

Unattended Illegal Parking Enforcement: The Power of Fines and Physical Evidence

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1. Policy Implementation Period

- Automated Parking Enforcement Service: System built in 2004
- Pilot project from April to September 24 (32 cameras installed)
- A total of 156 unattended enforcement cameras additionally installed by March 2008

- May - November 2004: Commissioned the basic/working design for the illegal parking enforcement service / selected locations for additional cameras to be installed under the expansion project, and finalized the system specifications
- December 2004 - August 2005: 53 additional cameras installed as part of the expansion project
- August - October 2005: additional 32 cameras installed along Cheonggyecheon-ro
- August 2006 - February 2007: additional 51 cameras installed along Cheonhodaero and other locations
- September 2007 - March 2008: additional 20 cameras installed along Songpadaero and other locations

2. Background Information

Traffic enforcement refers to processes concerning the enforcement of criminal and

¹ Translation by ESL®

administrative laws and regulations against violators of traffic laws and regulations, to ensure safe and efficient traffic movement and prevent the disruption of road traffic. Enforcement efforts had been undertaken exclusively by human enforcers at the police and local government level until the introduction of the automated enforcement system in 2004.

As the number of public officials is a finite resource, full-time enforcement cannot be expected through the use of human-only traffic enforcement. Outsourcing such enforcement services will not provide a viable or ultimate solution, either. In sum, human-only enforcement is virtually incapable of uninterrupted, continuous implementation. This situation has led to some violators thinking they simply had “bad luck” and thus have expressed their dissatisfaction about the punishment imposed. For such reasons, human-only enforcement has suffered from a multitude of frequent civil complaints regarding the overall fairness of traffic enforcement. The limited scope of a single person’s cognitive ability also raises questions about the unfairness of the enforcement and other unjustified practices in the course of carrying out such enforcement.

Another issue with human-only traffic enforcement is that it often causes traffic accidents, and can lead to or even exacerbate traffic congestion. However, traffic regulation violations (including that of illegal parking) disrupt the efficient use of traffic facilities in various ways, resulting in serious disruption of both traffic and circulation. In this sense, traffic enforcement is as crucial an element as the building of more traffic facilities.

State-of-the-art automated traffic enforcement services were introduced as a way to overcome the limitations of human-only traffic enforcement and thereby realize the full potential effect of traffic enforcement.

3. The Importance of the Policies

Seoul overhauled its public transportation system in 2004. It was preceded by Seoul’s plan for ITS construction in 2000. The announcement of the ITS plan spread the notion that efficient traffic systems can be achieved through innovative approaches using cutting-edge technology. The sweeping reform of the public transportation system resulted in the introduction and wide use of various means and tools seen as capable of radically improving traffic efficiency and the overall quality of road services- including the integration of bus services, the integration of traffic information, and the introduction of the bus-only lanes. However, if those traffic facilities and tools cannot operate properly or carry out necessary tasks because of rampant violations of traffic laws and regulations, any additional investments and facilities would seem to be nothing more than a waste. From this perspective, the automation of parking and bus-only lane enforcement may play a critical role in ensuring the effectiveness of the policy means and tools aimed at improving the quality of road services and the efficiency of traffic.

Such efforts can be understood in the context of transportation system management (TSM), a system that Western countries have emphasized since the late 1980s. In other words, the automation of traffic enforcement is consistent with the principle of balancing traffic demands and supply by ensuring the efficient management of existing facilities so as to improve their

capacity, rather than introducing additional facilities.

4. Relevance with Other Policies

Unattended enforcement services are also applied to the enforcement of bus-only lanes. This represents a policy approach based on the same principles and purpose as the unattended parking enforcement. Its purpose is to improve the efficiency of bus-only lane management and monitoring. Similar policies aimed at economical management and efficient punishments include the speed enforcement services. The drive-by unattended parking enforcement system has been attracting significant attention, in addition to the previous fixed parking enforcement system.

Furthermore, unattended enforcement services may be used for multiple purposes rather than simply the remote enforcement of parking regulations; services such as traffic monitoring and the collection of traffic information. More specifically, they can be used to inform the city's traffic policies through the video link function and integrated monitoring by TOPIS as well as the effectiveness analysis of installation locations.

- TOPIS
- Speed Enforcement Service
- Related to reducing traffic accidents
- Drive-by Parking Enforcement System

5. Policy Objectives

The automated traffic enforcement services are provided through automated systems to identify vehicles violating the traffic laws and regulations using various imaging and automated recognition technologies. Ultimately, the services are aimed at preventing traffic accidents and ensuring traffic safety in a more efficient manner.

By providing these services, the city seeks not only more efficient enforcement, but also fairer and more transparent enforcement.

The agencies in charge of traffic enforcement can use such services to manage their manpower more efficiently. It can also facilitate the handling of other related work– such as the manual enforcement and issuance of parking tickets.

6. Main Policy Contents

1) Legal Basis

The Road Traffic Act (June 13, 2008, Act No. 9115) provides the definitions of ‘standing’ and ‘parking’, the regulations concerning standing and parking, and the appropriate method of enforcement.

Article 87 (2) of the Enforcement Decree of the Act stipulates that evidence may be gathered using unattended equipment when identifying parking violations through the parking enforcement services.

Article 87 (Special Exceptions, etc. to Parking Regulations with Delegated Authority)

① Notwithstanding the provisions of Article 86 (2) 2, a Special Metropolitan City Mayor or a Metropolitan City Mayor may directly take necessary measures under Article 35 of the Act against vehicles violating parking regulations for the smooth flow of traffic and civilian safety.

Where a Special Metropolitan City Mayor or a Metropolitan City Mayor directly discovers and regulates a vehicle violating parking regulations pursuant to paragraph (1), he/she shall make known such instances with evidentiary materials, such as photographs of a vehicle on which a sign of vehicle subject to imposition of an administrative fine is attached or photographs, videotapes, or any other visual recording medium of the vehicle violating parking regulations taken by an unattended monitoring device (hereinafter referred to as "photographic evidence"), a document that describes the place where the violation occurred, the details of the violation, and the license plate number of the vehicle to the district leaders and country headmen that have jurisdiction over the location where such violations occurred.

2) Authority of Enforcement

Government officials of the cities and counties as well as the police have the authority for parking enforcement.

If each mayor of special and metropolitan cities may delegate its enforcement authority to the district leader and county headmen, the enforcement officials of each autonomous district have the authority for enforcement.

Article 86 (Delegation or Entrustment of Authority) ② Pursuant to Article 147 (2) of the Act, each mayor of special and metropolitan cities shall delegate its following authority to the district leader and county headmen under his/her jurisdiction: <Amended on June 20, 2008>

1. Authority to appoint and dismiss traffic enforcement officials (belonging to each district and county) under Article 12 of the Act, and the authority to take measures against vehicles violating parking regulations referred to in Article 35 of the Act;

2. Authority to have the task of towing, possessing and returning vehicles vicariously performed by an agent pursuant to Article 36 (1) of the Act, and the authority to place an order to take measures and conduct the education necessary for the vicarious performance of works pursuant

to Article 36 (3) of the Act;

3. Authority to impose and collect fines under Article 161 (1) (3) of the Act (limited to violations falling under any of Articles 32 through 34 of the Act)

3) System Structure

The automated parking enforcement service system is comprised of on-site subsystems and the center subsystem. Specific components may vary depending on equipment specifications and enforcement methods. However, a typical system composition is as indicated in Figure 1 below. Figure 2 shows Seoul’s parking enforcement system.

On-site subsystems should be fitted with the equipment necessary for identifying parking violations and collecting evidence. Ideally, the enforcement agency (center) should be able to monitor the parking enforcement areas and the current status of enforcement in real time.

The enforcement agency (center) should have the necessary equipment for imposing fines on the owners of the violating vehicles based on the evidence produced by the system. It is also recommended that they possess a server for the real-time monitoring of the enforcement sites and operation of the parking enforcement services.

The enforcement agency (center) may also choose to build a DB or link the relevant information from other agencies, and build a DB server or linkage server for those purposes.

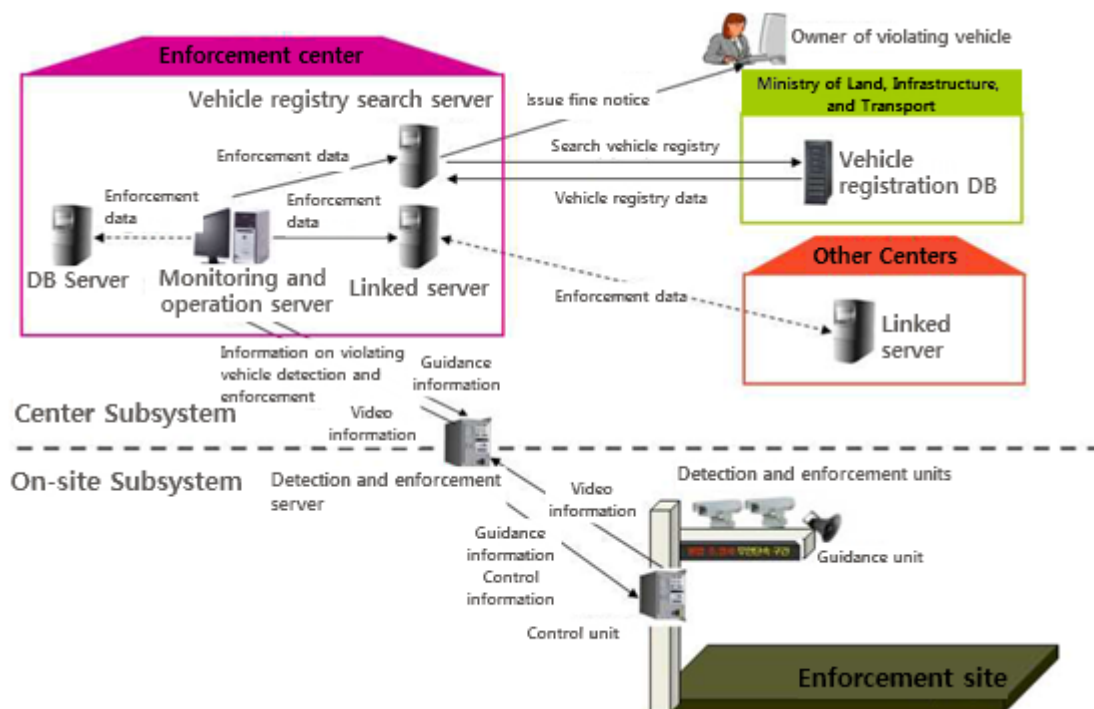


Figure 1: Illegal Parking Enforcement System

Source: Ministry of Land, Infrastructure, and Transport (2009)

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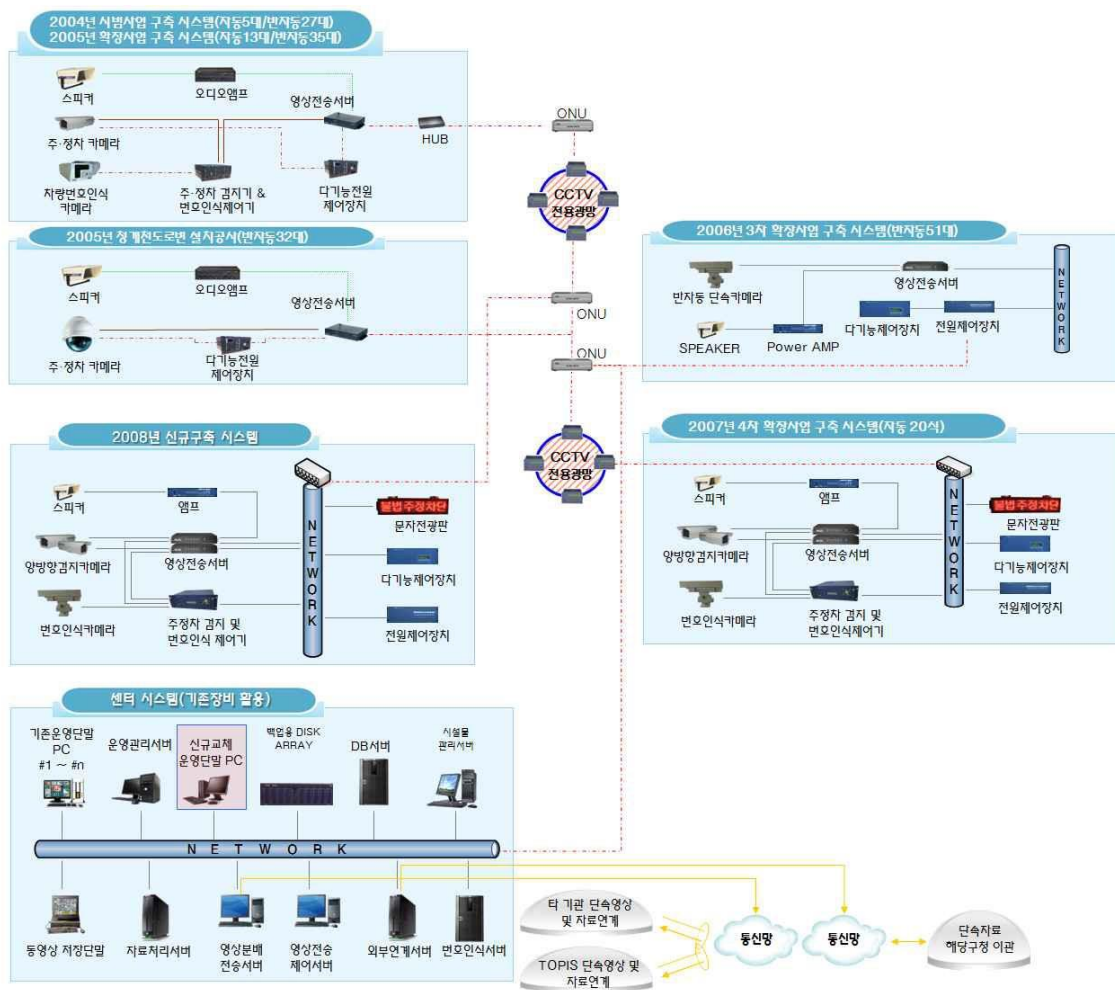


Figure 2: Seoul’s Illegal Parking Enforcement Systems

Source: Ministry of Land, Infrastructure, and Transport (2009)

<Translation>

(2004년시범사업...~: Systems built under the 2004Pilot Project (5 automated / 27 semi-automated)

(2005년확장사업...: Systems built under the 2005 Expansion Project (13 automated / 35 semi-automated)

(2005년청계천도로변...: Systems built under the 2005 Cheonggyecheonro Installation Project

(2008년신규구축...: Systems newly built in 2008)

(센터시스템: Center Subsystem (usingexisting equipment))

(2006년 3차...: Systems built under the 3rdExpansion Project in 2006 (51 semi-automated)

(2007년 4차...: Systems built under the 4thExpansion Project in 2007 (20 automated)

(스피커: speaker / 오디오앰프: audio amp /영상전송서버: video transmission server / 주차차카메라: parking enforcement camera / 다기능전원제어장치: multifunctional power control unit / 차량번호인식카메라: plate number recognition camera / 주차차감지기&번호인식제어기:parking detector & number recognition controller / 양방향감지 카메라: two-way detection camera / 문자전광판: electronic text display / 다기능제어장치: multifunctional control

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unit / 전원제어장치: power control unit / 기존운영단말: existing PC terminal / 운영관리서버: operation & management server / 신규교체운영단말 PC:newly installed PC terminals / 백업용 disk array: backup disk array / DB 서버: DB server / 시설물관리서버: facilities management server / 동영상저장단말: video storage terminal /자료 처리서버: data processing server /영상분배전송서버: video distribution & transmission server / 영상전송제어서버: video transmission control server / 외부연계서버: linked external server / 번호인식서버: number recognition server)

(타기관단속영상및자료연계: links enforcement videos and data from other agencies / TOPIS 단속영상및자료연계: TOPIS enforcement video and data links, 통신망: communication network / 단속자료해당구청이관: transmits enforcement data to relevant offices)

The table below lists the components of on-site subsystems and the center subsystem.

Table 1: Components of Illegal Parking Enforcement System at Enforcement Sites

Component	Function
Detection Camera	Automatically records the entry, movement, and exit of vehicles in and out of the enforcement site.
Enforcement Camera	A high-definition digital camera which records evidence of parking violations. Operated via control signals from the on-site control unit.
Zoom Lens	This lens adjusts the detection area of the camera so as to enlarge or shrink the collected images within a specific range.
Housing	Protects cameras and lenses from vibrations and sunlight
Image Server	Compresses images collected from the site and transmits them to the center in real time. The center transmits audio data to guide the violating vehicles at the site. Transmits serial signals for various on-site control functions.
Control Enclosure	Designed to maintain components at optimal conditions and protect them from vibrations, sunlight, smoke, and other interference.
Pan/Tilt	Controls the direction of the cameras so as to take photos of violating vehicles Provides accurate and stable position control and high-speed control.
Power Control Unit	Provides a stable supply of power to on-site equipment, and allows for remote power control.

Table 2: Components of Parking Enforcement System at the Center (Control Room)

Component		Function
Operation Terminal PC		On-site monitoring, control of on-site equipment, display of status information, issuance of guidance, and printing of violation notices Performs various functions for viewing, editing, revising, and registering DMBS ³⁾ .
Operation & Management Terminal		Monitors enforcement status and real-time traffic situations, and stores information in a DB
Data Processing Server		User account management, plate number recognition system data management, system operation and management, on-site equipment management, enforcement information list management, database link, system management (shutdown, plate number recognition data)
Video Storage Terminal		Allows for storing, searching, and displaying videos from the site. Allows for videos to be searched by time, date, and time zones in case of a civil complaint. Performs event log and enforcement list management.
Database Server		Stores and backs up enforcement data, updates detection areas and parameters, controls recording commands and vehicle detection functions.
DISK ARRAY ⁴⁾		Stores and manages data in preset folders at a specific cycle Backup software consists of Master Module, Client Module, and Disk Backup Module
Required ^{a)}	Plate number recognition server	Automatically recognizes plate numbers from the photographs of vehicle number plates
Optional ^{b)}	Video Distribution and Transmission Server	Distributes and transmits enforcement videos from each site to departments and agencies that require them.
	Video Transmission Control Server	Processes videos from the Video Distribution and Transmission Server in formats required by the respective departments, and manages the information on the history and display status of on-site videos transmitted to each department.
a) Required: Must be set up either in the onsite system or the center subsystem.		
b) Optional: To be selectively implemented as required		

3) Operation Organization

The automated enforcement services require a specific space to conduct the monitoring of the enforcement status. Semi-automated or manual enforcement systems require manpower to monitor and operate such systems.

The overall system of parking enforcement consists of two parts: one in charge of direct operation of the enforcement services and the other responsible for the administrative handling related to the imposition of fines. Therefore, each part should be manned with the suitable personnel.

4) Current Status of Unattended Parking Enforcement Systems in Seoul

In Seoul, parking enforcement systems are installed on 42 four-lane (or less) roads (22%), 50 six-lane roads (27%), and 96 eight-lane (or more) roads. Seoul's enforcement systems are concentrated around the city's main roads. Specifically, parking enforcement systems are installed on 42 four-lane (or less) roads (22%), 50 six-lane roads (27%), and 96 eight-lane (or more) roads.. The table below shows the status of parking enforcement systems across different roads and autonomous districts. The total number of systems in the entire city increased from 188 in 2007 to 252 in late 2014.

Table 3: Current Status of Unattended Illegal Parking Enforcement Systems Installed on Roads (In 2007)

Road	Number of Systems Installed	Road	Number of Systems Installed	Road	Number of Systems Installed
Gangnamdaero	7	Miariro	20	Wangsimnigil	6
Gangseoro	4	Banporo	1	Ujeonggukro	2
Gyeonginro	7	Bangbaedaero	1	Euijuro	4
Gongdanro	1	Bongcheonbokg aedoro	1	Itaewongil	5
Gwanakro	3	Seogangro	1	Jayangro	1
Namdaemunro	8	Songpaadaero	9	Cheonhodaero	10
Dobongro	3	Susaekro	4	Cheonggyecheonro	32
Dong2ro	2	Siheungdaero	5	Cheongjindonggil	1
Dongjakdaero	2	Sinbanporo	1	Tongilro	4
Deungchonro	4	Sinwolro	3	Toegyero	4
Maporo	6	Sinchonro	3	Hangangro	1
Manguro	5	Yangchongil	1	Hwagokro	1
Mokdongdongro	1	Yanghwaro	5	Hwarangro	1
Mokdongro	1	Yeonseoro	2	Hunryeonwonro	1
Mugyodonggil	1	Yeongdungporo	2	Heunginmunro	1

Table 4: Current Status of Unattended Parking Enforcement Systems Installed in Autonomous Districts (End of December 2014)

Name of autonomous districts	Number of Systems (units)	Illegal Parking	Bus-only Lane	Installed in Bus	Public (Yonseiro)
Total	329	252	45	28	4
Jongno-gu	30	29	1	-	-
Jung-gu	37	36	1	-	-
Yongsan-gu	4	4	-	-	-
Seongdong-gu	5	4	1	-	-
Gwangjin-gu	6	6	-	-	-
Dongdaemun-gu	9	9	-	-	-
Jungnang-gu	8	2	2	4	-
Seongbuk-gu	10	10	-	-	-
Gangbuk-gu	28	15	1	12	-
Dobong-gu	9	9	-	-	-
Nowon-gu	10	4	6	-	-
Eunpyeong-gu	16	9	3	4	-
Seodaemun-gu	16	7	5	-	4
Mapo-gu	16	14	2	-	-
Yangcheon-gu	20	15	1	4	-
Gangseo-gu	7	6	1	-	-
Guro-gu	1	1	-	-	-
Geumcheon-gu	8	8	-	-	-
Yeongdeungpo-gu	14	14	-	-	-
Dongjak-gu	10	9	1	-	-
Gwanak-gu	11	11	-	-	-

Seocho-gu	22	10	12	-	-
Gangnam-gu	6	2	4	-	-
Songpa-gu	23	15	4	4	-
Gangdong-gu	3	3	-	-	-

Note) Bus-installed type systems are based on the bus depots.

8. Policy Effects

The automated enforcement system, introduced for the purpose of dealing with the chronic issue of illegal parking, offers highly effective enforcement while reducing resistance or complaints from drivers. The system, therefore, eliminated resistance from, and conflict with, drivers on the roads. The system even works in situations where the driver stays inside the vehicle. This absence of personal interaction reduces complaints and conflict, and also reduces burdens associated with the bureaucratic process of paperwork and forms.

1) Installation, Before and After Effects

An article published in Volume 8 and Issue 3 of *Seoul Urban Studies* (2007) assessed the effect of the unattended automated parking enforcement service by looking into the case of Seocho-gu. The following table provides a comparison between traffic volume and the number of illegally parked vehicles before and after the installation of the enforcement system.

Table 5: Comparison of Traffic Volume before and after the System Installation

Target Location	2004	2005	Rate of Increase/Decrease
Seoul Art Center Nambu Circular Road	119,230	120,516	1.08%
Gangnam Taegeukdang (Gangnamdaero)	83,454	85,511	2.46%
Express Terminal (Sjinbanpo-ro)	111,661	113,197	1.38%
Total	314,345	319,224	1.55%

Table 6: Comparison of Changes in the Number of Illegally Parked Vehicles

Target Location	Equipment Size	Illegal Parking Before	Illegal Parking After	Change	Rate of Increase/Decrease
Nohyeon Station → Kyobo Tower	3 locations	163 units	47 units	-116	-71%
Kyobo Tower → Gangnam Station	1 location	144 units	90 units	-54	-37%
Gangnam Station → Woosung Apartment	1 location	116 units	66 units	-50	-43%
Total	5 locations	432 units	203 units	-220	-52%

After the introduction of the automated parking enforcement system, the traffic volume

increased by 0.12% - 3.10% or, 1.55% on average. The number of illegally parked vehicles per day significantly decreased from 37% to 71%, showing 52% on average.

The following table illustrates the gradual and continuous decrease following the introduction of the system.

Table 7: Number of Illegal Parking Enforcement by Year

(Unit: 1,000)

Division	2007	2008	2009	2010	2011	2012	2013	December 2014
Total	3,956	3,776	3,511	2,820	2,662	2,709	2,649	2,162
Seoul	902	907	804	608	441	450	427	328
Autonomous Districts	3,054	2,869	2,707	2,212	2,221	2,258	2,222	1,834

Source: Seoul Metropolitan Government, 2014

The following table shows the amount of fines imposed on, and collected from, illegally parked vehicles by year. The amount of imposed and collected fines all recorded gradual decreases until the end of 2014. The fines imposed for violations of bus-only lanes also largely decreased until recently.

Table 8: Amount of Fines Imposed and Collected from Traffic Enforcement

(Unit: million won)

Division	Parking Violation		Bus-only Lane	
	Imposed	Collected	Imposed	Collected
2008	136,917	105,721	4,122	3,270
2009	131,704	107,839	5,464	3,601
2010	101,317	85,822	3,472	1,843
2011	97,200	81,474	3,713	2,014
2012	96,874	79,485	4,291	2,559
2013	93,650	70,547	3,559	2,145
December 2014	44,736	26,702	2,116	1,419

Source: Seoul Metropolitan Government, 2014

Wonju-si Data

The City of Wonju announced on the 20th day of last month that it had completed the replacement of existing monitoring cameras at 10 locations - including Rodeo Street, Nonghyup Wonju, and Dangu-dong GS Mart- with fully automated systems. The systems, according to the city hall, are now operating around the clock, catching 128 illegal parking practices per day on average. Wonju has installed monitoring cameras at 26 locations with severe traffic congestion to great effect. However, illegal parking practices continued at nights as well as on holidays, when monitoring personnel is scarce. Therefore, the city hall announced that they had replaced them with automated monitoring systems capable of 24-hour operation. Wonju plans to apply the 24-hour enforcement capability to the other 16 locations by the first half of next year.

A Wonju official said, “the fully automated system is capable of unattended enforcement around the clock, allowing for parking enforcement at night or on holidays. This resulted in a 6-times increase of illegally parks vehicles identified.” He also added, “We will also operate two vehicle-mounted cameras to enforce paring regulations at night, focusing on areas where illegal parking has been disrupting traffic flow.” (Korea Economic Daily, November 20, 2008).

2) Effect Analysis through Demand Survey

The Analysis and Assessment of Suwon’s Intelligent Traffic System (ITS) surveyed the citizens’ satisfaction with the parking enforcement systems. The following diagrams show the perceived effectiveness of the enforcement parking services derived from the findings of the survey.

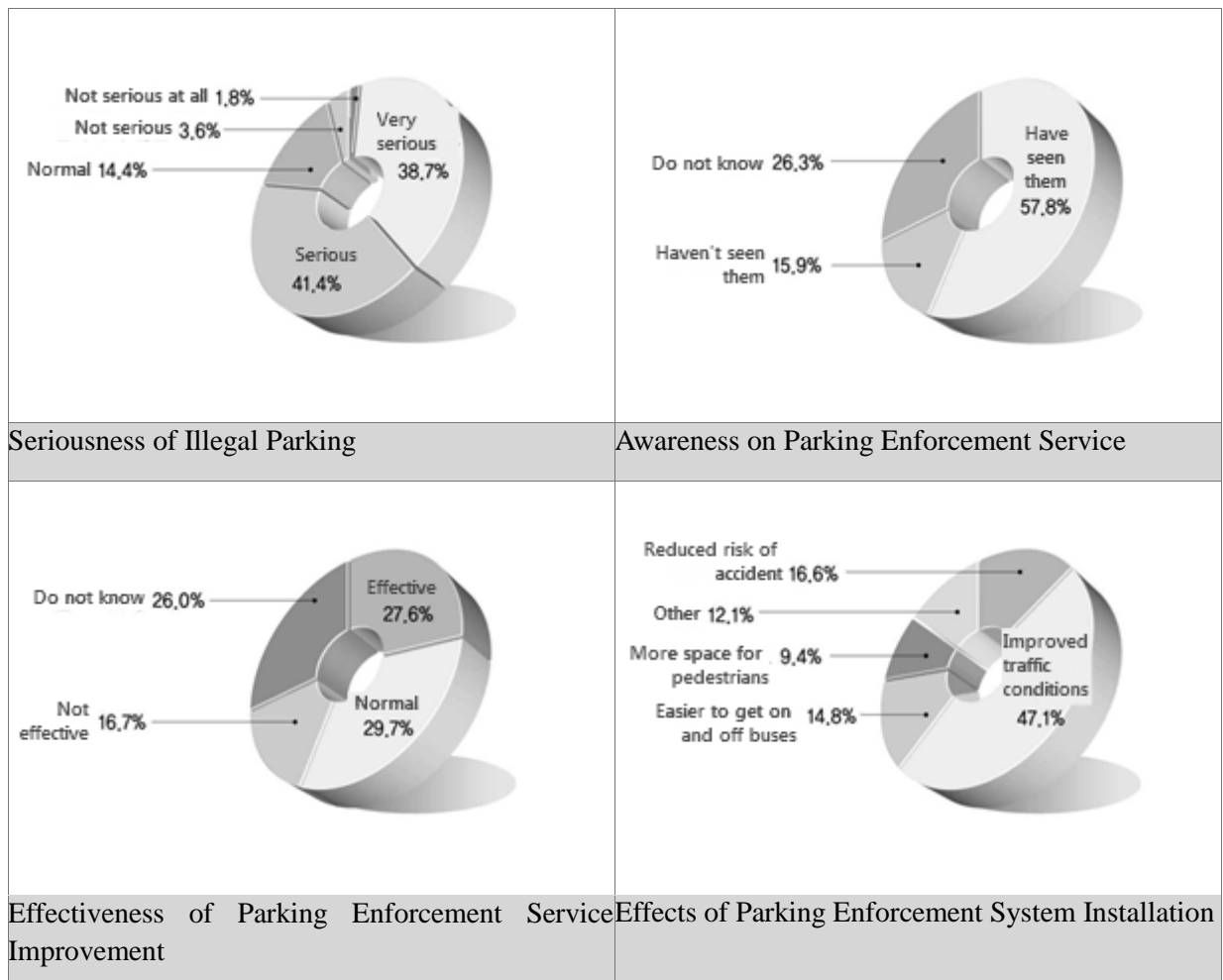


Figure 3: Findings from the Suwon demand survey

3) Allows for significant reduction of on-site dispatches and workload while preventing illegal parking with great effectiveness - automated plate number recognition with monitoring cameras (more than 100m away) (Geonah Information Technology, 2016)

9. Challenges and Solutions

1) While the automated systems contributed to an unprecedented increase in cases of illegal parking being identified and also proved to be highly effective in preventing illegal parking, it has been pointed out that an excessive number of parking regulation violators have been declared exempt from the punishment following enforcement.

The following table shows a gradual decrease of the collection ratio of parking fines since 2011,

and commentators point out that the decrease has been caused by excessive exemption.

Table 9: Amount and Ratio of Fines Imposed and Collected for Parking and Standing Violations by Year

(Unit: million won)

Division	Parking Violations		
	Imposed	Collected	Collection Ratio (%)
2008	136,917	105,721	77.2
2009	131,704	107,839	81.9
2010	101,317	85,822	84.7
2011	97,200	81,474	83.8
2012	96,874	79,485	82.0
2013	93,650	70,547	75.3
2014.12	44,736	26,702	59.6

Source: Seoul Metropolitan Government, 2014

2) Fixed CCTVs face limitations in that drivers who know the locations and ranges of the devices can predict or avoid any traffic enforcement. Therefore, drive-by enforcement equipment is expected to be used more widely as a way to overcome the shortcoming of the previous systems.

Mobile automated enforcement equipment has proved its effectiveness in several cities. As a piece of all-weather removable enforcement equipment, it has a monitoring camera installed on the roof of the vehicle. The camera rotates 350 degrees and is capable of taking up to 30 photographs per second. It can take photographs at a speed of 40km per hour, and maintains its effectiveness at night or under adverse weather conditions using its infrared device.

In 2007, the equipment was installed in four districts of Ulsan, except for Ulju-gun, and the results were notable since its enforcement achievements accounted for 27% of the total number of parking violations detected in a month (including enforcement by personnel and fixed-type equipment).