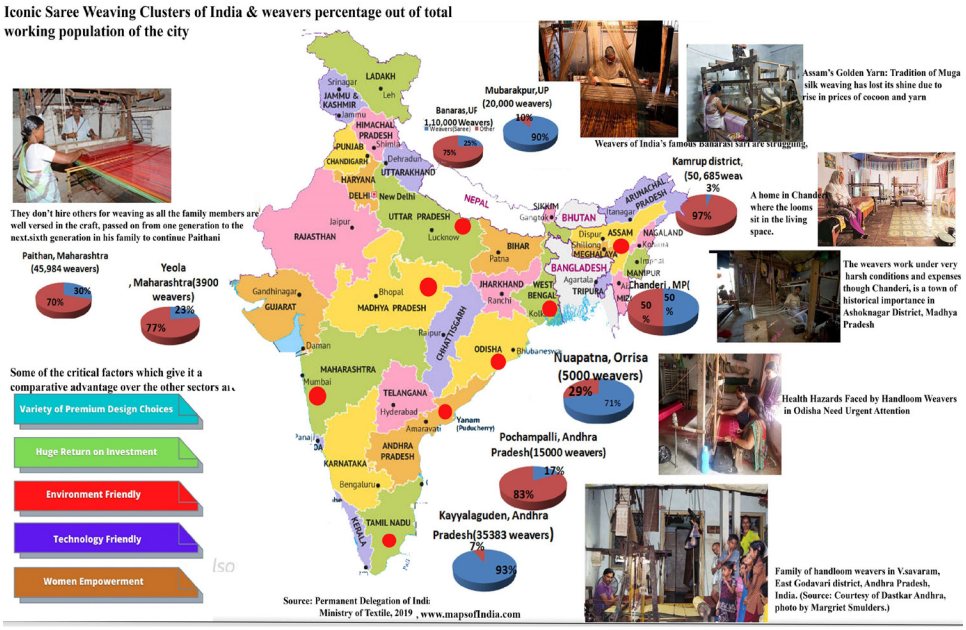

Figure 1: India's Iconic Saree Weaving Clusters and Their Weaver Workforce (Source: Ministry of Textile, 2019).

Table 1: **Number of Handloom worker households by ownership of dwelling unit (Source: Fourth All India Handloom Census, 2019-20).**

Ownership of dwelling unit	Rural	Urban	Total
Owned	26,06,735	3,18,435	29,25,170
	94.80%	80.30%	93.00%
Rented	1,04,189	69,749	1,73,938
	3.80%	17.60%	5.50%
Others	37,521	8,210	45,731
	1.40%	2.10%	1.50%
Total	27,48,445	3,96,394	31,44,839

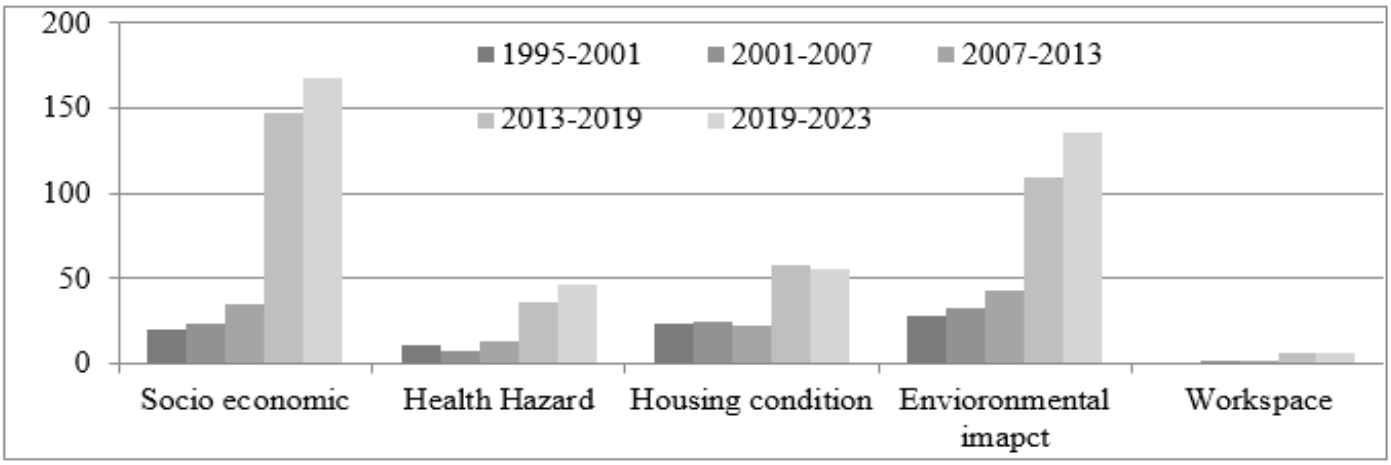

Figure 2: A Survey of Handloom-Related Research Conducted in Multiple Contextual Settings.

Urban Quality of Life: Impact of Space

A systematic review identified, screened, and filtered studies in the built environment, design, and urban/regional planning. From 13,483 initial terms, filtering produced 294 terms, and 176 (60%) were retained for analysis. VOSviewer keyword co-occurrence mapping revealed three dominant themes: accessibility, land, and transport. Accessibility is the most influential, strongly linked to distance, neighborhood, green space, parks, and transport: highlighting its central role in spatial equity, mobility, and quality of life. The literature is structured around: (1) accessibility and mobility, (2) land and economy, and (3) environmental–spatial dynamics.

Rural Quality of Life: Impact of Space

A parallel review for rural contexts collected 134 records; screening and eligibility filters yielded 68 records. From 4,603 terms, filtering retained 56, of which 34 (60%) were analysed. Co-occurrence mapping shows life and quality as central terms, linked to social themes (society, relationships, rural area, water) and environmental–spatial themes (place, sustainability, greenspace). The literature frames quality of life as multidimensional, bridging social and environmental contexts. However, explicit spatial analysis is limited in rural studies, suggesting a need for community-level spatial research to improve quality of life.

Analysis done to extract parameters for assessing vulnerability in urban and rural context.

Urban context

Urban vulnerability: Social, shelter, environmental, and economic dimensions dominate existing frameworks; spatial is largely absent.

Quality of life: Multidimensional (Costanza *et al.*, 2007; Sinha, 2019). Places with higher concentrations of skilled labor often report a better quality of life (Naylor & Florida, 2003). Spatial variables should be integrated with social, shelter, environmental, and economic metrics.

Recent focus: Accessibility has been the dominant spatial theme over the last decade.

Rural context

Quality of life: Includes economic, social, environmental, and governance dimensions (Sessa *et al.*, 2020).

Impact of space: Explicit spatial studies are scarce; a gap remains.

Urban and rural (home-based)

Home-based work: Multiple researchers show spatial conditions are critical; they should be included alongside economic,

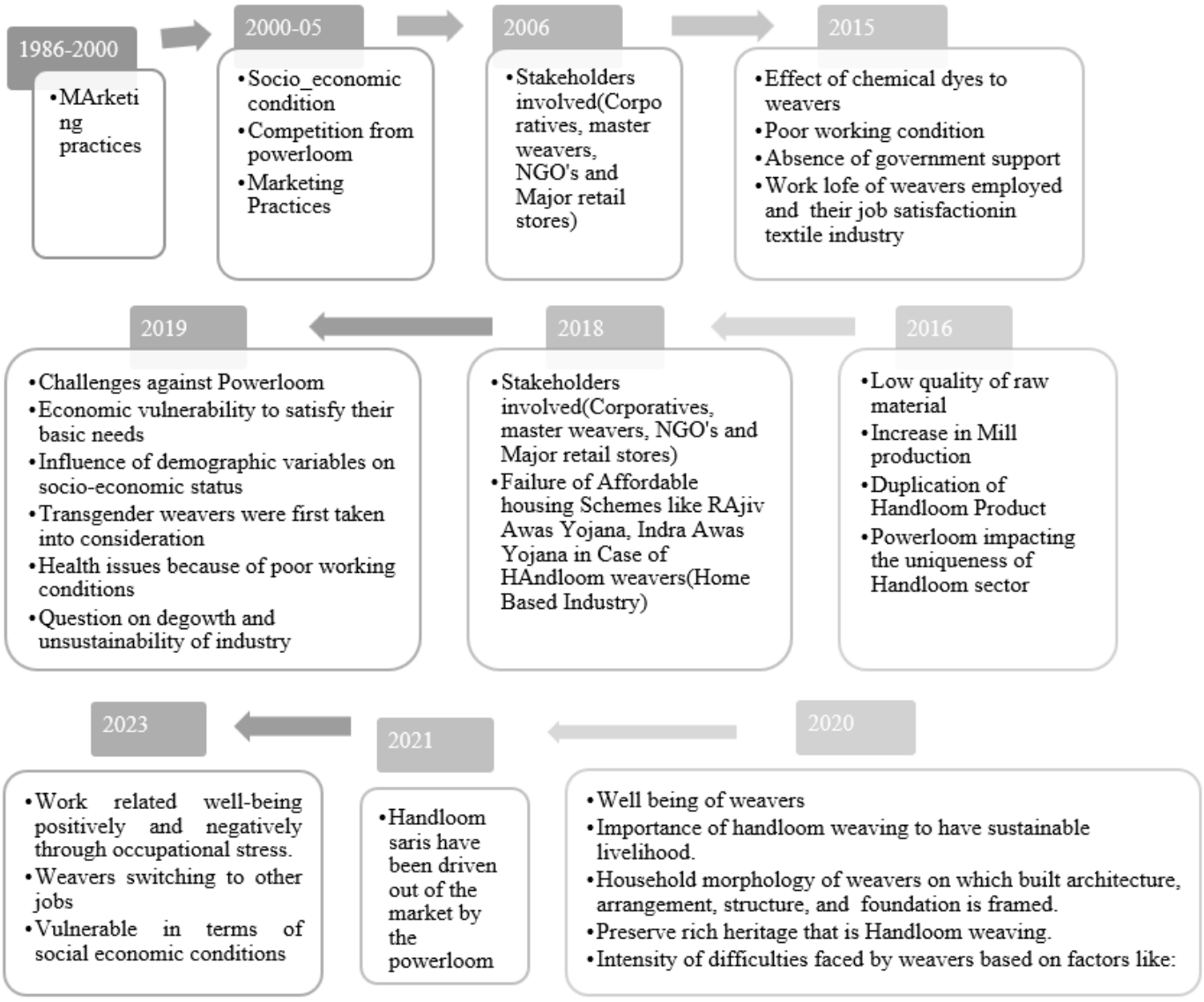

Figure 3: Chronological Literature Review on Handloom Weavers.

social, shelter, and environmental parameters in vulnerability assessments for handloom weavers.

Urban vulnerability studies mainly emphasise social, economic, environmental, and housing factors, with little focus on spatial aspects. Quality of life is multidimensional, influenced by accessibility and the concentration of skilled labor. In rural areas, research covers social, economic, environmental, and governance issues but rarely examines spatial factors, leaving a gap in understanding how space affects livelihoods. For both urban and rural handloom weavers, spatial conditions are crucial to their vulnerability and quality of life, underscoring the need to include spatial dimensions in future assessments and planning.

Need of the study and research gap

Across international journals, ILO reports, handloom censuses, and national publications, handloom weavers: classified as home-based worker households in the Fourth Handloom Census: experience social, housing, economic, and health vulnerabilities. Economic vulnerability directly undermines social and housing status and discourages the next generation from continuing the craft. Congestion, infrastructure deficits, and locational vulnerability in weavers' settlements exacerbate health and environmental risks.

Handloom weaving is a rich cultural heritage concentrated in old, congested, unplanned areas. Increasing congestion produces spatial vulnerability. Weaving often extends to the street (e.g., saree sizing), requiring long, open stretches (warp length ~18 m for three sarees of 6 m each; width ≈ 1.2 m). Such spaces are increasingly unavailable in dense urban areas, prompting relocation to rural areas: creating spatial-linkage vulnerability due to distance from markets typically located in older city cores.

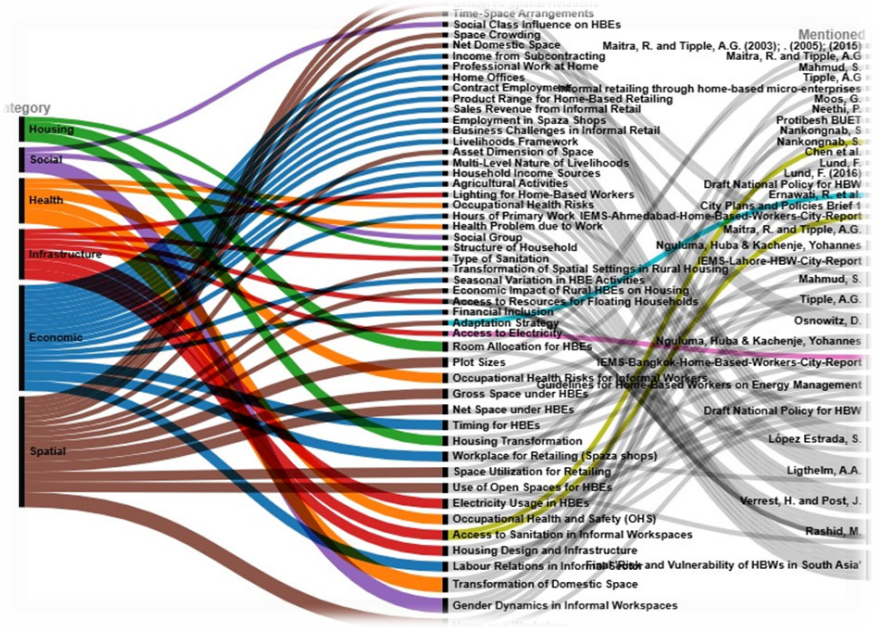

Figure 4: Scoping Review for Parameter Identification-Research Done on Home-Based Weaving.

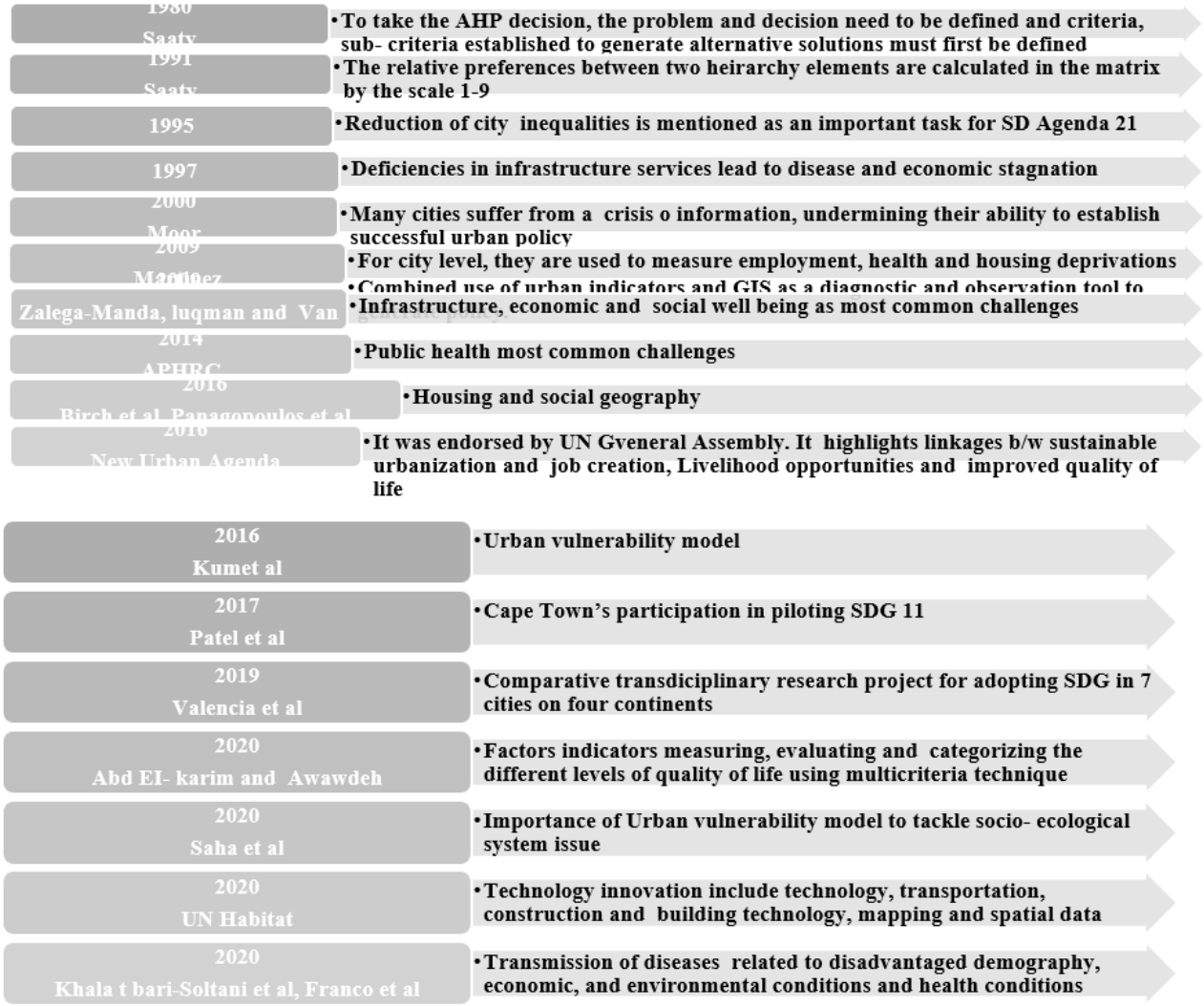

Figure 5: Approaches adopted to select the parameters to assess the Urban vulnerability (Source: Effat *et al.*, 2022).

Within dwelling units, installing a loom is often impossible in <25 m^2 of floor area. Spatial requirements are complex and can cause health problems when unmet (e.g., poor ventilation, humidity at pits). To preserve India's heritage, planning strategies must address spatial vulnerability to improve weavers' quality of life.

RESULTS AND DISCUSSION

Economic and social vulnerabilities dominate current discourse, but spatial and environmental aspects remain under-emphasised. Weavers in dense settlements such as Varanasi face critical housing shortages, with 61% living in slum-like conditions. Pit looms require subfloor pits, causing humidity and health issues. Environmental challenges include inadequate ventilation, pollution from dyeing, and indoor air contamination. Institutional review shows fragmented policy attention, where ministries address income and skill development but overlook spatial needs. Spatial and environmental neglect at both dwelling and settlement levels reinforces occupational decline, creating a feedback loop of vulnerability.

CONCLUSION

The research concludes that spatial vulnerability is a fundamental determinant of occupational health and sustainability in the handloom sector. Integrating spatial indicators into national and state policies is essential. Recommendations include: (1) incorporating spatial metrics in housing and livelihood programs; (2) creating region-specific design guidelines for weaver housing; (3) introducing environmental safeguards in dyeing and weaving clusters; and (4) fostering inter-ministerial coordination. Future research should employ GIS and spatial modeling to quantify vulnerability and guide sustainable interventions.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

REFERENCES

Ahmed, P., & Sheereen, Z. (2022). A Study of Socio-Economic Conditions of Handloom Weavers in Uttar Pradesh of India. *Saudi Journal of Economics and Finance, 6*(10), 341–352. DOI: 10.36348/sjef.2022.v06i10.002

Costanza, R., Fisher, B., Ali, S., Beer, C., Bond, L., Boumans, R., Danigelis, N. L., Dickinson, J., Elliott, C., Farley, J., Gayer, D. E., Glenn, L. M., Hudspeth, T., Mahoney, D., McCahill, L., McIntosh, B., Reed, B., Rizvi, S. A. T., Rizzo, D. M., ... Snapp, R. (2007). Quality of life: An approach integrating opportunities, human needs, and subjective well-being. *Ecological Economics, 61*(2), 267–276. DOI: 10.1016/j.ecolecon.2006.02.023

Effat, H. A., Ramadan, M. S., & Ramadan, R. H. (2022). A spatial model for assessment of urban vulnerability in the light of the UN New Urban Agenda guidelines: Case study of Assiut City, Egypt. *Modeling Earth Systems and Environment, 8*(3), 3687–3706. DOI: 10.1007/s40808-021-01281-7

Fourth All India Handloom Census. (n.d.). Retrieved November 20, 2025, from https://handlooms.nic.in/assets/img/Statistics/3736.pdf

Hussain, A. (2016). *Protection and Promotion of Traditional Crafts and Occupations in Globalising India: A case study of weavers of Mau (Uttar Pradesh). 6*.

Naylor, T. D., & Florida, R. (2003). The Rise of the Creative Class: And How It's Transforming Work, Leisure, Community and Everyday Life. *Canadian Public Policy / Analyse de Politiques, 29*(3), 378. DOI: 10.2307/3552294

Nupur, A. (2018). Revitalization of Strategy for Upgradation of Marginalized Weavers Through a Holistic Vision: Varanasi. In *International Conference on Urban Sustainability: Emerging Trends, Themes, Concepts & Practices* (ICUS).

Saha, D., & Sen, J. (2016). The Role of Place in Creative Economy: The Case of Varanasi. *International Journal of Cultural and Creative Industries, 4*, 28–37.

Sinha, B. R. K. (2019). *Multidimensional approach to quality of life issues. Institute of Science Banaras Hindu University Varanasi, Uttar Pradesh, India*. ResearchGate. Retrieved November 21, 2025, from https://www.researchgate.net/publication/335428173.

Sohane, N., Lall, R., Chandran, A., Hasan Lala, R., Kapoor, N., & Deepak Gajjar, H. (2021). *Home as Workplace: A Spatial Reading of Work-Homes*. Indian Institute for Human Settlements. DOI: 10.24943/HWSRWH10.2021

United Nations Agenda for Sustainable Development. (n.d.). Retrieved November 21, 2025, from https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf

WIEGO. (2020). *WIEGO* Annual Report 2020. Retrieved November 21, 2025, from https://www.wiego.org/research-library-publications/annual-report-2020-pdf/

Cite this article: Nupur N, Mathur M, Gupta R. Spatial Vulnerability in Weavers Settlement in India: A Bibliometric Study. Journal of Data Science, Informetrics, and Citation Studies. 2025;4(3):400-7.