Spring 2014

A City Within A City: Protecting the Spirit of Hutong

Yuan Yuan

Follow this and additional works at: https://surface.syr.edu/architecture_tpreps

Part of the Architecture Commons

Recommended Citation
https://surface.syr.edu/architecture_tpreps/236

This Thesis Prep is brought to you for free and open access by the School of Architecture Dissertations and Theses at SURFACE. It has been accepted for inclusion in Architecture Thesis Prep by an authorized administrator of SURFACE. For more information, please contact surface@syr.edu.
A CITY WITHIN A CITY
Protecting the Spirit of Hutong

ARC 505 | YUAN YUAN |
PRIMARY ADVISOR: YUTAKA SHO |
SECONDARY ADVISOR: ROGER HUBELI

THESIS PREPARATION | May 6th, 2014
Municipality: 6,336.14 sq mi
Urban: 528.31 sq mi
(Manhattan land area: 22.96 sq mi)
# CONTENTS

1. Introduction  
   Historical Preservation  
   Infrastructure in jiaodaokou Area  
   Demographics in jiaodaokou Area  
2. Statement  
3. Modality  
4. Development Trends  
5. Issues  
   Sanitation  
   Social Space  
6. Methodology  
7. Project  
   SECTION I: waste-water system  
   Beijing Water System  
   Site Analysis  
   New Waste-water treatment in Hutong  
   Different Typologies  
   Type I  
   Type II  
   Type III  
   Design Criteria of the system  
   SECTION II: social network  
   Social Programs's distribution on site  
   Section I_public bath house  
   Section II_outdoor fitness center  
   Section III_bike rental
A ‘Hutong’ is a narrow lane. The term is believed to be Mongolian in origin, since it first appears in Beijing’s Yuan Dynasty [1206-1271] records. It originates from the word ‘hottog’ in Mongolian meaning ‘water well’. Where there was a spring or well, there were residents.
Historic preservation in China is a relatively new concept. Throughout China’s recent history, urban development has focused on modern buildings and high density housing. The tension between “old” and “new” are in constant conflict in the realm of architecture and design. Decades of housing disinvestment during the Cultural Revolution produced dilapidated and unsafe housing structures.

The chinese way of developing is to destroy the old and build the new. Therefore, historical preservation was not part of the urban plan and concept. Preserving the past has been seen as the opposite of progress and modern.

In recognition of the urgency of current situation, the preservation of the historical and cultural city was included as a key objective of the first time in the Master Plan of Beijing. The goal of the preservation strategy is to protect important relics, preserve the physical environment, as well as maintain any existing social and cultural practices of the site.

In 1990, the Conservation Plan for 25 Historic Areas in Beijing's Old City was created in order to designate and outline preservation methods in and around the Forbidden City and the Old City’s historic North-South axis. These sites included 260 Hutong and 200 Siheyuan, protecting 17% of Beijing’s old city and 5% of the remaining hutong neighborhoods.
The lanes have their own layout and structure, and when viewed from the air the combination of the lanes and courtyards resemble a chessboard with delicate gardens, fine rockeries and ancient ruins. This makes them a wonder in the world. Because of the cross interlacement of the lanes, every house is connected to the other, making it easy for local people to keep in touch with their neighbors.

The ownership of the courtyard house owned by a single family. During the Culture Revolution in China, the ownership was giving back to the city government. Right now, several families share the courtyard house.
DEMOGRAPHICS IN JIAODAOKOU AREA

Residents

2006 Jiaodaokou Area

<table>
<thead>
<tr>
<th>AGE</th>
<th>TOTAL 100%</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-18</td>
<td>14.69%</td>
<td>7818</td>
</tr>
<tr>
<td>19-35</td>
<td>22.39%</td>
<td>11917</td>
</tr>
<tr>
<td>35-49</td>
<td>29.77%</td>
<td>15845</td>
</tr>
<tr>
<td>50-59</td>
<td>17.10%</td>
<td>9101</td>
</tr>
<tr>
<td>60-74</td>
<td>9.92%</td>
<td>5280</td>
</tr>
<tr>
<td>&gt;75</td>
<td>6.14%</td>
<td>3265</td>
</tr>
</tbody>
</table>

House Ownership
- public housing: 22%
- private property: 72%
- work-unit housing: 6%

House renting population
- local residents: 30%
- tenants: 70%

According to a survey by the team consisting of THF experts and Tsinghua students, 64% of the residents were mostly satisfied and like their home, 26% were dissatisfied and disliked their home, 10% said simply that they have gotten used to it.

Average income of the residents in Jiaodaokou area is CNY 9,000 (USD 1,475) per family. It is much lower than the Beijing’s 2013 local average annual income, which is CNY 24,902 (USD 4,082) per family.

Normally, people go to toilet times per day. According to the *Code on Sanitation of Beijing*, every 1000 residents should have 100 m² toilet, and 8 toilets should serve for 100 families in Historical Hutong area.

When the surveyed residents were offered the hypothetical choice to move into a newly-built apartment block, more than 60% expressed their preference to stay in their present Hutong lane under any circumstances, and only 34% agreed to move out if offered what they regard as adequate financial compensation, and depending on the suitability and location of the new flat. Without sufficient compensation, 82% would refuse to move.

Tourists

Domestic Visitors

2005 Jiaodaokou Area

<table>
<thead>
<tr>
<th>AGE</th>
<th>TOTAL 100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-14</td>
<td>1.66%</td>
</tr>
<tr>
<td>15-24</td>
<td>20.80%</td>
</tr>
<tr>
<td>25-44</td>
<td></td>
</tr>
<tr>
<td>45-64</td>
<td>22.20%</td>
</tr>
<tr>
<td>&gt;65</td>
<td>6.64%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PURPOSE</th>
<th>Domestic Visitors 2005 Jiaodaokou Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Royal Court Yard visiting</td>
<td>34.76%</td>
</tr>
<tr>
<td>Memorial site visiting</td>
<td>20.40%</td>
</tr>
<tr>
<td>Hutong visiting</td>
<td>13.72%</td>
</tr>
<tr>
<td>Old Citygate visiting</td>
<td>3.05%</td>
</tr>
<tr>
<td>Boating</td>
<td>5.33%</td>
</tr>
<tr>
<td>Food</td>
<td>12.22%</td>
</tr>
<tr>
<td>Other</td>
<td>10.12%</td>
</tr>
</tbody>
</table>

International Visitors

2005 Jiaodaokou Area

<table>
<thead>
<tr>
<th>AGE</th>
<th>TOTAL 100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-14</td>
<td>1%</td>
</tr>
<tr>
<td>15-24</td>
<td>6%</td>
</tr>
<tr>
<td>25-44</td>
<td></td>
</tr>
<tr>
<td>45-64</td>
<td>39%</td>
</tr>
<tr>
<td>&gt;65</td>
<td>12%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PURPOSE</th>
<th>International Visitors 2005 Jiaodaokou Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Royal Court Yard visiting</td>
<td>43.9%</td>
</tr>
<tr>
<td>Memorial site visiting</td>
<td>46.9%</td>
</tr>
<tr>
<td>Hutong visiting</td>
<td>3.05%</td>
</tr>
<tr>
<td>Living experience</td>
<td>5.33%</td>
</tr>
<tr>
<td>Old Citygate visiting</td>
<td>12.22%</td>
</tr>
<tr>
<td>Boating</td>
<td>10.12%</td>
</tr>
<tr>
<td>Food</td>
<td>13.72%</td>
</tr>
<tr>
<td>Other</td>
<td>6.64%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DURATION of STAY</th>
<th>Domestic Visitors 2005 Jiaodaokou Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 hr</td>
<td>78.4%</td>
</tr>
<tr>
<td>1-2 hr</td>
<td></td>
</tr>
<tr>
<td>2-4 hr</td>
<td></td>
</tr>
<tr>
<td>1 day</td>
<td>21.6%</td>
</tr>
<tr>
<td>&gt;1 day</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DURATION of STAY</th>
<th>International Visitors 2005 Jiaodaokou Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 hr</td>
<td></td>
</tr>
<tr>
<td>1-2 hr</td>
<td></td>
</tr>
<tr>
<td>2-4 hr</td>
<td></td>
</tr>
<tr>
<td>1 day</td>
<td></td>
</tr>
<tr>
<td>&gt;1 day</td>
<td></td>
</tr>
</tbody>
</table>

Every day, there are thousands of tourists from all over the world come to Hutongs to enjoy the way of lives in the historical area. Many Hutongs have already transferred from original housing types into commercial pedestrian streets. Tourism is perceived as good for the local economy.
Hutongs forms the grid-like network of the historic Beijing, where residential neighbourhoods are defined by a fish-bone-shaped borders. The hutong network has a particularly close relationship with the planned layout of irrigation channels, settlements, markets, and traffic corridors.
The ancient Chinese believed that humanity should exist coherently with the nature. In Siheyuan, which are the houses stand along the Hutong, the connection with nature is expressed through the centrally located courtyard. The grey brick walls and the low-angled tile roofs create the ancient atmosphere in that historical area, because the materials are quite different from the factories processed materials of the modern buildings, such as the pre-cast concrete and glass. At the same time, the relationship between family and family is pretty closed in that area. Many tenants have to share a courtyard, sometimes they have to share kitchens and bathrooms as well. There are lots of street markets selling vegetables and meat. Residents are willing to go out of the houses to play, go shopping, or take a rest. The Hutong now becomes a space for social communications to keep in touch with each other.

Because of these characters of Hutong, it attracts thousands tourists to visit these kinds of historical area to feel the local life. Many young people came to these areas to run their business. Some of them want to be an envoy to propagate the Chinese culture, some of them want to provide the new and young atmosphere in the old historical area. The architectural pattern of the old houses and the way of people's living become the engine to attract the money and investment from outside of the area.

The houses are old, and the basic functions of them could not be the standards of current living condition nowadays. One issue is the sanitation system. Because the sewage system in the old city is quite old, it can not support too many new pipes going into the single houses. So the residents have to go out to use the public toilets. In terms of the coding, 8 toilets should serve for 100 families, which means that 1 should serve for 12. But the current condition is that 1 toilets serves for about 40 families. And because one single courtyard house is divided into several small units to rent, there are at least 3 families share a single courtyard. So the spaces are quite limited both inside and outside the courtyard houses. So many activities are going out of the houses, which occupied on the Hutongs.

There are 2 main reasons why the residents still want to stay in that area. The 1st is because they grew up in that area, they are quite familiar with the neighborhood around. It is accessible to the market, bus stations, restaurants and so on. This reason works more on the old generation. The 2nd reason is because the living condition is not good enough, so the rental fee is lower than the rest area in the old city. The young generation could afford the rent in terms of that. In order to improve the living condition of that area, more new public toilets need to be built. The waste-water treatment system attached to the public toilets is the constructed wetland system.

There is no doubt that if the whole area are tore down, new types of houses build up in that area is one way to solve the problem. But those families who could not afford the high rent have to move out. The tourists who come to the area and want to feel the old types of building and the traditional way of lifes will not come anymore. It will affect the economy and investment in that area, so the value of the whole area will disappear. So the new strategy on the site needs to change less current condition, and provide more opportunities for the residents or the visitors to stay and pay attention to these types of preserved area.
The ancient Chinese believed that humanity should exist coherently with the nature. In siheyuan houses, the connection with nature is expressed through the centrally located courtyard. The combination of solid (buildings) and void (courtyard) creates a strong spatial contrast.

Because several families share one courtyard house now, the space of the courtyard are so limited. Residents are willing to go out of the houses to play and take a rest. The lanes now become a space for social comminuation to keep in touch with each other.

Many lanes are great stops for travelers and Beijing-dwellers alike. Some lanes once residential back alley is now another wannabe trendy lane packed with wi-fi cafes, cute restaurants, boutique shops and a couple of bars, which bring a large amount of money into the historical area.

Every year, the city government will hold Hutong Festivals to attract tourists to the local area in Beijing. During these events, there are lots of performers and stalls on the lanes.
Development Trends

1950- Private Rental Housing

Private housing was concentrated in the hands of a few landlords that rented housing to the working class.

1956-1976- Public Rental Housing

The State controlled housing allocation rent standards, and management. Original landlords received rent from the state instead of tenants. Work Units paid low wages to employees but also had to provide subsidized housing for their employees.

1988 to 2008

There has been an increase in homeownership and a decrease in rental housing. Private housing and homeownership have been encouraged through government subsidies. Families have more freedom in choosing housing types. Presently, housing has become more complex with a mixture of public and private housing and a mixture of rental and owner occupied housing.

2008 to present

The Olympic games was a catalyst for much of the recent large scale infrastructure projects and iconic buildings. Unfortunately, the large infrastructure projects have been built through the destruction of historic buildings and neighborhoods in the Old City. In 1949, there were over 7000 hutongs in Beijing. By the 1980s there were only 3,900 left. From 1990 to 1998, Beijing demolished 42 million square meters of housing in the Old City. Approximately 32,000 families, or about 100,000 people, were not relocated, while others waited over five years to find a new home.

Redevelopment trends in China have failed to incorporate resident participation in the redevelopment process. Instead, residents are usually forced out, relocated, or left displaced. Some scholars blame redevelopment projects for the loss of diversity, vibrancy, and community.

The rapid redevelopment and residential displacement have broken original resident’s social networks...
According to the Code on Sanitation of Beijing, every 1000 residents should have 100 m² toilet in Historical Hutong area. The User Service Radius of the public toilet in the historical area is 100m.

Right now, the quality and quantity of the public toilets in the area could not satisfy the need of the local residents.

SECTION 1: SANITATION

- Quantity

In the Jiaodaokou zone, there are 3 public toilets serving around 100 to 130 families in the 16 courtyards. On average here, 40 families share a toilet.

1 : 40

Some people wish to install a water-flush toilet in their home or courtyard. But space for such an installation needs to be identified, and a connection to the sewage needs to be made [and paid for]. In the Jiaodaokou area, 22% of the resident families already have at least one water-flush toilet in the courtyard.

- Quantity

Toilets on the streets
Presidents: New Design language

Public toilets in Hutong

Designs public toilet for Beijing
Michael Young

keeping in mind that the site is positioned within the classic stone work of the basic local housing, and within walking distance of one of the Chinese capital’s major cultural landmarks, the Hong Kong-based studio developed a scheme that reflects and responds to these two factors; which could also be applicable to other buildings of varying size.

A typical lavatory would consist of five holes in the ground, lacking any kind of partitions of flushing mechanism. In wanting to change this and provide proper drainage for waste, as well as privacy, the designer has envisioned an interior space of four stalls (two back to back) which allows for easy cleaning.

The architect has developed a series of 4 units that offers the user both privacy and stimulation. In this structure, it’s really important to improve user quality of life through additional drainage and privacy. The interior offers user easy cleaning, great air flow, and management of the industrial aspects that are housed such as power terminals and drainage.

The design provide privacy and save energy at the same time.

Private toilets in Siheyuan

Beijing Hutong Bubble / MAD
Construction Cost: 400,000 RMB
2009

The hutong bubbles, inserted into the urban fabric, function like magnets, attracting new people, activities, and resources to reactivate entire neighborhoods. They exist in symbiosis with the old housing. Fueled by the energy they helped to renew, the bubbles multiply and morph to provide for the community’s various needs, thereby allowing local residents to continue living in these old neighborhoods.

Hutong bubble 32, includes a bathroom since residents of hutongs usually have limited space with no indoor bathroom, and includes a staircase to the roof garden, taking the shape of a bubble, it is attached to the wooden column and brick structure of the old building.
SECTION 2: SPACE
for social communication

In most historical city quarters, the streets act not only as auto and pedestrian transportation arteries, but also as unofficial playgrounds for children, dining areas for restaurants and places for strolling and people watching. It was not until the advent of the personal automobile that streets began to serve cars rather than the pedestrians within them.

The streetscape is heavily used, because it infill development within the traditional Siheyuan (the old-type houses in Beijing) courtyards has forced many of these once private courtyard activities, out into the streets due to lack of outdoor space. Such density pressures have also led to the construction of unpermitted temporary stuffs along community streets, thereby reducing the width of the already narrow street systems. However within the traditional Hutongs, lively streets of the past can still be enjoyed at a leisurely slow pace.
Urban acupuncture is a socio-environmental theory that combines contemporary urban design with the traditional Chinese acupuncture; it uses small-scale interventions to transform the larger urban context.

Originally coined by Barcelonan architect and urbanist, Manuel de Sola Morales, the term has been recently championed and developed further by Finnish architect and social theorist Marco Casagrande.

CATALYTIC:

The catalytic is the ‘acupoint’ in a city. This urban interventions were ‘metastatic, strategic, for reconstruction, and mainly supported by the design of public spaces, since they are most immediately effective to achieve the goals. The catalytic should be the certain issues of a city, which could not be duplicated by other cities.
Precedents

Local Code is a systemic re-greening of leftover pavement space on a large scale. It suggests a set of individual landscapes for each site with the goal of mitigating larger urban performance variables like storm-water retention and heat-island effects. Together, the aggregated sites project an alternative green infrastructure with potentially measurable benefits to safety and public health as well.

Infrastructure_Brazil

Curitiba is a city in Brazil. One of the biggest problems in this growing city was its inoperative traffic system. Cars were taking over spending leisure time. The quick change had to make city pedestrian friendly and restore confidence about functioning urban fabric.

Housing in slums_Mexico

In Mexico urban acupuncture refers to a concept that converts temporary housing, like sheds in the slums, to simple homes that allow for “add-ons” later, based on need and affordability. This strategy transforms the slum zone, without relocating families that have been living together for generations.

The URS is established to create a new urban forum and opportunities for public participation. Urban renewal in the past emphasized strategies, such as reconstructing buildings, and enhancing and revitalizing the environment of old communities. Being the base of space and action, and present and future, URSs will extend into a new network system with creative atmosphere for development with good will.
Where are our TOILETS?

Catalytic in Hutong Area:
Sanitation System
SECTION 1: Water System

Since 2000, one sewage plant was built every year. Sewage treatment capacity increased from 0.32 billion cubic meter in 2001 to 0.93 billion cubic meter (2.52 million cubic meter per day) in 2008. The largest plant is in Gaobeidian with a capacity of 1 million cubic meters per day, making it the largest wastewater treatment plant in China and one of the largest wastewater treatment plants in the world. It serves 2.4 million people.

In 2008 out of the total treatment capacity of 2.52 billion cubic meters per day, about one third or 0.86 billion cubic meters per day could be treated at the standard of reclaimed water. According to one source, 56% of the reclaimed water was used for power plant cooling, 25% for agricultural irrigation, 16% to replenish watercourses and only 2.5% for non-potable residential uses such as toilet flushing, road cleaning, car washing, fire fighting and the use of water for construction.
Beijing’s drainage network has fundamental flaws as it is designed on the importance of roads and regions rather than actual drainage needs. In the past few decades, 90 percent of the drainage pipelines have worked well and is largely sufficient. The current problem is that several lower regions experienced extraordinary downpours.

Beijing will have more than 90% of urban sewage treated by 15 waste-water treatment plants around the city. It serves a population of 2.4 million people and has a daily capacity of 100,000 cubic meters (26.4 million gallons/day), processing about 40% of Beijing Municipality’s total wastewater volume.
According to the Code on Sanitation of Beijing, every 1000 residents should have 100 m² toilet, and 8 toilets should serve for 100 families in Historical Hutong area. The User Service Radius of the public toilet in the historical area is 100m.

Right now, the quality and quantity of the public toilets in the area could not satisfy the need of the local residents.
Public Toilets
SANITATION SYSTEM

Constructed Wetland System

In Beijing, the main components of the Living Machine System should be indoors.

In tropical and temperate climates, Living Machine systems can be outdoors, as the temperature will sustain sufficient biological activity throughout the winter. In cold climates, a greenhouse is used to keep water temperatures warm so that plants do not winterize. Supplemental heating may also be necessary.
Applications

Septic Tank

<table>
<thead>
<tr>
<th>Septic Tank Size</th>
<th>Dimensions</th>
<th>Weight (lbs)</th>
<th>Anchor Weight (lbs)</th>
<th>Soil Cover (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5000 gal</td>
<td>204&quot;L x 96&quot;W x 93&quot;H</td>
<td>41,400</td>
<td>30,850</td>
<td>24</td>
</tr>
<tr>
<td>3000 gal</td>
<td>165&quot;L x 92&quot;W x 76&quot;H</td>
<td>20,300</td>
<td>23,320</td>
<td>23</td>
</tr>
</tbody>
</table>

Constructed Wetland

Min. depth = 42" (18" screened washed river gravel under 24" clean pea gravel)
Max. depth = 48" (18-20" clean river gravel under 28-30" clean pea gravel)

12' x 12' for typical Residence (300 gpd)
Recirculation Tank

10 ft dia 35k gallon single wall tank

12 ft dia 35k gallon single wall tank

1 SINGLE WALL FRP TANK
2 PRECAST DEADMAN SYSTEM W/ HOLD DOWN STRAP AND TURNBUCKLE ASSEMBLY
3 24" FRP OPENING
4 30" FRP OPENING
5 30" FRP OPENING W/ INTERNAL FLANGE
6 4" SCH. 40 PVC INLET PIPING W/ SANITARY TEE
7 24" RIBBED PVC RISER W/ FRP LID
8 30" RIBBED PVC RISER W/ FRP LID
9 PVC SPLICE BOX W/ CORD GRIPS
10 SUSPENDED EFFLUENT PUMP W/ FILTER & LEVEL CONTROL FLOAT ASSEMBLY
11 EFFUENT DISCHARGE
12 RECIRCULATION SPLITTER VALVE
13 FULL SOLID FRP BAFFLE WALL
14 BASE MOUNTED EFFLUENT PUMP W/ LEVEL CONTROL FLOAT ASSEMBLY
15 24" x 24" FRP PUMP PLATFORM
Site Requirement

- The User Service Radius of the public toilet in the historical area is 100m.
- 1 flush toilet typically uses 3.4 US gallons (13 L) of water per flush.
- Normally, people go to the toilet 5 times per day.
- The capacity of a recirculation tank is 3.5k gallon per day.

\[ 3 \text{ gallons/flush} \times 5 \text{ times} \times 100 \text{ residents} = 1500 \text{ gallons} \]

- 3.3 public toilets could share a septic tank at the first step.
- 2.3 public toilets could share a recirculation tank at the second step.

The frequency of using sanitation facilities is 5 times per person per day.
Different Typologies

TYPE I: Cells distributed along Hutongs

- Original
- Proposal

- Retail
- Work units
- Public toilets
- Houses

- Wetland cells
- Pipes
- New public toilet
- Recirculation tank

Green land/clean wastewater on site
Linear subsurface wetland cell on streets

* No original Houses need to be torn down.
TYPE II: Cells distributed in the opening

- Green land/clean wastewater on site
- Linear subsurface wetland cells on streets
- Large open spaces for social communication
- The average per capita living space in Beijing is 31 sq meters in 2013.
  (2604 sq meters for total 28 families.)

- 107 families / 2 public toilets
- 107 families / 2 public toilets
- 28 houses need to be torn down.
- New apartment building, which has private toilets in each apartment will be built on site.
- Green land/clean wastewater on site

* Data and analysis provided by [Keyuan Park Preserved House Agency Kindergarten Institute].
TYPE III: Cells distributed at intersections

- Type: Cells distributed at intersections
- Keyauan Park
  - Preserved House
  - Kindergarten
  - Middle School
  - Agency
  - Hotel
  - Under Construction

- Potential area for new houses

- Open spaces for social communication
- Green land/clean wastewater on site

* The average per capita living space in Beijing is 31 sq meters in 2013.

* According to the Beijing Conservation Plan, 8 toilets should serve for 100 families in historical area.
Constructed Wetland Cell Dimension

42" < H< 48"  
Min. depth =42" (18" screened washed river gravel under 24" clean pea gravel)  
Max. depth =48" (18-20" clean river gravel under 28-30" clean pea gravel)

12' * 12' for typical Residence (300 gpd)

Efficiency of the system (planting)

Compare between 7 Water Purification Plants

**COD**

- 7 day
- 3 day
- 1 day

**TP**

- 7 day
- 3 day
- 1 day

**TN**

- 7 day
- 3 day
- 1 day

* The precipitation has less influence on the removal rate of TN than TP and COD.

Conclusion:
1. The bulrush, canna, irise and calamus are more efficient on removal rate.
2. The bog rush is more suit to use in winter comparing with the others.
3. The most efficient cycle for operating the constructed wetland is 3 days.
SECTION 2: SOCIAL NETWORK

with the wastewater system

The public restroom is the key element in preserved Hutong area. Because the old system of sewage and the limited space in the courtyard house, the residents have to go out of their courts to a restroom. In some areas, the locations of the restroom are further than 50 meters from a courtyard house, it is very inconvenient especially in winter. At the same time, the environment and sanitary conditions in the public restrooms are the big issues.

There is an very weird phenomenon in hutong’s area in Beijing about the public restroom, which is that residents always chat with each other while they are on the way to the restroom or even in it, because the relationship between them are very close and deep. The public restroom becomes a center that gather the neighbors every day. It has a potential to be a micro-community center for the people around in order to provide a shelter for the daily social activities.

Since the public restroom bases on the water system, it is also an opportunity to redevelop the wastewater treatment system in the historical area. Having a sustainable system with the basic function, the mode of the public restroom could be spread out into the whole area.
Program: Bathhouse
User: local residents

- Local residents with low incomes
- the old who is inconvenience to walk

Average wage of the residents
9000 RMB (1475 US Dollar) per family

Design Criteria

The principles behind the Conservation Plan are:
* Preserving a maximum amount of the authentic historic building materials
* Preserving the townscape and original historic setting of Si-He-Yuan type housing in the Hutong lanes
* Retaining the current mixture of subsidised housing, private house ownership, commercial buildings and services
* Working with existing resident community
* Traffic regulation

- gray brick walls
- low-angled tile roofs

* The height limitation of the adjacent area is 9 m. Basically, the height of the historical areas in Beijing should not go above the Tiananmen, which is 34.7m.

The site strategy:
The site should be in the dense residential area, with an opening space. Because of the requirement of the space for each specific program in the bathhouse, the site with an opening space could avoid tear down too many existing houses.
The site should be next to the public toilets in order to share the same pipe/sewage system.
Section II: Outdoor fitness center

Program: Outdoor fitness center
User: local residents (the old / children)

Design Criteria

- 1% slope
- 0.5% slope
- Potential area for new houses
- Potential area for sporting equipment
- Site section
  - 3500mm
  - 3300mm
  - 3500mm
  - 3300mm
  - 3500mm

Site Plan

- Site strategy:
  - The site should be in the dense residential area. With the high density of residents around, the site could provide a space for them to do exercises and communicate with their neighbors. Because the sporting equipment does not need too much space, it could be in the site with limited space in that area.
  - The site could be next to the constructed wetland with the green space.

Issue

- No permanent facility
- Occupied the streets
- Obstructed the traffic

Proposal

- Site Plan
  - 290m²
  - 1 house need to be torn down
  - 790m²

Diagram:

- Sporting equipment
- Public toilet
- Wetland cell
- Module
- Layout

- Potential area for new houses
- Potential area for sporting equipment
Program: Rental
User: visitors

Domestic Visitors
2005 Jiaodaokou Area

<table>
<thead>
<tr>
<th>PURPOSE</th>
<th>Royal Court Yard visiting</th>
<th>Memorial site visiting</th>
<th>Hutong visiting</th>
<th>Old Citygate visiting</th>
<th>Boating</th>
<th>Food</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic Visitors</td>
<td>34.76%</td>
<td>20.40%</td>
<td>13.72%</td>
<td>3.05%</td>
<td>5.53%</td>
<td>12.22%</td>
<td>10.12%</td>
</tr>
</tbody>
</table>

International Visitors
2005 Jiaodaokou Area

<table>
<thead>
<tr>
<th>PURPOSE</th>
<th>Royal Court Yard visiting</th>
<th>Memorial site visiting</th>
<th>Hutong visiting</th>
<th>Living experience</th>
<th>Old Citygate visiting</th>
<th>Boating</th>
<th>Food</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic Visitors</td>
<td>43.9 %</td>
<td>46.9%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Purpose

- Royal Court Yard visiting
- Memorial site visiting
- Hutong visiting
- Old Citygate visiting
- Boating
- Food
- Other

DURATION of STAY

- <1 hr: 78.4%
- 1-2 hr: 21.6%

Proposal

The site should be at the outskirt of the historical area, facing to the streets. The site should be accessible to the tourists, where next to the transportation hubs or shopping streets. It should have enough space for storage of bikes and segways.

Site strategy:
The site could be next to the constructed wetland with the green space.

Public toilet
- Bike rental
- Wetland cell
- Module
- Layout

220m²
2010 mm
1036 mm

Domestic Visitors
2005 Jiaodaokou Area

International Visitors
2005 Jiaodaokou Area
A CITY WITHIN A CITY
Protecting the Spirit of Hutong

ARC 505 | YUAN YUAN |
PRIMARY ADVISOR: YUTAKA SHO |
SECONDARY ADVISOR: ROGER HUBEL |

THESIS PREPARATION | April 7th, 2014