

CHAPTER 29

Designing a Smart Urban Planning Framework for Heritage Cities: A Case of Kolhapur

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ABSTRACT

India's heritage cities, with centuries of culture and architecture, face mounting challenges from rapid urbanization and inadequate infrastructure. Existing efforts lack an integrated framework connecting heritage conservation with smart urban growth, leading to fragmented planning and threats to cultural continuity. This study proposes a Smart Urban Planning Framework integrating heritage conservation, sustainable growth, and smart governance, using Kolhapur as a case study. Kolhapur's historic core reflects a rich cultural identity but suffers from congestion, poor coordination, and unplanned development under the Smart Cities Mission. The research underscores the need for harmonizing modern infrastructure with cultural preservation. Adopting a mixed-method approach, it combines literature review, GIS and Q-GIS spatial mapping, field observations, and stakeholder interviews. Thematic analysis interprets urban trends and governance practices, forming the basis for a heritage-sensitive planning model. The proposed framework promotes culture preservation, sustainability, smart governance, and heritage tourism. It aligns with India's Smart Cities Mission and UNESCO's Historic Urban Landscapes approach, providing a blueprint for medium-sized heritage cities to integrate technology with tradition. Kolhapur illustrates how responsive urban planning can safeguard cultural assets while enabling infrastructure modernization, setting a precedent for balanced urban transformation.

Keywords: Smart Urban Planning; Heritage Conservation; Sustainable urban development.

1.0 Introduction

1.1 Tourism

Tourism is the flow of people between one place to another destination that is economical, social and cultural phenomenon.

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It is a provisional migration of individuals to another place or destination. (Prof Yogesh Hole, 2019)

1.2 Cultural tourism

Cultural tourism is “movements of persons for essentially cultural motivations such as study tours, performing arts and cultural tours, travel to festivals and other cultural events, visits to sites and monuments, travel to study nature, folklore or art, and pilgrimages.” We expand this definition to encompass the participation of visitors in cultural activities whether those activities are the primary purpose of their travel or not. (*United Nations World Tourism Organization*)

1.3 Cultural tourism in India

Cultural tourism India is the predominant factor behind India's spectacular increase in the tourism segment in latest years, as India has been regarded as a country of ancient history, heritage, and culture since time immemorial. India has had many rulers over the centuries, and they have all influenced the culture of India. In dance, music, festivals, architecture, traditional customs, food, and languages, one can see the impact of different cultures. The heritage and culture of India is exhaustive and vibrant owing to the impact of all these different cultures. This cultural richness goes a long way toward projecting India as the ultimate cultural tourism destination to increase tourism in India. (*Mr. Girish Deore, 2020*)

1.4 Smart urban planning

A planning process that strategically combines smart technologies with sustainable urban development principles to enhance economic, social, and environmental outcomes. (*Yigitcanlar et al., Sustainable Cities and Society, 2019*)

1.5 Heritage cities

The cities that have old structures, space patterns, and intangible practices where maintenance solutions must be integrated with the areas, which represent part of the city itself. (*UNESCO, Recommendation on the Historic Urban Landscape, 2011*)

1.6 Cultural heritage

Cultural heritage does not simply refer to physical objects but also the meaning, values, and social behaviours attached to such objects by communities. (*Smith, Uses of Heritage, 2006*)

1.7 Sustainable city

A metropolis that satisfies the needs of the current and is not at the expense of the future generations to meet their needs by development in a balanced social, economic, and environmental way. (*UN-Habitat, Sustainable Urbanization, 2012*)

2.0 Statement of the Research Problem

There is a growing stress on the heritage cities in India, with the growing population of urbanization and smart city-style development of infrastructure that frequently do not consider the conservation of heritage. This has led to poor governance because of absence of a comprehensive planning strategy, unplanned development, overcrowding, and degradation of cultural identity in the traditional urban centres.

These problems are evident in inappropriately organized development in Kolhapur due to the Smart Cities Mission, which threatens the existence of the historic fabric and culture of the city. The study meets the research requirement to have a heritage-sensitive smart city planning framework that encompasses conservation, sustainability, and smart governance to inform balanced developments in medium-sized heritage cities.

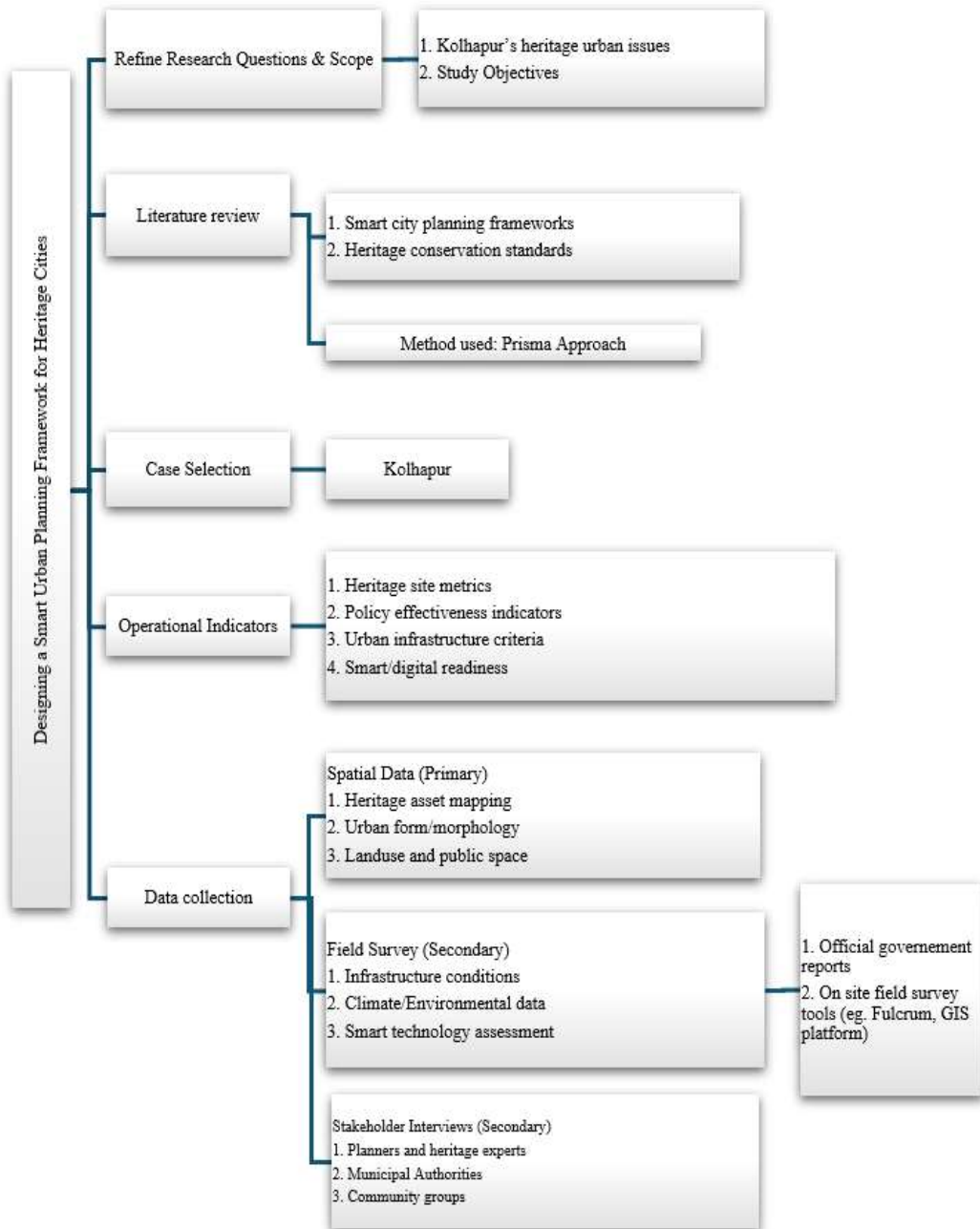
3.0 AIM

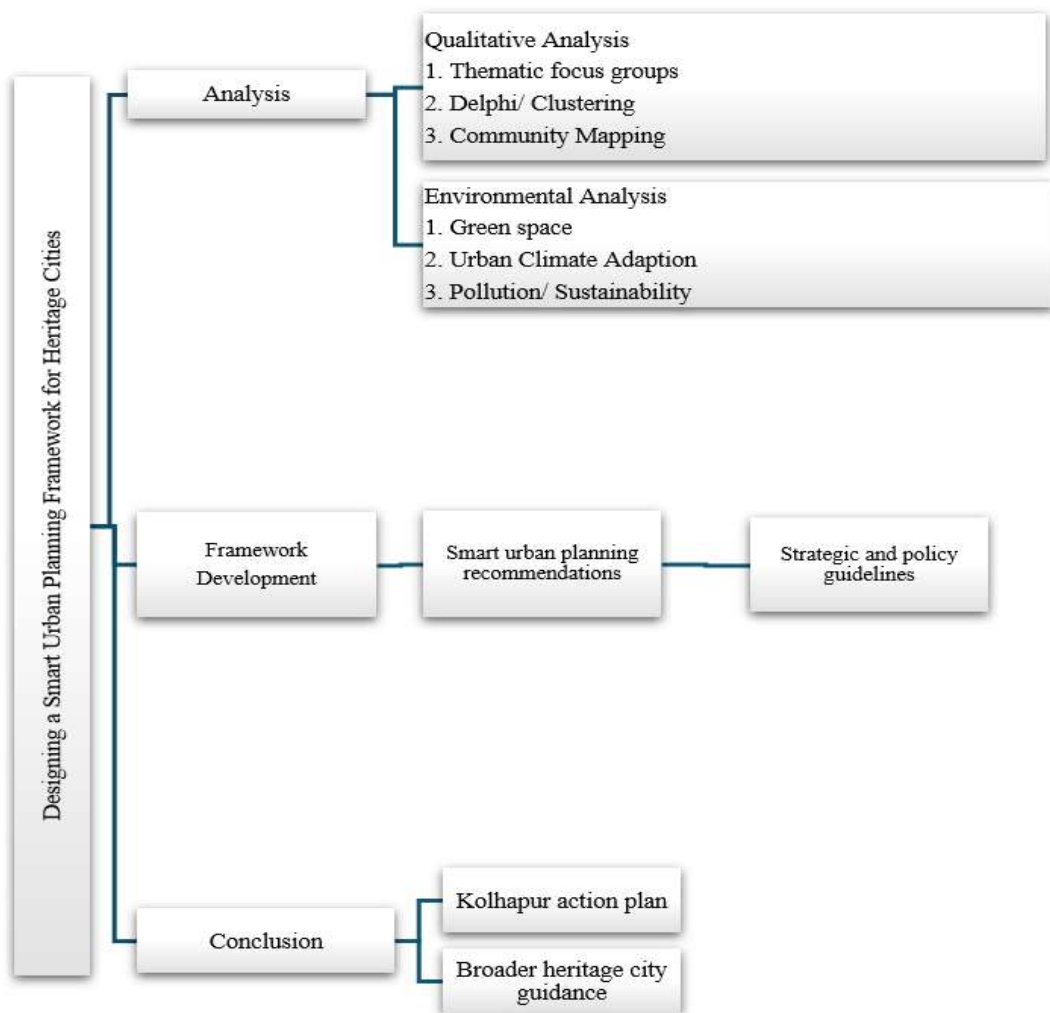
To develop a smart urban planning framework for heritage cities and smart governance with cultural sensitivity for Kolhapur.

4.0 Objectives of the Study

- To understand the existing challenges in Kolhapur related to traffic, infrastructure, waste management, and heritage conservation.
- To evaluate how Kolhapur's scale, urban form, and cultural context influence the suitability of smart city solutions.
- To analyse how smart governance and data-driven tools can improve urban planning, management, and citizen participation.
- To develop a smart urban planning framework that integrates modern planning approaches with heritage preservation, serving as a model for other heritage cities.

5.0 Research Methodology





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6.0 Literature Review

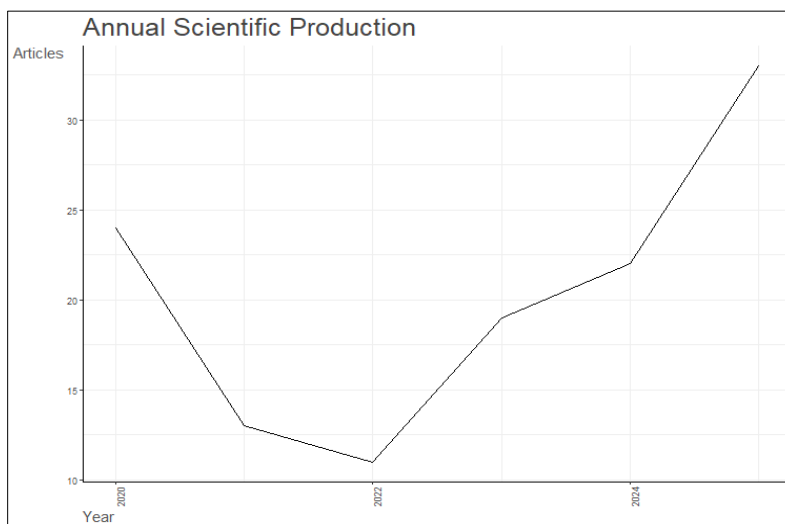
The literature review was initiated using a systematic and structured approach to understand research trends in smart cities and heritage-based urban planning. A PRISMA-guided search process was implemented to consider the relevant Scopus-indexed articles based on specific search terms. The chosen literature was classified in terms of thematic analysis, and the research goals were planned by means of Bloom Taxonomy to guarantee the logical order. The method was used to identify the major themes, knowledge gaps, and offered a very solid basis on which a smart urban planning formulation of heritage cities.

Table 1: Thematic Analysis

Theme	Sub-theme	Method	Inference	Reference (Authors, Year)
Sustainable Tourism & Heritage	Climate Action; Eco-destination	Case Study	Tourism supports multiple SDGs, promoting economic growth, conservation, and local resilience.	P., Das, Payel; S., Mandal, Santanu; ... (2025)
Digital Tools & Urban Heritage	Augmented Reality; Big And Small Data	Framework Development	Digital methods like augmented reality enable smarter urban and heritage revitalization.	J., Chen, Jinliu; P., Li, Pengcheng; ... (2025)
Heritage Conservation & Management	Digital-twins Model; Heritage Building Resilience	Empirical Survey	Digital Twin and monitoring improve heritage building resilience and disaster management.	H., Aroquipa, Hector; A.I., Hurtado, Alvaro I.; ... (2025)
Digital Tools & Urban Heritage	Cultural Heritage; Data Integration	Empirical Survey	Integrated digital models help manage urban waterway heritage and climate risk.	G., Tucci, Grazia; L., Fiorini, Lidia; ... (2025)
Sustainable Tourism & Heritage	Big Data; Smart City Governance	Framework Development	Tourism shifts urban access patterns, challenging spatial equity and facility distribution.	Y., Ai, Ye; M., Tian, Mengyao; ... (2025)
Urban Development & Sustainability	Flagship Parks; Global South	Empirical Survey	Green infrastructure projects enhance social, ecological, and cultural outcomes in fast-growing cities.	M., Sahle, Mesfin; S.A., Lahoti, Shruti Ashish; ... (2025)

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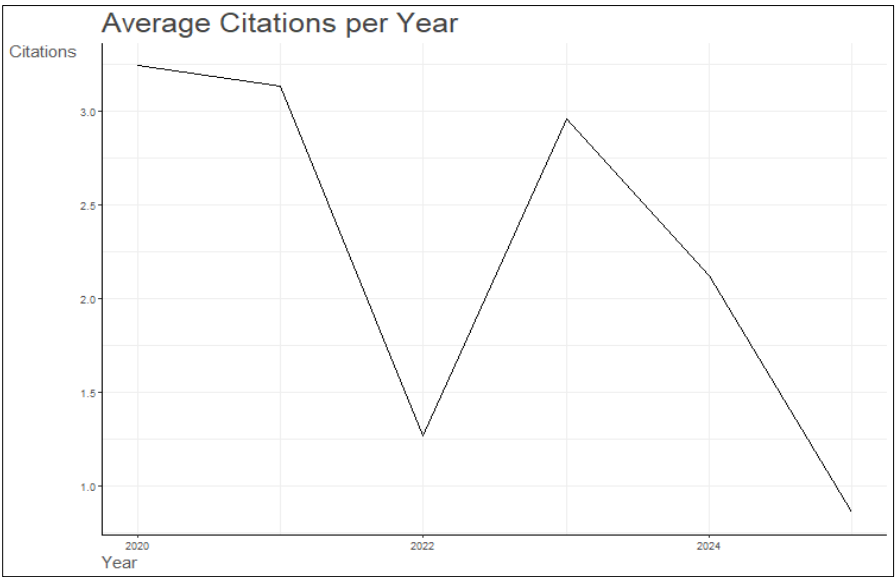
Figure 1: Annual Scientific Production



Source: Created by authors

This figure demonstrates how the amount of publications in the area of smart cities, cultural heritage, and sustainable urban development increased year by year. There is a drop in publications between 2020 and 2022, and then a drastic rise is seen after 2023. This motion shows that the world has returned to scholarly attention on combining smart technologies and heritage and sustainability issues. In the case of such heritage cities as Kolhapur, this development can be seen as a response to rising awareness of the importance of smart but context-sensitive urban planning solutions.

Figure 2:Average Citations per Year

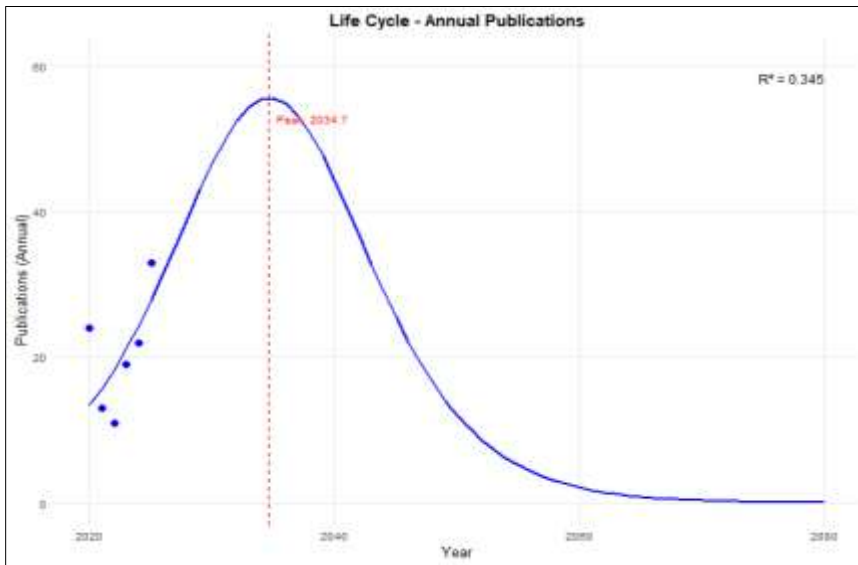


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The graph will indicate the average number of citations per year which is a measure of the academic impact of publications. There are more citation averages in the past years indicating that there are foundational and frequently cited studies, whereas recent years display lower citation values which is a result of citation lag. This shows that the field is in its dynamic stage and provides room to newer case-based studies like that done by Kolhapur to bring fresh ideas.

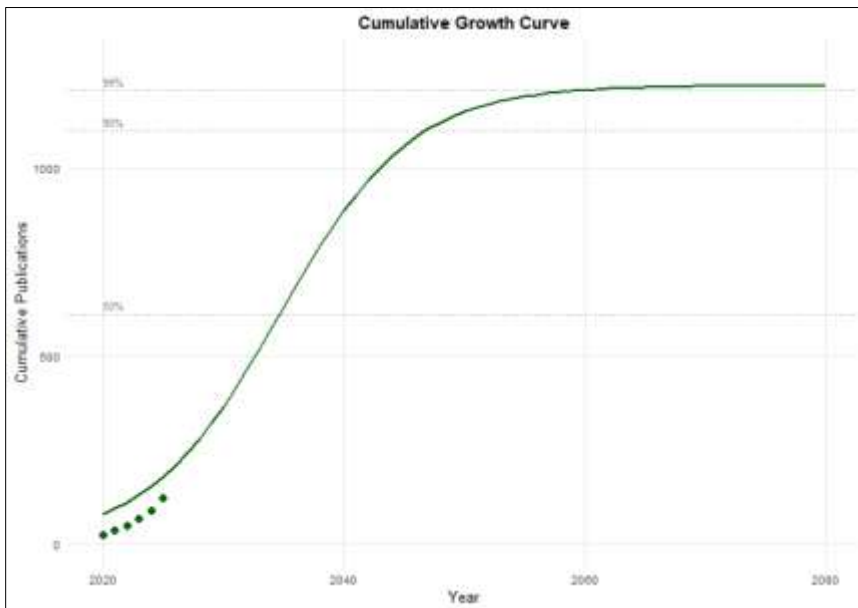
The life cycle curve has the research field in the growth stage with a forecasted peak in the mid 2030s. This implies that there is no saturation in the research of smart heritage cities. In the case of Kolhapur, this points to the topicality and acuity of a new planning framework proposal, especially to medium-sized heritage cities in the context of India.

Figure 3: Lifecycle of Annual Publications



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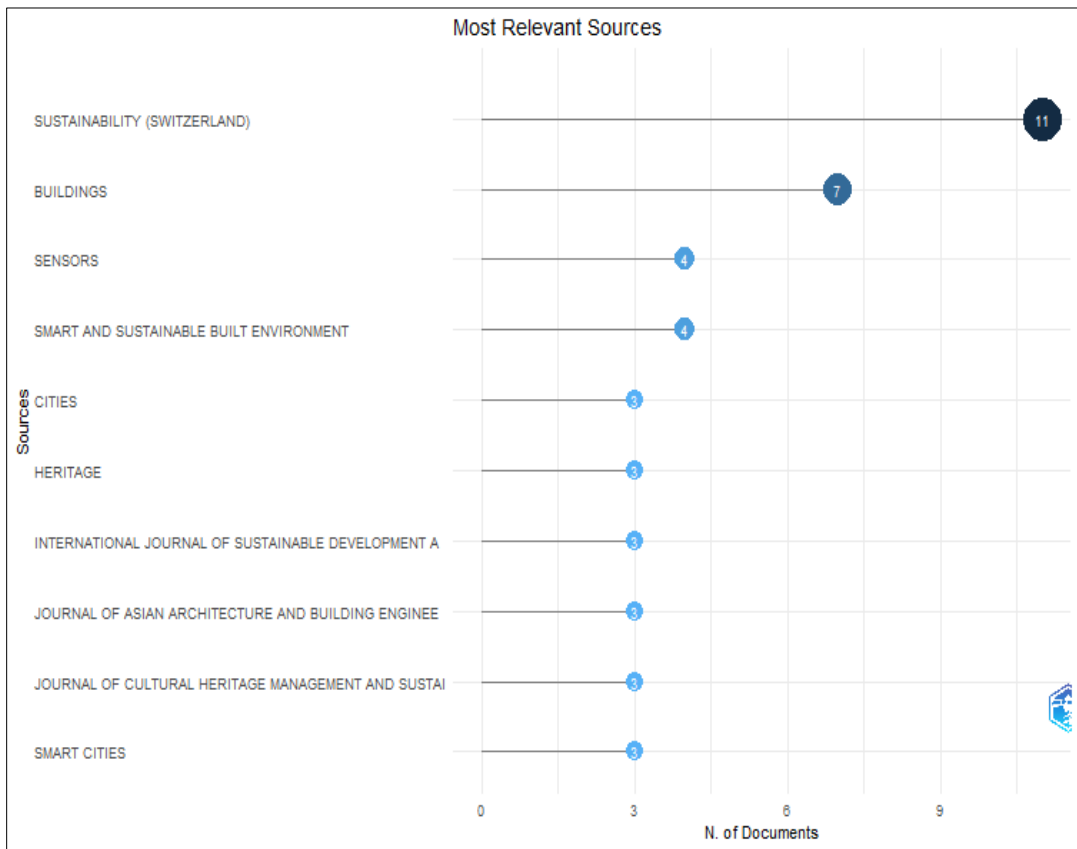
Figure 4: Cumulative Growth Curve



Source: Created by authors

The cumulative growth curve assumes a sigmoid shape and this means that there is slow early growth and then the literature grows rapidly. This attests to the fact that the area of research is maturing and there is augmented interdisciplinary interaction. The trend justifies the existence of systematic frameworks to constitute smart planning in heritage cities like Kolhapur where research is yet to be unified.

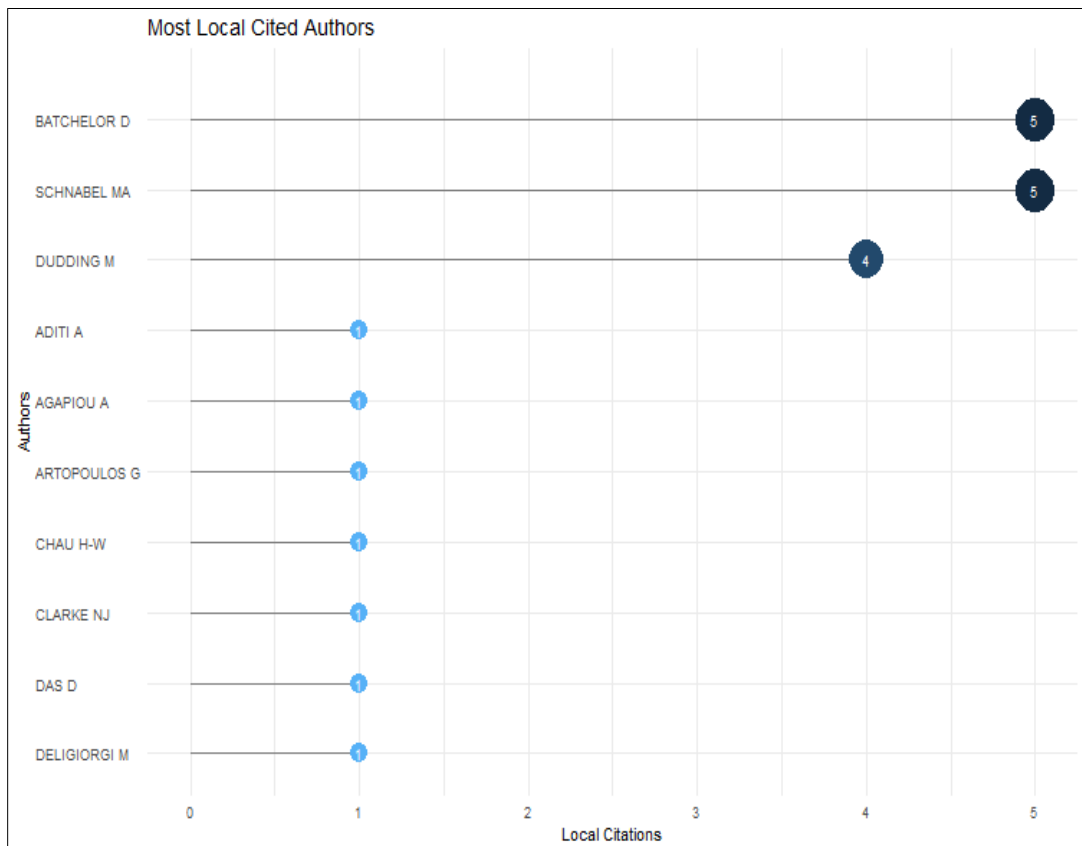
Figure 5: Most Relevant Sources



Source: Created by authors

This figure will determine the most popular journals in the field. Articles like Sustainability, Buildings, Sensors and Cities predominate and it reflects how interdisciplinary the research can be. This justifies the thesis approach to the work of Kolhapur, which is to integrate sustainability, built environment studies and smart technologies into heritage planning.

Figure 6: Most Local Cited Authors

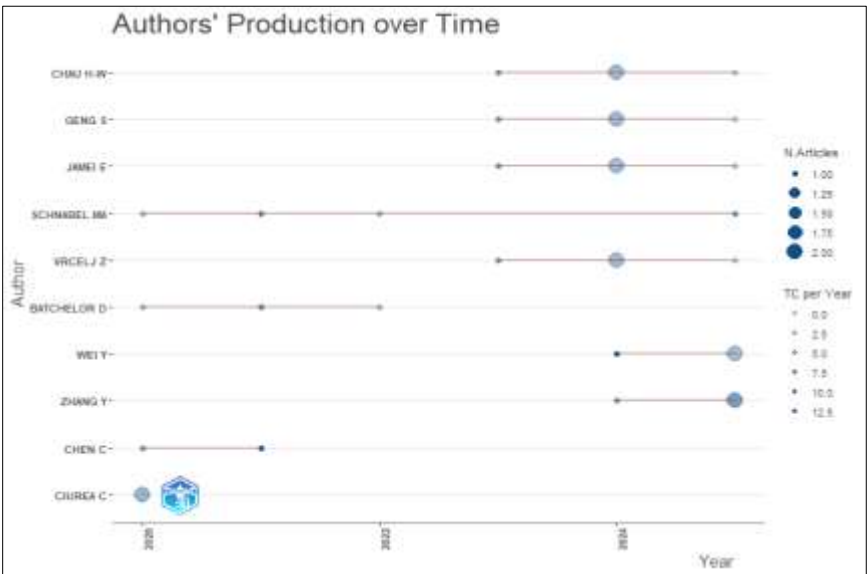


Source: Created by authors

This figure shows authors whose local citation numbers are the highest, which means they are the most influential intellectuals in the field of the research. The theme of their work mostly centres around smart city setups, sustainability, and preservation of heritage and creates a very solid conceptual foundation in this study. Such authors provide insights on the planning principles embraced in planning heritage-sensitive smart urban development in Kolhapur.

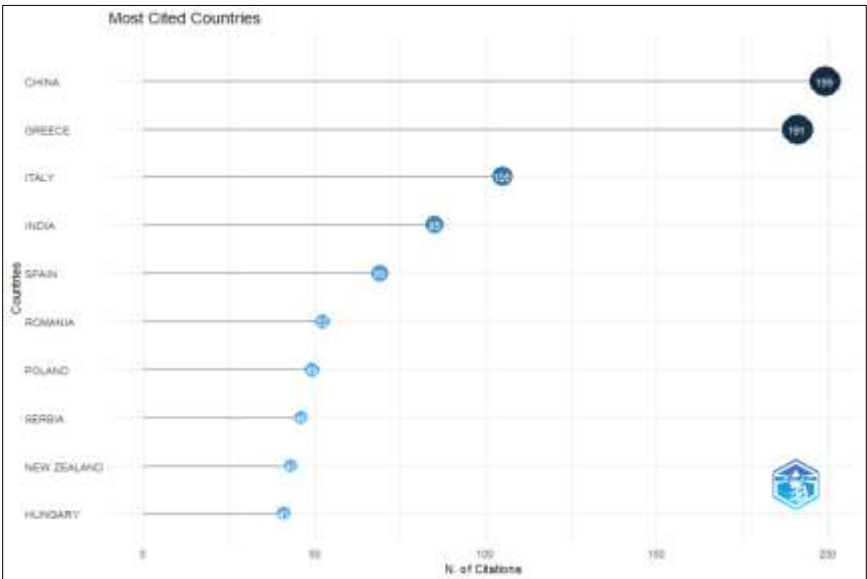
The graph illustrates the publication trends of the authors on a year-by-year basis. Few writers have a track record of contributions, with most having on and off publication records. This implies the researchers of various disciplines are attracted to the field, which supports context-specific research, like Kolhapur, instead of generality in smart cities models.

Figure 7: Authors' Production over Time



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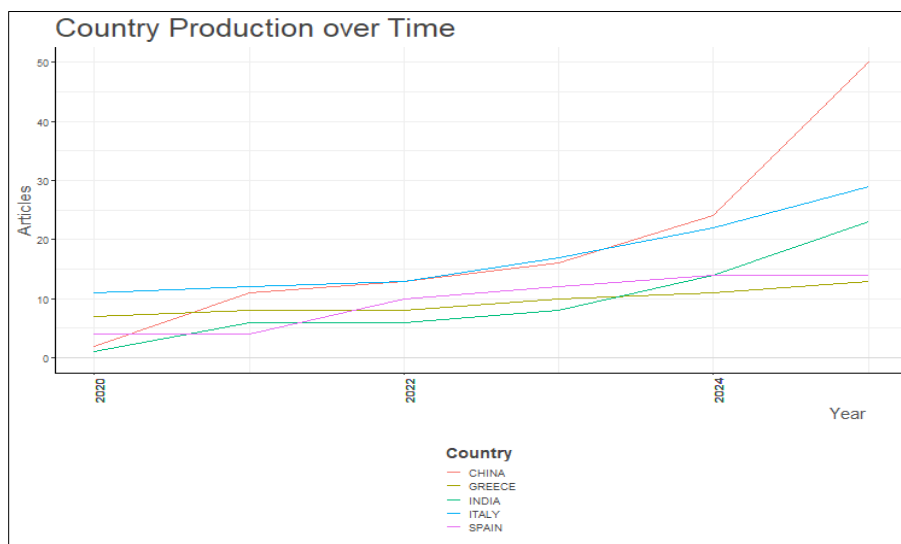
Figure 8: Most Cited Countries



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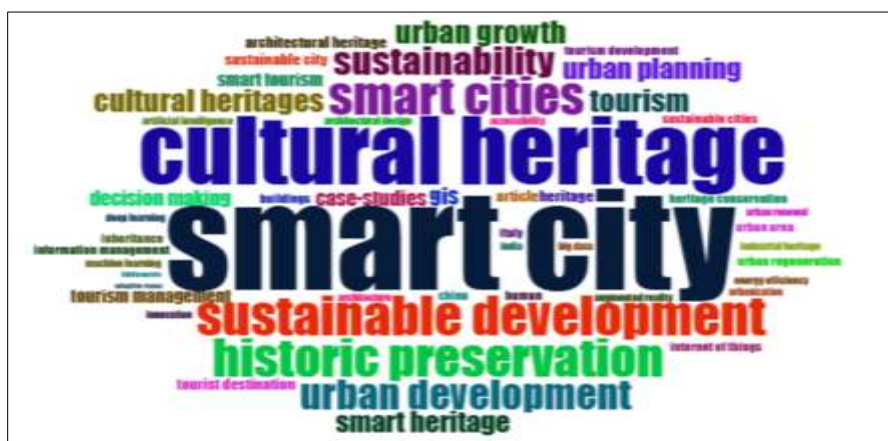
This figure gives the countries with the best citation impact. Top in the list are China, Greece, and Italy with India coming after. The first characteristic of these nations is their historic cities and good heritage properties that make them the relevant comparators of Kolhapur. The development of citation presence in India shows that there is more academic interest on heritage based smart urban development.

Figure 9: Country Production over Time



Source: Created by authors

Figure 10: Keyword Word Cloud



Source: Created by authors

This figure shows the increase of publications by country over period of time. China has been experiencing high growth rates and India has experienced a gradual growth in research output. This pattern indicates the increasing national concern with smart city projects, and the heritage preservation issue, which underlines the topicality of the research on Kolhapur as a part of the discourse of urban planning development in India.

The term cloud illustrates the most used keywords in the literature. Dominating concepts like smart city, cultural heritage, sustainable development, and historic preservation support the main focus of the research area. Such themes are closely related to the planning issues of Kolhapur where conservation and modernization should co-exist.

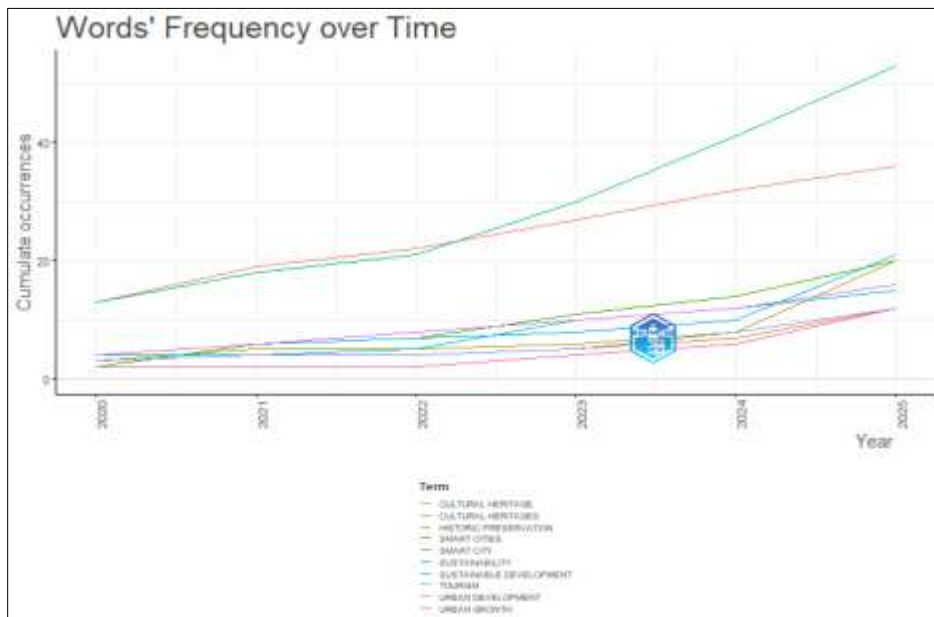
Figure 11: Keyword Tree Map



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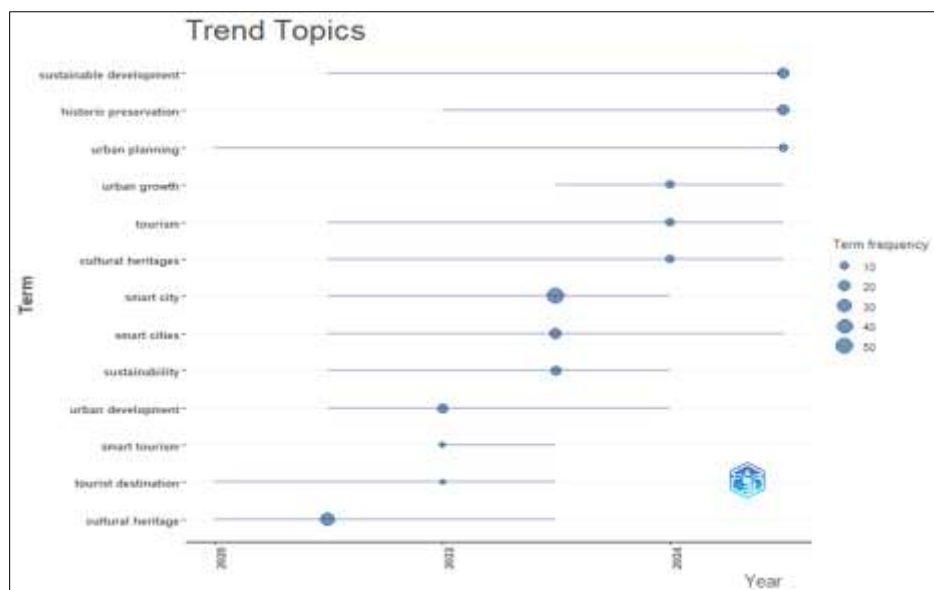
The tree map presents the relative importance of the keywords in terms of frequency. Big nodes of smart city and cultural heritage imply their key position and the use of such terms as GIS, tourism, smart heritage, and urban planning suggests the new planning instruments that can be used to oversee the work of heritage precincts in Kolhapur.

Figure 12: Words Frequency over Time



Source: Created by authors

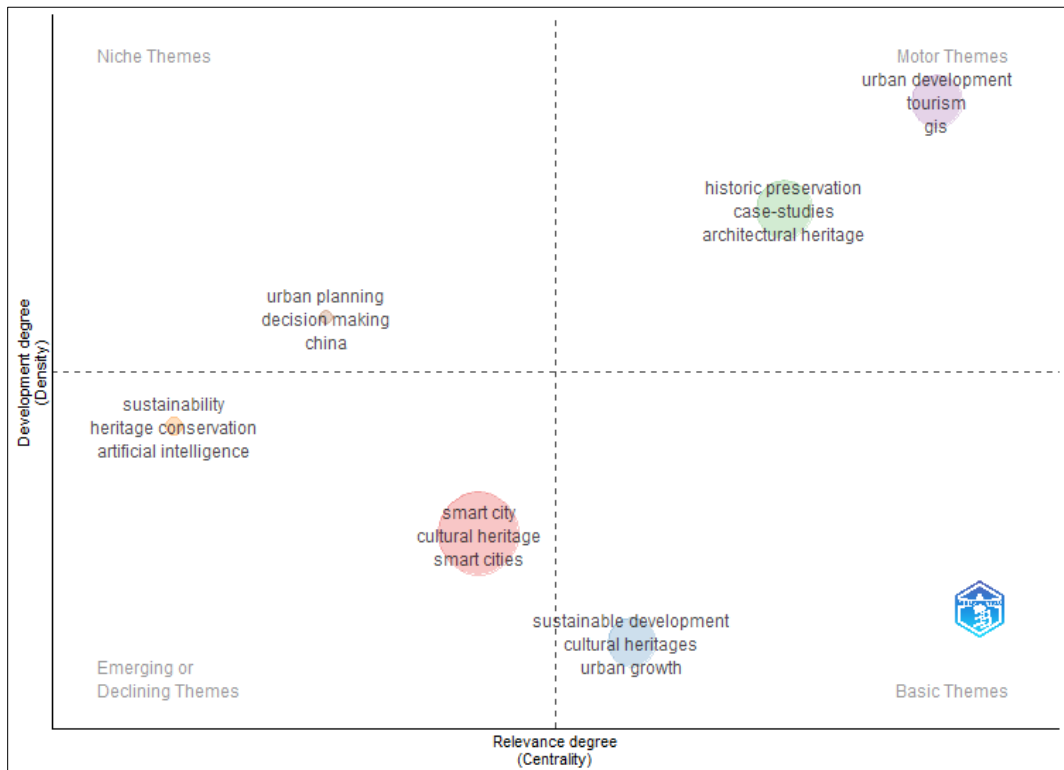
Figure 13: Trend Topics



Source: Created by authors

The conceptual structure map organizes several keywords into thematic clusters and it has strong connections between smart technologies, heritage conservation, urban planning, and digital tools. This grouping encourages the integrated planning strategy that is suggested in Kolhapur, in which smart interventions should be consistent with heritage-sensitive development.

Figure 15: Thematic Map



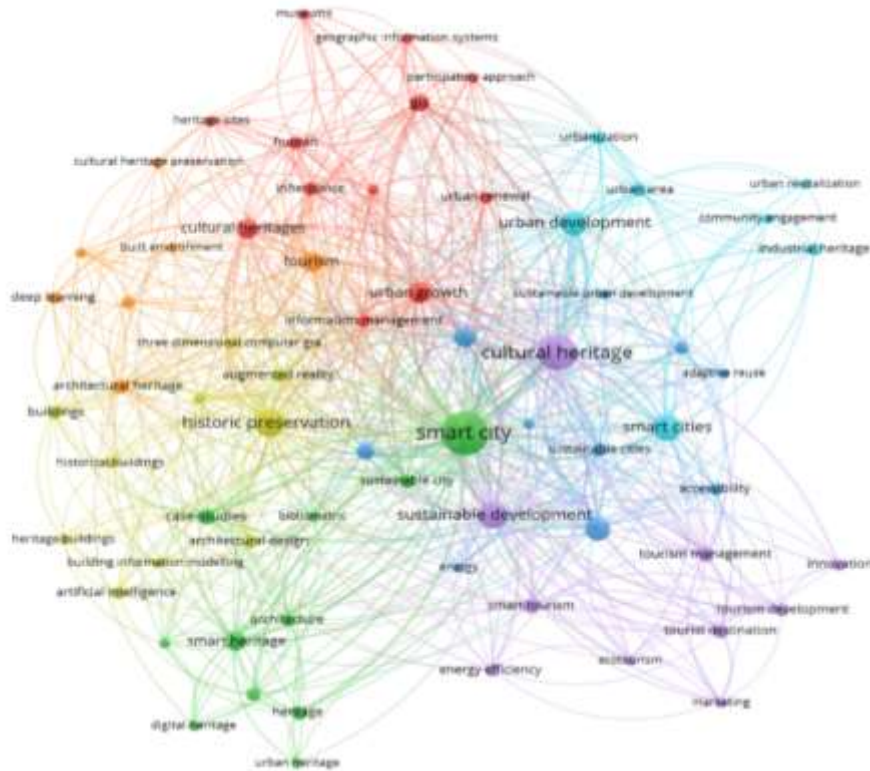
Source: Created by authors

The thematic map divides the research themes into basic, motor, niche and emerging themes. Basic themes contend to be smart city, cultural heritage and sustainable development and urban development and tourism are motor themes. New themes like artificial intelligence and digital heritage indicate emerging planning opportunities of Kolhapur.

The co-occurrence network shows that there are strong interconnections between sustainable development, cultural heritage and smart city. This validates the fact that the existing studies support the concept of integrated and holistic planning models, which is why

a smart urban planning framework that will retain the cultural identity of Kolhapur and still facilitate modernization is necessary.

Figure 16: Keyword Co-occurrence Network



Source: Created by authors

7.0 Historic Background of Kolhapur

Kolhapur is situated on the Brahmapuri branch of the Panchganga River and is historically known as Dakshin Kashi, reflecting its long-standing religious and cultural significance. City has been influenced by the reign of various dynasties such as the Mauryan dynasty, the Bahamani dynasty, and then the rule of Maratha dynasty introduced by Chhatrapati Shivaji Maharaj, the successors of which continued to lead the region. One of the most important stages in the urban, social, and cultural development of Kolhapur was the period of the reign of the Chhatrapati Shahu Maharaj (1894-1922). His reformist rule was very influential in the social setup of the city, education and the economy of the city. Shahu Maharaj was the pioneer of nurturing an inclusive development of Kolhapur; he was an advocate of education as a means of social justice and equity. His policies gave rise to the

boarding movement where students with varied social and economic backgrounds could now access education, and this played a major role in leading to universal primary education. In addition to institutional changes, Shahu Maharaj also saw the significance of cultural expression in the transformation of society. He advocated conventional folk-art genres like Tamasha and promoted theatrical productions to spread the Satyashodhak ideology, thus making the culture more aware and socially reformative. Such efforts not only contributed to the cultural life of Kolhapur, but they also made it an even more progressive and socially aware city. The inclusive governance, cultural patronage, and educational progress of the past also permeate the urban identity of Kolhapur, and this city is a heritage city today, where traditional cultural values and modern progressive values co-exist and makes it a case study in terms of the sensitive nature of urban planning in relation to heritage.

7.1 Background and rationale (Intangible)

- Mahalaxmi Festival (Navratri & Rath Yatra): It is a festival dedicated to Goddess Mahalaxmi, which has colorful chariot processions, rituals and considerable crowds of worshippers.

Figure 17: Intangibles of Kolhapur



Source: Created by authors

- Jyotiba Yatra: Huge pilgrimage, where followers bring sticks of Sasan of Jyotiba Temple and have nightly processions, and music.
- Kolhapur Royal Dussehra: It contains several events which are official and promoted by the state including folk arts, royal weapons worship (Shastra Puja), procession, dances, and cultural demonstrations.
- Wrestling (Kushti): Traditional akhadas (wrestling schools) and annual matches, reflecting local pride in strength.
- Kolhapuri Chappals and Jewelry: Generations-old crafts such as handmade leather slippers and the ornamental Kolhapuri Saaj necklace.

7.2 Background and Rationale (Tangible)

Figure 18: Tangibles of Kolhapur

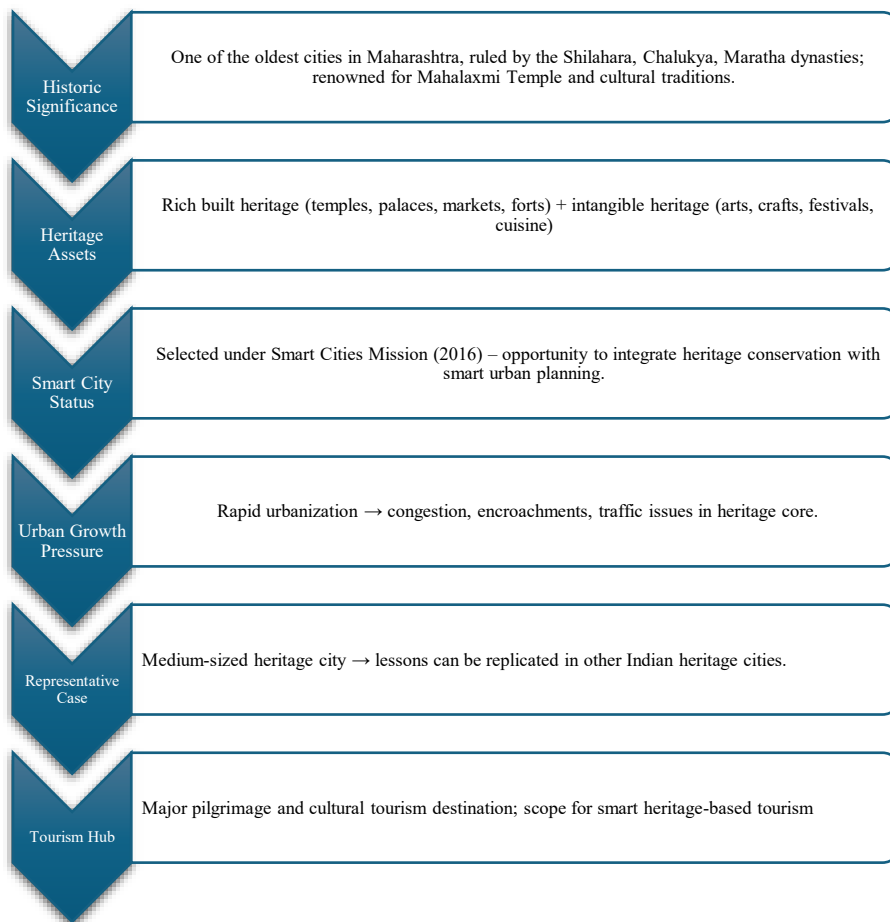


Source: Created by authors

- Mahalaxmi Temple: Temple that was built in 7 th century during the Chalukya rule and was dedicated to the Goddess Mahalaxmi (Ambabai), which is a key spiritual site in Kolhapur.
- Jyotiba Temple: Binkhambi Ganesh Temple: Unique for its pillar-less construction, dedicated to Lord Ganesha.

- Panhala Fort: Maratha-era hill fort, strategic and historic, with expansive views across Kolhapur's heritage landscape.
- New Palace: Stunning Indo-Saracenic palace (built 1884), former residence of Kolhapur's rulers, now a museum of royal artifacts.
- Rankala Lake: Natural 9th-century lake associated with local mythology; surrounded by palaces and a Shiva temple.
- Town Hall Museum: Neo-Gothic building from 1876 now displaying artifacts from Kolhapur's history.
- Panchganga Ghat: Historic and religious riverside bathing ghat, a hub of festivals and rituals.

7.3 Identification of study area: Why Kolhapur ?



Source: Created by authors

8.0 Data Collection and Analysis Framework

8.1 Primary data collection

First hand data were gathered to record the ground level environment and world view of the stakeholders in the heritage core and buffer zone of Kolhapur. Methods of data collection were structured household surveys, business survey, and vendor survey of the heritage-influenced business districts, tourist and pilgrim intercept survey of major heritage destinations, semi-structured interviews with municipal officials and planning practitioners, group discussion with residents and local organizations, and field observation survey. Moreover, brief technical audits were carried out to evaluate the urban infrastructure components which include the drainage, pedestrian structures, signage and public amenities.

8.2 Secondary data collection

The secondary data were gathered to put in place a policy, spatial and a historical context of the research area. This consisted of statutory development plans, Smart Cities Mission project reports, census and ward-level socio-economic information, cadastral and topographic maps, the existing GIS layers of land use and transport network, satellite imagery of land-use change and environmental evaluation, and peer-reviewed scholarly sources pertaining to smart cities and heritage planning.

8.3 Data analysis

The gathered data was discussed by combining the analytical approach based on PESTEL analysis, the Historic Urban Landscape (HUL) technique, and the methods of assessment of infrastructure.

Table 2: Stakeholder

Stakeholder Category	Sub-Category / Examples	Data Collection Method (How you collect data)	Analysis Framework Applied (How you interpret data)	Expected Outcomes
Government / Policy Level	- Municipal Commissioner & Mayor - Smart City Mission Office - State Urban Development/Heritage Dept.	Key Informant Interviews (Semi-Structured)	PESTEL + Smart Heritage Governance	Policy structure, funding, administrative coordination, regulatory constraints

Technical / Implementing Departments	- Town Planning Dept. - Traffic & Transport Dept. - Sanitation & Waste Management Dept. - Water Supply & Drainage - Archaeology/Heritage Cell	Structured Expert Interviews + Department Data Request	PESTEL + Smart Heritage Readiness + Risk & Infrastructure Assessment	Infrastructure condition, operational gaps, inter-departmental coordination level
Institutional / Knowledge Support	- Academic Institutions - Research Labs - Universities & Architecture Colleges	Expert Interviews + Document Review	Knowledge Integration + HUL / ISUF Research Mapping	Research capacity, available documentation, GIS/heritage mapping support potential
NGOs / Community Organizations	- Local Heritage Groups - Cultural Trusts - Environmental & Civic NGOs	Interviews + Focus Group Discussions (FGDs)	PESTEL (Social & Governance) + Community Engagement Framework	Participation level, outreach capacity, cultural awareness gaps, potential for joint action
Residents (Local Community)	- Residents in Heritage Core - Residents in Adjacent Wards	Household Surveys + FGDs	PESTEL (Social/Environmental) + HUL (Community Perception & Urban Fabric)	Livability, civic service satisfaction, heritage value perception, problem hotspots
Local Businesses & Vendors	- Shop Owners in Temple Bazaar - Food Vendors - Tourism Service Providers	Business Surveys + Informal Interviews	PESTEL (Economic) + Economic Sustainability Framework	Economic dependence on heritage areas, effects of congestion, digital payment adoption
Craftspeople & Artisans	- Kolhapuri Chappal makers - Jewellery, brass/metal artisans	Semi-Structured Interviews + On-Site Observation	HUL (Intangible Heritage) + Livelihood Sustainability Assessment	Craft continuity, youth involvement, market constraints, preservation needs
Visitors / Tourists / Pilgrims	- Temple Visitors - Sightseeing Tourists	Short Intercept Surveys at Sites	PESTEL (Social/Tech/Environment) + Visitor Experience Framework	Visitor satisfaction, amenity adequacy, cultural interpretation awareness
Physical Site / Heritage Assets	- Temples - Forts- Lakes / Ghats - Historic Streets & Markets	On-Site Observation Checklist + Photographic & GIS Mapping	HUL (Spatial + Physical Integrity) + ISUF (Urban Morphology)	Building condition, encroachment level, walkability, signage condition, environmental risks

Source: Created by authors

Quantitative data were surveyed and analysed statistically using descriptive statistical measures to determine spatial and perceptual differences between heritage core and buffer areas. Thematic analysis of qualitative data collected through interviews and focus group discussions was conducted to identify thematic important planning issues, governance problems and priorities in community. The GIS-based mapping was used to analyse spatial data to determine the land-use patterns, the distribution of infrastructures and features of the heritage precincts. Synthesis of the results was carried out to provide guidelines on how to develop a heritage-conscious smart city planning system that can be applied to Kolhapur (and other historic cities).

9.0 Research Framework and Questionnaire Design

The research paper assumes an interdisciplinary method of analysis with the PESTEL analysis, the Historic Urban Landscape (HUL) model and Infrastructure and Risk Assessment to explore smart urban planning in the framework of a heritage city. This model makes it possible to perceive external forces, culture and values, urban structure, infrastructure functionality, and city governance in Kolhapur in a holistic manner.

9.1 Integrated research framework

- PESTEL Analysis has been used to evaluate political, economic, social, technological, environmental and legal forces in the development of smart heritage city.
- The Urban form, cultural identity, heritage values and community perception of the historic core and culture were evaluated using Historic Urban Landscape (HUL) framework.
- Infrastructure and Risk Assessment Involving water supply, sanitation, drainage, mobility, safety and environmental risks to heritage precincts.

All these frameworks are integrated to make sure that they take into consideration the tangible and the intangible heritage dimensions as well as the readiness of smart cities and the resilience of the infrastructure.

9.2 Questionnaire design and parameters

Following the integrated framework, a questionnaire, which is structured based on question-and-answer format, was designed to obtain the perception and experiences of various stakeholder groups. The parameters that were included in the questionnaire entailed:

- Demographic profile
- Existence of basic city services of reasonable quality.
- The mobility and safety conditions are considered.

- Environmental conditions
- Cultural value, identity and usage: how often culture is discussed and followed.
- Community perception (social places, social communication)
- Ruling and involvement (redressal of complaints and involvement)
- Digital and smart city preparedness (knowledge, desire, and utilization).

These were the parameters chosen because it represents the reality of heritage city planning, whereby, the interventions of technology must align itself with the social, cultural, and spatial environment

9.3 Sampling strategy

The sampling was undertaken using a stratified systematic random approach that guarantees that there is a balanced representation amongst the spatial zones. The study region was subdivided to heritage core area (65% and the buffer/surrounding area (35%). The size of samples used was based on the population of Kolhapur district with proportionate samples of the two zones being used to cover differences in the intensity of heritage, infrastructure status, and community perception.

9.4 Relevance to the study

The proposed research framework and questionnaire design is structured and evidence-based way of comprehending the challenges of smart planning of Urban Kolhapur. The approach underpins the creation of a heritage-conscious smart planning approach that allows balancing urban development, cultural conservation, and technological assimilation.

10.0 Expected Outcomes and Further Scope of Study

10.1 Expected outcomes

In accordance with the literature analysis, bibliometric analysis, and the suggested mixed-method research frame, the study will produce the following results:

1. Identification of Planning Gaps: As part of the research, the researcher anticipates that the gaps in current interventions of smart city in Kolhapur will be identified, especially the absence of coordination between infrastructure development and heritage conservation outcomes and the demands of the community.
2. Heritage-Sensitive Smart Planning Parameters: The study will determine the essential parameters that can combine the smart technologies with the heritage values, such as mobility management, the quality of the public space, the instrumentality, and preservation of cultural assets.

3. **Stakeholder-Based Insights:** The survey, interviews, and FGDs will help the researcher to draw different perceptions among the stakeholders residents, artisans, tourists, and institutions of the heritage core and buffer areas.
4. **Assessment of Smart City Readiness:** The results will point to the willingness of Kolhapur to smart governance, digital solutions, and participatory planning and denote the institutional and capacity-related shortcomings.
5. **Smart Urban Planning Framework Proposal:** The most critical finding of the research will be the development of a city-specific smart urban planning model that facilitates balance between heritage preservation, sustainability, and urban development in medium heritage cities.

10.2 Further scope of the study

Although this study is limited to Kolhapur, there are other ways in which the method can be broadened:

- However, the framework applied to other Indian heritage cities like Nashik, Ujjain, or Madurai to compare it with other ones.
- Adoption of developed smart solutions of digital twins, AI-driven traffic control, and real-time heritage monitoring tools.
- Long-term research to measure the effectiveness of smart heritage planning strategies in the long-term.
- Climate resilience and disaster risk planning in inclusion into heritage precincts.
- The assessment of Smart Cities Mission policies at the policy level through a heritage-based planning approach.

11.0 Conclusion and Planning Implications

The issues faced by heritage cities in India are how to balance between fast urbanization and protecting the cultural identity, historic urban structure, and customs based on community. This paper shows that the current smart city practices tend to focus on technological and infrastructure centred solutions at the expense of institutional, spatial and cultural aspects of historic urban cores. The research presents a literature review, bibliometric analysis, and design of an organized research methodology, which proves the need to develop a policy-based smart urban planning framework based on heritage sensitivity.

Kolhapur is used as the case study; the study highlights the fact that the tangible heritage assets, intangible cultural practice, and daily socio-economic activities are entrenched in the spatial structure of the city. Based on the PESTEL analysis approach and the Historic Urban Landscape (HUL), along with the infrastructure performance and risk

assessment, the analytical framework also offers a policy-appropriate prism to explore the governance mechanisms, regulatory lapses, infrastructure operation, and heritage management practices. This framework is especially correlated to national urban projects, including the Smart Cities Mission, which emphasizes the necessity to promptly coordinate smart city projects, development policies, and heritage conservation policies.

The study has at the present level created a strong data collection framework. The analysis of primary data collected during the household survey, interviews with stakeholders, focus groups, and on-site observations will be done in the next step, which will be facilitated by the secondary sources of the statutory plans, census data, GIS layers, and policy documents. This combined examination will make it possible to identify the key parameters of planning priorities, spatial differences, and governance-related issues that need to be addressed in terms of policy, especially in the areas of the heritage core and buffer zones of the city of Kolhapur.

The research will generate clear planning deliverables to facilitate the evidence-based decision-making, such as:

- Thematic spatial maps that represent the heritage assets, the physical state of infrastructure, mobility patterns, risks of environmental harm, and the gaps in services.
- Indicative measurements of the smart city readiness, heritage sensitivity, infrastructure resilience and participation of community members etc.
- A smart planning framework diagram policy based and aligned: incorporating heritage conservation, smart governance, and infrastructure development with stakeholder participation.
- Guidelines of strategic planning, which entails short, middle, and long-term intervention in the heritage precincts, and adjacent urban regions.

In the planning and policy perspective the research focuses on the significance of incorporative governance systems, participative planning systems, and spatially conscious regulatory systems. The resultant project is likely to bring on board a scalable, adaptive, and policy sensitive urban planning model that may guide urban development policies in medium cities in India which have heritage. Although the empirical analysis and improvement of the framework is underway, the study is poised to provide practical implications on the planners, the local urban bodies, and the policymakers interested in the systematic and sustainable integration of smart urban development and cultural heritage preservation.

References

1. Ai, Y., Tian, M., & colleagues. (2025). Smart governance and analytics of big data of sustainable development of tourism activities in heritage cities. *Cities*, 138, 104365. <https://doi.org/10.1016/j.cities.2023.104365>

2. Angelidou, M. (2017). The place of smart city features in the strategies of fifteen cities. *Red J. Urban Technologies*, 24(4) 3-28. doi: 10.1080/10630732.2017.1348883.
3. Aroquipa, H., Hurtado, A. I., and others. (2025). Resilience of heritage buildings and disaster risk management Digital twin models. *Sustainability*, 17(2), 1-21.
4. Graham, B., Ashworth, G. J. and Tunbridge, J. E. (2000). *A geography of heritage: Power, culture and economy*. Arnold Publishers.
5. Hole, Y. (2019). Socio-economic and cultural phenomenon of tourism. *Journal of Tourism and Hospitality Research*, 10 (1), 1-8.
6. Komninos, N. (2015). *Smart cities and regions: Invention, networks and digital spaces*. Routledge.
7. MoHUA. (2015). *Smart Cities Mission: And Statement and guidelines*. Ministry of Housing and Urban Affairs Government of India.
8. Newman, P., & Kenworthy, J. (1999). *Sustainability and urban areas: Winning over automobile addiction*. Island Press.
9. Rodwell, D. (2007). *Historical city conservation and sustainability*. Blackwell Publishing.
10. Sahle, M., Lahoti, S. A., & colleagues. (2025). Global South cities Flagship urban parks and sustainable development results. *Landscape and Urban Planning*, 240, 104802.
11. Smith, L. (2006). *Uses of heritage*. Routledge.
12. Tucci, G., Fiorini, L., & colleagues. (2025). Digitalizing the management of cultural heritage and city waterways in risky climatic conditions. *Journal of Cultural Heritage*, 63, 45-60.
13. UNESCO. (1972). *Convention on the protection of the natural heritage and cultural world heritage*. UNESCO.
14. UNESCO. (2011). *Suggestion on the historic city landscape*. UNESCO.
15. UNESCO. (2013). *New life: historic cities: The historic urban landscape approach*. UNESCO.
16. UN-Habitat. (2012). *Sustainable urbanization: Urban settlements report*. Human Settlement Programme of the United Nations.
17. UN-Habitat. (2020). *Smart cities are people orientated*. United Nations Human Settlement Program.