

Traditional Walled Cities of Rajasthan India: A Sustainable Planning Concept

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ABSTRACT:

Walled city is a place, surrounded by high walls, with more than four gates for easy access to all directions. The walled cities depict a very high order of city planning. They include various residences for royal families as well as common people, market for daily needs, streets, Chowks, religious places, open spaces, water bodies and other amenities needed to survive in a city. Beyond the wall, these cities used to be protected by an all round moat, river or other water body. Kings have made walled cities to accommodate the need of growing population of their city while Military defenses are virtually endless. Rajasthan is famous for its forts and throughout Rajasthan; almost every fort has a walled city near it. The walled cities constructed in those times present very beautiful and strong heritage examples for us, but nowadays due to lack of awareness among common population and lack of policy mechanism and enforcement this heritage is being lost. Today condition of city walls and gates are very poor. People have made houses on city walls, somewhere broken the wall to make access, somewhere pasted the advertisement poster and thrown the garbage destroying it. To support this article, case studies are done for three walled cities of Rajasthan i.e., Jaipur, Jodhpur, & Jaisalmer. This article focuses on present condition of this heritage and emphasizes on protection and need of conservation to save our true heritage. While concluding, this article provides recommendation to conserve and maintain it.

KEYWORDS: Heritage, fortification, walled city, conservation, courtyard, Bazaars

1. INTRODUCTION:

History of Rajasthan is full of many wars, and repeated attacks by enemies. Safety and security of public and other goods, has always been a major concern for its rulers. Forts and walled cities are a result of this situation. The walled cities are developed by rulers at different places in Rajasthan, to accommodate the need of growing population of their city and provide safety and security to people and goods. The walled city depicted a very high order of city planning. The different components of walled cities i.e. Residences, Bazaars, religious places, Chowks, Streets & monuments are encircled by walls and protected by an all round moat, river or water flowing. Throughout Rajasthan, almost every fort has walled city near it. Their close proximity consolidated the defense of the region and threw an unsurpassable barrier in the way of the enemy. Walled cities are made all across India with similar concept but with different techniques depending on climatic condition and location. Some cities stand on the banks of or near a river or occupy some kindred site. Most of them are on hills or on plain land near the high hills. Heights of city walls are more on plain lands. These city walls are generally decorated in elevation series of holes of pointed arced parapet, sloping walls etc. The walled city constructed in those times present a beautiful and a strong heritage example for us.



Figure 1 View of few walled cities of Rajasthan (Author)

2. CONCEPT WALLED CITIES:

Walled cities are categorized in two types, based on the concept or need of origin, area where urban growth has started, and reason for their origin etc.

1. A seat of Administration or Aristocracy Ex. Jaipur, Hyderabad, old Delhi and
2. A seat of some religious activities ex: Banaras, Madurai

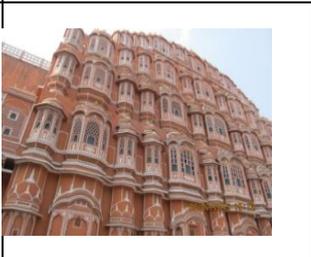
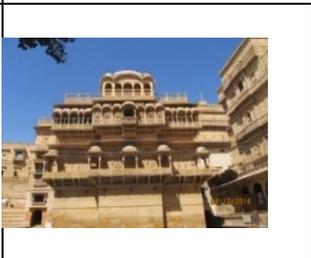
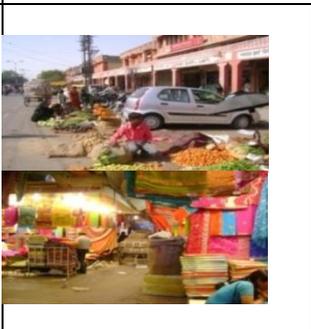
The reason for construction of walled cities includes; protection of public from attacks, for storage purpose, to accommodate king and protector of kingdom and to protect and store the wealth won from other countries. The Main Characteristics of walled cities are

1. High walls surrounding whole city
2. Four or more gate on all side for easy access to all directions.
3. Orientation with respect to sun and wind directions.
4. Height of residence from G to G+2
5. Narrow streets
6. High Density

3. COMPONENTS OF WALLED CITIES:

Table 1 Components of walled cities

Component	Description
City walls 	The city wall surrounds the city for security and privacy purposes. This wall used to be interrupted by four or more gates providing access to all directions. At most, of the places, this wall used to be further protected by an all round moat, or valley.
Gates 	These are intersecting Architectural elements of walled cities to define entry and exit points. Great architectural skill was involved with several motifs and forms in their design.
Streets/ Gali 	To provide circulation space to all areas of city, streets used to be categorized based on the area, circulation requirement, traffic etc.
Squares or Chowks 	A Chowk is an area where a street joins another street indicating there by a change of direction. They sometimes act as landmarks in the area. The residential Chowk give a very beautiful appearance with various activities of different age groups.

Component		Description
Water Bodies		Since the climate of Rajasthan is hot & dry climate with very low rain fall, resulting in scarcity of water. For fulfilling the daily needs, step wells, underground aquifers and other water bodies were created.
Mohallas/ Clusters		A Mohalla is a clearly defined area of residential and commercial activity fronting on a main street. It represents an introvert organization of dwelling units in Neighborhood pattern around open Chowks. The transition elements between house and street become important, in that they generate various community activities. It also represents a particular socio-economic group of people living there.
Nodes or Landmarks		These are the important places in old cities, located at strategic location. In the core city area the mosque, temple monuments, palace, towers and other specific institutions act as landmarks. In the past, there were no postal address systems, to identify any place. Hence, in old times the city level landmarks used to help, find out a particular location, dominating the entire surrounding environs.
Traditional Buildings		There are mainly two type of buildings; Residences, ranging from royal places to small Havelis and religious places like temples, mosques etc. The typical buildings were planned on courtyard pattern with other climate responsive features, considering the local climate. Common houses are mostly G+2or G+3 with decorated doors, windows and balconies with graceful balustrades or perforated screens or Jali.
Traditional Bazaars		The traditional bazaars are systematically planned and integrated into city design, used for commodity exchanges on retail and wholesale basis. These are the most colorful centers of social interaction at all levels. It is essentially a pedestrian concept, and its growth is mostly need oriented rather than preconceived and designed. Mostly traditional bazaar can be identified as prominent linear growth signifying the major type of movement in the city life. Like Mohalla, a bazaar is identified with socio-economic groups of people and type of goods sold in the area.

Source: Author

4. CLIMATIC CONSIDERATION IN WALLED CITIES:

Walled cities across the Rajasthan have a traditional urban character that comes out as a response to the climate, the site conditions and the culture. At some places, Buildings of a particular color, carved stone facades, Jharokhas, meandering streets, courtyard houses, bazaars, open Chowks, community spaces, temples and water structures make the fabric of the city. The open spaces are quite significant in the social lifestyle of the people forming the meeting spaces and are centre of activities for different age groups and different duration. The water bodies thus became coherent with the open spaces and the much required lung spaces for the city contributing in keeping the climate cool, and acting as a node for their social and cultural activities.

While conceptualizing these walled cities, extreme climatic consideration was given for the planning of open spaces, water bodies, construction material, built form and treatment of facades of buildings. The open spaces are quite significant in the social lifestyle of the people forming the meeting spaces and are centre of activities during the different times of the day. The water bodies thus became coherent with the

open spaces and the much required lung spaces for the city contributing in keeping the climate cool, and acting as a node for their social and cultural activities.

The **built form** is very compact in its structure and suited to the hot dry climatic conditions. The houses or Havelis have an introvert plan around a courtyard. The treatment of the facades and openings indicates a sensitive response to climatic conditions.

MATERIALS:

Almost all the walled cities in Rajasthan is constructed in various types of sandstone depending on local availability. The basic properties of sand stone is very climate friendly, it is not only a good insulator but also a poor conductor. Most of the sunlight is reflected from sand stone, and it heats up very slowly, allowing very little heat to come inside.

OPENINGS:

All these traditional buildings are full of openings which is a very important architectural feature. These opening vary in size and character ranging from small Jali to big courtyards. This porosity promotes very good cross ventilation. In this technique, exposed surface of building to sun is minimized. It is further shaded by overhangs, Jharokhas, projected balconies etc.

COURTYARDS:

A courtyard is a very important element of the Havelis, it provides good thermal insulation. These cities are compactly built, in which, the building and streets are very close to each other. But it is very important to close the house to the exterior and open it to the interior due to need of privacy as well as thermal insulation. Here courtyard proves to be an extremely important feature as it acts like a buffer between the outside heat and internal environment.

JALIS:

The most important function of Jali is to block the direct rays of sun while permitting cross ventilation. It also provided privacy to family member's, especially to the ladies of house in old times.

JHAROKHAS:

The Jharokhas & **Projected balconies** on building's facade draw cool air into the building which further circulates through the rooms and then exits through other openings emitting hot air outside.



Figure 2 Components of traditional buildings i.e; Jali, Jharokha and Courtyard (Author)

5. SOCIO-ECONOMIC PERSPECTIVE IN WALLED CITY:

Socio-economic aspect is the most important aspect of the core cities, which unfortunately lack in the budding cities. The city is like a family and in traditional core/walled cities we come across strongly knit social systems. Everyone had some sort of relationship with the others. There was a great regard for the elders, old people and for the women. The children are treated with warmth and affection.

For retaining the traditional culture from time to time, processions are being routed up through major streets, with bands, Jhankis and so on. The mosques, temples and churches were the focus of major landmarks, which commanded the major activities of different communities.

A **plaza or a Chowk** is another fine space where various lanes and by lanes meet. It is full of life. One could find their community tap, vendors selling sweet meals, animals wandering freely, old people gossiping, children playing and other such activities, which are connected and create completely different environment. The lanes joining, looks very interesting as the structures generating force, found to give way at these plazas with tension suddenly gets relieved.

The life in the core/walled cities had been tough from the beginning. Except royal courts, there were no other employment avenues, People could run only shop from their residences and earned bread on barter system.

Further section includes case studies of three walled cities of Rajasthan i.e., Jaipur, Jodhpur, &Jaisalmer.

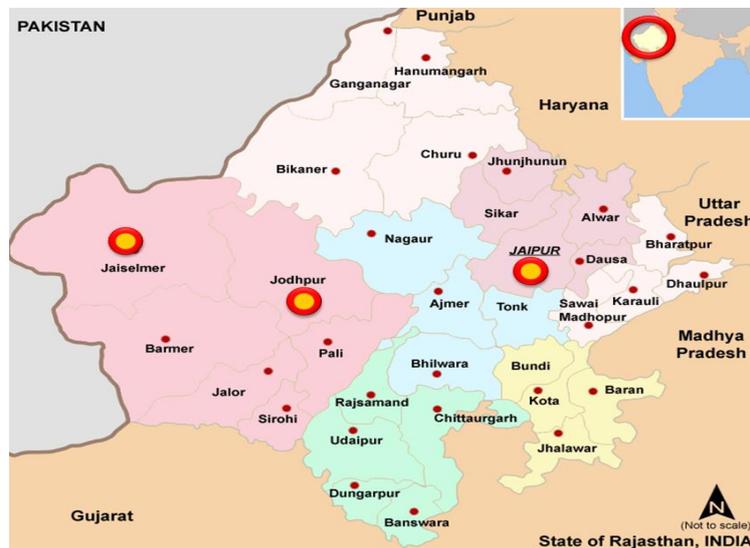


Figure 3 Location of Study area in i.e; Jodhpur, Jaisalmer& Jaipur, Rajasthan India

Source: http://upload.wikimedia.org/wikipedia/commons/c/cf/Map_rajasthan_dist_7_div.png

6. WALLED CITY OF JODHPUR:

1.1. INTRODUCTION:

Jodhpur is centrally located in Western region of the State. This bustling desert city was the seat of power for the Marwar region and the access to the western Rajasthan. Jodhpur is called the 'blue city'. The Brahmins were asked to paint their house in blue, in order to identify them as Brahmins. Over time a number of other also picked up this habit and a significant number of these houses are now painted blue.

1.2. BASIC PLANNING CONCEPT:

The walled city of Jodhpur is sited on a natural sloping ground, where the undulating terrains end and the plains begin. The walled city is fenced by 10 km long wall with eight Gates leading out of it. The entire region on the north and north-west, due to the topography, is difficult for habitation. Responding to the topography and the climatic needs have resulted in a compact organization of spaces. However, the forces of nature have resulted in a development of dense built fabric with narrow meandering streets, going up and down in order to negotiate the topography, making space for socio-cultural and socio-religious activities in the form of open Chowks. Planning in such climatic region is typical, where the layout is very compact and the only open space seen in such areas are Chowks, varying in scale from the large one in the Mohallas to the one within the house.

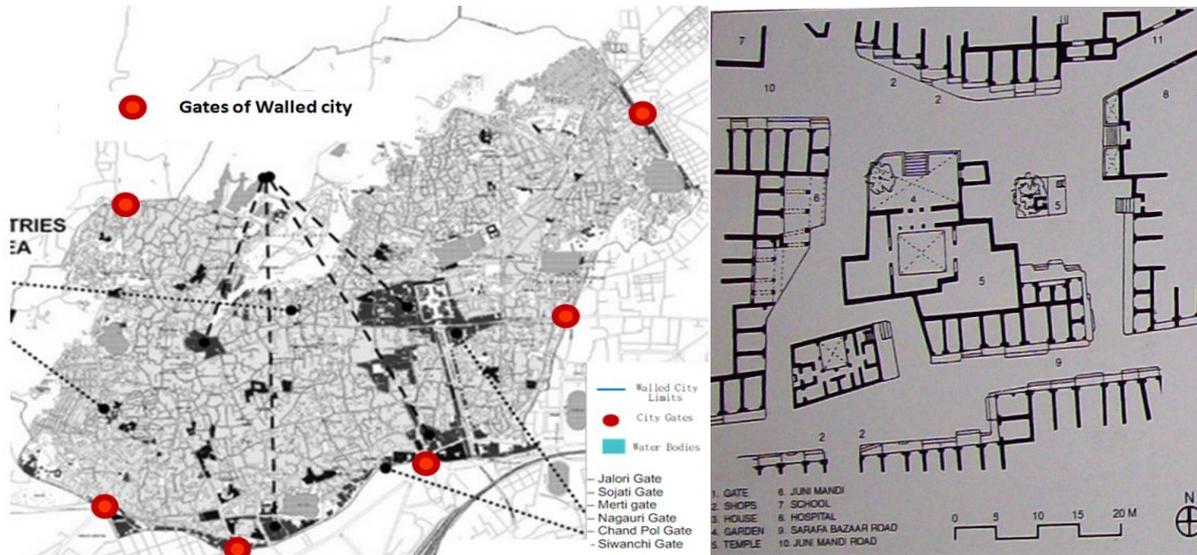


Figure 4 Map of walled city Jodhpur

Source: Kallakirti, 2011, Land Use Transformation – Problems &Prospects, A case of Walled City, Jodhpur, MNIT Jaipur

1.3. BUILT FORM AND CITY COMPONENTS:

Jodhpur is famous as blue city, as most of its old houses have painted blue. The traditional Mohallas in Jodhpur have evolved over a period of 500 years, starting from the foothills; the Brahmपुरi, Gundika Mohalla, and growing southwards, towards Bamba Mohalla.

The Mohallas were caste or profession based, for E.g. Sonaronkighati, Bohronki pol, Muthonka bas, Joshiyon ka bas. The Mohalla comprised of houses/Havelis, religious buildings, community spaces and circulation area. The bazaars, traditions, crafts and products, culture and value systems have also been reflected in the built form, existing in the walled city. Most of the houses are planned in typical Rajasthani style with flat terraces and open courtyard, with decorated doors, windows and balconies having elegant balustrades or perforated screens. Main roads have double storied houses built of stone with shops at lower levels and residences above them.

The houses have high plinth with projects platform facing the street, which is used as interaction spaces. The houses had narrow openings in form of Jharokhas, and a small gateway for entry. Courtyard remained the central focus of the house in response to the climatic consideration.



Figure 5 Few Glimpses of walled city Jodhpur (Author)

City walls wall is built of sand stone blocks and flanked by massive towers, surmounted by defensive battlements and was interrupt with ramparts at regular intervals.

The walled city has six **gates** that lead to various cities depicting their namesviz; Jalori gate, Sojati gate, Merta gate, Nagauri gate, Chandpole gate and Siwanchi gate

The two main streets of Jodhpur cross through the city in both directions and a centre of commercial activities. The **streets** provides privacy by cutting direct views and act as a traffic barrier by using steps to tackle the slope of the land and an arena for many socio-cultural activities. Residential streets and

Neighborhood level streets exhibit strong community structure being narrow and meandering for the purpose of privacy. Secondary streets and connectors of Neighborhoods have features like temples, wells, baolies etc. The streets are mainly stone paved.

The **open spaces** were the main interaction spaces and were part of every Mohalla. They were the centre of socio-cultural, recreational and Neighborhood level commercial activities. They are formed at the intersection of two or more secondary streets. At the neighborhood level there Chowks will have a small temple, a tree, a well and Vijaystambh. The bigger Chowks like the sardar market squares are exclusive to commercial activities etc.

1.4. CLIMATIC CONSIDERATION:

The city of Jodhpur has a traditional urban character that comes out as a response to the climate, the site conditions and the culture. Buildings of blue colour, carved stone facades, Jharokhas, meandering streets, courtyard houses, Bazaars, open Chowks, community spaces, temples and water structures make the blue fabric of the city. These open spaces are quite significant in the social lifestyle of the people forming the meeting spaces and are centre of activities. The water bodies helps in keeping the climate cool, and act as a node for the social and cultural activities.

1.5. COMMUNITY STRUCTURE:

The societies are based on caste and economic groupings localities exist. However earlier it was the cast system is much important than economy for example: Hindu – Shrimali Brahmin, Jains are middle income group, Muslim communities as lower income group. Common Chowks (squares) exists in these localities which are often the organization of these residential areas. New areas are based on economic grouping.

1.6. WATER SUPPLY & SANITATION:

Ground and surface water is there to sustain the population but this system mainly works on harvesting rainwater and aquifers. There are number of water bodies of different scale from the huge tank to the community tanks. These water bodies served the people of Jodhpur since the inception of the city and have sited some important structures along them like the palaces of the king & temples. Sandstone is the prime material used in construction of these water bodies.

The surface drainage was through the open drains built on either side of streets, which carried the rainwater. These drains ended up in reservoirs built outside the walled city and therefore not allowing the contamination by them mixing with wastewater.

Earlier sewage disposal was underground, but later it was collected manually by scavengers from the city and disposed to the drains, which is still in practice. Garbage is collected manually and the trams and trolleys disposed it outside the city.

7. WALLED CITY OF JAISALMER:

Jaisalmer is known as Thar (land of the dead) of India. It was established in 1156 AD by Maharawal jaisal as the capital for his territory on the site, which was protected by high sand dunes. It is built of yellow sand stone, located on top of a hillock; it is a compactly built city with a dense mass. The strategic position of Jaisalmer brought it great wealth through the merchants and townspeople, these wealthy people built magnificent Havelis, decorated with carving on wood and golden-yellow sandstone.



Figure 6 Few Glimpses of walled city Jaisalmer (Author)

Jaisalmer acquires the character of being a sensitive town for defense purposes as it lies very close to the border and a large area of this town is under defense establishment, which restricts the growth of city. There are some restrictions in terms of activities allowed by the defense establishment, which in some ways retorts growth. Limited availability of water puts a natural cap on the holding ability of population of the area. The city is located on high plateau than the surrounding area, which puts a natural barrier on growth.

1.7. BASIC PLANNING CONCEPT:

Jaisalmer was essentially a king's town. Protection against the enemy's attack was the important factor, which shaped the fort as well as the walled town. The building of Jaisalmer started with the construction of the fort, which was built mainly for the purpose of defense. Jaisalmer is built like a city within a city, with double line of fortification. The inner city is more protected with a stronger wall. The shape of the inner city follows the shape of hill on which it is built, hence its plan is an irregular polygon, and this hill is about 100 meters high from the surrounding area. The upper city has streets, which radiate towards the periphery from the royal square of the palace complex, which is the nucleus of city. In the lower city the streets are arranged in an irregular grid-iron pattern. The city has winding, narrow and steep roads which leads to the main palace, which dominates the entire landscape.

The residences of main officials of king, rich traders and priest are located surrounding the royal palace. The streets are arranged in an irregular grid-iron pattern, the fringe along the wall was occupied by the army. The city wall is penetrated by seven gates and Streets act as linkages, activity and interaction spaces.

The voids in the fabric of town are well related in the sequential hierarchy and the size, shape etc. are according to the functions performed in the square. The spatial linkages between all these squares reveal the relation of the urban form to the landform. These squares never detract from a sense of unity being fully integrated in to one by relationship of spatial sequences.

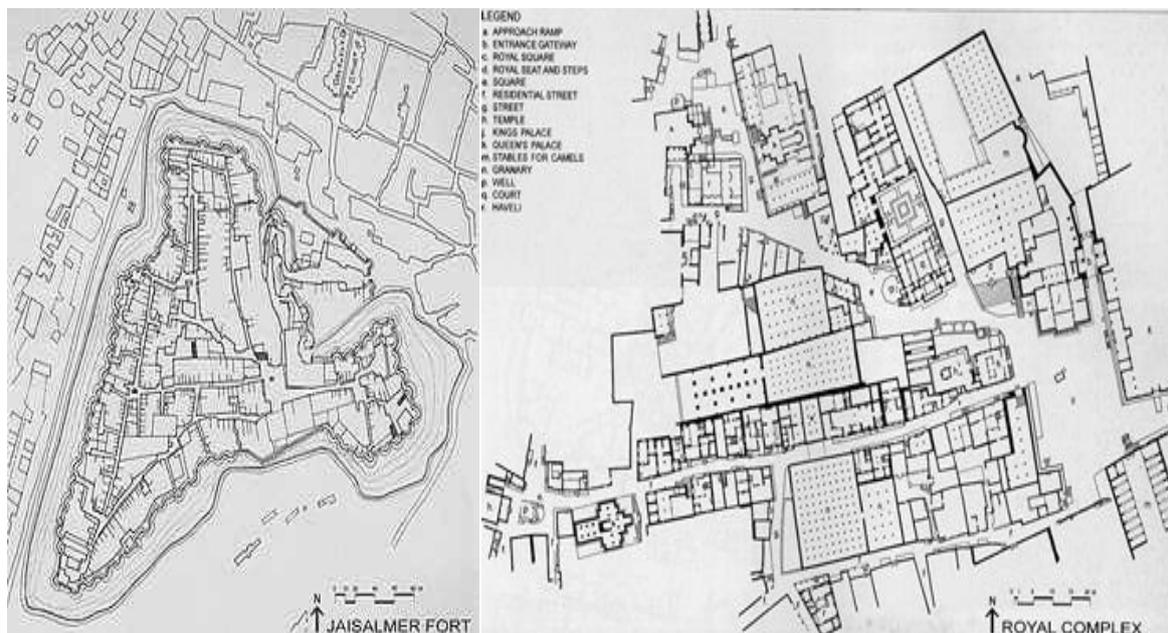


Figure 7 Map of Walled city Jaisalmer

Source: <http://www.webpages.uidaho.edu/arch499/Jaisalmer/jaisalmermain.htm>

1.8. BUILT FORM AND CITY COMPONENTS:

Security and privacy is the main concept behind the design of houses in walled city Jaisalmer. The ground floor of Havelis has no openings facing the street except the entrance door. Upper floors have lots of openings in the form of projected balconies Jharokhas and Jalis

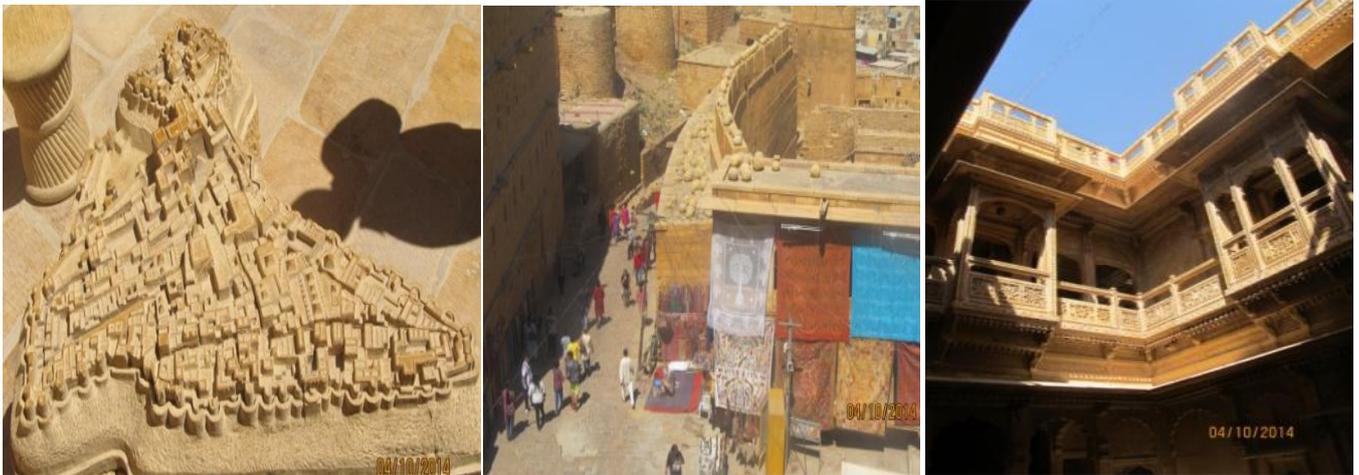


Figure 8 Few Glimpses of walled city Jaisalmer (Author)

1.9. CLIMATIC CONSIDERATION:

Buildings in Jaisalmer are a perfect response to its climatic conditions. These Buildings have openings in various sized and shapes ranging from courtyards and shafts to recess & overhang to finely carved stone Jalis, and all this allows passage for through cross ventilation and a perfect climatic response. Modular construction techniques was used in these building which includes cutting the sand stone into different components of building viz; columns, beams, brackets, wall panels and floor slabs that could be arranged in various combination providing each Havelis a unique character. Use of Mirrored glass provides access to indirect sun light via opening and elevates its aesthetics.

1.10. COMMUNITY STRUCTURE:

Public spaces in Jaisalmer may be classified according to their types. The major categories are: The Royal Square in the center of the upper city acts as a key linking element and a nucleus in the upper city thus holding it together, these squares build part of a sequence of spaces and streets forming the main bazaar. public spaces in the form of Chowks, viz; Gandhi Chowk and Gopa Chowk are all located in the lower city; small community or cluster spaces at the level of residential level is, either a space connecting two or four streets, or it is made by widening a street at a particular point. This space serves a group of houses for their day-to-day activities. Almost every house has a one to two meter wide platform in front of the houses as a key transition element, used for small get together and extension of some household activities. The small openings in the form of Jharokhas and Jalis also characterized the privacy for women, generated by social customs of allowing women to connect with external activities by maintaining their privacy. Streets & other open spaces were used by children to play and by elderly for social activities.

1.11. WATER SUPPLY & SANITATION:

Earlier, the main source of drinking water was the Gadisar tank outside walled city. Now the town faces acute shortage of water. Now Water is mainly supplied by tube wells. There is absence of planned garbage disposal and sewage network in Jaisalmer.

8. WALLED CITY OF JAIPUR:

The capital city of Rajasthan is also known as the '**pink city**' because of its pink- colored sandstone buildings, pink being the colour of hospitality. Jaipur has broad avenues and a remarkable harmony. The city sits on a dry lakebed in an arid landscape surrounded by barren hills and surmounted by fortresses and crenellate walls has many forts and crenellated walls and numerous other monuments, which have been interest from time immemorial.

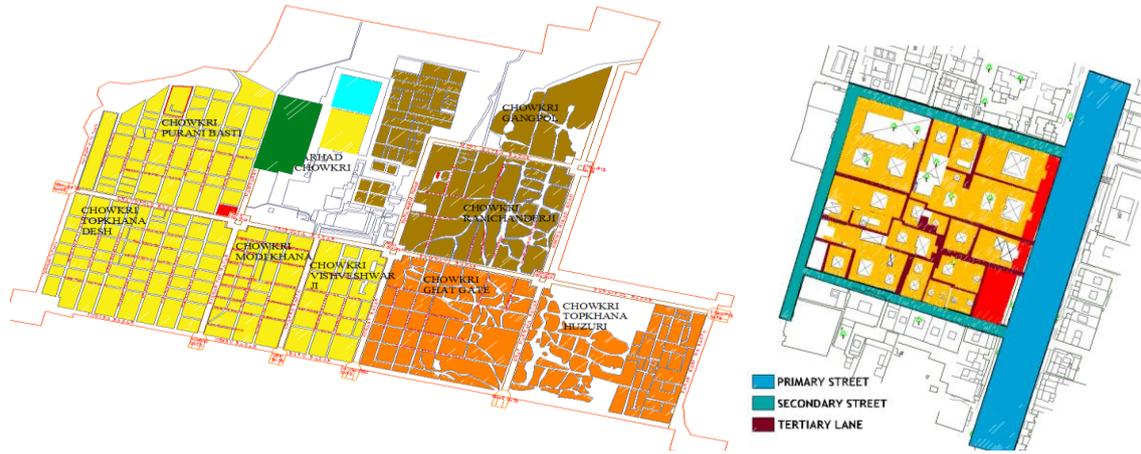


Figure 9 Layout plan of Walled city Jaipur with typical Cluster plan (Author)

It has almost uniform height and similarity of Architecture of the houses built on the main roads. In some parts of the city, the tops of these buildings have been decorated with domes and arches. The uniformity has been spoiled to some extent by buildings constructed in recent years on the Chaura Rasta etc. but otherwise most of the other roads have maintained regularity.



Figure 10 View of City wall, Chaupar and one of the gates of walled city Jaipur (Author)

1.12. BASIC PLANNING CONCEPT:

Jai Singh was a great patron of Mathematics and Astronomy and he applied the principal of Shilpa-Shastra and town planning in designing the new city. The city is divided into two portions by the central axis of the town laid from east to west between the gates of the sun (Surajpol) and moon (Chandpole). This was crossed by three main roads at right angles dividing the city into nine blocks, which were further sub-divided by lanes and alleys.

The walled city of Jaipur is encompassed by 20 Feet high, 9Feet thick crenellated masonry wall, which could be entered through seven gateways namely: Dhruvpol (zorawarsingh gate) in north, Gangpol and Surajpolin east, Rampol (Ghat gate), Shivpol (Sanganer gate), Kishanpol(Ajmeri gate) on south and Chandpol on west. The palace buildings are surrounded by a similar wall, the two walls acting as successive Defense lines.

Extreme consideration was given to the use and treatment of major roads and their intersection, with the strict control for the facades of building on these roads. Major roads were designed along with commercial activities. Following the direction of Hindu Shilpa Shastra, width of the main streets and other lanes were fixed. Thus the main streets of the city were 111’ wide, secondary streets 55’ wide, and the smaller ones 27’ in width. The well planned and harmonious construction of the city has made it a distinct model of town planning. Shops placed along these bazaars were standardized in width and design and had a continuous open verandah allowing shoppers to move in a sheltered space. The residences did not have an entry from these major roads. While temples had allowed entrances, they were invariably placed on the first floor level allowing a single flight of steps leading from the main road up to the temple.



Figure 11 Few Glimpses of walled city Jaipur (Author)

1.13. BUILT FORM AND CITY COMPONENTS:

The built form is very compact in its structure and suited to the hot dry climatic conditions. The houses or Havelis have an introvert plan around a courtyard and the treatment of the facades and openings indicates a sensitive response to climatic conditions- a unique feature of this fabric is the narrow lanes (gandigali) meant for cleaners to clean the night soil manually. This system was abolished but these narrow lanes continue to remain and act as ducts for air circulation during the hot summer months.

The urban structure of Jaipur may be defined as a grid iron hierarchy based on the orthogonal clustering of nine square sectors, also known as Chowkries. These chowkries are divided by straight roads. Structure of a Chowkry is formed by streets, chowks, temples and gates. Each chowkry is bound on its side by main bazaar streets. Chowkry is further sub-divided into mohallas by grid-iron pattern of secondary streets. Each Chowkry has distinct internal street pattern. As we enter inside the “Chowkry” it offers break from the continuity of pink colours of bazaar streets and add to the exclusiveness of the Chowkry by differentiating it from outer commercial streets.

The structure of the city is developed on the basis of artisanal activities. The Chowkries, mohallas are strategically planned to house distinct public art. The hierarchy of roads was also worked out on the basis of the criterion of those activities; it was like purely residential, workshop and residences, small commerce and residences, and finally the main commerce.

Gates are the intersecting architectural features of the walled cities creating a threshold. The concept of the gates was to identify the city’s definite entry and exit points. The design involved several motifs and forms put up with great architectural skill. Initially there were seven gates in the walled city named as Surajpol gate, Chandpol gate, Gangapol gate, Ajmeri gate, Sanganeri gate and Ghat gate and Jorawarsingh gate. But later in the reign of Savaimansingh another gate is added namely new gate between Ajmeri gate and Sanganeri gate, to give directed access & for procession from city palace to Ramniwas bag & Albert hall. Later one more gate also added named as singh dwar in southwest corner of walled city.

The basic concept of walled city of Jaipur is rooted in “Prastara’ plan prescribed in the traditional hindu scriptures. The road network in Jaipur is well planned and follows a definite hierarchy.

There are three categories of streets; the **primary streets** form sectors that are subdivided into smaller blocks by **secondary and tertiary streets**. Each street makes a context within a sector. There is a clear hierarchy, both functional and visual with each street generating different activities, which change when the order of the street changes.

The city squares or chaupars of Jaipur are organized within the public realm. There are three Chaupers and are distinguished from other Chowks by their size and location. They are Amber (Choti) Chauper, Manak(Badi) chauper and Ramganj Chauper. These chaupars not only served as important community spaces & intense social use, but also housed the main water source for the city with huge underground reservoir or aqueducts in the centre supplying numerous sources of drinking water at street level.

The traditional bazaars located within the walled city conduct retail and wholesale trading of these handicrafts. In the traditional set up, these were systematically planned and integrated into city design.

The houses in the walled city are mostly built 100 to 150 years back. These are planned in typical courtyard pattern. Houses are mostly G+2 with decorated doors, windows and balconies with graceful

balustrades or perforated screens. The traditional courtyard house known as Haveli is a large family residence for employees and general public, its size and aesthetics depended on the status of family. It is airy and equipped built around one or several central courtyard, with external walls rising directly against public streets. The size of openings on outer face of buildings are small to cut out harsh sun and hot winds, also it helps to strengthen the privacy.

Arch, pillars and aesthetics elements are used to decorate the buildings. Some buildings are also four-storied. The bazaars, traditions, crafts and products, culture and value systems have also been reflected in the built-form existing in the walled city.

1.14. CLIMATIC CONSIDERATION:

Extreme consideration was given to the use and treatment of major roads and their intersection, with the strict control for the facades of building on these roads. Major roads were designed along with commercial activities. Shops placed along these bazaars were standardized in width and design and had a continuous open verandah allowing shoppers to move in a sheltered space. The residences did not have an entry from these major roads. While temples had allowed entrances, they were invariably placed on the first floor level allowing a single flight of steps leading from the main road up to the temple.

1. The built form is very compact in its structure and suited to the hot dry climatic conditions. The houses or Havelis have an introvert plan around a courtyard and the treatment of the facades and openings indicates a sensitive response to climatic conditions.
2. The typical house design of Jaipur is compatible to the climatic conditions as well as social conditions.
3. The creation of a courtyard not only provided better shelter for hot and dry climate but also acts as a common space around which rooms are planned.
4. The closer knit structures help to reduce exposed surface area of building to harsh sun and therefore heat gain of a building gets reduced. The spaces between building form narrow lanes which protect the pedestrians for most of the day from sun.
5. The walls and roofs are having good thermal resistance to protect from hot climate. The size of openings on outer face of buildings are small to cut out harsh sun and hot winds, also it helps to enhance the privacy.
6. Generally the courtyards are of small size to contain cool air and to avoid harsh sun. In case of larger structures the numbers of small courtyards are more rather than having one or two large courtyards.

1.15. COMMUNITY STRUCTURE:

The city's division into nine wards is in conformity with the Hindu caste system which necessitated the segregation of people belonging to different social classes and ranks amongst the different Chowkries.

The original pattern had a centripetal arrangement with royal palace and observatory in the centre of the city. The peripheral areas were occupied by the serving class; even the lanes were named after the occupation of the inhabitants, such as Maniharonka Rasta, Thateronka Rasta, ghee Waloka Rasta etc. Brahmapuri had innumerable Brahmins from Varanasi setting here;Puranibasti had houses of leading courtiers who built their Havelis and private temples. Topkhanadesh was the Chowkry where the chiefs of important thikanassettled, while Modikhana and vishweswarji had rich Hindu traders and businesspersons and some officials. The Johari bazaar side of Chowkry Ghatdarwaza came to be inhabited by merchants and the other parts were occupied by artisans and workers. Chowkri Ramchandarji contained temples and Havelis built by the king, his queens and leading nobles on its sireh-deori bazaar side, while to the east and north-east were small residences of the royal staff and craftsmen. ChowkriTopkhana-hazuri, which was uneven and sandy, came to be used for the artillery of the ruler and by poor artisans, and Chowkry Gangpol was occupied primarily by laborers.

Plots for temples and for residential buildings were earmarked for certain people of the state were expected to build their residential houses in this newly founded city. This ensured that there would be a good proportion of richer people in the population, and also adds to the good look of the city, for naturally the richer people would build grand buildings for themselves.

1.16. WATER SUPPLY & SANITATION:

The city of Jaipur was planned according to the topography keeping in view the natural drainage and the soils permitting easy recharge of water through percolation. The city is situated on the ridge with dividing line from Surajpol gate in the east to Chandpole gate in the west the north side of this line had drainage towards north and the south had drainage towards south. Natural drainage of the city permitted easy recharge of water. City was not having piped water supply. Almost every house had a well and Step wells at the Chowkris for public use. The supply of water was through the traditional sources. Besides this there was a wide intersperse of wells constructed by communities to serve the purpose of drinking water needs. The Walled City of Jaipur has network of water canals below main streets, carrying water to provide for drinking water to those who could not afford their own wells. The channel opened into three reservoirs at Choti chauper, Badi chauper and Ramganj Chauper. Earlier these tunnels were used not only as water canal but also as escape routes at the time of emergencies.

Originally there were dry pit toilets for night soil but later underground network of sewerage is added for flush toilets in walled city Jaipur. Garbage is collected manually and disposed it outside the city with the help of handcarts.

9. FINDINGS:

The architecture and built form of the walled cities exhibit a strong sense of ambiguity. The use of various spaces in traditional cities changes during different times of a day, a season or a particular event, especially in case of residential areas. The exterior as well as interior open spaces like courtyards, terraces and balconies have special significance for this as they can accommodate various activities.

In walled cities, there are many communities and for each community the housing typologies vary with respect to design, components of house, use and architectural character. The traditional house design evolved on basis of culture, occupation and climatic considerations.

The walled city today is known as the congested areas of the city which house a number of areas that have predominant residential component. Most houses are in dilapidated condition especially in the market area inhabited by the lower income groups; infrastructure facilities are poor. The conditions of housing, availability of housing stock, distribution of densities and provision of basic amenities and public spaces reveals a thorough inadequacy on all fronts in old cities.

At present, walled cities are transformed into an overcrowded place, leading to unsatisfactory living conditions. Most of the traditional buildings in are old and badly maintained. Also lot of migration from rural area made things worse as the poor people who come, in search of employment and accommodation settle there, as they did not find accommodation in the new city. Most of the houses are subdivided, some owners have moved out of old area and their part of house is further subdivided to rent out. The rent used to be divided in to more than one tenants making it cheaper for per person. Hence, they easily found the rented accommodation rooms on rent with no basic infrastructure. However this increases the load on basic infrastructure due to increased members. Most of the rented accommodation lacks basic infrastructure.

Rapid population growth, migration and increasing commercial activities are creating congestion. In the walled city residential areas are over congested with very high density, and lack in facilities and infrastructure, in many cities, walled city comes under jurisdiction of development authority which usually lacks sensitive approach to solve old city problems and special approach is needed to control new developments in traditional housing. Originally, Walled cities were confined within the wall but with the passage of time and population growth congestion within the walled city increased and consequently the municipal area of the city expanded.

Many of the walled cities are getting more and more commercialized rapidly. The walled city density needs to be reduced by shifting the wholesale activities, traffic generating and intensive activities to the area outside the walled city. the congested bazaars need to be shifted and similarly these areas are to be developed as tourist sales areas, museum etc. there should be no permission for commercial complexes, shopping areas and basement should be permitted to avoid further congestion. Roadside vehicle parking should be prohibited and underground parking, parking at open spaces and at the location of dilapidated building should be developed, new by-laws should be formed to reduce the density.

10. CONCLUSIONS:

This article includes Study of only three walled cities but there are many more fortified cities in Rajasthan and India. In Rajasthan, almost every city has a fortified city in it. In addition, these cities need development and maintenance. There is a need to explore new direction for the growth of the cities. The cities need to be dissipating its growth and intensity outwards of the narrow bottlenecks in the walled city areas and need to consolidate around the walled city for a more compact development. To prevent fragmentation of growth the city need to grow from inwards, from inwards to outwards with the walled city as the core rather than the isolated suburbs. Certain older parts and elements of the city such as water tanks, Baolies, monuments etc that lend a distinct character needs to be understood and interpreted as contemporary structures to establish some kind of relevance with them. The walled cities and monuments are traditional and of heritage importance, these should be conserved with adequate care and maintenance. In many walled cities, transformation is taking place, where mixed use, commercial activities are overtaking the traditional building, thus there should be a limitation on these uses. Walled cities have great potential due to its architectural sights for tourism, with its beautiful fort and Havelis. We need to better understand the natural system of these cities to apply planning and designing of the compact city while addressing the topography to blend legibility within overall city structure.

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