Policies

Seoul's Intelligent Traffic System (ITS)

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Policy Implementation Period

The freeway traffic management system (FTMS) of Seoul's urban expressways was first designed by the Seoul Development Institute (currently known as the Seoul Institute) in the mid-1990s, and implemented in the 18-km-long leg of the Olympic Expressway in July 1997. After six months of operation as a pilot project, the FTMS was used in earnest from February 1998.

Since then, the FTMS project has been implemented and expanded in phases. In phase 1 (May 2000 - June 2002), the FTMS was introduced to a 40.1 km stretch of the Naebu Inner Beltway. During phase 2, the transportation management system was established in a 21.7 km segment of the Gangbyeon Riverside Expressway and the Bukbu Northern Arterial Road during November 2001 and June 2004. In addition, segments extending along 49.3km of the Olympic Expressway and the Nodeul Road & Han River Bridge were also equipped with the FTMS from October 2003 to September 2005. In Phase 3, the FTMS was installed on a 45.7 km stretch of the Dongbu Eastern Arterial Road and the Gyeongbu Expressway (managed by the City of Seoul), which began in April 2005 and was completed in April 2007. Phase 4 dealt with arterial roads rather than urban expressways. (See page 4, relevance with other policies). Phase 5, which is currently being implemented, covers 12.4 km of the Gangnam Beltway. Table 1 below presents a summary of Seoul's FTMS project.

In December 2000, Seoul developed a plan for the construction of the Urban Expressway Traffic Control Center, followed by plans for its operation in April 2004.

Table 1. Seoul's Urban Expressway FTMS Projects in Phases

	Segment	Start	Completion	Segment Length
Initiation	Olympic Expressway	July 1997	February 1998	18km
Phase 1	Naebu Inner Beltway	May 2000	June 2002	40.1km
Phase 2	Gangbyeon Riverside Expressway/Bukbu Northern Arterial Road	November 2001	June 2004	21.7km
	Olympic Expressway/ Nodeul Road & Han River Bridge	October 2003	September 2005	49.3km
Phase 3	Dongbu Eastern Arterial Road/Gyeongbu Expressway	April 2005	April 2007	45.7km
Phase 5	Gangnam Beltway	May 2015	May 2016	12.4km
Total				187.2km

Background Information

The rapid development of the Korean economy and the automobile industry in the 1980s brought about a sharp rise in traffic volume. The number of passenger cars exceeded one million in 1990, and rose to over two million units by 1995 with more than half of them being used in Seoul. Thus, in less than five years, the number of cars owned by Seoul citizens almost doubled to two million. Such a surge in car ownership quickly led to snowballing social costs - including road congestion and traffic accidents - in the City of Seoul.

The decision-makers of the city's transportation policy during that period shared the view that the existing supply-oriented approach - which was largely focused on expanding facilities, including continuous expansion of the transportation system and construction of new roads - might no longer be viable and started seeking a new approach in a bid to break away from conventional transportation policies.

At that time, other countries were expressing a keen interest in the intelligent transportation system (ITS), which applied cutting-edge technology to transportation facilities. The ITS was an innovative approach that was very appealing to policy makers as it helped promote the efficient management of existing traffic facilities by promoting efficient traffic flow at much more affordable costs compared with the provision of infrastructure facilities, including the construction of new roads. For that reason, an increasing number of cities in other countries showed interest in adopting the ITS, and South Korea pursued various ITS research and development programs and pilot projects in the 1990s. In line with such a move, the City of Seoul also promoted the adoption of an advanced overseas ITS. In the initial period, Seoul began promoting the urban expressway FTMS on a large scale. In fact, the urban expressway FTMS ultimately became one of Seoul's most representative ITS projects, dramatically improving the efficiency of its urban expressways.

Article 77 (Implementation of the Project to Establish Intelligent Transport Systems) of the National Transport System Efficiency Act provides the legal grounds for projects aimed at establishing the urban expressway traffic control system.

The Importance of the Policy

The implementation of the FTMS on Seoul Urban Expressways started in the mid-1990s when the Intelligent Transportation System (ITS) was gaining much attention, leading to Seoul's introduction of the ITS in earnest.

The Intelligent Transportation System (ITS) is an advanced traffic management system that enhances the efficiency and stability of transportation, conducts scientific and automatic operation and management of the transportation system, and provides traffic information and services through the use of cutting-edge technology - including electronic technology, control technology and communications technology - to the means of transportation, transportation facilities and infrastructure.

The implementation of the FTMS enabled real-time traffic control and automatic information/data collection of the urban expressways, thus enabling a prompt response to adverse traffic conditions and emergencies and improving the efficiency of the traffic system, which had previously been manually operated.

Relevance with other Policies

Seoul's FTMS Project in 4 Phases

Phase 4 was designed to improve the major bypasses of the urban expressways, and the FTMS was installed along 82.5 km of expressway between August 2011 and August 2013.

During the first to third phases of the FTMS project, as mentioned earlier, the FTMS was successively implemented along the Olympic Expressway, Naebu Inner Beltway, Gangbyeon Riverside Expressway/Bukbu Northern Arterial Road, Nodeul Road & Han River Bridge, Dongbu Eastern Arterial Road, and Gyeongbu Expressway (managed by the City of Seoul). In the 4th phase, the advanced management system FTMS, was installed on major arterial roads of the urban expressways with the aim of dispersing the traffic volume and enabling the optimal dispersion of traffic based on the real-time FTMS implemented on major bypasses. The FTMS was installed on the following arterial roads:

1st group: Banpo-ro, Hannam-ro, Gangnam-daero, Heolleung-ro, Dongjak-daero, Doomoogae Road, etc. (42km)

2nd group: Hwarang-ro, Jeongneung-ro, Segeomjeong-gil, Jinheung-ro, Tongil-ro, etc. (23km)

3rd group: Dongil-ro (18km)

FTMS System Advancement

The installation of the FTMS on arterial roads laid the cornerstone for the 'FTMS System Advancement' project, which focused on the integration and linkage of urban expressways and arterial roads. The goal of this project is to promote a closer linkage of traffic data between urban expressways and arterial roads, and integrated linkage control, as well as to provide a risk alert service that warns drivers of risk factors in order to ensure safe driving. This will be covered in more detail in the last part (Limitations and Resolutions) of this article where policy and the future is discussed.

FTMS on Expressways

The FTMS was not only installed on urban expressways in Seoul but was also planned to be installed on expressways across the nation under the management of the Korea Expressway Corporation. Due to the widespread implementation of the FTMS on expressways throughout the country, the Intelligent Transportation System (ITS) is the best - or even the most perfectly - realized system on expressways among all the road types in Korea.

In order to allow for the efficient management of the expressways based on 'intelligent' expressways across the nation, the KEC has deployed and now operates a high-speed optical communications network covering the country's 24 expressway routes, totaling

2,646km, including the Gyeongbu Expressway, since 1993.

The communications network provides on-site IT infrastructure for the KEC's work and also serves as a field communications network for the FTMS, toll collection system (TCS), hi-pass system (toll payment system), and emergency calls.

Policy Objectives and Processes

The FTMS aims to enhance the efficiency of expressways. More specific policy goals can be summarized as follows:

① To check the transportation and road situation on urban expressways, identify the causes of congestion and how to improve them, and ultimately promote efficiency in the traffic management system.

② To guarantee the mobility of urban expressways (maintaining a travel speed of 40km/h or higher).

③ To guarantee public safety on urban expressways (zero traffic fatalities).

④ To reduce travel costs by removing the causes of irregular traffic congestion based on the automatic detection of unexpected incidents and prompt responsive measures.

⑤ To establish a convenient and pleasant traffic environment by offering traffic information to road users.

Main Policy Contents

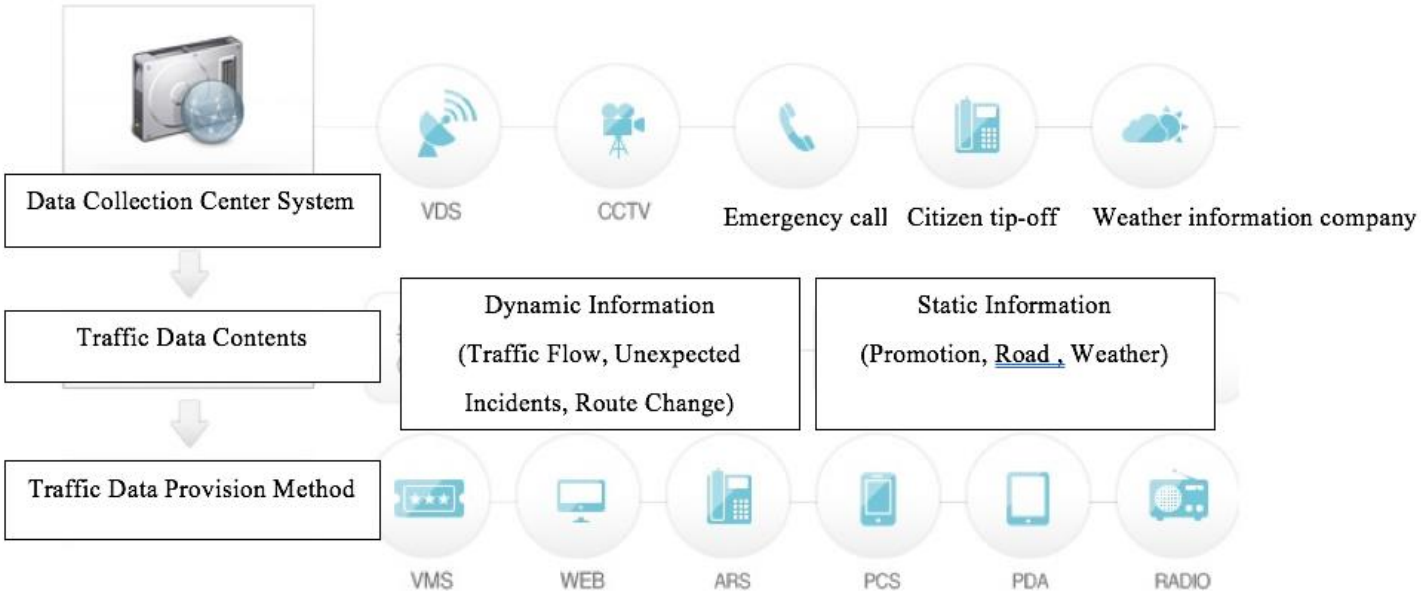
The Freeway Traffic Management System, or FTMS for short, and the Seoul Urban Freeway Traffic Management System are the intelligent transportation systems (ITS) installed on expressways by the SMG to centrally manage the traffic situation and to provide detailed traffic information to drivers on the expressways in real time.

The ITS efficiently manages the traffic flow with its combination of "hardware" (roads, construction, transportation, communications, electricity, electronics, automobiles, etc.) and "software" (operating methods, information processing techniques, etc.) technologies, thus dispensing with the need for a large workforce. The main goals of deploying the ITS are to provide the optimal route for individual passengers, to induce convenient and safe passage, to detect the causes of delays including unexpected incidents and provide solutions to them and, ultimately, to maximize the efficiency of the overall transportation system.

As such, the main function of the FTMS is to collect information on traffic conditions and to process and use the collected data. Information is gathered using a loop vehicle detector, which is installed under the road and detects the traffic flow, and a video vehicle detector, which identifies the traffic flow based on video recording, as well as CCTVs and emergency phone calls. In addition, tip-offs from road users provide a good source of information. Figure 1 is a schematic representation of the devices and information media used to collect and process data and to provide information.

Transportation Data Collection System

The Transportation Data Collection System collects information on the traffic flow, weather changes, and unexpected incidents that happen on expressways using VMS, CCTVs and emergency call technologies.



Traffic Information Provision Center System

The Traffic Information Provision Center System promptly provides information on expressway conditions to drivers and users by processing collected traffic information via VMS, LCS, ARS, emergency broadcast system, and WEB technologies among others.

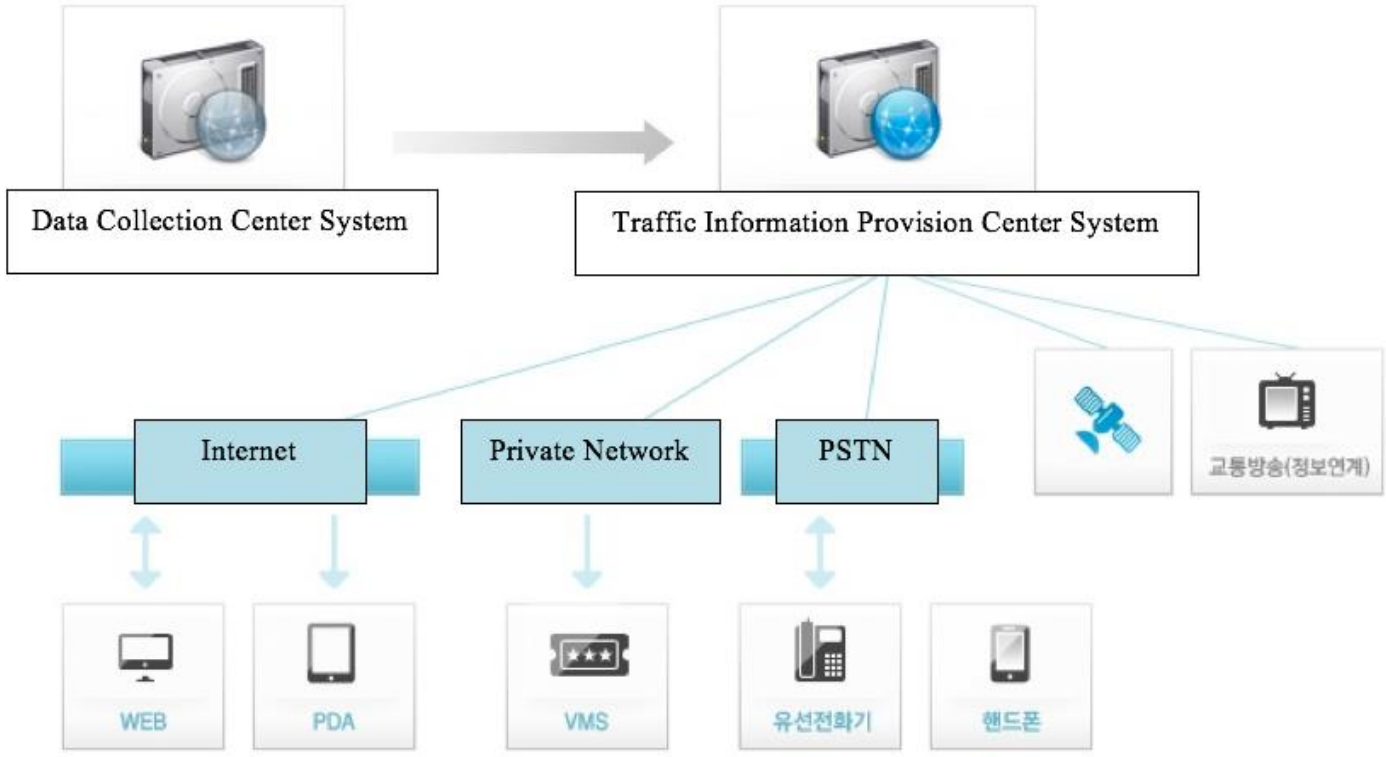
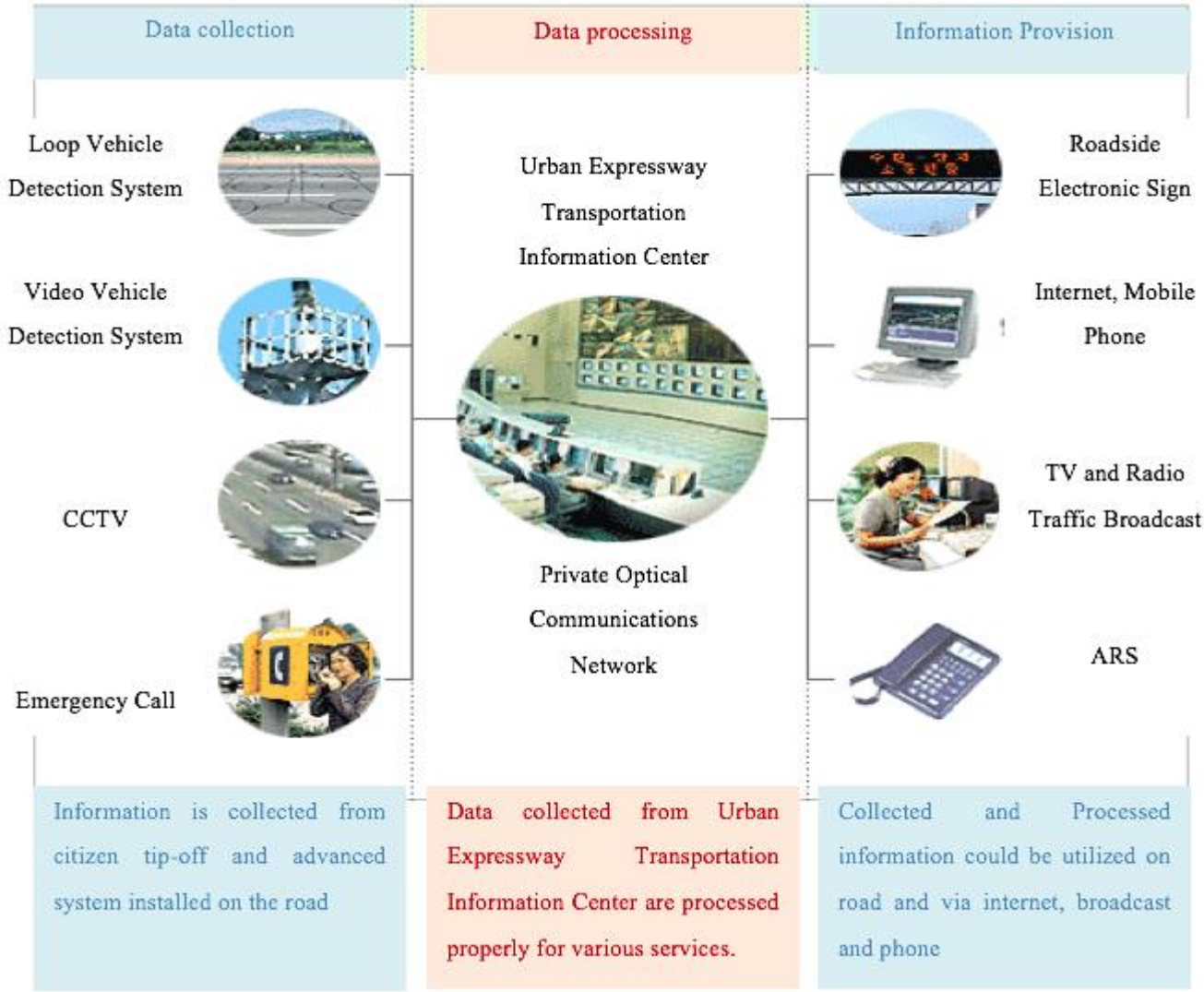


Figure 1. FTMS Data Collection Processing Provision



Source: Seoul Metropolitan Government (2013)

As of 2013, a total of 1,193 traffic data collection devices had been installed on the urban expressways in Seoul, including 1,047 Vehicle Detection Systems (VDS), 144 CCTVs, and two Road Weather Information Systems (RWIS). Among the media providing traffic information were 260 Variable Message Signs (VMS) as well as the website of the Seoul Urban Expressway Traffic Control Center, ARS and fax. On top of these, traffic flow control devices have been installed, including 30 Ramp Metering Systems (RMS), 33 Lane Control Systems (LCS), and cutting-in controllers.

Table 2 below shows the number of on-site data collection devices constituting Seoul's urban expressway FTMS that were in operation at each phase of the FTMS project. The collected data are directed to the Urban Expressway Traffic Control Center where all traffic information is to be collected. The center provides the collected data directly to the users or transmits it to other relevant institutions. It also receives information from other institutions and provides it to users via diverse media, as summarized in Table 3.

Table 2. Installation of the FTMS on Seoul Urban Expressways

Data Collection Devices					**Data Provision and Control Devices**					
Category	**VDS**		**CCTV**	**RWIS**	**VMS**	**RMS**	**LCS**	**cutting -in**	**Internet**	**Others**
	Video	**Loop**								
Phase 1	213	24	38	-	62	12	-	-	web page	ARS/ FAX
Phase 2	120	2	22	-	43	-	-	-		
	218	124	40	2	81	-	19	-		
Phase 3	194	10	36	-	61	19	14	2		
Phase 5										

Source: Seoul Metropolitan Government (2013, 2014)

*** Acronym**

VDS: Vehicle Detection System

RWIS: Road Weather Information System

VMS: Variable Message Sign

CCTV: Closed-Circuit Television

RMS: Ramp Metering System

LCS: Lane Control System

As of April 2007, the Seoul Metropolitan Government had installed the FTMS in nine segments (180.4km in total) of the urban expressways based on a high-speed communications network. Meanwhile, as of 2013, a total of 1,041 vehicle detection systems (VDS), 144 CCTVs and 260 roadside electronic signs had been installed across Seoul's urban expressways for the collection and provision of traffic data.

The Seoul Urban Expressway Traffic Information Center serves as the information source of the Korea Expressway Corporation, providing effective and proactive traffic management 24/7 and accurate real-time traffic information. The information center provides prompt traffic management in the event of unexpected emergencies, including traffic accidents and disasters on the expressways, and helps ensure a smooth traffic flow via the swift provision of traffic data after collecting and analyzing real-time traffic data. In particular, it helps drivers find the optimal routes by offering integrated transport information, including national highway and urban roads, as well as expressway information. Integrated traffic data are also provided in real time to various broadcasting media including TV and radio stations, DMB, and mobile phones, PDAs, navigation devices, ARS and the Internet. Drivers on the expressways can also assess the traffic information for themselves by reading the roadside electronic signs.

Table 3. External Information Links to the FTMS

Category		Details of Information	Frequency	Use of Information
From	Seoul Metropolitan Police Agency	Traffic flow at a fixed point (at 1 min intervals), traffic flow at a fixed segment (at 1 min intervals), unexpected incidents	1 min	-
		CCTV feed	-	-
	Korea Expressway Corporation	Traffic flow at a fixed segment (at 1 min intervals)	5 min	-
	Traffic Broadcasting Station (TBS)	CCTV feed	-	-
	Seoul Transport Operation & Information Service (TOPIS)	Traffic flow at a fixed segment (at 1 min intervals)	5 min	-
		CCTV feed	-	-
	Expressway to Incheon International Airport	Traffic flow at a fixed segment (at 1 min intervals), unexpected incidents	5 min	-
To	Expressway to Incheon International Airport	Traffic flow on the Incheon Airport Expressway (Bukno JC − Airport)	10 min	Provision of traffic information online
		Traffic flow on the Gyeongbu Expressway (Hannam − Shingal), Oegwak Outer Beltway (Toegyewon − Ilsan)	5 min	Provision of traffic information online, for display on operation devices and online maps

	Seoul Metropolitan Fire & Disaster Headquarters (Seoul Emergency Operations Center)	Weather data	1 min	Provision of weather information online
		Data on dams, Han River water level, and precipitation	-	Operation devices
	Namsan Zone Traffic Data	Traffic flow at a fixed segment (at 1 min intervals)	1 min	Provision of traffic information on the Namsan Zone via VMS

Source: Seoul Metropolitan Government (2013)

Technical Details

The FTMS is composed of a field system, which collects and provides traffic information, and a center system, which manages the process and analysis of traffic data, and system operation and integration of external links to the FTMS. As shown in Figure 3, information on weather and transportation collected by the vehicle detection system, CCTVs (closed-circuit television), and Road Weather Information Systems are processed and analyzed by the information processing system, a part of the center system, and provided to users via the ARS and the Internet, and are even displayed on variable message signs (VMS). Also, the FTMS exchanges information with organizations such as the Korea Expressway Corporation, the Seoul Metropolitan Agency, and the Seoul Emergency Operations Center, all of which are linked via the information network. Figure 2 is a schematic diagram of the elements of the urban FTMS and their relationship.

Figure 2. Structure of the Urban Expressway Traffic Management System

Source: Seoul Metropolitan Government (2016)

As of 2013, a total of 1,193 traffic data collection devices had been installed across the urban expressways in Seoul, including 1,047 Vehicle Detection Systems (VDS), 144 CCTVs, and two Road Weather Information Systems (RWIS). Among the media providing traffic information were 260 Variable Message Signs (VMSs) and the website of the Seoul Urban Expressway Traffic Control Center, ARS, and fax. On top of these, traffic flow control devices had been installed, including 30 Ramp Metering Systems (RMS), 33 Lane Control Systems (LCS), and two cutting-in controllers.

Policy Effects

Social Benefits

A report (SMG, 2007) released toward the end of 2007, when Phase 3 of the FTMS had been completed, included an analysis of the effects of the FTMS in terms of social benefits (as shown in Table 4 below) and the criteria for evaluating the benefits (as shown in Table 5). In other words, the social benefits in the section where the FTMS was implemented were evaluated in terms of reduced travel times, reduced travel times due to bypasses, reduced travel times due to the rapid response to unexpected incidents, reduced energy consumption, and improved air quality. Table 4 shows that the reduced travel times accounted for more than 66% of the benefits, energy reduction at 13%, and reduced travel times due to the rapid response to unexpected incidents at 15%.

In the meantime, the extension of the (road) networks generally turned out to lead to bigger benefits when Phase 1 of the FTMS project was completed in 2003. The system became stabilized and benefits steadily increased thereafter. In 2007, the benefits accruing from reduced energy consumption and improved air quality showed a temporary drop over the year, as a rise in both travel distance and traffic volume, which directly determine the amounts of energy consumption and air pollutant emissions, failed to offset the benefits generated by the increase in travel speed.

Table 4. Social Benefits Generated by the FTMS

(Unit: KRW 1 Million)

Category (Year/ Benefits)	Reduced Travel Time in Mainline	Route Change (Bypass)	Reduced Time In Responding to Unexpected Incidents	Reduced Energy Consumption (Operational Costs)	Improved Environment (Air Quality)	Sum
2003	16,634	472	3,910	5,647	565	27,229
2004	16,673	532	4,906	5,709	597	28,418
2005	25,181	765	6,201	9,579	963	42,689
2006	45,319	4,935	7,739	10,769	1,053	69,815
2007	72,382	7,793	10,942	6,679	649	98,445
Total	176,189	14,497	33,697	38,383	3,829	266,595
Percentage (%)	66.1	5.4	12.6	14.5	1.4	100.0

Source: Seoul Metropolitan Government, 2007, Cited by the Ministry of Land, Transport and Maritime Affairs 2009

Table 5. The Criteria for Determining the Effectiveness of Each Benefit Item

Category	Benefit Items
Direct Benefits	Lower Vehicle Operation Costs Faster Travel Times (Mainline, Bypass) Faster Response to Unexpected Incidents (Traffic Accidents, Breakdowns, etc.) Fewer Traffic Accidents Enhanced Pleasantness, Punctuality and Safety of Travel
Indirect Benefits	Lower Environmental Costs Regional Development Effect due to Improved Transportation System Expansion of Market Area

Source: Ministry of Land, Transport and Maritime Affairs 2009

The Price the User Is Willing to Pay

User satisfaction with information provision was computed by quantifying the qualitative evaluation items based on a survey on ‘the price the user is willing to pay’ to the FTMS information provision media (excluding Variable Message Signs). The qualitative benefits were calculated by multiplying the average price that the ‘user is willing to pay’ to each information-providing medium by the number of the user’s annual uses of each medium. As shown in Table 6, the type of Internet traffic information that was used far more frequently than other media turned out to have generated the biggest benefits.

Table 6. The Price Each User Is Willing to Pay for Data from the Urban Expressway FTMS, Annual Usage and Benefits

Category	Internet	ARS	SMS	FAX	Cell Phone	PDA
The price that the user is willing to pay (KRW/case)	55	38	38	24	57	

Category	Internet	ARS	SMS	FAX	Cell Phone	PDA
Usage	3,932,823	320,999	170	625	16,742	4,764
Benefits (KRW 1,000)	216,305	12,198	6	15	954	272

Source: Ministry of Land, Transport and Maritime Affairs 2009

The use of variable message signs (VMS) was not included in the target of the abovementioned survey as their usage is not optional. Instead, reliability was checked in the survey, and the users generally appeared to find the information on the VMSs reliable. For each

type of information, users found the information on traffic delays and congested areas on expressways (3.64 out of 5 points) the most reliable, followed by information on unexpected incidents and situations (3.54 points) (SMG 2007).

A more recent survey from 2013 showed that drivers used FTMS information 11.7 million times, indicating a sharp rise from the 4.6 million times recorded in 2007. While the use of FTMS information via the Internet remains high, the number of searches of information using mobile phones was about 5.8 million in 2013 due to a surge in the use of mobile devices including smart phones. Table 7 below indicates the annual use of Seoul's FTMS transportation data by each medium.

Table 7. Use of Seoul's FTMS Transportation Data by Each Medium

(Unit: No. of cases/Year)

Category	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Total no. of usages	2,256,940	2,780,286	3,026,974	4,276,123	4,593,626	4,862,232	5,930,403	10,449,609	18,117,411	13,612,320	11,777,260
Internet	2,025,411	2,584,203	2,822,365	3,932,823	4,059,065	4,294,350	5,337,458	9,904,212	17,759,764	13,364,052	5,726,604
Mobile	Uncounted										5,811,771
ARS/FAX	222,342	185,664	192,151	321,624	501,039	528,204	545,110	491,263	316,693	178,101	122,922
Telephone Inquiries	9,187	10,419	12,458	16,742	16,493	14,335	12,955	10,077	7,709	6,226	4,972
Feature Phone, PDA	-	-	518	4,934	17,029	25,343	34,880	44,057	25,155	54,753	7,794
Twitter	-	-	-	-	-	-	-	-	8,090	9,188	

Source: Seoul Metropolitan Government (2013)

Challenges and Solutions

The Seoul Metropolitan Government's experience in deploying and operating the FTMS over the past twenty years is, by and large, very positive but there remains some room for improvements in the following three aspects.

① Performance of applied technology

② Securing of the budget required to replace the deteriorated transportation management system

③ Linkage of the ITS with arterial roads

Performance of Applied Technology

The performance of devices and facilities that collect traffic information needs to be supplemented. The Traffic Information Bureau of the Seoul Metropolitan Facilities Management Corporation has established a master plan for the ITS performance evaluation of the FTMS, and has laid the foundation for testing the accuracy of traffic volume/speed measurement of each detector through the complete enumeration of the vehicle detection system, video frame analysis, relative inspection of the traffic volume and reconfiguration (recalibration or change setting) of video-based vehicle detectors (Seoul Metropolitan Facilities Management Corporation, 2014). Along with a performance test, thorough management of measures applied to facilities that fail to meet the standard will be necessary.

Also, with regard to certain sections of the FTMS, it has been pointed out that the 'simultaneous' or 'real-time' provision of information has some limitations, i.e. it takes a long period of time or frequency of updates is long for the commercial data to be utilized or for the information to appear on the electronic map of the traffic information center after collecting vehicle data from the vehicle detection system on the road. Therefore, greater efforts are needed to provide information in real time by shortening the update frequency and by reducing the time required for data processing based on a higher, more dispersed server load.

Securing of the Budget Required to Replace Deteriorated Facilities

According to Seoul's FTMS operation and maintenance plan, the 2015 detailed plan included a plan to achieve zero system failure through exhaustive FTMS pre-inspection activities. On top of the regular inspections, the 2015 plan also included a special inspection to prevent any failure and to raise the level of satisfaction with the service in preparation for periods such as national holidays and the monsoon season, when there is a huge surge in the use of traffic information. However, there have been difficulties in securing the budget to replace the deteriorated FTMS. Meanwhile, the 2016 plan included the maintenance of system facilities, performance testing of the vehicle detection system, and improvement of the performance of the dilapidated FTMS. On top of this, the Seoul Metropolitan Government has set aside KRW 2.69 billion for improving the performance of the deteriorated FTMS, while the maintenance of facilities

has been delegated to the Seoul Metropolitan Facilities Management Corporation. (Ministry of Land, Infrastructure and Transport 2015)

FTMS Advancement Plan

The FTMS advancement plan is included in Seoul's transportation master plan (SMG 2014) and Seoul's ITS master plan (SMG 2013), which outline the integrated operation of the FTMS on both urban expressways and arterial roads in order to upgrade operational efficiency based on the successful operation of the FTMS thus far. These master plans also cover the establishment of information service provision for road safety.

Under Phase 4 of the FTMS project (2011-2013), the FTMS was deployed on arterial roads and the main bypasses of urban expressways, with the goal of optimally dispersing the traffic volume to bypasses from the urban expressways.

On the basis of the FTMS on arterial roads, the FTMS advancement project will be conducted to achieve the following objectives:

-To improve the linkage of traffic information between urban expressways and arterial roads.

-To extend entrance/exit control to urban expressways by implementing integrated control and linkage with arterial roads in response to real-time traffic situations.

-To provide a risk alert service that warns users of risks to safe driving, including hazardous sections on expressways.

In addition, the Seoul Metropolitan Government plans to promote a smooth traffic flow by implementing variable speed limits (VSL) and a lane control system (LCS) on the mainline of the urban expressways. The variable speed limit designates the desirable speed as determined by traffic conditions and weather information, in order to maintain the optimal traffic flow and thereby guarantee safe passage while maximizing road capacity. This, in turn, leads to a smoother traffic flow in the mainline of the urban expressways. The lane control system (LCS) designates the optimal route and speed in the event of unexpected incidents or emergencies requiring the dispatch of emergency vehicles (Seoul Metropolitan Government 2014). Table 8 shows the FTMS system advancement plan for each year.

Table 8. FTMS System Advancement Plan by Year

Progress/Year	FTMS System Advancement
2013	Improvement of design and system
2014	
2015	Deployment of FTMS system and development of control strategy (Installation of field system on 96.7 km of road each year) - Development of control strategy and installation of system on mainline and ramp segments - Establishment of the ITS with the focus on hazardous segments
2016	
2017	
2018	
2019	Implementation of integrated linkage and control between urban expressways and arterial roads Widespread installation and advancement of the Intelligent Safety System using communications technology between cars.
2020	
2021	

Source: SMG, Urban Transportation Master Plan, 2014

The management of traffic flow is expected to become more efficient if 1) performance testing and replacement of deteriorated facilities are effectively performed, 2) the FTMS system advancement project is conducted according to the plan, and 3) FTMS information is effectively exchanged with information collected and provided by the private sector.

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