Urban Heritage Mapping: GIS Applications based Archaeological Explorations of Earliest Medieval Cities of Delhi

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Abstract: *Surrounded on two sides from the Aravalli ridge and river Yamuna on the third side, the landscape of Delhi provides a perfect setting for the evolution of an urban centre. Early rulers established the cities of LalKot and Qila Rai Pithora. The paper seeks to examine geospatial documents, the extents of Lal Kot and Qila Rai Pithora with the evolving change in the natural and anthropogenic factors leading to changes in the fort remains. Applications of Remote Sensing (RS) and Geographical Information System (GIS) are done in order to accurately trace the boundaries of the forts which was then used to conduct a field survey in order to trace and document the remains. In this context, the remains of these forts have been examined and given the historical importance which are in close proximity to the UNESCO World Heritage Site, Qutub Minar. This study establishes the extent and expanse of the historical monuments, urban settings, their protection status and natural habitats and cultures.*

Keywords: Lal Kot, Qila Rai Pithora, Urban Heritage, Remote Sensing, GIS

1. Introduction

The landscape setting of Delhi forms a significant triangle where two sides are covered with the Aravalli ranges (South and Southwestern side) and the third side by river Yamuna, giving it unique locational advantage with regard to fertile settlement area as well as safety and security of various kingdoms. The history of Delhi dates to prehistory during the time of *Mahabharta* and the city of *Indraprastha*. However, the city's first recorded establishment starts towards the end of the 1st millennium when Anang Pal Tomar ruled the city around the 11th century. He created the first cities of Delhi, Lal Kot and Qila Rai Pithora which were then partly destroyed by the Muslim invaders. Itwas however extended as part of the Qutb complex where they had their residences and place of worship. The Slave Dynasty, which ruled after the native rulers of Delhi, built Mehrauli or Qutb complex with structures like QutubMinar, QuwwatUl Islam Mosque and residences many of which are in ruins today. With the advent of the Turkish rule, Delhi expanded further with the establishment of Siri, Tughlaqabad, Jahanpanah and Firozabad significantly altering the landscape setting of Delhi. The paper mainly focuses on the firstmedieval cities of Delhi i. e. Lal Kot and Qila Rai Pithora. This study provides information on the exact archaeological remains of the two cities based on Remote Sensing (RS) and Geographical Information Systems (GIS). It also talks about the urban heritage aspects given that the present setting of these cities is part of major urban areas of Delhi. The use of RS and GIS has been done to locate the fort extensions of Lal Kot and Qila Rai Pithora, after which extensive fieldwork was done to identify and explore these structures. Some part of the fort lies under the purview of the Archaeological Survey of India (ASI) and comes under its protection boundary. The fact that a lot of remains are still left to be identified and brought under the protection status keeping their heretological status intact makes this study relevant for the analyses of medieval cities of Delhi.

History of Lal Kot and Qila Rai Pithora
Lal Kot and Qila Rai Pithora are the oldest cities of Delhi. While it is established that Lal Kotwas founded first, there are various debates on Qila Rai Pithora whether it was an extension of Lal Kot or was built by the successive ruler. The fort was built by Tomar King Anang Pal Tomar in the middle of the 11th century. The king brought the iron pillar from Mathura and installed it in Delhi as the inscriptions suggest. It is suggested that this place was taken as the center on which the city of Lal Kot was built with the construction of the fort [1]. The circumference of the wall was more than 3.5 km with a height of 60ft and a width of 30ft. According to B R Mani, Anang Pal Tomar constructed Lal Kot which was in ruins and the ancestry of the kingdom could be traced as back as Mahabharat [2]. However, there haven't been any built or buried structures found in or around the fort of the Mahabharat period. "Qila Rai Pithora" was first used to describe Lal Kot in the 16th century by a Mughal court historian Abu'l - Fazl in his book Ain - i - Akbari where he writes that Qutub Complex was inclusive of Qila Rai Pithora and that the fort was also the first site where early Delhi Sultanate rulers settled [3]. The present location of the city falls in the urban sprawls of South Delhi, Saket, Mehrauli, Sanjay Van, Kishangarh and Vasantkunj areas [4].

RS and GIS Analysis
RS and GIS Analysis: In order to geospatially map the two forts, extensive use of RS and GIS was done with context to literature and old maps (colonial). There were a few old maps that were explored that showed the old cities of Delhi. There have been maps that show all seven cities of Delhi in which prominent boundaries of Lal Kot and Qila Rai Pithora are marked. The map of 'Seven Cities of Delhi' has been used in this study becoming a base for RS and GIS analyses [5] (Figure 1).
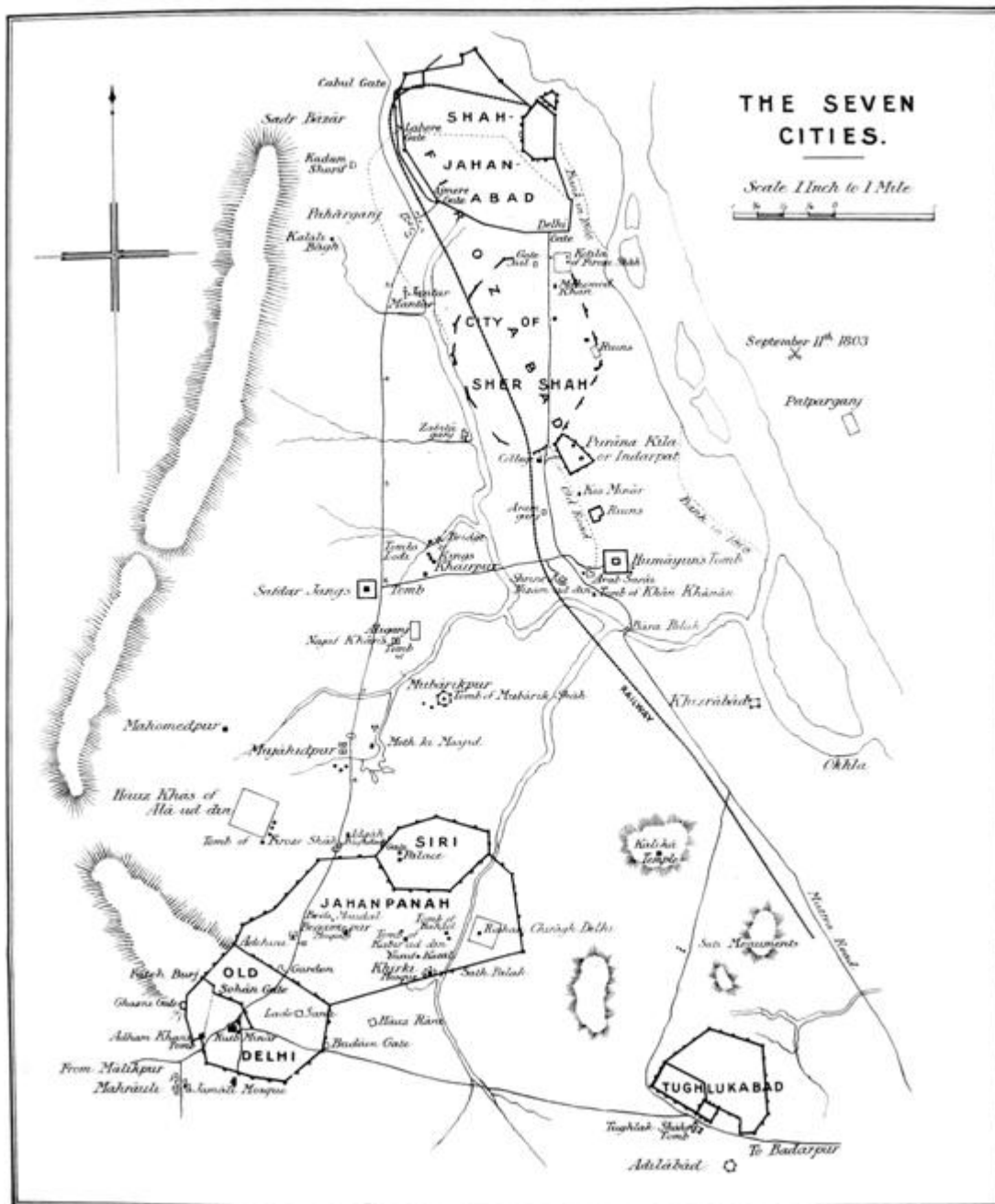
Figure 1: The Seven Cities (1867)

The map was georeferenced on Google Earth base map in order to bring out the old boundaries in context to present settings. Georeferencing is a method by which old maps and topo maps are given coordinates in order to identify the exact locations of the map features. Hence, georeferencing becomes one of the most basic steps for identifying and exploring archaeological remains using RS and GIS. The degree of error depends on how accurately ground control points (GCPs) are given. For higher accuracy, it is emphasized to take GCPs from old maps which are marked as a built feature or a road interaction as it becomes easier to identify the same features on the current base map (eg. Google Earth). Landscape features such as natural drainage channels or river flow direction are generally avoided as these natural features change with time and will present a greater degree of georeferencing error. A path file (shapefiles) was then created and the exact location of the fort areas was put on Google Maps to explore, access, record

and ground truth the geospatial field data (Figure 2). In this respect, another feature of GIS analyses, Google Earth pro provides functionality to look past 2 - 3 decades of satellite images of a given area. Such images provide a temporal shift in the landscape with continuous changes in natural vegetation and built structures. Use of this information is vital for field work and exploration as different access areas can be identified using this information: vegetation and built structures which can be overlooked due to no patterns of archaeological remains can be looked upon in detail with signs and patterns in older images.

The next step was to obtain Corona Satellite images that have been declassified by the US government back in the late nineties. Corona satellite images were high quality images taken all over the world as part of a Discoverer Program in the US in the 1960s and 70s. The name of the program was a decoy for the general public and the main

objective was to spy across the world and hold an upper hand in the ongoing US - USSR cold war. Given that technology was yet to be fully developed, balloons with sensors used to be sent up and the pictures were used to be collected as packets that the balloons would release at a given point in time and place. However, as the technology grew and became accessible to the world, these images were declassified in phases by the US government in the 1990s. The benefits of these images are wide - ranging for research purposes across different fields such as climate and environment studies, landscape studies, archaeological explorations etc. One of the reasons for this benefit is that global urbanization has taken a shift upwards causing innumerable changes in the landscape settings. In India, its use is immensely significant due to rapid urbanization over the past few decades. In the context of this study, the Corona satellite images show the extent of human intervention in and around the two forts, which is discussed later in the paper [6]. (Figure 2)
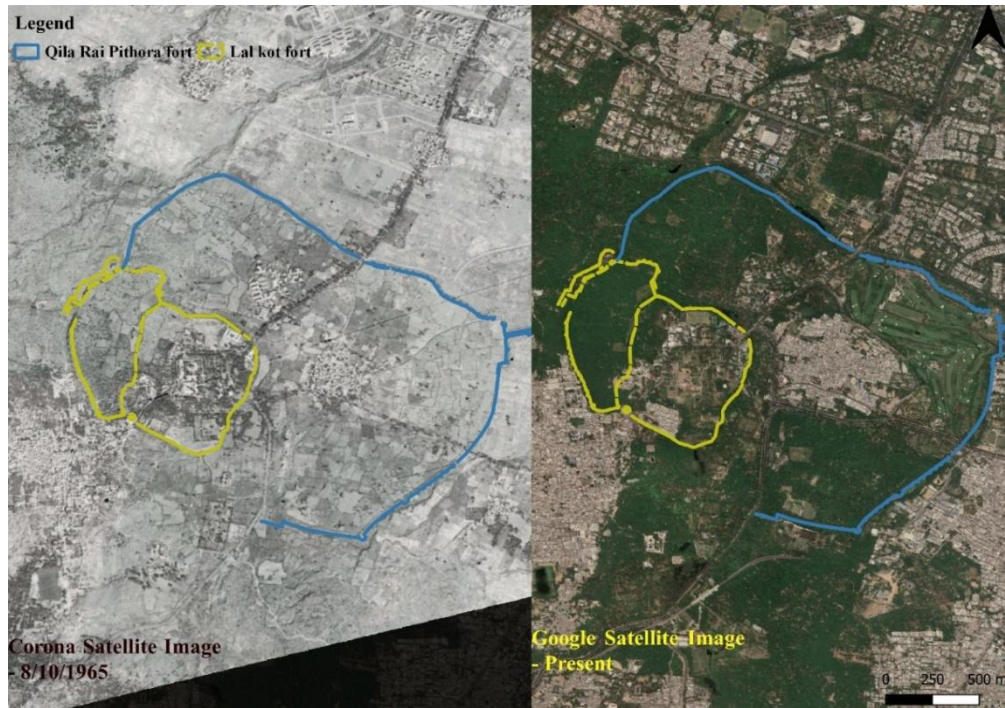

Figure 2: Comparative analyses of Corona Satellite image (8/10/1965) and Google Satellite image (present) to showcase increase in urban settlement in and around the two forts
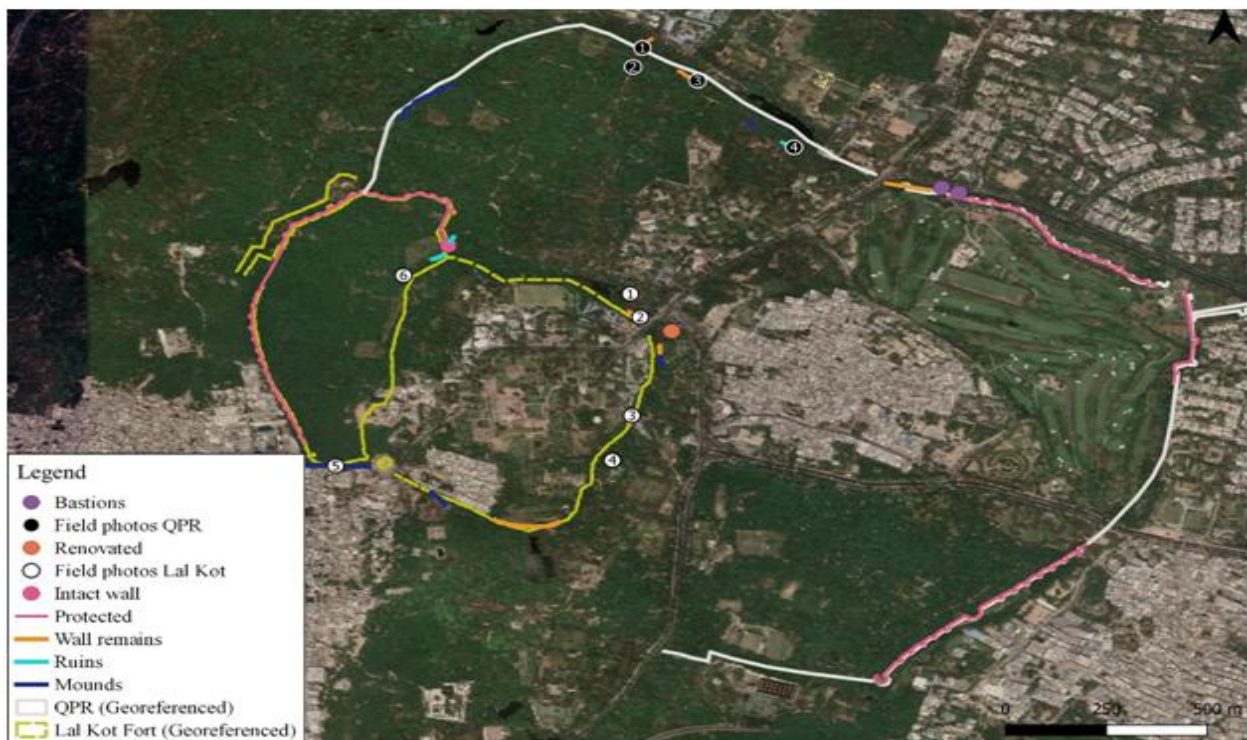

Figure 3: Field explorations based on GIS Analysis showing different remains of Lal Kot and QPR Forts (See Figure 4 and Figure 5 for field images)

Map description (200):

After exploring several old maps of Delhi of colonial times, the map of 'The Seven Cities (1867) was chosen to analyze and georeference. The map showcases the boundaries of all seven cities of Delhi with associated structures and hence gives varied pointers to bring accurate GCPs for its georeference. Another reason for this map selection was because individual boundaries of Lal Kot and Qila Rai Pithora are not present in any of the old maps that were searched in spite of the fact that the map is not planimetric and seems relatively indigenous when compared to the maps of its contemporary times (put examples). Early medieval cities such as Lal Kot, Qila Rai Pithora, Tughlaqabad, and Jahananah are prominently marked on the map whereas later cities of Sher Shah and Ferozabad are shown with dashed outlines. The scale for the map is present with a north - south directional orientation. It also encompassed the landscape setting of Delhi marking the extent of Aravalli ridges on the northwest and southwest and the flow of River Yamuna on the eastern side. Apart from the information on the boundaries of the seven cities, the map provides information on the medieval routes as well which are marked from Shahjahanabad. One of the routes goes from Ajmeri Gate of Shahjanahbad to Mehrauli ensuring Jahanpanah and QPR while another route starts from Delhi Gate extending to Mathura and crossing the City of Sher Shah with an elaborated path towards Tughlaqabad. Drainage networks are also marked with Satpula drainage channels shown prominently. The place of the second Anglo - Maratha War is highlighted as well.

Field explorations: Lal Kot

Lal kot Fort comprises a smaller area and circumference when compared to Qila Rai Pithora. It is situated around the immediate vicinity of the Qutub Complex in the southeast and Sanjay Van in northwest. A prominent part of Lal Kot has been identified and protected by the Delhi Development Authority (DDA). However, geospatial data gave possible areas where field explorations were necessary in order to identify and record the structure of Lal Kot present in any form (mounds, ruins, intact). (Figure 3)

Ground truthing for Lal Kot fort was started from a clockwise direction after the DDA protected part of the fort. On the northeastern edge of the fort boundary (based on the georeferenced map), a moat was located which seemed to be just outside the fort had the fort been present around it (Figure 4.1). The moat feature would possibly be a natural one and was regulated to use for defense purposes. Following the fort clockwise, a major chunk of a completely intact part was found just near the major road intersection. It was evident that the fort part was hidden in plain sight and came in between the Delhi Jal Board and the starting of Sanjay Van Park (Figure 4.2). It was covered with thick vegetation as well and provided a danger for wild animals also if ventured closely around it with no security. The clear visible length of the wall that was seen was close to 30 - 40 meters and could have been more but inaccessibility due to thick vegetation became a hindrance to further explore that part of the fort.

Moving further clockwise, another part of the fort was located, although the architectural features suggested it had been renovated. Again, as further southern exploration was made, half of the fort remains were found in between the park and Ojas Art (Figure 4.4). Even though the fort part was completely inaccessible, it was located from the terrace of Ojas Art. Following the fort boundary further, just outside the entrance of Qutub Complex part of the fort was visible which was closely attached to the local drainage channel (Figure 4.3). It was completely inaccessible to follow that part. The next remains of the fort are found via accessing Mehrauli Archaeological Park where a lot of mounds can be traced at the north end of the Park. Close to 50 - 60 meters of the broken wall remains of the same architectural material as that of Lal Kot were found but was inaccessible due to thick vegetation. At the southern part of the fort, it is seen going eastwards adjacent to Aadam Khan's Fort. Large chunks of disoriented as well as intact wall parts are closely found at the boundary of Sanjay Van (Figure 4.5). However, it is not clear where the exact protection status of DDA's protected boundary ends. Just east of the central portion of the fort area, field investigations showed that different type of remains of the fort was seen just before the signage of the DDA protection board (Figure 4.6). These ruins are present in a thick vegetation cover and are completely inaccessible, even taking photographs from a distance was hindered.

Even with extensive geospatial mapping and ground truthing of Lal Kot Fort, there is still the scope of further field explorations to identify more areas where the Fort could have been present in different forms. The above - mentioned field investigation had its limitation such as inaccessible vegetation blockages, wild animals in the Sanjay Van, drainage areas, etc.

Figure 4: Field investigation of Lal Kot Fort (See Figure 3 for locations)

Field Investigation: Qila Rai Pithora

The northern and northern eastern part of the fort is well protected by ASI and is more prominent than that of Lal Kot. the field investigation of Qila Rai Pithora was started from the protected boundary to access if any part of the fort lies outside of it. Coincidentally, the northern protected boundary falls inside the Qutub Golf Course, where one of the prominent bastions falls outside of the Golf Course and lay very close to the nearby road. Following the wall in the clockwise direction according to the georeferenced map boundary, it connects to the point where a small segment of the Jahanpanah wall meets Qila Rai Pithora [7]. From there, the wall goes further southward and is again protected. However, how much of the wall is protected further is unclear as thick vegetation growth starts from the southwest part and continues till the entire cover of Qila Rai Pithora till is meets Mehrauli Archaeological Park.

Moving toward the eastern and northeastern parts of the fort, it shows similar remains to that of Lal Kot since it also falls under the dense forest cover of Sanjay Van. It is worthwhile to note that from the point of the northern part of Lal Kot's protected features, just a few meters north the remains of Qila Rai Pithora start to appear (Figure 5.1). Although, another limitation was there to capture the ruins as the entirety of that particular stretch had a colony of monkeys and hence only the path was recorded. The entire stretch is filled with partial remains and ruins of Qila Rai Pithorafort with numerous identifiable mounds. Going further in the clockwise direction, the walls can be seen in much more visibility with larger remains (Figure 5.2). One point to note is that a different built material structural remains can be seen (made of stone) which is completely inconsistent with that of Qila Rai Pithora's

Figure 5: Field investigation of QPR Fort (See Figure 3 for locations)

yet its location is significant as it lays just on the same track (Figure 5.1). Following the wall further, a series of traces of the fort is evidently visible with construction material laying around the location of the map boundary. Moving further east, as the vegetation starts to fade, remains are also less seen with only comprehensible mounds identified (Figure 5.4). The north of this stretch lays another possible natural moat that could have been used as a defensive attribute.

In the same case as of Lal Kot, an extensive field investigation was done with a further potential to explore negating the limitation of vegetation, wild animals and bad social elements as was in the protected areas of Qila Rai Pithora.

Urban Heritage prospects of the two cities:
Qila Rai Pithora: Above mentioned field investigations give an insight into the present setting of Lal Kot and Qila Rai Pithora and how it is associated with various other urban elements of South Delhi. The image (maps generalizing all different sorts of remains) shows that a lot of built heritage of the significant part of Delhi's earliest settlements still exists, although in an alienation. These unexplored and undocumented fort remains to provide a great potential to integrate heritage in various aspects of South Delhi. At present, these edifices are seen as a liability rather than a resource that can be utilized to create holistic values in leisure, heritage, culture, education, art, etc. At the same time, with the given community landscape in and around Lal Kot and Qila Rai Pithora, a value - based heritage management plan can be incorporated where not only these structures will be deemed as culturally resourceful, but it will also work for the upkeep of the fort remains. The first and foremost thing that could be done for these two sites is to assign a multidisciplinary team with experts in the field of history, geospatial studies, archaeology, conservation, heritage management, forest department, public policy, social sector, urban planning, transport planning, community engagement, educationalists and any other stakeholders associated with the regional component of these structures.

As discussed above, the exact historical data of the relation between Lal Kot and Qila Rai Pithora forts are not present and hence it has always been a point of discussion among

scholars. This has led to a gap in building a culture, especially among the neighborhood communities which can be seen in other parts of Delhi such as the walls of Shahjahanabad. The team of historians can engage in a dialogue to put the present Lal Kot and Qila Rai Pithora in a significant and historically important landmark providing context to its identity. A close association with the neighborhood can mark a cultural shift, especially with the permanent residents and educational institutions. One such association can be in the form of labeling these sites as the formation of Delhi as we know it today. The role of geospatial documentation and providing protection status comes next. The concerned authorities such as State Archaeology, DDA, or ASI are limited by the urban aspects of the remains which can be tackled later once concrete geospatial documentation is done. This will not only map and locate the site in the present but will always give an insight into the damages incurred in the past due to activities like encroachment or uncontrolled vegetation growth. At the same time, it will provide a geospatial landscape setting that can be analyzed in the future so that the fort remains do not deteriorate further.

Field investigations showed that the remains of both Lal Kot and Qila Rai Pithora are in need of conservation. A sustainable conservation plan would not only protect the sites in the future but will take care of the causes which might affect the further deterioration of the site. It is important that this part of the work is done in consultation with heritage managers who can provide a holistic approach to not just built heritage but other aspects as well such as creating a trail for people to access the site in the forest. Consultation with the Forest Department should be done to take care of limitations and work on the potential of tourists coming to the site. Data on demography and security can be utilized by the heritage manager to bring up viable solutions to make this site not only accessible but valuable also. Close proximity to UNESCO World Heritage Site QutubMinar, Mehrauli Archaeological Park and Siri Fort can also be utilized by the heritage manager to create a narrative with respect to the oldest settlements in Delhi and its further growth. It is worthwhile to mention here that any heritage proposed plan requires time and constant work to create and channelize the cultural resource value among the locals and

every heritage place will have different takers. Efficient work on these fronts will bring the outcome in the form of demographics that can connect and associate themselves.

During the field investigations of both the sites, it was evident that they both are now surrounded by burdening urban sprawls which need to be taken care of. Around the southern part of Lal Kot near Aadam Khan's tomb, an urban settlement in Mehrauli has crammed up space. The gap between the fort extension and the settlements is brought by just a main road with constant disturbance to the site with nearby bad elements of society and open garbage disposal just adjacent to the fort boundary. Deterioration due to garbage disposal and excessive indulgence of locals in activities near the site has simple and effective solutions that need to come by experts who work in urban planning. In theory, the problem might seem simple to remove the garbage disposal near the site but that garbage disposal has to go somewhere else and occupy space. And hence the loop will continue, thereby making the role of urban planners immensely important to take surveys and identify solutions on urban settlement fronts which itself will show fruits near the heritage sites. The fort of Qila Rai Pithora presents a different problem in the same umbrella. The fact that most part of the protected boundary comes under Qutub Golf Course becomes a hindrance to a hassle - free outing and hence with time, it gets lost in an authoritarian subject. Heritage and urban planners will have to closely work together to identify such small details of limitations. Another example shows hindrance to mobility due to gated residential communities in Saket where the eastern part of the fort lies. Such aspects might show these are permanent limitations but bringing a viable solution will require a lot of research. Security around the protected monuments is merely present which allows people who do recreational drugs and alcohol drinking to occupy the space and threaten people who have arrived at the site for some leisure time. The southern part of the Qila Rai Pithora protected fort tends to provide an ideal space to conduct activities for school, workshops, and host events (to be done while not harming the monument) which is seen in places like Old Fort and QutubMinar. There is enough diversity in the local neighborhood which will allow footfall for such activities.

Creating a memory among people of the historical significance of the place is important, which needs to be done in layers. Around the close vicinity of both the forts, numerous schools are present which take students to QutubMinar and Mehrauli Archaeological Park. In continuation and adding to the context of the history, students can be enlightened about Lal Kot and Qila Rai Pithora and shown the growth of Delhi as one of the most habitable cities in the world with the inclusion of interactive and informative heritage walks. There is a lot of potential to bring heritage value to these forts among the people but requires adequate research and the involvement of experts from different fields. These methods have been in constant use in European sites where sustainable heritage models are followed largely.

2. Conclusion

Geospatial documentation of the first cities of Delhi in context to the landscape setting is vital to understand the settlement growth of Delhi. There are many aspects of RS and GIS studies that can be done to understand the drainage channels using DEM (Digital Elevation Models) but such a detailed study falls outside the purview of this paper. Current analysis has shown the actual remains of Lal Kot and Qila Rai Pithora which have been lost in the local memories, the same as that of Jahanpanah fort. Field explorations have shown the immense role of RS and GIS studies in order to obtain the exact locations. It has also helped to contextualize the associated landscape and its importance during the formation of these historical cities. It also paves the way for further field investigations into other historical cities of Delhi such as Jahanpanah and Siri Fort.

The study has also shown the limitations of these sites to have a cultural impact. These limitations have been consistently present in the form of forest covers on the fort remains, perpetual encroachment in and around the fort areas, insufficient management of already protected sites leading to uncivilized cases, etc. As discussed in the heritage management case study of Lal Kot and Qila Rai Pithora, a lot of potentials is still present in making these sites closer to people. Collecting data on exact demography, encroachment, forest department, etc. needs to be done in much more detail so as to visualize a solution which can then be given enough time to bring out the desired results. These approaches have been taken in other cities and even done in a few other heritage precincts of Delhi, but a holistic SOP (Standard Operating Procedure) needs to be created so that the diversification and subtle variations on different sites are managed accordingly.

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