



**Politecnico di Torino**

Department of Architecture and Design (DAD)

Master's of science in  
ARCHITECTURE CONSTRUCTION CITY  
A.Y. 2025/2026

Master's Thesis

**Sacred Urbanism: Regenerating Tirupati's Heritage  
Nodes and Pilgrimage Routes**

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## Acknowledgements

I am grateful to my family for their continuous encouragement and support in my education to pursue my dreams.

I thank my friends, especially Pranay, for being my constant support throughout my academic career.

I offer my heartfelt gratitude to my supervisor, Prof. Willemina Zwanida Wendrich, for encouraging me to explore this topic, and also to my co-supervisor, Prof. Janira Vassallo, for their invaluable guidance and patience in sharing their knowledge throughout the process. I am thankful for their generosity in understanding my situation throughout this journey and helping me to make it possible.

I thank God for allowing me to be a resident of Tirupati, which allowed me to think and contribute in the ways possible for my city.

Finally, I thank myself for gaining a deeper understanding and growing into a better architect.

# Abstract

Tirupati is one of the most significant pilgrimage centers in India, serving as the gateway to the sacred hills of Tirumala, drawing millions of pilgrims annually. While Tirumala is globally recognized for its spiritual significance, the city of Tirupati itself has evolved into a transient urban space, functioning primarily as a transit point rather than a destination in its own right. This has led to the neglect of Tirupati's rich heritage fabric, fragmented pilgrimage routes, and degraded water bodies that once defined its spiritual landscape.

This thesis proposes a regeneration framework rooted in the concept of Sacred Urbanism, seeking to reconnect the city's heritage nodes and revive pilgrimage routes through sustainable and culturally sensitive urban design interventions. By introducing a Green Spiritual Circuit, the project envisions a network of walkable, vibrant, and ecologically resilient corridors that enhance the pilgrim experience while revitalizing the city's cultural economy.

At the macro scale, the study focuses on linking major temples, sacred ponds, and heritage streets through sustainable mobility systems and green infrastructure. At the micro scale, design interventions are proposed for the Govindaraja Swamy Temple precinct, addressing issues of congestion, ecological degradation, and lack of public space quality.

Through literature review, spatial analysis, and stakeholder engagement, the thesis addresses the paradox of Tirupati as both a global pilgrimage hub and a neglected urban center. The outcome is a scalable model that balances spiritual traditions with contemporary urban needs, positioning Tirupati as a vibrant sacred city where heritage, ecology, and pilgrimage coexist harmoniously.

**Keywords:** Sacred urbanism, pilgrimage tourism, heritage regeneration, water heritage, green spiritual circuit, sustainability, Tirumala, Tirupati.

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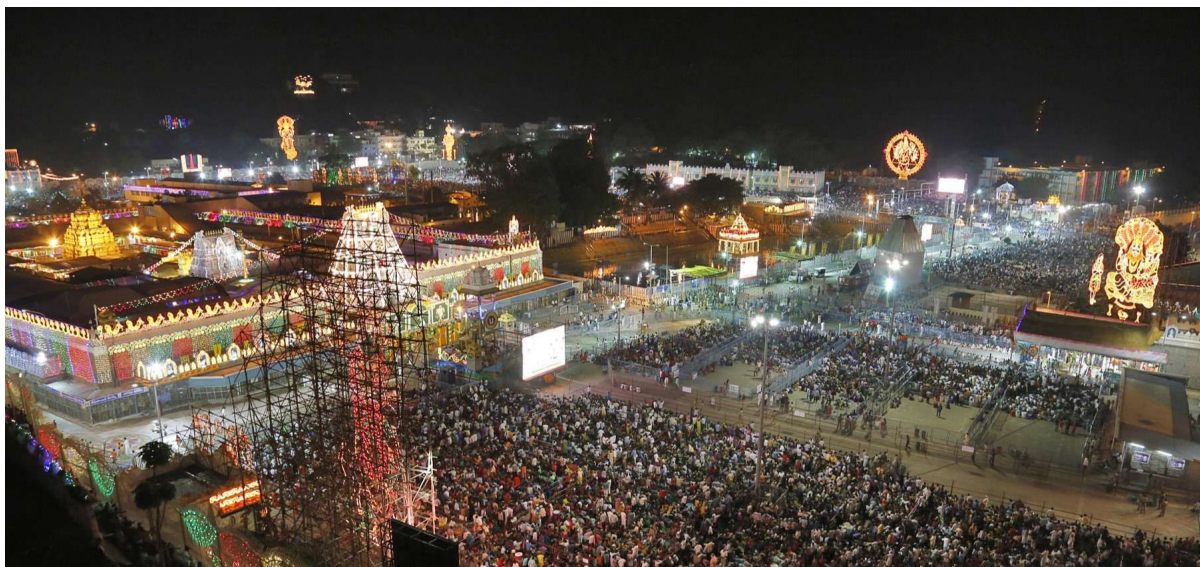
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# Chapter 1: Introduction – Tirupati and the Sacred City

## 1.1 Historical Background of Tirumala-Tirupati Pilgrimage

The Tirumala-Tirupati region is among the most sacred landscapes of India, located in Andhra Pradesh. Its pilgrimage tradition is rooted in both mythology and a long historical evolution for over a millennium. Hindu scriptures hold that Lord Vishnu himself, in the form of Lord Venkateswara, descended to Tirumala in the Kali Yuga<sup>1</sup>, making these hills his divine abode. In recorded history, the main temple's construction began around the 3rd century CE by the Pallava dynasty, then the Chola dynasty, followed by many other successive dynasties such as the Vijayanagara Empire, adding shrines and mandapas<sup>2</sup> over the centuries. They shaped the temple's form, rituals, pilgrimage, and economy over centuries. In the 18th century, the Maratha Empire formalized temple administration, leading to the formation of the Tirumala Tirupati Devasthanams (TTD) by law in 1933.

At the national scale, Andhra Pradesh ranks among India's top domestic tourism states, and Tirupati's temple system anchors a large share of that flow. Currently, the Tirumala temple complex alone sprawls over 16.2 acres, and millions of devotees visit annually, with daily averages around 70,000 pilgrims and reaching more than 100,000 pilgrims per day on special celebrations. As per records, over 25.5 million pilgrims worshipped at Tirumala in 2024 alone, which is the highest annual footfall by any pilgrimage in the world. This continuous flow of pilgrims over millennia has defined Tirupati's cultural identity and economy. Historically, Tirupati functioned as the ritual base town where pilgrims used to prepare for their ascent to the sacred hills of Tirumala. Gradually, the city's layout evolved organically around the shrines, temple ponds, processional streets, and ritual nodes, reflecting a deep connection between urban form, ecology, and spirituality.



*Figure 1: Grandeur of Tirumala temple with pilgrims during Brahmostavam celebrations  
Source: TTD photos*

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<sup>1</sup> **Kali Yuga:** The fourth and final age in the Hindu cycle of epochs (*Yugas*), characterized by a decline in righteousness, morality, and spiritual practice.

<sup>2</sup> **Mandapa:** A pillared hall, porch, or pavilion leading to the inner sanctuary (*garbhagriha*) of a Hindu temple, used for public rituals and gatherings.

## 1.2 The Paradox of Tirupati: Global Pilgrimage Hub vs. Neglected Urban Heritage

Even though it has deep historical and religious significance, today Tirupati city faces a distinct urban paradox. As Tirumala stands as one of the most visited pilgrimage destinations globally, the city itself is largely perceived as a transit node rather than a destination in itself. Pilgrims visit often, stay very briefly in the city, and then move directly to the Tirumala temple, bypassing Tirupati. This results in a unidirectional flow of pilgrims, limiting the quality time spent engaging with the inner city and its historically significant religious and heritage spaces.

TTD's daily pilgrim data reports show a heavy footfall moving continuously to and from the hill. This reinforces the pattern of pass-through pilgrimage rather than exploration of Tirupati's own temples, heritage, and public spaces. This single-destination focus creates a paradox where the city supports the pilgrimage logistically but receives less attention in terms of cultural walking, local markets, and heritage appreciation. As a result, the urban identity and everyday public realm of Tirupati are at risk and are being overshadowed by the uphill shrine's centralized draw, which pulls the city back from urban growth and development.

## 1.3 Problem Statement

The growing detachment between Tirupati's spiritual heritage and its current urban environmental situation presents a critical challenge. The city's historic and sacred network of temples, ritual ponds<sup>3</sup>, and pilgrimage routes is no longer legible or celebrated. Water bodies that once had ritual and ecological importance are polluted, dried, or lost with no care. Vibrant streets, which are meant for processions and pilgrim interaction, have now been overtaken by disorganised traffic and unregulated commercial activities.

As a result, Tirupati fails to offer an integrated pilgrimage experience. Instead, the city is functioning as a logistical base for the Tirumala temple rather than a vibrant sacred destination in itself. So without any strategic interventions, the city is at risk of losing its historical, spiritual identity and potential cultural economy.

### Core Problems:

1. **Fragmented Heritage Nodes:** Discontinuity among temples, ritual ponds, temple corridors, and heritage streets.
2. **Mobility Crisis:** Pilgrim congestion and unsafe pedestrian conditions due to vehicular-dominated street networks.
3. **Neglected Water Heritage:** Degraded, underused temple ponds and disrupted ecological systems.
4. **Economic Underutilization:** Pilgrims' spending is concentrated mostly on Tirumala, with minimal benefit to Tirupati city.
5. **Identity Loss:** Tirupati is perceived merely as a transit point rather than a sacred urban destination in itself.

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<sup>3</sup> **Ritual pond:** A water body in the temple premises which is designed and dedicated to religious, spiritual and ceremonial purposes.

## 1.4 Research Aim and Objectives

### Aim:

To rejuvenate Tirupati's pilgrimage routes and heritage nodes with the concepts of sacred urbanism by creating a vibrant, ecologically resilient, culturally and architecturally rich urban environment that enhances both the pilgrimage experience and the city's cultural economy.

### Objectives:

1. To understand the historical, cultural, and ecological resources of Tirupati.
2. To map and evaluate the state of pilgrimage paths, heritage nodes, and water bodies.
3. To suggest a Green Spiritual Circuit that reconnects fragmented heritage assets through sustainable mobility and ecological strategies.
4. To create design interventions for a heritage node (Govindaraja Swamy Temple precinct) as a model node for urban regeneration.
5. To develop guidelines and recommendations for heritage-sensitive urban development.

## 1.5 Research Questions

1. How can the principles of sacred urbanism be applied to regenerate Tirupati's pilgrimage routes and heritage nodes?
2. What strategies can be adopted to make Tirupati a vibrant city rather than a transient gateway to Tirumala?
3. How can sustainable mobility and green infrastructure improve the pilgrimage experience while protecting heritage and ecology?
4. In what ways can water heritage revival contribute to both spiritual and ecological resilience?
5. What role can urban design play in balancing the needs of pilgrims, local communities, and stakeholders such as TTD and the municipality?

## 1.6 Scope and Limitations

### Scope:

- **Macro Scale:** City-wide urban strategy to link the major temples, which are connected with the history of Tirumala-Tirupati, the ritual ponds, and the pilgrimage streets through a connected network of sustainable routes.
- **Micro Scale:** Urban design and architectural interventions within the Govindaraja Swamy Temple precinct, chosen for its cultural and ecological significance. It can become a model for other heritage nodes within the city.
- Focus on heritage-sensitive urbanism rather than the large-scale infrastructure expansion.

### Limitations:

- The design phase is conceptual, while the implementation phase depends on governance dynamics.

## **1.7 Methodology and Research Approach**

The research follows a macro-to-micro design methodology, integrating planning and design through multiple steps:

1. Literature Review – Understanding theories of sacred urbanism, heritage regeneration, and sustainable mobility.
2. Data Collection – Mapping, surveys, and photographic documentation.
3. Spatial Analysis – Mapping of temples, routes, and ecological systems.
4. Synthesis – Identifying opportunities and challenges based on the results of the analysis.
5. Design Development – Proposals at both city-wide and precinct scales.

## **1.8 Structure of the Thesis**

The thesis is organized into seven chapters:

- Chapter 1: Introduction – Establishes context, problem, aims, and methodology.
- Chapter 2: Theoretical Framework – Urbanism, tourism, sacred cities, and green infrastructure.
- Chapter 3: Context Analysis – Mapping heritage, mobility, ecology, and stakeholder dynamics.
- Chapter 4: Synthesis – Identifies opportunities, challenges, and strategic themes.
- Chapter 5: Macro-Scale Proposal – Green Spiritual Circuit for city-wide connectivity.
- Chapter 6: Micro-Scale Design – Detailed interventions at the Govindaraja precinct.
- Chapter 7: Conclusions and Recommendations – Summarizes findings and provides guidelines.

## **1.9 Significance of the Study**

This thesis contributes to the broader discourse on the sacred cities and sustainable pilgrimage planning by:

- Strengthening Tirupati's identity as not just a gateway, but a living sacred city.
- Offering a replicable framework for cities facing similar transit vs. destination challenges.
- Significance of the proposed interventions as part of creating a green city.
- Integrating ecological resilience through water heritage regeneration.
- Highlighting the potential of heritage-based urban design to boost local cultural economies.

## **Chapter 2: Theoretical Framework – Understanding Sacred Urbanism**

### **2.1 Urbanism and Pilgrimage Cities**

In today's world, urbanism means not just the study of built form and environments; it also includes how people, cultures, their beliefs, and spiritual processes shape cities across the world (UN-Habitat 2016). The International Guidelines on Urban and Territorial Planning define urbanism as a dynamic system integrating land use, mobility, environment, and heritage, focusing on inclusivity and resilience in spatial transformation (UN-Habitat 2016). In the context of pilgrimage cities, urban life also carries a deep symbolic and ceremonial meaning, tied to both physical and metaphysical structures.

Recent research shows pilgrimage routes as catalysts for urban transformations, shaping how spaces form and how communities identify themselves. According to Chodkowska-Miszczyk et al. (2025), pilgrimage routes can help in transforming urban areas, creating fresh forms where people engage socially and also keep the cultural continuity alive. In parallel to this, the work by Singh (2025) on Mathura-Vrindavan shows that pilgrimages often drive the government to reorganise power, altering how places are managed. Sacred landscapes end up functioning not just for worship but also as a framework where administration and land use evolve together.

Across many South Asian temple towns, the morphology of the sacred sites marks the landscape, axial street networks, temple tanks near the temples, and the procession lanes, which altogether bring a clear spatial legibility to the neighborhood. Kızılelma (2023) says that sacred centres influence the urban form and spatial hierarchies. Their ritual importance shapes the surroundings both spiritually and commercially. The space and culture by Burchardt et al. (2023), focusing on Religious Belonging and Urban Space, widens this view beyond regions, revealing how religious spaces still anchor identity within cities, despite growing secularity.

Among the studies on urban planning, the cities tied to religious journeys are recognised as “cultural laboratories” where movement shaped by traditions meets shifting identities and patterns of travel (Choe 2024). Religion-motivated travel or pilgrimage is the oldest form of tourism. It remains a powerful urbanization force influencing places like Tirupati, Varanasi, Mecca, etc., to manage resources, organize authority, and shape shared spaces. Hence, sacred urbanism can be understood as the convergence of spiritual topography blending with infrastructure and environmental networks within a continuously evolving city.

### **2.2 Tourism, Heritage, and Cultural Economies**

Tourism is defined as the number of trips one travels outside their usual place of residence for less than a year for recreation, exploration, religion, etc. The United Nations' IRTS (2010) defines who exactly counts as a visitor and what counts as the purpose of travel. This matters because when everyone uses the same definitions, governments and planners can actually compare data, measure growth, and make better decisions about infrastructure and services.

In India, religious travel has always been a major part of how people move across the country. After the disruptions of recent years, it has come back strongly, with both domestic pilgrims and international visitors coming for spiritual reasons. This is good for local economies, but it also puts a lot of pressure on the towns and temple cities that receive these visitors.

Tourism, particularly religious and heritage-based tourism, is a major force behind the development of local economies and infrastructure. Nearly 30% of domestic travel is religious tourism, according to the India Tourism Statistics (2023), and national policy recognizes pilgrimage paths as crucial development areas. The India Tourism Data Compendium (Ministry of Tourism 2024) further emphasizes that temple towns such as Tirupati, Varanasi, and Shirdi record the highest visitor footfall per capita, stressing the need for developed urban services and sustainable design recommendations (Ministry of Tourism 2024).

From a cultural-economic viewpoint, pilgrimage tourism serves not only as a heritage preservation mechanism but also as a source of revenue. India's spiritual tourism sector is one of the fastest-growing in the world, according to the KPMG in India (2024) Sacred Journeys research, highlighting its potential to stimulate local crafts, hospitality, and cultural industries. Oktay (2024) places this within the framework of sustainable urbanism and identity, contending that if community values are followed, heritage-based regeneration can reconcile economic viability with cultural authenticity.

The Tourism Geographies (Choe 2024) special issue on Religious Tourism and Territorial Development reaffirms that pilgrimage tourism has an impact on urban planning forces that impact urban planning and land use, housing, and mobility regulations worldwide. These studies highlight that heritage and tourism economies should be treated as interdependent systems, but not as parallel sectors, sustaining each other when anchored in authenticity, accessibility, and inclusivity.

### **2.3 Sacred Urbanism: Linking Spirituality and Urban Design**

While enhancing access, safety, ecology, and livelihoods in everyday settings, design must protect the sense of sanctity. Sacred urbanism is a method of looking at cities where religious rituals are practiced across networks, including temples, shrines, ghats, streets, ponds, homes, and markets (Singh 2025; Burchardt et al. 2023). In simple words, streets, routes, and nodes are devotional spaces whose atmosphere and dignity are equally important as capacity and flow because it sees the journey and its sites as part of the sacred experience (Chodkowska-Miszczuk et al. 2025).

Sacred urbanism integrates the spatial, ecological, and ritual elements of cities to produce a comprehensive framework for design and governance. Chodkowska-Miszczuk (2025) describes urban pilgrimage routes as transformative tools that alter both city form and social meaning and views mobility as a sacred act of urban production. (Singh 2025) also sees pilgrimage as a process of creating sacred spaces, where rituals, political systems, and urban governance converge.

The Space and Culture by Burchardt (2023) issue on Religious Belonging and Urban Space reiterates that holy urbanism comprises vernacular shrines, temples, festival paths, and intangible practices that infuse life into ordinary cities. (Cunha 2025) expands on this perspective by linking eco-spiritual urban planning with sacred urbanism, proposing that cities should respect the "rights of nature" through biophilic design and respect for sacred ecologies.

Recent Indian research by Mukhopadhyay (2024) frames sacred urbanism as both a cultural rebirth and an ecological imperative, where reestablishing sacred geographies can offset the separation brought on by industrialization. These ideas translate into incorporating temple precincts, ritual paths, and water systems into modern urban design in pilgrimage sites like Tirupati, thereby balancing spiritual function with environmental resilience.

## **2.4 Sustainable Urban Mobility and Green Corridors**

Both the pilgrimage experience and urban liveability depend heavily on mobility. Sustainable mobility in pilgrimage cities means making it simple, safe, and comfortable for people to travel mostly on foot and by shared, low-emission transportation, particularly during festival surges when densities are high, and streets must support both everyday life and ritual (Ministry of Tourism 2024).

Green corridors are continuous, planted routes that integrate pedestrians, cyclists, and natural flows and are mostly adopted as strategies to lower carbon emissions and enhance microclimates (Ana 2025). When paired with barrier-free design, tree-lined avenues, reflective surfaces, and water points can reduce felt temperatures significantly, reduce fatigue, and increase safety for elders, children, and people with disabilities. Additionally, they offer the physical framework that allows pilgrimage pathways to be reinterpreted for contemporary settings.

Caceido (2023) describes how Bogotá's green corridors made it possible to implement the "15-minute city" model, which promotes accessibility and health while preserving cultural connectivity. Similarly, Zouridaki (2024) sees cultural pathways as opportunities to combine heritage experience with sustainable mobility, using soft transport infrastructure to guide tourists along significant narratives.

Mecca's pilgrimage management offers a technical analogy. Research on Hajj crowd management shows how spatial planning, crowd analytics, and pedestrian-first design guarantee both safety and cultural coherence (Alharbi et al. 2023; Owaidah 2022; Rmili et al. 2025). The Lourdes 2030 Vision, officially proposed by the Sanctuary of Our Lady of Lourdes, also highlights pedestrianization as a spiritual and ecological design priority.

Moscatelli (2024) cites the Darb Zubaydah Hajj Route as an example of combining heritage and transport planning in India, striking a balance between conservation and mobility innovation. Future of Cities (2025) summarizes these strategies into concepts of continuity, shade, inclusivity, and multimodal integration. So, this literature depicts that green corridors are more than just transport infrastructure; they are urban customs of movement, balancing sustainability with holy circulation.

## **2.5 Water Heritage and Ecological Resilience**

Sacred water systems like temple tanks, ponds, wells, and stepwells are essential to Indian cities' ecological memory and cultural identity. Since they have both hydrological function and spiritual importance, Rajendran and TP (2025) highlight that digital documentation is crucial to their sustainable management. By portraying water bodies as public commons that support ecological and cultural resilience, the World Monuments Fund (2025) Historic Water Systems of India initiative similarly encourages restoration through community engagement.



Chaudhary's (2025) analysis of the Sheshnarayan Pond depicts the potential of incorporating sacred tanks into contemporary groundwater recharge systems, providing ideas that are applicable to Tirupati's temple ponds. Raksha S and Harsha T.S. (2024) suggest empirical proof of the water conservation benefits of temple ponds, highlighting their capacity to balance urban aquifers and reduce heat islands. According to the Blue Papers (2022) on Water & Heritage for Sustainable Development and Dhaundiyal's (2026) publication on reconciling heritage with modern water infrastructures, both underscore that cultural water heritage must be positioned as a fundamental urban ecological asset, rather than a decorative one.

Vallerani and Visentin (2022) describe how Indian temple towns might learn from Europe's adaptive reuse of waterways, modifying canals into green cultural corridors. From the above studies, these sources emphasize that revitalizing sacred water systems improves spiritual health, climate resilience, biodiversity, and urban identity.

## **2.6 Heritage Node and Public Space Regeneration**

The revitalization of heritage nodes, as places where the spatial intersections of culture, economy, and faith represent an important area for sustainable urbanism. Through South Indian temple precincts, Abdurahiman et al. (2022) illustrate that revitalization must address socio-cultural participation as important as physical restoration. With India's demand for precinct-level revitalization, the URBACT (2022) offers European frameworks where heritage becomes a catalyst for circular economies and social innovation in cities.

Stakeholder participation, adaptive reuse, and economic viability principles that are directly applicable to Tirupati's temple streets are among the performance criteria for heritage conservation established by Abdul Huq and Puthuvayi (2024). The Future of Historic Cities, published by the National Institute of Urban Affairs (Jain et al. 2022), highlights the need for historic precincts to support residential communities by fusing traditional spatial typologies with climate-responsive infrastructure.

Emerald Insight (2025) further introduces context-shaping paradigms that describe micro-scale urban design interventions, like shaded courtyards, local material use, shaded street design, and participatory street design. These frameworks, when paired with the World Monuments Fund (2025) insights on node-based water heritage activation, imply that regenerating a temple node, the Govindaraja Swamy precinct, can combine environmental functionality with cultural storytelling, changing it into a lively, pedestrian-friendly civic space.

## **2.7 Relevant Case Studies in the Literature**

### **2.7.1 Varanasi Corridor Redevelopment**

Varanasi is one of the oldest temple towns in the world, which is located in the state of Uttar Pradesh, and it is popular for the Kashi Vishwanath Temple and the Ganga River. Initially, Hari Chandra built the temple in the eleventh century. Later, Ahilyabai Holkar constructed a second temple here. The Kashi Vishwanath temple's Shivalinga is one of the twelve most important Jyotirlingas in the world.

The city offers a precedent to understand the link among heritage, pilgrimage, and urban evolution. The redevelopment project included reconnecting all the holy places in the town, enhancing accessibility, and revitalizing public spaces with respect to the increasing pilgrimage tourism.



importance of sacred water bodies as environmental infrastructure, supporting the view that spiritual landscapes and ecological systems are closely related.

For Tirupati, Varanasi offers several useful strategies:

- Re-establishing ritual continuity through connected pilgrimage routes.
- Combining heritage conservation with upgrades to modern infrastructure.
- Enhancing public spaces to support both tourism and local identity.
- Treating sacred water systems as cultural and ecological assets.

### 2.7.2 Jodhpur Stepwell Revitalization

The revitalization of historic stepwells in Jodhpur serves as another significant example for this thesis, especially concerning the regeneration of water heritage and adaptive reuse. Historically, stepwells served both practical purposes and social gathering needs. However, rapid urban growth and modern water systems led to their decline and damage. The restoration of Toorji Ka Jhalra, one of Jodhpur's famous stepwells, shows how heritage water systems can be brought back to life as lively public spaces while maintaining their cultural identity. The project brought together architectural conservation and community engagement, turning the site into a cultural and tourism center.



Figure 3: Old Space-New Use: Exhibition space at Toorji Ka Jhalra.  
Source: Times of India.

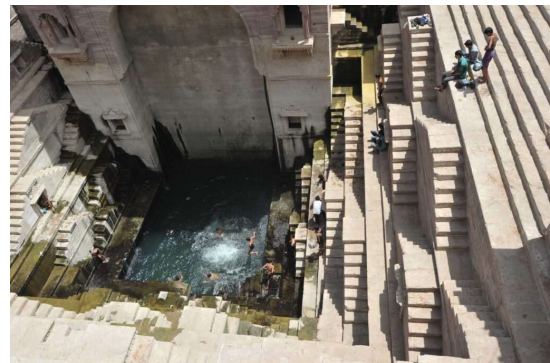


Figure 4: Toorji Ka Jhalra as a Heritage pool.  
Source: Times of India.

The Ministry of Tourism's Swadesh Darshan 2.0 report also highlights organizations like INTACH, which are working on restoring the stepwell while promoting nearby economic activities through cafes, local markets, and tourism-related programs. This shows how restoring heritage can stimulate local economies and boost environmental resilience. Mistry and Suhane (2024) refer to stepwells as "living heritage," stressing that their importance lies not just in their architectural value but in their ongoing social and ecological relevance. Similarly, Mungona and Thakre (2025) support adaptive reuse approaches that balance conservation with current public needs. Technical studies by Parmar and Mishra (2024) also show that stepwell structures can provide passive cooling, highlighting their eco-friendly design in hot climates.

For Tirupati, the Jodhpur example is particularly relevant for revitalizing ritual ponds as multifunctional public spaces, blending ecological resilience with cultural heritage, and creating climates that respond to urban environments using traditional water systems.



### 2.7.3 International Pilgrimage Cities: Mecca and Hajj Mobility Management

Mecca serves as one of the most advanced models for managing pilgrimage crowds and mobility. The city helps us understand how urban design, transportation planning, and digital tools can work together to support large religious gatherings while preserving the spiritual nature of sacred spaces. The Hajj involves a series of rituals between important locations, such as the Grand Mosque, Mina, Muzdalifah, and Arafat. This requires managing millions of pedestrians and transit trips in a tightly packed urban area.

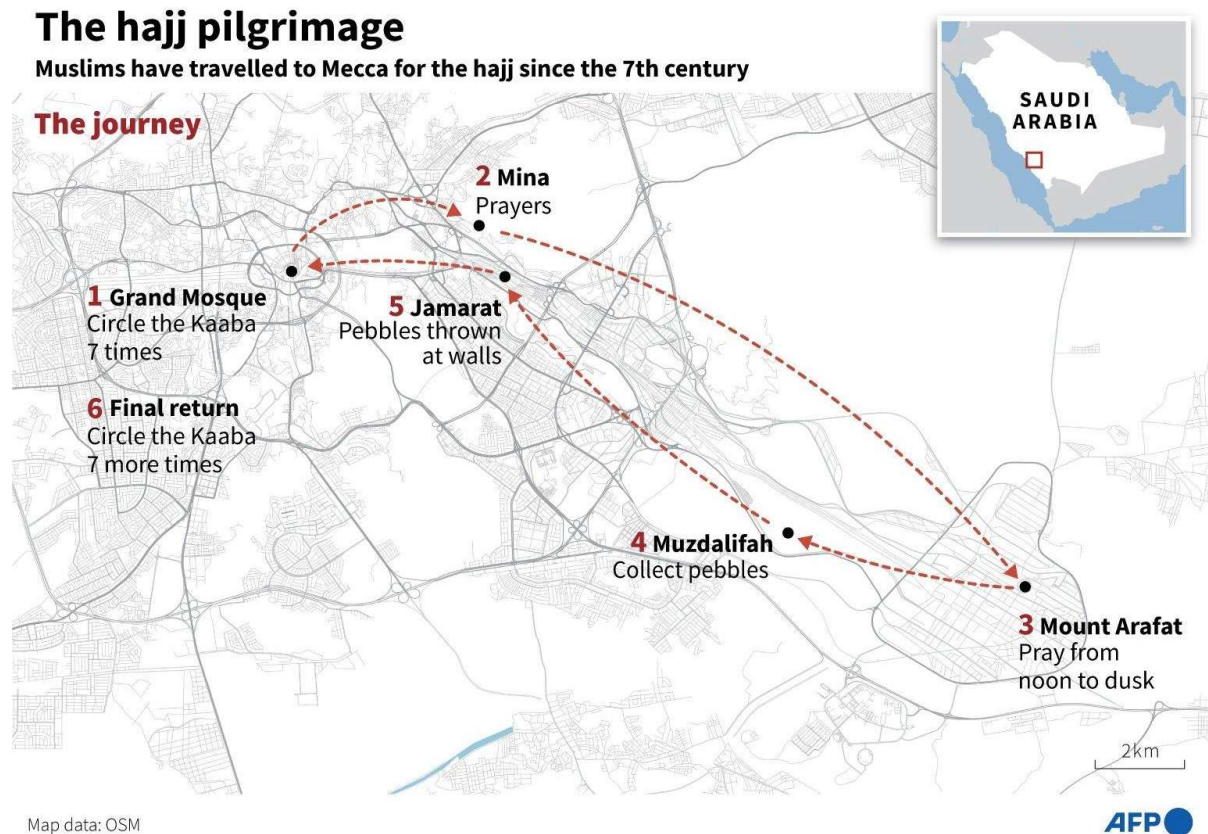


Figure 5: The Hajj pilgrimage © Laurence CHU / AFP

Research on Hajj crowd management shows the heavy use of crowd simulation models, pedestrian flow analysis, and mobility forecasting to improve safety and efficiency. Studies indicate that computer-based crowd analytics and video monitoring systems estimate crowd density, identify congestion points, track pedestrian speed, and anticipate possible bottlenecks before they become dangerous. These technologies aid real-time decision-making and help authorities manage the flow of pilgrims across the ritual pathways (Abalkhail and Al Amri 2022).

A key lesson from Mecca is the intentional separation of pedestrian and vehicle traffic. The city's pilgrimage infrastructure includes dedicated movement paths, elevated walkways, controlled access points, and designated transit routes, reducing conflicts between different types of movement. This design recognizes that pilgrimage is a walking experience, prioritizing pedestrian mobility as a core part of urban planning rather than a secondary concern. The ritual paths themselves become vital urban spaces that shape the pilgrims' experience of the city.

Transportation planning is another important part of Mecca's urban management strategy. Large public transport systems, such as the Hajj metro, shuttle buses, and coordinated transit

services, move pilgrims between major ritual sites and reduce reliance on private vehicles. Integrating transportation systems with pedestrian networks allows the city to manage high travel demands while ensuring organised movement during the pilgrimage. This shows the importance of planning for multiple modes of transport in religious destinations with seasonal visitor spikes.

Recent research spotlights the growing use of smart city technologies in managing pilgrimages. Radio Frequency Identification (RFID)-based wayfinding systems, Internet of Things (IoT) applications, wearable sensors, and artificial intelligence are increasingly used to monitor crowd conditions, guide pilgrims, and enhance emergency responses. RFID navigation systems help visitors locate ritual sites and follow set paths, while wearable tech offers real-time updates on crowd movements and safety. These advancements highlight how digital tools can enhance traditional urban management practices in sacred spaces (Rmili et al. 2025).

Another significant aspect of Mecca's planning is its focus on data-driven governance. Machine learning models and predictive analytics evaluate pilgrimage performance, forecast demand, optimize services, and improve resource use. Using real-time data allows authorities to anticipate crowd conditions and take proactive management steps rather than just responding to issues as they arise. This shows a shift toward evidence-based urban management in pilgrimage cities (Ragab 2025).

From an urban design standpoint, Mecca shows that effective pilgrimage cities need coordinated mobility systems, organized governance, and ongoing monitoring of public areas. The city's planning approach views movement as a key part of the religious experience, ensuring that circulation networks support both spiritual practices and public safety. Even though Mecca operates on a much larger scale than Tirupati, its planning principles like prioritizing pedestrians, organized movement systems, transit integration, and technology-assisted crowd management offer valuable insights for designing and managing other pilgrimage sites.

#### Key Lessons for Tirupati

- Construction of pedestrian walkways and segregation of pedestrian traffic from vehicular traffic to ensure pilgrim safety and comfort.
- Designing pilgrimage routes for integration with public transportation networks to move from one transport node to another and then to the religious destination.
- Hierarchical circulation system involving primary pilgrimage routes, secondary circulation routes, and service routes.
- Availability of congregating areas for pilgrims near main pilgrimage sites.
- Understanding of ritual procession as part of the urban design process in which circulation routes contribute to the spiritual experience of pilgrims.

#### 2.7.4 International Pilgrimage Cities: Fatima, Portugal

Fátima is one of the most significant Catholic pilgrimage sites in the world, centered around the Sanctuary of Fátima, which became renowned after the Marian apparitions reported in 1917. The rise of pilgrimage turned the area from a rural landscape into a city focused on spiritual visits. This transformation linked the city's growth, economy, and layout closely to religious tourism. Studies on Fátima's development show that its growth pattern is unique in Portugal. The sanctuary serves as the main element organizing the urban layout and regional economy (Barbato 2021; Vilaça 2010).

Fátima illustrates how pilgrimage sites shape architectural and urban spaces to support spiritual experiences. Research comparing Fátima with other major pilgrimage sites suggests that the sanctuary's influence goes beyond the church building. It transforms the surrounding area into a sacred space. Public areas, plazas, ceremonial routes, and open gathering spots are designed to host large religious events while strengthening the city's spiritual identity.



*Figure 6: Aerial view of the Fátima Sanctuary, Portugal, showcasing surrounding architecture.  
Source: Marg S.*

A key feature of Fátima is its network of pilgrimage routes called the Caminhos de Fátima. Studies on pilgrimage movement highlight the need for safe pedestrian paths, clear route signs, and walking corridors that connect pilgrims to the sanctuary. Research on the safety of these routes stresses the importance of planning for pedestrians, wayfinding systems, and improving interactions between pilgrims and vehicles. These results show that mobility planning is crucial to the pilgrimage experience (Débora Fino and Cristina Andrade 2018).

Fátima has become a year-round destination for pilgrims and religious tourism. Research shows that visitors come with various motivations requires infrastructure that supports both spiritual activities and tourism services. Managing accommodation, public facilities, commercial areas, and visitor services reveals how pilgrimage cities must balance religious functions with tourism growth. This model shows that pilgrimage planning should be linked with local economic development strategies.

Studies on Fátima's religious area emphasize that the pilgrimage experience goes beyond the sanctuary and includes the wider urban landscape. Research using mental mapping indicates that both residents and pilgrims view the sanctuary, nearby public spaces, and urban environment as a cohesive sacred area (Benatti 2016). This supports the idea that pilgrimage planning should focus not just on individual monuments but also on maintaining the broader cultural landscape and sense of place.

#### Key Lessons for Tirupati

- Development of dedicated pilgrimage corridors and footpaths.
- Integration of religious spaces with surrounding public areas rather than leaving temples isolated.
- Balancing pilgrimage duties with tourism infrastructure and local economic growth.
- Preservation of cultural landscapes and sacred routes as part of heritage planning.
- Designing large gathering spaces that support rituals and manage crowds effectively.



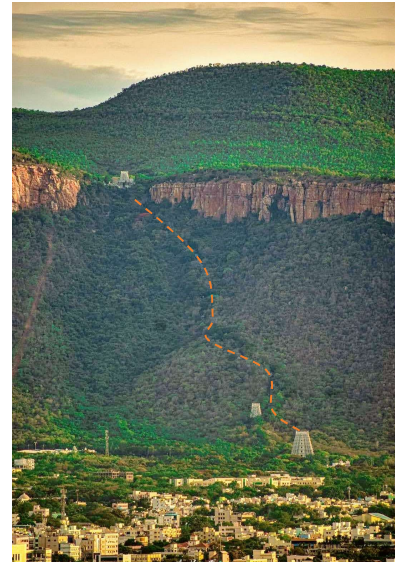
## Chapter 3: Tirupati Context and Analysis

### 3.1 Introduction of the context

Tirupati is one of the most sacred pilgrimage cities in India, recognized as the spiritual capital of the state of Andhra Pradesh. Visiting this pilgrimage in Hinduism has utmost importance, which pulls everyone around India to visit this city at least once. The city is situated under the foothills of the Seshachala mountain range of the Eastern Ghats in India.



*Figure 7: Aerial view of Tirupati.  
Photo: TTD*



*Figure 8: Tirumala Hills - city backdrop.  
Photo: Mukku Sri Hari Kiran*

### Historical evolution

The official books on the history of Tirupati by T.K.T (1997) say that before Tirupati, the area was a small village called Kottur adjacent to the Parthasaradhi temple. Tiruchanur was the most well-known village settlement at that time, which is just 2 miles away from Tirupati, and was famous for the Pallava and Chola dynasty influence on it. Around the start of the 12<sup>th</sup> century AD, Sri Ramanuja visited Tirupati to spread Vaishnavism<sup>4</sup> in South India. During this time, a neighbouring state called Tamil Nadu was ruled by the Chola ruler, who was a follower of Shaivism<sup>5</sup>. He ordered the destruction of all the Vishnu temples in their region, and an idol of Vishnu in the form of Govindaraja from the important Chidambara temple was thrown into the sea, which was later carried secretly to Tirupati since Sri Ramanuja was residing there for his religious responsibilities.

Ramanuja decided to safeguard this idol in the existing Parthasaradhi temple and give the temple a new form of worship. So Ramanuja himself made the first master plan for the temple expansion and the surrounding neighbourhood. He added four lanes called Rajavidhis, a north mada street, and a Sannidhi street around the temple and gave residential plots for the Vaishnava brahmans to grow their community, also to take care of the ritual activities year-round at the temple. He created a new image of Govindaraja for the town and called it Tirupati.

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<sup>4</sup> **Vaishnavism:** a tradition in Hinduism that worships Vishnu as the supreme lord and preserver of the universe.

<sup>5</sup> **Shaivism:** a tradition in Hinduism that worships Shiva as the supreme diety and the creator, protector and destroyer.



Later, from the 12<sup>th</sup> to 14<sup>th</sup> centuries, Tirupati flourished under the rulers of the Tiruvenkadam Yadava Kings, who developed it into a prosperous town. Then, the Vijayanagara emperors made great contributions to the development of the town. In the 19<sup>th</sup> century, the administration was controlled by the British, as the temple's enormous wealth attracted them to gain control over the temple and the city. After the British decline, the area was incorporated into the local municipality by the Indian government, and over time, it became a global hub of spirituality.

## Geographical and environmental context

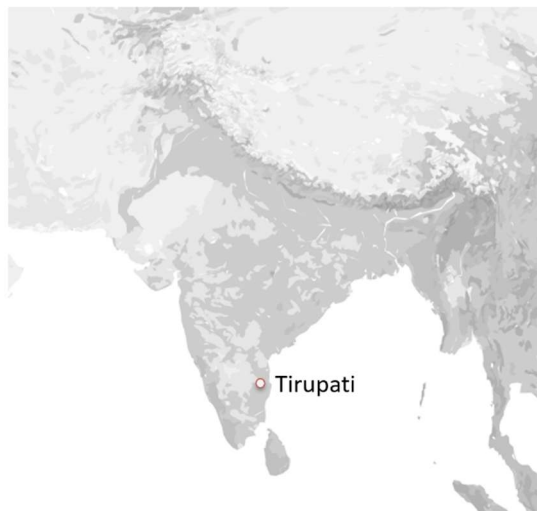


Figure 9: Tirupati's geographical context in India  
Drawing: Author

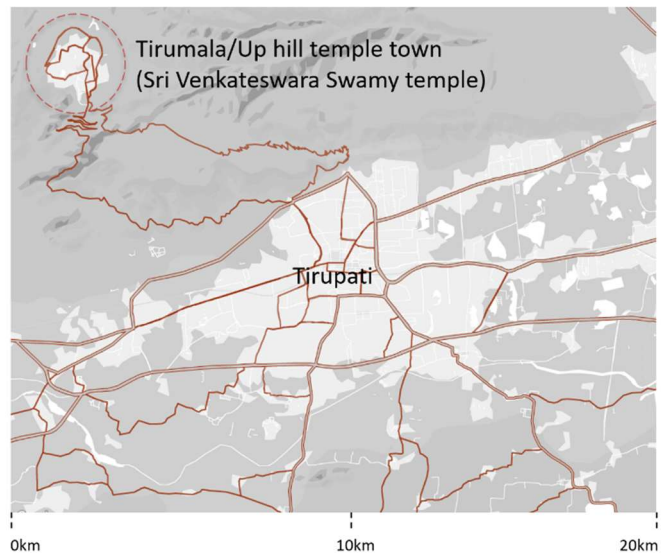


Figure 10: Tirupati-Tirumala geographical context  
Drawing: Author

Tirupati is geographically located in the southern part of India under the foothills of the Sheshachala mountain range. The topography of the city is flat, but its skyline is composed of beautiful, lush green hills with a 360-degree view.

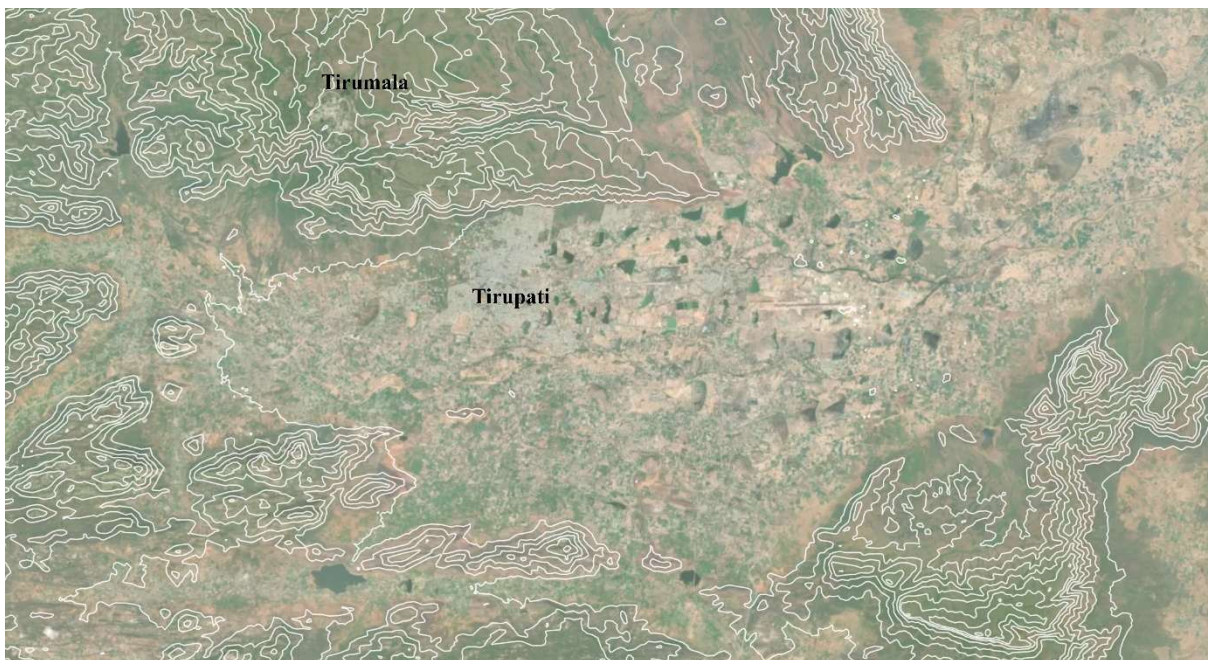


Figure 11: Tirupati-Tirumala Topography  
Drawing: Author from topomaps.io

## Climate

Tirupati has a hot and humid climate, where the wet seasons are hot, oppressive, and overcast, and the dry seasons are sweltering, muggy, and partly cloudy. Over the year, the temperatures typically vary from 17<sup>0</sup> to 41<sup>0</sup> C. The hot season is from the end of March to the start of June, with an average daily high temperature of 39<sup>0</sup> C. The hottest month is May with an average high of 41<sup>0</sup> C and a low of 27<sup>0</sup> C. The cool season is from the end of October to the end of January, with an average daily high of 31<sup>0</sup> C. The coolest month is December with an average low of 18<sup>0</sup> C and high of 29<sup>0</sup> C.

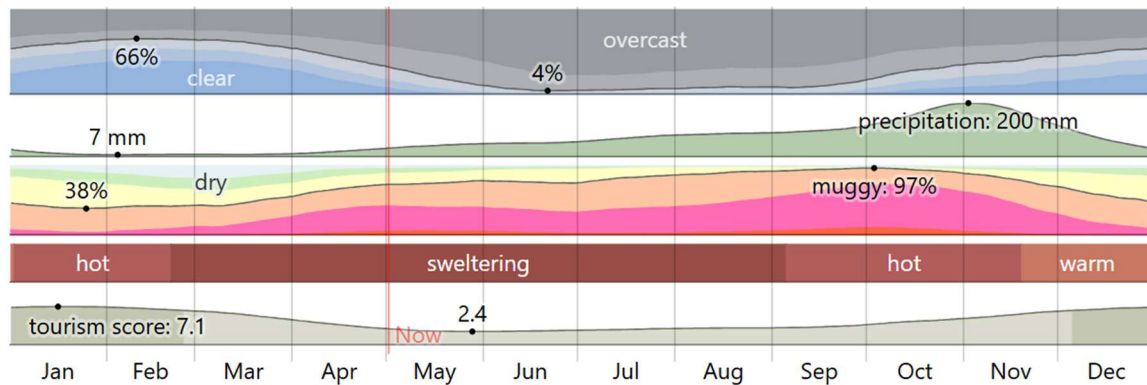


Figure 12: Climate of Tirupati © WeatherSpark.com

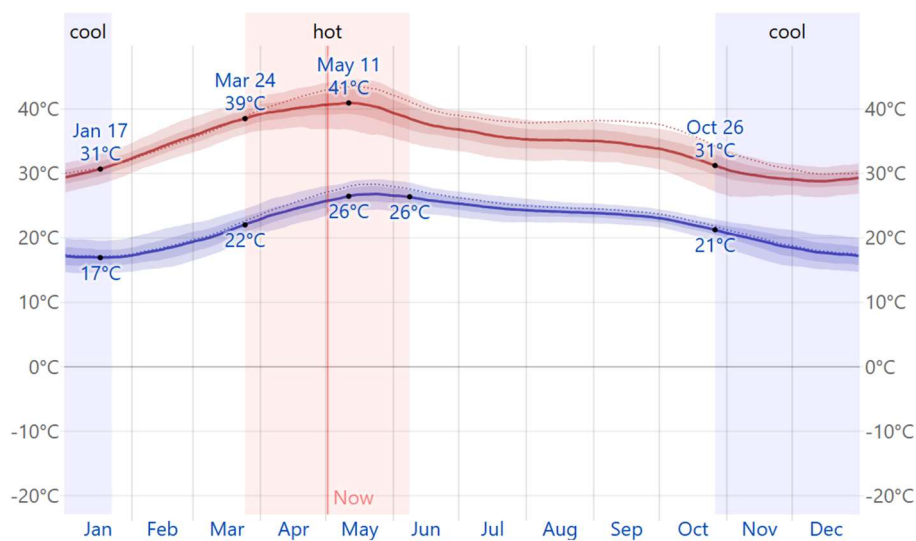


Figure 13: Average high and low temperatures in Tirupati © WeatherSpark.com

As per the tourism score, the best time to visit Tirupati-Tirumala is from December to February. Year-round, the city hosts pilgrims, but May and June, being the hottest period, are expected to have the maximum crowd in the form of students who have finished school and are looking forward to their higher studies. This is a part of tradition where students visit to have the blessings of Lord Venkateswara, which brings more pilgrim crowds to the city during the most uncomfortable and hottest months.

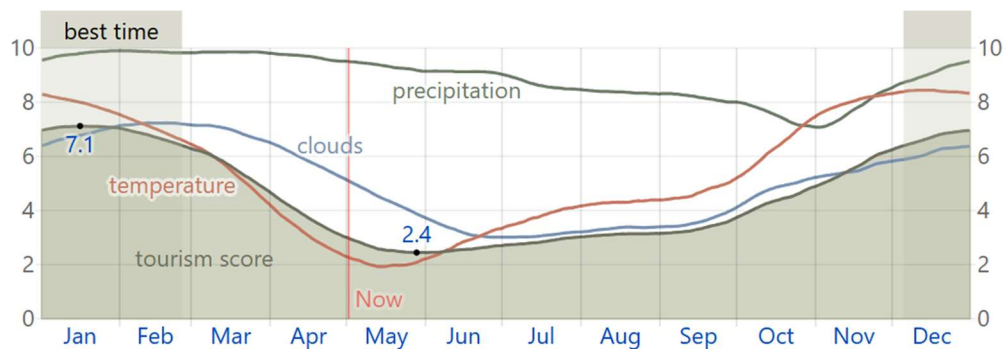


Figure 14: Tourism score in Tirupati © WeatherSpark.com

## Spirit of the place

Tirupati is a city blessed by hills, powered by devotion. Its identity is inseparable from the seven hills that surround it. These hills, known as the Seshachalam range, are not just a geographical backdrop. They are the reason the town exists at all. The presiding deity, Lord Venkateswara, is believed to reside on the seventh hill, Tirumala, and everything about Tirupati- its streets, its economy, and its daily rhythm is organised around that important belief. The town itself sits at the base of the hills, and this relationship between the flatland settlement and the hilltop shrine has defined how Tirupati has grown over centuries. The climb to Tirumala, whether on foot through the forested ghat paths or by road, is understood by most visitors not as a journey to a tourist destination but as an act of devotion in itself. This sense of movement toward something sacred gives the entire town a particular orientation and energy that is hard to find anywhere else.

Thousands of people pass through its transit hubs daily. At street level, Tirupati feels like a town permanently in motion. Pilgrims arrive at all hours, from every part of the country, speaking different languages and carrying different traditions. Yet there is a shared purpose that holds it together. The temple rituals set the pace of the day. The sounds of temple bells and devotional music move through the air in the early morning. The local air carries a distinctive blend of the scent of exhaust fumes mixed with burning camphor, fresh jasmine flowers, and the sweet aroma of laddu prasadam<sup>6</sup>. The streets around the Govindaraja temple and the railway station are always busy with people who have just arrived or are preparing to leave. The architecture at the base of the hills, especially around areas like Alipiri, functions as a psychological threshold. It is where the everyday concrete world slows down, signaling to your mind that you are moving from the mundane to something grander.

What gives Tirupati its spirit of place is not any single monument or street but this continuous act of arrival and devotion that has been happening for over a thousand years. Ramanuja laid out the mada<sup>7</sup> streets and the residential plots in the 12th century to support exactly this kind of sustained religious life, and in many ways the town is still living inside that original intention. The form has grown and changed, but the purpose has not. Today, the city, on the one hand, has ultra-modern infrastructure, and on the other hand, the historic core with temples, traditional street bazaars, and water tanks. The city does not try to hide its ancient roots; instead, it uses modern planning to protect and support them, creating a scope where technological development and timeless devotion actually make peace with one another.

<sup>6</sup> **Laddu Prasadam:** a sacred sweet offering distributed in temples after the worship.

<sup>7</sup> **Mada street;** refer to the sacred streets that directly surround major Hindu temples. They are primarily known for hosting grand temple processions, festivals, and cultural events.



### 3.2 Urban morphology and growth patterns

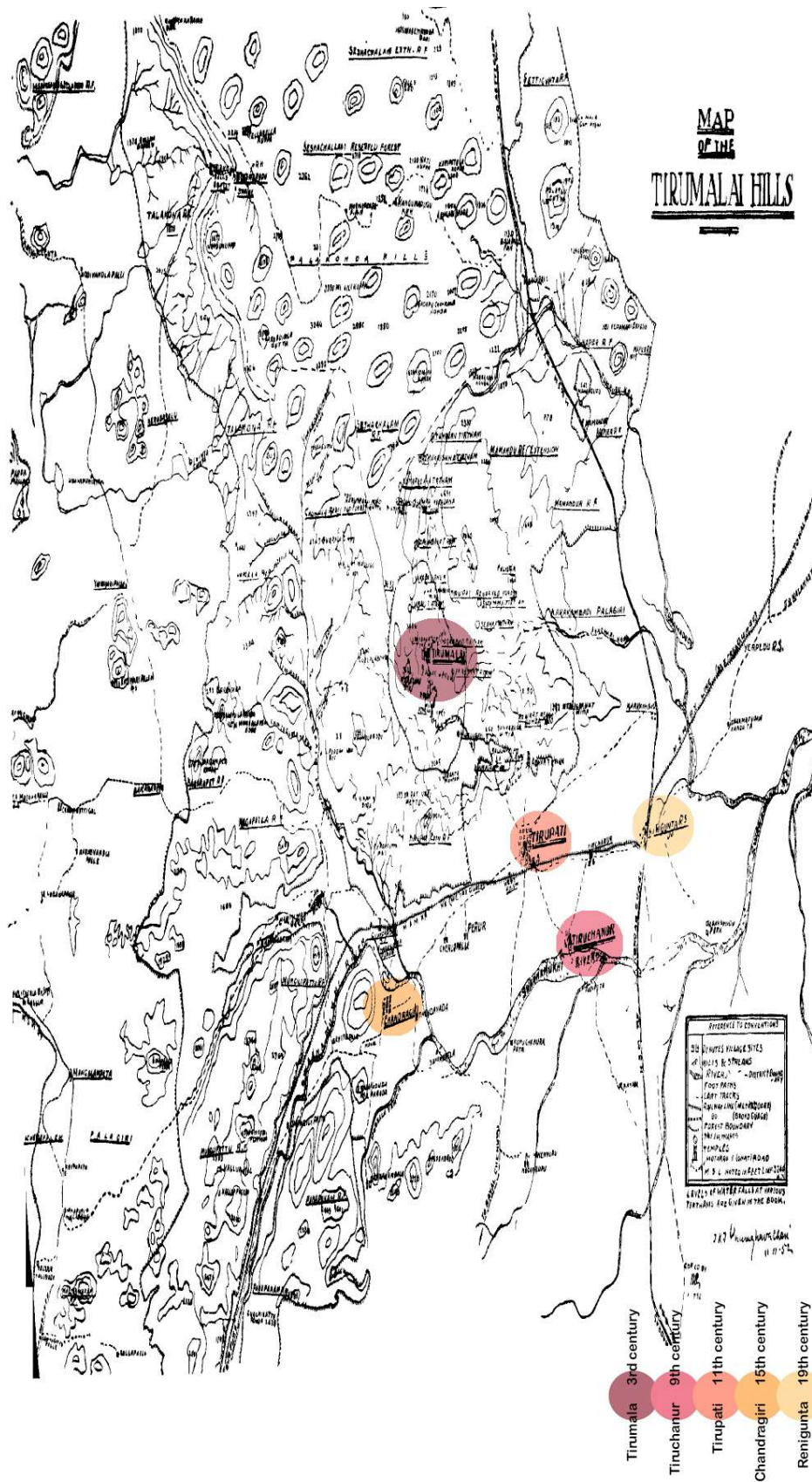


Figure 15: Timeline of Tirumala-Tirupati surrounding neighbourhoods.  
Drawn by T.K.T. in 1952.

Different factors led to the formation of the neighborhoods in and around Tirupati. Some are based on historical ceremonial ties to the major temple, while others are based on administrative authority, political influence, and the expansion of the commerce economy and culture. As per the books on the history of Tirupati and archaeological evidence, the temple town on the hill was formed around the 3<sup>rd</sup> century CE. The important and first settlement that formed below the hills was Tiruchanur because of the Padmavathi temple, which has a ritual history connected till today with the uphill temple. It had completely grown into a divine hub under the Pallava dynasty by the 9<sup>th</sup> century CE. The next settlement that came into existence was Tirupati, primarily to create a new centre for worship below the hill and for the community growth of Vaishnavas. The reason behind that was the Vaishnava guru Sri Ramanujacharya during the 11<sup>th</sup> century. One more important settlement that grew adjacent to Tirupati was Chandragiri by the Vijayanagara rulers during the 15<sup>th</sup> century. It is a fortified town primarily formed to show the political power and administration over the area (T.K.T 1997). Later, with the British invasions of India, they laid the foundation to develop a new neighbourhood focusing on trade and transportation during the colonial period. Till today, each of these neighbourhoods still relies on the purpose of their formation.

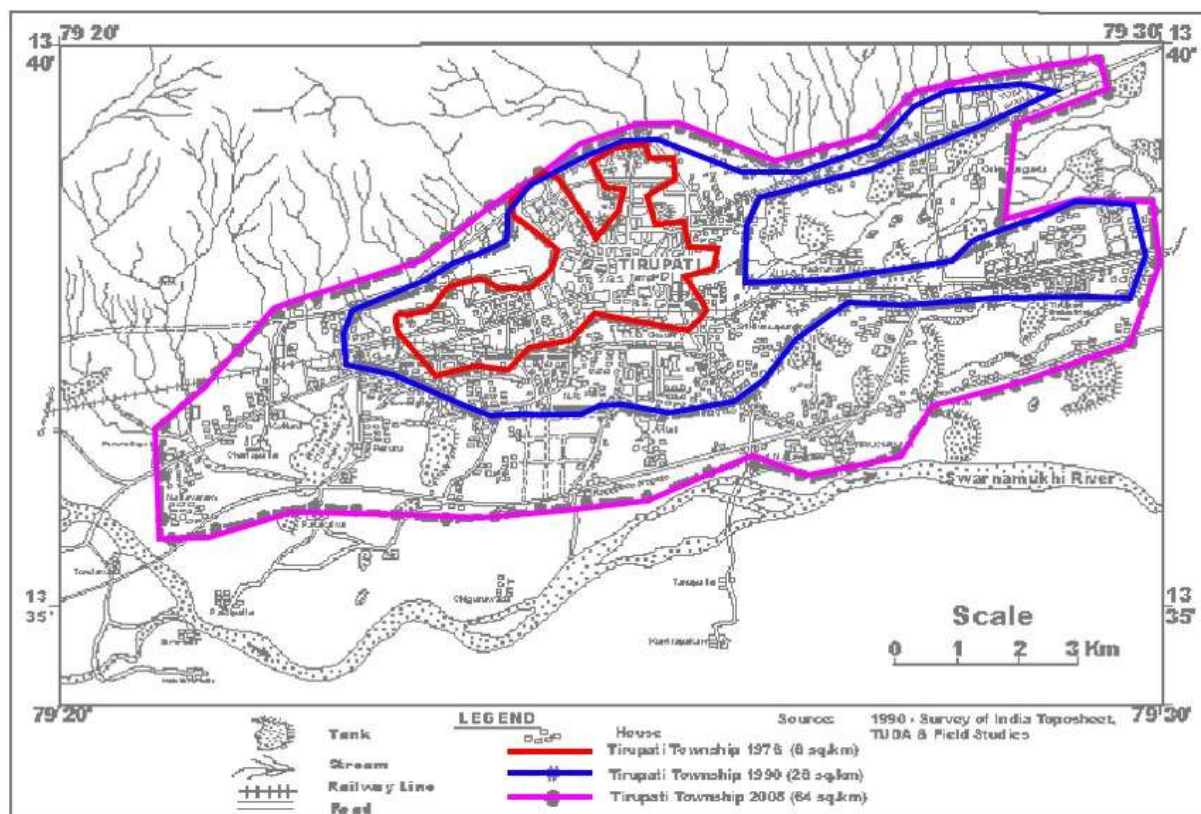


Figure 16: Tirupati municipal boundaries over the decades.  
Source: 1990, Survey of India Toposheet, TUDA & Field studies.



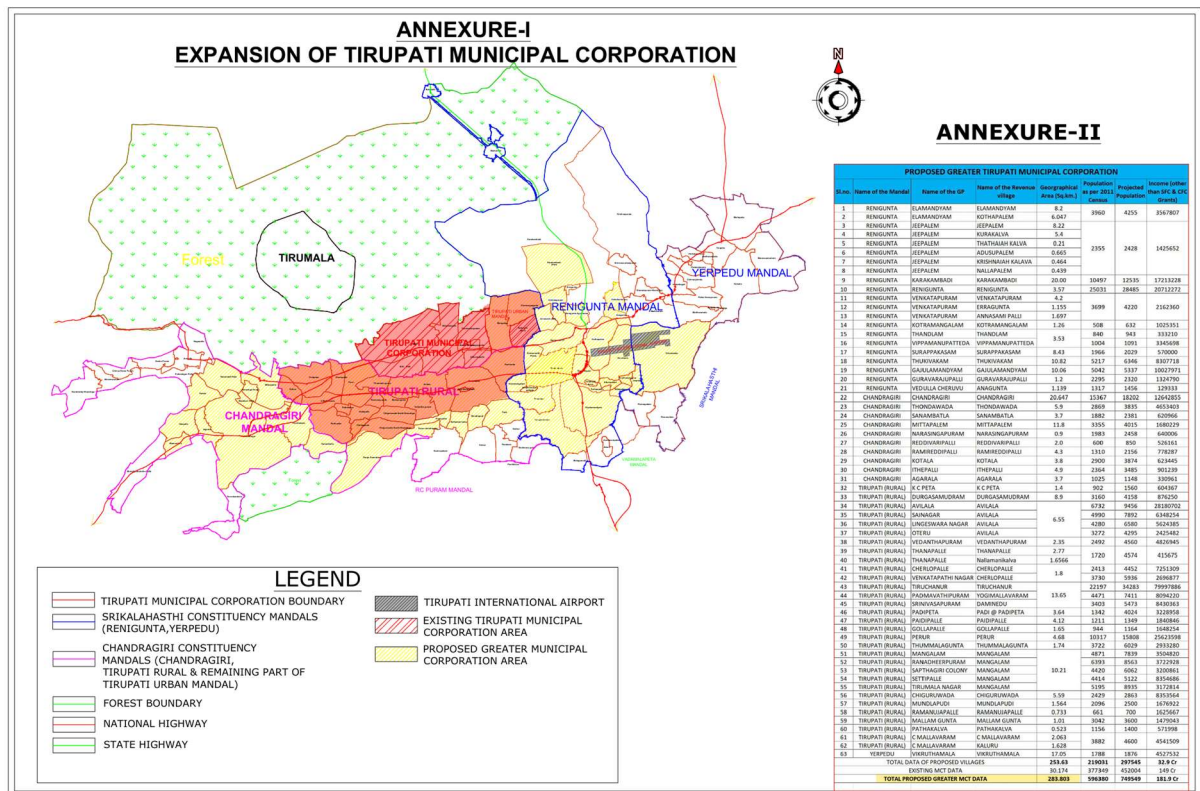


Figure 17: Tirupati latest municipal boundaries after 2025 revision.  
Source: Tirupati Urban Development Authority.

Over the decades, Tirupati has grown from a small town with an urban development zone of 8 sq km to a larger municipal corporation of around 90 sq km. Since the end of the year 2025, Tirupati has transformed into a greater municipal corporation with an urban development area covering around 284 sq km. All these surrounding neighbourhoods with the historic significance are now being unified as Greater Tirupati.

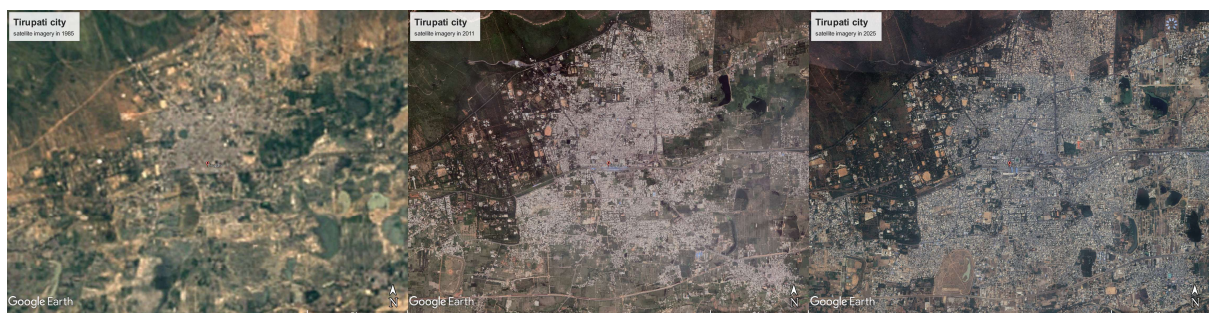


Figure 18: Satellite imagery of Tirupati (1985,2011,2025)  
Source: Google earth pro.

The urban morphology and growth pattern of the Tirupati core can be understood by examining the satellite imagery. The existence of SV University to the west and Seshachala hills to the north restricted the growth of the city in those directions, allowing it to expand towards Renigunta to the east. This allowed the neighbourhood to be the new hotspot for investments, which included Information technology, electronic manufacturing, and aviation. The 2040 master plan also envisioned the neighbourhood as the “water city” along the riverfront of the Swarnamukhi.



### 3.3 Land Use and Functional Zoning

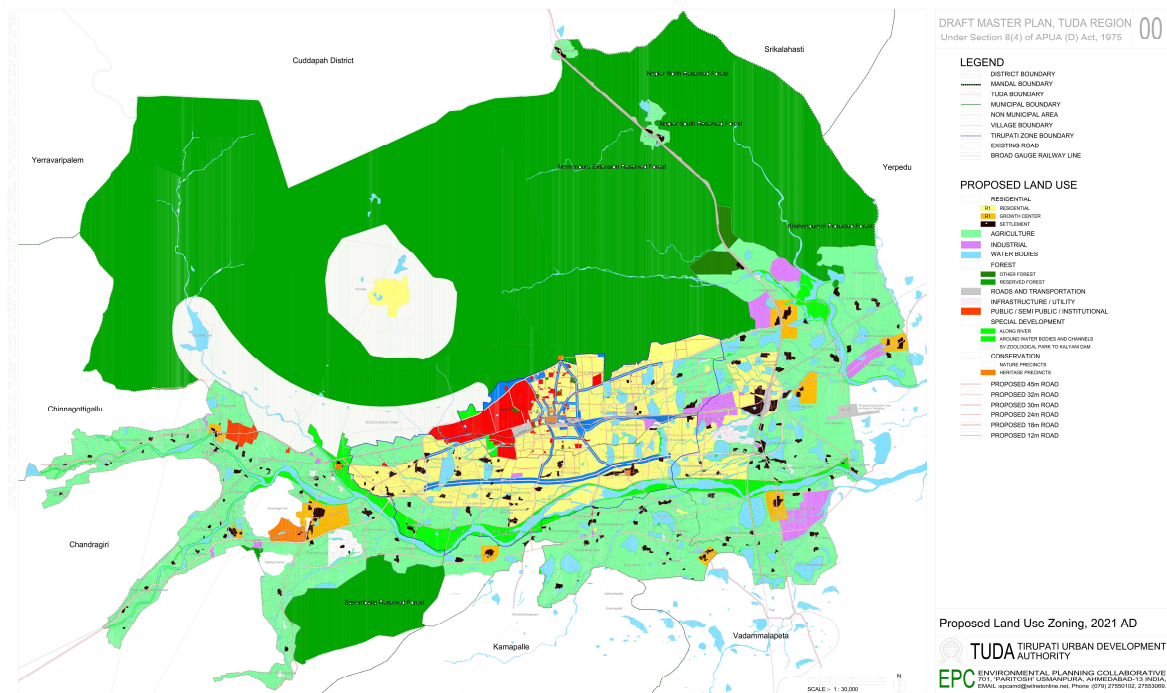


Figure 19: Master plan 2040, TUDA region.  
Source: TUDA

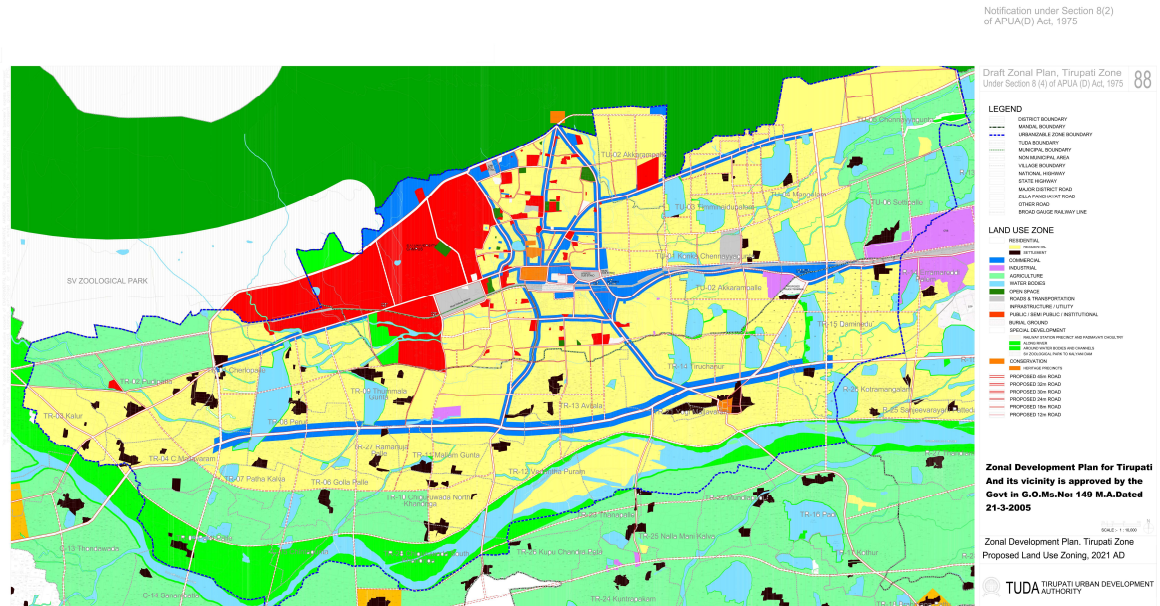


Figure 20: Zonal Development plan with proposed Land use, Tirupati zone.  
Source: TUDA

TUDA's Master Plan for 2040 is set on a comprehensive land use and functional zoning programme for the Tirupati Urban Development Authority region that divides the whole into built and unbuilt zones, special zones, and conservatory or forestry areas to manage growth through 2040. The key land use categories are residential, recreational, public, semi-public and institutional, commercial and mixed use, transport and circulation, tourism and heritage zones, industrial, environmental, conservation, and forest reserves.

The functional zoning intent is to separate built zones from unbuilt zones, like water bodies, conservation, and buffer zones. Directing dense development to suitable locations away from sensitive areas. Transit-oriented development corridors with a flexible Floor Area Ratio (FAR) are proposed to concentrate on high-density mixed-use along major transit corridors. Heritage-sensitive planning, which allows historic core and pilgrimage precincts to be identified for renewal and controlled commercial activity. This manages tourism pressure while conserving the character of the area.



*Figure 21: Figure ground map, Tirupati zone.  
Source: Author*

The figure ground shows the core area of Tirupati with very fine and dense urban fabric, mostly composed of residential areas and along the transit corridors with commercial and mixed-use buildings. Within this densely growing urban fabric, there are still open spaces in the form of sacred sites like temples, ponds, recreational parks, and institutional spaces, allowing spaces to meet, breathe, and recreate for the community. The yellow zones on the east and south, which are open, are now experiencing rapid residential growth with luxury townships. The purple zones are the growing industrial zones, which are zoned away from the main city. In the northwest, the red zone with very coarse urban fabric is occupied by the SV University, which blends with the forest. The zone is semi-public, allowing the residents of the city to perform daily active routines in a natural setting.

### 3.4 Mapping of Heritage nodes and Sacred Sites

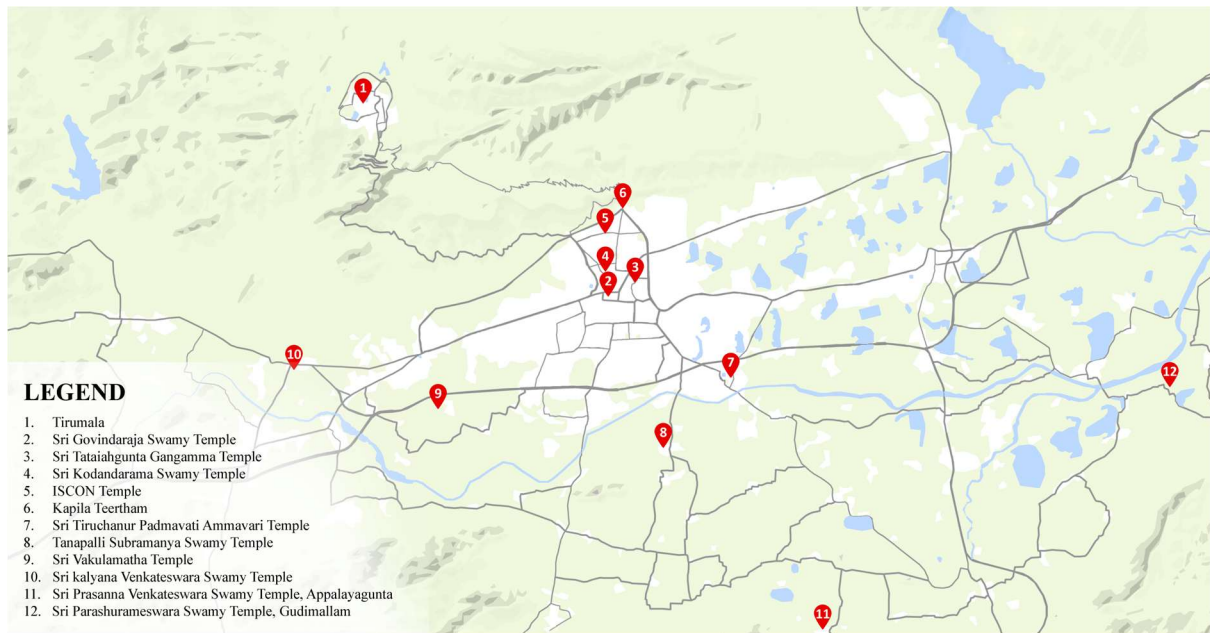


Figure 22: Heritage and Sacred sites of Tirupati.  
Source: Author

| S.No. | Site Name                  | Architectural Typology                                            | Chronology/Dynasty                    | Urban Spatial Role                                                      |
|-------|----------------------------|-------------------------------------------------------------------|---------------------------------------|-------------------------------------------------------------------------|
| 1     | Tirumala                   | Concentric Prakarams <sup>8</sup> ; Dravidian Vimana <sup>9</sup> | 300 CE; Chola-Vijayanagara            | The Nucleus: Primary sacred and economic hub                            |
| 2     | Sri Govindaraja Swamy      | Vijayanagara; Dominant Rajagopuram <sup>10</sup>                  | 1130 CE; Consecrated by Sri Ramanuja  | Urban Anchor: Civic grid developed around it.                           |
| 3     | Sri Tataiahgunta Gangamma  | Vernacular Shrines; Open Festival Layouts                         | Ancient Folk Origin                   | Subaltern Frontier: Indigenous civic protector.                         |
| 4     | Sri Kodandarama Swamy      | Chola-Vijayanagara Hybrid; Town-temple                            | 10th c. Chola; 15th c. Expansion      | Intra-Urban Node: Axial urban alignment.                                |
| 5     | ISCON Temple               | Contemporary Revivalist; Globalized Scale                         | 21st Century CE                       | Globalized Transit: Modern tourist gateway.                             |
| 6     | Kapila Teertham            | Rock-cut & Structural Dravidian Cliff base                        | Pallava / Chola Origins               | Liminal Threshold: Hydrological boundary to Tirumala hills and Tirupati |
| 7     | Sri Tiruchanur Padmavati   | Dravidian; Prominent Temple Tank                                  | 16th c. Independent Identity          | Conjugal Twin Hub: Mandatory ritual connection to Site 1.               |
| 8     | Tanapalli Subramanya Swamy | Hillock Vernacular; Linear Approach                               | Regional Antiquity                    | Peripheral node: South-eastern approach guard.                          |
| 9     | Sri Vakulamatha            | Fortified Hilltop Perch; Visual Axis to 1 & 7                     | Puranic; Restored 21st century by TTD | Visual Pivot: Spatial bridge over the plain.                            |
| 10    | Sri Kalyana Venkateswara   | Late Vijayanagara; Grand Axial Symmetry                           | 16th Century CE (ASI Protected)       | Spatial Proxy: Lowland alternative to Site 1.                           |
| 11    | Sri Prasanna Venkateswara  | Compact Late-Medieval; Detached Consort Shrines                   | 1232 CE; Yadavaraya/Regional          | Agrarian Link: Extends sacred grid to eastern plains.                   |
| 12    | Sri Parashurameswara       | Apsidal (Gajaprishta); Semi-subterranean                          | 3rd–1st c. BCE; Rebuilt 1126 CE       | Historical Base: Ancient anchor of the Swarnamukhi basin.               |

Table 1: List of Sacred sites, Typology, age, and role.  
Source: Author

Historically, most of these temples are a part of the divine pilgrimage to Tirumala. Now managed by the TTD trust for the ritual ceremonies, restoration, and development. Today, these historical assets tell us about our culture, evolution, belief systems, art, and architecture.

<sup>8</sup> **Prakaram:** High bounded courtyard layouts

<sup>9</sup> **Vimana:** The pyramidal super structure built on top of the main idol in Indian temple architecture

<sup>10</sup> **Rajagopuram:** The main or the first entrance gate way structure to an Indian temple



The Sacred sites had a deep mythological connection with the main temple, Tirumala, which held the pilgrimage for centuries. Lack of mobility and connection has reduced the footfall to these sites. The architecture of some of these sites is very rich in the Dravidian style, with huge entrance gateways, inner sanctums, pillared halls, holy water ponds, and golden articulations.

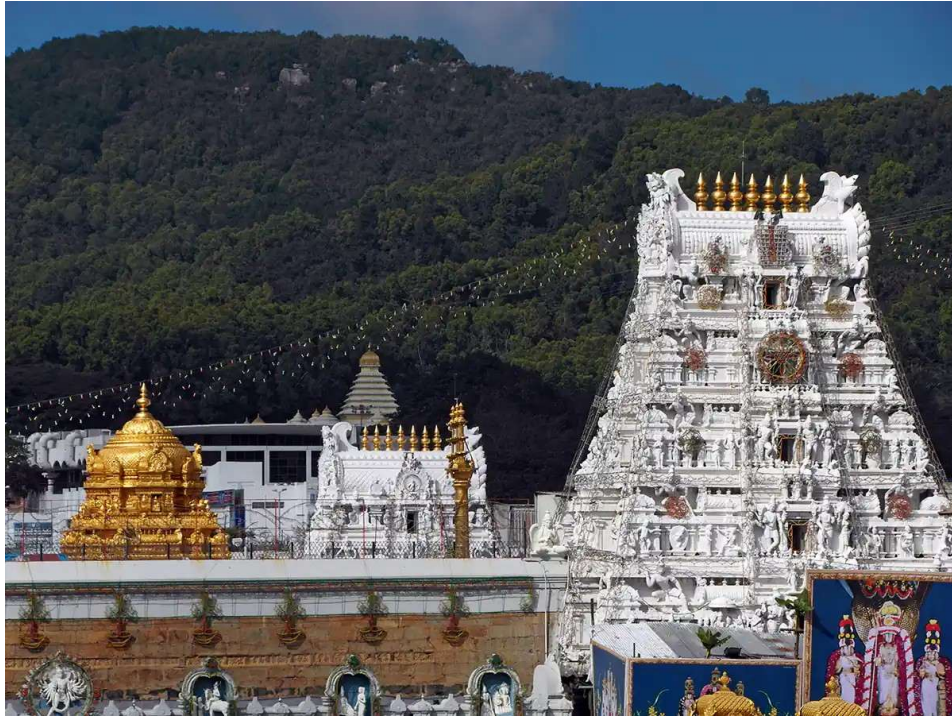


Figure 23: Tirumala Venkateswara Swamy Temple.  
Source: Martin Grey.

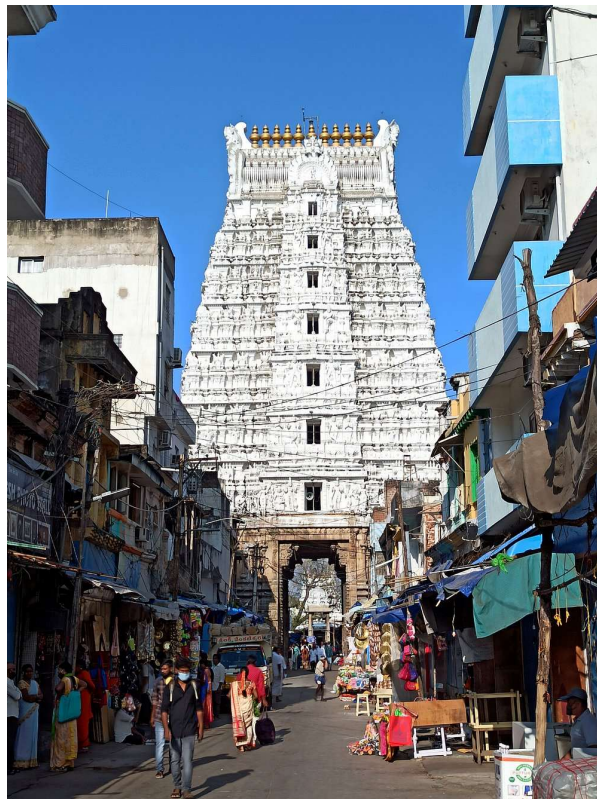


Figure 24: Sri Govindaraja Swamy Temple.  
Captured by Vikas Singh.





Figure 25: Sri Tataiahgunta Gangamma Temple.  
Captured by Sandeep Raghavan.



Figure 26: Sri Kodandarama Swamy.  
Captured by Sharath Chandra.





Figure 27: ISKCON Temple.  
Source: <https://iskcontirupati.info/home/>



Figure 28: Kapila Teertham.  
Captured by Hemanth.





*Figure 29: Sri Tiruchanur Padmavati Temple.  
Captured by Pathri Rajasekhar.*



*Figure 30: Tanapalli Subramanya Swamy Temple.  
Captured by Ganesh Velayudam.*





*Figure 31: Sri Vakulamatha Temple.  
Captured by Author.*



*Figure 32: Sri Kalyana Venkateswara Swamy Temple.  
Captured by Author.*





*Figure 33: Sri Prasanna Venkateswara Swamy Temple.  
Captured by Author.*



*Figure 34: Sri Parashurameswara Swamy Temple.  
Captured by Author.*



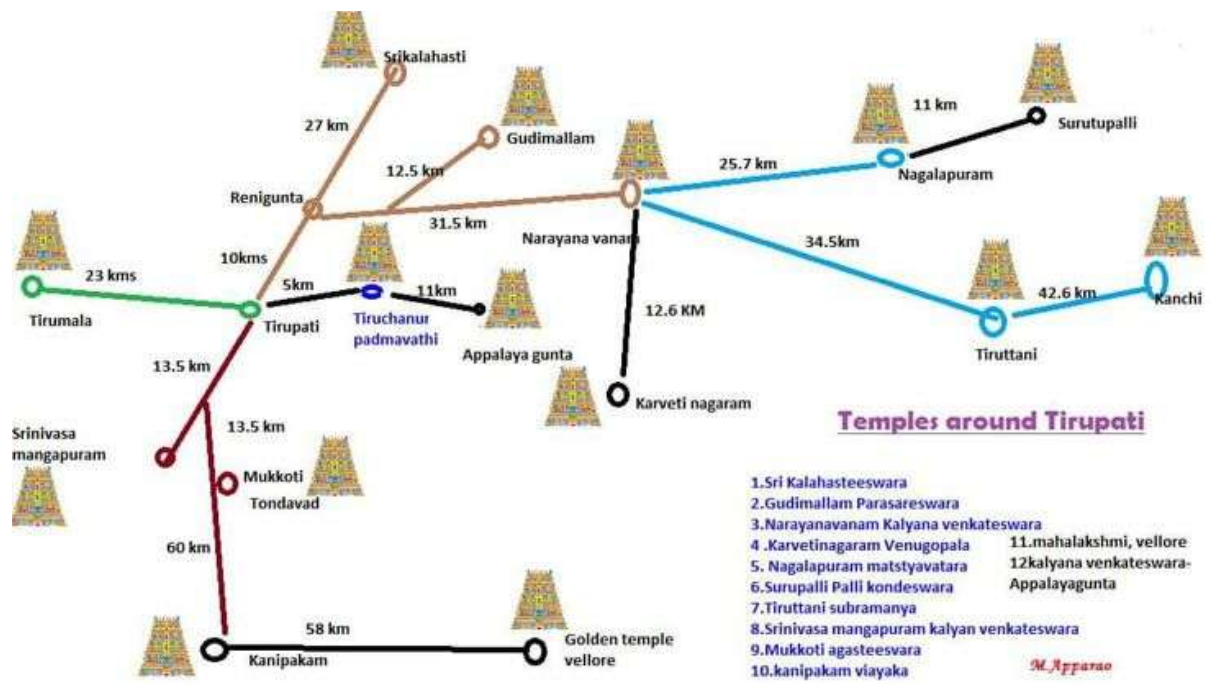


Figure 35: Schematic Temple Map of Tirupati around 100km radius.  
Source: M Apparao.

### 3.5 Ecological Baseline: Waterbodies, Green Cover, Microclimate

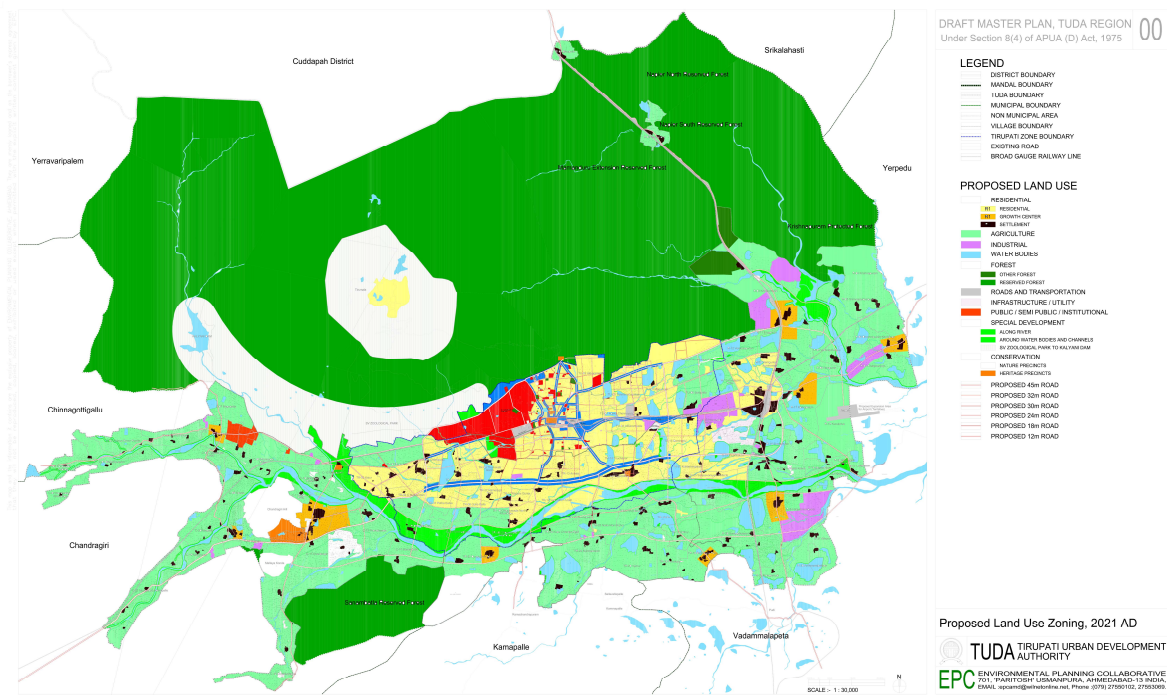


Figure 36: Master plan 2040, TUDA region.  
Source: TUDA



Figure 37: Tirupati and 360° hill view from Srivari  
Footsteps way to Tirumala. Captured by Author

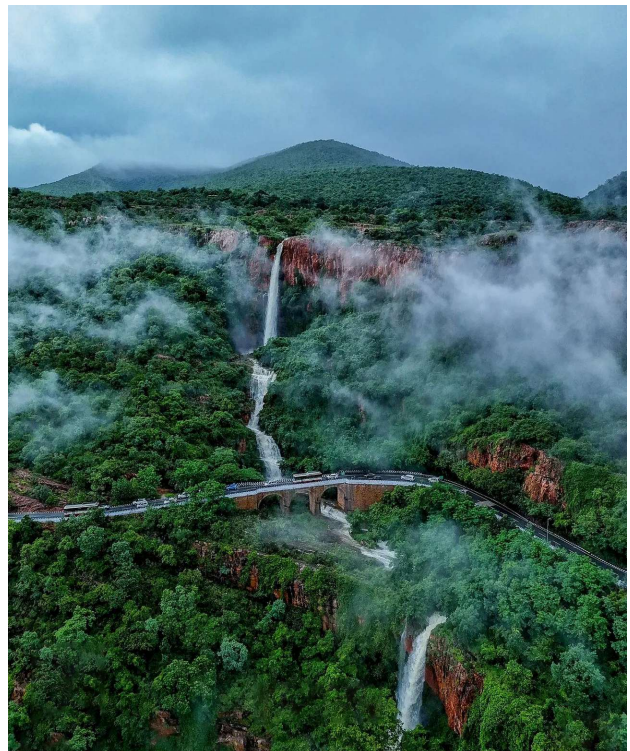


Figure 38: Tirumala Ghat Road and Waterfalls.  
Captured by Kumar Pixels



Tirupati has a huge forest cover in the form of hills, which is clearly visible from the land use map. The Tirumala hills formed around 2.5 billion years ago with Quartzite, an extremely hard metamorphic rock. These hills are at an elevation of 980 meters above sea level, which is a remarkable cultural and natural heritage. These hills have the Eparchaeon Unconformity, a major discontinuity of stratigraphic significance that represents a period of remarkable serenity in the geological history of the Earth (UNESCO 2025). The hill range is also famous for a rare and unique National geoheritage monument in the form of a natural arch called Shilathoranam. The arch is believed to have formed over 1.5 billion years ago due to erosion and weathering of the quartzite rock, which is one of the very few such formations in Asia.

The forest area is famous for a rare and expensive wood called Red Sandalwood, which is only grown in this particular region in the entire world. It has a huge market globally, used in making expensive crafts, cosmetics, medicine industry. The area is native to a lot of animals, birds, and butterfly species. Below the foothills, the SV Zoological Park is a conservation zone and a must-visit for botanical and zoological lovers.



Figure 39: Natural Arch ( Shilathoranam), Tirumala.  
Source: IncredibleIndia.



Figure 40: Red Sandalwood.  
Captured by Dinesh.

The area is rich in lakes and ponds along with the river Swarnamukhi, which are very evident in the land use map. The ongoing government is taking care of the conservation of water bodies. The Renigunta neighbourhood translates its name to land of lakes in local terms, and the government planned development for the year 2040 around these lakes and called it the water city of Tirupati. These water bodies help to alter the microclimate of the space when combined with perfect planning. The SV University is a biosphere reserve of the city with ecologically rich green areas, a botanical garden, and herbal plants, and dedicated green spaces integrated into it.

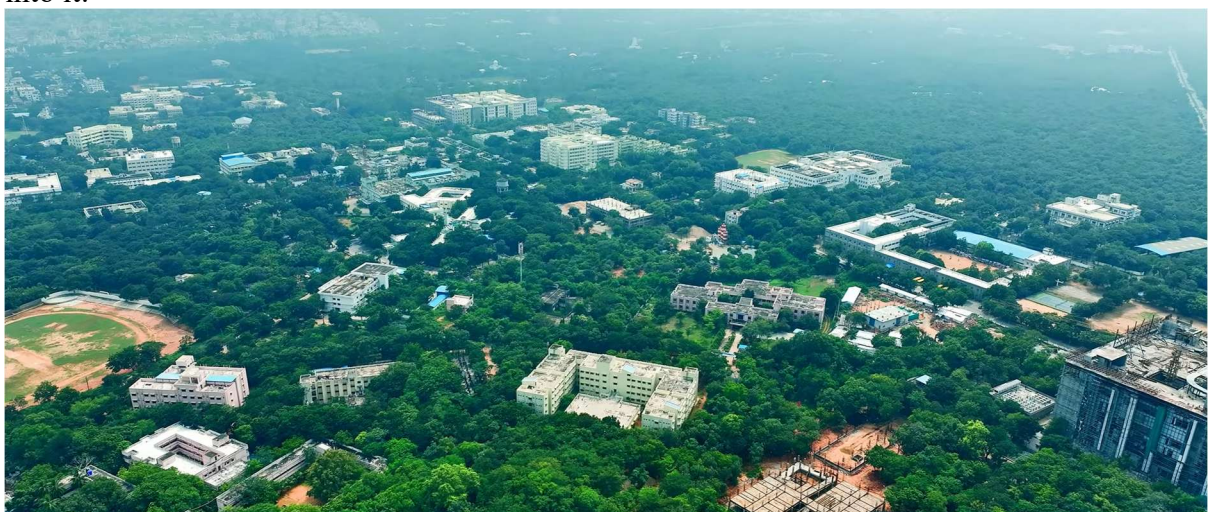
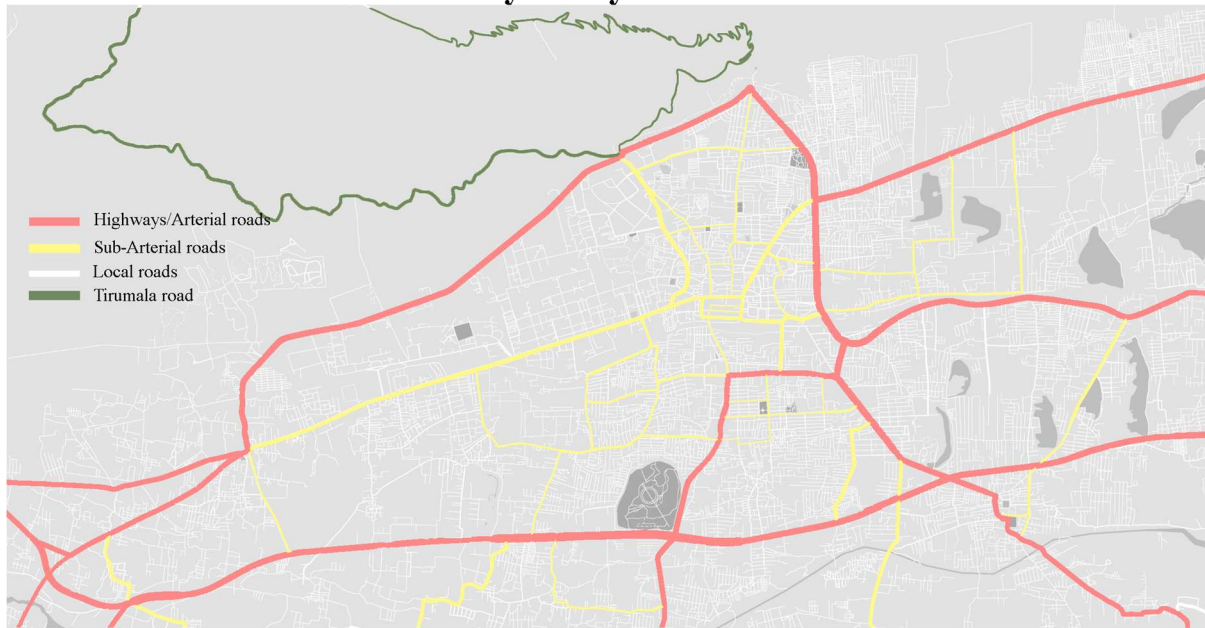


Figure 41: SV University Aerial View.  
Captured by Srikanth Krishna..



### 3.6 Street Network and Mobility Analysis



*Figure 42: Tirupati Road network.  
Drawn by Author.*

The street network of Tirupati has the influence of natural assets. The peripheral roads on the north are limited by the hill range, on the south by the Swarnamukhi River basin. The city is growing linearly to reach the adjacent twin city, called Renigunta, to expand its functional zones. So the highways pass through Renigunta to connect to further cities. The economic corridors around the city are developed by the National Highway Authority of India (NHAI) with world-class infrastructure, which supports commerce, tourism, and pilgrimage to the city. India is investing a lot in regional transportation to boost the economy.



*Figure 43: Tirupati-Naidupeta Corridor express way.  
Source: Megha INFRA.*

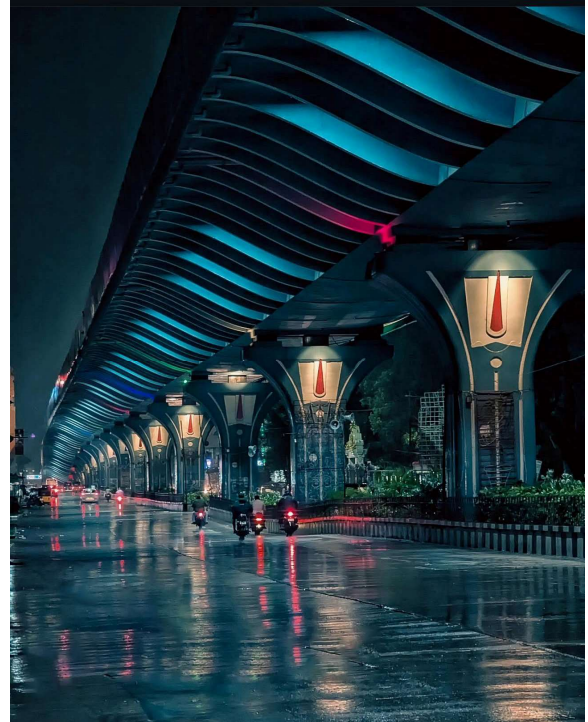


*Figure 44: Tirupati-Chittoor Corridor express way.  
Source: Sahil P.*





*Figure 45: Sub Arterial roads/Garuda Flyover.  
Captured by Kumar Pixels.*



*Figure 46: Sub Arterial roads/Garuda Flyover.  
Captured by Kumar Pixels.*

The road infrastructure, which is meant for the pilgrims to flow towards the hill, is very well designed and connected to Tirumala. The Garuda flyover is a project completely invested in by the Tirumala Tirupati Devasthanams (TTD) trust, which came into operation a few years back. This project is designed to connect the pilgrims' flow from 3 directions of the city, especially from the airport, bus station, and Tirupati bypass. This resulted in taking the pilgrim crowd directly to the Tirumala security gate, completely bypassing the traffic and also avoiding the city by considering it as a transit hub. The infrastructure to boost the pilgrimage has never been compromised by either the Tirupati Municipality or the TTD trust.



*Figure 47: Arterial road/Garuda circle.  
Captured by Srikanth Krishna.*



The local streets are completely in contrast with the routes for the pilgrim flow. These evolved around the temple nodes, mainly planned for the rituals as processional streets, connected to the adjacent water ponds and other sacred amenities. As the city grew around these sites, the roads got extended, and further unplanned development made them look staggered and inconsistent all the way. The streets feel narrow compared to their actual width due to irregular parking arrangements, stalls, and vendors, lack of margins, pavements, and unorganised movement of people and vehicles. The streets are vibrant at the same time chaotic. Streets are completely open to the sky with hardly any green canopy. The streets very often see the footfall of pilgrims.



Figure 48: Local/Internal streets of Tirupati, around the temples, local markets, transit nodes, etc.  
Source: Google street view.



Along with road networks, the most important connection to this pilgrim hub, connecting the farther parts of India, is the Tirupati Railway Station. Under the railway development program by the Government of India has listed Tirupati and allocated 300 crore INR equals 27 million Euro. The works are on a rapid pace, halfway through the redevelopment. The project started in 2023 redesigned by GPM Architects. The development is set to utilise the commercial potential of the location of the station and modernise the station facilities. The architectural style of the project is inspired by the Dravidian style of architecture to create a sense of belongingness.



*Figure 49: Tirupati Railway Station Redevelopment final approved design proposal.  
Source: Gain P Mathur Architects.*



*Figure 50: Tirupati Railway Station Redevelopment progress till 30 March 2026.  
Source: Ministry of Railways, Government of India.*





Figure 51: Tirupati Railway Station Main Entrance (after and before) Left design, Right current situation.  
Source: Gian P Mathur Architects, Author.

The main entrance of the railway station has always been in chaos with passengers arriving, departing, rental cabs, autorikshas holding near the entrance, and locals passing through with their personal vehicles like cars and bikes. It was always very hard to manage this chaotic movement.

The redesign was cleverly done, taking the most of the vehicular crowd towards the rear end of the station and allowing only drop-off at the farther ends of the main entrance. This allowed the creation of a piazza all along the existing main entrance. This new space in the heart of the city has a huge impact on the adjacent street networks in a good way and is about to create a huge difference in the urban infrastructure of the city. The space can hold the current and future crowd, reduce chaos, increase pedestrian safety, and improve spatial experience.

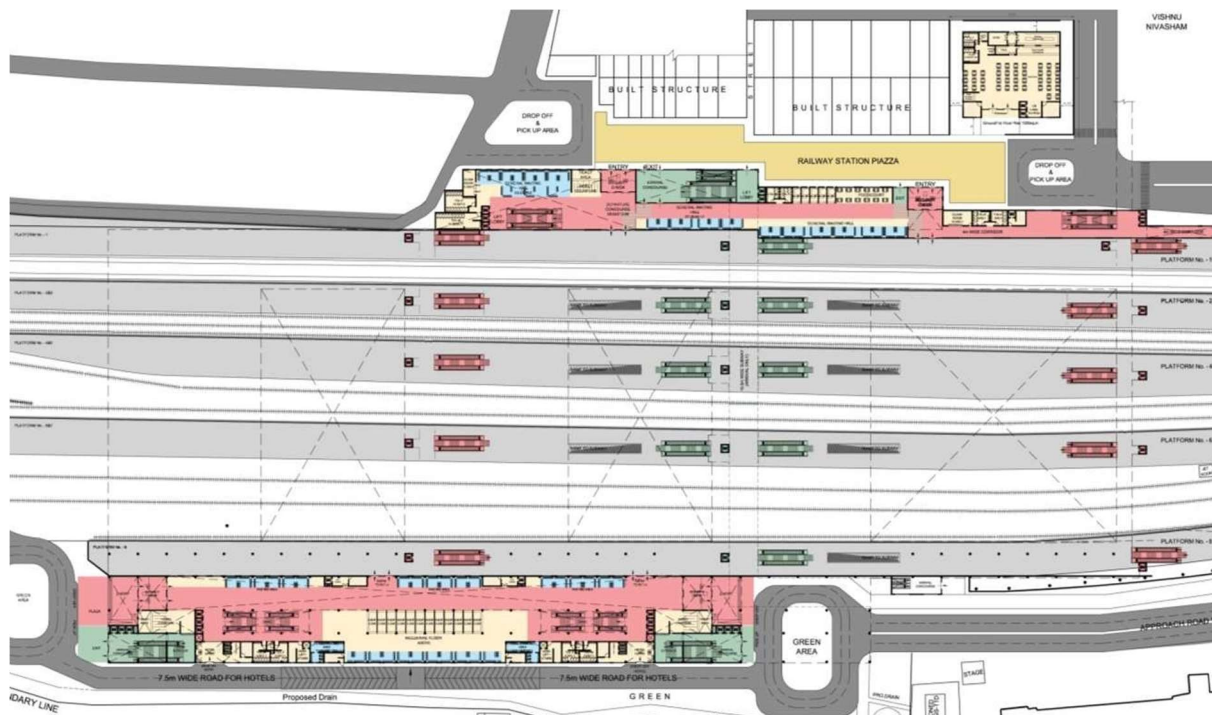


Figure 52: Tirupati Railway Station Redesigned Ground Floor Plan.  
Source: Gian P Mathur Architects.

Tirupati can be accessed by air route as well through the Tirupati International Airport. The airport is very well connected to the city through the expressway, which can directly take the pilgrims to the foothills of Tirumala. TTD also offers temple ticket services at the airport for visitors' convenience. The Airport Authority of India has planned seaplane services in India, and Tirupati's Rayalacheruvu lake was listed for development. The lake was constructed by the great Vijayanagara ruler Sri Krishnadevaraya around the 1500s. The seaplane project is going to add another air-based transit point for the city. The project is envisioned to promote tourism and heritage and improve connectivity among nearby areas.



*Figure 53: Tirupati Airport.*  
*Source: Author.*



*Figure 54: Rayalacheruvu lake, Sanctioned Seaplane port.*  
*Source: Author.*



### 3.7 Socio-Economic and stakeholder analysis

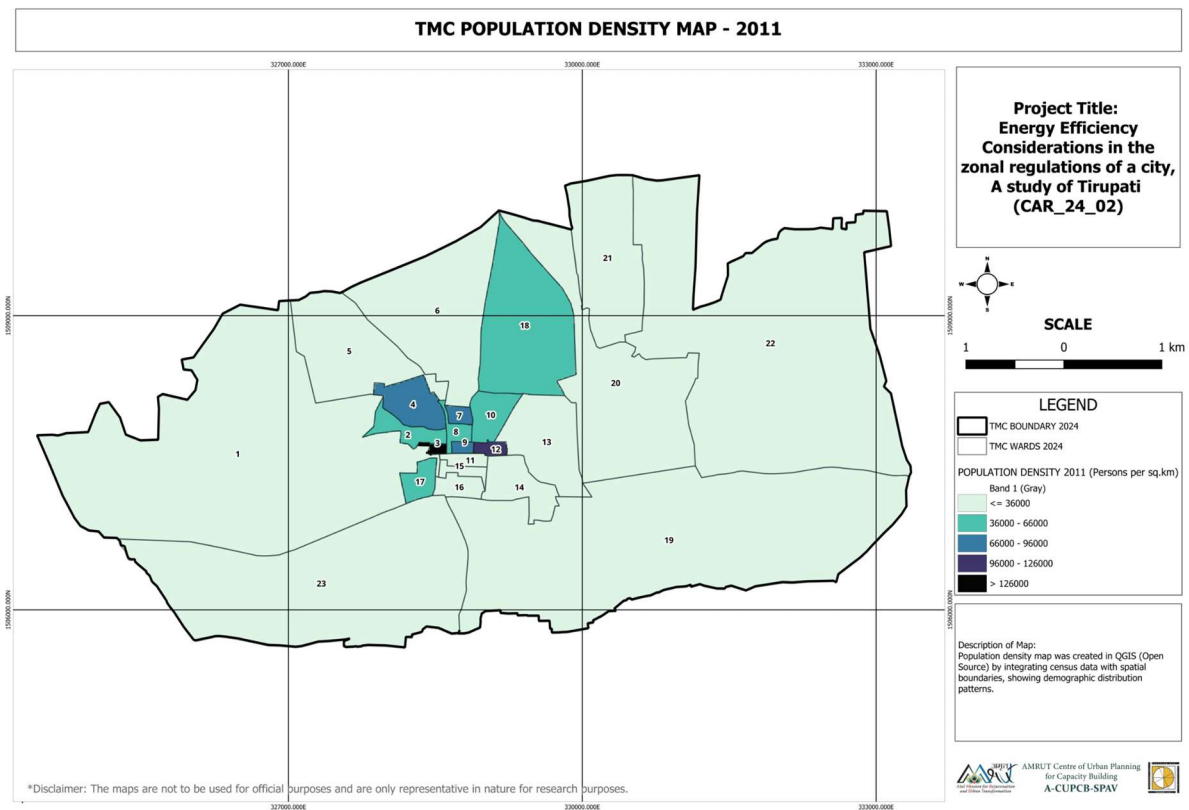


Figure 55: Tirupati Municipal Corporation Population Density Map 2011.  
Source: School of Planning and Architecture Vijayawada.

Tirupati's population as per the 2011 census is 459,985. The estimated 2026 population is around 850,000. It's not one of the most populous cities of India, but it sees the highest floating population in a day by any Indian city, of around 70000 people. The population density map of Tirupati shows a higher concentration within the core, which is the same as in any other city, but here the population is driven by the pilgrimage, the temples, the local markets, and businesses. As it is a Hindu religious pilgrimage hub, 88% of the city's population is Hindu, 5% is Muslim, and the rest are minorities. The most spoken language is Telugu.

Socio-economic and stakeholder analysis of Tirupati highlights a unique urban ecosystem driven primarily by religious pilgrimage, which is diversely increasing towards educational, industrial, and technological sectors.

#### Socio-economic analysis

The primary economic driver is the service and hospitality industry, hosting on average 50000 daily visitors. This includes hotels, restaurants, travel, and tour operators. Moving beyond the pilgrim economy, the city has grown into an industrial hub called Sri City with international brands related to construction, hardware, electronics, etc. The economy from education is another important driver, as Tirupati is the knowledge hub for students in southern Andhra Pradesh. On the broader side of Tirupati, the rural population depends on agriculture, which is another economic driver in the area. They grow mainly commercial crops like paddy, sugarcane, groundnuts, and horticulture.

## Stakeholder analysis

The highest level of stakeholder is the Tirumala Tirupati Devasthanams (TTD) trust, formed in 1933. It is the richest trust in India, managing the richest temple in the world. The net worth of the trust is 3 Lakh crore INR, which is equal to \$31 billion USD or 26.7 billion Euro. The assets are in the form of gold of around 12.5 tons, huge bank deposits, land properties, and annual temple income in the form of offerings (TTD 2025).

Its main objectives are temple management, pilgrim welfare, cultural preservation, etc. It acts as the local secondary governing force, creating a major impact on the socio-economic development of the area by funding major infrastructure, hospitals, universities, social safety, etc. TTD spends 1% of its annual revenue on the Tirupati Municipal Corporation for development works like roads, sanitation, gardening, etc. Donates land to public organizations for the development of hospitals (TATA Cancer Hospital) and housing for the poor. Invested 67% of the budget of the Garuda Varadhi expressway, which is equal to 435 crore INR or 39.15 million Euro. Allocated 118 crore INR, or 10 million Euro, for the development of schools and universities run by the trust (TTD 2025). All these are the recent welfare and development steps taken by the TTD trust towards the city and its community, which are not new compared to the previous allocations.

## Economic Statistics of TTD (Tirumala Tirupati Devasthanams)

| Parameter                  | Amount (INR Crore) | USD             | Euro          | Notes                               |
|----------------------------|--------------------|-----------------|---------------|-------------------------------------|
| Annual Revenue (2024-25)   | ₹5,179.85          | \$620 million   | 466.2 million | Total budget revenue                |
| Annual Revenue (2025-26)   | ₹5,258.68          | \$650 million   | 473.3 million | Total estimated budget revenue      |
| Hundi Offerings (annual)   | ₹1,729             | \$180 million   | 155.6 million | The largest single source of income |
| Interest on Deposits       | ₹1,310             | \$136.3 million | 117.9 million | From TTD's bank fixed deposits      |
| Prasadam Sales             | ₹600               | \$62.5 million  | 54 million    | Sale of holy food items             |
| Darshan Ticket Sales       | ₹310               | \$32.25 million | 27.9 million  | Paid darshan tickets                |
| Human Hair Auction         | ₹176.5             | \$18.4 million  | 15.9 million  | Tonsured devotees' hair auction     |
| Average Daily Hundi Income | ₹3.6 - 3.85        | \$400,492       | 346,500       | Weekdays and weekends, respectively |
| Highest Single-Day Hundi   | ₹7.68              | \$798,898       | 691,200       | Recorded on Jan 2, 2023             |

Table 2: Economic statistics of TTD.  
Source: TTD.

The next important and primary local governing body is the Tirupati Municipal Corporation (TMC), which takes care of the urban development of the city. It takes care of urban planning, infrastructure development, water and sanitation management, and environmental and cultural conservation. TMC operates locally but is managed and monitored by the state and central government.

Local business owners and the hospitality sector are other important stakeholders of the city, which maximizes the pilgrim spending through hotels, restaurants, travel, and infrastructure development. Creates an impact on socio-economic development by generating employment, driving public sector wealth, and supporting the tourism market.

Pilgrims are the continuously flowing stakeholders who constantly feed the local economy with their spending on accommodation, food, and transportation. Local vendors, arts and crafts makers, small scale businesses also contribute to the socio-economic development.

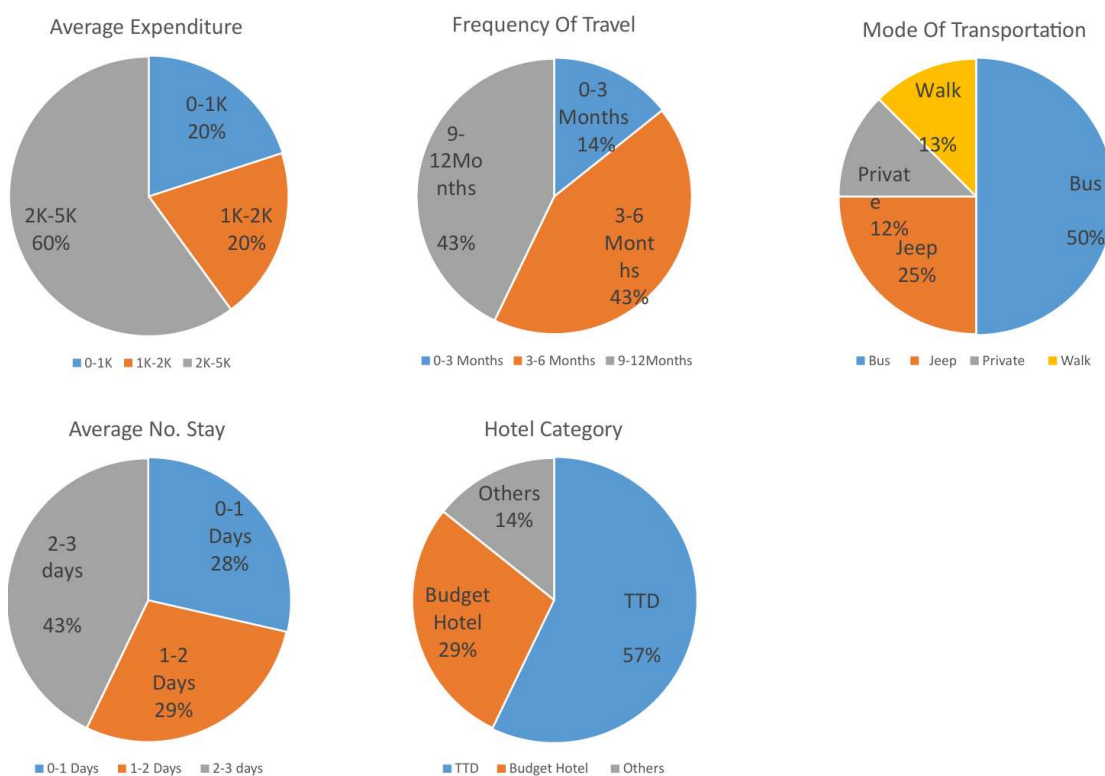


Figure 56: Tourist profile Survey.  
Source: GPM Architects.

| Craft/Art Form         | Description & Features                                                                   |
|------------------------|------------------------------------------------------------------------------------------|
| Kalamkari              | Hand-painted/block-printed textiles using natural dyes; motifs from mythology and nature |
| Wooden Toys & Carvings | Locally sourced wood, vibrant colors, intricate designs (animals, gods, dolls)           |
| Brass & Copperware     | Utensils, lamps, idols, ritual objects with intricate patterns                           |
| Stone Carving          | Sculptures and temple decorations from granite/marble                                    |
| Handloom Weaving       | Silk sarees (Venkatagiri), textiles with Zari work                                       |
| Traditional Jewellery  | Gold/silver jewelry with precious stones, traditional designs                            |
| Pottery & Terracotta   | Decorative and utilitarian items, sculptures                                             |

Table 3: Tirupati Local crafts and art forms.  
Source: Author.



### **3.8 Challenges Identified**

Tirupati faces several urban challenges because of the way the city has grown around pilgrimage. Although the city has a strong sacred identity, this identity is not clearly reflected in its present urban structure. Many temples, sacred ponds, and pilgrimage streets still exist, but they do not function as one connected system. As a result, the sacred network of the city feels fragmented.

Mobility is one of the main issues. Large numbers of pilgrims move through the city every day, but the streets are often congested and uncomfortable for walking. In many areas, vehicles, parking, vendors, and unplanned street activity reduce the quality of movement. This creates stress for pilgrims as well as local residents, especially in the older parts of the city.

Water heritage is another major concern. Several temple ponds and water bodies that once had ritual and ecological importance are now neglected, polluted, or underused. These spaces no longer contribute to the city in the way they once did. Their decline has affected both the environmental balance and the spiritual character of Tirupati.

The city also faces a problem of identity. Most visitors use Tirupati only as a stop on the way to Tirumala, and very little time is spent experiencing the city itself. Because of this, Tirupati is often seen mainly as a transit point rather than a sacred destination. This limits the local economy and reduces the visibility of the city's heritage spaces.

Another challenge is the lack of coordination among the different stakeholders involved in the city. TTD, the municipality, transport agencies, businesses, and pilgrims all shape the city in different ways. Without a shared urban vision, it becomes difficult to manage heritage, mobility, and public space in a unified manner.

Overall, the main challenges are fragmentation of sacred spaces, congestion in the street network, neglect of water heritage, and the loss of a clear urban identity. These issues show the need for a more connected and sensitive regeneration approach.

## **Chapter 4: Synthesis – Opportunities, Challenges, and Strategic Directions**

### **4.1 Recap of Key Findings**

The analysis in the previous chapter shows that Tirupati is a city with a very strong sacred identity, but its present urban structure does not fully support that identity. The city has important temples, sacred routes, water bodies, and heritage spaces, but these elements are not working together as one connected system. Because of this, the overall pilgrimage experience feels fragmented.

The study also shows that the city has grown in a way that places more emphasis on transport and movement than on the quality of the urban experience. Regional connectivity to Tirupati is strong, but the inner city streets, especially around the heritage areas, are often crowded and difficult to navigate. This affects both pilgrims and local residents.

Another important finding is that Tirupati has valuable ecological assets, especially its hills, water bodies, and green landscapes. However, many of the sacred ponds and urban water spaces are neglected or not used to their full potential. This means there is a clear opportunity to connect ecological restoration with urban regeneration.

The socio-economic analysis further shows that pilgrimage is the main driver of the city, but most of its benefits remain concentrated around Tirumala and transport corridors. Tirupati city itself has the potential to become more active as a cultural and heritage destination, but this requires a stronger urban framework.

Overall, the findings suggest the need for a regeneration approach that reconnects heritage, improves mobility, strengthens ecological systems, and supports the local urban economy. These findings form the basis for the strategic directions discussed in the next section.

### **4.2 Opportunities for Heritage and Pilgrim-Oriented Urban Renewal**

The analysis of Tirupati reveals that, despite its present urban pressures, the city still holds a very strong base for regeneration. The sacred identity of Tirupati has not disappeared. It is still present in its temples, sacred routes, water bodies, historic streets, and ritual landscape. What is needed now is not the creation of a new identity, but the reactivation of the one that already exists in a fragmented form.

One of the biggest opportunities lies in the city's existing network of heritage nodes. Tirupati has many important sacred sites that are historically and culturally connected to Tirumala. At present, these sites work more as separate destinations, but they have the potential to function as part of one larger sacred system. If these nodes are connected through better pedestrian routes, public spaces, and interpretive elements, the city can regain its sense of continuity and spiritual legibility.

Another major opportunity is the presence of a strong pilgrimage movement. Tirupati already receives a large number of pilgrims every day, which means the city has a constant flow of people, activity, and economic energy. This movement can be used not only for transport but also for urban renewal. If pilgrims are encouraged to experience the city at a slower and more

meaningful pace, Tirupati can grow beyond a transit point and become a place where people spend time, walk, rest, and engage with heritage. The thesis direction toward a Green Spiritual Circuit is therefore supported by the actual movement pattern of the city.

The ecological setting of Tirupati also offers a strong opportunity. The hills, water bodies, green zones, and temple ponds give the city a natural and spiritual character that many other pilgrimage towns do not have. These elements can support a more climate-responsive urban environment. By restoring ponds, improving tree cover, and linking open spaces with sacred routes, the city can become more comfortable for pilgrims and more resilient for the future. In this sense, ecological improvement is not separate from heritage; it is part of the sacred experience itself.

There is also a clear opportunity in the urban economy. At present, much of the pilgrimage spending is concentrated around Tirumala and the transport system, while Tirupati city itself receives less benefit than it could. If heritage streets, local crafts, food spaces, and small public nodes are strengthened, the city can support a wider local economy. This can create more activity for residents, more engagement for visitors, and more value for the historic core. The city can then function not only as a service base but as a living sacred destination.

Another opportunity lies in the existing institutional and governance structure. Tirupati already has strong stakeholders such as TTD, the municipal corporation, transport agencies, and local communities. While this creates coordination challenges, it also means that the city has the institutional base required for implementation. If a shared vision is created, these stakeholders can support regeneration through mobility improvements, heritage care, landscape works, and public space upgrades.

Overall, the opportunities in Tirupati lie in reconnecting what already exists rather than introducing something completely new. The city has sacred memory, active pilgrim flow, important heritage assets, ecological resources, and institutional support. These conditions make it possible to frame Tirupati as a regenerated sacred city where heritage, mobility, ecology, and economy work together.

### **4.3 Constraints and Challenges to Implementation**

Although Tirupati has strong potential for heritage-led regeneration, there are several constraints that need to be considered before any design strategy can be implemented. The first challenge is the complexity of governance. The city is influenced by multiple authorities and stakeholders such as TTD, the municipal corporation, transport agencies, local businesses, and residents. Since each stakeholder has a different priority, coordination can become difficult. A regeneration strategy will therefore need cooperation and a shared vision among all these groups.

Another major challenge is the pressure of the pilgrimage movement. The city already handles a very large number of pilgrims every day, and this creates heavy demand on streets, transport systems, open spaces, and public facilities. Any proposal for walkability, heritage activation, or public realm improvement must work within this high-density condition. It cannot depend on large disruptions or long construction periods because the city has to continue functioning during all seasons and festivals.



Land availability is also a constraint. The older parts of Tirupati are already built up and dense, especially around the heritage core. This makes it difficult to introduce new spaces without affecting existing structures, movement patterns, or commercial activity. Because of this, the proposal must focus on sensitive interventions, incremental changes, and careful reuse of available spaces rather than large-scale demolition or expansion.

Another important challenge is balancing heritage conservation with everyday use. Many sacred sites, temple streets, and water bodies are historically important, but they are also active parts of the city. They cannot be treated only as monuments. At the same time, they cannot be over-commercialised or altered in ways that reduce their sacred character. The design approach must therefore respect ritual needs, local practices, and the existing atmosphere of the place.

Environmental maintenance is another issue. Restoring ponds, improving green cover, and maintaining shaded public spaces will require regular care, not just initial design intervention. Without a long-term management system, the quality of these spaces can decline again. This means the proposal should be practical in terms of maintenance, governance, and phasing.

Financial feasibility is also a constraint. Even though the city has strong institutional backing and a powerful pilgrimage economy, regeneration projects still need realistic funding, phased implementation, and clear priority areas. Not everything can be done at once. The proposal must therefore identify actions that are achievable in stages and can show visible improvement over time.

Overall, the main constraints are governance coordination, heavy pilgrim pressure, limited space in the historic core, conservation sensitivities, maintenance needs, and financial feasibility. These challenges do not reduce the value of the proposal, but they do shape the way it should be implemented. They show that the regeneration of Tirupati must be gradual, sensitive, and well-coordinated.

## **4.4 Strategic Themes for Regeneration**

Based on the findings of the previous chapter, the regeneration of Tirupati should focus on four main themes. These themes come directly from the city's existing strengths and challenges, and they provide a clear direction for the design proposal.

### **4.4.1 Reconnect the Sacred Network**

Tirupati has many important temples, sacred streets, and ritual nodes, but they do not currently function as one connected system. The first strategic theme is therefore to reconnect these scattered elements into a more legible sacred network. This can be done by improving pedestrian linkages, strengthening visual connections, and creating a clearer relationship between key heritage sites. The aim is to make the city feel like one continuous pilgrimage landscape rather than a set of separate destinations.

### **4.4.2 Celebrate Water Heritage**

The second theme is to restore and celebrate the city's water heritage. Temple tanks, ponds, and other water bodies once played an important role in both ritual life and ecological balance. Many of them are now neglected or underused. Regeneration should bring these water spaces back into the urban experience through restoration, edge improvement, public access, and

landscape integration. This will help improve both the spiritual quality and environmental resilience of the city.

#### **4.4.3 Enable Pilgrim-Friendly Mobility**

The third theme is to create a more comfortable and safe mobility system for pilgrims and local users. Tirupati receives a very large number of visitors, but its street network is often crowded and difficult to walk through. The city needs routes that are more pedestrian-friendly, better organised, and more sensitive to pilgrimage movement. This includes improving walkability, reducing conflicts between vehicles and pedestrians, and supporting shared mobility where needed. The goal is to make movement itself part of the sacred experience.

#### **4.4.4 Activate Heritage Streetscapes**

The fourth theme is to activate the older streets around the sacred core so that they become more lively and meaningful public spaces. These streets already carry cultural memory, but they are often affected by congestion, unplanned activity, and a lack of spatial quality. Through better street design, shaded edges, small public spaces, local commerce, and place-making elements, these streets can become active heritage corridors. This will support both pilgrims and local communities.

Together, these four themes create the basis for the urban design proposal. They suggest that Tirupati should be approached not as a city that needs isolated fixes, but as a sacred urban system that needs to be reconnected, restored, and activated. The proposal in the next chapter is therefore built around movement, heritage, ecology, and public life working together.

### **4.5 Expected Benefits and Outcomes**

The proposed regeneration strategy is expected to create benefits at multiple levels, including heritage conservation, pilgrim experience, ecological improvement, and local economic development. By reconnecting sacred sites, restoring ecological assets, and improving public spaces, the proposal aims to strengthen Tirupati's identity as a living sacred city rather than merely a transit point to Tirumala.

One of the primary outcomes will be the creation of a more connected pilgrimage experience. Improved linkages between temples, heritage streets, and sacred water bodies can encourage pilgrims to explore the city beyond their journey to Tirumala. This can increase the visibility of important heritage sites and reinforce the cultural significance of Tirupati within the larger pilgrimage landscape.

The regeneration strategy is also expected to improve the quality of public spaces and mobility. Safer pedestrian routes, better street environments, and more comfortable movement networks can enhance the daily experience of both pilgrims and local residents. Reduced conflicts between pedestrians and vehicles can contribute to a more organized and accessible urban environment.

Ecological benefits are another important outcome. The restoration of ponds, enhancement of green infrastructure, and integration of landscape elements can improve environmental quality, support microclimatic comfort, and strengthen the city's resilience to future urban pressures.

At the same time, these interventions help revive the traditional relationship between spirituality and nature that has historically shaped Tirupati's urban character.

The proposal can also contribute to local economic development. By encouraging pilgrims to spend more time within the city, opportunities can be created for local businesses, traditional crafts, food markets, and cultural activities. This can help distribute the economic benefits of pilgrimage more evenly across the city while supporting local livelihoods.

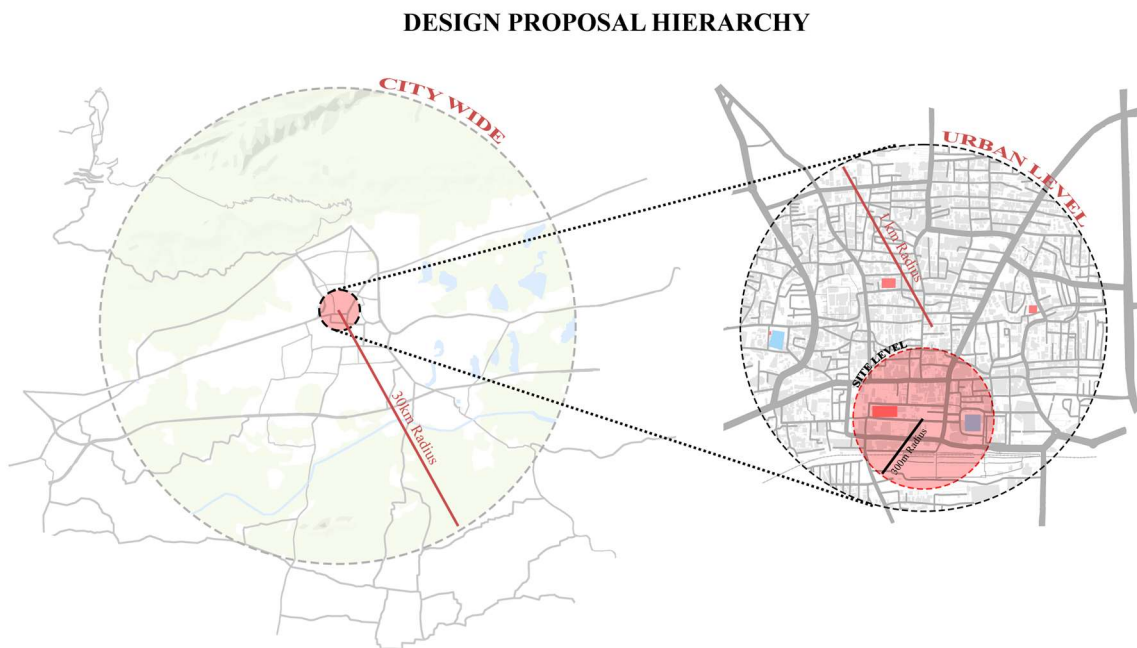
From a governance perspective, the strategy promotes a more integrated approach to urban development by bringing together heritage conservation, mobility planning, ecological restoration, and public space improvement within a common framework. Such an approach can support long-term collaboration between TTD, municipal authorities, local communities, and other stakeholders.

Overall, the expected outcome is a more vibrant, walkable, and resilient Tirupati where heritage, ecology, pilgrimage, and everyday urban life are better connected. These outcomes provide the foundation for the city-level proposal presented in the following chapter, which introduces the Green Spiritual Circuit as a framework for sacred urban regeneration.



# Chapter 5: Macro-Scale Proposal – Green Spiritual Circuit

## 5.1 Vision and Design Principles



*Figure 57: Design Proposal Hierarchy.  
Drawn by Author.*

The proposal is based on the idea of reconnecting Tirupati's sacred places through a continuous network of pilgrimage routes, heritage nodes, and public spaces. Instead of treating temples and sacred sites as isolated destinations, the proposal aims to strengthen their relationship with each other and with the city.

The framework operates at three scales. At the city scale, the Green Spiritual Circuit connects major pilgrimage destinations and sacred landscapes across the Tirupati region. At the urban scale, the Urban Heritage Loop links important temples, water bodies, and public spaces within the historic core through walkable and sustainable mobility routes. At the site scale, the Govindaraja Heritage Node demonstrates how these larger strategies can be translated into a detailed urban intervention.

The proposal is guided by five design principles:

**Connectivity:** Strengthening connections between heritage sites, public spaces, and pilgrimage routes.

**Walkability:** Creating safe, comfortable, and pedestrian-friendly movement networks.

**Ecological Integration:** Reinforcing the relationship between sacred places and water heritage.

**Heritage Conservation:** Protecting and enhancing the cultural identity of the city.

**Place Activation:** Encouraging social, cultural, and economic activity around heritage spaces.

## 5.2 Green Spiritual Circuit: City-Wide Framework

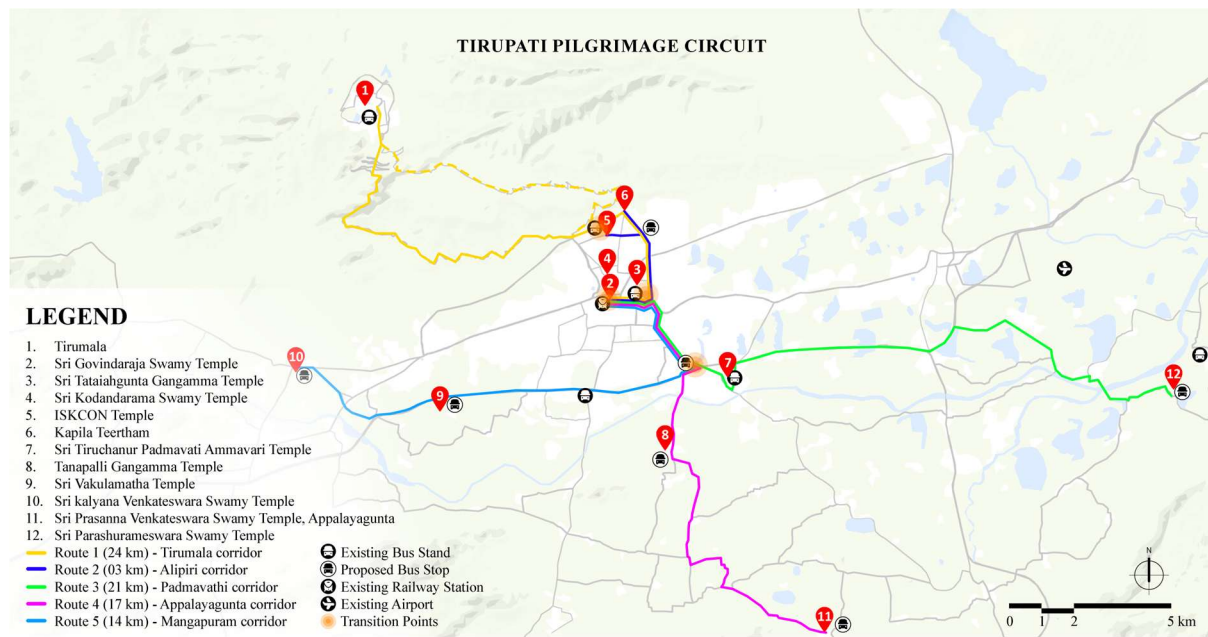


Figure 58: Tirupati Pilgrimage Circuit.  
Drawn by Author.

The Green Spiritual Circuit is the city-wide framework of the proposal. It connects the major sacred destinations of Tirupati through a linked pilgrimage network so that the city can function as more than just a transit point to Tirumala. The idea is to bring together the important temples, heritage nodes, and sacred landscapes into one larger urban system.

At this scale, the circuit includes the major pilgrimage destinations across Tirupati and its surroundings. These sites are not treated as isolated places, but as parts of one sacred network. The routes between them are equally important because they shape the way pilgrims move through the city and experience its heritage. By strengthening these connections, the proposal aims to improve the legibility of the sacred landscape and distribute pilgrimage movement more evenly across the city.

The city-wide circuit also helps in reducing the concentration of movement only toward Tirumala. Instead of all activity moving in one direction, the circuit encourages a more layered pilgrimage experience where visitors can also engage with Tirupati's temples, streets, and water-related heritage. This creates the possibility of extending the pilgrim stay, supporting local activity, and making the city more visible as a sacred destination in its own right.

The framework is not meant to redesign every route in detail at this stage. It works as a conceptual structure that identifies the main sacred anchors and their broader connections. This gives a clear base for the next level of the proposal, which is the Urban Heritage Loop in the historic core of the city.

### 5.3 Urban Heritage Loop

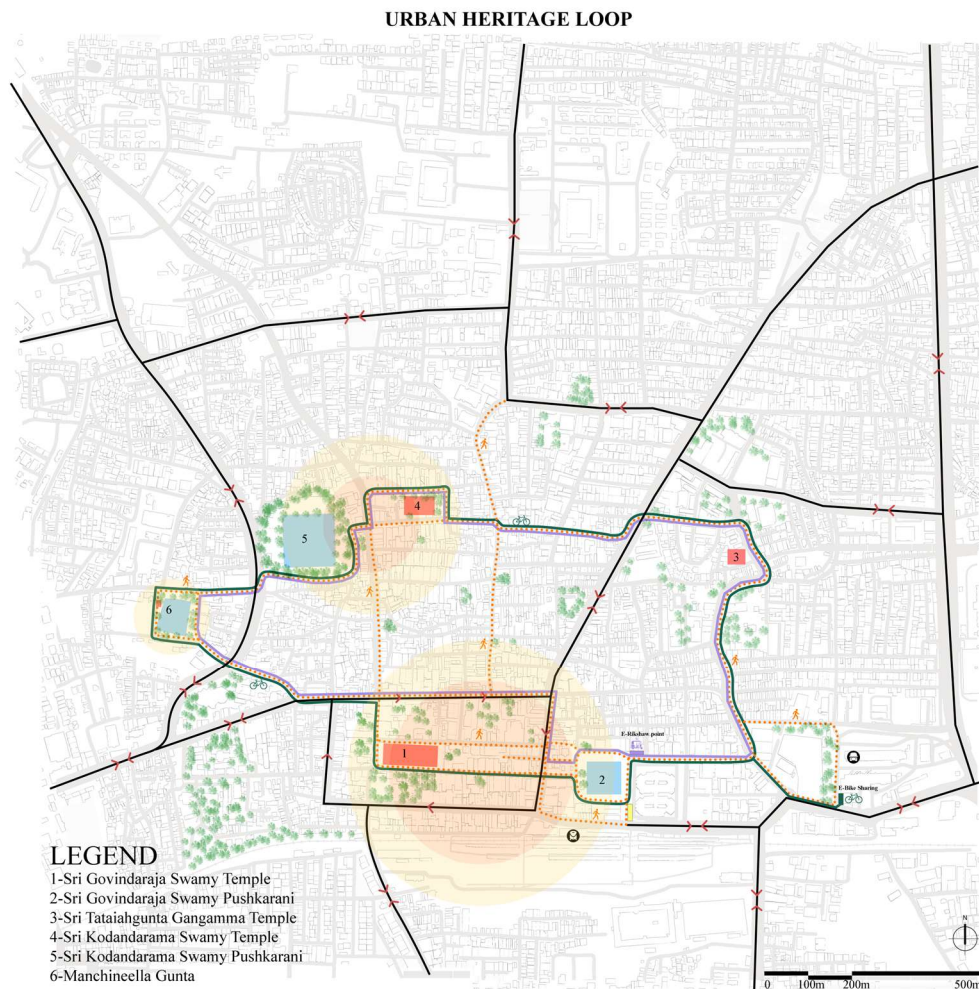


Figure 59: Urban Heritage Loop.  
Drawn by Author.

The Urban Heritage Loop is the second layer of the proposal and focuses on the historic core of Tirupati. Unlike the city-wide Green Spiritual Circuit, which connects major pilgrimage destinations across a wider area, this loop works at a more walkable scale and brings together the important sacred and heritage spaces within the city center. It links Sri Govindaraja Swamy Temple, Sri Tataiahgunta Gangamma Temple, Sri Kodandarama Swamy Temple, and Manchinella Gunta through a connected route of movement and public experience.

This loop is important because it shows how sacred urbanism can work at the everyday level of the city. The core area already has strong religious and cultural importance, but at present, the movement through it is fragmented and uncomfortable in many places. By creating a clearer loop, the proposal gives structure to the way pilgrims and local people move through the historic center. The route can support walking, cycling, and e-rickshaw movement, making it convenient and accessible.

The Urban Heritage Loop also helps connect heritage with water. In this part of the city, the temples and the water body are not separate elements. They are part of the same sacred urban



setting. By linking the temple precincts with Manchinella Gunta, the proposal creates the possibility of a more continuous and meaningful experience of the historic core. This also makes the water body a part of the city's active public life rather than an isolated leftover space.

At this stage, the loop is presented as a conceptual framework rather than a detailed design. The main idea is to show the possibility of a more connected urban core where pilgrimage movement, heritage identity, and public space work together. This also prepares the ground for the next section, where mobility and public realm strategies are explained more clearly.

## **5.4 Mobility and Public Realm Strategy**

The movement system within the Urban Heritage Loop is intended to be calm, flexible, and pilgrim-friendly. Since the core area contains important temples, streets, and a sacred water body, the proposal does not treat mobility only as transportation. It treats movement as part of the pilgrimage experience itself. The aim is to make the route easier to walk through while also allowing other slow modes of travel where needed.

The first priority is pedestrian movement. The streets within the loop should support comfortable walking with better continuity, clearer edges, and safer crossings. This is especially important around the temple precincts, where the present street condition is often affected by congestion, parked vehicles, and unorganized movement. By improving walkability, the route can become more usable for pilgrims of all ages as well as for local residents.

The second part of the strategy is to support the cycling and e-rickshaw movement. These modes are useful in a city like Tirupati because they provide short-distance connectivity without depending fully on private vehicles. Cycling can support younger users and local movement, while e-rickshaws can help pilgrims and elderly visitors move between important nodes. This creates a more layered mobility system that is still light and non-intrusive.

The public realm along the loop should also be improved through simple design elements. Shaded edges, resting points, better paving, and clearer route marking can make the loop more comfortable and legible. These are not treated as decorative additions, but as basic supports for movement and experience. The idea is to make the route feel connected, readable, and respectful of the sacred setting.

In this way, the mobility strategy supports the larger proposal by connecting the heritage nodes, improving everyday use, and giving the urban core a more walkable character. It also prepares the ground for the next section, where the proposal is brought together through implementation and phasing.

## **5.5 Implementation and Phasing**

The proposed Green Spiritual Circuit and the Urban Heritage Loop are intended to be developed in phases. Since the project covers both city-scale and urban-core scale interventions, it is not practical to implement everything at once. A phased approach makes the proposal more realistic and also allows the most important areas to be improved first.

The first phase can focus on the most immediate and visible improvements. This includes route marking, pedestrian priority, basic wayfinding, and small public realm upgrades along the

Urban Heritage Loop. At this stage, the intention is to make the route more legible and easier to use without requiring major construction. This phase can also help create awareness about the larger circuit and build public support for the proposal.

The second phase can focus on strengthening the character of the historic core. This may include improved street edges, better connections between heritage nodes, shaded walkways, and stronger integration with the water body. At this stage, the Urban Heritage Loop begins to work more clearly as a connected sacred route and not just as a series of separate places.

The third phase can focus on larger city-scale linkages. This includes strengthening the Green Spiritual Circuit by improving connections between the major sacred destinations of Tirupati and linking them more effectively with transport nodes. At this level, the proposal begins to operate as a broader pilgrimage framework for the city.

This phased approach keeps the proposal flexible and achievable. It also allows the city to grow gradually toward a more connected, walkable, and heritage-sensitive form. In this way, the project can begin with small interventions and expand into a larger sacred urban network over time.

# Chapter 6: Micro-Scale Design – Govindaraja Heritage Node

## 6.1 Context and Significance of the Site

The Govindaraja heritage node was selected as the focus area to develop the design proposal because of its rich religious, cultural, historical, and urban significance within the city. Located in the heart of the city, adjacent to the railway and bus transit nodes. It has the Sri Govindaraja Swamy temple, one of the most important religious and architectural landmarks of Tirupati. Often considered as lower Tirumala, the deity is the brother of Lord Venkateswara. The node is also associated with a sacred temple tank and the surrounding heritage streets.

The site occupies a strategic position within the proposed Urban Heritage Loop in the city and acts as a major pilgrimage destination as well as a public space within the historic urban core. The precinct experiences a high footfall of pilgrims, residents, and continuous commercial activity due to its proximity to the transit nodes, making it one of the most active and vibrant urban spaces of the city. At the same time, it experiences issues like huge pedestrian congestion, fragmented public spaces, weak connections between temples, streets, and water bodies, which reduce the overall quality of the urban experience.

The significance of this node lies in its ability to demonstrate how the broader-scale objectives of the Green Spiritual Circuit can be translated into a site-scale intervention. By strengthening the pedestrian movement around, enhancing the public realm, and reconnecting the temple precinct with its heritage ritual pond, the Govindaraja Heritage Node can serve as a model for the regeneration of other sacred and heritage areas within Tirupati.

## 6.2 Site Analysis



*Figure 60: Govindaraja Heritage node area.  
Source: Drawn by author on google satellite image.*



The site is located at the city centre with a latitude of 13°37'47.53"N and Longitude 79°25'3.47"E. The highlighted zone is considered the Govindaraja Swamy precinct. As the city grew, the node was divided into different zones, as marked in the above Figure 47.

1. The main Govindaraja Swamy Shrine/the Deity area with a specified high wall boundary. This particular zone was expanded over centuries by different reigns from the early 9<sup>th</sup> century to the 17<sup>th</sup> century, with major contributions by Sri Ramanuja, Yadava Kings, and Vijayanagara rulers (T.K.T 1997).

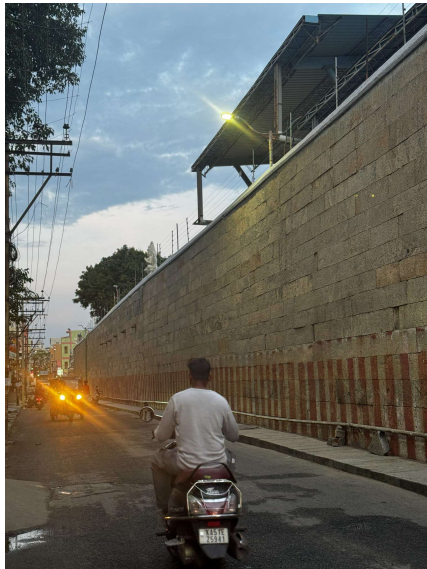


Figure 61: Govindaraja Swamy temple high wall boundary. Captured by author.



Figure 62: Govindaraja Swamy temple aerial view. Captured by Ganesh Velayudam.

2. The open courtyard space or the entrance of the temple to accommodate the crowd. Allows visitors to enter from both the north and south streets, with a few shops, mandapas (pillared halls), and temple amenities.



Figure 63: Govindaraja Swamy temple entrance courtyard. Captured by author.



Figure 64: Puja stalls in the entrance courtyard. Captured by author.

3. This zone has temple-associated priests' residences, also called the Mutt, along with private buildings, shops, and temples.



Figure 65: TTD Jeeyangar's Mutt.  
Source: Google street view.



Figure 66: Handicraft stores, private residences along the zone 3.  
Source: Google street view.



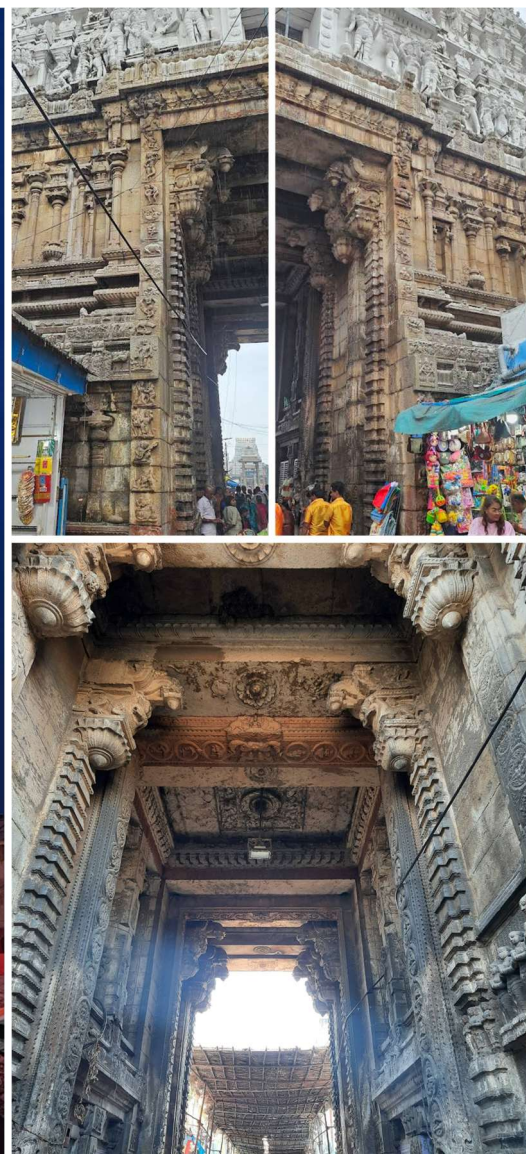
Figure 67: temple, stores, sharing common walls and forming a foreground to the Raja Gopuram  
Source: Google Street View.



4. The Rajagopuram – A seven-tiered, 50-meter-high East entrance gateway to the temple, which has a blend of Dravidian and Vijayanagara architecture styles, constructed from the 14th to 17<sup>th</sup> centuries. The base is made of stone, and the rest is stucco. The structure has scenes depicted from Hindu mythology, the Ramayana, Bhagawata, and Lord Venkateswara's life stories. It was constructed by Matla Anantaraja; a welcoming portrait of him along with his three wives is sculpted on the inner wall of the entrance. The architecture of the gopuram is rich, but parts of its base are visually blocked by the adjoining built fabric. The entrance is around 10 metres high, which is the highest in the district by any Gopuram (TTD 2025). It served as a visual axis point guiding pilgrims miles away and defining the towering urban identity of the city. Sri Govindaraja Swamy Temple was originally envisioned as a prominent east-facing sacred enclosure, with the Rajagopuram serving as a monumental gateway and skyline marker. Over time, encroachment and urban densification reduced the openness of its setting, weakening the temple's visual hierarchy and ceremonial approach



*Figure 68: Raja Gopuram view from adjacent terraces.  
Captured by Butta Lokesh.*



*Figure 69: Raja Gopuram entrance.  
Captured by Tejas Pabale.*





Figure 70: Raja Gopuram stone base sculptures without hardly any visibility, captured by Author.



Figure 71: Entrance walls being used by local vendors to hang their items, captured by Author.

5. The private buildings leading to the Rajagopuram are used as commercial spaces on the lower floors to sell goods and items related to the temple, Hindu culture, ornaments, jewellery, crafts, toys, etc., grabbing the attention of all age groups.



Figure 72: Sannidhi street with stalls on either sides leading to the Raja Gopuram, captured by Author.



Figure 73: Visitors buying handicraft from the stalls in the Sannidhi street, captured by Author.



6. Sri Govindaraja Swamy Pushkarini<sup>11</sup> – the tank also shares the historic roots along with the Govindaraja Swamy temple equally. During the reign of the Vijayanagar Rulers in the 15<sup>th</sup> century, it was transformed into a square form with stepped stone layering to support the temple and pilgrims' rituals. The tank hosts a ritual called Tepotstavam, which is a floating festival that happens for a week annually in the month of February. It has spiritual, social, and devotional importance. A spiritual atmosphere in the presence of the Lord creates a platform for all the people to gather and celebrate that yearly event and to get the divine blessings of Govindaraja Swamy. Currently, TTD is taking steps to restore all the temple tanks that fall under their administration to celebrate the water-related rituals. The tank is filled with water from the municipality's underground water connections. The urban quality around the tank is completely carried away by the parked vehicles all along the perimeter, and there is hardly anything public about it. They form a thick barrier around the tank, taking away the sense of visibility.

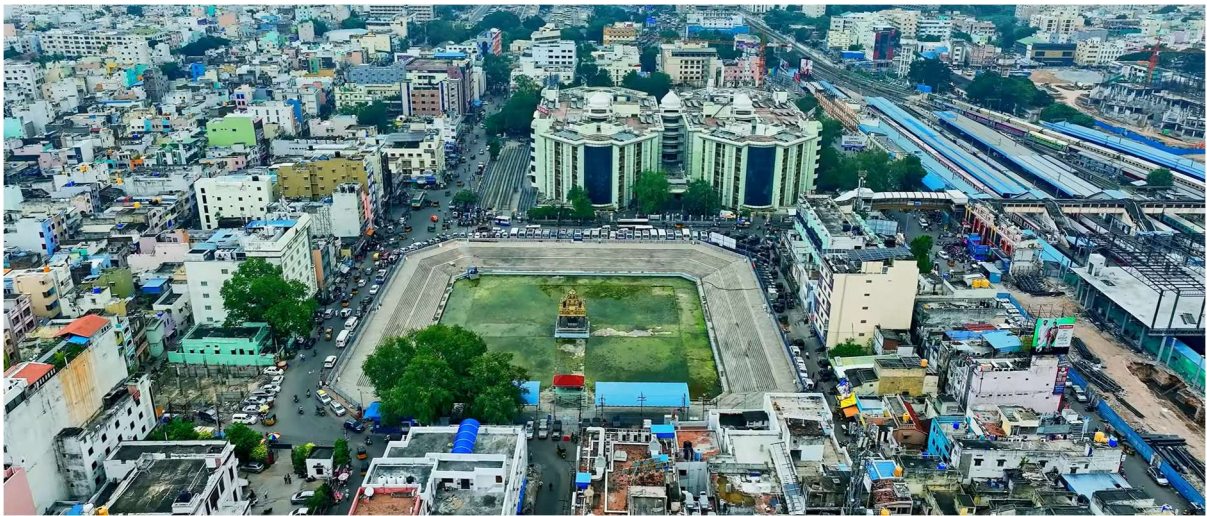


Figure 74: Sri Govindaraja Swamy Pushkarini aerial view.  
Captured by Srikanth Krishna.



Figure 75: Street views around the Govindaraja Pushkarini.  
Source: Google Street View.

<sup>11</sup> **Pushkarini:** A sacred water tank or stepwell built near or inside Hindu temple complexes.



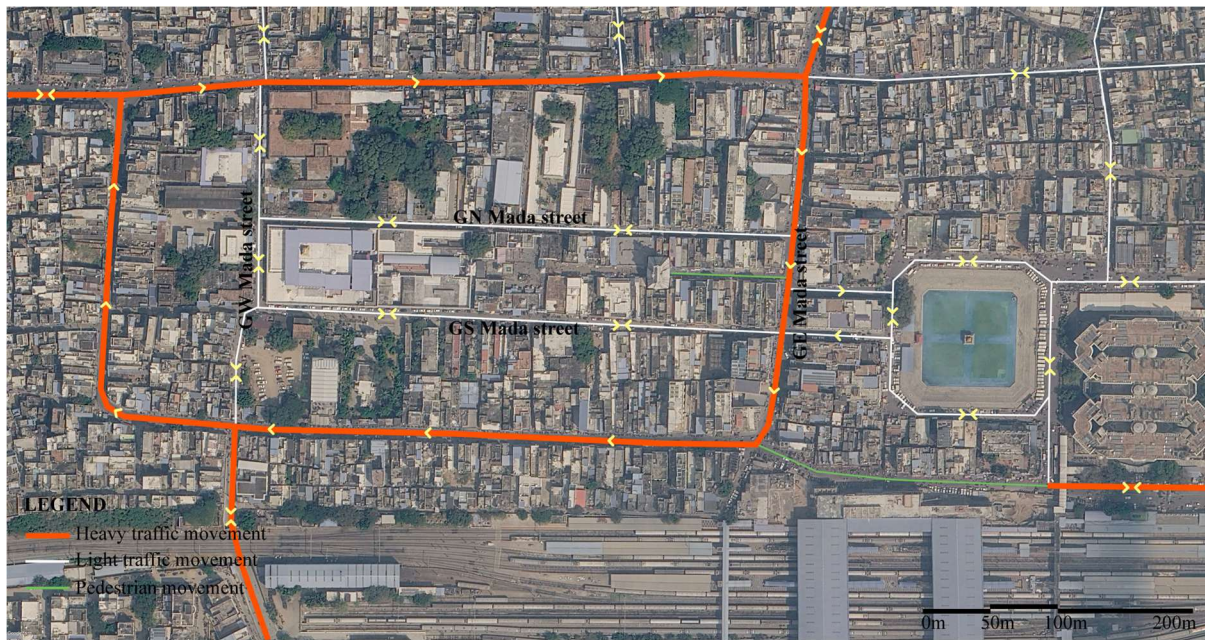


Figure 76: Circulation flow around the Govindaraja Heritage Node.  
Source: TUDA.



Figure 77,78,79: North, West, and South Street views around the temple boundary wall.  
Captured by Author.

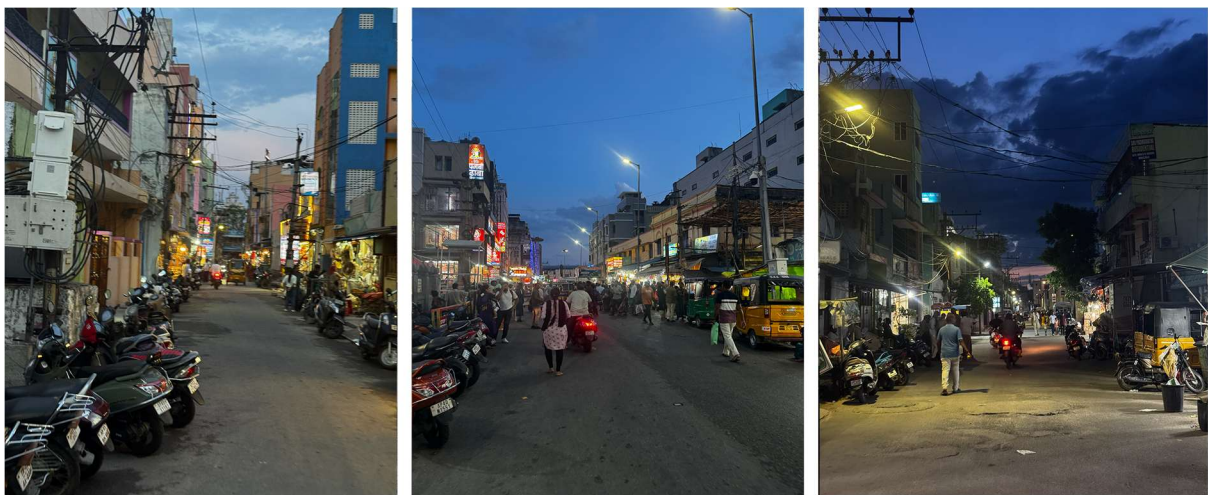


Figure 80,81,82: North, East, and South Street views in front of the temple.  
Captured by Author.



The highlighted flow in red is the steady, continuous traffic moving around the Govindaraja Heritage Node in a loop, allowing the roads adjoining the temple precinct to have less vehicular movement. The street character around the node is busy and highly active. The area has temples, stores, residences, and small commercial spaces along the streets leading to the shrine. There is hardly any basic street infrastructure like footpaths, pedestrian crossings, signage, etc.



Figure 83,84,85: Mada Street characters showing old residence, footpath condition, and cultural building.  
Captured by Author.



Figure 86: Land use plan of Govindaraja Heritage Node.  
Source: TUDA.

The land use shows that the temple precinct is the zone for conservation, commercial along the streets, with residential behind. The 2040 master plan has proposed a wider network of streets along this zone as well, for better movement of the crowd by keeping in mind the future pilgrim flow and traffic. The adjacent railway station precinct is also in the process of expansion to facilitate better amenities and transit comfort for the pilgrims.

Overall, the site analysis shows that the Govindaraja Heritage Node has strong sacred and urban significance, but its present condition is affected by congestion, parking pressure, weak pedestrian edges, and poor visibility of the heritage fabric. At the same time, the site has enough spatial value and activity to support regeneration through a more connected street system, improved public realm, and stronger relationship between the temple and the Pushkarini.

## 6.3 Conceptual Framework for Heritage Node Regeneration

The conceptual design framework for the Govindaraja Heritage Node is based on strengthening the relationship among the temple precinct, the surrounding street network, and the sacred water tank. The site analysis shows that these elements currently function as different entities, though they are from the same urban heritage setting. While the temple continuously attracts a lot of pilgrims daily, the streets are dominated by vehicles and commercial activities all along, and the tank remains disconnected from everyday public life.

The proposal therefore focuses on reconnecting these fragmented elements through a simple, people-oriented approach. Instead of introducing major physical transformations, the intention is to improve the existing urban infrastructure and enhance the quality of the public realm of the node. The key ideas that guide the regeneration of the node are as follows.

**Reconnect:** strengthening both the physical and visual relationship among the temple precinct, the streets around, and the Govindaraja Pushkarini through continuous pedestrian movement.

**Enhance:** improving the experience of both pilgrims and local users by creating safer and more comfortable street environments while respecting the existing urban character of the precinct.

**Activate:** Bringing the Pushkarini back into public life by improving its accessibility, edges, and reinforcing its role as an important cultural and ritual space within the heritage node.

## 6.4 Design Proposal

### 6.4.1 Master Plan

The proposal aims to improve pedestrian movement, enhance the public realm, and reconnect the sacred water body with the everyday life of the precinct. The temple precinct remains the primary sacred core of the node. The proposal reinforces its importance by creating a clearer and more comfortable movement system around the precinct. The Rajagopuram acts as the main visual and ceremonial gateway, connecting the temple with the surrounding streets and the wider Urban Heritage Loop.

A continuous pedestrian corridor is introduced between the temple precinct and the Pushkarini to strengthen the physical and visual relationship between the two heritage elements. This route becomes the main public spine of the proposal and supports pilgrimage movement, everyday activity, and cultural interaction. The corridor is supported by improved walkability, shaded edges, seating opportunities, and wayfinding elements to enhance the visitor experience.

The proposal also integrates sustainable mobility within the heritage node. E-rickshaw stops, bicycle-sharing facilities, and the pilgrimage circuit bus stop are positioned at strategic locations to improve accessibility while reducing dependence on private vehicles. Existing parking is organized at the edge of the precinct to minimize conflicts between pedestrians and vehicular movement within the heritage core.

The Govindaraja Pushkarini is treated as an important cultural and public space rather than an isolated water body. By improving access, visibility, and pedestrian connections, the proposal seeks to restore its role within the sacred landscape of the precinct. The tank edge is envisioned as a place for gathering, resting, cultural activities, and ritual events while maintaining its

spiritual significance. Overall, the master plan establishes a more connected, accessible, and people-oriented heritage node where the temple, streets, and water body function together as a unified sacred urban environment.



Figure 87: Govindaraja Heritage Node Redevelopment Master Plan.  
Source: Drawn by Author.



## 6.4.2 Street Design and Public Realm Improvements

### Rajagopuram Forecourt Section

The proposed intervention creates a setback around the Rajagopuram to improve visibility of its base, carvings hidden by the built fabric over centuries, and strengthen its role as the primary landmark of the precinct. The forecourt provides a transition space between the temple entrance and the surrounding streets while improving pedestrian movement and gathering opportunities.

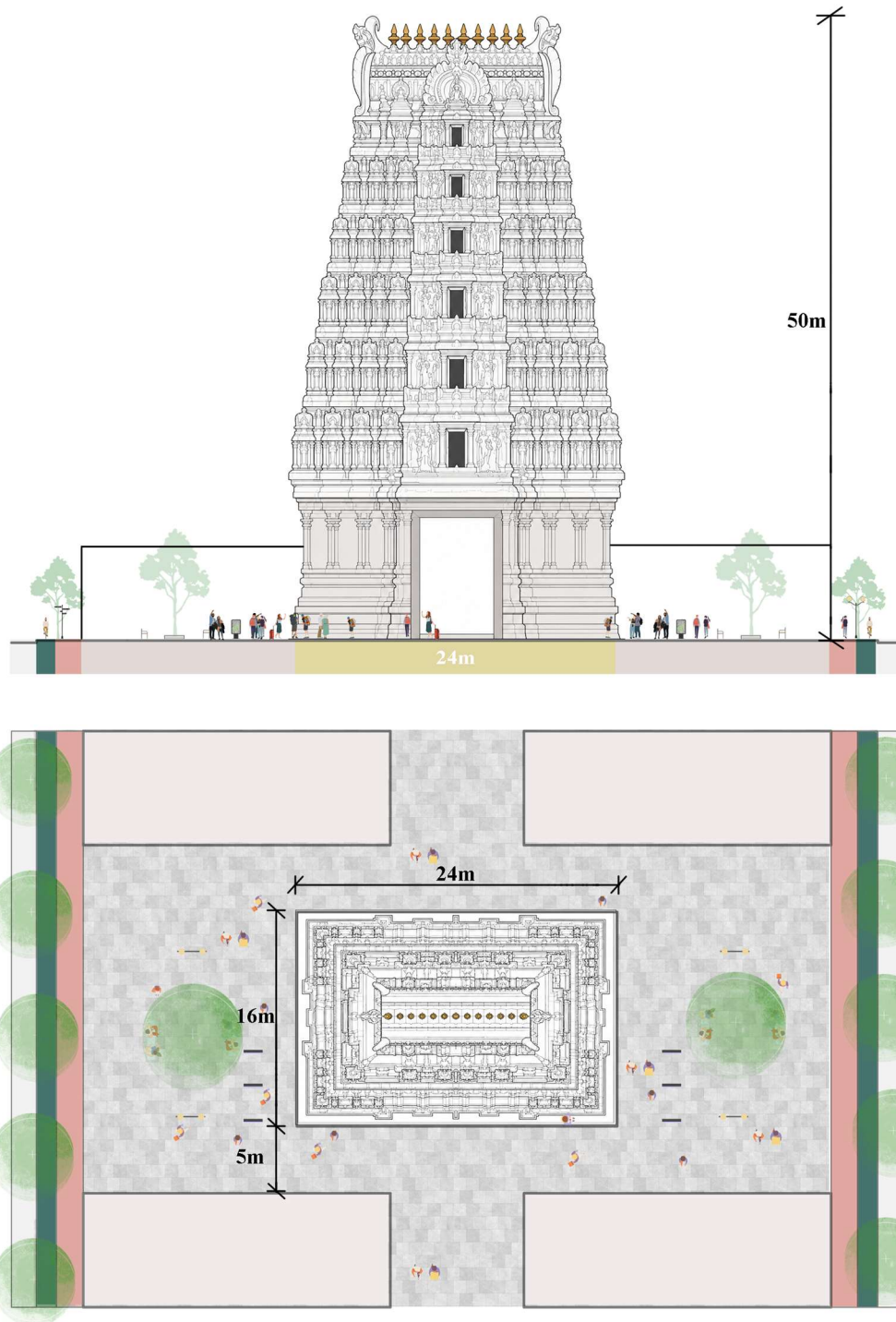


Figure 88: Rajagopuram Forecourt Design (Section-S1)  
Source: Drawn by Author.

### Sannidhi Street Section

This section represents the primary ceremonial approach to the Rajagopuram. The design prioritizes pedestrians through wider walkways, seating areas, tree planting, and improved public realm elements while maintaining access to surrounding mixed-use buildings with clear visibility of the Rajagopuram.

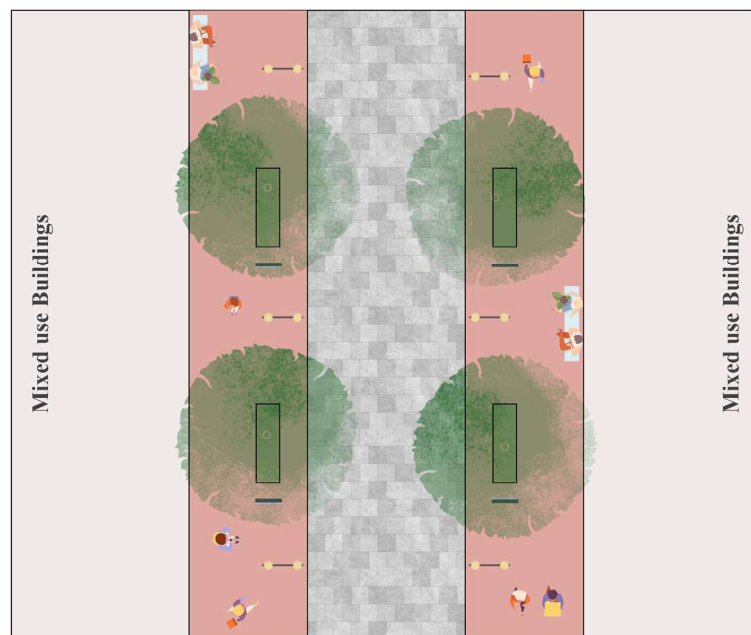
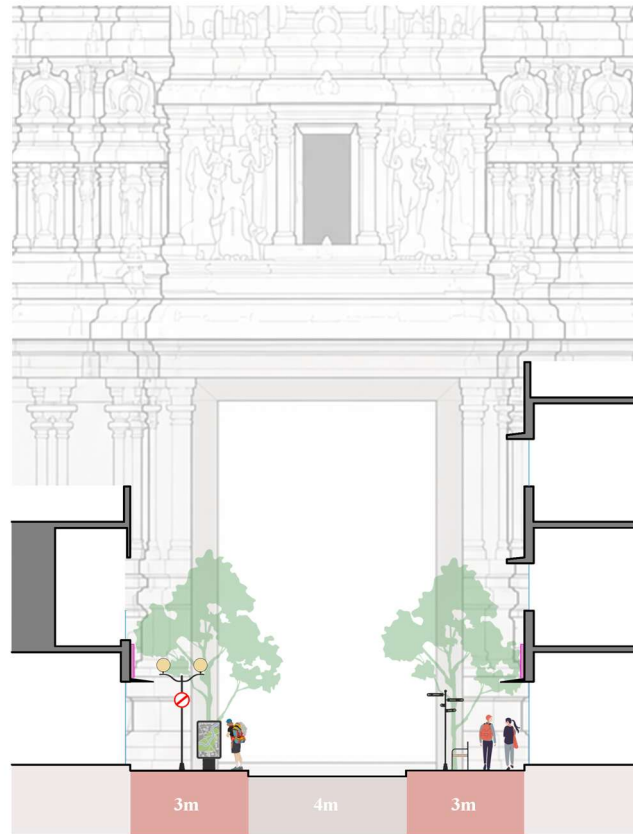


Figure 89: Sannidhi Street Design (Section-S2)  
Source: Drawn by Author.

### Temple Edge Street Section

This section improves the street running along the temple boundary by introducing dedicated pedestrian and cycling infrastructure. Traffic calming measures and landscape elements help create a more comfortable environment while preserving vehicular access.

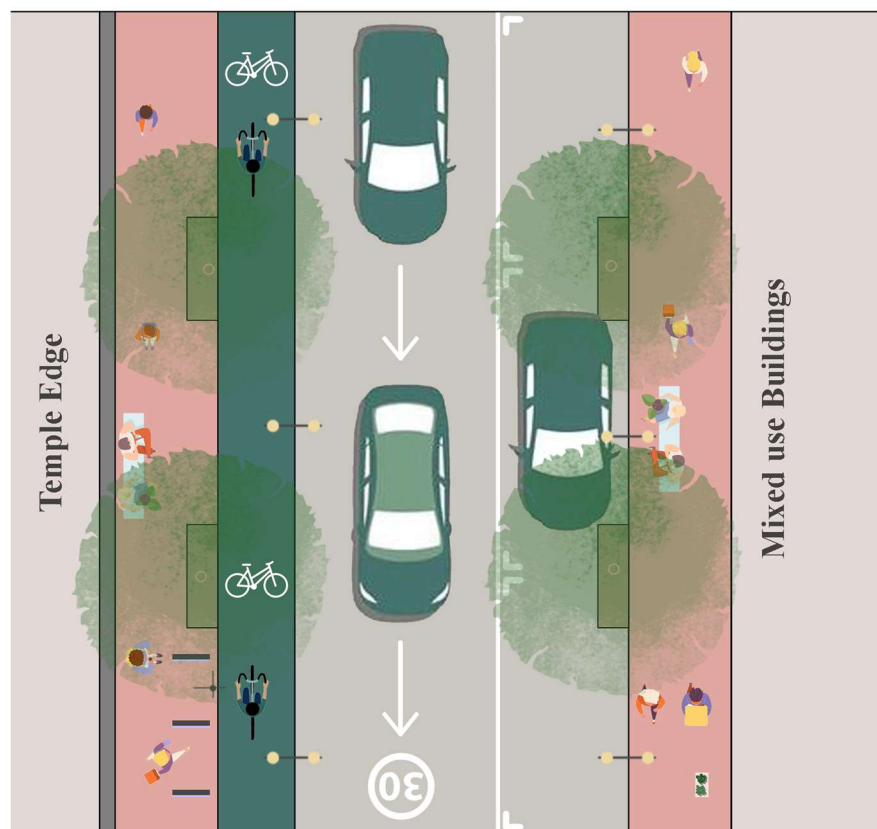
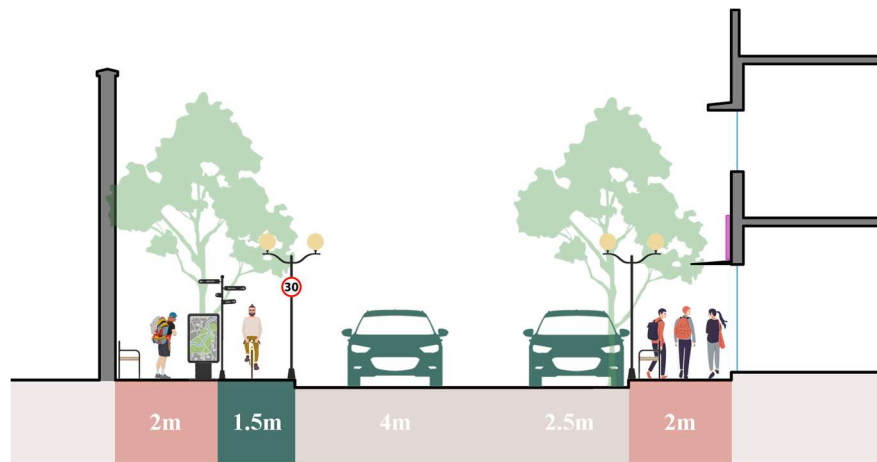


Figure 90: Temple Edge Street Design (Section-S3)  
Source: Drawn by Author.



### Commercial Street Section

This section demonstrates the reorganization of a mixed-use commercial street. Wider footpaths, cycling lanes, street trees, and reduced traffic speeds contribute to a more pedestrian-friendly urban environment.

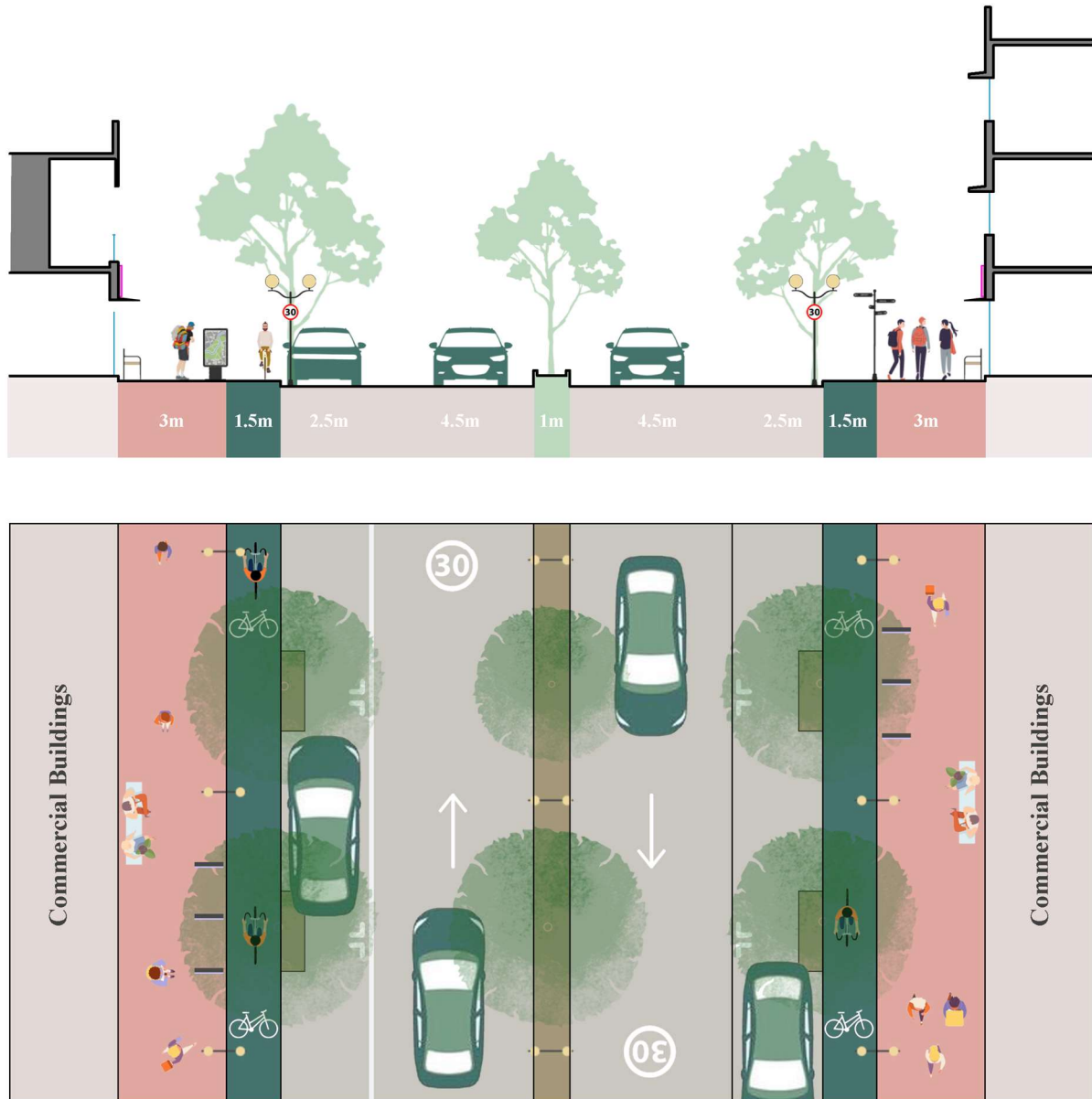


Figure 91: Commercial Street Design (Section-S4)  
Source: Drawn by Author.

### 6.4.3 Govindaraja Pushkarini Redevelopment

The proposal seeks to strengthen the connection between the Pushkarini, the temple precinct, and the public realm by improving accessibility, visibility, and user experience. The design focuses on creating a more active and welcoming edge through stepped access, landscape interventions, seating areas, and pedestrian-friendly spaces. While maintaining the ritual and cultural significance of the water body, the proposal reimagines the Pushkarini as an integrated public space that supports both everyday use and special cultural activities.

#### Pushkarini Edge Section

The section demonstrates the integration of the Pushkarini with the surrounding public realm. The proposal introduces pedestrian walkways, cycling infrastructure, seating opportunities, landscape elements, and stepped access to the water edge, transforming the tank from an isolated heritage element into an active public space.



Figure 92: Pushkarini Edge Design ( Section-S5 )  
Source: Drawn by Author.

### Pushkarini Perspective View

The perspective illustrates the envisioned character of the Pushkarini edge, combining cultural activities, gathering spaces, shaded seating areas, and water-sensitive public realm improvements while maintaining the sacred significance of the tank.



Figure 93: Pushkarini Edge Redevelopment 3D View.  
Source: Drawn by Author.

## 6.5 Implementation and Phasing

The regeneration of the Govindaraja Heritage Node should be carried out through a phased and participatory process. Since the precinct is an active religious, commercial, and public space, the proposal should be developed in consultation with the different stakeholders who use and manage the area. This approach helps ensure that the design responds to local needs while respecting the cultural and religious importance of the site.

The first step is to establish a dialogue between the key stakeholders, including Tirumala Tirupati Devasthanams (TTD), Tirupati Municipal Corporation, planning authorities, local residents, temple priests, shop owners, street vendors, transport operators, and pilgrims. Understanding their daily activities, concerns, and expectations will help identify practical solutions that are acceptable to all users of the precinct.

Based on these discussions, the design proposal can be refined and adapted wherever necessary. This stage provides an opportunity to review circulation patterns, public space requirements, vendor locations, accessibility, and heritage conservation measures before implementation begins. Such a process allows the proposal to remain flexible while responding to the changing needs of the site.



Implementation can then begin in stages, starting with interventions that require minimal physical changes. Improvements such as pedestrian infrastructure, wayfinding, street furniture, landscape enhancements, and traffic management can be introduced first to improve the overall public experience. These early interventions can also help build public confidence in the project.

The next stage can focus on larger public realm improvements, including the redevelopment of the Pushkarini edge, streetscape enhancements, and strengthening the connections between the temple precinct, surrounding streets, and the sacred water body. These works should be coordinated carefully to avoid disrupting temple activities and the daily movement of pilgrims.

The long-term success of the project depends on continuous management and maintenance. Regular monitoring, stakeholder feedback, and periodic improvements will help ensure that the heritage node continues to function as a vibrant sacred public space while adapting to future needs. In this way, regeneration becomes an ongoing process rather than a one-time intervention, and the proposal can grow slowly while respecting the existing character and functioning of the precinct.

### **Summary**

The Govindaraja Heritage Node demonstrates how the larger vision of the Green Spiritual Circuit can be translated into a site-scale intervention. Through improvements to the public realm, pedestrian movement, and the Pushkarini edge, the proposal illustrates a possible approach for reconnecting heritage, water, and urban life within the historic core of Tirupati. The following chapter reflects on the findings of the study and the broader implications of sacred urbanism for the future development of pilgrimage cities.

## **Chapter 7: Conclusion**

### **7.1 Recap of the Thesis**

This thesis began with a simple question: how can Tirupati be understood and regenerated as a sacred city, not only as a gateway to Tirumala? The study looked at the city through its history, urban form, heritage nodes, water bodies, movement systems, and daily activity. The analysis showed that Tirupati has a strong sacred identity, but many of its important spaces now function in a fragmented way. The temples, streets, and water bodies are still present, but they do not work together as one connected urban experience.

To respond to this, the thesis proposed the idea of Sacred Urbanism. At the city scale, this was translated into the Green Spiritual Circuit. At the urban core scale, the Urban Heritage Loop connected the important sacred and heritage spaces in the city centre. At the site scale, the Govindaraja Heritage Node showed how the larger vision could be brought into a detailed design proposal.

### **7.2 Main Findings and Contribution**

The main finding of this thesis is that Tirupati should not be seen only as a transit city for pilgrims going to Tirumala. It has the potential to function as a living sacred city with its own heritage value, public life, and cultural identity. The city already has many elements needed for this transformation, such as temples, processional streets, ritual water bodies, and active pilgrimage movement. What is missing is a stronger connection between them.

The thesis contributes by showing that pilgrimage cities can be understood through both urban design and spiritual identity. It also shows that heritage regeneration does not always need large-scale redevelopment. Sometimes, the most effective approach is to reconnect what already exists, improve movement, restore water heritage, and strengthen the public realm. In this way, the study offers a small but clear framework that may be useful for other pilgrimage cities with similar conditions.

### **7.3 Limitations**

This thesis is based on a conceptual design approach and is limited to a selected part of Tirupati. It does not cover the full details of implementation, funding, or governance arrangements. The proposal also depends on coordination between different stakeholders such as TTD, the municipality, transport agencies, and local users. Because of this, the drawings and strategies should be understood as a design direction rather than a final executed project.

### **7.4 Future Scope**

The study opens up several possibilities for future work. The Green Spiritual Circuit can be developed further for other parts of Tirupati and for other pilgrimage cities in India. The Urban Heritage Loop can also be explored in more detail through street design, mobility planning, and public space improvement. The relationship between sacred water bodies and urban ecology is another area that can be studied further, especially in cities where temple tanks and ponds remain part of the cultural landscape.

## **7.5 Closing Statement**

Tirupati has always been more than a place of transit. It is a city shaped by devotion, movement, memory, and urban life. This thesis has tried to show that its sacred identity can be strengthened through careful regeneration of its heritage nodes, pilgrimage routes, and water bodies. The idea of Sacred Urbanism is therefore not only about design, but also about understanding the city in a deeper way. It offers one possible path toward a Tirupati that is more connected, walkable, and meaningful for both pilgrims and residents.



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