

A STUDY OF RESIDENTS' AWARENESS OF PARKING LOTS IN RESIDENTIAL AREAS AND WAYS TO PROMOTE PRIVATE PARKING LOTS

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Abstract: As cars become very popular, there have been many problems with shortage of parking space. Especially, it is serious in the high-density residential areas which were built before the enactment of the Parking Lot Act. Utilizing the fact-finding survey of demand and supply of parking lots conducted by Busan, the study carried out a survey of areas which had poor conditions for parking. Based on the survey, the study found out the status of using a parking lot and the seriousness of the parking issue. Also it presented the promotion of building private parking lots as a means of improving parking environment. As part of activating private parking lots, the study noted mechanical parking stations suitable for hilly districts. Based on the support standard for building private parking lots in Seoul and Busan, the study took an example a roof parking in SANBOK (Surrounding the mountains) road in Busan and calculated the construction cost and profits on a case basis. As a result, the current support policy for private parking lots was not enough to promote private ones in the high-density residential areas. In conclusion, the study maintained that system improvement was urgent.

Index terms: Private Parking lot, Quantification Theory, Residential area, District of parking environment improvement

I. INTRODUCTION

While the residential areas constructed after 1979 when the Parking Lot Act was enacted are relatively free from parking issue, the existing high-density residential areas are in poor conditions in Korea. Understandingly, illegal parking hinders traffic into the residential areas. It causes many problems. Especially, emergency vehicles and/or heavy traffic are having big trouble getting into the zones. To solve these problems, each local government is introducing various policies: Residents parking area, Public parking lots using unexecuted urban infrastructure, Green parking lots securing space by removing house walls, and Skyway parking lots. But those policies cannot follow with the speed of car distribution in the high-density residential areas. So illegal parking and parking-related issues continuously increases.

Researches on the improvement of parking environment in residential areas have been actively on-going. One person along with JinHyeon-jo argued that the solution of parking problem did not lie in lacking space for park. They insisted that efficient management without increasing parking place should be prepared. Unlike existing policies for parking, after analysing parking demand, exact and detailed parking space should be arranged accordingly.

Zhan Guo explored whether parking regulation in residential areas affected the traffic and could be utilized by demand-management policy. The findings showed that people thought keeping a car was more important than parking lots, and they did not mind parking on the roads. Also respondents said parking issues did not affect owning cars.

Two persons apart from Jesper De Groote figured out welfare loss through implicit street parking in

Amsterdam. They found out that annually the street parking caused average 270€

Existing researches maintained that demand for cars and illegal parking could be controlled by parking regulation in the residential areas. They also added that, in realty, the lacking parking lots was not serious and the problems could be solved by well-organized management.

However, the lowest secure ratio of parking lots in the high-density residential areas in Busan stands at 10.07 percent. That indicates there are not enough researches on improvement of parking environment and promotion of private parking lots to deal with the shortage of parking space.

The study is to choose a region where the parking environment is very poor and search the residents' awareness of parking space. Also, it is going to present a solution to secure parking space especially in the high-density residential areas.

The study utilized the 2014 fact-finding survey of demand and supply of parking lots conducted by Busan. The survey is conducted to find out the state of parking lots and the state of demand and supply in regions every three years by the Parking Lot Act. The study conducted a survey in the worst areas among parking environment improvement districts designated by the fact-finding survey.

After choosing a target area, a survey was carried out. Based on the investigation, the study figured out residents' possession of parking lots, seriousness of parking issue, and awareness of measures for securing parking space. At the same time, by presenting appropriate ways to get parking lots in the high-density residential areas, the study tried to resolve regional parking issues.

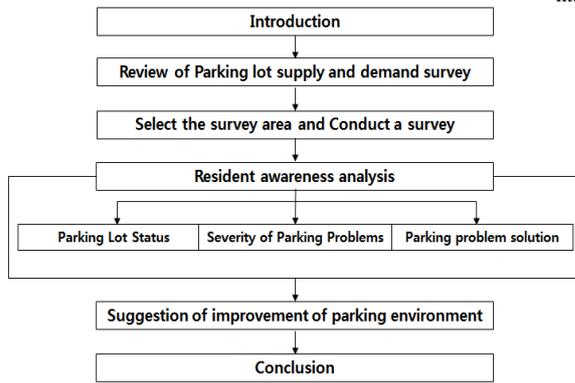


Figure 1: The progress of this study

II. THE FACT-RECELING OF PARKING IN THE REGION

1. The outline of investigation

For a survey, the study selected a region with the lowest secure ratio of parking lots. For a survey, the study selected a region with the lowest secure ratio of parking lots among the district of parking environment improvement. The method was a face-to-face interview with residents who visited community centers. The outline and results of the survey are the same as table 1 below.

Classify	Contents
Date of surveys	2016.09.01 ~ 2016.10.07
Method of surveys	A one-on-one interview with residents visiting the community center.
Details	Parking lot owned by house type Awareness of usage of parking lot Awareness of how to solve parking problems
Place of survey	12 Resident Center
Number of available surveys	447 (100.0%)
Number of vehicle owners	381 (85.2%)
Number of Parking lot owners	249 (55.7%)

Table 1 : The outline of investigation

II. THE STATE OF PARKING IN RESIDENTIAL AREAS

The questions were whether they had parking lots and had an experience of being exposed to inconvenience because they could not use their parking spaces. Among respondents living in detached houses and town houses, 52% and 37% did not have their parking lots respectively. For the question if they were in a situation of not being able to use their own parking space, 50.6% of those who said yes lived in detached houses, 61.7% in town houses, and 21.7% in apartments.

Classify	Own the parking lot		Uncomfortable parking experience	
	Own	Do not own	Yes	No
Detached house	85 (47.2%)	95 (52.8%)	43 (50.6%)	42 (49.4%)
Town house	81 (68.6%)	37 (31.4%)	50 (61.7%)	31 (38.3%)
Apartment	83 (100.0%)	0 (0.0%)	18 (21.7%)	65 (78.3%)

Table 2 : Parking status by housing type

According to figure 2, 80.8% or more residents who could not use their parking lots parked their cars on the backside roads. 10.5% did in a vacant lot, which was followed by others' houses (6.1%) and paid parking lot (2.6%).

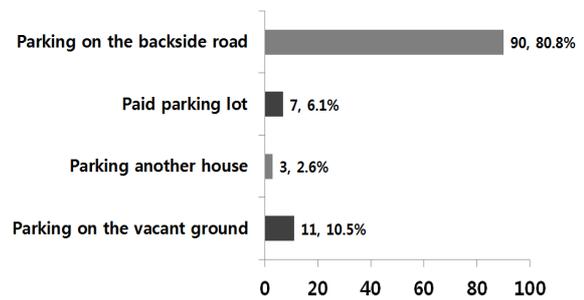


Figure 2 : Parking place (when they could not use their parking lot)

Figure 3 shows that all items related to the seriousness of illegal parking issue were graded more than 3.5 out of 7. It is assumed that many residents did not have parking lots and did illegitimate parking.

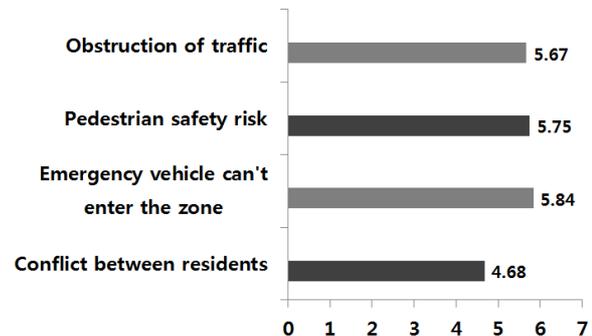


Figure 3 : Problems caused by illegal parking

III. LEVEL OF SATISFACTION FOR USING PARKING LOTS

To explore factors which affected parking lots satisfaction, the study employed quantification method 2. The groups, who were not satisfied with the parking lots, were residents who had strong intention to use new parking spaces and lived in detached houses or town houses. Less number of cars produced more satisfaction. Residents parking area had the highest level of satisfaction and followed by House yardparking, public parking lots and private

parking space. Actually, the less inconvenience leads to more satisfaction.

Items	Category	Frequency	Value	Range	A
Degree of satisfaction	Satisfaction	124	-0.673	Corelation ratio 0.450	
	Dissatisfaction	125	0.668		
Gender	Man	151	0.001	0.003	0.001(7)
	Woman	98	-0.002		
Age	20s	36	0.045	0.565	0.174(4)
	30s	48	-0.366		
	40s	74	0.065		
	50s	68	0.199		
Number of cars owned	Over 60s	23	-0.103	0.700	0.095(6)
	1	167	-0.016		
	2	76	-0.018		
House type	Over 3	6	0.682	0.504	0.158(5)
	Detached house	85	0.153		
	Town house	81	0.176		
	apartment	83	-0.329		
	Road parking for residential	47	-0.101		
Parking type	House yard parking	33	-0.529	0.810	0.238(3)
	Building parking lot	135	0.281		
	On-street parking	1	0.239		
	Public parking lot	6	-0.303		
	Private parking lot	27	-0.525		
Uncomfortable parking experience	Yes	111	0.540	0.974	0.321(1)
	No	138	-0.434		
Intention to use new parking spaces	Absolutely yes	19	0.481	1.456	0.319(2)
	Yes	32	0.593		
	Nomal	14	0.922		
	No	108	-0.004		
	Absolutely no	76	-0.534		

Table 3 :Result of Quantification analysis about satisfaction

IV. ANALYSIS OF AWARENESS OF SOLUTION TO PARKING PROBLEMS

Practical solutions to parking issues in residential areas are described in figure4. The solutions can be classified as three categories – regulatory aspect, securing parking space, and financial supporting. In downtown areas, it is needed to introduce regulatory tools such as parking maximums for regulating inflows of vehicles or strengthening illegal parking control. As residential zones have their own characteristics, they are needed to adopt customized approaches.

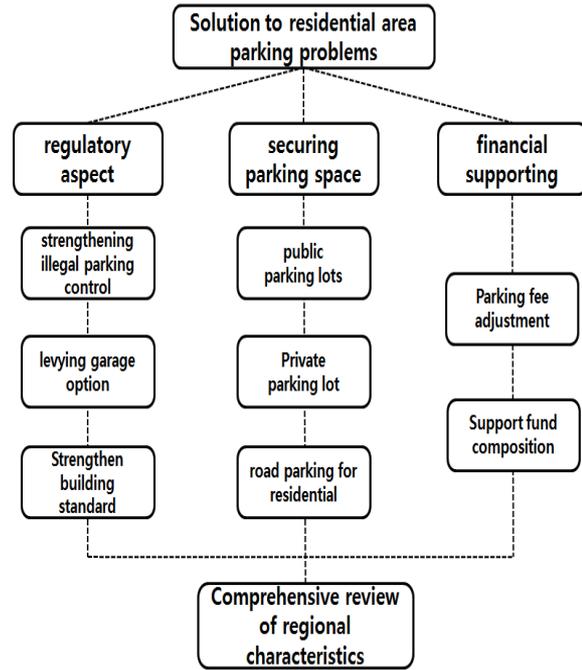


Figure 4 : Solution to residential area parking problems

The study questioned to the residents about the importance of eight means to solve the parking problems. The establishment of public parking lots was ranked the first. It can be interpreted that residents put much value on securing parking space by building parking facilities. But they showed negative responses to the ideas of implementing regulatory measures such as strengthening parking control or levying garage option on car buyers.

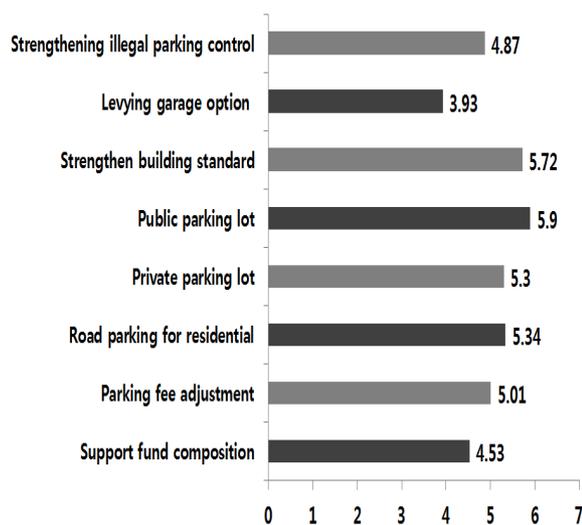


Figure 5: Importance of solutions to parking problems

Table4 displays influence factors on the question: whether the street parking as a solution to parking problems should be allowed for residents who did not have parking lots.

Items	Category	Frequency	Value	Range	A
solution to parking problems	illegal parking allowed	47	-0.75	Cordation ratio 0.312	
	Create a parking space	85	0.42		
Gender	Man	63	0.01	0.02	0.01(8)
	Woman	69	-0.01		
	20s	12	-0.24		
Age	30s	21	0.51	0.75	0.15(5)
	40s	40	-0.15		
	50s	40	-0.06		
	Over 60s	19	0.03		
	1 million won	7	-0.44		
Household income	1 ~ 2	18	-0.44	0.72	0.15(6)
	2 ~ 3	56	-0.04		
	3 ~ 4	39	0.24		
	Over 4 million won	12	0.28		
Number of cars owned	1	106	0.01	0.07	0.02(7)
	Over 2	26	-0.06		
House type	Detached house	95	-0.29	1.02	0.29(3)
	Town house	37	0.73		
	Absolutely yes	41	0.41		
Intention to use new parking spaces	Yes	64	0.21	2.01	0.36(1)
	Normal	8	-0.43		
	No	18	-1.38		
	Absolutely no	1	-1.63		
The fundamental cause of illegal parking	There are many cars	14	-0.35	1.19	0.32(2)
	There is not enough parking space	73	-0.37		
	parking fee is expensive	16	0.54		
	The car owner did not secure the parking lot	5	0.75		
The seriousness of illegal parking (Seven point scale)	Parking policy is insufficient	24	0.82	1.41	0.19(4)
	3	6	-0.81		
	4	13	-0.33		
	5	40	-0.07		
	6	57	0.04		
7	16	0.59			

Table 4 :Result of Quantification analysis about solution to parking problems

The results indicated that residents, who had low income, more cars and no intention to use new parking lots, argued that the street parking should be permitted. On the other hand, residents, who had high intention to use new parking lots and considered illegal parking serious, insisted securing parking space had the priority.

V. CONSIDERATION FOR PROMOTION OF PRIVATE PARKING LOTS

The city has exerted much effort to deal with parking issues. Also residents give much weight on the authorities role for this matter. But the solution carried only by the authorities might be a huge financial burden for the local government. In this regard, the study has checked current standards for supporting and deliberated the ways to stimulate building private parking lots in residential districts. According to the supporting standards for private parking lots in Busan, it lends 50 percent of construction costs without interests for a maximum of five years. The cost does not include the expenses for land purchase.

Target areas were as the table5. The regions were hilly districts and maximum height limited districts in

which large-scale parking lots could not be constructed. The study also estimated the profits from mechanical parking stations which were assumed to be created in the target areas where roof tops were being used as parking lots.

Target area	
usage	Detached house & off-street parking lot
use zoning	residential area, height limit district
Officially assessed land price	645,000 Won(2016.01.01.)

Table 5: Target areas status

The profit formula for private parking stations will be as the formula (1).

$$\alpha \cdot f_i + \beta \cdot f_m - O - S = N \cdot B \quad (1)$$

α : parking surface • operating hours • 365(day)

• time user utilization average rate(%)

β : parking surface • 12(month)

• monthly user utilization average rate(%)

f_i : hourly parking charge(won/h)

f_m : monthly parking charge(won/m)

O : oprating expenses (wage + cost of maintenance) • 12(month)

S : annual loan charge

$N \cdot B$: annual net profit

Based on current supporting standards, the study has produced case 1 and case 2. Case 3 is an estimate with the condition of stepping up the current standards.

Case 1, which is building a mechanical parking station in their land with the current supporting standards, generated profits. But in case of purchasing lands, case 2, it failed to yield profits. But in case 3, which strengthened the standards through construction-cost funding, adjustment of lending period, and modification of interest rate, the purchasing land did not affect creating profit. Given the fact that the land price in residential area is lower than in downtown, the reinforced supporting

standards will lead to promoting the private parking lots in the residential zones.

introducing regulatory policies like levying garage option on car buyers.

Finally, the solution conducted by the authorities had some limitations. The study has reviewed the ways to promote private parking lots. As the current support standards could not generate profits, it was hard to expect boosting the private parking lots.

It is advisable to review and strengthen the support standard through an in-depth economic analysis in future. The promotion of private parking lots in residential districts will lead to secure parking space, and that will be a big help for the improvement of parking environment.

Classify	Contents
case1 (Owned land)	Condition Parking surface : 42, Interest rate : 5%, Operating hours : 24hours Investment amount : Construction cost (1surface : 7million won)X0.5 / payback period : 5years time user utilization average rate : 15%, monthly user utilization average rate : 35% $f_1 : 2,000\text{won}$, $f_2 : 60,000\text{won}$ $O : 3\text{million won}$
	Profit and loss Gross earnings per year: 88 million won Annual Loan charge: 63million won Annual net profit: 25 million won Parking surface : 42, Interest rate : 5%, Operating hours : 24hours
case2 (purchasing the land)	Condition Investment amount : Land purchasing cost, Construction cost (1surface : 7million won)X0.5 / payback period : 5years time user utilization average rate : 15%, monthly user utilization average rate : 35% $f_1 : 2,000\text{won}$, $f_2 : 60,000\text{won}$ $O : 3\text{million won}$
	Profit and loss Gross earnings per year: 88 million won Annual Loan charge: 168 million won Annual net profit: -80 million won Parking surface : 42, Interest rate : 3%, Operating hours : 24hours Investment amount : Land purchasing cost payback period : 10years time user utilization average rate : 15%, monthly user utilization average rate : 35% $f_1 : 2,000\text{won}$, $f_2 : 60,000\text{won}$ $O : 3\text{million won}$
case3 (purchasing the land)	Condition Investment amount : Land purchasing cost payback period : 10years time user utilization average rate : 15%, monthly user utilization average rate : 35% $f_1 : 2,000\text{won}$, $f_2 : 60,000\text{won}$ $O : 3\text{million won}$
	Profit and loss Gross earnings per year: 88 million won Annual Loan charge: 74 million won Annual net profit: 14 million won

Table 6 :Example of private parking lot installation

CONCLUSION

The findings of the study are as follows.

First, inhabitants in residential environment improvement districts were mainly living in detached houses and town houses. Many of them did not have parking lots.

Second, the residents considered parking issue serious because there were many people who did not have parking lots and did illegal parking.

Third, when the residents, who did not have parking space, had many cars and had low intention to use parking lots, they argued that illegal street parking should be allowed.

Fourth, in solving the parking problem in their residential areas, the inhabitants maintained the authorities should play a key role. But, without provision of parking lots, they were not in favor of

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