Improvement of Travel Survey and Statistical Indicators for Walk Trips

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Summary

There is a need to improve the statistical indicators of pedestrian traffic volume by utilizing a range of data collected by the Household Travel Survey, the Floating Population Survey, and the Global Positioning System (GPS).

1. Introduction

A lack of reliable statistical indicators of foot traffic volume makes it difficult to develop effective public policies for pedestrian mobility. Yet a problem is that there is no clear standard for such indicators.

Today, people increasingly choose walking over other means of transportation. This recent social trend has induced many governmental entities to introduce various public policies and programs for pedestrian mobility. The Seoul Metropolitan Government (SMG) also has been carrying out several policies on behalf of Seoul citizens seeking a more pedestrian-friendly environment. Yet a dearth of proper statistical indicators of foot traffic makes it difficult for the government to design and implement effective policies.

The Household Travel Survey and the Floating Population Survey are the two commonly used tools to investigate pedestrian travels. The former primarily aims to find out modal share of each means of transportation. Therefore, it is not specifically interested in every kind of pedestrian travels: It only counts a long-distance walk that takes at least ten minutes, although it considers all commutes whether they are short or long. The latter, on the other hand, measures the

volume of foot traffic in selected areas on a yearly basis. It has its own weakness in measuring the pedestrian volume: As the survey looks at different sites each year, it is impossible to compare its findings across years. In other words, it cannot detect change in the annual volume of pedestrian traffic.

Like this, the current statistical tools harnessed to measure pedestrian volume do not produce data that properly and accurately show such volume. On top of this, there is no clear definition nor standard for the indicator of foot traffic. SMG needs to come up with standard statistical indicators to objectively and efficiently gauge the efficacy of its pedestrian policy. Then, it should regularly update them. But before all, the government must first set what it intends to achieve with the policy. These must be done if SMG is to continue with developing and taking innovative approaches to improve pedestrian mobility and convenience.

[Table 1] Two Tools Used to Measure Pedestrian Traffic

Name	Feature
The Household Travel Survey	· Not considers every kind of pedestrian traffic · Measures the modal share of each means of transportation · Takes place in every five years
The Floating Population Survey	· Counts every kind of pedestrian traffic · Usage of its results is limited as it investigates different locations · Takes place annually

2. Main Findings

This paper first sets a standard for measuring pedestrian travels to secure reliable statistical indicators that can be renewed on a regular basis. Next, it outlines how SMG should investigate and analyze the data on pedestrian travels.

If SMG measures the floating population of every 282 areas in Seoul each year, it will be able to identify change in total volume of foot traffic across the city

Identifying change in the annual volume of pedestrian traffic is essential for

improving statistical indicators. One of the most commonly used tool to estimate pedestrian traffic is the Floating Population Survey. Its primary goal is not to measure the total volume of pedestrian traffic. Instead, it focuses on analyzing the characteristics of walking population in selected commercial areas. Since 2009, SMG has conducted the survey each year. But, out of total 10,000 areas selected for the survey, only 108 (which represents a mere 1 percent) have been investigated every year from 2012 to 2014. Most of those 108 places studied are reportedly urban areas holding large pedestrian volume. Given that, they are biased toward certain groups and therefore not suitable as a representative sample. In other words, it is inappropriate to regard the survey of those 108 places as a statistical indicator of how the total volume of pedestrian traffic in Seoul has changed.

Yet no survey other than the Floating Population Survey investigates foot traffic in various areas throughout Seoul. Besides, it is practically infeasible to undertake new research for the sole purpose of finding change in the annual volume of pedestrian traffic. Nor is it possible to secure the budget for such a project. Therefore, it is more realistic and practical for SMG to select a number of monitoring sites for the annual Floating Population to monitor change in pedestrian traffic volume. Assuming 10,000 places studied in 2009 represent the total population, this study has chosen 282 places for annual survey by applying the principles listed in [Table 2] below. If the Floating Population Survey studies every 282 monitoring sites, it will be able to identify change in the total volume of foot traffic in Seoul.

[Table 2] Principles for Monitoring Site Selection

1	Reflect the sample size of each special zone and region
2	Include 108 areas studied every year for 4 years
3	Reflect the absolute value of pedestrian traffic volume of each special zone and region
4	Select monitoring sites that demonstrate similar change in annual pedestrian traffic volume to that in the total population (2,000 areas/10,000 areas)
5	Select more than 30 areas constituting the minimum sample size of each region

Category	Housing Zone	Commercial Zone	Green Belt	Industrial Zone	Total
Downtown	18	25	1	0	44
Northeast	64	8	1	2	75
Northwest	40	8	1	0	49
Southwest	48	10	1	11	70
Southeast	36	7	1	0	44
Total	206	58	5	13	282

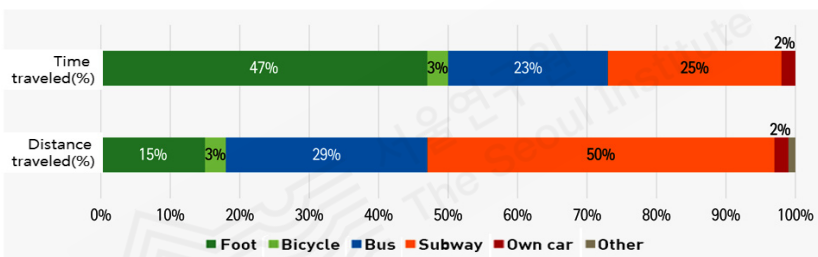
[Figure 1] Monitoring Sites for Special Zones in each Region (Draft)

The daily walking distance and time each accounts for 15 percent and 47 percent of total distance and time traveled

According to the road traffic data collected by the sample survey (size: 182 individuals) using the GPS, we find that people travel on average 16.2 km per day. They travel 8.0km and 4.8km by the subway and bus, respectively - each represents 50 percent and 29 percent of the total distance traveled. The daily walking distance is 2.4km. Meanwhile, the average daily travel time is 91 minutes, of which 42.5 minutes (that is, 47 percent of the total travel time) are consumed in traveling on foot. The rest of 21.1 minutes (23 percent) and 22.6 minutes (25 percent) are each spent in traveling by subway and bus. In terms of distance, foot travels account for a mere 15 percent of total distance traveled. However, it represents almost a half of total travel time. This clearly illustrates the significance of walking as a means of transportation. It also explains why there need policy actions for pedestrian mobility and convenience. Prior to initiating such actions, SMG must first obtain useful statistical data on pedestrian traffic.

[Table 3] Comparison of the Average Daily Travel Time and Distance between each Type of Travel

Means used for travel	Time (min)	Ratio(%)	Distance(km)	Ratio(%)
Total	91.0	100	16.2	100
Foot	**42.5**	**47**	**2.4**	**15**
Bicycle	2.7	3	0.5	3
Bus	21.1	23	4.8	29
Subway	22.6	25	8.0	50
Own car	1.7	2	0.4	2
Other	0.4	0	0.1	1

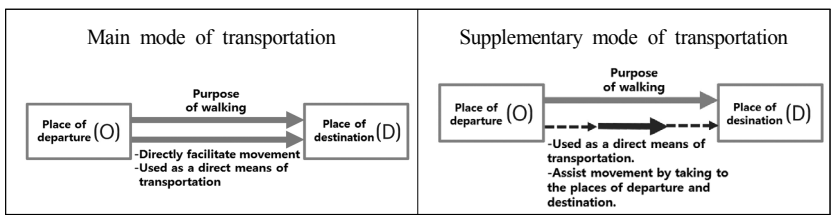


[Figure 2] Comparison of the Average Daily Travel Time and Distance between each Type of Travel (based on the sample of 182 persons)

Walking can be divided into two types: One that serves as main mode of transportation and other functioning as supplementary mode that takes individuals to other means of public transportation.

For the sake of research, this paper categorizes walking into two types by their functions: the main and supplementary modes of transportation. They both facilitate movement of individuals. However, the former directly takes people from one place to another. In other words, travel begins and ends with walking. The latter, on the other hand, transports individuals to other means of transportation such as private cars, taxis, and public transport modes. Say a person uses the metro

to commute. To get to the station from home or school, they walk. This is the case where a walk constitutes the supplementary mode of transportation.



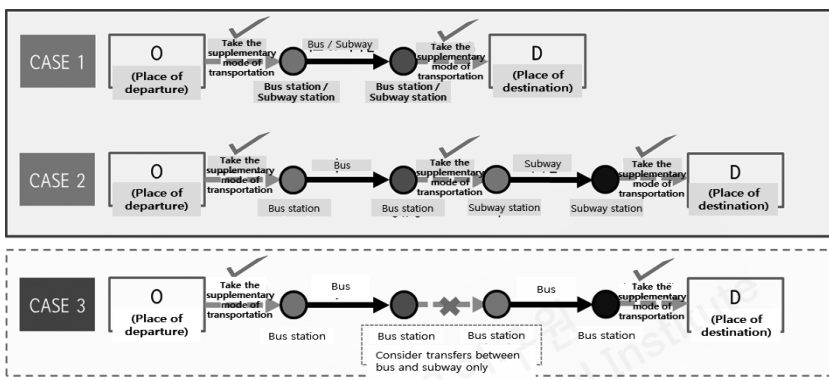
[Figure 3] Comparison between the Main and Supplementary Mode of Transportation

For walking as main mode of transportation, this paper applies the concept of "walking" defined in the Household Travel Survey. In other words, this research only studies pedestrians who commute on foot for over 10 minutes.

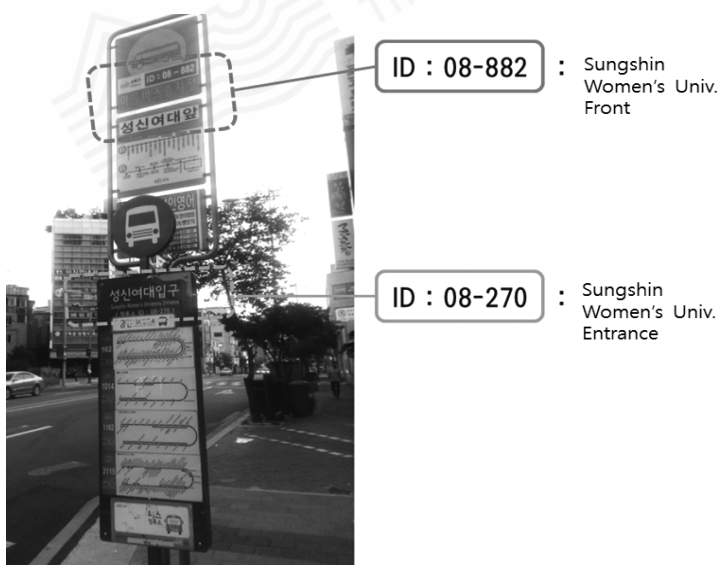
For walks serving as supplementary mode of transportation, this paper counts every walk that links individuals to their private cars, taxis, and public transport vehicles. The Household Travel Survey has discovered that most people do not have to walk when they drive their own cars or ride a taxi. This means that walks as supplementary mode of transportation are barely measured in times other than when individuals use mass transit services.

In this regard, this research only deals with walks that bridge people and other means of public transport, which qualify as the supplementary mode of transportation. When people transfer between buses or from bus to subway (vice versa), they take supplementary mode of transportation. The volume of pedestrian transfer between public transport systems can be measured from the data on public transportation card usage. However, there lies a pitfall of relying on such data. For instance, a pedestrian may find two bus stations in the same spot. Each has its own station ID (refer to [Figure 5]). Though there are two different stations in theory, they are recognized as one. Therefore, there arises no need for the supplementary mode of transportation. For this reason, the data on public transportation card usage cannot accurately indicate the volume of pedestrian transfer between buses.

Meanwhile, the pedestrian traffic data gathered by the GPS show that most transfers between buses take place between the same bus stations. Due to these issues, this paper limits walks functioning as supplementary mode of transportation to ones happening in transfer between bus and subway.



[Figure 4] Concept Map about Walks Serving as the Supplementary Mode of Transportation Linking Individuals to Public Transport Services



[Figure 5] Bus Station where Transfer between Buses is Possible without Taking the Supplementary Mode of Transportation

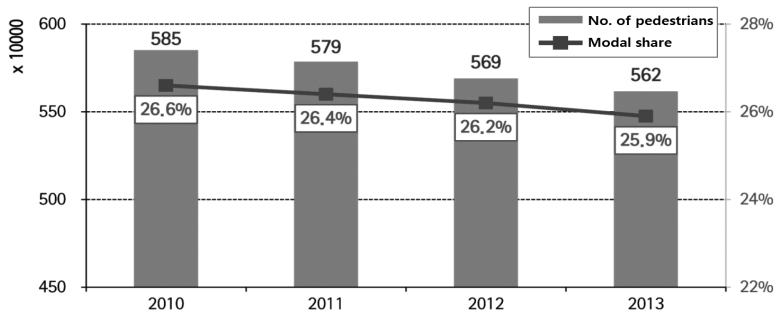
The volume of pedestrian traffic measured by the Household Travel Survey and the data from transportation card usage are used to identify the number of pedestrians taking main and supplementary mode of transportation, respectively. The former is 5.37 million and the latter is 22.03 million, making the total of 27.40 million people (note: only those traveling within Seoul are counted).

[Table 4] The Volume of Pedestrian Traffic in each Region

Category	No. of individuals traveling by the main mode of transportation (A)	No. of individuals traveling by the supplementary mode of transportation (B)	Total no. of individuals traveling on foot (A+B)
Downtown	353,458	3,226,163	3,579,621
Northeast	1,692,999	5,319,514	7,012,513
Northwest	592,577	2,371,414	2,963,991
Southwest	1,605,740	5,950,248	7,555,988
Southeast	1,121,432	5,168,657	6,290,089
Total	5,366,207	22,035,996	27,402,202

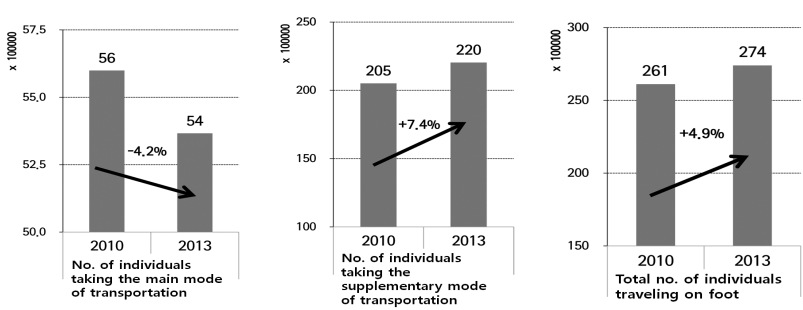
The population of pedestrians taking the main mode of transportation has gone down, whereas total volume of foot traffic is on the rise due to the increased number of pedestrians to access transit stations.

SMG estimates modal share of public transportation every year. According to the study, the number of people traveling by main mode of transportation has been decreasing in recent years. The same is also true of the modal share of foot travel. It is due to continuous fall in the population of students who mostly travel on foot. However, pedestrian mobility has decreased in spite of SMG's policy effort to improve pedestrian environment.



[Figure 6] Change in the No. of Pedestrians Taking the Main Mode of Transportation and the Modal Share of such Foot Travel (within Seoul)

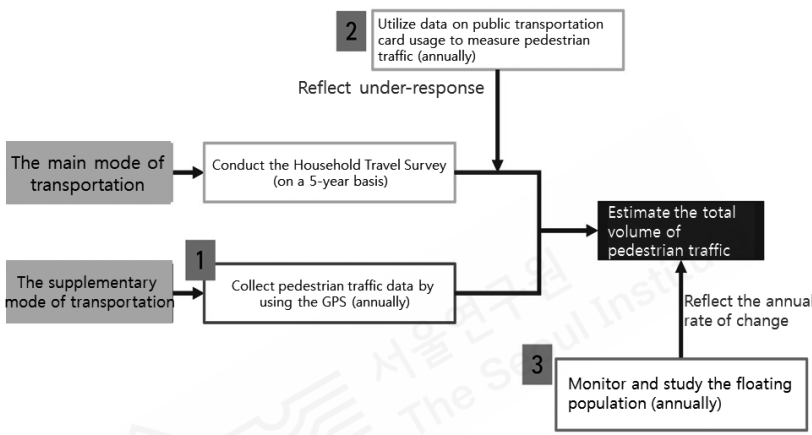
Besides the number of people taking the main mode of transportation, those walk as supplementary mode of transportation also have been studied to more reliably detect change in total pedestrian traffic volume. The Household Travel Survey has discovered 4.2 percent decrease in walking as main mode of transportation between 2010 and 2013. By contrast the number of individuals walking serving as supplementary mode of transportation has gone up by 7.4 percent, according to the data on public transportation card usage. This means that there has been a 4.9 percent increase in total volume of pedestrian traffic. However, modal share of pedestrian traffic volume measured by the Household Travel Survey only count walks serving as main mode of transportation. Therefore SMG cannot fully rely on them to support its policy decisions or assess the efficacy of current pedestrian policies.



[Figure 7] Change in Pedestrian Traffic Volume in Seoul

3. Conclusions & Policy Recommendations

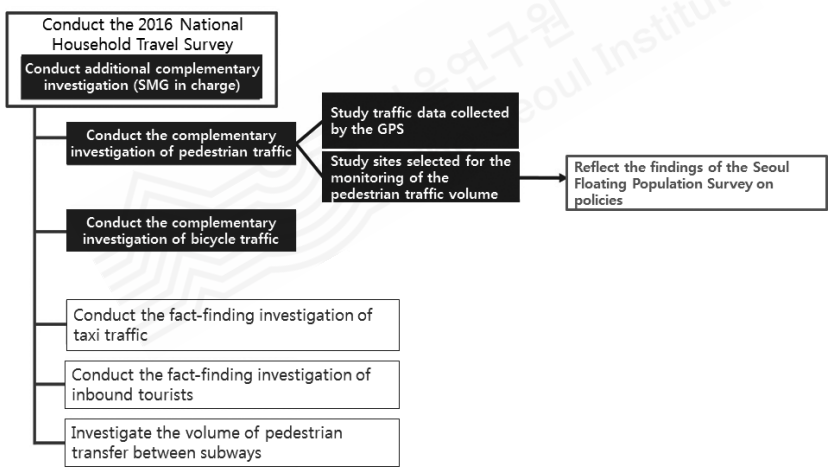
Use the Household Travel Survey and the data on public transportation card usage to measure the number of pedestrians traveling by main and supplementary mode of transportation, respectively.



[Figure 8] Outline of the Plan for the Improvement of Statistical Indicators of Pedestrian Traffic

Earlier, this paper has explained why the SMG cannot develop statistical indicators of pedestrian traffic with a single type of survey. This paper also has distinguished walks serving as main mode of transportation as supplementary mode of transportation. The total volume of pedestrian traffic can only be measured by using multiple survey results and data as demonstrated in [Figure 7]. The Household Travel Survey, which takes place in every five years, can obtain data related to main mode of transportation. The review of public transportation card usage (from which census data on pedestrian traffic can be collected almost every year) can provide information about supplementary mode of transportation. Yet the Household Travel Survey cannot identify annual changes, for it is conducted in every five years. Moreover, errors form under-response may arise from its methodology. To overcome these downfalls, pedestrian travel data should be

collected by GPS. However this kind of data also have its own problems: It can only be proceeded as a small-scale sample study due to limited budget and characteristics of investigation. Thus, it cannot fully detect changes in total volume of pedestrian traffic on its own. As a solution to this, the SMG may avail itself of the Floating Population Survey that observes and investigates pedestrian traffic volume on the road. This paper has suggested 282 monitoring sites as the representative places to indicate change in total pedestrian traffic volume in Seoul. Since the Floating Population Survey only looks at pedestrian traffic volume in certain areas, SMG should conduct additional surveys to investigate, say, the purpose of travel. In this way, it will be able to secure statistical data required for policy development.



[Figure 9] The Current Progress of Harnessing the Research Results for Policy Development (Research in use: The 2016 Study on the Volume of Air Traffic of each Type of Passenger Planes)