# THE VISUAL AND SPATIAL INFLUENCE OF TEMPLES UPON SOUTH INDIAN TEMPLE TOWNS

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**DECLARATION**

I understand the nature of plagiarism and I am aware of the University's policy on this. I certify that this dissertation contains original work by me and that all the sources I have used or cited as a part of the discussion have been demonstrated by means of traceable references.

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## ABSTRACT

Temple cities of south India have achieved the highest social, cultural, and economic ideals through many centuries, representing a unique genre of built fabric and functioning as independent social units. Over time, the concept of a south Indian temple city has evolved from simple settlements into a complex theory that incorporates a huge deal of experience and experimentation. In the context of South Indian temple cities, the temple complex is not limited to the central core, but encompasses the whole settlement, which is recognized for its ability to adapt to urban change and continued habitation. In South Indian temple cities, the built environment is arranged, proportioned, and designed to reflect the physical, cultural, and functional setting. Throughout the ages, the temple cities of South India have been shaped by numerous cultural and political influences that left an indelible mark on their visual fabric.

The purpose of this study is to examine how temples and temple towns have interacted over time, examining the relationship between the development of temple towns in South India. Throughout the course of the research, temples are examined in terms of how they shape the architectural styles and design elements of the surrounding urban fabric, and how they are oriented and situated within the urban context to create spatial and visual hierarchies, which affect the overall layout and design of the city. Moreover, the study explains how temple festivals and rituals, such as the Ratha Yatra, shape the social and cultural life of South Indian temple towns and how they are manifested in urban settings. In addition, the study examines how urbanization and development pressures

affect the historic fabric of South Indian temple towns and how these cities can preserve their unique cultural and religious heritages.

In traditional South Indian temple towns, the urban fabric reflects the community's cultural needs and aspirations and is based on a variety of architectural and planning frameworks. In these towns, the built environment is inextricably linked to religious and cultural practices based on the metaphysical interpretation of space. This study explores the basic norms that govern the structure and function of Indian temple towns and analyzes how temples interact with the surrounding urban fabric. Temples are often the focal points of these towns, and their architectural styles and design elements influence the surrounding urban fabric.

This study analyzes three temple cities in South India on the basis of their social, architectural, and cultural continuities and changes. Combined with the socio-cultural attributes of these spaces, interconnections between people have caused a considerable spatial configuration. In addition to implementing both quantitative and qualitative approaches, the research utilizes combinational research strategies such as logical reasoning, comparative simulation and descriptive-analysis to examine the South Indian temple towns. The study also includes questionniers, field studies, documentation, questionnaires and desk research.

As part of this study, three primary components are considered for analysing the environmental image: Gopuram represents identity, Ratha Yatra represents structure, and temple represents meaning. Our main goal is to gain insight into how these three components contribute both to the form and function of temple towns in South India. In

this study, the architectural styles and style elements of temples in South India are analyzed and their influence on the surrounding urban fabric is discussed in relation to the historical development of South Indian temple towns. A study of how temples are positioned and oriented within the urban environment in order to establish visual and spatial hierarchies, assessing the social and cultural impact of temple festivals and rituals in South Indian temple towns, and identifying the challenges and opportunities for preserving the historic fabric of South Indian temple towns despite the pressures of urbanization and development. The visual influence of southern Indian temples on the built environment has been examined using a regression model, and a number of samples of visual heritage, as well as direct observations and documentation, have been collected. Through the analysis of the composition of south Indian temple cities, the findings of this research will contribute to the preservation and enhancement of India's rich cultural and architectural heritage.

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## *SECTION 1: RESEARCH SYNOPSIS*

This section focuses on the purpose and significance of the study by providing an overview of the study domain. In this section, the study aims in introducing concept of 'South Indian temple city' and its significance in modern time. As shown in the Figure 1, this section comprises of three chapters: 'Introduction'; 'Aims and Objectives'; and 'Methodology'. In the 'Introduction' chapter the study focuses on introducing the research domain, focusing on the purpose of the study as well as providing an overview of the previous study creatiang a platform for research gap and research questions. The following chapters focus on the goals and methods of the study.
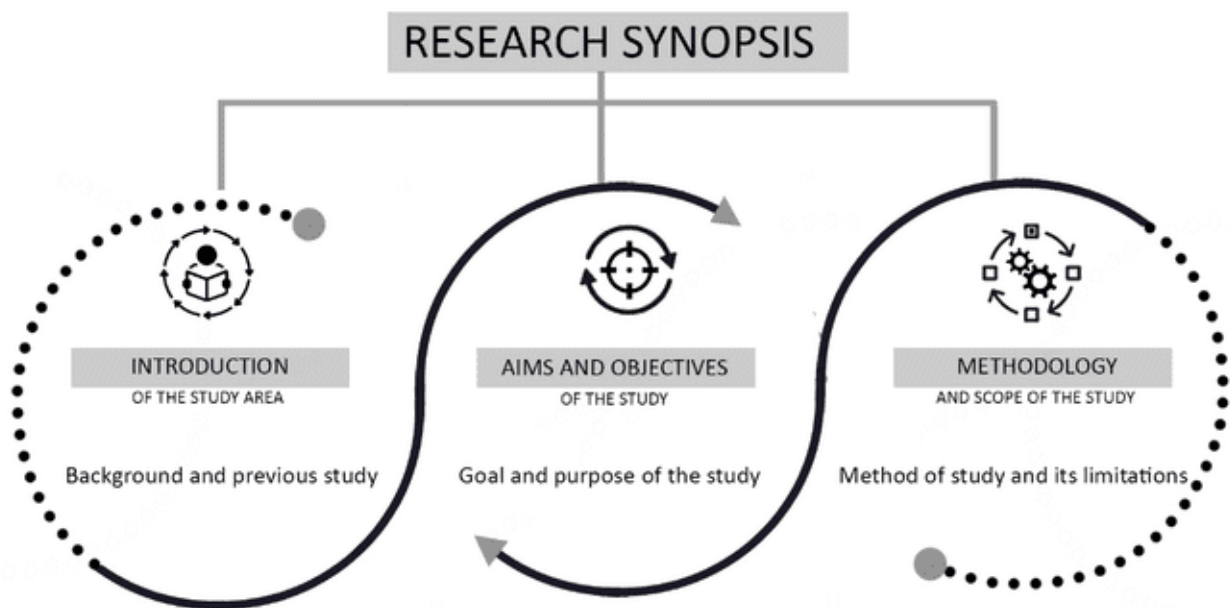


Figure 1 : Research overview flowchart

Source: (Author, 2021)

Through this section the study focuses on the factor of 'imageabilty' in a temple city and its significance on the city's skyline as well as the evolution and functioning of the city in

response to its socio-webs. To analyze the above the study adopts a 'mixed methodology' which is a combination of multiple quantitative and qualitative techniques for both data collection and analysis in a single research design.

# CHAPTER 01: INTRODUCTION

India holds a record of 5000 years of urbanization, still preserving its glorious legacy in some of its ancient cites (Ramachandran, 2010). Specifically, the concept of 'temple city' stands unique in India as India is the only country where the temple is constructed before and the whole city is constructed with reference to the temple both spatially and visually. The temple city fabric of India is product of Vedic (ancient sacred scriptures) Town planning priciples and cultural exchanges developed with ecologically, socially, culturally, spatially and visually sustainable platforms. Temples served as seats of worship, knowledge, celebration and justice. They also played a crucial role in encouraging as well as preserving art and culture along with contributing to economy.

The temple cities of South India share a unique template demonstrating their rich culture and technology through spatial and visual composition. These characteristics helped in preserving the social connectivity and sense of belongingness among the people enhancing the quality of communal life. South Indian temples, as a result, are well balanced among visual, spatial, social, and cultural dimensions, which is reflected in the urban form of the temple city.

From its inception, the Indian built environment has continually evolved. The newer built environments that are emerging in developing cities, however, do not seem to reflect the continuity of this development as they reflect the cultural preferences of the locals. Managing the emerging built environments of contemporary times requires an understanding of traditionally developed built environments. In order to understand spatial configurations and embedded reasoning of user preferences in such a method, statistics has

been used to study South Indian temple cities. Identifying culture-specific preferences regarding space proxemics was made possible by taking into account the importance of religious, administrative, and commercial urban activity nodes as part of the overall spatial configuration of the urban landscape.

## 1.1 Background

South Indian towns have manifested themselves as the abodes of immortals in response to the deep-rooted built heritage, which is not just a product of building materials and techniques but a framework generated to represent traditions, cultures, and lifestyles that have been being passed through various generations.  Over the years this heritage has reflected itself as the identity of the city in response to its magnificent structures that are often not of human scale. South Indian architectural framework in particular has witnessed robust sacred landmarks in the form of Gopurams and Vimanas (massive gateways of temple or temple city) which visually and spatially dominated the city fabric serving as focal points.  The vibrancy of the South Indian temples is extended onto the temple town in the form of both physical and social elements. These sacred edifices are epitomes of numerous layers of evolutions that have been witnessed on the traditional architectural framework. According to Kevin Lynch the built heritage that shapes the skylines and streetscapes not just enhances the history of the city and adds beauty to the space but also creates sense of belongingness to their inhabitants (Lynch, 1960).

### 1.1.1 Need for the study

Temple fabric served as the physical identity preserving the cultural character along with connecting the past and present social structure. This was achievable as these temple cities have a well-prescribed character at their central core that exhibits the identity of the city in a 'frozen' form. This character is a product of visual, spatial, social and cultural structure formed through a number of experience and experimentation.

South Indian temple cities are clad in rich character, once stood as an epitome of the robust cultural character, evidence to many historical events as well as tribute to a certain personalities and communities. The character of these cities is reflected with a certain dimension of visible aura. There is dire need for the preservation of the aura of these structures as they act as a strong centripetal force in binding the people and creating a sense of belongingness. Over the last five decades, preservation of historic towns and mitigating the impact of new development have been challenging tasks because architecture is the only surviving medium that reflects the social structure and technology of that particular era.

As far as religious, cultural, and economic structures in a town are concerned, the temple plays a significant role in shaping them. It is possible to categorize a town according to the type of religion it is centered on – either single-centered or multi-centered. In spite of the fact that the temple towns possess a strong heritage and religious heritage, which binds them together and promotes their development and links them together, the genotype of Hindu sacred space gives the temple towns their distinct spatial identity.

### 1.1.2 Previous research

Various pieces of research have been conducted on these cities, each focusing on a specific aspect or element of these cities.The initial research on the South Indian temple city fabric was mostly confined to theoretical prescriptions of Vedic principles and very less emphasis has been made in understanding the practical exiting geometry and evolutionary pattern of the city form with respect to physical, social and economic frictions that have been witnessed in time.  For example, Binode Behari Dutt in his 'Town Planning in Ancient India' illustrates the theoretical models of town planning that were designed in response to their geographical location, capacity and function (Dutt, 2009). The timeline of the temple towns is another aspect of research, such as Devakunjari's work, "Madurai through the ages" (Devakunjari, 1957). While George Mitchell in his work 'Temple towns of Tamil Nadu' (Michell, 2008) highlights the significance of sacred and urban spaces in South India, Julian Struthers discusses the sacred geometry of the South Indian temple towns in his work 'Madurai, India: The architecture of a city' (Smith, 1976), and James Heitzman focuses on the evolution of the temple towns through his work 'Temple Urbanism in Medieval South India' (Heitzman, 1987). Some of the recent works like 'The morphological characteristics of medieval temple towns of Tamilnadu' (Thilagam and Banerjee, 2015) which focused on the spatial pattern of temple towns while others like 'Visual perception on the architectural elements of the built heritage of a historic temple town: A case study of Kumbakonam, India' focused on the visual perception of temple towns (Kiruthiga and Thirumaran, 2017). Though the spatial and visual platforms of South Indian temple cities have been a topic of research very little research has been performed on their three-dimensional aspects.

The concept of temple city has been majorly viewed as a pilgrim or a heritage destination but not an as sustainable model city as the framework of these cities have never been decoded in a holistic way. Though the temple cities have numerous common denominators the spatial and visual grammar of these cities differs in response to the evolving social, economic, political and cultural structures. Although these evolutionary patterns share similar theoretical domains, they are affected by unique genetic codes produced through social and physical experiences with the prevailing conditions.

The historical zones of South Indian temple cities were subjected to a continuous process of evolution in response to the various influencing factors that differ in the spatio-temporal platform. In the South Indian temple context the historical zones operate as independent social organisms where the heritage buildings act as the nerve cells. These heritage buildings are positioned in such a way that they knit visual webs throughout the historical realm and manifest as strong urban identities. The urban identities together with its spatial and visual attributes form the imageability of the space improving the quality of social life.

These historical zones of the South Indian temple cities are often reffered for their religious aura, cultural character and visual magnificience. Many studies have examined on the religious, cultural and visual domains of these zones independently but the interconnection between them is less investigated.  The study strongly belives that the celebrated identies of these cities are a product of these three domains and there is a dire need in analysing the various factors responsible for preserving and binding religious, cultural and visual domains.

## 1.2 Research questions

The research presented in this thesis has one overarching research question: How do the religious, social, and visual connections established through temples, rituals, and gopurams impact the spatial and visual fabric of South Indian temple cities?

A sub-question to this is: How do these religious, social, and visual connections contribute to the social and cultural life of these communities?

## 1.3 Method selection and application

The following illustrates the methodology adopted to answer the research question.

### 1.3.1 Brief description:

Throughout South India, the majestic temples are surrounded gracefully by an exquisite urban layout. An urban mandala combining the abstract ideals of the town and temple seamlessly blends together in a symmetrical arrangement in concentric squares, demonstrating the intricate geometry of the central complexes. In addition to offering a spiritual experience to the faithful, the parallel streets serve as a path for circumambulating the deities. This is especially true during the auspicious car street festival.

As the primary access routes to the temples, the majestic "Gopuram" streets radiate from the sacred structures' entrances, guiding visitors into the mystical heart of the city through an enthralling journey. Its architectural style, scale, mass, pattern, texture, building type, use, activity, and inhabitants contribute to its unique identity and aesthetic appeal. This creates emotional resonance for pilgrims and tourists visiting these temples.

Sacred monuments have been designed to engage believers in experiencing their sacredness and architectural beauty, and this is done by their physical location, design, layout, and form, all of which communicate their symbolic meanings. As a significant part of South Indian culture, ritual processions have played a significant role in shaping urban planning, as they are considered physical structures that influence the urban fabric in a significant way. Rather than congregating at a single religious center, these processions move outward throughout the settlements, thereby adding a sense of spatial manifestation and ritualism to these towns. Through their auras, South Indian temples have a distinctive identity that extends beyond the temple town. This aura encapsulates completeness and creates a sacred atmosphere. The temple is surrounded by a circular path that symbolizes completeness. Throughout the visual landscape, the "Gopurams," a series of built structures that mark the boundaries of the temple in all directions, reinforce the idea that the temple is both controlled and secular in nature.

### 1.3.2 Data required:

Several samples of visual heritage were collected through direct documentation and observation in this research to examine the visual impact of South Indian temples on their built environment. In addition to photos and videos of street facades on both cardinal and circumambulatory streets, yearly rituals, and spatial maps of Gopurams, this collection includes viewshed maps of Gopurams. A temple town's carefully planned spatial layout makes it possible to see temple monuments from many public places, which gives the temples an impressive aesthetic quality and distinctive sense of place.

The composition of South Indian temple cities has been analyzed using a regression model in a more holistic manner. A user-perception survey and statistical analysis of user

experience of the temple city, along with data on the importance of "architecture and culture functioning as the most significant characteristics," have been conducted. In order to better understand people's perspectives, physical surveying and ArcGIS, as well as land use patterns, were used. The combined analysis of these data forms allows us to better understand how South Indian temples influence their built environment.

### 1.3.3 Research Method:

In this study, multiple samples of visual heritage, direct documentation, and observations will be collected in order to examine how southern Indian temples affect their built environments comprehensively. Our regression model was used to analyze the composition of South Indian temple cities more holistically. In order to collect data, on-site questionnaires were designed based on "context" and "perception."

Using an online survey, users were asked how they felt about the urban environment and how well they understood architectural elements. The impact of rituals on the visual fabric of the city was assessed by using a multi-model regression method. Using a multi-model regression tool and an online questionnaire, the user experience with three independent variables was examined to examine the impact of independent variables on the city's fabric. It was found that there are three primary independent variables that substantially influence how a city's heritage character is shaped and preserved.

An understanding of both the theoretical and practical aspects of urban fabric was used in this study to examine how heritage is preserved over time, utilizing both constructive and experimental methods. A comprehensive examination of the built

environment of southern Indian temples was also conducted through a spatial analysis using Space Syntax Relative Comparison and View-shed maps using the 3D Isovist tool.

### 1.3.4 Implementation:

An integrated approach to studying the visual impact of southern Indian temples on their built environment is used in this study, which employs a multidisciplinary approach. The data collection process involved preparing an online questionnaire and distributing it to the participants via Microsoft Forms, in which the guiding words were "context" and "perception," in order to understand people's perceptions of the city's culture and visual experience, especially in relation to rituals, and to conduct the research. Each city was mapped and drafted to scale using ArcGIS data and a physical survey, followed by a spatial analysis that was tested using Space Syntax and analyzed statistically. Based on the maps and data obtained from ArcGIS, a three-dimensional model is created using Rhino.

A 3D Isovist tool was developed specifically for this study using Grasshopper with the Ladybug plugin for the generation of view-shed maps. The built heritage impression is calculated based on the visual impact of architectural elements that significantly affect how a city is perceived visually. According to the online survey, elements of high visual importance were identified, and their association with spatial structures was investigated. Also considered was the spatial fabric of the city in relation to the theoretical model prescribed in the traditional texts. In order to evaluate the impact of culture on the built heritage, visual heritage percentages are calculated based on how rituals influence culture's expression through visual perception.

# CHAPTER 02: GOAL AND PURPOSE OF THE RESEARCH

Using South Indian temple towns as an example, this study investigates the relationship between the built environment, cultural aspirations, and functional order. In order to develop guidelines to preserve and enhance the unique identity of Indian temple towns in the face of contemporary urban challenges, we examine the fundamental structure of these towns, including the norms that govern their spatial and visual dynamics as well as their organization around temple festivals and events. Though these cities have endured many urban changes and embraced a variety of cultural influences, their character has remained largely unchanged. The adopted methodology incorporates various tools focusing on a specific domain or the relationship between two or more domains in order to gain a better understanding of the form and function of the temple cities of South India.

## 2.1 Research aim

This study explores how temples shape the visual and spatial characteristics of temple towns in South India. In order to expand the concept of contextual planning that existed in temple towns in South India, along with the analytical concepts that structure them, the study uses both traditional and conceptual empirical approaches. A discussion of the historical significance of South temple towns and their pattern of evolution is discussed here to illustrate how the visual and spatial patterns of these cities have been shaped around their historical significance. Studying the formality and intellectuality of their behavior within the urban form along with a selection of contemporary and seminal modern theories and applications throughout the world is the focus of this research.

## 2.2 Research objectives

There are many temple cities in South India that serve as powerful symbols of the society within them. Throughout centuries, temples, rituals, and gopurams have established religious, social, and visual connections deeply rooted in the cultural and religious traditions of the region. Through these connections, the temple cities play a crucial role in defining the identity of the local communities by hosting religious, cultural, and social events and serving as gathering places for religious, cultural, and social events.

Furthermore, the temples in the area and the associated rituals draw a large number of tourists from around the world. Ultimately, this dissertation seeks to examine the way these religious, social, and visual connections have impacted the architecture and visual landscape of South Indian temple cities, as well as the way in which they have influenced their overall identity, structure, and meaning. In order to provide insight into how these elements have shaped the fabric of South Indian temple towns, this thesis examines how the establishment of these connections has taken place through the use of temples, rituals, and gopurams.

Three primary components are considered in the analysis of the environmental image, namely:

1. Gopuram for identity: Gopurams or gopuras are often multi-tiered, ornate gateways that distinguish South Indian temples.
2. Ratha Yatra ritual for structure: The Ratha Yatra ritual is used in temple towns to facilitate the enormous temple car rocesions, a vital part of temple rituals.

As a result of this functional necessity, the spatial pattern of the cities reflects

a street structure that connects the urban elements.

3. Temple for meaning: The temple in South Indian temple cities gives them

their unique layout due to their religious lineage and cultural repertoire.

Research aims to determine the contribution of these three components to both

temple towns' function and form.

## 2.3 Purpose of the Research

A key objective of this research is to examine how temples, rituals, and gopurams

have shaped the spatial and visual fabric of south Indian temple cities by establishing

religious, social, and visual connections. Over the centuries, these connections have evolved

and are deeply rooted in the cultural and religious traditions of the region. Additionally, the

study explores how these connections contribute to the social and cultural lives of

communities by serving as important gathering places for religious, cultural, and social

events.

In addition, this study examines the spatial and visual fabric of temple towns in

relation to the historical and cultural significance of South Indian temples and their

associated rituals, as well as how they are oriented and positioned within the urban context

in order to generate visual and spatial hierarchies that shape the overall design and layout

of the city. In order to preserve these temple towns' unique heritage and historical fabric

while maintaining their distinctive cultural and religious identity, it is necessary to

understand how to preserve their unique heritage and historical fabric.

In addition to interconnecting social and physical domains, South Indian temple cities preserve a unique cultural character while serving as examples of sustainable city models. While the basic form of these cities remains unchanged, the complex composition of multiple layers of temporal stages exists together. It aims to provide a better understanding of how temples, rituals, and gopurams contribute to forming the cultural and spatial fabric of South Indian temple cities through their religious, social, and visual connections. Studying south Indian temple cities offers a unique opportunity to understand how they have managed to preserve their identity, culture, and architecture despite significant urban changes

# CHAPTER 03: METHODOLOGY AND SCOPE

Temple towns have historically formed unique urban structures which combine both functional and symbolic characteristics of space into one urban structure. Each settlement has its own unique identity based on its culture and traditions. This study examines the function and structure of a temple town by examining its origins, evolution, organization, and utilization of spaces, along with various activities that take place there throughout the year. All data collected during this study will be analysed to establish the evolution pattern of South Indian temple towns, while assuming that heritage towns need to be preserved and conserved at the same time as meeting the needs of modern society.

There are three nodes within this research model, forming the central core of a concentric sacred settlement. While these three nodes exist and function at the same time, their influence on surrounding elements of core fabric is profound. Cultural connectivity is represented first by ritual, followed by religious connectivity by the temple, and visual connectivity represented by the Gopuram. Using these three nodes as examples, this study investigates how they affect city fabric and human behavior.

As disucessed earlier, this study adopted mixed-method and multimethod approach to analyze the form and function of temple cities in South India. Data collected includes both qualitative and quantitative elements; where the qualitative data sample envelops perspectives and opinions from quetionnire surveys and interviews and the quantitative data sample consists of numerical data fro physical survey and information mapping.

Multimethod approaches and mixed methods are widely used in a variety of social research disciplines today. The study opts for a multimethod research model as the research

design that combines two or more qualitative or quantitative methods have some advantages over single-method designs, especially when proposing theories that account for complex phenomena that occur at multiple levels of analysis (Benoit and Holbert, 2008). Furthermore, mixed-methods design provides a faster way to apply and develop theories as a result of integrating theories and getting a more nuanced understanding of social reality (Klassen et al., 2012).

## 3.1 Methodology

A literature review and field research are both part of the research on which this thesis is based. The study examines the literature to understand how different factors have shaped South Indian temple cities over time and how these factors are related to human behavior. As well as learning about the cultural, social, and visual excellence of these South Indian temple cities, it is also important to learn about their history. Several theories were utilized to formulate the theoretical foundation of this research, including urban morphology, cultural landscapes, concepts of space, socio-cultural interrelationships, and image mobility.

In addition, the ideology of city patterns has also been investigated from a visual, spatial, social, and cultural perspective in order to gain a better understanding of the heritage cores. For a better understanding of the fundamentals of structure and functioning of a sacred center, Vedic cities, pilgrimages, rituals, liminal spaces, and factors affecting the shape of sacred cities have been studied.

The configurations of temple towns in south Indian districts of select cities are examined using spatial, visual, and cultural understandings. As well as examining spatial

properties of environments, this research examines the interrelationships between spatial experience and behavior. Specific hypotheses about the relationship between behavioral and spatial data were developed after translating qualitative theories into empirical analysis. The purpose of this research is to gain a better understanding of the real relevance and characteristics of abstract spatial descriptor variables by conducting empirical tests.

In response to culturally specific space proxemics about public spaces, the importance of religious, administrative, or commercial urban activity nodes varies with movement patterns. In order to understand human preferences regarding culture-specific space proxemics, it is important to observe the location of important religious, administrative, or commercial urban activity nodes within the overall spatial configuration. An explanation of how South Indian Hindu temple towns function based on cultural principles is offered in this study.

The methodology focuses on understanding the South Indian temple city fabric in a holistic way. To operate the same both visual and spatial data has been collected and developed as quantifiable data. The domain formulation has been done after careful analysis of the case-studies and their overlapping domains on the theoretical data that has been studied. This section further elaborates on the approaches that have been employed to quantify and compare the visual and spatial of the three case studies along with understanding their level of deviation from their prescribed theoretical models. The pattern of evolution has been analysed by referring both theoretical principles as well as practical factors that have had major influences. Then the quantified results are compared to understand the inter-relationship of both spatial and visual patterns with the socio- cultural

structure. The results are then tested with pre-formulated hypothesis. The five key stages of the methodology are:

### 3.1.1 Stage 01

a)    Various prominent architectural factors that primarily influenced the form of each city are analysed and categorised in visual, cultural, and Vedic theory-based domains.

b)    The mapping of each city is done using data from Arc GIS and physical survey and drafted to scale in AutoCad.

c)    Various maps based on visual, cultural, and Vedic theory are fabricated along with the land use pattern.

d)    The primary streets of each city are identified along with the processional routes.

### 3.1.2 Stage 02

a)    A threedimensional model is generated in Rhino using the maps taken from ArcGIS and heights obtained from Municipal corporation of respective cities

b)    Ladybug plugin of Grasshopper is used (as 3d isovist is not available, a plugin is designed/customised specially for this study) to generate view-shed map.

### 3.1.3 Stage 03

a)    Architectural elements that have strong association with the visual perception of each city are identified.

b) Building heritage visual percentage ($BH_{VP}$) is calculated with the identified elements, illustrate the level of visual impression on the built heritage which can be computed by employing the following formula.

$$BH_{VP} = \frac{B_{Heritage} \; X \; 100}{B_{Total}}$$

Where,

- $BH_{VP}$ indicates the level of visual perception on the built heritage

- $B_{Heritage}$ indicates the number of buildings with a heritage value situated on the street, while

- $B_{Total}$ indicates the total number of buildings situated on the street

c) The obtained results are converted into graphs using Microsoft excel.

### 3.1.4 Stage 04

a) By taking individual photographs of the street façades, a thorough physical study of the street fabric has been conducted.

b) A multi model regression tool is used to analyse the degree of influence of landmarks on each city's fabric.

### 3.1.5 Stage 05

a) The city form is evaluated by an online questionnaire listing its perpetual qualities

b) The questionnaire is circulated across random samples of people who visited these cities at different occasions.

c)    The results are examined through statistical analysis.

The integration of the five stages of this research framework provides a comprehensive analysis of the profound impact that religious, social, and visual connections established through temples, rituals, and gopurams have on the spatial and visual fabric of South Indian temple cities. The intricate interplay of these elements is essential to understanding the complex cultural and historical significance of the South Indian temple's urban form

## 3.2 Scope and Limitations

This research explores the planning strategies that govern the temple city fabric of South India in a comprehensive and profound manner, focusing on the intricate interconnectivity among religious, social, and aesthetic factors. For an in-depth understanding of the form, several carefully selected methodologies were examined and applied with meticulous attention to detail. The study focuses exclusively on three temple cities where Vedic patterns of planning and cultures have been preserved, eliminating any post-independence developments.

In order to find out how these intricate elements affect people's perceptions of the town and its features, the primary objective of this study is to discover how these intricate elements impact people's perceptions of the town. However, COVID-19 pandemic had unprecedented ramifications, making it necessary to conduct the research using online questionnaires rather than face-to-face interviews, and also limiting the timing of site visits due to the limitations of the epidemic. Notably, it is important to emphasize that the scope of this PhD study should not be considered to include an analysis of sacred geometry from

scriptures, an analysis of the environment, or an analysis of the economy, as they are topics

that exceed the scope and timeframe of the current study.

# SECTION 02: LITERATURE REVIEW

In this section, the study aims to understand and analyse various theroritical meanings, and methods that have been applied in studying city patterns. As shown in figure 2, the literatue review consists of four chapters with the first chapter seeking to understand the theories illustrating the structure of urban form.
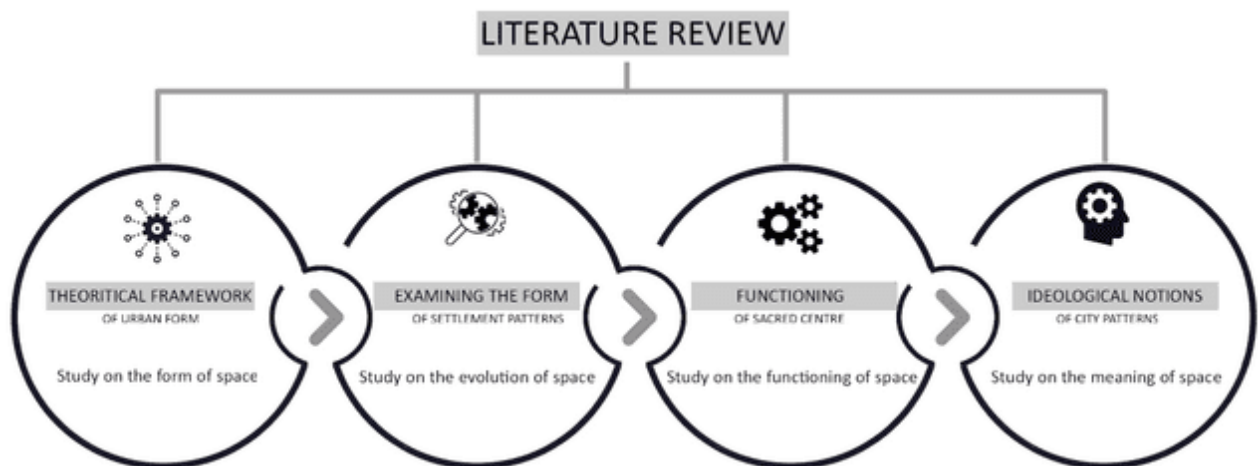


Figure 2: Literature overview

Source: (Author, 2021)

The first chapter of literature review section focuses understanding the interrelationship between spatial character and function of a space, interconnections among various elements of the space, evolution of space in response to cultural, social and physical factors, as well as the social forms reproduced by physical form. This will provide a deeper understanding on how each element of the urban form has influence on each other and how they together function in shaping and preserving the character of the urban form.

The second chapter of literature review section describes the pattern and chronology of settlements as well as the factors that contributed in their growth and development focusing on its relevance to the theoretical prescriptions of ancient Indian

planning frameworks and response to cultural attributes. This will assist the research in decoding the settlement pattern of Sounth Indian temple town.

Continuing the study, the third chapter of literature review section will analyze the form and function of a piligrim city as well as its role as a liminal space. In addition, it will explore aspects of cultural tourism. The purpose of this is to gain a deeper understanding of how Piligrim city operates.

The final fourth chapter of literature review section explores various theories and approaches that help understand the meaning of city patterns. These help to decode the ancient planners' perspective and concept of planning.

# CHAPTER 04: THEORETICAL FRAMEMORK OF SPACE

In recent decades, pioneers like Christopher Alexander, Amos Rapoport, and Lewis Mumford have ilustrated many theories on the relationship between the built environment and human aspects (Alexander, 2005; Rapoport, 2013; Mumford, 1961). Lewis Mumford (1961) was one of the pioneers in introducing social implications to urban studies without limiting them to the physical fabric. Rapoport (2013) focused on the cultural factor of human aspects and its relation to built-fabric by developing a scientific approach. He stated that different groups have different set of rules for spatial organization. While Alexander (2005) through his theories concentrated on order and structure of built environments. According to his lines of thought; a living system invariably has a huge respect for the framework it is a part of and always in the process of finding the further step to preserve and extend the framework. In order to preserve the built environments, the evolution has to resonate with the existing state. Therefore, there is a dire need to understand the existing condition and analyse its pattern of evolution in accordance to prime factors of identity.

## 4.1 Urban morphology

Urban morphology has as its goal the study of the character and spatial structure of urban areas by studying how urban patterns develop and how they evolve over time (Miller, 2010). This study comprises of an interdisciplinary and international framework of various methodological and theoretical approaches. Urban morphological studies and approaches commonly focus on urban fabric and physical entity of the space. (Nikovic, Djokic and Maric, 2014). Urban morphology is a combination of places, space, forms and shapes; it is closely connected to level of physical spaces, nature and the relation between them. Laburn

identifies urban morphology as physical information to understand the process behind the form of settlements (Peart, 2002). On the other hand, Peter Bosselmann states urban morphology is the tool used to conceptualise the complexity of physical form (Bosselmann, 2008). Urban morphology is expressed as a product of roads, squares, streets and built forms and all elements that compose the city fabric. The factors that led to the specific form and arrangement of these elements can be classified into two broad domains: man-made information determinants that comprise of religion, culture, political and socio-economic powers and geographical factors that consist of local raw material for construction, topography and climate (Morris, 2014). On the other hand, Lynch defines urban morphology as an equation that constitutes of economic systems, social structures, activities of people, living organisms and physical things (Lynch, 2001). Henceforth it can be understood that the main factors that contribute to the form of urban morphology are topographical conditions, socio-political aspects, trade relations, economic standards, cultural values, spatial connections, historical background of the city along with the degree of interdependency among them. These factors control the form, growth and change of the urban morphology in different temporal phases.

The field of urban morphology has been viewed in different perspectives and witnessed as an evolution of ideologies and principles. Each ideology has been designed emphasising on a factor that is believed to be the major driver of the urban form. The Austrian architect Camillo Sitte formulated principles of urban planning using on the basis of artistic principles, using the urban morphological understanding of ancient cities (Sitte, 1979). While Le Corbusier proposed a conflicting perspective by proposing modernistic view reprimanding the idea of traditional urban forms (Le Corbusier, 1961). In contrary Jane Jacobs in her work "The Death and Life of Great American Cities" criticizes the modernistic

ideas which lack in social interactions (Jacobs, 1961). Furthermore, Gordon Cullen in his approach 'concise townscape' appreciates the traditional townscapes by illustrating the pattern of town as a sequence of spaces but not as a pattern of streets (Cullen, 1968). In terms of understanding street and space patterns and their relationship to built forms as well as using human scales and establishing the extent of urban development, there is a clash between neo-traditional and conventional modernist approaches.

The different perspectives of analysing the relation between urban morphology and urban design can be broadly categorized in three perspectives: 'two-dimensional planning'; 'big architecture'; and 'lack of socio-spatial perspective'. A 'lack of socio-spatial perspective' refers to urban morphologies that lack socio-spatial concern in their design domain and are unaffordable from the socioeconomic perspective and ecologically sustainable. (Gunder, 2011). 'Big architecture' refers to the urban morphology blown out of human scale which is visually monumental. This morphology is heavily criticized as economically unsustainable by Scheer (Scheer BC, 2008). And 'Two-dimensional planning' is extracting from the idea of Le Corbusier who emphasises on three-dimensional planning which showcases form and space quality unlike the two dimensional planning model (Hall, 1997).

Conzen in his work 'Thinking about Urban Form' quotes that: "Man's environment is the meeting point between the architect and the planner on one hand and the geographer on the other." (Conzen and Conzen, 2004: 47). In his statement he explains the relation between urban morphology and geography. He further illustrates the relation by demonstrating geosphere as highly articulated and structured space with many variations but not just a featureless mathematical entity.  Geography is a powerful tool that can analyse the four-dimensional space which is continuously evolving.  Urban morphology of

places with distinctive geography exhibits a strong character. These areas exhibit three elemental attributes: Introducing a definite yet accessible domain of interaction and morphological attribute: expressing itself in a specific spatial form, for example a landscape, and historico-geographic attribute: illustrating the passage of time. All the three attributes are interconnected and mutually dependant in forming the complete domain of study (Conzen and Conzen, 2004).

Every human settlement is a unique formula of social, economic, cultural, political and topographical factors. In order to analyze the form of the human settlement, three systematic approaches are needed: functional, morphological, and historical-geographical. The above study has been adopted to understand the different domains of factors that have to analysed in understanding the morphology of a city.

### 4.1.1 Cultural landscape

A similar approach has been adopted by Schlüter where he describes about two concepts cultural geography and cultural landscape; cultural landscape being a product of cultural geography. Schlüter represents cultural geography which constitutes of man-made elements that are confined in the boundaries of nature, history and actions of man. Schlüter expressed cultural landscape as a combination of lines of communication, land utilisation and settlements. He further illustrated his concept by sub-dividing cultural geography into transport geography, economic geography and settlement geography (Whitehand, 1981). Cultural landscapes create a sense of identity and place as they provide a chronicle of our relationship with the land throughout time. They are both integral to our lives and are a part of our national heritage. These heritage sites are associated with particular group of people, person, activity or event. The concept of cultural landscape has its roots in geographical

thought where a landscape that has been intentionally created and designed by man, evolving organically eg, a fossil or relic with cultural flavour or associative cultural landscape is considered as a cultural landscape. Under the 1972 convection UNESCO considered natural heritage and cultural heritage as two separate entities with different operating mechanisms but in the year 1990's UNESCO activated a new category of cultural landscapes which acted as a bridge between the former two (Samuels, 2017).

### 4.1.2 Urban fabric

Wirth defines urban growth as a "relatively large, dense and permanent settlement of socially heterogeneous individuals" emphasising on both cultural diversity and density of the domain (Wirth, 1938: 8). According to Wirth the measure of urbanisation cannot be calculated by the ratio of people living in cities but can be analysed by the equation between city character and social life. A further illustration is stated by Mumford as "Point of maximum concentration for the power and culture of a community." (Mumford, 2016: 3). Cities never witnessed a static phase in their evolutionary process in response to the great social ideas that acted as change initiators. They display distinctive characteristics in the form of land use patterns and morphologies owning to their political, social, economic, topographic, cultural and climatic conditions. The precise form of the urban form can be decoded by analysing the overlapping multiplicity of the above factors including the scale, style and age of the evolutionary process (Kivell, 2004).

The urban forms can be categorised on the following basis.

a) Settlement density: Importance of the city is analysed by the settlement density but not with absolute numbers or extent of the boundaries. It determines not just the

size of the urban domain but also influences its growth and serve as points of reference (Kostof and Tobias, 1999).

b) Interdependency: The factor of interdependency is witnessed as the cities evolve as clusters. The city is usually read as the part of a larger domain as it exchanges influences (Kostof and Tobias, 1999).

c) Physical circumscription: Owing to social, religious, political, climatic or topographical influences cities share similar material or symbolic pallet through separated by spatio-temporal factors (Kostof and Tobias, 1999).

d) Function: Each city has been designed to fulfil a certain purpose or function, and that function is well reflected in its form. Cities are divided into distinctive domains which are positioned according to the social hierarchy (Kostof and Tobias, 1999).

e) Economy: The major driving factor of the city growth is the source of economy. The source may have a dominant entity of a group of dependent entities (Kostof and Tobias, 1999).

f) Laws: Cities follow a set of rules and regulations on which the way of life is organised and community is governed. This also regulates the ownership of land as well as the economic and political scenario (Kostof and Tobias, 1999).

g) Engagement with countryside: the equation the city shares with its country side decides the factors of energy resource, security as well as source of raw material (Kostof and Tobias, 1999).

h) Monumental fabric: The character of the cities can be easily identified by its monumental fabric which helps in decoding the historical timeline of the city. The proportion of the monumental fabric determines the hierarchy of the city on the larger territory (Kostof and Tobias, 1999).

i) Equation between people and buildings: Every city adopts a unique equation between people and buildings which regulates the factor of sustainability (Kostof and Tobias, 1999).

Human fabric can be viewed as a complex space and has overlapping domains of private space and civic space. Michael categorized city forms into three the urban morphological traditions owing to their form and temporal status (Dobbins, 2009). Chronologically the first is organic tradition where the shape is determined by the topographical features and main activities are determined by the climate, orientation, arable soils, land contours, water resources etc. This tradition can be described as picturesque, romantic, informal, incremental, vernacular, indigenous and naturalistic. The cities of medieval North Africa, Middle East, Ancient Greece, and Turkey exhibit organic tradition where the street pattern is in the form of a tree exhibiting the order of hierarchy. Formalistic tradition is next in order where the form of the city displays strict geometrical order and the street system is orthogonal with plazas, squares, parks and other public structures are positioned at specific nodes. While modernistic tradition believes in efficiency, systematic pattern, utilitarianism, technological advancement, rationalism and functionalism. The cities seldom have independent traditions as they share overlapping socio-cultural domains (Dobbins, 2009).

### 4.1.3 Elements of Urban design

The urban form constitutes three main bodies which are physical environment, human activity and the connections between them. Physical environment is further divided into natural world and built world. Figure 3 below shows the interaction between physical environment and built form. This environment can be considered as a platform for the

human activity. The form of the urban fabric is majorly determined by the connections or interrelationship between both physical environment and human activity (Chapin, 1974).
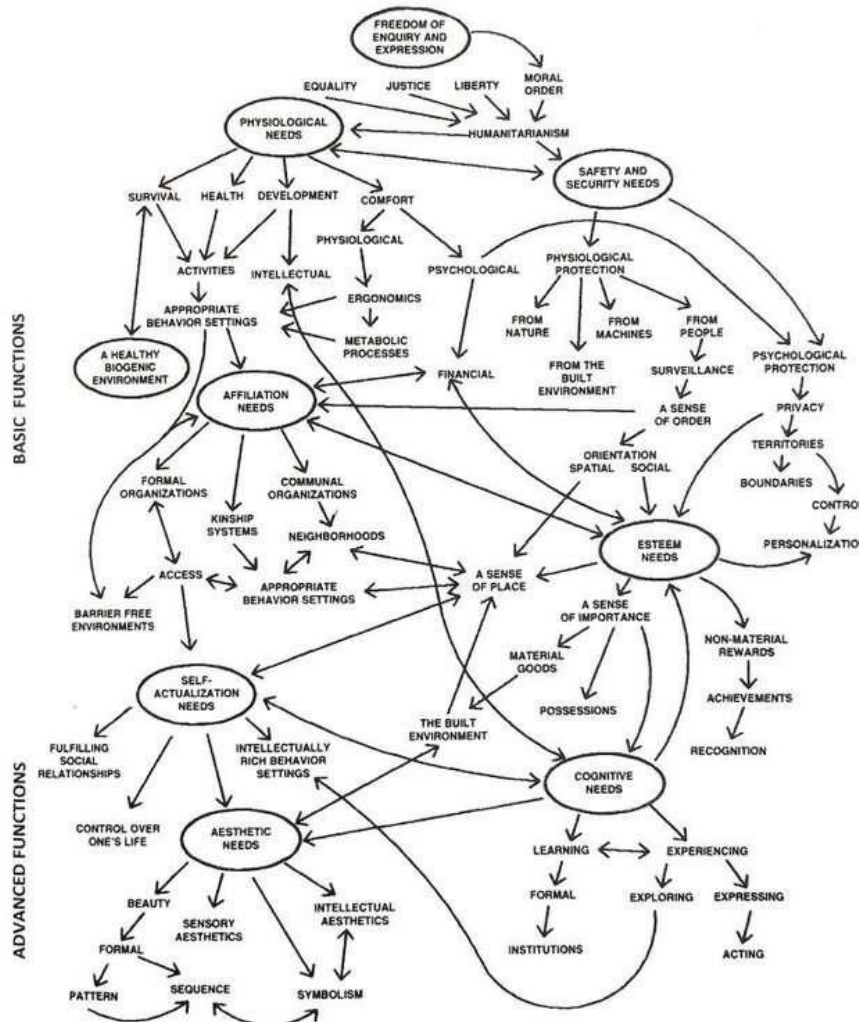


Figure 3 : Human needs and the function of the built environment

Source: **https://www.researchgate.net/figure/Human-needs-and-the-function-of-the-built-environment-Lang-2017-p-15_fig3_323701498**

## 4.2 The concept of space

According to Norberg specified notions 'tri-dimensional geometry' or 'architectural perception' omits the fundamental concept of human existence. Through his theory of

'existential space' he strongly believes that analysis of human environment is vital for space concept (Norberg-Schulz, 1971). The conception of space is an intricate structure which involves many variables. Thus, the space perceived is a result of past experiences and inspirations (Norberg-Schulz, 1966). A further analysis by Jean illustrates that space is subjected to continuous evolution and cannot be driven by a single thought (Holloway and Piaget, 1967). While some perceive space as uniformly extended material that can be shaped in multiple ways (Tschumi, 2001). Space is created by the adaption and orientation of human to the climate. The man's perception of space is a product of complex interaction between human behaviour, culturally or socially cultured elements and architectural fabric. Giedion (1962) categorises the concept of space into three fundamental phenomenons. The first illustrates the relation and interaction between different volumes of space and their individual potential. This concept is applicable for Greek and Egyptian notion of urban forms expressed through their outward inclination of the volumes. Genesis of second concept of hollowed interior space is witnessed during Roman civilization, where interior space occupied priority in architecture. While the third focuses on the interdependency between the exterior and interior spaces (Giedion, 1962). The above concepts lack in understanding the urban grammar in a practical way. Walter proposes 'Field Theory' where he believes, the conceptualization of urban pattern is well conducted by analysing geometrical character of three-dimensional patterns (Alexander, 2002). While on the other hand Nitschke prioritizes perception of the space as he feels that experience of the space is vital in understanding its character (Norberg-Schulz, 1971). A further development has been showcased by Leonardo expressing his notion of man being responsible in creating 'sensation of spce' (Leonard, 1969).

Through the concept of 'image' Kevin Lynch demonstrates the different elements that contribute to the structure of space in relation to the human existence (Lynch, 2014). While Collins in his work illustrates space as an expression of human activity framework, designed in response to given conditions (Merleau-Ponty and Smith, 1996).

### 4.2.1 Orientation of space

Mircea demonstrates that the fundamental approach behind organizing space is based on proximity which decides the positioning of various places or centres, continuity that is establishment of connection between them and finally enclosure categorising different domains based on similar social, physical, political, topographical or economical entities. He further illustrates that space according to human perception is centred, though some active points are positioned externally in response to cultural or physical environment. According to him place is an enclosed designed entity catering a distinctive function or purpose and act as platforms to experience significant events (Eliade, 1997). The interaction of different urban spaces is driven by preferred path which is based on concepts of maximum experience, minimal work, security and short distance (Cassirer, 1953).

### 4.2.2 Character of space

The character of space is defined on the basis of the equation between human activity and the environment, where the environment acts as containers of the human activity. Here the environment is a product of inter-relationship formed by cultural, social, psychic and physical elements. This equation is highly sensitive to spatio-temporal conditions, which design the hierarchical scale of human activity (Norberg-Schulz, 1966). Hence the complexity of the character is directly proportionate to the advancement of the society. According to Rapoport, environments with more complexity appeal to humans than

environments with less complexity. And the level of advancement of the society is calculated by the measure of man's control over his environment (Rapoport and Kantor, 1967). Acoording to the writings of Paul, human landscape is a formula formed by three components which are agents, institutions and structures. Agents refer to the individuals responsible for the precise visual product of social interaction, while institutions determine the regulations on which the activities operate on the other hand structures represent the deep long seated social practices that determine the way of daily life (Knox and Pinch, 2010).

## 4.3 Morphological frame of traditional city

In the field of both urbanism and theory of architecture, the urban form of traditional city is an important topic of research as it is considered to be complex. The main objective of the urban morphological studies of late 19th century and early 20th century is to study about a traditional city which consists of an exceptional space of a unique urban morphology used as a primary backbone for comparative studies of planned urban settlements. Since the last five decades a strong study is being conducted in analysing the form of traditional urban fabric in response to the complications identified in the modern planning principles. (Nikovic, Djokic and Maric, 2014).

### 4.3.1 Historico-Geographical approach

As the city form is a result of continuous evolution the dominant and consistent elements of urban growth are to be recognised and sustained (Wirth, 1938). Historico-geographical domain has been fairly untouched though urban form has been explored in various disciplines. This has not only underestimated the importance of historico-

geographical aspect but also has showed detrimental effects in research (Conzen, 1966). The urban fabric is the product of continuous evolution and in true sense epitome of characters belonging to the place and time of creation (Conzen, 1966 pg 52). Thus the subtle nature of landscape should not be misunderstood with the crudity of the figure ground which has been fairly subject to cautionary notes (Harvey, 1968).

This study proposes a debate between two foci quantitative and qualitative aspects of urban morphology. The qualitative aspect deals with modifications of the form with time for example the materials used, function of the built form and the style of construction. While the later deals with the changing amounts of construction activity with time. Thus the adoption of construction techniques has a significant role in categorizing the different urban morphologies. Though quantifying the innovation activity is difficult it fluctuates over time and in many cases the curve of the number of adopters over time approximates to a normal probability distribution (Morrill, 1970). For example, the late nineteenth century during the Edwardian period was witnessed the peak rates of adoption of tunnel back (Tomlinson, 1964). The study of the pattern of innovations helps us understand the relation between geography and urban form. Building cycles is a theory introduced by Lewis where he relates the population as the key factor that influence the urban pattern. This implies that with the increase in population by the change in balance of emigration and immigration or rise in birth rate the demand of hosing increases which impacts the other sectors like education, employment, entertainment etc. (Lewis and WEBER, 1965). The positioning of activities and their connectivity in response to locational decisions forms an intricate web which is termed as land use pattern (Harvey, 2009). This land use pattern is highly influenced by the locational preferences along with cultural values (Alonso, 1964).

### 4.3.2 Temporal factor of urban morphology

Albert Levy while considering the temporal factor of urban morphology states that certain elements and aspects of urban fabric remain permanent while some categories act as constants (Levy, 1999). And growth and arrangement on the urban fabrics are in response to the rules of transformation. Here morphogenetic approach focuses on the history of the urban pattern in order to understand the chronological growth and change of the urban fabric along with the factors that are contributing to the change. This morphogenetic approach has two main methods in analysing the urban pattern. The first one is concerned with nature and function of urban elements that remained constant through the evolution of the city fabric while the second one deals with the interdependency between urban fabric and building type over time (Levy, 1999). He further states that in few cases the style of the built form is influenced by the urban form while in other cases the urban form is shaped in accordance to the built form.

### 4.3.3 Effect of change on urban fabric

A similar approach is produced by Conzen, where he further elaborates on the aspects of resistance to change. The resistance to change can be considered to be main attribute of a complex urban form as it is adaptable and flexible as well as consisting of a hierarchy of units and historico-morphological characteristics (Birkhamshaw and Whitehand, 2012).

In Conzenian concept the urban morphology comprises of three main componets: land use pattern, two-dimensional ground plan and architectural form. All these components exhibit traditional character and historical importance in their own language.

The ground plan acts as the framework for the architectural forms and specifies the percentage and system of land utilization specifying the open and closed volumes of spaces. Ground plan is most resistant to change specifically when concerned to street pattern. Architectural forms are long-lasting but are responsive to replacement and adaptation. While the land use pattern is the component, most affected to change mainly at the urban core. The stratification of historic urban landscape can be analysed by identifying and understanding the variations among the three components and their temporal changes along with their combined behaviour from creation to adaptation. This process results in interpreting the unique residues of different temporal periods which varies from one urban fabric to another (Whitehand, 2009).

### 4.3.4 Concept of urban tissue

Karl Kropf n the late 20th century proposed a simplified explanation to Conzenian concept of 'morphological region'. He proposed the concept of urban tissue which he illustrated using levels of resolution (Kropf, 2011). These levels of resolution relate to the different temporal stages where different elements of urban fabric can be interpreted by the typo morphological analysis. The urban components like built forms, building materials, urban blocks and streets along with different functional spaces have a certain mark on the hierarchy scale (Scheer, 2017). Considering the aspect of hierarchy as a fundamental frame, the form of urban fabric can be identified in an organized way with degree of specificity, illustrating the components that form at different levels of resolution. The three main traits to define each component are its internal arrangement which constitutes of number of sub-elements, their nature and their relative positions; its outline which is expressed in its scale of external skin, size and shape; and its position identified by its proximities with the main

urban units. He further explains by illustrating two cases the first case with high degree of specificity and low degree of resolution where the houses are arranged in clusters and then to rows, in this case the blocks and streets are well distinguished. While in the second case the high degree of resolution and low degree of specificity outline of the houses are well identified as they are detached or semi-detached. According to Karl's perspective the urban form is the product of fundamental concepts that formed the basic structure and key influencing factors that led to transformations at different levels and scales of evolutions (Kropf, 2011). These factors can assist in gaining a deeper understanding of a city's morphology.

### 4.3.5 Concept of inherited outline

According to Conzen the existing morphology of a traditional city exerts few constraints over the subsequent plan development. These constraints include built forms like street patterns or urban blocks and natural forms which are topographic elements. Conzen uses the term 'morphological frame' or 'inherited outline' indicating the nature of the elements which have high resistance to change and are constants in development. He focuses on street patterns, stating that they are 'morphological priorities' which have high magnitude of resistance and would not change once formed, unlike the function of architectural structures and land use pattern which have high dynamics of change (Conzen and Whitehand, 1981).

### 4.3.6 Concept of urban morphological frame

The settlement pattern of a traditional city is a product of intricate process formed in response to the political, social, economic and climatic conditions. While the pattern of

evolution exhibits the rate interdependency and regulations among these conditions. Hence 'morphological period' is the cultural period that can occur during any phase of development which influence morphology on a part or whole town. The collective effects of morphological periods form a morphological frame, where Conzen demonstrates the connection between characteristics of urban fabric to the type of process (Conzen and Whitehand, 1981).

### 4.3.7 Concept of urban morphological regions

Albert demonstrates the delicate balance between the building type and the fabric, understanding this equation helps in analysing the urban fabric. He states that the morphological frame consists of 'morphological regions' which are zones with have homogeneous urban morphology in terms of building typology, pattern of land use and planning style. These morphological stages with their cumulative effects are expressed as the quality of multi layered entities and urban complexity which is known as 'urban sedimentation' (Levy, 1999). Thus, the sustainability of a city weaved with distinct hues is achievable and sustained within a unified entity defined by social or physical boundaries. This implies that the qualities of a traditional city are hugely balanced on its play of volumes of spaces, contrast in visual sequence, space diversity on urban fabric and interconnectivity among the spaces (Krinsky, 1989). While on the other hand, Canniggia presents an organic approach where he speaks about the 'typological processes' where its genesis begins with a fundamental unit (Caniggia,2001). The fundamental unit takes a repetitive pattern leading to a 'basic fabric' whose extension along the streets with hierarchal order to form 'particular fabric' (Levy, 1999).

## 4.4 Relationship between society and urban landscape

Conzenian urban morphology is based on the interconnection between society and urban landscape, where the urban landscape according to Conzen is the 'objectivation of the spirit' of the genesis and development of the society (Conzen, 1966: 57). According to conzen's perspective *genius loci* is to identify the topographical variations in the arrangement of the city plan, built fabric and land use pattern. He also states that urban landscape as a palimpsest where the initial footprint cannot be completely erased even after superimposed by multiple layers (Conzen, 1966: 59). In further illustration of the schema, the visual observatory elements are impressions of ancient past societies which are the product of several experience, efforts and aspirations. These observatory elements include entire spectrum of urban elements from window design to the city's configuration. This is an aggregate result of immense experience and experimentation and thus a valuable asset. (Whitehand et al., 2011). The primary aspect of analysing urban landscapes is to identify the fundamental components of towscape. Identifying these components, contribute in understanding the intensity and nature of the historical eloquence of the various parts of urban fabric (Conzen, 1975).

### 4.4.1 The Genius Loci

'Genius Loci' is the term that definition and context has changed in the period of two hundred years. The initial usage of the term was to indicate the new landscapes which were were still raw and rural. This was further improved by Alexander Pope promoted as landscape fashioned by human hand (Mowl, 2000). Jackson in his writings links the theory of the 'character of a place' to genius loci, while some other designers term it as 'spirit of of place (Jackson, 1994, pp. 157–158). Gordon Cullen has given genius loci an architectural

language. According to his perspective townscape was "the art of relationship" and all its elements have a role to play (Cullen, 1968:  9).

Jakle in his writings prioritizes the visual experience though the experience is felt by other senses. He strongly expresses the inborn friction between visual and verbal understanding. To him a tourist can have a better expression of *genius loci* that the resident, as tourist in involved in exploring the place (Jakle, 1987). While on the hand, Walter focuses on a holistic perseverance of a space with all senses, imagination, intellect and memory terming it as 'expressive intelligibility' (Walter, 1988). The Norwegian architect Norberg-Schulz explores the relation between architecture and psychology and identifies the character of place and its meaning perceived by the people.  He applies the concept of townscape to epitomise the horizontal silhouette of the skyline to image of the place. Norberg beleives the traditional design of towns and built forms bring out strong symbolic interpretation of places (Norberg-Schulz, 1996).

Norberg-Shulz describes the four stages of methodology as genius loci, character, space and image, which illustrates the experience of the people with the tangible atmosphere. According to him nature decides the meaning of object and places, which in turn is the fundamental for the interpretation of people. He also addresses the existence of cosmic symbolism and its relation to morphology in weaving the city fabric. Through which one can understand the function and meaning of the settlement. Norberg-Schultz's theory illustrates that the nature of people's life decides the identity and orientation of the place (Norberg-Schulz, 1993).

### 4.4.2 Sense of place

The recent planning policies highlight the celebration or reinforcement of 'sense of place' or 'character of place' for historical and contemporary city fabrics. According to this policy the design should consider a wider perspective of the city fabric understanding the ecology, building materials, tradition of construction and pattern of spaces and streets. The fundamental notion of the design model, 'New urbanism' states that the factors that contribute to the positive building of character of a place should be recognized and analysed. An architectural language that reflects vernacular architectural elements, like the elements of the façade, alleyways, and common spaces around the houses, helps recreate the sense of place (Kim, 2000).

### 4.4.3 Effect of human behaviour

The human behavioural pattern is framed by architecture which also shapes the environmental and social relationship through cultural attribution. Though in few occasions a rapid change in architectural forms is witnessed, this is in response to environmental changes as well as modifications in the everyday activities. These changes may lead into the collapse of environmental and social stability (Blake and Lekson, 1999). The physical fabric of organizations and firms that occupy the town centre are under continuous change acknowledging the technological and functional changes and developments in everyday life, which is further reflected in planning policies. During the process of understanding the changing physical fabric two questions can been prioritized. Firstly, what are the different variations witnessed by the physical fabric of the town and what elements played an important role in the process of initiation, design and implementation. Secondly, what is the

scope of activity in and what are the areas it is concentrated in and the temporal variations of the activities in different centres (Whitehand and Whitehand, 1983).

### 4.4.4 Effect of socio-economic structure

Saverio Muratori has done typo morphological investigations on Italian towns which were shaped understanding the functional attributes of a traditional Italian town. These were based on morphological theories that are concerned with organic growth of town base on generic features and generative elements. The function of the town is heavily responsible in designing the socio-economic and physical structure. For example, a commercial town has a different history, appearance, economical condition and social fabric when compared to a free standing administrative town as the driving agents of change differ (Whitehand and Whitehand, 1983). Further research exhibits the important role played by the land use pattern and street plan, which decides the functional characteristic of the town.

A similar example is given in the case of Great Britain, where the two phases of change are associated with the wars. The first was during the interwar period and the second was post the Second World War. These periods witnessed a major rebuilding activity to accommodate the urban change where the outlook of the streets majorly changed (Davies and Bennison, 1979). The initial initiators of change where the firms and organizations that fell in the loop of trade and associated with a decision-making chain. These initiators exercised influence over various sectors of the city which brought about a multi-dimensional change on the physical fabric (Whitehand and Whitehand, 1983).

### 4.4.5 Settlement scaling theory

The initial social networks that decided the dynamics of space were the human settlements. Even the simple geometries of settlements have their roots associated with long experience of topography, climate and socio-economic conditions. With the understanding of Th¨unen model the city patterns are in response to the socio-economic rates of interaction. This approach implies that settlement geometry and socio-economic standards are not independent but highly effected by contextual factors of the society such as culture and society. This view states that that human settlements are social reactors where the large settlements are accommodate a large population which involves a number of activities associated with social interactions. So the scaling is done calculating the number of social interactions that can be sustained per unit time. (Fujita, Krugman and Venables, 2001).

## 4.5 Interdependency between culture and space

The fundamental connection between culture and space focuses on the explicit beliefs in culture and expertise in geometry. These the notions of culture are born from specific ideological dimensions adopted to express the relation between the place and way of life. The landscape thus formed works on the laws unfolded through the life and death of human settlements (Heller, 1967) As the city form is a result of continuous evolution the dominant and consistent elements of urban growth are to be recognised and sustained (Wirth, 1938).

### 4.5.1 Cultural Geography

Cultural geography focuses on the interdependency between place and culture, examining the distribution of cultural over spatio-temporal setting, interpretation of place

and its identity, approach towards meaning and knowledge, the degree of plurality and cultural diversity of the society, external and internal material expression and the socio-cultural values. Mike Crang illustrates landscape as reflection of social culture. He demonstrates chorography, which is an ancient geographical tradition that analyses how landscapes formed unique pattern of processes through idiographic approach, which is the product of combination of circumstances (Crang, 1998). According to the nomothetic approach the character of landscape is seen as a continuous evolution and reproduction of culture, where the symbolic form and material expression of urban fabric is the epitome of cultural notions which determine the way of life (Diemer and Gore, 2009).

### 4.5.2 Reproduction of a social process

A similar notion is specified in the Marxist theory where the production of all social processes is a process of reproduction at the same time (Marx, 2001). The Marxist theory of production illustrates the various types of discontinuity and continuity in the social processes. It helps in understanding the connection among the various levels of social structure as well as the interdependency between successive historical processes and non-economic factors of production. Reproduction of a social process is considered as a dynamic phenomenon as it stabilizes historical continuity even during the transitional phases (Althusser and Balibar, 2015).

### 4.6 Imeagebility

Several components make up the city image, according to Lynch: 1) identity (recognization or identification of objects); 2) structure (recognizable patterns); and 3) meaning (emotional value we derive from these objects). Lynch recognized the importance

of meaning and evaluation, but his research emphasized identity and structure (Lynch, 2014). According to him, people perceive identity and structure more consistently than meaning, making it somewhat impractical to investigate meanings. As Nasar argues, knowledge of identity and structure (imageability) is insufficient. A city is evaluated based on its evaluative image of human feelings and meanings, and Nasar's work is centered on the third category, inferences about its quality and character (Nasar, 1998). In Rapoport's view, we recall places that are connected to our feelings, and we are more likely to recall (imageable) parts of a city (Rapoport, 1970). Several studies have shown that the city's most image-friendly buildings elicit both negative and positive reactions (Appleyard, 1976). As a result, Nasar considers city appearance from a point of view of how it is evaluated by the public as opposed to treating it as an aesthetic object in and of itself.

In contrast to visual arts such as painting or sculpture, the shaping of a city is different. While it may be acceptable to accept the concept of "high" visual arts that appeal to a narrow audience who visit a museum, it is imperative that city form and appearance please a broader audience who frequently visit it. The observer does not have the choice whether or not to experience city design, as compared to art, literature, and music. As part of their daily activities, people are forced to pass through public areas of cities in which they must experience and evaluate their urban environments. It is important to shift the emphasis from the characteristic emphasis on the form of the city as an object of art towards the evaluation of urban environments by those who have experienced them.

## 4.7 Wayfinding

It is important to have spatial orientation when navigating and wayfinding (Golledge and Stimson 1997). As the navigation is necessary to avoid geographic disorientation or

getting lost, it is crucial to have good spatial orientation to do wayfinding tasks and make spatial judgments whenever a planned route is disrupted (Montello and Sas 2006). A number of studies have examined and proved the importance of landmarks in navigation and wayfinding. Instructions become more meaningful if landmarks are included. Local landmarks are particularly useful for pedestrians (Raubal and Winter 2002). Many types of landmarks have been studied by researchers. As a natural set of descriptions containing a minimal set of landmarks, Denis developed a skeletal description framework to test its effectiveness in different areas through wayfinding (Denis et al. 1998) where landmarks and actions are considered the most important components of route instructions. In spite of this, the authors claim that landmarks need to be explored and evaluated in relation to the cognitive abilities of individuals

## 4.8 Conclusion

In order to determine whether a settlement is functional, it is necessary to examine its morphological patterns and meanings as a first step. Throughout the chapter, morphological patterns have been described as the result of a complex network of urban elements influenced by sociocultural influences and various temporal factors. As part of the theoretical analysis, various concepts regarding urban forms were examined in relation to natural and human factors. Based on a fundamental framework, this study explores the morphology or forms of Indian towns. The topography, social-political aspects, trade relations, economic standards, cultural values, spatial connections, the history of the city, as well as the degree to which they are interdependent (Morris, 2014) (Lynch, 2014) are the main factors that influence the shape of urban morphology (Morris, 2014).  Through the evolution of urban forms, the physical, social, political, and social elements organically

interact with each other. It is through physical and spatial entities that urban elements express themselves, forming the complex structure of the city. The complex structure of the city is a product of continuous interactions between environmental, economic, social, and spatial domains.

# CHAPTER 05: STRUCTURE OF A SACRED SETTLEMENT

Settlement patterns provide the most subjective and intellectual aspects of life in a condensed form that caters to the objective and perpetual aspects of human culture. (Danesh, 2010). The evolution of settlement patterns is believed to occur in stages which is known by following phrases like "the emergence of a new concept of city development", "transformation stage" and "the shaping and appearance stage" (Pourjafar et al., 2014). Figure 4 demonstrates the five important elements that define the the form, function and evolution of the settlement pattern.



**PHYSICAL SETTING**
NATURAL DOMINENT PHYSICAL FEATURE LIKE RIVER OR MOUNTAIN
GEOGRAPHYICAL LOCATION

**FUCTION OF THE CITY**
PURPOSE OF THE CITY : TOURIST, ROYAL CAPITAL, TRADE CITY, RELEGIOUS CITY
ITS LOCATION IN THE KINGDOM

**INFLUENCES**
CULTURAL OVERLAYS
TRADE RELATIONS
POLITICAL POWER

**SIZE OF THE CITY**
POPULATION
ECONOMIC STANDARDS
DIFFERENT CATEGORIES OF PEOPLE IT IS ACCOMODATING

**TRADITIONAL METHODS OF PLANNING**
EXPERIENCE FROM THE PAST
RELIGIOUS AND CULTURAL BELEIFS
ANCIENT CALCULATIONS

SETTLEMENT PATTERN

Figure 4 : Factors that define the settlement patterns

Source: (Author, 2020)

## 5.1 Interrelationship between settlement pattern and human behaviour

According to Figure 5 below, the evolution of the settlement patterns is drafted according to the changing human behaviour and the prevailing functional attributes.
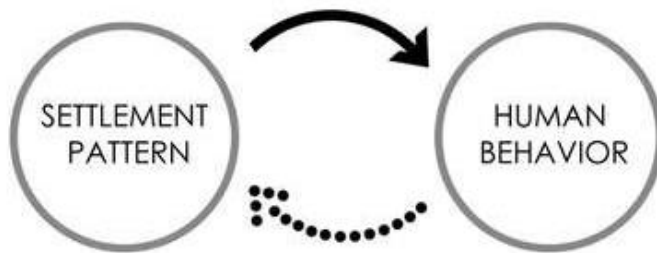


Figure 5 : Interrelationship between settlement pattern and human behaviour
 Source: (Author, 2021)

In the case of Neotlitic settlement high prominence is given to the food storage systems as the concept of agriculture allowed the people to settle down. The proximity to the river was did not exceed mts as the resources to access the fresh water was limited. In the course of time the inhabitants were divided by profession as agriculture became one of the activities. In response to this, settlements were designed to accommodate multiple activities this led to the concept of land use pattern. With the growth of the kingdoms, security measures strengthened and the cities were well fortified. Hierarchy of the profession was well witnessed in the land use pattern were the temples and palaces occupied the central core while the residential realm was weaved around them. Later when royalty overpowered religion the central core was purely dedicated to the ruling elite.

The second millennium B.C. cities were designed with progressive land use pattern that included distinctive whorl system that broadly divided the city. During late Bronze Age religion dominated the politics as a result temple was laid on an elevated ground and occupied the central position. This age also witnessed a slow transition from organic city patterns to grid patterns. The subsequent cities witnessed a sudden boom of population which resulted in forcing multiple functions on single dimensioned cities. While the later cities were planned following strict geometry in response to the religious monarchism. On the other hand, the cities of Middle East experienced inward residential fabric and lack of urban spaces in response to the prevailing social customs social. Due to the advancement in trade, the tenth century European city fabric observed privatisation of land which led to additional lavish private buildings apart from palaces. During industrial revolution a great deal of fusion in architectural as well as urban fabric has been witnessed in response to colonization and the city planning gave prime importance to the function.

## 5.2 Structure of Vedic settlement patterns

The framework of Vedic cities strictly follows the Vaastu principles which are designed in response to natural force respecting the interrelationship between different living and non-living things. As per the notion of this theory a harmonious balance in the electromagnetic web created by the vastu patterns, generate a positive aura that affects the human life (Parikh, 2008). This theory is backed up by the Kirlean photography which is also termed as aura photography, these images show the electromagnetic radiations around the objects, but do not have a solid evidence.

According to the ancient Vedic texts, the settlement patterns are designed in such a way that they mimicked the structure of the cosmos. Typical Hindu religious morphological

schemes comprise squares arranged in a concentric pattern. These geometric patterns represent the abstract representation of the universe, which is represented as a mandala in ancient literature of traditional Indian architecture. The sacred symbols and geometrical designs used by the traditional societies are said to be the drafted with the knowledge of intangible energy fields radiated by the Earth and other cosmic bodies. These forces are said to influence on human health and behavior (Das and Rampuria, 2017). This approach in understanding the patterns is impractical as it beyond the reach of classic physics that reasons physical tangible forces.

Another school of thought believes that Vedic settlement patterns follow the diagram of Vastu purusha mandala, which represents a picture of celestial man, with the head facing east or northeast, presented in an anthropomorphic form in a square as shown in the Figure 6. Here purusha, the celestial man lays face-down in the ground, with 32 gods settling on various parts of his body. The diagram consists of square of squares from 4 to 81 with different whorls. Each square has a specific function and possesses a certain magnitude of energy depending on its position (Kramrisch 1946; Vatsayan 1983).
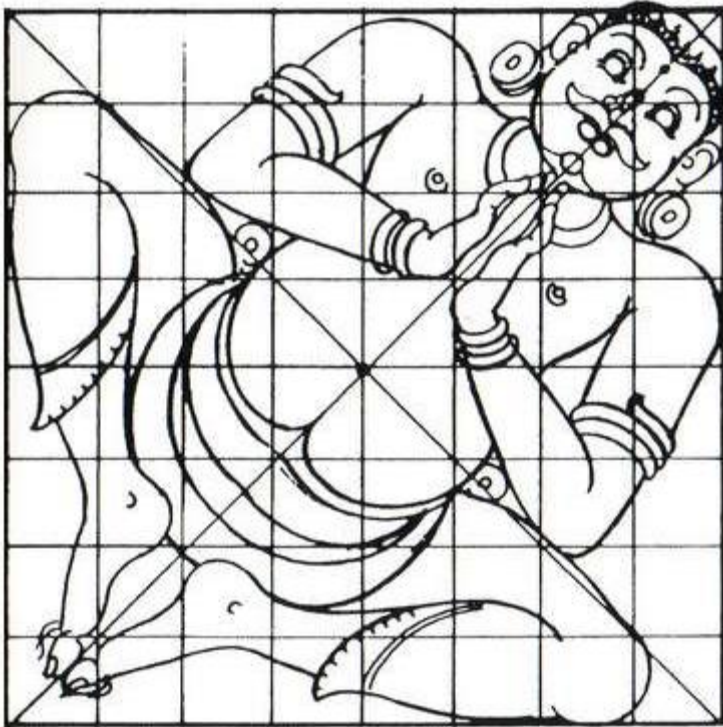
Figure 6 : Vastu purusha Madala

Source: https://www.ayurvedichealthcenter.com/ahcws-vastu-purusha-mandala-front-inset/

In the view of a different perspective in decoding these traditional patterns, believes that culture is the framed in response to the environmental context along with the interpretations of cosmos and belief in supernatural powers (Kent, 1993). The hence formed culture changes according to four major variables of communication, meaning, time and space. According to this theory the traditional patterns of different cultures with different environmental backgrounds have similar concepts owing to the system of activities that take place within the settlement (Kent, 1993).

### 5.2.1 Indian traditional built environments

Traditional built environments do not directly translate to the domain of preserved built fabrics from the history but also relate to the cultural framework which transcended in

space and time to sustain the urban change (Desai, 2007). Indian cities are weaved with concentric web of cultural and political experiences. This is well reflected in the multi layered built environments with pluralistic and multi-layered manifestations. Though, the genesis of the city in terms of traditional settlements has a certain temporal record its pattern of evolution resonated with the evolution of the social structure. Hence, these settlements exhibit a great deal of life and change by "living" and "evolving". The present spatial structure of these settlements is a product of human experiences and experiments in time (Choudhary and Adane, 2020).

Secondly, the spatial frameworks of these traditional settlements are concerned with linkages and continuity. The planning of these settlements is underplayed with a complex geometry that is codded with shifting axis of movement to import a factor of surprise that gradually unfolds the spaces. These spaces are also equipped with thresholds and pause points to reaffirm or reorient bearings in space ( Pandya 2005). Though most of the traditional Indian cities are based on similar formula, it is not enough to analyse as theoretical models but have to quantify with specific equations. In order to analyse the Indian built environments it is necessary to acknowledge as a system of spaces with entwined interrelationships among parts and a whole.

## 5.2.2 Concept of Vedic cities

The planning of Indian cities during the medieval period was strictly based on the lines of Vaastu Shastras, a metaphysical design philosophy. Vaastu shastra is a small section of Vedic scripts which deal with the design geometry of large scale settlement patterns to small scale furniture details. During the Vedic period the ancient tenants of India weaved the settlement patterns with precise knowledge on anthropometrics, climate and

geomagnetic forces. Decoding the design philosophy of behind these settlement patterns is quite complicated as they are many factors that governed their geometry. Each city is formulated on a unique pattern in response to its function, topography, and scale along with the number of cultural overlays it witnessed (Dutt, 2009). Owing to the geographical location the country's history witnessed crossroads of cultures from Europe to China and most powerful Asian connection with African cultures (Casson, Chandra and Prasad, 1979).

The celebrated scared and secular cities of South India though separated by spatiotemporal contexts have planning principles which are the multiplied by similar fundamental elements. The ground is fragmented according to the planning principles, which is an enhanced scale of the architectural design principles with few additional rules owing to the function. In few contexts the amalgamation of spatial patterns is witnessed. The towns and villages are subjected to similar planning principles that helped them in fusing into each other with the growth of the city (Jefferson and Ayyar, 1921). This also helped in shifting of the capital city to big village in answering the problems of political instability or saturation of natural resources.

To decode the character of Indian historical cities the cities have to be studied involving different parameters which governed their character. The temple cites of South India have robust architectural fabric which strongly contributes to the visual portrayal of character. The Hindu temple atmosphere is often visualized with porous built forms sheltering the functional dimensions of worship and distinguished open areas to accommodate open to sky rituals. A thoughtful play of solid and void is witnessed with great observance of symbolic and pragmatic paradigms of Hindu Myth as well as tropical climate.

To interpret the form of Hindu temple typologically is to analyse a pattern of tropical place making.

### 5.2.3 Temple Town

Temple towns of South India are the most dramatic spaces with architectural fabric blown out of human scale. The space retains its sacred flavour and celebrated for its robust introverted lobes defining the layers of spatial planning which is permeable through massive gateways. Prakara or the sacred circumambulatory path manifests itself as the most important and unique urban feature as it defines the enclosures of inner precinct. South Indian temple towns are witnessed with robust view-scape as dramatic play of massing is involved fabricating the here dimensional urban form. The mass of the gateways diminishes converging to the centre serving the purpose of both architectural transition and urban marker (Thilagam and Banerjee, 2015). Moreover, George Michell observed that the patterning of temple compound walls continues into the urban fabric as streets emulate the wall pattern, creating an urban mandala which links temple and town spatially and conceptually (Michell, 1993). Pattrich geddes believes that the cultural and spiritual events in India are highly connected to the administration and town planning of the city, in which the grandeur of Indian temples and of Indian civilization is embodied in the traditional planning of temple-cities, which democratize the urban spaces with acknnowleding the ancient design (Geddes and Tyrwhitt, 1947).

The significance of temples has been documented not just through epigraphy, but also through the centuries-long struggle for supremacy among various political and religious factions. Additionally, temples have played a vital role in promoting and preserving a wide range of artistic expressions, including sculpture, music, dance, and other art forms, which

have become integral parts of the temple's cultural heritage.Temple towns in India are not only an important part of India's cultural heritage; they also greatly contribute to its social, cultural, economic and even political development. In this regard, a temple city has become an epitome of tourism, , travel and spirituality which has changed in India's traditional form. Temple cities are seen more evenly distributed throughout the year than the peaks witnessed during festivals.

Most temple towns owe their existence to the temples surrounding them. As per the Manasara Shilpa Shastra (A treatise on Indian design and architecture from ancient Sanskrit) an ideal temple town consist of a temple complex at the center, with streets running in concentric circles adjacent to the temple walls and radiating out in the four cardinal directions from the gates (Acharya, 2006). A typical South Indian temple complex can occupy more than 100 hectares, and the gateways to these complexes can be 80 meters high, allowing visitors to focus attention on the temple. Temple towns are usually dominated by one large complex or pair of complexes, but some are home to more than one temple. In these towns, each temple defines a distinct neighborhood, and the roads connect the distinct neighborhoods instead of forming a geometric pattern as in single-temple towns (Michell, 2008). When it comes to temple towns, the streets are symbolic of the physicality of the landscape and express the experience of the temple.

A temple town's plan offers controlled access and flow of people through space, architectural changes as one moves through these pathways, and directed lines of sight. A pilgrim's movement through the towns is dictated by rituals and circumambulation. The pilgrim's path also directs sightlines to prominent temples and their elaborate facades, which lends an air of grandeur to the architecture (Pieper, 1980).

## 5.3 Factors that effected shape of the settlement

A study by Odum (1971) of the flows of energy and materials in societies can be compared to the same analysis of organisms and ecosystem (Samaniego and Moses, 2008). Here Odum compares city as a living organism and its life as a response to series of different factors. Similarly, the existence and development of a city is a product of various aspects that includes political, economic, socio-cultural and climatic aspects (Pourjafar et al., 2014).

### 5.3.1 Role of culture

Richard Hartshorne (1950) introduced the concept of centrifugal and centripetal forces to the formation of settlement patterns. He identifies few factors and categorizes them into centripetal and centrifugal forces. Centripetal forces are described as the binding forces that pull people together ensuring the durability of the settlement. Culture is one of the strong centripetal forces that helped in unifying a whole settlement. Language and religion which are in close association with culture have strong impressions on the pattern. While national identity and local economy are other centripetal forces in political and economic dimension respectively (Hartshorne, 1950).

The role of culture in shaping the cities can be divided into three major time frames on the timeline of settlement patterns. The first time frame includes civilizations of ancient world where the cultural exchange was limited. So the impressions of culture in the form of language and symbol are very unique (Sathis Kumar, 2011). During the medieval period, with the advancement in trade, cities witnessed cross-cultural influences which were witnessed on their patterns. And the modern day world is highly globalized. Here the culture holds limited role in exhibiting the identity of the city in its fabric (Redfield,1989).

Robert Redfield proposes three different perspectives in viewing the role of cultural influence on the city patterns. He describes the first perspective as the long run perspective which is during dawn of civilizations cities are the carriers and symbols of cultures. The short run perspective cities are the cities which formed their patterns with local narratives while the perspective middle run cities developed on the borrowed idea of long run perspective cities. (Redfield, 1970).

Ancient cities have to be decoded using all the three perspectives though one of them can be given a primary importance. Geographical, sociological and empirical ethnographic research initially concentrates on short-run perspective but gradually gets linked various hypotheses and ideas drawn from other perspectives. (Gosh, 1950)

The terms "cultural centres" and "cultural functions" are frequently used by ecologists, sociologists and geographers. Centres of art, education and religion relate to cultural centres and distinguish themselves from economic, military and administrative activities. Culture acted as the prime deciding factor of the traditional life in community though administrative and economic standards have a fair share. The administrative, economic and cultural domains share a delicate equation which is well reflected in the city patterns. Urban centres of ancient world were shaped either on political-intellectual or political-religious (Dembo and Gadgil, 1975).

The religious and royal structures formed the symbolic identity of the ancient cities while the central business district is the symbolic identity of the modern cities. Market places acted as central business district for the ancient cities where most of the cultural exchange took place in form of goods. These market places accommodated various activities

located in close proximity to the urban centres or as buffer spaces at the city gates. And hold a strong identity as they welcome people from various parts of the globe with different cultural groups. This part of the city operates on handling impersonal relations among diverse ethnic backgrounds (Spate and Ahmad, 1950). The city patterns operate in association with cultural role with different distinctive objectives. The first objective is to bear and transfer the image of an old culture. Second one deals with creating new models of thought and operating them while the third variety is formed by absorbing the first two views. In all the above roles the face of culture constantly changes where the pattern of the city continuously adapts.

## 5.3.2 Environmental responsive Settlement patterns

The main notion of environmental determinism is that patterns of social development and human culture are determined by the physical environment that refers to climate and topography. It strongly believes that psychological human behaviour and cultural pattern are virtually unaltered by the social conditions but highly influenced by the physical environment. Contextually Ellen illustrates that cultures formed on islands have unique cultural traits in response to their isolation. She also states that cultures associated with higher latitudes are less advanced that the ones of lower latitudes with response to the climatic conditions (Semple and Ratzel, 1911).

### *Topographic responsive*

From the past experiences cities were planned on flat lands and many of the modern planning codes specify that the angle of slope should not be greater than 25 degrees. The reason behind preferring flat land over slope is less quantity of arable land in the proximity

as compared to the flat land, a serious risk of landslides and floods, high rates of construction and difficult engineering (Wu, 2002). This implies topographical condition is one of the prime factors in determining the scale of the settlement. As the settlement grows the outer whorls of the settlements sprawl up the slopes, but the farmlands are untouched. A layered morphology is witnessed during the long-term development (Tao, Chen and Xiao, 2017).

### River systems responsive

Most of the ancient settlements were highly dependent on the rivers for water, agriculture, transport etc. But the distance between the river and settlement was carefully decided as being far from the river demands a lot of resources whereas being in close proximity to the river has a huge risk of floods (Wu, 1991). The scale of the settlement was highly influenced by its proximity to the river. Settlements were usually located at the bend of the river for the rate of flow is relatively low and specifically of the convex side as is has considerably less risk of flood than the concave side (Tao, Chen and Xiao, 2017).

### Sunlight responsive

Most of the ancient civilizations considered Sun as the prime God and oriented their built forms according to the sun path. The ancient people used sunlight to cure different health conditions (Liu, 1998). Built forms shaped themselves regulated the amount of light suitable to the function of the place. This phenomenon was further developed in placing a deity in each of the cardinal directions who were associated with a particular natural element (Tao, Chen and Xiao, 2017).

### 5.3.3 Functional attributes

Hoselitz identifies two distinctive characters of cities "economic centres" and "political-intellectual centres" the first ones are designed for economic activity but the later ones evolved to accommodate economic activity. Each city pattern is usually shaped in response to its primary function: Capital cities - which are the administrative centres, Trade cities- whose main activity is business, Religious city- these cities are around a temple or any religious built form and handle activities of pilgrimage, Educational cities- cities which accommodate all learning centres, Industrial cities: these operate on production of goods, tourist towns- based on touristic activity and cantonment cities- these cities are built for security purposes (Redfield and Wilcox, 2007).

### 5.3.4 Role of Market

Markets played a crucial in shaping the cities by regulating to the social fabric as well as boosting the local economy. In addition, they have functioned as vibrant meeting points. The market place is fashioned in a different way in each city as it reflects the cultural fabric of the city. Markets of medieval Muslim towns obey the strict rules of religion and culture, so often covered from above and located in narrow streets. Here, both the market and its keeper are subject to religious and cultural norms that are explicit and universal. While the market places in Guatemala do not witness much interaction as people are only visit to buy and sell goods. Whereas the Indian markets are quite colourful and follow façade byelaws. On the other perspective market accommodates people from diverse cultural backgrounds to communicate as well as a platform where there is a universal standard of utility is applied to conduct the exchange, which is neutral to and hostile to particular moral orders. Markets

determine the density of the society as most of the urban gatherings occur there (Pourjafar, et al., 2014).

### 5.3.5 Role of a ritual

Extensive study and research have been done on celebrations, festivals and rituals by both sociologists and anthropologists but not effectively by urban designers and architects to understand the overlapping domains of ritual participation and city framework. The festive celebration or ritual can be defined as one the highest cultural expressions with collective mode of enjoyment assertion of solidarity and participation (Kanekar, 1992). Rituals play their fair share in weaving the city pattern. Ritual can be defined as a specific human behaviour confined to a specific community or place fashioned in response to the existing socio-cultural values. In every culture rituals hold a symbolic importance and celebrated with communal participation, which strengthens the solidarity among the residents. Rituals can be customary actions, ceremonial or religious. The main objective of the ritual apart from social interaction is preserving the culture and celebrating the deeds of the previous tenants while the political rituals mark the social behaviour.  As per the notion of Confucian virtues, the planning of ancient Chinese cities is a ritualistic aspect of Chinese moral and social character (Rowe and Kuan, 2002).

These rituals are categorized according to their nature of celebration dynamic or static, further their demand in location, time and space. Static rituals are usually confined to one area occupying the centre or main nodes of the city. Games, festive gatherings, fairs etc are quite examples of static rituals. On the other hand, the dynamic rituals are linear in nature with processions and parades. Static rituals demand the existence of squares and plazas while the dynamic rituals force axiality on the urban fabric. The shape and size of

these spaces depend on the importance of the ritual, time of occurrence and its scale. This states that the character of the built forms is highly associated with the nature of rituals and how the city's fabric adapts to the temporal modifications in the rituals (Michell and Ramamrutham, 2008). During festive rituals the urban spaces are transformed with grandiose at an enormous level which otherwise exhibit a prosaic flavour. In this context it very clear that cities considered ritualistic or ceremonial events while planning (Kanekar, 1992).

The urban fabric of the ancient cities usually revolved around the procedure into how the rituals were performed. And the space appropriation is sometimes flexible catering different rituals at during times of the year or specifically designed for one ritual. Here the question arises what would be the activity in the space during the absence of the ritual. Mostly these spaces are quite happening as they occupy the central nodes or main spine of city often associated with a religious or royal structure. These rituals encourage interdependence promoting social interaction as well as boosting the local economy (Kohane, 2001).

Aldo Rossi in his writings expresses ritual as fundamental feature in protecting the significance of the monument and celebrating the lore behind its fabrication. This indicated the close link of the ritual and its city's architecture. He also states that if ritual is a permanent so is the myth that helps in preserving the monument (Rossi, 2007).

Lefebvre in his work the production of space states that ancient cities cannot be read as a group of people or a combination of things in space; nor can be decoded on the basis of different treatise describing the space. According to him every historic city has its unique

spatial practice within its own appropriate space. These spaces exhibit the social relations of reproduction which is the balance between the genders and the specific organization of the family. On a larger view they demonstrate the relations of production that is the categorization of professions and hierarchy among them (Lefebvre, 1991).

By understanding how the multiple evolutions in urban environments effected by multiple evolutionary mechanisms the study tries to interpret how the core of these settlements is shaped. Numerous Indian cities have a deep history of their evolution, which has resulted in their core and old part of the city displaying elements of natural growth that are recognized as venacular elements.

# CHAPTER 06: FUNCTIONING OF A SACRED CENTRE

Mumford (1961) in his writings illustrates the ancient cities as places with cosmological symbolization that epitomised the condensed form of world that is often linked to the heavens. These ancient cities were celebrated for condensation and centralization of power and culture though they hold a complex mapping of activities. Mumford's study explains the strong connection between the purpose of the city and human behaviour. He writes, that "The mixture of divinity, power and personality that brought the ancient city into existence must be weighed out anew in terms of the ideology and culture of our own time, and poured into fresh civic, regional and planetary moulds" (Mumford, 1961: 575). Here the city is a manifestation of organized human behaviour which is termed as culture.

The ancient cities celebrated today are virtually synonymous with cultural fabric of entire civilization. Robert Redfield and Milton Singer (1954) defined such cities as "orthogenic cities." These cities summarized the human behaviour associated with culture in a virtual form. Few of the immediately generative ortho-genic cities are Peking, Kyoto, Jeruselem, Banaras and Rome. These cities are built on the prime objective of mimicking the cosmic arrangement on the human plane. These cities are the expressions of moral order operating as centres of world ordering rites, pilgrimage centres and serving platforms for holy and royal ceremonies (Redfield and Singer, 1954).

Many of the ancient sacred cities weave around a temple, stupa or a religious structure symbolizing the cosmic structure. These cities often participate in reconstructing

the stories from the mythology in order to express their power of divine linkage and also to preserve the continuity of the belief (Xu, 2010).

The growth of the city culture is highly connected to the building up of territorial kingship and expansion of royal power. According to the Chinese ancient town planning principles the palace was situated at the centre, for the emperor is believed to connect the earth and heaven (Zhang and Wang, 2019). A similar concept is witnessed in India where Patliputra the capital of Magadha is described as "the touch stone by which other cities are judged" showing the power of Emperor Ashoka over his empire (Dave, 1991:7). Similarly in the South of India Madhrai once served as a royal city for the Pandaya and effortlessly transformed into a temple city for the Nayakas.  So, this city was operated as a ceremonial platform for honouring the king and worshiping the deity. Typically, in Cambodia till recent times the capital city of Phnom Penh was subjected circumambulation on special occasions.

The geographical location of the traditional cities of India is dependent of their function. The positioning of these sacred cities is in such a way that they are interconnected and support each other. These cities are celebrated for their sacred structure but not for their uniqueness or individuality. The powerful sacred spaces are often collective though spread across different spatiotemporal setting. They serve the same deity but with a different form reconstructing the setting of local folklore. For example, the famous city Benaras is not a singular city but a part of sacred city chain consisting of seven cities. Similarly, there are different chains of sacred cities each associated for purpose for example cities like Ayadhya and Dwaraka celebrate the birth of Lord Vishnu (Hindu God) whereas Somnath and Kedarnath narrate the life incidents of Lord Shiva (Hindu God). This shows the

difference of singular cities of the west associated with single God belief to the chain of sacred centres associated to numerous Gods in the east (Lochtefeld, 2002).

## 6.1 Understanding a pilgrimage

Pilgrimage can be understood as a complex human activity which is a universally practiced. Pilgrimage has perpetuated through various eras of human evolution as it is the most significant aspects of many faiths. While the dictionary meaning of pilgrimage is 'a journey to a shrine or other holy place celebrated or made special by its associations, undertaken in order to gain a greater closeness to the religion, etc or as means of affirming one's faith' (Robinson, 1996: 1050). Whereas, the wider application of the term 'pilgrimage,' can be translates into a journey with a specific purpose.  But in the context of anthropology it is defined as 'a journey of an individual or a group towards a fixed goal (geographical or metaphorical) or in search of a hidden goal they believe to embody a valued ideal' (Morinis 1992:4).

Three basic notions of the relation between humans and pilgrimage have been observed by Morinis (1992).

- Belief in existence of forces which are infinitely larger than humans- Gods and super beings that are cable in influencing human lives.
- Notion that humans have potential to establish a meaningful relation with devine forces
- Knowledge about the presence of certain places with transcendental powers which are close enough to touch

Every pilgrimage has a prescribed mode which is designed in response to the religion, place, local notion and individuals. Nevertheless, all pilgrimages have two key elements

destination and journey which have the potential to build a higher spiritual level image of the pilgrimage. Turner (1987) in his work classified pilgrimage experience into three stages:

1. The start of the journey – separation
2. The journey itself - the liminal stage
3. The return - re-aggregation

These three stages are witnessed with different mental stages engendering the nature of transformation of the pilgrimage (Turner, 1987).

## 6.1.1 Movement

The movement is the most critical part of the pilgrimage where the pilgrim is exposed to various experiences in his travel to the pilgrimage. In this context the movement refers to the movement in space that falls within the physical brackets of the the domain of the pilgrimage. At its simplest form the movement may be linear with a start and end point as well as can be circular having a circumambulatory path where the pilgrim returns to the start point. While other types of moments are observed with larger circumambulatory paths that encircle a shrine, group of shrines, territory, or even a region. This movement has a subtype usually witnessed at mountain regions with a spiral path where the pilgrim follows an accentuating path moving towards the centre (Morinis, 1992).

While the second classification of movement is based is related to human behaviour pattern. This is when pilgrims move as a group towards the religious node, one religious ode to another or even in circumambulatory path around the religious node. These massing pilgrimages are observed as a cultural performance rather than a functional physiological act (Morinis, 1992). The Figure 7 below shows the various types of piligrimage movement patterns in temple cities.

Figure 7 : Types of pilgrimage movement

 Source: (Sane, 2006)

The mass pilgrim movements with effects of public display influence both surroundings as well as the individuals. These collective rituals have taken a pronounced magnitude on infrastructural arrangements, political aspects and socio-economic impacts. While the individual journey of a pilgrim can be hardly be refereed as a pilgrimage but as a private travel.  Victor in his writings illustrates two important stages of pilgrim behaviour the former is the 'liminal stage which is a temporary detachment from the society. The next is the 'communitas' stage, where the pilgrim builds a sense of bonding with the fellow pilgrims. Where he argues that this 'sense of bonding' is quite essential to sense the focused involvement and steady flow (Turner,1987).

The third classification of movement recognizes the mode of movement which can vary from rolling, dancing and singing or by any other means of travel. However, the traditional beliefs state that the harder is the journey to the destination the more meritorious is the pilgrimage.

The most crucial aspect of the movement is the time which is the fourth classification where its importance lies in its layers. Mircea comments on the sacred time intervals prescribed by the concerned religious texts that have to be observed by the

followers of religion. He also points out the various time zones that been prescribed for the occurrence of religious events monthly, annual basis or nature's cycles in response to cultural beliefs (Eliade, 1968).

## 6.1.2 Destination

As discussed earlier the journey to the scared node is the most crucial part of the pilgrimage. Turner in his work illustrates 'spiritual magnetism' where the pilgrimage has a special power or value that attracts the pilgrims towards itself (Turner, 1973). The magnitude of the spiritual magnetism is directly proportionate to the flow of pilgrims. This phenomenon is elevated above the above other religious establishments (Morinis, 1992). The elemental notions in the shaping of sacred nodes have been witnessed throughout the cultural evolution irrespective of differences in faith. Mircea Eliade demonstrates this aspect as 'spatial nonhomogeneity'. The concept that few spaces exhibit more significance and they manifest the sacred as opposed to the infinite space which is formless explains its non-homogeneity (Eliade, 1968). This marks a reference point for orientation or a centre around which the entire organization is weaved. The collective activity intensification at a pilgrimage is observed during specific times marking the sacred time zones.

Preston in his work demonstrates how pilgrimage functions as a spiritual magnet by attracting pilgrims with an organised principle that helps in understanding the pilgrim patterns (Preston, 1992). As per his writing there are four variables that endow a pilgrimage with spiritual magnetism which are as follows:

1. A faith that some pilgrimages have the power of both psychological healing. This sometimes refers to natural elements like streams, herbs or any other natural formations with the intervention of saint or a deity.

2. Belief that some sites host apparitions of supernatural beings or divine forms. These sites sometimes gain prominence with tales of apparitions with human encounters.
3. Existence of theories that pilgrims are located with knowledge on sacred geometry. These are sometimes located at dramatic features of landscape like valleys, outcrops, river fords and mountain peaks.
4. Notion that the magnitude of difficulty encountered to reach a sacred node is directly proportionate to the sacrifice and endurance of the pilgrim. This may be observed with performance of rigorous rites, difficulties during travel or physical dangers.

Furthermore, in this process the pilgrim experiences a sense of closeness and achievement to the divine force after reaching the node. Thus, shaping the culture of a pilgrimage is a multilayer process. The goal of the pilgrim and the means to achieve along with its all supporting factors are interdependent and work together in influencing the participant pilgrims as well as the spatial environment around it. Thus, they together create a sense of belongingness and identity which is beyond the physical boundaries.

## 6.1.3 Concepts of pilgrimage

Given its existence in various historical and cultural contexts, no specific meaning can be attributed to the concept of pilgrimage. As discussed earlier, pilgrimages are linked to a specific time and place. Usually, pilgrimages are associated with ritual movements apart from involving movement across cultural and physical landscapes that leads to the sacred node. Every pilgrimage is associated with a ritual movement which may vary in response to religion, culture, faith or the historical time frame it is involved with. For example 'Stations of the Cross' are performed at Roman Catholic shrines, seven circles of walk around Ka'bah (central cube shaped ) shrine is observed at Mecca, circumambulations around stupas or dome-shaped reliquaries at Buddhist sepulchral monuments and circumambulations in clockwise direction around the main shrine at any Hindu temple.

## 6.2 Hindu Religion

Among the earliest and most famous religions in the world is Hinduism or Santana Dharma. The religion was initially known as Santana Dharma and the word Hinduism was later coined by Muslim invaders indicating the inhabitants of Indus valley territory. As the religion is very ancient there is no founder in response to the same the faith has diverse notions and customs. This religion can be rather explained as a codified collection of philosophies, moral conduct, social values, legends, history, practices, traditions and mode of worship (Davidson and Gitlitz, 2002).

### 6.2.1 Hindu pilgrimage and social life

It is considered a pilgrimage in Indian tradition to undertake a journey to a sacred place to visit a religious site, which generally involves four aspects: the territory, sacred site, riverbank, and sacred path associated with divine activities (Singh and Rana, 2017).

As discussed earlier, Hinduism exhibits a complex interweaved matrix of both human aspirations and human behaviour. The diverse practices and rituals reflect its multi-layered nature.  Due to its lack of one prophet or supreme text, the religion is structures as a set of guidelines rather than rules, leaving room for interpretation. In response to the same the religion has undergone several changes through the spatio-temporal frames yet retained the essence by the presence of culture and traditions. Shaping the culture of a pilgrimage is a multi-layered process which involves interweaving of goal of a pilgrimage, its means of achievements and the factors supporting the process. These supporting factors together work in influencing the surrounding spatial environment as well as the pilgrims.  Hence, they

hold the capacity to create an identity and sense of belongingness which goes bend the physical setting (Conlon, Mokashi and Engblom, 1989).

## 6.2.2 The Emotional Experience of Pilgrimage

As a form of travel, temple cities offer people a great opportunity to visit sacred places with a robust historical basis and a captivating cultural legacy. According to Alan transformation in the most common element in pilgrimage, that can occur at the metaphysical level. (Thiel-Horstmann and Morinis, 1985). This collection of illustrations illustrates how pilgrimage involves many different types of physical activity, from walking and crawling to dancing and even leaping. In presenting pilgrimage images, however, most fail to exhibit movement itself, revealing the dilemma facing both the anthropologist and the photographer. In the act of representation, either literal or ethnographic, the analyst is primarily concerned with images and issues that lend themselves easily to analysis, so that relatively fixed rather than fluid process images are represented. It should not be misconstrued that the Turners were not aware of the inherent mobility of pilgrimages (Turner, 1992).

A common element in pilgrimage is transformation, which can occur at the mundane or metaphysical level (Morinis, 1984). This transformation occurs through the process of the journey, and more specifically, through the motion that propels that journey. Stanley (1992) has argued that the action of pilgrimage is central to pilgrimage, and pilgrims express their devotion and emotions through their movements. Therefore, pilgrims' experience of pilgrimage is often defined by their movement through the landscape (Stanley, 1992).

As a ritualized pattern of movement, circumambulation in particular carries with it a distinct set of meanings for pilgrims. Coleman and Eisner (1995: 32) contend that, by circumambulating a sacred goal, a pilgrim is marking their arrival to their goal as well as making a statement about the sacredness of space. In the Hindu tradition, the cycle takes on additional significance. As illustrated in the story Ganesha and Karttikeya, sons of Shiva and Parvati, the power of circumambulation is highlighted as a symbol to embody the sacred (Bhardwaj, 1999). Ganesa is a large, elephant-headed deity who rides on a rat and is loved by many Hindus. His brother Karttikeya is represented as a young man who rides a fast peacock. When challenged to a race in which the goal was to circle the earth, Karttikeya and his peacock sped ahead of Ganesa. However, rather than lumbering around the planet, Ganesa circumambulated his mother. By symbolically circulating the earth in the form of the goddess, Ganesa easily defeated his brother. In addition to its great symbolic meaning, the act of circumambulation also fosters a communality among Hindu pilgrims, among whom Sopher argues that "common forms and a sense of community have been maintained by means of largely informal, autonomous, circulatory flows" (Sopher, 1968: 392).

### 6.2.3 Structure of Hindu temple

In the recent times the studies focused on the multidimensional role played by the temples in a particular spatio-temporal domain which bought a major paradigmatic shift (Richards, 1998).  The genesis of Hindu temple is biological but not morphological as the origins of this concept are associated with a tree. Initial temple forms of village are observed with tree at the centre of a village with sacred banners and flags. With the lapse of time this crude form of shelter was given a shelter form. This place was also associated with local judiciary and educational body. Later when the tree perishes the space is considered as a

sacred space with relevant local rituals. This place acts as a communal religious space with solid platforms to accommodate religious and cultural gatherings. Thus a tree establishes a 'genius loci' (Keerthi, 2010).

The Hindu notion of place making can be broadly classified into three categories: the temple compound, the autonomous pavilion and the rock cut cave. These categories are subdivided with variations in layouts designed acknowledging topographical and climatic conditions. For instance, the cave temples are carved on mountains in such a way that the void creates a shaded cave to shelter the space from harsh outdoor heat. Rock cut temples of Ajanta and ellora where the basic principle was to create a shaded cave to fight the harsh heat from outdoors. While the Kandaria Mhadev Temple in Khajuraho is an autonomous pavilion which portrays the concept of freestanding baroque stone which balance notions of worship: form inside it is a dark space for idol worship and on the outside it is enveloped with a circumambulatory path accommodating open to sky rituals. Whereas the third form is the most advanced form where the temple accommodates numerous pavilions each dedicated to a particular God spatially designed according to hierarchy. The temple as a whole is enclosed with a compound defining boundaries with rest of the city. These types of temples are usually positioned at the city centres and designed to accommodate huge population. The best examples of these temples are witnessed in South India like the Brihadeshwara Temple in Tanjavur and the Kailashanatha temple in Kanchipuram. Here the shrines and the pavilions form a definite pattern within the temple campus. As shown in the figure 8, a wonderful experience is thus created when one walks from one pavilion to another pavilion in a ritualistic pattern with a delicate transition. The ritualistic path unfolds

a journey which is play of open-to-sky spaces, semi-closed and closed spaces integrated to achieve a cohesive whole temple campus (Keerthi, 2010).
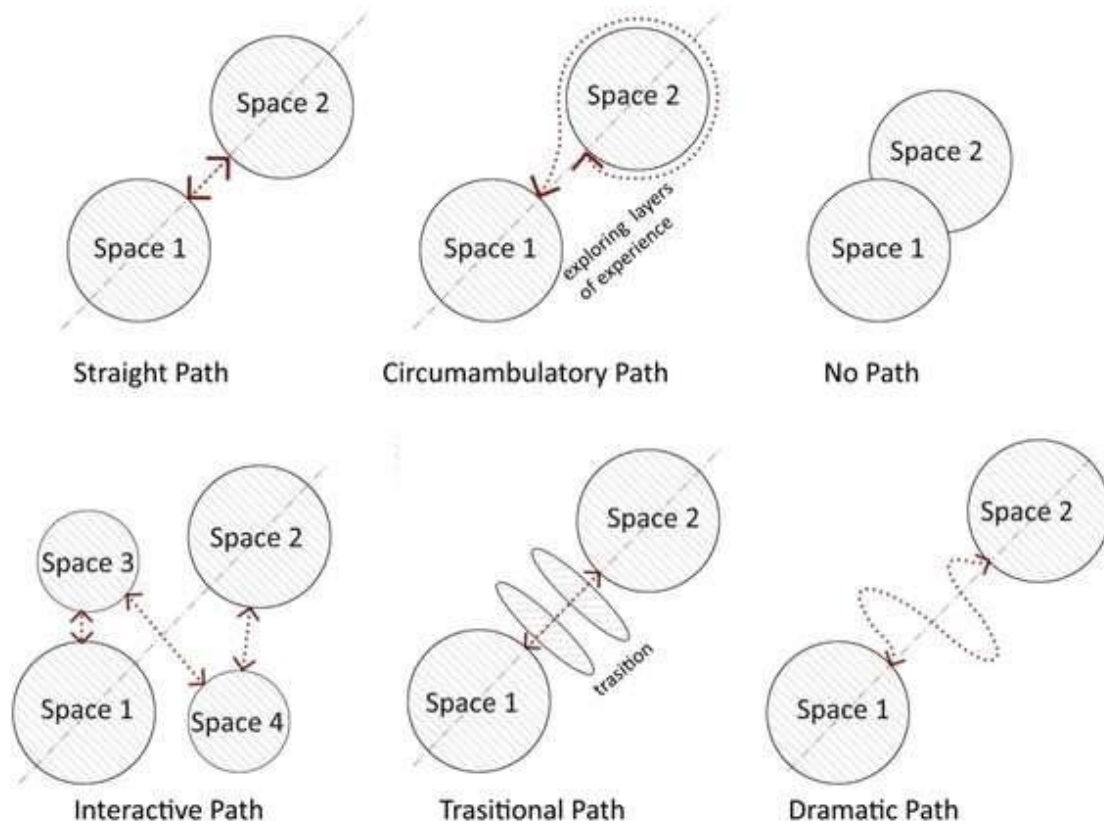


Figure 8 : Different paths adopted in Vedic temple towns

Source: (Author, 2021)


6.2.4 Understanding the concept of religion

It is believed that religions exist as an explanation of what man has been unable to comprehend. They were based on a variety of theories, including naturalism, inclusivism, exclusivism, etc. As a psychological response to our surroundings and lives, as an expression of social needs, as a focus on supernatural and sacred aspects of our lives, and as a survival strategy. A sacred image of a place is also enhanced by events and popular myths. We live in

a society where pilgrimage tourism, spiritual tourism, and religious tourism are prevalent. The terms cultural tourism and cultural heritage tourism are often used as synonyms since most of the aforementioned tourists visit pilgrimages during their travels, hence they are known as pilgrims. It is also considered to be the oldest source of tourism in the world. Pilgrims may visit religious places for a variety of reasons, including:

- Showing faith and devotion to their deity through pilgrimage

- Expressing gratitude, confessing sin, or performing a vow or ritual.

- For the purpose of reaching spiritual salvation.

- Observe and celebrate certain religious occasions.

- Communicate with fellow believers.

The places offer affordable accommodation and entertainment for the kids, and are often visited for picnics or as holidays. Besides the reasons mentioned above, people go to religious places for picnics or for holidays. Consequently, people take their families to religious places on vacation, making it convenient for their wallets, satisfying for their souls, satisfying for the elderly, and entertaining for the children. As a result, small business establishments around the temple can cater to visitors of all ages and from all over the country. Nevertheless, such a trip isn't the same as visiting temples, mosques or churches, which are a more cultural trip than a religious one. Visiting sacred places for sightseeing or working is also not a religious trip. To qualify as a religious pilgrimage, the pilgrim's journey must have a religious purpose, such as strengthening his/her faith in God.

## 6.3 Ritual in shaping identity

It is apparent from the discussion above that religiosity and its manifestations were vital to medieval sociopolitical institutions. As per the writings of Colleen Shantz ritual is a rich source of information that illustrates the socio cultural fabric of a society, and this information includes the genetic code as well as the evolution of the community tradition (Shantz, 2018). The adjectives customary, ceremony and ritual have been interchanged in used according to the context. Ritual depicts itself as the fundamental need to human existence and not just a liturgical or ceremony but a social need (Shaughnessy, 1975). Ritual helps in reviving and expressing the memory of a myth of a place, person or event. Thus ritual could be portrayed as a formal celebration or recreation remembering a collective memory beyond a functional attribute.

Though the architectural features, social settings or the characteristics of the urban form help in illustrating the meaning of the urban form, ritual plays a vital role in establishing the meaning beneath the larger configuration, which is achieved by connecting places separated through both space and time (Kanekar, 1992). Festive rituals play a significant role in urban renewal. According to Walter "we are living through the end of an era, experiencing the demise of modern architecture, a revulsion from 'futurism, ' scepticism about planning, and a reaction against the urban renewal programs." (Walter, 1988:2). Here he projects the need for the urban renewal in a holistic perspective by establishing the past glory which is well achieved through mental and emotional transformation experienced through participation in the festive rituals.

Though the history has recorded rituals in several contexts, every experience of the ritual has a unique narration as it creates heavy impressions on the memory realm in order

to build a more dynamic, non-parametric and evocative understanding of the past (Kanekar, 1992). Ritual is a human behaviour with an extra degree of intensity, passion and fervour based on a belief or memory of an event or person that is socially accepted. Festive ritual can be illustrated as a cyclic recurring of a social event that is exhibited through multi layers of indirect and indirect participation of various levels with overlapping domains ranging from language, geographical location, community and religion (Manning, 1983). As per the descriptions of Van Gennep the festive ritual is characterised into three broad stages. The first stage is the pre-liminal stage which demarking the spatio-temporal platform for the ritual process, while the second stage is the liminal stage which is witnessed at the heart of the spatio-temporal platform forming the core of the celebration whereas the third stage is the post liminal stage which exhibits de-sacralisation of the celebration. As per the illustration of Turner "it is in liminality that one enters a ritual time and space that are betwixt and between those ordered by the categories of the past and future mundane social existence." (Turner, 1983: 202). A ritual can be a product of a number of events, where each acts as an independent ritual especially in case of Indian temple cities.

## 6.4 Liminal space

Liminal is developed from the root word derived from the Latin word 'limen', or threshold. This is also refferd as a point at which psychological and physiological effects begin to produce (Alexander, 1991). Liminal space can be refered to as a trasitional space existing in between two fixed domains which differ in cultural rites or architectural language. The study of this space provides an understanding to decode the structure of transformative spaces. These spaces often envelop charecteristics which include ambiguity, blurring dissolution and layering which creates an atmosphere of transformation to the user

passing through these spaces. This experience of liminality exhibits a discontinuity leading the occupant to question the physical surroundings guiding to the magnified knowledge of the space as a threshold in-between the two seperate domains. The contrasts displayed by these dissimilar domains offers an opportunity for the user to experience and explore the spatial perspectives expressed through blurring, layering, transition and threshold (Zimmerman, 2008). In this context the perspective behind the discontinuity of space is to increase the spatial awareness for the user. Peter Eisenman further illustrates how spaces represent a unique situation with unique opportunities with distinctive transformative potential (Benjamin and Eisenman, 2003).

## 6.4.1 Perception of a liminal space

Through photoghphs Michael Graves illustrates liminal space as a mediator between the profane exterior and the sacred interior. By blending the occupied space and transformative threshold of the spaces they join, the in between spaces have the qualities of both (Ambroziak and Graves, 2005). The reference of liminal space can be taken at various levels and contexts that range from spatial to cultural and social. As per the writings of Van Gennep a person in the liminal stage is in the trasitional stage where he has left the former domain but has not entered the later state (Van Gennep, Vizedom, Caffee and Kertzer, 2019). While Fred Koetter defines this threshold space as "the realm of conscious and unconscious speculation and questioning – the 'zone' where things concrete and ideas are intermingled, taken apart and reassembled – where memory, values, and intentions collide" (Koetter, 1980: 68). Victor Turner builds up on the illustration of liminal space as a state with stable condition or relatively fixed but with a trasitional stage (Turner, 1970). Alexander in

his writing expresses liminal space as a pure potententiality or pure possibility which everyday cultural and social experiences can be transformed (Alexander, 1991).

## 6.4.2 Rites of passage in liminal space

Ethnographer Arnold van Gennep's theory of 'rites of passage' explains liminal space as a gradual trasition experience of the user as he progrsss from the prophane domain to the sacred domain. The rites of passage are a three part framework which is: rites of separation (séparation), transition rites (marge) and rites of incorporation (aggrégation) (Van Gennep, Vizedom, Caffee and Kertzer, 1960). This theory has been futher elaborated by anthropologist Victor Turner thorugh his throritical study on the functionanility of ritual transitional phase comparing it with the cultural dramas of change in the social and individual life. This is further structured as as the existence of an alteration between blurring of social roles and formulated social roles wich occur in the titual context. In his writings he spefies that 'rites of passage' is reflected in all societies but the maximal reflection is exhibited by cyclical, relatively stable and small-scale societies (Turner, 1974).

## 6.4.3 Understanding of liminality to architecture

The application of liminality to architecture opens up possibilities to analyse the importance of threshold between spaces to experience those in-between spaces regardless of their function or program (Sfinteș, 2012). In the architectural context the liminal space is demarked by boundaries of built fabric. These boundaries are shaped by thresholds and enclosures punctured by openings defining the inside and outside relationship. Vlad Gaivoronschi chategorises these boundaries into three types: multiple (in which the threshold becomes spatial, requiring more time for crossing the boundary), thin

(transparent) and thick (opaque and massive). Every boundary has a unique influence on human behaviour, as they perceive it as being smooth to dramatic or continuous (Gaivoronschi, 2002).

### 6.4.4 Temple town as a liminal space

The temple town that is weaved around the temple serves as a liminal space where the 'gopurams' or gateways act as thresholds at different levels creating a gradual transition. The concept of liminal space can be applied in studing the temple towns of South India as the temple town gradually transforms as the user moves between the profane and sacred domains of the temple town. Here the temple town acts as the space for procession facilitating the temple activity (sacred space) and as the space for inhabitation imitating the function of the proface space as well a distint domain separating the profane and sacred entities.
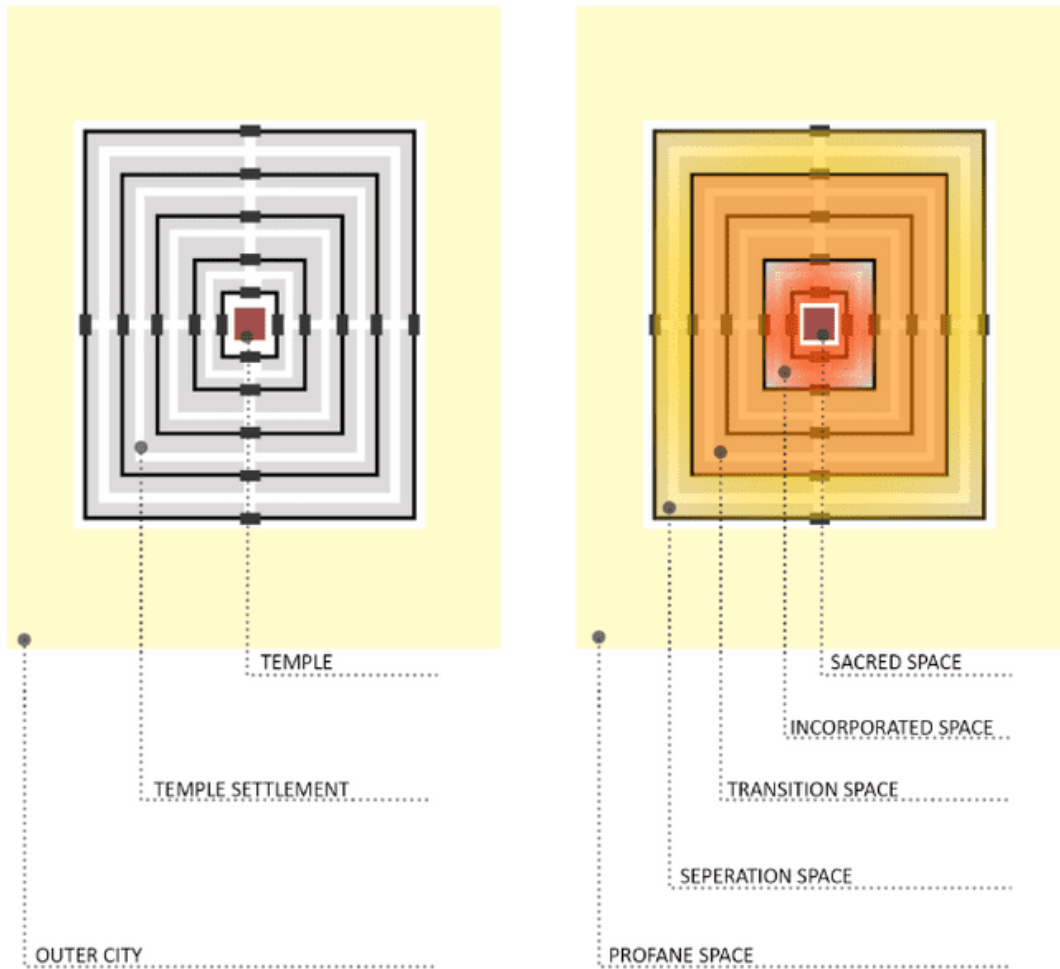
Figure 9 : Temple pattern showing the liminal space of transition

Source: (Author, 2021)

The entrance into the temple town trough the gateway or gopuram facilitates a transformative transition between the outer settelement area and temple complex as shown in the figure 9. This space distinctively reflects a transitional zone as the user progresses through the layers of spaces or series of thresholds inored to reach rhe temple complex. The gateways which are massive and dominate the skyline of the settlement facilitate in barriers of spatial and visual seperation of the profane and transition zone. Upon crossing the outermost whorl or outermost ring of settlement the user reches the transition zone in which the user is not yet in the sacred complex but they have been detached from

the profane domain. On reaching the first ring or the temple adjacent whorl of streets the user reaches the zone of incorporation where the user is at the porch of temple complex. By understanding the the structure of rites of the passage a process thr transformation of the liminal space can be analysed.

## 6.5 Temple economy

The general economy of the temple town was handled by the Brahmins as they were the supreme landowners. Portions of land was leased to the tenants or workers worked directly under them for daily wages in the form of grain or coins. Almost 70% of the agricultural land was cultivated by the Adi-Dravidians who worked directly under Brahmins as labourers. These labourers received bonus money during special occasions of festivals, birth or death. The rigidity of the occupational hierarchy is clearly exhibited in the spatial pattern (Ghosh and Mago, 1974).

As the land is rich in expensive commodities like precious stones, pearls, pepper etc. the trade in the city was always in boom as the merchants came from across the globe. Tamils had trade relations with Romans in the west to Chinese in the east. Apart from expensive commodities Tamils produced sugarcane, cereals, pulses and cotton in abundance. Silk sarees is one of the most popular in response to their skill acquired over many generations (Ghosh and Mago, 1974).

The Tamils gave a high degree of emphasis for all forms of education which was exhibited through continuous endowments provided by the ruling kings. Stone carvings on the temple walls illustrate the level of literature achieved by the Tamil people. For the Tamils temple is beyond the place of worship as it played a dominant role in socio-economic

life of the people as a supreme seat of justice and learning as well as a platform for festival and fairs (Ghosh and Mago, 1974). Stein cpresented a major work on this perspective by decoding the inscriptions on the temple walls that illustrate the endowments of money and land placed with the temple as religious endowments (Stein, 1960).

Stein developed the concept of 'shared sovereignty' as a way to describe what a deity shares with the king, while the king shares divine powers, in Medieval South India. He introduced the idea of deity and society connecting due to the structure of South Indian kingship (Stein, 1978). Protecting the temples was an integral part of the king's political role of safeguarding the kingdom and its inhabitants. These protective mandates resulted in the king's direct involvement in temple affairs, which is best exemplified by the large benefactions kings provided to the the staging of rituals, maintenance of temples and the remuneration temple staff (Fuller, 2007). In turn, the contributions were turned into honors for the donor, the temple staff, and the worshipers as a whole, as shares of the resources donated (Appadurai, 2011).

### 6.5.1 Political economy

Under the reign of Pallava dynasty during the 5th century the domain of political economy boosted as a result of growing temple endowments in response to the the agrarian developments and commercial transactions (Stein, 1960).

### 6.5.2 Temple urbanism

The temple towns that grew in the patronage of Chola Empire exhibit a wide range of traits that categorize them as holistic towns through the endowments of central place approach or Childe's tradition (Smith, 2009). Hearts of settlements were witnessed with

ornate stone temples of monumental scale. Local affairs were handled by separate assemblies that were spatially mirrored and operated through occupational specialization, while the trade was concentric at ritual cores. The temple sites catered as the major interaction hubs at various levels in response to the occasion. These temple zones served as platforms for political manifestations and many legitimations that resulted in donations by leaders both from and outside the religious centres (Ludden, 1985).  According to Richard Eaton (2000) the Indic conquerors especially the raids by Sultan raids on South India were extremely strategic in selecting the places of target which were mainly wealthy pilgrim targets and the ones that contributed the sovereignty on their territory. The selected list of places mainly includes the temples of Madurai, Srirangam and Chidambaram (Eaton, 2000).

The temple urbanism in South Indian temples is operated on the basis of religious economics. As Champakalakshmi points out that "prasastis were the chief domain of legitimation of the ruler's sovereignty, containing as they do, all the chief motifs and themes drawn from the composite package handed down as the  Brahmanical tradition, common to all the South Indian dynasties of the early medieval period" (Champakalakshmi, 2008: 23). In most of the South Indian temples the central core area that includes the temple precinct and ritual space witnessed administrative dominance of the Brahmins while the area outside the ritual centre experienced a rather relaxed economic dominance of the temple administrations. Administrators of the temple possessed few rights on the lands beyond the ritual domain. The fringes of the temple town were usually witnessed with large expanses of cultivable land in response to the water source available from the rivers. These agricultural lands were possessed both by small peasants as well as large land owners. The segregation of land to the temple authorities dates back to twelfth century A.D. (Heitzman, 1987).

### 6.5.3 Cultural economy

Though the combined notion of cultural value dis-aggregated into many constituents not all are applicable for any given case and are dependent on the situation. According to the writings of the Torsby, though the product of cultural heritage can be perceived just as an asset, its unique character yields or embodies economic significance through its financial worth as well as boosts cultural value through its aesthetic and historical value along with enhancing communities' cultural experiences (Torsby, 2012). The concept of cultural capital is very important in understanding the impact of social and cultural reproduction as well as formulating heritage policies with respect to socio-cultural impacts (Lamont and Lareau, 1988). To have a deeper understanding of the same there are four reasons, which are as follows:

Firstly, the idea of 'cultural capital' plays a crutial role in the domain of economics. By representing heritage as cultural capital it opens a dialogue between economists and heritage professionals who in turn work together in formulating cultural and economic policies.

Secondly the concept of 'cultural capital' revolves around the articulation of particular forms with a certain value. Specifically the phenomenon draws attention to the culture value independent of economic value.

Thirdly, the notion of cultural capital naturally contributes to sustainable intensions as the capital assets are long lasting. As ecological and environmental sustainability leads to the path of development for the future tenants by preserving the natural resources,

similarly growth in cultural sustainability preserves cultural heritage for the future tenants. There is huge treat to the cultural systems leading to a break down followed by loss in both economic output and welfare if the heritage is allowed to deteriorate in response to the failure in sustaining the cultural values that build the sense of identity. This happens with neglect in investing on the maintenance both intangible and tangible cultural systems.

Finally, methods of economic appraisal can be usually applied to public investment in capital assets. The phenomenon of defining heritage as cultural capital initiates various prospects with cost benefits grounds for heritage projects (Throsby, 2012).

The activity of cultural conservation can be understood as a capital investment project as it involves private and public funds. But the property should stream both cultural and economic value that is being assessed or evaluated (Navrud and Ready, 2002).

# CHAPTER 07: IDEOLOGICAL NOTIONS OF CITY PATTERNS

In the context of urbanization processes that exceed the traditional concept of the city, this research reexamines the theory of the city. The initial approaches in decoding the settlement pattern greatly relied on a single characteristic as the dominant. For example, Amith Ray in one of his works quotes; "cities...must have grown up in response to demands made by increasing activities in arts and crafts and trade and commerce." (Ray, 1964: 48). The author highlights the growth in culture exchange being the sole factor deciding factor. This approach cannot determine the function of the settlement along with the religious beliefs and social behaviour of its residents. However, the process of the growth can be analysed from a particular stage of growth but the genesis of the city cannot be decoded.

Another approach is studying the urban grammar according to the morphology. According to the texts of Manasara the towns are classified into eight models owing to their function and geographical location (Dutt, 2009). Every city Vedic follows a particular model or an amalgamation of two or models. This process can analyse the function of the city but cannot illustrate the changing urban fabric of the city.

"Cultures, just as cities, are viewed as assemblages of traits, whose roles within the total cultural-system are ignored." (Erdosy, 1985: 84). Here the culture refers to different traits adopted by the people after through experience and experimentation with the prevailing physical, social and economic conditions. Therefore, human behaviour is one of the key factors that govern the structure of the settlement pattern.

Dissecting a particular culture exhibits the traces of various foreign influences. Consequently, the term 'diffusionary mechanism' emerged, which describes the process of diffusion and its origin. In this case the foreign trait is focused which diverted the direction of cultural evolution leaving the parallel operation of other traits which are usually overlooked. The finest example can be taken from the texts of "Painted Grey Ware people", where the type of ceramics is used defines the cultural degree of that society (LoMonaco, 1989).

## 7.1 Meaning of Early Urban Planning

The cities of ancient world were designed in response to the expressions of ancient architects and builders under the word of their rulers. Several approaches have been made to decode the message the ancient builders wanted to communicate.  Amos Rapoport (1990) identifies an effective method in analysing the messages and categorises them into three levels which exhibits the level of advancement practiced in designing the city.

The first one is the high-level meaning which deals with supernatural and cosmological symbolism that is encoded in the planning and building morphology. Second one is the middle level meaning which refers to the cultural status and identity of the place the city planners wanted to communicate while the third of the low-level meaning deals with the relation of the human behaviour and built environment. These levels do not stand independent in the planning of the cities but are mutually exclusive (Rapoport, 1990).

### 7.1.1 High-level meaning- Cities Built as Images

According to the Rapoport's illustration the high-level meaning is associated with the domain of scared, worldviews and cosmological factors which are esoteric and can be

appreciated by few people (Rapoport,1990).  Mircea Eliade demonstrated the relation between cosmology and city patterns by proposing four major nations:  (1) augury and divination are needed to sanctify and identify sacred place on earth;  (2) the cosmos are fashioned according to the four cardinal directions, which should be imitated by the human constructions;  (3) *axis mundi is* the fundamental connection between cosmos and the earth; and (4) In many ways, life on earth and the functioning of the heavens are similar (Eliade, 1959). These concepts were quite popular and universal among the ancient cities. According to the Rapoport these concepts are used as a combination which varied according to the cultural and temporal fabric (Taylor et al., 1993).

Kevin Lynch promoted this approach with similar theory "theory of magical correspondences" which states the pattern of any permanent settlement in the ancient world is the magical model of the universe (Lynch, 2001: 73-81).  He provides a practical explanation illustrating the cases in India and China and frames fundamental concepts: processional axes, encircled enclosures, up-versus-down dominance, a grid layout, and bilaterial symmetry define this passage. These principles according to him exhibit definite social ethics: a enduring and close fit between form and action, dominance, stability and order (Lynch, 2001).

The urban fabrics of Cambodia and other Khmer civilizations have been documented to have been designed according to the cosmological symbolism (COE, 2018). Although the ancient Chinese cities do not posess strong documentation the presence of cosmological principles is well exhibited in archaeological evidence. The Indian planning has a profound set of cosmological standards which were used in ancient planning. (Spodek and Srinivasan, 1993)

### 7.1.2 Middle level meaning- Planning and Power

Rapoport's concept of middle-level meaning concerns with messages of power status and identity the elite society wanted to exhibit through their architectural manifestations (Rapoport, 1990). According to Lynch architectural principles and elements like city walls, plazas, axiality and symmetry are the language of middle level meaning than the high-level meaning (Lynch, 2001). The location of the urban building their style and shape are expressions of control of the labour by the state. In addition to the architecture the planning of the city was done according to zones. Each zone was accommodated by the people of a particular occupation and the location of the zone was according to the societal hierarchy (Taylor et al., 1993).

The middle level meaning planning laws provide reliable information unlike the high level meaning which is difficult to prove. Middle leaving meanings of the ancient plinning have their roots from formality and monumentality. As per the explanation of Trigger the design of middle level meaning cities demand more material and labour for construction. The ancient rulers constructed structures beyond the human scale as an expression of power and political ideology (Trigger, 1990).

As discussed above in the recent findings, researchers have identified number commonalities in the architectural standards that were followed during the construction of ancient capitals across the globe. These principles of monumentality and formality used in fabricating the ancient cities had huge influence on both residents and visitors (Trigger, 2010). By decoding the message of middle level meaning one can understand the social scenario of those temporal settings for example no. of people working over a single monument their

lifestyle. In most of the cases the monuments were constructed during the agricultural off season. The huge monuments played a powerful role in the political dynamics especially in bindings the citizens to the ruler and to the cultural laws (Papadopoulos and Leventhal, 2003).

### 7.1.3 Low-Level Meaning: Negotiating the Urban Built Environment

As per the illustration of Rapoport the middle level meaning deals with recursive behaviour between human behaviour and city patterns (Rapoport, 1990). This study deals with the adaptations of the city patterns in response to the social, economic, cultural and political framework. On the cities with low level meanings the effects and dynamics of visibility and access have a huge influence. The study also relates to the effect of ritual exclusion on the city fabric. The cities took their shape under thorough experience and experimentation of the prevailing human behaviour (Taylor et al., 1993).

Most of the ancient capital cities have cosmograms as the fundamental structures. Ancient records believe that the capital cities were constructed to maintain harmony between earth and heaven. So these cities followed strict geometry with symmetrical rectangles with principle avenues connecting the cardinal directions through the centre where the royal compound is located, in addition there are nine gates one at the centre and one for each cardinal direction. The concept "sociogram" or "microcosm" features social organization but not cosmology. Sociogram is a diagrammatic representation of the social structure along with its formation and function (Drahota and Dewey, 2008).

## 7.2 Cosmology

Extensive research has been done on the planning of the ancient cities as they exhibit a significant uniformity which led to the question on intentionality and symbolism supporting these patterns. These city patterns maintain a delicate balance between praxis, urban day to day needs — and idealism, expressing a cosmological or symbolic image understanding the urban needs (Carl et al., 2000). The physical urban form as a whole acts as strong base to explore the concept behind the arrangement whether ideological or symbolic. In ancient urban traditions like ancient Khmer Angkor and Imperial China the planning of the cities directly mimicked the structures of cosmos ("cosmograms"). Many other ancient traditional planning principles are compared to have been borrowed from the patterns of cosmograms (Smith, Smith and Profile, 2019).

## 7.3 Standardization of City Plans

Romanist Simon Ellis (1995) in his texts defines planned cities as the cities which follow certain set of regulations designed for a specific location, time, culture or climate (Ellis, 1995). This idea was further elaborated by Peter Lacovara (2009) in his explanation of Egyptian cities (Lacovara, 2009). To understand the degree of advancement of planning a city holds a comparative analysis has to be done on the city plans which belong to a similar cultural or temporal background. To have a clear observation the concept discusses three platforms of comparison which are metrology, orientation, spatial patterns and architectural inventories.

### 7.3.1 Architectural inventories

The architectural inventories serve as the hallmark visual standards of the ancient cities. Nancy Steinhardt discusses eleven features of traditional planning out of which three relate to the architectural inventory: defensive protections, gates and four sided enclosures

(Steinhardt, 1999). The cities which were associated with particular socio-cultural principles weaved their urban fabric with basic inventory of public buildings for example royal palace compound, stelae carved with hieroglyphic texts, rectangular plazas and temple- pyramids were associated with Mayan cities of classic period. While the Andes where known for their stonework and partly for their qollcas (storehouses), kallankas (long administrative /ceremonial halls) and kanchas (walled residential compounds) (Andrews, 1975).

## 7.3.2 Spatial Patterns

Commonalities in the spatial planning are difficult to document objectively but serve as a better form of comparison than the architectural inventories. Steinhardt formulated eleven principles of planning out of which four relate to spatial planning: visual perspectives, water accessibility, system of wards and clearly defined spaces in the form of streets (Steinhardt, 1999). Most of the ancient cities of Mesoamerica share a combination of two or more features (Smith, n.d.) The South Indian temple cities share a strong similarity in their city weave and location of the principal temple. In the case of Yoruban cities a large royal palace occupies the core of the city and the market is located in the close proximity. The street pattern runs outward radially from the royal palace connecting the residential areas which where fashioned as into lineage-based neighbourhoods (Krapf-Askari, 1969).

## 7.3.3 Orientation and metrology

In a number of ancient cities across the world, the cardinal directions were strictly observed. This standardization of orientation can be observed in many South Asian cities including the palace cities of China and the temple cities of South India (Aveni and Hartung, 1986). While in the case of Mesoamerica the urban fabric is oriented seventeen degrees

East of North. Anthony Aveni in his writings states that, "Alignment studies reveal a widespread pattern of systematically deviated orientations." (Aveni, 2003: 163).

Metrology refers to the standardization of specific units of measurement. The urban planning in ancient world was often the multiple of a specific unit which is usually associated with a God in the pantheon or a calculation based on lunar or solar calendar (Mannikka, 2000).

## 7.4 Degrees of Urban Planning

The degree of urban planning can be quantified based of the extent of area that is planned according to the prevailing planning principles of that city. Most of the cities exhibit intense planning at the epicentre which gradually fades towards the peripheries of the city. Quantification of planning can be done by two methods which are calculating the no. of planned hectares which is the absolute quantity and by calculating the percentage of the planned portion to the city which is relative measure. A great portion of the epicentre is associated with the administrative function in most of the ancient cities. Absolute quantity of planning is highly proportionate to the power of the kingdom. So the political power is the major deciding factor in understanding the absolute and relative factors of measurement especially with the capital cities in the ancient world (Smith, 2005).

## 7.5 Planned vs Unplanned

The organic ancient cities are often viewed as unplanned cities as the planned cities of ancient time are believed to be associated with orthogonality.  Smith's writings on planned and unplanned cities argue that "the 'organic' description of irregular cities often

mistakes cultural variation in aesthetics for decentralization of urban planning" (Smith, 2003: 226). According to him the notion of planned cities got formulated not on the geometry but the role of politics that shaped the cities. A similar analysis has been presented by Keith Lilley, historical geographer who states that most of the ancient planning bodies constituted kings (Lilley, 2004).

The organic planning refers to the cities which grew without a proper monitored direction and lack in co-ordination. Grid layout is associated with intersecting streets at right angles and the cities usually follow strict geometry. These cities can grow and merge into each other effortlessly. Diagrammatic cities are described as inflexible cites as they are developed with a single vision and usually associated with limited function that cannot expand on spatio-temporal basis. The grand manner cities are designed on the basis of visual expression of grandeur (Kotsof, 1992). Figure 12 below shows different urban patterns where the rectilinear pattern is quite flexible to merge with another while the star pattern is highly dramatic and rigid in expansion. On the other hand, the linear pattern is subjected to expansion from the ends while radial grows radially.
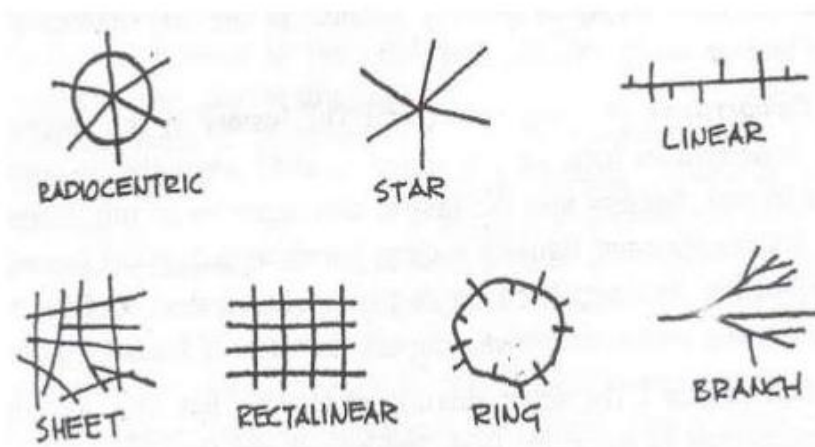
Figure 10 : Different urban patterns

**Source: https://www.slideshare.ne**

## 7.6 Concept of co-ordination

Harold Carter (1977) in his understanding of planned cities demonstrates that the grade of planning is directly proportionate to the co-ordination among the building (Carter, 1977). This concept is further modified by Robert Scranton (1949) as "group design" which is explained as designing an architectural pattern that satisfies its relation to the surrounding (Scranton, 1949).

This concept demonstrates the models of cities where the elements of the shared a common orientation. The degree of common orientation and its relation to the nature of planning has been investigated and stated that common orientation does not indicate central planning but also based on topography or in response to a natural element such as river. In some cases the orientation is towards royal palace, city walls, plazas, avenues or any other public architecture. A further analysis is done by Edmund Bacon (1967) who categorised them as "mass as connector" and "axes as connectors". As per his argument the axes or the weighed corridors are to be analysed in a similar way as these structural linkages serve as access to ecological necessities, control of the activities and communication (Bacon, 1967).

## 7.7 Formality and Monumentality

The concept of formality indicates to the cases of those cities whose design prioritized observers or participants (Ehrlich, 1959). Nancy Steinhardt phrases these cities as "clearly articulated and directed space" (Steinhardt, 1999: 5) Kevin Lynch mentions a similar case in his work "The Image of the city" where he demonstrates ten qualities of form out of

which five apply to the concept of formality which are clarity of joint, dominance, continuity, form simplicity and singularity (Lynch, 2014).

The ancient planning of capital cities practiced the combined formula of monumentality and formality where the urban fabric that is well articulated and consisted of buildings that dominated the human scale to high degree (Stark, 1999). The principal idea behind this practice was to deliver visual messages of political power and technologic advancement. Khmer capital of Cambodia and Angkor contribute to the absolute examples of monumentality and formality of ancient world while the built forms of Tula stand out for formality than monumentality (Trigger, 1990).

## 7.8 Concept of Modular planning

A modular orthogonal plan is a high-level planning proposed where a regular street layout is exhibited by the integrated orthogonal plan. One of the rare nonclassical examples of modular orthogonal planning is the pyramid town of Kahun in Middle Kingdom Egypt (Moholy-Nagy, 1969).

Orthogonal plans experience distortion in their layout in response to the topography (Castagnoli and Caliandro, 1971). Orthogonal plans are broadly divided into semi-orthogonal and modular orthogonal plans which relates to the level of advancement of the city planning. Semi-orthogonal plans are shaped according to opinion of individual builder to builder or resident to construct a house in relation to the existing construction. In contrast, modular orthogonal plans come pre-designed with integrated orthogonal plans, providing a higher level of planning. Here the buildings are arranged orthogonally with respect to a larger public structure and sun-orientation. The city plan of Mohenjodaro is a fine example

of semi-orthogonal layout whereas the ideal example of modular orthogonal planning is Olynthus, a Greek city (Cahill, 2001).

## 7.9 Semiotics

As per the notion of Umberto, semiology is a not only a theory-based study but a methodology based study. He defines semiotics as everything that can be taken as a sign (Eco, 1997). According to Saussure a sign is composed of signifier and significant, while signification is the relationship between significant and signifier (Key and Noble, 2017). In contrast to 'self-contained diad', the sign model of Saussure, a triadic model has been introduced by Pierce:

1. The element implied by the sign or 'an object'.

2. The sense of the sign or 'an interpretant'.

3. The form taken by the sign or 'the representament' (Chandler, 2006)

The qualities of architecture can be broadly classified into four components cultural parameters, social parameters, physical structure and spatial organization. The first two parameters are collectively known as socio-cultural backgrounds of the built environment while the last two parameters are jointly known as architectural mechanics which primarily deal with the function of the built environment (Harries, 1998). The semiotic tools are broadly classified in three methods which help in deriving information at different levels.

### 7.9.1 Tool 1—Structural Relation

The initial step of this analysis is the façade selection:

Step 1: Selection of elements acknowledging the common elements on the street facades identified by the people.

Step 2: Understanding the relation typology among these elements with respect to architecture, semiotics, culture etc.

Step 3: Analysis of relation's expression between the elements and their application on the façade.

Step 4: Establishment of link between the independent and dependent variables ie, the architectural edifices and the street facades.

### 7.9.2 Tool 2—Operations of Transformation

Step 1: Selection of a façade with chosen elements to study.

Step 2: Characterization of the façade in response to the number traditional elements.

### 7.9.3 Tool 3—the Semiotic Square

The third tool of semiotics initiates from selection of elements, breaking them into meta elements, illustrating relation among the meta elements, formulating possible iterations, re-observing and making final classification.

Step 1: Selection of elements using the street façade.

Step 2: Identification of the Meta-elements.

Step 3: Illustrating relationships among the elements.

Step 4: Deriving all possible solution through iterations.

Step 5: Re-analysing the space involving people's opinion.

Step 6: Classifying the facades in response to the commonalities.

## 7.10 Conclusion

To establish a template for analyzing South Indian temple towns, this study examined various ideologies of city patterns. As part of critical urban and spatial theory, this study addressed the specter of the city. In recent years, urbanization patterns have taken qualitative directions that have challenged urbanism as a unit of analysis, transforming inherited sociospatial landscapes.

Different ideologies and sociological thought have believed that globalization (and modernity in general) are more likely to favor patterns that can be predicted completely or impersonally, and therefore cannot be described. Rather than being understood as a category of analysis or as a moment during urbanization, the city should be viewed as a category of practice: an ideological representation of the urbanization process. Traditional cities are first and foremost spatial environments, which is why urban spaces should not be viewed as ethereal, spiritual, or slippery in any way.

Traditionally, urban settlements do not view space as a blank space, but as a formless void. Also, space is something human beings are capable of creating, and it can be configured. It is an artifact. The notion of shaped space is the basis of human society, whether in the intimate setting of a private room or in the public setting of a street or plaza. Often, much of social life is conducted in shaped spaces.

In addition, traditional urban settlements tend to be hierarchically structured, characterized by reciprocal relationships among public spaces and more prominent religious and civic structures at the foreground, as well as a smaller number of residential and commercial buildings in the background. As a result, when these structures are combined, we can see traditional urbanism – both as a city and in a town – represented as a whole.

## SECTION 03: DATA AND ANALYSIS

The purpose of this section is to evaluate the domain of study. As shown in the figure 13, this section comprises of three chapters; 'Case study', 'Data collection', and 'Analysis'. The initial chapter describes and illustrates the study domain and its various dimensions while the following chapters illustrate the process of evaluation as per the designed methodology.
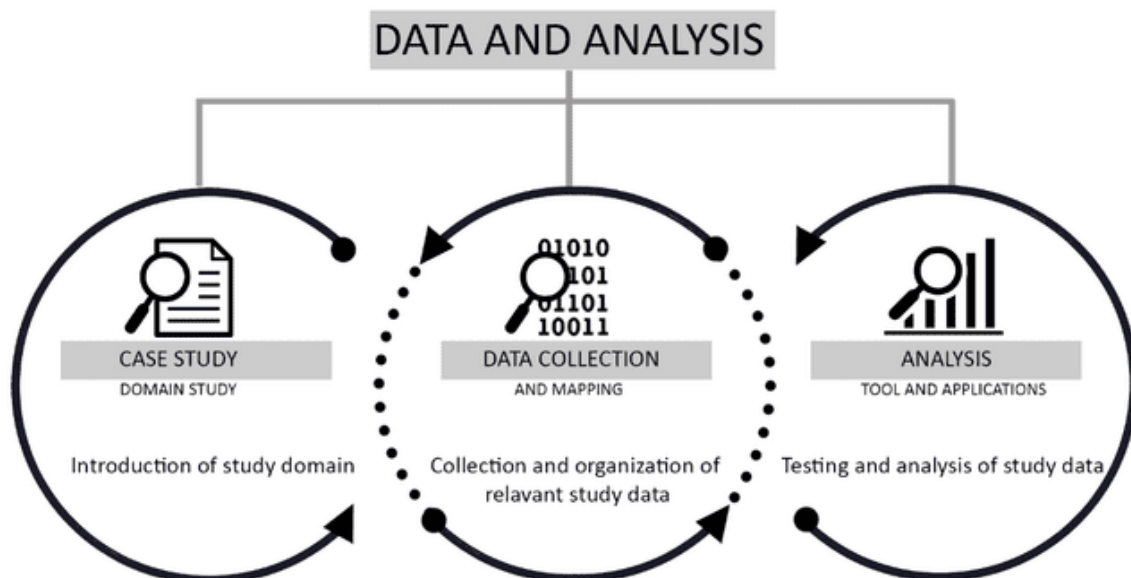


Figure 11: Data and analysis flowchart

Source: (Author, 2021)

# CHAPTER 08: CASE STUDIES

According to Glynis Cousin, a case study method can described as an approach to define cases and explore a framework in order to understand it but not as means to analyse cases (Cousin, 2005). The research opts for a multiple case study method which according to Robert Stake will help in understanding the similarities and differences between the cities (Stake, 1995). This also enables in researcher to analyse the data in both across the situations as well as within each situation. Multiple case studies also help in either auguring similar results or contrasting results for expected results (Yin, 2009). This will help in analysing the value of the findings. The relative comparison of the case studies is that they offer a convincing theory when the suggestions are massively grounded in several empirical evidences (Eisenhardt and Graebner, 2007). As per the writings of Baxter and Jack the results and evidences of multiple case studies always scale high in reliability and strength. Therefore, multiple case studies support a wider exploration of the theoretical framework and research questions (Baxter& Jack, 2008).

## 8.1 Domain Formulation

The research aims in developing an appropriate framework to decipher the genetic code of South Indian temple cities that are celebrated for their, continues inhabitation and existence absorbing the urban change. Though all the cities follow similar theoretical principles of planning their framework is highly governed by the spatio-temporal platforms, function and political scenarios. India is witnessed with a lot of religious, ethnic, climatic and

geographical diversity in response to his vast area with several overlays of socio-cultural patterns. Diagrammatically, Madurai, Srirangam, and Chidambaram have similar features.

The central courtyards of these three temple complexs seamlessly merge into the city's framework, dictating the form of the city.Acknowledging the above scenario cities with common denominators of geography, function and area are considered to facilitate better understanding of the cities. Though these cities are exposed to the challenges of urban change their configurations have not been heavily altered. Based on the available data, the historic center has been undergoing transformations, due to the development of tourism and the growth of commercial activity. Considering the same the research also focuses on analysing the factors that have helped in preserving the identity and flavour of these cities.

### 8.1.1 Area of study

The case studies selected of the study are carefully chosen on the basis of following criteria. Firstly the cities chosen are predominantly monotemple centres, spread across the Tamil territory of India. Secondly these cities have circumambulatory patterns as the common denominator for solidifying the street structure. Thirdly gopurams or gateways play an important role as the physical identity for these cities where the gateways are given more visual prominence than the main temple. Lastly these cities are based on Vedic theoretical models of planning and have similar spatial configuration.  So to facilitate the same three South Indian temple cities have been selected which are Madurai, Srirangam, and Chidambaram. These three cities have common denominators of time, political scenario and geographical location apart from function.

The primary data base on which this model is based is important to note since this is an attempt to develop a general and schematic description of south Indian temples. A three-part ethno-historical study in south India was used to establish common characteristics. The first study examines the Sri Ranganatha Swami Temple in Srirangam, Tiruchirapalli city, the largest temple compound in India and among the largest religious complexes in the world; the second examines the Meenakshi Sundaraswarar Temple in Madurai, a large temple complex with Shaktism palliations; and finally the Nataraja Temple in Chidambaram, an ancient temple complex with five elements.

## 8.1.2 Typology

Each city functions as the abode to a particular deity but interconnected through rituals. The receding deity governs the number of circumambulatory patterns which in turn the number of whorls and the spatial organization. As an example, the receding deity of Madurai is Goddess Meenakshi, whose temple is prescribed with five circumambulatory patterns, so the city follows a fivefold spatial framework. While Srirangam is the abode of Lord Vishnu whose temple is prescribed with seven circumambulatory patterns where the first four whorls are dedicated to the temple and the last three whorls are allotted for residential purpose. Whereas in the case of Chidambaram the receding deity Lord Shiva is associated with death so his temple is often prescribed with a three circumambulatory patterns where the first two are inside the temple premises and a the last forms as the principle whorl of streets. Along with the circumambulatory pattern the street that links the west outskirt of the city (associated with cemetery or a ritual tank) and temple is also considered as one of the principle streets. Circumambulatory pattern also governs the street structure in response to the processional rituals that are observed during the important

festivals following the lunar calendar. Some of the processional rituals are accompanied by 1000 men pulling the chariot of the deity along with numerous devotees as observers. In response to the above the street volume is defined.

## 8.2 Introduction

Most of the celebrated ancient cities in India are based on Vedic principles which are drafted on huge experimentation with the relation between human behaviour and climatic conditions. This spatial network also involved challenges of varying socio-cultural traditions, economic standards as well as topographical conditions. Decoding the geometrical patterns primarily involves decoding the natural patterns, their relative functions, the direction of their alignments, and their symmetry in relation to the atmosphere (Binode, 1984). Vedic texts contain a branch of study known as Sthapathyam, which deals with city-planning. The cities of pre-colonial India had their own chosen Sthapati, who practiced Sthapathyam. The evolution ancient Indian cities that followed the Vedic framework can be broadly classified into two main categories. Firstly, those cities that followed the initial framework planned by then ruling king according to his anthropometric data along with specified Vedic principles, which then grew adapting to the changing cultural and climatic patterns. Secondly, those cities that originated as crude village forms and subsequently developed by certain dimension of economy (local trade) under a particular community or patriarchal family (Binode, 1984). The South Indian temple towns of the medieval era (6th to 16th century AD) flourished under the shadow of religion and as a response the urban form bears its symbolic imprint.

The temple towns of Tamil Nadu, in particular, exhibit a unique urban genotype. Each town is associated with an exclusive socio-spatial formation though they reflect many

overlapping characteristics when viewed as a whole. The fundamental feature that makes these towns celebrated is the presence of high level of axiality along with high degree of connectivity. Their integrated cores are accommodating robust structures used for religious purposes. The choices of case studies were crucial as it involved strong understanding of the nature of the city which was evolved through many adaptations. Profound analysis has been conducted in considering the three temple cities over multiple other South Indian temple cities owing to the common denominators they share. These cities are integrated with complex unique patterns which are product of several factors that has to be considered in designing a sustainable city. The cities selected for the case studies have the following planning characteristics with common denominators which would be appropriate for relative comparison:

- The central space of the three cities is dedicated to the temple.

- The prime streets of the city are primarily designed to cater the circumambulation of car street festivals.

- All the three cities fall under the pilgrim tour loop.

- The cities are weaved around the temple in concentric circles.

- The cities are oriented along the cardinal directions.

- The intersection cardinal streets and cardinal streets are the studded with gopurams or gateways.

- The periphery of the three from the centre is one kilometre which is designed in response to pedestrian feasibility.

- The Gopurams or gateways are more visually prominent than the main temple making them a very prominent visual identity.

- Continuous habitation of these cities dates back very long.

- Topographical, political and climatic factors were added to theoretical model of the Vedic Nandyavartha pattern.

- The principle function of the city has been subjected several changes but well accommodated meeting all the needs.

- There is no rigidity in growth of the cities as the planning was quite flexible.

- The city accommodated multi facet functions with diversified professional groups.

- Urban form is robust and has huge psychological effect on human behaviour.

- The cities contributed huge economic benefits to the territory they were a part of.

Table 1 below shows the various charecteristics of the three temple cities in brief.

Table 1: Brief Characteristics of the Case studies

| Charecteristic | Types | Madurai | Srirangam | Chidambaram |
|---|---|---|---|---|
| Funtionality | Capital city | █ | | |
| | Temple city | | █ | █ |
| | Trade city | | | |
| Influences | Pallava | | | █ |
| | Chola | █ | █ | |
| | Pandya | █ | █ | |
| | Hoysala | | █ | |
| | Vijayanagara | █ | | |
| | Nayakas | █ | | █ |
| | Mughals | | | █ |
| | Chettiars | | | █ |
| | French | | █ | █ |
| | British | █ | █ | |
| Styles | Dravidian | █ | █ | █ |
| | Buddhist | █ | | |
| | Jainism | █ | | |
| | Malabar | | | █ |
| | Vesara | | | █ |
| Planning | Nadyavartha | █ | | |
| | Sarvabodra | | █ | █ |
| No. of Parikramas | 3 | | | █ |
| | 5 | █ | | |

| | | 7 | | | | |
|---|---|---|---|---|---|---|

Source: (Author, 2021)

Though the cities are a product of numerous cultural overlays as shown in the Table1, the principle identity of these cities is well preserved through time.

### 8.2.1 Madurai

Madurai has been selected as the case study city for this research for a number of reasons. It is considered one of the most prominent religious cities of South India owing to its temple vibe. In the last two millenniums, Madurai has been celebrated for its robust culture and established a civilization of its own. This cultural prominence earned Madurai the title "The Athens of the East" with its temple located on a 'raised platform' with similarities to the location of the Acropolis in Athens.Madurai served as the major city to the Pandyan kingdom which appeared around 600BC and lasted upto the early 16th century when Nayaks succeeded the throne and reigned over Madurai and its regions (Pillai, 2019). The genesis of Madurai is recorded in the early Sangam period and its evolution is greatly concentrated around Meenakshi Sundareshwarar temple complex till British occupancy in 1801 (Rajayyan, 1974).

Figure 12 : Bird's eye view of the temple town: Madurai

Source:

Similarly, the lofty gateways of Madurai are constructed in such a way that their grandeur can be seen from any part of the city (Annamalai, 2015). Figure 14 shows the massing of the urban form while figure 15 shows a detailed view temple form and raised platform resembling Athens.
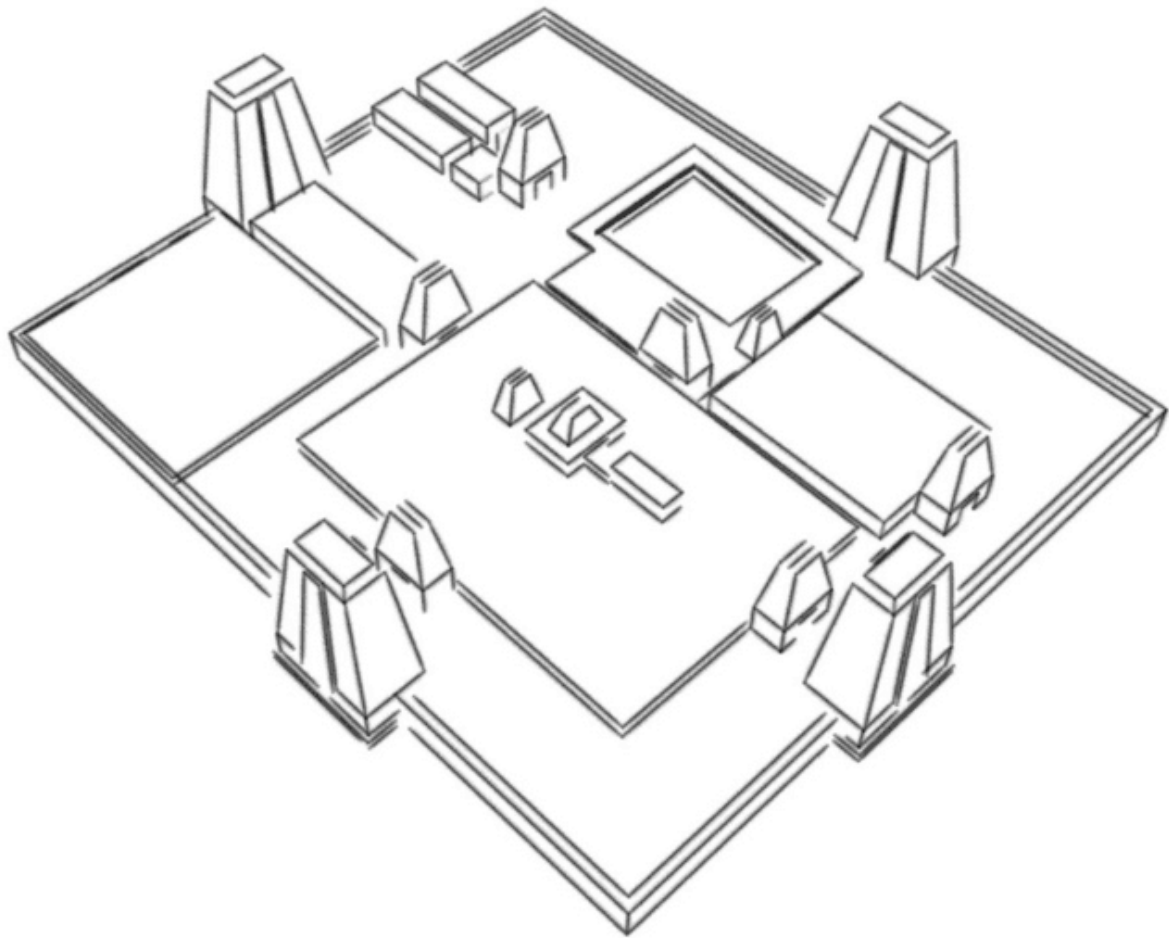
Figure 13 : Volume of the temple: Madurai

Source: (Author, 2020)

A second parallel between Madurai and ancient Greek cities was the presence of pedestrian walkways and lanes reserved for one and two vehicles.

### 8.2.2 Srirangam

The second case study is Srirangam which is primarily selected for its planning characteristics which are strictly laid according to the prescribed theoretical principles without much deviation. Secondly the city is celebrated for being the base for Srivaishnavite

temple (Temple of Lord Vishnu) which is world's Srivaishnavite temple (Temple of Lord Vishnu) largest operating temple (Pillai, 2019). Srirangam is the most important pilgrimage as it is overlaying city in all four pilgrim circuits of South India which are Circuit 1: Srirangam - Tuticorin-Tiruchendur-Tirunelveli-Kanyakumari, Circuit 2: Srirangam -Pudukkottai-Sivaganga-Ramanathapuram, Circuit 3: Madurai- Srirangam - Dindigul-Coimbatore-Ooty, Circuit 4: Chennai-Kancheepuram-Tiruvannamalai-Vellore-Dharmapuri-Salem- Srirangam (Srirangaminfo.com, 2013). The figure 17 shows the massing of the urban form while figure 16 shows a detailed bird's eye view of the temple form.



Figure 14 : Bird's eye view of the temple town: Srirangam

Source: https://www.skyscrapercity.com

The existence of Srirangam has been recorded in the Sangam era (spanning from c. 4th century BC to 2nd century AD) and in thenTamil epic Silapadikaram (book 11, lines 35–40) has these inscriptions dating from the 10th century. The temple has inscriptions dating from the Vijayanagar, Pandya, Hoysala and Chola dynasties, which had a fair share in the construction of the temple. As per the writings of Hari Rao Sri Ranganath Swami temple is a

product of gradual process of accretionthe number of neighbouring shrines around the main temple hosting minor deities and sublimated devotees were erected during different periods of time by different patrons (Hari Rao and Reddi, 1976).
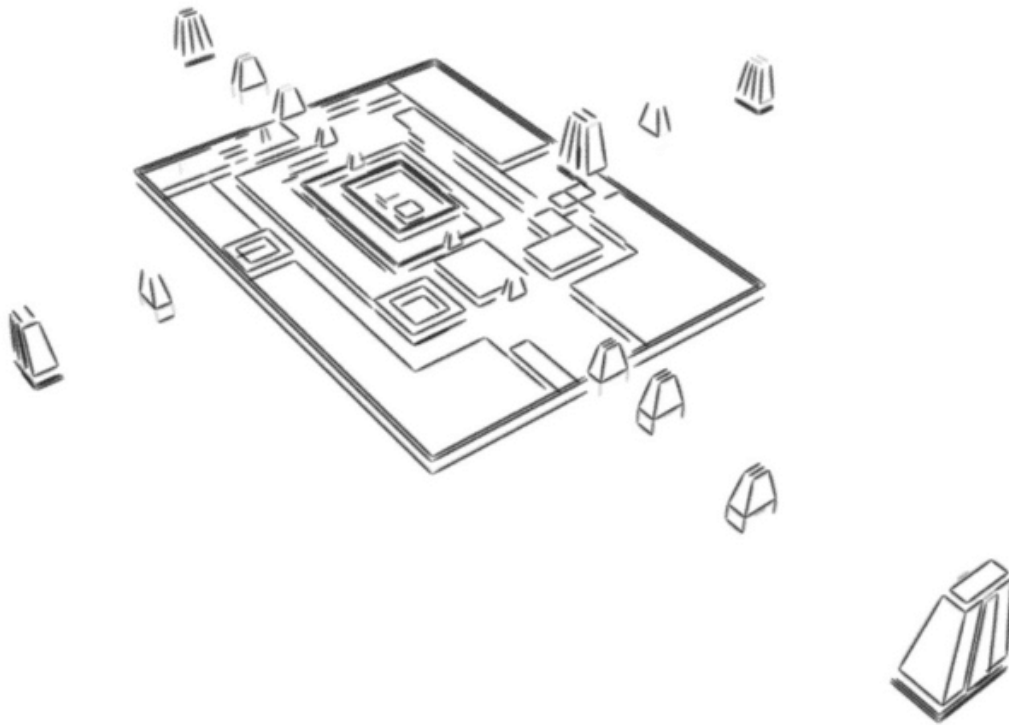


Figure 15 : Volume of the temple: Srirangam

Source: (Author, 2020)

### 8.2.3 Chidambaram

On the other hand, Chidamabarm is the major city to the Chola Kingdom whose earliest datable references date to 3rd century BC. According to the references from Sangam literature the earliest existence of the temple is dated around 1st century AD. Chidambaram recurred in the timeline of Cholas for its incidents of religious revolts. The Chola kingdom in Tamil Nadu ruled from 260 to 1371, from Chidambaram to Tiruvarur, and Nagapattinam to Tiruchirapalli and Tanjore. The towns of Chidambaram, Tiruvarur, and Nagapattinam are

now Tiruchirapalli and Tanjore. It is estimated that approximately 30 million people lived in the Chola kingdom (Natarajan, 1974). Figure 19 shows the massing of the urban form while figure 18 shows a detailed bird's eye view of the temple form.
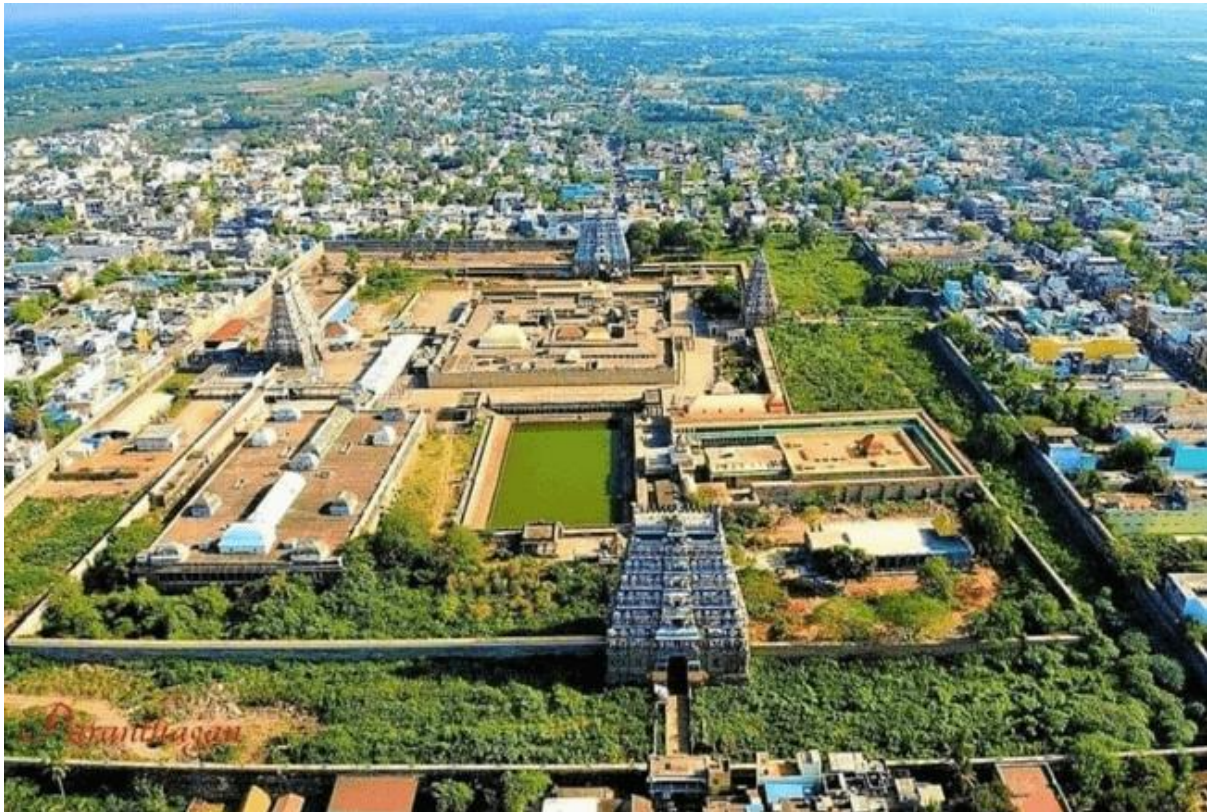


Figure 16 : Bird's eye view of the temple town: Chidambaram

Source: https://business.

In 1128, Vikrama Chola planned the car streets that surround the temple complex and transform the layout of the historic core of Chidambaram, which is located in the northern parts of the Chola territory (Francis, 1932). This led to the city becoming a major

place of pilgrimage for Saiva pilgrims.
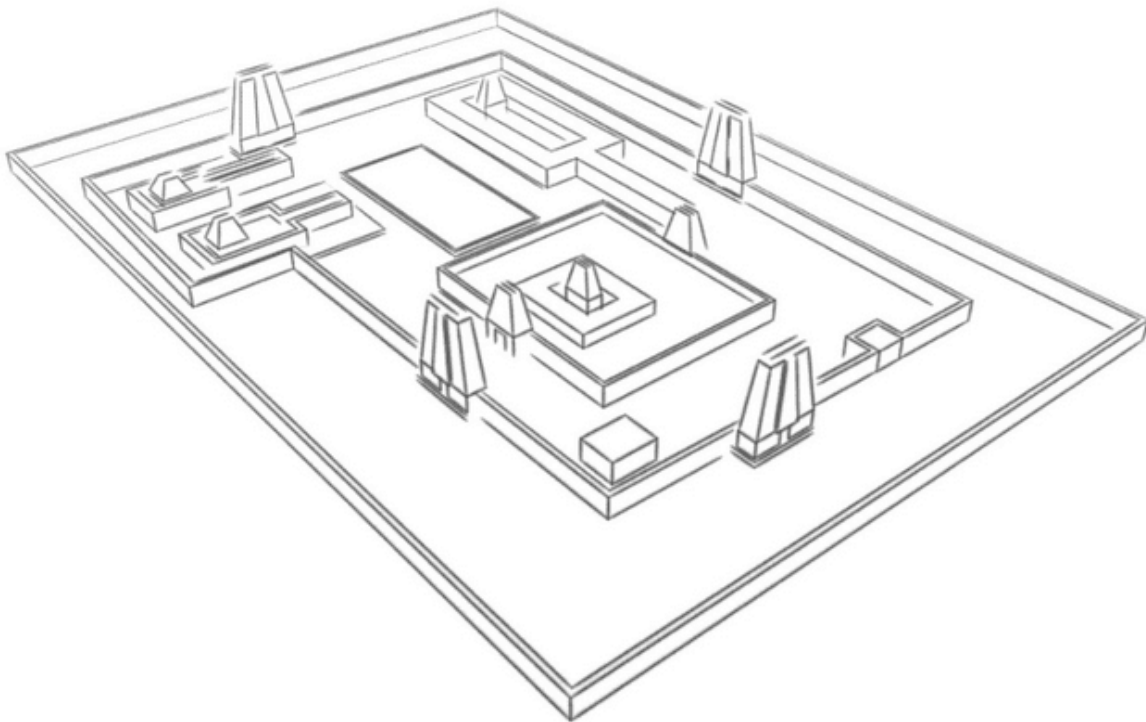


Figure 17 : Volume of the temple: Chidambaram

Source: (Author, 2021)


## 8.3 Evolution of the city

Alexander Rea, the head archaeologist of Madras Presidency (modern day Tamil

Nadu state in India) in 1904 writes about the evolutionary process of South Indian temples:

"As with the majority of the great Dravidian temples, the chief central shrine or vimana is of

much greater age than the surrounding buildings. The shrine has been a small one, which

has acquired sanctity by some means or other. Successive kings in later ages have added the

outer courts and mandapams" (Rea, 1904:70)

From the perspectives of political history, the initial phase of urbanization can be

classified as the timeline between the 10th and late 14th century AD, largely dominated by

the Cholas and Pandyas and sometimes invaded by Islamic rulers. Over the last six centuries, seven temple towns have emerged along the four most important rivers, the Tamarbarani-Palar- Tondaimandalam, the Pandya Mandalam, the Vaigai and the Kaveri-Chola Mandalam (Champakalakshmi, 1996). The second phase was largely governed by Carnatic, Nayak, and Vijayanagara rulers from the late 15th century to the late 18th century AD. During this period, festivals played a greater role, with towns growing significantly.

**8.3.1 Madurai**

The evolutionary stages of Madurai can be broadly explained and classified in the following stages.

Stage 1: The genesis of Madurai dates back to 3$^{rd}$ century BCE where he referred it as Methora by Megasthenese during the visit to India (Zvelebil, 1992). Chanakya in his "Arthashastra mentioned the existence of this city in the late 3$^{rd}$ century BCE (Ojha, 2008). According to the records of Tamil-Brahmi inscription, the city was referred as "Matiray" which means walled city during 2$^{nd}$ century BCE (Mahadevan, 2003). As the area then was covered by Kadamba forest the city was also known as Kadambavanam (Reddy, 2010). According to different local folklores the city is referred wih various names which are "Thirualavai", "Naanmadakoodal", "Malligai Maanagar" and Koodal along with Madurai. The word Madurai derived from the Sankrit word Madhura which means nectar referring to sweet nectar which was showered by Lord Shiva on the city (Harman, 1992). Many historians like Greek geographer Strabo, Ptolemy and Pliny the Younger mentioned the importance of this of this city to the Tamil kingdoms (Smith and Reynolds, 1987).

Stage 2: In the second stage the city served as the capital to the Pandya kingdom the in 12th century AD. The city was well structured along the Southern banks of river Vagai, after the discovery of a Linga (worship form of Lord Shiva) near a pond. This point was used as the point of origin for both the growth of city and the temple (Kundu, Lahiri, Pandey and Sharma, 2019).

Stage 3: In the Medieval period the city was taken over by the Vijayanagara kings where it experienced glory in both expansion and development. The power planning of the city was done by Viswanatha Nayak who was the chief architect and planner of Nayakas. His planning obeyed the prescriptions of Manasara texts. Every street has a significance in response to the car street festival it caters (Stierlin, 1999).In the reign of Nyakas many iconic structures where built that catered both holy and royal functions. The land use pattern of the city has been well tailored in this period where the centre is dominated to the Lord Shiva and his followers while the Southwest corner is dedicated to Lord Vishnu and his followers and the other segments of the area is allocated to different occupational communities in response to the social hierarchy which diminished towards the outer end. Most of the west ward lands of the city were assigned for the agriculture as they were well fed by the Vaigai river(Saravanan, Padmasri and Lakshmi, 2011).

Stage 4: During the Mughal period Madurai witnessed a number of emerging residual colonies in and around the city: Goripalayam to the north of river Vaigai, Mahaboobpalayam near west veli Street, Khajilpalayam near the South Veli street and Khanpalayam near East Veli street. In this period many mosques were built in response to the Islamic domination (Suhatharahima and Shafiullah, 2019).

Stage 5: From the late 18<sup>th</sup> century Madurai fell under the British rule which changed the structure of the city dramatically. The fort walls were demolished in order to allow the city to grow radially.  Madurai became the administrative center for the southern district mid-nineteenth century after the railway was built linking the southern and northern regions of the country. Colonies, institutions, and industries were established as a result. The compact city planning of Madurai was of great advantage to the British in setting up civic services. Meenakshi temple was enveloped with iron fencing and bridges with rubble stone masonry were laid. Recreational parks, Town halls were built with Gothic flavour (Shanthini, 2014).

Stage 6: Madurai experienced a substantial urban growth post-independence in response to the colossal rural migration (Shanthini, 2014)..

### 8.3.2 Srirangam

The evolutionary stages of Srirangam can be broadly explained and classified in the following seven stages.

Stage 1: Evidences of inscriptions on the temple wall prove the origin of the temple in 1st century CE during the reign of early Cholas ruling from Uraiyoor situated to the South of Srirangam, though the narration of Sri Ranganantha swami temple is referred in the Sangam era around 4<sup>th</sup> Cerntury A.D. as well as in epic Silapadikaram of Tamil literature (Hari Rao and Reddi, 1976).

Stage 2: The Early Chola king Dharma Varma along with his successors is said to have built the Lord Ranganatha Swami temple. But for many generations the temple has been long forgotten and was covered in sands (Parthasarathy, 1954).

Stage 3: The Pandyas of Madurai from the South re-erected the temple and was under their patronage from 6th to 10th centuries (Hari Rao and Reddi, 1976).

Stage 4: Till the beginning Vir Someshwara' rule only seventh and sixth were inhabited with scattered residences. But under his reign ie; the end of thirteenth century a major portion of the temple complex of Srirangam gradually transformed into a residential area (Ghosh and Mago, 1974).

Stage 5: the later Cholas took over the temple during the 13th Century and Hoysalas who developed the temple with massive enclosures (Ghosh and Mago, 1974).

Stage 6: During the 14th century the town fell under the wrath of Muslim rulers who plundered most of their wealth. The revival of Srirangam slowly happened during the rule of Nayaka and Vijayanagara rulers during the 15th and 16th centuries (Gopalakrishnan and Srinivas, 2014).

Stage 7: During the 17th and 18th centuries the city fell under Muslims, the French, and finally the British rulers till 1947 when India got its independence (Narayanan, 2013).

### 8.3.3 Chidambaram

The evolutionary stages of Chidambam can be broadly explained and classified in the following eight stages.

Stage 1: The first references of the temple or the temple town were first found in the Sangam era spanning from first to fifth century A.D. of Tamil literature (Kulke and Rothermund, 2016). Thillai trees once dotted the temple town, which is an extension of

Pichavaram wetlands, the second largest mangrove forest on earth. Chidambaram derives from the Tamil word Chithambalam or Chitrambalam which means 'wisdom atmosphere' (Gopinatha Rao, 1999).

Stage 2: The evolution of the temple started under the patronage of Early Pallavas, where the temple town then had the shrines of both Tillai Amman temple and the citsabha of Nataraja temple. This shrine is venerated as Thillai ambalam which menas open stage of Thillai or Lord Shiva (Natarajan, 1974).

Stage 3: During the 10th century A.D. the town came under the rule of Cholas who built the Chidambaram royal temple from 10th to 13th centuries. The town during this era witnessed the migration of Saivites from Kashmir (Sivaramamurti and Narasimhaiah, 2007).

Stage 4: The early period 11th century A.D in Chidambaram was observed continuous clashes between Vaishnavites and Saivites due to the sanskritized the Shaivism of Chidambaram which resulted in the destruction of the Vishnu shrine by the Chola ruler Kulothunga II and installing bronze Nataraja idol inside the shrine. Several public educational bodies like libraries and schools were in constructed during this period promoting Vedic education (Balasubrahmanyam, Natarajan, Venkataraman and Ramachandran, 1979). By the 11th century Chidambaram became the seat of learning. Cholas built many Shiva temples in addition to the Chidambaram and Tanjavore temples in the 12th century A.D. They constructed capital cities at Kumbakonam and Darasuram (Findlay and O'Rourke, 2009)

Stage 5: The car streets, layout for Prakaras(circucbulations), nritta sabha and the ghats around the temple tank-Shivaganga,along with the 1000 pillared hall and nritta sabha gilding of Chit Sabha roof are constructed during the Chola rule (Swamy, 1979).

Stage 6: The Cholas where overthrown by the Vijayanagara Empire and appointed Nayakas in 16th century A.D. the Telugu Nayakas built Govind Raja Shrine re-establishing Vaishavism in Chidambaram and took away the supremacy of the Shaivite Brahmin priests. They built the Northern Gopuram during this period and appointed called 'Agora Sivacharya Pandaram' for Chidambaram temple. In the early 16th centure they started edowments to conduct car festival in Chidambaram (Mahalingam, 2012).

Stage 7: In the mid-18th century the French troops occupied Chidambaram and during the late 18th century the troops of Hyder Ali occupied Chidambaram. During this time the priests fled to Thiruvarur which led to the disruption of temple functioning (Swamy, 1979).

Stage 8: The late 18th and early 19nth century was observed with British rule where most families of Chidambaram fled to different Srilanka, Singapore and Burma (Myanmar). Major patronage was received by the temple during the early 20th century by the Chettiars as they constructed several health and educational institutions. Chidambaram became a municipality in the Cuddalore district of TamilNadu (Nanda, Michell and Ramamrutham, 2004).

## 8.4 Planning

The Vedic dialog of planning states the balance of male and female entities through spatial planning characteristics as: "The prākāra articulates the female principle as it protects, enfolds, and circumscribes the male principle embodied in the vimāna" (Kaimal, 2005: 73). Where the prākāra implies to the circumambulatory paths and the vimāna indicates the main shrine at the centre. Gujral in his writings illustrates how architecture and planning play a significant role in representing the cosmic order (Gujral and Malville,

2000). This expression is particularly seen in the spatial organization and orientation of settlement according to the activities and ritual field of force (Chakrabarti, 2013). The principle features of the planning models area:

1. Orientation to the cardinal directions (believed to have corelation to the fundamental directions in the celestial realm)

2. Centre should be the genesis of settlement (as creation emerged from centre)

3. Spaces are mathematically dived into individual padas or squares through for spatial organization.

4. These padas are assigned with specific Gods expressing a dedicated function guiding the spatial organization of function (Yadav, 1987).

5. In these temple towns, the east-west axis is seen as an important route of worship.

6. Traditionally, the main deity is accessible from the river or a tank near an east-west axis.

### 8.4.1 Madurai

Madurai's planning characteristics strictly follow the Nandyavaratha model of planning where the entire city is drafted over an 8x8 grid plan. As Goddess Meenakshi's temple is nestled at the central core the city is drafted with five concentric pradakshna pathas or circumambulatory paths in the form of streets as prescribed for Shakti (worshipers of Goddess Durga) temple. The innermost four plots are dedicated to the temple and the consecutive twelve plots are occupied by the nobles and royals while the successive twenty plots cater to common people residences and the outermost ring is inhabited by slaves or considered as gross space. As shown in figure 20, street hierarchy is strictly followed which accommodates three orders. The principle streets are considered as

the first order of the streets which bisect through the city forming the main through fare. Circumambulatory streets are considered as the second order which is designed by offsetting the temple boundary while the third order consists of connector streets that connect the first and second order of the streets.



Meenakshi Temple served as the origin

Gateways alligned with cardinal points marked the prime points of access

Principle axis is drafted through gateways

Five fold pattern is followed

The concentric streets are rotated 5° from the consucutivestreet taking temple as the central reference

Nandyavartha model is superimposed

Final form of Madurai
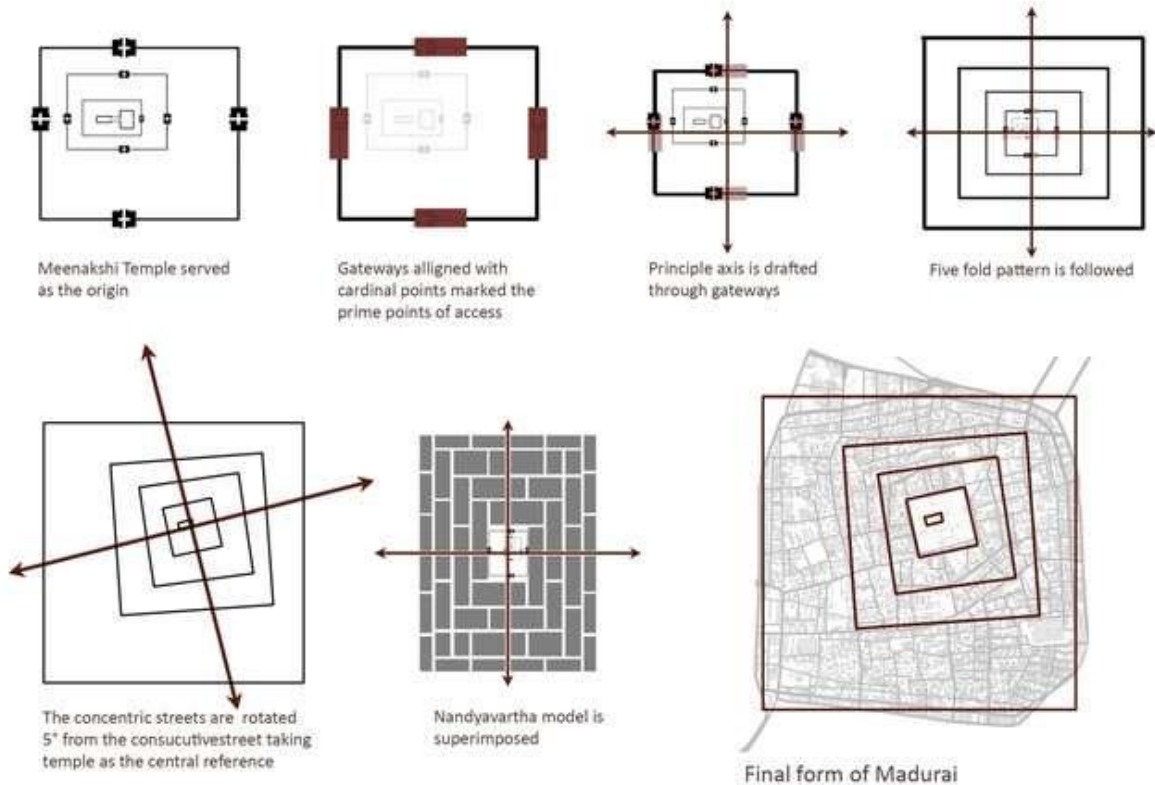
Figure 18 : Planning attributes of Madurai

Source: (Author, 2021)

## 8.4.2 Srirangam

Srirangam follows Sarvabhodra model of planning where the core area is strictly dedicated to the temple. The planning features a boulevard that brackets the grid iron pattern of the town with streets running east to west and north to south. Unlike other temple cities Srirangam is accommodated only for Brahmins or noble people. This land use

patten still follows occupational hierarchy as the higher rank priests or nobles occupy the central area and the rank of the nobles diminish as they move outward from the temple. As Lord Vishnu's temple is nestled at the central core the city is drafted with seven concentric pradakshna pathas or circumambulatory paths (as shown in the figure 21) in the form of streets as prescribed for Vaishnavite (worshipers of lord Vishnu) temple city.



Sri Ranganathaswamy Temple served as the origin.

Gateways alligned with cardinal points marked the prime points of access

Principle axis is drafted taking temple as the centre.

The concentric ramparts are punctured with gateways obeying the cardinal directions.

Total seven concentric rampants are fabricated according to the topography.

Sarvabhadra model is superimposed

Final form of Srirangam

Figure 19 : Planning attributes of Srirangam

Source:  (Author, 2021)

## 8.4.3 Chidambaram

Chidambaram is drafted over Sarvabhadra model of planning which is applicable to larger villages. As Lord Shiva's temple is nestled at the central core the city is drafted with three concentric pradakshna pathas or circumambulatory paths in the form of streets as prescribed for Shaivite (worshipers of lord Shiva) temple. This settlement pattern is designed in response to the occupational hierarchy based on the caste and community where the central and north areas are occupied by the higher caste people while the other areas are occupied common people and the outer space is known as gross space and is inhabited by slaves (Kapila vatsayana, 1991). Figure 22 below shows the stage wise evolution of Chidambaram temple town.



Nataraja Temple served as the origin

Gateways alligned with cardinal points marked the prime points of access

Principle axis is drafted through gateways

North cardinal street is shifted to continue with second concentric street

Three fold pattern is followed

Sarvabhadra model is superimposed

Final form of Chidambaram

Figure 20 : Planning attributes of Chidambaram

Source:  (Author, 2021)

## 8.5 Importance of the city in the past

Historically, temple towns have been amalgamations of worship sites, academic institutions, art and cultural schools, and collaborative spaces for urban interaction. The prescribed Vedic temple town models in both planning and cultural execution have been preserving the knowledge of various arts and traditions successfully for many centuries and the cultural beliefs have proven to be important because of their central location and their role in accelerating economic development. The research concentrates on the historic aspects of on the three temple cities to understand how these cities played an important role on spectrums of economy, culture and politics. These three cities share a common denominator with centrally placed temples. This temple functioned as the prime generator of the development. The prime function of these cities were places of worship but had strong auxiliary functions like commercial activity, educational hub an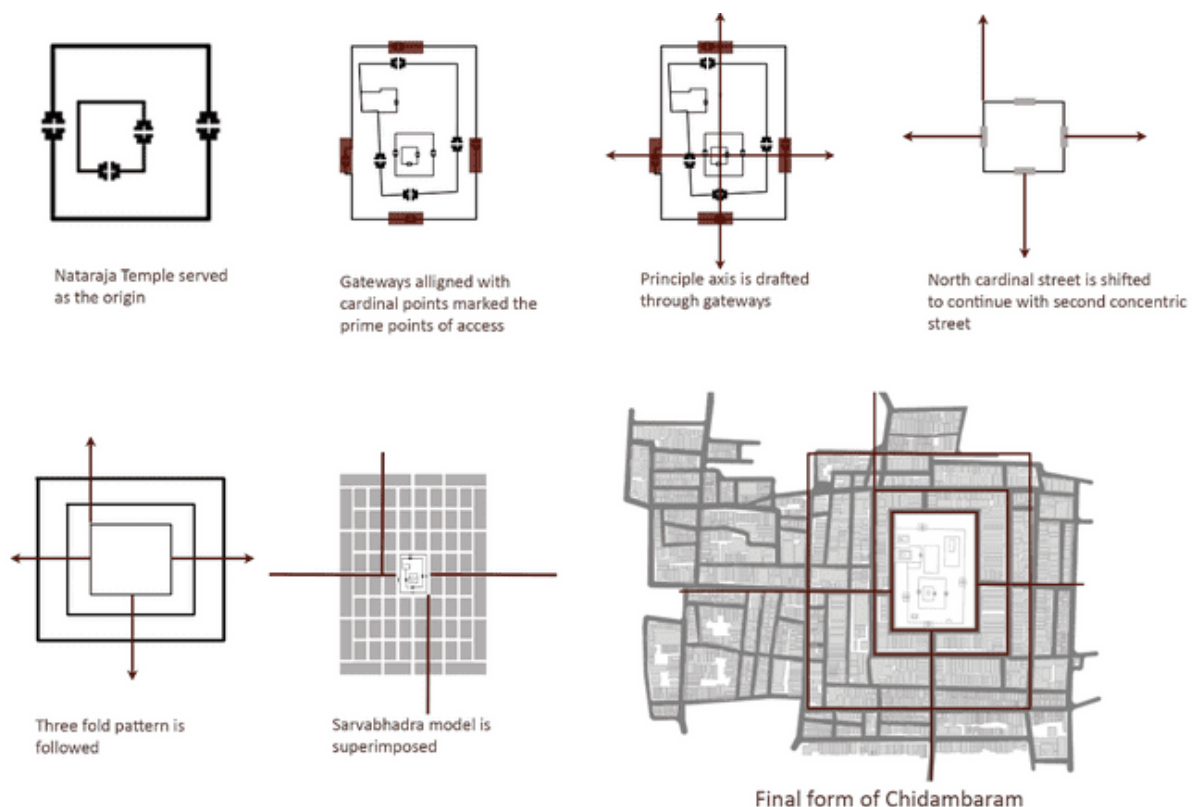d political centre which enhanced the development of these cities. In the case of all the three cities it is the structure of these temple complexes that dictated the structure of the cities. There were different communities in the cities that were given specific duties, but they were not allowed to disperse. Their temple architecture not only served as a tribute to the temple complex, but also played an important role in creating a sense of identity for their various communities. Most of the city's planning characteristics are hugely in response to the temple complex though some are inclined towards environmental conditions. The concentric streets around these temples are a product of the circumambulations defined by the prime deity placed at the centre of the city. These long unbroken threads of history rendered these temple cities with a ethnic, diverse, rich, religious and socio-cultural set up.

### 8.5.1 Madurai

Madurai served as the major city to the Pandyan kingdom which appeared around 600BC and lasted upto the early 16th century when Nayaks succeeded the throne and reigned over Madurai and its regions. The genesis of Madurai is recorded in the early Sangam period and its evolution is greatly concentrated around Meenakshi Sundareshwarar temple complex till British occupancy in 1801 (Devakunjari, 1957).

### 8.5.2 Srirangam

Among Hindu pilgrims (especially Srivaishnavites), Srirangam is recognized for its Sri Ranganathaswamy Temple, which is the biggest temple in India. Researchers believe that the temple dates back to the 3rd century B.C. However, other findings suggest it may have been constructed by the Ganga ruling dynasty in the 9th century A.D (Ghosh and Mago, 1974).

### 8.5.3 Chidambaram

On the other hand, Chidamabarm is the major city to the Chola Kingdom whose earliest datable references date to 3rd century BC. According to the references from Sangam literature the earliest existence of the temple is dated around 1st century AD. Chidambaram recurred in the timeline of Cholas for its incidents of religious revolts (Francis, 1932).

## 8.6 Architecture

Percy Brown in his writings illustrates the connect between architecture and sense of belongingness in the domain of religion as: "Religious emotion with regard to such edifices had however to find some form of expression, and it did so by exalting their environment, surrounding them by high walls to emphasise their sanctity, and making the entrances to

the enclosures thus formed into gateways of imposing size and rich appearance." (Brown, 1997: 106)

## 8.6.1 Madurai

Madurai exhibits an overlay of various layers of architectural styles in response to the diversified political administration during its evolution. The city's architecture reigns to colonial style from Dravidian style. But the city also showcases few remnants of Buddhism and Jainism built with sandstone and granite structures form third century B.C. However the Pandiyan impressions can be still be clearly observed in and around the temple complex. Of all the Pandiyan structures East gopuram is the most visually focused structure in response to its scale. This initiated the construction of three other gopurams marking the cardinal points.

## 8.6.2 Srirangam

Srirangam's architecture typology is follows the architecture typology in drafted the Sukla Yajur Veda which has prescribed typology to construct a Vaishnavite temple. Srirangam celebrates its prominence as the most important holy destination dedicated to Lord Vishnu, which is why the entire archaeological complex is clad in stone with rich Dravidian elements. The entire temple is studded with twenty one gopurams, thirty nine stone pillared pavilions and fifty shrines. Rajagopuram or the main gateway is the largest architectural edificethat majestically scales high measuring 77 metres in height.  The principal shrine or Rangavimana is located in the center of the temple complex, which includes several other shrines that feature different deities. They were built during the

Pandian period, which is noted for their thousand intricate granite carvings of leaping animals (Malcolm, 1839).

### 8.6.3 Chidambaram

The architecture style in Chidambaram is an epitome of Dravidian architecture but the sanctum exhibits styles of Malabar or Kerala style of architecture as the royal architects of the sanctum are Keralites. The temple is also inspired from Vesara architecture which is reflected in its apsidal shape of the roof. The vast forty acre temple complex accommodates several structures apart from the main shrine, Kanak Sabha and Chit Sabha (the two pillared halls)(Ehnbom, 1995). Tough the principle diety of the temple complex is Lord Shiva the temple also includes shrines of Ganesha, Vishnu, Devi, Subrahmanyar, Surya and Amman shrine along with nine gopurams and water storage units(Sahai, 2006). The plan of the complex also includes several 1000 and 100 pillared halls which narrate the legendary tales from Hindu scriptures through frescos and inscriptions (Nanda, 2004).

## 8.7 Housing Typology

Housing typology and the planning of these three cities are formulated with a unique formula of thermal comfort. The planning principles of these towns are designed allowing frequent movement of air to pacify the micro climatic conditions of the town with direct sun. This explains the design typology of the houses with deep row houses protected from both sides with from direct exposure of sun while the remaining four walls are punctured with openings for ventilation. The figure 23 shows a typical plan of South Indian temple city's housing unit.
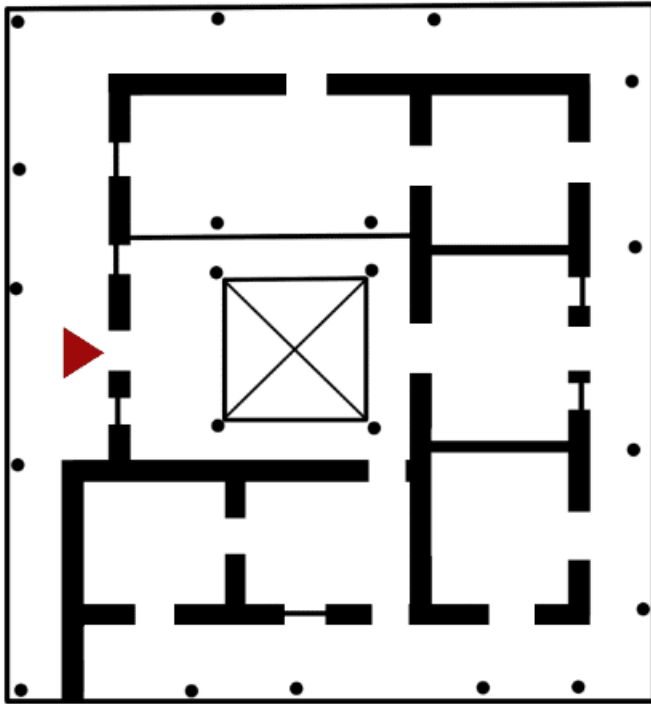
Figure 21 : House typology of South Indian temple city

Source: (Author, 2021)

The houses feature the traditional Tamil pitch roof, often with a single or two-story library that has a high plinth. Large blocks of houses increase in size as they approach the city center, while streets are often narrow, but remain permeable for pedestrians and minor vehicles. Accordingly, the dwelling model was differentiated according to the occupation and lifestyle of the occupant. The inner rings of the town were often occupied by Agraharams following strict Vedic principles that were occupied by Brahmins or people from higher social classes (Chakrabarti, 1999).

There is a common feature in all traditional temple houses: a transition space between the floor levels called tinnai, a semi-open veranda space. All the houses built around the circumambulatory paths were historically never higher than two floors. In

addition, these spaces function as places where spectators can view the processions of rituals or festivals and are honoured by the deities for those services rendered. These spaces also serve as a place for pilgrims to stay the night when they travel from distant villages to attend the festivals (Neve, 2000).

## 8.8 Present scenario of the cities

People:  Signs of modern lifestyle are reflected yet preserving their cultural values as the cities' inhabitants are influenced by the city's cultural heritage. The social fabric is well balanced and people live in harmony. The land use pattern is still well preserved with the noble priests occupying the inner cores. Caste and community-based ties formed the basis of separate neighborhoods, although the present pattern is shaped by the fragments of formative and traditional cultures.

Religion: The majority of the settelment's population follow Hinduism but Christians, Muslims and Jains are significant in number. But no religious clashes are recorded so far and the city operates with 'unity in diversity'.

Language: In these temple towns Tamil is spoken in its pure from. Majority of settlement dwellers speak in Tamil while the people of people of Sourashtra community speak in Sourashtra language. But all the hymns in the temple premices are recited in Sanskrit and occasionally in Tamil. The other languages include Urdu, Hindi, Malyalam and Telugu which are spoken by the minorities.

### 8.8.1 Madurai

Madurai stands as the third largest populated city and second largest corporation city in the state of Tamil Nadu. The city exhibits a combination of both colonial architecture as well as traditional Dravidian architecture which is uncommon Southern Tamil towns. 8.5% of the total city area is occupied by the temple core which nearly half of the population is concentrated at the historical core. Madurai functions both as commercial and official headquarters of Madurai district which is the prime factors of urban growth. The city also provides employment to nearly 30% of the total population. Thus the city witnesses a minimum floating population of 0.15 million population everyday which comprises of pilgrims and tourists (Nelson, 1868).

Meenakshi Amman temple along with its concentric whorls operates as the microcosm representing the spiritual characteristics of Vedic culture. The streets are always crowded, bustling and spotted with people from all walks of life. The spaces are heavily peppered with small shops catering the temple offerings, souvenirs and food (Fosmire, 2021).

### 8.8.2 Srirangam

Srirangam is considered as the foremost seat of the Vaisnava movement in South India and the biggest functioning temple in the entire world (Hari Rao and Reddi, 1976). The city is ganing fast attention in the domain of tourism as athe focal point for Vaishnavite tourism covering an area of about 631000 square metres. Temple town of Srirangam reflects Dravidian style of architecture with traces of Islamic and French styles in response to their invasions. Srirangam is an island of the city of Tiruchirappalli and a part of

Tiruchirappalli Metropolitan Area. Tiruchirappalli is the fourth largest city in Tamil Nadu having a population of about 846,915 as per census 2011. In the city, the civic administration is organized into four zones – Ponmalai, Srirangam, Ariyamangalam and K. Abhishekhapuram divisions. Apert from being the major city in the four piligrim circuits of Tamil Nadu the city owing to its geographical location is considered as a very important city as it stands as junction of the east-west and north-South major transport routes. The city also serves as the regional metropolis of a region covering adjoining districts. Srirangam is a popular destination among the Hindu pilgrims because of the famous Shiva(Jambukeshwar) and Vishnu(SriRanganathaswamy) temples and other famous temples includes the Kumara Vaiyalur temple, Mariamman temple, Samayapuram, Uraiyur Vekkali Amman temple, Thiruvanaikoil temple and Rockfort temple.

### 8.8.3 Chidambaram

Chidambaram is one of the few temples in India that depicts Shiva as an anthropomorphic being instead of a lingam, Chidambaram Nataraja Temple, commonly known as Thillai Nataraja Temple. Chidambaram is regarded as a sacred place of high veneration both by Saivites and Vaishnavites since both the famous Nataraja and Narayana shrines as well as Govindaraja are located inside its four walls. The town has been ruled by numerous groups throughout its history, including the Pallavas until the 9th century, the Cholas in Medieval times, the Cholas again later, and the Pandyas in the Pandya era, the Vijayanagar Empire, Thanjavur Nayakas, Marathas and last by the British. The city primarily reflects Chola Dravidian architecture with traces of colonial architecture. Located in Tamil Nadu, Chidambaram occupies an area of 4.8 square kilometers (1.9 square miles). As of

2011, it had a population of 62,153. The tertiary industry involving tourism is the primary industry in Chidambaram.

## 8.9 Festivals

In Tamil Nadu, temple-centric urban centres are characterized by rituals and festivals that contribute to the social and spatial arrangement of these urban groups, a series of living cities that is unique in the world (Kunkumadevi, 2011). They are an integral component of a temple town's cultural heritage, and their protection is necessary to preserve their identity. Among the most important festivals and ritual spaces of Tamil Nadu were the ones that emerged from the process of urbanisation that occurred between the 10th and 18th centuries AD. To continue the old tradition of legitimization of festivals among the Tamils, Nayak and Vijayanagari kings patronized many new festivals, in keeping with their love for dance, music, architecture and art (Neve, 2000). In response to this, many platforms were created that were used to festive spaces during the festival season and utilized for social functions at other times. These platforms were induced with sacred meaning as they cater festivals that were connected to the presiding God, and so it was the responsibility of the community to protect these so the sacred place would be preserved (Kunkumadevi, 2011).

Figure 22: Car street festival in Masi Street of Madurai

Source: Author

Tamil Nadu is home to some of the biggest and most important temple towns in the world, including Madurai, Srirangam, and Chidambarm, where people celebrate the various festivals in honor of Sri Ranganatha Swamy, Meenakshi Devi, and Nataraja Swamy at least

120 days of the year. Each and every temple celebrates its festivals within the context of the Tamil calendar, which follows the Solstices and Equinoxes. The festivals are divided into four categories in response to their duration and frequency:

Brahmotsava (annual festivals): There are one to six different Brahmotsava festivals every year. It usually lasts 10-11 days, and its biggest feature is the grand chariot processions around the circumambulatory path or pradakshina patha.

Masotsava (montly festivals): These festivals are witnessed with processions only during the eveneing where the festive idols (processional idols) leaving or not leaving the temple complex.

Ekadinotsava (sigle day festival): These are one-day festivals where the idol of the deity who resides in the temple complex or a sub-shrine is taken in procession, leaving or not leaving the temple complex.

Parvotsava (short period festival) - These are short-lived festivals celebrated within the temple complex.

In addition to the original uses of temple components, most of these have been integrated into festivals or have been incorporated into one or more festivals as elements of the festival. In this way, the complexes were sanctified and assimilated into the urban landscape (Kunkumadevi, 2011). The table 2 shows the importatnt festivals celebrated in the three temple cities.

Table 2 : Festivals celebrated in the three cities

| Name of Tamil Month | Period | Madurai | Srirangam | Chidambaram |
|---|---|---|---|---|
| Cittirai Chaitra | mid-April to mid-May | Chithirai Brahamostavam – Arumigu Thirukkalyanam. | Chithirai Brahamostavam | Chithirai onam |
| Vaikāsi Vaisākha | mid-May to mid-June | Vasantham Festival | Vasanthaotsavam | Mahaa kumbhaabhishekam and Naayanmaar uthsavam |
| Āni Jyaishtha | mid-June to mid-July | Unjal Festival | thiru manjana | Aani thirumanjana festival |
| Āṭi Āshāḍha | mid-July to mid-August | Aadi – Mulai Kottu Festival | Sri Jayanthi | Aanithirumanjanam |
| Āvaṇi Shrāvaṇa | mid-August to mid-September | Aavani Moolam Festival – " Puttukku Mansumantha Leela Festival" | Pavithrothsavam | Aavani chathurdhasi |
| Puraṭṭāsi Bhādrapada/Prauṣṭhapada | mid-September to mid-October | Navarathri festival | Navarathri Utsava and Killing Vaniyasura | Purattasi chathurdhasi |
| Aippasi Ashwina/ Ashvayuja | mid-October to mid-November | Kolattam Festival | Oonjal and Unjal Utsava | Sri moolanaathar annaabhishekam, Sri Sivakama Sundhari uthsavaarambam, Sri Sivakama sundhari rathothsavam and Poora chalangai |
| Kārttikai Kārttika | mid-November to mid-December | Kolattam Festival | Thiru pavai and Karthigai Deepam | Aardhraa abhishekam, Soora samhaaram and Devasena Subrahmanyar kalyanam |
| Mārkazhi Mārgaṣīrṣa | mid-December | Thiruvathirai – Arudhra Dharsan Festival and | Ekadesi | Aarudhraa dharsana festival and Thirukalyanam |

| | to mid-January | Thiruvembavai and Thiruppavai Festival. | | |
|---|---|---|---|---|
| Tai Pausha/Ta iṣya | mid-January to mid-February | Pongal festival | Ratothsavam and pongal | Thai-poosam and maasi chathurdhasi |
| Māsi Māgha | mid-February to mid-March | Masi – Mandala utsavam for 48 days. | Teppotsava | Maasi chathurdhasi |
| Panguni | mid-March to mid- April | Summar Vasantham Festival | Chithirai Ther and Adhi brahmotsav | Mahaa siva raathri |

(Source: Author, 2021)

## 8.10 Cimate

Two essential elements of cooling from heat and humidity are adequately addressed in south Indian temple cities: shade and wind. As evidenced by mandapams, chatries, etc., for public buildings, which have evolved over time to ensure air circulation is effective, this is emphasized. South Indian temple cities are characterized by a concentric rectangular pattern, with ramparts defining successive space sequences. In addition to providing shade for pedestrians, the ramparts also protect the city from cyclonic winds and dust, and define its enclosures. Streets lead to the temple through the monumental gopurams punctuating the ramparts. As a result of successively placing these gopurams in a single axis, wind speeds are increased for cooling due to the "venturi effect", which occurs when small openings in gopurams are made.

As a result of this design, the sun is reflected and the number of exposed surfaces is kept to a minimum with narrow and deep stone houses covered in white plaster. In this complex, two pairs of houses share the longer walls of one house, with the shorter walls of

the other two sharing the longer walls of the other two. As a result, the exposed surface to volume ratio is minimized, making it easier for the sun to shine. Additionally, mandapams (pillared halls) and pushkarnis (holy ponds) enhance the cooling properties of the towns, which are situated in the prevailing wind directions on the west and north sides. There are high ceilings in most of the enclosures around the main deity of the temple, providing shade throughout the day and cooling the interior. They have thin slits in the walls to allow ventilation and light, but their interiors remain completely dark.

## CHAPTER 09: Data collection and mapping

To get the holistic image of the space the research focuses on developing an understanding of its phenomenon, its background setting and the participants. This data can be achieved through 'first level descriptions which place the researcher in the context' (Morse and Richards, 2013:149). According to Janice and Lyn these data are synthesis of publically available information and public documents as well as fundamental description of the setting through photography, mapping and other suitable means that helps in illustrating the setting and describing the people (Morse and Richards, 2013).

### 9.1 Data collection

To orient the study to towards the temple cities and their settings the publically available literature is considered as the initial step which consisted of books on Vedic and temple cities which illustrated the theoretical prescription followed to draft the fundamental design of the cities along with street hierarchies and basic block typologies. The second source of data included books and published papers which mainly described the evolution of the cities, their land use pattern and major factors that shaped these cities.

While the data related to present scenario which includes demographic analysis, climatic data, road network, existing land use pattern and present problems have been taken from local authorities, published papers, newspaper archives and physical survey whereas details of socio-cultural and political frames of these cities have been collected through published papers and newspaper archives. The other major form of data collection included public documents on its land use plans and maps.

### 9.1.1 Theoretical data

The urban framework of South Indian temple cities like Madurai, Srirangam, and Chidambaram is produced with concentric rings that is highly influenced by the circumambulatory procession, which is a religious ritual held on auspicious days across the lunar calendar. Though these cities have similar structures of society, yet the urban morphology of these cities varies in response to the varied nature of the ritual. The essence of rituals on the urban form has been is discussion in both sociology and anthropology. Victor Turner, a British cultural anthropologist defines ritual as "prescribed formal behaviour for occasions not given over to technological routine" (Turner, 1967: 19). On a further explanation, rituals exhibit the beliefs of a society or a person where they promote the participant beyond the daily functional platform. Rituals observed with similar fundamental frameworks differ with respect to spatio-temporal planes. The general spectrum of the rituals across the globe falls in the overlapping domains of religion or politics. Rituals which are observed with community participation are often enveloped with certain belief or authority. While the political face of the ritual controls the social behaviour. The nature of the festival controls the appropriation of space which is promising for the study of planners and urban designers (Leslie, 2000). The appropriation of space on the 2 dimensional

contexts can be categorized as linear, nodal and circular. Aldo Rossi in his works illustrates the relationship between monumentality and ritual and compares ritual to a monument where it functions much more than memorial entity (Rossi, 2007). The nature of ritual is observed in various scales with respect to the number of participants.

### 9.1.2 Spatial Data

The spatial data is collected using online platforms and physical survey in the following ways:

1.  Spatial mapping has been done with reference to Google maps, ArcGIS and physical survey.

2.  Building heights are referred from the concerned urban development authorities.

3.  Land use pattern is drafted according the physical survey and secondary data collected from published papers.

### 9.1.3 Visual data

The visual data has been documented in the following ways:

1.  To analyse the visibility on the site the temple photographs have been taken from various points lying on the lines of visibility.

2.  The street facades of both cardinal streets and circumambulatory streets have been visual documented using videography as the medium.

## 9.2 Mapping

In addition to data collection, data development, tools and testing the research also focused on people space relationship which required a combination of spatial setting and

human behaviour patterns. According to Jan Pieper this is derived from the fieldwork techniques for architectural anthropology, where he illustrates activity mapping on existing physical configuration of the town (Piper, 1980). There are various types of techniques for representation and analysis which have been discussed by Matthew which illustrates both advantages and appropriateness. In his description the fundamental techniques range from two dimensional diagrams and maps to three dimensional perspectives and models or four dimensional animations and computer generated models. Representation of the spatial ideas can be most accurately done through graphic representations though they are 'abstractions of reality' (Carmona, Heath, Oc and Tiesdell, 2010). Activity maps play a vital role in explaining space and form better than photographs or words, they have vitality and often simple, they reveal essence and separate out issues and they are selective have clarity and easy to communicate. Thus, the research uses activity mapping as a tool to represent spaces by superimposing various layers of activities, architectural features (both semi fixed and fixed), movement patterns etc. on the base maps. These are also known as 'Sieve maps' (Moughtin, 2016). Thus mapping is used as a tool to represent the spatial usage from the data acquired from fieldwork. The maps are also supplemented with schematic cross sections, overall three dimensional model, visual heat maps as well as visual maps. Furthermore, this method has been proven to be a very convenient method in understanding both spatial and visual patterns.

### 9.2.1 Base map

To prepare the base map Arc GIS and Google Earth platforms are used and developed using references physical survey as all the existing buildings are not documented in the by the online platforms. The building blocks and streets are redrafted in AutoCAD to

scale with referring to the above mentioned platforms. Photoshop is used as a post-production tool for presentation.



Figure 23 : Madurai base map

Source: Author (developed using ArcGIS and physical survey)

Figure 24 : Srirangam base map

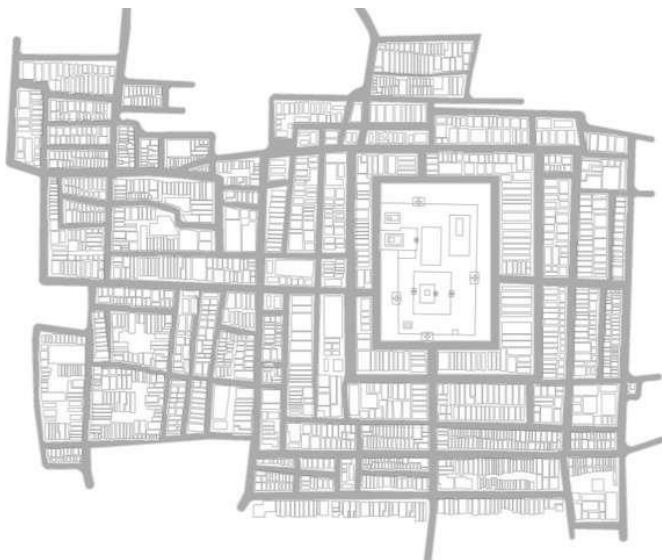Source: Author (developed using ArcGIS and physical survey)



Figure 25 : Chidambaram base map

Source: Author (developed using ArcGIS and physical survey)

## 9.2.2 Built density



Figure 26 : Madurai blocks

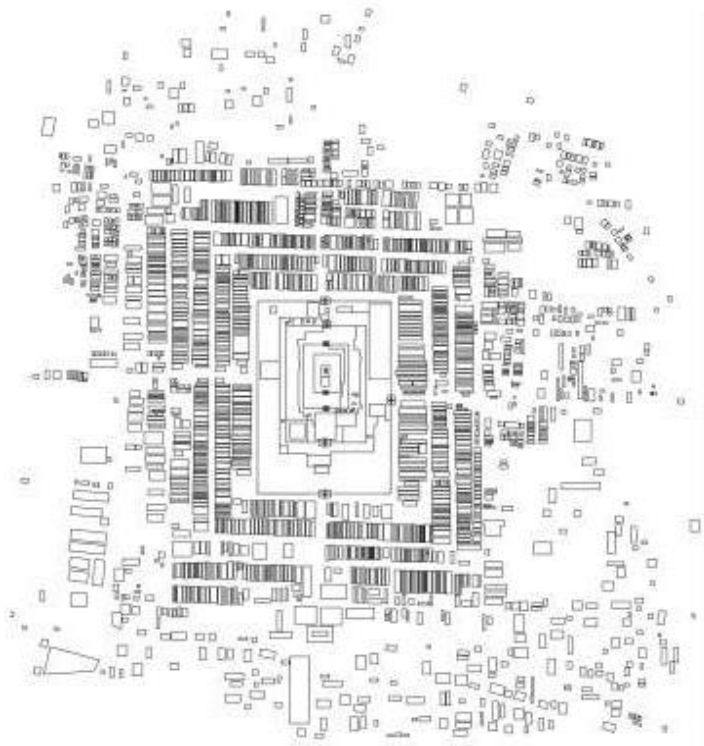Source: Author (developed using ArcGIS and physical survey)

Figure 27 : Srirangam blocks

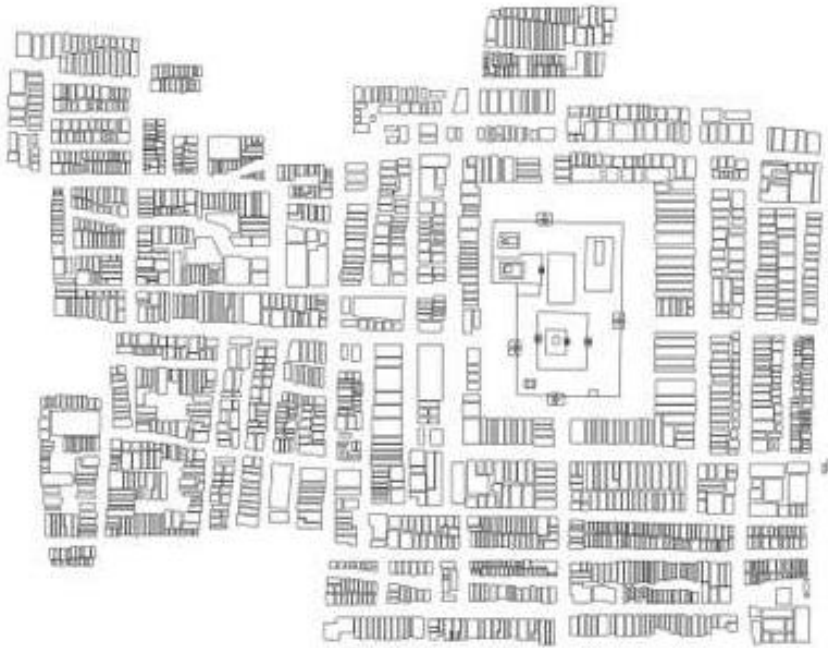Source: Author (developed using ArcGIS and physical survey)

Figure 28 : Chidambaram blocks

Source: Author (developed using ArcGIS and physical survey)

Table 3 below shows the number of blocks in each city

Table 3: No. of blocks

| Factor | Madurai | Srirangam | Chidambaram |
|--------|---------|-----------|-------------|
| Blocks (B) | 5237 | 1979 | 1879 |

Source: (Author, 2020)

### 9.2.3 Figure ground

The temple cities are formed with compact built fabric that is concentric towards the centre.

Where Chidambaram offers the highest density of figure ground where the ratio of built up

area to open space is 4:6. Srirangam exhibits a little less intense ratio of built up area to open space as 3:7 and Madurai with built up area to open space as 2:8. The figure ground is prepared using the base maps drafted in AutoCAD and the Photoshop is used for final presentation. Area calculations are done using AutoCAD and the pie diagram is generated in Microsoft excel.
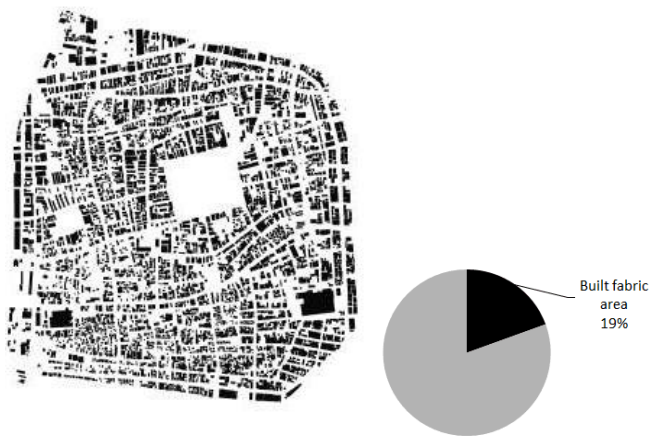


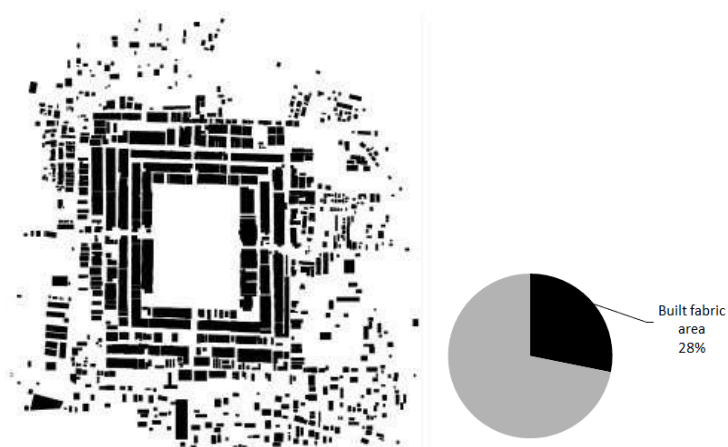Figure 29 : Madurai figure ground

Source: Author (developed from GIS)
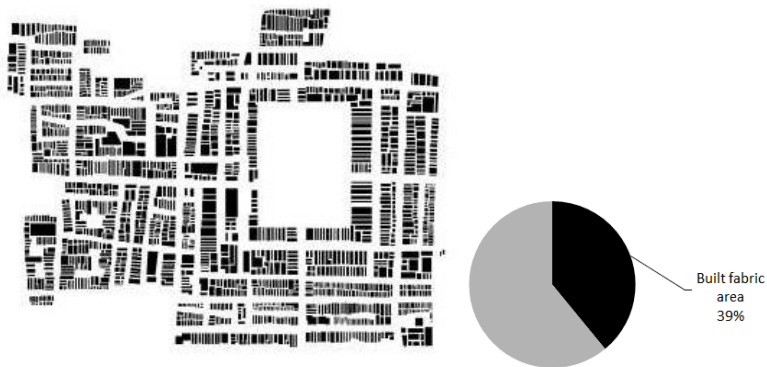


Figure 30 : Srirangam figure ground

Figure 31 : Chidambaram figure ground

Source: Author (developed from GIS)

## 9.2.4 Street geometry

The street geometry model is the base framework for street organization which determines both hierarchies of the streets as well as the connection among prominent urban features. This further regulates the composition of built fabric.  Madurai adopts Nadyavaratha pattern as shown in the figure 33 where the principal streets do not connect the cardinal directions while srirangam and Chidambarm adopted Sarvabodra patter as shown in the figure 34 and figure 35 where principle streets connect the cardinal directions.
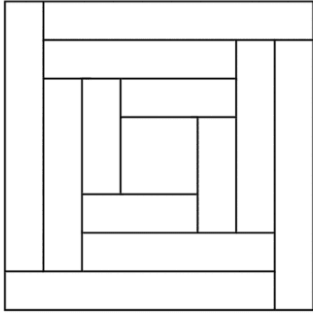
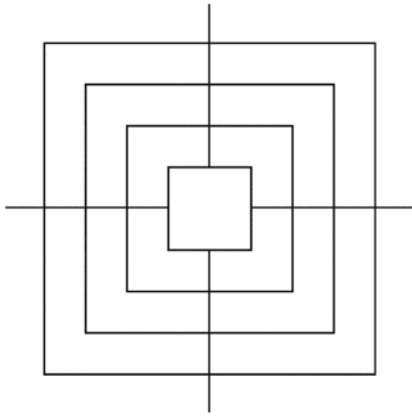Figure 32 : Madurai street geometry

(Source: Author, 2020)



Figure 33 : Srirangam street geometry
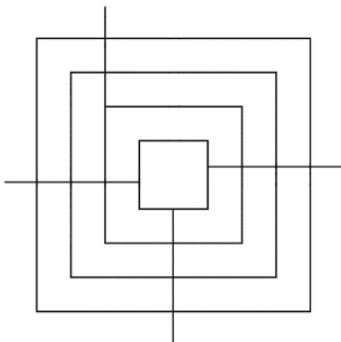
(Source: Author, 2020)



Figure 34 : Chidambaram street geometry

(Source: Author, 2020)

## 9.2.5 Land use pattern

The land use pattern of these cities is broadly divided into three zones based on the functional activity: (1) Temple: the area that accommodates principle shrines, auxiliary shrines, mandapams (pillared halls), holy tanks, kitchen stores and all necessary utilities for temple activity; (2) Public buildings: this includes all commercial and educational buildings; and (3) Residential: this caters accommodation for all the inhabitants (Ghosh and Mago, 1974). The figure 36, 37 and 38 show the landuse pattern of the three temple cities.



Figure 35 : Madurai land use pattern

(Source: Author, 2020)

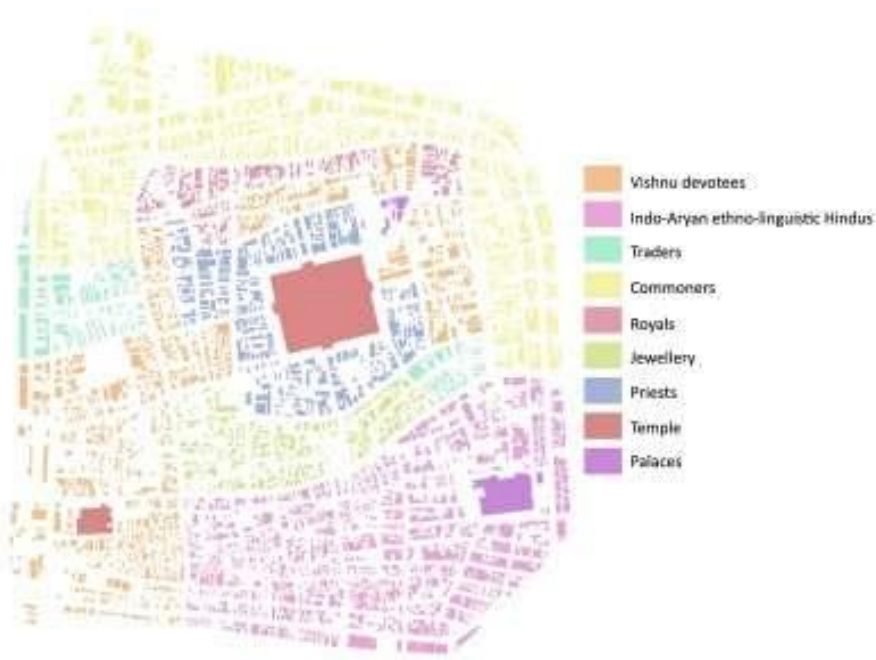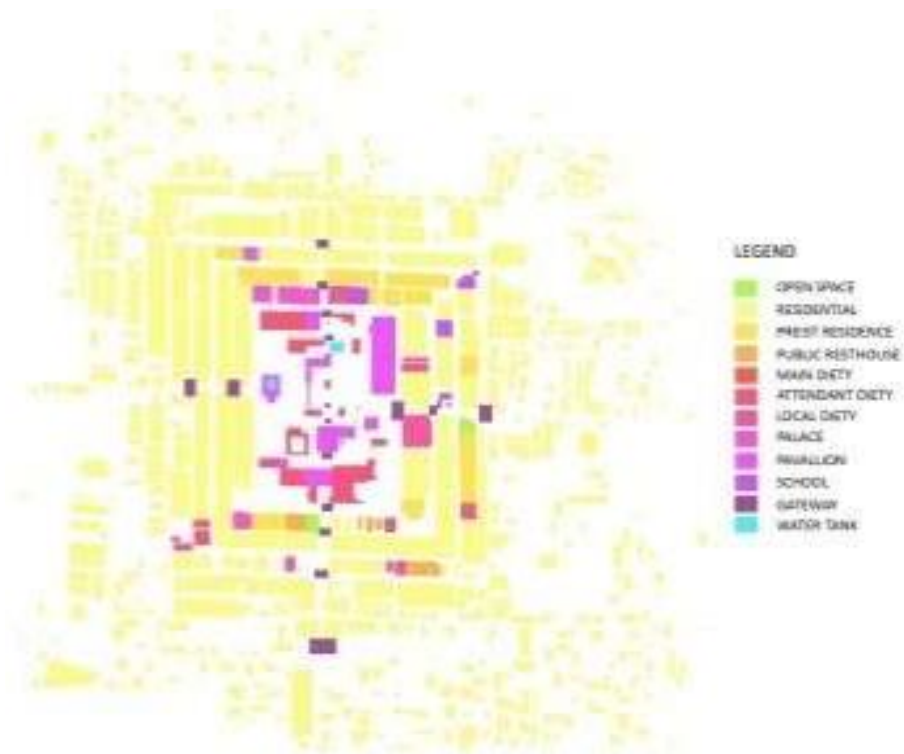Figure 36 : Srirangam land use pattern
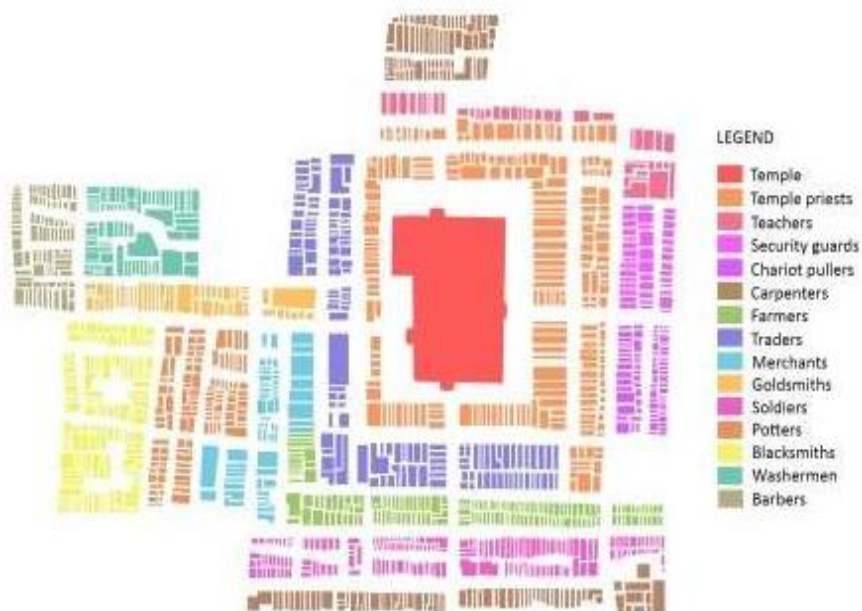
(Source: Author, 2020)



Figure 37 : Chidambaram land use pattern

(Source: Author, 2020)

### 9.2.6 Pattern of processions

The genotype of South Indian temple towns is shaped from religious symbolism. These cities surfaced during the medieval era as the political proclamation heavily backed by religion. Most of these cities served as capital cities or secondary capital cities supporting the royal temple and palace as the prime attributes. All these cities are witnessed with a central shrine with the entire city weaved around it in concentric rings following the principles of Shilpa shastras and texts of Mayamata. Architecture and religion have evolved on parallel ground influencing each other, in the context of ancient India. Traditional texts present set of principles on spatial hierarchy, orientation and positioning of urban elements with respect to both the function of the city and the residing diety (Volwahsen, 1969).

In most of the cases, the circumambulatory path defined the boundaries of a city when the utsava murti (processional idol) and the piligrims circumambulated the main shrine during festivals. The processional route for the important festivals is witnessed at the outermost circumbulatory streets to allow all the residents (including the lower castes) to get a glimpse of the presiding deity. In order to handle the large chariots and the hundreds of people, procession routes are typically 15 to 20 m wide. The turning radii at each corner of the circumumbulatory path also made contact with the traditional town planning, linked to festivals, as they were the most important and only path of domestic circulation in scheduled temple towns (Kunkumadevi, 2011). Figures 39, 40 and 41 show the circumumbulatory pattern of the three temple cities.
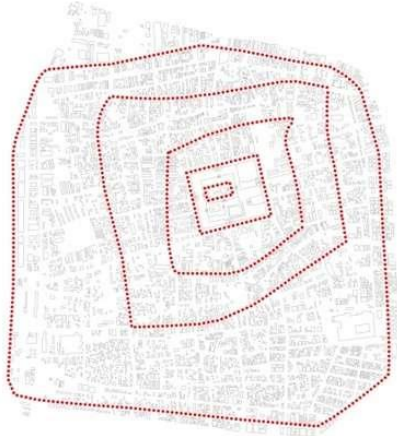
Figure 38 : Pattern of circumambulation in Madurai

*(Source: Author, 2020)*
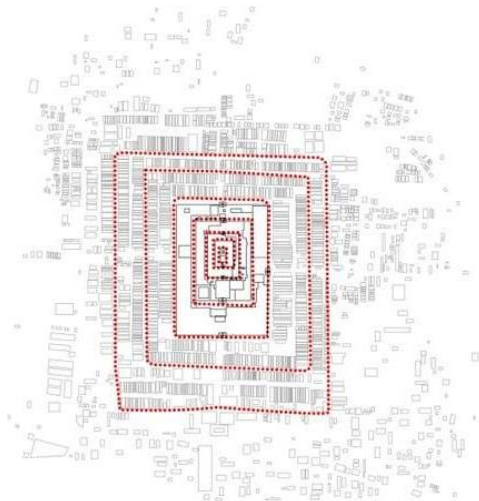


Figure 39 : Pattern of circumambulation in Srirangam

*(Source: Author, 2020)*
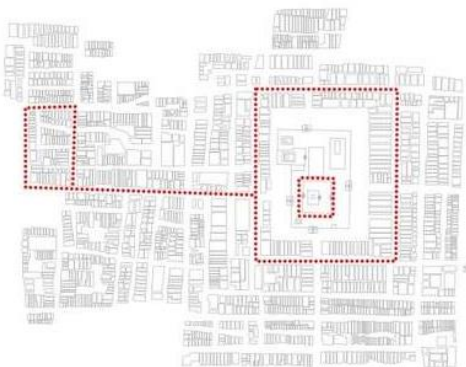


Figure 40 : Pattern of circumambulation in Chidambaram

*(Source: Author, 2020)*

## 9.2.7 Three dimensional model

In Rhino, a three-dimensional model is created using ArcGIS maps and height data

obtained from municipal corporations of respective cities as shown in the figures 42,43 and



44.
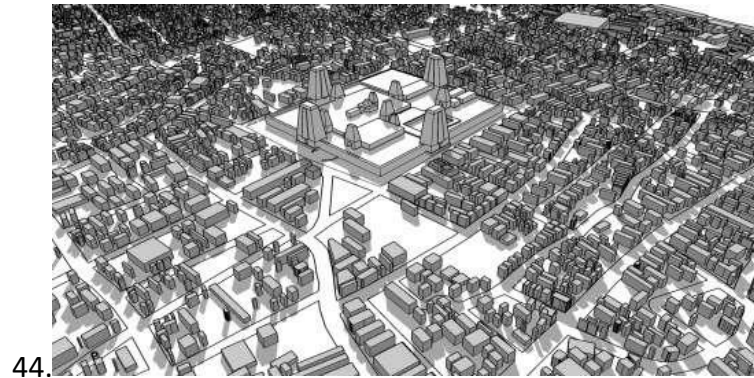
Figure 41 : Madurai 3-dimensional city model
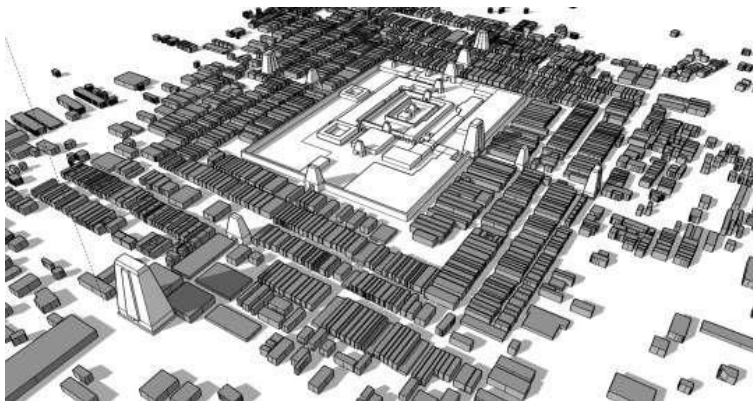
(Source: Author, 2020)



Figure 42 : Srirangam 3-dimensional city model
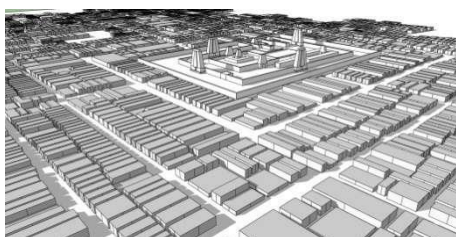
(Source: Author, 2020)

Figure 43 : Chidambaram 3-dimensional city model

(Source: Author, 2020)


## 9.3 Demography

Madurai


In absolute terms Madurai metro urban area recorded a population hike from 0.36 millon to 1.80 million in 70 years from 1951 to 2021. Acoording to the 1951 cences 97.60% of the population lived in the Madurai urban centre which declined to 69.40% as per the records of 2011 cences. This decline is in response to the saturation at the core of the urban center which resulted in spilling over of the population onto the peripheral developing settlements.  The graph of Madurai's migrants witnessed steady hike post independence in response to its educational centers and indeustrial units but this followed a sharp decline due to decreasing percentage of rural-urban migration.


### 9.3.1 Population composition- Religion

Table 4 : Population composition of religion

| Category | Madurai | Srirangam | Chidambaram |
|---|---|---|---|
| Religion<br>■ Hindu<br>■ Muslims<br>■ Christian<br>■ Sikh<br>■ Buddhist<br>■ Jain<br>■ Others<br>■ Not Stated | | | |
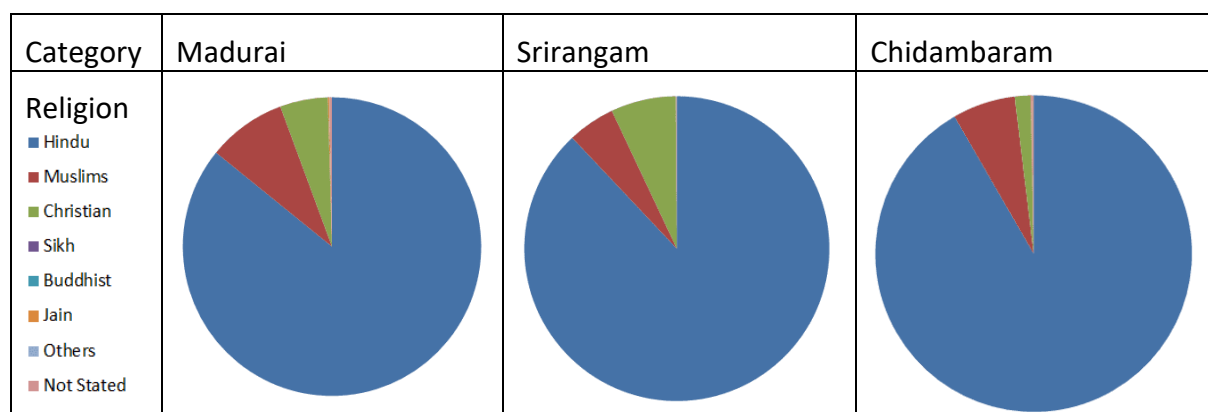
(Source: Census, 2011)


### 9.3.2 Population composition- Gender

Table 5 : Population composition of gender

| Gender | | | |
|---|---|---|---|
| ■ Male<br>■ Female | Female<br>50.05% Male<br>49.95% | Female<br>51.14% Male<br>48.86% | Female<br>46.92% Male<br>53.08% |
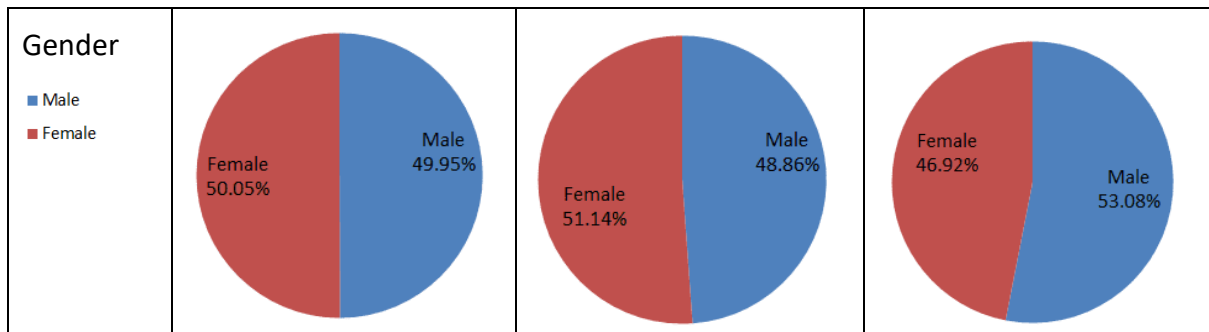
(Source: Census, 2011)

### 9.3.3 Male literacy

Table 6 : Male literacy composition

| Male literacy | | | |
|---|---|---|---|
| ■ Male literacy<br>■ Male illiteracy | Male<br>illiteracy<br>12%<br><br>Male literacy<br>88% | Male<br>illiteracy<br>11%<br><br>Male literacy<br>89% | Male<br>illiteracy<br>8%<br><br>Male literacy<br>92% |
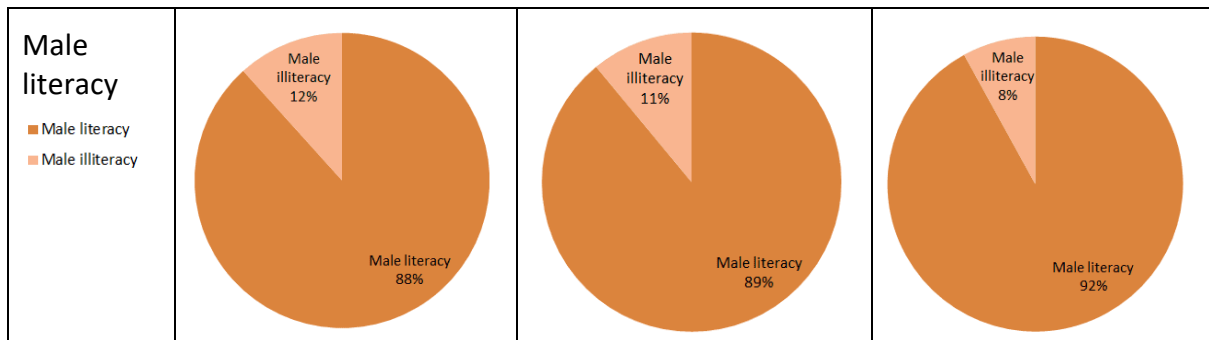
(Source: Census, 2011)

### 9.3.4 Female literacy

Table 7 : Female literacy composition

| Female literacy | | | |
|---|---|---|---|
| ■ Female literacy<br>■ Female illiteracy | Female<br>illiteracy<br>16%<br><br>Female literacy<br>84% | Female<br>illiteracy<br>14%<br><br>Female literacy<br>86% | Female<br>illiteracy<br>13%<br><br>Female literacy<br>87% |
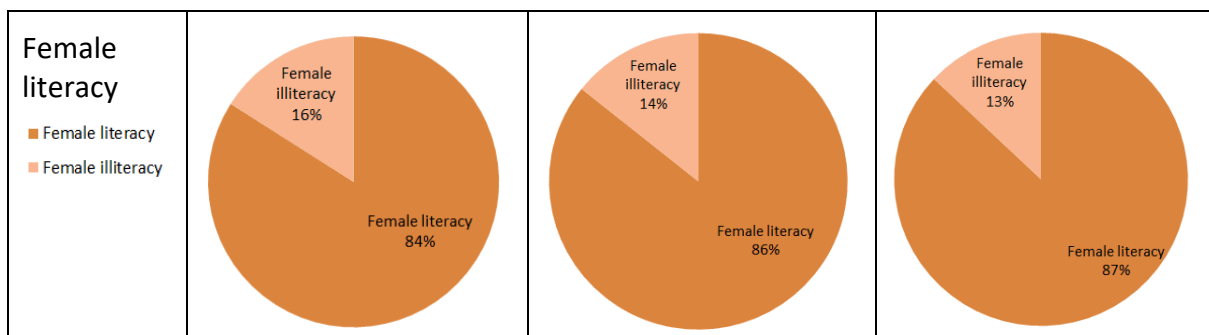
(Source: Census, 2011)

## 9.4 Piligrim footfall

According to Vellamandi N. Natarajan, Tourism Minister of Tamil Nadu, the state of Tamil Nadu tops in the list of tourist population of both foreign and domestic travellers in three consecutive years since 2014 as shown in the figure 45 specially during the time of car festivals (Karthik, 2019).
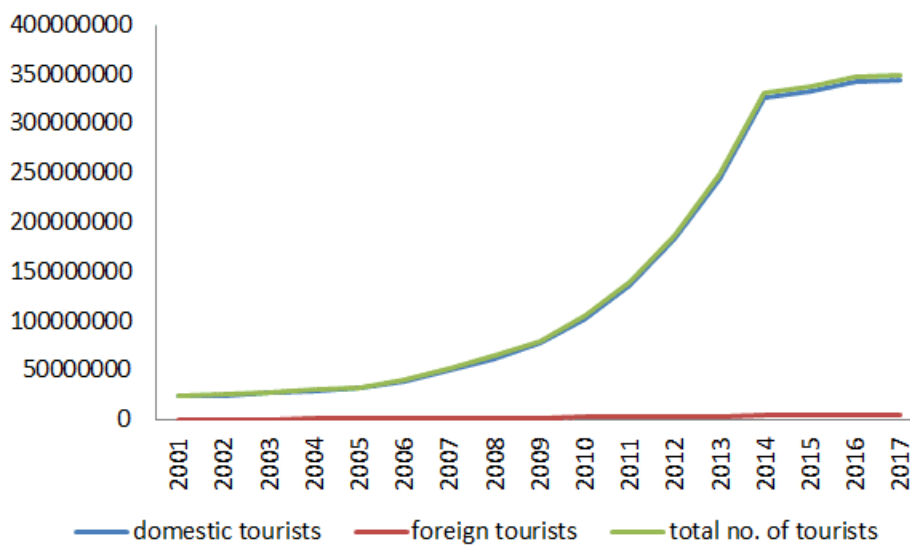


Figure 44 : Piligrim footfall of Tamil Nadu from 2001-2017

Source: Author, 2021 (information adapted from Tamil Nadu tourism)

As shown in the figure 46 the temple cities contribute to a great percentage of state piligrim footfall percentage.

Figure 45 : Piligrim footfall of various cities in Tamil Nadu in 2017

Source: Author, 2021 (information adapted from Tamil Nadu tourism)

The purpose of this data is to provide a better understanding of the potential costs and benefits of tourism growth, particularly for destinations seeking to achieve more sustainable platform. Based on the pie chart of tourist footfall, it is evident that the temple cities drew in a good number of tourists after the capital city.

### 9.4.1 Madurai

Most of the tourist flow is witnessed between months of October to March as it is good season to visit (Devanathan, 2013). As per the records of tourist officials most of the

domestic as well as foreign tourists limit their visit to Meenakshi Amman temple, Thirumalai Naicker Mahal, Gandhi Memorial Museum, Alagarkovil and Tiruparankundram. Madurai recorded a healthy growth of domestic tourists by 24% in 2018. K. Bharathi an official (Program Advisor of Dhan Tourism) from the tourism department stated that the tourism department is concentrating on developing the lesser known places of interest in the temple settlement as 80-90% of the tourists are are staying at Madurai for two nights (The Times Of India, 2018). The following graphs show the domestic tourism in the three temple cities from 2001 to 2017.
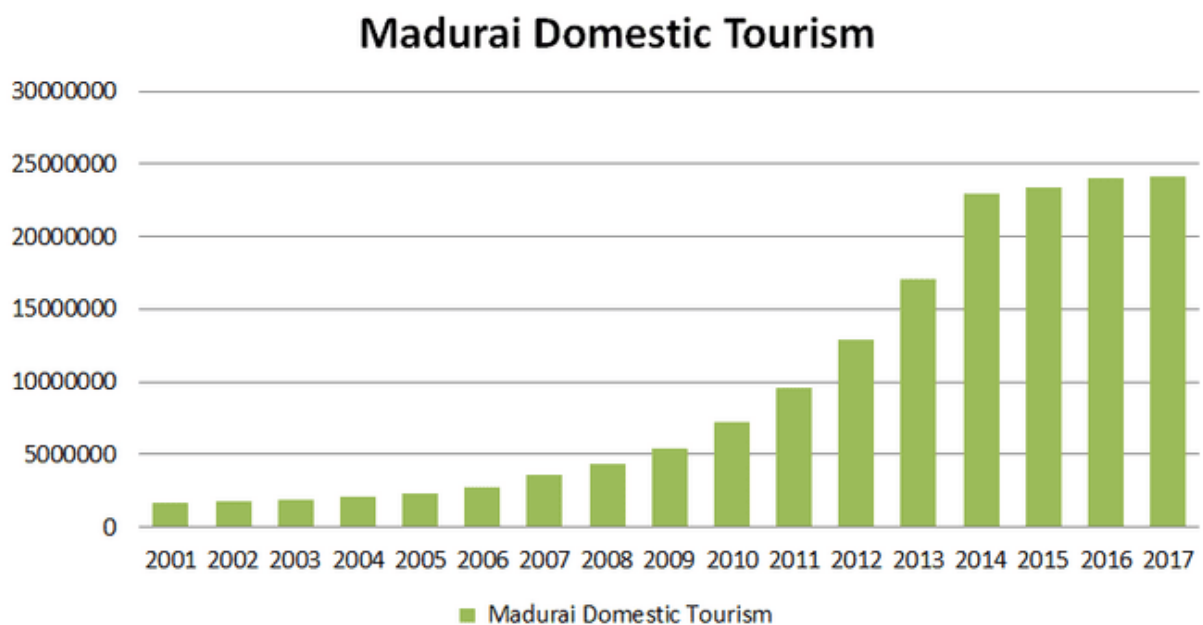


Figure 46 : Domestic piligrim footfall Madurai from 2001 to 2017

Source: Author, 2021 (information adapted from Tamil Nadu tourism)

## Madurai Foreign Tourism
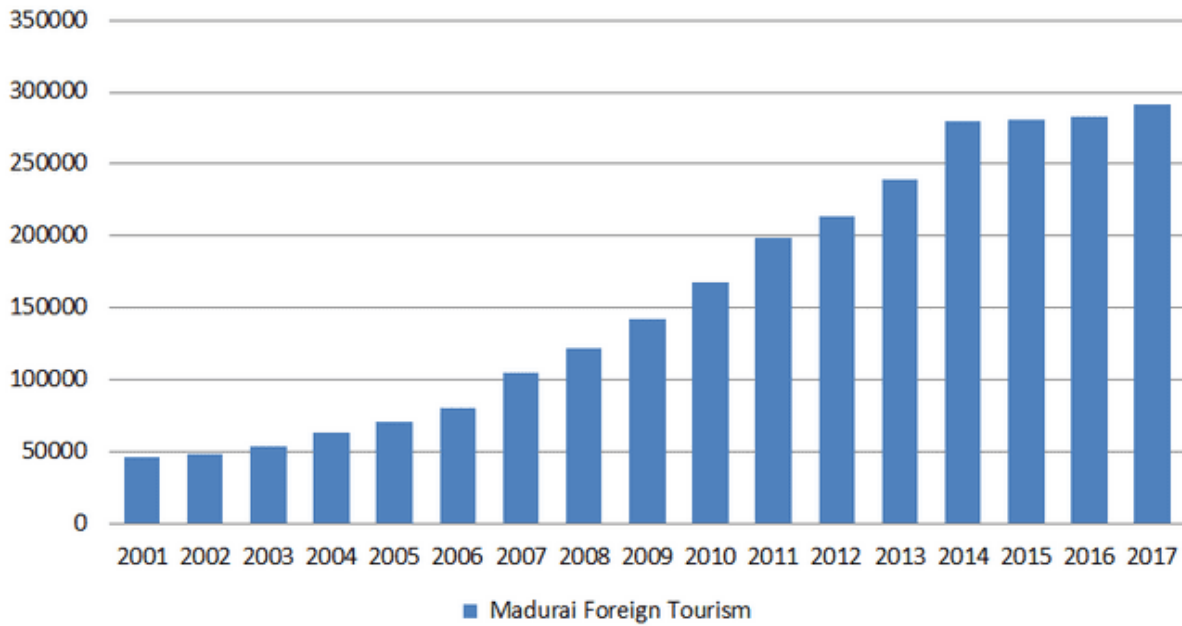
Figure 47 : Foreign piligrim footfall Madurai from 2001 to 2017

Source: Author, 2021 (information adapted from Tamil Nadu tourism)

## 9.4.2 Srirangam
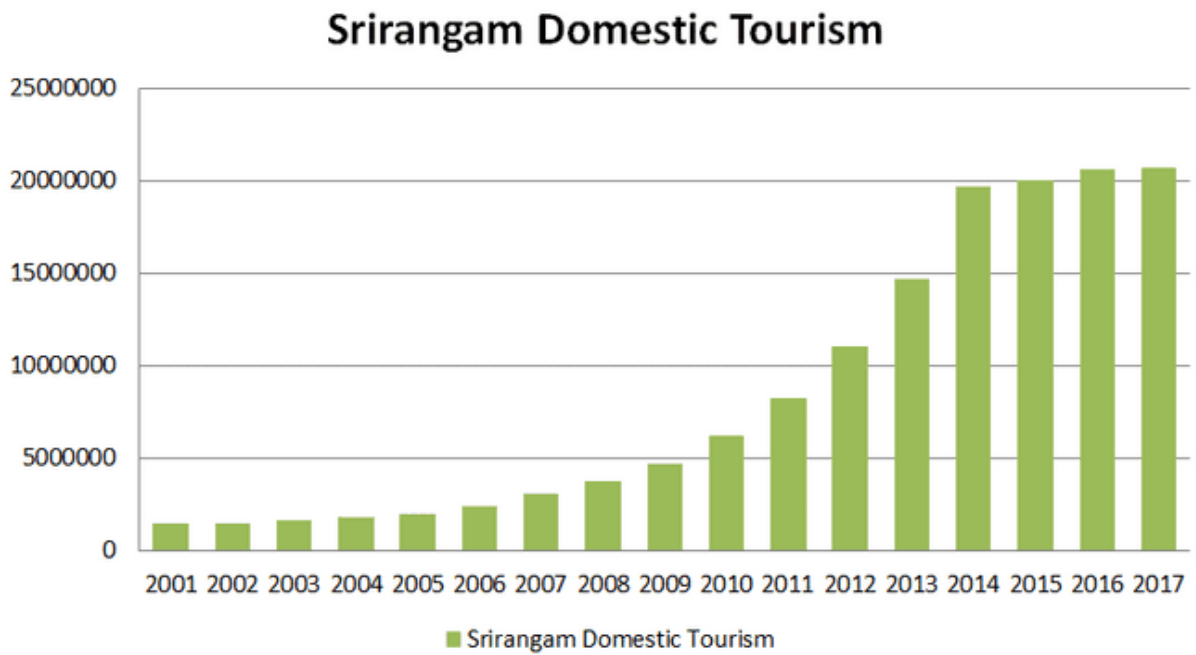


Figure 48 : Domestic piligrim footfall Srirangam from 2001 to 2017

Source: Author, 2021 (information adapted from Tamil Nadu tourism)

Figure 49 : Foreign piligrim footfall Srirangam from 2001 to 2017

Source: Author, 2021 (information adapted from Tamil Nadu tourism)

### 9.4.3 Chidambaram
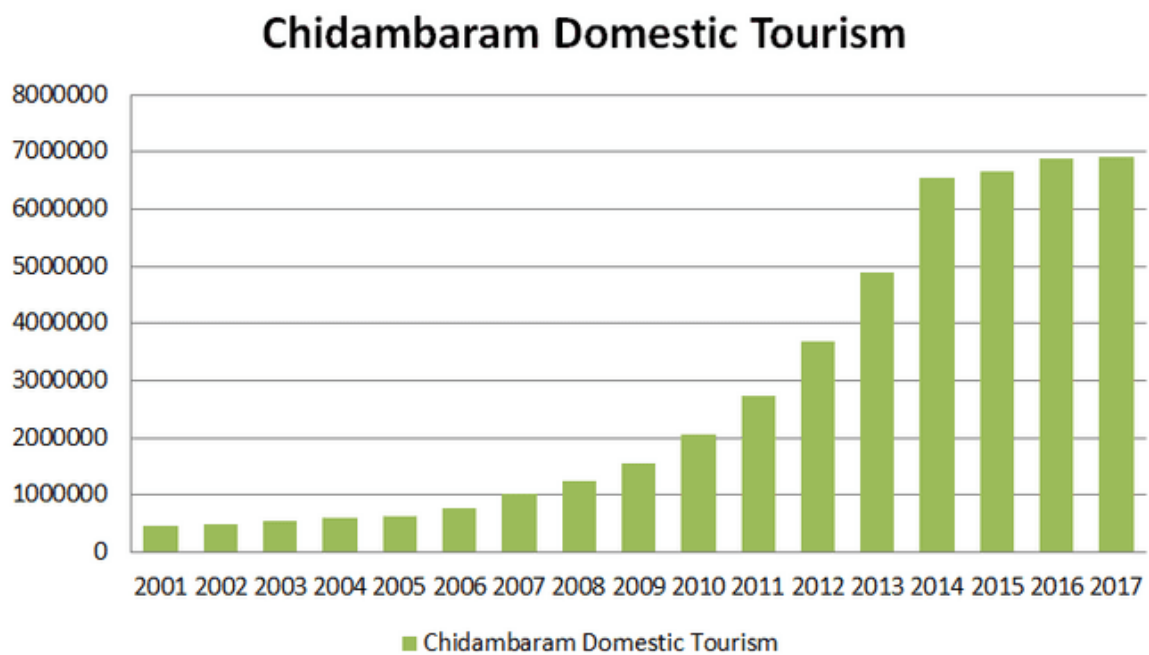


Figure 50 : Domestic piligrim footfall Chidambaram from 2001 to 2017

Source: Author, 2021 (information adapted from Tamil Nadu tourism)

**Chidambaram Foreign Tourism**
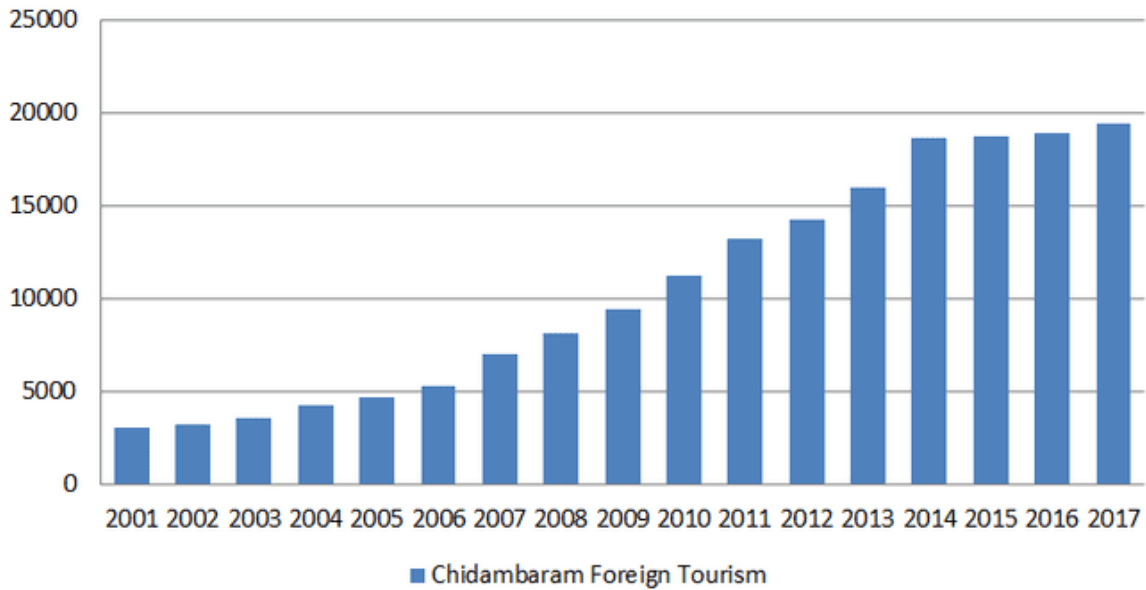
Figure 51 : Foreign pilgrim footfall Chidambaram from 2001 to 2017

Source: Author, 2021 (information adapted from Tamil Nadu tourism)

As shown in the Figures 47 to 52, the piligim footfall over the last 17 years has increased steadily, indicating a good tourism economy growth. In response to religious tourism fairs and the emergence of both public and private tourist accommodations, a sudden increase in pilgrim footfall has occurred in all cities in both the domestic and foreign statistics from the year 2013 to 2014

## 9.5 Land use

The land use patterns of these temple cities over the years have changed and the principal streets of the cities are witnessed with heavy commercial pockets while the settlement as a whole is majorly catered for residential activity.

### 9.5.1 Madurai

The city witnesses more than 1.5 lakhs people a day. The major land use pattern of the city is residential and commercial with many dotted public spaces. Among the major public spaces of Madurai are a Madura Meenakshi temple, whole sale market, Thirumalai Nayakar Mahal, the headpost office, bus stand, railway station, hospitals, cinema halls, and tourist accommodations. Since the area has been used for conflicting and nonconfirming purposes such as government offices, godowns, lorry booking offices, whole sale markets, etc., it has lost its sanctity and desperately needs to be protected.

Like in any other typical traditional Indian city, the commercial land consists of linear strips along major and minor roads. Some shops are geared toward pilgrims, tourists, and locals, while the others serve the entire region. According to surveys, there are 3000 Wholesale Markets in Avani and Masi streets, which cover 51.62 hectares. The first floor of houses is used for storage for shops. About 67% of traders are willing to shift outside the CBD.

Figure 52 : Present land use pattern of Madurai

Source: Author, 2021
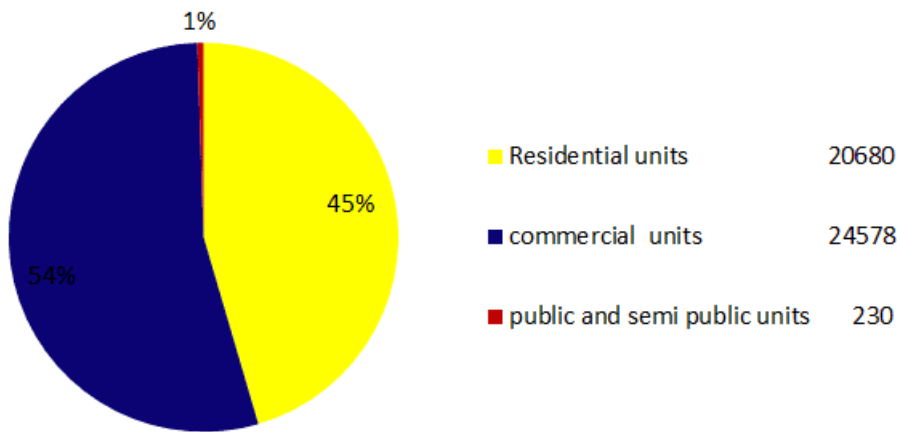
Figure 53 : Built composition of Madurai according to 2011 censes

Source: Author (adapted from Munciple Corporation Madurai, 2011 censes)

## 9.5.2 Srirangam

Residential, agricultural, and open space are the major land uses of the Island of Srirangam, while commercial, institutional, and residential uses are found in the South of Srirangam. In spite of the fact that there is a substantial presence of temple complexes, the residential use is predominant in the town when it comes to the total town. Island of Srirangam has a dispersed physical growth pattern towards the eastern side of its zone due to the influence of NH5 (National Highway no.5), and South Srirangam is predominantly westward due to the influence of NH5.
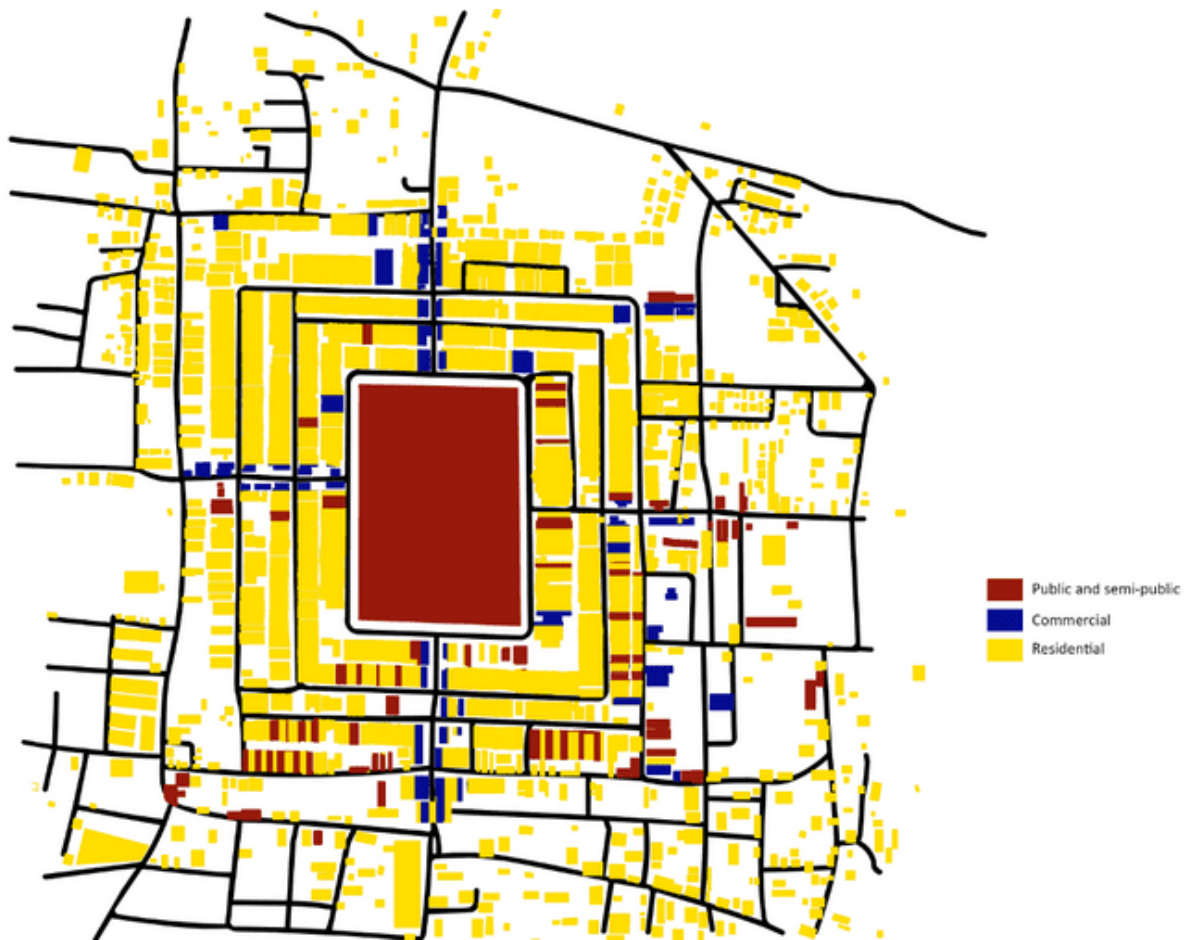
Figure 54 : Present land use pattern of Srirangam

Source: Author, 2021



| | |
|---|---|
| Residential units | 7779 |
| commercial units | 1487 |
| public and semi public units | 2175 |
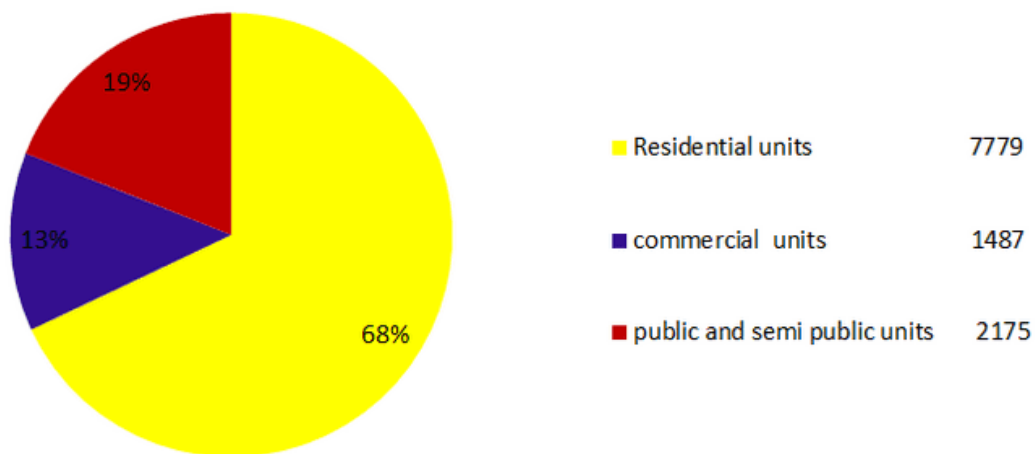
Figure 55 : Built composition of Srirangam according to 2011 censes

Source: Author (adapted from Munciple Corporation Srirangam, 2011 censes)

### 9.5.3 Chidambaram

The land usage is predominantly residential, with the commercial activities mostly concentrated around the temple centre along the streets such as car streets, bazaar streets, market places, S.P.Koli streets etc. Government buildings are situated near the center of the northwestern side of the town. Slums are common along the tanks, which are accompanied by temples, as are backyards and flood banks along the rivers. The agricultural lands lie on the outskirts of the towns, surrounded by green spaces. Slums are a common feature along the tanks. Communities and occupations tend to dominate the settlements in the town. The newer developments and residential layouts are found inthe South east region of the town. Commercial activities, however, are predominant along the road leading to the university.
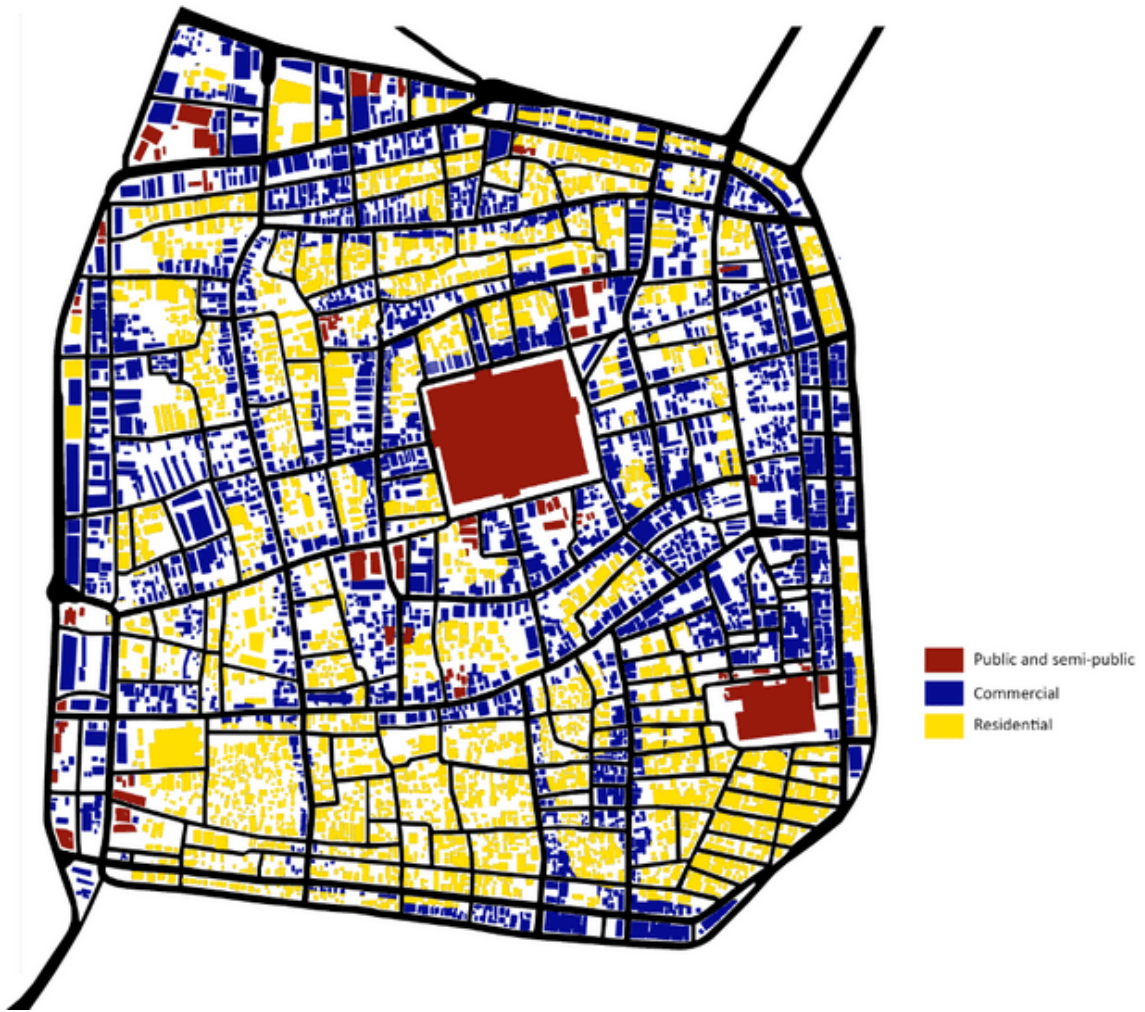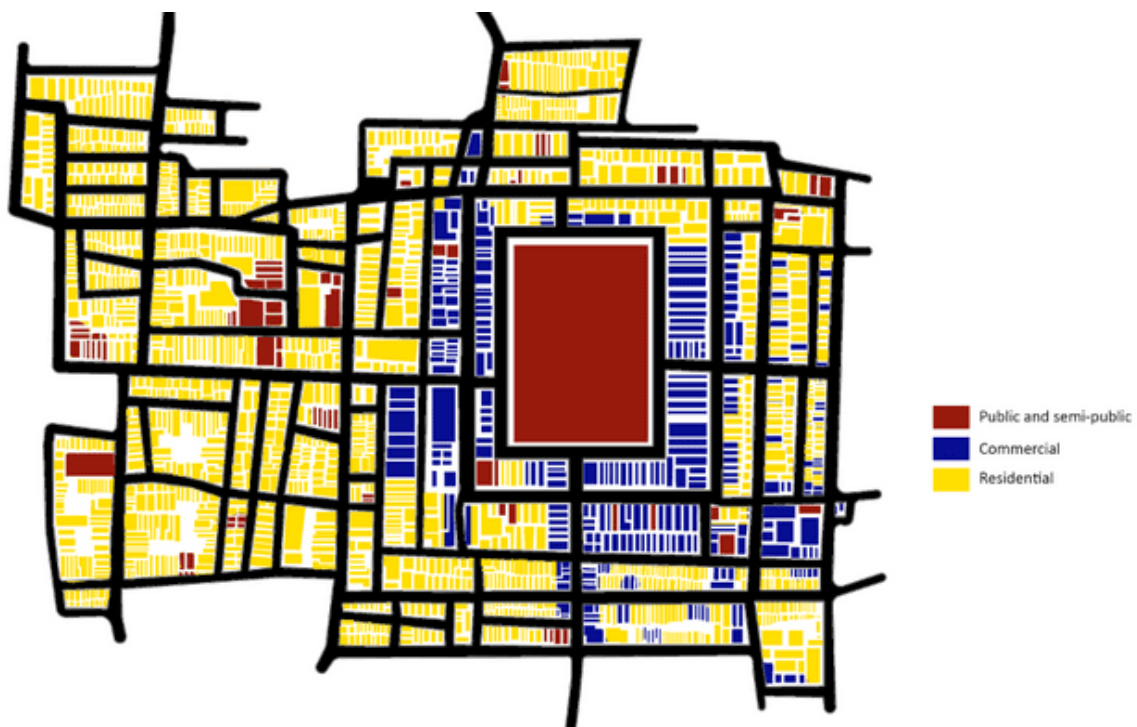
Figure 56 : Present land use pattern of Chidambaram

Source: Author, 2021
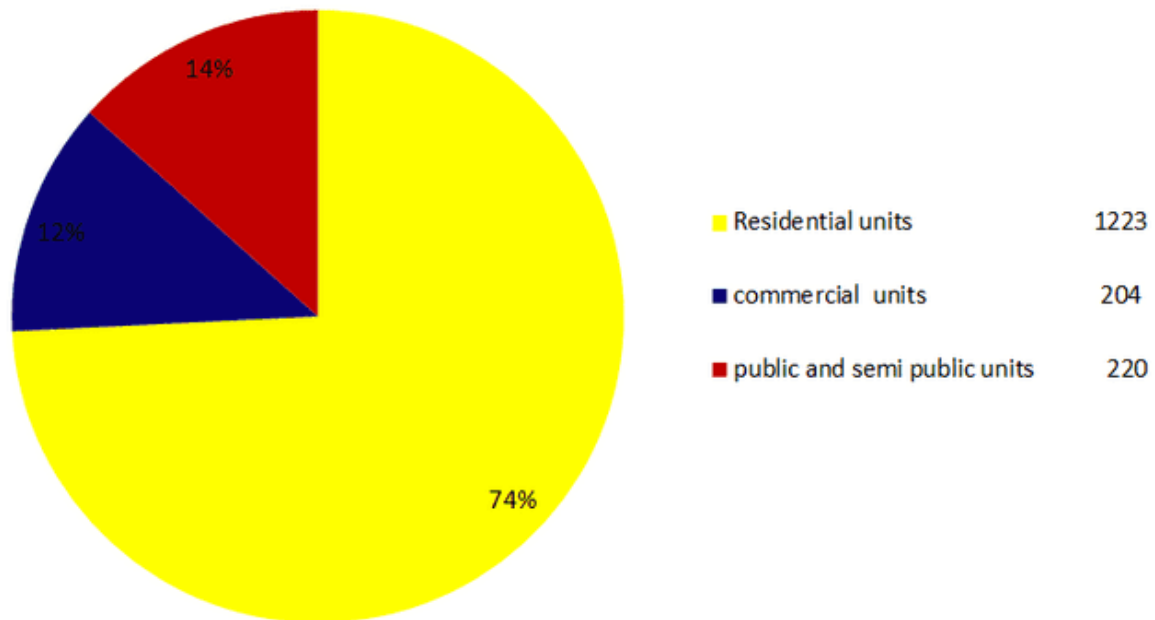


Figure 57 : Built composition of Srirangam according to 2011 censes

Source: Author (adapted from Munciple Corporation Srirangam, 2011 censes)

## 9.6 Visual Perception

Several factors contribute to the perception of a town's visual appearance. In the form of sketches, the visual perception level of the architectural elements of the built heritage along traditional processional routes in the three temple towns is illustrated. Observations and documentation of existing architectural elements were documented for each building in the study. Buildings which have been in existence for at least four to five decades were identified as having contextual architectural elements.

## 9.6.1 Madurai



Figure 58: Gopuram view from South Chitrai street of Madurai

Source: Author

## 9.6.2 Srirangam



Figure 59: Gopuram view from North Chitrai street of Srirangam

Source: Author

### 9.6.3 Chidambaram
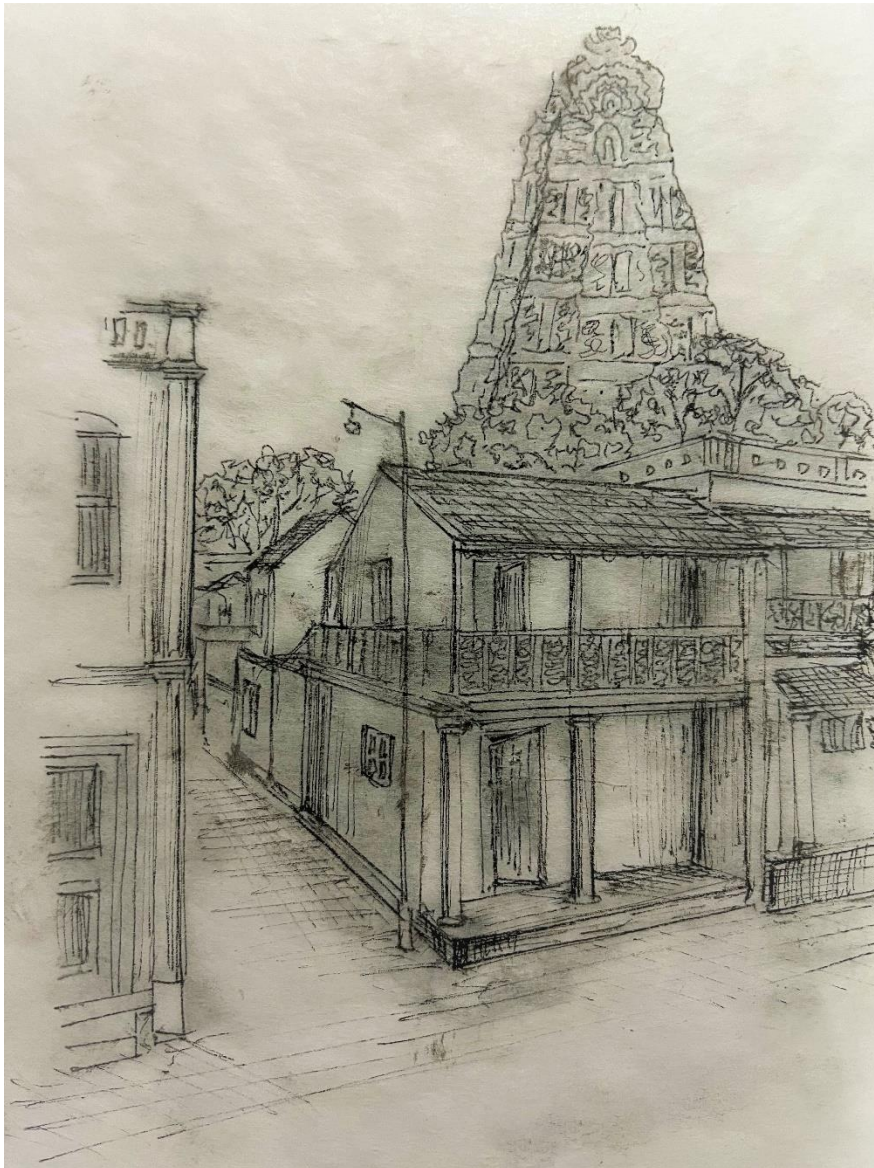


Figure 60:  Gopuram view from East Car Street of Chidambaram

## 9.7 Core city issues

The following table lists out the main issues in the South Indian temple towns.

Table 8 : Core city issues of South Indian temple towns

| Criteria | Issues |
|---|---|
| Land Ownership/Building | Uncontrolled population growth, illegal floors being built, encroachment, overcrowding, a variety of activities and amendments to their activities, along with enormous disputes over baseline information, jurisdiction, and ownership of property. |
| Traffic And Transportation | Squatting on roads/paths, slow-moving/mixed traffic, lack of parking, narrow roads and congestion |
| Conservation Of Heritage | Change in architectural features, streetscape and character, lack of documentation and data of heritage along with loss of heritage area and buildings. |
| Infrastructure Services And Amenities: | Physical and social infrastructure is inadequate, there is encroachment on public land, and open space is underused. |
| Legal Framework And Enforcement: | The complexity of legal frameworks, court cases, disputes, and long delays |

Source: Author

### 9.7.1 Madurai

Based on this analysis, the following are the core issues of Madurai:

- A high density is observed at the historic core due to the centralized activity.

- Occurrence of pedestrian vehicle conflict and traffic congestion is most common.

-  Insufficient parking in response to heavy vehicular flow.

- Complementary activity is generated by commercial hubs.

- Formation of incoherent facades and decline of green spaces due to heavy commercialization.

- Heritage buildings are enveloped by commercial clusters due to the continues hike in commercialization

- Repeated overlaying of roads led to the sink in temple floor level.

- Visual pollution due to massive hoardings.

- The semi-commercial cluster enveloping the Vasantha mandapam have gradually led to the decay of the mandapam.

- Vasanth Mandapam aslo known as Pudhu mandapamm hosts the festival of Vasthosavam or the Spring festival is built by Thirumalai Nayakkar showcases massive sculptures of the divine couple Lord Shiva and Goddess Parvathi as well as the royals. The semi-commercial cluster enveloping the Vasantha mandapam have gradually led to the decay of the mandapam.

- Hawkers have encroached heavily on the base of Rayagopuram, causing the heritage structure to deteriorate.

- Pathuthoon is located on the street with several hundreds of old pillars dealt with shear negligence. The commercialization of this street led to the haphazard growth of settlement around it. Private buildings especially the commercial units abutting these are posing both a physical as well as a visual threat. The beauty of the monument is heavily destroyed by the location of lampposts and electrical cabling.

- The buffer space between ASI (Archaeological Survey of India, under the Ministry of Culture) site and its surrounding space is characterless and visually unimpressive to the visitors.

- Rani Magammal palace situated on the Chitrai streets stand as testimonials to the architectural skill of Dravidian builders now face a threat in response to the low maintenance.

- Though the fort wall is nearly five centuries old it has not yet been declared as a heritage site. In response to its functional uses the wall has been severely damaged by mounting of banners and posters.


## 9.7.2 Srirangam

Based on this analysis the following are the core issues of Srirangam:

- Nearly 50% of the pathway between Ranga Ranga gopuram and Raja gopuram is occupied by the hawkers and the rest by the two wheelers.

- There are no proper sign boards to guide the devotees in way finding for parking, enterance and exit.

- Pedestrians face a havoc to reach both Ranga Ranga gopuram and Raja gopuram in response to unorganized parking of vehicles and traffic congestion.

- Adayavalanjan gopuram and Chithiraiveedhi gopuram also face similar situation as a portion of road is occupied by hawkers.

- The settement pattern still reflects the caste system.

- Northern part of the Sri Ranganathaswami temple falls in the Kollidam flood line area. So, there is no adequate space for the development in northern part of the temple.

- Most of the commercial activity is witnessed in the Northern part of the temple town where the public transport is absent.

- Development of west side Teppukulam pond is very necessary though it is active only once in a year.

- All gopurams of Srirangam that are situated outside the temple precints are witnessed with rampant encroachments by hawkers. Hawkers have heavily encroached the gopurams on Adayavalanjan Street and Chithiraiveedi Street

- It's a has become a very difficult task for the devotees accessing Ranganathaswami using platform as they need to walk 300mts form Rajagopuram in the conjested roads.

- As per the records of Tirichi police nearly 500 cars arrive at Ranganathaswamy temple everyday in which more than 75% of the vehicles are parked in the no parking zone.

- The cars are haphazardly parked durin the VIPs' visits making it a herculean task for the devotees on foot to visit the temple. According the police the devotees are forced to violate the rules as there is no proper parking zone.

- Rama Theertha Kulam, a temple tank belonging to Jambukeswarar Akilandeswari Temple in Thiruvanaikoil, Tiruchi, is filled to the brim after several years following good rainfall.

- Most of the public parks are in different parts of the city are being unused.

### 9.7.3 Chidambaram

Based on this analysis the following are the core issues of Chidambaram:

- The streets including the main car streets are very congested with heavy vehicles and street hawkers.

- The principal streets that lead to the temple are undity with the garbage extracted from the temple.

- The city does not have proper hotel stays for the tourist in 1.5km radius to the temple.

- There is no proper car parking facility outside the temple catering the visitors.

- Heavy commercialization can be witnessed in the car streets.

- The streets get clogged during heavy rains making the traffic flow very difficult.

- During the time of floods all the water storage units reach to the rim and overflow into the creating waist lvel water.

- The main irrigation system constructed during Chola dynasty, desined to store water during draught and drain flood water should be revived.

- Circumventing protective water way ("Aghali") around the temple is neglected without proper attention to cleaning and often witnessed with rubbish.

Being a melting pot of cultural and traditional architecture, beliefs, and essence, pilgrim cities embrace a multifarious spectrum of issuesIn order to preserve, protect, and uplift the built heritage, urban transformations must be done within the context of existing structures from the past. In urban planning, the term sustainability must be used in the context of preserving the magnificent structures of the past. Because, disparate and poorly executed

urban physical changes can destroy the urban fabric. Therefore, cohesive economic and social development policies should include the conservation of historical towns and other areas of historic urban settlement. A successful conservation program relies heavily on the participation and involvement of the residents and these temple towns should be repurposed for new purposes and activities that complement their unique characteristics. Local Self Government is a good model to integrate heritage into a strategic vision while also strengthening the capacities of planning agencies and local stakeholders.

## CHAPTER 10: TOOLS AND APPLICATIONS OF ANALYSIS

A high degree of axiality is the most common characteristic of pilgrim cities found in antiquity, as evidenced by the considerable literature on temples and sacred spaces. As per the writings of Kelley Alley Indian temple cities are characterized by a high level of axiality along a corridor; regular settlement patterns and a hierarchical settlement pattern; high levels of connectivity and a central temple core with discernible structures. In these cities the urban fabrics are marked by a hierarchical order of streets and landmarks that reinforces the symbolic structure of the core (Alley, 2003). The 'centrality' of temple cities is the outcome of a convoluted and intricate process of 'centralization' that shapes them into the symbolic epitome of political, religious and cultural influence in society (Thakur, 1999).

In response to the changing structures of the social orders, human societies have undergone major transformations on both visual and spatial domains (Smith, 2009). To understand the patterns and transformations witnessed by the visual and spatial platforms the research adopts technical tools like Isovist and Space Sytax along with a theoretical framework of visual and spatial urban environments. Inorder to anylyse the spatial

structure of these temple cities the study uses a space syntax technique to evaluate this

spatial configuration objectively by examining the spatial mediation that exists between the

different urban elements. An analysis of the urban space structure has been performed

using a mathematical model based on quantitative measures, providing numerical and

objective comparisons of the syntactic variables of the sample towns, enabling a more

logical finding of the urban structure along with a 3D isovist tool athat analyses the visual

dimension of the city fabric.

## 10.1 Space Syntax

'Built environment' is the physical component of the urban fabric which is the

tangible version of the social environment and physical environment. Everything that is

humanely arranged, maintained, modified or created is considered as the built

environment. Therefore, the processes and the products created by human are collectively

called as built environments (McClure and Bartuska, 2007). Every city's built environment is

addressed with a unique formula designed in response to the interrelationship between

environment and man. The city's built fabric consists patterns formed by built and un-built

(spaces) elements. These spaces are linked to each other forming "system of spaces" and

the spatial configuration of a place is determined by the composition of these spaces. A

continuous transformation can be witnessed on the spatial configuration which is in

response to the user preferences in the form of socio-cultural behaviour that is subjected

continuous evolution.  The face of social life can be easily decoded by the spatio-temporal

setting and built morphology of a particular space (Rapoport, 2013).


Firstly, there is a dire need to understand the genetic code of the urban morphology

as it illustrates the user preferences of a specific place. Secondly by understanding the urban

morphology of ancient cities, some qualities can be borrowed on to the contemporary built fabric. Thirdly there is huge gap in understanding the built patterns as irregular geometry is often considered as unplanned without understanding the inbuilt logic.

### 10.1.1 Space Syntax evolution

As per the notes of Hiller human activity draws its own spatial geometry and Space syntax is one of the approaches that represent the geometries in graphical format (Hillier, 1999). Space syntax helps in analysing the casual relationship between the social patterns of occupancy and structure of urban space (Hillier, 1996). The theory demonstrates the dependence of the casual relationship on extrinsic properties which is its relationship with other spaces in the structure rather than intrinsic properties of a confined space.  This pattern of relationship between spaces in a system is known as configuration.

Among many technological developments in quantifying the urban spaces Space syntax is can be considered as one of the finest theories in analysing the design policies or urban planning principles that have been applied in designing urban fabrics. The theory of Space syntax was first developed at University College London in the 1980s to simplify the complex spatial structure of urban fabric and its effects on human behaviour (Netto, 2015). Space syntax prescribes number of techniques and theories to evaluate the topological relations of settlement spaces (Zhou and Lu, 2013). The measurement is observed topologically rather than metrically as spatial elements act as connecting spaces. Space Syntax became a powerful instrument in performing quantitative spatial analysis, as the spatial form is broken into simple geometrical forms that can converted into graphs which is analysed with mathematical formulas (Serra and Pinho, 2011).  Axial lines help in

understanding the nature of the dynamic activities while convex spaces decode the nature of the static activities (Hillier and Hanson, 2003).

## 10.1.2 Space syntax as a tool

Space is always observed as continues and solid three-dimensional system (Franz and Wiener, 2008). Space Syntax is one of the methods, that is used to analyse architectural space as discrete and syntactic model by abstracting or converting some features of spatial configuration (Bafna 2003). Space syntax helps in decoding the relation between human behaviour and topological properties of a space as they work as interdependent factors (Ostwald, 2011). Space syntax works on abstraction of space by simplifying a three-dimensional space into a two dimensional space and then into a graph, where the graph metrics are based on the concepts of depth and connectivity (Vaughan, 2015). According to Klarquvist the three main approaches of space abstraction are isovist mapping, axial mapping and convex mapping.  The syntax space analysis is done using parameters of intelligibility and integration (Topçu, 2019).

Urban morphology is analysed with a scientific perspective using space syntax method as it plays an effective role in process-based investigation of how historical cores have been transformed in time (Batty and Rana, 2004). The harmony between social structure of the city and its spatial form is revealed in this way.  Along with analysing the morphology of the city, function is and its attributes are also examined by incorporating data obtained from different factors. Based on the spatial configuration of the city and the inter-weave of its attributes, the city's morphological development is explained using space syntax. The interpretation is exhibited through numerical values providing a data that is verifiable (Kubat, 1997).

### 10.1.3 Space syntax range of applications

Space syntax method has been used in analysing – London's urban fabric; post the Great Fire in 1666. The internal urban blocks post great fire, were terrible and overcrowded with buildings and had no proper hygiene. City was organically organized where the merchant houses were magnetized to the main theatres of public life while the poor lived in close proximity away from the urban core. Hanson's (1989) work demonstrates that a focus simply on order, on the geometrical properties of plans, makes organic cities appear as disordered, chaotic systems.
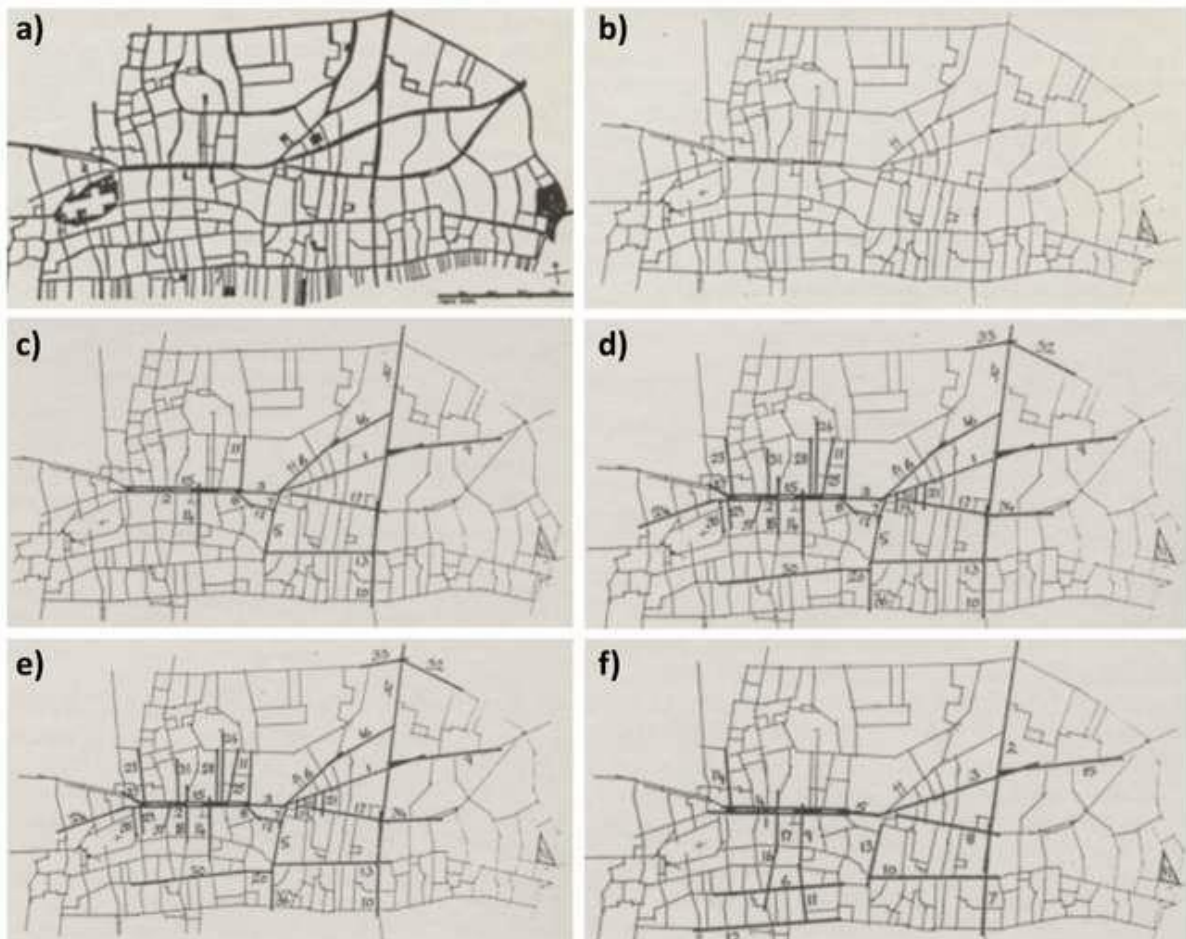


Figure 61 : X illustrates Hanson's work examining:

a) London - the open space of the City as shown in Leake's map afterthe Great Fire of 1666, with a 100 metre scale attached; b) London Axial map of the City in 1966; c) London - 5 per cent integration core of the City in 1666, numbered in order of integration from the most integrated axial lined; d)  London – 10 per cent integration core of the City in 1666, numbered in order of integration from the most integrated axial line; e) London - the core of 5 per cent most integrated lines in the City in 1666 at a radius of three axial steps, numbered in order of integration from the most integrated; and f) London - 50 per cent of segregated lines in Leake's map of the City

Source: Hanson, J., 1989. Order and structure in urban design: the plans for the rebuilding of

London after the Great Fire of 1666. *Ekistics*, [online] pp.22-42. Available at:

<http://www.jstor.> [Accessed 15 June 2020].

| Plan name | Number of axial lines | Thoroughfare: dead-end ratio | Number of islands | Grid axiality | Mean depth (mean integration, RRA) |
|---|---|---|---|---|---|
| 1. Leake | 374 | — | 185 | 0.0780 | 0.9352 |
| 2. Ogilby + Morgan | 797 | 0.853 | 469 | 0.0569 | 0.7501 |
| 3. Hooke | 61 | — | 120 | 0.3920 | 0.4680 |
| 4. Knight-City | 94 | 11.75 | 169 | 0.2980 | 0.3756 |
| 5. Knight-all | 138 | 7.263 | 210 | 0.2250 | 0.5037 |
| 6. Evelyn-City | 91 | — | 56 | 0.1440 | 0.7070 |
| 7. Evelyn-all | 118 | — | 74 | 0.1630 | 0.7222 |
| 8. Wren-City | 178 | — | 224 | 0.1790 | 0.4679 |
| 9. Wren-all | 226 | — | 264 | 0.1530 | 0.5007 |
| 10. Newcourt | 264 | — | 227 | 0.1220 | 0.5900 |

Figure 62 : Characteristic measures for comparison of the changes envisaged by the ten post fire plans

Source: Hanson, J., 1989. Order and structure in urban design: the plans for the rebuilding of

London after the Great Fire of 1666. *Ekistics*, [online] pp.22-42. Available at:

<http://www.jstor.org/stable/43622101> [Accessed 15 June 2020].


The above ten plans were analysed using Space Syntax method. The urban

morphology of cities like London is a product of gradual accumulation of layers. So, these

cities may differ from the fully planned cities as they have few readily identifiable ordering

principles. Though planned cities exhibit more order it does not indicated that accreted

cities envelop chaos.  So, to understand the character of the city planning urban

configuration has to be well analysed. According Haanson's demonstration focus on simple order exhibits organic cities as chaotic and disordered sytems (Hanson 1989). As per Harshad's and Wendy's understanding one of the prime reasons for not studying cities as structures is that structure is one of the most challenging factors to define though it has been studied for a long time (Pullan and Bhadeshia, 2000). During the early 20[th]century, inspired from the methodology of Hanson, Kavyan investigated on the spatial dynamics of urban change with respect six historical cities as shown in the following figure.
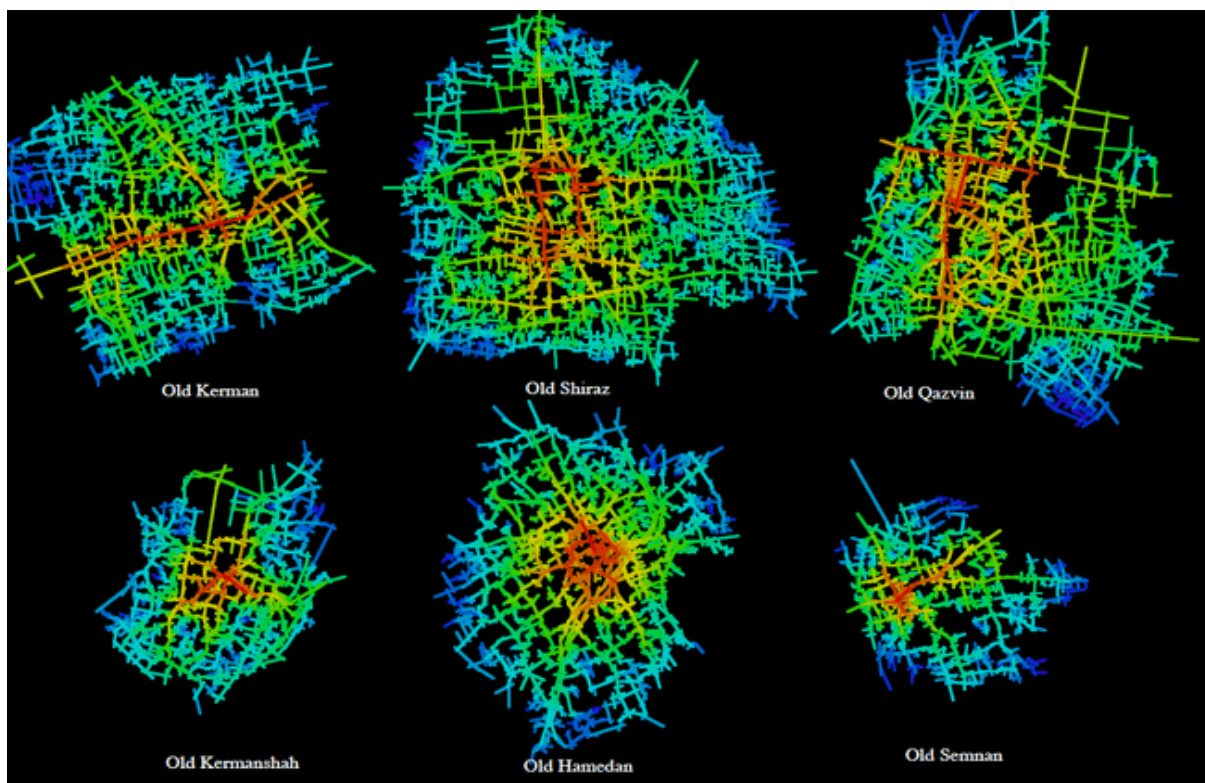


Figure 63 : Axial analysis of six historic cities in Iran (c.1800).

Source: (Karimi, 1997:39)

Taking into consideration global integration, it creates a very revealing picture of an urban grid without any geometry. Karimi in his investigation identified that the central core is a composition of cores of activity, main thoroughfares, local centres and residential

quarters. The social and economic characteristics of these spaces greatly coincided with the results obtained from spatial interpretation (Karimi, 1998).

## 10.2 Spatial analysis through Space syntax

To understand the spatial fabric the study employed space syntax method. This enables in reading the space and quantifies in the bases of functionality it also helps in identifying the proximity towards the prescribed theoretical models. The space syntax adopts two major procedures in quantifying the space on the functional platform which is convex mapping and the other is axial mapping. Using maps of urban space as the basis for analysis, the study divides the map into two types: a convex map, which uses a two-dimensional polygonal space as its basic unit, and an axial map, which uses an axial line as its basis. An axial line represents the linear movement from origin to destination, while a concentric line represents the 'moving around' movement between origin and destination.

Using AutoCAD software, the base maps are digitized and converted into dxf files, which are imported into Depthmap software version 5. Based on the statements made by Hillier and Hanson, this study uses syntactic measures to analyze the space syntax of a settlement whereas the syntactic measures that are presented in detail, based on the work of Kubat.

In all the cities, approximately 1.5 $km^2$, surrounded by a radius of 0.65 km and covering the historic core, was delineated as a standard boundary that could be used to define a uniform study area for each city. There were two types of units of measurement for town planning in India based on Vastu principles. The ancient script of Manasara prescribed a specific measuring system for cities designed according to Vastu principles. (Funo, 2002) In

this study, the block size analysis indicates that the majority of these three temple towns have perimeters that range from 200 meters to 400 meters. It will be interesting to observe which type of urban grain resulted from such an measuring system.

The study combines the objective analysis of the syntactic measures with the qualitative aspects of historical evolution in order to assess the urban characteristics of the case-study cities based on the method that has been adopted in this study.

A review of some fundamental findings regarding urban change in urban morphology is provided in this section, as well as a discussion of more recent studies devoted to temple town settings in south India. Despite the fact that our main focus will be on understanding the morphological processes and growth dynamics of urban tissues, the above studies are critical to understanding the evolution of street networks. A brief review of the literature on space syntax in South Indian temple towns is followed by an introduction to the theoretical and analytical framework of space syntax.

### 10.2.1 Convex space mapping

Convex space is the area contained in a clear polygon which is further defined as the area between all its vertices, is the area within which no angle exists (Hillier and Hanson, 1984). To quantify a space with convex mapping the space is divided into convex polygons, which are largest or fattest and fewest in number of polygons (Klarqvist, 1993). Analysis on convex spaces is done using parameters of convex ringness, grid convexity, convex deformation and convex articulation (Topçu, 2019). The following are the convex maps of the three case studies

Figure 64 : Madurai Convex map

(Source: Author, 2020)
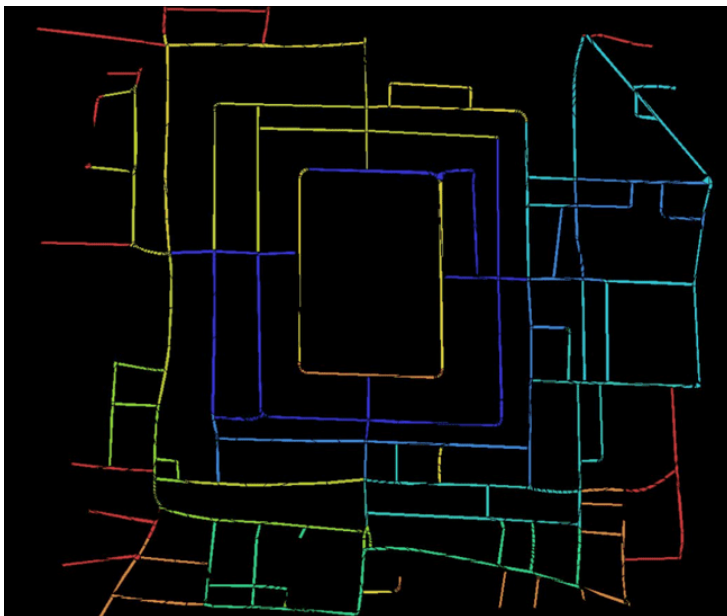


Figure 65 : Srirangam Convex map

(Source: Author, 2020)

Figure 66 : Chidambaram Convex map

(Source: Author, 2020)

The following table shows the number of axial spaces.

Table 9: Convex spaces

| Factor | Madurai | Srirangam | Chidambaram |
|---|---|---|---|
| No. of convex spaces | 1051 | 595 | 321 |

As shown in the table 8 the no. of convex spaces spaces of Madurai are high when compared to the other two cites which indicates that Madurai exhibits a compact open space system while Srirangam and Chidambaram exhibit an expansive space sytem.

## 10.2.2 Axial line mapping

Axial line on the other hand is the longest straight line without any access or visual interruption. This theory is built on the concept which illustrates the orientation of people according to the visual access (Turner, Penn and Hillier, 2005). This has been extended to 'all line' approach which draws all of the possible lines visually connecting points on continues convex spaces. Analysis on axial lines is done using parameters of axial ringness grid axiality, axial integration and axial articulation (Topçu, 2019). The following are the convex maps of the three case studies. The following table shows the number of axial spaces.

Table 10 : Axial lines

| Factor | Madurai | Srirangam | Chidambaram |
|---|---|---|---|
| No. of axial lines | 335 | 154 | 103 |

Figure 67 : Madurai Axial map

(Source: Author, 2020)



Figure 68 : Srirangam Axial map

(Source: Author, 2020)



Figure 69 : Chidambaram Axial map

(Source: Author, 2020)

## 10.2.3 Island spaces

An island space is defined as a space bounded by convex spaces (Hillier and Hanson, 1984). Island spaces usually comprise of the built area bounded with streets.



Figure 70: Madurai island map

(Source: Author, 2020)

Figure 71: Srirangam island map

(Source: Author, 2020)
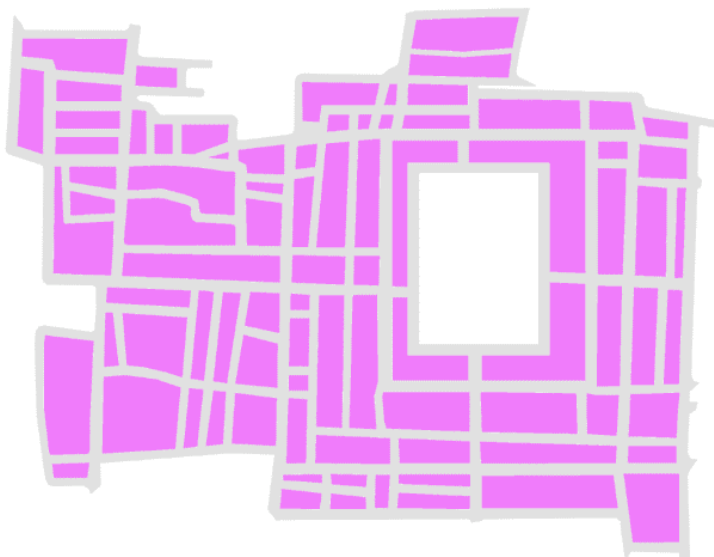


Figure 72: Chidambaram island map

(Source: Author, 2020)

The table 11 below shows the number of island spaces.

Table 11: No. of island spaces

| Factor | Madurai | Srirangam | Chidambaram |
|--------|---------|-----------|-------------|
| No. of island spaces | 255 | 81 | 87 |

(Source: Author, 2020)

## 10.2.4 Link lines

Link lines are the lines that connect the centroids of convex spaces (Hillier and Hanson, 1984).



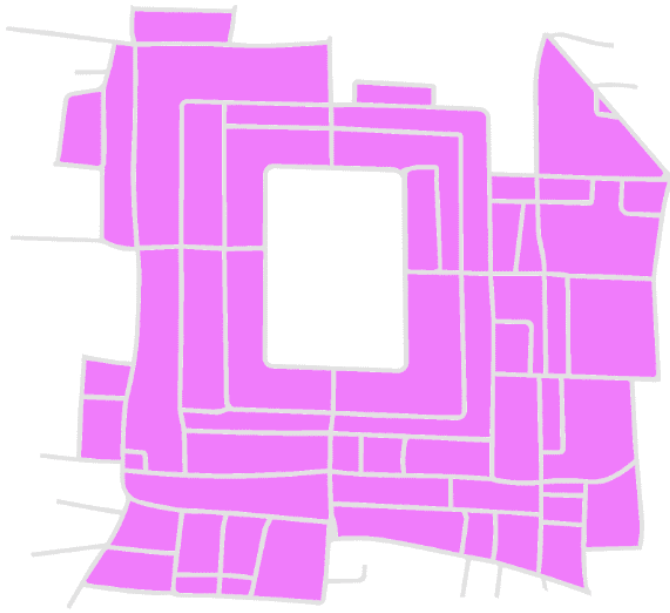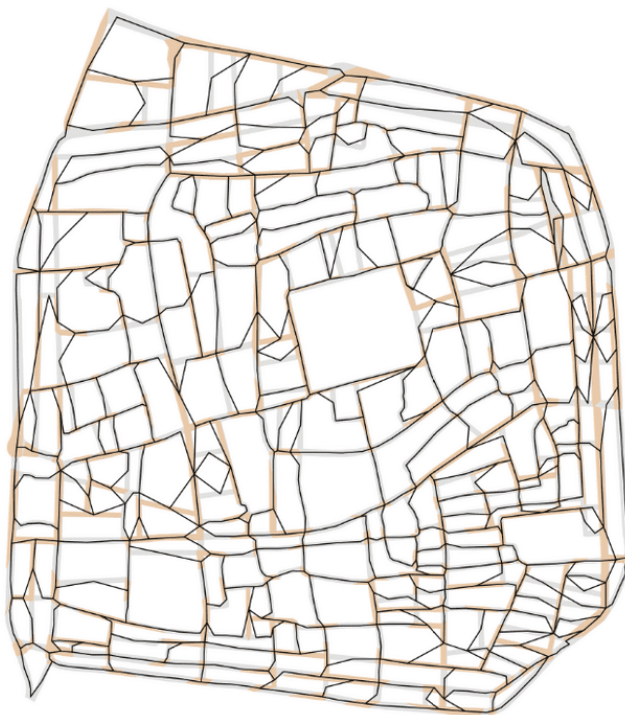Figure 73: Madurai link line map

(Source: Author, 2020)
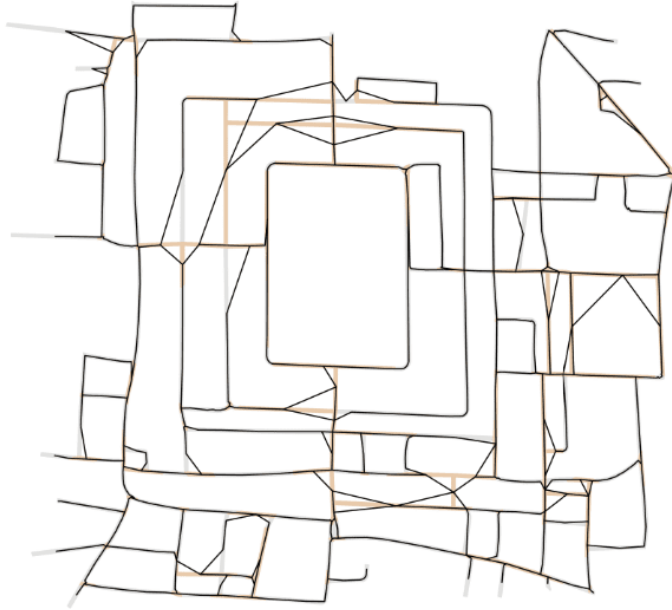
Figure 74: Srirangam link line map

(Source: Author, 2020)
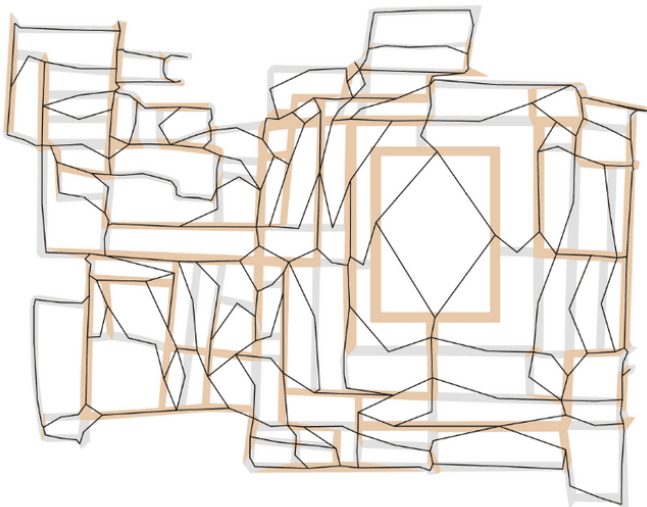


Figure 75: Chidambaram link line map

(Source: Author, 2020)

The table below shows the number of link lines

Table 12: Link line

| Factor | Madurai | Srirangam | Chidambaram |
|---|---|---|---|
| No. of link lines | 1293 | 667 | 407 |

(Source: Author, 2020)

According the observations from Table 11 Madurai exbhibits a high number of link lines in response to the dense street network.

### 10.2.5 D-spaces

Spaces shared among rings are called d-spaces; a higher ratio of d-spaces enclosed the rings is indicative of the number of connections between rings, or more transitions (Hillier and Hanson, 1984).



Figure 76: D-spaces in Madurai map

(Source: Author, 2020)



Figure 77: D-spaces in Srirangam map

(Source: Author, 2020)
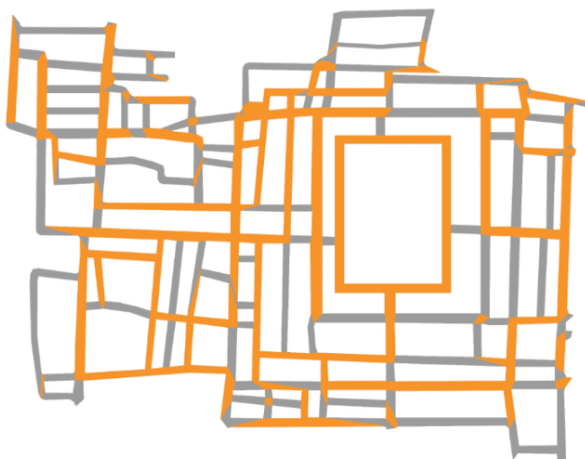


Figure 78: D-Spaces in Chidambarm map

(Source: Author, 2020)

The table below shows the number of D-Spaces

Table 13: D-Spaces

| Factor | Madurai | Srirangam | Chidambaram |
|---|---|---|---|
| No. of D-Spaces | 366 | 139 | 141 |

(Source: Author, 2020)

According the observations from Table 11 Madurai exbhibits a high number of D-spaces indicting ringiness in street structure.

## 10.2.6 Mean convex space ($\frac{y}{C}$)

$\frac{y}{C}$ is a measure for mean convex space where y indicates the open area and C indicates the number of convex spaces. It represents the average use of convex space. Higher values indicate a more formal settlement, attributed to larger convex spaces (Holanda, 1997). The table below shows the measure of Mean convex space

Table 14: Mean convex space

| Factor | Madurai | Srirangam | Chidambaram |
|---|---|---|---|
| Measure of open area (y) | 545524 | 143440 | 584018 |

| No.on Convex spaces | 1051 | 595 | 321 |
|---|---|---|---|
| Mean convex space $(\frac{y}{C})$ | 519.05 | 241.07 | 1819.37 |

(Source: Author, 2020)

As shown in the table 8 the the mean convex space unit of Chidambaram is high when compared to the other two cites which indicates that Chidambaram exhibits a higher degree of formal settlement when compared to Srirangam and Madurai.

### 10.2.7 Space-link ratio (SLR)

SLR $=\frac{Li+1}{C}$ computes the ratio of edge counts in a j-graph to the number of edges required for a perfect tree structure. The SLR value of 1 signifies a perfect tree structure, while values greater than 1 indicate a ringed structure, and higher values indicate a ringier one. The table below shows the SLR value. (SLR) (Hillier and Hanson, 1984)..

Table 15: Space-link ratio (SLR)

| Factor | Madurai | Srirangam | Chidambaram |
|---|---|---|---|
| Convex spaces (C) | 1051 | 595 | 321 |
| Link (Li) | 1293 | 667 | 407 |

| Space-link ratio (SLR) | 1.23120837 | 1.1226890 | 1.2710280 |
| --- | --- | --- | --- |

(Source: Author, 2020)

As shown in the table 8 the spatial pattern of all the three cities exhibits ringiness characteristic in response to the circumumbulatory street structure.

## 10.2.8 Transivity (TS)

In order to analyze the degree of interconnection among rings, the study measures the proportion of spaces in the layout that are open spaces, usually referred to as 'transivity'. TS = $\frac{D}{C}$, where C indicates the number of convex spaces and D indicates the number of d-spaces (Hillier and Hanson, 1984).

Table 16: Transivity

| Factor | Madurai | Srirangam | Chidambaram |
| --- | --- | --- | --- |
| No. of D-Spaces | 366 | 139 | 141 |
| Convex spaces (C) | 1051 | 595 | 321 |
| Transivity (TS) | 0.348239771 | 0.233613445 | 0.43925336 |

(Source: Author, 2020)

As shown in the table 8 the spatial pattern of all the three cities exhibits low Transivity characteristic in response low interconnections among the rings.

## 10.2.9 Axial articulation

Axial articulation is measured to majorly understand the visibility access from one point to another point. As shown in the figure 35a there is a break in the visual access in response to urban geometry whereas in figure 35b there is a clear visual access as denoted by a single axial line (Hillier and Hanson, 1984).
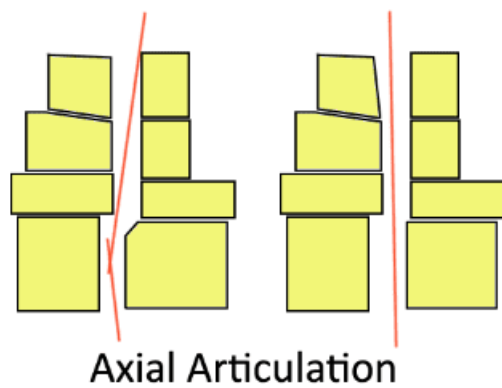


Figure 79 : Axial articulation

(Source: Author, 2020)

As specified earlier continues axial lines denote uninterrupted visual access. The formula for calculating the Axial articulation is by dividing the number of axial lines by the number of buildings (Hillier and Hanson, 1984).

$$Axial\ articulation = \frac{Axial\ lines}{the\ number\ of\ buildings} = \frac{L}{B}$$

Table 17 : Axial articulation table

| Factor | Madurai | Srirangam | Chidambaram |
|---|---|---|---|
| No. of axial lines | 335 | 154 | 103 |

| No. of buildings | 5237 | 1979 | 1879 |
|---|---|---|---|
| Axial articulation | 0.063967921 | 0.077935223 | 0.054816 |

(Source: Author, 2020)

The higher value of axial integration is observed in areas with higher deformation of urban geometry or with more number of convex spaces while the lower value indicates areas with more visual access. As per the observation in Table 9 the three cities exhibit a very low axial articulation value indicating a high degree of visual access.

## 10.2.10 Convex articulation

Convex articulation is calculated to understand the extent to which the open area polygons are broken to get convex spaces. As shown in the figure 38a exhibits high degree of deformity when compared to figure 38b.

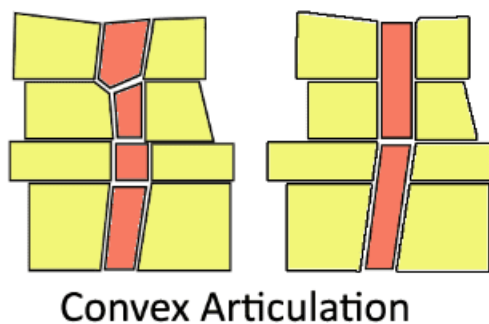

Figure 80 : Convex articulation

(Source: Author, 2020)

The formula for calculating the convex articulation is by dividing the number of convex spaces by the number of buildings (Hillier and Hanson, 1984).

Convex articulation $= \dfrac{Convex\ spaces}{the\ number\ of\ buildings} = \dfrac{C}{B}$

Table 18 : Convex articulation table

| Factor | Madurai | Srirangam | Chidambaram |
|---|---|---|---|
| No. of convex spaces | 1051 | 595 | 321 |
| No. of buildings | 5237 | 1979 | 1879 |
| Convex articulation | 0.200687416 | 0.30111336 | 0.170836 |

(Source: Author, 2020)

A higher value of convex articulation indicates a higher degree of deformity while the lower value indicates the more synchrony. Based on the observation in Table 10, the three cities have a very low convex articulation value, indicating a high level of synchrony.

## 10.2.11 Convex deformation

Convex deformation is quantified to understand the deformity of the urban form. The value of convex deformation depends on the structure of the island spaces, where an island space is a group of building blocks surrounded by island spaces. As shown in figure 70a it has more convex spaces when compared to figure 70b in response to the geometry of the island spaces.

The formula for convex deformation

*Convex deformation* $= \dfrac{number\ of\ Convex\ spaces}{no.of\ Islands} = \dfrac{C}{I}$

Where,

$C$ is number of convex spaces and $I$ is the number of islands. (Hillier and Hanson, 2003).



Convex Deformation
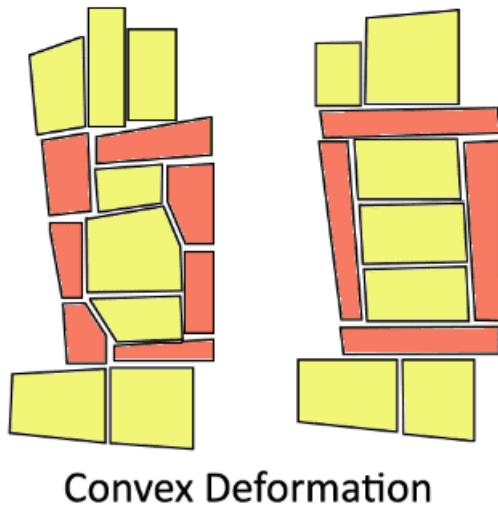
Figure 81 : Convex deformation

(Source: Author, 2020)

Table 19: Convex demormation table

| Factor | Madurai | Srirangam | Chidambaram |
|---|---|---|---|
| No. of convex spaces | 1051 | 595 | 321 |
| No. of island spaces | 255 | 81 | 87 |
| Convex deformation | 4.1215 | 7.3456 | 3.6896 |

(Source: Author, 2020)

A higher value of convex deformation indicates a higher degree of deformity while the lower value indicates the more synchrony. As per the observation in Table 10 the three cities exhibit a very low axial articulation value indicating a high degree of visual access.

## 10.2.12 Grid Convexity

Grid convexity is calculated by overlapping the city map over an orthogonal grid and measuring the extent of distortion. As the orthogonal grid has least number of convex space divisions, it is considered as ideal grid convexity value. The grid convexity is measured relative to the orthogonal grid of that particular space, where a high value indicates low distortion while a low value indicates high degree of distortion. In the figure 40a the space higher distortion when compared to the figure 40b which orthogonal grid mapping for a given space.



Figure 82 : Grid Convexity

(Source: Author, 2020)
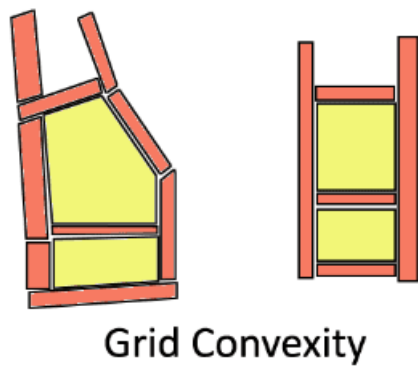
The formula for calculating grid convexity is Total Square of root of Island spaces added to 1 and value added to 2 and the total value divided by convex spaces.

Table 20 : Grid convexity table

| Factor | Madurai | Srirangam | Chidambaram |
|--------|---------|-----------|-------------|
|        |         |           |             |

| No. of convex spaces | 1051 | 595 | 321 |
|---|---|---|---|
| No. of island spaces | 255 | 81 | 87 |
| Grid convexity | 0.273965213 | 0.168067227 | 0.332258 |

(Source: Author, 2020)

The historical temple city fabrics of South India have synchronous frameworks manifesting common reflections with complex grid systems and constitute higher synergy and intellibility than regular grid and iron frameworks.

The higher value of grid convexity is observed in areas with less distortion of urban structure or with less number of convex spaces while the lower value indicates areas planed organically.

## 10.2.13 Grid Axiality

Grid axialiity value exhibits the visual access value between the convex spaces. Grid axiality is measured by comparing the city map to the orthogonal grid of the same space, as it has ideal visual access. The value of grid axiality is between 0 and 1, where the orthogonal grid has a grid axiality value of 1. As shown in the figure 41a the grid axiality is compared to figure 41b with gird axiality value of 1. Hence a space with values close to one has high visual access among the convex spaces as it has less orthogonal deformity.

Grid axiality = $\frac{(\sqrt{I} \, X \, 2) + 2}{L}$

where I is the number of islands and L is the number of axial lines
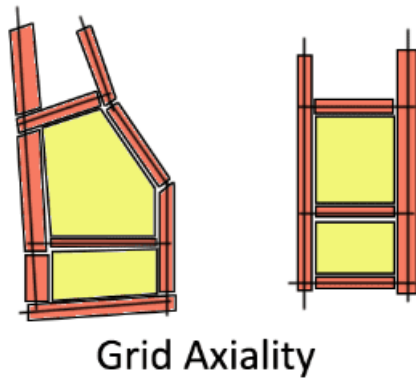
Grid Axiality

Figure 83 : Grid axiality

(Source: Author, 2020)

The formula for calculating grid convexity is root of Island spaces multiplied by 2 and value added to 2 and the total value divided by axial lines.

Table 21 : Grid axiality table

| Factor | Madurai | Srirangam | Chidambaram |
|---|---|---|---|
| No. of axial lines | 335 | 154 | 103 |
| No. of island spaces | 255 | 81 | 87 |
| Grid axiality | 0.059608118 | 0.084415584 | 0.129392 |

(Source: Author, 2020)

The higher value of grid axiality is observed in areas with high degree of visibility access as it has less continuous axial lines of urban structure or with less convex spaces while the lower value indicates areas with more broken axial lines.

## 10.2.14 Axial Integration

Axial integration is measured to understand the deformity of the building foot print that leads to broken visual access. It is computed by dividing the number of axial lines by the number of convex spaces, where the high level of axial integration is indicated by low value and vice versa (Kubat, 1997). As shown in figure 42a there is broken visual when compared to figure 42b.
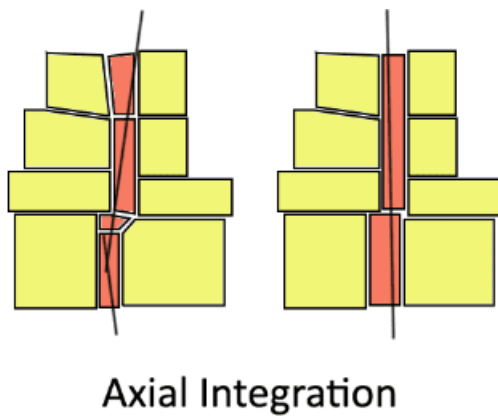


Figure 84 : Axial Integration

(Source: Author, 2020)

Axial integration = $\dfrac{number\ of\ Axial\ lines}{number\ of\ Convex\ spaces} = \dfrac{L}{C}$

where L is the number of axial lines and C is the number of convex spaces.

Table 22 : Grid integration of three cities

| Factor | Madurai | Srirangam | Chidambaram |
|--------|---------|-----------|-------------|
|        |         |           |             |

| No. of axial lines | 1051 | 595 | 321 |
|---|---|---|---|
| No. of convex spaces | 255 | 81 | 87 |
| Grid integration | 0.318744053 | 0.258823529 | 0.320872 |

(Source: Author, 2020)

## 10.2.15 Curvature

The form of streets and its approximation to a straight line is determined by curvature. This helps in understanding the geographic orientation and functions as an indicator to identify the degree of street-grid formation. Curvature focuses on relative curvature of the grid unlike grid axiality that aims only on the gird approximation measure (Omer and Goldblatt, 2015). Curvature is measure by dividing the number axial lines to the number of streets. Therefore, higher the measure higher curvature is possessed by the street and less measure indicates a straighter street.

$$\text{Curvature} = \frac{number\ of\ Axial\ lines}{number\ of\ Streets} = \frac{L}{S}$$

Where, L is the number of axial lines and S is the number of streets.

Table 23 : Grid curvature of three cities

| Factor | Madurai | Srirangam | Chidambaram |
|---|---|---|---|
| No. of axial lines | 1051 | 595 | 321 |
| No. of streets | 204 | 99 | 113 |

| | 121 | 21 | 66 |
|---|---|---|---|
| No. of grid streets | | | |
| Curvature | 5.151960 | 6.010101 | 2.840707 |
| Grid curvature | 8.6 | 28.3 | 4.86 |

(Source: Author, 2020)

As shown in the table 14 Srirangam is observed with higher value of grid curvature and is observed with high degree of visibility than Mudurai and Chidambaram.

## 10.2.16 Axial ringiness

Axial ringiness refers to the number of islands or rings in an axial map and is calculated by computing $\frac{I}{2L-5}$, where L stands for the number of axial lines and I stands for the number of islands. As per writings of Hiller if the Axial ringiness value is above 0.25 then the settlement exhibits a grid system.

Table 24: Axial ringiness

| Factor | Madurai | Srirangam | Chidambaram |
|---|---|---|---|
| No. of axial lines | 1051 | 595 | 321 |
| No. of islands | 255 | 81 | 87 |
| Axial ringiness | 0.383458647 | 0.267326733 | 0.432836 |

(Source: Author, 2020)

As shown in the table 24 Axial ringiness is above 0.25 for all the three temple cities which indicates that the cities exhibit a strong grid sytem of planning.

## 10.2.17 Convex ringiness

Convex ringiness measurement derives from the spatial properties inherent in y-graphs. It measures how many rings or circuits are actually present in a spatial arrangement as a percentage of the maximum number of planar rings that could be generated with the spaces in the settlement. Convex ringiness is calculated by computing $\frac{I}{2C-5}$, where C is the number of axial lines and I is the number of islands. A low convex ringiness indicates more grid like settlement.

Table 25: Convex ringiness

| Factor | Madurai | Srirangam | Chidambaram |
|---|---|---|---|
| No. of convex spaces | 1051 | 595 | 321 |
| No. of islands | 255 | 81 | 87 |
| Covex ringiness | 0.121602289 | 0.06835443 | 0.136578 |

(Source: Author, 2020)

As shown in the table 24 Convex ringiness is low for all the three temple cities and specifically for Srirangam which indicates a strong grid sytem of planning.

## 10.2.18 Space syntax calculation by whorls

The land use pattern in these cities is defined according to the occupational hierarchy of the residents, therefore by calculating the built footprint the study analyzes the population density relative to the socioeconomic land use pattern. According to the writings of Smith, the degree of planning is high in the core and gradually decreases outward, since the core is responsible for a majority of a city's functions. It is in the core, that the character of the entire city is expressed and becomes the basic identity of the city. Specifically, the study quantifies the spatial planning of each whorl and measures the degree of planning through comparative analysis.
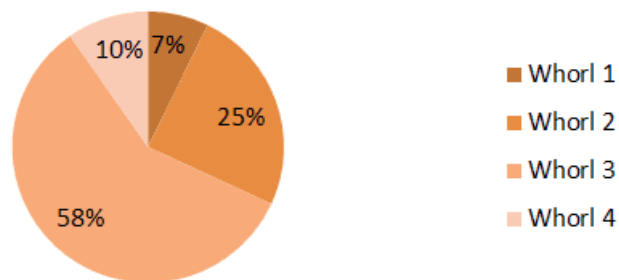
## Madurai built foot print



Figure 85 : Madurai built foot print

Source: Author, 2020 (developed using Microsoft excel)

Table 26 : Madurai whorl wise spatial analysis

| Factor | Whorl 1 | Whorl 2 | Whorl 3 | Whorl 4 |
|--------|---------|---------|---------|---------|
| Convex spaces | 99 | 267 | 643 | 246 |
| Island spaces | 18 | 43 | 148 | 44 |

| | | | | |
|---|---|---|---|---|
| Axial lines | 34 | 75 | 188 | 85 |
| Buildings | 377 | 1287 | 3047 | 508 |
| Streets | 27 | 45 | 125 | 48 |
| Grid street | 22 | 36 | 82 | 46 |
| Axial Integration | 0.34 | 0.28 | 0.29 | 0.34 |
| Grid Convexity | 0.27 | 0.21 | 0.26 | 0.23 |
| Grid Axiality | 0.24 | 0.14 | 0.08 | 0.21 |
| Convex ringiness | 0.09 | 0.08 | 0.11 | 0.09 |
| Axial ringiness | 0.28 | 0.29 | 0.39 | 0.26 |
| Axial articulation | 0.09 | 0.05 | 0.06 | 0.16 |
| Convex articulation | 0.26 | 0.20 | 0.21 | 0.48 |
| Convex deformation | 5.5 | 6.20 | 4.34 | 5.59 |
| Curvature | 1.54 | 2.08 | 2.29 | 1.84 |

# Srirangam built foot print
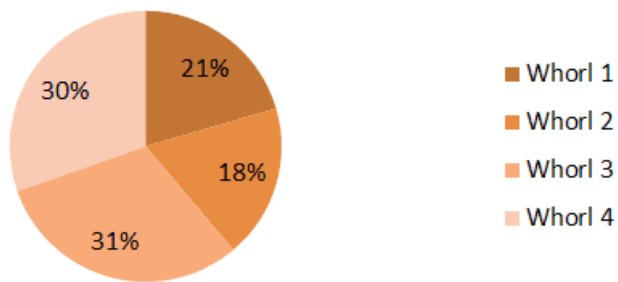


Figure 86 : Srirangam built foot print

Source: Author, 2020 (developed using Microsoft excel)

Table 27 : Srirangam whorl wise spatial analysis

| Factor | Whorl 1 | Whorl 2 | Whorl 3 | Whorl 4 |
|---|---|---|---|---|
| Convex spaces | 78 | 88 | 213 | 359 |
| Island spaces | 5 | 6 | 17 | 31 |
| Axial lines | 17 | 15 | 47 | 117 |
| Buildings | 406 | 364 | 611 | 602 |
| Streets | 13 | 13 | 28 | 76 |
| Grid streets | 13 | 12 | 25 | 67 |
| Axial Integration | 0.21 | 0.17 | 0.22 | 0.03 |
| Grid Convexity | 0.13 | 0.13 | 0.12 | 0.12 |
| Grid Axiality | 0.36 | 0.42 | 0.17 | 0.86 |
| Convex ringiness | 0.03 | 0.03 | 0.04 | 0.04 |

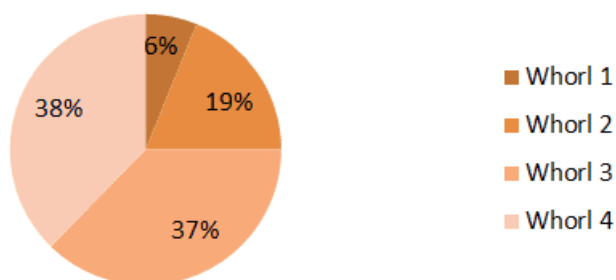| | | | | |
|---|---|---|---|---|
| Axial ringiness | 0.17 | 0.24 | 0.19 | 1.82 |
| Axial articulation | 0.04 | 0.04 | 0.07 | 0.01 |
| Convex articulation | 0.19 | 0.24 | 0.34 | 0.59 |
| Convexdeformation | 15.6 | 14.6 | 12.5 | 11.5 |
| Curvature | 1.3 | 1.25 | 1.88 | 1.74 |



Figure 87 : Chidambaram built foot print

Source: Author, 2020 (developed using Microsoft excel)

Table 28 : Chidambaram whorl wise spatial analysis

| Factor | Whorl 1 | Whorl 2 | Whorl 3 | Whorl 4 |
|---|---|---|---|---|
| Convex spaces | 23 | 69 | 159 | 172 |
| Island spaces | 4 | 17 | 34 | 31 |

| | | | | |
|---|---|---|---|---|
| Axial lines | 12 | 22 | 49 | 57 |
| Buildings | 119 | 364 | 723 | 730 |
| Streets | 12 | 27 | 54 | 63 |
| Grid street | 12 | 20 | 38 | 41 |
| Axial Integration | 0.52 | 0.31 | 0.30 | 0.33 |
| Grid Convexity | 0.39 | 0.38 | 0.29 | 0.25 |
| Grid Axiality | 0.50 | 0.36 | 0.20 | 0.16 |
| Convex ringiness | 0.09 | 0.12 | 0.10 | 0.09 |
| Axial ringiness | 0.21 | 0.43 | 0.36 | 0.28 |
| Axial articulation | 0.10 | 0.06 | 0.06 | 0.07 |
| Convex articulation | 0.19 | 0.18 | 0.21 | 0.23 |
| Convexdeformation | 5.75 | 4.05 | 4.67 | 5.54 |
| Curvature | 1 | 1.10 | 1.28 | 1.39 |

Open space systems characterized by high axial-ringiness and convex-ringiness result in distributedness. Where the term distributedness describes the properties that are generated solely by arranging an equal number of cells rather than by superimposing one or more superordinate cells on the cells to be distributed. All the three cities exhibit low riginess which indicates a nondistributedness charecterestic implying to a complex overlayed spatial pattern. As seen from the comparison, it is highly peculiar for temple

towns to have the large temple complex located in the middle of the city grid. This is determined by the principle of centrality, which states that the space surrounding such a centrally located structure is less integrated. In spite of this, the temple is situated at its highest symbolic visual axis, so it can be seen from many different angles.
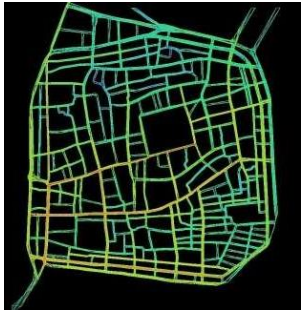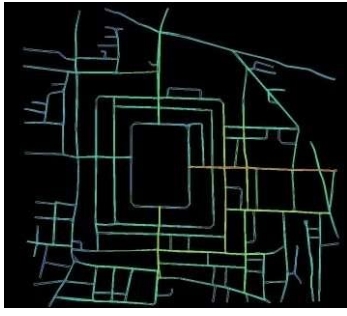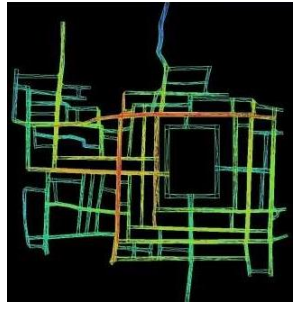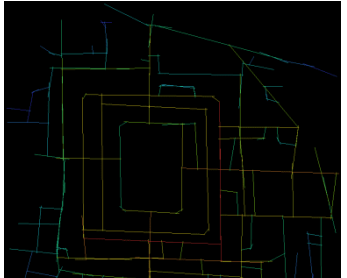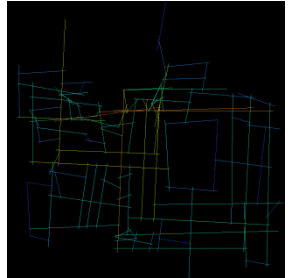
'Whorl 1' in all three cities exhibits low convex deformation, axial ringiness, curvature, and convex ringiness, and high grid axiality and grid convexity indicating a higher level of planning and visual accebility.

### 10.2.19 Integration

One of the most significant concepts of space syntax is integration. The technique allows to exhibit integration in mathematical components. These values are based on the arrangement of the urban pattern. The value of integration is achieved by computing the mean number of lines that change the direction to aces the route path. Therefore, integration is considered a syntactic accessibility but not metric. Furthermore, depth is used to show the spacing between the line rather than distance. Every axial line in the spatial structure has a certain depth value with every other line. Integration values are based on relative depth values. It was assumed that the spread of integration values across space corresponds to the patterns of movement within an area. Spatial arrangements can be distinguished using various levels of integration. The quality of an urban space can be determined by the measure of integration. By computing the segregated and integrated parts of the settlement, it is feasible to understand how a new design idea is going fit in the existing spatial structure.

Table 29 : Spatial integration analysis of three cities

| City | Madurai | Srirangam | Chidambaram |
|------|---------|-----------|-------------|
|  |  |  |  |
| |  |  |  |
| Mean integration | 1.91 | 1.14 | 1.99 |
| Street with highest integration | 3.03- South Chittarai road extended to Netaji road | 1.79- East Adyavalanjan street<br><br>1.69- VOC street ot Manikkampillai street | 3.67-Gayatri Amman Koli Street<br><br>3.38- Periya Vania street extended to Ilamaiyaakinaar koil *street*<br><br>3.33- North car street |

According to the observtions of table 18 the street pattern in the temples streets consist of concentric circles around a temple complex. Straight axial streets intersecting the concentric street pattern connect the innermost center of the temple complex with its outer

edges. Furthermore, the arrangement of thin blocks with back-to-back plot configurations results in er inner tertiary residential streets, thus creating a high level of integration. As a result, all the three temple towns have high integration values, with Chidambaram streets ranking the highest.

## 10.2.20 Connectivity

A connectivity index is an indicator that indicates the pattern of an urban grid, with lower values being attributed to nonorthogonal grids. It is an important component of axial maps as it exibits the number of lines connecting to each other or intersecting a given line. Through comparitative analysis the study analyses the streets with maximum connectivity.

Table 30 : Spatial connectivity analysis of three cities

| City | Madurai | Srirangam | Chidambaram |
|------|---------|-----------|-------------|
|  |  |  |  |
| |  |  |  |

| Mean Connectivity | 8.74 | 4.01 | 6.26 |
|---|---|---|---|
| Street with connectivity | 29- South Chittarai road extended to Netaji road<br><br>28- West Vadampokki street<br><br>28- S Marret street | 13- Street perpendicularly connecting East Uttrai street and Nelson road.<br><br>12- Singer Kovil street | 24- Gayatri Amman Koli Street<br><br>21- Periya Vania street extended to Ilamaiyaakinaar koil *street*<br><br>21- North car street |
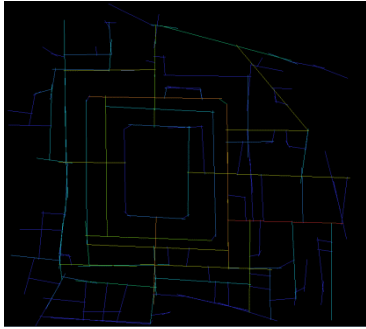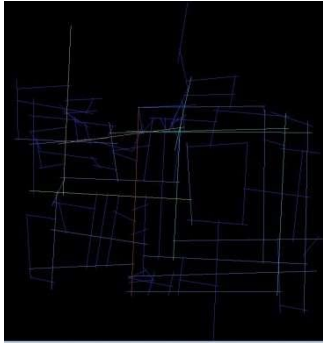
As per the connectivity spatial ananlysis Madurai exhibits streets with high degree of connectivity in response to its dence street network. As Madurai is a commercial city the street network follows tributatry road sytem which provides privacy to the residents and quick accebility to the tourists.

## 10.2.21 Choice

Choice indicates the probability of encountering an axial line or a street segment on every shortest route within or beyond a predetermined radius of every space within the entire system (Hillier, 1999).

Table 31 : Spatial choice analysis of three cities

| City | Madurai | Srirangam | Chidambaram |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Mean Choice | 1041.54 | 674.19 | 228.32 |
| Street with highest choice | 23835- South Chittarai road extended to Netaji road | 4251- Singer Kovil street | 2648- Periya Vania street extended to Ilamaiyaakinaar  2081- Gayatri Amman Koli Street |
| | | | |
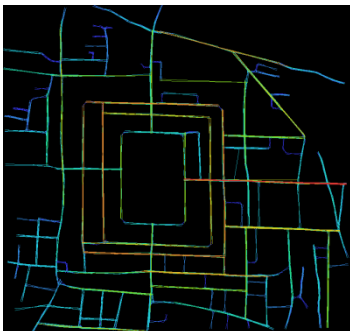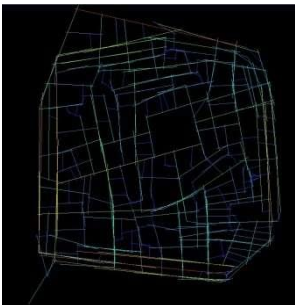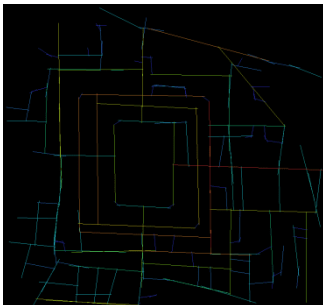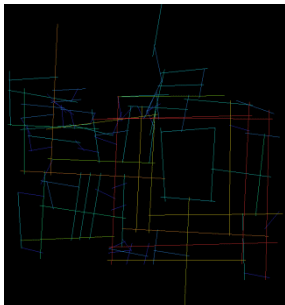
As per the observations from table 20 South Chittarai Road of Madurai exhibits highest choice value as it is caters both cultural and commercial activity. South Chittarai road of Madurai hosts the maximum commercial activity as well the serces as the platform

for the most import Chittari festive procession. Singer Kovil Street as well as Periya Vania street function as the prime commercial streets of the cities.

## 10.2.22 Longest line

According to the definition of the longest line, it represents the length of the longest straight line connecting two points in space.

Table 32 : Relative longest line analysis

| City | Madurai | Srirangam | Chidambaram |
|---|---|---|---|
|  |  |  |  |
| |  |  |  |
| Average length | 256.52 | 207.45 | 354.07 |
| Street with | 1085.7- S Marret street<br><br>1010.1- Tamil Sangam road- NH85 | 693.21- street perpendicularly | 1038.54- VOC street |

| highest length | | connecting East Uttrai street and Nelson road. 668.07- East Adyavalanjan street | 1029.60- Periya Vania street extended to Ilamaiyaakinaar 1025.19- S.P. Kovil street |
|---|---|---|---|
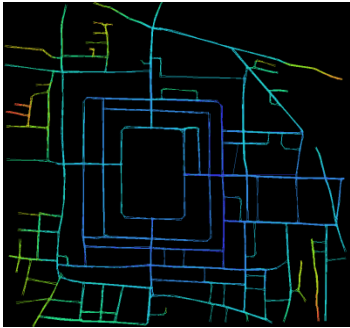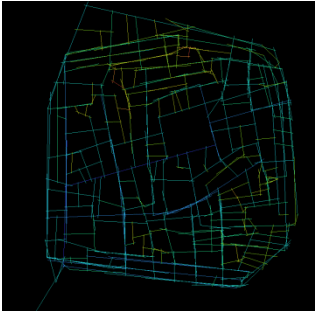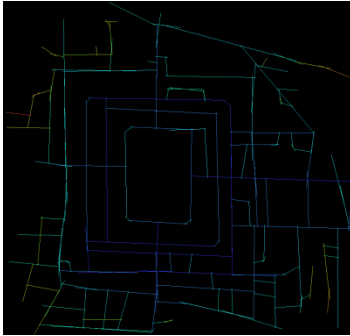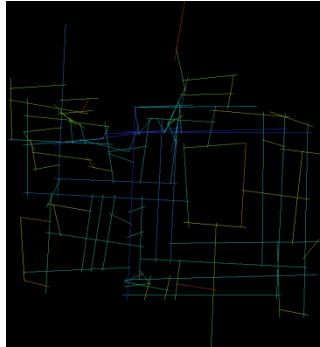
Typically, temple town patterns consist of long lines that connect the periphery and the center, with other long lines on the periphery. Within 50% of the longest lines classified according to histological axial and concentric streets, the center is directly connected to the peripheral areas by at least one line. Interestingly, and in contrast to other towns, a majority of these long lines intersect at right angles in temple towns (Hillier, 1999). As per the observations from Table 21 the streets associated with the outermost whorl exhibit high values as the outer whorl streets are relatively longer than than the streets of other whorls as well as the cardinal streets that connect the centre to the periphery. Long lines are typically bracketed with obtuse angles of incidence. Only towns designed to express power symbolically have long lines that strike building facades at a right angle (Hillier, 1996). Similarly, the axial lines in the temple towns in Tamil Nadu are framed at right angles to the temple Gopuram, making for very imposing views from the streets of the Gopurams.

### 10.2.23 Mean depth

In order to calculate mean depth, each space is assigned a depth value based on how far it is from the origin, and then summation and division by the total number of spaces minus one generate the result (the origin).

Table 33 : Relative mean-depth analysis

| City | Madurai | Srirangam | Chidambaram |
|---|---|---|---|
|  |  |  |  |
| |  |  |  |
| Average mean depth | 4.11 | 5.34 | 2.91 |
| Street with lowest mean depth | 2.91- South Chittarai road extended to Netaji road<br><br>3.12- TPK road | 3.65- East Adyavalanjan street<br><br>3.80- VOC street ot Manikkampillai street<br><br>3.92- Thiruvalluvar strrt extendend into Sathara street | 2.13- Gayatri Amman Koli Street<br><br>2.22- Periya Vania street extended to Ilamaiyaakinaar<br><br>2.27- North car street |

According to the observations from Table 22 the streets exhibit high connectivity to the temple which is situated at the central core of streets.

In the study, the urban genotype of Hindu sacred spaces as an influence on the spatial configuration of South Indian temple cities is compared. These cities exhibit a high level of axiality, a traditional settlement pattern with a great level of spatial synchrony, and a strong degree of connectivity with highly organized structures centered on the temple.

## 10.3 Inference

Three key characteristics of these cities are: high axiality, spatial synchrony within regular settlement patterns, and high connectivity with highly discernible structures formed by integrated cores centered around temples. A temple town's functional center, which is geometrically, topologically, and conceptually, is not isolated from its main temple complex as it is with most symbolic cities. Because of this uniqueness, conservation strategies in these cities present enormous challenges.

As explained in the previous section, Ancient Indian planning structures resulted in certain geometries or spatial orders within the three temple cities. This paper focuses on the experience and use of cities by their inhabitants outside of their cosmological significance. It is interesting to consider how these geometries function outside of their cosmological significance. By arranging space in an ordered manner, cities are structured. This study uses the following questions as a guide to explore how these three temple cities developed their spatial DNA. What were the impacts of such movements on land use and activity distribution? How did parts and wholes relate to each other? Since cities are often modeled after society, how did this spatial system facilitate navigation? The goal of this

spatial analysis is to determine how social hierarchy manifested. Furthermore, how does the location of urban elements in a spatial network reflect the social system at the time?

In spite of being situated in the middle of concentric streets, the temple does not seem to be the most integrated space within the system, according to a spatial accessibility analysis of the three cities. The most integrated space in the city, however, is the third whorl street connecting to the main gopuram. Further, the study suggests that external connections to the main city are mostly made through the outermost whorl streets, while internal connections are mostly made through the third whorl streets. In this study, choice value is correlated with commercial activity. It is evident from the overlap of highly chosen routes on the current land use plan that most of the city's commercial activity has occurred along highly chosen routes. Moreover, there is some evidence that street trade has been influenced by the scale of movement. It is interesting to note that choice value has a correlation with commercial activity. As indicated by the overlapping of highly selected routes on the current land use plan, most of the city's commercial activity occurs along highly chosen routes. Moreover, there is some evidence that the scale of movement contributed to the characteristics of street trade.

The spatial analysis indicates that the traditional South Indain temple layouts appear in symmetric order, which refers to spaces connected to the temple (root space) directly. In contrast, the modern house layouts appear in asymmetric order and refer to all spaces in these layouts that are arranged in a linear sequence away from the original space. In the case of traditional house layouts, the overall spaces are more segregated than the overall spaces in the case of modern house layouts.

The historic cores of these three temple towns remain integral parts of the entire system in a spatial model of the three temple towns today. According to the spatial accessibility analysis, streets in the third and fourth whorls are well chosen as external throughfares since they are highly integrated into the spatial structure and become central to the urban space. In addition to these factors, they also prevent a lot of traffic entering the temple complex, which contributes to a flourishing commercial activity along these streets.

Observing the spatial perspective of the current temple cities, it becomes evident that a significant portion of the city center is still an integral part of the whole system, a part that is also highlighted as the most integrated part of the entire urban system. According to a spatial accessibility analysis conducted by the city, the streets in the third and fourth whorls are designed in a way that is conducive to serving as external throughways. These factors have led to the development of commercial activity along these streets, as well as the impediment of heavy traffic flowing close to the temple complex as a result.

## 10.4 Visual theoretical understanding

Urban environments are highly complex systems with multi-layered built frameworks that operate with different building codes. Specifically in the historical domain new urban design developments are imposed with additional restrictions in order to preserve the historical favour of the place. Urban regulations are designed viewing multiple perspectives addressing various platforms of sustainability, these regulations very from city to another city. City planners and urban designers solve the complex urban issues by designing certain building codes in response to economic, social and physical factors. These codes are designed with reference to theoretical urban models with geometrical diagrams as an attempt to evaluate results by exploring possible solutions. The 2-dimensional

representations of urban space are often equipped with deficiencies in terms of understanding the building proportions. For instance it is difficult to analyse the urban volume through a 2-dimensional illustration. A physical model on the other hand cannot give accurate propositions owing to its small scale in representing the whole urban area. Therefore the conventional methods, of perceiving the physical space are not powerful in analysing the urban spaces and its interactive web (Chan, 2002).

As discussed earlier the major aspect of concern for the historical cities is preservation of the historical character. Protecting views of heritage buildings and landmarks is a key aspect of preserving the character of historic towns. These historic buildings contribute greatly to the image of the heritage town. The once celebrated views capes are heavily altered in response to the rapid growing built densities in the central cores of the cities.  These landmarks which once stood at the prime locations and dominated their surroundings, however, their current state of their visibility is jeopardized due to a variety of factors obstructing it.

As per the writings of LeBlanc (2008: 8): "*Views play an important part in shaping our appreciation and understanding of historic environment, in towns and cities and in the countryside. Some views are designed to be seen as a unity, more commonly, a significant view is an historical composite, the cumulative result of a long history*". Edmund Bacon (2005) in his work Design of Cities elaborates on the importance of sight lines and how the Italian hill towns have been influenced by the concept of lines of vision and planned in response to it. The hill towns of Italy have deigned based on the visual framework locating the focal points of vision over the prominent locations of the towns. This has been further illustrated by Doxiadis (1972) is his work Architectural Space in Ancient Greece where he

decodes the arrangement of the ancient Greek complexes with visual geometry. He focuses on how orientation and positioning of the building are worked with respect to the angles of vision. According to Doxiadis the experience of the visitor in the ancient Greek complex is greatly supported by the visual narrative. As per his diagrams the planning system is designed in response to the shifting visual co-ordintes with reference to a specific pole or view point and the positioning and orientation of the buildings in line to the angles of vision with respect to the angle of vision (Doxiadis, 1972).
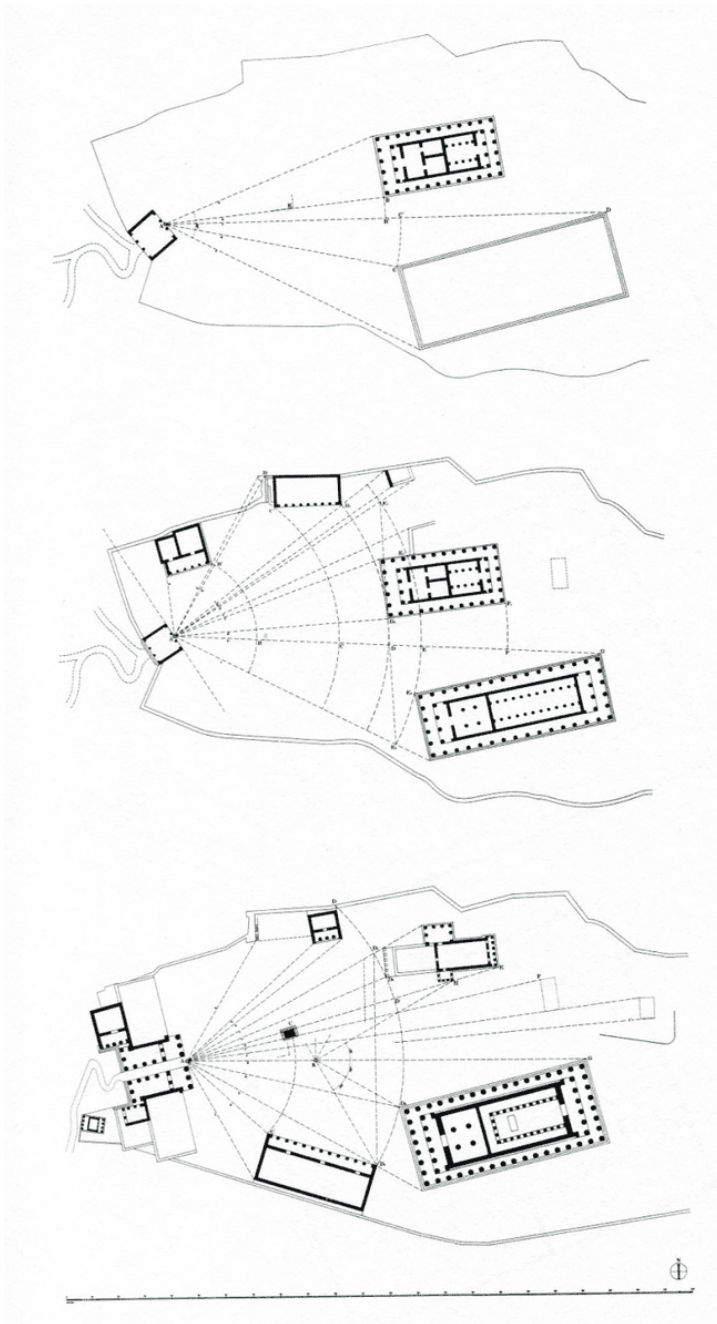
Figure 88 : Athens, Acropolis I (ca. 530 BC), Acropolis II (ca. 480 BC), & Acropolis III (after 450 BC)

Source: Doxiadis, 1981

This section will introduce to different domains of visual study that have been employed in previous research works to understand how visual connectivity plays effects the image of the city.

### 10.4.1 Visual experience of historical townscape

According to Conzen historical townscape helps in visually experiencing the temporal social activities. In the study of a historical city, the city block acts as a fundamental unit of the city representing its character on a smaller scale.  The pattern of the historical city is decoded firstly by identifying the prime urban structures, secondly analysing their hierarchical position and then the interconnection between them. This forms the genetic code of the city which decides its form and pattern.

Muratori in his work exhibits two fundamental hypotheses: historical evolution stages are to be analysed to understand the urban structure and the basis for an urban form are built urban form and typology (Djordjevic and Vujic, 2010). On the similar note Rossi acknowledges Caniggia's perspective and states that urban morphology is a strong rationale that can be clearly analysed by the level of urban artefacts (Rossi, 2007).

### 10.4.2 Reflection of urban form on architecture

On the other hand, a French school of thought focuses on the relationship between city and its architecture (Whitehand, 2007). A compact traditional block inherits the characteristics of a traditional city and exhibits the different layers of growth. The front side of the city block opens on to the city and represents the flavour of the traditional city, while the back side of the city block is more private and carries an independent flavour. As the fresh layers of development are added to the fabric of traditional city the difference between the back side and front side of the city block gradually disappear privatising the whole block with an independent character. This weakened the relation between architecture and urbanism resulting in the rise of a new concept: urban form of a city block

where architectural typology and urban morphology are heavily disconnected (Nikovic, Djokic and Maric, 2014). The physical detachment of residences from the streets is defined as "ruptured interfaces" by Hanson. This phenomenon has transformed 'all neighbours' to 'no neighbours', which has changed the idea of street to an estate (Hanson, 2000). According to George Banz the modern city consists of two domains which are non-space and private space, where the non-spaces are the neglected spaces which no link to the urban tissue (Banz, 1970). These spaces are further defined as lost spaces by Trancik as these are neither designed nor defined and act as agents of discontinuity on the urban web (Trancik, 1986).

### 10.4.3 Concept of morphological priority

Conzen refers to streets as 'morphological priority' as they remain as constant in the evolutionary layers of the city. These streets confine the city block within their loops as a definite unit preserving the historical urban matrix. These approaches differ greatly from French school of urban morphology which mostly focuses on socio cultural factors of city's pattern while the Italian school mostly concentrates on the architectural fabric (Nikovic, Djokic and Maric, 2014).

### 10.4.4 Access and Visibility

Morphology of the ancient cities highly focused on the zoning of degree of accessibility. The cities often where zoned into whorls or sectors divided by buffer spaces or city walls which served both visual symbol and defensive purpose as well as a channel of movement from one zone to another (De la Croix, 1972). On a larger note, the centre of the city was enclosed by high walls often restricted to the use of nobles and royals and opened

to the commoners on special occasion (Tracy, 2000). While few specific cultures operated on further detail zoning the cities on the professional hierarchy. The best known example of cities fabricate on the idea of accessibility is the "Forbidden City" of Beijing and other palace cities of China. Some other examples are the massive elliptical compound at Great Zimbabwe, the sacred precincts in the centre of Aztec ruins, or the ten great structures of the Chimu capital, Chan Chan, on Peru's coast. (Moore, 1992).

The concept of visibility has been introduced by Constantinos Doxiadis is divided into two categories of visual perception which are inward view shed (the spaces from which a given point can be viewed) and outward view shed (the spaces that can be viewed from a given point) (Doxiadis, 1972). As per the record of research many of the early cities exhibit the characteristics of inward view shed which had huge influence on their building morphology as well as location of key structures (Lake and Woodman, 2003).

### 10.4.5 Visual communications

In the context of human made environments visual messages play a vital role in developing the quality of urban spaces. Visual comfort has become the key ingredient in of a sustainable urban scape. The structural code of the urban scape is the product of socio-cultural values formed with numerous experiments with continues influences. The visual fabric of the city is the reflection of these experiments. Evaluating the visual fabric helps in decoding the visual messages that helped in creating the sense of belongingness and identity. The facades of the buildings act as the element of recognition establishing the building view-scape as one of the most prominent features in enhancing the quality of the urban space.

### 10.4.6 Visual anthropology

As per the writings of Dipesh, society relies heavily on visual information, particularly images (Kharel, 2015). Visual information, in Pink's view, has an inextricable relationship with our everyday lives, societies, cultures, lifestyles, narratives and identities, as well as with ideas about the past, truth, and space (Pink, 2013).

Visual anthropology is a strong tool in the field of architecture that helps in understanding the relation between architectural fabric and human behaviour. It also works in building strong platform to restore the intangible heritage of the city.  The premise of visual anthropology is that culture is expressed through rituals, ceremonies, gestures and objects found within built and natural environments. As per the writings of Ruby Jay culture can be viewed as the sum of scenarios in which one participates (Ruby, 2008). Applied visual anthropology has two distinct yet intersecting perspevtives. The first pesprctives deals with the involvement of photographs, films, and videos are used by anthropologists to express their observations and insights through anthropological studies incorporating images including video and film. As for the second, it is more or less the anthropology of art, illustrating visual images, for example:

- How important is the visual dimension of civilization or society play an important role?

- How does visual images play a role in representing (exhibit, reproduce, make visible or bring to existence) something as an example?

- How much of human life is based on what is seen and how does it affect them?  (Visual Anthropology: Studying Images to Learn About People, 2021)

As per the writings of Jenny Chio, a visual anthropologist's methodology and theory are connected with those of ethnography, audiovisual media, and perception and imagination (Chio, 2021).

### 10.4.7 Visual ethnography

A visual ethnography is an investigation into the everyday lives of people by using photography, video or film to document their social and cultural environments. Ethnography is a method of research based on fieldwork that is based on fieldwork with people, and a visual ethnography is the result (Pink, 2021). In his book 'Using Visual Data in Qualitative Research', Banks contrasts two different approaches to visual ethnography: using images to study society and studying images for their sociological significance (Banks, 2018). Visual ethnography deals with a wide spectrum of study which includes art and material culture, gesture, facial expression, and the spatial aspect of behavior and interaction among other things (Banks and Morphy, 2012).

### 10.4.8 Visual anthropometrics

Three-dimensional visualization and understanding visual anthropometrics is very essential as it determines the massing ratios of the architectural elements. This application also improves the perceptual understanding of the material fabric.

### 10.4.9 Manual View-shed Calculation

A view-scape is defined as a visual relation between the viewer and spatial arrangement of urban landscape elements. The view-scape comprises of three elements which include view-subject, vantage-point and view-corridor. Here the view-subject is the physical component which is the subject of view while the vantage point is the place from

where the view-subject is being viewed and the view-corridor is the area conically extended

from vantage-point to the view-subject. View-corridor can also be defined as a three-

dimensional space that connects the view subject and the viewpoint. The view corridors are

often bounded by prominent public buildings of a certain urban or heritage value. To

preserve view accessibility, height restrictions are imposed with defined lines of sight. To

analyse the sight lines in response to building heights a view calculation formula has been

established. This formula has been adopted by state legislature in 1999 to preserve the

visual accessibility of the dome on the capitol building.
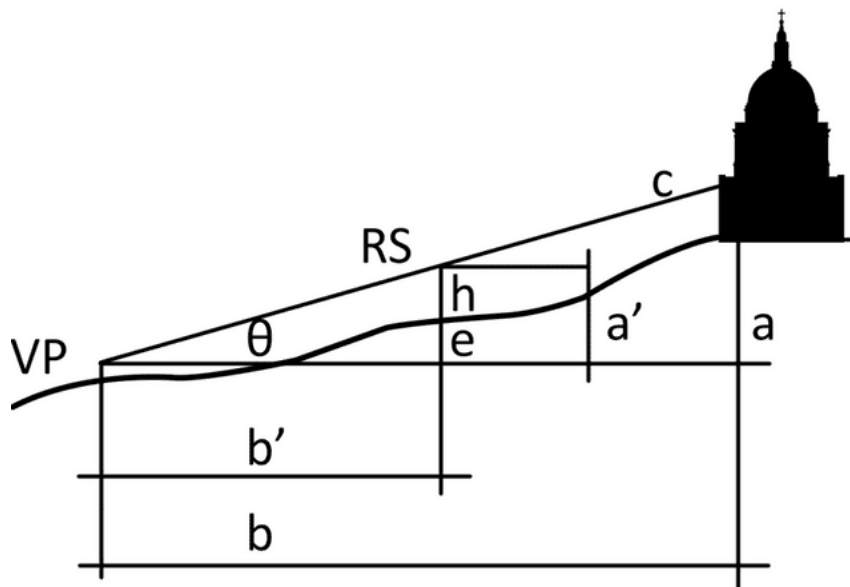


Figure 89 : Capitol view preservation height calculation formula.

Source:https://www.researchgate.net

$$\tan \theta = \frac{a}{b} = \frac{a'}{b'}$$

$$\tan \theta \times b' = a'$$

$$a' - e = h$$

where,

VE= View elevation

VP=Viewpoint

RS=Review Site

a=VE-VP elevation

b=Distance, VP to mountain

c=Sightline to mountain

e= RS elevation –VP elevation

a'= VP elevation to sightline at RS

b'= Distance, VP to RS

h= Allowable height (Portland City Council, 1991:21)

According to these new building codes for view preservation any new building is imposed with building height regulations. The seven corridors are around the capitol building range from 450ft to 80ft in response to the different height regulations imposed by the state legislature. For instance, a 194ft height limitation is imposed the 15th Freeway corridor while 225ft height limitation is imposed on 2nd Freeway corridor (Chan, 2002).

## 10.5 Visual analysis through Isovist

An environmental psychologist James Gibson (1983) was the pioneer of developing the visual perception geometry. In his work "Ambient optic array he illustrated a new dimension to examine the link between environment and the viewer. The three words in his title refer to the three characteristics that contribute to the visual narrative. Firstly ambient refers to the experience of the viewer of the localized environment here Gibson (1983) demonstrates the importance of viewer's acquaintance with the environment. While the second word optic focuses on the visual mechanics which deals with angles and extent of vision. Finally the word array concentrates on the organization of the components on the larger system. To explain further the theoretical model explains the behaviour of light striking the urban environment and reflected to the retina of the viewer. This process demonstrates the spatial fabric exhibited to the viewer (Gibson, 1983).

### 10.5.1 Concept of isovist

The concept of isovist has its roots in both geography and architecture along with mathematics. The term 'isovist' has been coined by Tandy. He elaborates this as the process of *"taking away from the [architectural or landscape] site a permanent record of what would otherwise be dependent on either memory or upon an unwieldy number of annotated photographs''* (Tandy, 1967: 9). However, Davis and Benedikt (1979) identified a repeatable process of constructing and measuring the visual fields which helped in formally adopting the concept of 'isovist' in architecture. Similar visual concepts like "view-shed" have been illustrated by Kevin Lynch (1991). While on parallel grounds Gibson focused on "intervisibility" in computer topographic models (Gallagher, 1972). Both the concepts were based on the common denominators of landscape and urban geography.

The most important factor of isovist definition is that it accommodates all the rays of light accessible to the viewer's eye radially. However, it is intuitive to assume that human vision's geometrical limits are confined to a cone as it is clearly observed in my studies that perception and vision are highly complex. The vision is physically monitored my body, head and eyes with a combination of dimensions at allows a broader visual sampling of the environment (Smardon, 1986). Though the typical macular field has a high acuity region with 124° cone of vision the low acuity area expands to over 170°; with the tilting of the head it increases to 230 and by the partial rotation of waist and shoulders combined with head and eye movement the cone of vision is increased to 300°. Understanding the above factors, the isovist theory is accommodated with a holistic visual analysis by adopting 360° isovists which is standardised in all the architectural analysis (Meilinger et al. 2012).

## 10.5.2 Application of isovist

Isovists are often associated with space syntax which is a group of techniques and theories that re used for analysing urban and architectural spaces. Isovists have been applied in a huge spectrum of purposes since 1970's which includes domains of way-finding and cognition (Braaksma, 1980); spatial structure (Psarra, 2005; object display (Stavroulaki and Peponis, 2003); social structure (Markhede and Koch, 2007) and accessibility (Turner, 2003). The function of isovists have aslo been extended to analyse the works of few particular architects. Isovist application has been done to examine the characteristics of few notable architects like Frank Lloyd Wright for his work 'Falling Water' (Peponis and Bellal, 2010). Isovists have also been employed in testing the spatio-visual framework of various theories (Dawes and Ostwald, 2018).

### 10.5.3 3D Isovist Mapping using Grasshopper

As part of this study, the isovist tool is used to determine the distance and size of a given area. The tool is used to calculate the distance and size of the set of points visible from a particular vantage point at ground level. In order to describe the spatial properties of south Indian temples, this isovist tool can be a valuable resource. It creates a polygonal boundary that represents space from the viewpoint.

Gopuram is usually located in a prime location with a strong visual connection typically at the city's center; however, increased urbanization has posed serious problems for the visual accessibility of such identities. In this scenario, issues of social bonding are highly relevant because these identities embody strong historical narratives. In an attempt to understand the three dimensional visual connections of the urban elements and analyse the visual urban proportions of the city the research initiates a visual tool that can generate a digital visual heat map with respect to the existing urban volumes.

The following process has been used to fabricate the 3D isovist map

1. Maps taken fom ArcGIS

2. Drafted in Autocad to scale

3. The data of the building heights is taken from the respective munciple commisions.

4. 3 dimesional model is generated using Rhino

5. Ladybug plugin of grasshopper is used (as 3d isovist is not available, a plugin is designed/customised specially the study) to generate view-shed map.
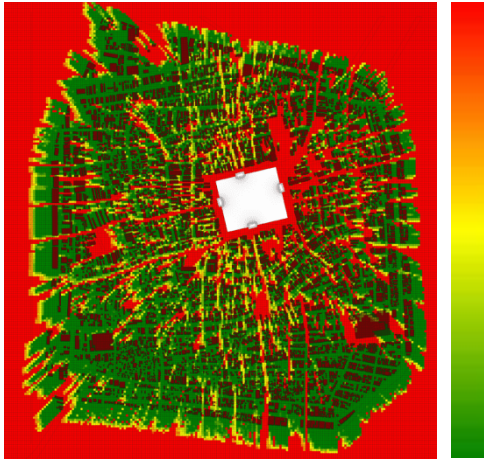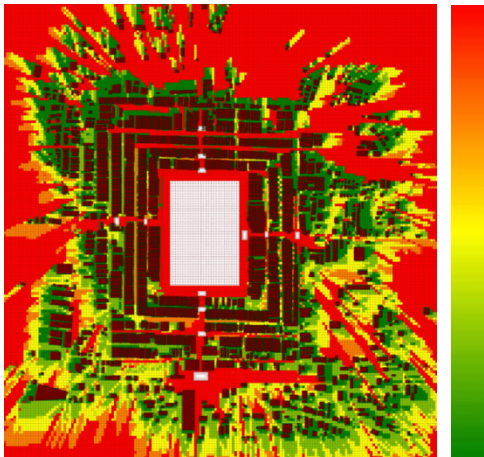
Figure 46: Madurai 3D isovist map (where Red zones have 100% visibility and green has null visibility).

Source: Author (developed using Rhino software with grasshopper plugin)



*Figure 47: Srirangam 3D isovist map* (where Red zones have 100% visibility and green has null visibility).

Source: Author (developed using Rhino software with grasshopper plugin)
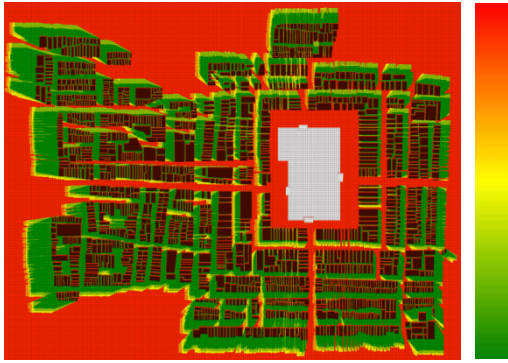
**Figure 48: Chidambaram 3D isovist map** (where Red zones have 100% visibility and green has null visibility).

Source: Author (developed using Rhino software with grasshopper plugin)

## 10.6 Inference

It is possible to numerically represent many spatial configuration properties by isovists and isovist fields. To some extent, these properties can be used to make inferences about how people interact with certain spaces. Observation of space is based on spatial visualization, which presents patterns that teach the observer in an ordered manner about the area of space depicted. Using south Indian temple cities as a cognitive graphic of sacred space, this study examines their function as such. By examining the notions that underlie cartographic portrayal, space, and contestation, this comparative study expands cartographic representation, space, and contestation, which affect cartography and religious geography.

As a result of the three-dimensional imagined nature of the south Indian temple city, transforming a multidimensional subject into essentially two-dimensional representation is enhanced. Geographic visualization is one of the key components of cartography that has

become increasingly dynamic and interactive, expanding what was once considered mapping in a number of new ways.

## 10.7 Built Heritage

Temple cities in Southern India are planned according to a paradigm that expresses an expansive and powerful state conceived by the ancient builders. In terms of scale and architectural clarity, their structures are unsurpassed; the larger examples are probably characterized as distinctly imperial in style (Champakalakshmi, 1979). Therefore, the image and elements of these temple cities reflect the character of the town as a whole.

The visual perception of towns is affected by multiple factors. By reviewing the architectural elements of temple cities and defining the visual perception level of the built heritage, the study proposes a conceptual framework. Through this research the study aims to understand how architectural elements, such as entry gates or arched windows,doors, lean-to roofs, pilasters, decorative columns, horizontal cornices and pottile roofs, affect the perception of the built heritage of the temple cities.

### 10.7.1 Sample

As the study focuses on understanding the form of South Indian temple fabric in a holistic way, various platforms have been considered in the collection of samples.

*Independent variables*

With reference to the theoretical and practical understanding of the city fabric, the study identifies three prime independent variables which have a huge influence in shaping the city's heritage character:

1) Temple - the abode of deity centrally placed
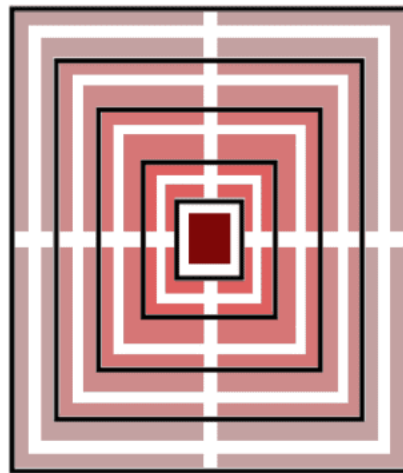


FACTOR: TEMPLE
NATURE: STATIC
INFLUENCE: SOCIAL HIERARCHY

▮ INFLUENCED AREA
▮ INDEPENDENT VARIABLE
▮ NON-INFLUENCED AREA
▮ CONCENTRIC WALLS

Figure 90 : Temple as an independent variable

(Source: Author, 2020)

The temple is architectural epitome of surviving culture and reflection of past social structure. Temple served as a node or reference point for the planning of the city and geographically positioned in such a way that they would dominate the surrounding territory. The whole settlement weaved around the temple in concentric circles and inhabited according the social or occupational ranks.

2) Gopuram – the gateways puncturing the concentric whorls, which are placed at the cardinal points.

FACTOR: GOPURAMS (GATEWAYS)
NATURE: STATIC
INFLUENCE: VISUAL

INFLUENCED AREA
INDEPENDENT VARIABLE
NON-INFLUENCED AREA
CONCENTRIC WALLS

Figure 91 : Gopuram as an independent variable

(Source: Author, 2020)

Gopuram serves as a visual identity to the city in response to its massive form and unique style. Gopurams dominate the skyline of these temple cities allowing the people to view and worship from far and near. In the aspect of human-environment bonding gopuram play a vital role in strengthening sense of place and emotional attachment with the place.

3) Ratham – the ritual cart which is used for deity procession in the city.

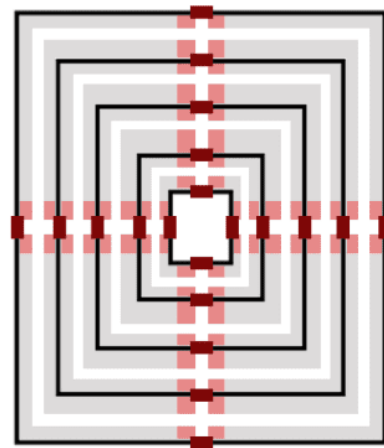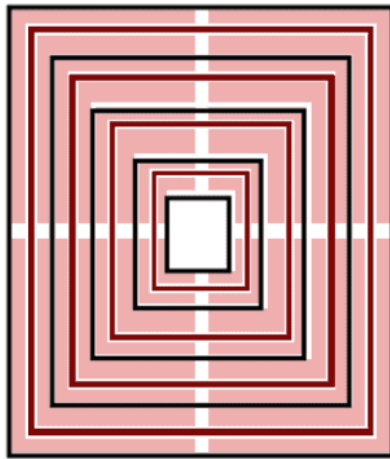FACTOR: RATHAM (PROCESSIONAL CAR)
NATURE: DYNAMIC
INFLUENCE: CULTURAL

INFLUENCED AREA
INDEPENDENT VARIABLE
NON-INFLUENCED AREA
CONCENTRIC WALLS

Figure 92 : Ratham as an independent variable

(Source: Author, 2020)

Ritual procession has always influenced the urban fabric in the context of urban planning as the ritual processions have always been viewed as physical frames. The nature of the processions is outward in nature where the procession circulates the through the settlement rather than the notion of gathering at one of the religious nodes. These processional rituals are accompanied with most participatory and collective aspects of movement and involved in exhibiting visual messages. This visual messages as well as the collective participatory are witnessed with the spill of visual heritage on the settlement reflecting mostly on the visual architectural fabric of the streets. For the purpose of analysing the data it is quantified by considering the value of each independent variable is considered as 1.

### *Dependent variables*

A visual pallet is prepared in response to the common facade elements of historic character present in the three cities. The elements were identified acknowledging the connection between temple architecture and architecture of street façade. To identified the elements a detailed study with visual documentation is conducted for the three temple cities of Madurai, Srirangam and Chidambaram collecting the visual samples of 1797, 1505, and 1337 buildings of the respective cities. This comprises of the concentric processional streets as well as the cardinal streets of each city. After a detailed analysis seven architectural elements are considered which are both common in the three cities' street facades as well as reflecting Dravidian flavour. The identified architectural elements are considered as dependant variables as they have been borrowed from the temple architecture. Each building on that accommodates the street façade is evaluated by tabulation the number of yes and no (presence or absence of the element). The following are identified dependent variables which are present in all the three selected case studies.
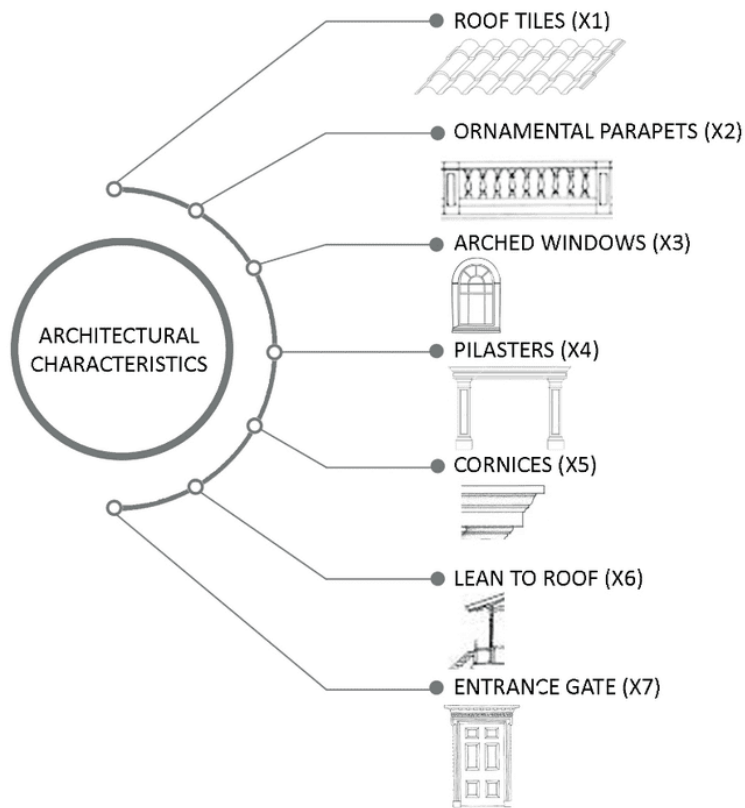
Figure 93 : Dependent variables

(Source: Author, 2020)

With reference to the same every building is given a number in response to the sum of architectural elements. To quantify the heritage values streets are used as the medium.
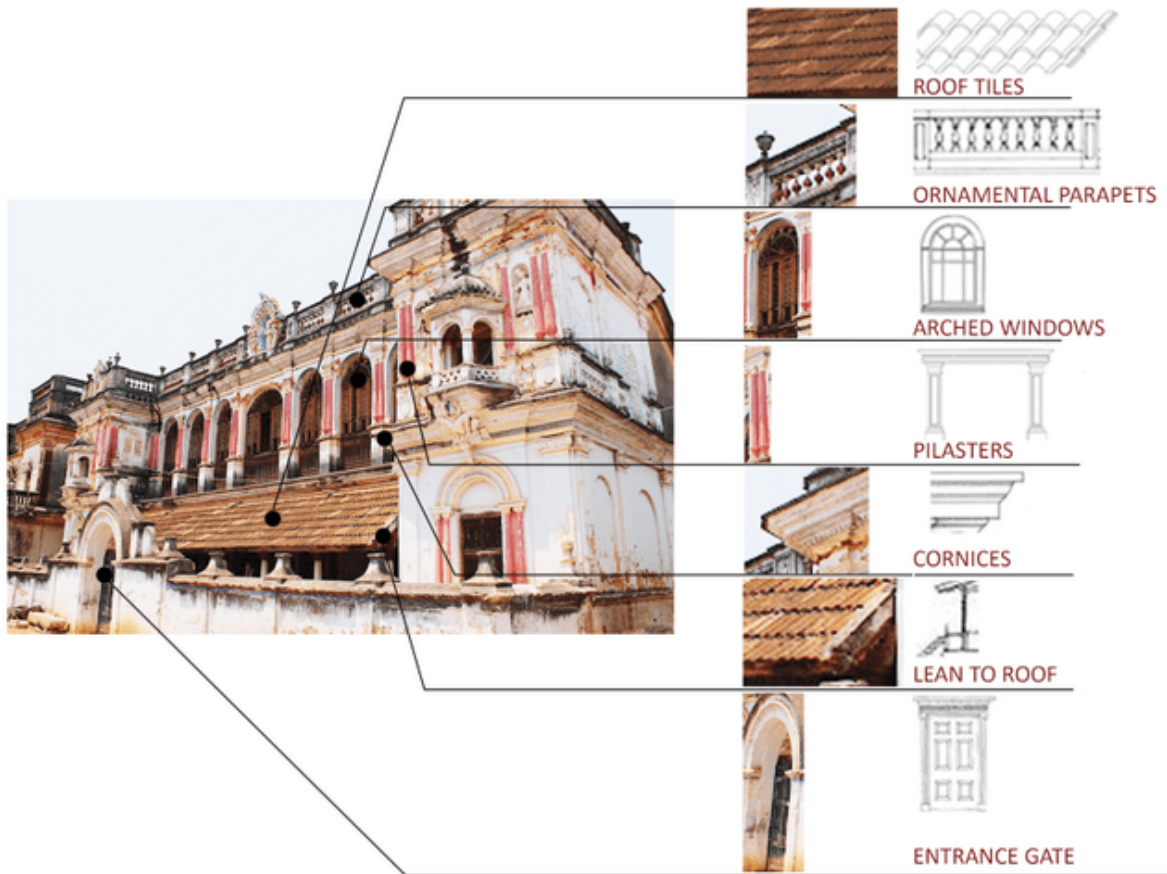
Figure 94 : A typical South Indian temple street house.

(Source: Author, 2021)

*Madurai*



CORNICE

ROOF TILES

ORNAMENTAL PARAPETS

LEAN TO ROOF

ARCHED WINDOWS

PILASTERS

ENTERANCE GATE
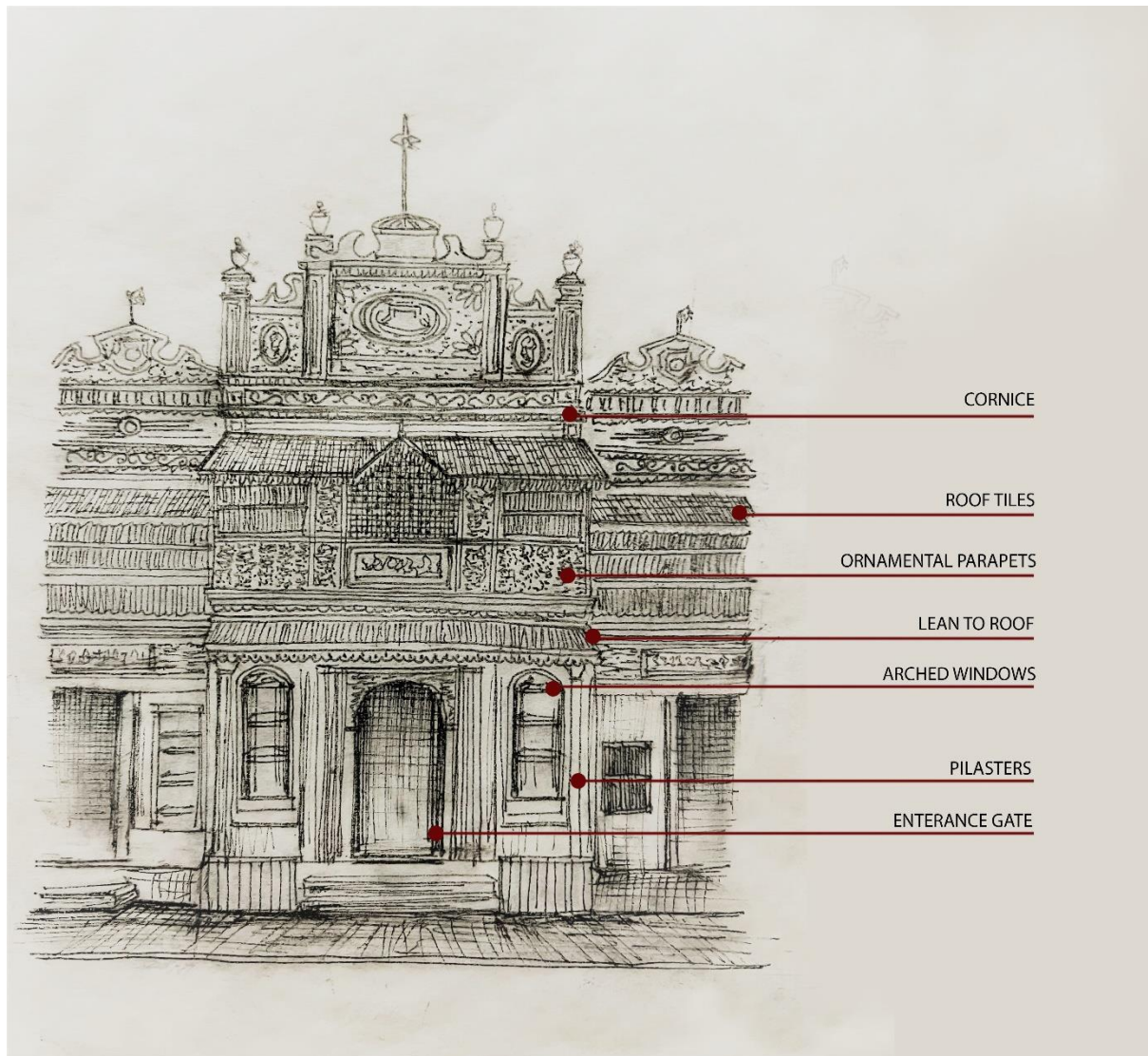
Figure 95: Facade on East Chitrai Street of Madurai

Source: Author

*Srirangam*
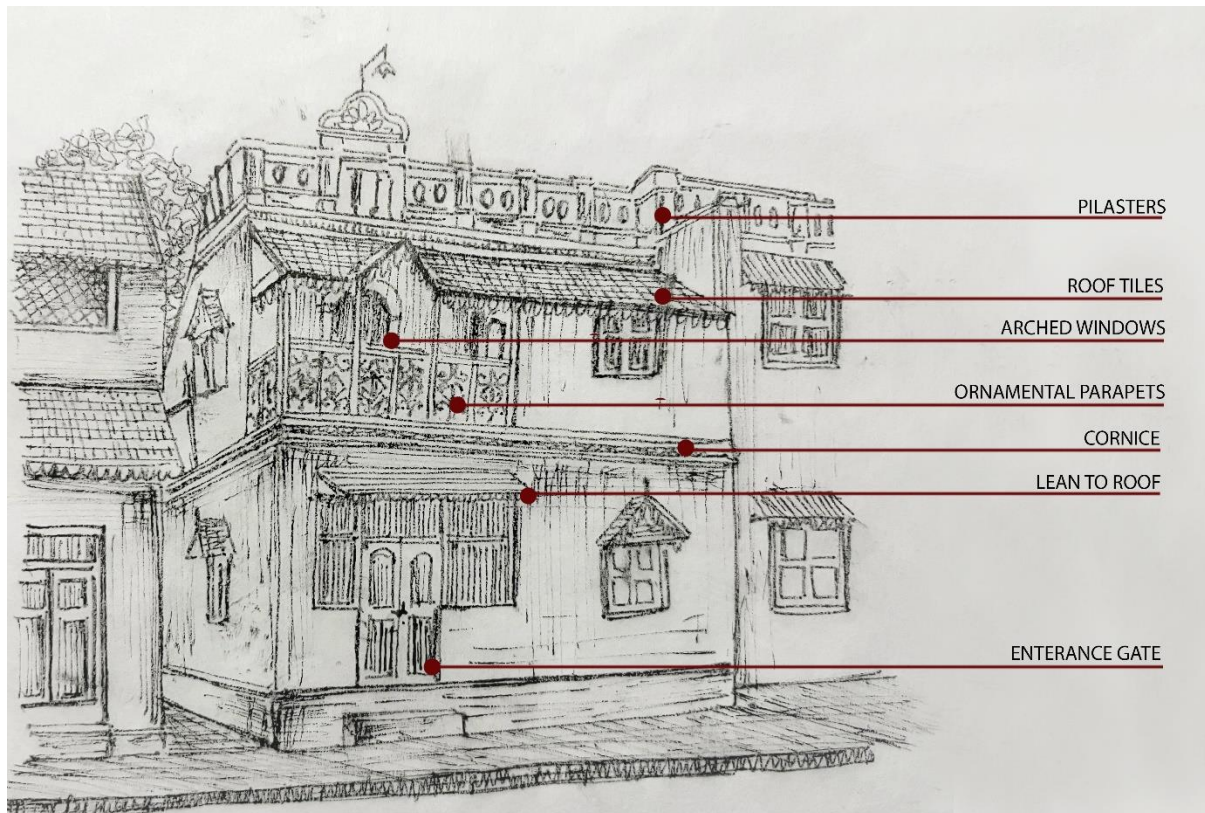


Figure 96: Facade on South Uthrai Street of Srirangam
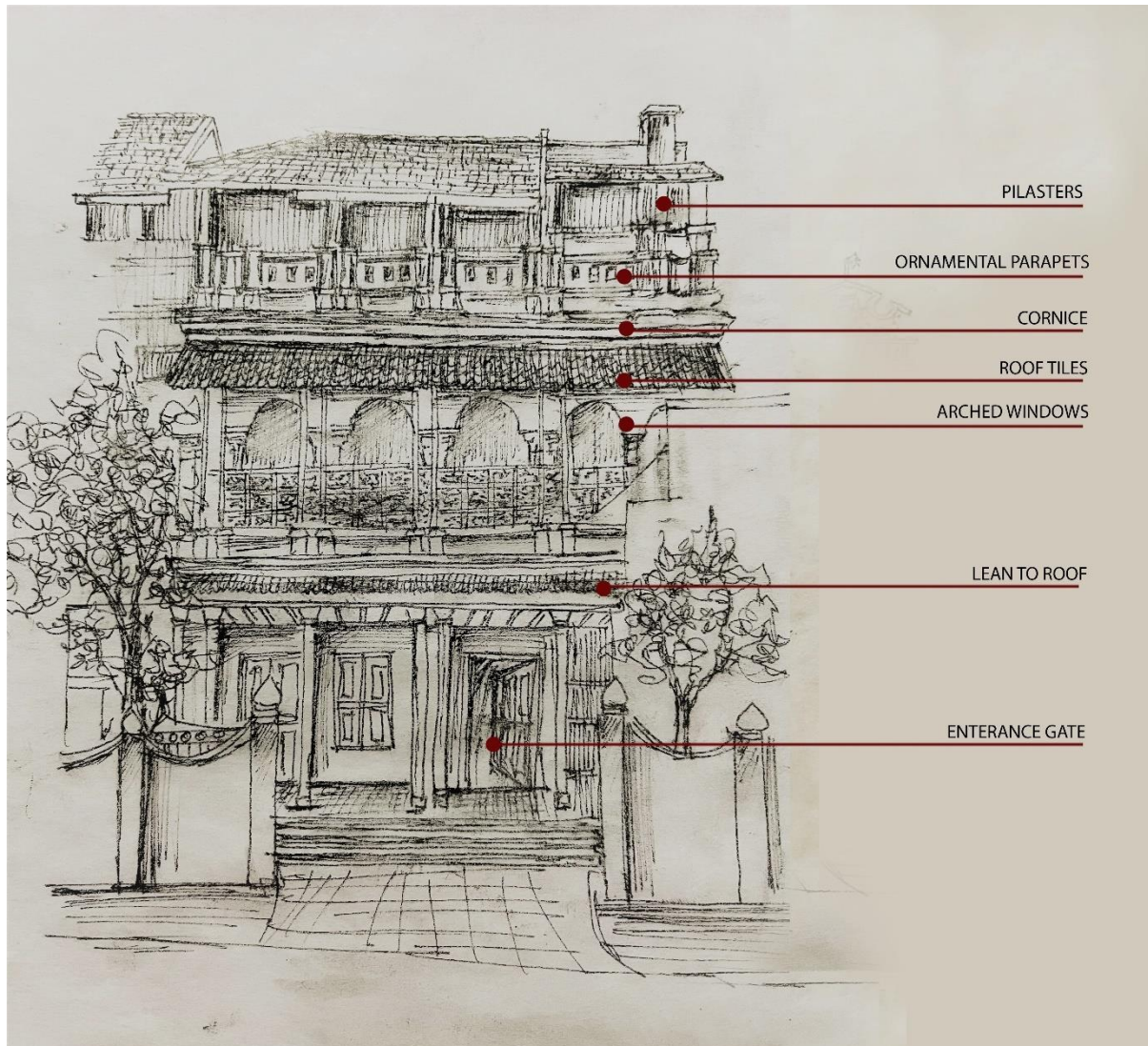
*Chidambaram*



Figure 97: Facade on West Car Street of Chidambaram

Source: Author

## 10.7.2 Built foot print

The following table shows the number of buildings in each street.

Table 34 : Built foot on individual streets

| Madurai | Srirangam | Chidambaram |
|---|---|---|
|  |  |  |
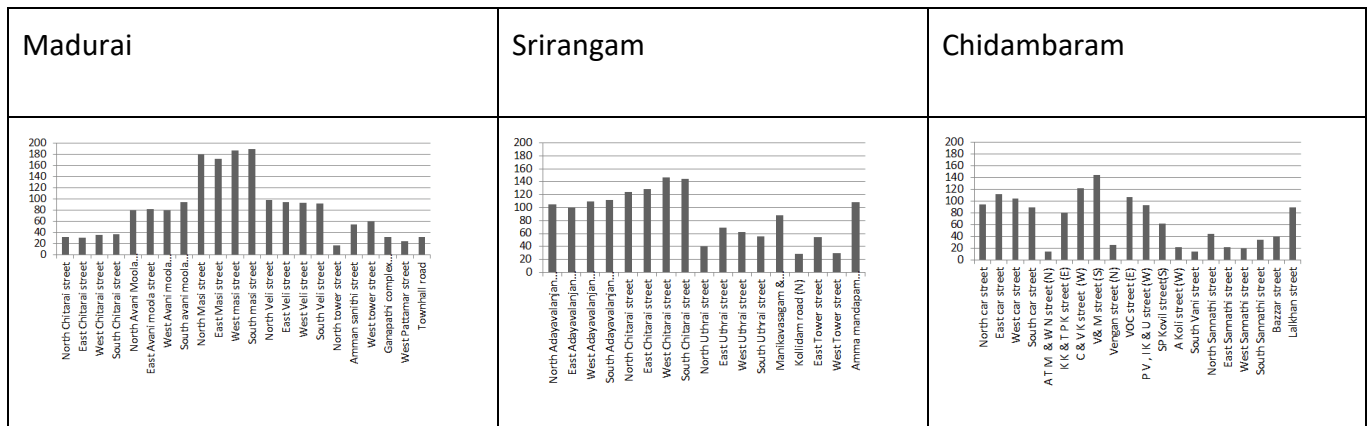
(Source: Author, 2020)

### 10.7.3 Heritage foot print

The following shows the number of heritage buildings in each street.

Table 35 : Heritage foot print in each street

| Madurai | Srirangam | Chidambaram |
|---|---|---|
|  |  |  |
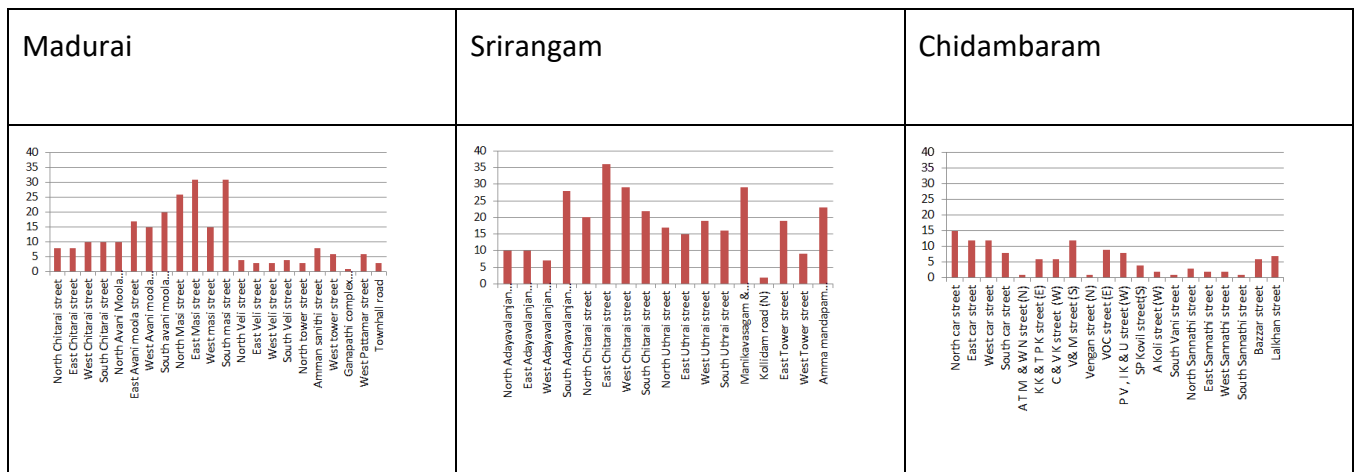
(Source: Author, 2020)

### 10.7.4 Heritage density

The following shows the number of heritage density in each street.

Table 36 : Heritage density in mapping

| Madurai | Srirangam | Chidambaram |
|---|---|---|
|  |  |  |
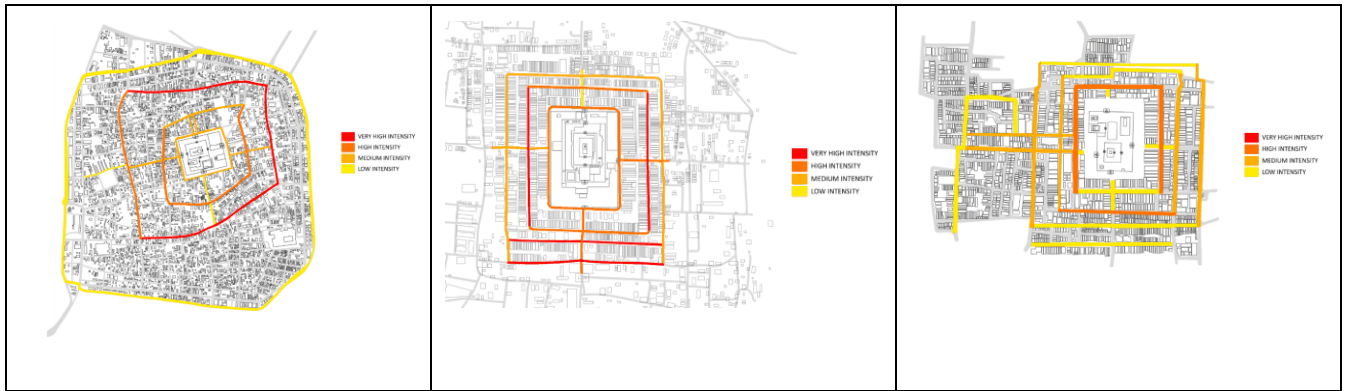
(Source: Author, 2020)

## 10.7.5 Heritage percentage

The following shows the percentage of heritage buildings in each street.

Table 37 : Heritage percentage of individual streets

| Madurai | Srirangam | Chidambaram |
|---------|-----------|-------------|
|  |  |  |

(Source: Author, 2020)

## 10.7.6 Heritage percentage density

The following shows the percentage of heritage buildings in each street.

Table 38 : Heritage percentage density mapping

| Madurai | Srirangam | Chidambaram |
|---------|-----------|-------------|
|  |  |  |
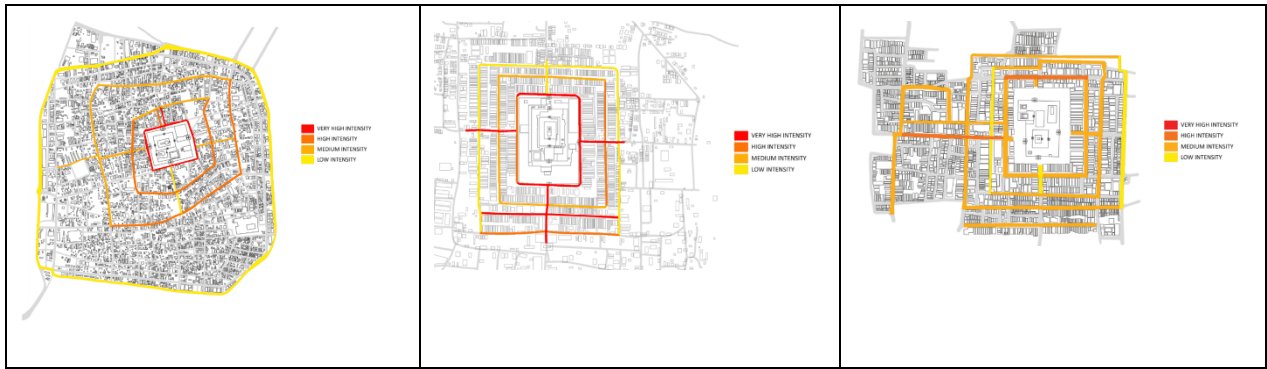
(Source: Author, 2020)

## 10.7.7 Heritage and non-heritage graph

The following shows the heritage and non-heritage graphs buildings in each street.

Table 39 : Heritage and non-heritage of individual streets

| Madurai | Srirangam | Chidambaram |
|---------|-----------|-------------|
|  |  |  |

## 10.7.8 Heritage and non-heritage ratio

The following shows the percentage of heritage buildings in each street.

Table 40 : Heritage and non-heritage ratio of three cities

| Madurai | Srirangam | Chidambaram |
|---------|-----------|-------------|
|         |           |             |
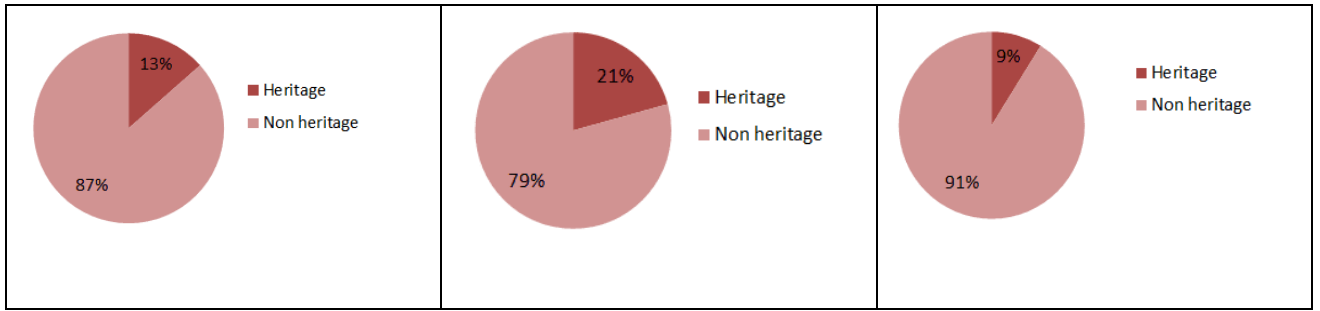
(Source: Author, 2020)

## 10.7.9 Heritage Value calculation of each street

The following shows how the heritage value of each street is calculated

Heritage value of each Street:

$$S_h = \sum_{B_h=1}^{B_h=n} X_{B_h}$$

Heritage value of each building: $B_h = \frac{\sum_{k=1}^{k=7} X_k - X_{min}}{X_{max} - X_{min}}$

Where,

$S_h$ = Heritage value of each street

$B_h$ = building heritage value

$X_1$ = Roof tiles

$X_2$ = Ornamented Parapets

$X_3$ = Arched windows

$X_4$ = Pilasters

$X_5$= Horizontal Cornices

$X_6$= Lean-To Roof

$X_7$= Entrance Gate

$X_{min}$=4 (As all the heritage buildings are identified with minimum of 4 factors)

$X_{max}$=7

Note: only positive values are considered

Table 41 : Built heritage value of individual streets

| Madurai | Srirangam | Chidambaram |
|---------|-----------|-------------|
|  |  |  |
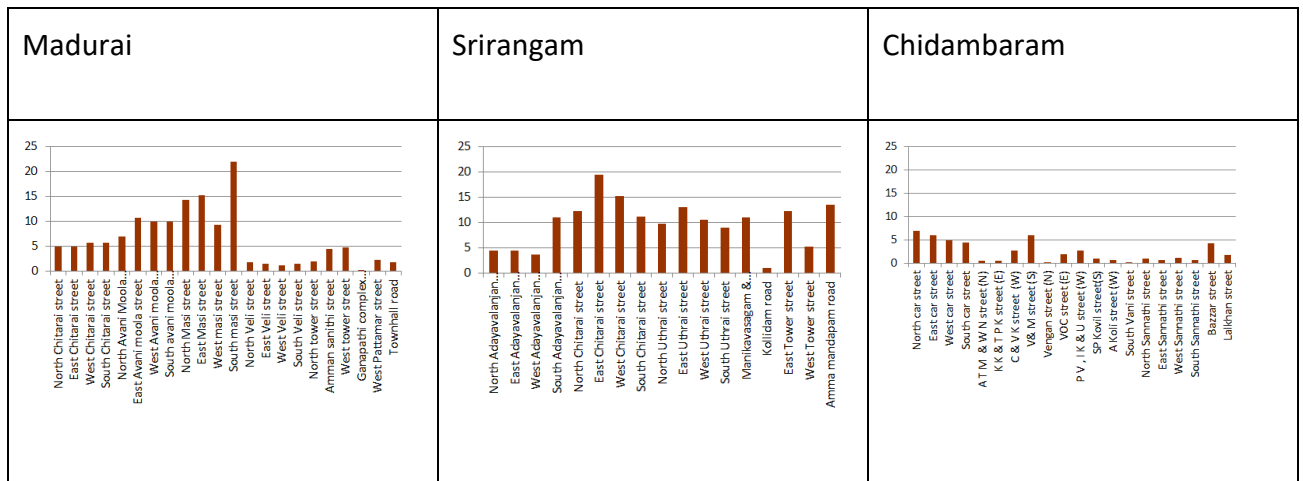
(Source: Author, 2020)

## 10.7.10 Geographical representation heritage values of each street

The following shows the percentage of heritage buildings in each street.

Table 42 : Built heritage value mapping

| Madurai | Srirangam | Chidambaram |
|---------|-----------|-------------|
|         |           |             |
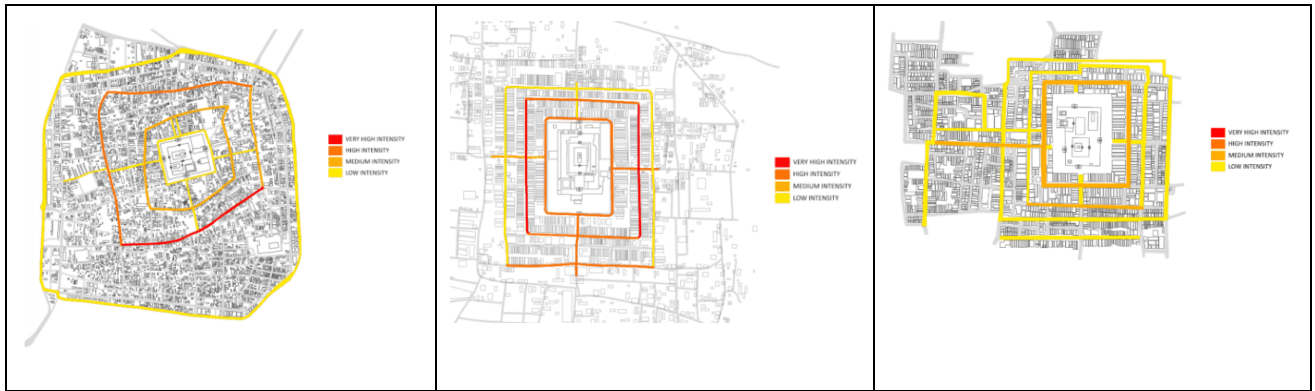
(Source: Author, 2020)

## 10.7.11 Normalized heritage values of each street

The following shows how the normalized heritage value of each street is calculated.

Normalised heritage value of each Street :

$$S_{hn} = \frac{\sum_{B_h=1}^{B_h=n} X_{B_h}}{n}$$

Where,

$S_{hn}$= Normalized heritage value of each street

$B_h$= Heritage value of each building

n = no. of buildings

Note: only positive values are considered

Table 43 : Normalized heritage value of individual streets

| Madurai | Srirangam | Chidambaram |
|---------|-----------|-------------|
|         |           |             |
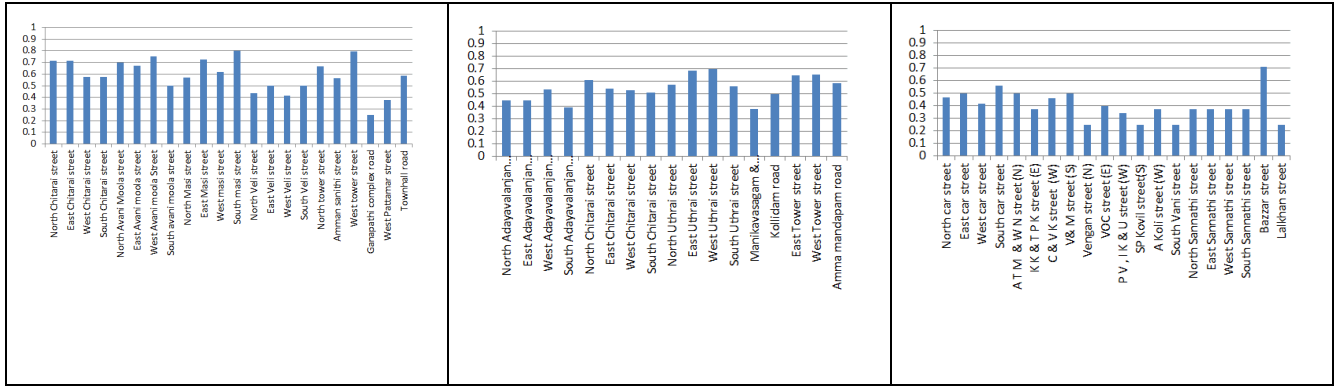
(Source: Author, 2020)

## 10.7.12 Sum of buildings with maximum heritage values

Sum of buildings with maximum heritage value

$$S_{hmax} = \sum_{B_{hmax}=1}^{B_{hmax}=n} X_{B_{hmax}}$$

Where,

$$B_{hmax} = \sum_{k=1}^{k=7} X_k - X_{max-1}$$

Where,

$B_{hmax}$=buildings with maximum heritage value (normalized value)

$X_1$=Roof tiles

$X_2$= Ornamented Parapets

$X_3$=Arched windows

$X_4$= Pilasters

$X_5$= Horizontal Cornices

$X_6$= Lean-To Roof

$X_7$= Entrance Gate

$X_{min}$=4 (As all the heritage buildings are identified with minimum of 4 factors)

$X_{max}$=7

Table 44 : Sum of buildings with maximum heriage value

| Madurai | Srirangam | Chidambaram |
|---------|-----------|-------------|
|  |  |  |
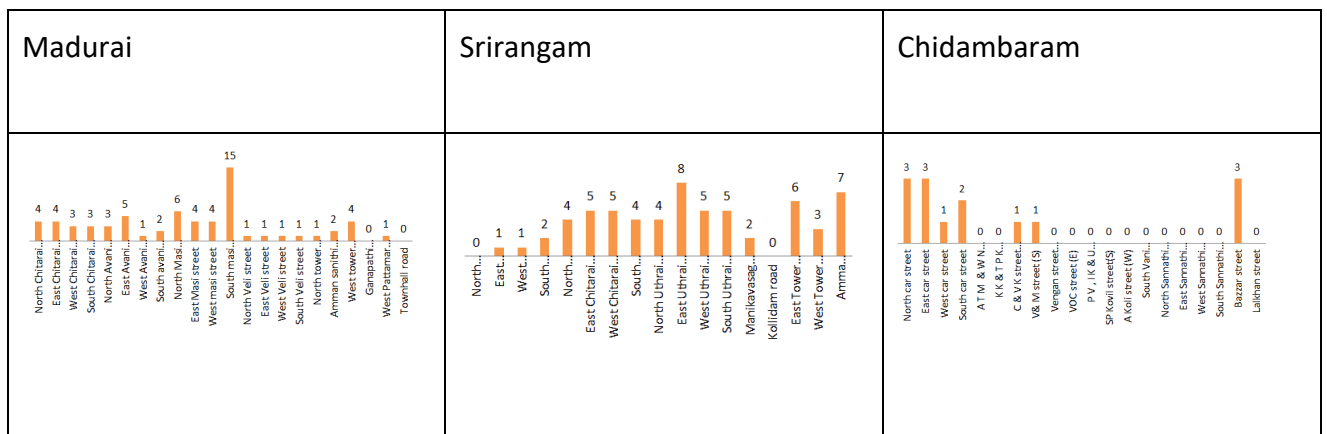
(Source: Author, 2020)

## 10.7.13 Geographical representation of maximum heritage value

The following shows the maximum heritage value of each street in each street.

Table 45 : Maximum heritage value mapping

| Madurai | Srirangam | Chidambaram |
|---------|-----------|-------------|
|         |           |             |
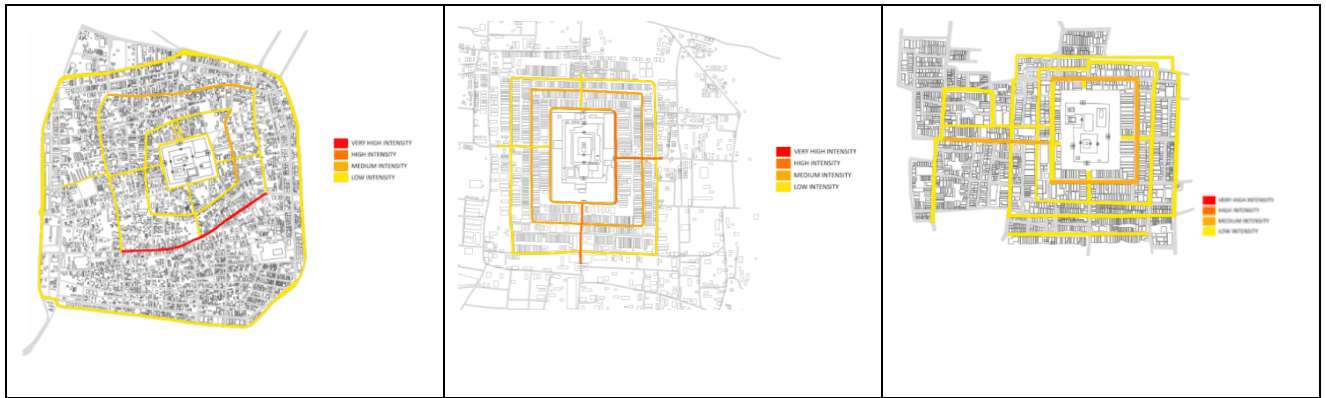
(Source: Author, 2020)

### 10.7.14 Maximum heritage value in each whorl

The following shows the maximum heritage value of each street in each street.

Table 46 : Whorls with maximum heritage value

| Madurai | Srirangam | Chidambaram |
|---------|-----------|-------------|
|  |  |  |

(Source: Author, 2020)

## 10.8 Testing using multi-model regression

An ordinal regression model in SPSS was used to assess the relationship between the architectural elements of the three temple towns and the influence of visual, cultural and religious factors. The dependent variable was predicted from an ordinal regression using "ordered" multiple categories. According to Marija regression is a method which allows a combination of dependent variables (with multiple ordered levels) to interact with an

independent variable or variables (Norusis, 2005). As per the writings of Mudrov an ordinal logistic regression can be used to determine how the transformations of the independent variables affect the dependent variable. So, a multi-model regression model is used to test the values obtained. The procedure is as follows.

Alternate hypothesis: Syntactic value co-relates to the existing spatial pattern of the temple cities.

Null hypothesis: Syntactic value does not co-relate to the existing spatial pattern of the temple cities.

Obtaining heritage %: the heritage valueof each street is obtained using $S_h = \sum_{B_h=1}^{B_h=n} X_{B_h}$ as specified in the obove work using buit heritage formula

Obtaining 'y' value (Normalized heritage percentage): the dependent factor y value is obtained by $S_{hn} = \frac{\sum_{B_h=1}^{B_h=n} X_{B_h}}{n}$ (divinding each value with highest obtained value in the series so values fall between 0 and 1).

Obtaining '$x_1$' value (Normalized Ratham or car street festival value): the independent factor $x_1$ is obtained by calculating the number of observed car street festivals or ratha yatras conducted on the street annually and normalizing (divinding each value with highest obtained value in the series so values fall between 0 and 1) the obtained value.

Obtaining '$x_2$' value (Normalized temple value): the independent factor $x_2$ is obtained by calculating the distance between the street and the temple and inversing the obtained value as the influence is inversely proportionate to the distance between the street and temple.

The result is then nomalized (dividing each value with highest obtained value in the series so values fall between 0 and 1) to get the the value of $x_2$.

Obtaining '$x_3$' value (Normalized gopuram or visual value): the independent factor $x_3$ is obtained by calculating the visual percentage of gopuram from the street obtained from the the isovist map. The result is then nomalized (dividing each value with highest obtained value in the series so values fall between 0 and 1) to get the the value of $x_3$.

### 10.8.1 Madurai heritage analysis

Table 47 : Madurai- Obtainaing values of independent and dependent values

| Street | Heritage % | Normalized Heritage % | No. of car street ritual | Normalized value of ritual | Distance from temple in mts | Inverse distance | Normalized value of Temple | Factor of visibility | Normalized value of gopuram |
|--------|-----------|----------------------|------------------------|---------------------------|----------------------------|-----------------|---------------------------|---------------------|----------------------------|
| | | Dependent Factor (y) | | Independent Factor ($x_1$) | | | Independent Factor ($x_2$) | | Independent Factor ($x_3$) |
| North Chitarai street | 25 | 0.9 | 6 | 1 | 30 | 0.03 | 1 | 100 | 1 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| East Chitarai street | 26 | 0.9 | 6 | 1 | 30 | 0.03 | 1 | 100 | 1 |
| West Chitarai street | 28 | 1 | 6 | 1 | 30 | 0.03 | 1 | 100 | 1 |
| South Chitarai street | 27 | 1 | 6 | 1 | 30 | 0.03 | 1 | 100 | 1 |
| North Avani Moola street | 22 | 0.8 | 6 | 1 | 150 | 0.01 | 0.2 | 80 | 0.8 |
| East Avani Moola street | 21 | 0.8 | 6 | 1 | 150 | 0.01 | 0.2 | 100 | 1 |
| West Avani Moola street | 19 | 0.7 | 6 | 1 | 130 | 0.01 | 0.2 | 80 | 0.8 |
| South Avani Moola street | 21 | 0.8 | 6 | 1 | 200 | 0.01 | 0.2 | 80 | 0.8 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| North Masi street | 15 | 0.5 | 6 | 1 | 380 | 0 | 0.1 | 40 | 0.4 |
| East Masi street | 18 | 0.6 | 6 | 1 | 360 | 0 | 0.1 | 40 | 0.4 |
| West Masi street | 16 | 0.6 | 6 | 1 | 350 | 0 | 0.1 | 40 | 0.4 |
| South Masi street | 17 | 0.6 | 6 | 1 | 360 | 0 | 0.1 | 40 | 0.4 |
| North Veli street | 4 | 0.1 | 2 | 0.33 | 600 | 0 | 0.1 | 10 | 0.1 |
| East Veli street | 3 | 0.1 | 2 | 0.33 | 560 | 0 | 0.1 | 10 | 0.1 |
| West Veli street | 3 | 0.1 | 2 | 0.33 | 700 | 0 | 0 | 10 | 0.1 |
| South Veli street | 4 | 0.1 | 2 | 0.33 | 800 | 0 | 0 | 10 | 0.1 |
| North Tower street | 18 | 0.6 | 4 | 0.67 | 50 | 0.02 | 0.6 | 70 | 0.7 |
| Amman sanithi street | 15 | 0.5 | 4 | 0.67 | 70 | 0.01 | 0.4 | 100 | 1 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| West Tower street | 10 | 0.4 | 4 | 0.67 | 40 | 0.03 | 0.8 | 100 | 1 |
| Ganapathi complex road | 3 | 0.1 | 4 | 0.67 | 100 | 0.01 | 0.3 | 30 | 0.3 |

(Source: Author, 2020)

Model used :

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_{1,1} x_1 * x_1 + \beta_{2,2} x_2 * x_2 + \beta_{3,3} x_3 * x_3$$

Where,

y = Normalized heritage value of the street

$x_1$ = Normalized value of Ritual –car festival (Cultural factor)

$x_2$ = Normalized value of Temple (Physical factor)

$x_3$ = Normalized value of Gopuram- gateway (Visual factor)

**Model:**

Heritagevalue=0.775679−3.848642·Ratham+0.200906·Temple+2.140553·Gopuram+2.97793

·Ratham∗Ratham+0.025116·Temple∗Temple−1.332643·Gopuram∗Gopuram

Table 48 : Madurai regression

| Predictor | Coefficient | Estimate | Standard Error | t-statistic | p-value |
|---|---|---|---|---|---|
| Constant | $\beta_0$ | 0.775679 | 0.229091 | 3.385899 | 0.004873 |
| Ratham | $\beta_1$ | -3.848642 | 1.051454 | -3.660305 | 0.00288 |
| Temple | $\beta_2$ | 0.200906 | 0.661805 | 0.303573 | 0.766258 |
| Gopuram | $\beta_3$ | 2.140553 | 0.734133 | 2.915757 | 0.012038 |
| Ratham* Ratham | $\beta_{1,1}$ | 2.97793 | 0.754438 | 3.947218 | 0.00167 |
| Temple *Temple | $\beta_{2,2}$ | 0.025116 | 0.565211 | 0.044436 | 0.965232 |
| Gopuram* Gopuram | $\beta_{3,3}$ | -1.332643 | 0.530747 | -2.510881 | 0.026049 |

Table 49 : Madurai regression - Summary of Overall Fit

| | |
|---|---|
| R-Squared: | $r^2$ = 0.9686 |
| Adjusted R-Squared: | $r^2_{adj}$ = 0.954108 |
| Residual Standard Error: | 0.067886 on 13 degrees of freedom. |
| Overall FF-statistic: | 66.836178 on 6 and 13 degrees of freedom. |
| Overall pp-value: | 0 |

Table 50 : Madurai regression- Analysis of Variance Table

| Source | df | SS | MS | FF-Statistic | pp-value |
|---|---|---|---|---|---|
| Regression | 6 | 1.848089 | 0.308015 | 66.836178 | 0 |
| Residual Error | 13 | 0.059911 | 0.004609 | | |
| Total | 19 | 1.908 | 0.100421 | | |
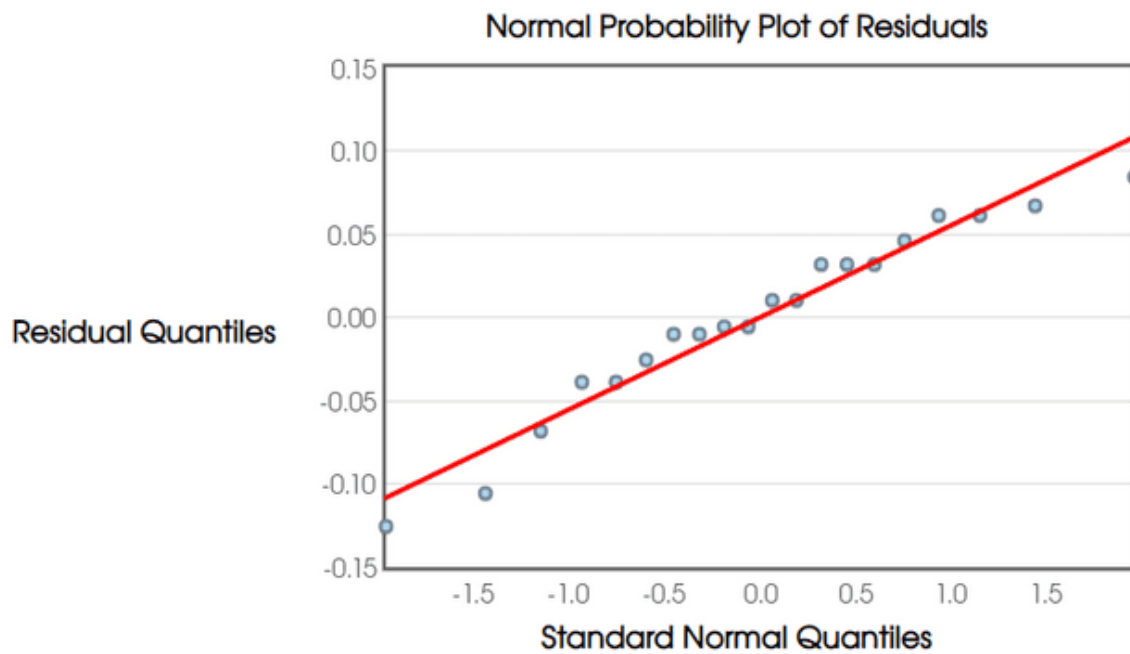


Figure 98 : Madurai regression –Normal probability plot of residuals

(Source: Author, 2020)

Table 51 : Madurai regression- Five Number Summaries of Residuals

| Minimum: | Min=−0.125525 |
|---|---|

| 1st Quartile: | $Q_1 = -0.032237$ |
|---|---|
| Median: | $M = 0.002234$ |
| 3rd Quartile: | $Q_3 = 0.038815$ |
| Maximum: | $Max = 0.084207$ |

(Source: Author, 2020)

## 10.8.2 Srirangam street heritage

Table 52 : Srirangam- Obtainaing values of independent and dependent values

| Street | Heritage % | Normalized Heritage % | No. of car street ritual | Normalized value of ritual | Distance from temple in mts | Inverse distance | Normalized value of Temple | Factor of visibility | Normalized value of gopuram |
|---|---|---|---|---|---|---|---|---|---|
| | | Dependent Factor (y) | | Independent Factor ($x_1$) | | | Independent Factor ($x_2$) | | Independent Factor ($x_3$) |
| North Uthrai street | 43 | 1 | 6 | 1 | 20 | 0.05 | 1 | 100 | 1 |
| East Uthrai street | 30 | 0.7 | 6 | 0.5 | 20 | 0.05 | 1 | 100 | 1 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| West Uthrai street | 31 | 0.7 | 6 | 0.5 | 20 | 0.05 | 1 | 100 | 1 |
| South Uthrai i street | 29 | 0.7 | 6 | 0.5 | 20 | 0.05 | 1 | 100 | 1 |
| North Chitarai street | 16 | 0.4 | 6 | 0.8 | 110 | 0.01 | 0.2 | 40 | 0.4 |
| East Chitarai street | 28 | 0.7 | 6 | 0.8 | 130 | 0.01 | 0.2 | 60 | 0.6 |
| West Chitarai street | 20 | 0.5 | 6 | 0.8 | 100 | 0.01 | 0.2 | 40 | 0.4 |
| South Chitarai street | 15 | 0.3 | 6 | 0.8 | 100 | 0.01 | 0.2 | 40 | 0.4 |
| North Adayavala njan street | 10 | 0.2 | 2 | 0.3 | 150 | 0.01 | 0.1 | 30 | 0.3 |
| East Adayavala njan street | 10 | 0.2 | 2 | 0.3 | 180 | 0.01 | 0.1 | 30 | 0.3 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| West Adayavala njan street | 6 | 0.1 | 2 | 0.2 | 150 | 0.01 | 0.1 | 30 | 0.3 |
| South Adayavala njan street | 25 | 0.6 | 2 | 0.5 | 200 | 0.01 | 0.1 | 100 | 1 |
| Kollidam road | 7 | 0.2 | 4 | 0.2 | 30 | 0.03 | 0.7 | 100 | 1 |
| East Tower street | 35 | 0.8 | 4 | 0.5 | 30 | 0.03 | 0.7 | 100 | 1 |
| West Tower street | 30 | 0.7 | 4 | 0.5 | 30 | 0.03 | 0.7 | 100 | 1 |
| Amma Mandapa m road | 33 | 0.8 | 4 | 0.5 | 30 | 0.03 | 0.7 | 100 | 1 |

(Source: Author, 2020)

Model used :

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_{1,1} x_1 * x_1 + \beta_{2,2} x_2 * x_2 + \beta_{3,3} x_3 * x_3$$

Where,

y   = Normalized heritage value of the street

$x_1$ = Normalized value of Ritual –car festival (Cultural factor)

$x_2$ = Normalized value of Temple (Physical factor)

$x_3$ = Normalized value of Gopuram- gateway (Visual factor)

Model:

Heritage value =

Gopuram−0.725282·Ratham∗Ratham+0.096662·Temple∗Temple+0.709617·Gopuram∗Gopuram

Table 53 : Srirangam regression

| Predictor | Coefficient | Estimate | Standard Error | t-statistic | p-value |
|---|---|---|---|---|---|
| Constant | $\beta_0$ | -1.408712 | 0.289346 | -4.868605 | 0.001242 |
| Ratham | $\beta_1$ | 2.070852 | 0.363093 | 5.703361 | 0.000453 |
| Temple | $\beta_2$ | -0.34395 | 0.265249 | -1.296706 | 0.230882 |
| Gopuram | $\beta_3$ | 4.985666 | 1.31158 | 3.801267 | 0.005227 |
| Ratham* Ratham | $\beta_{1,1}$ | -2.400079 | 0.38387 | -6.252316 | 0.000245 |
| Temple *Temple | $\beta_{2,2}$ | -0.554949 | 0.247107 | -2.245788 | 0.054927 |
| Gopuram* Gopuram | $\beta_{3,3}$ | -3.479279 | 0.99168 | -3.508468 | 0.007979 |

(Source: Author, 2020)

Table 54 : Srirangam regression - Summary of Overall Fit

| R-Squared: | $r^2$= 0.975655 |
|---|---|
| Adjusted R-Squared: | $r^2_{adj}$= 0.954353 |
| Residual Standard Error: | 0.057791 On 8 degrees of freedom. |
| Overall FF-statistic: | 45.80125 On 7 and 8 degrees of freedom. |
| Overall pp-value: | 0.000008 |

(Source: Author, 2020)

Table 55 : Analysis of Variance Table

| Source | df | SS | MS | F-Statistic | p-value |
|---|---|---|---|---|---|
| Regression | 7 | 1.070781 | 0.152969 | 45.80125 | 0.000008 |
| Residual Error | 8 | 0.026719 | 0.00334 | | |
| Total | 15 | 1.0975 | 0.073167 | | |

(Source: Author, 2020)

Normal Probability Plot of Residuals
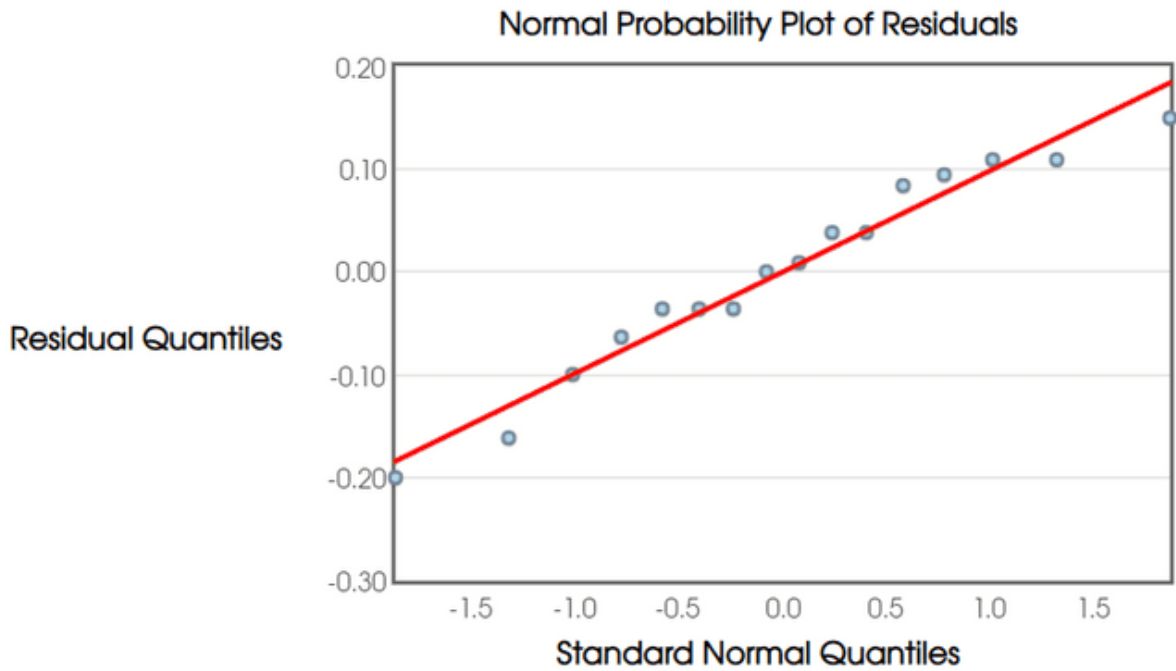
Figure 99 : Srirangam regression – Normal probability plot of residuals

(Source: Author, 2020)

Table 56 : Five Number Summary of Residuals

| Minimum: | Min=−0.199776 |
|---|---|
| 1st Quartile: | $Q_1$=−0.049555 |
| Median: | M=0.004589 |
| 3rd Quartile: | $Q_3$=0.089109 |
| Maximum: | Max=0.149553 |

(Source: Author, 2020)

### 10.8.3 Chidambaram street heritage

Figure 100 : Chidambaram- Obtainaing values of independent and dependent values

| Street | Heritage % | Normalized Heritage % | No. of car street ritual | Normalized value of ritual | Distance from temple in mts | Inverse distance | Normalized value of Temple | Factor of visibility | Normalized value of gopuram |
|---|---|---|---|---|---|---|---|---|---|
| | | Dependent Factor (y) | | Independent Factor ($x_1$) | | | Independent Factor ($x_2$) | | Independent Factor ($x_3$) |
| North Car street | 16 | 0.9 | 1 | 1 | 80 | 0.01 | 0.8 | 100 | 1 |
| East Car street | 15 | 0.9 | 1 | 1 | 80 | 0.01 | 08 | 100 | 1 |
| West Car street | 15 | 0.9 | 1 | 1 | 80 | 0.01 | 0.8 | 100 | 1 |
| South Car street | 17 | 1 | 1 | 1 | 80 | 0.01 | 0.8 | 100 | 1 |
| A T M & W N street (N) | 7 | 0.4 | 0 | 0 | 230 | 0.004 | 0.3 | 70 | 0.7 |
| K K & T P K street (E) | 7 | 0.4 | 0 | 0 | 260 | 0.004 | 0.2 | 100 | 1 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| C & V K street (W) | 5 | 0.3 | 0 | 0 | 250 | 0.004 | 0.2 | 70 | 0.7 |
| V& M street (S) | 6 | 0.4 | 0 | 0 | 270 | 0.004 | 0.2 | 40 | 0.4 |
| Vengan street (N) | 4 | 0.2 | 0 | 0 | 280 | 0.004 | 0.2 | 20 | 0.2 |
| VOC street (E) | 7 | 0.4 | 0 | 0 | 420 | 0.002 | 0.1 | 20 | 0.2 |
| P V , I K & U street (W) | 6 | 0.4 | 0 | 0 | 320 | 0.003 | 0.2 | 20 | 0.2 |
| SP Kovil street(S) | 6 | 0.4 | 0 | 0 | 330 | 0.003 | 0.2 | 20 | 0.2 |
| North Sannathi street | 7 | 0.4 | 0 | 0 | 60 | 0.017 | 1 | 100 | 1 |
| East Sannathi street | 9 | 0.5 | 0 | 0 | 60 | 0.017 | 1 | 100 | 1 |
| West Sannathi street | 10 | 0.6 | 0 | 0 | 60 | 0.017 | 1 | 100 | 1 |

| South Sannathi street | 9 | 0.5 | 0 | 0 | 60 | 0.017 | 1 | 100 | 1 |
|---|---|---|---|---|---|---|---|---|---|
| Bazzar street | 15 | 0.9 | 1 | 1 | 190 | 0.526 | 0.31 | 100 | 1 |

(Source: Author, 2020)

Model used :

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_{2,2} x_2 * x_2 + \beta_{3,3} x_3 * x_3$$

Where,

$y$ = Normalized heritage value of the street

$x_1$ = Normalized value of Ritual –car festival (Cultural factor)

$x_2$ = Normalized value of Temple (Physical factor)

$x_3$ = Normalized value of Gopuram- gateway (Visual factor)

**Model:**

Model: Heritage value = 0.4013 + 0.508313 · Ratham − 0.398814 · Temple + 0.041586 ·

Gopuram + 0.439052 · Temple ∗ Temple + 0.015273 · Gopuram ∗ Gopuram

Table 57 : Chidambaram regression

| Predictor | Coefficient | Estimate | Standard Error | t-statistic | p-value |
|---|---|---|---|---|---|
| Constant | $\beta_0$ | 0.4013 | 0.132113 | 3.03756 | 0.011296 |
| Ratham | $\beta_1$ | 0.508313 | 0.10265 | 4.951912 | 0.000434 |
| Temple | $\beta_2$ | -0.041586 | 0.912947 | -0.436843 | 0.670676 |
| Gopuram | $\beta_3$ | 0.041586 | 0.561617 | 0.074047 | 0.942302 |
| Temple *Temple | $\beta_{2,2}$ | 0.439052 | 0.782384 | 0.561172 | 0.58593 |
| Gopuram* Gopuram | $\beta_{3,3}$ | 0.015273 | 0.483346 | 0.031598 | 0.975358 |

(Source: Author, 2020)

Table 58 : Chidambaram regression - Summary of Overall Fit

| R-Squared: | $r^2$ = 0.937595 |
|---|---|
| Adjusted R-Squared: | $r^2_{adj}$ = 0.909229 |
| Residual Standard Error: | 0.076856 on 11 degrees of freedom. |
| Overall FF-statistic: | 33.053471 on 5 and 11 degrees of freedom. |
| Overall pp-value: | 0.000003 |

(Source: Author, 2020)

Table 59 : Chidambaram regression - Analysis of Variance Table

| Source | df | SS | MS | FF-Statistic | pp-value |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Regression | 5 | 0.976202 | 0.19524 | 33.053471 | 0.000003 |
| Residual Error | 11 | 0.064975 | 0.005907 | | |
| Total | 16 | 1.041176 | 0.065074 | | |

(Source: Author, 2020)
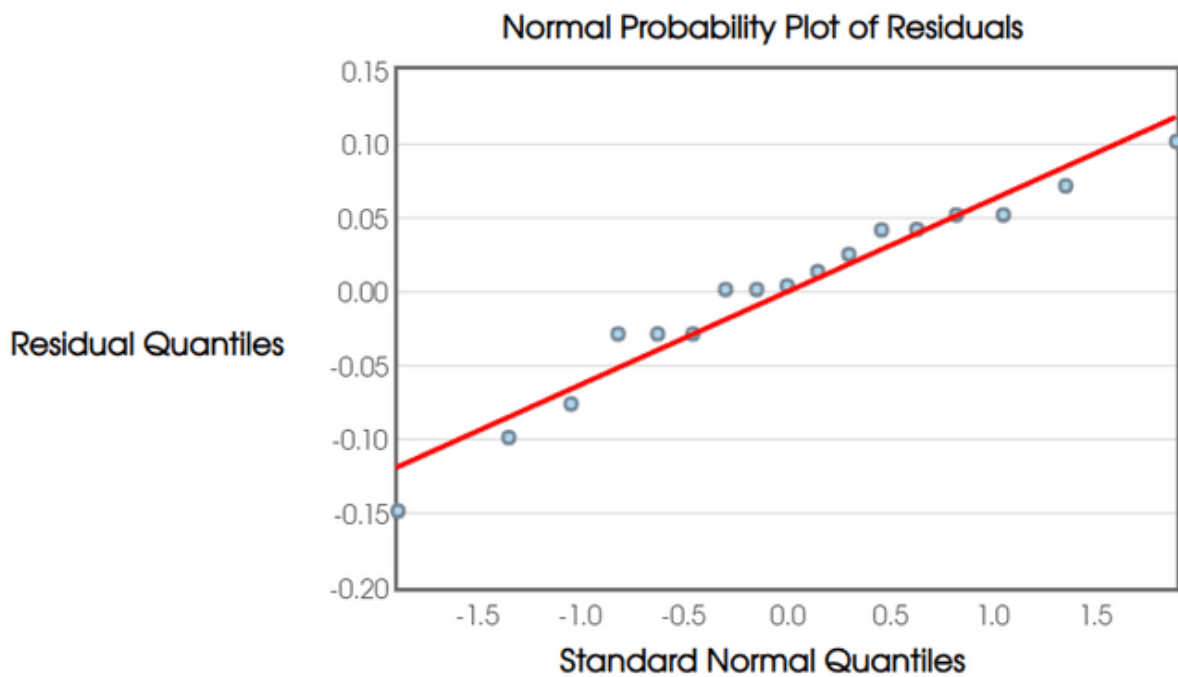


Figure 101 : Chidambaram regresion- Normal Probabilty of residuals

(Source: Author, 2020)

Table 60 : Chidambaram regresion- Five Number Summary of Residuals

| | |
|---|---|
| Minimum: | Min=$-0.148028$ |
| 1st Quartile: | $Q_1$=$-0.028414$ |

| | |
|---|---|
| Median: | M=0.004042 |
| 3rd Quartile: | $Q_3$=0.047104 |
| Maximum: | Max=0.101604 |

(Source: Author, 2020)

### 10.8.4 Inference

As per the above data an ordinal logistic regression model was used to measure the influence of each architectural element on Madurai, Srirangam, and Chidambaram's built heritage. As per the obtained results it is evidendent that the streets are highly influenced by the three prime independent variables which are exhibited on their facades. Together the three independent variables; temple, gopuram and ratham through their religious, visual and cultural auras have influenced the architectural fabric of the city enhancing the character of the city. As an architectural element's absence or presence strongly influences public perception of that city, a change in an architectural element's absence or presence impacts the visual perception of that city.

The buildings constructed in the past few decades show low visual perception indicating the influence of globalization and a sharp shrink in traditional characteristics of South Indian temple cities. This is due to the sudden expansion of the cities due to urban-change which led to heavy population inflow and unorganized commercialization. The effects of urbanization are being felt in changes in the built heritage, which lead to the gradual decay of a city's heritage.  With development in urban infrastructure, a huge neglect of heritage guidelines and polices is observerved along with disrespectful demolishion of

heritage buildings, urorganized changes in land use pattern and induction of alien architectural styles. As the temple towns of Madurai, Srirangam and chidambaram have significant cultural significance and robust architectural character, the towns require a suitable policy framework to conserve and preserve their heritage. To build such a framework, the significance of each architectural element in the town must be investigated carefully.

A study of three south Indian temple towns was conducted in order to identify and investigate factors associated with changes in buildings caused by urbanization. Urbanization is slowly eroding the built heritage of a city. In this study, we used a multi model regression model to assess the identified factors, showing that this method enabled us to manage categorical data when continuous variables could not be handled. It is evident from the results of the study that buildings with low levels of change were found in the study areas as a result of independent variables. The building's heritage character is largely determined by three elements: Gopuram (gateway), temple, and Ratha Yatra. The temple cities have been shaped by these three elements alone, which have had a profound impact.

## 10.9 Understanding

As a result of the research, the research has presented case studies in which the focus is solely on how the approach to architectural design can be influenced by considering ritual, visual, and cultural space from a socially based perspective rather than purely theoretically. In order to understand how the built form of the city is interconnected with its ritual practices, the research has the main objective of clarifying that relationship. An intriguing aspect of this study is the cohesion between architectural theory, religion and society.

As the space is intertwined with the beliefs of a society, there is a strong bond connecting it to its surroundings. It is hard to fully appreciate how religion, architecture, and mythology interact here from a modern perspective. In spite of modern-day changes, religious practices remain dominant in these places, and rituals continue to be performed in the same manner as centuries ago. There is, however, no connection between the new growth and the old city diagram, and it reflects the aspirations of a new generation that are independent of the previous generations.

## 10.10 Collective Memory

An American sociologist named Maurice Halbwachs coined the term 'collective memory' in 1950. In his writings he focuses on the social character of the human subject by analing the individual memory. He further illustrates how most of the shared activities happen in social frameworks and how these social frameworks feature as identities in individual memory (Halbwachs, 1992). Collective meomory can aslo be understood as a reconstruction in the present understanding the past and being compatible with social character of the people (Mack and Hirst, 2008).

Collective memory is classified into cultural memory and communicative memory where cultural memory has long term validity as it is based on ceremonial communication whereas communicative memory has short-term validity as it mostly consist of memories associated with fellow humans which fades with their death (Assmann and Czaplicka, 1995). Culture functions as the principal provider of identity and meaning as it frames the collective memory of the society, forming the base for social order. Cultural heritage in many ways functions as the carrier of collective memory which involves both intangible and tangible heritage. Visual heritage illustrates the relation between identity and remembering.

Identity here is referred as the product of processes that have reached culmination through gradual development (Viswanath and Nishant, 2021). Narration of the experiences from the past to the present is transmitted through historical landmarks, libraries, heritage buildings along with systems of value, music, language, fables, myths, legal or political traditions (Odendahl and Peters, 2009).

### 10.10.1 Collective memory in architecture

The concept of Collective memory can be applied in various levels of architectural domians in studying the design of urban spaces, designing monumental spaces, creating memories in places and studying religious buildings (Soltani, 2020). In most of the historical zones collective memories play an important role in studying the space through architectural fabric, as the presence of the cultural memories contributes to a stronger sense of identity by enhances the sense of belonging. This helps in the preserving and continuity of life in sacred complexes which inturn strengthens the collective memories.

### 10.10.2 Factors effecting collective memory

Collective memory exhibits both similarities and differences with the history and is heavily associated with the notions of social belonging and concepts of identity as well as with concept of place (Soltani, 2020). It is necessary to interpret festive celebrations in lines of working of memory. As per the illustrations of Aldo Rossi these workings are basically of two modes that of interpretation and of actualization which according to him depend on circumstances as well as temporal and cultural factors (Rossi and Moschini, 1979). Festive events, rituals and social practices are habitual events and occur at different levels of both scale and time. They are significant in relevance to who practices them as a community or society whether performed in private or public as well as the frequency on the yearly

calendar. These festivals acknowledge the identity of people or event mark different dates on the agricultural calendar with relevance to the stages of man's life.

### Temporal factor

Festive events and rituals are celebrated on special occasions of the year reminding the community of an historic or mythological event or person. Celebrations are bound to celebration of time as in olden days the festivals helped in celebration of time. Rituals are celebrated in with different scales in time:  time of the day, time of phasing of the moon, time of season, time of agricultural events, time of human events etc. Kevin lynch illustrates the same as "look for social image of time which enlarges, celebrates, and vivifies the present, while increasing its significant connections with the past and especially with the future." (Lynch, 1972:134). The ritual carries a deep emotional sense if it is well oriented in time as it connects the present with the distant past. To anchor and enhance the temporal orientation the human activities along with environmental sequences and forms play a vital role.

### Spatial factor

The space, stage or frame that caters the ritual plays a vital role as functions with aspects of vision as well as experience. No space lacks its meaning as the area is made sacred as it falls in the domain of sacred area. The ritual space is a product of distinctive frames with distinctive atmospheres and emotional moods. Sometimes the very identity of the place is defined by the experience of the place during the ritual. Aldo Rossi illustrates an interesting perspective in defining the relation between city and ritual by exhibiting ritual as one of the modes in expressing the collective memory of the past or the space. Thus, the

ritual is of huge importance in analysing the implications of the space and transmitting the ideas into the urban context (Rossi, Ghirardo, Ockman and Eisenman, 1982)

### 10.10.3 Collective memory mapping

As discussed in the above work the urban heritage of these temple cities evolved as a product of cultural exchanges and town planning frameworks prescribed in the ancient Indian texts. These cities were successful enough to establish culturally identifiable, sustainable and visually attractive urban forms. South Indian temple cities exhibit a unique plan where the city weaves around the historic core which is a product of concentric inhabited whorls around the temple. This pattern is secured with a well-defined boundary exhibiting a unique morphological framework and identity. The historical cores of these cities are recognised for their unique architectural character as they stand out both as visual and cultural landmarks where the temple forms the visual dominant structure more specifically the gopuram.  Through the multi-layer traditional forms of architecture, the heritage monuments create a sense of place invoking a strong mental image to the observer. Therefore, these landmarks along with their view-scape are highly important for the quality of our communities. Due to rapid changing faces of the urban form the visual webs are heavily destroyed.

### 10.10.4 Mental images

Mental images are product of symbolic retrospection by retrieving and revivng of individual and collective memories with the help of organization of perception and visualization. The collective memory has a strong reflection of the relation between time

and space along with its association with patterns of functions and architectural productins (Hamza, Kadhim Al-Yousif and Salman, 2021).

The image of the city will be positive if the majority of its inhabitants prefer the imageable elements. The cityscape's likability is the component of city image. If they dislike the imageable elements, the city conveys a negative evaluative image, indicating that its appearance should be improved. The concept of Likability refers to the perception that people who are exposed to an environment are likely to express a positive evaluative opinion about it.

## 10.10.5 Mental mapping

In south India, temple cities are pilgrimage destinations that create mental journeys through sacred spaces. Mental mapping is the process by which individuals recognize and organize spatial information while they travel through a city based on their observation of their area of interaction. A person's personal memories and explanations are reflected in the data collected. There is no universal scale or objective direction. Instead, the focus is on the content, with no right or wrong answer. The most common association of temple towns with temples, gopurams, or festivals was discovered through Mental Mapping surveys conducted in three temple towns.

The aim of the research was to gain an understanding of how temple city is perceived through people compared to its theoretical and visual understanding by conducting an experiment in which participants were asked to share their impressions and experiences of temple city from various perspectives. According to Wiener et al. (2007) and Stamps (2011), participants were instructed to rate the spaces they experienced.

## 10.11 Sample collection

By combining the individual perspectives of many residents and tourists, evaluative statistics were developed for this project as part of a neighborhood's collective image of its city form. Analysis of the users' perspectives is necessary to understand the significance of the city form in influencing the sense of belonging.

The objective of the study is to find out the users' images and perceptions related to the temple town of Madurai experienced in different frames of time. To operate this study a questionnaire of city baric and user experience has been drafted and circulated through Microsoft forms. The questionnaire has a total of 14 questions out of which 6 questions are subjective, 6 are objective and 2 are 5 point likert scale. This helped analysing the people's orientation in a temple town of Madurai as well to understand how collective memories are shaped and preserved within a social bracket. In this study the selected themes of observation are:

a) Factors responsible in forming the mental images of the users.
b) Different functions catered by the temple town.
c) Hierarchy of the city characteristics according to the collective user preferences.

### 10.11.1 Madurai

The sample considered for the questionnaire has four age groups.



| Under 25 | 28 |
| 25-40 | 34 |
| 41-60 | 22 |
| above 60 | 9 |

| Male | 33 |
| Female | 60 |
| Non-binary | 0 |
| Prefer not to say | 0 |
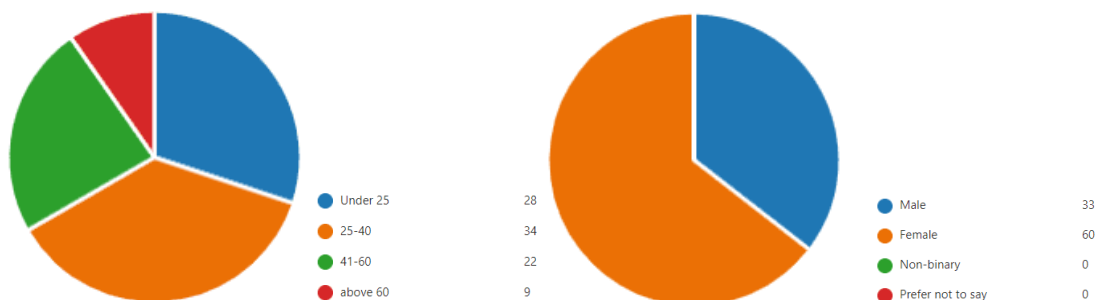
Figure 102 : Categorizing of: (a) age groups and (b) gender participated in the survey for Madurai

Source: Primary survey (Author)
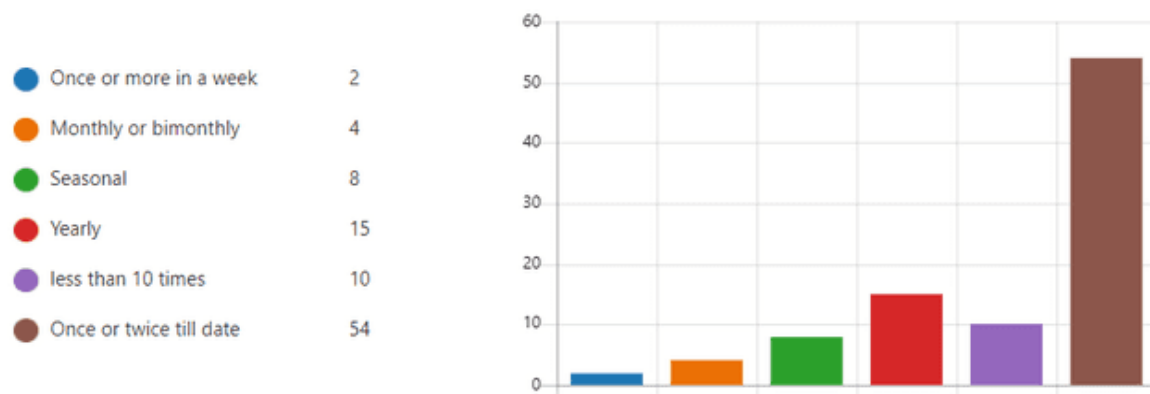


Figure 103 : Bar chart showing the frequency of visit.

Source: Author (using microsoft forms)

This indicates that, the frequency of visit is mostly once or twice in a lifetime by the respondents. As the considered case study is a piligrim centre majority of the participants were either tourist or piligims. The following bar chart idicates the purpose of visit to the temple town of Madurai.

| Pilgrimage | 34 |
| Tourism | 49 |
| Visit ( friend or relative) | 14 |
| Specific occasion | 9 |
| Resident | 12 |
| Shopping | 1 |
| Other | 9 |
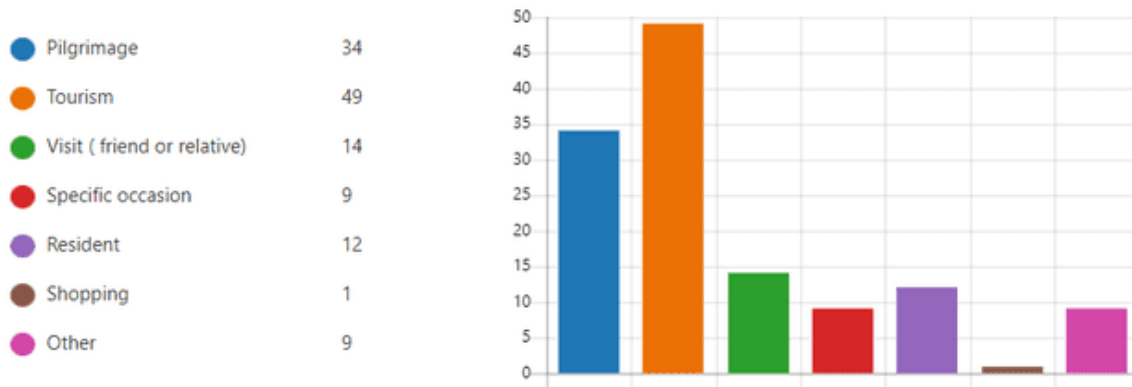
Figure 104 : Bar chart showing the purpose of visit.

Source: Author (using microsoft forms)

According to the considered sample, the purpose of visit to the 75% of respondents is either tourism or piligrimage. The following bar chart idicates the importance of visual identity in the form of gopuram as it stands as the 'first image that symolizes madurai ' to most of the users.



| Gopuram | 58 |
| Idol of deity | 11 |
| Ratha yatra | 0 |
| massive enclosures | 2 |
| Mada veedhi | 1 |
| Sannidhi streets | 4 |
| Sacred Water bodies | 6 |
| Chithirai thiruvizha | 6 |
| Other | 5 |

Figure 105 : Bar chart showing 'first image that symolizes madurai ' to the user.

Source: Author (using microsoft forms).

The above bar diagram indicates that 'gopuram' is the first image that symbolizes Madurai to 62.3% of the users of the considered sample. The following bar chart idicates the importance of architecture functioning as the 'most significant charecteristic' for most of the users.
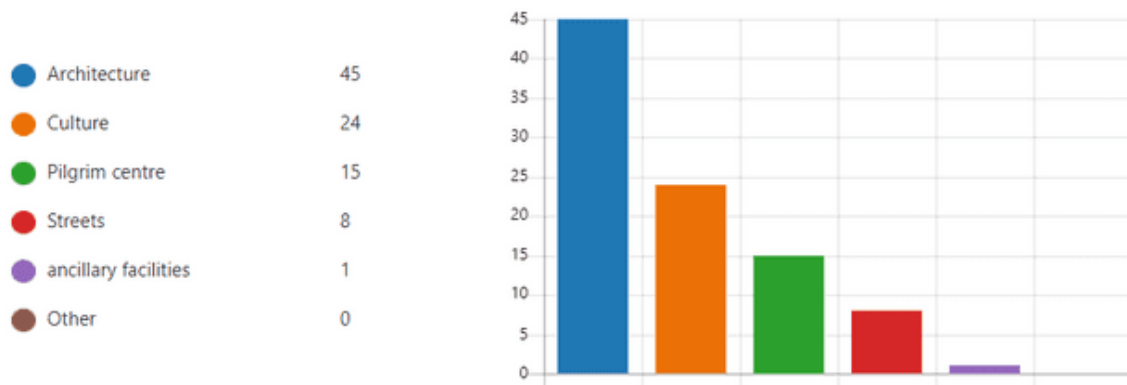


Figure 106 : Bar chart showing 'most significant charecteristic' to the user.
Source: Author (using microsoft forms)

This indicated that 48.3% of the respondants opted for architecture as the most significant charecteristic showing an inclination towards visual  heritage. The following likert chart idicates how important are various factors in forming the mental images for the users.
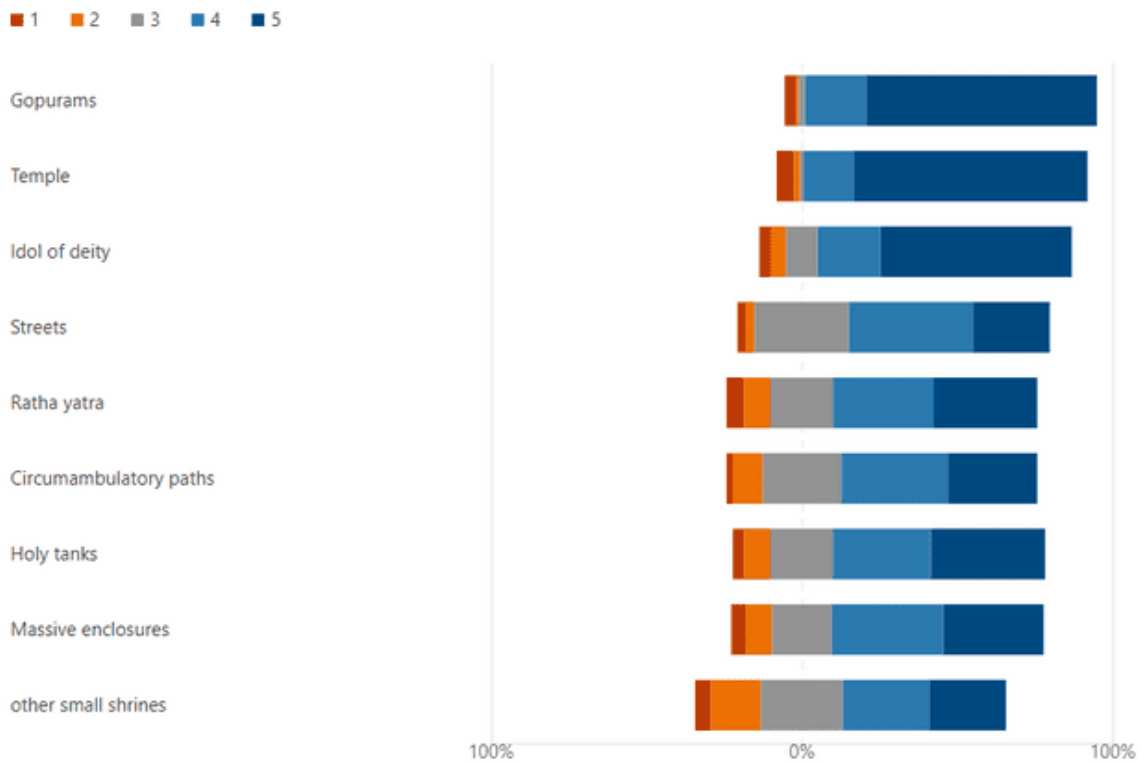
Figure 107 : likert chart showing 'On the scale of 1 to 5 how important is the factor of recognition of city elements' to the user.

Source: Author (using microsoft forms)

The following likert chart idicates how significant are the sensory factors in forming the mental images for the users. From the above diagram it was observed that both 'temple' and "Gopurams" were termed as most important factor of recognition of Madurai city by 75% of respondents and 61% of respondents responded that 'Idol of deity' is important factor of recognition of the city.
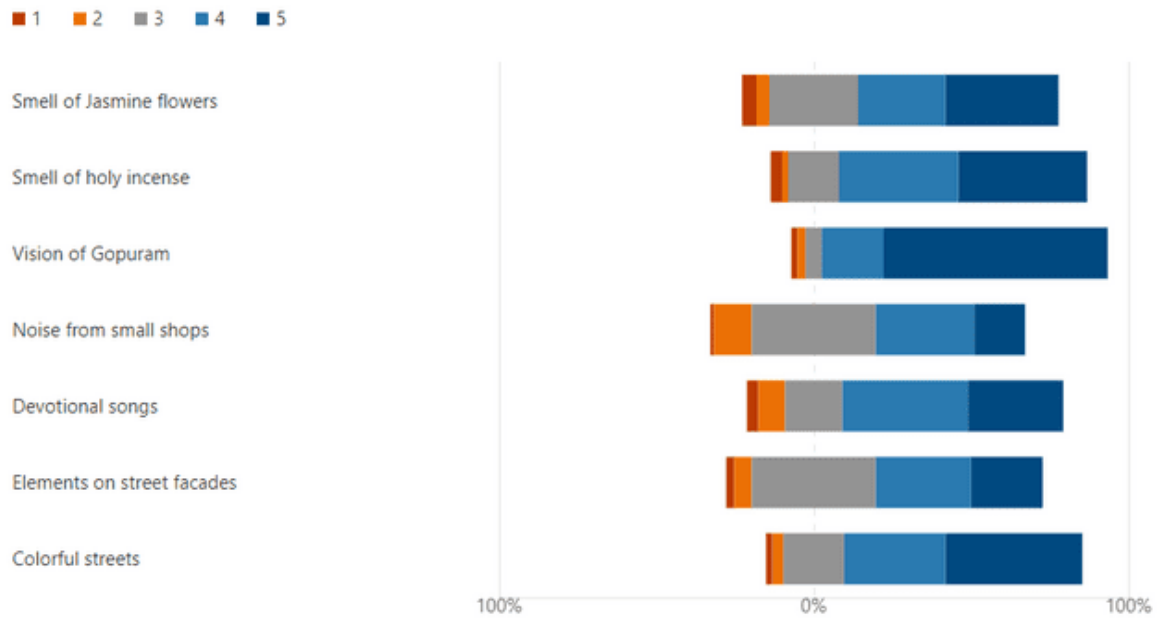
Figure 108 : likert chart showing 'how attractive are the sensory factors on the scale of 1 to 5 along the temple streets' to the user.

Source: Author (using microsoft forms)

While the respondents rated most of the factors above 4 point, figure 9 indicates that 90% of respondents felt that 'Vision of Gopuram' is one of the significant factors in the temple city of Madurai although the Likert chart exhibits that all the sensory factors play an important role in preseving the mental images of Madurai.
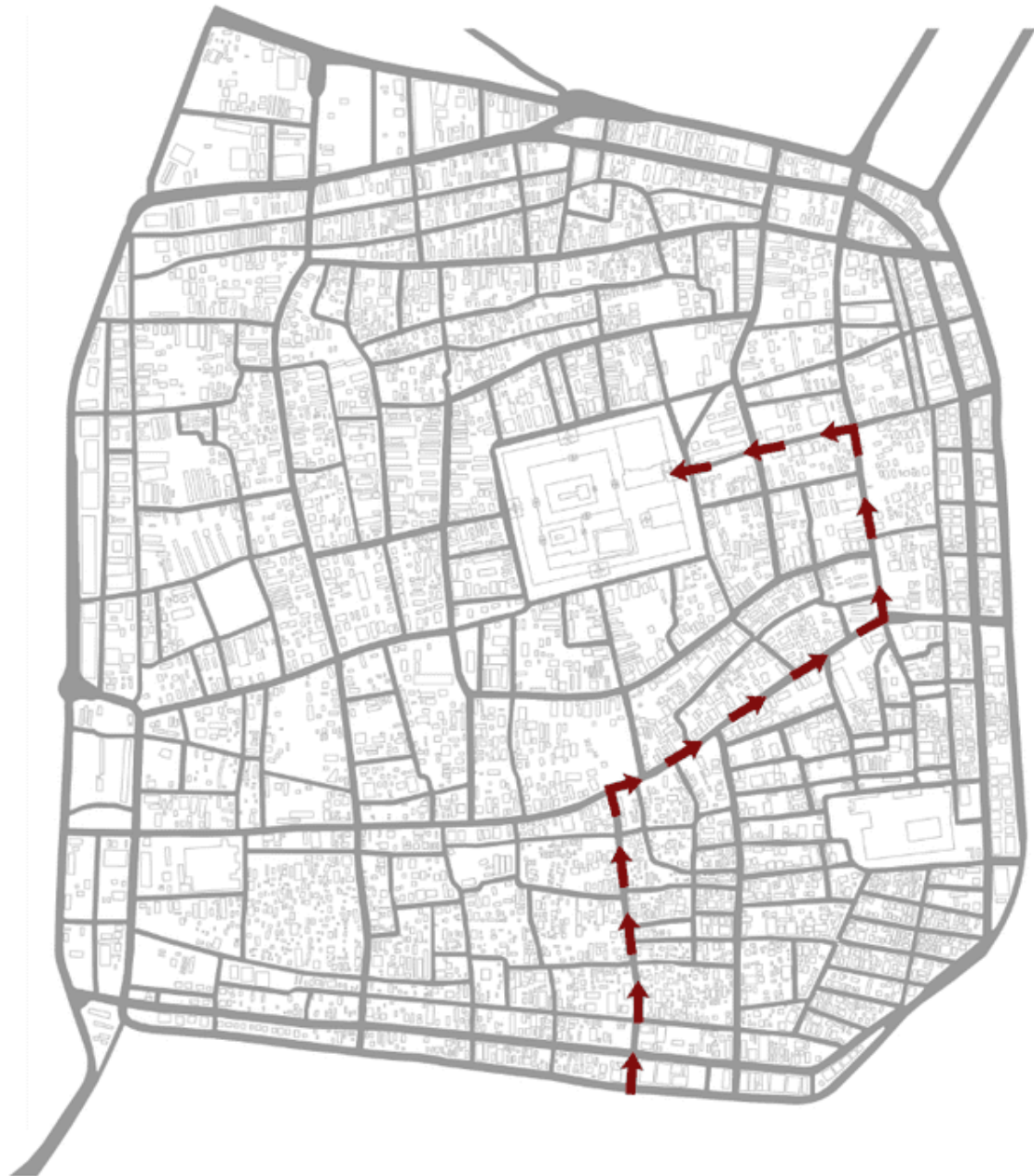
Figure 109 : Pedestrian mapping of Madurai

Source: (Author,2021)

The responses to the sequential movement in the temple complex icluded the prime

charecteristics of the temple along with details of the sensory factors. Sequential order is as

follows:

1. Entry to the temple town through South gate
2. Visit Vinayagar sanathi (shrine of Lord Ganesha)
3. Visit Amman sanathi (shrine of the Goddess)
4. Entering into the main sanctum to worship Goddess Meenakshi ( an actar of Goddess Parvathi cosort of Lord Shiva)
5. Visit Mulavikgraham (shrine of a Demigod)
6. Visit Praharam
7. Visit the Navagraham (shrine of the nine planets)
8. Visit Thamarai kulam
9. Visit 1000 kal mandapam
10. Sit and relax listning to devotinal songs.
11. Go to shopping
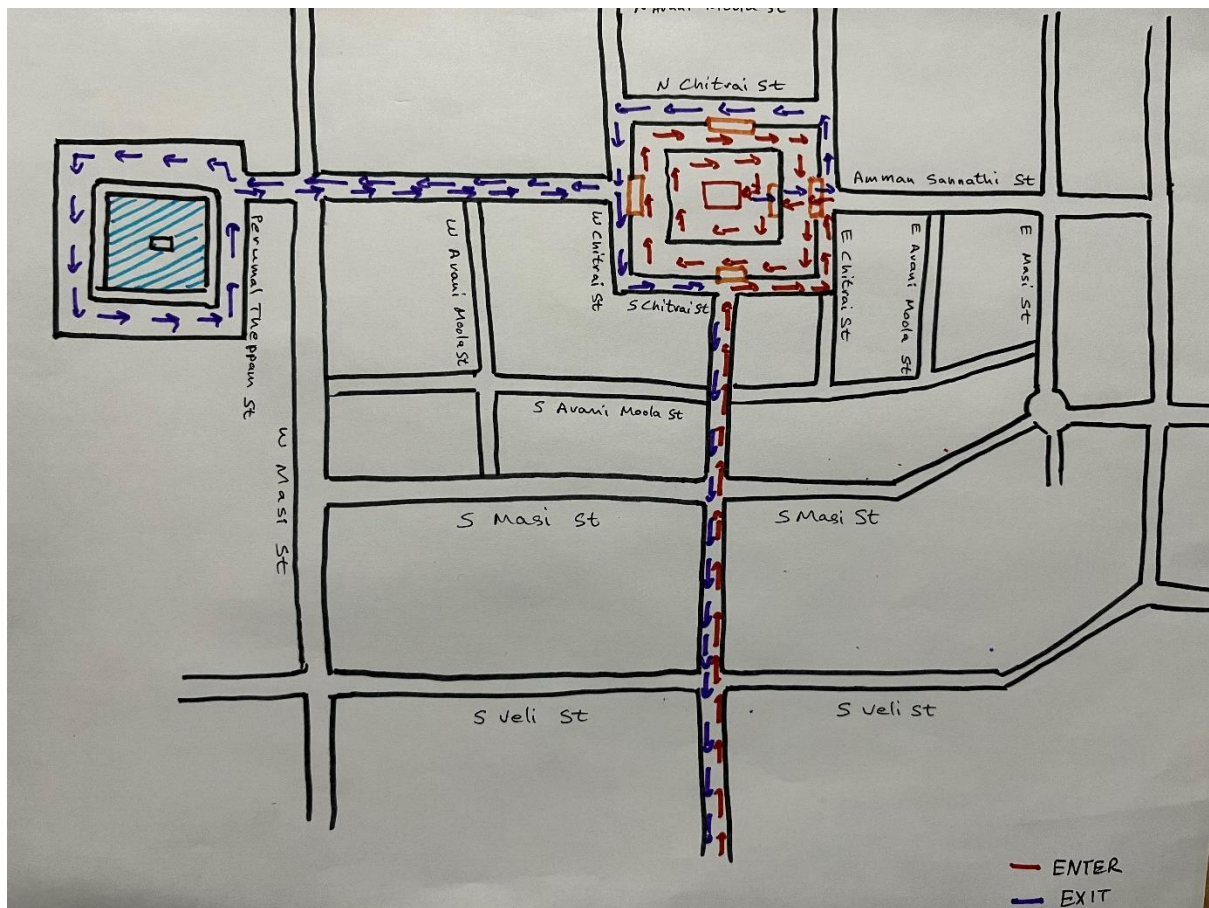


Figure 110: Sequential movement of Madurai (opt-1)

Source: Author (adapted from interviews)
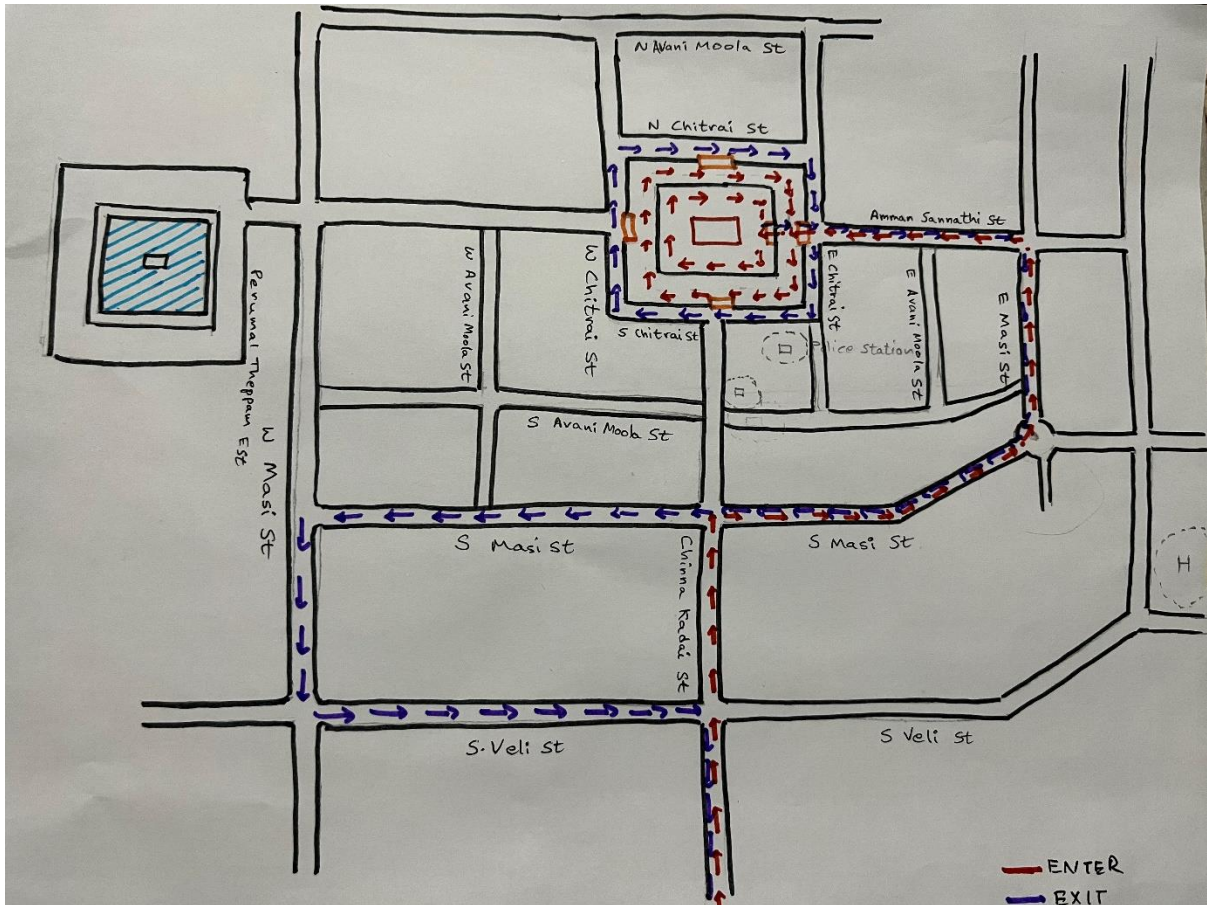
Figure 111: Sequential movement of Madurai (opt-2)

Source: Author (adapted from interviews)

The responses to other subjective questions include:

a) Time of visit: which majority of resposes stated April and December in response to the time of vactions

b) Specific emotions with various elements of the space: Most of the responses were inclined towards spirituality and culture entwined with temple, streets and ratha yatra while few were inclined toward the beauty of architecture.

c) Important festivals/events that are associated with the temple: Chithirai thiruvizha was the most common answer followed by ther thiruvizha, Meenakshi thirukalyanam, navaratri, panguni ashtami sapparam, pittukku man sumantha padalam and azhagar aathula irungurathu.

d) How easy was the way finding on the scale of 1 to 10: the average of the responses was 7.7.

## 10.11.2 Srirangam

The sample considered for the questionnaire has four age groups.
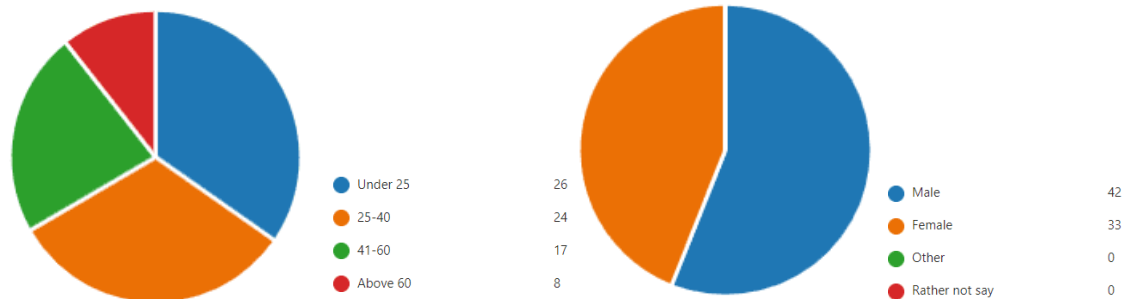


Figure 112 : Categorizing of: (a) age groups and (b) gender participated in the survey for Srirangam

Source: Primary survey (Author)
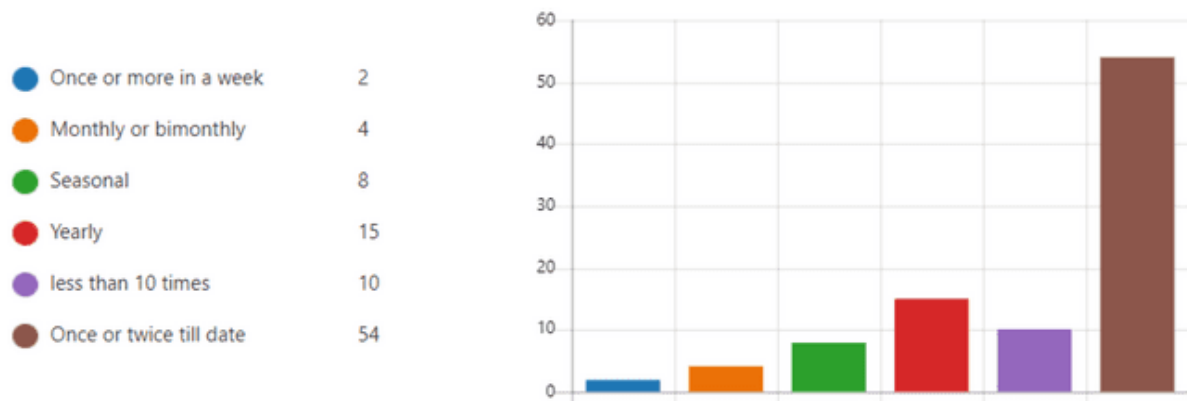


Figure 113 : Bar chart showing the frequency of visit.

Source: Author (using microsoft forms)

This indicates that, the frequency of visit is mostly once or twice in a lifetime by the respondents.  As the considered case study is a piligrim centre majority of the participants

were either tourist or piligims. The following bar chart idicates the purpose of vist to the temple town of Madurai.



| | | |
|---|---|---|
| ● Pilgrimage | 31 | |
| ● Tourism | 30 | |
| ● Visit ( friend or relative) | 8 | |
| ● Resident | 0 | |
| ● Shopping | 1 | |
| ● Other | 5 | |
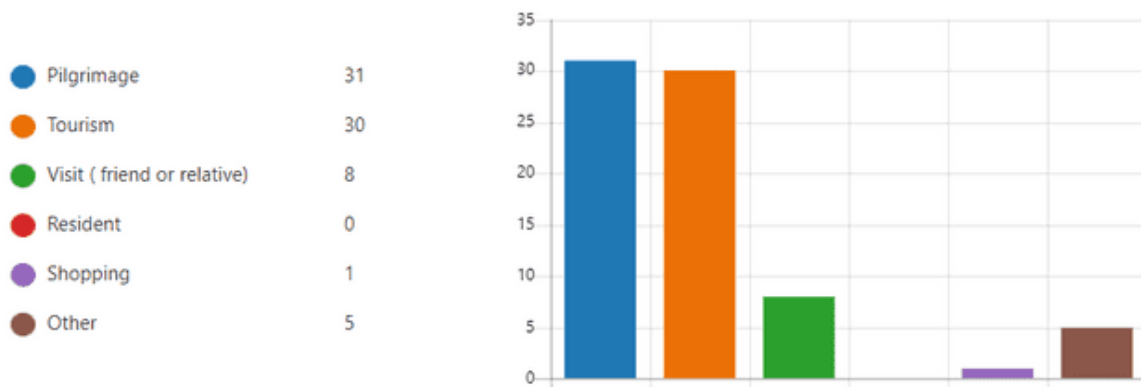
Figure 114 : Bar chart showing the purpose of visit.

Source: Author (using microsoft forms)

According to the considered sample the purpose of visit to the 40% of respondents opted for tourism while 41.33% opted for piligrimage. The following bar chart idicates the importance of visual identity in the form of gopuram as it stands as the 'first image that symolizes madurai ' to most of the users.



| | | |
|---|---|---|
| ● Gopuram | 48 | |
| ● Ranganatha idol | 17 | |
| ● Ratha yatra | 1 | |
| ● massive enclosures | 2 | |
| ● Car streets (streets around te... | 1 | |
| ● Sacred Water bodies | 3 | |
| ● other | 3 | |
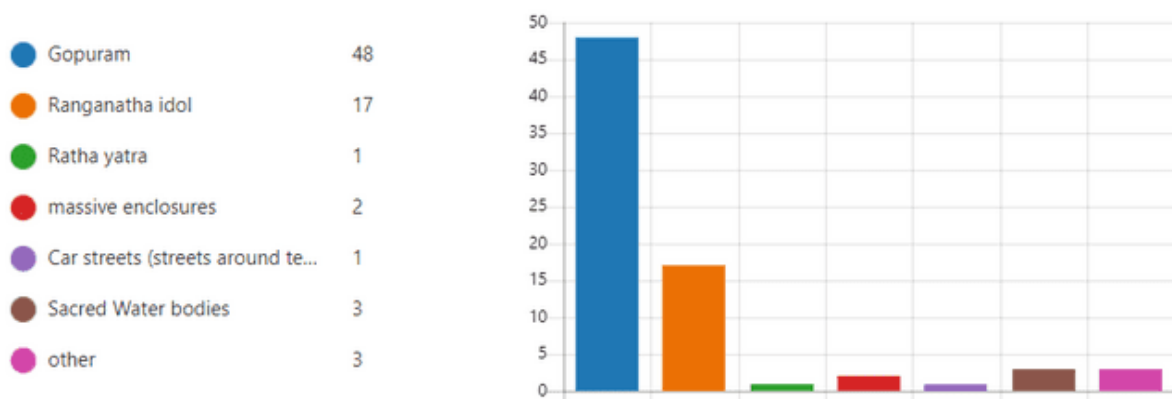
Figure 115 : Bar chart showing 'first image that symolizes Madurai ' to the user.

Source: Author (using microsoft forms).

The above bar diagram indicates that 'gopuram' is the first image that symbolizes Srirangam to 64% of the users of the considered sample. The following bar chart idicates the importance of architecture functioning as the 'most significant charecteristic of Srirangam' for most of the users.



| | |
|---|---|
| ● Architecture (massive gopura... | 46 |
| ● Culture (festivals –ratha yatra) | 11 |
| ● Pilgrim centre (temple aura) | 13 |
| ● Streets ( planning) | 5 |
| ● ancillary facilities (please speci... | 0 |

Figure 116 : Bar chart showing 'most significant charecteristic' to the user.

Source: Author (using microsoft forms)

This indicated that 61.3% of the respondants opted for architecture as the most significant charecteristic showing an inclination towards visual  heritage. The following likert chart idicates how important are various factors in forming the mental images for the users.
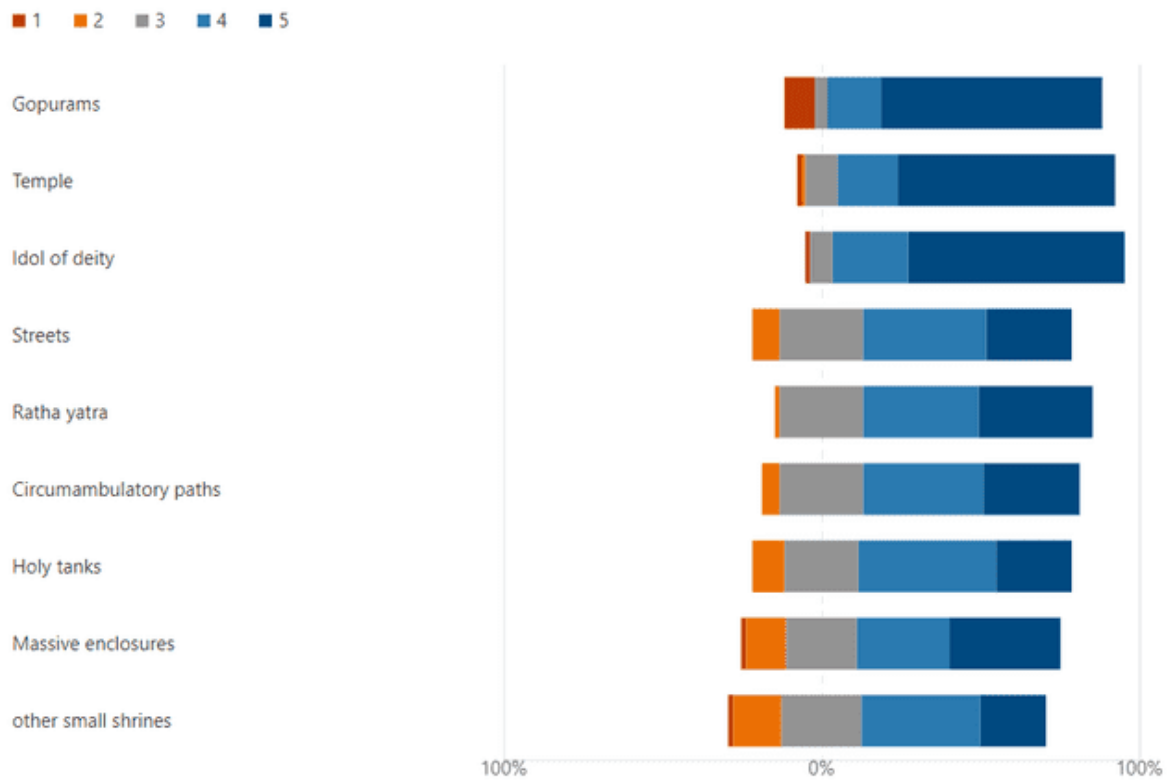
Figure 117 : likert chart showing 'On the scale of 1 to 5 how important is the factor of recognition of city elements' to the user.

Source: Author, 2021 (using microsoft forms)

From the above diagram it was observed that both 'idol of the diety', 'temple' and "Gopurams" were termed as most important factor of recognition of Srirangam. Out of which 70% of respondents opted for gopurams and 68.1% of respondents responded that 'Idol of deity'  and 'temple' is important factors of recognition of the city.

The following  likert chart idicates how significant are the sensory factors in forming the mental images for the users.
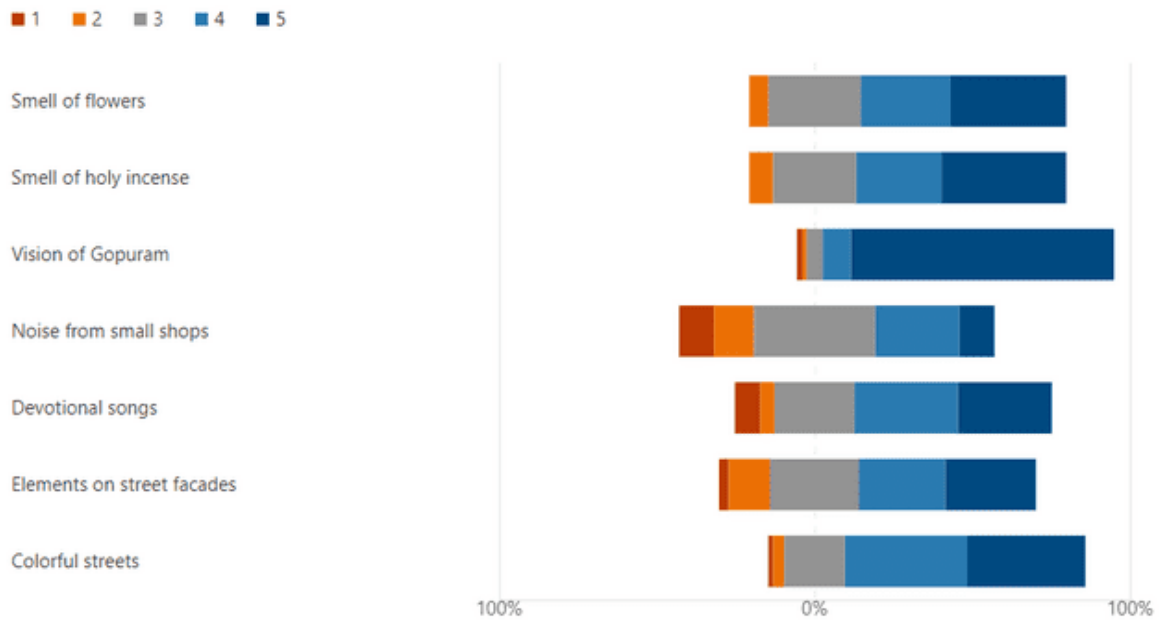
Figure 118 : likert chart showing 'how attractive are the sensory factors on the scale of 1 to 5 along the temple streets' to the user.

Source: Author (using microsoft forms)


While the respondents rated most of the factors above 4 point, figure 9 indicates

that 83.1% of respondents felt that 'Vision of Gopuram' is one of the significant factors in

the temple city of Madurai although the Likert chart exhibits that all the sensory factors play

an important role in preseving the mental images of Srirangam.

Figure 119 : Pedestrian mapping of Srirangam

Source: (Author,2021)

The responses to the sequential movement in thetemple complex included the prime charecteristics of the temple along with details of the sensory factors. Sequential order is as follows:

1. Enter through East gopuram (main enterance)/ South (second preference)
2. Clockwise circumbulation around the inner sanctum
3. Visit Vinayagar Sanathi (small shrine of Lord Ganesha)
4. Enter into the main sactum to worship Lord Vishnu
5. Visit amman sannidhi (small shrine of Goddess)

6. Collect Kumkum (sacred Vermillion smeared on the forehead)
7. Visit Praharam
8. Visit Navagraham (small shrine of 9 planets)
9. Circumbulation around Thamarai Kulam (sacred water tank),
10. Visit 1000 Kal Mandap (1000 pillar hall)
11. Sit and relax listning to devotinal songs.
12. Go to shopping
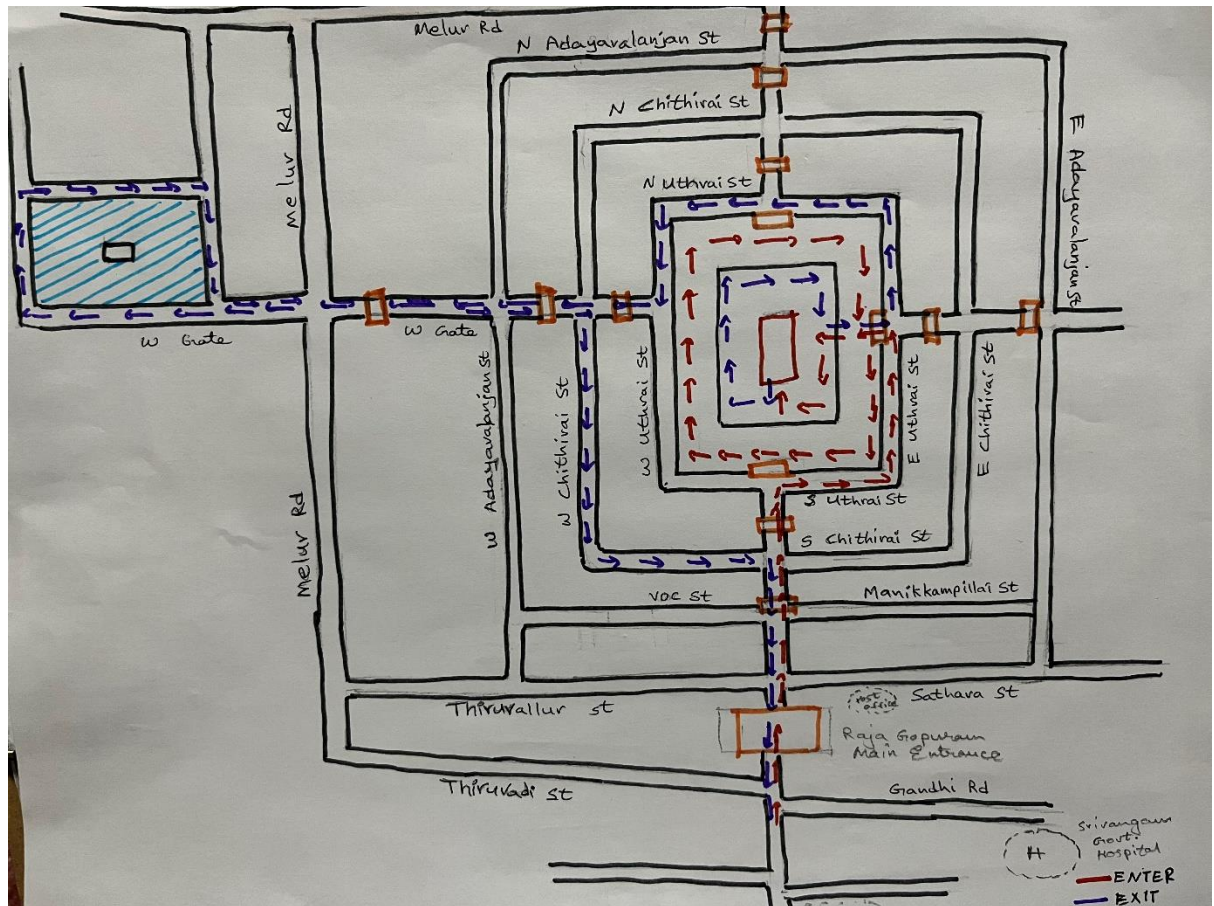


Figure 120: Sequential movement of Srirangam (opt-1)

Source: Author (Adapted from interviews)
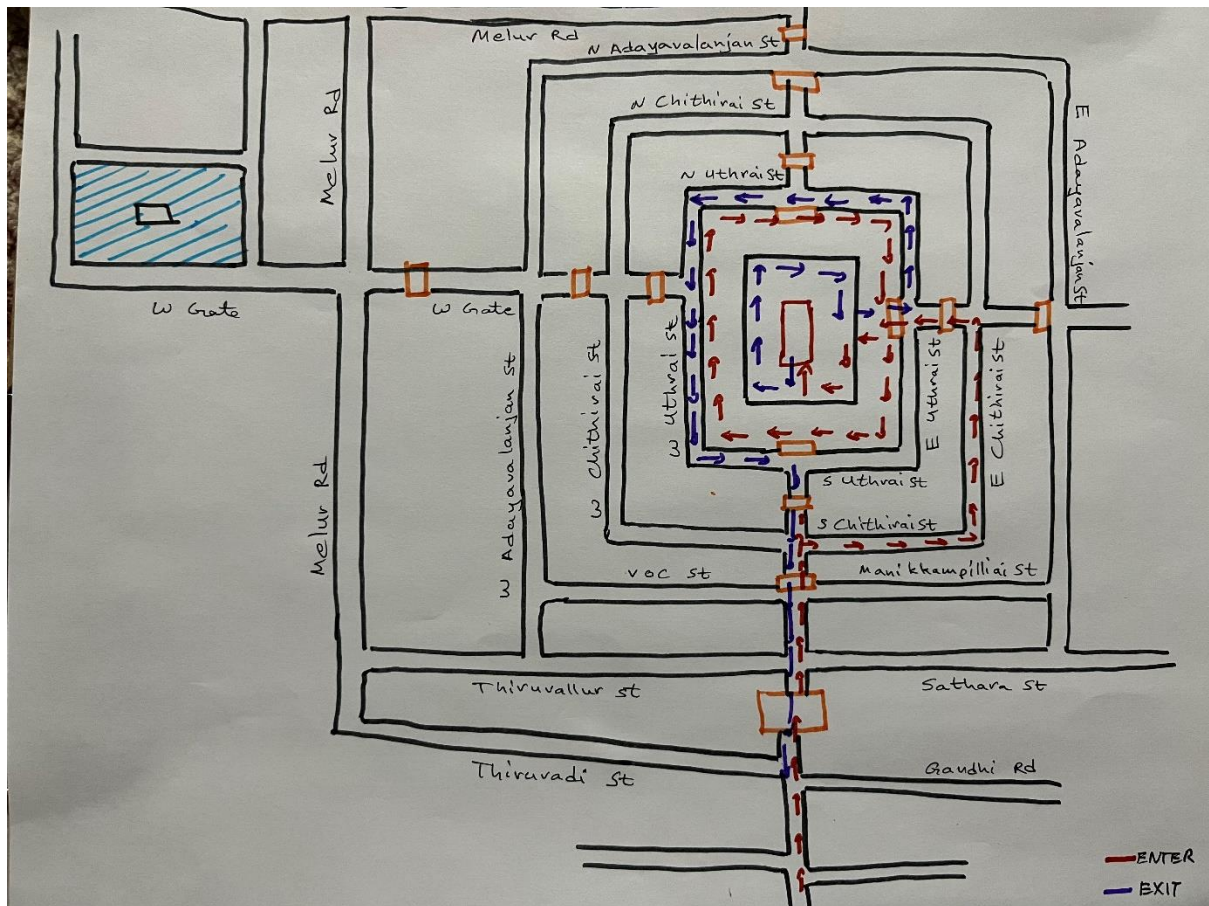
Figure 121: Sequential movement of Srirangam (opt-2)

Source: Author (Adapted from interviews)

The responses to other subjective questions include:

e)  Time of visit: which majority of resposes stated April and December in response to the time of vactions
f)  Specific emotions with various elements of the space: Most of the responses were inclined towards spirituality and culture entwined with temple, streets and ratha yatra while few were inclined toward the beauty of architecture.
g)  Important festivals/events that are associated with the temple: Chithirai thiruvizha was the most common answer followed by ther thiruvizha, Meenakshi thirukalyanam, navaratri, panguni ashtami sapparam, pittukku man sumantha padalam and azhagar aathula irungurathu.
h)  How easy was the way finding on the scale of 1 to 10: the average of the responses was 7.8.

## 10.11.3 Chidambaram

The sample considered for the questionnaire has four age groups.
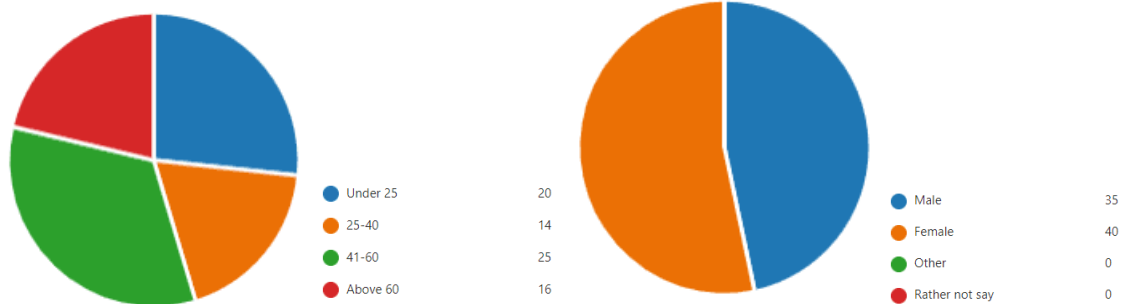


Figure 122 : Categorizing of: (a) age groups and (b) gender participated in the survey for Chidambaram

Source: Primary survey (Author)
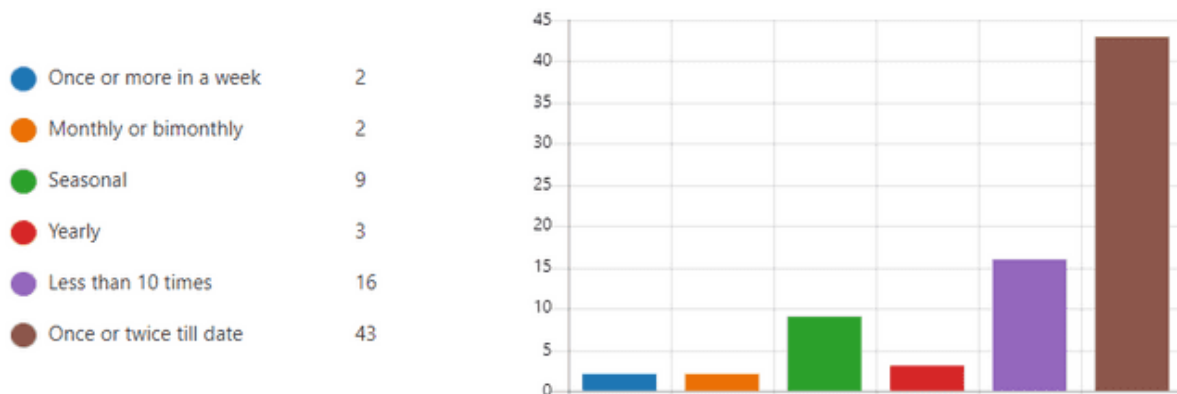


Figure 123 : Bar chart showing the frequency of visit.

Source: Author, 2021 (using microsoft forms)

This indicates that, the frequency of visit is mostly once or twice in a lifetime by the respondents.  As the considered case study is a piligrim centre majority of the participants were either tourist or piligims. The following bar chart idicates the purpose of vist to the temple town of Chidambaram.
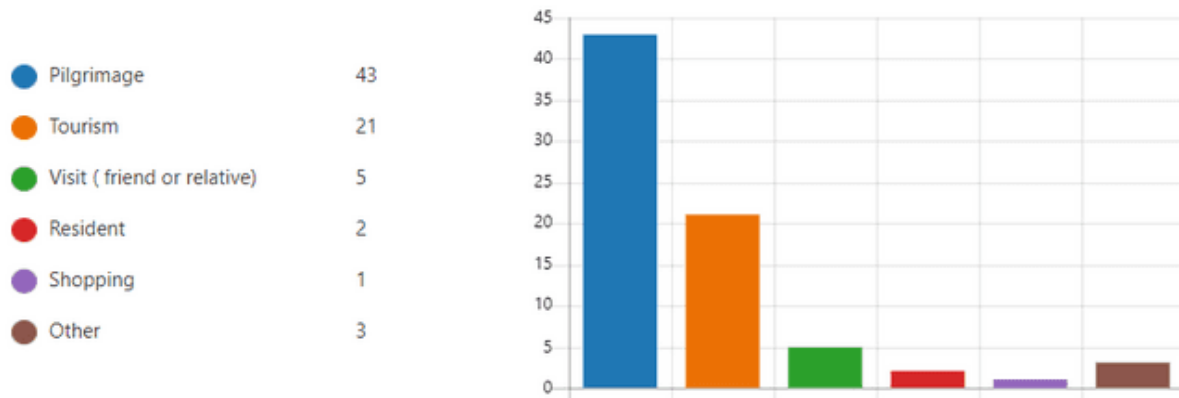
Figure 124 : Bar chart showing the purpose of visit.

Source: Author, 2021 (using microsoft forms)

According to the considered sample the purpose of visit to the 57.3% of respondents opted for tourism while 28% opted for piligrimage. The following bar chart idicates the importance of visual identity in the form of gopuram as it stands as the 'first image that symolizes Chidambaram ' to most of the users.
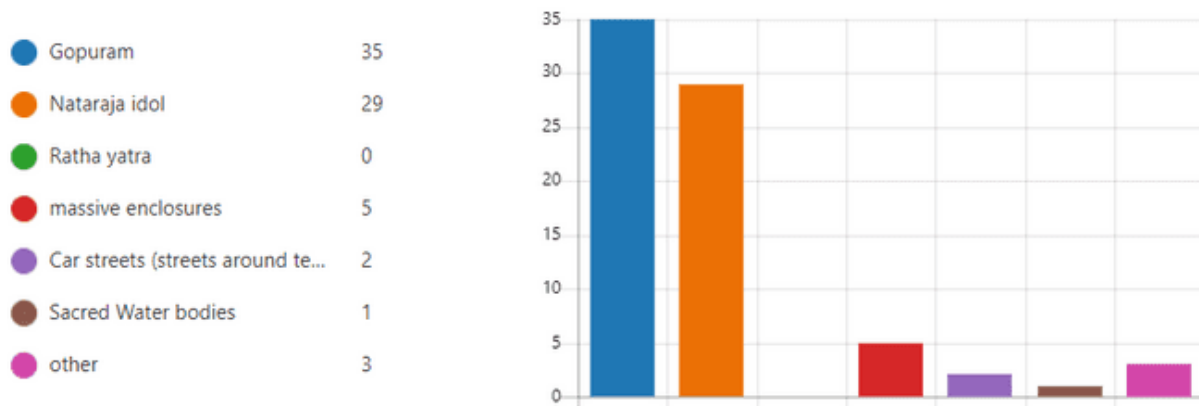


Figure 125 : Bar chart showing 'first image that symolizes Chidambaram ' to the user.

Source: Author, 2021 (using microsoft forms).

The above bar diagram indicates that 'gopuram' is the first image that symbolizes Chidambaram to 46.6% for of the users while 38.6% opted for Natraja idol for the

considered sample. The following bar chart idicates the importance of architecture functioning as the 'most significant charecteristic' for most of the users.



| | | |
|---|---|---|
| 🔵 | Architecture (massive gopura... | 54 |
| 🟠 | Culture (festivals –ratha yatra) | 16 |
| 🟢 | Pilgrim centre (temple aura) | 29 |
| 🔴 | Streets ( planning) | 4 |
| 🟣 | ancillary facilities (please speci... | 1 |

Figure 126 : Bar chart showing 'most significant charecteristic' to the user.

Source: Author (using microsoft forms)

This indicated that 72% of the respondants opted for architecture as the most significant charecteristic showing an inclination towards visual heritage. The following likert chart idicates how important are various factors in forming the mental images for the users.
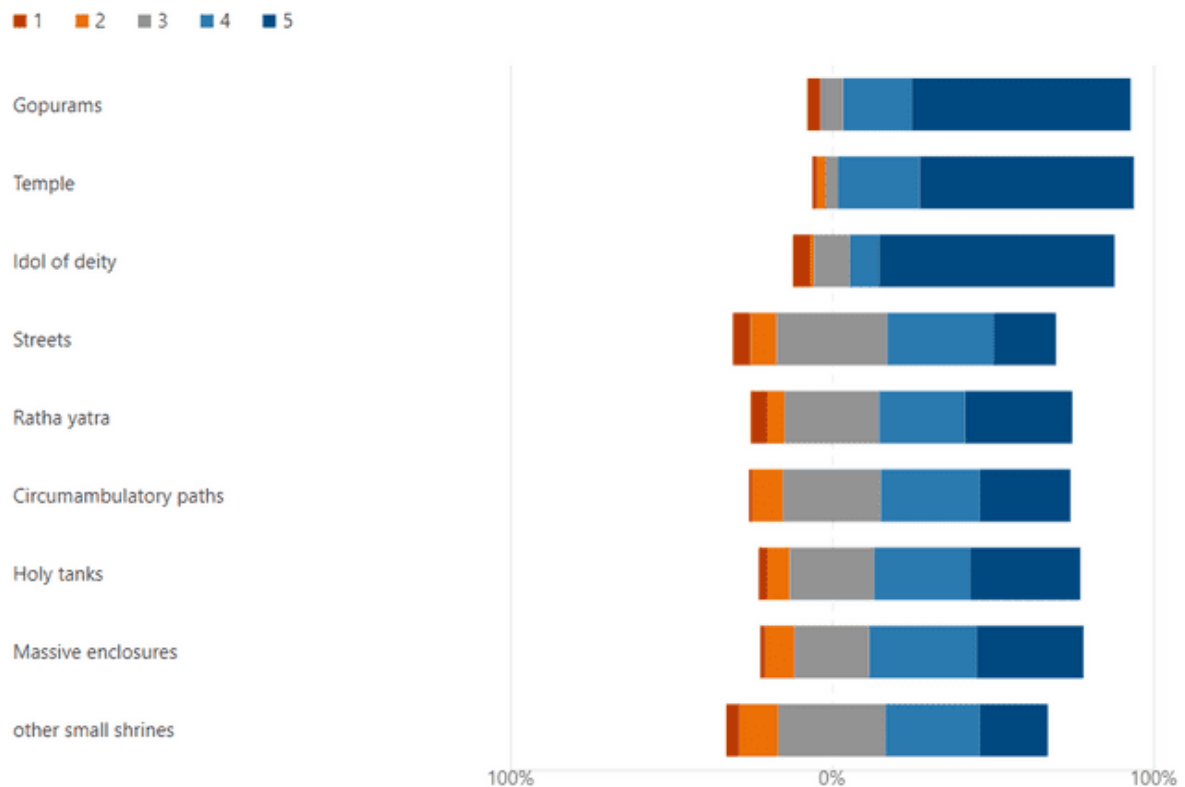
Figure 127 : likert chart showing 'On the scale of 1 to 5 how important is the factor of recognition of city elements' to the user.

Source: Author (using microsoft forms)

From the above diagram it was observed that both 'idol of the diety', 'temple', and "Gopurams" were termed as most important factor of recognition of Chidambaram. Out of which 68% of respondents opted for gopurams and 73.3% of respondents responded that 'Idol of deity'  while 66.7% opted for 'temple' are important factors of recognition of the city.

The following  likert chart idicates how significant are the sensory factors in forming the mental images for the users.
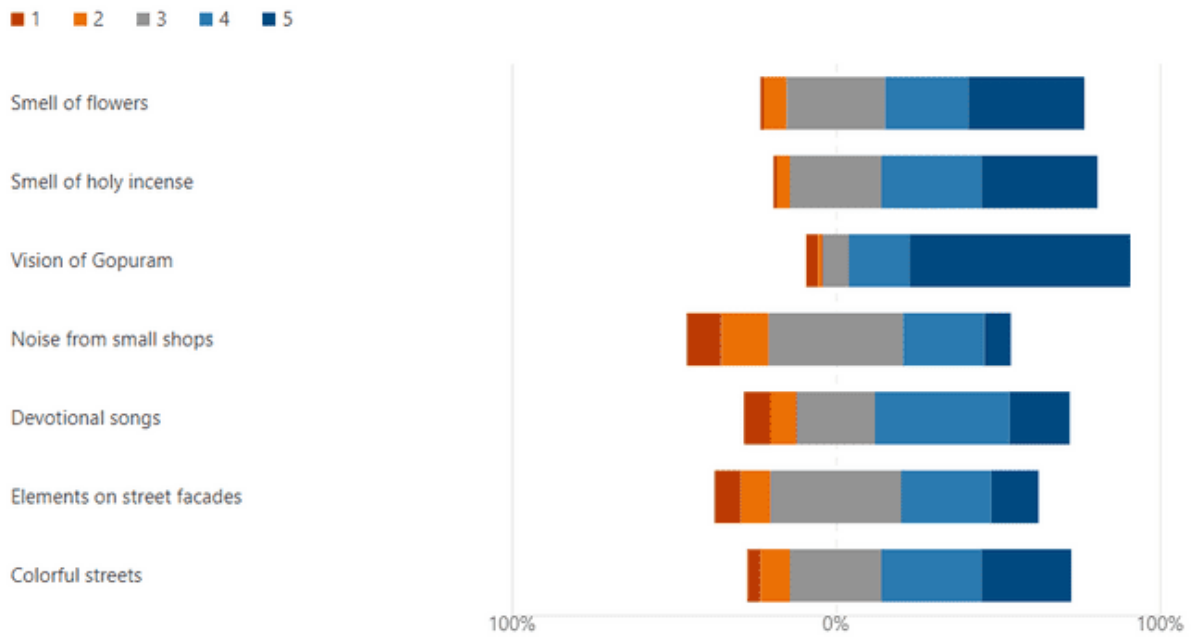
Figure 128 : likert chart showing 'how attractive are the sensory factors on the scale of 1 to 5 along the temple streets' to the user.

Source: Author, 2021 (using microsoft forms)

While the respondents rated most of the factors above 4 point, figure 9 indicates that 68% of respondents felt that 'Vision of Gopuram' is one of the significant factors in the temple city of Chidambarm although the Likert chart exhibits that all the sensory factors play an important role in preseving the mental images of Chidambaram.

Figure 129 : Pedestrian mapping of Chidambaram

Source: (Author, 2021)

The responses to the sequential movement in thetemple complex icluded the prime

charecteristics of the temple along with details of the sensory factors. Sequential order is as

follows:

1. Enter through East car street

2. Enter through South gopuram (main enterance)/ east (second preference)/ west

   (third preference)

3. Clockwise circumbulation around the inner sanctum through three concentric

   circumbulatory paths.

4. Enter into the main sactum to worship Lord Nataraja (dancing form of Lord Shiva)

5. Collect Vibuthi (sacred Ash smeared on the forehead)

6. Visit Perumal shrine (shrine of Vishnu)

7. Visit Thayar shrine (shrine of Goddess Lakshmi)

8. Visit the shrine of Nalvar (four great saints of Shaivism)

9. Visit the shrine of Dakshinamoorthy (lord of South direction)

10. Visit Shrine of Moolanathar (devotee of Lord Shiva)

11. Visit Navagraham (small shrine of 9 planets)

12. Circumbulation around Paramanandha koobham (sacred water tank),

13. Visit outer praharam

14. Sit and relax listning to devotinal songs.

15. Go to shopping
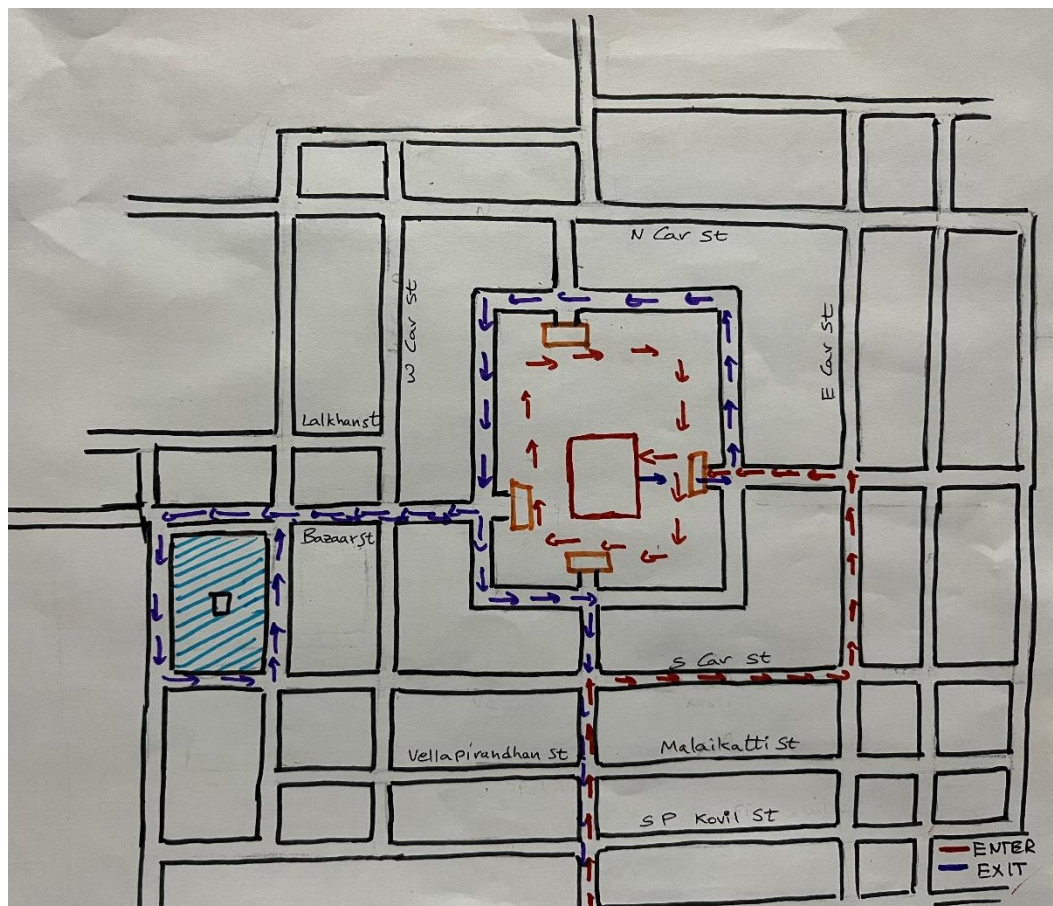
Figure 130:Sequential movement of Chidambaram (opt-1)

Source: Author (Adapted from interviews)
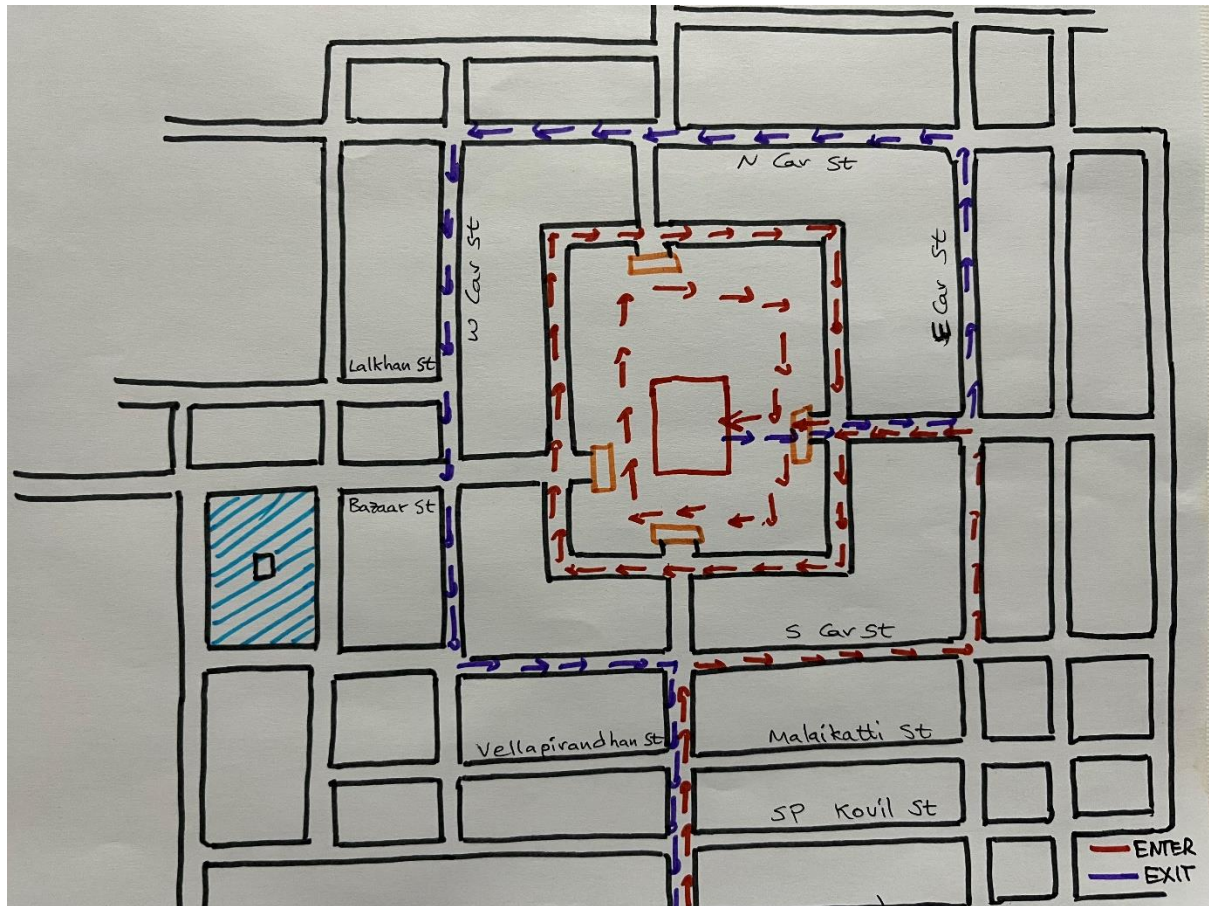


Figure 131:Sequential movement of Chidambaram (opt-2)

Source: Author (Adapted from interviews)

The responses to other subjective questions include:

a) Time of visit: which majority of resposes stated April and December in response to the time of vactions
b) specific emotions with various elements of the space: Most of the responses were inclined towards spirituality and culture entwined with temple, streets and ratha yatra while few were inclined toward the beauty of architecture.
c) Important festivals/events that are associated with the temple : Chithirai thiruvizha was the most common answer followed by ther thiruvizha, Meenakshi

thirukalyanam, navaratri, panguni ashtami sapparam, pittukku man sumantha padalam and azhagar aathula irungurathu.

d) How easy was the way finding on the scale of 1 to 10: the average of the responses was 7.8.

Imageability is the most dominant concept as it connects the people to its environment. Therefore, one of the major goals of the city planning is to enhance aesthetics of the temple town through proper urban design policies that aims in preserving the imageability in a holistic way. It is very important to include design policies based on three dimensional visual image of the city with inclination towards the relationship between built form and its context. There is a dire need in understanding the strategies used for formulating these traditional cities in order to incorporate them into the planning of modern city fabric.

## 10.11.4 Understanding

Based on the results from the online questionnire South Indian temples through their distinctive architectural styles and design elements, have a significant impact on the surrounding urban fabric, according to an online questionnaire. Besides reflecting the architectural characteristics of the temple town, these elements also contribute to the regional architectural identity, which is shaped by scale, mass, pattern, texture, building types, and functional activities. According to the results of a mental mapping study, the temple's visual identity, particularly its iconic gopuram, plays a key role in shaping users' mental images. In addition, the ratha yatra festival and the city's role as a pilgrimage destination reinforce the cultural and religious significance of the city, further strengthening the visual and social connections established by these architectural landmarks. Therefore,

visual, cultural, and religious attributes are all interconnected in shaping the identity of a city.

In addition, the study emphasizes temple cities' multifunctionality, since they serve as residential areas, commercial centers, tourist destinations, and platforms for grand celebrations. Based on observations and interviews, local residents follow the guidelines outlined in the Agamashastras (religious texts prescribing the procedures to be performed at the temple premises) in order to practice and perform religious rituals in their homes, along circumambulatory streets, and at holy tanks on auspicious days. The cultural aura extends throughout the entire city, permeating various aspects of everyday life in a manner that illustrates how it is embraced by every aspect of life.

As a result, temples, rituals, and gopurams establish profound spiritual, social, and visual connections that influence the physical and spatial structure of temple cities in South India. These connections shape the architectural style, cultural identity, and multifaceted functions of these cities, resulting in a vibrant and culturally significant urban center where tradition and spirituality are seamlessly intertwined.

## 10.12 Inference

South Indian temple cities were studied for their visual, social, and religious connectivity, which was found to play an important role in defining their characteristics. A key feature of South Indian temple architecture is the magnificent Gopuram, which enables visual connectivity. Additionally, the Ratha yatra festival fosters social connectivity by taking temple deities on a procession through the city, allowing residents to participate in festivities and make new friends. Furthermore, religious connections are established

through the temple itself, which is the center of the city and is a source of identity and belonging for its citizens.

Through a thorough analysis of three South Indian temple cities, this study demonstrates how these three factors play a crucial role in maintaining the imageability and strength of these cities. This study examined how temples have influenced the growth of South Indian temple towns over time based on the research inquiries outlined above. To collect data and examine the influence of temple towns on surrounding urban landscapes, a variety of methods were used, including online surveys, spatial analysis, and visual examination.

South Indian temple towns have been shaped by the function of temples, as evidenced by the findings of the investigation. These cities have been transformed into alluring urban mandalas created by intricately designed urban complexes that seamlessly fusing the abstract ideals of the town with the abstract ideals of the temple. In the auspicious car street festival, the streets served as the quintessential paths for the deities to circumambulate the temple wall compound.

In order to reach the temples, visitors traversed the magical "Gopuram" streets emanating from the sacred buildings' entrance gateways, which led them deep into the mystical heart of the city. South Indian temples also have influenced the surrounding urban fabric significantly by their architectural styles and design elements, reflecting the architectural style, scale, mass, overall pattern and texture, building type, use, activity, and inhabitants of the temple town. In order to gain a more comprehensive understanding of

the composition of South Indian temple cities, a regression model was used to examine the visual impact of temples on their built environment.

Based on the study's findings, temples are strategically oriented and located within the urban environment to create spatial and visual hierarchies that significantly influence the city's overall design and layout. Based on a theoretical model prescribed in traditional texts, the spatial fabric of the city was evaluated, identifying elements of high visual importance that were associated with its spatial structure. A secondary focus of the investigation was on how temple festivals and rituals contribute to the life and culture of south Indian temple towns, as well as how these events manifest in their urban environments.

# SECTION 4: DISCUSSION AND CONCLUSION

This section focuses on the examining the current scenario of the temple cities and with its drift from original character along with the factors of influence. As shown in the figure 112 this section comprises of three chapters; 'Issues of Concern', 'Recommendation', and 'Conclusion'. The initial chapter of the study discusses various issues that are present in the three cities in the current scenario observed during the study. The following chapter discesses on various possible recommendation for the issues discussed abovewhile the final chapter summarizes the study focusing the holistic model of the South Indian temple city.
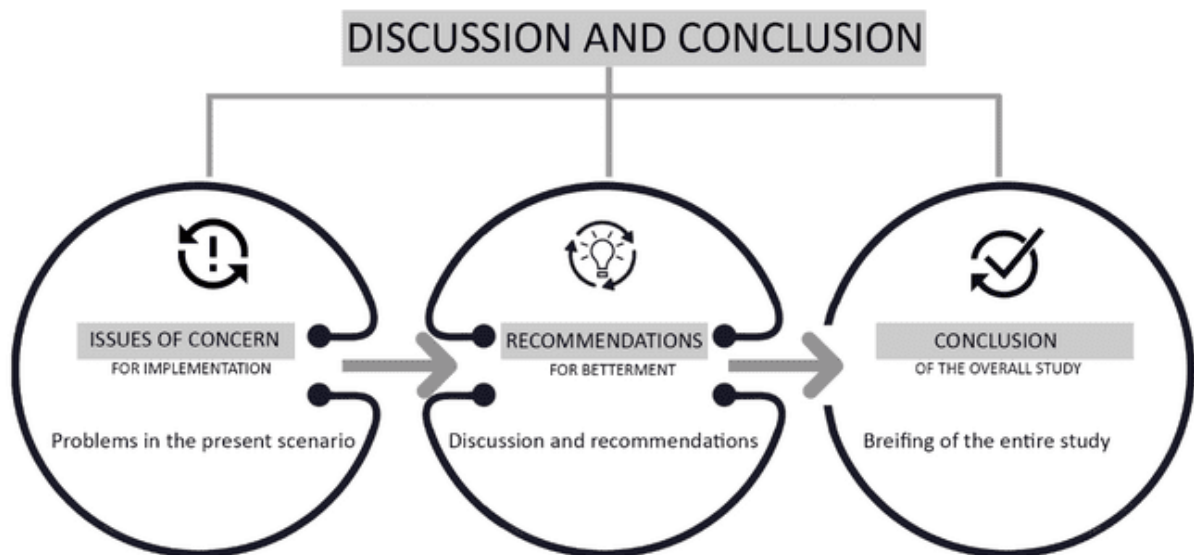


Figure 132: Discussion and conclusion flowchart

Source: Aurthor

# CHAPTER 11: ISSUES OF CONCERN

According the UNESCO World Heritage Sites the potential threats that affect the inherent characteristics are as follows:

1. Diminishing the degree of heritage protection by the modification of juridical status
2. Absence in proper policies for conservation
3. Planning projects of regional level causing threats
4. Threats caused by modern town planning
5. Threat or outbreak of armed conflict
6. Hazards impacts caused by environmental, geological and climatic factors (Jimura, 2019).

## 11.1 Urban change as a visual threat

Traditionally view capes which once enjoyed the views cape are greatly threatened due to the rapid economic and social changes creating a visual decay in the historical core areas. The issue of the controversial high-rise project in historical city of Vienna stands as a paradigm showing a great magnitude of public concerns and dire need for view-specific policies (Machat, Petzet and Ziesemer, 2010). In response to the same a threat to "visual integrity" for the world heritage centre has been perceived by UNESCO. A similar occurrence is observed in the year 2014 in Istanbul where the local judicial body ordered the demolition three luxury apartments which obstruct the view of city's historical peninsula. The skyline of majestic spires and domes is succumbed to continuous threat due to lack of strong policies. On the other hand, natural views capes like Mouth Fuji is sacred for the Japanese. The street named 'Nippori's Fujimizaka' offers a spectacular view of the mountain which is now greatly hindered by the urban development projects of Tokyo. Countering the same the locals formed a group named "CASF" (Citizens Alliance to Save the Fuji-View) and appealed to the International Council on Monuments and Sites (ICOMOS), a UNESCO advisory body. The

group also created a number of programmes to create awareness and publicity to the Fuji view preservation (Aukema, 2012). This represents the strong bonding of the people with views capes of religious and cultural landscapes. Similarly, there are several other cases where visual integrity concerns threatened Outstanding Universal Value of a World Heritage property which is as follows:

1. The world's greatest sheet of falling water, Mosi-oa-Tunya/Victoria Falls of National Park in Zambia with a natural trans-boundary is significant worldwide for its active land formation processes, exceptional geomorphological and geological features and most prominently for its spectacular beauty. This is threatened by developments of tourist accommodation in response hike in impacts of recreation and tourism (Mosi-oa-Tunya / Victoria Falls | World Heritage Outlook, 2020).

2. The historic topography of Istanbul the Bosporus peninsula surrounded by the Golden Horn, Bosphorus and Sea of Marmara were imprinted on the UNESCO World Heritage List in 1985. The site is known for its beauty and inspiration for many poets. In the last few decades, the city's fabric has faced a huge threat by the dynamic transformation and developments in response to the private investments and new scale of building investments. (Yilmaz and Gamil, 2018)

3. Ciudad Colonial or "Colonial City" of Santo Domingo (Dominican Republic) is the most ancient continuously inhabited European-established settlement in the Americas and now the main tourist attraction of Santo Domingo. Economic and social risks like mass tourism flow into the city along with property development pressure are threatening the historic urban silhouette of Colonial City of Santo Domingo (Sawe, 2017).

4. In the heart of Seville, Spain, the Alcázar, the Cathedral, and the Archivo de Indias Spain form an outstanding architectural ensemble. This complex epitomises the golden age of Spain. The recent high rise structurs now stand as a huge threat to the visual heritage of the place (Ballano, 2009).

5. Vilnius Historic Centre (Lithuania) is a Political centre of the Grand Duchy of Lithuania for five centuries from thirteenth to eighteenth and had a strong influence on the architectural and cultural development of the large part of Eastern Europe. Now the space suffers both visually and spatially with high rise buildings and deterioration of urban environment (Navickienė, 2007).

6. Historic Centre of Riga is regarded as the metropolis and world capital of Art Nouveau. The centre is popular for its preservation of culture through its architecture which exhibit profound style art and architecture that dominated the 19th ans 20th centuries. The historical centre is now affected by recent high rise tendencies that uprooted in the adjoining areas of River Daugava causing a disjuncture between the urban scales and planning (Dripe, 2021).

7. Dresden Elbe Valley in Germany is an 18th- and 19th-century cultural landscape along the river from Elbe River Island and the Pillnitz Palace and in the South-east to the Ostragehege fields and Übigau Palace in the north-west.  In the case of Dresden Elbe Valley the visual heritage is heavily compromised construction of bridge (Gaillard, 2014).

8. Cologne Cathedral is a Roman Catholic cathedral church, located in the city of Colognev in Germany which serves as the hallmark to the city. The dramatic view of this heritage now suffers with harmful visual impact due to the four new office

buildings that popped up along the river Rhine (Cologne Angered By UNESCO Criticism | DW, 2004).

9. The French government is continuously facing numerous challenges in preserving the integrity of the Mt. St. Michel and its Bay which has been recognized by multiple international and national institutions for ecological and richness and human activities such as farming, fisheries, and tourism. This due to the environmental conditions in response to the heavy concrete constructions (Lefeuvre and Bouchard, 2002).

10. The historic centre of Bordeaux as an outstanding architectural and urban ensemble phenomenal example of the exchange of human cultures over more than two thousand years. The historic landscape now suffers with the changing urban phase due the resource consumption, intensity of climate change, increasing pollution and density of steel and concrete structures (Appendino, 2017). .

11. A city on both sides of the Vltava River, Prague (Praha) is one of the most beautiful European cities. A major change in perception of cultural significance has occurred in many historic European cities due to the rise in tourism. In response to the same the visual character of the historic city suffers a great damage due to modern high rise buildings (Simpson, 1999).

12. Historic and cultural landscape of Macao is an ensemble of more than twenty spectacular monuments in China with four centuries of cultural interchange. This historic fabric suffers with heavy imbalances due to the proposed high-rise buildings (Chung, 2009).

13. The historic centre of Vienna is known for its robust architecture which includes the Baroque gardens and castles, along with the late-19th-century Ringstrasse lined with

grand picturesque, architectural edifices. According to the UN, the proposed high-rise construction may undermine the intricate visual knit of this heritage framework (Oh Vienna: world heritage status threatened by high-rise, 2017).

City concepts continue to transcend traditional ideas about what a city is and continue to play a significant role in the everyday practices of urban spatial planning.

## 11.2 Concerns in South India

In South India, several cases on the issue of non-cohesive urban interventions have raised public concerns as they obstructed sacred heritage monuments' view-scape. To protect the view-scape of five century old Sugavaneshwarar – Shiva temple, notable people from Salem town in Tamil Nadu have approached the corporation authorities in 2005 (Salem, 2005). The historical strains of Pandians, Cholas and Cheras are well preserved in this temple which stands magnificent in the heart of the city of Salem with its imposing towers. In order to retain the aesthetical view of the ancient Sugavaneshwarar Temple, the locals stepped forward to not only preserve the rich heritage and culture but also to prevent the growing concrete jungle around it. The present urban view is peppered with unpleasant and dilapidated buildings housing business establishments and shops that had infringed the grand walls of the temple blocking the view from all possible ways.

These temple towns that were solely used for religious purposes had evolved into commercial land uses, contributing to the growth of their kingdom's economy, this can be clearly observed from the commercial activity on the principle streets as well as emergence of large number of hotels of varying size to cater to the varying economic groups of tourists. Due to the need for modern services and conveniences, traditional veedus (houses) and

chattrams (traditional lodging facilities) are being replaced by modern ones. With the government's introduction of the Special Economic Zone, people have migrated in from different parts of Tamil Nadu and India, leading to urban sprawl and apartment building in peripheral areas. Consequently, new apartment typologiesare introduced due to urban spraw (Sasidhar, Jayanthi and Nallusamy, 2022).

In the case of Madurai many bodies of public interest have stood up against the buildings with height violations as they obstruct the views cape of temple gopurams (Shivarajah, 2012). According to government order passed in the year 1997 buildings existing within 1km radius from the Meenakshi Sundareswarar Temple's outer walls should not exceed the height of nine metres. However, 30 metre tall buildings exist as their construction had been approved according to the government order of 1968. To get a better understanding of this issue a detailed report had been submitted set of commissioners appointed by the Madras High Court Bench which highlighted 547 buildings that violated the height restrictions. Water Supply Department and Municipal Administration has not approved these constructions as per the order issued in 30th of January 1997. Due to the several violations of the permissible height bye law of 9mts issued by the government the view of the Gopuram is being greatly obstructed. Under the Architectural Regulation Bye-Laws, 1993 and Madurai City Municipal Corporation Height, the Madurai Corporation audited the height of the constructions in the temple city much before the government order passed in 1997. On the other hand, the topic of protecting Yanaimalai (the historical natural form with resemblance to an elephant in squatting rock formation) is raising serious public concerns. This solid block of rock covers an area of 3 kilometres and raises to a height of 90 metres (Imranullah, 2012).  In 2010 a high-level committee authorised by state

government of Tamil Nadu restrained the stay proceedings of Madras High court inorder to consider the idea of constructing a sculpture park by carving the Yanaimalai. This hillock is being worshipped by the locals as a guardian diety or 'Mauniyandi' and so many consider the entire rock formation divine accosiated with numerous legends.

In the case of Srirangam the entire town falls in the temple premises and all the twenty-one gopurams together form a picturesque view for the pilgrims. But the recent scenario is being witnessed with mushrooming of residential apartments around the temple obstructing the view scape. The fast development of Srirangam as a tourist destination is the prime reason behind the construction of buildings by flouting norms. But according to the Country planning Act, 1971 and policies of Tamil Nadu Town no construction should exceed 9mts of height in the vicinity of temples or any heritage buildings (Times of India, 2015). But the recent reports show various buildings above the permissible height are emerging in close proximity to the royal temple tower, Rajagopuram. The huge footfall of pilgrims and tourists to the city of Srirangam, hiked the potential for business development which resulted in big investors venturing into real estates and violating the construction norms to witness higher economic profits.

In the case of Chidambaram, mandapam construction adjacent to the temple complex near Eastmada Street got a stay in Madras high court as the new construction will obstruct the visibility of the gopuram (Ragunathan and Kolappan, 2014). For that reason the petition presented that any building would block the clear view of the 160 feet east gopuram of Chidambaram Nataraja temple. They submitted that the proposal of the authorities to construct a massive concrete shelter on East Mada Street would deliberately obstruct the view. Thus, it is understood from the above cases that emotional bonding and

aesthetic values exit with both landscape features and monuments and raise public concerns aross the globe.

## 11.2.1 Infringement of Carrying Capacity

During the special days of the holy calendar, both minor and major temple cities in India experience a heavy footfall of tourists and pilgrims. In this brief period of time in the year the cities experience heavy dynamic changes.

### 11.2.2 Waste Management

The most challenging part in the religious sites of India is the waste management. To minimise this many initiatives are being taken to promote the use of bins and recycle units by providing awareness among pilgrims and tourists.

## 11.2.3 Pollution

Due to the heavy growth in urban infrastructure in response to the pilgrim footfall the religious sites suffer with four types of pollutions which are air pollution, water pollution, land pollution and noise pollution. This is also causing permanent impressions on the bio fabric of the city.

Due to the steady hike in traffic density these temple cities are witnessed with rise in air pollution. Using the case studies of three ancient temple towns in Tamil Nadu, this stydy examines the issues related to historic towns and urban heritage conservation. Some of the heritage characteristics of the temple cities are undergoing changes, losing part of their heritage character. This includes the ritual topography, procession routes, street heritage, the temples' sacred precincts, the water tanks, and even some streetscapes. There are many

factors contributing to the threats to heritage settings such as ignorance of heritage settings, unplanned development, demographic changes, commercial interests, real estate booms, desire for modernization among people and adoption of "international styles" that are amorphous.

### 11.2.4 Transport facility

Most of the Indian pilgrim sites require a combination of transport facilities to reach a destination. Though majority of the travel volume is accomplished by rail and air travel in response to the strong rail and air network in India, the pilgrim destinations have to be reached by foot.

### 11.2.5 Degradation of natural resources

There is a large-scale movement of visitors during the festive weeks in temple towns, which has a high level of influence on the environment in these places. Moreover, constant evolutionary processes of these temple towns weave complex interactive webs which have visible effects on the environment through three interrelated processes, which are degradation of natural resources, increase in pollution and stress on basic services.

The temple towns of Tamil Nadu now face problems in providing amenities and facilities for the pilgrims as it demands in the exploration of natural resources. In response to the continues rise in foot fall of the pilgrims there is high rise in demand for water supply which in turn led serious exploration of water tables and also to a substantial loss of irrigation water. This is also resulting in the imbalance of the ecosystem which is visible on the numbers of flora and fauna in response to the increased rate of soil erosion.

## 11.2.6 Scrutiny of Religious Trusts

The financial status and regulations of the trusts should be transparent and should not involve in money laundering activities as these contribute in strengthening the countries economy. These funds should be well managed and adequately used in both the benefit of city's fabric as well as well as promoting the community's well being.

Since the temple is a major center of attraction, it is certain to continue to attract an increasing number of people from both within and outside of the city. Despite the necessity of activity, the area also needs promotion so as to bring in more tourists to maintain the city as a prominent centre of activity and also maintain its heritage qualities. It is therefore necessary to plan for such heritage areas in a comprehensive manner, where heritage conservation, land use planning, traffic management and tourism ought to be integrated. The sustainable development of South Inadian temple cities is dependent on the involvement and commitment of local communities. Therefore, the planning process should also prioritize the involvement of local people and should begin at the grassroots.

### 11.3 Impact of view-scape on property values

The importance of viewscape was confined to strategic reasons historically as the notion of a dominant point would empower the owner to be conscious to the possible intrusions. Whereas today view-scape is acknowledged for aesthetic reasons associated with identity and sense of bonding. Usually views capes associated with water bodies and green areas are witnessed with a hike in property values. A similar affect is shown on places with view-scapes associated with religious or heritage views.

In the case of Srirangam, properties in close proximity to the temple or properties with good view of Rajagopuram exhibit high market value than the other properties. Several

hotels in the temple towns like Chidambaram, Tanjavur, Srirangam and Madurai tend to rent their guest rooms with heritage view-scape in response to its demand. Though the heritage is given a colossal importance in India most of the view impact on property values studies concentrated on natural values. Despite the fact that healthy nature views are mostly associated with quick access to nature, the two effects should be distinctly disentangled. As distance variables can be used as measures as well as various physical activities are permitted owing to the access to nature, while views are complex to measure (Bourassa, Hoesli and Sun, 2004). Most studies that have been conducted analysing the property values have showed a positive impact. To have a wider perspective on these positive impacts on a property value analysis has been conducting based on three factors. First analysis involved in considering samples through various timelines, various cities and various types of views. The second method varies substantially in response to the wide range consideration of various view scopes. In this case an average value cannot be obtained but a range of impacts is achievable. While the third analysis involves empirical studies comparing the property values due to the impact of view scape of sacred monuments.

### 11.3.1 Studies and reports on assessment and protection of view-scape

Spatial and visual assessments of physical environment like visual impact analysis, townscape assessment, visibility analysis, scenic view corridor studies etc., can be analysed by several approaches. The concept: 'sense of place' based on symbols of historical, social and cultural domain play a vital role in human perception (Daniel 2001). Landscape assessment is often associated with view shed analysis or visibility analysis while it is used to assess the visual impact of a new construction as it has the potential analyse the locations

with prominent visual resource in both urban design and planning. In the field of urban analysis, the significance of visual assessment has long been recognised. Blair defines visual experience as a compound of psychological response and physical stimulus while some aspects of visual impact are completely subjective (Blair, 1986). Thus, the above view states that their various views and approaches for conducting visual analysis of the urban form and no one method is indispensable or correct. In order to have a clear interpretation of some methodologies followed by experts of landscape planning and urban design, it is perhaps useful to examine some methods from literature which is relevance to the present study. The concepts of Kevin Lynch are one of the most significant as it aims on relationship between imageablity of the city and depth of human experience which strengthens in response to coherent, visible, clear and distinctive environments (Lynch, 1960). According to Cullen cities are popular for living and people prefer to live in places which provide basic amenities, public contact and visual pleasure rather than living in isolation. His analysis on unban scape implies that there are four major aspects that involves people's emotional reaction to direct physical environment (Cullen, 2015). Here the aspects of concern are related to functional tradition, content, optics and place. One of the pioneer studies that focused on view-scape preservation of built environment and landscape is the Capital View preservation study which focused on preserving the skyline of the Austin capital city which is being threatened by the high-rise constructions. The Planning Department of the City of Austin formulated a document in February 1983 evaluating sixty potential view corridors on the basis of three factors: The viewpoint: What is the viewpoint and does it have particular significance by itself?, The view frame: What is actually in the view?, The view type: Is it sustained or a glimpse? Is the view pedestrian or vehicular? (Downtown Development and Capitol View Corridors, 2007). In Summer 2004 the Cambridge view-scape assessment and

urban character study was conducted by a group of volunteers to analyse the types of

characteristics, urban landscapes and types of view-scapes that are identified as prominent

to the Galt city centre within the Cambridge city. The results received could differ as the

selected group of volunteers can be altered and manipulated. To avoid these negative

effects, it is important to analyse how the characteristics and views capes play a prominent

role to preserve the image of Galt city centre (Burcher, Cura and Arseneault, 2005). While in

the city of Ottawa a view protection study was conducted to protect the views of parliament

buildings and other structures of national importance, in partnership with National Capital

Commission. The proposed development of an office tower was the prime reason for the

initiation of the study as it would obstruct view of the parliament hill. In response to the

same, City of Ottawa's Official zoning bylaws and plan has incorporated special background

and foreground height regulations (Allsopp et al., 2007). A similar study was conducted

under the phenomenon known as Vancouverism (architectural and urban planning

phenomenon) in the Vancouver city, British Columbia, Canada to protect the view-scape of

North Shore Mountains and its view corridors which are being threatened by the tall

buildings of downtown area. The study proposed five skyline options for the public to

examine and identify the best option to be created as the city downtown's skyline (Short,

2012).  In the view protection report of Seattle a policy has been drafted in order to protect

the natural views of the city. The prime objective of this project is to understand how

valuable the people's views in protection of public views are in particular the report

addressed the possibilities for the view preservation of Space Needle (a 'designated Seattle'

landmark structure) (King Staff, 2013). In 2008 LVMF or London View Management

Framework under the guidelines of the Mayor of London undertook to the task of

protecting 26 views of London's significant landmarks. The views of these landmarks are

considered according to three main designations: The viewing location should be open and should be permeable to all public and should be a place of its own right allowing for a pause to enjoy the view; should be a prominent building and present in prominent place in London; its view has to be highly significant and should allow for both appreciation and understanding of a major element of the London city or London as a whole (London View Management Framework, 2013). In contrast the recent zones of development the only criteria such as the similitude with existing urban patterns, aesthetics and proportions are considered when designing buildings. Omitting the concept of visual assessment in urban planning is one of the root causes in generating negative effects to the 'imageability of the city' as it obstructs or manipulates the desired view-scape.

In response to the same a lot of studies were conducted to reduce the negative impacts of new developments (Gimblett et al., 1987). To experiences are formulated on the description of threshold beyond which impacts of view shed analysis could be considered (Shang and Bishop, 2000). Evaluation of the visual impact assessment is, however, quite complex since it is subjective. Stamps considers three main features in classifying non-significant and significant visual impacts vagueness of design language, magnitude of impacts and subjectivity (Stamps, 1997). In order to develop the quality of decision making every kind of technology has been adopted since many years. Three main qualities are taken into account to analyse the visual aspects:

Environment: every anthropic or natural element between observer, object and behind the object.

Object: all human artefacts that are present included in the landscape.

Observer: any person affected by the perception of object (Bishop and Karadaglis, 1996)

## 11.3.2 Visual aspects in International Charters and Declarations

Since the year 1931 the international charters, other doctrinal texts and documents which included notes from recommendations, conventions, declarations and charters have been reviewed on the aspect of defining the importance of heritage views and protecting them (LeBlanc, 2008). And the result exhibited the use of view in the context of historical view-scape only twice by two people and both refer them only once which is in declaration on the conservation of setting of heritage structures that is drafted in 2005 at Xi'an mentioned in Article 4. The use of diverse information sources and multidisciplinary approach in an inclusive way requires a thorough understanding of the setting. For the same strong sources from knowledge from traditional frameworks, oral history, scientific descriptions, artistic illustrations, formal archives and records along with collective perspectives of local and associated communities as well as deep analysis of vistas and views (The Xi'an Declaration on the Conservation of the Setting of Heritage Structures, Sites and Areas, 2005). In the year 1976 UNESCO produced a draft under Article 5 which is 'Recommendation concerning the Safeguarding and contemporary Role of Historic Areas'. In response to the concerns of heavy building foot prints due to modern urbanization, a real danger is being sensed with potential of ruining the historical environment, though there is negative scope for the direct demolition of historical zones in the newly developed areas. It is very important that a contemporary and harmonious life is induced in the historical zones through proper policies and design frameworks by town planners and architects through careful analysis of view scapes of historic areas and monuments (Recommendation concerning the Safeguarding and Contemporary Role of Historic Areas, 1976).

An exclusive operational framework for the heritage monuments across the globe on visual aspects has been recommended by the World heritage committee in the year 2013 through a report on visual integrity by international expert meet at Agra, India. Along with the report it also includes recommendations, that have to be added in the nomination dossier: As a part of OUV and properties intrinsic significance attributes enhancing the qualities of visual and spatial structure has to be included; Visual aspects of cultural and historic significance as well as influences and interconnectedness enhancing the OUV of the property should be included (Report on the International World Heritage Expert Meeting on Visual Integrity, 2013).

### 11.3.3 Legislative framework in India

The legislative framework in India in the domain of contributing to the historic antiquities and monuments is enacted to the protection and preservation of country's cultural wealth by both Central government and constituent states. They include:

- Antiquities and Art Treasures Act, 1972 (AAT Act 1972)
- The Ancient Monuments and Archeological Sites and Remains Act (1958)
- The Ancient and Historical Monuments and Archaeological Sites and Remains Act (1951)
- The Antiquities (Export Control) Act (1947)
- Ancient Monuments Preservation Act (1904)
- The Indian Treasure-Trove Act (1878)
- The Act XX (1863)
- The Madras Regulation VII (1817)

> ➢ The Bengal Regulation XIX (1810) (Maintenance of monuments by archaeological survey of India, 2008)

ULB's or Urban local bodies, regional and urban planning development acts have the potential to regulate and protect both the heritage and its visual and spatial corridors.

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## CHAPTER 12: RECOMMENDATIONS

Culturally and historically significant, temple cities are highly visited and economically developed. Despite the positive aspects of their current conditions, these cities use space in both positive and negative ways. In addition to creating economic opportunities and leading to rapid urbanization, pilgrims and tourists also exert pressure on the cultural, sociological, and economic environments of these cities. Understanding the impact of these transformations requires an understanding of temple cities' spatial characteristics. There is an essential need to preserve the original form of the space in temple cities, as it represents their history and culture.

The spatial characteristics of these cities, however, are negatively impacted by insufficient infrastructure, frequent visitor traffic, and delayed implementation of schemes and procedures. This has a direct effect on the built and cultural fabric of temple cities, which are more prone to recur, intensify, and accumulate over time. Taking a closer look at the spatial characteristics of these cities is crucial if we are to reflect on both the positive and negative aspects of current conditions. Keeping the heritage and cultural significance of South Indian temple cities and other historic urban areas intact is crucial. In order to formulate sustainable development policies for these cities, it is important to consider their visual and spatial characteristics, and to develop harmonious interventions that preserve the existing urban fabric in a context-specific manner.

In summary, temple cities serve as a vital place for reflecting on current conditions, both positively and negatively. Keeping these spaces in good condition is essential for safeguarding their cultural and historical significance as well as fostering sustainable

development. In order to protect these cities' spatial characteristics and cultural heritage, policies and interventions must also take into account their aesthetic and cultural attributes.

## 12.1 Prime observations

It can be concluded by analyzing the findings of this study that there are three principles that serve as a locus of meaning for the south Indian temple, as well as ensuring that it serves as a functional institution. The three principles are: identity (recognizing individual elements of urban spaces as distinct entities), structure (relationships between urban elements and the surrounding environment as well as the observer), and meaning (a connection between the observer and the urban elements)

In the study, it was observed that temple cities in South India have a complex and homogeneous social structure, and the role of temples has shaped their urban fabric. According to Vedic scripts, these cities plan according to the principle of 'Form follows function'. As a result of the intricate design of urban complexes surrounding temples, the spatial configuration of these towns has been transformed, resulting in alluring urban mandalas combining the abstract ideals of the town with those of the temple. Visitors to the temples were greeted with a stunning array of streets that emanated from the entrances of the sacred structures. These streets served as the primary access routes to the temples, taking them on a captivating journey deeper into the city's mystical heart.

Furthermore, the study revealed that southern Indian temples have a significant visual impact on their built environments and are strategically located and oriented within urban contexts to create spatial and visual hierarchy. According to the theoretical model prescribed in traditional texts, the spatial fabric of the city was evaluated, identifying

elements of high visual importance and their relationships with spatial structure. Besides temple festivals and rituals, South Indian temple towns also have urban landscapes that reflect these events. As a result of the investigation, both dynamic and static factors play a vital role in maintaining the city's character and boosting its growth. There is a unique combination of architectural features and cultural attributes in temple cities in South India, which contributes to their high visual quality and powerful mental imagery.

## 12.2 Cosiderations to be adopted

The concept of conservation must be understood as encompassing all three components, built, natural, and living. The purpose of this is to create mandates for institutional frameworks that manage heritage conservation as part of integrated planning frameworks, which are largely under-recognized and under-protected as an important tool for conservation of heritage. In addition, those who are responsible for the preservation and administration of heritage at the state or national levels must acknowledge and clarify the responsibilities of local stakeholders.

The study recommends the following measures to improve temple city operation: The socio-economic sphere should be properly planned in order to enhance development.

- Local governance should be used to conduct operations with direct public involvement.
- In order to preserve and promote cultural heritage, cultural-driven activities need to be preserved and promoted.
- Providing better facilities with minimal damage to heritage is an important aspect of improving infrastructure at both micro and macro levels.

### 12.2.1 Religious tourism

Religious tourism, faith tourism, sacred tourism or spiritual tourism is studied with respect to two different perspectives: travel to spiritual or religious place as pilgrimage, and the viewing religious heritage in the form of monuments and artefacts (Shanthakumari, 2017). Destinations referred with religious tourism often attract tourists in response to their contributions towards religious observations, holy festivals, traditional practices, heritage, socio-cultural framework, architectural fabric as well as their narrations in historic texts. These characteristics can be enhanced by preserving the socio-cultural flavour, restoring the architectural and urban fabric, maintaining the ecological balance, minimalizing the effects of globalization, developing the infrastructure to support pilgrim and tourist footfall, improvising transport of tourism circuits and promoting the local traditional art. Through the lenses of economic development religious tourisms facilitates the growth of infrastructure, contributes in revenue for the local government and the community, stabilises regional level strategies for development along with nurturing peace and socio-cultural harmony. Generally, religious tourism refers to a type of tourism driven by religious beliefs and often accompanied by holiday activities. There is an urgent need for better infrastructure in small temple towns in India so they can boost their economy and improve their quality of life. Even though many large cities have improved in recent years, the small temple towns still face challenges.

Religious tourism should be well monitored with appropriate regulatory bodies to both maintain the harmony as well as preserve the flavour of the space.

### 12.2.2 Holistic Tourism Experience

The religious tourist destinations should widen the spectrum of tourist segments by attracting tourists who do not seek to visit a relious site for the sole purpose of piligrimage. To achieve this religious tourism should be marketed as alternative tourist destination apart from being just a piligrmage. This gives the tourist a hoilistic tourism experience.

### 12.2.3 Architectural heritage and conservation

A huge effect on conservation education and widening its range of concerns has been witnessed with the growth of preservation movement, thus formulating a set of standards. Since the nineteenth century, environmental preservation has become one of the primary goals of city planning. Urban planners from across the have attempted to deal with historic city issues. Many spaces exhibit the lack of connection between conservation education and architectural education, thought the functional interaction between preservation and architecture occupies the prime importance as both ensure that the built environment is rehabilitated together. Lately a number of paths are introduced that work on the common domain of these two disciplines (Tomlan, 1994).

*Architectural heritage*

Acording to Bernard Feilden heritage protects citizens' sense of identity and community when old buildings and spaces are preserved. Preservation is about preventing decay (Feilden, 1994). The following permanent impressions express the architectural heritage in a 'frozen form':

- Monuments: Monuments are the structures and buildings with a conspicuous social, scientific, artistic, archaeological, historical or technical interest.

- Group of buildings: These consist of a homogenous set of buildings known for their conspicuous social, scientific, artistic, archaeological, historical or technical interest situated in a geographical bracket and are adequately coherent to form topographic definable unit.
- Sites: Sites are a product of natural and manmade environments with a partial built up area and buildings known for their conspicuous social, scientific, artistic, archaeological, historical or technical interest along with being sufficiently homogenous and distinctively topographically definable (Explanatory report on the Convention for the protection of the architectural heritage of Europe, 1986).

***Architectural conservation***

Intangible cultural heritage plays a critical role in maintaining cultural diversity in the face of globalization by promoting respect for culture, human creativity, and cultural diversity. Intercultural dialogue can be facilitated and mutual respect for different ways of life and human creativity can be fostered by understanding intangible cultural heritage associated with different communities.

Architectural conservation is an attempt to interpret and understand the heritage and to exhibit heritage in the same way as it was when established (Taylor and Cassar, 2008). Architectural conservation is defined as a process of protection and maintenance (Michael, 2004). The conservation refers to both social as well as physical preservation in the form of architectural elements along with values attached to them. Till the eighteenth century, conservation of heritage was based on religious notions and only few with logical foundations (Carbonara, 2015). Studies prior to nineteenth century illustrate how conservation focused on improving the physical condition on the architectural structures through the aesthetic and artistic lenses as well as measures to eliminate erosive factors.

More attention was given to the visible and tangible factors of the heritage from the nineteenth century though architects and conservation theorists have had multi-fold

understanding on the concept of conservation. During the mid-twentieth century concepts of human behaviour, psychology and environment have been introduced to the domain of conservation to develop quality spaces with sematic aspects. This change in the perspective of conservation has enabled the experts and researchers to consider conservation as tool in handling the sematic aspects of heritage but not just a preserving and optimizing tool handling the physical aspects of the building (Del and Tabrizi, 2020 On a general understanding conservation is classified based on two levels: (i) physical aspects; and (ii) sematic aspects. Conservation of physical aspects is based on a set of measures that focuses on improving the tangible aspects of the heritage through direct or indirect methods. The direct method involves the process restoration while the indirect method involves in changing the environmental factors that are causing damage to the heritage (Feilden, 1982). The New Zealand Charter classified four levels of interventions: (1) conservation through repair, maintenance or stabilization, (2) restoration through removal, reinstatement or reassembly, (3) adaptation and (4) reconstruction but no intervention compromising on the value of heritage should happen (Sunney, 2016). As per the writings of Nara Charter heritage conservation principles should depend on the how the value of heritage is perceived and applied and the basis of how well the intangible heritage values are undertood (The Nara document on authenticity, 1994).

### Concept of urban catalyst

Donn Logan and Wayne Attoe introduce this concept in Catalysts in the Design of Cities, 1994, a work published in the United States (Attoe, and Logan, 1994). The theory compares the interrelationships of various urban elements to chemical reactions. It is a metaphor for opening up a new level of understanding, contemplating, and observing urban

problems and putting emphasis on urban development as a process rather than an outcome. This method identifies the fundamental elements of urban development, such as a prominent urban activity or construction trend that can act as catalysts in realizing the desired result. In this sense, the historical district could reveal its inheriting law, shifting from isolation to interconnection. (Attoeand Logan, 1994).

## 12.2.4 The Spheres and Challenges of Conservation

The concept of heritage has considerable widened its spectrum from monuments, clusters of historical structures and heritage sites to include more complex areas, landscapes, settings along with their intangible dimensions exhibiting a deeper and diverse approach (Delhi Declaration on Heritage and Democracy, 2017). Heritage continuously portrays new expressions addressed by the tourist, the user, the town dweller or the curious architecture addressed in the place negotiating with reconstruction of urban life frameworks with respect to prevailing local traditions (Mihaila, 2014). In the domain of cultural heritage conservationists face consistent challenges on three major fronts:

1. The initial challenge is dealing with the physical condition which concerns with the decoding the structure of systems and behaviour of the materials, understanding the mechanisms behind the cause of deterioration, examining the various suitable interventions, designing possible long-term efficient treatments etc. (Cody and Fong, 2007).

2. Management context is the second challenge which deals with the resource availability that includes technology, trained workmanship, funds along with synchronization with conditions and mandates of legislative and political bodies along with issues on land use.

3.  The third challenge is to understand and maintain both social values and cultural significance. To execute this, a deeper understanding on how a place and object are significant and to whome is it meaningful as well as how the interventions are impacted and how are they perceived or understood (Avrami, Mason and Torre, 2000).

The main components of heritage, according to the study introduced by Throsby are authenticity value, symbolic value, historical value, social value, spiritual value, aesthetic value and cultural value (Throsby, 2012). Additionally, he established the relationship between economic and non-economic values of the architectural heritage with respect to the current rules (Torre, 2005). Heritage aided with innovative and technological developments not only launches controversies, questions, innovations and educational frameworks but constantly compliments the in-situ image of the space on local or global level (Mihaila, 2014).

### *Heritage as a Social asset*

According to Mariana, heritage lives in the society through the common traditions prescribing social values (Rosado Correia and Walliman, 2014). Kennedy illustrated conservation with a practical process by operating a computer aided conservation project and observed the results of comparative analysis based on people's opinions (Kennedy, 2015). Heritage conservation exhibits itself as enduring process in the form of social activity, where the process is both motivated and creative, supported by the values of communities, institutions and individuals (Peters, Boer, Johnson and Pancaldo, 2016). By referring culture as a product of common beliefs and values followed by a certain community or a social group is reflected in the social value of the heritage and contributes to social consistency

and stability (Twala, 2009). The heritage has a huge influence on people's lives by establishing relations, identifying values in the community and considering notions of the society (Díaz-Andreu, 2017). For the purpose of social improvements, growth of ethics, developing the culture, building or rebuilding the identity architectural heritage displays great potential which can also be referred as social wealth (Kennedy, 2015).

### Heritage as an Identity

As per the writing of Alfredo Conti, the maintenance and conservation of heritage witnessed a development of robust and balanced identity that withstood heavy modernist movements to a great extent (Conti, 2009). Heritage exhibits itself as a manifestation of socio-cultural values that serves as an identity for the urban environment (Zadeh, 2002). Moreover, heritage doesn't represent an abstract meaning is clad with a set of elements that define environmental character which represents a part of nature (Norberg-Schulz, 1986). Most of the heritage complexes represent manifestations of spiritual, supernatural, religious, historical figures or events of the past. This spiritual value as a whole, accounts for a great contribution as a sense of identity in the society (Throsby, 2012). Heritage exhibits through its set of historical elements exhibits a collective identity as they have been fabricated from a common experience. These heritage elements collectively narrate common experiences and memories (Lydia, 2016).

### Heritage as a Cultural asset

To summarize, the multi-fold values of heritage the conservation professional use the term 'cultural significance'. Heritage connects generations through time preserving culture. Heritage boosts the cultural value of the place and the community by representing

the identity of the place and the community through the viewpoint of the people (Feilden and Jokilehto, 1998). Heritage and cultural value of the society is a product of norms, values, beliefs, traditions, rituals, quality of life, lifestyle as well as the social structure of the community of place (Feary, Brown, Marshall and Wild, 2015). The collection of aesthetic, spiritual, social, scientific and historic values of present, future and past generations is referred as cultural significance in the Burra Charter (Walker, 2000).

### Heritage as a Communal asset

The value of heritage is assigned by the local community in response to the social wellbeing, spiritual meaning, identity, culture conserved for future tenants (Del, Sedghpour and Tabrizi, 2020). Heritage as an amalgamation of cultural influences exhibits itself as a non-renewable source of energy that often binds communities (Delhi Declaration on Heritage and Democracy, 2017). It is often witnessed how the voluntary workers of local communities carry out conservation cultural heritage specifically when the heritage objects are not preserved by the heritage authorities, not listed or not of major national interest. The prime objective of communal heritage preservation doesn't concern about the communal objects, fund or time investment but revolves around establishment of identity and maintenance of common social institutions in the heritage zones (Mydland and Grahn, 2012). Heritage acts as an asset to the community as the activity based on community heritage conservation draws in the associates of the community to participate in moments, stories or events of local historical figure, past professions, political moments etc which enhances social binding (Power and Smyth, 2016). The heritage site conveys both information and meaning that helps the community to assert its cultural personality and interpret its identity. Representation of meaning plays vital role in strengthening its

educational purpose for the developing knowledge platform as well as the interpretation of the entire community (Barthel-Bouchier, 1996).

### Heritage as an Economic asset

The relationship between economy heritage conservation has been illustrated by Mason where he introduced principles like artistic qualities of the architecture, aesthetic value, cultural symbolism, senses of the place and historical associations (Nilsson, 2008). The value generated in response to conservation or by the heritage resource forms the economic value in the architectural heritage terms as the economic values is not restricted to the financial value but caters to a wide range of needs. Amenities, function, commerce and tourism account to be the four potential sources of revenue for the economic values. The value of the heritage is highly enhanced by the historical work framed by amenities, function, commerce and tourism (Hubbard and Lilley, 2000). Ancillary industries like transport, hotel etc. can generate both income and employment through tourism based on heritage sites. This adds commercial value to the site (Greffe, 2004).

### Heritage as an Aesthetic asset

Heritage enhances the aesthetic flavour of the space as it displays beauty with strong visual qualities. The broad heading of aesthetic includes landscape associated with qualities of heritage environment.

## 12.2.5 Constraints concerning urban conservation

The prime constraits concerning the urban conservation revolves around urban transformations that need to maintain with the flavour of the existing urban fabric. Planning of the new structures should be in accordance to the upliftment, preservation and

protection of the built heritage, as poor planning ruins the character of the urban fabric. The criterion of sustainability should consider a holistic preservation of the magnificient edifices which are the epitomes of the vibrant past (Sjöholm, 2013).

Taking precations at policy level through legilatory reforms or acts should be focused instread of problem solving to address problems at root level. There is dire need for the policy makers, urban planners, urban developers and architects to induce heritage conservation for a sensitive heritage friendly urban environment. Base level enhancement should be initiated by educating at micro level about the cultural heritage. This can be operated by establishing special institutes at city level that works along with town planning department such that the master plan of the city is positively invclined towards built heritage (Roy and Kalidindi, 2017). Primarily the piligrim cities which are the product of traditional architecture and cultural beleifs have plethora of challenges which have to be dealth with further care. The following are the major concerns of urban conservation in Indian heritage cities:

1.  Most of the concerns related to the cultural structures are dependent on the poor governance structure and corruption.

2.  The other prime concern is the physical environment through pollution which in certain cases is causing a serious threat to the heritage structures.

3.  Involvement of stake holders is another important concern as they play a vital role in implementation of various schemes involving the heritage conservation.

4.  In some cases, heritage conservation schemes lead to minimal economic support and a high degree of business opportunities where the individual does not get enough compensation provided by the authorities.

5. It was very difficult to educate and convince the local residents to follow guidelines and rules concerning the use of materials.

6. The regulations of preservation of the urban fabric are not well applicable on preservation of the property of Private ownership.

7. Inorder achive a similar style of construction there is dire need for trained craft persons who are both expensive and very difficult find in large number.

8. A customised approach in the methods of conservation and restoration is needed.

9. Rules formed by ASI for heritage structure should be strictly implemented.

10. The divion of funds should primerly be focused on preservation of heritage through strengthening of culture and history.

11. There is no unified cultural policy which is one of the major drawbacks for a country like India with diverse cultural background.

12. Upliftment of local economy is very important as the local residents depend of the temple and the dependent market area.

13. Tourism and heritage understanding has to be imparted in the educational sytem.

14. Isues concerning equity both between and within generations, intangible and tangible cultural heritage and environment have to be addressed along with social and physical attributes.

15. Investment on heritage conservation is considered as non-renewable capital resources-of materials financial and energy investment.

16. It is very important to establish continued function with a principle of minimum intervention of the material fabric and social community.

Fast urbanization is bringing changes in temple towns such as commercial establishments, mismanagement of traditional structures, pollution of the environment and degradation of natural resources, the formation of unplanned settlements, and the formation of slums. Despite the rapid transformation of these towns, there is still a sense of continuity in layers, established by traditional temples that have been the foundation for these urban settlements, which is evidence of continuous time flowing through layers.

## 12.3 Possible approaches

The following are the possible approaches that can be adopted to preserve the identity of these temple towns:

- Alternative tourism to provide the tourist a holistic tourism experience with a wider range of activities.

- Mainting a proper balance between land value and public revenue by increase the local economy which inturn helps preserving the character of the inner cores.

- Organization of the commercial activity by proper zoning which easens the traffic flow as well as preserves the innermost cores with traditional flavour.

- Promoting the concept of "Transfer Of Development Rights" which encourages stakeholders to participate directly in urban regeneration.

- Integrating the concept of a "Living Museum" which both preserves the identity of the core and supports local employment.

- Implimenting the concept of "City branding" though Façade bylaw" atleast on the principle streets which greatly helps in enhancing the identity of the city.

### 12.3.1 Conservation easement

The conservation easement is a legal and voluntary agreement the owner and the land conservation agency (government or a land trust agency) that restricts the utilization of the land to improve and encourage its conservation values (Byers, Ponte and Diehl, 2005). Conservation easement also known as conservation agreement or conservation restriction functions on transferring development rights to the conservation agencies either by purchase of development rights or donation. The main purpose of introducing easements is to significantly preserve the land that conserves historic resources, preserves ecological benefits, promotes recreational opportunities and protects open spaces (Wright, 1994). Acquisition of conservation easement is mostly based on incentives or voluntary that relies on continuous private management and ownership to avoid stubborn political issues and high financial costs that are linked with public management or acquisition. The conservation agencies largely acquire the easement that limits to the development or preservation of the land (Main, Roka and Noss, 1999). These easements cost much less than a full cost acquisition which benefit the land owners in meeting their personal goals by protecting their habitat, contributing to contributing open space, assuring a home site for children, reducing friction among heirs and maintaining the land for farming (Wright, 1994).

Land trust face many challenges in response to internal and external variables which may effects accomplishments and activities of the land trust agencies as they rely on the property owners to voluntarily sell or donate partial or full interest in their land. The classifications of variables are as follows:

### *External variables*

External variables are broadly classified into environment, economic along with political and cultural variables. Environment variables are sub classified into biodiversity, habitat types, physiography, endangered and threatened species. The economic variables are sub classified into taxes, agricultural products and markets, land value and market history, capacity industrial and structure. And the division of cultural /political variables are sub classified into prevailing perceptions about private land, conservation and environmentalism, availability of private and public funding organizations, current land uses and land-use history, distribution of parcel sizes, ownership history and patterns, land-use and zoning regulation, advocacy organizations, population density, functioning and availability of other conservation, level of participation and political structures.

### *Internal variables*

Internal variables are broadly classified into monitoring/stewardship program, institutional partners, degree of prescriptions used governance, transaction tools, age of organization, portfolio size, staff, funding sources, assets, membership and mission

## 12.3.2 Form-Based Coding

Local government municipalities use a Form-Based Code to regulate land development to achieve a certain form of urban development. To achieve predictable built results and a high-quality public realm, they focus on physical form rather than land use.

### 12.3.3 Place branding

According to Evans culture led-regeneration is an approach of aknowledging cultural activity as "The catalyst and engine of regeneration—epithets of change and movement" (Evans, 2005: 968). Having a high public profile, this activity epitomizes regeneration. Anholt's concept of city branding was introduced in 1996, the idea being to revive the unique urban language of a territory to maximize the quality of life. (Anholt, 1996).In his modern brand theory he explains place branding as a unique method of equating sensitive human issues with strong financial and administrative affairs and bring out holistic solutions (Anholt,2006).
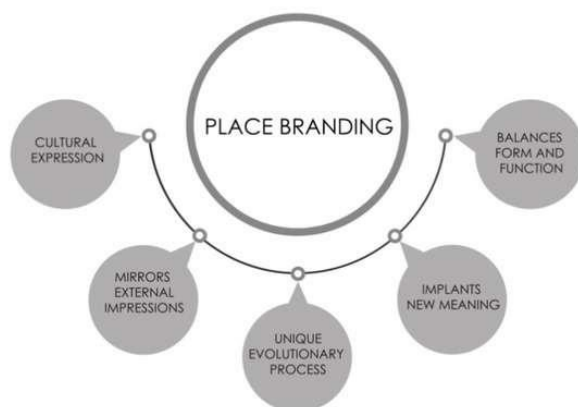


Figure 133 : Concept of place branding

Source: Author

According to the figure place branding is a unique evolutionary process developed in response to the socio-cultural fabric and external influences acknowledging the urban change and maintaining a delicate balance between form and function as well adds a new meaning to the place. The initial approach is to introduce a façade bylaw which creates a

homogeneous architectural ensemble reflecting the image of the city. A city's physical identity is a constant component that serves as a link to its past and its present human fabric. So the fundamental objective is to induce the lost character with minimal interventions.

### 12.3.4 Cultural heritage

The term cultural heritage has witnessed multi-fold definitions through years owing to the defining tools and instruments developed by UNESCO. UNESCO, states that cultural heritage is beyond collection of objects and monuments as it acknowledges inherit living expressions carried through generations in the form of skills and knowledge to produce traditional crafts, practices and knowledge relating to nature and the universe, festive events, social practices, rituals, performing arts, and oral traditions (UNESCO, 2011). In the modern phase of globalization, cultural diversity has become increasingly important by balancing the intangible cultural heritage with tangible heritage. UNESCO (United Nations Educational, Scientific, and Cultural Organization) has classified cultural heritage into intangible and tangible forms. Tangible heritage is further divided into movable heritage and immovable heritage. Movable heritage is defined as manufactured or natural object of heritage value whereas immovable heritage which includes archaeological sites, monuments and historic buildings (Hasibuan, Kurniawan, Salim and Suhartanto, 2011).

Awareness on the structure of intangible cultural heritage of various communities recommends mutual respect for other ways of life and helps with intercultural dialogue. Furthermore, intangible cultural heritage is a product of skills and knowledge passed through generations but not a cultural manifestation. As a means of contributing to economic growth and development, cultural heritage preservation is recognized by the UN

Sustainable Development Goals both as an instrument for promoting peace and appreciating cultural diversity, as well as a means of contributing to the advancement of sustainable development.

## 12.3.5 Urban conservation in temple cities

In the case of South Indian temple cities, the issue of urban conservation should be of paramount importance due to the culture and values which have informed their design. Preserving and renewing the temple towns of South India are integral parts of its social, cultural and architectural heritage. As the layout of these cities is not just reflected in temple premises, but also in the region within which the city is located and its relationship with other features as well (Snodgrass, 1992). A considerable portion of India's alluring cultural heritage consists of religious destinations that contribute to an area's social, cultural, and economic development. Due to temple cities' traditionally low population density, rapid urbanization brings its own pressures, such as strain on framework due to a huge inflow of population, impacts on existing resources, dilapidation of built heritage, water tanks, urban space and increased congestion in the traffic. Due to the float of the population in the sacred space, its inner-city core would rapidly degrade to a pathetic state lacking its original character. There would be no specific planning and associated infrastructure to accommodate the additional frequent influx of the floating population. Thus, it is important to determine the extent of issues and challenges that pilgrimage brings to the religious cities.

***Makeover done so far***

People's attachment to heritage has been boosted by fear of cultural homogenization caused by globalization. As a result, communities are more likely than ever to consider heritage representations a source of value, resulting in a growing number of informal and popular movements dedicated to preserving and promoting heritage. A number of initiatives have been organized, not only to preserve and promote cultural heritage, but also to involve communities in its preservation and fruition, in order to safeguard cultural heritage.

Madurai

Under the smart city mission, many approaches are being taken to uplift the visual scape of the city and synchronise with the existing heritage flavour. The mission was initiated by pedestrianizing certain sections of roads with cobble stones replacing paver blocks them which is helping in both cutting down the traffic and promoting vibrancy of the street in response to its commercial activity. To increase the quality of the heritage streets during the night a total of 570 ornamental lamp posts have been installed. A heritage loop is demarked connecting fourteen prominent structures which starting at Periyar bus stand, connect Koodal Azhagar Perumal Temple tank, arrival park at Jhansi Rani Park, Meenakshi Sundareswarar Temple, Pudhumandapam, Rayagopuram, Kunnathur Chathiram, Old Central Market, Vittavasal, Thermutti, Vilakkuthoon, Pathuthoon and end at Thirumalai Naicker Mahal. The entire pathway is lined with handrails and spotted with seating at regular intervals (The Hindu, 2020).  Under the Minister for Municipal Administration, Urban and Water Supply K.N. Nehru mst of the tanks in the Srirangam are being renovated.

Most of the streets leading to Meenakshi Sundareshwarar temple are planned under Smart city Mission which also introduced exclusive walkways to provide hassle-free and safe roads for pedestrians and cyclists in the heart of the city free from heavy traffic and constant honking created by innumerable vehicles. According to S. Aneesh Shekar, Corporation Commissionermost of the strrets of Meenakshi Sundareshwarar temple are eavily choked with traffic which is now being resolved by clearing the encroachments on the pavements by platform vendors and shopkeepers. For betterment of the streets a multi-level parking facility is being constructed (The Hindu, 2018).

Srirangam

The pathway adjacent to the innermost sanctum has been dysfunctional for decades. This has now been cleaned up and being operated since the last five years, for the devotees to explore (Jayaraman, 2017).  In order to control problems of the traffic a new traffic scheme has been initiated by scheme Commissioner of Police G. Karthikeyan, which is organizing based on organizing the traffic zone (The Hindu, 2021). To further ease the situation of traffic a new bus stop along with a parking are being constructed near the rajagopuram (The Hindu, 2021). The temple enterance patways are being studded with ornamental lightings set up erecting cast iron poles. The encroachments in Perikulam are removed and the waterbody is well renovated (The Hindu, 2021).

Chidambaram

The encroachments are being removed zone wise. Nearly 400 structural encroachments of shop/houses have been removed which have been identified with 3 decades of existence. As per the records of district administration 125 new encroachments

have been removesand further removal is being planned. The removed encroachments are provided with permanent houses adjacent to the city by the Slum Board (Chidambaram town lake restoration project gets underway, 2021). District officials, citizens and volunteers together have removed all the forms of garbage in the form plastic, paper, weeds and all other waste matter.

# CHAPTER 13: CONCLUSIONS

In response to the research question "How do religious, social, and visual connections that have been made through temples, rituals, and gopurams impact the spatial and visual fabric of South Indian temple cities?" It has become evident that South Indian temple cities possess a significant spatial and visual fabric that has been influenced by the religious, social, and visual connections that have been built through the construction of temples, rituals, and gopurams over the years. The south Indian temple city's physical and visual characteristics are defined by its unique cultural and social dynamics through these connections.

According to the analysis conducted using Space-Syntax, cities are distinguished by their high axiality, synchronized settlement patterns, and enhanced connectivity. In response to the Ratha Yatra festival procession, the street structure has been designed in such a way that it is centered around temples. In addition, prominent gopurams contribute to these urban dynamics by serving as landmarks.

Using the 3D isovist tool, it becomes evident how gopurams exert a significant visual influence on the urban fabric. The street structure, which is intricately influenced by temples and festivals, contributes to this influence directly. We gain a deeper understanding of South Indian temple cities through the religious, social, and visual connections that are established through temples, rituals, and gopurams. It is these connections that shape the overall urban landscape, leaving a lasting impression on the visual and physical identity of a city.

In this study, it was determined that temples in an urban environment are strategically oriented and located to create a visual hierarchy that has a significant impact on the overall design and layout of a city

According to the findings from a built heritage factor analysis using ordinal, three primary independent variables strongly influence the streets of South Indian temple cities: temples, gopurams (gateways), and rathas (chariots). As a result of these variables' religious, visual, and cultural significance, the architectural fabric of the city is profoundly affected and its character is enhanced. These architectural elements play a major role in shaping the public perception of a city, and any changes in their presence or absence can have a direct impact on the perception of that city. There are three elements that dominate the heritage character of these temple cities: gopurams, temples, and the Ratha Yatra festival. These elements alone have played a pivotal role in shaping these temple cities, leaving an enduring impact on their spatial and visual fabric. Through temples, rituals, and gopurams, South Indian temple cities have created profound spatial and visual connections. As a result of their collective influence, South India's rich cultural heritage has been encapsulated in a unique urban environment.

As a result of an online questionnaire, it appears that South Indian temples have a significant impact on the surrounding urban fabric through their architectural style and design elements. The architectural identity of the temple town is shaped by its scale, mass, overall pattern and texture, building type, activity, and inhabitants. Based on observations from a mental mapping study, the visual identities of the architecture, particularly the gopurams, play a major role in the formation of mental images. Culture and religion play an important role in the city, as demonstrated by the ratha yatra festival and the city's role as a

pilgrimage site. The visual, cultural, and religious characteristics of these cities are therefore essential to defining their identity. In addition, the study highlights temple cities' multifunctional nature, as they serve both as a platform for grand celebrations and as a place for residential, commercial, and tourist functions.

Based on observations and interviews, the residents of the area engage in religious practices and rituals at their homes, along circumambulatory streets, and at holy tanks on auspicious days, following the guidelines laid out in the Agamashastras (texts describing religious procedures performed within temple grounds). Throughout the entire city, the cultural aura has been extended. The spatial and visual fabric of South Indian temple cities is profoundly influenced by the religious, social, and visual connections established by temples, rituals, and gopurams. In addition to influencing the architectural style, cultural identity, and multifaceted functions of these cities, these connections make them culturally significant and vibrant.

These temple cities are characterized by religious practices and the presence of temples, which influence the arrangement and organization of their spaces. In addition to acting as focal points both architecturally and socially, temples also serve as gathering places for communities, creating a strong bond between them.

The spatial and visual fabric of these cities are influenced by rituals, which are a part of temple life. Processions, circumambulations, and prescribed paths are often used during these rituals, which influence urban design and movement patterns. It is these rituals that give the cities a distinctive rhythm, which helps create order and cohesion within their urban fabric.

In South Indian temple cities, gopurams hold great visual significance. They serve as landmarks and guideposts, visually delineating sacred spaces. By combining intricate carvings and vivid colors, the gopurams create an urban environment that creates an identity that is distinctive to these cities.

There is a profound impact on social and cultural life of the communities of these cities beyond the physical aspects of the cities through these religious, social, and visual connections. Community centers act as centers for social interaction, strengthening community bonds, and cultivating a sense of belonging. Festivals and celebrations of religion bring people together, creating a vibrant atmosphere filled with devotion, music, dance, and rituals.

The architectural, religious, and aesthetic elements within the temples serve as a visual language that communicates the values, beliefs, and traditions of the community. They evoke a sense of spirituality and inspire a collective sense of pride and identity.

In concusion, the architectural and visual fabric of South Indian temple cities is profoundly influenced by the religious, social, and visual connections established by temples, rituals, and gopurams. Moreover, these connections shape the cities' physical layouts, movement patterns, and visual identities. Furthermore, these temple cities contribute greatly to social cohesion, cultural vibrancy, and a sense of belonging for the communities residing there.

## 13.1 Inferences

In adapting to changing times, the temple cities of South India are an exceptional testament to resilience. In addition to sustaining cultural, social, and economic transformations, they have maintained their historical significance, a feat that few have accomplished. In modern urban environments, these ancient systems have proven resilient and adaptable, which has been essential to their survival.

These ancient temple towns still retain traditional spaces and socio-cultural forms, despite the impact of contemporary rituals on urban design. In spite of the fact that they are regarded as urban centers with grid patterns, they do not strictly adhere to this pattern. Using a concentric pattern in their street structure, they create a buffer zone between the temple and the outer city. A combination of a diversity of ethnicities and globalization has resulted in the street geometry of the outer ring to be irregular, while the smaller residential blocks are located farther away from the temple.

Creating a domain that transcends the physical boundaries of these cities and fostering a sense of identity that is unparalleled, the temples in these cities permeate the surrounding areas. As a symbol of completion and as a reinforcement of a controlled, secular space, the circumambulatory paths encircling the temples symbolize the notion of completion. In temple towns, all aspects are subservient to the Hindu religion, rituals, and rites, resulting in a simple, homogeneous social structure. Even today, these ancient Indian towns employ town planning practices and theories rooted in classic town planning principles.

A South Indian temple city's gopuram, ritual practices, and temple structure are intrinsically linked to its visual, cultural, and belief systems. By combining these elements,

the city creates a captivating mental image, evoking awe, wonder, and spiritual connection. In order to strengthen the bond between people, religion, and place, it is vital to preserve and enhance the visual art and heritage of these temple towns. As a result of post-independence developments that neglected preserving their unique identity, the historical cores of these cities have suffered. As a result, maintaining religious ideals, spirituality, community, and sense of place depends on safeguarding and enhancing the views of these sacred monuments.

In traditional South Indian temple cities, analyzing the visual aspect is challenging since the city fabric is intricately composed and consists of multiple layers from different historical periods coexisting harmoniously. In addition, different sections of these towns constantly reveal themselves, providing opportunities to understand and explore the city's past. A prominent feature of South Indian temple architecture is the awe-inspiring Gopuram, which facilitates visual connectivity. By participating in the Ratha yatra, a festival that celebrates the worship of temple deities, people can form social bonds and actively participate in the festivities. Temples provide residents with a sense of identity and belonging and serve as a central point of religious connection in the city.

As a result of a meticulous analysis of three South Indian temple cities, this study highlights how temples, rituals, and gopurams shape the architectural and visual fabric of these cities through their connections to religion, society, and architecture. A deep rooted cultural and religious tradition has allowed these connections to evolve over the centuries. Additionally, this study explores how the connections serve as important sites for religious, cultural, and social events within communities, contributing to their social and cultural well-being.

The complex composition of the city fabric of traditional South Indian temple cities, which encompasses layers from different historical eras coexisting harmoniously, though presents a formidable challenge in analyzing the visual aspects, different elements of these towns continually reveal themselves, providing an opportunity to discover their history and identity. South Indian temple architecture is characterized primarily by the Gopuram, a prominent feature of visual connectivity. It is possible to form social bonds during the Ratha yatra, when temple deities are paraded throughout the city, thus encouraging social connectivity. Providing a sense of identity and belonging to its residents, the temple is the center of religious connectivity in the city.

## 13.2 Areas of further research

Through this work the reaserch identifies areas for further research on the following five aspects:

1. How are the physical landmarks in modern cities contributing to the social connectivity among the people?

2. How applicable are the Vedic models in modern cities with respect to function? With similar comparitative study among other Vedic model cities.

3. How successful are the traditional cities in facing the urban change economically?

4. How much responsible are the environmental factors in shaping the spatial fabric of temple towns of South India?

5. How are the traditional markets contributing in preserving the cultural identity of the heritage cities?

## 13.3 Research limitations

In this thesis, the primary goal is to analyze how temples, rituals, and gopurams have established religious, social, and visual connections, and how they have impacted the fabric of temple towns in South India. Among these factors are spatial organization, socio-cultural palette, demographics, tourism inflow, land use patterns, and mental maps, and how they influence people's perceptions of the town and its features. In order to maintain a focused approach, the research will focus on only three temple cities with well preserved Vedic planning patterns and a rich cultural heritage. The study does not examine the modern conditions of the cities, but only the fabric of them before the independence era. Due to the topic and time frame of the PhD study, this topic will not be addressed as part of this study. Furthermore, the study does not explore sacred geometry in the scriptures as it goes outside the scope of this thesis. In order to understand people's perceptions of temple towns in South India, the study used online questionnaires instead of face-to-face interviews. According to COVID-19 regulations, site visits were also constrained in terms of timing, which sometimes resulted in visits that were not the most convenient for the research schedule. As these topics are outside the scope of this PhD study, the study does not include an analysis of the environment or the economy.

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