Journal of Civil Engineering and Environmental Technology
p-ISSN: 2349-8404; e-ISSN: 2349-879X; Volume 10, Issue 1; January-March, 2023, pp. 1-11

http://www.krishisanskriti.org/Publication.html

Critical Evaluation of Ancient Indian Town Planning Principles used in Neighborhood Design: A Case Example of Vidyadhar Nagar

Ar. Yogesh Makkar and Dr. Gaurav Gangwar

PG Student, Chandigarh College of Architecture, Chandigarh
Associate Professor, Chandigarh College of Architecture, Chandigarh
E-mail: yogeshmakkar111@gmail.com, gangwarg72@gmail.com

Abstract*—Ancient Indian Towns were designed considering non-motorized transportation, social integration of all stakeholders, climate responsiveness, etc., and were focused on a human-centric design approach. After Industrial Revolution, the mode of transportation changed to motorized vehicles, which played an important role while planning for new towns all over the globe. India has forgotten its ancient town planning principles and has adopted western models in the design of new cities like Chandigarh, Gandhinagar, Bhubaneswar, etc. These have been designed considering a high traffic volume of motorized vehicles while prioritizing privacy rather than social integration and adopting western models of built environment ignoring vernacular techniques.*

Many Indian Architects have incorporated ancient and vernacular principles of design in their projects such as Aranya Housing by Doshi, Asian Games Village by Rewal, and Belapur Housing by Correa. But hardly any new town has been designed based on ancient Indian town planning principles except a contemporary neighborhood, Vidyadhar Nagar by B.V. Doshi. It is a matter of research whether adopting these ancient principles has been successful or failed.

This research has been carried out by understanding ancient town planning principles practiced in India, through Literature Review. The case study and survey method has been adopted to analyze the design of Vidyadhar Nagar on various parameters.

The result shows that the ancient town planning principles such as orientation and hierarchy of streets are working fine in Vidyadhar Nagar. Also, social cohesion is possible due to the presence of a central spine. Still many factors considered in ancient times might not prove relevant in a contemporary neighborhood considering safety and security, legibility and Imageability, etc. Thus it is recommended to adopt ancient Indian town planning principles and amalgamate them with contemporary models to design the present towns/neighborhoods for social integration, climate responsiveness, and Imageability, with a human-centric design approach.

Keywords: *Town Planning, Vastu, Cardinal Directions, Street Layout, Society.*

1. INTRODUCTION

World Bank statistics reveal that the rapid urbanization in India with an annual growth rate of 2.3% has brought around 35% of the nation's population into the urban setting. This growth might cause various urban issues like overcrowding, housing shortage, traffic congestion, and degraded environmental quality. Also, considering simultaneously happening social change, we subsequently participate in discussions about creating better-functioning neighborhoods, trying to eliminate these problems. This is not achievable without the knowledge of critical systems and functioning of the society. Also, it is evident that the historic settings across the world, based on systematic approaches to development, considering various ecological, political, and socio-economic factors, survived for a long and performed at their best (Raina et al., 2008).

Scholarly research has found that the modern-day principles of town planning, which we are generally focused on to understand, evaluate, and then apply, are far behind the thoughts of ancient Indian architects and engineers (Dutt, 1977). They focused on the social aspects along with considering nature, following the approach of overall sustainability, and thus created models for the perfect existence of humans in the natural environment.

"The most advanced science of Europe has not yet improved upon the principles of the planning of garden cities of India based on the Indian village plan as a unit"- (Dutt, 1977).

Thus from these ancient Indian town-planning principles, we might find some aspects which are still useful and relevant to be applied in the present context (Raja, 2016). Hence this research project is focused on the comprehensive assessment of the ancient Indian town planning principles, and examination of their relevance in the present context taking the case example of Vidyadhar Nagar.

Aim: To evaluate the relevance of ancient Indian town planning principles in the present context for designing a contemporary neighborhood.

Objectives:

1. To identify various principles of town planning practiced in ancient India and their evolution through a literature review.
2. To determine various parameters of design from the principles of town planning in ancient India.
3. To analyze the relevance of ancient Indian town planning principles as applied in Vidyadhar Nagar based on the determined parameters through the case study method and survey method.

2. LITERATURE REVIEW

2.1 Neighborhood and the Town Planning

Scholarly description of a neighborhood unit revolves around geography, people, and the characteristics of a society.

"Neighborhood is a spatial construction denoting a geographical unit in which residents share the proximity and the circumstances that come with it"- (Chaskin, 1997).

"Neighborhoods are a particular type of place: locations where human activity is centered upon social reproduction" - (Martin, 2003).

"A neighborhood is a collection of people who share services and some level of cohesion in a geographically bounded place"- (Park & Rogers, 2015)

This neighborhood unit further leads to the formation of a community and ultimately, a town. Thus, town planning has a major role in the formation of an inclusive and cohesive society, providing good quality of life and channelizing the development to optimize the use of resources (Raina et al., 2008). It is focused on the physical form, economic functions, and social impacts, to provide functionality, convenience, aesthetics, and safety in the urban environment (Noah & Isiwele, 2017). The purpose of town planning might include the formation of zoning regulations, fulfillment of housing demand, prevention of haphazard growth, provision of recreational and public places, and formation of the transport system.

2.2 History of Town Planning in the Indian Context

Urban settlements in the Indian subcontinent date back to 2300 BC (Kaushik, 2018; Khanna, 2019). The ancient Indian town planning principles were majorly based on cardinal directions and geometry, still visible in the remains of the *Harappa* and *Mohenjo-Daro* (Raina et al., 2008). After the fall of the Indus Valley civilization, there was a gap, and then towns reappeared in the late *Vedic* period dating back to 1500 BC to 500 BC (Kaushik, 2018; Patwari, 2019; Pusalkar, 2022). During the Mughal period (16th century, lasted for around 300 years), the towns were planned based on their function, majorly categorized into administrative, religious, military, and trade towns. After Mughal's decline, the British took over and it led to the practice of modern-day town planning principles, with a focus on making economically beneficial settlements disregarding social needs. These principles were not indigenous, rather they changed into monumentality, constructing more public buildings. The street was no more an integrated part of the neighborhood, rather it was dominantly used to divide the land into smaller parts, where the external setbacks replaced the internal courtyards (Raina et al., 2008).

2.3 Town Planning in Ancient India: Introduction to the Treatises

Based on the four *Vedas*, there are various ancient Indian treatises about town planning, which categorize the settlements primarily based on their purpose of establishment, location, and nature of activities. Further, their shape, components, and various design parameters have also been described based on the principles of the *Vastu Purusha Mandala* (Kaushik, 2018). Many professionals have given their concepts, considering socio-political, religious, and economic aspects of the present, past, and future (Pusalkar, 2022). *Sthapatya Veda* deals with city layout, *Smriti Shastra* describes street layout on macro and micro levels, and *Vastu Shastra* suggests building planning and design, site selection, service layout, landscaping, and building orientation (Chakrabarti, 1998; Fergusson Lee et al., 2020; Patwari, 2019).

Kautilya Arthashastra, written around the 4th century BC by *Chanakya (Kautilya)*, literally meaning *"Scripture of Wealth"*, elaborates on the elemental features of a society, focusing on social, spiritual, and economic growth (Deshkar, 2010; Rangarajan, 1992). It mentions the systematic and scientific approaches towards city planning, describes bye-laws and development controls, focused on the idea of walkability, ventilation, privacy, built ratio and aesthetics, etc. (Raina et al., 2008; Rangarajan, 1992). Apart from physical dimensions, the hierarchy of settlements was also influenced by resources and the opportunities available in a region, where *Kautilya* defines the smallest division as a village having 100 to 500 families. Migration to the countryside was encouraged to prevent overcrowding, helping to maintain the built density in city centers and reducing the risks. This planning also invited foreigners to come and settle in the newly developed high-density areas to generate human resources and promote knowledge sharing. The roads ran E-W and N-S, where the land use connected by a specific road determined its width. Preventing fire outbreaks is defined as the responsibility of both the citizens and the municipal authority (Deshkar, 2010; Rangarajan, 1992).

Manasara Shilpa-Shastra in its 75 chapters, provides knowledge about overall planning and the design of architectural elements for the settlements and classifies the villages into 8 categories, whereas *Mayamuni* describes 15 categories for the villages and *Vishvakarma Vastu-Shastra* describes 20 types of towns (Acharya, 1927; Dutt, 1977; Raina et al., 2008).

2.4 Vastu Purusha Mandala

Vastu translates to *"the wisdom of dwelling place"*, and also *"the place where the man and God reside"*(Dutt, 1977; Raina et al., 2008). *Vastu Vidya* (ancient science of dwelling) dates back to the *Vedic* period, where *Sthapatya Veda* (a subordinate to the *Atharva Veda*) is believed to be the origin (Fergusson Lee et al., 2020; Pusalkar, 2022). *Vastu Shastra's* (textual part of *Vastu Vidya*) principles are based on three major aspects, the ground (principal one), the building, and the convenience (Dutt, 1977). These principles talk about the doctrine of orientation, examination of soil, proportionate measurements, aesthetics, and architectural features (Chakrabarti, 1998; Fergusson Lee et al., 2020; Patra, 2014).

Vastu defines the site, *Purusha* defines the man with pure energy and creative intelligence of the universe, and *Mandala* means the plan. When the cosmopolitan features resembling a man, are applied on a site, it is termed the *Vastu Purusha Mandala* (Patra, 2014). *(See Figure 1)*

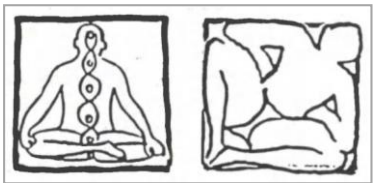

Figure 1. A Physical manifestation of Vastu Purusha, (Doshi & Chauhan, 1989)

The principles define the plot as a square, if not available, that can resemble some other geometric shape, but the area equivalent to the square to retain its symbolism (Patra, 2014).

Shilpa Shastras define 32 types of *Mandala*, the simplest one being a square, followed by its fragmentation into either 49, 69, or 81 smaller squares and *Mandala* with 1024 divisions being the largest one (Begde, 1978; Chakrabarti, 1998). *(See Figure2)*

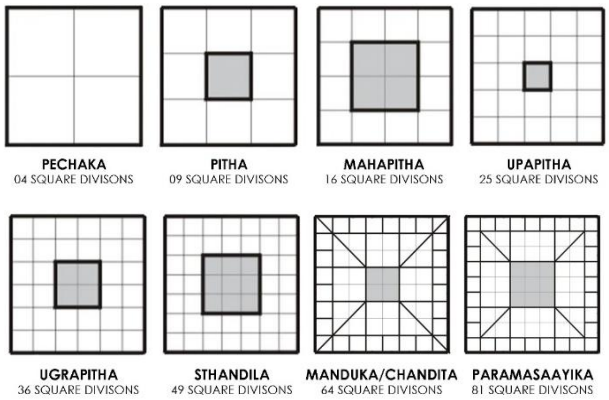

Figure 2. Types of Vastu Purusha Mandala (Position of Brahmasthana in the center) https://sitalakshmikr.wordpress.com/2016/01/03/magic-squares-and-vaastu-purusha-mandala-a-mathematical-interpretation-of-vaastu-shastra/

The schematic layout consists of squares dedicated to various aspects of life, and an arrangement of *Pancha Mahabhootas*, according to the cardinal directions, creating a balance between the built mass and the elements of the universe (Chakrabarti, 1998; Doshi & Chauhan, 1989; Patra, 2014; Raina et al., 2008).

2.5 Establishment of a Town

The Indo-Aryan town planning was based on astronomy and astrology widened up to sociology. *Manasara* and *Mayamata* discuss the steps for the establishment of a settlement, starting with *Bhu-Parikhsa* (examination of soil), selection of site, determination of cardinal directions (with the help of a Gnomon), and division of the ground. Deciding the shape and size of the settlement along with planning the street layout were the initial steps toward development. It further extends to the planning for settlement, leading to building-level construction (Acharya, 1927; Begde, 1978; Chakrabarti, 1998; Dutt, 1977). These towns can be classified into two categories, conscious and unconsciously evolved. In the unconscious evolution, a village occupied by one patriarchal family is considered as the origin and evolved into a town primarily because of the market center or the spread of knowledge in the case of educational towns like Nalanda. Whereas the consciously evolved towns were new and planned based on their stability and suitability, their purpose of establishment, and political, and economic conditions (Dutt, 1977).

There is mention of strategic locational planning for public buildings like the granary in *Harappa*, located near the river for ease of transportation, places of rest in *Mohenjo-Daro*, where the lower floor might have been used for parking carts, and a stadium for recreational purposes, in *Dholavira* (Kaushik, 2018). Also, to bring an organic identity to the town, the sense of a whole ward dominated the sense of individuality through the application of development controls (Dutt, 1977).

2.6 Shape and Size of the Town

Various treatises describe different shapes of a town ranging from square (*chatursara*), oblong (*ayatasara*), roughly circular (*vrtta*), elliptical (*vrattayata*), and completely circular (golavratta). There are also varied opinions about any angular or semi-lunar (*chandrardhaba*) shape. The hierarchy of a town is defined by its size ranging from 1000 *dandas* to 2000 *dandas*, and in some literature, towns up to 8000 *dandas* in length. Further, the neighborhoods ranged from 100 to 3000 *dandas* (600-18000 feet), considering 1 *danda* as 6 feet (Chakrabarti, 1998). However, it is also observed that these measurements were not strictly followed, as the size of the town also changed, proportionate to the dimensions of the king's body (Dutt, 1977; Patwari, 2019).

2.7 Streets and their Planning

The street layout was planned according to what is known now as the Chess Board system, where the streets run parallel

and cut each other at right angles, along the cardinal directions (Doshi & Chauhan, 1989; Dutt, 1977). *(See figure 3)*

Also, the function of a street changes as per their hierarchy, where the major traffic road surrounds the town and also runs through the center (forming the arms of the cosmic cross), the intermediate ones determine the plots and the internal ones provide ventilation and subdivide these plots (Patra, 2014). This layout tries to provide speedy passage from all the quarters to the centers of public importance, considering traffic volume while deciding on the width of the thoroughfares, thus minimizing the collisions, caused due to inadequacy (Dutt, 1977).

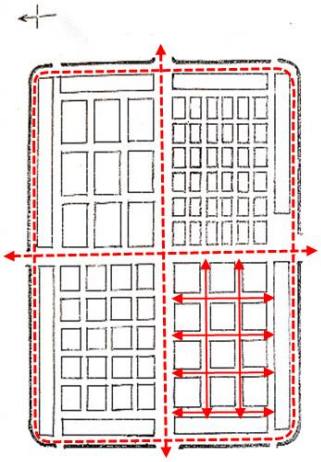

Figure 3. Street layout in Prastara, (Chakrabarti, 1998)

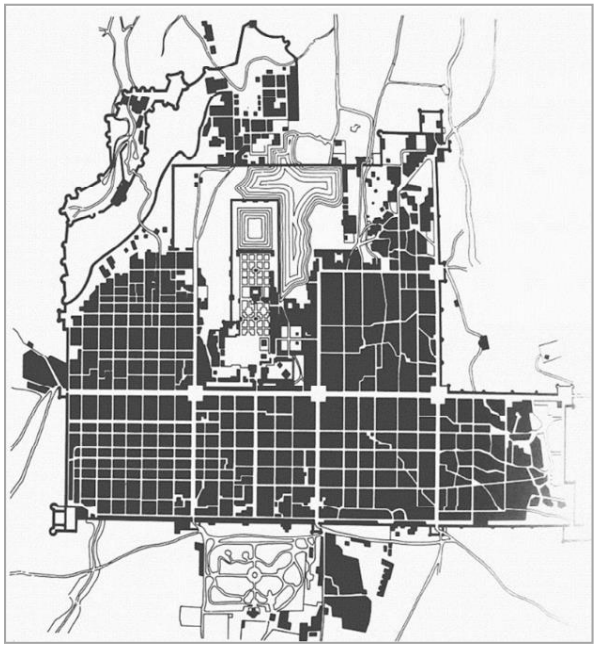

Figure 4. Map of the walled city of Jaipur, (Doshi & Chauhan, 1989)

A similar system can be observed in the walled city of Jaipur, resembling the schematic layout of *Prastara*. A 33m wide major traffic road runs E-W from *Surajpol* to *Chandpol*, and three 16.5 m wide N-S roads divide the city into the district sectors. An orthogonal network of comparatively narrow (8.5x4 m) wide internal streets determines the plot size and divides the sectors further into *mohallas* (Doshi & Chauhan, 1989; Pusalkar, 2022). *(See Figure 4)*

The principle of five-minute walking has been adopted while planning the walled city of Jaipur, where the city has been divided into 800x800m sectors providing commercial activities within 300m distance from the center of the corresponding sector.

Terminologies like *Mangalavithi/Janavithika* (peripheral road meant for passage of deity and *Pradakshina*), *Rajapatha/Mahapathas* (runs E-W or N-S), *Mahakala/Vamana* (lies in the southerly side), *Sandhivithi* (having junctions), and *Brahmavithi* (passing from center) have been described, along with diagonal streets radiating from the center. Also, attention to the intervening space in between the houses has been given, serving the purpose of light and ventilation (Dutt, 1977; Kaushik, 2018). *Manasara* suggests elevated footpaths on both sides of a street, to which the houses faced, and the back of these houses faced the narrow lanes called *Padya* which restricted vehicular movement (Acharya, 1927; Dutt, 1977).

Trimming was also done at the street junctions based on the angle of the intersection, where some significant architectural element or a tree was placed to create a visual focus and an aesthetic appeal. Roads, elevated in the middle are described to have drains on both sides along with bridges and culverts. Widening and lengthening of the existing streets helped and extension of the existing town, by setting up new housing lanes (Dutt, 1977).

2.8 Caste and Divisions

There are four categories described in the Vedas, i.e. *Brahmins*, *Kshatriyas*, *Vaishyas*, and the *Sudras*, who in general resided in the North, East, South, and West respectively (offspring of intermarriages were not recognized by the Aryan law). The allocation of plots was generally done based on the ruling planet and the taste, smell, and quality of the soil (Doshi & Chauhan, 1989; Dutt, 1977; Patra, 2014).

Based on the principle of Varnasrama Dharma, this segregation happened to bring uniformity of life and consequent economic efficiency (Patra, 2014). These different categories were interdependent and their segregation was not preferred at the city level leading to a society that was non-inclusive and non-cohesive. Thus, the smaller sites were divided into blocks reserved for a specific class, serving as a prototype (Dutt, 1977; Patra, 2014).

2.9 Findings from the Literature

The findings from ancient Indian town planning principles derived from the literature review are described below:

1. Towns in ancient India were categorized primarily based on their functions i.e. administrative, religious, military and trade towns, either consciously or unconsciously evolved.
2. The *Vastu Purusha Mandala* emphasized the square as the best suitable shape for a town, which can be divided further into 49,69, or 81 smaller squares. Other shapes of the town such as oblong (*ayatasara*), roughly circular (*vrtta*), elliptical (*vrattayata*), and completely circular (golavratta) were also taken into account.
3. The size of a neighborhood ranged from 600 ft to 18000 ft which also shows a lot of variation.
4. Neighborhood design was human-centered and social activities played a pivotal role in town planning, the street being an integral public space.
5. Walkability, ventilation, privacy, overall social integration, open-to-built ratio, and aesthetics were also given importance in ancient Indian town planning. *(The principle of 5-minute walking has been adopted in Jaipur town and sectors have been planned as the size of 800 m x 800 m), (Vehicle-free narrow lanes called Padyas are also mentioned in the literature).*
6. A network system with a defined hierarchy of roads was worked out in all ancient Indian towns. Majorly the grid-iron pattern has been followed in the layout of streets and was oriented toward cardinal directions, the N-S and the E-W.
7. The sites were divided into blocks reserved for a specific class of people based on caste, profession, economic status, or rank in society.
8. Firefighting has also been considered while planning towns in ancient India, which was taken care of with the help of bye-laws.

3. RESEARCH METHODOLOGY

The first phase of this research is a methodical assessment of the ancient Indian town planning principles and an understanding of the components, design process, and features of ancient Indian settlements along with a comprehension of the needs of the people in the respective period. This assessment further leads to the identification of various parameters for the evaluation of these principles and the settlements. It is followed by an analysis of the factors of the evolution of these principles and examining their relevance in the present context by studying a case example, finally leading to a conclusion.

A review of the literature including books, ancient treatises, and various scholarly articles about the principles of modern and ancient town planning has been useful for the assessment and derivation of the desired set of parameters. A case study of Vidyadhar Nagar (a contemporary neighborhood in Jaipur) has been taken as an example of the present context that has been designed based on ancient Indian principles of town planning, which has been further evaluated based on these parameters. *(See Figure 5)*

Primary data for the case example Vidyadhar Nagar has been collected through field observations, documentation, mapping, survey, and interviews. A structured survey has been conducted targeting a group comprising users from different age groups, gender, religion, professions, income groups, and their purpose of visiting the neighborhood. A total of 37 responses have been collected from different parts of the study area but dominated by the users along the central mixed-use zone. The survey is supported by a semi-structured interview taken along with the questionnaire. Secondary data for the case example has been collected from the literature studies.

A comparative analysis of the case example and the referred literature has been conducted and findings have been derived, supported by the survey results.

Figure 5. Base map of Study Area of Vidyadhar Nagar, (Captured on Nov 2, 2022, Google Earth Pro)

This research project falls under the category of Evaluation Research.

4. ANALYSIS AND DISCUSSIONS

The design of Vidyadhar Nagar (named after Vidyadhar Bhattacharya, architect-planner of the walled city of Jaipur) is based on the sacred principles of the *Vastu Purusha Mandala*. Ar. B.V. Doshi took a challenge to concentrate on contemporary needs and incorporate traditional knowledge simultaneously, which is the reason behind the selection of this example as a case study. The study area comprises a neighborhood consisting of four sectors spread over around 200 Ha.

The parameter-wise analysis is as followed:

4.1 Shape and Size of Town

4.1.1 Literature Review:

Various treatises describe the size of a town generally ranging from 6000-12000 feet for a small settlement and going up to 48000 feet for a larger town, whereas the size of a neighborhood ranged from 600-18000 feet in a similar order. The shape of a town as a square (primary), oblong, elliptical, and circular one has been described. *Manasara Shilpa-Shastra* classifies the towns/villages into various categories as *Dandaka, Sarvatobhadra, Nandyavarta, Padmaka, Swastika, Prastara, Karmuka, and Chaturmukha.* The classification was primarily based on the shape and street layout, and also other aspects such as site context, size, population, social and religious values, etc.

4.1.2 Case Study

The shape of Vidyadhar is almost square, with sides approx. 5000 feet. But due to the existing site conditions around the neighborhood, it is having slight irregularity in the periphery. Also, the overall planning as well as the four sectors resemble and appear to be based on the layout typology described as Swastika. *(See Figure 6)*

4.1.3 Findings:

It can be stated from the above facts that the shape and size of the Vidyadhar Nagar neighborhood have been derived from ancient Indian town planning principles.

4.2 Street Layout and Traffic Movement

4.2.1 Literature Review

The streets run parallel and cut each other at right angles along the cardinal directions where the width of thoroughfares depends on the traffic volume to minimize traffic congestion (Doshi & Chauhan, 1989; Dutt, 1977). A typical village/town is divided into four quarters by two intersecting streets running through the center also catering to major traffic, along with a peripheral road. The intermediate streets determine the plots, and the internal ones subdivide these plots (Dutt, 1977; Patra, 2014). This orientation along cardinal directions made the buildings open to free ventilation as winds in India generally flow along N-S (Dutt, 1977).

4.2.2 Case Study

Vidyadhar Nagar follows a similar layout with parallel running streets cutting each other at right angles but along the NW-SE and NE-SW directions. The neighborhood is similarly divided into four sectors with the help of two roads running along the central spine cut by a transverse market street. *(See figure 6)*

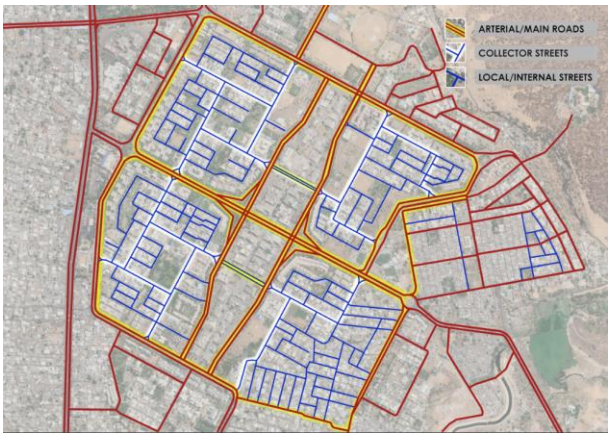

Figure 6. Street layout map of Vidyadhar Nagar

The slow-moving traffic is catered by a network of internal housing lanes leading to the collector streets in respective sectors, which further connect to the high-speed roads running along the central spine and the periphery. This categorization and hierarchy of streets help to manage traffic and minimize congestion. *(See figure 7)*

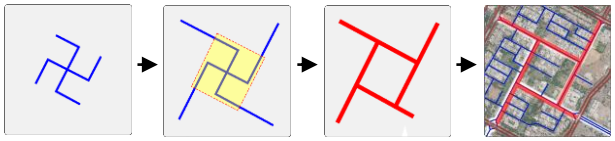

Figure 7. Interpretation of schematic layout of collector streets connected to main roads in Vidyadhar Nagar, based on the mystic figure of Swastika

The NW-SE and NE-SW orientation of the street layout help people commute easily without facing direct morning and evening sun at the respective times. This orientation also considers the direction of prevailing winds at the micro level, both in the summers and winters.

4.2.3 Survey

62.2% of respondents find the traffic on the main roads moving easily and face no traffic congestion, whereas 35.1% of the respondents face traffic congestion during peak hours. The results indicate a street layout with the main roads capable of catering to the present traffic volume.

4.2.4 Findings

The street layout of Vidyadhar Nagar is capable to manage the traffic volume throughout the neighborhood, defined as per the hierarchy and pattern of streets similar to those mentioned in the literature. The modification in layout orientation considers the missing parameter of the movement of the sun and also ponders the wind direction at the site level.

It can be inferred that the street layout of ancient Indian towns demonstrates its efficiency and suitability in the present context as applied in Vidyadhar Nagar, except for the doctrine of the orientation of the streets along the cardinal directions.

4.3 Walkability and Pedestrianization

4.3.1 Literature Review

Manasara suggests elevated footpaths on both sides of a street, towards which the houses are faced, and their back faced the narrow lanes called *Padya* (literally meaning a footpath), which restricted vehicular movement and made the area pedestrian friendly(Acharya, 1927; Dutt, 1977). The principle of five-minute walking has been adopted in the walled city of Jaipur providing commercial activities within a 400-500 m distance from the center of the corresponding sector making it walkable (Doshi & Chauhan, 1989). Also, in a typical village, the ground floor of the houses along the central streets consists of shops, thus providing access to commercial facilities at the center, equidistant from all residential zones (Dutt, 1977).

4.3.2 Case Study

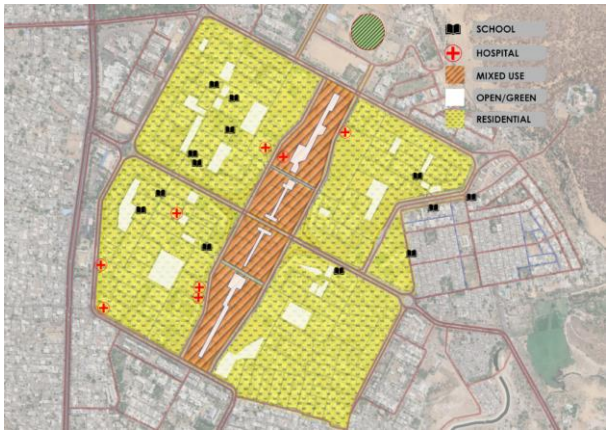

Figure 8. Zoning map of Vidyadahar Nagar (with marked location of schools and hospitals)

Mixed-use development along the central spine clusters all local shopping, work, and recreational facilities around the central plaza making it walkable and pedestrian friendly. Thus people living in and around the central spine have better pedestrian access to these facilities as compared to the ones living around the periphery. Green open spaces distributed in the residential zone make it easily accessible by pedestrians, whereas people from the spine have to commute to these spaces through other means to avail the benefits.

Also, improper pedestrian crossings create traffic conflicts and cause hindrances in pedestrian movement.

4.3.3 Survey

37.8% of the respondents prefer to walk and 48.6% prefer two-wheelers to reach the place to utilize the basic amenities and services. Only 10.8% of the respondents prefer a four-wheeler and very few people are dependent on means of public transport

Out of this 37.8%, cumulatively 86.5% of respondents rate their comfort level as 4 to 5 while walking in the neighborhood

4.3.4 Findings

The clustering of facilities along the central spine has created a walkable zone for the users living or working around the plaza, which is supported by a pedestrian-friendly network. But this concentration has put an adverse effect on the residential zone by making these facilities absent within walkable limits, turning a major percentage of the population dependent on vehicles.

It can be inferred that the mixed-use development and clustering of activities along the principal streets, (as also practiced in ancient times) help to make the central zone of Vidyadhar Nagar walkable and pedestrian friendly. Whereas the size of the neighborhood creates a hindrance to creating walkability as a whole.

4.4 Categorization of Housing Typologies

4.4.1 Literature Review

The sites were divided into blocks reserved for a specific class of people (as described in the *Vedas*), serving as a prototype for the whole city (Dutt, 1977; Patra, 2014). The categorization was done either based on caste, profession, economic status, or rank in society as per the defined hierarchy (Also visible in the walled city of Jaipur) (Doshi & Chauhan, 1989; Pusalkar, 2022). It was purposed to bring uniformity of life and consequent economic efficiency as these four categories were considered to be interdependent (Patra, 2014).

4.4.2 Case Study

The neighborhood is dominated by a *Hindu*communitywhere *Muslims* are generally not entertained in society due to the belief system and communal discrimination. Also due to the scarcity of affordable housing, the neighborhood consists of majorly middle to high-income group residents, and people of the lower-income group generally have to reside outside the neighborhood. Thus, no such categorization as visible in ancient settlements has been found in Vidyadhar Nagar.

4.4.3 Survey

97.3% of respondents do not find any issue related to caste and community. The problem is faced by only the *Muslim* people, who are generally not preferred to be a part of society. Also, no issues related to the economic background of the residents have been found.

4.4.4 Findings

It can't be ignored that the present lower and the higher income groups in a society are interdependent considering business and other activities happening inside the neighborhood. Thus not adhering to any principle of categorization has brought monotony in society which has

advantages in terms of minimal issues based on the community and economic status of the residents. Whereas it has also blocked the potential of the site to cater to a good mix of housing typologies, thus might create hindrances in the interdependent activities.

It can be inferred that a neighborhood comprising people from all income groups (similar to those in ancient settlements considering the interdependency) can be considered more efficient in comparison to a monotonous development with either of a category dominantly acquiring the majority of the plots in Vidyadhar Nagar.

4.5 Green Open Spaces

4.5.1 Literature Review

Along with *Chaupars* (large open squares at road intersections), small pockets of open spaces were planned within the *mohallas* in the sectors of the walled city of Jaipur, serving a group of houses clustered around these open spaces. Also, In the *Mandal*a, it is prescribed that the center space which belongs to Brahma has to be kept open (Doshi & Chauhan, 1989).

4.5.2 Case Study

Although there is a deviation from the original plan for a system of open spaces, still the parks and green open spaces are evenly distributed in the four residential sectors being easily available to the users living around and also serving the adjoining neighborhoods. But the lack of green open spaces in the central spine creates a shortage for the residents around the spine, as well as for the people coming for business/work purposes. *(See figure 9)*

Figure 9. The existing system of open spaces in Vidyadhar Nagar

This arrangement diminishes the usage which is made worse because of the intermediate high-speed roads creating hindrances in pedestrian access to the green open spaces, those available in the residential zones.

4.5.3 Survey

45.9% of respondents use green open spaces on the regular basis and 32.4 % of the respondents are inconsistent users. Whereas 21.6% don't use these spaces at all, and this group of respondents consists of the residents and visitors around the central spine.

4.5.4 Findings

Although there is not much information available about the principles of designing specific green open spaces in ancient Indian settlements, still some text defining the provision of open spaces within the clusters is found.

It can be inferred that the green open spaces in Vidyadhar Nagar might serve the needs of the residents and the adjoining neighborhoods as well. But the mixed-use development around the center allows the plaza to be the only open space available in the corresponding zone, thus making the present layout less competent to the needs and generating a need for better distribution and provision of green open spaces.

4.6 Safety and Security

4.6.1 Literature Review

Security from external invasions had always been in consideration while planning settlements in ancient times, by providing boundary walls and moats, etc. Also, to deal with internal safety and social concerns, a set of bye-laws have been defined by Kautilya. Fire has been considered more dangerous than floods. It is also defined that preventing fire outbreaks is the responsibility of both the citizens and the municipal authority (Deshkar, 2010; Rangarajan, 1992). Subsequent punishment has been defined for the people who fail to follow responsibility. When talking about the divisions of sectors in a town, Kautilya advised that the blacksmiths, who work with fire, should live together in a single locality. He also suggests the citizens have a common fireplace and also should he define the regulations for that in terms of size and distance from the built parts (Dutt, 1977).

4.6.2 Case Study

The clustering of activities around the spine has brought down the potential for the remaining areas to be developed as active public places. *(See figure 10)*

Figure 10. An inactive public place in Vidyadhar Nagar

4.6.3 Survey

78.4% of respondents find it safe, whereas the rest have varying opinions about the safety and security within the neighborhood.

4.6.4 Findings

It can be inferred that the clustering of a mix of activities around the central spine in Vidyahar Nagar creates a sense of safety and security and keep the central spine alive throughout time, but simultaneously diminishes the usability and activeness of the rest of the potential areas, turning them into comparatively unsafe zones.

4.7 Legibility and Imagibility

4.7.1 Literature Review

The aspect of aesthetics has been taken into consideration while panning the roads, where a pleasant effect was created by providing significant architectural elements or a tree at the junction of long wide streets so that there is something to focus on, instead of having a street that wears the eye-sight. This was the reason for the erection of a shrine, a college, or a monastery at the junctions (Dutt, 1977). This led to achieving better legibility and imageability of the streetscape.

4.7.2 Case Study

Visually similar structures make it hard for the occasional/new users to identify the correct building to be visited and make the neighborhood illegible. *(See figure 11)*

Figure 11. Comparative images of visually similar mixed-use buildings along the central spine in Vidyadhar Nagar

Whereas the regular street layout with all internal streets leading to the same corresponding collector street along with the location of public buildings serving as a landmark has made the layout legible and also makes it easier for the users to reach their destination. *(See figure 6)*

4.7.3 Survey

A larger fraction of respondents feels it is easy for a guest/visitor to reach an address, whereas some describe it as a difficult task for a user to reach a new address for the first time.

4.7.4 Findings

Strategically planned public buildings present in various zones in Vidyadhar Nagar work as landmarks and helps in the process of way-finding s for a specific location in the vicinity supported by a simple linear street layout. Whereas the similar visual appeal of all the structures affects the legibility, distracts the users, and creates hindrances in the process of way-finding.

This analysis as a whole indicates the appropriateness of the ancient Indian town planning principles and demonstrates their relevance in the present context for designing a contemporary neighborhood.

5. CONCLUSION

The ancient Indian towns were planned to serve various functions such as trade, administrative hubs, religious centers, and cantonments. These towns were designed based on the principles of *Vastu Purusha Mandala* considering various site-specific, socio-cultural, religious, economic, and socio-political contexts. Many scriptures such as *Sthapatya Veda*, *Smriti Shastra*, *Vastu Shastra, Kautilya Arthashastra*, *Manasara Shilpa-Shastra*, *Vishvakarma Vastu-Shastra,* and *Mayamata* describe the aspects of designing these settlements.

It has been derived from the literature review that a square (followed by a rectangle) was considered the best shape for a town, and its size ranged from 6000-12000 feet for a small settlement and goes up to 48000 feet for a larger town. Whereas the size of a neighborhood ranged from 600-18000 feet in a similar order to the towns. Walkability was the key factor while planning ancient Indian towns because of the absence of a motorized vehicular system at that time. The streets were oriented in cardinal directions ie. N-S and E-W, also cater to the overall wind movement in the country. The housing typologies were classified based on the caste system, economic status, etc. and higher caste or high economic status people were given the larger plots. The open spaces were integrated with the streets or the small residential clusters themselves and were not categorized specifically as green open spaces. Internal safety was taken care of by incorporating building bye-laws such as fire fighting systems. The streets were always having junctions as the focal point having structures such as religious buildings, schools, or any public building for better imageability.

Vidyadhar Nagar by B.V. Doshi is a neighborhood designed to take advantage of the existing knowledge of the ancient Indian town planning principles simultaneously incorporating contemporary models and catering the present-day needs.

The square shape layout appears to be of the optimum size for a neighborhood. Layout with parallel streets intersecting at right angles, and overall planning, as well as the four sectors, resemble and appear to be based on the ancient settlement typology described as Swastika. Although, the streets are oriented towards NW-SE and SW-NE, to serve the wind movement at the site level along with minimizing the glare, works well also as per the perception of residents.

The central plaza works as a pedestrian-friendly public open space serving a mixed-use activity zone around the central spine, creating a walkable zone, also comparatively safer than the rest of the neighborhood. But this also can't be ignored that the clustering of activities at the center and the non-availability of a central green has put an adverse impact on walkability, triggered by the size of the neighborhood.

Dominant buildings serve as landmarks for the way-finding process and help to make the regular layout much more legible, but simultaneously a similar character of these buildings makes them lose their impact, and imageability is also disturbed. Also, the existing monotony of the high-income category Hindu community slightly brings down the potential of a good housing mix that can bring uniformity of life and consequent economic efficiency.

Thus it can be concluded that the Vidyadhar Nagar neighborhood is performing well in all major aspects of design. It is an amalgamation of ancient Indian town-planning principles and the knowledge of the contemporary models of town planning, thus catering to present-day needs. There are very few examples of similar settlements in India, thus there is always an opportunity to explore the ancient Indian town planning principles and apply the same in contemporary neighborhood design taking into consideration of the issues and problems of the modern context.

6. ACKNOWLEDGEMENT

This research work is based on the M.Arch 3rd semester Dissertation of the main author. The Co-author has acted as the Dissertation Coordinator for the same.

We acknowledge all the guidance given by the rest of the studio team i.e Dr. (Prof.) Sangeeta Bagga Mehta, Ar. Priya Gupta, and Ar. Nikhita Kinger. We acknowledge Chandigarh Administration and CCA for providing all the necessary infrastructure, library and lab facilities, etc. that have made this research possible.

REFERENCES

[1] Acharya, P. K. (1927). Indian Architecture: According to Mansara Silpsastra (Vol. 2). Oriental Books Reprint Corporation.

[2] Begde, P. V. (1978). Ancient and Medieval Town-Planning in India (1st Ed.). Sagar Publications.

[3] Biswas, D. (2018). Town-Planning in Ancient India, as Depicted in Arthasastra. Journal of Emerging Technologies and Innovative Research, 5(11), 54–58. www.jetir.org

[4] Chakrabarti, V. (1998). Indian Architecture Theory: Contemporary Uses of Vastuvidya (1st ed., Vol. 1). Curzon Press.

[5] Chaskin, R. J. (1997). Perspectives on Neighborhood and Community: A Review of the Literature. Social Service Review, 71(4), 521–547.

[6] Deshkar, S. M. (2010). Kautilya Arthashastra and its Relevance to Urban Planning Studies. Institute of Town Planners, India, 7(1), 87–95.

[7] Doshi, B., & Chauhan, M. (1989). City and Symbol: Learning from Old Jaipur. Urban Design Quarterly, 32.

[8] Dutt, B. B. (1977). Town Planning in Ancient India. New Asian Publications.

[9] Fergusson Lee, Nidich Sanford, Bonshek Anna, & Nidich Randi. (2020). Maharishi Vedic Architecture and Quality of Life: An International Mixed Methods Study of Lived Experience. International Journal of Architecture and Urban Development, 10(4), 05–18. https://doi.org/10.30495/IJAUD.2020.16370

[10] Kaushik, A. K. (2018). Ancient Indian Town Planning: A Journey Across Two Urbanisations (1st ed.). Literary Circle.

[11] Khanna, S. (2019). Urbanisation in Kautilya's Arthasastra : Archaeological Evidence. International Journal of Research Culture Society, 3(5), 68–70.

[12] Martin, D. G. (2003). Enacting Neighborhood. Urban Geography, 24(5), 361–385.

[13] Noah, A. G., & Isiwele, A. J. (2017). A Review on the Role of Town Planning to Architectural Development. Journal of Engineering and Architecture, 4, 99–109.

[14] Pandey, S. (Ed.). (n.d.). Mayamatam: Indian Treatise on Housing Architecture and Iconography. Chaukhamba Surbharati Prakashan.

[15] Park, Y., & Rogers, G. O. (2015). Neighborhood Planning Theory, Guidelines, and Research: Can Area, Population, and Boundary Guide Conceptual Framing? Journal of Planning Literature, 30(1), 18–36. https://doi.org/10.1177/0885412214549422

[16] Patra, R. (2014). Town Planning in Ancient India: In Moral Perspective. The International Journal of Humanities & Social Studies, 2(6), 44–51. www.theijhss.com

[17] Patwari, P. v. (2019). Case Study: A Comparative Study the Karmuka Vedic Planning and Existing City Central Place in Latur City in India. International Journal of Engineering Applied Sciences and Technology, 4(5), 311–314. http://www.ijeast.com

[18] Pusalkar, S. M. (2022). Understanding The Vastu Shastra: City Planning in Walled City of Jaipur. Esempi Di Architettura, 9(1), 62–71. https://doi.org/10.53136/97912599480766

[19] Raina, A. S., Bhagyalaxmi, A., & Madapur, S. (2008). The Potential and Relevance of Indigenous Knowledge System of City Planning Principles in Shaping Contemporary Urban Milieu. International Research Journal of Engineering and Technology, 5(8), 312–323. www.irjet.net

[20] Raja, S. (2016). Glimpses of Ancient Indian Town Planning for Modern Heritage Cities. Dev Sanskriti: Interdisciplinary International Journal, 7, 07–11.

[21] Raja, S. (2016). Glimpses of Ancient Indian Town Planning for Modern Heritage Cities. Dev Sanskriti: Interdisciplinary International Journal, 7, 07–11.

[22] Sastri, V. K., & Gadre, N. B. (Eds.). (1990). Viswakarma Vastusastram (2nd Ed.). Saraswati Mahal Library Society.