Survey on Development and Management System of Public Toilets in Beijing
- Case Studies in Dongsi and Xianyukou Areas -

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Abstract
New and old sanitation systems coexist in Beijing. The densely populated old districts of the city abound with traditional courtyard houses known as siheyuan, most of which do not have toilets and who's residents generally use public toilets instead. Surveys conducted in the target areas of Dongsi and Xianyukou revealed there to be two types of public toilet in use; an old type built in the 1960's and a newer type built after 1990. This system suits these densely populated areas and also makes for easier waste removal by cleaning workers; in addition to ensuring better living conditions for the residents. The results show that the public toilets improve the indoor environment of the siheyuan and also contribute to preserving the condition of the historical milieu. This efficient public toilet system also supplies jobs for migrant workers who act as custodians; the newer type of public toilet system also allows the Beijing government to display a modern sanitation system. Thus the public toilet system in these densely populated areas can be seen to be beneficially effective for residents, migrant workers, and the Beijing government.

The conclusions drawn in this study can serve as an important foundation for future discussions on the urban environment of traditional places from the viewpoint of infrastructure, especially in Beijing, as these areas are currently undergoing regeneration.

Keywords: Beijing; toilet; historical area; Dongsi; Xianyukou

1. Introduction
1.1 Background and research objectives
The objective of this study was to determine the nature and importance of the public toilet system in the traditional neighborhoods of Beijing at present. Its areas of focus are, 1) The development of Beijing's public toilet system, 2) The relationship between the area and the public toilet system, 3) The system followed by the Beijing Municipal Government (BMG) to maintain these toilets. The focus of the study was on analyzing the importance of the public toilets in the traditional area in Beijing at present.

The existing documentary research on the architecture, city planning and urban history of Beijing constitute a sizeable bibliography1). Furthermore, some important studies with regard to urban history and urban planning were published in the late 1990's in Japan. The evolving architectural typology of central Beijing was detailed in chronological order by Jinnai et al. (1996)2). They investigated the transformation of architecture such as siheyuan and the history of the city planning in Beijing. A series of studies conducted by Yi et al. (1999, 2000a, 2000b, 2002)3-5 analyzed a city map termed Qianlong Jingcheng Quantu and examined the initial planning dimensions, the process of dividing urban blocks formed within the planned grid structure and the characteristics of the architectural composition of the old inner city of Beijing. They also shed light on the development of the street patterns and the transformation of the Beijing courtyard houses.

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Tanimura et al. (2002a, 2002b, 2005) surveyed a traditional neighborhood to identify the values and characteristics of the traditional city. Their studies also involved a detailed survey into the physical and social conditions in that area. On the basis of this, a redevelopment model was produced which was compatible with the area’s cultural identity while allowing for the development of buildings appropriate for modern life.

These studies in the field of architecture aimed to serve as an important foundation for the conservation of the historical milieu of Beijing by focusing on the history of planning, architecture, and patterns of urban structure. However, little attention has been paid to infrastructure and public facilities. This study seeks to complement the series of existing works that have focused on city planning in Beijing.

The modern city of Beijing is now the cultural, economic, and political center of China. However, the residents who live in the old part of the city usually use the public toilet beside the streets in the absence of private toilets in their homes. Some families even use public toilets by the side of the streets that pedestrians may also use. Some public toilets are old, without washstands and of the pump-up type. While this Beijing custom may seem curious and outdated without washstands and of the pump-up type, it has clear historical origins. The main purpose of this paper is to examine the role played by these public toilets in Beijing.

The investigation was based on information collected from three sources:
1. Interviews with (I) the residents, (II) the workers working at the public toilets in the study area, and (III) The Beijing Dongcheng District Municipal Commission (BDDMC).
2. Field surveys to identify the locations and examine the conditions of the public toilets.
3. Literature with reference to the 25 historical areas under conservation in the Old City of Beijing.

2. History of Public Toilets

This section concerns the evolution of the waste collection system in Beijing from the end of the Qianlong era to the formation of the People's Republic of China. It refers to not only Dongsi and Xianyukou but also Beijing as a whole.

2.1 The period before 1949 till the end of the Qianlong era and the days of the Republic of China

The history of public toilets is quite long, and the guilds took charge of excreta collection and cleaning public places at the end of the Qianlong era and the days of the Republic of China. The level of education of the average guild worker was low; thus they did not maintain written records and historical information on them is very limited. The words "the Cleaning Guild" and "the Excreta Commercial Guild" are found in "The guilds of Peking". From the sentence "Cleaning Guild denied the collection of excreta from the public toilet", it can at least be assumed that "the Cleaning Guild" was responsible for the collection of excreta. Although the role of "the Excreta Commercial Guild" cannot be determined from the context, it can be presumed from its name that it might have taken charge of selling the excreta. The information provided by the interviewed residents suggests that the workers from the BMG who collected the excreta used to sell it to farmers as fertilizer before the 1960’s. Therefore, it might be appropriate to speculate that the guild also sold excreta to farmers.

This explains the circulation system that existed till the end of the Qianlong era and the days of the Republic of China, wherein the excreta circulated from the residents to the farmers through the guild and was eventually transformed into fertilizer to grow farm products for the residents.
2.2 Sanitation after the formation of the People's Republic of China in 1949

After 1949, with the national policy changing to socialism, the guilds were disbanded and the Beijing public service took their place. The new class of workers called "Fengongren" fundamentally functioned in the same way as the workers of the guild. The residents stored their excreta in pots called "matong", or in holes in the courtyards of their siheyuan, and the workers visited each household to collect the excreta.

2.3 The move to public toilets from the 1960's

Based on our research, we can assert that the present public toilet system was originally developed in the 1960's. Public toilets were constructed by the side of the streets and the "toilet" was removed from the courtyard. The residents could use the space in their courtyards to erect new constructions, and it also became easier for the workers to collect the excreta. During an interview with the residents and officials from the BDDMC, we learnt that the residents easily accepted this system to improve their living conditions. Newer public toilets were constructed mainly after 1990 along big streets to provide for tourists. Recently there has been a surge of construction for the 2008 Beijing Olympics.

At present, "honey trucks" visit each public toilet and collect the excreta from areas where no sewage system is installed.

3. The Relationship between the Characteristics of the Dongsi and Xianyukou Areas and the Construction of Public Toilets

After the formation of the People's Republic of China in 1949 many immigrants came to Beijing. However, the infrastructure and housing facilities were stagnant until the early 1970's due to a series of natural disasters and the focus on the Cultural Revolution. The residents themselves undertook constructions in the courtyards of their siheyuan and as a result, unplanned and cluttered residential areas with high population density proliferated.

*Dongsi* is one such densely populated area. The 3rd to 8th lines in *Dongsi* (Fig.2.) cover an area of 48.8 ha, with a population of 18,006 people in 6,681 households as of the year 2000. As shown in Table 1., more than 14% of the people have less than 10 m² of housing area; for residents living alone in just one room this means that there is no space in which to set up their own toilets, hence they must use the public toilets outside (Figs.3. and 4.). The BDDMC recognizes the problem: "The reason they don't set up private toilets in each house in the *Dongsi* Area is lack of space".

As of 2000, *Xianyukou* covers an area of 38.08ha, with a population of 26,530 people in 6,207 households. It is more densely populated than *Dongsi*; 74% of the people have less than 10 m² of housing area (Table 1.). The population densities of *Dongsi* and *Xianyukou* are higher than the average for Beijing City (Table 2.).
A survey of public toilets was conducted in the "Important conservation area" of eastern Xianyukou (Fig.5.). This area consists of 7 lines (hutong, Fig.6.) running from north to south, the width of which is 4.8 m at the widest (Table 3.). It is difficult to build typical public toilets in such small streets so smaller men's and women's only toilets have been built in some places; often between existing buildings. As shown in Fig.5. this situation is the same throughout the whole of Xianyukou.

In the Xianyukou area, the average living area for one person is 6.68 m² (9) this includes the sanitary area and kitchen space. During our interview, the residents remarked that they use public toilets rather than installing private toilets in their house in order to save housing space. If each house had its own toilet, lack of

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Table 2. The Comparison with Beijing City, the 3rd to 8th Lines in Dongsì and Xianyukou for Population Density, Population and the Number of Public Toilets

|                      | Population Density (persons/ha) | Population (persons) | Number of Public Toilets |
|----------------------|---------------------------------|----------------------|-------------------------|
| Beijing City         | 275                             | 18,006               | 58                      |
| Xianyukou            | 732                             | 26,530               | 44                      |

Table 3. The Width and Length of hutongs in the Important Conservation Area (9)

| Hutong  | Width | Length |
|---------|-------|--------|
| Hutong 1| 4.8 m | 225 m  |
| Hutong 2| 3.4 m | 304 m  |
| Hutong 3| 3.5 m | 304 m  |
| Hutong 4| 3.6 m | 276 m  |
| Hutong 5| 4.5 m | 315 m  |
| Hutong 6| 3.2 m | 326 m  |
| Hutong 7| 4.3 m | 300 m  |
living space and the sanitary conditions would become more serious. Thus, the public toilets contribute toward improving the living conditions of siheyuan, which comprise the historical areas. Moreover, the BDDMC recognizes that the public toilets activate the local communities; the residents use public toilets and so they have to be acquainted with each other everyday.

However the interview also revealed that the biggest problem with the public toilet system in these areas, from the resident's point of view, is the limitation of the number of public toilets. Table 2. shows the population and number of public toilets in the 3rd to 8th lines in Dongsi and Xianyukou. In the 3rd to 8th lines in Dongsi, the number of men's and women's public toilets are 58 each for the population of 18,006. In Xianyukou, there are 39 men's public toilets, and 44 for women for a population of 26,530. Most of the public toilets have 3-5 toilet stools, therefore, the number of public toilets is obviously limited in these areas. In fact, many lines of people waiting to use the toilets were observed in the morning. The BMG also recognized this problem and has a plan to renew the infrastructure totally in Xianyukou which includes not only public toilets but also the sewage system, a water supply system and electric supply system, and so on.

Table 4. Standard for Public Toilets

| Place                  | 1st grade toilet | 2nd grade toilet | 3rd grade toilet |
|------------------------|------------------|------------------|------------------|
| Date                   | Downtown, conservation area, main street, bus stop, public facilities | Downtown, conservation area, main street, bus stop, public facilities, market place | Normal street, hutong, residential area |
| Air conditioner       | Equipped         | Case by case     | None             |
| Toilet paper           | Equipped         | Equipped         | None             |
| Private room space     | 0.9-1.2m×(1.3-1.5)m | 0.9-1.2m×(1.2-1.5)m | 0.85m×(1.0-1.2)m |
| Manager's room         | ≥6m²             | ≥4m²             | Case by case     |
| Interior height        | 3.7-4m           | 3.7-4m           | 3.7-4m           |

4. Types of public toilet

In Beijing, there are three main types of public toilet: (1) Freestanding public toilets, (2) Non-freestanding public toilets, and (3) portable public toilets. This paper analyses the freestanding public toilets which have been built by the side of the street for use by both residents and pedestrians.

These freestanding public toilets are classified into three types: (1) 1st-grade, built after 1990, with high-grade facilities, e.g., automatic toilets; (2) 2nd-grade, built after 1990, with flush toilets and sanitary provisions (Figs.7., 8., 9., 10. and 11.); and (3) 3rd-grade, built in the 1960's, with poor facilities (Figs.12., 13. and 14.). 1st-grade toilets are mainly set along busy streets or in bustling shopping districts. Dongsi and Xianyukou, which are residential areas have just 2nd-grade and 3rd-grade freestanding public toilets.

2nd-grade toilets have washbowls with mirrors (Fig.9.), urinal stools (Fig.10.) and separate cubicles for each toilet (Fig.8. and Fig.11.). The facilities are modern and clean enough for travelers from other developed countries. 3rd-grade toilets do not have separate cubicles (Figs.13. and 14.), nor flush toilets, moreover, no washbowl is fitted and users have to wash their hands at houses or other facilities. Thus,

Table 5. Data Obtained from the Interview with the Managers of 2nd-Grade Public Toilets

| Question                                      | Dongsi 1 | Dongsi 2 | Dongsi 3 |
|-----------------------------------------------|----------|----------|----------|
| Hometown                                      | Anhui    | Anhui    | Hebei    |
| Reason for coming to Beijing                 | Emigration| Emigration| Emigration|
| Time of joining                              | May 2004 | Before 2003 | August 2004 |
| Occupation in hometown                        | Farmer   | Farmer   | Farmer   |
| Way this job was obtained                     | Appeal to the public | Introduced by a friend | Introduced by a friend |
| Families: occupation, location                | Son: elementary-school pupil, Beijing | Son: newspaper and magazine deliverer, Beijing | Daughter: high-school student, hutong, Beijing |
|                                               | Daughter: elementary-school pupil, Beijing | Daughter: newspaper and magazine deliverer, Beijing | Son: working, Beijing |
| Remittance to hometown                        | No       | No       | Around 300 RMB per month |
| Frequency of clean-ups                        | Every time it is dirtied | Every time it is dirtied | Every time it is dirtied |
| Frequency of honey truck's visit              | Once a week | Once a week | Twice a week |

| Gansu                                         |          |          |         |
|                                               | Anhui    | Anhui    | Hubei    |
| Emigration                                    | Emigration| Emigration| Emigration|
| Before 2003                                    | May 2004 | Before 2003 | Before 2002 |
| Carpenter / operative                         | Farmer   | Farmer   | Carpenter |
| Introduced by a friend                        | Introduced by a friend | Introduced by a friend | Introduced by a relative |
| Parents: in hometown                           | Son: working, Shanghai | Daughter: 3 years old, hutong | Son: high-school student, hutong |
|                                               | Daughter: unemployed, Beijing | | Son: working, Beijing |
| Several hundred yuan per month                | No       | No       | Several hundred yuan per month |
| Every time it is dirtied                      | Every time it is dirtied | Every time it is dirtied | Every time it is dirtied |
| Twice a week                                  | Twice a week | Once in 3 days | Unknown |

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they don't function as a washstand but only as a toilet. The toilets are evenly distributed in this area (Figs. 2. and 5.), and the residents can easily access them. The 2nd-grade toilets that have high-quality sanitary provisions were mainly constructed along important streets for the convenience of pedestrians and travelers.

The statutory standards laid down for these toilets are shown in Table 4. Although they are not strictly followed in all cases, these detailed criteria are significant since they help prevent the construction of inferior toilets.

5. Management of Public Toilets

5.1 3rd-grade public toilets

The cleaning workers visit and clean each 3rd-grade public toilet once in the morning and once in the afternoon. They sprinkle water on the floor and the walls and thoroughly wash them with a hose (Figs. 15. and 16.). They also flush the excreta, which accumulates under the toilet's hole to the underground tank (Fig. 11.). The 3rd-grade public toilets are old and may appear dirty because the general public use them, they stand exposed along streets and the constructions are very old. However, they are thoroughly cleaned by cleaning workers twice a day, and therefore they are clean from the point of view of hygiene, thanks to the cleaning workers. Moreover, during our interview, in cases where the 3rd-grade toilet is closer to the houses than the 2nd-grade, the residents prefer to use the 3rd grade. Thus, it seemed that they have no major complaints about the indoor environment of 3rd-grade public toilets

The cleaners work from 7:30 to 11:00 am, and 1:30 to 4:30 pm. One cleaning worker covers around 10 public toilets and they can take a rest after they finish cleaning. They are migrant workers and the BMG provides housing and meals for them. Sewage pipes are not installed in Dongsi and Xianyukou for the collection of excreta; thus, in this area, "honey trucks" visit each public toilet and collect the excreta once or twice every week. With regards to sanitation, the managers need to clean the toilets whenever they become dirty. Thereafter they can rest as they do not have to clean other public toilets.

The BMG decided to station two managers at each 2nd-grade public toilet for three reasons: 1) to provide more job opportunities, 2) to provide living space to the immigrants in Beijing, and 3) to ensure the cleanliness of the toilets.

5.3 Managers of the 2nd-grade public toilets

All the managers of 2nd-grade public toilets in Dongsi and Xianyukou are married or family members and are migrant workers from other provinces (Table 5.). Officials from the BDDMC conduct training programs for the managerial candidates, who are often unaccustomed to living in big cities since they come from farming villages outside of Beijing.

The managers live in a room attached to the toilet, which is furnished with a bunk bed, plumbing fixtures, a table and a heater. Furthermore, they do not have to pay the normal public utility charges.

Table 6. Comparative Figures Showing the Annual Earnings of 2nd-Grade Public Toilet Managers in their Hometowns and at Present

| No. | In hometown | At present |
|-----|-------------|------------|
| Dongsi 1 | Negligible | 14,400 |
| Dongsi 2 | Several thousand | 14,400 |
| Dongsi 3 | Several thousand | 14,400 |
| Dongsi 4 | 10,800 | 14,400 |
| Dongsi 5 | 2,000 | 14,400 |
| Dongsi 6 | 0 | 14,400 |
| Dongsi 7 | 12,000 | 14,400 |
| Xianyukou 1 | Several thousand | 12,000 |

Fig. 17. Levels of the Annual Income of 2nd-Grade Public Toilet Managers in Beijing in Comparison to Earnings in the Rest of the City
In Dongsi the monthly wage is 600 RMB for an individual and 1200 RMB for a couple, while in Xianyukou the rate is 500 RMB for an individual and 1000 RMB for a couple. Their salary is higher than the lowest working income in Beijing \(^1\) (Fig.17.) and is significantly higher than the income earned in their respective hometowns (Table 6).

Although at first it seems inferior to live in a public toilet, these migrant workers receive far more benefits than they did in their previous occupations and they earn enough money to live in Beijing. Hence this occupation is clearly better for migrant workers from other provinces. In the course of our interview with them, all the managers said that they were satisfied with this job and that they wished to continue with it in the future, especially as it is difficult to find better jobs.

The BDDMC has fixed a set of standards to employ the managers: 1) the candidates should be under 35 years of age, 2) they should possess a certain level of skill, and 3) the wage is at least 550 RMB per month. Although these standards are not strictly enforced, they are significant in so far as they define the managers’ working conditions and ensure that the sanitation of the toilets is entrusted to capable workers.

6. Results and Discussion

From the end of the Qianlong period to the formation of the People’s Republic of China in 1949 the guild was mainly engaged in human-waste treatment. A recycling system for human waste was maintained between the guilds, farmers, and residents.

After 1949 cleaning workers employed by the BMG replaced the guild and took charge of collecting human waste. During this period, the inhabitants used the movable toilet called "matong", or holes to store the excreta in their houses. The first public toilets were constructed across the residential district in the 1960’s and the residents began to make use of them. The public toilet system resulted in the disappearance of unhygienic toilets from private residences and a consequent improvement in living conditions. It also made the task of collecting excreta easier for cleaning workers. After 1990, newer and modern public toilets were constructed based on the public toilet system installed in the 1960’s. Thus, the present human-waste collection system is essentially modeled on the system that was formed in the 1960’s. In the densely populated areas, the public toilets act as sanitation for siheyuan, houses which represent the historical areas.

The capitals of other advanced countries have functional sewerage systems and the inhabitants of these cities have toilets in their own homes. Seen in this light, we found this particular case involving the use of public toilets by residents who had earlier used private toilets to be a rare phenomenon.

The 2nd and 3rd-grade public toilet management system provides job opportunities and housing facilities to migrant workers. Furthermore, 2nd-grade public toilets maintain high sanitary standards because every toilet is under the supervision of managers stationed there. Thus, it can be said that the profession of maintaining good sanitary conditions — including the cleaning and collection of human excreta — has consistently provided employment opportunities for workers in guilds as well as migrant workers from the end of the Qianlong era to the present time.

7. Conclusion

The residents of the study area do not have toilets in their own houses owing to the lack of space, which is in turn caused by the high density of population in the area. In fact, using public toilets is the optimum solution for the residents of such densely populated areas. From the point of view of migrant workers, the job of cleaning public toilets is beneficial because they can obtain adequate living space and higher wages than in their hometown. The 2nd-grade public toilet system also allows the BMG to display a unique example of large-scale sanitation for other cities.

We found that this system is quite effective for residents, migrant workers, and the BMG. It is also an important part of the efforts to conserve places of historical importance. These conclusions can be instrumental in further studies concerned with the conservation of historical places in Beijing, from the point of view of infrastructure.

Notes
1. Siheyuan is a type of traditional residence commonly seen in Beijing, which consists of a courtyard surrounded by four buildings.
2. The authors interviewed the residents of the Dongsi and Xianyukou areas from September 16 to 25 and December 6 to 11, 2004.
3. The authors interviewed all the managers (8 pairs) of the 2nd-grade public toilet in Dongsi and Xianyukou from September 16 to 25 and December 6 to 11, 2004.
4. This interview was conducted on December 14, 2004.
5. The authors conducted this survey from September 16 to 25 and December 6 to 11, 2004.
6. The managers could be sisters and brothers. Such a pair was actually found in the Xianyukou area.
7. As of December 11, 2004.

References
1) Deng, Y., Funo, S. and Shigemura, T. (2002) A Study on the block formation and its subdivision into the housing lots in the inner city of Beijing; an analysis of Qianlong Jingcheng Quansu, map of the capital city during the Qianlong period (1750). Journal of Asian Architecture and Building Engineering, Nov 2002. pp.209-217.
2) Jinna, H. (1996) Tyuugoku Pekin Ni Okeru Toshikuukan no Kaiseigai ni to Kindai ni Henyoukai ni Kansuru Kenkyuu (1) (2). Tokyo: Housing Research Foundation.
3) Deng, Y. and Funo, S. (1999) A study on the formation and the transformation of street blocks in CAO-YANG-MEN district, the old inner city in Beijing. J. Archit. Plann. Environ. Eng., AJJ, No. 526, pp.175-183.
4) Deng, Y., Funo, S. and Shigemura, T. (2000) A study on the block formation and its subdivision into the housing lots in the inner city of Beijing. J. Archit. Plann. Environ. Eng., AJJ, No. 536, pp.163-170.
5) Deng, Y., Funo, S. and Shigemura, T. (2000) Considerations on neighborhood unit in the old city of Beijing-ann; analysis of
Qianlong Jingcheng Quantu, map of the capital city of Qianlong-period (1750). J. Archit. Plann. Environ. Eng., AIJ, No. 582, pp.163-170.

6) Fujikawa, M., Tanimura, H. and Watanabe, S. (2002) Spatial order of a traditional neighborhood in the FENG-SHENG district of Beijing. J. Archit. Plann. Environ. Eng., AIJ, No. 555, pp.145-150.

7) Tanimura, H. (2002) Higashi Ajia Dentouteki Toshi no Gendaika niokeru Kuukanseigyojitu ni Kansuru Kenkyu Tsukuba: Kuukan Gijutu Seigyo Kenkyukai.

8) Uekita, Y., Tanimura, H., Sakamoto, J., Yoshida, T., Fujikawa, M. and Watanabe, S. (2005) Residence in courtyard houses at Fengsheng district, Beijing. J. Archit. Plann, No. 591, pp.25-31.

9) Beijing Municipal City Planning Commission. (2002) Conservation planning of 25 historic areas in Beijing Old City. Beijing: Beijing Yanshan Publishing House.

10) Song, Z. and Nishimura, Y. (1996) Conservation planning in the historical and cultural cities of China. Department of Urban Engineering, the University of Tokyo, doctoral thesis.

11) Xiong, Y. (2000) The water supply business and ‘waterways’ in Beijing. Socio-Economic History Vol. 66, No. 2, pp.1644-1949.

12) Burgess, J. S. and Chinkin, S. (1942) The guilds of Peking. Tokyo: Seikatsusya.

13) Beijing Bureau of Quality and Technical Supervision. (2003) Standard for construction of public toilets. Beijing.

14) Beijing Statistical Bureau. (2004) Beijing Statistical Yearbook 2004. Beijing: China Statistics Press.