TRANSPORT AND SOCIAL EXCLUSION; DEFINITION, STATUS AND MEASUREMENT METHODS

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Abstract

Today, my topic is social exclusion and I propose new method to measure the level of social exclusion for a specific activity quantitatively.
In order to make mobility in our city sustainable, transport planners must pay attention to sustainability. I think that sustainable mobility is achieved by maximizing Mobility within the restriction of sustainability.

Social exclusion: an important issue in Japan

Traditionally, mobility was KING in transport planning and to contribute economic development and vitality, transport planning tried to expand mobility as much as possible. However, this approach causes environmental and social problems in many cities. So, sustainable mobility should have 3E objectives and satisfy these three objectives simultaneously.
Then, I have to say that social exclusion is one of the most important issues about sustainable mobility. Then, I move next topic, definition of social exclusion.

The status of social exclusions in Japan

Nation-wide person trip survey selected 500 HH randomly for one city and collected one day trip record both of weekday and weekend. The 1999 survey selected 98 cities.
It covered thee biggest metropolitan areas and other regional cities.
This survey gives very interesting information. One of them is a relationship between trips per day and car availability. Here, three categories of trip rates and three categories of car availability are used. Then, percentage of not going out, that is percentage of no trip is greater for those without car availability. For regional hub cities, that percentage is 10% for having own car people and 22% for having no car people.
Next is Tokyo Metropolitan area. It has very good person trip data. The 4th person trip survey covered 50 km radium area having 33 million people. It selected 880 thousands samples and collected one day trip record of weekday in 1998.
One analysis showed that the railway share is about 46% for home-to-work trips. However,

in terms of person・km, railway share becomes more than 80%, because trip distance of railways commuters are four times greater than that of car commuters.
From now, I put focus on mobility level of elderly in Tokyo. This slide is mobility level of elderly without car in Tokyo. These lines are JR, Japanese Railway lines. This is the Circular line. We call it Yamanote-line. Tokyo station is around here. As you know, other than JR, we have excellent private railway lines, Tokyu, Seibu, or Tobu lines around….. Also, we have extensive subway lines.
Then, this figure tells us that the trip rate is high alongside railway lines and low in zones distant from railway lines. There IS a strong relationship between railway availability and mobility level of elderly without car.
In fact, cross-table analysis shows the relationship more clearly. Trip rates are breakdown by railway availability and car availability. Zones are divided by railway availability into zones with railway station and zones without railway station. On the other hand, elderly people are grouped by car availability into three categories.
Then, trip rates in zones without station are much lower than trip rates in zones with station. In particular, trip rate of elderly without car is very low in zones without stations.
The combination of car availability and railway availability has strong impacts on mobility level of elderly in Tokyo.
Even in Tokyo, with aging society, I think that social exclusion will become one of the most important issues.

Measurement Methods

Now, I discuss how to measure social exclusion level and propose a new method with its application to a Japanese local city. It is based on the concepts of space-time accessibility which is widely used in activity-based analysis of human behavior.
I will explain step by step. First is space-time prism, then space-time accessibility, quantitative definition of social exclusion, calculation process and a concrete example.
In France, in China and in Japan, people always have common major constraints on their daily activities. They are activity schedule, transport network and opportunity.
First one is activity schedule. For example, Professors must study and teach in University and take sleep at night in home. So in the morning, usually, I will make a home-to-university trip.
I can not start my house not earlier than 8 o’clock, because I wake up 7 o’clock and wash my face, change clothes, read newspaper, and take breakfast making conversation with my wife. Also, it is my rule to start my work not later than 930 in my university office.
So, I have 1 hour and half, namely from 800 to 930, for the home-to-university movement.

Within this time window, I must move from my house to the University and I can take additional activities, if I want.
Second one is service level of transport network. It directly defines the speed of the movement. It defines how far I can move within the time window. Then, I can imagine the space-time prism that is areas I can move within the time window.
Third one is opportunities, location and business hours of facilities for specific activities.
If I want to buy magazines on the way to University, there are three shops within the space-time prism. Whether these shops are available to me or not depends on the locations and business hours of the shops.
It is space-time prism with transport network and the locations of services.
Then, space-time accessibility can be discussed using the space-time prism. For example, I try to do exercise in my holiday. When I am free in the morning without deadlines of papers and no events of my family, I can enjoy golf range. Within three hours' time window, it is difficult to go to golf course, but it is possible to go to golf range and make practice. I have my favorite golf range within 20 or 30 minutes driving from my house. Buy, when my wife uses my family car, I can not use the car and I must use bus to go to the golf range. Then, I walk to bus stop, wait bus, ride on bus, get off bus and finally walk to the golf range. So, I can enjoy practicing one hour at maximum. On the other hand, when car is available, I drive the car to the golf range and can enjoy practicing two hours at maximum. There is big difference in the maximum duration of the activity. Also, one hour is not enough for me. So, usually I do not go to the golf range when car is not available to me. My wife uses the car often and keeps me in my house.
Then, I can reach the idea how to measure social exclusion. The key is the size of the maximum duration time. If the maximum duration time is big enough to do the activity, then I can do the activity and I am included into society. On the other hand, if the maximum duration time is not big enough, then I can not do the activity and I am excluded from society for the specific activity.
As you can see from my golf-range example, the maximum duration time can be determined by space-time prism of a specific person and location and service hours of facilities for specific activity. In this example, an elderly has his own schedule and has two space-time prisms. One is in the morning; the other is in the evening. And there is two shops and they have their own service hours. And he has Tminimum for the shopping. Then, it is possible to judge feasibility. LA&AM is feasible…..

If data about three major constraints and minimum duration time for a specific activity are available, then it is possible to calculate how many people can be included for a specific

activity by simply doing the following steps for every sample, for available mode of travel, and for available facilities.

Now, I will show you an example of social exclusion index calculation.
I selected a Japanese local city, namely AKITA city with 300 thousand populations.
AKITA city locates northern part of Japan.
This is a map of AKIATA city and Black line is road network, red one is bus network, not so extensive and black points show bus stops.
Our laboratory made diary-survey of 70 HH and got one day activity schedules of 70 elderly people in AKIATA city. Then, for the analysis, elderly people having these 70 patterns of activity schedule are assumed to reside in each 1km mesh.
For a specific activity, going hospital activity is selected and minimum duration time of the activity is set as 120 minutes, according to nation-wide time-use survey.
In Akita city, there are five general hospitals and they have different service hours.
Then, for each hospital, it is possible to judge how many percentages of 70 different activity schedules can have minimum activity duration time.
It is a result for the Hospital E. For car users, percentages of feasible people are almost red, that means above 40. On the other hand, for bus users, the percentages become low and many of them are below 20.
Then, by combining the results for each hospital, it is possible to calculate percentage of infeasible elderly, who can not find available general hospitals in AKITA city.
For car users, the percentage of infeasible elderly is very small and less than 10%.
For bus users, the percentage of infeasible elderly is not small. Meshes near some of the five hospitals show low percentages. However, distant meshes show relatively high percentage such as 30% and 40%.
This method to calculate social exclusion index considers major three constraints on daily activities. So, by using the social exclusion index, it becomes possible to evaluate the effects of any measures to reduce these constraints.
Last slide shows the potential measures which can be evaluated by the proposed index.
Next step is to apply the method to more households and to validate the results with actual participation records. Then, it will suggest possible improvements of the index or the importance of choice set constraints due to lack of information.