# Creation of cultural heritage inventories: case of the historic city of Ahmadabad

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## Abstract

**Purpose** – The purpose of this paper is to illustrate the relevance of cultural heritage inventories and documentation as critical tools for heritage conservation and management in historic cities, through the case study of the historic city of Ahmadabad, India.

**Design/methodology/approach** – The paper discusses the creation of inventories as part of the comprehensive documentation undertaken for preparation of the World Heritage nomination dossier. In this context, the goal of preserving the outstanding universal value of the historic city formed the basis for selection and assessment of the assets to be included in the inventory. Standard processes and methodology employed for creation of the database involved archival research and planning; field surveys for mapping, photo documentation and data collection; data registration and processing using CAD, Ms Office and geographic information system (GIS)-based digital platform. Optimal data acquisition while maintaining cost and time efficiency was an important consideration for the fieldwork.

**Findings** – While an inventory remains a critical conservation tool, the heritage assets are integrally linked to and influenced by their surroundings in an urban context. A comprehensive documentation approach that provides a broader understanding of the city's natural features, built environment, heritage resources, cultural practices and socio-economic networks is therefore necessary for creation of a suitable management plan for historic cities. Traditional field surveys based on external visual observation are time and cost effective, and can generate adequate information on identification and assessment of built heritage assets for creation of inventory along with documentation of their context. However, the scale of investigation and the intended role of an inventory as an urban management tool calls for creation of integrated, accessible and updatable data management systems.

**Research limitations/implications** – At the moment, the database created is only used for the limited purpose of monitoring and managing the conservation of listed properties. The importance of the inventory as a critical conservation and urban management tool can be further validated once the GIS database of the historic city is integrated within the urban management and planning system for the city.

**Originality/value** – The inventory created for the historic city of Ahmadabad offers one of the few examples of heritage documentation at such a large scale. It covers an area of 543 ha with a detailed inventory of more than 6,000 properties. The description of, and the reflections on the process employed provide an overview of usual challenges encountered in creation, presentation and management of heritage inventories for historic cities which may offer useful guidelines to practitioners planning similar exercises and help them establish efficient work processes.

**Keywords** Cultural heritage, Management, World Heritage, Urban conservation, Inventory methodology

**Paper type** Case study

## 1. Background

### 1.1 Historic cities and sustainable development:

Ensuring environmental, economic and socio-cultural sustainability in the context of unprecedented urban development is a key challenge for the world in the twenty-first century. As emphasised by Rodwell (2007, p. 58), well-managed historic cities can play a significant role in responding to the challenges of sustainable development, "[…] considered in terms of their functionality within communities, the natural resources of

materials and energy that have gone into their construction and the financial means that have been invested in them often over several generations […]". A similar argument put forth by UNESCO in the recommendation on the historic urban landscape (HUL), emphasises that "Urban heritage, including its tangible and intangible components, constitutes a key resource in enhancing the liveability of urban areas, and fosters economic development and social cohesion in a changing global environment. As the future of humanity hinges on the effective planning and management of resources, conservation has become a strategy to achieve a balance between urban growth and quality of life on a sustainable basis" UNESCO (2011, p. 1).

Rapid urban growth fuelled by economic development, rise in consumerism and large scale rural to urban migration has resulted in extraordinary pressures on the characteristically fragile infrastructure and insufficient housing stock of Indian cities. While various agencies are working relentlessly to provide the necessary infrastructure and services needed for ongoing urban development, the pace and scale of operations come with unforeseen risks. One of the major concerns is the probability of generating a homogenised urban development modelled on standard global practices, with no relation to its context, as against the uniqueness, diversity and vitality intrinsic to historic cities. Thankfully, the need to understand and utilise the potential of its numerous historic cities for mitigating the impacts of urban growth and achieving sustainable development is widely recognised by professionals, administrators and policy makers in the country.

### 1.2 Urban heritage conservation and heritage inventories

Identification and recording of a cultural heritage asset is vital for its recognition and conservation. Historic cities are stratified urban landscapes with complex layering of natural, cultural and socio-economic resources, which have acquired significant values and meanings for their inhabitants over the period of their existence. In addition to monuments and historic buildings, urban heritage assets include site topography, natural resources, urban morphology, open spaces, land use patterns, urban infrastructure and intangible heritage of crafts, traditions and societal relations. Planning for urban heritage conservation therefore requires a holistic understanding of all these assets and their interrelationships. Mapping, detailed inventories, measured drawings, photography and audio-video recordings are some of the primary tools for documentation used in urban conservation planning.

Heritage inventories and statutory lists are critical tools for recognising, assessing and managing cultural heritage resources. Heritage inventories can contain a wide range of information on an object, building, precinct, site or open space. They typically include details on identification, location, boundary, physical features, function, material, condition and values contributing to the cultural significance of a particular asset supported by detailed description, photographs and audio visual documentation. Describing the impact of heritage lists and inventories, experts like Logan and Mackay (2013, p. 10) assert that, "The inclusion of a cultural site on a statutory heritage list provides legal protection and guidance about permissible or desirable change. It also celebrates, educates, and supports good decision making. Heritage inventories facilitate comparative evaluation, confer status, and inform priorities for resource allocation. In short, heritage inventories make a difference". Apart from their role in conservation, they are also invaluable for creation of public awareness as well as planning for disaster risk mitigation and response for heritage protection in urban areas.

Until a few decades ago, the scope of heritage conservation in India was largely restricted to exceptional monuments listed by the Archaeological Survey of India (ASI) at national level and the State Department of Archaeology (SDA) at the state level. With growing awareness regarding the importance of urban heritage, the provisions for creation and management of lists of significant properties and precincts protected by local government authorities were introduced towards the end of twentieth century. The Town and Country Planning Organisation, Ministry of Urban Development has mandated the administrative authorities to identify assets and prepare heritage lists as part of local development plans through its Model Building bye-laws (2004) and Model Heritage Regulations (2011). The stimulus provided by such initiatives has contributed significantly to the increased knowledge and appreciation of the historic built environment as well as efforts for urban heritage conservation through heritage listing, precinct designations and heritage city revitalisation schemes.

This paper presents the process adopted for creation of inventory as a key tool for heritage conservation and holistic urban management in the historic city of Ahmadabad, India. The work was undertaken between the year 2011 and 2014 as part of the documentation and research for preparation of the World Heritage nomination dossier for the city.

## 2. Case of the historic city of Ahmadabad – introduction
### 2.1 Historical overview
The historic city of Ahmadabad was founded in 1411 AD by Sultan Ahmad Shah-I as the capital of the independent Sultanate of Gujarat (1411-1572 AD) in western India. Its location on the eastern banks of river Sabarmati, along an important trade route and protection provided by sturdy city walls fulfilled the requisite conditions for the growth of a thriving medieval urban centre with a significant population of merchants and artisans. The city remained an important trade centre and regional capital during subsequent periods of Mughal (1572-1757 AD), Maratha (1757-1817 AD) and British rule (1817-1947 AD). It has retained its prominence as the economic and cultural capital of the region since independence (Figure 1).

### 2.2 Architectural and urban character
The city is renowned world over for the unparalleled richness of its architectural and urban heritage, consisting of its medieval urban structure, monuments, community-based settlement pattern, traditional houses with intricately carved wooden façade, building crafts, cultural traditions and progressive social outlook.
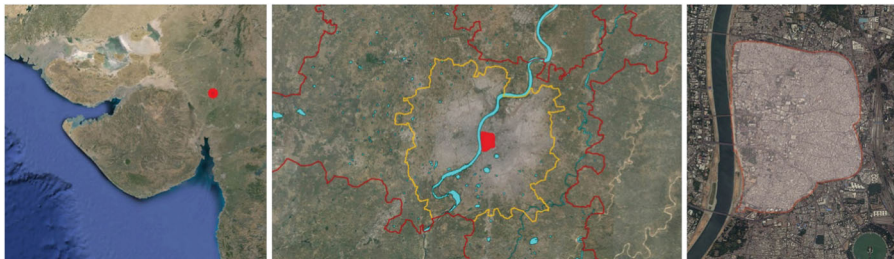


**Figure 1.**
Location of the historic city of Ahmadabad in the region and urban agglomeration

**Sources:** Base Map – Google Earth (April, 2016), AUDA map (2013); Boundary adapted by Author (2016)

*2.2.1 Urban structure.* As depicted in Figure 2, the city's urban system is made up of hierarchical organisation of its constituent units – house, pol, pur and the city where each is self-sufficient while being generator of the next. The north-south axis of the city corresponds to the ancient trade route connecting north-India to the Gulf of Cambay. The monumental axis is defined by the royal citadel "Bhadra" along the river's edge, followed by the royal square "*maidan-i-shahi*", ceremonial gateway "*teen darwaja*", Friday (Jami) mosque, and the royal mausoleums, moving from west to east. The mosque and mausoleum complex, with the main market square between them mark the approximate centre of the city. The primary streets link the centre to the city gates and are lined with traditional markets "bazaars" with wares and names which echo centuries of history.

*2.2.2 Pur.* The primary streets mark the boundaries of the pur, the constituent element of the city. The city is formed by coming together of pur within the fortified walls. Pur is the larger settlement unit formed by grouping together of pol(s) and houses larger community institutions and resources catering to them making it a self-sufficient unit.
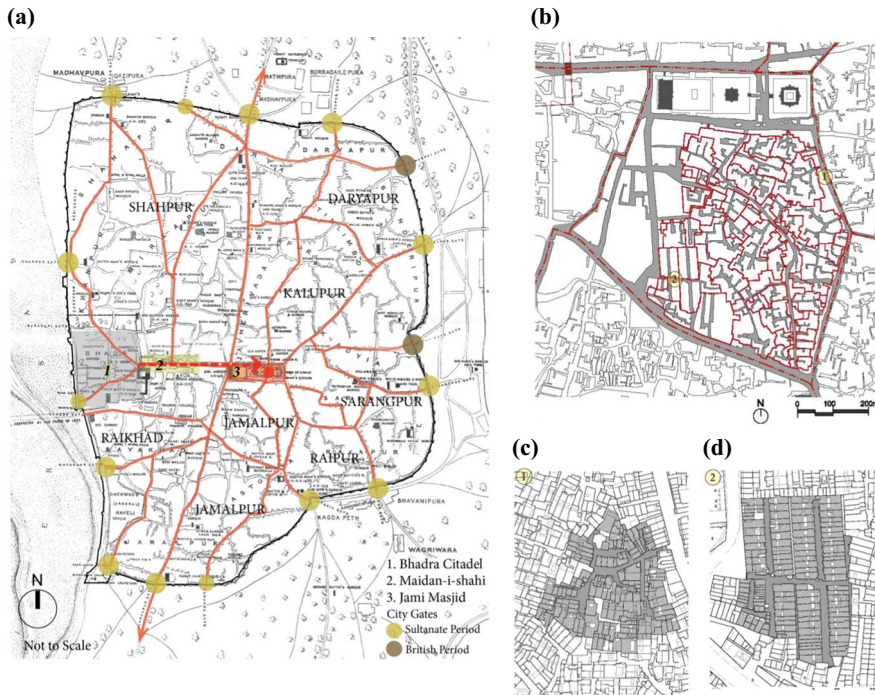


**Notes:** (a) City structure showing the citadel, monumental centre, city walls and primary street network; (b) Jamalpur Ward 2 – a typical pur with pol boundaries; (c), (d) typical pol clusters with organic and rectilinear settlement plans, respectively

**Sources:** (a) Prepared by author, based on City Survey map, nineteenth century, available in Burgess (1990/1997) ; (b) CCS, CEPT University (2012); (c) and (d) prepared by author based on cadastral map (1940s) of AMC

**Figure 2.**
City structure and
hierarchy of
settlement planning –
city, pur and pol

*2.2.3 Pol.* The traditional residential neighbourhoods "pol" are characterised by a series of densely packed courtyard houses with shared longitudinal walls, arranged along a narrow winding street, accessed by a controlled gateway and ending in a cul-de-sac. A typical pol is made up of 50 to 100 houses inhabited by a close knit community group which was traditionally governed by a community council. Most pol are relatively self-sufficient with a well for water supply, a place of worship – temple or mosque, a bird feeder "chabutaro" and a community open space "chowk". The settlement structure and interrelationship of elements follow more or less the same principles throughout the city irrespective of religious beliefs of the resident community. The plan of a pol often varies from entirely organic to strictly rectilinear or a combination of both depending on the topography and availability of land (Figure 2 and Plate 1).

*2.2.4 The house.* As shown in Figure 3 and Plate 2, the traditional pol houses of Ahmadabad are characterised by narrow frontages, deep plan, shared longitudinal walls, courtyard house typology, highly ornamented façades with upper floors projecting towards the street and rain water harvesting cistern "tanka" in the court. The construction system, using partial timber framing, timber laced brick masonry and light weight wooden façades on upper floors combined with the compact settlement form with series of mutually supported structures has exhibited remarkable resilience to earthquake forces in the past, in addition to being an intelligent response to the hot dry climate. The traditional wooden façades of the pol houses exhibit an exceptional richness of creative expression with structural members and panels covered in intricately carved motifs and patterns reflecting the cultural beliefs of the owner. The decorative idiom and building materials evolved with the technological advancement and cultural influences, as observed in the houses with European influence which exhibit extensive use of stucco, glass panes and European style motifs on the façades. However, the organising principles of urban and architectural form as well as building typology in the city remained the same until very recently, a continuity that reflects their relevance to the socio-cultural and environmental context of the city.

*2.2.5 Monuments.* The most remarkable monuments of the city include the remains of the citadel, city walls, mosques, mausoleums, temples, stepwells and other public buildings. A large number of these monuments are representative of the highly acclaimed Gujarat Sultanate style of architecture, which developed in the city, out of fusion of the Islamic culture of its founder with the indigenous Jain and Hindu culture. This unique synthesis is characterised by the excellence in stone craftsmanship, extensive use of the local trabeate construction system, carved stone screens, niches and traceries, embellished minarets and buttresses, clerestory lighting, and balcony windows "jharokha" supported on carved brackets with details derived from local building traditions but adapted to the Islamic form of veneration and cultural expression (Plate 3).

*2.3 Background of the world Heritage nomination*
Industrialisation and socio-economic developments of late nineteenth century initiated the processes of structural, social and demographic changes within and around the historic city. Their impact was further intensified by the exponential increase in urban development that followed the economic liberalisation in late twentieth century. Today, the historic core admeasuring 5.4 km$^2$ finds itself at the centre of one of the fastest growing cities in India with an urban area of more than 300 times its size (see Figure 1). The historic city faces typical pressures of urban development, like fragmentation of
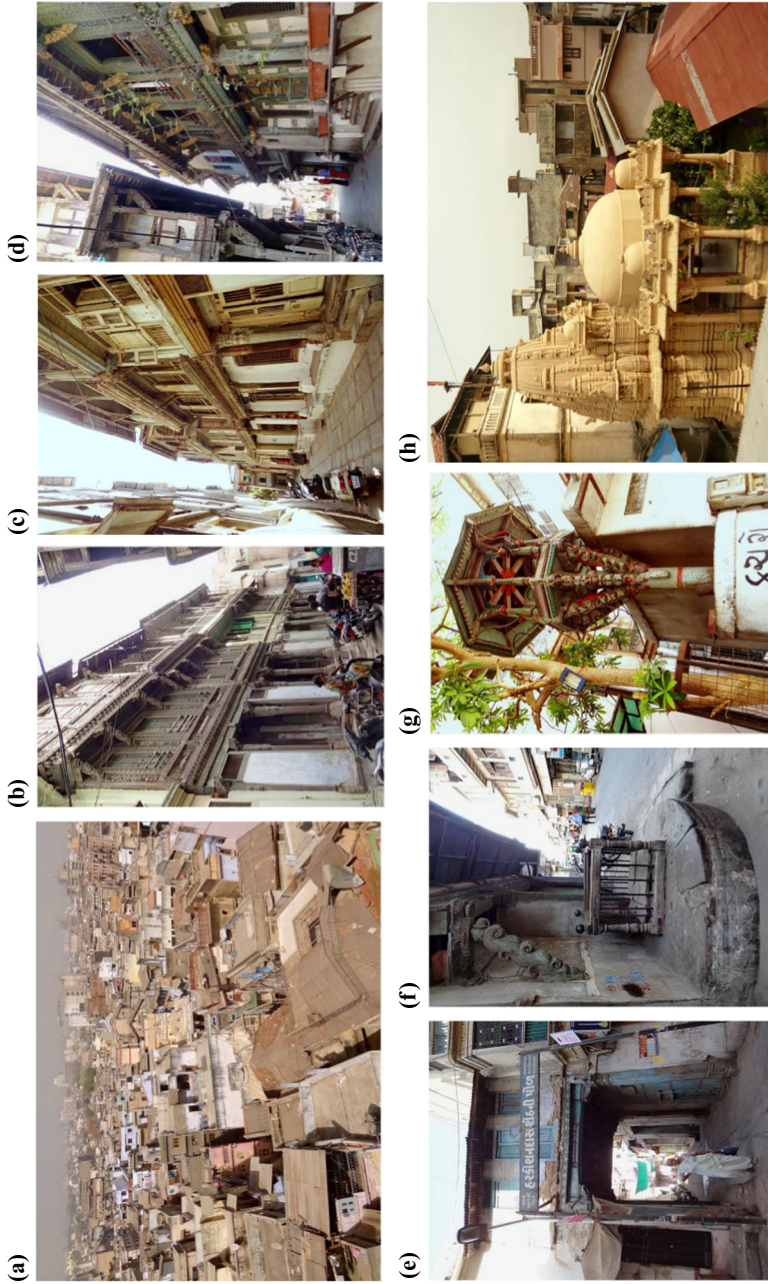
**Notes:** (a) Dense urban fabric reflecting social solidarity and cohesion; (b)-(d) typical street views; (e) pol gate; (f) community well; (g) bird feeder; (h) temple integrated within the settlement

**Source:** Author (2010-2016)

**Plate 1.**
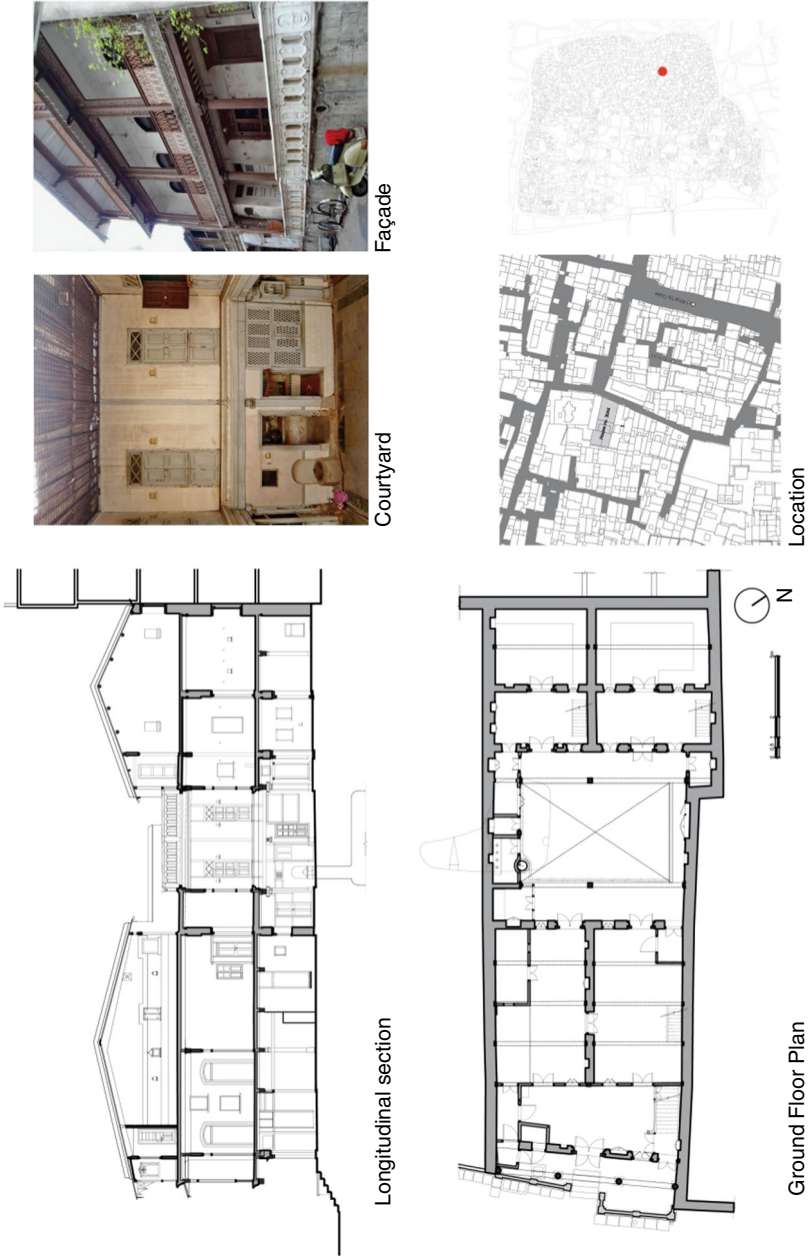Architectural and
urban character of
traditional
neighbourhoods

Façade


Courtyard


Location


Longitudinal section


N

Ground Floor Plan
**Source:** Author (2010, 2012)

**Figure 3.**
Details of a typical
courtyard house in
traditional typology
with European
influence on the
architectural idiom
(the presence of
water harvesting
cistern and many
traditional building
elements in the
interior hint at the
building being a
reconstruction from
late nineteenth
century on the site of
an older structure)

**Notes:** (a) Traditional wooden building with intricately carved façade and projecting upper storeys; (b) details of wood carving; (c) courtyard of a traditional house; (d) house with European influence

**Source:** Author (2016)

**Plate 2.**
Architectural
character of
the pol houses

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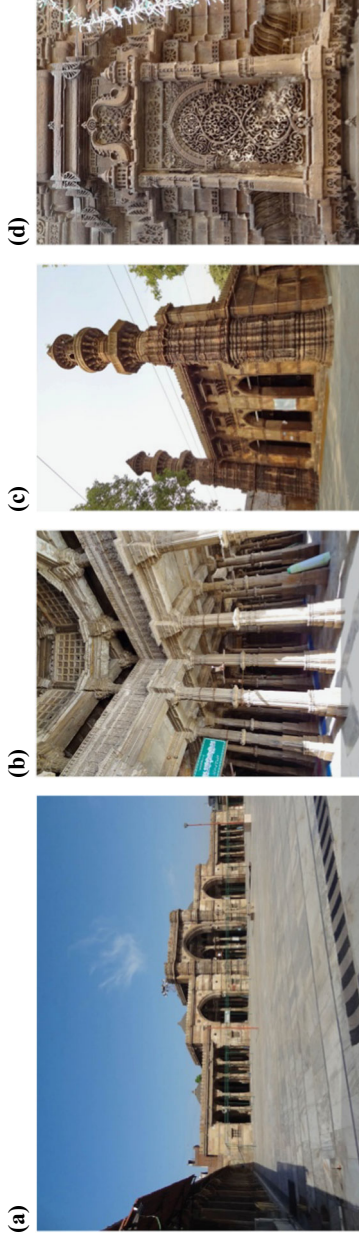
**Notes:** (a) View of the courtyard and east façade of the prayer hall, Jami mosque; (b) interior of the prayer hall with detail of the clerestory and stone grills; (c) east façade of Muhafiz Khan's mosque with its exquisite minarets and jharokhas; (d) detail of a niche on the minaret, Sheikh Muhammad Chisti's mosque
**Source:** Author (2011-2016)

**Plate 3.**
Some examples
of the Gujarat
Sultanate style

historic areas, unsympathetic new developments, changing land use, out-migration of original inhabitants, weakening social networks and deteriorating quality of life, all contributing to the loss of tangible and intangible heritage of the city.

In the last two decades, considerable city wide efforts for conservation of individual monuments, traditional houses and urban structures have been undertaken by various government authorities, non-governmental organisations as well as international cooperation agencies. While relevant in their own contexts, these efforts could not make significant impact on the state of conservation of the historic city as a whole due to piecemeal nature of actions, lack of political will, a weak policy framework and lack of integration with larger development policies.

In 2010, on the eve of the 600th year of the city's foundation, Ahmedabad Municipal Corporation (AMC), the local authority responsible for the city initiated efforts for inscription of the historic city on UNESCO's World Heritage list. The proposal for nomination of the city can be seen as an acknowledgement of its cultural heritage values as well as an opportunity to catalyse political will, public interest, pride and commitment towards their conservation. The task for preparation of the nomination dossier was entrusted to the Centre for Conservation Studies (CCS), CEPT Research and Development Foundation, CEPT University. In March 2011, the historic city of Ahmadabad was placed on the tentative list. In January 2016, the nomination dossier for the historic city of Ahmadabad was submitted to UNESCO as the official entry to the World Heritage list by the Government of India.

*2.4 Values and World Heritage criteria*
Considering its wealth of tangible and intangible heritage resources described in Section 2.2, the city has been proposed for inscription to the World Heritage list, under criteria ii, v and vi of the operational guidelines (UNESCO, 2013) of the World Heritage convention (UNESCO, 1972). The significant attributes of its outstanding universal value (OUV) justifying its inscription under these criteria can be summarised as:

(1) The architectural and urban heritage of the Gujarat Sultanate period as a testimony to the mutual exchange and synthesis of different cultural traditions enriched by the complex layering of influences from the succeeding periods of the city's development.

(2) The exceptional quality of the city's traditional settlement system, which derives its character from mutual respect and synthesis of cultural traditions, appropriate climatic response and socio-economic considerations.

(3) The progressive outlook and philanthropic traditions of its citizens which supported many institutions of social and political reform; made a remarkable contribution to the struggle for Indian independence under guidance of eminent leaders like Mahatma Gandhi and Sardar Patel; pioneered developments in the fields of science, education, labour rights and modern municipal governance.

## 3. Documentation process
The aim of the documentation was, to create a comprehensive and easily accessible database of cultural heritage resources to identify and record their values; ensure their protection and facilitate processes of conservation, heritage management and sustainable urban development in the city. It involved extensive archival research, mapping of topography and natural resources, reconnaissance surveys, mapping and creation of

detailed inventories of built heritage. Other complementary studies like stakeholder perception surveys, disaster risk assessment, mobility and traffic management, etc. were undertaken to achieve a holistic understanding of the HUL. This section details out the broad steps followed for creation of detailed heritage inventories.

## 3.1 Planning

*3.1.1 A review of available documentation.* Numerous studies on the city's history, culture, monuments, crafts, traditional houses and urban settlements, including inventories dating from as early as the 1890s, are available. Apart from the statutory lists of protected monuments, the most significant earlier inventories include: the Special Census report on Ahmedabad (1962), which identified some 500 wooden houses of exceptional architectural significance; Ford Foundation and AMC joint study "Urban conservation, the walled city of Ahmedabad" (1988), which proposed a list of 250 remarkable houses for conservation; the documentation of the historic city and the preliminary inventory of 12,500 properties carried out between 1999 and 2001 by the team of Indo-French cooperation project for the revitalisation of the walled city of Ahmedabad.

The inventory of 2001 was notified as the statutory list in 2007, and set an important legal precedent for protection of listed buildings in the state of Gujarat. While being a commendable effort, the considerable time gap between its preparation and notification along with the lack of detailed photo documentation made the application of its protective provisions difficult. The geographic information system (GIS) database created during the process was rendered unusable due to absence of technology and knowledge transfer to the local partner, AMC. A significant part of the data remains untraceable today.

Thus, in spite of a wealth of information on the city available in earlier records, critical gaps in the existing data sets made it necessary to prepare a comprehensive inventory for the city. Nevertheless, the review of available documentation provided essential contextual understanding of urban development and evolution of the city through the history. It also provided an understanding of the potential challenges of data creation and management for long-term use and helped in determining the basic parameters for the documentation process to be followed.

*3.1.2 Scope and limitations.* The geographical extent of investigation was determined by the proposed boundary for World Heritage nomination. The initial boundary of the property demarcated in the tentative list submission included the traditional settlements "pur" located to the east of the north-south axis and the original extents of the citadel. Following a reconnaissance survey, an area of some 73 ha spread across nine municipal wards was identified as the detailed study area for comprehensive documentation within this boundary as shown in Figure 4(a). In 2012, in light of a better understanding of the World Heritage criteria, Ahmadabad's urban landscape and requirements for its holistic management, it was decided to propose the entire historic city defined by the extents of its fifteenth century fortifications as the nominated property. This led to a corresponding expansion in the study area to cover 543 ha distributed in 13 municipal wards consisting of more than 65,000 cadastral parcels as seen in Figure 4(b).

The scope of work included creation of detailed inventories of cultural heritage assets in the historic city, mapping of physical and functional attributes of the selected assets and their context along with preparation of lists of selected properties to be proposed for statutory protection. Due to the overall scale of the exercise, time and

**Notes:** (a) Boundary as per tentative list submission showing the detailed study area; (b) final boundary of nominated property

**Sources:** CCS, CEPT University (2011-2012), minor adaptation by Author (2016)

Proposed boundary for nomination

Detailed study area

**Figure 4.**
Maps showing
geographical extent
of investigation
based on the
proposed boundary
for World Heritage
nomination

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resource constraints, the scope of investigation during field surveys was restricted to external visual observations only.

*3.1.3 Criteria for identification and selection of properties.* Consistent with the aim of creating comprehensive documentation to support a well-informed heritage management plan, the detailed inventories include all buildings, structures and open spaces representative of significant qualities of the city's cultural heritage and contributing to its OUV, as described in Sections 2.2 and 2.4, and listed below:

- Non-protected religious monuments, infrastructure elements and surviving fragments representative of the Gujarat Sultanate style.

- Important elements of the public domain: pol gate, community well, chabutaro and open spaces along with integrated institutions within the traditional settlements.

- Buildings/structures exhibiting traditional character in terms of construction, façade articulation, elements and spatial planning as well as their interaction with the street and surroundings.

- Buildings/structures exhibiting homogenous architectural expression discernible through use of material, elements, construction systems and associative imagery on the façades from traditional or later periods.

- Buildings/structures representative of evolution of architectural idioms and built form expressed through adaptation of materials and cultural imagery representative of the city's historic evolution.

- Buildings/structures and places associated with traditional craft practices; important social, cultural and historic events as well as personalities.

- Exceptional examples of traditional settlement pattern and urban form.

*3.1.4 Assessment and grading of inventoried properties.* The inventoried properties were classified in different categories of values based on the assessment of their architectural, contextual, socio-cultural and historical importance. The properties were assessed based on the uniqueness of architectural expression, use of materials, quantity and quality of embellishment as well as homogeneity of architectural idiom; integrity of built form and architectural expression with respect to time of construction; their relationship to and function within the pol domain and the community. The final criteria for identification and grading evolved with the evolving understanding of the built heritage and were updated following a process of trial, review and refinement as the inventory progressed. The final criteria used for assessment of the heritage value of properties were:

- Exceptional value: monuments or institutions with exceptional architectural, historic and/or social significance.

- Highest value: buildings/structures with uniform language of articulation all over the façade with a high degree of ornamentation irrespective of the construction time period.

- High value: buildings/structure with moderate or high degree of ornamentation but with articulation and structure belonging to varying time periods/ expressions on the same façades.

- Moderate value: buildings/structure with little or no ornamentation and modern modifications to the façade but important to overall urban character of the pol in consideration of relationship with the public domain.

At the time of scrutiny and final processing of the list for statutory protection, to comply with the nomenclature used by General Development Control Regulations (GDCR-17.20) of the state government (2007), the field of heritage value with classification of properties as exceptional, highest, high and moderate value was replaced by heritage grade classified as Grade I, IIA, IIB and III, respectively.

*3.1.5 Documentation standards*. While there are no uniformly agreed national data standards for heritage documentation in India, the INTACH brief on identification and documentation of heritage properties (Gupta, 2007) provides guidelines which closely resemble the core data standards developed by the Council of Europe (Thornes and Bold, 1998) for the purpose. The INTACH guidelines along with the ones used for the earlier inventories of Ahmedabad were used as reference while deciding the optimum details to be included in the inventory in view of the scale and timeframe of the exercise.

As shown in Figure 8, the inventory formats include observations and dated record of location/address, land use, building heights, age/historic time period of construction (where available), along with a brief description with details of architectural form, decorative idiom, building materials, construction technique, historic events and associations. Standard architectural vocabulary is used for description of structural elements and building configuration, whereas traditional local terms are often used for specific building elements to describe cultural imagery. It also includes assessment of heritage value and building condition, classification of the property as described in Section 3.1.4, and observations on addition/alterations to the structure. This information is supplemented with relevant photographs and mapping of base information on cadastral maps. The attempt to include building ownership and occupancy information was given up due to difficulty in obtaining reliable data from field surveys.

*3.1.6 Documentation tools*. Printed cadastral base maps, digital camera and concise site inventory forms were the basic tools used for field observations. AutoCAD, MS Excel, Adobe Creative Suite and ArcGIS 10 from ESRI were used for data registration and management. An AutoCAD map prepared by combining cadastral maps distributed over 97 separate sheets was the best available base map. It was last updated in the 1940s and required considerable corrections on site through visual observation.

*3.1.7 Configuration of the documentation team*. A senior professor at CEPT University, with many decades of research experience and extensive knowledge of the historic city was chosen to head and guide a project team of architects engaged as research fellows and associates. The field survey teams consisted of young architects trained at the post-graduate programme in Architectural and Settlement Conservation (MASC) at CEPT, which uses the historic city as a laboratory for study of traditional architecture and settlements. They were hence familiar with the site and the task at hand. The research fellows participated in the surveys and worked in close collaboration with the project head and field teams to develop the methodology as well as provide training, guidance and support as and when required.

The work of the project team was supported by regular interactions with the Heritage Department of AMC; the Heritage Conservation Committee at Ahmedabad Urban Development Authority (AUDA); and an advisory team of experts in heritage conservation, urban management and planning.

### 3.2 Data acquisition and registration

The data for creation of the inventories were acquired through field surveys and archival research. As a standard practice, the fieldwork was carried out in the first half of the day, while the second half was spent in the office, for compilation and creation of the digital database, creation of base maps and archival research on the inventoried structures.

*3.2.1 Fieldwork methodology.* The primary unit of investigation was an individual property/parcel with traditional urban settlement "pol" as the unit for mapping and recording of the inventory data. The work was undertaken by teams of two to three members with each person responsible for a separate task – mapping, photography and filling up of detailed inventory forms. A team could document a pol or two in a day (approximately 100 properties), and on an average spent two to three days a week on the field.

The fieldwork (Figure 5) for comprehensive data acquisition consisted of:

(1) Mapping of basic physical and functional attributes:

- all properties – building heights and land use;

- inventoried properties – building condition and heritage value;

- pol/public amenities – location of gate structures, bird feeders, trees, community wells, blackboards, open spaces, right of way passages and street networks;

- observations of changes in plot boundaries due to road widening, amalgamation or subdivision of properties for corrections.

(2) Recording the details of the identified cultural heritage properties in detailed inventory formats, and assessment of their cultural heritage value as well as condition as described in Sections 3.1.3 and 3.1.4.

(3) Photographs of all inventoried properties.

The overall data acquisition process following guidelines described in Section 3.1 can be broadly classified in three distinct phases spanning three and a half years with varied outputs in terms of details and quantity of data acquired as presented in Figure 6. This variation was a direct result of the evolving scope of work, adaptation of the methodology as a response to the issues encountered in field surveys and limitations of resources. The scope, methodology, challenges and results achieved in each of these phases can be summarised as depicted in Table I.
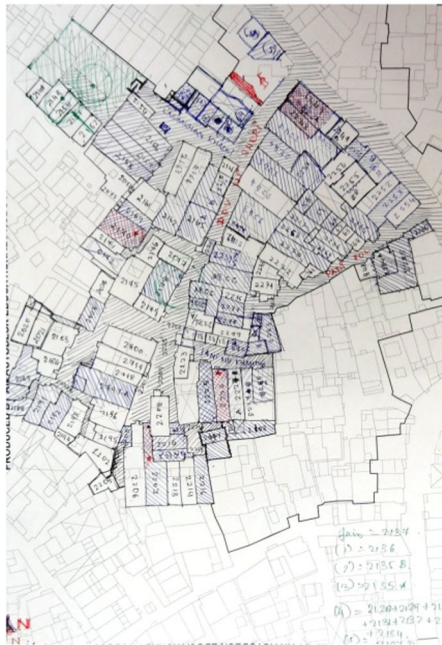
### 3.3 Data processing and management

*3.3.1 Database creation, presentation and processing.* The choice of tools for database creation, processing and management was informed by and evolved with the changing scope of work, quantity of data acquired, available expertise and resources, as well as the ease of data retrieval, analysis and presentation.

In the first two phases described in Table I, a comprehensive digital database was created by recording all spatial information mapped during the field survey on AutoCAD drawings. The data from site inventory sheets were entered in the detailed inventory formats using MS Excel. The relevant photographs of the selected properties were sorted pol wise, renamed using their unique cadastral survey numbers and inserted into the corresponding MS Excel files with hyperlinks for easy access.
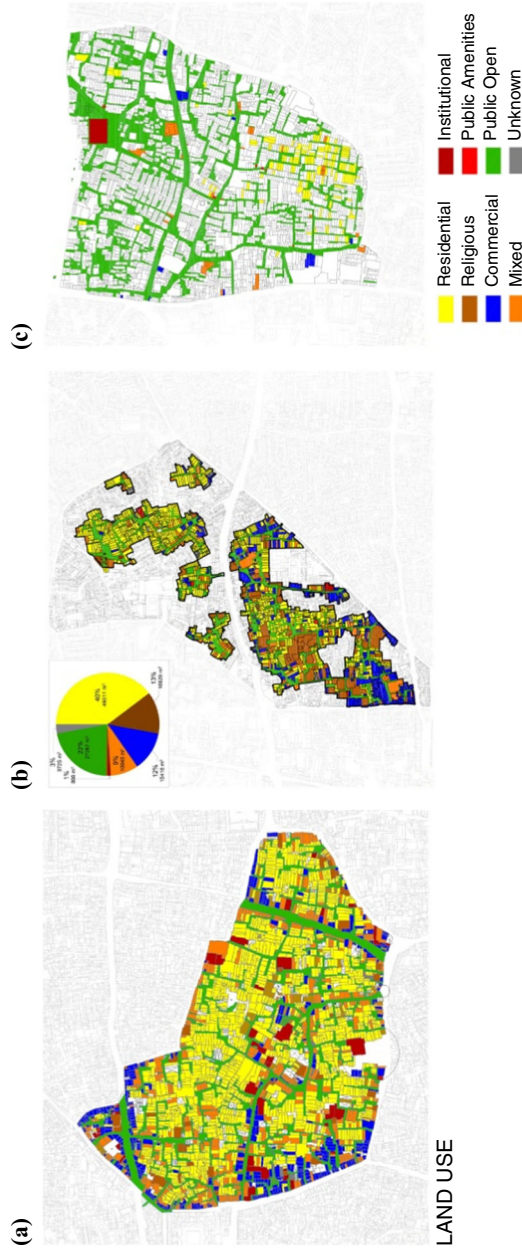
**Source:** CCS, CEPT University (2011)

(c)

Residential
Religious
Commercial
Mixed

Institutional
Public Amenities
Public Open
Unknown

(b)

(a)

LAND USE

**Notes:** (a) Khadia Ward 3; (b) Kalupur Ward 2; (c) Dariapur Ward 2
**Source:** CCS, CEPT University (2011-2014)

**Figure 6.**
Variation in quantity
of data acquired
during the three
phases of fieldwork
based on the survey
methodology

| Data acquisition | | |
|---|---|---|
| Phase 1 – pilot<br>Mid June 2011-July 2011 | Phase 2<br>August 2011-July 2012 | Phase 3<br>June 2013-August 2014 |
| *1. Scope* | | |
| Extent of investigation<br>Khadia Ward 3 – pilot study | Detailed study area of 73 ha identified through reconnaissance survey as depicted in Figure 4(a) | Entire historic walled city except the areas within the detailed study area already covered in Phase 2, amounting to more than 450 ha |
| Details of data collected<br>Mapping and detailed inventory as defined in Section 3.2.1 | Mapping and detailed inventory as defined in Section 3.2.1 | Mapping and detailed inventory of selected individual properties only |
| *2. Observations and challenges*<br>Considerable time required for detailed study of the entire ward<br>Concentration of valuable properties varied from one pol to another based on the impact of ongoing processes of change<br>Numerous errors in the base map to be corrected through visual observations<br>Lack of reliable data on age of buildings<br>Difficulty in obtaining data on ownership and occupancy from field surveys<br>Difficulty in obtaining photographs with full façade coverage due to narrow street widths<br>Subjectivity in assessment of building condition and heritage value | In addition to the errors in base map<br>Difficulty in assessing time period of construction based on architectural idiom due to incremental changes and alterations to the building which have resulted in presence of elements from many different periods simultaneously<br>Impossibility to link the building ownership, occupancy and use records received from AMC to the spatial database due to lack of a common identifier<br>Large quantity of data and resultant difficulty in data processing and management using CAD and MS Excel software | Impossibility to conduct a thorough documentation of the context of listed buildings due to scale of area to be covered with limited time and manpower resources |

(*continued*)

**Table I.**

| | Phase 1 – pilot<br>Mid June 2011-July 2011 | Phase 2<br>August 2011-July 2012 | Phase 3<br>June 2013-August 2014 |
|---|---|---|---|
| Data acquisition | | | |
| *3. Response to challenges* | A reconnaissance survey to identify areas with higher concentration of valuable properties and to concentrate detailed study effort to only those areas in Phase 2<br>The field "Age" of building replaced by historical time period of construction based on architectural idiom<br>Further refinement of assessment criteria and periodic internal reviews for ensuring data consistency and removal of ambiguities<br>Ownership and occupancy details requested from the AMC | Time period, age of construction to be used only where reliable information is available, as in the case of institutional properties and some well documented residential/mixed use properties<br>Introduction of GIS for facilitating data processing and management | Further studies on the urban context of the listed properties outside the detailed study area to be undertaken as and when possible in the future<br>Efforts to integrate the official database available with the AMC by finding a way to link it with the cadastral maps to be made |
| *4. Results* | Detailed inventory of more than 800 properties<br>Comprehensive mapping of base information for the entire ward | Detailed inventory of more than 5,000 properties along with a preliminary inventory of 1,200 institutional properties<br>Comprehensive mapping of representative urban settlements within the detailed study area | Detailed inventory and mapping of more than 600 properties<br>Detailed inventory for more than 700 institutional properties |

**Source:** Author (2016)

On a request from the administrative authorities, the detailed inventories of selected Institutional properties and residential/mixed use properties were compiled in separate statutory lists to facilitate the application of varied administrative provisions for heritage conservation incentives.

AutoCAD and MS Excel were chosen for the sheer simplicity and existing know-how for their use. Considering the need for data analysis and interpretation, the presentation of inventories and the complete documentation of residential settlements "pol" were prepared at two different scales – the municipal administrative unit, ward and traditional settlement unit pol as described below:

(1) Ward database packages contain:

- Key map indicating the location of the ward, a list of pols selected for detailed study, area statement, list and location of ASI/SDA protected monuments, delineation and area statement for the zone of prohibited development and regulated development generated by the monument.

- Ward-level maps corresponding to various data sets: land use, building heights, grading and condition of valuable buildings, as well as presence of pol amenities with area distribution of each attribute on pie charts.

(2) Pol database packages contain:

- Cover page: location plan and photographs to illustrate the characteristics of the public realm as well as some exemplary buildings.

- Map sheets: the maps showing land use, building heights, pol amenities, assessment of valuable buildings and conditions of valuable buildings with pie charts showing their corresponding areas as shown in Figure 7.

- Inventory: the detailed inventory format in MS Excel with assessment and description of each property with a photograph as depicted in Figure 8.

While this database provided rich information about the inventoried properties and their context they came with inherent challenges for efficient data analysis and management as listed below:

- a large corpus of data including pol wise CAD maps, Excel sheets and thousands of photographs covering more than 5,000 properties made data management very cumbersome;

- while the pie charts provided a basic tool for analysis and understanding of the data, simultaneous exploration of two or more attributes was difficult;

- minor corrections required updating the database at three different locations; and

- limited potential for view and spatial exploration of different data sets and finite presentation formats.

*3.3.2 GIS as a tool for efficient data management.* In response to the challenges listed in Section 3.3.1, and taking into consideration the need for long-term usability, periodic up gradation, efficient data analysis and integration of spatial and non-spatial data for heritage management, GIS, using ESRI ArcGIS 10 software was adopted as a tool for data management in June 2011. The entire CAD and photographic database generated during the documentation process was transferred to GIS over the next two years and the detailed inventory formats were linked to the spatial information.
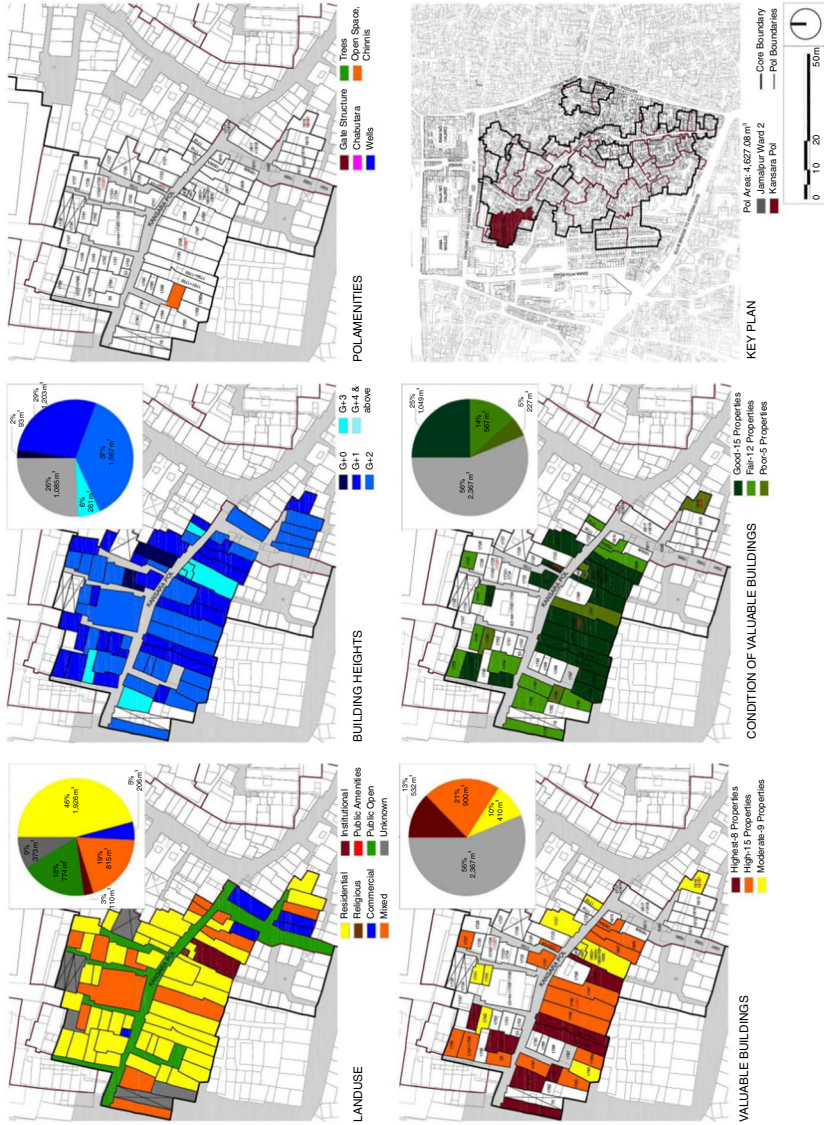
**Figure 7.**
Typical presentation
of maps in a pol
package, Kansara
Pol, Jamalpur Ward 2

**Source:** CCS, CEPT University (2012)

**Source:** CCS, CEPT University (2011–2012)

The form contains the following fields:

| | |
|---|---|
| Survey no. | Ward Name - _____ |
| Address | _____ pol |
| Land use | |
| Building ht | PHOTO |
| Significance | |
| Facade Type | |
| Section type | |
| Age/ Approx. Time Period | |
| Heritage Value | |
| Condition | |
| Description | Structure : |
| | Interesting elements : |
| Surveyed on | |

KHD 3 - 09/3 - Page 1 of 1   Detailed Study - Khadia Ward 3 - Lakha Patel Ni Pol

| | |
|---|---|
| Survey no. | Khadia 3 - 936 |
| Address | Lakha Patel ni pol |
| Land use | Residential |
| Building ht | G+2 |
| Significance | Architectural |
| Facade Type | With Embellishments- Wooden |
| Section type | Projection on the street side |
| Heritage Value | Highest |
| Condition | Good |
| Description | **Structure - Wooden** |
| | **Interesting Elements:** Elaborate wooden haveli. |
| | *Ground floor:* elaborately carved traditional entrance door, lintel, todlas, tie bands, traditional wooden columns, struts and brackets , ceiling and beam faces with mostly creepers and floral motifs along with todlas shaped like elephant trunks. |
| | *First floor:* a completely wooden facade consisting of elaborately embellished curved balustrade bands, posts, sills, window shutters, brackets and wooden jaali with plain panelling. The motifs include creepers, flowers, peacocks, animals and human figures, musicians etc. |
| | *Second floor:* post and beam structure with traditional wooden windows, carved brackets and brick wall infill. The overhang on first floor has traditional wooden structure with G.I sheet roofing and the whole building is also roofed by G.I. sheets. |
| Surveyed on | 30/06/2011 |

**Figure 8.**
Typical presentation
of detailed
inventory format

GIS-based maps along with lists and detailed inventory in MS Excel were retained as final data presentation formats.

As shown in Figure 9, Jamalpur Ward 2 was identified as a pilot study area for detailed analysis and preparation of a heritage management plan. The inventory data were augmented with details like location and size of the courtyard of the houses, sample data on risk and vulnerability assessment and location of public infrastructure networks for analysis. As illustrated in Figure 9 it facilitated simultaneous visualisation and analysis of multiple layers and variables of data.

### 3.4 Outcomes of the documentation process

The documentation of the historic city of Ahmadabad created an accessible and upgradable digital database consisting of: an up-to-date base map for an area of 543 hectares and more than 65,000 cadastral parcels on a GIS platform; mapping of land use, building heights and public facilities for more than 90 ha (Phases 1 and 2) of the urban fabric; detailed studies on various aspect of urban management for a pilot area as described in Sections 3.3.2 and 4.2, in addition to a detailed inventory of more than 6,000 properties.

*3.4.1 Legal status of the inventory.* Following consolidation and scrutiny of data from all the three phases of documentation, and as per the recommendations of an
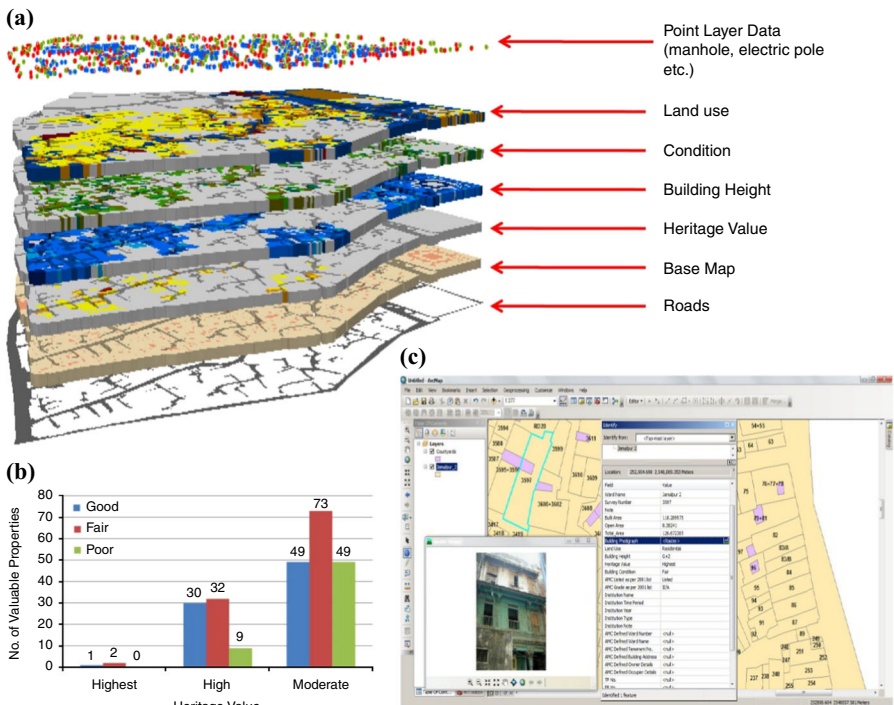


**Figure 9.**
Application of GIS for heritage inventories

**Notes:** (a) Spatial data integration; (b) analysis of relationship between total number of valuable properties, their heritage value and condition; (c) screen shot of data visualisation
**Source:** CCS, CEPT University (2013-2014)

Experts Committee Meeting called by AMC in June 2014, two lists, one with 2,247 residential and mixed use properties and another with 449 institutional properties were finalised as tentative lists of heritage buildings to be protected through provisions of the GDCR. The lists were put up for public consultation on the AMC website in June 2015. Objections against listing were raised by owners of 12 residential properties. The lists, with the remaining 2,235 residential properties and 449 institutional properties, were approved for notification by the board of AMC. As of the first week of April 2016, they are under process for approval by the state government following which they will be notified by publication in official gazette and their protective provisions will come in force. The listed buildings will also qualify to receive financial incentives like tax concessions and Tradable Development Rights from the urban authority as per the provisions of section 10 of the Development Plan 2021 (3013/3015).

The entire database was handed over to the Heritage Department, AMC in 2015 and is managed by the GIS cell of AMC.

*3.4.2 Summary of findings.* The data on land use, building heights, heritage value and building condition acquired for the inventory was complimented by detailed studies for disaster risk assessment, traffic management, social perception surveys and infrastructure mapping for a pilot area – Jamalpur Ward 2. An analysis of this comprehensive database provided some critical observations on values, socio-economic issues, vulnerability of built fabric and factors affecting the state of conservation which were instrumental for preparation of the heritage management plan for the historic city. Some of the relevant observations are listed below:

(1) Land use mapping:

- Commercial land use traditionally restricted to the primary streets and traditional mixed use streets is gradually taking over the peripheral residential neighbourhoods, with many residential buildings being converted to shops, offices or warehouses.

- The change in use is often accompanied by unsympathetic additions/alterations or complete reconstruction and loss of architectural heritage.

(2) Building heights:

- While a majority of traditional buildings in the city have Ground (G)+2 upper storeys, some of the new constructions with multi-family apartment living or for commercial use often have G+4 storeys or more and are built in clear violation of regulations.

(3) Risk assessment:

- Increased vulnerability to disasters like earthquake, fire and torrential rainfall due to: lack of maintenance; unsympathetic extensions to and subdivision of the properties; use of non-adapted new materials; insensitive (and often illegal) change of use; damage due to demolitions or additions to neighbouring buildings; extremely dense settlement pattern and limited accessibility to safe areas.

- Traditional focus of building bye-laws on new construction, lack of effective legal provisions and insufficient institutional capacity to regulate changes to historic building and their context contribute significantly to the vulnerability.

(4) Social perception:

- Most members of the younger generation are eager to move out of the city.

- The closely packed urban settlement with its emphasis on community ties and sharing is perceived as a limiting factor for personal growth. It is also unsuitable for the modern way of life where individual privacy, insular/nuclear family lives and car ownership are important indicators of social standing.

- Heritage conservation is perceived to be a very expensive activity.

- The exponential rise in price of the real estate when used for commercial purposes is an opportunity for capitalising on the family inheritance and heritage listing has a negative impact on property values.

- Lack of access to varied cultural/recreation options and quality English medium education in the historic city is a major factor for families with young children preferring to move out.

(5) Traffic management:

- Ever growing commercial activities in the historic city and the resultant increase in floating population as well as innumerable commercial delivery vehicles is a major contributor to the parking issues, traffic congestion and perception of danger in the city.

The interrelationship of various social, functional and physical attributes of the built heritage as observed in these studies draw attention to the need of holistic urban management in line with the HUL approach for the historic city.

## 4. Conclusion

While far from perfect, the process adopted for documentation at Ahmadabad was able to collect optimal data for identification, protection and conservation of significant cultural heritage assets in the historic city through heritage listing. It also provided critical understanding of the state of conservation, factors affecting the built environment and potential threats to its conservation which underscores the importance of considering the social and economic forces working in the city along with the tangible heritage. For a historic city of the scale and complexity of Ahmadabad, one time documentation and preparation of a heritage list cannot be considered an end in itself. Efforts for research and documentation of the historic built environment should be a continuous activity providing regular updates on the condition, risk and value assessment to support a holistic urban management process. To conclude a few reflections on the process adopted, its outcomes and lessons learned are presented along with suggestions on the future management of the documentation and inventory of the historic city of Ahmadabad.

*4.1 Reflections on the experience*

- Traditional paper-based mapping and descriptive forms remain time and cost efficient tools for field surveys.

- Inaccurate or outdated base maps are a major challenge for fieldwork and data registration. To avoid errors and ambiguity, the creation of a correct base map

should be the first priority. Given that it is an exercise with legal implications, the correction of cadastral maps requires active participation of local authorities who often lack resources to undertake such an exercise.

- Using a well defined fieldwork methodology, data standards and controlled vocabularies can help create consistent data and should be integrated in the project planning phase to reduce ambiguity and subjectivity in the records. However, the knowledge and understanding of the inherent complexities and values of the historic built environment often evolves significantly during the documentation process and may consequently require adaptation and refinement of work processes and standards to suit the local context.

- Preparation and management of heritage inventories entail an important financial commitment on the part of local authorities which can only be justified when the database is designed for long-term use with possibilities of periodic updating and serving larger goals in the field of urban management.

- Spending some time on thorough archival research and a few pilot surveys to test the methodology and standards at the beginning of the project may help in developing more efficient work processes.

- Change in scope of work or methodology has an important bearing on the time and resource requirements and should ideally be accompanied with relevant modifications to the same in order to achieve optimum results.

- Maintenance and presentation of inventories using CAD and MS Excel, while simple and affordable, become cumbersome when dealing with large data sets as is often the case in historic cities.

- Use of GIS allows creation of a quality database with the capacity of integrating numerous layers of spatial and non-spatial data; rapid querying for presentation, dissemination and analysis as well as real time monitoring and up gradation using mobile applications. This makes it a viable tool for urban planning and management of historic cities including heritage conservation.

- Given that most cities in India are now adopting GIS for town planning purposes, extending its application to the creation and management of an inventory can be relatively effortless. Integrating GIS from the very beginning will greatly reduce the time and effort spent in data registration, presentation and analysis.

- To ensure that the inventories remain relevant for heritage protection, the processes of notification, monitoring and inventory management should closely follow their creation. It has been observed by the author that many buildings identified in the lists have already been modified or demolished while the process of notification is still in progress. Unfortunately, the notification of a statutory list is a time consuming administrative process and the tentative lists are not legally binding for protection.

- While consultants bring in necessary expertise, skills and manpower for specialised tasks of documentation and inventory creation, the staff of local authorities can contribute important insights and also benefit by actively participating from the early stages of the process. They should be encouraged to develop a thorough understanding of the database that they eventually have to use and manage.

*4.2 The way forward*

- In view of continued monitoring and protection of the built heritage, the legal processes should be up graded to allow periodic additions of assets to the list as required based on the availability of new knowledge on the cultural heritage of the city and ensure their immediate protection without inordinate administrative delays.

- Capacity building and training of site inspectors and a data manager engaged with the Heritage Department of AMC for monitoring and maintaining an up-to-date database should be undertaken.

- While the cadastral map of the historic city has been considerably updated by visual observations, it still is an approximation and many ambiguities need to be dealt with. This should be taken up on a priority basis to create reliable and authenticated data support for future updating, monitoring and management activities.

- For the listed properties, the detailed inventory formats must be further updated to include photographic documentation of interior features, measured drawings and detailed condition assessment to guide conservation proposals and resources allocation.

- The present database should be enriched by adding the information on various aspects like property ownership, occupancy, land use, vehicle ownership and population available in varied formats with various government authorities.

- The pilot studies should be expanded to the entire city and information on geomorphology; disaster risk and vulnerability; existing infrastructure systems; social and economic networks as well as historic databases for the entire city should be integrated in the GIS to create a truly valuable research, analysis and interpretation tool for holistic urban management.

- Application of the GIS database should not be limited to use for maintenance of heritage inventory and management of historic city alone. Rather, it must be integrated in the existing urban management systems at the level of the urban agglomeration (AUDA area), to facilitate formulation of sustainable urban development strategies sympathetic to the cause of heritage conservation.

- A GIS-based web platform should be created for data dissemination and creation of public awareness regarding the significance of cultural heritage. This tool can also be designed to allow contribution of relevant supplementary information, citizen monitoring and stakeholder feedback. It can be further useful for real time onsite monitoring and reporting of state of conservation by the AMC inspectors.

- Use of arches, an advanced geospatial database platform specifically designed for creation of cultural heritage inventories and management can also be explored for: increased functionality and flexibility in database design including possibility of linking various data types and resources for enhanced information; efficient querying; high level of customisations and the possibility of tracking data edits while being compatible with existing GIS systems.

- Last, but not least, safety of data are of prime importance and best practices for protection from data corruption and loss should be employed.

## Acknowledgement

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