

RESEARCH ARTICLE

From fertilizer to refuse: the history of human waste disposal in Shanghai, 1949–2010

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Abstract

As the most populous city in China, Shanghai's human waste disposal underwent a dramatic transition between 1949 and 2010. While human waste continued to be sold to farmers as fertilizer, the authorities attempted to modernize the methods of manual removal, promoting nightsoil dump stations and vacuum trucks from the early 1970s. These new methods soon became widespread. However, urban human waste gradually lost its value as fertilizer from the late 1970s, chiefly because of the popularization of chemical fertilizers, at which point Shanghai was faced with serious human waste issues. Encountering this unforeseen shift, the municipality had to accept the reality that there were no longer rural markets for urban human waste, and that it would have to start treating human waste as refuse. In contrast to the Western model, Shanghai's approach to modernizing human waste disposal was distinctive, having been influenced by factors beyond the city.

Urban human waste was widely used in farming in traditional China; there was a fully fledged industry for the sale of human waste.¹ Urban residents relied primarily on nightsoil buckets, as toilets and urinals were relatively scarce. The residents would leave their waste-filled buckets outside their doors early each morning. Nightsoil collectors from nightsoil firms, as well as suburban farmers, were then responsible for removing human waste for free. The human waste collected by local suburban farmers was used directly in their production, whereas the waste removed by nightsoil firms was carried to nightsoil boats and transported to the outskirts of the city. The waste was usually stored in suburban pits and left to sun-dry before being sold to farmers.² In the early twentieth century, municipal governments in China became aware of issues plaguing the nightsoil industry. These included prevailing notions of public health, the influence of Western urban administrative models and the ongoing processes of industrialization and urbanization. As a result, the authorities resolved to improve the management of

¹Y. Xue, '“Treasure nightsoil as if it were gold”: economic and ecological links between urban and rural areas in late imperial China', *Late Imperial China*, 26 (2005), 41–71.

²G. Wang, 'An alternative approach to municipalization: the transition of human waste disposal in Hangzhou, 1900s–1940s', *Journal of Urban History* (2024): 10.1177/00961442241229081.

human waste disposal, a reform that could be characterized as the municipalization of the service. However, this reform did not fundamentally alter the disposal of human waste, which was still transported to the countryside as fertilizer. Even in Shanghai, the most modernized city in China, while new sewage systems were available in the foreign concessions after the 1920s,³ manual collection of nightsoil predominated.⁴

Even after the Communist victory in 1949, urban human waste continued to be used as fertilizer in China. The business was controlled by state-owned institutions rather than private enterprises. This arrangement remained in place until the late 1970s, when the rural market for urban human waste was reduced because of the promotion of chemical fertilizers. As Joshua Goldstein has observed in his study of Beijing, this situation was common throughout China.⁵ As urban human waste lost its agricultural value, the pattern of human waste disposal underwent a dramatic transition, which has remained understudied. Shanghai has been chosen as a case-study in this article for two reasons: the first is that Shanghai, which was the most populous city in China with approximately 6.4 million urban residents in the 1960s, can be regarded as representative of common practice.⁶ The second is the intricacy of the transition in the development of human waste disposal in Shanghai. Prior to the 1980s, most of Shanghai's human waste was transported to the countryside as fertilizer. Despite some problems, this human waste disposal system was fundamentally sustainable. However, Shanghai's human waste outlet was suddenly blocked in 1978, precipitating a sanitation crisis. This dire situation shocked residents: 'In the world-renowned metropolis of Shanghai, on the thriving Nanjing Road, nightsoil and sewage overflowed (from overburdened sewers); what a baffling phenomenon.'⁷ To tackle this predicament, the authorities began to reform the disposal process, establishing 'basic implementation of a sewerage system' as the objective.⁸ However, as of 2021, this goal has yet to be fully accomplished.⁹

This article delineates the evolution of human waste disposal in Shanghai from 1949 and covers the period from the 1950s to the 1970s, the emergence of the human waste crises during the 1980s and the transformation of municipal policies regarding human waste into the early 2000s. Although the issues engendered by the appearance of chemical fertilizers in the 1980s greatly expedited the transition to modern disposal methods in Shanghai, the mechanization of human waste removal had already commenced in the early 1960s and included the popularization of vacuum trucks and nightsoil dump stations. The transformation in the 1980s mainly concerned the final disposal outlets for human waste. However, the nightsoil dump stations

³X.C. Shen, 'The creation of sanitary sewage system in Shanghai's International Settlement', *Shilin (Historical Review)*, 178 (2019), 14–24.

⁴S.M. Peng, *Gonggong weisheng yu Shanghai dushi wenming (1898–1949) (Public Health and the Urban Civilization of Shanghai, 1898–1949)* (Shanghai, 2007), 257–71.

⁵J. Goldstein, *Remains of the Everyday: A Century of Recycling in Beijing* (Oakland, 2021), 85–8.

⁶Shanghai Municipal Archives (SMA), B256-1-36, Shanghai shi huanjing weisheng jü guanyü Yuenan weisheng daibiaotuan Li Wenfeng sizhang liaojie fenbian laji wenti zuotanhui de huiyi jilu (The minutes of the discussions about urban waste issues between the Shanghai Environmental Sanitation Bureau and the director of the Vietnam health delegation, Li Wenfeng; hereafter 'The minutes'), 18 Jul. 1964.

⁷SMA, B1-9-184, Shanghai shi Jing'an qu geming weiyuanhui guanyü jixü jie jue woqu fenbian waiyi yanzhong de baogao (Report of the Revolutionary Committee of Jing'an District, Shanghai, on the imperative to resolve the grave predicament of human waste spillage in our district; hereafter 'Report of RCJD'), 14 Apr. 1980.

⁸Wenhui Bao (Wenhui Daily), 16 Oct. 1993, col. 3.

⁹Jiefang Ribao (Jiefang Daily), 25 Jan. 2021, col. 20.

remained operational after the 1980s. The history of human waste disposal in Shanghai thus illuminates a distinct approach to modernization, one that diverged from Western paradigms, as it was propelled by factors outside the city.

The mechanization of human waste removal

There were three different methods of human waste disposal in Shanghai during the Republican and Mao eras. The first was the sewerage system in the (former) Shanghai International Settlement,¹⁰ whereby human waste was discharged into sewers through flush toilets and then channelled to sewage treatment plants. The second was the septic tank system in the (former) French Concession; human waste was flushed into three-chamber septic tanks and the supernatant flowed into the sewers after sedimentation and fermentation. According to an estimate made in 1964, approximately 5 per cent of Shanghai's urban residents utilized the first method, with 20 per cent using the second and the remainder, roughly 70–80 per cent, employing nightsoil buckets for excretion. Around 800,000 buckets were emptied by thousands of cleaning workers early each morning.¹¹

Before 1945, nightsoil merchants were responsible for collecting human waste in Shanghai (including the foreign concessions and the Chinese City). As in other Chinese cities, the massed waste was sold to farmers as fertilizer. After the Second Sino-Japanese War in 1945, a Cleaning Agency was established in Shanghai and was responsible for human waste disposal citywide. However, the actual work was contracted to nightsoil merchants, who generated so-called 'second contractors', 'third contractors' and 'fourth contractors'.¹² After the Communist victory, human waste disposal in Shanghai was undertaken by the Cleaning Administration Agency (also termed the Manure Company), which was subject to the Shanghai Health Bureau, while the contractor system was progressively dismantled. In 1955, the Manure Company administered human waste disposal in the urban area excluding the outskirts, with numerous cleaning stations, 29 nightsoil wharves, 23 parking lots, 454 public toilets, 3,799 nightsoil trucks of various types and an aggregate of 4,663 cleaning workers.¹³ In the outskirts of the city, human waste was removed by nearby farmers until 1965 (the boundaries of each commune for cleaning purposes had been delineated in 1961). However, since reliance on farmers was causing even more sanitation issues, the Manure Company instead initiated cleaning stations to dispose of human waste in the suburbs.¹⁴

¹⁰The Shanghai International Settlement was the largest and most modernized foreign concession in Shanghai. It originated from the merger of the British and American concessions in 1863.

¹¹SMA, B256-1-36, The minutes, 18 Jul. 1964.

¹²On the transition of human waste disposal in modern Shanghai, see Peng, *Gonggong weisheng yu Shanghai dushi wenming* (1898–1949), 257–71; A.M. Xiao, 'Shanghai shi jiefang hou sanci zhengfei shijian kaocha' (A study of three incidents of farmers' struggles over manure after the liberation of Shanghai (1949–64)), *Zhonggong Dangshi Yanjiu* (CPC History Studies), 8 (2017), 97–9.

¹³SMA, A71-2-421, Zhonggong Shanghai shiwei jiaqu gongzuo weiyuanhui duiyü liyong chengshi shifei fenbian xiaochu qingkuang baogao (Report of the Suburban Working Committee of the CPC Shanghai Committee on the elimination and use of urban waste; hereafter 'Report of SWC'), 28 Nov. 1955.

¹⁴SMA, A256-2-120, Shanghai shi qingjie guanlisuo guanyü gajin jinjiao jierang diqu fenbian qingchu gongzuo de fang'an (Scheme of the Shanghai Cleaning Administration Agency for removing human waste in the outskirts), 28 Jul. 1965.

According to regulations imposed in 1956, cleaning fees were charged by the workers: 0.35 yuan monthly for a medium bucket and 0.7 yuan monthly for a large one. If residents asked the workers to empty and wash the buckets, the fees doubled. The Manure Company was also responsible for septic tank cleaning, charging 1.5 to 35 yuan each time depending on the tank size.¹⁵ According to statistics for 1955, Shanghai's annual human waste output was 29 million dan (approx. 1.45 million tons), with daily output at around 3,970 tons.¹⁶ All human waste removed by the company was sold to farmers from the suburbs and from Jiangsu and Zhejiang Provinces,¹⁷ while the free market for trading in nightsoil was supplanted by 'farmers' nightsoil' pacts in 1955. These pacts were contracts between the Manure Company and farmers' associations stipulating regular conveyance of nightsoil from wharves to the countryside, either by farmers themselves or by the agency. Though the contracts reduced nightsoil prices for farmers, they also mitigated seasonal variations in nightsoil demand, hence their popularity.¹⁸ In 1953, 38.5 per cent of Shanghai's human waste was sold freely, but by 1955 the free market had essentially vanished, with 53.9 per cent of nightsoil going to Shanghai's suburbs, 41.05 per cent to rural Jiangsu and 5.05 per cent to Zhejiang.¹⁹

In 1964, Jin Huaigang, then director of the Shanghai Environmental Sanitation Bureau,²⁰ provided a detailed breakdown of the Manure Company's annual income. Including the cleaning fee, each bucket was charged at 0.35 yuan monthly, or 4.2 yuan annually, totalling over 3.3 million yuan. Bucket nightsoil was sold to farmers at wharves for 2.5 yuan per ton, garnering over 6 million yuan annually. Bucket nightsoil cleaning and sales alone could generate over 9.3 million yuan per annum. The operational costs exceeded 3 million yuan annually and were primarily comprised of cleaning workers' wages and equipment maintenance. Apparently, bucket nightsoil income alone adequately covered all the expenses, with a surplus of over 6 million yuan.²¹

Shanghai's human waste disposal system was efficacious and profitable, but some problems remained. The first issue was antiquated nightsoil wharves. Human waste was first transported by handcarts to wharves before shipment to the countryside, with nightsoil ports used as distribution hubs. However, the obsolete ports were ill-equipped. They usually required the manual loading of human waste, which was inefficient and unhygienic. In the 1950s, many nightsoil wharves were simple wooden structures that used bamboo piping to channel nightsoil.²² To mitigate environmental nuisances caused by nightsoil wharves, the Shanghai Municipal Committee

¹⁵SMA, B242-1-944, Shanghai shi weishengjü guanyü fenbian guanli zanxing guize caoan (Provisional rules drafted by the Shanghai Health Bureau on human waste management), Mar. 1956.

¹⁶SMA, A71-2-421, Report of SWC, 28 Nov. 1955.

¹⁷Shanghai Municipality and Jiangsu and Zhejiang Provinces were administratively independent from each other.

¹⁸Shanghai Huanjing Weisheng Zhi Bianzuan Weiyuanhui (Shanghai Environmental Sanitation Gazetteer Compilation Committee), *Shanghai Huanjing Weisheng Zhi* (Shanghai Environmental Sanitation Gazetteer) (Shanghai, 1996), 157–8.

¹⁹SMA, A71-2-421, Report of SWC, 28 Nov. 1955.

²⁰The Shanghai Environmental Sanitation Bureau was established in 1963, serving as the superior administrative body of the Manure Company.

²¹SMA, B256-1-36, The minutes, 18 Jul. 1964.

²²Shanghai Shi Nanshi Qü Zhi Bianzuan Weiyuanhui (Shanghai Nanshi District Gazetteer Compilation Committee), *Nanshi Qü Zhi* (Nanshi District Gazetteer) (Shanghai, 1997), 754.

(the highest administrative body in Shanghai) opted to convert obsolete ports into concealed pumping wharves. These reinforced concrete nightsoil wharves, which featured hidden storage tanks and vacuum pumps, could vastly improve loading efficiency and minimize hygiene concerns. Moreover, the tanks enabled short-term storage of surplus nightsoil, thereby addressing delayed nightsoil shipments during storms. In April 1954, construction commenced on Shanghai's inaugural concealed pumping wharf along Suzhou Creek,²³ with the project completed by October of that year. This pumping wharf essentially mechanized human waste loading. While the wharf looked like an ordinary bungalow, there was a 450-ton capacity tank underground. Vacuum trucks were admitted through the entrance, unloading nightsoil into the tank via funnels before departing after rinsing. Human waste in the storage tank was first agitated by a churn before being pumped into nightsoil boats through subterranean pipes. The entire process was effectively labour free and minimized the leakage of nightsoil.²⁴ The concealed pumping wharf was gradually promoted throughout Shanghai. For instance, in 1963, the Manure Company planned to convert the Hanyang Road nightsoil port in Hongkou District into a concealed pumping wharf. It intended to utilize the no. 2 house on Xi'an Road as the site for the wharf buildings, as it was over 700 square metres in breadth. The company budgeted around 15,000 yuan for this task.²⁵ By 1963, nine nightsoil wharves in Hongkou District had been upgraded, 'all equipped with pumps and eight tanks constructed'.²⁶

Hand-pushed nightsoil trucks had first appeared in the French Concession in 1912 and were widely used in Shanghai because of their economical and convenient nature.²⁷ After 1949, these handcarts continued to be used, although they were in poor condition and needed improvement. In 1953, the Health Bureau considered promoting the use of nightsoil tricycles equipped with iron barrels for collection and capable of moving more quickly than hand-pushed trucks. The bureau ordered a trial of 20 nightsoil tricycles, but quickly discontinued the programme, possibly because it was impractical.²⁸ In 1958, cleaning workers in Yulin, Hongkou and Penglai Districts started using hand-cranked nightsoil pumps.²⁹ By 1960, with backing from the Manure Company, various hand-operated 'pit emptiers' were popularized.³⁰ In 1960, vacuum trucks began to be utilized to make the cleaning of septic tanks and cesspools more efficient. The Manure Company's automobile team mounted vacuum nightsoil pumps on three-wheeled trucks, using the truck engine as the pump's power source. These vacuum trucks were highly efficient, capable of extracting a truckload of nightsoil in one minute.³¹

²³*Xinmin Wanbao* (Xinmin Evening News), 10 Apr. 1954, col. 1.

²⁴*Ibid.*, 30 Oct. 1954, col. 1.

²⁵SMA, B256-2-18, Shanghai shi feiliao gongsi guanyü diaohuan Xi'an Lu 2 hao fangwu yongzuo jianzao yinbishi fenmatou youguan wenti de qingshi jingfei de baogao (Report of the Shanghai Manure Company on the request for the exchange of the no. 2 house on Xi'an Road to construct a concealed pumping wharf, and the financing issues), 26 Sep. 1963.

²⁶Shanghai Shi Hongkou Qū Zhi Bianzuan Weiyuanhui (Shanghai Hongkou District Gazetteer Compilation Committee), *Hongkou Qū Zhi* (Hongkou District Gazetteer) (Shanghai, 1999), 539.

²⁷Shanghai Huanjing Weisheng Zhi Bianzuan Weiyuanhui, *Shanghai Huanjing Weisheng Zhi*, 142.

²⁸*Xinmin Wanbao* (Xinmin Evening News), 10 Oct. 1953, col. 1.

²⁹*Ibid.*, 29 Nov. 1958, col. 4.

³⁰Shanghai Huanjing Weisheng Zhi Bianzuan Weiyuanhui, *Shanghai Huanjing Weisheng Zhi*, 352.

³¹*Xinmin Wanbao* (Xinmin Evening News), 5 May 1960, col. 4.

However, the vacuum trucks only applied to the cleaning of septic tanks and toilet cesspits; bucket nightsoil accounting for over 95 per cent of output continued to be manually collected. A 1960 report by the Manure Company to the Shanghai Municipal Committee detailed the manifold issues of manual nightsoil collection:

1. Detrimental to the appearance of the city. There are hundreds of thousands of nightsoil buckets throughout the city. Though cleaning workers empty them daily, buckets still line the streets at around 9 a.m., even more so in alleys, and such views are unsightly.
2. Residents pour bucket-washing wastewater randomly, which not only stains the ground but the water also flows into gutters, severely polluting waterways, spreading germs and breeding mosquitoes and flies. This is especially serious during typhoons, frosty periods and periods of sudden weather changes, when nightsoil ships cannot return in a timely manner, delaying the collection of nightsoil.
3. Most nightsoil collection occurs at night and in the early morning, conflicting with residents' sleep time. Especially during inclement weather, bucket emptying is even more inconvenient. With the popularization of urban communes and women working outside the home, this contradiction has become more widespread and prominent. Bucket emptying has become a major issue of daily life requiring urgent resolution.
4. Scattered bucket emptying involves lengthy, intense labour at low efficiency (averaging just 240+ buckets per worker daily), also impeding mechanized operation.
5. Thousands of manual nightsoil trucks on the streets not only mar the city's aesthetics but also obstruct traffic.³²

Manual nightsoil collection was causing serious issues and conflicted with Shanghai's image as a modern metropolis. To resolve these dilemmas, the Manure Company first attempted to change the manual approach in 1960 by promoting complex lavatories, incorporating male and female toilets, urinals, bucket emptying, nightsoil storage and rubbish disposal. Residents could conveniently empty buckets themselves, with nightsoil stored in cesspits for periodic vacuum truck removal, thereby eliminating the need for manual trucks. Additionally, the lavatory cesspits could maximize nightsoil collection to deter indiscriminate dumping and preserve sanitation. In the Manure Company's plan, over 3,000 complex lavatories would be required citywide, with the cost estimated in the millions of yuan.³³ The company first constructed three complex pilot lavatories in Zhangjiazhai Subdistrict in the Jing'an District, Xilingjiazhai shanty town in Nanshi District and Mengsan shanty town in Luwan District. The pilot lavatories were welcomed by the residents, and the company's objectives were fulfilled. By the end of 1960, 38 complex lavatories had been completed citywide. Despite the advantages over manual collection, there were difficulties associated with complex lavatory construction which included acquiring

³²SMA, A72-2-356, Zhonggong Shanghai shi feiliao gongsi weiyuanhui guanyü jianzao linong zonghexing cesuo zhengqü zai yi er niannei zhubu xiaomie jiushi matong renli fenche tigao chengshi huanjing weisheng shuiping de qingshi baogao (Report of the Shanghai Manure Company Party Committee on constructing complex lavatories to progressively eliminate old-style buckets and manual nightsoil trucks within one to two years for improving urban sanitation standards), 3 Jun. 1960.

³³*Ibid.*

land as well as odour and sanitation issues. This impeded large-scale expansion of the programme and eventually led to the cessation of construction.³⁴

Given the difficulties with complex lavatories, in early 1973, the Manure Company proposed the construction of simpler nightsoil dump stations. These dump stations were similar to complex lavatories, facilitating bucket emptying while enabling mechanized nightsoil removal via vacuum trucks pumping from cesspits. They were cheap and required only 3 square metres for the construction area.³⁵ By June 1974, Shanghai's dump station promotion had achieved some success. Over 600 stations had been completed citywide, disposing of more than 260,000 nightsoil buckets daily (over 30 per cent of the total buckets) and cutting down the number of carts by 580. Most stations utilized former public urinals to reduce construction costs. The Manure Company summarized four benefits of the dump stations:

1. Convenient for the public. Dump stations are open for around 6 hours daily (carts only for a few minutes), at fixed times and locations, without loud reminders. Cleaning workers can also empty buckets for the elderly, infirm and disabled.
2. Reduced manual work, enabling mechanized human waste removal.
3. Increased manure collection, supporting farming. Residents can pour nightsoil into dump stations at any time instead of using gutters. The stations can also collect wastewater.
4. Improved city appearance and sanitation. With motor vehicles replacing carts, many nightsoil wharves can be abandoned, and roadside waiting buckets will be eliminated.³⁶

A report from June 1974 stated that the Manure Company envisioned the construction of another 1,000 dump stations that year for basic mechanized nightsoil removal in Nanshi, Changning, Zhabei, Luwan and Hongkou Districts, and sought citywide realization by the following year. Shanghai Revolutionary Committee³⁷ leaders were similarly optimistic, as is clear from the following directive: 'This approach is good: mechanized nightsoil removal should be realized citywide.'³⁸ Subsequently, the promotion of dump stations continued, with 810 built in 1975 and another 404 in 1976. By the end of 1980, a total of 3,445 dump stations took care of all human waste collection in Shanghai, with all the old carts phased out.³⁹

The emergence of a human waste crisis

The abundant protein in urban diets imbued human waste with richer minerals (such as nitrogen, phosphorus and potassium) than green manure and animal manure,

³⁴Shanghai Huanjing Weisheng Zhi Bianzuan Weiyuanhui, *Shanghai Huanjing Weisheng Zhi*, 149–50.

³⁵*Ibid.*, 492.

³⁶SMA, B246-2-1028, Shanghai shi geming weiyuanhui gongye jiaotong mishuzu Gongjiao Qingkuang di 173 qi (Shanghai Revolutionary Committee Industry and Transportation Secretariat Group *Industry and Transportation Situation* issue 173), 8 Jun. 1974.

³⁷The Revolutionary Committee was the re-established government during the Cultural Revolution (1966–76).

³⁸SMA, B246-2-1028, Shanghai shi geming weiyuanhui gongye jiaotong mishuzu Gongjiao Qingkuang di 173 qi (Shanghai Revolutionary Committee Industry and Transportation Secretariat Group *Industry and Transportation Situation* issue 173), 8 Jun. 1974.

³⁹Shanghai Huanjing Weisheng Zhi Bianzuan Weiyuanhui, *Shanghai Huanjing Weisheng Zhi*, 492–3.

rendering it more agriculturally beneficial as a compost and higher in demand among farmers. Seeking to increase the use of rural fertilizer repositories and aid agriculture, the Chinese Communist Party spearheaded manure accumulation campaigns centred on urban human waste. For example, a 1952 Agriculture Ministry notice announced that 'all local governments must harness urban human waste and organize nightsoil shipment to the countryside'.⁴⁰ To amass more human waste, Shanghai's cleaning workers contrived a way to reclaim the nightsoil in sewers by fitting curved manure collectors, and these devices were disseminated extensively across the city in the 1960s.⁴¹ As a result of the manure campaigns, Shanghai witnessed three riots by farmers scrambling for nightsoil between 1949 and 1963,⁴² an indication of the extensive rural demand for urban human waste.

As highlighted in a 1965 report from the Shanghai Chemical Industry Bureau, farmers preferred chemical fertilizers over nightsoil because of their perceived soil enrichment qualities and economic benefits.⁴³ However, the backwardness of China's chemical fertilizer industry hindered their promotion until the 1970s. This situation changed dramatically with the substantial increase in chemical fertilizer yield from the 1970s onward. China's aggregate outputs of nitrogen, phosphate and potash fertilizers (by active content) more than quintupled from 2,435 million tons in 1970 to 12,318 million tons in 1980.⁴⁴ This rapid growth slashed costs. Chemical fertilizers appeared in rural areas at lower and lower prices, representing a better economical alternative to urban human waste. In 1984, Shanghai had to cut nightsoil prices steeply from 1.38 yuan to 0.38 yuan per ton to make them more competitive.⁴⁵ As the promotion of chemical fertilizers eroded the value of human waste, the prevailing disposal model could no longer be sustained, as was especially evident in Shanghai. Shanghai relied primarily on dump stations and vacuum trucks to gather nightsoil, which impeded sewer and wastewater treatment. Consequently, its human waste disposal continued to rely on the extant system although it was unprofitable. Shanghai's disposal issues essentially arose from market changes in both supply and demand. The urbanization process increased the urban population and the output of nightsoil. At the same time, chemical fertilizers eliminated the popularity of nightsoil. Facing serious overstocking, the Environmental Sanitation Department (the former Manure Company) had to cut back removal frequency as well as the quantities removed. As a result, the accumulated waste from the growing population

⁴⁰*Renmin Ribao* (People's Daily), 14 Jul. 1952, col. 1.

⁴¹Shanghai shi Jing'an Qū Zhi Bianzuan Weiyuanhui, *Jing'an Qū Zhi* (Jing'an District Gazetteer) (Shanghai, 1996), 383–4.

⁴²Xiao, 'Shanghai shi jiefang hou sanci zhengfei shijian kaocha', 97–108.

⁴³SMA, B76-4-172, Shanghai shi huaxue gongyejū guanyū zai Shanghai shi Fengxian xian diaocha shiyong huafei nongyao ji nongye bomo hou jingji xiaoguo de qingkuang huibao (Report of the Shanghai Chemical Industry Bureau on investigating the economic benefits of using chemical fertilizers, pesticides and agricultural plastic film in Fengxian County), 1965.

⁴⁴Huagong bu Shanghai huagong yanjiuyuan (Shanghai Institute of Chemical Industry, Ministry of Chemical Industry), *Huafei ji huafei gongye zhishi qianshi* (Elucidation of fertilizers and the fertilizer industry) (1985), 5.

⁴⁵SMA, B45-8-827, Shanghai shi nongyejū Shanghai shi gongxiao hezuoshe Shanghai shi caizhengjū deng guanyū gajin fenfei fenpei guanli tiaodi fenfei shoufei biao zhun de tongzhi (Notice of the Shanghai Agriculture Bureau, Supply and Marketing Cooperative, Finance Bureau and others on improving manure distribution and reducing price; hereafter 'Notice'), 3 Jul. 1984.

was dispatched to dwindling agricultural outlets, creating a serious human waste problem in Shanghai from the late 1970s onwards.

Jing'an District, situated in the downtown area of Shanghai, experienced a boom in population, but still relied chiefly on sewers left over from the former foreign concessions. The obsolete sewerage was totally inadequate. To make matters worse, from the late 1970s the reduced nightsoil conduits experienced a sharp increase in the volume of sewage, which overran the system and caused a continuous flood of unsanitary spillage. In April 1980, the Jing'an District Revolutionary Committee petitioned the municipal committee to resolve the 'serious nightsoil overflow'.⁴⁶

Hundreds of residents from Huayeli on West Nanjing Road wrote: 'In the world-renowned metropolis of Shanghai, on the thriving Nanjing Road, nightsoil and sewage overflowed – what a baffling phenomenon. We spent New Year's Day 1980 amid sewage and stench. Now the overflow intensifies daily, greatly concerning us. We hope officials can show mercy and rescue us from this sea of crap.'⁴⁷ Appeals were couched in fury. A resident of West Nanjing Road 1213 Alley wrote to *Jiefang Daily*: 'Nightsoil spurts from pipes everywhere, even under our dining table. How can we live like this?! I cry for your help to rescue me from this "gilded" land.' Even patriotic health campaigns were difficult to implement, with residents asking: 'With nightsoil spread all over, how can we care about sanitation?'⁴⁸ The Diplomacy and United Front work departments⁴⁹ also 'regret such unsightly phenomena affecting official receptions. Such circumstances have never occurred in Shanghai since the Communist victory. The overflow not only disrupts sanitation and people's lives, but also directly hinders the "four modernizations", besmirching the party-masses relationship and the party's public credibility.'⁵⁰

Apart from Jing'an, other districts in Shanghai experienced varying degrees of nightsoil overflow. In 1980, sewage spillover occurred in 147 locations in the Puxi area of Huangpu District. The causes were analogous to those in Jing'an, with overburdened sewers and blockages occasioning widespread flooding.⁵¹ Though the Shanghai Municipal Committee introduced remedial measures after 1980, nightsoil overflow persisted, and spread from sewers to septic tanks and dump stations. Statistics at that time recorded over 7,700 tons of daily nightsoil output against 6,000 tons of removal capacity in Shanghai; the supply-demand gap was simply intractable.⁵²

The consensus was that the popularization of chemical fertilizers had reduced rural nightsoil demand and cut off the traditional outlets for disposal. By the 1980s, rural demand for human waste in Jiangsu, Zhejiang and Shanghai had progressively weakened, with some areas even refusing nightsoil delivery.⁵³ The declining sales

⁴⁶SMA, B1-9-184, Report of RCJD, 14 Apr. 1980.

⁴⁷*Ibid.*

⁴⁸*Ibid.*

⁴⁹The United Front work department, tasked with 'united front work', managed relationships with influential individuals and organizations both inside and outside mainland China, encompassing Hong Kong, Taiwan and other nations.

⁵⁰SMA, B1-9-184, Report of RCJD, 14 Apr. 1980.

⁵¹SMA, B1-9-184, Shanghai shi chengshi jiansheji guanyü Huangpu qū fenbian maoyi qingkuang de diaocha baogao (Investigative report of the Shanghai Urban Construction Bureau on nightsoil overflow in Huangpu District), 14 May 1980.

⁵²*Xinmin Wanbao* (Xinmin Evening News), 16 Feb. 1985, col. 4.

⁵³Shanghai Shi Lühua He Shirong Guanlijü, *Shanghai Shirong Huanwei Gaige Fazhan Gaikuang*, 1978–2010, 157.

hindered the boats from swiftly unloading nightsoil in the countryside, with ‘delays ranging from 2–3 days up to half a month’, which considerably interrupted transport capacity and exacerbated the sanitation issues. To ensure timely removal, the authorities devised plans to upgrade the nightsoil wharves and erect nightsoil storehouses in the suburbs. The port upgrade projects aimed to expand throughputs by consolidating the 31 nightsoil and refuse wharves along the Huangpu River and Suzhou Creek into just 12 facilities, in addition to combining the separate refuse and nightsoil ports into 20 integrated ones. From the early 1990s onwards, growing concerns about river pollution then led to the phasing-out of nightsoil wharves, with water transport gradually supplanted by land conveyance. By the end of 2010, only 2 nightsoil ports remained in Shanghai: the Huiguan Street and Longshui Road wharves.⁵⁴

The construction of nightsoil storehouses in the suburbs was a major project introduced by the government, originally conceived to expedite human waste transport cycles and balance seasonal demands. The initial plan required 200 cesspits, each with a 500-ton capacity for a total 100,000-ton capacity by 1985. These cesspits could contain over 10 days’ worth of nightsoil in Shanghai (approximately 9,500 tons were produced daily), accelerating the turnover of nightsoil boats and enabling the timely disposal of human waste.⁵⁵ It was originally planned that the cesspit projects would be funded by the suburban county governments, but the Shanghai Municipal Committee soon assumed responsibility. The government allocated a special fund of over 5.3 million yuan for this task, and construction materials such as steel, wood and cement were also provided. By the end of August 1981, the first lot of enclosed cesspits with a 1,000-ton capacity had been built.⁵⁶

According to a report of March 1982 from the Sanitation Department, the cesspits in operation were beneficial in many respects. They not only alleviated the nightsoil outlet issues but also reduced parasites and pathogens as the nightsoil underwent sealed fermentation.⁵⁷ By the end of 1985, all 200 of the cesspits with a total capacity of 100,000 tons had been completed. The cesspits had capacities of 50 tons per unit, 100 tons per unit or 200 tons per unit, and each group had a total capacity of 500 tons. The money spent on this project far exceeded the original budget. From 1980 to 1985, the total investment reached 21.36 million yuan. However, this costly project did not achieve satisfactory results. The cesspits operated normally in the first few years, and the fermented liquid was welcomed by farmers. But because of competition from chemical fertilizers, the cesspits were soon superfluous, and their usage declined year by year until they were finally dismantled.⁵⁸

From the 1980 onwards, Shanghai’s human waste issues became increasingly severe, with the gap between nightsoil production and rural demand steadily

⁵⁴*Ibid.*, 156.

⁵⁵B289-2-301, SMA, Shanghai shi jianshe weiyuanhui guanyü chengshi huanjing weisheng gongzuo de diaocha baogao (Investigative report of the Shanghai Construction Committee on urban sanitation issues), 28 Aug. 1980.

⁵⁶*Wenhui Bao* (Wenhui Daily), 3 Sep. 1981, col. 2.

⁵⁷SMA, B292-2-401, Shanghai shi huanjing weisheng guanlichu guanyü baosong 1982 nian jianzao 50 zuo (zu) zhufenchi jihua renwushu de baogao (Report from the Shanghai Environmental Sanitation Department on submitting the 1982 plan to build 50 (batches of) cesspits), 3 Mar. 1982.

⁵⁸Shanghai Shi Lühua He Shirong Guanlijü, *Shanghai Shirong Huanwei Gaige Fazhan Gaikuang*, 1978–2010, 158.

widening. The impact of the suburban cesspits was limited: as stated in March 1984 in a report from the Environmental Sanitation Department, the 100,000-ton total capacity of the cesspits 'could only store the city's nightsoil for a dozen days', which barely alleviated the crisis. Therefore, the government attempted to expand rural sales in every feasible way. The primary measures proposed and implemented in April of that year were as follows. First, the price of manure, which was more expensive than chemical fertilizers, was drastically reduced. The price was cut from an average of 3.93 yuan per ton to 2.93 yuan per ton. Second, financial subsidies were provided for the conveyance and sale of manure to adapt to the decrease in demand under the household responsibility system.⁵⁹ The Sanitation Department paid these subsidies to supply and marketing co-operatives and manure transport teams in the surrounding counties. Under the designation of 'manure distribution fees', they amounted to 0.2 yuan per ton of manure, with a total annual payment estimated at around 500,000 yuan. Third, because of a switch from the planned allocation system to the free market, anyone could purchase manure by contract. As a result of the reduced manure price and the payment of distribution fees, the Sanitation Department needed to increase its annual expenditure by 3 million yuan, which was paid directly by the Shanghai Finance Bureau. In addition, the department also suggested 'vigorously publicizing the benefits of using manure'. It was believed that although urban human waste disposal could 'take other pathways', it had always been employed as a fertilizer and this practice could not be abruptly discontinued. As an organic fertilizer, it was still considered to be beneficial for enriching soil. The Sanitation Department actively encouraged farmers to continue using urban human waste in their production.⁶⁰

In July 1984, the Environmental Sanitation Department considered significantly reducing the price of nightsoil to boost sales, lowering average prices of yellow and pit nightsoil⁶¹ from 1.38 yuan to 0.38 yuan per ton and standardizing them as 'urban manure' to simplify the purchase procedures. The water transport prices remained unchanged because of high costs.⁶² Despite the drastically reduced price of urban human waste, sales continued to diminish. In January 1985, the Changning District Government recognized the grim prospects for the nightsoil trade in a report to the municipal government. The report stated that because of the significant decrease in rural demand for nightsoil, Changning District was facing a 'grave situation' where nightsoil could not be conveyed out to the countryside. The 2,200-ton capacity cesspits in the district were already filled up on 16 January, with 'nightsoil outlets in desperate straits'. The report also doubted the feasibility of selling nightsoil to farmers, stating that the district produced around 480 tons of nightsoil per day, of which 300 tons could not be transported out. Although the district sanitation

⁵⁹The household responsibility system was a new agricultural production system instituted in 1978 across China. The new system reallocated collective agricultural land to individual rural households, giving them relative autonomy over land use decisions and crop selection.

⁶⁰SMA, B45-8-827, Shanghai shi nongyejū Shanghai shi caizhengjū Shanghai shi huanjing weisheng guanlijū guanyū chengshi fenbian qingyun chuli wenti de qingkuang baogao (Report on the issue of urban human waste disposal from the Shanghai Agriculture Bureau, Finance Bureau and Environmental Sanitation Bureau), 19 Mar. 1984.

⁶¹Yellow nightsoil refers to waste stored in dump stations, while pit nightsoil refers to the waste after fermentation in sewers or septic tanks.

⁶²SMA, B45-8-827, Notice, 3 Jul. 1984.

department had implemented multiple measures, the 'quantity conveyed out was still far below daily output'. Residents were encouraged to 'use sanitation facilities reasonably and reduce blockages'. With no other viable solutions, the government had to request 'relevant municipal departments to promptly resolve the nightsoil outlet problems'.⁶³

Human waste as refuse

In early 1985, faced with the nightsoil crisis in Shanghai, the authority had no option but to approve the 'emergency measures' proposed by the Sanitation Department, and to temporarily discharge redundant nightsoil into the drainage system leading to the Yangtze River Estuary. There were eight temporary nightsoil vents along the drainage lines, with four in Chuansha County and Baoshan County respectively. Moreover, according to regulations from the Shanghai Construction Committee, there were stringent restrictions on nightsoil sluicing, with discharge only allowed during 'busy farming seasons or rainy days, when the nightsoil is unattractive to the farmers'.⁶⁴ However, as nightsoil sales continued to plummet, these temporary vents became the primary outlet for nightsoil. After 1986, apart from a small portion transported to rural areas, most human waste in Shanghai was discharged into the vents via nightsoil boats. By 1994, the drainage system was accepting 4,642 tons of nightsoil daily, accounting for 70.6 per cent of the daily production, and the drainage arteries became a major outlet for Shanghai's human waste. In 2004, the drainage system disposed of 1.41 million tons of nightsoil, averaging around 3,880 tons per day. Until 2010, there were still three nightsoil vents, employed to discharge the nightsoil liquid after solid-liquid separation, while the sludge was mainly conveyed to landfill.⁶⁵

To attenuate environmental pollution from directly discharged human waste, the Shanghai Municipal Committee initiated the construction of sewage treatment plants to pretreat human waste before discharging it into the drainage system. In April 1986, the Sanitation Department invested 18 million yuan in the construction of a sewage treatment plant by the Huangpu River in Pudong District, specifically to process human waste delivered by nightsoil boats. It was designed to have a daily treatment capacity of 4,000 tons. However, a trial in 1992 demonstrated that the plant's actual daily capacity was only 150–200 tons, far below designed capacity. After this failure, there was a hiatus in the construction of sewage treatment plants. It was not until 2002 that the newly built Zhabei District sewage treatment plant succeeded, treating 600 tons of human waste daily. The sewage was discharged into the drainage pipes after pretreatment procedures such as fermentation. The success of the Zhabei plant promoted the sewage treatment plant model. By the end of 2010, Shanghai had built four such plants, distributed across Putuo, Zhabei, Yangpu and Pudong Districts, treating over 2,000 tons of human waste daily.⁶⁶

⁶³SMA, B1-10-214, Shanghai shi Changning qū renmin zhengfu bangongshi guanyū huanwei gongzuo zhong fenbian chulu kunnan de baogao (Report from the Office of the People's Government of Changning District, Shanghai, on the difficulties in nightsoil outlets in sanitation work), 18 Jan. 1985.

⁶⁴Shanghai Shi Lühua He Shirong Guanlijū, *Shanghai Shirong Huanwei Gaige Fazhan Gaikuang*, 1978–2010, 158–9.

⁶⁵*Ibid.*

⁶⁶Shanghai Shi Lühua He Shirong Guanlijū, *Shanghai Shirong Huanwei Gaige Fazhan Gaikuang*, 1978–2010, 158, 160.

As rural outlets for urban human waste dwindled after the 1980s, the dump stations and vacuum trucks that had been used to collect nightsoil seemed superfluous. Moreover, daily emptying of nightsoil buckets was difficult for residents, especially those living in tower blocks or far from dump stations, or for the elderly and disabled, for whom daily bucket emptying was a misery. Therefore, with the government's approval, flush toilets were installed in many newly built apartment buildings, with pipes connecting to septic tanks or sewers. The nightsoil buckets were abandoned forever. For instance, the 22 newly built residential buildings for the Shanghai Petrochemical General Factory were originally planned with nightsoil bucket rooms on each floor. However, by 1980, the residents were extremely dissatisfied with the sanitation facilities and 'resolutely demanded to convert the nightsoil bucket rooms into flush toilets'. The authority considered this request reasonable and invested 100,000 yuan to complete the reconstruction project, as well as building septic tanks and other 'outdoor projects'. The Shanghai Infrastructure Committee also approved this reconstruction request straightaway.⁶⁷ From the 1990s, the Shanghai Municipal Committee mandated that all newly built residential buildings must be constructed with corresponding septic tanks to accommodate human waste from flush toilets. With this policy change, the number of septic tanks in Shanghai rose sharply. For example, Putuo District had 1,267 septic tanks in 1980, but the number had increased to 3,217 by 1998.⁶⁸

While flush toilets and septic tanks brought modern convenience to residents, these decentralized human waste disposal systems still required regular pumping by vacuum trucks. However, the Sanitation Department's limited pumping capacity, along with the diminishing rural demand for nightsoil after the 1980s, led to further issues. The defective design of septic tanks and nightsoil pipes, coupled with improper toilet usage, including neglecting to flush toilets with water closets, frequently caused blockages. Consequently, from the 1980s to 1990s, overflowing septic tanks were a common problem in Shanghai and emerged as the primary source of nightsoil flooding.⁶⁹ Abandoning septic tanks in favour of expanding the sewerage system was not feasible. Thus, the authorities had to mitigate septic tank overflow through strengthened administration, including strategies such as the creation of 'septic tank archives' to assign responsibility for maintenance of each tank, enabling timely clearance whenever spillage occurred. Furthermore, as overflow often occurred in autumn and winter (as the weaker fermentation reactions induced blockages), the Sanitation Department chose to increase the frequency of septic tank pumping in summer to lower overflow rates.⁷⁰ Nevertheless, completely eliminating overflow remained a challenge. In 1998, nightsoil spillage was still a prominent issue in Shanghai, sparking many civic complaints.⁷¹ The problems with septic tanks pushed the government to adjust its policies. In 1996, Shanghai's Ninth Five-Year

⁶⁷SMA, B289-2-322, Guanyü Shanghai shihua zongchang jūmin xincun daobianqi gajian wei choushui matong de pifu (Reply to the reconstruction of nightsoil bucket rooms into flush toilets in the New Village of Shanghai Petrochemical General Factory), 5 Dec. 1980.

⁶⁸Shanghai Putuo Shirong Huanwei Zhi Bianzuan Weiyuanhui, *Shanghai Putuo Shirong Huanwei Zhi* (Shanghai Putuo City Appearance and Environmental Sanitation Gazetteer) (2010), 179–80.

⁶⁹*Wenhui Bao* (Wenhui Daily), 25 Mar. 1987, col. 3.

⁷⁰*Wenhui Bao* (Wenhui Daily), 6 Dec. 1994, col. 2; Shanghai Shi Xūhui Qū Zhi Bianzuan Weiyuanhui, *Xūhui Qū Zhi* (Xūhui District Gazetteer) (Shanghai, 1997), 439.

⁷¹*Xinmin Wanbao* (Xinmin Evening News), 20 Feb. 1998, col. 3.

Plan set the goal of promoting the 'piped transport of nightsoil'.⁷² From the late 1990s onwards, flush toilets in some newly built apartment buildings started directly connecting to sewers.⁷³

While flush toilets, septic tanks and sewers were promoted in Shanghai, nightsoil dump stations still continued to operate after the 1980s. Many residents still relied on nightsoil buckets, and the decline in both buckets and dump stations was gradual. In the early 1990s, over 600,000 nightsoil buckets remained in Shanghai,⁷⁴ and by the end of 2005, there were still 450,000 in use.⁷⁵ Dump stations also remained, decreasing from around 3,400 in 1980 to 2,000 in 2010, a modest 40 per cent drop over 30 years.⁷⁶ Moreover, the reduction rate slowed after 2007. For instance, while Huangpu District averaged 22 closures per year from 1992 to 2007, it shuttered only 36 stations over four years after 2007.⁷⁷ The lingering presence of nightsoil buckets and dump stations in Shanghai was not attributable to residents' nostalgia for traditional lifestyles. Rather, the primary factors were Shanghai's high building and population densities, which made installing flush toilets difficult in cramped housing, while electric pump toilets frequently caused sewer blockages. As a result, many Shanghai residents had little option but to persist with the nightsoil bucket routine.⁷⁸

Conclusion

Urban human waste disposal in Shanghai underwent a dramatic transition between 1949 and 2010. Even after the Communist victory, the removal of Shanghai's human waste still depended mainly on manual effort, which accounted for the waste of over 70 per cent of the city's residents. Given the importance and complexity of this issue, the Shanghai Municipal Committee founded a city-owned Cleaning Agency to replace the contractor system and extended its scope to the urban fringes by 1965. From the 1960s, authorities aimed to mechanize human waste removal to reduce labour and improve residents' daily lives, substituting nightsoil handcarts with vacuum trucks and piloting integrated toilets and nightsoil dumping stations. After 1973, dumping stations plus vacuum trucks were selected as the primary mechanization solution, and these methods were widely used by 1980.

The widespread availability of chemical fertilizers for agriculture caused a shift away from nightsoil as manure. This led to severe human waste issues in many Chinese cities from the late 1970s onwards but was especially acute in a large city such as Shanghai. The government first tried stimulating sales in human waste by erecting suburban storage tanks and lowering prices, but these efforts failed to alter the trend. By 1985, the disappearance of traditional rural disposal outlets had further worsened, forcing the authorities to temporarily approve nightsoil discharge into

⁷² *Wenhui Bao* (Wenhui Daily), 17 Nov. 1996, col. 2.

⁷³ Shanghai Putuo Shirong Huanwei Zhi Bianzuan Weiyuanhui, *Shanghai Putuo Shirong Huanwei Zhi*, 179.

⁷⁴ *Wenhui Bao* (Wenhui Daily), 28 Mar. 1991, col. 3.

⁷⁵ *Jiefang Ribao* (Jiefang Daily), 23 Feb. 2007, col. 1.

⁷⁶ Shanghai Shi Lühua He Shirong Guanlijü, *Shanghai Shirong Huanwei Gaige Fazhan Gaikuang, 1978–2010*, 243.

⁷⁷ *Chengshi Daobao* (City Herald), 9 Jan. 2012, col. 6.

⁷⁸ Z.L. Ding, 'Heshi gaobie baiwan matong' (When to move away from millions of nightsoil buckets), *Shanghai Tan* (Shanghai Bund), 6 (1992), 9–12.

the drainage system. This temporary measure became the primary outlet for nightsoil. The authorities promoted sewage treatment plants to treat human waste before discharge.

The prevalence of nightsoil overflow in Shanghai after the 1980s stemmed largely from the substantial increase in the use of septic tanks. As rural sales of waste declined, the government abandoned the dump station model, and newly built apartment buildings were allowed to install flush toilets and septic tanks. However, the imperfect design of nightsoil pipes and septic tanks, along with insufficient pumping, led to frequent spillage, which proved difficult to eliminate. As decentralized septic tanks were problematic, the government planned to implement 'piped transport of nightsoil'. While the number of flush toilets increased, dump stations and nightsoil buckets remained widespread in Shanghai. Use of nightsoil buckets persisted even as late as 2010.

As the most modernized city in China, Shanghai was not devoid of modern sewage systems, which were first established in the Shanghai International Settlement as early as the 1920s. However, these new systems were not widely adopted even within the foreign concessions. Manual or mechanized collection persisted as the predominant method for human waste disposal in Shanghai until the 1980s. One might assume that tradition or socio-economic backwardness hindered the promotion of sewage systems. However, this perspective reflects a preconceived notion that the modernization of urban human waste disposal necessitated the development of sewage systems along the Western model.

The history of human waste disposal in Shanghai reveals that transitions in disposal methods were not driven by factors within the city but rather by developments in rural areas. Before the 1970s, urban human waste still held value as fertilizer, and Shanghai's disposal methods evolved towards a certain form of modernization. The basic pattern remained focused on collecting human waste for agricultural purposes, albeit with mechanization to save labour and improve convenience for residents. Meanwhile, the use of sewage systems stagnated. After the late 1970s, urban human waste was devalued as a fertilizer because of the promotion of chemical fertilizers. It was at this point that municipal authorities began treating human waste as refuse, promoting decentralized systems including septic tanks.

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