



Reimagining Urban Streets through Indian Knowledge Systems: A Sustainability Framework for Durg, Chhattisgarh

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Abstract

This paper examines the crisis of unsustainable street design in rapidly urbanizing Indian cities, where technocratic designs favour vehicular speed over pedestrian security, ecological sustainability, and social equity. Based on an empirical case study of Durg, Chhattisgarh—a medium-sized city that represents the typical Indian urban experience—it proposes a new conceptual framework that incorporates the Indian Knowledge System (IKS) into modern street design and management. IKS, which includes philosophies from Vedic texts, Vastu-Shilpa treatises, and living traditions, provides a holistic paradigm that stresses the interdependence of human, natural, and social systems. Four key principles of IKS—harmony with nature, moderation and sufficiency, equity and justice, and community-oriented spatiality—are identified and applied to four street design factors: mobility hierarchy, public realm quality, ecological performance, and governance. Based on historical examples such as Indus Valley city grids and mandala patterns in classical cities, the framework criticizes the prevailing IRC standards and Smart City norms for their car-oriented approach, which contributes to congestion, heat islands, and exclusion of non-motorized road users in Durg. The empirical study, based on the author's thesis work, uses a mixed-methods approach that includes street audits, traffic observations, microclimatic data collection, pedestrian activity observations, and user surveys in commercial, mixed-use, and residential areas. Results indicate that there is a lack of continuity in pedestrian paths, a lack of tree cover, vendor intrusions, and safety problems, which are seen as symptoms of IKS disharmony, thus violating the principles of harmony (dharma), non-harm (ahimsa), and coexistence (sah-astitva).

1. Introduction

Indian cities are experiencing rapid urbanization, with street networks absorbing much of the pressure from increasing motorization, densification, and changing land-use patterns. In most urban centres, streets have been progressively reconfigured as high-capacity traffic corridors, prioritizing vehicular throughput over pedestrian safety, social interaction, and ecological performance. This shift has contributed to persistent congestion, air and noise pollution, urban heat island effects, and the marginalization of vulnerable road users such as children, women, the elderly, and low-income groups who depend primarily on walking, cycling, and public transport for their everyday mobility. The cumulative result is an urban street environment that undermines both liveability and long-term sustainability in Indian cities of different sizes, including medium-tier cities like Durg in Chhattisgarh.

The need for inclusive, safe, resilient, and sustainable cities is emphasized in global policy frameworks like the Sustainable Development Goals (SDGs) and the New Urban Agenda, which focus on compact urban form, sustainable mobility, and people-oriented public spaces (UN-Habitat, 2016; United Nations, 2015). However, the application of these agendas in the planning of streets in India tends to be technocratic, with a focus on traffic engineering parameters like capacity, Level of Service, and travel speed, with less emphasis on the socio-cultural context of the streets and indigenous concepts of well-being. This has led to a paradox where Indian cities are committed to global sustainability agendas but continue to produce streets that are not aligned

with their needs and ecological context. Durg, like other regional cities in India, is a case in point, where formal planning is heavily dependent on standardized guidelines that favour motorized mobility, while informal planning continues to shape the streets in ways that are not adequately acknowledged by formal planners.

In this context, the Indian Knowledge System (IKS) provides a civilizational approach that recognizes the interconnectedness of space, environment, and society, and a tradition of settlement planning that is context-sensitive. The history of Indian thought on town planning and public space, and the contemporary literature on the subject, indicates that the Indian approach to town planning and public space has been one of harmony with nature, community-oriented spatial planning, climate-responsiveness, and ethical considerations of justice and duty in the allocation and use of public space (Chakrabarti, 2013; Sinha, 2019). Recent research on IKS and environmental sustainability has emphasized the relevance of indigenous ideas of coexistence, moderation, and stewardship to the practice of sustainability in the contemporary world (Guha & Gadgil, 1989; Kothari et al., 2013). These approaches are highly relevant to the rethinking of the planning and management of streets in cities such as Durg.

However, the potential for IKS in the context of urban street planning remains an unexplored area despite the increasing focus on IKS in areas such as agriculture, water resources management, and environmental ethics. The current state of urban planning in India is dominated by the adoption of foreign standards and approaches, and at the same time, instruments such as the National Education Policy (NEP) 2020 urge the need to incorporate IKS into the architecture and planning education curriculum. This creates a paradox that signifies both a challenge and an opportunity to apply the principles of IKS to urban street planning. This paper responds to that need by connecting Indian Knowledge System with urban street planning for sustainability, using Durg as the empirical context. The specific objectives are threefold: first, to identify core IKS principles relevant to sustainable development and everyday living; second, to relate these principles to historical Indian town-planning practices, particularly in the design and use of streets and public spaces; and third, to develop a conceptual framework that links IKS values to contemporary street-planning dimensions such as mobility hierarchy, microclimate, social use, and participation, and to operationalize this framework through the author's thesis research on urban streets in Durg. In doing so, the paper seeks to reframe streets not merely as technical infrastructure but as socio-ecological spaces where the ethos of Indian Knowledge System can be enacted to advance sustainable and livable urban futures in medium-sized Indian cities.

2. Indian Knowledge System and sustainability

The Indian Knowledge System encompasses all the ideas and practices that people in India have thought about and done for thousands of years. It encompasses not only codified textual traditions, including the Vedas, Shilpa and Vastu treatises, Arthashastra and classical works on polity and ethics, but also living practices transmitted through communities, crafts and customary institutions (Narayanan, 2001; Pani, 2019). A defining characteristic of IKS is its holistic orientation: It adopts a holistic perspective that does not separate knowledge into discrete categories, but instead examines the interdependencies among people, other living beings, and the environment. Whether dealing with farming, water management, health systems such as Ayurveda, or town planning IKS recognizes that there are limits to what we can take from the earth and that everything is connected in cycles (Shiva, 1988). IKS acknowledges the consequences of excessive resource extraction from the environment. IKS seeks to balance human activities with natural rhythms. IKS emphasizes mindfulness regarding the consequences of our actions, on the environment and other living things.

Contemporary global discourse typically defines sustainable development as meeting present needs without compromising the ability of future generations to meet their own, operationalized through environmental, social and economic pillars and articulated in the SDGs. IKS converges with this broad agenda but articulates it through indigenous categories such as dharma (right conduct), ahimsa (non-violence) and sah-astitva (coexistence), which emphasize moral responsibility toward other humans, other species and future generations. Rather than pursuing maximum growth, IKS emphasizes balance and self-imposed limits. IKS promotes sufficiency and contentment instead of pursuing unlimited expansion. This perspective demonstrates that sustainability encompasses more than mere efficiency. Sustainability must also include questions about purpose, equity, and the quality of relationships.

Scholars examining IKS and environmental conservation have found that traditional practices demonstrate significant ecological benefits (Gadgil & Berkes, 1991; Ramakrishnan, 2007). For example, IKS encompasses sacred groves, community-managed water tanks, agro-forestry systems, and vernacular architecture. These IKS practice to save resources protect biodiversity and deal with climate change. IKS systems typically integrate ecological functions such as shade provision and habitat creation with socio-cultural practices including rituals, festivals, and community organization. IKS demonstrates that environmental stewardship is inseparable from cultural and social well-being, emphasizing that sustainability requires attention to both ecological and human dimensions. This perspective challenges the separation of environment and society as distinct domains. The way we treat the environment and the way we treat each other are fundamentally interconnected. IKS-based

practices seek to make the environment and society work together. Environmental health supports social cohesion, while social cohesion in turn reinforces environmental stewardship. In this manner the environment and society mutually reinforce one another.

A unique contribution of Indigenous Knowledge Systems (IKS) to sustainability is found in its ethical and relational perspective. Environmental sustainability is not merely viewed as a technical issue of efficiency; rather, it is considered a matter of the connections among humans and between humans and the broader environment. Principles such as *vasudhaiva kutumbakam* (the concept of the world as a single family) and the sacred status ascribed to rivers, forests, and various species illustrate a moral framework wherein exploitation is limited by empathy, duty, and reverence (Dwivedi, 2000). This approach is evident in community norms surrounding the management of shared resources, rituals that transmit ecological knowledge, and social institutions that govern access and usage in a manner that balances individual and collective needs. In the context of urban sustainability, this indicates that technical solutions, including low-carbon transportation and green infrastructure, must be complemented by shifts in values and institutional arrangements that promote responsibility, care, and collaboration.

There is an increasing acknowledgment within Indian policy and academic circles that IKS can enhance sustainable development strategies, particularly in urban settings. National and international dialogues regarding the integration of indigenous knowledge into the Sustainable Development Goals (SDGs) suggest that such systems can bolster climate adaptation, disaster resilience, and participatory governance (UNESCO, 2017). In India, the National Education Policy (NEP) 2020 explicitly advocates for the incorporation of IKS into curricula across various disciplines, including architecture and urban planning, and professional bodies and institutions have commenced the establishment of dedicated centers and courses focused on IKS within town planning and governance (Government of India, 2020). Concurrently, rapid urbanization, evolving lifestyles, and the prevalence of globalized planning models have contributed to the erosion or marginalization of numerous context-specific knowledge practices within Indian cities. Informal street economies, traditional neighbourhood social structures, and everyday ecological practices are frequently perceived as hindrances to “modernization” rather than as valuable resources for sustainable urban development. This tension highlights the critical need to re-engage with IKS thoughtfully—not to idealize the past, but to selectively recover, reinterpret, and adapt its principles to address contemporary urban challenges, including the design and governance of streets in cities like Durg.

This paper focuses on four interconnected IKS principles relevant to sustainable urban street planning: harmony with nature, moderation and resource efficiency, equity and justice, and community-centric spatial design. Harmony with nature requires that urban mobility systems minimize environmental impact and respond to local climate, hydrology, and ecology through sustainable materials, shade provision, and water-sensitive design. Moderation demands efficient resource use and equitable infrastructure allocation, necessitating a shift from automobile-dominated street designs to prioritize non-motorized and public transport modes. Equity and justice require that all users, particularly marginalized groups, can access streets safely and with dignity. Community-centric design recognizes streets as shared public assets reflecting collective values and ethical responsibilities.

3. Indian Knowledge System in town planning and public space

Town planning within the Indian Knowledge System is informed by a complex set of principles, observable from the urban designs of the Indus Valley civilizations to classical and medieval texts. Archaeological investigations of ancient settlements such as Mohenjo-daro and Harappa demonstrate grid-patterned street layouts, right-angled intersections, and integrated drainage systems, signifying an emphasis on order, hygiene, and efficient movement within a pedestrian-friendly urban environment. Subsequently, textual traditions such as *Vastu-Shastra* and *Shilpa-Shastra* further delineated urban forms, street hierarchies, and public structures, often organized through geometric mandalas and proportional frameworks that aimed to harmonize constructed spaces with human activities and cosmic order (Chakrabarti, 2013; Kramrisch, 1946). In these traditions, town planning is perceived as an applied science that aligns human settlements with geographic, climatic, and cosmological contexts.

The orientation of sites and streets was associated with cardinal directions and celestial phenomena, while layouts including *Prastara*, *Chaturmukha*, *Padmaka*, and *Karmuka* defined the arrangement of streets, neighborhoods, and entrances concerning population density, trade requirements, and defense strategies. These models established distinct roles for primary, secondary, and tertiary streets, as well as public squares, water features, and religious edifices, recognizing both functional and symbolic aspects of urban spaces. The spatial configuration was intended to facilitate material functions (trade, mobility, safety) alongside cultural and ritual practices, reflecting a comprehensive planning rationale that holds direct relevance to modern sustainability challenges.

Within these traditions rooted in the Indian Knowledge System, streets and public areas were envisioned as multifunctional socio-ecological infrastructures rather than merely corridors for transportation. Historical

narratives and reconstructions indicate that major thoroughfares often served dual purposes as marketplaces, festive routes, and ceremonial pathways, characterized by active frontages and shaded by colonnades, trees, or protruding balconies, thereby fostering continuous, human-scale public environments. Secondary and tertiary streets linked residential areas, wells, shrines, and small squares, facilitating everyday social interactions and the distribution of communal resources. Public spaces such as markets, temple forecourts, water tanks, and gardens were seamlessly integrated into the street network as focal points, exhibiting clear spatial connections and visual coherence. Guidelines derived from texts such as Mayamatam and Arthashastra outlined the placement of markets, parks, and public buildings with a focus on accessibility, security, and water management, reinforcing the notion that public space is fundamental to civic life and environmental stewardship (Acharya, 1927; Kangle, 1972).

Environmental responsiveness is central to IKS-based town-planning traditions, significantly influencing street design and urban living patterns. Street design and how people live in these towns. Scholars reconstructing historical urban forms suggest that the big roads and the smaller streets around them had paths for people to walk on. This shows that the people who designed these roads cared about making sure pedestrians could move comfortably and safely even before all the modern ways of building roads that we have today (Chakrabarti, 2013). The people who built these roads also thought about how to manage water and make the streets look nice with green things like trees and gardens. They built tanks and canals and even stepwells along the roads or where the roads met. These things helped keep the air cool, filled up the water underground and gave people places to meet and hang out. The roads were not just for getting from one place to another. They were also nice to look at and had special meaning for the people who used them. Water management and green elements were a part of the street system.

Indian Knowledge System in town planning also encompasses governance and community dimensions, not just physical morphology. Traditional norms about the distribution of land uses, the location of public institutions and the maintenance of commons (roads, tanks, temple lands) were intertwined with local social structures and political authority, ensuring that planning decisions reflected shared cultural priorities and collective responsibilities. The Centre for Indian Knowledge Systems in Town Planning is showing us how people used to plan towns and cities in a way that worked well for the people who lived there. They thought about the land, the government and how people shared things and lived together.

The Centre for Indian Knowledge Systems in Town Planning thinks that one should make rules for planning that are specific to each place rather than using the same rules everywhere. This is because every place is different and what works in one place may not work in another. When we think about city streets we should consider what the people who live there need. Integrating the perspectives of the community into street planning can help us see streets as something that belongs to everyone. This means that urban street planning should think about the environment, the culture of the people and what the community needs (CIKST, 2021). Urban street planning should make sure that the design of the streets and the way they are managed are good, for the ecology, the culture and the community needs of the people who use the streets.

4. Conceptual framework: connecting IKS and urban street planning

This paper builds upon the preceding discussion to develop a conceptual framework that connects the main ideas of IKS to specific parts of planning streets in cities. The framework serves dual purposes: to analyze existing street conditions and to guide the design or redesign of streets in cities such as Durg. This framework operationalizes the four IKS principles. Living in harmony with nature being moderate and having enough being fair and just and thinking about the community when it comes to space. It does this across four planning domains: mobility, public realm quality, ecological performance, and governance. These four IKS principles are fundamental to the framework's operation.

The first domain, Mobility hierarchy and right-of-way allocation address the distribution of street space among different users and modes. An IKS perspective prioritizes equitable and low-impact mobility modes, like walking, cycling, and public transport, instead of letting private cars take over. This embodies the IKS principles of moderation and social justice. In practice, this translates to providing wider, continuous sidewalks with universal accessibility, building safe bike lanes where they fit, and setting aside space for buses or other public transport. Simultaneously, it requires limiting the dominance of private vehicles in road space allocation, especially in crowded city areas. Configuring streets in this manner advances broader objectives of public health, climate action, and equity. Moreover, this approach is not without historical precedent. This represents a revival of historically proven planning principles adapted to contemporary contexts.

The second dimension—public realm quality and social function conceptualizes streets as multifunctional social spaces rather than mere transportation corridors. They are spaces where social interaction, livelihood generation, and cultural expression occur. An IKS perspective reveals streets and squares as communal spaces. They serve not only mobility functions but also facilitate social gathering, commerce, and leisure. Contemporary street planning must therefore consider elements such as open and active ground floors, spots for vendors and

hawkers, places to sit or pause, and little plazas or wider spaces where paths cross. These design elements enhance natural surveillance and social cohesion, support livelihood generation, particularly for economically vulnerable groups, and give the city a stronger sense of identity. In Durg, where street life and commerce remain vibrant, these design choices are crucial for sustaining social vitality.

The third dimension—ecological performance and microclimate—emphasizes alignment with natural processes rather than resistance to them. An IKS perspective requires streets to respond to local climatic conditions and support urban ecosystem functions. This includes comprehensive tree canopy coverage, shade along walking routes, permeable surfaces for rain to soak in, and ways to manage stormwater—bioswales, rain gardens, or even bringing back old water channels. For Durg, characterized by extreme summer heat and intense monsoon precipitation, these interventions reduce urban heat, mitigate flooding, and enhance pedestrian and cycling comfort. This approach integrates traditional climate knowledge about the climate with what we know now about climate resilience.

The fourth dimension—governance, participation, and knowledge integration addresses the IKS conception of knowledge: emphasizing contextual understanding and relational processes over prescriptive regulations. In Durg, this means street planning needs to include everyone—residents, street vendors, commuters, and those whose voices often get left out. Accessing local wisdom about climate, how people use the streets, and what matters culturally is key. This may include participatory street-use mapping, co-design workshops, or having the community help take care of street trees and public spaces. It also requires reorienting professional and administrative perspectives to value IKS-based criteria equally with conventional engineering standards, just like NEP 2020 suggests for planning and architecture education.

The framework therefore moves beyond conventional performance metrics such as vehicular Level of Service toward value-based indicators aligned with sustainable living and universal well-being. It provides a structured way to reinterpret existing street conditions in Durg through an IKS lens and to generate design and policy recommendations that are both context-sensitive and rooted in indigenous notions of sustainability. The following section applies this framework to empirical findings from the author's thesis research on selected streets in Durg.

5. Application to urban street planning in Durg

5.1 Study Context and Methodology

Durg is a medium sized city in Chhattisgarh. The city has developed around major transportation corridors, industrial areas, and its function as a regional center. This research examines representative streets in Durg: a mix of busy commercial roads, areas where shops and homes blend together, and quieter residential lanes. These were selected based on how much traffic they get, how intensely people use the land, and how important they are for getting around town.

To assess current street conditions, a mixed-methods approach was employed. Methods included pedestrian surveys, traffic counts, behavioral observations, microclimate measurements, and user perception interviews. This approach captured both quantitative data and qualitative user experience.

5.2 Current Conditions: Findings

The findings reflect patterns common across many Indian cities. Footpaths are fragmented and obstructed by various encroachments. Pedestrian crossings are infrequent, and traffic comprises a heterogeneous mix of vehicles and pedestrians competing for limited space. Traffic calming measures are largely absent. Infrastructure for cycling and public transport is inadequate. On commercial corridors, vendors occupy roadway and footpath space. While this reflects vibrant local commerce, it also generates conflicts due to inadequate spatial planning.

Environmental conditions further compound these challenges. Shade is minimal, and surfaces are predominantly impervious. This results in extreme heat for much of the year and localized flooding during heavy rainfall. Interview respondents expressed safety concerns, particularly among women and older adults. Road crossing is difficult, shade is scarce, and streets become nearly unusable during peak heat hours.

5.3 Regulatory Context and IKS Lens Analysis

These findings indicate systemic deficiencies in Durg's street planning and management practices. The regulations and guidelines governing street design primarily derive from national and state manuals—such as Indian Roads Congress codes, Smart City guidelines, and general road standards, most of which borrow a lot from Western engineering. These standards prioritize vehicular flow and intersection efficiency. However, they provide minimal guidance on social functions, ecological performance, or cultural context. These guidelines offer no framework for integrating Indigenous Knowledge Systems (IKS), resulting in the perpetuation of automobile-centric interventions despite clear evidence that Durg requires context-responsive approaches aligned with local climate and social practices.

Analyzing Durg's streets through an IKS lens reveals deeper systemic issues. Narrow, fragmented, obstructed footpaths and insufficient crossings represent not merely technical deficiencies but manifestations of spatial injustice. They disproportionately disadvantage captive pedestrian users. Streets with minimal tree cover and extreme heat exposure demonstrate disconnection from natural systems and the absence of climate-responsive planning principles that historically informed settlement design in similar climatic zones.

Ultimately, Durg's streets exhibit more than technical deficiencies. They lack integration with local social practices and environmental context. These fundamental disconnections require attention.

5.4 IKS-Informed Recommendations

In response, the thesis develops IKS-informed design and policy recommendations for Durg's streets, grounded in the four framework dimensions. For mobility hierarchy, cross-sections are proposed that systematically prioritize walking, cycling and public transport, including continuous 1.8–2.5 m wide footpaths, safe crossing points aligned with desire lines, traffic calming near schools and markets, and dedicated bays or lanes for buses and auto-rickshaws where feasible. For public realm quality, the design integrates formalized yet flexible vending zones along commercial stretches, small sitting areas at key nodes, and improved lighting to enhance perceived safety and social presence. For ecological performance, strategies such as establishing continuous street tree avenues with native species, introducing permeable shoulders or rain gardens, and reconnecting surface runoff to existing or revived water bodies are suggested. For governance, the paper proposes participatory street design pilots in selected stretches, involving local traders' associations, resident welfare groups, women's collectives and municipal engineers, supported by capacity-building workshops on IKS-oriented planning in collaboration with institutions such as the Centre for Indian Knowledge Systems in Town Planning.

These proposals are not merely additive “green” or “inclusive” features but are explicitly grounded in the IKS principles of harmony with nature, moderation, equity and community-centric spatiality. By demonstrating how such principles can generate concrete design details and governance processes in a specific city like Durg, the case illustrates the practical applicability of an IKS-based framework for urban street planning.

6. Discussion and conclusion

Analysis of Durg's streets through the IKS framework demonstrates that integrating IKS into urban street planning is both theoretically sound and practically viable. IKS brings in ideas like living in harmony with nature, practicing moderation, pushing for equity and justice, and focusing on community space. These represent more than abstract values; they provide normative guidance compatible with global frameworks such as the SDGs, while remaining grounded in local traditions and ethics. Applying these principles and apply them to how we approach mobility, public spaces, ecology, and governance on the street level, you start to see real shifts in how planners, engineers, and communities think about and shape their streets.

However, implementation in Durg faces significant challenges. Existing regulatory frameworks and institutional practices remain oriented toward automobile mobility, creating barriers to implementing IKS-informed approaches. There is also the risk of romanticizing historical practices without critically addressing contemporary inequities related to class, gender, and caste that shape access to and use of public space. Moreover, operationalizing IKS requires sustained effort rather than isolated interventions. This necessitates continuous capacity-building, institutional support, and adaptive learning. Consequently, integrating IKS into street planning depends on systemic transformations in planning education, inter-professional collaboration, and urban governance.

Despite these challenges, the findings indicate that an IKS-informed approach can help reposition urban streets in cities like Durg as socio-ecological infrastructures that support everyday well-being and resilience, rather than as mere conduits for vehicles. By reconnecting planning with civilizational concepts of balance, duty and community, such an approach can enrich contemporary debates on sustainable urbanism in India and contribute distinct perspectives to global discussions on decolonizing planning and integrating indigenous knowledge into sustainability practice. Future research could extend this work by applying the framework to other cities and street typologies, developing measurable indicators for “IKS-aligned streets” and exploring the long-term impacts of IKS-based interventions on mobility patterns, ecological performance and social life.

References

- Acharya, P. K. (1927). *Indian Architecture According to Mānasāra-Śilpaśāstra*. Oxford University Press.
- Bilimoria, P. (1991). Indian ethics. In P. Singer (Ed.), *A Companion to Ethics* (pp. 43-57). Blackwell.
- Chakrabarti, V. (2013). *Indian Architectural Theory: Contemporary Uses of Vastu Vidya*. Routledge.
- Chapple, C. K. (1998). *Nonviolence to animals in Buddhism and Jainism*. SUNY Press.
- Centre for Indian Knowledge Systems in Town Planning [CIKST]. (2021). *Framework for IKS integration in urban planning education*. Ahmedabad: CEPT University.
- Dwivedi, O. P. (2000). Dharmic ecology. In C. K. Chapple & M. E. Tucker (Eds.), *Hinduism and Ecology* (pp. 3-22). Harvard