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Article

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Improving urban non-motorized mobility for public affairs trips: A survey and analysis of innovative official bicycles in Nanjing city, China

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ABSTRACT

Mobility and accessibility are two important factors of urban transportation planning and design. Generally, mobility is described as the right and convenience of using different modes of transport. We usually focus on commuting mobility, business mobility, and the mobility of vulnerable groups, but tend to ignore the mobility of public affairs, which is also an extremely important consideration. Official Bicycles have become an issue of vital importance due to public concern about green travel, reform of the official business-car system and reduction of public expenditures. In order to explore the feasibility of this new traffic tool for official business, a survey was conducted on the Official Bicycles of Government of Gulou District in Nanjing by means of questionnaires and interviews of both officials and citizens, as well as follow-up and simulation surveys of official travel behavior. On this basis, comparisons between Official Bicycles and official cars were made in terms of efficiency, cost and carbon emissions. The results substantiate the feasibility and rationality of Official Bicycles as well as identify some problems. In order to promote feasible and reasonable bicycle transportation and maximize its advantages, suggestions are proposed from the perspectives of changing public policy, urban planning optimization and social values.

Introduction

In recent years, carbon reduction, environmental protection and social justice have become issues of vital importance. In February 2012, to further energy-saving emissions reduction nationally, the National Development and Reform Commission of China and 17 other departments released the *National Action Plan for Energy Conservation and Emission Reduction in the 12th Five-Year Plan*, and suggested that people would like to walk within 1 km, ride within 3 km, and take public transport within 5 km. Furthermore, they advocated for Green Travel Action according to which national official cars should run one day less a month based on the last digit of the license plate number to carry out the Official Bicycle Pilot Project ([The State Council of China, 2011](#)).

Meanwhile, reform of official car use to reduce public expenditure is in progress. To reduce government expenditure and maintain social justice, the *Party and Government Agency Enforcing Saving and Opposing Waste Regulations* was promulgated in November 2013. It stipulates eliminating general public affairs vehicles, the social provision of general public travel, and moderate transportation subsidies to cut government expenditure and realize social justice ([The Central Committee of the Communist Party of China & the State Council of China, 2013](#)).

In this context, the government of Gulou District of Nanjing takes the lead in promoting Official Bicycles (see [Fig. 1](#)). Gulou

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Fig. 1. Official bicycles in Gulou district, Nanjing.

District is located in the middle of the main city of Nanjing, with the area of 54.18 square kilometers and the population of 1,293,200 (Nanjing Statistics Bureau, 2018). It is an important national science and technology innovation center. It has more than 90% government institutions in Nanjing. Official Bicycles are designed by the government as another form of official business mobility, a substitute for official business cars, and an enhancement to travel mobility for civil servants with middle or short distance official travel. Civil servants can use official bicycles only during working time. And using official bicycles can also improve civil servants' work efficiency (Ewing & Cervero, 2017). The government of Gulou District of Nanjing weeded out old public bicycles at the end of 2013 and purchased 100 new bicycles, placing them in Gulou District Government and the Government Affairs Service Center, respectively. So there are totally about 300 bicycles for civil servants to use. Below, we will focus on the operation of the Official Bicycles in Gulou District and make our in-depth research, as well as explore the feasibility of this new way of official travel. First we do the literature review. Then we will introduce first and second round survey in next three sections. And do the detailed analysis. Then give related suggestions. At the last section make conclusion and discuss the necessity of promoting the Official Bicycles.

Literature review

Limited research exists within the peer-reviewed literature regarding the Official Bicycles programs. The Bike-sharing systems (BSSs) and the Official Bicycles programs have similarities. Although they serve different people (BSSs serve all citizens and the Official Bicycles programs only serve civil servants), the systems are similar. So we do the review of BSSs which can help have better understanding of the Official Bicycles programs and make appropriate policy recommendations.

Mobile technology has changed the consumer's attitude in transportation mode and mobility behavior. As cities seek to improve sustainable transport options, BSSs have been expanding even at a higher rate over the past decade, especially in European and East Asian countries (DeMaio, 2009). And it also has seen a substantial increase in the perception of the bicycle (Nikitas, 2018). There are now over 1600 bike share programs in operation around the world (Meddin & DeMaio, 2015).

Most of the previous studies performed detailed analysis of anonymous bike flow data, yielding original insights on spatio-temporal patterns and dynamic performance of the systems (Caulfield, O'Mahony, Brazil, & Weldon, 2017). And it sometimes combined with some basic socio-demographic data (e.g. gender, age, home postcode) (Morency, Trépanier, & Godefroy, 2011; Vogel et al., 2014). Some specific additional surveys targeting scheme members cover perceptions of their own modal shift by respondents (Bachand-Marleau, Lee, & El-Geneidy, 2012; Nikitas, Wallgren, & Rexfelt, 2016; Shaheen, Martin, & Cohen, 2013) or exceptionally compare BSS members with traditional cyclists (Buck et al., 2013) or with the general population (Fishman, Washington, Haworth, & Watson, 2015).

And there are some reasons why people would like to use BSSs. Shaheen et al. (Shaheen, Guzman, & Zhang, 2010) summarize the potential benefits of bike share as flexible mobility, emission reductions, physical activity benefits, reduced congestion and fuel use, individual financial savings and support for multimodal transport connections.

As Pucher, Dill, and Handy (Pucher, Dill, & Handy, 2010) suggested bicycling and its positive impacts have increased in cities that have implemented bike-sharing programmes but these results reflect simultaneously the impact of improvements in bicycling facilities implemented at the same time as the bike-sharing programmes. But there are some people would not like to cycling. One of the most common reasons people give for not cycling is its perceived risk. A recent survey of UK adults found that 86% selected cycling as the mode most at risk of traffic accidents, as opposed to 2–7% for other modes (Thornton, Bunt, Dalziel, & Simon, 2010).

Usage survey

To understand the use of Official Bicycles in the Gulou District government, we conducted a variety of on-site investigations of the configuration and usage of the Official Bicycles of the Gulou District Government and surrounding offices. The survey found that on average Official Bicycles were lent 20–30 times a day to the district office staff, covering the area within 20–30 min by car of the district government. As to the maintenance and management, in addition to numbering the bicycles, bicycles use is registered with

Table 1
Sample composition of civil servants (N = 89).

Characteristic	Operationalisation	%
Gender	Male	57.1
	Female	42.9
Age	20–30	24.8
	30–40	30.3
	40–50	26.6
	50–60	18.3
	More than 60	4.9
Educational level	Primary school	4.9
	High school	28.8
	University/higher professional	66.3
Income (household disposable income per month)	Less than 2000yuan	6.8
	2000–5000yuan	47.3
	More than 5000yuan	40.1
	Would rather not say	5.8
The time of using official bicycle	0–5 h per week	7.1
	5–10 h per week	15.3
	10–20 h per week	44.2
	20 h or more per week	33.4

the staff meal card as assurance. Official Bicycles' repair costs, however, are undertaken by the users.

To carry out a thorough investigation and quantitative analysis, we conducted surveys through questionnaires and random interviews with the general public in the surrounding area and government staff in the Gulou District. In addition, to analyze the travel routes and the user experience of the Official Bicycles, the bicycle riders were studied.

Analysis of questionnaires

We distributed more than 250 questionnaires and interviewed both civil servants and ordinary citizens. The reason why we investigate ordinary citizens is that the public's awareness of the project is very important for the promotion. As to civil servants, we focused on the entry-level staff and the total number of valid returns was 89. The questionnaires for the general public were distributed within 3 km of the Gulou District Government at random, and a total of 121 valid questionnaires were returned.

The findings of the questionnaires for entry-level civil servants are as follows. First, the civil servants' recognition of business bicycles is at a high level and 86 per cent said they had ridden Official Bicycles. Based on the survey content, most of them acknowledged the convenience the Official Bicycles had offered and thought it was important to advocate for Official Bicycles. Second, there were still some aspects to be improved in the use of Official Bicycles. Among various problems, simplifying the rental process was the most urgent issue (Table 1).

The analysis of the questionnaires for the general public is as follows. First, the public had little knowledge of Official Bicycles. In valid questionnaires returned, only 2 per cent said they knew Official Bicycles in the Gulou District very well, while 64 per cent considered Official Bicycles very unfamiliar. Second, public recognition of Official Bicycles is different. Although most citizens thought the use of Official Bicycles was meaningful, some were still holding the skeptical or uncertain attitudes. Third, 12 per cent of citizens investigated thought there was no need to advocate for Official Bicycles, while 24 per cent thought it was not important

Table 2
Sample composition of ordinary citizens (N = 121).

Characteristic	Operationalisation	%
Gender	Male	48.1
	Female	51.9
Age	18–30	4.8
	30–40	32.6
	40–50	37.5
	50–60	22.6
	More than 60	2.5
Educational level	Primary school	4.4
	High school	42.8
	University/higher professional	52.8
Income (household disposable income per month)	Less than 2000yuan	15.6
	2000–5000yuan	39.9
	More than 5000yuan	32.2
	Would rather not say	12.3
Know about official bicycles	Very well	2.5
	Know a little	33.9
	Very unfamiliar	63.6

whether Official Bicycles should be provided because they were used by a small number of people and not related to the lives of citizens (Table 2).

In addition, results of interviews with government officials in the Gulou District are as follows. The first official of Gulou District government said that the district government's promotion of Official Bicycles was an effective method to reduce the waste of resources, support Green Travel and encourage people to exercise. He often used Official Bicycles, but he thought the relatively complex rental process of Official Bicycles was the primary problem and was contrary to the initial intention of convenience and mobility. So, he hoped the rental process could be simplified to be easy for the staff to use. The second official said there were still many problems in the actual operation even though the purpose of Official Bicycles was positive. He personally wanted to use Official Bicycles, but he did not often have the chance due to the objective conditions. The main problem was that the allocation and use of Official Bicycles were limited by geographic conditions. For example, because bicycles in the remote sub-district offices were relatively few and the offices were far away from other sub-district offices, travelling on bicycle was not very feasible. So, he hoped the government could learn from the experience of allocation of public bicycles and appropriately adjust the number of bicycles among the sites as well as add electric bicycles to provide convenience for relatively long-distance travel. The third official said official agencies' implementation of Official Bicycles impacts travel by reducing government car travel directly, is beneficial to Green Travel and is more convenient. The city government agencies had not yet implemented Official Bicycles at that time, so he had not used Official Bicycles but said he would use them if the plan was carried out. He thought that in the context of the reforms reducing government cars, the implementation of Official Bicycles could definitely help by cutting down public expenditures and providing more convenience for general clerks to travel, especially in urban areas. Specifically, he suggested that Official Bicycles rental stations could be placed where government organizations gather and the government could also purchase a certain number of electric bicycles to support long-distance travel. Furthermore, he advised that those relatively decentralized organizations could purchase Official Bicycles or Official Electric Bicycles on their own to facilitate use for their staff.

Follow-up investigation and analysis

Through the follow-up investigation of civil servants' travel by Official Bicycles, we found that typical travel included the following: point-to-point travel (travel between two sub-district offices) and non-destination travel (travel based on the need of stopping or continuing the visit). The former way has the benefits that it takes approximately 10 min and the road is in good condition. Additionally, it can compensate for current inadequacies of bus routes and at the same time avoid inconvenience resulting from lack of parking space. The latter is mainly applied in municipal engineering inspection, which can be carried out thoroughly in the sub-district community during the ride. In this situation, road conditions vary along the route, with narrow road sections in many places, an unpleasant environment and many construction vehicles. This type of travel fully reflects the flexibility of Official Bicycles travel, and it also helps the process of narrowing the distance from the people.

Travel benefit analysis

According to the data gathered from follow-up research, site surveys and questionnaires, we compared and analyzed the benefit of travel by government car and Official Bicycles, including travel efficiency, public expenditure and carbon emissions.

The efficiency of travel

We carried out follow-up research and simulation experiments of taking the bus or taxi, and applied quantitative analysis to both point-to-point travel and non-destination travel.

With a point-to-point travel distance of 4.5 km between the Service Center and the Gulou District government, we compared Official Bicycles and the government car rental process, travel time and other related factors. As for Official Bicycles, it took 28 min in total from registration to reaching the destination and parking the bicycle. Car travel took 21 min in total from the application, coordinating cars and drivers, reaching the destination, to parking the car. Thus, it could be observed that the government car was slightly superior (Fig. 2).

On the other hand, non-destination travel entails longer distances and more complex road conditions. In addition to the borrowing process, if we had to stop 7 to 8 times along the way to carry out visits, locate parking places, and switch off and start the car, the efficiency of government car travel would, on the contrary, be lower than that of Official Bicycles (Fig. 3).

Expenditure of public funds

Using the distance of 3 km, which is a realistic assumption for bicycles, we analyzed accumulative cost within a year. Given the cost of 300 yuan per Official Bicycle, Official Bicycles' travel frequency of 20 times per day at the speed of 15 km per hour, and a government car consuming 11 L gasoline, driving per 100 km, the driver's salary of 5000 yuan per month, and car insurance of 5000 yuan per year, we found that the existing 100 Official Bicycles consume only 30,000 yuan of public funds in one year, while the government cars consume up to 81,500 ($200 \times 11 \times 7.5 + 5000 + 5000 \times 12$) yuan of public funds annually.

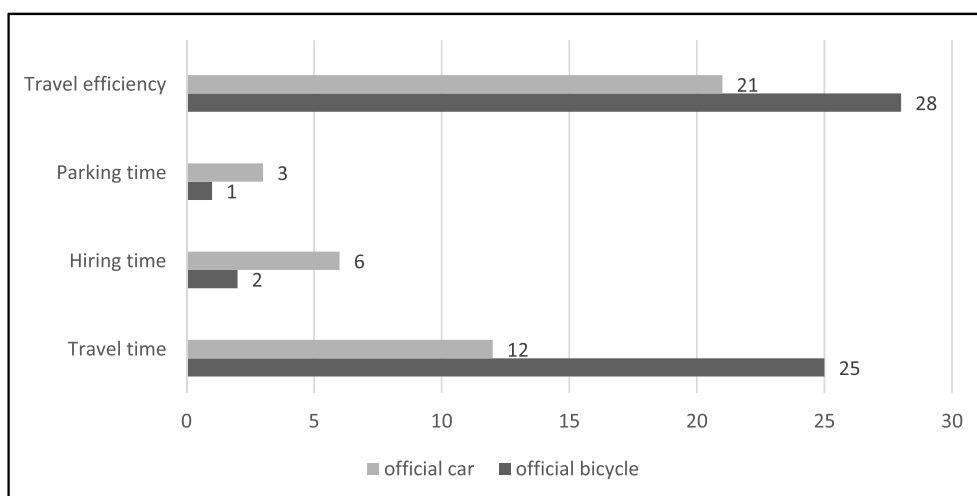


Fig. 2. Point to point travel's time efficiency: comparison of two types of official travel modes (unit: min).

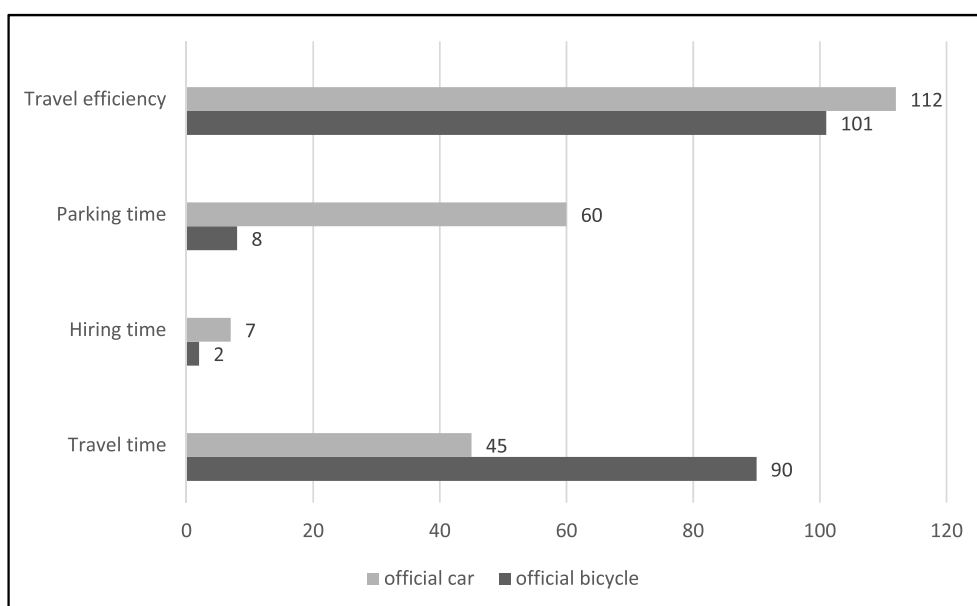


Fig. 3. Follow-up travel time efficiency: comparison of two types of official travel modes (unit: min).

Carbon emissions

The formula for calculating carbon emission is as follows¹: carbon emissions (kg) = fuel consumption liters * 0.785. (Equation source: Baidu Library).

According to the civil servants' valid questionnaires, the average travel time of the Official Bicycles was 12.5 min (Fig. 4). With the average riding speed of 15 km/h, the average travel distance was approximately 3.125 km ($12.5 \times 15/60$), combined with 11 L of fuel consumption per hundred kilometers, we worked out that a single government car trip was 0.27 kg ($3.125 \times 11 \times 0.785/100$). According to the analysis, we found that after the implementation of Official Bicycles, Official Bicycles were used 20–30 times a day, which could reduce carbon emissions by at least 1971 kg annually ($0.27 \times 20 \times 365$) (Fig. 5).

According to travel efficiency, expenditure of public funds, and carbon emissions, it can be seen that after the implementation of Official Bicycles, although travel efficiency decreased slightly, the one-time cost of purchasing is far less than the cost of using government cars in one year, under the same conditions. Additionally, Official Bicycles greatly reduced public expenses and lowered carbon emissions nearly to zero. On the whole, after the implementation of public bicycles, the overall external cost has been significantly lowered, and the negative impacts on society, the economy, the environment, and so on have been reduced.

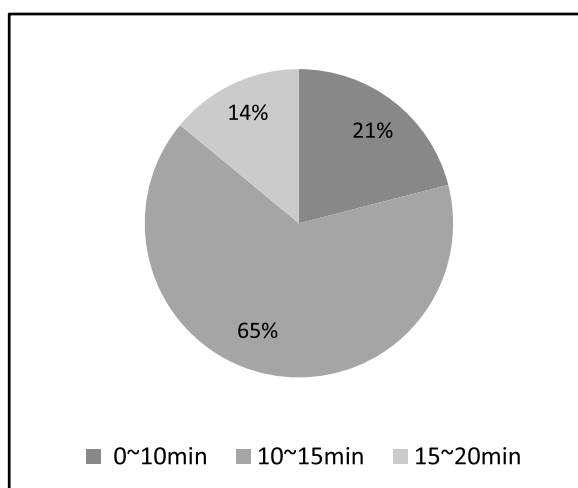


Fig. 4. The average travel time pie chart.

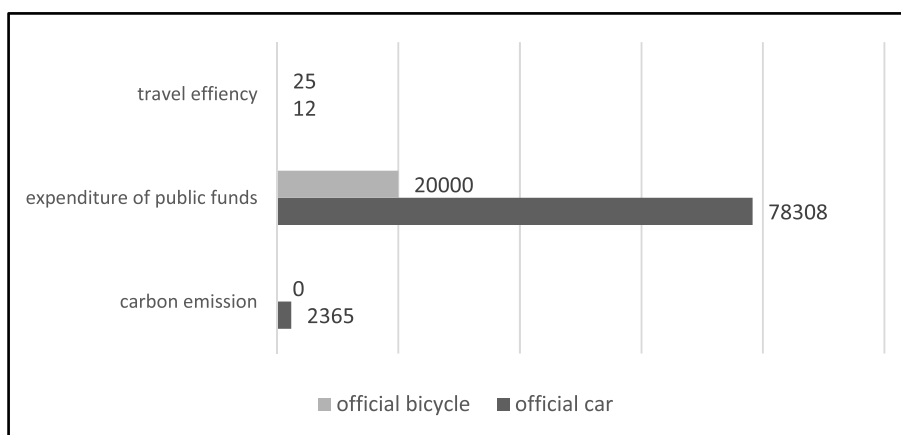


Fig. 5. Two ways of travel comparison chart.

Advantages and disadvantages

Advantages

Comprehensively considering the questionnaire, interviews, benefit analysis and field experience, we determine that, as a solution for short-distance official trips, Official Bicycles make sense and are the better option.

(1) conducive to social equity

The number of official cars in China is surprising – more than 6 million. Costing around a trillion yuan annually, they are severely overdrawing social equity. The most urgent desire of the general public is to cut spending and eliminate both the private use of official cars and the right of way given to official cars. The promotion of Official Bicycles can improve the relationship between the government and public, ease social conflicts and establish service awareness of public servants.

(2) conducive to low-carbon environment

According to the state of Official Bicycles use in Gulou District, we can estimate that using 50 Official Bicycles instead of official cars in Gulou District can reduce 1971 kg carbon emission per year, and the average carbon emissions reduction from a single bicycle is 39.42 kg per year. Assuming the whole city has 2000 Official Bicycles, 78,840 kg (39.42×2000) carbon emissions would be reduced completely. Looking at China as a whole, the carbon reduction figures will be much larger, which can make an important contribution to the Carbon Reduction Plan China has promised³.

Table 3
The supply and demand condition of Official Bicycles in part of the sub-district offices.

	Amount of Official Bicycles	The way of purchasing	Mainly travel modes beside Official Bicycles	Expectation of Official Bicycles
Huaqiao Road sub-district office	0	/	Personal electric bikes, taxicabs, official cars	expectation of electric bikes for comparatively long distance
Hunan Road sub-district office	2	By office	Personal bicycles, taxicabs, official cars	The lack of Official Bicycles
Central Gate sub-district office	4	By office	Personal bicycles, taxicabs, official cars	The lack of Official Bicycles

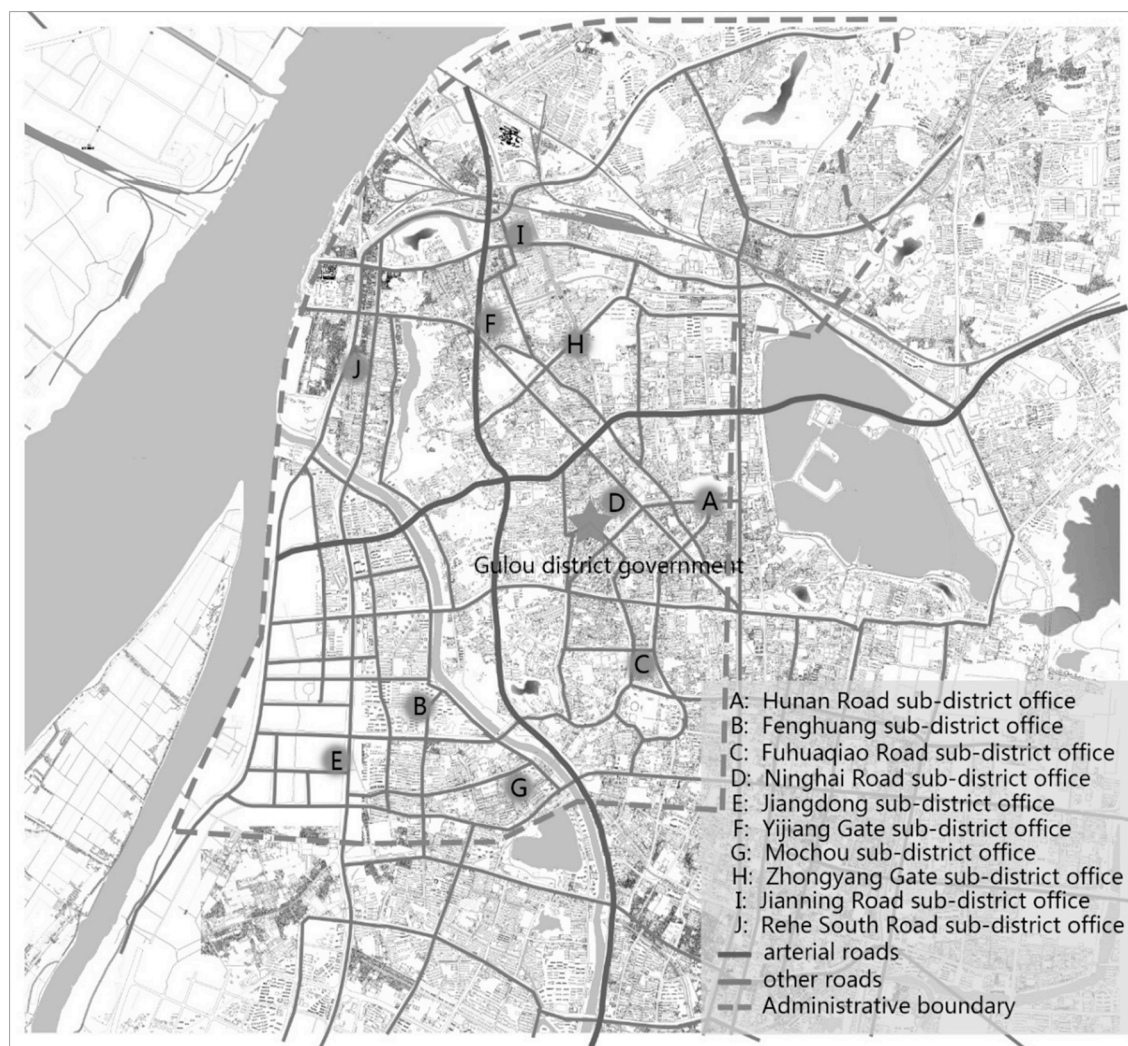


Fig. 6. Spatial layout of sub-district offices in Gulou District.

(3) lower economic cost

The cost of official car trips (including fuel costs, driver wages and vehicle insurance) per year is approximately 83,308 yuan/vehicles, while the cost of purchasing a public bicycle is only 300 yuan. By promoting Official Bicycles, our government would save approximately 166 million yuan per year if the number of Official Bicycles extends to 2000 in the city of Nanjing.

Disadvantages

During the investigation, we found deficiencies in policy-making, facility allocation and the restriction of trip distance. We summarize in the following two points:

(1) Disproportionate distribution of supply to facilities, imbalance of supply and demand, weak promotion in sub-district scale

The basic activity of official affairs by sub-district offices, a comparatively short distance of official travel, and a narrow community road support the necessity of promoting Official Bicycles. However, the promotion and popularization of Official Bicycles in sub-district offices is sub-par, which is reflected in the sufficiency of bicycles in District Governments and Government affairs centers and the inadequate supply in sub-district offices (see Table 3). Imbalance in supply and demand, unreasonable spatial distribution, etc., reduces the frequency of Official Bicycles use, and results in failure to serve their purpose.

(2) The distance between each sub-district office

Table 4
Value description of the questionnaire.

Grading value	1	2	3	4	5
Classification type	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Some of sub-district offices are not within the three kilometer range of district government (Fig. 6), thus each sub-district office may not have convenient access. This fact does not support the goal of connecting the district government and the sub-district offices, meanwhile it increases the difficulty in promoting the Official Bicycles in Gulou District.

Specific reinvestigation

We learned the basic usage of Official Bicycles in the first-round questionnaire and interview. To further explore the causal mechanism behind the difficulty in popularizing public bicycles, we conducted a questionnaire with the topic of usage intention of Official Bicycles by public servants. The questionnaires were distributed to public servants in Gulou District, and we were only able to use 49 out of 52 questionnaires (see Tables 4 and 5).

Under normal circumstances, the choice of travel modes is affected by internal and external factors: internal factors include characteristics of individual commuters, commuting pattern and travel modes, while external factors include urban spatial structure, urban natural conditions, transport facility conditions and policy conditions (Heinen, van Wee, & Maat, 2010; Vuchic, 2017; Wang, 2015). After considering the special attributes of official travel, internal and external influences of travel choice, and ruling out immutable elements, we selected ten issues of concern in the questionnaire.

We identified the following phenomena from the results of the questionnaires.

Firstly, public servants subjectively agree the promotion of Official Bicycles included in the official cars reform is positive. Secondly, most public servants show willingness to use Official Bicycles under the premise of an optimal system (improving the trip efficiency and optimizing trip experience). Finally, all public servants confirm that the improvement of the bicycle traffic conditions will impel them to use Official Bicycles.

Improving strategy

After evaluating results of the reasonableness of Official Bicycles in Nanjing Gulou District, we affirm the rationality and positive impact of Official Bicycles. However, based on our analysis, we find some optimizable areas in policy formulation and implementation, transport line facilities planning and design, and explanation and publicity of the concept. Based on further research and domestic and international cases, we offer recommendations from the perspectives of public policy, planning and design and social values.

Public policy adjustment

(1) Adjust the compensation policy of official cars reform and increase enforcement

The newly enacted *The Party and Government Agency Enforcing Saving and Opposing Waste Regulations* expressly provides that “official cars should be eliminated” to “innovate modes of official travel”. With this policy as the catalyst, management of existing official cars needs to be transparent. Meanwhile, the development of innovative official travel modes such as Official Bicycles should be actively promoted.

Table 5
Statistics and Analyses of Official Bicycles use intention.

Statistics on use intention of Official Bicycles			
questions	N	Average value	Standard deviation
a. When the government supports an innovation, I am more likely to accept and use it. When the Government ignores an innovation, I do not accept it easily.	49	3.6939	1.0449
b. Official cars configuration and usage is an important consideration for the three public expenses for the time being.	49	4.0612	0.7748
c. I think using Official Bicycles is an effective way to reduce public expenditure.	49	4.0204	0.7497
d. Using Official Bicycles is a healthy travel mode.	49	4.5714	0.6124
e. I think using Official Bicycles can maintain the efficiency of official trips.	49	3.4694	0.7933
f. I am willing to use Official Bicycles under the premise of trip efficiency to reduce official trip expenditure.	49	4.3469	0.4809
g. I am inclined to use Official Bicycles when a more flexible mobility is required.	49	4.3061	0.6521
h. The popularization of Official Bicycles will eliminate the right of way which was previously taken by official cars.	49	3.4694	0.8685
i. The trip environment for bicycles will influence my choice of Official Bicycles.	49	4.4898	0.7394
j. I am inclined to use Official Bicycles under the premise of a more convenient transfer between bicycles and other travel modes.	49	4.2041	0.6448

We should continue to encourage the official car trips supplied by social companies, but strictly control and standardize the calling of official cars, especially for short distances. Fuel subsidy is suitable transitional policy for the beginning of the official cars reform and should be abolished with the advancement. Nanjing currently has approximately 20,000 public servants. Assuming 500 yuan² in fuel subsidy was eliminated from eighty percent of them per month, combined with the encouragement of using Official Bicycles and other public transport, the annual savings of government expenditure would be $500 \times 12 \times 20,000 \times 80\% = 96$ million yuan.

(2) Formulate supportive and incentivizing policy for Official Bicycles

Urban transport policy should be based on considerations of both fairness and efficiency. We should focus on the minimization of negative externalities of transport systems and give encouragement and protection to travel modes of low externalities: individuals should obtain government subsidies when the external cost by personal trip behavior is lower than average level (Sakai & Shoji, 2010; Small, 2013; Tscharaktschiew & Hirte, 2012). Accordingly, to encourage public servants to select Official Bicycles or other green travel modes instead of exclusively using official cars in a short or medium distance official trip, a reward mechanism for using Official Bicycles should be established.

Optimization of planning and design

(1) Comprehensive improvement of Official Bicycles system

The allocation method of “overall planning, each point connected” can factor all government sectors into the planning. Potential measures include setting up Official Bicycles parking lots near government agency gates, establishing an Official Bicycles borrowing and returning system similar to the Public Bicycle System⁴, and building a microcirculation system of bicycles in connection with the provision of public bicycles in the main city.

The bicycle borrowing and returning program should be standardized and complete management and maintenance mechanisms ought to be established; meanwhile, the detailed design of Official Bicycles needs to be improved, such as bicycle baskets for conveniently carrying office supplies and road maps which can strengthen the mobility and flexibility advantages. To increase borrowing and returning efficiency and optimize usage experience, we can provide a search mechanism for geographical positions of bicycles in parking lots, with updated information of bicycle availability.

To solve the supply and demand problem of Official Bicycles identified in the survey, the usage data of Official Bicycles should be regularly monitored and analyzed. We should maximize the utilization of Official Bicycles through flexible deployment to each sub-district office and the district government.

Because actual trip distance is sometimes over three kilometers, we can also purchase a certain number of electric bicycles called Official Electric Bicycles. This is an efficient option for public servants when the destination is too far to ride standard bicycles.

(2) Improve the traffic conditions for bicycles

Interview and questionnaire statistics show that the traffic conditions have greatly affected people's choice of Official Bicycles. As a sub-system, the development of Official Bicycles is influenced by the optimization of the overall cycling environment. Due to great development of urban motorized transport, the travel environment is deteriorating significantly, and the bicycle is gradually becoming a marginalized travel mode, with its share rates declining rapidly (Kaplan & Prato, 2015).

Considering on the ebb and flow of bicycle use historically in Netherlands, Denmark and Germany, we should study their management policy, which covers bicycle transport, land use, urban development, environment, tax revenue and parking (Buehler & Pucher, 2017; Sheldrick, Evans, & Schliwa, 2016).

- 1) Improving the bicycle network by setting up bike lanes, such as curb lanes and priority lanes, and forming shortcuts to connect streets, which can give riders access to destinations more directly. Compared to motorized transport, this is more efficient.
- 2) Improving the design of road intersections and traffic signal systems. Setting the intersection stop line of bicycles before that of motor vehicles and establishing green wave traffic or dedicated traffic direction sign systems for riders.
- 3) Strengthening the direct connection between bicycle routes and streets and ensuring the absolute priority of bicycles in these streets through the use of traffic calming in residential areas.
- 4) Other indirect strategies for promoting the development of bicycles: limiting vehicle speed in urban areas, restricting road capacity and parking spaces, increasing taxes on cars and supporting urban transit-oriented development (Ali, 2017; SuZuki, Cervero, & Iuchi, 2013).

Guidance of public beliefs

(1) Eliminate public doubts through publicity

In the process of investigation, many citizens have negative impression of Official Bicycles project and doubt its significance. To address this phenomenon, the government should increase information and publicity available to the public. Let citizens know this

project is important to save the government expenditure and also good to the environment.

(2) Operate cycling promotional activities and revive bicycles

Public servants usually work indoors, except for some site investigations on duty, so they seldom have time to exercise. Riding a bicycle is an easy way to keep fit. Over the past few decades, Chinese cities overly encouraged the development of cars through construction, which caused the habitual use of cars by urban residents (Fei, 2016). The revival of bicycles and the development of public transport are direct solutions to address climate change, energy conservation, and traffic congestion. Government and society should invest more effort in improving public awareness. Specifically, regular bike events, cycling promotion and encouraging bicycle planning participation are efficient measures.

Conclusion

During the 2014 APEC Beijing meeting, Beijing-Tianjin-Hebei Region formulated a series of transportation rules including automobile restriction, leading to 'APEC Blue' and 'APEC Smooth Traffic.' Those who had not taken a bus for more than ten years began to choose public transport because of restriction measures. Similarly, the Official Bicycles system is aimed at rapidly changing the ideas of some public servants who are used to official cars. The implementation of Official Bicycles has not only brought about positive influence but also a change in touring habits of public servants. The value of Official Bicycles lies both in cost savings and in protecting the environment. It also offers a high-level demonstration to reforming official car usage.

Given that the reform of official cars is difficult and bicycles share rates keep declining, Official Bicycles deserve much more attention and support from our government and society and will become an alternative to official cars in the near future. The goal of the reform is not only to curb corruption at the source but also to totally change the ideology and work style of public servants and to dramatically reduce administration cost while improving public administration efficiency. Furthermore, it can be conducive to creating an eco-friendly society that conforms to the carbon emissions reduction targets proposed in the 13th national five-year plan by the Chinese government.

In addition, the reduction of official cars is bound to promote the development of official bicycles because of official cars reform. Nowadays, shared bicycles seize the market on a large scale by means of shared economy. Whether bike-sharing is a shared economy is not the focus this time, the large-scale development of shared bicycles absolutely has a certain impact on the development of official bicycles. No pile of bicycle rental model of bike-sharing is indeed a kind of innovation, however, there are also some drawbacks. For example, if choosing a shared bicycle as a travel tool, civil servants who have a stop travel not only need to pay twice, but take risk of the shared bicycle's being ridden away by others at any time, leading to the impairment of their work efficiency. Currently, the number of shared bicycles on the market is excessive, resulting in a great waste of resources. Based on this situation, we put forward a question whether we can create a customized shared bicycle referring to the customized bus mode, this kind of bicycles is customized for civil servants. On the one hand, there is no necessary to increase the number of official bicycles, the problem of excessive launch of shared bicycles will also be solved. Official bicycles and shared bicycles will get collaboratively developed. On the other hand, customized shared bicycles can provide convenience for different people and attract more groups to choose this eco-friendly travel mode. In the near future, Customized Shared Bicycles can gradually resolve the issues of official cars reform, leading to higher usage rate of bicycles and an improvement in urban mobility.

Note

1. There are many general formulas of carbon emissions calculations worldwide. They are developed jointly by the United Nations and some environmental organizations. For China, it is more suitable to use these formulas with local data and the conversion factors.
2. *The idea of comprehensively promoting the reform of official vehicles system and the reform plan of official vehicles system by central and state agencies*: the transport subsidy standard of the central and state agencies is 1300 yuan per person per month for ministerial or bureau level, 800 yuan per person per month for division level, and 500 yuan per person per month for section level or lower.
3. The outline of China's 13th Five-Year Plan confirmed that carbon dioxide emissions per unit of GDP should be decreased by 18% in the next five years.
4. Currently, there are 23,500 Public Bicycles in the main city of Nanjing that are distributed in 645 bicycle stations especially in Gulou and Qinhuai District. Data source: <http://news.nanjing.fang.com/2015-10-13/17673060.htm>

Conflicts of interest

The authors declare that they have no conflicts of interest.

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