Reconsidering Authenticity: Alternative Preservation Strategies for Siheyuan in Beijing

Ida D.K. TAM

College of Architecture, Art, and Planning, Cornell University, Ithaca, NY 14853, New York, United States

*Corresponding Author: dt332@cornell.edu

Copyright © 2014 Horizon Research Publishing All rights reserved.

Abstract Through the case study of Dazhalan, one of Beijing's 25 preservation districts, the following article evaluates Beijing's current preservation and urban design policies specific to protection and rehabilitation strategies for traditional courtyard houses, Siheyuan, and their alleyway neighborhoods, Hutong. Beijing's ambitious 1990s Master plan attempted to define a totalizing image and characteristic form for the entire Old City.[1] This city-wide preservation policy have produced solutions that also handicapped the city's ability to accommodate changes. Despite the designation of twenty five historic zones, ambiguities in the legislation, such as the lack of definitions of 'style' and 'harmony' that new constructions should adhere to, resulted in the destruction of 77% (9,720,000 sqm) of Siheyuan and 7000 Hutong.[2] Instead, preservation policies must be revisited and expanded to incorporate community building, sustainability, and contemporary design tools and methods to better address conflicts between inevitable social changes and historic image.

Keywords Urbanization, Preservation, Traditional Courtyard Housing, Siheyuan, Hutong, Beijing, Computational Design Methods

1. Introduction

The 2008 Beijing Summer Olympics was a major catalyst for the capitol's modernization and economic development. In order to make way for the Olympics, many traditional courtyard housing neighborhoods communities were torn up both physically and socially by way of demolition and forced evictions. The scale and speed of erasure of these historic neighborhoods escalated international concerns of historic preservation across China. However, in actuality, the transformation of Hutong neighborhoods dates back to 1949.

In just 60 years, with the exception of monuments and landmarks such as the Forbidden City and the Drum and Bell Towers, over 77% (9,720,000 sqm) of Siheyuan, traditional courtyard houses in Beijing, have been demolished. Over 7000 Hutong[3], narrow alleyways between the blocks of

Siheyuan, have also disappeared as a consequence of rapid urbanization and land reform. (Figure 1)

Beyond the loss of historic architectural heritage, the bulldozing of traditional Hutong neighborhoods has caused irreparable destruction to the social fabric of Beijing; communities have been displaced and residents have been relocated to new towns in the outskirts of Beijing[4]. Frustration from forceful clearance has led to social unrest, and in extreme cases, suicide attempts. [5]

(a) In 1949, Total residential area 13,540,000sqm; Siheyuan 12,720,000sqm
(b) In 2000, Total residential area 0.42 bil sqm Siheyuan 3,000,000sqm
(c) Population Density in Siheyuan
(d) 2010, Number of Siheyuan

Figure 1. Changes in Siheyuan since 1949[6]

Since 1990, historic preservation in Beijing has been approached at three regulatory scales: (1) individual sites, (2) streets and districts, and (3) the Old City as a whole[7]. However only the regulations targeting preservation of individual sites is well-defined, and only this policy among the three is well-enforced.

1.1. Objective

Despite Beijing's 1990s legislations, the continued

destruction of Hutong, as demonstrated by the events leading up to the 2008 Olympics, clearly reveals that the policies surrounding preservation and urban design demand re-evaluation. The objective of this article is to evaluate the consequences of current Beijing preservation and urban design policies, through review of the criteria for what to preserve, specific to the protection and rehabilitation of Siheyuan and Hutong. Based on an analysis of the district of Dazhalan as a case study, this paper proposes to expand the scope and function of preservation in Beijing to include community building, sustainable and computational design strategies and methodologies to better accommodate social and cultural evolution.

2. Background Materials and Methods

2.1. Definition of Terms

Historic preservation and conservation are evolving concepts, defined relative to a specific time, culture, and place. In the context of this article, these terms should be understood as follows:

Historic preservation: similar to the term "heritage conservation" commonly used in the United Kingdom, is used a general term that refers to several kinds of treatments of historic properties including preservation, rehabilitation, restoration, reconstruction, or combinations of these treatments.[8]

Preservation: applying the measures necessary to sustain the existing form, integrity, and materials of a historic property. Preservation work generally focuses on the ongoing maintenance and repair of historic fabric rather than extensive replacement or new construction.[9]

Rehabilitation: adapting a property for continuing or new compatible use through repair, alteration, or additions, while preserving those portions or features that convey its historical, cultural, or architectural values.[10]

Restoration: accurately depicting the form, materials, features, and character of a property as it appeared in a particular period of time. Restoration retains as much of the fabric of the historic period as possible. Inconsistent or anachronistic features may be removed, and missing features may be faithfully reconstructed in accordance with the historic period.[11]

Conservation: prolonging the life and strengthening the integrity of the architectural character, such as form and style, or of a building's materials, such as stone, brick, glass, metal, or wood. In this sense, the term refers to the "professional use of a combination of science, art, craft, and technology as a preservation tool." [12].

2.2. Overview of Historic Preservation in Beijing

The government of Beijing adopted preservation policies as early as 1957[13], when shortly after the Cultural Revolution, the government identified individual

monuments for protection. By the year 2000, more than 800 [14] sites were placed under protection and underwent restoration.

The attitude of historic conservation in Beijing and in China at large differs greatly from that of the West. The goal of conservation in the Western world, particularly Europe by the 18th century[15], is to present the object in a way that the object's message remain comprehensible without distortion; efforts are made to protect the actual pieces of artifacts of important historic buildings. Any interventions to the state of an object should be minimal, with preference given to methods of intervention that are reversible, identifiable, and will not prejudice possible future interventions[16]. As a consequence, European landmarks tend to show their age.

On the other hand, the objective of preservation in China, has historically been politically motivated. Historic Chinese capital cities were often destroyed in the warfare between newer and older dynasties. Damaged buildings were repaired with an emphasis toward establishing a continuity of form and usage, which would in turn sustain cultural continuity and imperial pride[17]. Today, the monumentalizing of historic sites acts to glorify political power[18] through honoring the past, with the goals to stimulate patriotism and help to ensure the political stability of the country. Methods used in historic conservation tend to rebuild, restore, replace, and repaint elements of monuments to the extent that they look brand new. These interventions are not meant to be identifiable or reversible, and they would not likely fit Western definitions of preservation.

In 1982, national preservation legislation expanded the scope of protection for zones by adding the protective measure of 'drawing certain construction control zones in the vicinity of the preservation site' to ensure the maintenance of the environmental character of the monuments[19]. But it was not until 1999 that the Beijing municipal government approved the boundaries and detailed plans for the protection of twenty-five preservation districts[20]. However, neither of the legislative acts provided guidelines for the appearance of new buildings or for their relationships to each other and to public space. The only implied guidance for the design of individual projects was the suggestion that each new development should mimic the treatment of monuments by being set off from its context and surrounded with greenery and open space. Though new buildings within the zones were required to be limited in height and stylistically harmonious with the historic architecture, this stipulation lacked specificity,

providing no definition of 'style' or 'harmony.' [21]

2.3. Overview of the Architectural Components of Hutong Neighborhood

2.3.1. Siheyuan

Siheyuan (Figure 2), meaning "quadrangle," is an 800 year-old traditional building typology prevalent in Beijing, consisting of four one-story, tile-roofed, grey brick buildings surrounding a central courtyard. Siheyuan are of sociological

interest in that their physical characteristics reflects the socio-economic status of the owners in relation to their community, while residential Siheyuan's internal organization and composition reflects the familial hierarchical structure of its residents.

Figure 2. Siheyuan 800 year-old traditional building typology

This basic unit is the typological model used for residences, palaces, temples, monasteries, family businesses and government offices[22]. Variations on the Siheyuan structure include increasing the number of courtyards, which,

in addition to size of buildings, and material finish or ornament, reflect the wealth and status of the owner. For example, a typical person's residential Siheyuan will likely have one courtyard with a primary building to the North, while a titled or wealthy family's residential Siheyuan would likely have two or more courtyards in which the major courtyard would be situated in the center, separated and protected by the "Fore courtyard", a walk-through pavilion, and "corner courtyards" at the rear end[23].

2.3.2. Hutong, the alleyway

Hutong (Figure 3) is the alleyway that forms in between blocks of Siheyuan planned according to the etiquette systems of Beijing. It follows a clear hierarchical organization and classification system: a big street (DaJie) is 19-36 meters wide, a small street (Lu) is 10-18 meters wide, and alleyway (Hutong) is 1-9 meters wide, spaced 60-70 meters apart, and run east-west in parallel lines. Hutong form the living room of Beijing. For example, on the contrary to the private courtyard within Siheyuan, these circulation routes serve as open spaces providing venues for T'ai Chi, mahjong and chess, playground for children's play.

Figure 3. Different components of a Hutong neighborhood (Below)

2.3.3. The cultural meaning of Hutong neighborhood

The wall and its organization plays a very important role in the organization of Siheyuan and Hutong neighborhoods; it represents stereotypical characteristics of Chinese people. The inner courtyard satisfy the introverted, quiet demeanor, private and domination of family-minded values[24]. It is a physical, as well as psychological boundary that separates the family from the external world. In addition to the tall and windowless perimeter wall that borders the Siheyuan, the gate at the southeastern corner is connected to a screen wall to minimize external visual intrusion. In contrast, the Hutong spatial organization limits visitors to only pedestrians and cyclist, thus enabling a way of life that creates a strong sense of community within its neighborhoods.

2.4. Evolution of Hutong Neighborhood Since 1960s

2.4.1. Densification

During land reform of the 1960s, the rooms in courtyard houses were assigned to different residents. To accommodate more families, larger rooms were subdivided into more units by transforming Siheyuan from single family to multi-family occupation. During the population explosion of the 1970s, “self-help housing activities” started to emerge as informal unit extensions constructed by residents to cope with overcrowded living conditions. (Figure 4)

Figure 4. Densification Black- Self-help housing activities” to increase living spaces White- Original Siheyuan Structure

2.4.2. Widening of Road

As Beijing became more urbanized, car ownership became widespread and infrastructure for emergency vehicle access became necessary by modern building codes. In 1993, the Beijing Master Plan required nearly all street rights-of-way to be widened to relieve congestion[25]. However, there was no consideration given to the environmental and social impact of such requirement. In many instances, Hutong are widened by literally slicing off the fronts of Siheyuan (Figure 5), the fragmented facades are then patched with poorly made or found materials. The configuration and privacy of the typology are tremendously

altering.

Figure 5. Widening of Road

2.4.3. Historic Preservation of Siheyuan and Hutong Neighborhood

The earliest designation of Siheyuan for historic preservation started in 1984. At that time, only individual Siheyuan that were considered worthy of preservation as examples of classic Qing residential architecture to be protected. As of the 1993 Master Plan revision, the number of Siheyuan being designated to municipal-level has grown to thirteen. Preservation of Siheyuan as a neighborhood only began in 1990, when the Municipal Government initiated designation of twenty-five sites as “historic-cultural districts”. However it was not until 1999 that the municipal government approved specific boundaries and detailed plans for the districts to be protected.[26]

2.5. Methods

2.5.1. Selection of Case Study

To understand the impact of Beijing’s current preservation policy beyond the theoretical implications, the Dazhalan Preservation District has been selected as a case study. Dazhalan, a grassroots neighborhood situated immediately south of the imperial wall, Northwest of Tiananmen Square, South of the Forbidden City, and north of the Temple of Heavens, is one of the twenty-five designated preservation districts in Beijing.

Since the Ming Dynasty (AD1369), Dazhalan has been one of the most important commercial and residential regions in Beijing. (Figure 6) Unlike most neighborhoods in inner Beijing, which functioned to serve the imperial family and nobles, Dazhalan is unique in that its primary function was to serve the commoners(laobaixing). It is comprise of diverse typologies including traditional retail, factories, academic, public and residential spaces. As a result of its unique grassroots socioeconomic status, its infrastructural grid has unconventionally deformed from the rest of the city grid. In addition to the conventional East-West Hutong, Dazhalan also has Hutong running perpendicularly from North to South, and diagonally from Northwest to Southwest

to maximize the economic efficiency needed.

Figure 6. Location and historic context of Dazhalan

Based on the above factors, Dazhalan provides a representative case study to evaluate the successes and shortcomings of current Beijing preservation and urban design policies.

2.5.2. Research Scope and Methods

For this case study, Dazhalan is divided into three primary areas: East Dazhalan, North-South Dazhalan, and West Dazhalan (Figure 7), categorized by their predominant typologies, massing organization, land-use and demographic.

- (1) East Dazhalan
- (2) North-South Dazhalan
- (3) West Dazhalan

Figure 7. Different areas of Dazhalan

2.5.2.1. Site Massing Organization and Plans

As “self-help housing activities” resulted from densification of Siheyuan are not officially registered and legally documented. In order to obtain a realistic picture of the neighborhood, surveys are conducted on site to draw up plans and sections. “Self-help structures” and alternations to original building structures are being documented, analyzed by cross examining information gathered from site inspection, interviews with owners and tenants, historic and

current photographs, aerial photographs, also the basic typological model of Siheyuan.

2.5.2.2. Land Use and Demographic

To understand the change in land use and demographics of Dazhalan, three key periods are being identified: Pre-1960, before the era of land reform and urbanization; Post 1990, after the designation of twenty five historic district of Beijing were established; and Post 2000 when the long term effects of Open Door Policy starts to appear. Historic maps and photographs, government registry, interviews with owners and tenants were being collected and analyzed by cross examining information to arrive at the most appropriate deduction.

Figure 8. Key map of Survey

3. Results and Observations

Among the three areas, similarities and differences in transformations can be found and are summarized in Table 1.

3.1. Description of Observations

3.1.1. Restoration: Commercial Sector (East Dazhalan)

East Dazhalan has been occupied by traditionally well-known commercial institutions, corporations and old brand name businesses (Lao zhaos). Notable retailers exceeding 100 years in business include: Tongrentang-Chinese herbal medicine; Rui Fu Xiang- silk fabric; Ma Ju Yuan- hats; Nei Lian Sheng- shoes; Zhang Yi Yuan- the tea shop. Dazhalan was also the former entertainment center of Beijing hosting the five grand Chinese opera theaters.

In the 1980s when the commercial strip of East Dazhalan was pedestrianized, retail landmarks and theaters were restored to their original appearances; broken elements were being replaced. Notable residences were restored and repurposed to house government offices, hotels, clubhouses and restaurants to exclusively serve high-end customers and politicians.

Table 1. Summary of results

	East Dazhalan	North-South Dazhalan	West Dazhalan
Historic Typologies and Demographic	<ul style="list-style-type: none"> Mixed use: Traditional commercial with shops in the front and living quarters at the back Entertainment: Housed the five grand Chinese opera theaters and the first movie theater in Beijing High income residential 	<ul style="list-style-type: none"> Middle income residential Local retail Religious: temples and mosques 	<ul style="list-style-type: none"> Art and craft retail selling craftwork, artistry, antiques Highly skilled workshop producing glazed tiles for palaces, temples and residences of officials Academic Institutions were scholars, painters and calligraphers to gather, write compile and purchase books
Current Typologies and Demographic	<ul style="list-style-type: none"> Traditional commercial Tourist retail Museums High income residential 	<ul style="list-style-type: none"> Low & middle income residential Local retail Religious: temples and mosques 	<ul style="list-style-type: none"> Tourist retail selling low end artstries, often fake antiques Restaurants and teahouses
Primary Preservation Methods	Restoration	Neglected in preservation and modern transformation processes	Reconstruction
Agents of change			
Densification	None found along the main arteries, increase in density further inner Hutong	<ul style="list-style-type: none"> Single family housing turned into multi-family occupation High density of 'self-help housing activities' 	None found along the main arteries, increase in density further inner Hutong
Widening of Road	~2-3 m on both sides of the street	~1m on both sides of the street by directly slicing off the parameter wall and front facades	~2-3 m on both sides of the street
Resulting urban fabric	Façade and interiors restored to original appearance financially supported by tourism and high end service industry investment	Derelict and fragmented façade	<ul style="list-style-type: none"> Newly constructed standardized grey brick façade with overly simplified traditional ornamentation Disneyland theme park style of standardized retail units

The facades of these structures remain physically intact, look newly built, and the interior retail spaces have been expanded as much as permissible. However, the original configuration, in which retail is situated at the front face of the building connected to living quarters via a courtyard, no longer exists. The current main demographics of visitors include day-workers, tourist and high-income consumers. Neighborhood shop owners, sales persons, laborers, who used to work and live in the community, have moved to the outskirts of the city where rent is more affordable. The diversity and close neighborhood ties that once defined the area have now disappeared. (Figure 9)

3.1.2. Reconstruction: Cultural Sector (West Dazhalan)

West Dazhalan, an area that includes the famous Liulichang arts and crafts street and Rong Bao Zhai Arts Academy, once housed the most reputational art institutions, colleges and bookstores in the country. However the fact that West Dazhalan is located within the boundary of Dazhalan Preservation District did not save the area from destruction. Under the pressures of skyrocketing land values and low economic incentive to preserve academic typologies, the original historic buildings were demolished.

New identical standardized grey brick shells are constructed in place of the historic facades. These new constructions are set back to allow for vehicle access in Hutong. They are rented out to antique, arts and crafts

retailers who sell low end art pieces, souvenirs, and often fake antiques catered towards tourists. Since most art academies and institutions were not reinstated, West Dazhalan is no longer a place for knowledge exchange and art creation. In an attempt to emulate the past, West Dazhalan falls just short of resembling a Chinese version of Disneyland theme park. (Figure 10)

Black- New Built Structure
White- Original Siheyuan Structure

Figure 9. East Dazhalan (For location refer to Figure 8)

Black- New Built Structure
White- Original Siheyuan Structure

Figure 10. West Dazhalan (Refer to Figure 8 for location)

3.1.3. Neglected: The Local Community (North-South Dazhalan)

North-South Dazhalan is a region that is mostly residential, connected by a network of local community and local retail services. Off the bustling boulevards and major avenues of commercial activities, this area has been less attractive to real estate developers and therefore remains highly residential, occupied by multiple families and filled with “self-help housing activities”.

As deduced from the surveys, these “self-help housing

structures” are direct extensions adjacent to the subdivided Siheyuan houses. They are 2-3 meters in width, and often used as kitchens and cooking spaces. These units usually only contain one room which the living and sleeping are integrated. In some instances, bigger units are rented out by bunk beds equipped with no living and dining areas. Furthermore, these “self-help structures” are often built of temporary materials, construction waste and scavenged materials characterized by short life spans, structurally unstable and non-compliant of building code and fire regulations. The high density of “self-help housing structures” leaves circulation spaces between units to less than 1 meter, and eliminating almost all open spaces of the courtyard. (Figure 11)

As residents generally lack living and leisure spaces within their own unit, the role of the Hutong as the communal space has gained growing importance. It often becomes play and study areas for children, kitchen and dining area for families during unbearably hot summer. The original private courtyard spaces are turned into semi-public corridors, these corridors are turned into small courtyards whenever possible. (Figure 12)

Black- New Built Structure
White- Original Siheyuan Structure

Figure 12. North-South Dazhalan

To widen the roads with the least cost, Siheyuan houses were being cut and sliced off a meter inwards. This dismantled one facet of the perimeter wall of Siheyuan; the four sided wall then became 3 sided. In low-income areas with little investment, the fragmented facades can only be patched with shoddy materials. The boundaries between public and private, inside and outside become further blurred, redefining the privacy levels of the Siheyuan.

Figure 11. North and South Dazhalan Survey Results

4. Discussion

4.1. Evaluation of Current Scope and Goals of Preservation in Beijing

The case study of Dazhalan has exposed three main issues regarding its current scope and goals of preservation in Beijing: museumification, gentrification, and false preservation.

4.1.1. Museumification

The 1990s Master plan for preservation attempted to define an overall characteristic form for historic Beijing. With the goal of preservation, primarily political and patriotic, Beijing is designed to be appreciated “from up high, rather than on the ground, in the street.”[27] This over-simplified, top-down policy suggested that preservation is more an expression of state power than an act aimed at sustaining the local culture embodied within everyday life. The city of Beijing is in the danger of being ‘museumified.’

Museumification is a process originated from museums, though not necessarily confined within one. In the interpretive medium of museumification, everything is a potential ‘artefact’ - entire villages, or abstractions such as ‘ethnicity’ and ‘nation,’ or even human beings. Yet, reality cannot be represented: museumification distorts, inverts and subverts meanings. [28]

In East Dazhalan, it is true that investments from tourism and high-end service industries have maintained individual monuments and notable Siheyuan alive. Meanwhile, the Hutong, which lie off the major avenues of the imperial city, such as those of North-South Dazhalan, wait in neglect, undergoing rapid deterioration. Among others, Kees van der Ploeg[29] theorized: by trying to freeze the city in time, it is in danger of becoming “a sugary-sweet backdrop” that “bears hardly any real relation to normal urban activities, between image and reality”. In addition, on a city scale there are far greater historic buildings than can be turned into museums; it is not financially realistic to restore all buildings worthy of preservation without creating conflicts with present needs. By attempting to turn the city in an open air museum is also making it incapable of coping with contemporary challenges.

4.1.2. Gentrification

The historic designation of neighborhoods and the attempts to preserve the city often lead to gentrification; East and West Dazhalan, are no exception. Architectural preservation has created an enclave of wealth, business, and tourism, the market forces forced the poor to move, frequently pushing them outside the city’s center. These new typologies marginalized populations such as laborers, artisans, neighborhood store-owners, the underemployed and the elderly. They are expelled from the historic environments of their own culture, often by forceful clearance and minimal compensation. Since 1990, more than 580,000 Siheyuan residents[30] have been relocated to the outskirts of Beijing.

Frustrations from these forceful clearances have led to public protests and lawsuits against lower-level government agencies and real estate, in extreme cases, suicide attempts.

4.1.3. False Preservation

As discussed earlier in section 2.2, based on the differences in attitude of conservation between East and West, whether reconstruction and restoration of the Siheyuan can be classified as historic preservation is still largely disputed. Nonetheless, the effort of restoration in East Dazhalan, similar to other historic landmarks in Beijing such as those on Qianmen Main Street, is hardly an accurate depiction of the original buildings as they appeared in any dynasty. They have failed to demonstrate the potential historical significance of these ancient structures and to achieve the objective of restoration which is to retain as much of the historic period fabric as possible.

The method of ‘reconstruction’ in West Dazhalan is a also very representative example of preservation in Beijing and can be found in the vicinity of major landmarks such as Houhai and Qianhai lakes, the Drum and Bell tower. Unfortunately, it has proven to be unfaithful to the definition of reconstruction; and did not attempt to retain as much of the evidence of the historic period as possible. The new construction methodologies are standard shells that are being plugged into the site. Other than material palette and scale, these reconstruction methods have no relation to the historic property that once existed. Despite being protected by legislation, by no means has the historic fabric been faithfully preserved.

4.2. Expanding Scope and Goals of Preservation in Beijing

The singular and formal aims of the current preservation policies have reinforced the narrow and exclusive approach to urban investment. This has resulted in the loss of historic architectural heritage and displaced the previously diverse socio-economic classes, further exacerbating social inequity between rich and poor. As argued by Rose[33] on the evolution of scope and goals of historic preservation of the United States in 1981, on top of the two phases which is first “to inspire the observer with a sense of patriotism,” and second to preserve for cultural, artistic and architectural merits, in order to maintain the physical environment necessary for an urban community, it is more important in providing procedural vehicles for community organization and activity.

As demonstrated in the case study of Dazhalan, there is an emerging urgency to expand the preservation with the aim of strengthening local community ties and social organization. The following sections propose an expanded scope and function of preservation in Beijing to include community building, sustainable design strategies and methodologies to better accommodate social and cultural evolution.

4.3. Design Considerations in the Expanded Scope of Preservation

4.3.1. Typology and Demographic

If authenticity and aura are the integral and desirable aspects of a neighborhood, to capture and preserve a historic neighborhood is more than preserving the formal qualities of the neighborhood. It also requires the preservation of the kinds of people who make up the community of that neighborhood. Therefore, when assessing a building's importance to the community, criteria to be considered should not be limited to its age, historic significance and architectural merits, but also include the present typologies of the community.

4.3.2. Energy Optimization

Similar to vernacular housing types in other cultures, Siheyuan evolved as inherently efficient and sustainable responses to the geographic and climatic factors by building organization, orientation and scale. However, such sustainability principles are compromised by the unplanned densification and overpopulation of residents. Therefore, any design solutions should try to generate value through high energy performance, low maintenance and cost-effective construction solutions, in order to provide better living conditions, and incentives for continuous investment.

4.3.3. Computational and Digital Simulations Tools

Consider the inseparable link between computational tools and performance. As computational tools, such as digital simulation, rationalize scientific behaviors and turn them into design trials and viable alternatives, design solutions generated are inherently efficient and performative. Digital stimulation design tools also allow designers to develop inclusive site strategy that potentially improves the environmental conditions and prepares for repercussions in future crisis. Not only does it offer new sets of nonlinear constraints and opportunities, working both bottom-up and top-down, it also forms a series of feedback loops that connect varied scales and scopes, providing more inventive, performative and economic alternatives.

4.3.4. Conceptual Reconsideration of Traditional Building Elements

In East Dazhalan and West Dazhalan, restoration and reconstruction preservation approaches have adopted the strategy of referencing the past. They utilize the symbolic value of traditional architectural elements and forms to rebuild the identity of the location, and make it instantly recognizable as very "Chinese." Traditional building elements of Siheyuan have rich and intricate values that used to be cultural, functional and economical. However, such literal translation of architectural languages diminishes their relevance to us, and much of the meanings and functions are lost in the relentless evolution of human societies. Therefore, to effectively deploy the symbolic values of traditional building elements, we must repurpose them and give them meaning and function that is relevant to our time and demands.

4.4. Potential Design Methodologies

4.4.1. Daylight System

Assuming the need to increase occupancy capacity of Siheyuan's original accommodation, the daylight system attempts to search for the most energy-optimized scenario for densification. By inputting 3-dimensional data of the site into energy analysis software, building mass, geography and climate information is utilized to generate, a datamap of daylight factors of each site subdivision. (Figure 13) Datamaps of optimized locations for light wells and outdoor spaces are being identified. Progressive densification scenarios are also being generated, ranging from most dense to least dense. (Figure 14) All these scenarios are then consolidated into one single datamap incorporating different priority of factors such as growth, economics and program.

Figure 13. Daylight datamap model

Figure 14. Progressive datamaps of optimized locations for light well and outdoor spaces

4.4.2. Wind System

Much of the Hutong's characteristics are defined by walls; namely, the height and distances between the perimeter walls that bordered the Siheyuan. As a consequence of road widening, privacy has decreased, and the wall has opened up new privacy levels. This might give rise to a new opportunity

in which we can reinterpret the cultural significance of the wall that defines the characteristics of Hutong.

Traditionally, brick was only allowed to move in 2 dimensions creating a flat facade. If we turn the normative arrangement into three dimensional structural configurations, we can begin to generate porosity and volume using its modularity efficiency and produce a new wall that has different degrees of porosity that encourages interaction and filtration between inside and outside.

The frequent sandstorms in winter and heat waves in summer have posed difficult challenges to the building performance in Beijing. By beginning with behavioral studies of seasonal air-flow in Beijing (Figure 15), computational models are set up to translate the data of direction and magnitude of wind vectors into variable parameters. These parameters govern the degree of rotation and separation in between bricks, forming a 3-dimensional structure that will be further refined by daylight, natural ventilation and programmatic strategies. (Figure 16) We can then efficiently generate variation in porosity and volume due to its inherent modularity.

Figure 15. (a) Wind rose of Beijing (b) Wind vector

5. Conclusion

In conclusion, without developing a formalized set of criteria for strategically prioritizing buildings for preservation, together with the financial realities paired with a preserve-all attitude, have resulted in the deterioration and ultimate loss of potentially invaluable architectural gems. This handicap, imposed by the blanket desire to maintain formal characteristics of Hutong across all of historic Beijing, functions to suffocate the city by neglecting development of the non-monumental, yet still important, neighborhood communities.

Through insights gained from Dazhalan, we can see that despite the effort to emulate the past, the preservation of classes is lost and thus reminds us the need to design for the community, which includes their socioeconomic, cultural and behavioral patterns. Ultimately, identity and authenticity is generated and regenerated by the people who live in Hutong.

By proposing the use of computational and digital

simulation tools, it is suggested that any resulting interventions should not be just an object with architectural merits, or a new skin that possesses material and textural connection between the past and present, but also a performance-based solution that is capable of dynamically responding to community building, environmental and pragmatic considerations.

Figure 16. Wind vector translated into orientation and spacing between bricks

Acknowledgements

I am very grateful to my thesis advisors, Andrea Simitch and Jenny Sabin for their knowledge and support to the development of this paper; Lily Chi and David Salomon for their guidance and inspirations in conceptual stages of the thesis. Ran Yan for her expertise in historic preservation. Also illustrator Yau Tai; editors Tiffany Arakaki, Leslie Ayers, Wenfang Li, Kate Loh, Colin McCrone, for their tremendous time and patience; and special thanks to Anh Tran for her support since the first submission.

REFERENCES

- [1] D. B. Abramson, The aesthetics of city-scale preservation policy in Beijing Planning Perspectives, 22 (April 2007), p.129–166
- [2] M. Greist, Making Place for Neighborhood in Beijing, University of Florida, Journal of Undergraduate Research Volume 8, Issue 6 - July / August 2007. Online available from www.clas.ufl.edu/jur/200707/papers/paper_greist.html
- [3] M. Greist, Op. cit [2]
- [4] M. Greist, Op. cit [2]
- [5] M. Greist, Op. cit [2]
- [6] M. Greist, Op. cit [2]
- [7] Beijing Municipal Cultural Relics Bureau, Xin Bian Wenwu Gongzuo Shouce [New Edition of the Handbook for Cultural Relics Work]. Beijing: Beijing Yanshan Press, 1996, p. 457.
- [8] Guide to Historic Preservation, The American Institute of Architects, 2001, p. 2. Online available from <http://www.aia.org/aiaucmp/groups/aia/documents/pdf/aia075381.pdf>
- [9] Op. cit [8]
- [10] Op. cit [8]
- [11] Op. cit [8]
- [12] M. E. Weaver, Conserving Buildings: A Manual of Techniques and Materials. New York: John Wiley & Sons, 1997, p. 1
- [13] Beijing Municipal Cultural Relics Bureau, Xin Bian Wenwu Gongzuo Shouce [New Edition of the Handbook for Cultural Relics Work]. Beijing: Beijing Yanshan Press, 1996, p. 457.
- [14] Beijing Municipal Cultural Relics Bureau, Op. cit [13]
- [15] A. M. Tung, Preserving the World's Great Cities: The Destruction and Renewal of the Historic Metropolis. New York, p. 163
- [16] Stille, The future of the past, Picador, 2003, p. 56
- [17] M. Feilden, Conservation of Historic Buildings, Architectural Press, 1982, p.5
- [18] M. Tung, Op. cit [13], p. 165
- [19] M. Tung, Op. cit [13], p. 165
- [20] B. Abramson, Op. cit [1], p. 139
- [21] B. Abramson, Op. cit [1], p. 139
- [22] G. Wang, "Kaifa Jianshe Zhong de Beijing Jinrong Jie: Ji Beijing Jinrong Jie de Guihua yu Jianshe [Beijing's Financial Street in Development and Construction: Notes on the Planning and Construction of Beijing's Financial Street]," Beijing Guihua Jianshe [Beijing City Planning and Construction Review], Vol.41 No.4 (July 1995) p. 32–34.
- [23] Da Zhou Yang, Take a Lesiure Stroll in Hutong of Beijing, Wa Wen Press (2003), p.5
- [24] Mingde Li, A Culture Tour to Beijing Hutong, China Architecture & Building Press, 1st edition (November 2005), p. 19
- [25] X. Hu, Boundaries and openings: spatial strategies in the Chinese dwelling, Policy and Practice, J Hous and the Built Environ, 2008, p. 357
- [26] B. Abramson, Op. cit [1], p. 141
- [27] D. B. Abramson, Op. cit [1], p. 139
- [28] D. B. Abramson, Op. cit [1], p. 141
- [29] P. Dellios, The museumification of the village: cultural subversion in the 21st Century, Culture Mandala: The Bulletin of the Centre for East-West Cultural and Economic Studies, The Bulletin of the Centre for East-West Cultural and Economic Studies, Volume 5 | Issue 1 Article 4, 11-1-2002, p. 1
- [30] W. Denslagen, Romantic Modernism Nostalgia in the World of Conservation, Translated by Donald Gardner Amsterdam University Press, 2009, p.9
- [31] M. Greist, Op. cit [2]