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Role of Form-Based Codes as Determinants in Reclaiming Threshold Spaces: A Case Study of Walled City of Vadodara

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Abstract:

Since 1980's there has been boost in Indian economy, shift in the planning mechanism and tools employed in development and re-development of urban form within cities. This has significantly influenced the manner in which sites within old city cores are redeveloped. This transformed the inherent DNA of the built and the unbuilt spaces of urban forms. This paper will focus on how the shift in the paradigm of utilization of threshold spaces occurred due to mushrooming of new building typologies within the city cores. For the study purpose all the interface spaces forming the edge between the built and the unbuilt such as, plinths, steps, otlas, verandahs, gate, etc. have been defined as threshold spaces. The traditional urban form extended an opportunity for its users to conduct variety of multifunctional activities within mentioned threshold spaces. The manner in which these spaces were used was essentially based on the user's perception, context, and necessity. The hierarchy was established according to its purpose and adjoining building use. Hence, when new building typologies such as apartments, commercial buildings replaced the traditional built forms, the ground floors got

substituted with stilt parking, and streets got redefined to accommodate vehicles. The study of walled city of Vadodara is undertaken in two parts: critical review of existing building byelaws stated within the Gujarat Development Control Regulation and empirical on-site observations, and primary survey. The American model of Form-Based Codes which was introduced in 1980's as an alternative to development regulation, is now being published at national level as Form-Based Codes Policy Workbook in partnership of Smart City Mission and MHUA, India and being tested for various kinds of projects such as the commercial - station redevelopment of Indian Railways.

Based on overall findings, this paper will conclude establishing the critical role of form-based codes in arriving to context-specific response to reclaim threshold spaces within the walled city of Vadodara.

Keywords: ***Form-Based Codes, Threshold Spaces, Reclaiming, Building Typology***

Introduction:

Formal public spaces such as chowks, streets, or semi-private spaces such otlas, verandahs, steps outside the house, other such spaces at the interface of private and public realm are all integral part of the built form. "This transition space has a strong physical presence in several aspects of human life in India and is equally significant for its metaphysical implications. The most intriguing aspect of these spaces is the quality that allows large variations in scale. From very small domestic threshold to large ghats on the riverbanks, one can see enormous diversity in the creation of transition realms" (Jain, 2002, p. 14). These spaces are typically vibrant, versatile, accessible, and distinctive in nature. The function of the built form at the edge of public realm or transition

spaces largely contribute to the nature of activities occurring within them. All such spaces which generate an opportunity for people to come together for casual conversations, leisure, play, work, read, simply sit, and watch passerby, etc. can be considered as "Social Spaces."

Here, the intend of the study is to focus on the transition spaces which fall within the threshold of public realm (sidewalk and street) and private realm (house, shops, commercial development). For the purpose of this study elements such as otlas (raised platform), steps, plinths, verandahs, and gates at the interface of traditional and non-traditional built form and the street or sidewalk will be considered as the threshold spaces. Vadodara is one of the major cities of the western state of India, Gujarat. For the study purpose only the walled city area of Vadodara city, has been considered.

Shift in the Planning Paradigm:

The composition of built and unbuilt spaces is an evolving phenomenon and hence it is important to get an insight of the reasons which played a vital role in transforming the urban form of these historic cores of Indian cities. Economy is always at the core of any kind of change which occurs within a country. Hence, the boost in Indian economy in 1980's turned out to be one of the key players in bringing in reforms in planning approaches and in the structuring of the urban authorities. It also laid the foundation for institutionalizing the idea of urban authority and formulating reforms in the legacy of colonial approaches. "More importantly, in addition to diverse players who modified the neighborhoods through incremental adaptations, the state officials often employed the planning idea selectively, transforming the spatial form of Indian cities in critical ways" (Kumar , Vidyarthi, &

Prakash , 2021, p. 172). This approach was reflected in the redevelopment across all parts of the cities including the ones where more sensitive and context responsive solutions were required such as the historic cores within cities. New building types such as apartments, commercial complexes, retails shops, etc started mushrooming wherever land was available within the city including the old city cores which were already dense.

Aim:

The aim here is to critically analyze the reasons for loss of threshold spaces within the old city cores and establishing the relevance of Form-Based Codes in order to reclaim threshold spaces within new development.

Research Framework:

This paper is part of an ongoing PhD research work focusing on the Form-Based Codes and the Walled City of Vadodara, Gujarat. Specifically for the purpose of this paper the research has been carried out in following two stages:

***Stage 1:* Primarily consists of literature review to understand the threshold spaces and the determinants shaping it.**

***Stage 2: Is* derived from on-site observational study of the Walled City of Vadodara.**

The pre-requisite for selection of threshold spaces is based on following parameters:

a. **Buildings from 1800-1900 have been selected in order to understand elements and attributes of threshold spaces which were part of built form in this period**

b. New development from 1980's onwards i.e., forty years period

Analysis is drawn from the theoretical premise set by the literature review and primary study carried out of on-site observations.

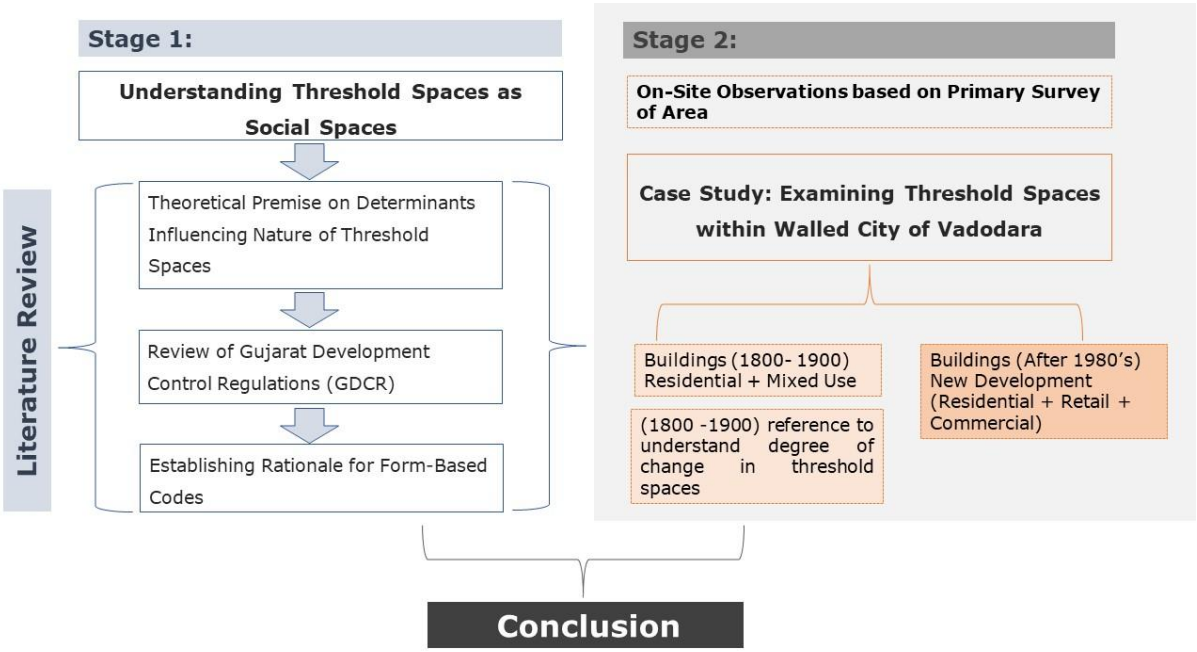

Figure 1: Illustrating Research Framework to give an overview of the method undertaken to conduct this study.

Scope and Limitation:

This paper will only focus on last forty years around i.e., 1980's onwards and not on the period prior to that. The earlier period-built form is used only for reference to measure change. The study only examines the non-listed structures prevalent in the study area. Internal residential streets and the only residential and mixed use (commercial+ residential) use have been examined.

Introduction to the Study Area – Walled City of Vadodara:

Vadodara is located in Gujarat in the western state of India. Historically, it was one of the princely states of India which was

known for its progressive approaches to education, society, art and architecture. It has long established history, embellished with rich architectural and cultural heritage. The walled city of Vadodara was established in 1511 AD by Khalil Khan, son of Sultan Mahmud Begada. At that time, it was also known as Daulatabad – the walled city. Later in 1734 AD Marathas took over and since then Gaekwads ruled the State of Baroda till the independence of India in 1947.

The walled city is divided into four quadrants which are divided by four cardinal axes and marked by four gates at the end of cardinal axes and one at the center. The urban fabric is closely knit with traditional house forms such as pol housing with common parallel walls, havelis, wadas with large courtyards and khadkis forming cul-de-sac cluster of houses. Public building types such as religious places, institutions, community places, etc. are also part of the urban composition. Architectural elements such as intrinsically carved fenestrations, columns, brackets, steps, plinths, otlas, verandahs and gates are inherent elements of architectural vocabulary profoundly seen in the traditional built form. These elements formed a repetitive pattern in the streetscape, by either projecting beyond the building line or creating intricately carved out semi-covered spaces within the building façades. Each house has a unique identity which is demarcated entrances and threshold elements.

Old derelict buildings, demolished building sites or the redevelopment of the houses for upgradation of lifestyle gave way for the developers to propose new building types and uses within this close-knit fabric. Hence, when new building types started mushrooming in this area the pattern of continuity of threshold elements, entrances and street line began disappearing.

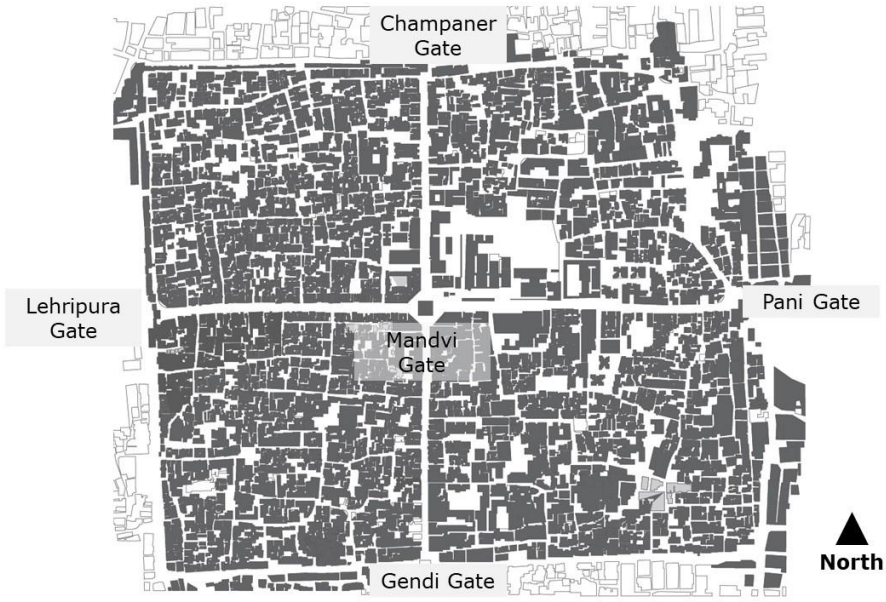

Figure 2: Figure ground generated by author based on google earth aerial map indicating recent scenario of the walled city of Vadodara.

Stage 1: Literature Review:

Understanding the Threshold Spaces as Social Spaces:

The term threshold can be defined as, "A design feature that emphasis where two parts of a building meet" (Cowan, 2005 , p. 395). Meaning the edge at the interface or at the transition of different types of spaces or built forms. In this case steps, otlas, verandahs and plinths are considered as elements defining threshold spaces. Typically, these have interface with either street, sidewalk, or other built form. Usually, the streets become an extension to these threshold spaces accommodating the spill over from the semi-public space to public realm. Another peculiarity of otlas and steps is that even a passerby could take a pause and sit for a while and proceed, as these are at the interface of private and public realm. The verandahs, and otlas were designed keeping in mind the local climatic conditions. These spaces can be covered, semi-covered or completely open. The buildings within the walled city are back of the pavement with insignificant to zero setback from the street edge. Elevated plinths

or otlas not only gave protection in case of floods but also formed an important feature of privacy as it raised the ground floor level from the adjoining street.

"Public space is, by definition, space used by those who do not individually control it" (Habraken, 2000, p. 158). Whereas the threshold spaces delineate territorial boundary between private and public space and hence create a sense of ownership alongwith security for its users. Socializing is seen as an important function and an integral part of human life and of the society as well. Threshold spaces give an opportunity to its users to interact with other people and still being able to restrict the entry of unwanted acquaintances within the house. "Entering the public realm from private space is a fundamental right: the door to public space is always open, and there must always be a public space we can move out to. In doing so, one is till on "home turf": public space is communally shared among those from similarly included territories'' (Habraken, 2000, p. 158).

Traditionally, threshold spaces in Indian context also carries a symbolic interpretation and demarcation of public & private spaces. Rituals and beliefs are demonstrated through colorful rangolis, red swastika, and traditional torans are used to decorate and customize these spaces.

Plinths, otlas and steps outside shops were and are still used for displaying products and for luring potential shoppers to shop. Typically, these spaces are overlooking the streets due which they tend to provide active surveillance on streets throughout the day. Thereby, reducing the possibility of any kind of anti-social activities occurring and hence making streets safe for all.

Determinants influencing the nature of threshold spaces:

Following are the determinants that influence the threshold spaces:

1. ***Use***
2. ***Socio-Cultural Values***
3. **Control and Regulatory Mechanism**

1. **Use: Can be defined as "The aspect of use refers to the human activities that give rise to and are accommodated by particular elements of the built environment" (Kropf, 2017, p. 22). In case of Vadodara this will be observed in the built forms with residential use and mixed-use with shops at ground level and residence above. These are the primary building uses taken up for this study. "Use is therefore fundamental to understanding the structure and character of places. We understand built form at a primary level in relation to its use" (Kropf, 2017, p. 22). Each building type varies in its design based on the functions it houses and, on the requirements, associated with it. The type of activities occurring on the threshold spaces will also differ with the varying building uses.**

2. **Socio-Cultural Values: These values are DNA of our built environment at large. The societal and cultural values determine the order of built form, characteristics of spatial organization and representation of symbolic values which is represented in the kind of threshold spaces. "The human activities that create and make use of the built environment necessarily take place within a wider context of social, political and economic activities" (Kropf, 2017, p. 25). Intricately carved motifs also carry symbolic association and are an integral part of the communities and belief system they carry. For example,**

presence of God's idol at the entrance of a Hindu house as a protector against evil, is believed to be a symbol for auspiciousness and well-being of the family by the house-owners.

3. **Control and Regulatory Mechanism: These two terminologies are on purpose being congregated together to ascertain a connection between these terms and the mutuality they hold. "Control is a socially established relationship between a person or group and a particular object or area of land, often in the form of ownership" (Kropf, 2017, p. 25). Whereas the regulatory mechanism determines the character of the built form based on what is mentioned within the building byelaws norms based on what is considered to be acceptable by the respective planning authority.**

Components of Regulatory Mechanisms:

As the primary study area is the walled city of Vadodara the following building regulations are reviewed to comprehend the impact on the disappearance of threshold spaces in the new typologies.

Following regulations have been reviewed:

1. ***General Development Control Regulations 2006 (Vadodara Urban Development Authority) (GDCR)***
2. ***Comprehensive General Development Control Regulations 2017 (Urban Development and Urban Housing Department – Government of Gujarat)***

GDCR 2006				
Threshold influencing Parameters				**Inferences**
Access to building to be provided not less than 3m and shall have clear access to such building.	**Projections on setbacks such as steps shall not be permitted on setbacks, streets, or roads.**	**Plinth of minimum height of 0.45 m to be provided.**	**Parking generic parking requirement used for this area. Based on % of maximum permissible F.S.I.**	**Access, projections, plinths, and parking are regulated. No specific mention about any other architectural standards.**
Comprehensive GDCR 2017				
Threshold influencing Parameters				**Inferences**
Permissible Building Uses based on the road widths	**Permissible ground coverage on building units' area in sqm**	**Onsite parking requirement f residential building, wi areas more than 100 sqm. For non-residential use less than 60 sqm parking not required. All othe had to provide parking as per the norms.**	**Setback of 3 m from the central line.**	**Lack of control over the continuity of street line and the character of the built form at ground floor. Prominence given to parking as an essential aspect of newer developments – generic guidance.**

Table 1: Analytical review of building byelaws as one of the determinants influencing threshold spaces in apartments, houses and mixed-use building uses.

Stage 2: Approach for On-site Observations:

Photographic documentation of threshold spaces from all the four quadrants of the city has been captured. The intention is to give an overview of the present scenario of the continuity of these

elements in the existing buildings and the shift in the new building types. Series of photographs have been taken covering cross section of residential building types.

Key:

Identifies varying kinds of threshold spaces in following building types which is a manifestation of composition of plinths, otlas, steps, gates and jalis, grill, parking, stilt parking, entrances, etc.

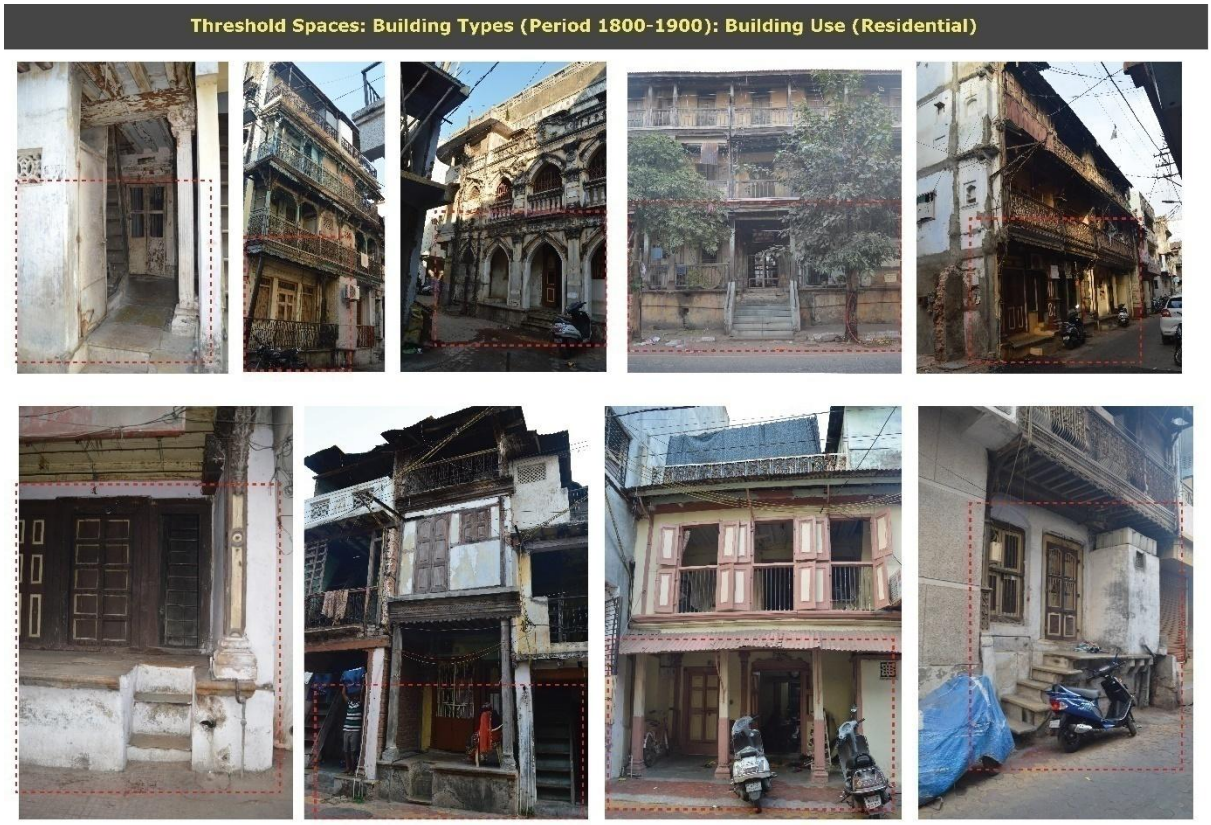

Figure 4: Traditional house forms (1800-1900) indicates robust nature, manifestation of architectural expression

Building Use: Residential (1800 -1900)		
Element of Threshold Space	**Determining factors**	**Overall Observations**
Otlas, steps, verandah, raised level, semi-covered entrances flanked by projecting balconies, chajjas	▪ **Scale** ▪ **Proportion** ▪ **Material** ▪ **Symbolic Value Motifs**	▪ **Establishment of hierarchy of spaces** ▪ **Privacy is achieved due to depth of otlas** ▪ **Response to contextual order**

Figure 5: Mixed-use traditional built forms (1800-1900) indicates robust nature, manifestation of architectural expression.

Building Use: Mixed-Use with retail at ground floor & residential above (1800 -1900)		
Element of Threshold Space	**Determining factors**	**Overall Observations**
Raised plinths, steps, projecting weather sheds, recessed entrances to shops, Shutters for shops	▪ Scale ▪ Proportion ▪ Material ▪ Space to display	▪ Well demarcated retail spaces ▪ Flexibility of space ▪ Response to contextual order

Figure 6: New development (1980 onwards) indicates the of ground floor and the associated uses with it.

Inferences:

Building Use: Residential & Mixed-Use (1980 onwards)			
Building Types	**Replacement of Threshold Spaces**	**Determining factors**	**Overall Observations**
▪ Apartment ▪ Mixed-Use (ground floor retail and residential above) ▪ Semi-detached house	▪ Parking ▪ Stilt Parking ▪ Jalis ▪ Gates ▪ Shutters ▪ Steps to access basement	▪ Regulations ▪ Parking ▪ Higher density ▪ More number of users per plot	Introduction of following functions at ground level: ▪ stilt parking ▪ Parking on streets ▪ Gated parking ▪ Setbacks Shops

Major transformation has occurred in this area in last twenty-five to thirty years. Hence, keeping that into account above mentioned regulatory timeline has been considered. Planning tools had to accommodate the changing trends and the surge of modernization leading to vehicle-oriented streets to accommodate increasing demand of off-street and on-street parking spaces. From the real-estate perspective too residential schemes (apartments) or multi-family units without parking did not turn out to be beneficial. Even in the case of house owners rebuilding the house to meet the needs of increase in family size or as part of the upgradation of lifestyle, there too parking was given priority and was being accommodated at ground level or on the streets or in chowks. Not only were the threshold spaces replaced by parking but the public spaces such as chowks also got packed with vehicles instead of being used for other social purposes. It is only at the times of

festivals that the vehicles get moved out of chowks and the celebration takes priority.

The facades of the building turned out to be less articulated and mediocre in character due to absence of threshold spaces. In these new typologies closed, private spaces dominated the streetscene. The threshold spaces got replaced with closed jalis or metal grill verandahs or closed room with entrances onto the street. Steps directly leading to the foyer inside the house. The commercial development on the main streets also lost those spaces where they could extend out their display; the idea of conducting retail got modified too. Closed introvert air-conditioned showroom type retails stores got higher preference over the traditional open shops with the activities extending out with the items being displayed beyond the steps, onto the plinths or the sidewalks. The relevance of transitional social spaces has almost completely got replaced by vehicles. Shift from human-centric to vehicle-oriented spaces has modified the street character.

"New development should enrich the qualities of existing urban places" (Davies , Llewelyn;, 2000, p. 14). Somehow this statement of the new development within an existing urban setting is supposed to enhance the distinctive character of the place and reflect in its built and unbuilt spaces does not hold true in case of the walled city of Vadodara.

The relevance between the activities, socio-cultural significance, and the way the built form was configured does not matter much now. The control of regulatory mechanism has predominantly prescribed the nature of spaces at the interface of private and public realm.

Establishing the Rationale of Form Based Codes:

Form-Based Codes (FBC) came into use as an alternative to conventional zoning and regulatory system. After examining the limitations of conventional planning tools to control what gets developed and how it responds to the public realm FBC seemed to be bridging the gap between planning, urban design, and architecture. It has an integrated approach towards social, cultural, economic, and environmental concerns. This comprehensive approach provides a platform for the local authority to achieve coherent and predictable built form. It was initiated in 1980 but in 1981 first development code for Seaside, Florida, was formulated by Duany Plater-Zyberk in U.S.A.

"FBCs are holistic, addressing both private and public space design to create a whole place, including buildings, streets, sidewalks, parks, and parking. They regulate private development for the impact it has on the public realm" (Parolek, Parolek, & Crawford, 2008, p. 11).

Inclusive Process of FBC:

Other advantages of FBC are the inclusion of communities in form of public participation which becomes bases for inclusiveness in the process. Also, unlike urban design or any other guidelines FBC would hold statutory status leading to its mandatory acceptance by all and has potential for its integration within the exiting regulatory system too.

FBC for Indian Cities:

Now Indian Government has also acknowledged the use of FBC within Indian cities. A Form-Based Codes Policy Workbook is

published by Ministry of Housing and Urban Affairs, Government of India, Smart City Mission in collaboration with WRI India – Ross Center. "The current planning process in Indian cities emphasizes rigid land-use, zoning and development controls that fails to recognize the unique urban fabric, fine-grained mix of uses, potentials and constraints of different areas or neighborhoods within the city needing area-specific solutions and interventions" (MoHUA and WRI India - Ross Center, 2021, p. 5). Recently, there has been proposals of FBC being specifically used for Commercial Development within Station Railway Land Redevelopment Project in India. This project has been undertaken by Indian Railway Stations Development Corporation Limited. This also, presents an exceptional possibility of tailoring FBC structure for formulating and implementing it on case-by-case basis.

Application of FBC for Threshold Spaces:

As discussed earlier that in case of walled city of Vadodara, it is evident from the inferences drawn from the literature review and site observations that threshold spaces at ground floor level which are at an interface of the buildings and the street edge necessitates to be articulated and regulated. It is significant to determine which components to include in order to formulate context responsive codes.

The foremost part of FBC's is the flexibility and compatibility in its approach which can be attained by identifying appropriate structure for it. Such as:

A. Elements of FBC

B. Organizing Principles of FBC

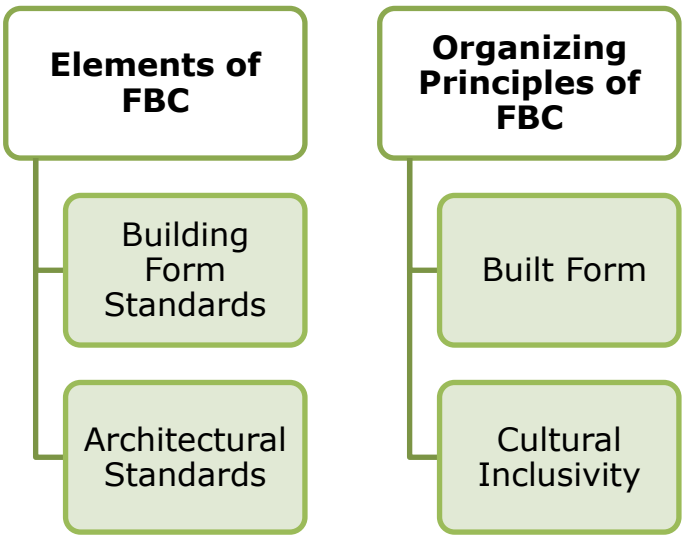

Figure 7: Potential structure for formulation of FBC for reclaiming threshold spaces as social spaces within walled City of Vadodara.

Elements of FBC:

These are also known as specifications which are chosen based on the type of context and development anticipated. Some of them are supposed to be mandatory and few are optional. Here the focus is on ones which are specific to place:

- ***Regulating Plan***
- ***Public Space / Street Standards***
- ***Building Form Standards: "Regulations controlling the configuration, features, and functions of buildings that define and shape the public realm" (MoHUA and WRI India - Ross Center, 2021, p. 13).***
- ***Architectural Standards: "Regulations controlling external architectural materials and quality" (MoHUA and WRI India - Ross Center, 2021, p. 13).***
- ***Administration***
- ***Definitions***

Organizing Principles of FBC:

"The organizing principles act as guiding elements that define planning and implementation of FBCs" (MoHUA and WRI India - Ross Center, 2021, p. 13). Based on the concern of reclaiming the elements of threshold spaces following principles can be used:

Among various principles mentioned under this design component the highlighted ones are most relevant in this scenario:

- ***Building placement***
- ***Building form & parking***
- ***Allowed land uses***
- ***Frontage types***
- ***Block standards***

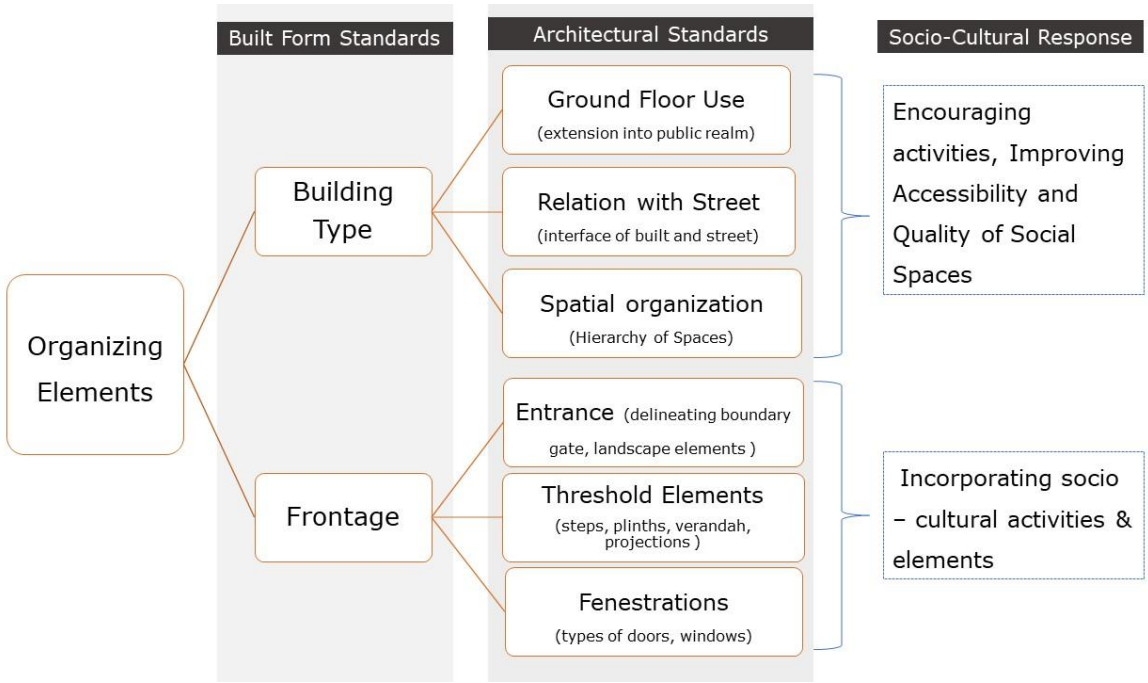

Figure 8: Inter-relationship diagram indicating the design principles to be considered for formulating FBC for reclaiming threshold spaces

Conclusion:

"The code is developed by using a combination of built form and street elements. The built form elements i.e. chajjas, balconies, bay windows, front porches, balconies, etc. may extend over the build-to-line (the distance between the property line and the building façade) or at times, the street elements i.e. footpaths, trees, landscaping help determine the nature of activities. The combination of the two elements leads to the development of a contextually rich urban form" (MoHUA and WRI India - Ross Center, 2021, p. 23).

It is apparent from the above stated arguments that FBC can be one of the most appropriate approaches to be adopted in order to address micro level concerns such as regulating and articulating elements of built form such as threshold spaces based on its contextual setting. It also provides a platform for incorporating the theoretical premise determining the threshold spaces such as Use, Socio-Cultural Values, Control and Regulatory Mechanism. It can be well integrated within the built and unbuilt spaces to make them meaningful to the respective communities.

Hence, it can be concluded that Form-Based Codes not only can be used to reclaim threshold spaces within newer developments but also to create more inclusive and accessible social spaces within historic contexts.

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