

Article



Exploring the Applicability of the PPP in Tourist Toilets: Reflections on the Laoshan Case in China

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Abstract: Although public–private partnerships (PPPs) for tourism have received extensive attention, there has been limited research on their application to tourist toilets. The purpose of this study was to systematically explore the applicability of PPPs with respect to the construction and operation of tourist toilets. The study conducted field investigations and semi-structured interviews in the Qingdao Laoshan Scenic Area (LSA), where purposive sampling techniques were used to manage participant selection and expand sample sizes. It finds that first, the use of PPPs to build tourist toilets is new and has shown both development potential and challenges. Second, the use of PPPs to provide tourist toilets is not yet mature owing to management and supply inefficiencies. Third, the DBTO model in the Laoshan case offers a significant methodological value for similar PPP projects, which could be replicated and promoted more widely when certain conditions are met. This study has filled a research gap in the global toilet revolution and shows a different path from the investment guarantee system in developed Western countries and the Guilin model in China. This application of a PPP in provision of tourist toilets also broadens the knowledge base of researchers studying PPPs in the field of tourism and could lead to the development of a policy approach with respect to PPPs' application in the toilet revolution and regional tourism development.

Keywords: public-private partnership; tourist toilet; tourism management; DBTO; Laoshan

1. Introduction

The toilet revolution has played an important role in this age of sustainable development. This term, first proposed by the United Nations Children's Fund (UNICEF), refers to renovating toilets in developing countries and China, in cooperation with the latter's National Patriotic Health Campaign Committee (NPHCC). Historically, poor sanitary conditions have caused epidemics and environmental pollution [1,2]. Human excrement, a primary cause of environmental pollution and a threat to public health [3], has led to the deaths of 1.5 million children from diarrhea-related causes annually [4], and it is the main cause of death in sub-Saharan Africa [5,6]. Therefore, sanitary toilets are essential for human habitation and have been referred to as the barometers of civilization [7]. Global efforts are being made to improve toilet sanitation [8], in a revolution that has now extended beyond just toilets to include the entire health system [9].

The peculiarity of the Chinese toilet revolution is its expansion from the health system into tourism. In the 1950s, it was closely related to the patriotic health movement that aimed to improve the health environment [10]. Zhu Jiaming and other scholars began advocating for a toilet revolution in China in the 1980s because they believed that the state of a nation's toilets, to a great extent, reflects a country's civilization [11]. The issue climaxed, however, when, after China's reform and opening, a large number of foreign tourists, mostly from developed countries, came to China for sightseeing. They frequently complained about having to use the country's generally unsanitary and unshielded public toilets, to the point



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Copyright: © 2023 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https:// creativecommons.org/licenses/by/ 4.0/). that, during the 1980s and the 1990s, China's toilet problem was continually reported on by foreign media. By the early 1990s, hundreds of domestic and foreign news organizations, in tens of thousands of articles, criticized China's toilet problem [12], which eventually prompted the government to focus on addressing the issue of tourist toilets, thereby significantly improving their overall quality.

The toilet revolution has spread to many areas, including rural, tourist, and highway rest areas [13]. By 2015, the tourist toilet revolution became a national project that was actively promoted by the National Tourism Administration (NTA), which is a campaign launched for the phenomenon of dirty and untidy toilets in tourist attractions. President Xi Jinping twice noted that the toilet revolution was one practical cleanup measure that would improve the experience of tourists. Presently, the tourist toilet revolution has become a national civilizing project in China and the government sees the improvement in the quality and quantity of tourist toilets as a significant way to develop tourism, and eventually achieve a high standard of all toilets in tourist attractions, along tourist routes, traffic distribution points, tourist restaurants, tourist entertainment venues, leisure walking areas, etc.

Building and maintaining tourist toilets is expensive, however, and this places financial pressures on various levels of the government. Moreover, owing to a lack of professionalism and experience in the workforce, the government has been unable to significantly improve toilets—this has led, in due course, to the introduction of public–private partnerships (PPP) into the sector. PPPs are long-term partnerships between the public and private sectors for the provision of public facilities and services. The modern PPP concept was first proposed by Reymont in 1992; as a model for financing and operating public facilities and services projects, PPPs form a bridge between the government and the market. In a typical PPP arrangement, the private sector finances, maintains, and operates the project for an agreed period, and then transfers it to the public sector [14].

Existing study on PPPs is primarily focused on municipalities, transportation, and the environment, with little research on PPPs in tourism and much less on PPPs in tourist toilets. From the standpoint of study on the use of PPPs in toilets, we find that current research is increasingly focused on urban public toilets, and there is a shortage of targeted and systematic research on the factors impacting the PPP model for the construction of tourist toilets. However, tourist toilets have their own special characteristics compared to other public toilets. On the one hand, tourist toilets located in scenic areas have the commercial potential to develop profitability by taking advantage of the characteristics of the scenic areas and the flow of people. On the other hand, tourist toilets are not only aimed at local citizens, but also at tourists from all directions; both local citizens and tourists can use them. Tourist toilets are critical for improving the visiting experience, increasing the attraction of beautiful areas to tourists, and establishing a city's overall image. On a practical level, as a link between the public and private sectors, PPPs may not only alleviate the government's financial burden in these projects, but also use the market to improve the operational efficiency and service efficacy of tourist toilets. The applicability and model design of PPPs for tourist toilets are worth investigating.

The purpose of this article is to close the gap on the applicability of PPPs to tourist toilets. It was unclear whether a typical PPP model was appropriate given the characteristics of the tourism industry [15]. This is especially true for tourist toilets, which are considered to have a higher research value. Frequently, tourist toilets are used for free as auxiliary facilities for visually appealing locations, but free use does not mean that they should not generate cash flow, although the price of their use may be included in tourism admission tickets or paid by governments. When a PPP is implemented, franchise rights are often bundled and attached to certain scenic spots and to compensate the social capitalist. This exposes private capital sources to risk and raises question on the PPP model's applicability to tourist toilets.

We aimed to contribute to the literature on implementing PPPs in the tourism sector, focusing on tourist toilets, and using empirical analysis of the Laoshan model, which is a

PPP project in the Laoshan Scenic Area (LSA) of Qingdao, China. It was one of the earliest PPP projects for tourist toilets in China and was promoted as the Laoshan model in the paper entitled "Report on the Promotion of the Toilet Revolution", issued by the NTA.

In this study, we aimed to answer the following questions: (1) How does the PPP model in the LSA work?; (2) Is a PPP model applicable for tourist toilets?; and (3) Which PPP model is most suitable for the construction of tourist toilets? To achieve this overall aim, we comprehensively analyzed the value of applying PPPs to tourist toilets and examined the applicability of PPP contributions to tourism infrastructure.

2. Literature Review

2.1. PPPs and Tourism

International PPP research has focused mainly on risk management, key factors for PPP success, the investment and financing environment, economic feasibility, and concession agreements [16,17]. Since China's reform and opening in 1978, PPPs have become a common means of funding projects in the country [18,19]. This is especially true for infrastructure, given the country's growing urbanization [20]. In their overview of PPPs in China, Ke et al. (2014) summarized the opportunities, environment, and application [21]. Mu et al. (2011) analyzed and explained the process of institutional change that PPPs have caused in China's transportation sector, based on the path dependence theory [22], while Wang et al. (2014) analyzed the overall application of PPPs in China by investigating the characteristics of different departments and projects [20]. Adams et al. (2006) studied the main models of China's PPP system and identified the major constraints [23]. Other Chinese PPP studies have focused mainly on the types of PPPs that optimize financing structures, legal issues, and designs during concession periods, as well as pricing mechanism strategies and frameworks [24].

Some nations in Europe, Africa, and Southeast Asia have implemented tourism PPPs over the past two decades [25–28]. In the tourism sector, PPPs have been mostly used to manage cultural heritage sites [29–31]; however, the private sector's ability to engage with the public sector in heritage site management activities has been constrained by partnership responsibilities and resource allocation [31]. PPPs in the field of sustainable tourism are particularly valuable, with a good example provided by the article of the Australian Center for Sustainable Tourism Cooperation: "How APEC can implement sustainable strategies for tourism destinations through the PPP" [32]. The use of PPP development in sustainable tourism can drive strong stakeholder participation in job creation, social development, and environmental practices [33]. Research has also been conducted on PPPs in tourism destination marketing, such as the restoration of the Bai people's houses in Dali, China, where a PPP project was adopted as part of the marketing program for the city, showing that, in addition to heritage protection, PPPs can be applied to promoting destination branding [34].

In the literature, tourism PPPs are still generally examined from the perspective of partnership theory [35]. Researchers generally believe that PPPs provide a means of generating funds to supplement government support. This is important in the current political environment because it can help increase the self-sufficiency of heritage reserves worldwide [36,37]. Weiermair opined that since the tourism industry is significantly affected by government regulations and private (usually short-term) interests, it is necessary to establish principles and management requirements for PPPs in tourism by analyzing the core interests and issues associated with PPPs in the tourism industry [38]. Although PPPs effectively allocate risks and responsibilities, they have been associated with over-commercializing public heritage property, in a negative phenomenon amplified by the media [39].

Since 2014, the Chinese government has vigorously promoted PPPs for public services, including tourism. The emergence of a PPP policy for the tourism industry was not a temporary policy variation, but rather an inevitable evolution of tourism policy, and it was influenced by political, economic, and cultural factors in China [40,41]. By the end of



October 2018, 244 tourism PPP projects existed in the China Public–Private Partnerships Center, where they accounted for 2.8% of the total number of projects (Figure 1).

Figure 1. Number of PPP projects by industry (October 2020), source: http://www.bridata.com/project?type=hylx&in_cpppc=1, (accessed on 10 November 2020).

These mainly support the overall development of tourist attractions, regional tourism infrastructure construction, rural tourism, self-driving and camping tourism, and other projects, and they generally incorporate for-profit models. Tourism PPPs are not simply a way to provide investment and financing for tourism projects, but also allow China to change its tourism governance and achieve sustainable development under the influence of a new public management movement [15].

In the field of tourism investment, a historical mismatch between tourism resources and market factors such as professional developers and capital has had a detrimental effect on the sustainable development of tourism resources, to the point where this supply and demand mismatch has seriously harmed the sustainable development of tourism resources [42]. Now, a PPP is frequently viewed as a macropolitical force driving China's tourism development, as a means of resolving the mismatch between national tourism resources and producing forces, hence aiding the achievement of geographical equality in tourism development. Tourism industry projects generally require a large investment in their early stages and then provide a relatively stable cash flow on an ongoing basis. The significant funds needed to construct tourist facilities can strain government finances, and this financial pressure can be alleviated by introducing other investors. The popularity of tourist attractions creates good conditions for various forms of commercial development, and thus provides a suitable avenue for private capital investment in the pursuit of profit.

While tourism is a good candidate for PPPs, tourism infrastructure projects, particularly tourist toilets, are frequently disregarded since they are not directly tied to a tourism resource imbalance. They are also incompatible with the public and commercial qualities of tourism at the microscale level of investment; research into their provision and management will lead to a more holistic understanding of public–private partnerships in the tourist sector.

2.2. PPPs and Tourist Toilets

The majority of public–private partnership research on toilets has focused on urban and public facilities. The bulk of current research states that market mechanisms should be included in urban public toilet development and that public toilets are vital urban infrastructure. They are typically viewed as public goods, and as such can be either a pure public good built with government funding or a market-based, quasi-public good (Greed 2010). Furthermore, the institutionalized contracting of public toilet construction projects through the introduction of the PPP model could improve public toilet management in cities [43].

China's venture into the field of PPPs in public toilets also started with urban public toilets, with the Guilin model heralded as the first example of business-oriented toilet installation and management. The Guilin Municipal Government issued a fifty-year management right for the auction of new toilets, which proposed that the toilets were bundled with commercial stores, and public bids were invited. The winning bidder had the right to operate the facilities for 50 years but was responsible for toilet construction, maintenance, and management. The Guilin government formulated management standards for its public toilets and allocated itself the right to monitor and inspect them at any time after the auction [44]. This model produced exceptionally good results. Guilin's toilet revolution has now been transformed into the Guilin consensus, and the Guilin model has been promoted for toilet development and management throughout the country, to the extent that it has begun to expand into the tourism field.

In recent years, China's tourism industry has vigorously promoted the toilet revolution, aiming to increase the number and quality of toilets and introduce market forces into the improvement of overall tourism experiences. The Chinese NTA has issued a series of policy documents, including chapters of the National Plan of Action for the Construction and Management of Tourist Toilets (2015–2017) and (2018–2020), and guidelines for the construction and management of tourist toilets. It has also revised and promulgated standards, such as on the classification and assessment of quality grades of tourist toilets, and included the toilet revolution in the Tourism 515 project. Local governments also have plans to improve public toilet facilities. The toilet revolution has expanded from scenic areas and tourist routes to tourist cities and has now spread throughout China via the All-for-One Tourism concept [45]. China has adopted the goal of making sanitary toilets available for 85% of the population by 2020, and 100% by 2030 [46].

Nowadays, the promotion of the toilet revolution is often bound up with policies for new rural construction, rural revitalization, and rural tourism development, which can often result in a lack of specific toilet funding. Although financial subsidies have been provided for local economic development, the common-use nature of toilets makes private financing difficult: while building enough new toilets in China requires billions of yuan, funds are also required for their ongoing maintenance. A shortage of maintenance funds has thus become an obstacle for the toilet revolution, especially in underdeveloped areas, even though financial support is available from state subsidies or scenic area operators. Since the market is still in its infancy [47], more private capital is needed if China is to complete its toilet revolution.

With the sustained and rapid development of China's tourism industry, better public toilets in scenic areas are required to improve the overall tourist experience in each area. As a fundamental component of tourism public service facilities, the quality of tourist toilet construction and operation has an effect on not only the tourists' experience during their stay, but also on their overall perception of the tourist destination. Under long-term budget constraints, toilets at China's tourist destinations have often been last in line for funding, again underscoring the need for private capital. It is expensive to build and renovate toilets as well as to increase their distribution density in scenic areas. This issue provides a good example of how the experienced and professional use of private capital is needed to introduce improvements in the design, layout, and operational management of these facilities. China's scenic areas, which have large tourist flows, offer a significant business potential for private capital investment.

Briefly, in both the academic and practical levels of application, the use of PPPs in the field of toilets has been concentrated mainly on urban public toilets, and there have been few discussions regarding tourist toilets. Since flagship, large-scale, tourist attractions in China are often managed by governmental agencies, the PPP model's application in tourist toilets can not only solve the problem of their construction and operation, but it also represents opportunities to apply a new means of governance for major Chinese tourist attractions. Therefore, the applicability of the PPP model in providing tourist toilets should be further considered.

3. Materials and Methods

3.1. Representation of the Case

To establish a revolutionary tourist toilet model, the NTA published its "Report on Promoting the Toilet Revolution" in May 2017, in which the Laoshan case was highlighted as a typical public–private partnership model for national tourist toilets [45]; thus, it was chosen as a representative case for this study. Laoshan Mountain, located east of Qingdao in Shandong Province, is one of the Shandong Peninsula's most noteworthy peaks (Figure 2). The LSA's 446-square-kilometer footprint includes the Laoshan National Forest Park and seven major tourist areas—Jufeng, Liuqing, Taiqing, Qipan Stone, Yangkou, Jiushui, and Hualou—all of which feature abundant natural and cultural landscapes.



Figure 2. Laoshan Scenic Area map (drawn by authors).

The PPP project for tourist toilets in the LSA resulted from cooperation between the municipal government and China Everbright Eco-technology Co. Ltd. (EE) which located in Beijing, China. As the only 5A scenic area in Qingdao, the LSA has greatly promoted local tourism; however, as tourist numbers increased, the toilet problem gradually started to affect tourist satisfaction levels there. A lack of toilets, outdated facilities, underdeveloped water supply technology for mountain toilets, and other reasons, forced tourists to go into the mountains or forests to relieve themselves, which then meant that LSA workers had to carry water up the mountains to clean these areas.

To address these problems, the Tourism Department of the Laoshan District wrote several reports over 2015–2017, promoting the toilet revolution as a crucial measure to improve its public services for tourism. This resulted in LSA management departments being prepared to introduce private capital to build and manage mountain toilets and to relieve some of the funding pressure caused by urgent toilet projects.

The China Everbright Group, a financial holding company directly under the State Council, operates in the financial and industrial sectors. As a large-scale, state-owned enterprise, the Everbright Group follows the will of the government when making strategic decisions to the point where, as a state-owned financial service entity, the group has recently increased its direct participation in the industry.

Tourism has become one of the group's main strategic business areas, and it has made notable investments in the toilet revolution. EE, a subsidiary of the Everbright Group, developed a new business model, focusing on tourism and environmental protection, by constructing tourist toilets and undertaking related businesses, including scenic retail facilities and associated catering. Therefore, the LSA has become a valuable experimental site, potentially setting an example for future investment in tourism. The Laoshan PPP project is a Design-Build–Transfer–Operate (DBTO) model (Figure 3). The private sector invests capital in infrastructure development and then transfers it to the public sector at an agreed price. The public sector then rents the facility back to the private sector, which operates it for a fee. The private sector does this to avoid the numerous obligations and other problems associated with asset ownership.



Figure 3. Contractual arrangements applicable to the Laoshan tourist toilet PPP project (drawn by authors).

In the LSA case, EE has been responsible for the design, construction, and operation of the project, which will be bought back by the government after its completion. The government authorized EE to open a commercial complex—the Everbright Post Station—as well as to build and renovate 100 standard ecological toilets in the LSA. To date, 38 new and renovated toilets have been completed, all of which meet or surpass the 2A standards of the national tourist toilet quality rating, with nine meeting the highest, 3A, standard. The government spent RMB 7.2 million to buy back these nine toilets in the first phase of the project, at a cost of RMB 6000–8000/m².

3.2. Investigation and Interviews

In this study, we used field investigation and semi-structured interviews. Semistructured interviews are based on a rudimentary understanding of the interviewees' circumstances and the questions to be asked. The interviewer retains the ability to make appropriate modifications based on the circumstances surrounding the interview. There are no criteria for the manner and sequence of questions, the manner in which interviewees respond, the manner in which the interview is recorded, or the time and location of the interview. Field investigation may provide an opportunity for face-to-face interviewing to bolster the investigation's confidence and efficacy. While these in-depth, qualitative studies focus on a small number of collaborative relationships, it is believed that this was a useful methodology and appropriate for the exploratory nature of PPPs [48].

In this case, a field investigation was conducted in January 2018 in the Taiqing, Jufeng, and Yangkou tourist areas of the LSA, to observe the distribution and density of toilets and their internal and external design and operation. Four toilets from Taiqing, three from Jufeng, and four from Yangkou were selected at random, and assessed against the applicable Chinese national standard (GB/T 18973–2016: Classification and evaluation of quality grades of tourist toilets).

We used purposive sampling and eventually interviewed 21 individuals (Table 1). Purposive sampling is a technique used to provide researchers with the discretion to choose participants who have a detailed understanding of a subject, whereas snowball sampling helps expand sample sizes through recommendations from the professionals involved in a project. When these techniques are combined, they form an effective way of investigating the subject under review. For all interviews, the interview process covered selected core questions, including the following:

- (1) PPP project planning for toilets in scenic areas, and the rights and obligations of both the government and enterprises;
- (2) Changes to toilets in scenic areas after PPP model adoption;
- (3) The specific evaluation methods of enterprises during late-stage operation of toilets;
- (4) The business scope and economic benefits of the Everbright Post Station; and
- (5) Tourist flows and business conditions for commercial areas around toilets (excluding those at the Everbright Post Station).

Table 1. Sample descriptions.

NO.	Gender	Position	Method
1	Male	Official of Laoshan Scenic Spot Administration Construction Planning Office	Face-to-face
2	Male	Official of Laoshan Scenic Spot Administration Construction Planning Office	Face-to-face
3	Male	Official of Laoshan Scenic Spot Administration Construction Planning Office	Face-to-face
4	Male	Manager of China Everbright Real Estate Co., Ltd.,	Telephone
5	Female	Official of Laoshan Scenic spot Taiqing Tourist Area Management Office	Telephone
6	Male	Official of Laoshan Scenic spot Taiqing Tourist Area Management Office	Face-to-face
7	Male	Toilet cleaning staff of Laoshan Scenic Area	Face-to-face
8	Male	Toilet cleaning staff of Laoshan Scenic Area	Face-to-face
9	Male	Toilet cleaning staff of Laoshan Scenic Area	Face-to-face
10	Female	Toilet cleaning staff of Laoshan Scenic Area	Face-to-face
11	Male	Toilet cleaning staff of Laoshan Scenic Area	Face-to-face
12	Female	Conductor of Laoshan Scenic	Face-to-face
13	Female	Shopkeeper in Laoshan Scenic Area	Face-to-face
14	Male	Shopkeeper in Laoshan Scenic Area	Face-to-face
15	Male	Shopkeeper in Laoshan Scenic Area	Face-to-face
16	Male	Tourist	Face-to-face
17	Male	Tourist	Face-to-face
18	Male	Tourist	Face-to-face
19	Female	Tourist	Face-to-face
20	Female	Tourist	Face-to-face
21	Female	Tourist	Face-to-face

Besides the core questions, the interview structure allowed for different questions to be posed to different types of interviewees. To study the applicability of the PPP model in Laoshan tourist toilets, we selected three government staffers from the Laoshan District of Qingdao and two LSA staff members to understand how the Laoshan district government and the government-managed agencies in the scenic area participated in PPP model operation. Two EE staff members were responsible for representing business participation in the model operation, while five tourist toilet operators and maintenance personnel were selected to represent tourist toilet operation and maintenance activities. Three shop owners around the tourist toilets represented businesses around tourist toilets, and six tourists were invited to express their levels of satisfaction with the LSA tourist toilets.

The numbers of respondents for each type were determined based on the information saturation technique, in which new respondents were interviewed until they could no longer consistently provide new perspectives. Nineteen people were interviewed face-to-face, and two by phone; all interviews lasted for at least 40 min.

3.3. Value for Money (VFM) Method

Due to toilets' high costs and private capital firms' interest in returns, some projects may require the government to spend more money or to use more social resources. To measure whether a PPP is economically feasible for a public facility project, it is necessary to compare its costs and benefits with those of a traditional government procurement model for the same project.

Compared with traditional PPP model evaluation methods such as direct government investment measurement and expert evaluation, VFM has become the most widely used method to evaluate PPP projects around the world. Generally, one either compares costs for the same benefits or compares benefits for the same costs. The former assumes that the benefits of a PPP model and a traditional government procurement model are equal and compares the net present value, the public sector comparator value, and the PPP value of a project over its entire life cycle. The latter assumes that the government's cost for the two models is the same and compares the quality of products or services provided by the project. For a tourist toilet project, the government adopts a PPP mode and introduces private capital to improve the service quality of toilets by utilizing the professional expertise of private capital firms. Thus, the benefits of these two modes are different. This paper adopts the latter approach and expands it, considering the perspectives of both the government and private capital firms when conducting a VFM analysis of PPP toilet projects in the LSA.

3.4. Materials Collection

This paper also collected the following materials. (1) Scenic area information: as the LSA is a famous domestic tourist attraction, information on it can be found on the official website and local government websites, which can reflect the development of the LSA; (2) Project materials, mainly related documents provided by the interviewees in the survey, such as project manuals, business reports, promotional videos, etc., which can reflect the specific content of the project in detail; (3) Direct observation: on-site observation by the research team and work specifications for tourist toilets in scenic spots provide data from field observations, and associate abstract interview content from actual situations. These different types of evidence sources complement each other and jointly support data analysis and theoretical construction.

4. Applicability Analysis Model of PPPs for Tourist Toilets

1

4.1. Government Applicability Analysis Model

In a traditional procurement mode, the overall cost for the Qingdao Municipal Government includes the costs of toilet construction, operation, and maintenance. Toilet construction costs include pre-construction bidding costs, construction costs, and fixed assets costs (i.e., toilet seats). Operation and maintenance costs include daily cleaning, labor management, equipment maintenance or replacement, and other expenses. For free toilets, the government makes an implicit rather than a cash profit. The former is the greater satisfaction of tourists visiting the Laoshan scenic area, which can increase ticket revenues at the scenic area and bring other benefits to Qingdao City. Greater usage of the scenic area also promotes the development of other industries, such as the hospitality and catering industries. Equations (1)–(3) describe net revenues before adopting a PPP:

$$C_g^1 = B_g^1 + O_g^1 \tag{1}$$

$$R_g^1 = IP_g^1 \tag{2}$$

$$NR_g^1 = R_g^1 - C_g^1 = IP_g^1 - B_g^1 - O_g^1$$
(3)

The government's net revenues before adopting a PPP are shown as NR_g^1 , where R_g^1 represents revenues and C_g^1 represents government costs. C_g^1 mainly consists of the cost to build (B_g^1) and operate (O_g^1) toilets. R_g^1 is the implicit profit (IP_g^1) .

According to the PPP agreement between Qingdao's Municipal Government and the Everbright Group, the government buys back the toilets after they are built but does not bear any future operating costs. Thus, the government pays for buying back the toilets but

earns the implicit profit and new tax revenues. Equations (4)–(6) describe net revenues before adopting a PPP:

$$C_g^2 = BB_g^2 \tag{4}$$

$$R_g^2 = IP_g^2 + TR_g^2 \tag{5}$$

$$NR_g^2 = R_g^2 - C_g^2 = IP_g^2 - BB_g^2$$
(6)

After PPP adoption, the government's net revenues are NR_g^2 , where R_g^2 represents revenues and C_g^2 represents government costs. C_g^2 mainly consists of government buyback costs (BB_g^2) . R_g^2 primarily consists of implicit profit (IP_g^2) and tax revenues (TR_g^2) , which are negligible in this project.

Since the quality of toilets improves after PPP adoption, the government's cost to buy back these better toilets is higher in comparison to when purchasing standard toilets. However, the higher price avoids the high cost of operating and maintaining the toilets. In addition, as shown in Equation (7), since implicit gains are obviously higher under a PPP, the government's net income increases with the adoption of a PPP.

$$NR_{g}^{2} - NR_{g}^{1} = \left(IP_{g}^{2} - IP_{g}^{1}\right) - \left(BB_{g}^{2} - B_{g}^{1}\right) + 0_{g}^{1} > 0$$
⁽⁷⁾

4.2. Enterprise Applicability Analysis Model

In a traditional purchasing model (before a PPP), the Everbright Group is not involved in scenic area toilet projects. As a result, the projects have no financial impact on the company (see Equation (8), where NR_e^1 represents the Everbright Group's net revenues before adopting a PPP).

$$NR_e^1 = 0 \tag{8}$$

After a PPP is adopted, the firm's costs include toilet construction and operational management, as well as the government's buyback and franchise profits. According to the agreement, the government's repurchase price equals the construction cost. Equations (9)–(11) describe net revenue before adoption of a PPP:

$$C_e^2 = B_e^2 + 0_e^2 \tag{9}$$

$$R_e^2 = BB_e^2 + FP_e^2 + TC_e^2 \tag{10}$$

$$NR_e^2 = R_e^2 - C_e^2 = BB_e^2 + FP_e^2 + TC_e^2 - B_e^2 - 0_e^2 = \left(BB_e^2 - B_e^2\right) + \left(FP_e^2 + TC_e^2 - 0_e^2\right)$$
(11)

The Everbright Group's net revenue after adopting a PPP is NR_e^2 , where R_e^2 represents revenue and C_e^2 represents enterprise costs. C_e^2 mainly consists of toilet build (B_e^2) and operating costs (0_e^2) . R_g^2 mainly consists of the government's buyback (BB_e^2) , toilet charges (TC_e^2) , and franchise profits (FP_e^2) .

Assuming that the government recycles according to the cost of construction, $BB_e^2 = B_e^2$. Since economic benefits exceed costs, the Everbright Group has made a rational business decision regarding this toilet project. Equation (12) shows that $FP_e^2 + TC_e^2 - 0_e^2 > 0$ and that net income is positive.

$$NR_e^2 - NR_e^1 = FP_e^2 + TC_e^2 - 0_e^2 > 0$$
(12)

4.3. Comprehensive Applicability Analysis Model

By comparing net income before and after adopting the two models, we find that both the government and the private capital company obtain positive net income from the PPP project for toilets in the LSA, which embodies the principle of mutual benefit and the benefit sharing of the PPP.

We used a supply and demand model for a comprehensive applicability analysis (see Figure 4). The supply curve (*S*) shows the quantity of a product (toilets, in this case) that producers are willing to sell at different price levels, while the demand curve (*D*) shows

the relationship between quantity and price. The specified price (P^*) is the price that the government plans to pay for tourist toilets. Deadweight loss, also known as welfare loss, reflects inefficiencies created in this market.





If toilets are regarded as commodities, and government payments for toilet construction are regarded as the demand side, enterprises will be more willing to build toilets at the same price by adopting a PPP. This shifts the supply curve to the right, from *S* to *S'*, and narrows the social deadweight loss from $\Delta P_o AB$ to $\Delta P'_o CE$. Moreover, direct users of toilet facilities (i.e., tourists, under the condition of free usage) have been receiving more and better services and are enjoying the benefits that the change of mode has brought about.

5. Model Selection and Validation of PPP's Applicability in LSA Case

5.1. The Most Applicable PPP Model Selection for the Case

The most interesting thing in the LAS PPP is its DBTO model, especially the transfer first and operate second sections. We compare different PPP models in tourist toilets in Table 2.

	Concept	Government	Enterprise
DBTO	DESIGN-BUILD-TRANSFER-OWN	Ownership is vested in the government, which holds the control of the project and can ensure the distribution of rights and interests from the scenic spot to the tourist toilets.	Private sector can recover costs and realize profits more quickly after the completion of the project, which can attract a large amount of private sector participation and can make full use of the professional design capability of private sector.
DBFO	DESIGN-BUILD-FINANCE- OPERATION	Private sector is considered in a holistic manner so that the cost of government investment in the entire project is reduced, but the government is provided with project services rather than project property rights, which may easily lead to property rights disputes.	Private sector would allow for holistic consideration of the full lifecycle costs of the project, but China currently lacks a guiding process for the implementation of this model, which can increase project costs for enterprises.
BOOT	BUILD-OWN- OPERATION- TRANSFER	Loss of control over the project during the operation period, which may result in the project construction not achieving the expected purpose, and even entails the risk of default by the private sector.	During the concession period, the private sector has ownership of the project, which reduces the difficulty of financing for the private sector, but is prone to property rights disputes as there is a transfer of ownership.
BLOT	BUILD-LEASE- OPERATION- TRANSFER	Applicable to operational projects with stable cash flow and rate of return. As a quasi-operational project, the expected rate of return for tourist toilets is relatively low, and the absence of other subsidy measures may discourage private sector investment, while subsidies will increase government costs.	Financing relies solely on the credentials of the private sector and the profitability of the project, and the private sector does not own the property rights of the project, making it more difficult for the private sector to raise funds.

 Table 2. A comparative analysis of the application of different PPP models in tourist toilets.

By adopting the DBTO model, for the government, the financial pressure is reduced to a certain extent and the social benefits brought are large, and the introduction of the private sector's advanced technical means and management model improves the overall operational efficiency of the tourist toilet project. For the private sector, it does not have to worry about the coordination problems with tourist attractions and can recover the capital advance faster after the project construction is completed and handed over to the government, and it can continue to operate subsequently, which ensures the project yield and enhances investment confidence, so DBTO can be the preferred option for the PPP model for tourist toilet in the LSA.

5.2. Positive Impact of the Case Study

Reality testing of the PPP model's applicability is likely a key link in evaluating the potential of this model, and it is the only way to move from theoretical feasibility to practical promotion [16]. Until now, investigations of the PPP model's application have mostly relied on cost–benefit analyses and analytic hierarchy processes; however, greater investigation of the PPP model's contribution to tourist toilets, as well as the conditions under which it should be employed, is required. This is particularly true if it is determined to be viable following extensive case studies.

The PPP has positively impacted the Laoshan toilet project and eased financial pressure on the government. The construction, cleaning, and maintenance of public toilets require significant capital, and the more toilets built, the greater the total costs, and the higher the required budget. Toilets do not generate direct revenue under standard financing models, and the investment must be entirely subsidized by the government, which constitutes a significant burden in instances when municipal revenues are limited.

The PPP model introduces private capital, which prepays construction costs, and then, after the project is completed, the government buys back the toilets in stages, which extends its financing window, thus reducing the associated financial pressure. In addition, franchising private capital firms can establish commercial areas near tourist toilets, which, if profitable, can fund toilet operating expenses and further reduce the total cost to the government.

Owing to toilet improvements, the reputation of the LSA has improved. Because of Laoshan's toilet revolution, tourist attractions from all over China have sent representatives to the LSA for visits and investigations, which has further expanded the influence of the area and its PPP model project. In an interview, LSA officials noted:

Various media members have reported on us a lot, and dozens of delegations from other places came here in 2017.

In constructing toilets and nearby service areas, private capital firms can design and build better toilets, which meet tourists' esthetic needs (Figure 5). Direct users of toilet facilities—that is, tourists, under the condition of free usage—have been receiving more and better services, and they have enjoyed the benefits of these mode changes. User impressions were reflected in the tourist interviews, and the consensus was that:

These toilets are accessible and novel, and in general, we will happily use them.

Managers of the scenic area also expressed their satisfaction, saying:

If we look at the scene, the toilets are really well built, especially with respect to their decoration and appearance. They are similar to the buildings in the scenic area, and no longer represent the 'old toilet' image.



Figure 5. Typical appearance and interior of a Laoshan toilet (images taken by authors).

PPPs can leverage the technological experience of an enterprise. In scenic areas, EE has designed ecological toilets that incorporate various environmental protection technologies. For instance, their toilets routinely use rainwater and recycled/reclaimed water for toilet flushing, and water treatment plants help solve water supply and sewage treatment problems. Selected energy-saving technologies, such as wind/solar energy and ground-sourced heat pumps, provide hot water and lighting. Photocatalyst technology has been introduced to decompose ammonia compounds, and a fresh air system has been implemented to reduce odors. In addition, toilet exterior design now fits in with the surrounding architecture in scenic areas—for example, the toilets near Taiqing Palace incorporate Taoist architecture, which allows them to become integrated with the scenic area's original ancient buildings. As LSA officials noted:

The toilets are really well made, especially with respect to their decoration and appearance. There is no toilet sign, just like the buildings in the scenic area, and they are relatively clean. In terms of effect, they use technology, which is very good.

Introducing EE technology has solved the problem of water supply to the high mountain toilets in the LSA. In the past, the toilets located at the lower exit of the ropeway in this scenic area were in better condition, and there was a small reservoir next to the toilets to store water for cleaning. However, the water supply for high mountain toilets mainly relied on rainwater, which was pumped up from a reservoir. In the winter, when there was little rain, the pipes froze, and the toilets were left with no flushing water and in a state of poor sanitation. As the LSA tourist toilet maintenance personnel said:

In the past, the water pressure for toilets in the mountains was inadequate, and water could not be pumped up—so that, sometimes, water had to be carried up the mountains by hand, to ensure proper hygiene. This is almost no longer the case, as pumps have been built, and the toilets (in the high mountains) can be flushed.

5.3. Risk Analysis of the Case Study

The LSA toilet project has been expensive; it required a sizable initial one-time expenditure and regular maintenance contributions. Private capital revenues are mostly obtained from government subsidies and the franchise income captured by business precincts around toilet facilities. Because the quality of toilets has improved as a result of PPP implementation, the government's buyback cost for these advanced toilets is more than it would be for standard toilets. As officials from Laoshan District stated:

The PPP cost for toilets designed by the Everbright Group is between RMB 6000 and 8000/m²; they are priced 40% higher than standard public toilets produced under the same construction conditions.

The Everbright Post Station, which was constructed adjacent to bathrooms, increased its commercial activities and formed a tourist service complex akin to an expressway service station. Since the LSA offers many attractions, tourists remain there for longer periods, and the facilities receive more extensive usage. This, in turn, provides a clientele who use service complexes built near the toilets. Tourists can rest and make purchases while enjoying the mountain climbing experience.

The Everbright Group segmented the post station into five distinct sections: retail, catering, panoramic travel experience, parent–child amusement, and remote diagnosis and treatment. The food and retail establishments, which were constructed with tourists in mind, were the post station's first service amenities. The related toilets contain interior and outdoor advertising display devices, while special needs-friendly toilets accept payment via a scanning code. Our investigation showed that to be sustainable, the Laoshan toilet facilities face many challenges.

First, the space available for development and construction was limited. As the LSA is on a hillside, commercial service sites such as the Everbright Post Station can only be established on the rare, relatively flat areas. Bases of hills, or cableway entrances, are suitable sites; construction and transportation costs are too high if toilets are built on sloping hillsides. This is particularly true if the toilets use high technology because some key equipment cannot be operated or maintained without light, making operational and maintenance costs higher. As LSA officials said:

Now, the facilities are managed by each (tourist scenic area) management office. Everbright provides the key personnel. We cannot repair this company's high-tech toilets. We look for local personnel to keep costs very low. If Everbright comes, it costs more to send someone. We have discussed a cooperative operation, which is the establishment of a joint venture company, with a certain percentage of shares.

Second, restaurants and retail establishments located near the Everbright Post Station actively compete for their business and draw a sizable customer base. For instance, the shopkeeper stated during one interview that a tea house adjacent to the Everbright Post Station had been functioning for six to seven years and that a KFC (Kentucky Fried Chicken) had been erected adjacent to the tea house:

The toilet at Everbright was okay, and we did not say it was extra good. It was mainly novel. We tried it the day it opened. The Everbright Post Station (tea house) seems to cost more than RMB 20 and has three or four tables, which are too small. KFC also has coffee, so people choose KFC.

Third, the advertising display system, originally planned for indoor and outdoor toilets, has not been used, apparently owing to its small size and the large number of seasonal tourists. This caused revenues to decline and made it difficult for this commercial operation to be profitable; thus, the government may have to step in and pay additional subsidies to underwrite the venture's success. Simultaneously, the commercial space around the tourist toilets needs support from a more substantive, market-oriented force. The LSA head referred specifically to a bookstore project, which has been suggested as a project to help revitalize business around the tourist toilets.

We recently discussed a particular project. This is a market project that I am going to talk about. The Laoshan Bookstore would mainly sell native books. I found a cultural company able to do this, whose personnel are very professional. We have been working on our system for many years. I have been working in Laoshan for 26 years, so we are relatively old and are hampered by institutional restrictions. We cannot do this type of operation well by ourselves.

5.4. Case Summary

In the PPP model, toilets are mainly funded by private capital, with the venture capitalists being also responsible for post-construction operations and management. In the Laoshan case, the government buys back toilet property rights, in either single or staged

payments, while also allowing private capital to franchise commercial operations nearby. Since the PPP model has been endorsed by the government and offers stable returns at low risk, it is an attractive choice for private capital firms [49].

In this case, the Laoshan project aided the government in relieving budgetary strain and established a pattern of constructive engagement between stakeholders. First, the government gained additional time to secure finance, as it could pay for toilet construction in installments following completion. Second, it is possible to leverage commerce surrounding toilets to maintain the toilet system, which not only minimizes the government's investment in maintenance and administration but also elevates the professionalism of public toilet operation and management. This ensures the continued availability and quality of public toilets. Third, both parties can generate revenue from public toilet operations, including advertising, commercial, and indirect revenue (Figure 6).



Figure 6. PPP operational processes for tourist toilets (drawn by authors).

However, after the completion of the tourist toilet construction, the outlook for the project's sustainability has dimmed. Currently, the Everbright Post Station space around the toilets is small and can only handle a limited number of people. The advertising and commercial revenues anticipated have fallen short of covering operational costs, particularly given Everbright's usage of high-tech toilet designs, which increased overall operating and maintenance costs. Simultaneously, the adjacent infrastructure must be better managed.

The Laoshan tourist toilet PPP concept was a worthwhile study, and it demonstrates considerable potential—particularly for scenic spots with limited public resources and a history of environmental management failures. The effectiveness of this model cannot be automatically guaranteed, however, and it still needs to be continuously improved. The model relies on the formation of a multi-governance mechanism between local governments, scenic area staff, social investors, and operators, and it will only become an effective model for tourist toilet construction if it meets the needs of local governments with strong governance capacity, and those of social participants with a strong, market-based operating capacity.

6. Conclusions and Implications

The contribution of this paper is to provide a new research perspective for promoting the global toilet revolution. Unlike Germany and other developed countries with rich experience in the field of marketization of public toilets, China is still far from perfecting the investment guarantee system for the toilet revolution. In the past, urban sanitation services represented by public toilets in China were completely planned and undertaken by the government, but with the accelerated urbanization in China, the burden of sanitation has greatly increased, and the government's capacity in this area is becoming increasingly insufficient. Innovating the construction of sanitation affairs such as public toilets and introducing the PPP model into it might be an effective measure to relieve the pressure of the government, and the LSA case can be regarded as an important attempt to optimize the investment and operation guarantee system of the toilet revolution in China. For toilet revolution projects in China, unlike the top-down promotion of the Guilin toilet revolution initiated by the government, the LSA case is the result of close cooperation between enterprises represented by Everbright Group and the government. As far as the tourism sector is concerned, tourist toilets are an essential basic element for destination construction, and the good or bad environmental management of toilets can largely influence the choice of tourist places in potential markets. The PPP model is used in the construction of tourist destinations to promote the injection of social and commercial funds into the enhancement of tourism toilets. The adoption of the PPP model in the construction of tourist destinations to promote the integration of social and commercial funds into the upgrading of tourist toilets through a multi-path commercial toilets approach is also an important contribution of this case study to the tourism sector. DBTO model will also provide an important reference for the continued promotion of the tourist toilet revolution.

The toilet project for the LSA is an ongoing attempt to apply a PPP model to tourist toilets, and it has provided considerable information to PPP application researchers who have been monitoring its progress. The following findings were drawn from the work detailed here. To begin, using the PPP model in tourist toilets as a novel institutional arrangement presents both developing opportunities and constraints. The applicability analysis model shows that PPPs can serve as a new paradigm for the tourist toilet revolution, given the ever-increasing pressures on government finances. Although the PPP model has significant application and promotion potential, the inherent complexity of a PPP and the uncertainty inherent in the building and maintenance of tourist toilets, as well as their other issues, cannot be overlooked.

Second, the application of the DBTO model in tourist toilets in this case will contribute subsequent tourist toilet PPPs studies. It should be considered that the LSA is large and mountainous, which makes construction technically and economically difficult and increases renovation costs. The expected rate of return of the tourist toilet project is not high, and the ecological toilets have a certain technical threshold, which is suitable for the DBTO model that is less risky to transfer to the private sector.

Third, the current Laoshan model, as embodied in the PPPs for tourist toilets, has aided in the reduction of government financial burdens while improving the toilet ecological environment through innovative technology, hence increasing tourist pleasure. However, its sustainability has not been optimized, and the performance of the core businesses supported by the toilet model has been restricted to date due to their small scale and inefficiencies—obstacles that might easily result in the marginalization of toilet operations and maintenance.

Forth, the PPP model's effectiveness is not guaranteed and cannot be taken for granted. Only when the business models of the managing entities responsible for the toilets are truly focused and certain conditions are met—such as the local government's ability to coordinate governance, the scenic spot operators' ability to operate efficiently, and the enterprise's commitment and continuity—can the PPP model become a viable and significant option for the tourist toilet revolution. Only then should it be replicated and promoted on a larger scale.

This is one of the first studies to use qualitative research to explore PPPs' use in building tourist toilets, which are considerably different from the PPPs used to build urban public toilets and so contribute to the subject of PPPs theoretically. In contrast to the BOT, BOO, and TOT models, the LSA case makes use of the DBTO model, which adds important methodological value. The value of this model is that when applied to tourist toilets, it considers not only the construction and operation aspects, but also the coordination with scenic spots and potential revenue streams that can be tapped during the design stage, thereby imposing stricter requirements on social capital parties. Due to higher level of expertise and the difficult operational processes associated with the PPP model in tourist toilets, their viability in tourist toilets may be jeopardized. This implies that the efficiency of the use of PPPs in building tourist toilets should be evaluated, as well as the model's sustainability. However, it would be useful to do more study with other kinds of scenic spot, as well as making comparisons with other countries. The authors produced the following policy guidelines for implementing PPPs in tourist toilets considering their findings. First, special attention should be devoted to the contract's design and implementation. The government must support toilet projects as a kind of public benefit, and because private capital corporations share financial risk with the government, they should be viewed as long-term partners, rather than just lessees [48].

Second, to avoid private capital firms defaulting, the government should only work with private capital firms that have strong financing capabilities and relevant experience building and operating toilets. Additionally, the government should conduct frequent reviews to ensure efficiency and quality, as well as to defend against contract breach.

Third, contracts for projects should clearly identify risk mitigation strategies, including potential damages. Additionally, to assess the operational risks associated with a project, a consistent source of commercial earnings must be created to offset government financial expenditures and ensure adequate private capital returns. To ensure a franchise's success, the number of rival franchisees in the scenic area should be rigorously limited. A variety of enterprises reflecting the unique qualities of each scenic place should be established, as well as diverse revenue streams. Improved service in business venues, such as post offices, converts toilet users into paying customers. Additional funding mechanisms, such as asset securitization and other sources, should be examined for toileting assets.

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