

Muratorian urban morphology: the walled city of Ahmedabad

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Abstract. *This paper investigates the complexity of the urban fabric, from the urban scale to the building and neighbourhood scale, by using the concepts and tools of urban morphology according to the Muratorian School. Specifically, basic concepts such as 'urban polarities', 'routes hierarchical system' and 'building neighbourhood' are used. They are deployed in the walled city of Ahmedabad, India, which has a rich architectural heritage clearly recognizable in Indo-Islamic monuments and particularly in aggregative structures called pols.*

*Keywords: urban morphology, history, pol, urban community, India,
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The central concern of this paper is the application to the Indian city of Ahmedabad of a number of concepts and tools of urban morphology that have been developed by the Muratorian School. Though the basic tenets of this School have been promulgated and discussed over several decades, notably within Europe (see, for example, Caniggia and Maffei, 2001), it is nevertheless necessary to begin by setting the specific application undertaken in this paper within its epistemological and methodological context.

Prolegomenon

A city may be considered unitary in its conception, yet infinitely plural in its manifestations.

Yet settlements require some affinity with the environment of which they become part: they require at least a minimal relationship to the territory they occupy – for example to its resources and productive potential. Specific urban histories and identities are the result of the territorial 'readings' of different civilizations over time. Traces of such histories and identities may be recovered and interpreted, becoming interesting communicators of knowledge. They are interesting because they point to the 'structural' substance of the city and its inhabitants. They act as underlying support for urban phenomena in their unfolding, focusing on the logic of formation and transformation of the city rather than on its 'historiography'. They are concerned with the structural evidence of urban fabrics

as mirrors of social, economic, and civic ‘fabrics’.

Thus, if the ‘idea of settling in a certain location already presupposes the intention of using the land [...] intended as economic potentials translated into structural susceptivities’ (Maretto, 1973, p. 252), such intention implies a plan to organize the territory, albeit with a rudimentary system of land division – a network of land ownership, however basic. This primary structure is a basis for subsequent land and social organization. Yet this structure, even in the rural settlements of the most primitive sedentary civilizations, is always an expression of social structure, albeit an elementary one, characterized by the polarities and hierarchies of communal spaces that identify a community – a community that tends to ‘gather and identify’ in public places. The latter will gradually multiply and differentiate, and be arranged by hierarchy as society expands, becomes richer and develops a complex civic structure mirrored in its urban structure.

Since the appearance of the first permanent primitive settlements, three key concepts seem to characterize all human settlements up to the twentieth century: the concept of *polarity*, the concept of *route*, and the concept of *fabric*. ‘A city is a system in which all life, including daily life, reveals a tendency to polarize, to unfold in terms of social aggregates which are either public or private. The more strongly the polarization is exerted and the closer the interchange between the public and private spheres, the more ‘urban’ the life of an urban aggregate is from the sociological viewpoint’ (Bahrtdt, 1966, p. 180). It is no coincidence that through history a vast urban iconography presents the city as an object enclosed by walls, and enhanced by towers and domes. Such towers, walls, bell towers, domes, minarets, and so on, stand out among urban polarities as recognizable and identifiable elements stating their presence and their role within the social and architectural fabric of a city. Their task is to co-ordinate the urban fabric; their role is to identify the different urban communities in order to grant all citizens a sense of belonging to one civic

individuality (Maretto, 2008, 2009, 2016). But routes are the instruments, perhaps more than any others, that allow us to understand the process of formation of an urban fabric in its ‘structural’ aspects. The more a context is anthropomorphized, the more the rationale of route formation is accurate and concise.

In general, a distinction can be made between planned systems and spontaneous systems. The latter in particular must be taken into careful consideration. In fact, when analysing the underlying logic beneath the formation of urban fabrics over time, informal and commonplace aspects have a key role as they are the direct expression of the vitality of an urban society. Ultimately, ‘basic’ route typologies can be found in most spontaneous building fabrics, from medieval towns to contemporary informal cities (Caniggia and Maffei, 2001).

The planned city, in contrast, could be considered from a morphological point of view as a special component of the informal city. Except for urban projects of an explicitly ideological or utopian nature, the construction of its fabric is to a significant extent spontaneous. The level of regulation depends on the degree of civic development of the society undertaking the planning. Particularly advanced systems develop ‘spontaneous’ fabrics that are orderly; the ordering element is not so much due to building regulations as based on continuity, with a *modus operandi* that has been in use for centuries. This leads to the adoption of well-developed and efficient building types.

Finally, a city is an organism made of ‘fabrics’ – social, economic, cultural and environmental fabrics, upon whose interaction depends the very functioning of an urban structure (Maretto, 2008, 2016). But there is a system of built structures which has the essential task of mediating the transition between the citizen’s (or family’s) individual dimension and the city’s public one. The more complex the public dimension is the more important is the role played by these structures in the functioning of an urban organism. Such structures, at the same time physical and social, are the result of ‘social-building neighbourhoods’,

and have been entrusted for centuries with an important role in building the city. ‘Perhaps the most considerable historic example is that of Venice, where between the fourteenth and eighteenth centuries the Republic or other public institutions (for example, ‘schools’, arts and crafts guilds), built a number of famous and beautiful social housing units, generally centred on ‘intentional’ neighbourhood spaces: the courts’ (Maretto, 1973, pp. 203–7). Other significant examples are medieval *béguinages* and later Dutch *hoffjes*, and British squares.

The social-building neighbourhood is responsible for creating a collective dimension of space that acts as a fundamental area of mediation between urban public spaces and private pertinent spaces; and is a semi-public space of great relevance for urban identity, functionality and sustainability (Maretto, 2008, 2014, 2016). The value of the social-building neighbourhood lies in its intermediate position, both from a social and urban point of view. It brings together the many elements that characterize urban fabrics and the demand for unity characteristic of living spaces: a sort of ‘unity in plurality’. In the city of Ahmedabad, which is the focus of attention in this paper, it plays a fundamental role and takes the name of *pol*, which is an aggregate structure with a domestic area still recognizable.

Polarities, routes and fabrics are basic elements in Muratorian urban morphology and key concepts for a structural (morphological) reading of the informal walled city of Ahmedabad. Based on these concepts we can trace what we shall later term a *morphological map*.

Morphological analysis of the walled city of Ahmedabad

Urban polarities

The concept of polarity is fundamental to understanding the organization of urban space. According to Gianfranco Caniggia, ‘the pole is the sublimation of the term node,

generally determined by the existence of several continua, not so much intersecting as terminating at or starting from a point: ‘polarity’ is the resulting attribute. But the distinction between ‘node’ and ‘pole’ is intrinsically linked to the reading scale’ (Caniggia and Maffei, 2001, p. 126). Consequently, polarity is the attribute of an organism with properties of attraction and orientation. Thus ‘polarization’ is the attitude of attracting or orientating towards a direction. Two key elements are embodied in the concept of polarity. The first is the dynamic relationship that develops between polarities. The relationship between polarities affects the survival and transformation of urban structures. A city can be understood in its basic creative processes through this relationship. The second element is the relationship that develops between polarities and the urban fabric. It is a reciprocal relationship: the fabric reveals the various potentials of polarization, but it is the physical construction of polarity that generally allows those potentials to materialize and the fabric to be realized (Maretto, 2016, p. 10).

On this basis, there are three kinds of polarity within the urban fabric of the walled city:

- *inner polarities*, present in the Bhadra Fort (royal court of Ahmedabad), in the adjacent area of the Maidan-Shah directly accessible from Teen Darwaja, in the Jama Masjid (congregational mosque) and in the commercial area of Manek Chowk (now Mughlibibi’s tomb) located to the east of the mosque. These polarities (shown in red in Figure 1) date back to the founding of Ahmedabad in 1411.
- *local inner polarities*, present in specialized buildings (mainly temples and mosques) and in open spaces conceived as gathering places for the urban community (shown in blue in Figure 1). In the walled city the role of so-called local polarities is accentuated by the organizational structure of the *pols*.
- *outer polarities*, namely the gates in the city walls (shown in green in Figure 1). These help to define the image of the *urbs* as a unitary element.

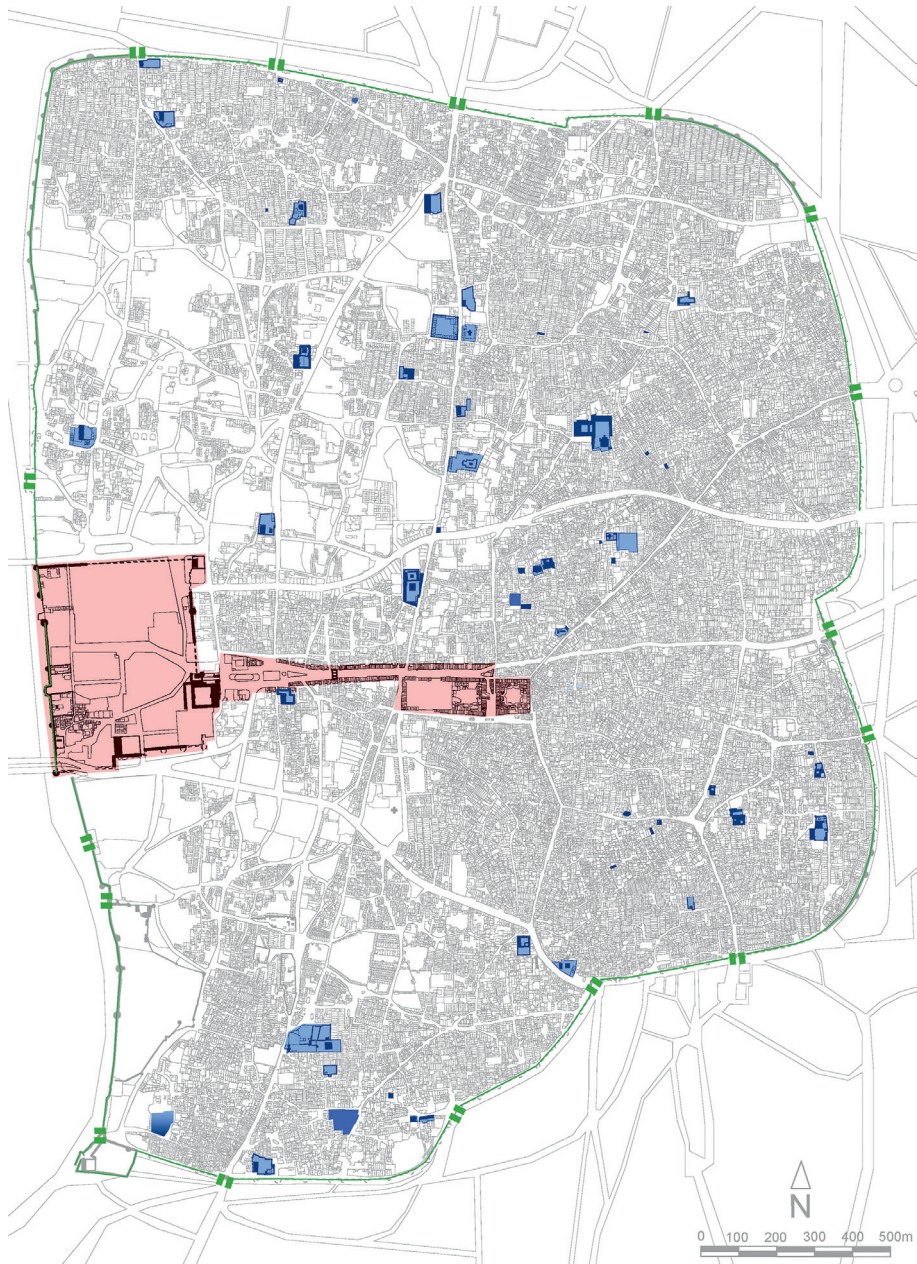


Figure 1. Polarities of old Ahmedabad. Inner polarities (red), from west to east: Bhadra Fort, Maidan-Shah, Teen Darwaja, Jama Masjid, and market area of Manek Chowk. Local inner polarities (blue): small mosques, temples and open spaces within the urban fabric. Outer polarities – city gates (green), clockwise from top left: Shahpur Darwaja; Halim Darwaja; Delhi Darwaja; Dariyapur Darwaja; Prem Darwaja; Kalupur Darwaja; Panchkuva Darwaja; Sarangpur Darwaja; Raipur Darwaja; Astodiya Darwaja; Mauda Darwaja; Jamalpur Darwaja; Khan-a-jahan Darwaja; Raikhad Darwaja; Ganesh Darwaja; Kharu Darwaja.

Urban routes

Reading the hierarchical route system means understanding and interpreting historical anthropic and structural processes. Five route typologies can be distinguished:

- *matrix route*. The route linking any two nodal points (urban or territorial) in the most direct way is termed a matrix route. It is deeply influenced by the fabric it fits into and often has a distinct curvilinear outline to achieve the required mediation between local geomorphological conditions and the rectilinear continuity of a path. This will normally create a fairly continuous pertinent strip, essentially parallel to the line of the route. The depth and shape of this strip will depend on variations at any given time in the plot type (and building type).
- *building route*. This will typically develop orthogonally to the matrix route, with the pertinent strip positioned at the edge of the pertinent strip of the main route. The need for optimum use of the new building fabric will entail a preference for parallel placement of the new building routes, rather than orthogonality to the matrix route. Variations in the matrix route will not necessarily entail any change in the outline of the urban fabric. Building routes tend to be as rectilinear as possible, to allow for the orthogonal arrangement of building plots.
- *connection route* (between building routes). When a route is formed at the edge of a building, it will tend to develop a single pertinent strip on the opposite side of the lateral boundary of previously built houses. When serial building has already exceeded the maximum linear distance from a nodality for the proper functioning of a building system, the route can be formed by demolishing two houses opposite each other and removing the pertinent strip. The route will no longer necessarily be rectilinear and continuous, but may be fragmented between one building route and another.
- *local paths*. These are normally for pedestrians. They are aimed at establishing a network of complementary and alternative

routes to the main roads. In underdeveloped urban systems they may coincide with connection routes. In well-developed systems they may generate neighbourhoods containing distinct building types (Maretto, 2016).

- *restructuring route*. Such a route is superimposed on an existing fabric when it is deemed necessary to create a direct link between existing and new polarities. It tends to contain relatively recent, more specialized buildings. It will tend to run diagonally across the existing built environment, giving rise to trapezoidal plots.

These different types of routes can all be recognized in the old fabric of Ahmedabad. There are two matrix routes, one east-west oriented, and connecting the Bhadra Fortress to Panchkuva Darwaja (shown in brown in Figure 2) and the other north-south oriented, connecting the Delhi Darwaja to Jamalpur Darwaja (shown in orange in Figure 2). The building routes are of major significance in relation to the structure of the urban fabric as a whole, mainly corresponding to the boundaries between urban districts (Raykhad, Jamalpur, Khadia, Kalumpur, Dariapur and Shahpur) (Figure 3). The connection routes link the paths that structure the dense urban fabric. They essentially follow the perimeter of each urban aggregate (pol) delimiting its distinct unitary character (Figure 4). The many local paths characterize the aggregates (the pols) that are encompassed by the matrix routes (Figure 5). An example of a restructuring route, providing connections between existing polarities and new ones, is the east-west route created after 1947 to connect Lal Darwaja to the city walls (Figure 6). Figure 7 shows the relationship between the different types of route forming a hierarchical system.

Urban fabric

The term 'urban fabric' broadly corresponds to 'urban tissue' or, in some usages, 'building tissue', which is characterized by the coexistence of buildings linked to each other by common formative and transformative



Figure 2. Matrix route of old Ahmedabad. The east-west oriented route connecting the Bhadra Fortress to Panchkuva Darwaja is shown in brown. The north-south oriented route connecting the Delhi Darwaja to Jamalpur Darwaja is shown in orange.

processes. On the definition of building tissue, Petruccioli comments that 'every building tissue has its building type preference; in other words, every kind of tissue is formed using the type most appropriate to it' (Petruccioli, 2007, p. 137). The courtyard house proved to

be historically appropriate for Ahmedabad's building tissue because it reflects the 'spontaneous consciousness' (Caniggia and Maffei, 2001) of the Indian civil community. The complex fabric of the walled city could be defined as an organic sum of complementary



Figure 4. Connection routes in the north-east part of old Ahmedabad.



Figure 3. Building routes of old Ahmedabad.



Figure 6. Restructuring routes of old Ahmedabad.



Figure 5. Local paths in the north-east part of old Ahmedabad.

aggregates of courtyards (pols), combining with each other in their specificities and roles, and structured by a system of routes and polarities organized according to various hierarchical orders (Figure 8).

The structure of the pol

The urban fabric of Ahmedabad, like that of many cities in the Gujarat region, comprises

a cellular structure of enclaves commonly called pols (Figure 9). They are essentially closed building aggregates, independent and purely domestic, that are entered through a portal surmounted by a porch occupied by a caretaker. Initially, and in most cases still today, each pol was inhabited by people of the same religion and caste or specializing in certain activities. Today this distribution still exists, although in less marked forms. The pol's size can vary from a few houses



Figure 7. Hierarchical system of routes and paths in the north-east part of old Ahmedabad.

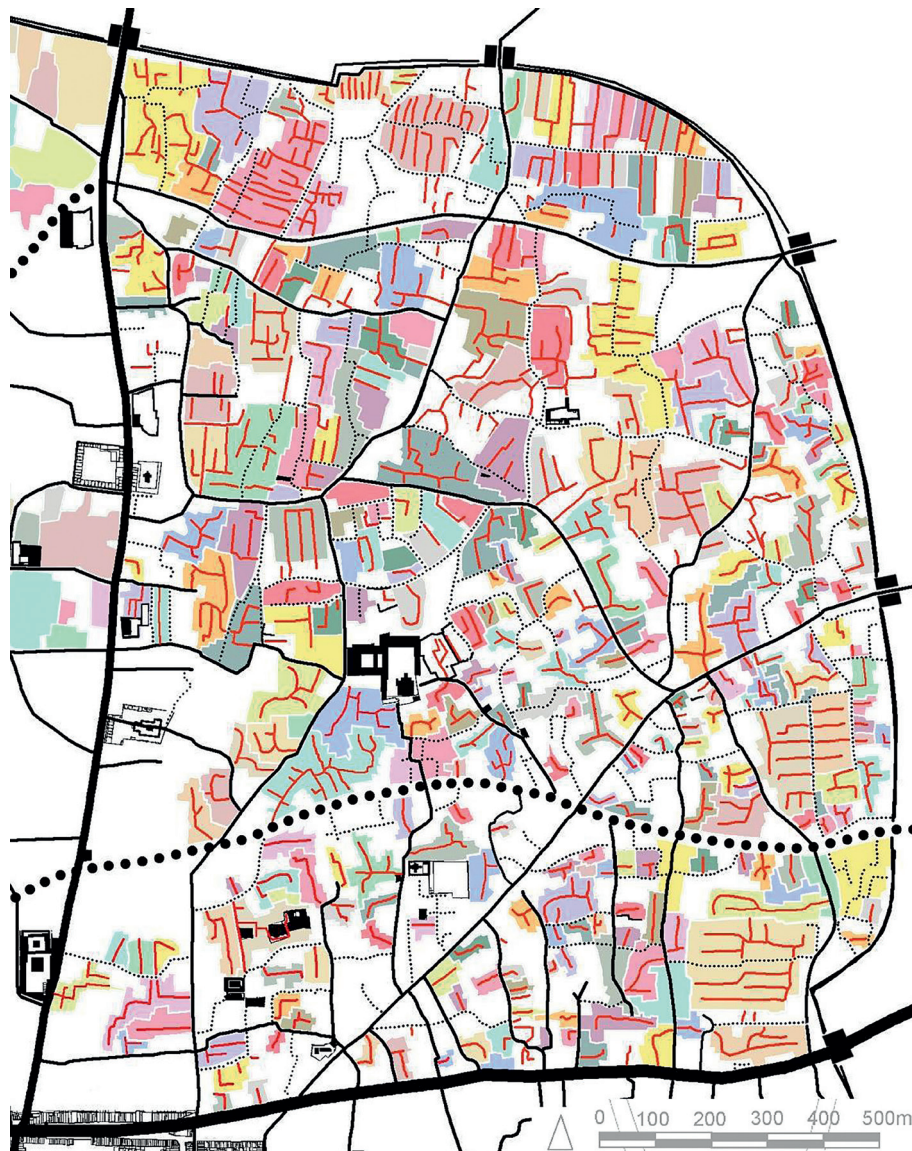


Figure 8. Routes, polarities, pol structures and building typologies in the north-east part of old Ahmedabad.

to many hectares, and within the main pols it is also possible to find sub-pols. Although information concerning the founding dates of pols is meagre, the irregularities of their perimeters suggests that they are the result of fabric adaptations (subdivisions or consolidations) occurring throughout history. There are morphological differences between pols (and differences related to, for example, castes and religions), and it is evident that each pol acts as a self-sufficient entity in terms of social and economic structure. However, at the

same time it is part of a whole, namely the city organism (the walled city of Ahmedabad) which is representative of the entire urban community. Each pol is generally structured by a hierarchical system of paths and polarities conceived in the form of specialized buildings and urban courtyards (*chowk*). With regard to routes, three orders of paths can be identified: the pol, a first-order path which plays the role of matrix route within the urban aggregate; the *sheri*, a second order path which branches into the aggregate fabric



Figure 9. Pols in the northern part of old Ahmedabad.

orthogonally to the first order path; and the *khadki*, a third order path which gives rise to small residential communities, on average of 10–20 units.

Morphological analysis at the scale of the urban aggregate is focused here on the Aka-Sheth-Kuwa-ni-pol. It is a pol that belongs to a series of intersecting pols within the district of Khadia (to the south of the walled city), directly accessible from the Anandshankar Dhurav Road (previously indicated as a building route). This pol has a complex form which seems to have evolved substantially since 1881. Comparing plans of 1881 and 1947, it is evident that on the one hand the eastern border of the Aka-Sheth-Kuwa-ni-pol has annexed a portion of fabric belonging to the neighbouring pol (explaining the irregularities of the current pol perimeter), and on the other hand a further parcelling of the entire building aggregate has occurred (Figure 10). By analysing the pol plan of 2000, it is evident how it is structured through a hierarchical system of paths. There is the pol matrix

route oriented north-south and with a direct access through a portal on the Anandshankar Dhurav Road. Then there are second and third order routes, respectively *sheri* and *khadki*. The first orthogonal to the pol matrix path is east-west oriented. The second is north-south oriented and parallel to the pol matrix path. The pol's polarities are either open spaces (*chowk*) or in the form of specialized buildings. There are two urban courtyards having a religious character (one with a votive temple, and the other with a *Mahalla*). Two others have a more domestic character with public wells inside. Along the southern perimeter of the pol there is a 'cultural' pole represented by a school which stands inside a fenced open space. In terms of its unitary structure, the pol is characterized by 'socio-building' homogeneity, or 'neighbourhood unit community'. The pols that constitute the urban fabric of the walled city would seem to be based on the following binomial: caste/religious community/specialized community of workers (reflecting social homogeneity) and the courtyard house

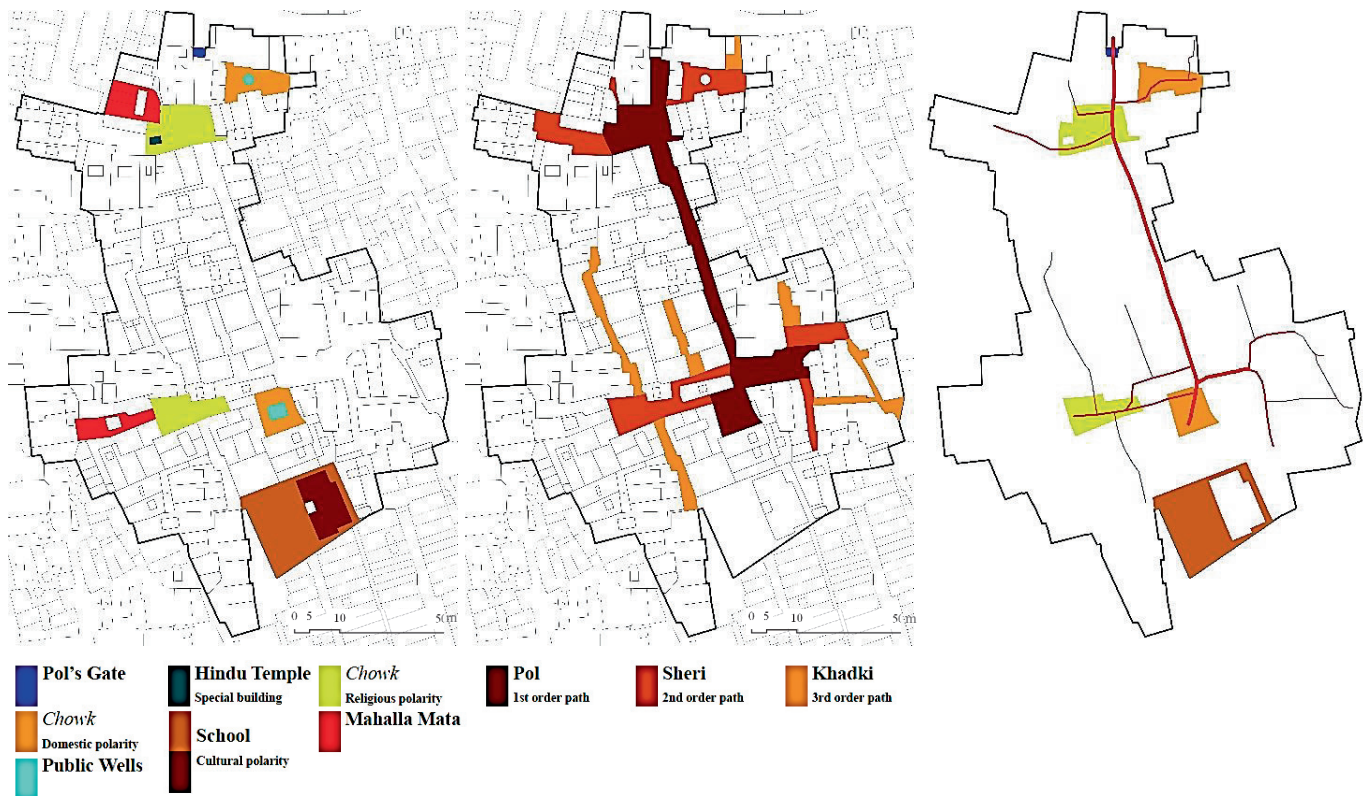


Figure 10. Hierarchical system of paths and polarities in Aka-Sheth-Kuwa-ni Pol.

(expression of building type homogeneity and known as *haveli* in its mature form). It is essentially such a binomial that characterizes the pol as a whole and defines a domestic dimension that links between the house with its inner courtyard and Ahmedabad's urban organism (Figure 11).

Typological process of the North Gujarat house

In the absence of detailed surveys of the old city of Ahmedabad, the analysis of the housing typological process has been extended to the entire area of North Gujarat. Using plans and sections in Pramar's book *Haveli: wooden houses and mansions of Gujarat*, the analysis first focused on the formation and evolution of the basic housing type in the rural environment and then on the transposition and transformation of that house type in the urban

environment. Such a hypothesis of the typological process is illustrated in Figure 12.

In the rural environment the settlement form containing the house type is called *khadky*. It is an enclosed space comprising a path along which individual housing units stand. Its form and function resemble that of other courtyard settlements (for example, the Roman Heredium in the Venetian lagoon) (Maretto, 2004, 2005, 2008), and are evidence of a structure of wider diffusion in time and place. The typological process of the North Gujarat house can be essentially synthesized into seven phases.

First phase. The basic house type consists of two parts: an internal rectangular space with flexible functions and a balcony (*otlo*) which represents a nodal space between the interior and the public space, that is the khadky matrix path.

Second phase. A partial transformation of the basic type occurs through the construction

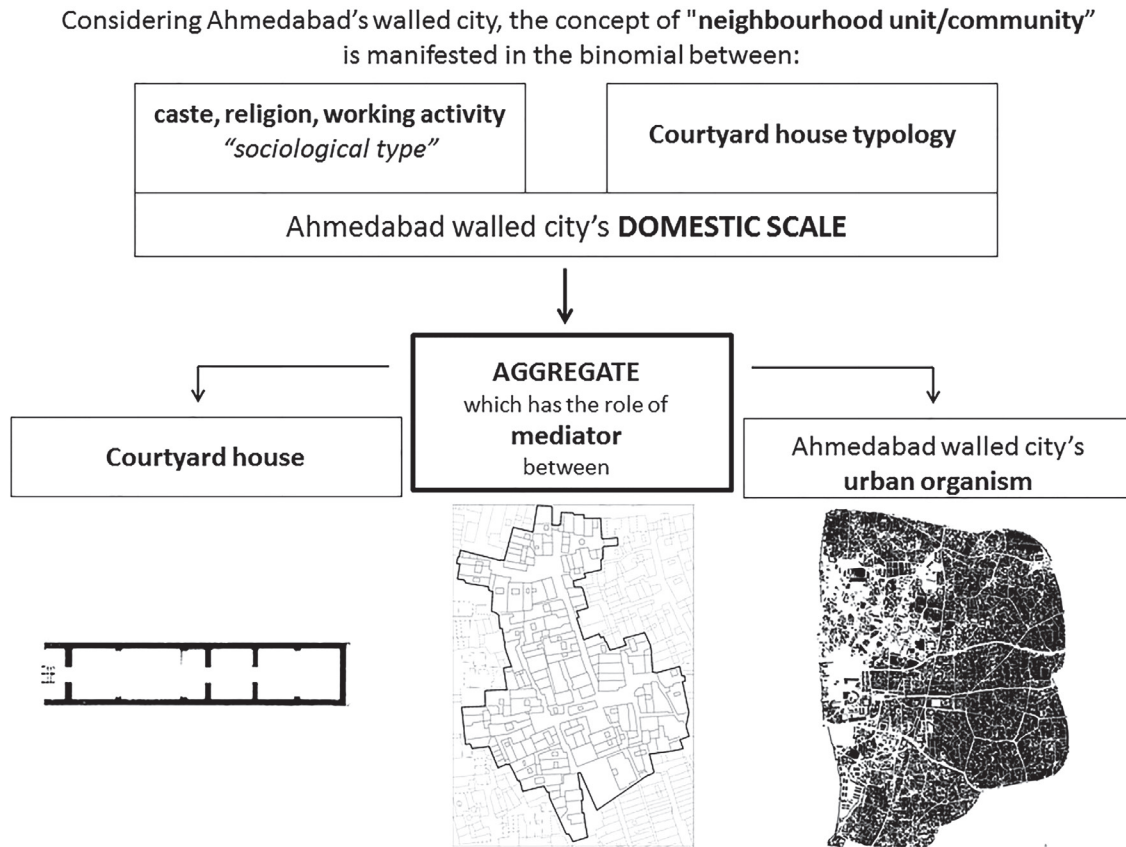


Figure 11. The concept of 'neighbourhood unit/community'.

of a wooden loft (*mala*). This stockroom covers the rear area of the rectangular room and leads to change in the configuration of the interior space: between the porch and the upper space at the back of the room, a nodal double-height space containing the staircase for the loft is created.

Third phase. The rectangular room is divided by a wall into two equal parts with a central opening aligned to the doorway axis of the house. In this way the rear area, identified as an *ordo*, becomes the hearth place, while the front area is turned into an independent double-height space identified as a *parsal*. The *parsal* is entered directly from the porch which is called an *otlo*. Therefore *ordo* - *parsal* - *otlo* form a fixed layout for the house and remain unchanged through all the stages of its development even in the urban environment. With the exception of the hearth, no part of the house has any permanent function. 'The

average width of the house was about 4.9 m; the depth of the *ordo* 5.5 m, the depth of the *parsal* 2.7 m, and of the *otlo* 2.4 m. Thus the ratio of total width to total depth is about 1:2. In North Gujarat the common material for load-bearing walls was mud while in better houses it was wood-framed brick. But the different materials did not affect the plan of the dwelling' (Pramar, 1989, p. 81). The *khadki* layout was that of a row house. The roof was always pitched and tiled, with the ridge parallel to the yard. The simple pitched roof required a square or rectangular plan.

Fourth phase. The final development phase of the rural house is the extension of the wooden loft in order to cover both the *parsal* and *otlo*. This involves doubling the height of the ground floor structure. In the urban environment, the need for residential and commercial functions to coexist in the same building leads to further transformations of the



Figure 12. Typological process of the North Gujarat house.

tripartite axial plan. These can be summarized in the fifth, sixth and seventh phases.

Fifth phase. Basically the tripartite system of the rural houses remains unchanged both in plan and residential function although the otlo begins to take the form of an *osari* or *raveshi*. The longitudinal axis is strengthened by the addition of three more rooms or enclosed spaces: the chowk (courtyard), the khadki and the otlo. The khadki is devoted to commercial activities and the accommodation of customers; the otlo is the new porch that lies between the road and the khadki; and the chowk has the role of a nodal space within the new house layout, being a courtyard that separates the commercial function from the residential one. The need to make the commercial and residential areas independent of each other leads to the introduction of two staircases: one in the parsal, and the other in the khadki.

Sixth phase. The need to connect the rear of the house (the raveshi, parsal and ordo) to the commercial area of the house (khadki and otlo) leads to a partial occupation of the chowk. Along the courtyard boundary walls, both a covered portico that connects the raveshi to the khadki, and two more rooms (the *rasodu* and the *paniaru*, namely the kitchen and a water reservoir) are constructed. Thus a clear specialization of functions is evident from this stage onward. For example, the first floor, a place where family members and occasional visitors are hosted, becomes the *divan-khanu*, which is directly accessible by a staircase inside the otlo where valuables are sold.

Seventh phase. 'The final development of the urban house resulted in the *haveli*. It is a word of Persian origin that denotes a great mansion associated with wealth, status and size. In architectural terms the haveli was merely a very grand version of the common urban house' (Pramar, 1989, p. 108). The following changes take place: the size of the ordo is doubled or tripled; the parsal maintains the same depth but expands to the full house width; the raveshi acts as a filter between the house interior spaces (ordo, parsal and khadki) and the chowk; the khadki is extended to the width of the whole house or it is subdivided to provide

a separate entrance hall and smaller rooms used for storage; the otlo continues to act as a filter between the public street and interior of the house; and the *rasodu* and *paniaro*, where present, continue to occupy a peripheral position within the inner chowk.

Conclusion

This paper has shown how the Muratorian approach to urban morphology can aid understanding of a complex urban reality such as the informal fabric of old Ahmedabad. It serves as a basis for an analytical tool – a morphological map. In recording basic information in relation to key concepts, the aim is to trace fabrics as a developing system that provides a morphological basis for configuring those functional layers which, on a case by case basis, characterize the life of a city. It is a map offering complementary 'levels' of interpretation, each analysed individually or collectively. Each reading is the manifestation of a particular aspect of an urban context's morphological structure. It is susceptible to the recognition of many sub-levels according to need. This morphological-structural map allows at any time the transition from smaller to larger scales (and vice versa) that are characteristic of urban phenomena, yet remaining connected to the whole ensemble (Maretto, 2016). It is a tool for use in the planning of urban regeneration. It is technically, economically and socially efficient in historical contexts in which the aim is not to create a 'museum city' but a city which is lively and conscious of its own identity.

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