# A Comparison Study on Two Bikesharing Programs in Korea

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**ABSTRACT:** A bikesharing program has several advantages as a sustainable transportation mode such as the promotion of public transport through multi-modality, the reduction of automobile dependency, and the contribution to healthy life-styles. However, all of bikesharing programs do not necessarily become a sustainable transportation mode. Two bikesharing programs, Nubija and TA-SHU, in Korea have similar historical backgrounds, but present completely distinctive features as a transportation mode. Nubija successfully brings positive impacts on the city's transportation system by reducing automobile usages and providing a transportation alternative to large population groups. On the other hand, TA-SHU is only utilized by limited group of people for limited purposes. Therefore, comparing the features, bicycle usage patterns, and users' travel behaviors of two programs provides insights on the factors that make a bikesharing program a truly sustainable transportation mode. The data from users' surveys and daily operation data indicates that three main factors, users' demographic characteristics, fare system, and the geographical extent of service, make Nubija a successful sustainable transportation mode.

## INTRODUCTION

Since 1960's bikesharing program has been evolved from the bike systems such as "white bikes" of Amsterdam and "free rental bikes" of several cities in Korea. In 1998, the first contemporary bikesharing program with 200 bicycles was initiated by Clear Channel in Rennes, France (*1*). Since then bikesharing has emerged as a viable new form of public transportation modes for urban trips. Bikesharing program, which is interconnected with public transportation, promotes multi-modality, the reduction of automobile dependency, and the contribution to healthy life-styles (*2*). Expecting the positive impacts of the program as a sustainable transportation mode, many cities in the world are currently implementing bikesharing programs. Nowadays, bikesharing program has adopted new technologies such as electronic payment systems, Global Positioning System (GPS) tracking, and locking systems. One of success cases is the new bikesharing program in Paris, Velib, which adopts Information and Communication Technologies (ICTs) on public bicycles. ICTs contribute to the promotion of bicycling by reducing crimes, improving the management of the system, and allowing people to go to anywhere at any time *(3*). A contemporary bikesharing system typically consists of; a fleet of uniquely designed bicycles, a network of stations in which bikes can be locked when not in use, kiosks to borrow and return the bikes, a user registration and management program, a system status information system, and a bike redistribution mechanism (*4*).

However, all of bikesharing programs do not necessarily become a sustainable transportation mode. Some of them become transportation alternatives by replacing automobile trips and by sharing utilitarian trips with other transportation modes in everyday life, while some of them are simply underutilized or mainly utilized for recreational purposes. There is limited research on factors that make a bikesharing program a sustainable transportation alternative. The data supporting the successfulness of the program as a sustainable transportation mode are limited due to the relatively short history of bikesharing program. This paper presents a case study comparing two bikesharing programs, Nubija and TA-SHU, in Korea. Using the data from users' surveys and daily operation data support, this paper focuses on identifying the differences between two programs in terms of users' characteristics and bicycle usage patterns of the programs. By comparing two bikesharing programs, this paper identifies the features of bikesharing program that make it a truly sustainable transportation mode. Then, the features will become valuable guidance to cities that want to improve their bikesharing programs or to implement a new bikesharing program.

## OVERVIEW OF BICYCLE POLICIES IN KOREA

The level of bicycle use in Korea is generally low. Korean Census 2005 indicates that about 1.2 percent of all trips were made by bicycle. Table 1 summarizes the latest bicycle ridership data in major cities in Korea. Country overall bicycle share data was extracted from Census 2005 and the others were estimated based on the person trip survey performed by Ministry of Land, Transport and Maritime affairs in each shown year. The table illustrates higher bicycle share rates in mid-size or small cities than in metropolitan cities.

It is necessary to review the history of bicycle policies for better understandings of the bikesharing programs in Korea. The Korean national government has actively promoted bicycling since mid 1990's, while European countries and Japan started in the mid 1970's (*5)*. Since 1995 the Bicycle Promotion Act promoted a compulsory national bicycle master plan, the installations of bicycle facilities, and statements about financial support for bicycle promotion policies. Many bicycle policies were instituted during last two decades (Table 2). Since 2008 the investment on bicycle has increased at a large scale. The variety of bicycle policies such as the bicycle model city project has been enacted. However, bicycle ridership has not significantly increased. In order to increase bicycle ridership, the Korean national

**TABLE 1 Bicycle ridership of main bicycle cities in Korea**

| Cities | | Bicycle share (in all trips) | Trips/day | Population | Year |
|---|---|---|---|---|---|
| Korea | | 1.2 | - | 48,782,274 | 2005 |
| Capital area | Seoul | 1.3 | 381,468 | 10,181,166 | 2006 |
| | Kyonggi-Do | 1.4 | 328,288 | 10,906,033 | |
| | Incheon | 1 | 64,681 | 2,624,391 | |
| Metropolitan cities | Busan | 0.4 | 34,140 | 3,611,992 | |
| | Daegu | 2.1 | 127,179 | 2,496,115 | |
| | Gwangju | 1.4 | 49,687 | 1,407,798 | |
| | Daejeon | 1.5 | 59,123 | 1,466,158 | |
| | Ulsan | 1.4 | 33,985 | 1,092,494 | |
| Cities | Chuncheon | 1.9 | 11,777 | 256,239 | |
| | Chungju | 2.2 | 37,252 | 626,679 | |
| | Gyungju | 2.9 | 19,081 | 273,419 | |
| | Kongju | 1.4 | 4,918 | 128,330 | |
| | Gumi | 1.7 | 16,837 | 386,465 | |
| | Gimhae | 1.2 | 11,206 | 453,728 | |
| | Gunsan | 2.5 | 15,455 | 260,989 | |
| | Changwon | 1.6 | 18,584 | 502,727 | 2009 |
| | Gangneung | 2 | 7,947 | 217,464 | |
| | Goesan | 3.2 | 1,511 | 36,775 | |
| | Seocheon | 4.2 | 3,794 | 60,066 | |
| | Namwon | 6.3 | 8,101 | 87,675 | |
| | Suncheon | 1.6 | 7,785 | 269,516 | |
| | Gwangyang | 2.2 | 5,741 | 143,461 | |
| | Sangju | 11.9 | 19,830 | 106,208 | |
| | Jinju | 4.2 | 24,200 | 331,720 | |
| | Jeju | 1.4 | 10,057 | 410,379 | |

*( - ) no data available*

**TABLE 2 Brief history of bicycle policies in Korea**

| Periods | History of bicycle policies |
|---|---|
| 1995~2004 | · 1995 : Establishment of act for bicycling promotion |
| | · 1997 : Planning of bicycle promotion plan<br>: Issue of bicycle insurance |
| | · 1998 : 1st National plan of bicycle facilities (1998~2002) |
| | · 2002 : 2nd National plan of bicycle facilities (2003~2007) |
| 2005~Present | · 2006 : 1st bicycle model city project(15 cities) |
| | · 2008 : Announcement of plan for Complex Material for bicycle promotion<br>- Compulsory establishment of bicycle parking facilities(ministry of public administration and security)<br>- Project to promote bicycling and riding (Ministry of Land, Transport and Maritime Affairs)<br>- Development of bicycle-only insurance<br>- Adoption of bike land using road diet<br>- Set up "hook turn" for left turn |
| | · 2010 : Establishment of National 10-year bicycle plan, including construction of 2,175km bicycle road (1,020.5 billion₩)<br>: Ten bicycle model city project (100 billion₩)<br>: Establishment of guideline on bicycle facilities |

government supported bikesharing program. The national government also selected 10 bicycle model cities as a growth pole region, and is currently investing about 8.3 million dollars per city for the initiations of new bicycle programs, including the 2012 bikesharing program. For the reason, bikesharing program becomes such a new trend in the history of transportation policy in Korea.

## CURRENT BIKESHARING PROGRAMS IN KOREA

In 2008, the first Korean bikesharing program, known as Nubija, was established in Changwon, and Daejeon opened TA-SHU as a test project with 200 bicycles in 2009. There are currently seven operating bikesharing programs equipped with 100 or more bicycles in Korea (Table 3). The City of Changwon has the longest history of bikesharing in Korea although it has been only for three years. It also operates the largest numbers of bicycles and bicycle stations followed by Goyang. In terms of the quantity of bicycles and bicycle stations, the other cities show significant differences from the top two cities. It is worth mentioning that the top two cities are not metropolitan cities, while other cities such as Seoul, Busan, and Daejeon are ones of largest cities in Korea. Four of the bikesharing programs are run by city governments, while three of the programs are operated by private sector. Most systems offer a registration system that allows users easily accessing bikes using a debit card, a credit card and/or a cell phone. In addition to these cities, 12 bicycle model cities are currently planning to adopt a bikesharing program. Cities like Daegu and Gwangju are about to implement a bikesharing program in 2012.

**TABLE 3 Public bicycle systems in Korea**

| Cities | Name of PBS | Operator | Registration and payment system | Established in: | No. of bicycles | No. of stations |
|---|---|---|---|---|---|---|
| Changwon | Nubija | Changwon Cycle Racing Corporation | Card | 2008.7 | 3,300 | 165 |
| Daejeon | TA-SHU | Direct management | Cell phone | 2009.1 | 200 | 20 |
| Goyang | Fifteen | Hanhwa SNC | Card, Cell phone | 2010.3 | 3,000 | 125 |
| Seoul | Seoul PBS | Witcom | Card | 2010.1 | 976 | 43 |
| Busan | Busan PBS | Direct management | Cell phone | 2010.1 | 300 | 15 |
| Gongju | Pabalma | Direct management | Card | 2010.9 | 360 | 12 |
| Suncheon | Onnuri | Direct management | Cell phone | 2010.1 | 166 | 11 |

## OVERVIEW OF NUBIJA AND TA-SHU

When the City of Changwon started the bikesharing programs, the cities implemented 430 bicycles with 20 bicycle stations while the City of Daejeon had 200 bicycles with 20 stations. While TA-SHU has not been expanded for last few years, the City of Changwon has significantly improved their systems. In 2010, Nubija possessed 3,300 bicycles with 163 stations. During the relatively short time period, Nubija becomes a city-wide bikesharing program expanding it services, while Daejeon has kept the original 20 stations concentrated in a limited area.

Both Nubija and TA-SHU provide affordable fare systems. Both programs offer a free fare system. The Nubija bicycles are for free during first two hours, and the TA-SHU bicycles are free for one hour. These fare systems make it possible for users to make a large portion of short trips in everyday life for free. In addition to the free fare system, Nubija also offers a membership policy. Nubija requires $8 for its annual membership fee. With the membership fee, users can ride the bicycles at a reduced fare, 40 cents per 30 minutes. Non-members pay 80 cents per 30 minutes. Compared to $1.30 of one time bus fare in Changwon,

$8 for the annual membership is affordable. On the other hand, TA-SHU does not offer a membership policy. After the first hour, users pay 40 cents per 30 minutes for three hours. The fare goes up to $1.67 per 30 minutes after 3 hours.

The affordable fare systems along with significant amount of initial financial investment cause the financial deficits of the programs (Table 4). In average, the cities invested 8.3 million dollars for the installation of the programs. The costs per bicycle of the system in Changwon and Deajeon are $2,132 and $4,164 respectively. The cities should additionally pay for large amount of annual operation costs including bicycle repair, bicycle redistribution, and the equipment and personnel in operating centers. However, the revenue from the programs does not compensate the costs. The programs mostly depend on fare and advertisements on bicycles. TA-SHU did not generate any revenue while the revenue from Nubija was $0.6 million dollars in 2010, which was about a quarter of the annual operation cost. Although TA-SHU is supposed to charge users after the first one hour, it does not do so in reality. Since users rarely ride bicycles more than one hour in practice, the program does not strictly enforce the fare. Therefore, TA-SHU users practically ride the bicycle for free. For the reasons, both systems generate financial deficits and depend on subsidies from the cities.

**TABLE 4 Operational revenue and cost status**

| Bikesharing Program | Revenues (in million dollars) | | Total operation cost per year (in million dollars) | Operation cost per year per bicycle (in dollars) |
|---|---|---|---|---|
| | Revenues from fare | Revenues from advertisement and others | | |
| Nubija | 0.39 | 0.25 | 4.34 | 1,304 |
| TA-SHU | - | - | 0.40 | 2,000 |

*( - ) data not applicable*

The numbers of trips per bicycle and day of Nubija and TA-SHU are 4.9 and 6.8 respectively (Table 5). Compared to bikesharing programs in European cities, the trips per bicycle and day of two programs are relatively low. For example, the "Bicing" program in Barcelona reports the 12 trips per bike and day (*2*). The locations of bike stations likely contribute to the high average trips per bike and day of TA-SHU. TA-SHU strategically selected the locations of bike stations within the downtown of Daejeon, which is occupied by the most dense, intense land uses and the concentration of population. Meanwhile, Nubija diversified the locations of its stations within the entire jurisdiction of the city including urban areas as well as suburban areas. Many Nubija stations serving suburban areas show low levels of trips per bicycle and day.

**TABLE 5 Average trip frequencies in 2010**

| Program | Residents per bike | No. of stations | Bikes per station | No. of bikes operated | Total trips per day | Average trips per bike & day |
|---|---|---|---|---|---|---|
| Nubija | 151 | 163 | 20.4 | 1,900 | 9,399 | 4.9 |
| TA-SHU | 7,593 | 20 | 10.0 | 160 | 1,295 | 6.8 |

## DIFFERENT CHARACTERISTICS BETWEEN NUBIJA AND TA-SHU

Both Nubija and TA-SHU collected their users' travel behavior and characteristic data by conducting telephone and field surveys. TA-SHU collected the data by conducting a telephone surveys with 420 participants from October 14th to 21st, 2010. Nubija also conducted interviews with 215 users between August 23rd and 24$^{th}$, 2009. The data from the surveys allows making judgment that Nubija compared to TA-SHU shows potential as a

sustainable transportation mode in three categories including trip purposes, transportation modes replaced, and access and egress transportation modes.

The survey data clearly indicates that Nubija shares daily traffic with other transportation modes, while TA-SHU is mainly used for recreational purposes. Trip purpose data shows different types of trips that two programs support. Two programs indicate the significantly different percentage of recreational usages (Table 6). About 40% of TA-SHU riders use the bicycles for recreational purposes, while about 24% of Nubija riders use the bicycles for the purposes. On the other hand, 37% of riders use, Nubija bicycles for commuting trips including work and school trips, while 20% of TA-SHU usages are for the same purposes.

**TABLE 6 Trip purposes of Nubija and TA-SHU**

| Program | Work | School | Educational Institute | Business | Recreational Purposes | Others | Total |
|---|---|---|---|---|---|---|---|
| TA-SHU | 11.2 % | 8.3 % | 14.5 % | 3.3 % | 39.5 % | 23.1 % | 100 % |
| Nubija | 24.4 % | 13.0 % | - | 5.7 % | 24.4 % | 32.5 % | 100 % |

*( - ) data not applicable*

The data from the user surveys also indicates that the positive impacts of Nubija as an alternative transportation mode in terms of transportation modes replaced. TA-SHU mainly replaces trips by walking and buses, while Nubija substitutes automobile trips with bicycle trips (Table 7). Nubija and TA-SHU replaces 34 and 12 percents of automobile trips respectively. Nubija replaces 13 percents of walking trips, while TA-SHU replaces 43 percents of walking trips. These results suggest that Nubija contributes the reduction of vehicle mile traveled (VMT) and greenhouse gas emission (GHG) by replacing automobiles. The positive impacts of TA-SHU on the reduction of automobile trips are not significant as Nubija.

**TABLE 7 Replaced by and access /egress modes of Nubija and TA-SHU**

| Transportation Modes | TA-SHU | | | Nubija | | |
|---|---|---|---|---|---|---|
| | Replaced | Access | Egress | Replaced | Access | Egress |
| Walk | 42.4 % | 44.0 % | 53.4 % | 13.2 % | 68.8 % | 69.5 % |
| Bus | 32.9 % | 30.5 % | 24.0 % | 31.7 % | 10.8 % | 12.5 % |
| Subway | 3.3 % | 7.9 % | 10.2 % | - | - | - |
| Taxi | 9.5 % | 3.8 % | 3.1 % | 7.9 % | 0.6 % | 1.0 % |
| Automobile | 11.9 % | 13.8 % | 9.3 % | 33.7% | 1.9 % | 3.2 % |
| Others | - | - | - | 9.5% | 17.8% | 13.8% |
| Total | 100% | 100% | 100% | 100% | 100% | 100% |

*( - ) data not applicable*

The access and egress modes of Nubija and TA-SHU reconfirm Nubija's positive impacts as a sustainable transportation mode. The surveys reveal that walking is the primary mode from/to both programs. The majority of Nubija users walk to/from the bike stations, 68.8 % and 69.5% respectively. 44% and 53.4% of TA-SHU users also walk to/from its stations respectively. However, many TA-SHU users depend on public transit in order to access/egress the bicycle stations. In total, 38.5% and 34.2% of the riders use public transit including bus and subway to/from the bike stations. The high percentages of pedestrians from/to Nubija stations mean less numbers of transitions between transportation modes. For example, a Nubija user reaches to a final destination using three modes, walk – Nubija -

walk. However, TA-SHU users who come from/to its stations using public transit need more transitions, for example, walk – bus - TA-SHU – bus - walk. This means that Nubija users spend less time for transition between the modes, and consequentially save travel time. 13.8% and 9% of TA-SHU users still access and egress to/from its bicycles driving their cars. On the other hand, automobile usage rates for Nubija, 1.9% and 3.2%, are very low compared to TA-SHU's. In addition to the automobile usages replaced by Nubija, the differences of access/egress modes of two programs clearly suggest the superior role of Nubija in terms of reducing automobile usages from/to its bike stations.

The differences identified from the survey data can be also reconfirmed with bicycle usage patterns. Both programs run a bikesharing operation center, which controls, monitors, and manages the daily operation of the programs. The operation center regularly collects data on daily operation status from the Radio Frequency Identification (RFID) chips installed on each bicycle station. The daily operation data was collected from the operation centers of both programs, and utilized for analyzing the usage characteristics of both bikesharing programs. One year of the data for Nubija, from January 1st to December 31st, 2010, including 2,232,995 cases was extracted for this study. 40,942 cases of TA-SHU were also analyzed. The data reveals significant differences between Nubija and TA-SHU in terms of daily and weekly usage patterns.

The daily bicycle usage pattern of Nubija is significantly different from one of TA-SHU. The daily usage pattern of Nubija is similar to the typical daily automobile trip pattern in U.S., which presents the concentration of traffic during morning and evening rush hours (Figure 1). This pattern indicates that Nubija shares commuting traffic with automobiles. Unlike Nubija, the usages of TA-SHU during morning rush hours are not significant, while the usages peak during evening rush hours. Another notable difference in the usage patterns is the bicycle usages between 4pm and 9pm. The usages of Nubija sharply rise and drop during this time period. However, the usages of TA-SHU incrementally increase and decrease during this period. Consequentially, TA-SHU remains the high usage level during the period. The usage concentration during the time of a day is related with the usages of TA-SHU bicycles for recreation, which usually concentrate during the time period.

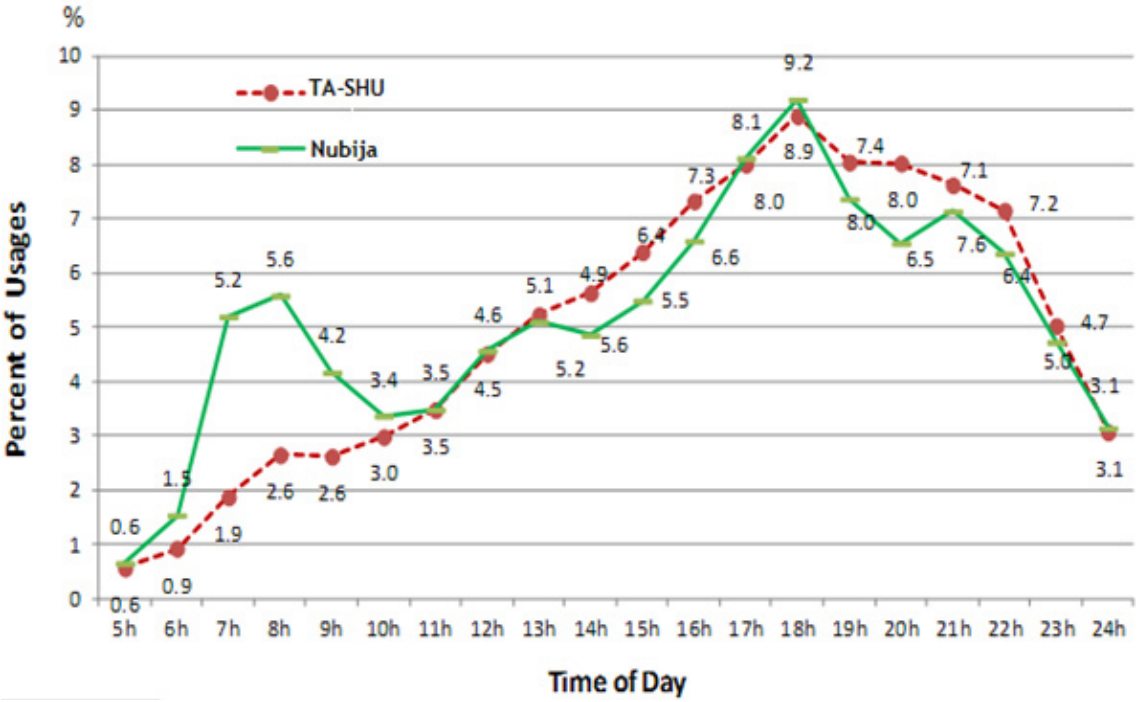


**FIGURE 1 Distribution of rental trips for one day.**

The differences on weekly usage patterns of Nubija and TA-SHU also support the roles of Nubija for utilitarian trip purposes. The patterns show opposite dynamics in terms of weekly usage patterns (Figure 2). The usage ratio of Nubija decreases during weekends, and shows the lowest rate on Sunday. The average trips per day and bike of Nubija during weekdays and weekends are 3.98 and 3.25 respectively. Meanwhile, TA-SHU bicycle usages increase during weekends, and peak on Sunday. People use TA-SHU bicycles, in average, 5.14 times per bike and day during weekdays and 6.5 during weekends. These results are consistent with the trip purpose data, TA-SHU for recreation and Nubija for non-recreational purposes.

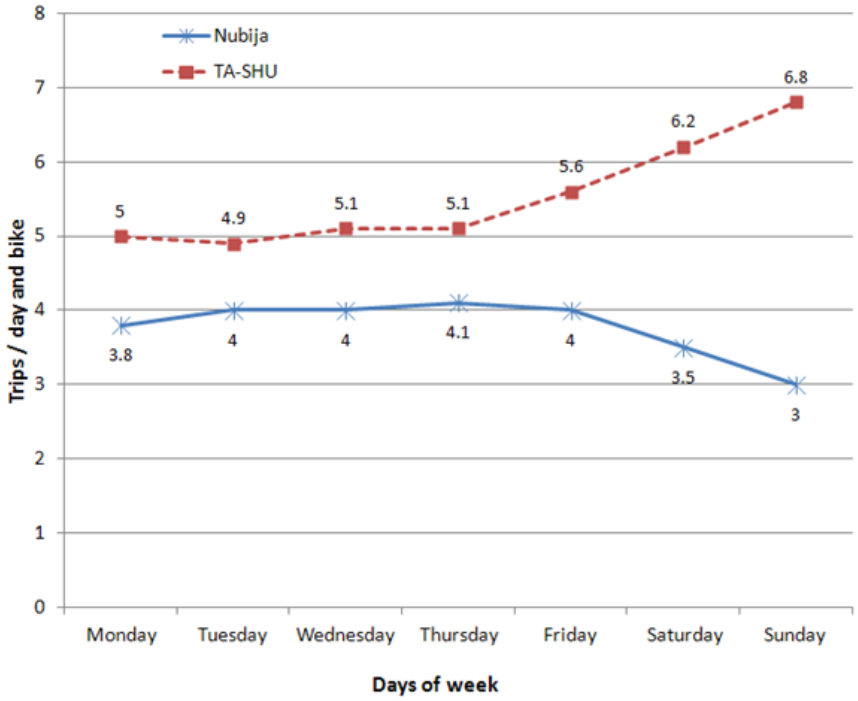


**FIGURE 2 Change of rental trips for a week.**

The daily operation data and the survey data display the differences between Nubija and TA-SHU. Furthermore, the data evidently supports the superiority of Nubija compared to TA-SHU as a sustainable transportation mode. Nubija has potential as a transportation alternative serving for utilitarian trip purposes. It also contributes to reducing VMT and GHG by replacing automobile trips. However, the data analyzed do not clearly explain why the differences between two programs exist. It was difficult to find comprehensive evidences that directly answer to this question. However, the evidences found from the data provide insights that make it possible to estimate the reasons for the different usage patterns between two programs.

## REASONS FOR THE DIFFERENCES BETWEEN NUBIJA AND TA-SHU

The few datasets obtained from the daily operation centers and the surveys allow deducting the reasons for the differences between two programs although they are not exclusive evidences for the differences. The different demographic characteristics of Nubija users from ones of TA-SHU users make it possible for Nubija to serve for utilitarian trip purposes in everyday life. The survey data describes the demographic overview of both Nubija and TA-SHU users. The primary users of TA-SHU are much younger than ones of Nubija (Figure 3). About 80% of TA-SHU users are under 30 years old. Almost half of TA-SHU users are people between 10 and 19 years old, which mean students in middle and high

schools. In the case of Nubija, the percent of the age between 10 and 19 is only 9%. Instead, the age groups of main Nubija users are 30's and 40's. The younger users of TA-SHU likely cause the differences in daily usage patterns of Nubija and TA-SHU. Since the younger users ride TA-SHU bicycles for recreational activities after school, TA-SHU shows the high levels of the daily bicycle usages during the time period between 4pm and 9pm. Since the age legally allowed driving in Korea is twenty, TA-SHU's primary users are not drivers. Therefore, automobile usages that TA-SHU can absorb are relatively limited. On the other hand, Nubija' main users, age between 20 and 49, switch their transportation modes from automobile to bicycle.

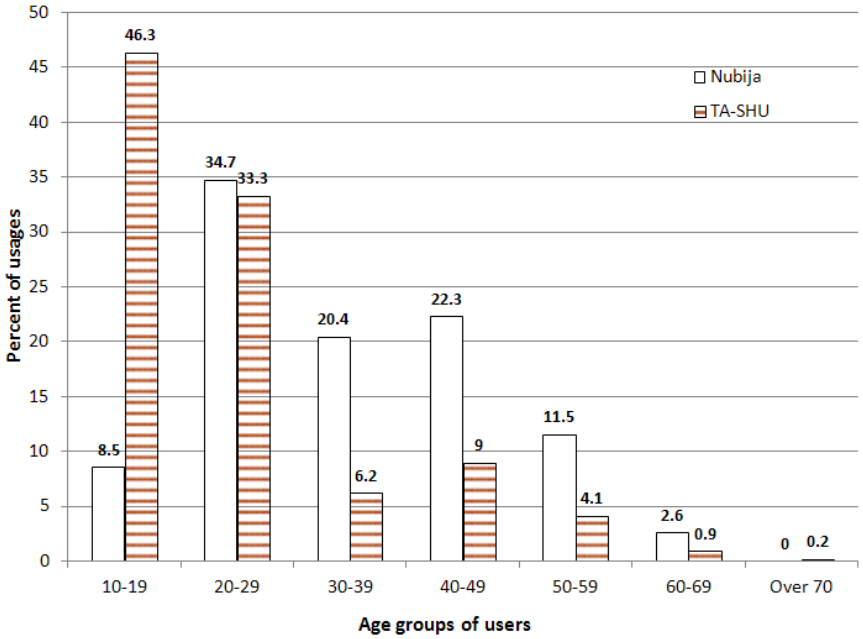


**FIGURE 3 User percentages by age.**

One interesting trip purpose from the user surveys is 'trip to educational institute' (Table 6). It is an ordinary activity for middle and high school students in Korea to go to educational institutes after school. Since TA-SHU already recognized the high ratio of student users, it included 'educational institute' as one of trip destinations in the user survey. On the other hand, Nubija having relatively small student users did not incorporate 'educational institute' in the survey. This factor confirms how student users influence on the programs.

It is hard to identify what makes such different compositions of age groups. However, it is probably worth pointing out that one possible contributing factor for the age difference is the payment system including membership requirement and payment methods. The membership policy of Nubija probably discourages younger population from using its bicycles despite of the affordable membership fee. Nubija also requires a debit card or a credit card for payment, while TA-SHU requires a cell phone owned by almost every teenager nowadays in Korea. Therefore, the payment method of TA-SHU can be easily adopted by the population under 20 years old.

Another fundamental factor causing the differences between Nubija and TA-SHU is the discrepancy on the geographical service extents of two programs. Nubija is a city-wide bikesharing program that provides services to 113 square miles (equivalent to 292.7 $km^2$) of the entire city jurisdiction. Meanwhile, TA-SHU covers only the limited downtown area of Daejeon. The difference on the extent of the service area causes for several discrepancies between two programs. The different levels of the service areas partly contribute to the users'

trip purposes. Nubija provides accesses to a variety of origins and destinations scattered in the city, while TA-SHU serves limited numbers of origins and destinations. The various options of origins and destinations by Nubija offer its users to utilize the bicycles for utilitarian purposes rather than recreational purposes. Sequentially, Nubija shows the concentration of the daily usage during the morning and evening rush hours, which is not found from TA-SHU. This relationship is even more significant in the weekly usage patterns of two programs. The high usage rates of Nubija during weekdays can be explained by the availability of many origins and destinations within its extended service area. The differences on the access/egress transportation modes can be related with the geographical extent of service. The widely scattered stations of Nubija, especially in low-dense residential areas, also make it hard to access the stations through other transportation modes than walking. However, the stations of TA-SHU, strategically located at downtown Daejeon, allow users to access and egress through public transportation modes.

## CONCLUSION

Many transportation planners recently pay attentions to bicycle due to its potential to reduce vehicle travel mile (VMT) and greenhouse gas (GHG) emission and to promote healthy communities. It is clear that bikesharing program has many advantages as a sustainable transportation mode. In the history of bikesharing program, the program has been evolved in a way that guarantees convenience and accessibility for people who concern about parking, access to public transportation, and the profitability of bicycle for their whole trips. However, every bikesharing program does not necessarily guarantee the promotions of bicycle riding and the role as a sustainable transportation mode. Only bikesharing programs, which are well designed and properly implemented, become a sustainable transportation mode.

This study provides clues for the features of bikesharing program as a sustainable transportation alternative by comparing two distinctive bikesharing programs in Korea, Nubija and TA-SHU. Identifying differences in trip purposes, transportation modes replaced by the programs, access/egress transportation modes, and daily/weekly bicycle usage patterns of two programs, this study points out three main reasons for the difference, users' demographic characteristics, fare system, and the geographical extent of service. TA-SHU mainly serves for student population within a limited geographical boundary. This program naturally has limited accesses to origins and destinations in everyday life. Using a cell phone for checking out bicycles encourages student population to use its bicycles. For the reason, the program is utilized for recreational purposes rather than utilitarian purposes. On the other hand, Nubija, a city-wide program, effectively connects a variety of origins and destinations in an entire city as well as serves all age groups of population. That makes it possible for this program to replace automobile uses. This research indicates that a bikesharing program must provide services for wide range of population groups within wide geographical areas in order to be a sustainable transportation mode sharing traffic with automobile. It is also found that the users sensitively react on subtle operation matters like fare systems and payment methods.

Although the findings from this study partly explain the features required by a sustainable bikesharing program, they only provide indirect evidences for factors making a bikesharing program a sustainable transportation mode. The data explaining the reasons for the differences between Nubija and TA-SHU is limited. It is necessary to conduct further research identifying the factors that directly cause the differences between two programs.

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