

Examination about the Possibility of the Introduction of the Group Taxi for the Purpose of the Outing Support of the Elderly and Disabled Persons :

Maebashi City, Gunma is Examined as an Example

Tsutomu MEGURO (Gumma Paz College)

Akira YUZAWA (Maebashi Institute of Technology)

Abstract

There have been harmful effects in the provincial towns and cities in accordance with the development of motorization. Above all, guiding old and disabled people to go out is the social issue among others. This study aims to examine the feasibility to introduce group taxi service as a main supportive means to guide old and disabled people to go out. The Group taxi service proposed in this study are not only the means of transportation for people to go out but also to develop integrated social capital among the fellow passengers. Thus this study defines group taxi service as a means to revitalize the regional communities in doing so. The pilot program preliminarily conducted in Maebashi City, Gunma Prefecture shows the significant outcome to defining the agenda and strategies toward popularizing group taxi service.

Keywords: regional towns and cities, elderly and disabled persons, Group taxi service

1. Introduction

Securing daily means of transportation for individuals in households of regional towns and cities who are experiencing difficulty using cars, and the elderly and disabled persons residing in area with inconvenient public transportation, has become a social problem. The Ministry of Agriculture, Forestry, and Fisheries defines people who are experiencing difficulty with shopping in their daily lives (shopping displaced persons) as "people who are at least 500 meters in linear distance away from the nearest store, who do not own a car. " They are estimated to number 9.1 million nationwide¹⁾. The life of the elderly based on the assumption that they own a car will completely collapse in such a case, once they reach the stage where driving a car becomes difficult.

The sudden motorization will produce area with inconvenient public transportation. (it is indicated the area of a radius of 1km beyond from railroad station, and a radius of 300m beyond from the bus stop in this article.)

Developing a transportation operating system that can sufficiently provide for the convenience of individuals with limited mobility, which is sustainable for the operator and presents less burden of subsidizing costs for the public administration , has become an urgent issue for regional public transport as public financing becomes increasingly restricted in the future, with limited financial resources available.

2. Existing Research and Purpose of this Research

The number of studies concerning support for outings of elderly and disabled persons has been increasing in recent years. Shinriki et al⁽²⁾⁽³⁾. conducted a review on transportation operating routes using a method that involves layering, based on the analysis on the density of population, the rate of aging, and the degrees of inclinations, taking the shared taxi service implemented in the City of Kitakyushu as a case example. Kawaguchi et al⁽⁴⁾⁽⁵⁾. reported on the implementation of transportation systems and regional revitalization in depopulated communities and calculated the level of limitation on usage by individuals with the Monte Carlo method, through a social experiment on shared taxi service. Yamashita et al⁽⁶⁾. sorted out respective programs of shared taxi services and examined them from the perspectives of convenience and cost. Nobuoka et al⁽⁷⁾. examined the regional public facilities elderly people feel at ease to use, to clarify the current conditions and issues relating to the support for the elderly. Studies on support for outings by the elderly in the intermediate and mountainous areas and regional towns and cities have just started to proliferate and are currently at the stage where individual case studies are being accumulated.

But we can find out a lot of shared taxi service research that from conventional, although, group (riding together) taxi has been noted in recently⁽⁸⁾.

The purpose of this research is to build a system of public transportation that can be universally achieved and is sustainable, through a study on the outing characteristics of the elderly and disabled persons in regional towns and cities, as well as a study on the current status of public transportation. This research focused on "taxi service" as a practical method to achieve such a system. In an attempt to use this method, the study examined the possibility of implementing "shared taxi service" and related issues.

3. The difference of shared taxi (conven-

tional type) and group (Carpool) taxi

We discuss the difference of shared taxi and group taxi described in this article (Table 1). The shared taxi is divided in Classification by Road Transportation Act as a general shared passenger automobile carrier business. Furthermore, it is subdivided for regular service route, irregular service route, area operation. The regular service route is a system traveled in the time setting of origin / destination and the stop of the service circuit in the appointed hour. It includes conventional route bus or community bus. The irregular service route includes airport type shared taxi or sight-seeing type shared taxi; it is the service system of setting of the time in origin or the destination is an inconstant service system. The area operation means shared taxi and demand-type bus in the depopulated area. It does not limit route, and it is traveled by the system of the riding together depending on the demand of the traveler.

The group taxis to describe in this article are classified in general passenger automobile carrier business by the Road Transportation Act, it is operated one vehicle by a charter in one (a group or an individual) agreement, and the full crew per 1 vehicle is under 11. About the conventional shared taxi, the taxi company is operated with the permission of a general shared passenger automobile carrier business, and competition with the taxi business which is a main business line or competition with the route bus, cut-down in sales is the points at issue⁽⁹⁾. However, in the group taxi, the taxi company operates it on extension of the original business, and the above-mentioned issues do not come in the point of utilizing the preexisting taxi (under the general passenger automobile carrier business). In addition, the new authorization does not occur in particular and it is different from the shared taxi crucially, in the point that introduction is extremely easy, the shared taxi is developed nationwide in each place, but the region where the present writer was able to confirm the group taxi is only Miyagi Kurihara city and Yamaguchi city,

Yamaguchi.

The shared taxi service is a means of reducing per person usage charges by using ordinary taxis with multiple people, which can be operated under the current legal system. Taxi service operators can expect to achieve effective use of their vehicles and increase their revenues.

Table1: The difference of shared taxi and group taxi

sources) made by the author

	Shaerd Taxi	Group Taxi
Classification	A general omnibus passenger automobile carrier business	A general passenger automobile carrier business
Type of contract	Multiple	Single
Passenger	A large indefinite number of people	Individual
Vehicles	Less than 11 people	
Routes	Regular routes and schedule	Flee
Business operator	Taxi service providers with permission Bus operator	taxi service providers
Fare	Individual	Group
Problem	New competition with the existing public transport may occur	Nothing in particular

4. Outing of elderly and disabled persons and their use of taxi services

A field survey was conducted using the questionnaire method to gain understanding of the outing characteristics of elderly and disabled persons, with the cooperation of the Maebashi City Social Welfare Council and the Welfare Department of Maebashi City. The targeted elderly persons were "users of Iki-iki Salons," while targeted disabled persons were "users of the Hired Car Subsidy Welfare Project." The summary of the questionnaire survey is described in Table 2. Results are provided below.

Population of Maebashi city is 341,030, and, as for the number of the elderly, 86,064 people, aging rate (the percentage that population 65 years or older occupies in total population) are 25.2 %; (at the end of September, 2013). In addition, physically disabled persons population is 11,665; (in March, 2012)⁽¹⁰⁾⁽¹¹⁾.

As a whole, sphere of railway station's influence and the

sphere of the route bus's influence in the urban area (urbanization promotion area and use district designated area) of Maebashi city are 87.1%.

Table2: The summary of the questionnaire survey sources) made by the author

	Elder	Handicaped
Area	Whole Maebashi-shi	
Date	Jun, 2013	July, 2013
Distribution Method	Direct	mail
Recovery method	Direct	mail
Distribution number of sheets	152	1186
Recovery number of sheets	152	604
Recovery percentage	100	50.9
Main study subject	Personal attribute	
	Outing Characteristics	
	Hired Car Coupon	
	Subsidy Welfare	
	Project	

2 JR route and 1 private railroad route are in Maebashi city, and, as for the bus, it is traveled community buses except for a route bus⁽¹²⁾. In addition, car ownership rate per one household is the third place in whole country with 1.68. The region is the transportation system depending on automobile⁽¹³⁾.

A variety of policies have been implemented in Maebashi City for mobility support. These policies can be largely categorized into projects that are not limited to persons eligible for mobility support and projects that are limited to eligible persons. The former entails the "bus route sustainment project" (consigned scheduled bus service provider), which imposes a public finance burden of about 300 million yen annually to operate municipal shared bus service. Projects that are limited to eligible persons include the "Hired Car Subsidy Welfare Project for Mentally and Physically Handicapped Persons" (for disabled persons, etc., hereinafter referred to as the "Hired Car Coupon Subsidy Welfare Project") and the "Senior Discount" (for ages 65 and over). Furthermore, an "Iki-iki Salon" (vibrant life salon) has been established in each district of Maebashi City, serving as a venue for creating purpose in life of the elderly through volunteer activities conducted by community centers and assembly halls in the region.

The "Hired Car Subsidy Welfare Project" is available to persons 18 years and over, who are living at home, with a Class 1 or Class 2 Physical Disability Certification or Class 1 Mental Disability Welfare Certification, who are not eligible for reduction or waiver of automobile tax and light vehicle tax. The subsidy provides two to three taxi coupons to cover a portion of taxi fares (basic fare of 690 to 710 yen) each month.

(1) Outing characteristics of the elderly and disabled persons

Figure 1 shows the principal purposes for outings by elderly and disabled persons, while Figure 2 shows the frequency of their outings. The principal purpose for outings of the elderly was "shopping," comprising 50% of the total. "Hospital visit" was the highest with 54%, followed by "shopping" with 22% and "Health-center for elderly visit" with 18%, for the disabled persons.

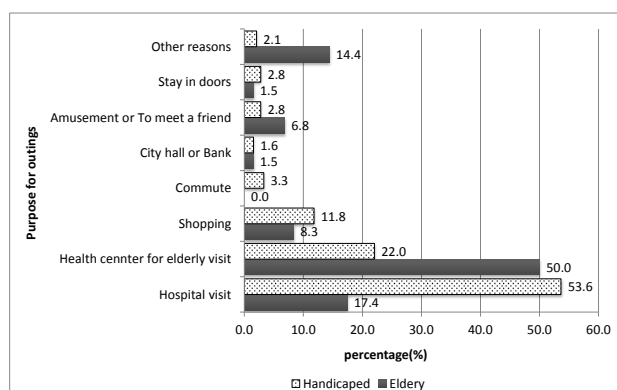


Fig.1: The principal purposes for outings by elderly and disabled persons

sources) made by the author

Furthermore, "practically every day" was the highest with 27% for the frequency of outings of the elderly, while the frequency was "a few times a week" for the disabled persons with 25%. This indicated that there is a gap in the purposes and frequencies of outings between the elderly and disabled persons.

Figure 3 shows the usability of individual means of transportation for the elderly and disabled persons respectively. The figure reveals that the elderly generally

responded they were "able to use on their own" all means of transportation, whereas the disabled persons often responded that they "require pickup and assistance," except when taxi services are used.

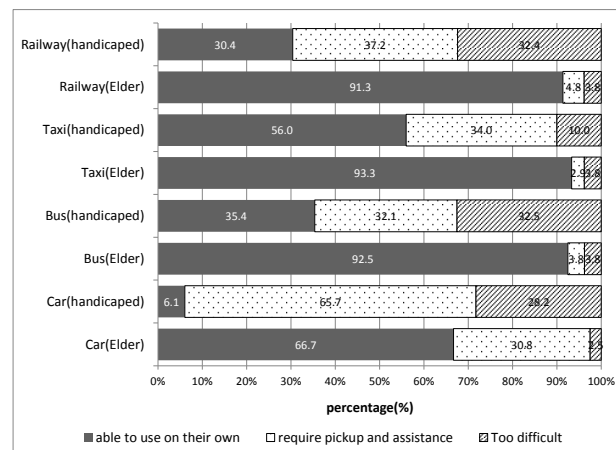


Fig.2: The usability of individual means of transportation for the elderly and disabled persons respectively sources) made by the author

Such results clearly indicate that there is a difference in the outing characteristics and the usability of means of transportation between the elderly and disabled persons. The use of taxi services offers high usability for the individuals with limited mobility, but the most significant problem is the high expense of fares in comparison with other options.

(2) Examination of usage charges for implementation of group taxi service

Table 3 categorizes the transportation services provided for fee according to the Road Transportation Act.

Per vehicle expenses of methods available from the General Passenger Bus Transportation Business, such as municipal buses and community buses, require about seven to 12 million yen annually, regardless of the number of users¹⁴⁾. The group taxi service, on the other hand, corresponds to the General Passenger Vehicle Transportation Business and the public administration burden can be kept low. The group taxi service, furthermore, is based on use by groups. As such, a variety of effects can be expected, such as revitalization of local

communities through creation of bonding social capital or promotion of better health through outings by elderly and disabled persons¹⁵⁾.

Table3: categorizes the transportation services provided for fee according to the Road Transportation act.

sources) made by the author

Classification by Road Transportation Act			Number of operators	Number of vehicle
Passenger automobile carrier business	a general omnibus passenger automobile carrier business	regular service route	28	519
		irregular service route		
		Area operation		
	a general reserved passenger automobile carrier business		91	765
	a general passenger automobile carrier business		66	1699
Onerous passenger transportation with their private vehicle	a specific passenger automobile carrier business		8	25
	municipal governments onerous transportation	area with no transportation	6	
		municipal governments welfare onerous transportation		
		depopulated communities onerous transportation		
Exception permission	welfare onerous transportation		95	636
	at the time of disaster			

*The number of the companies and the number of the vehicles are results levels in Gunma as of March 31, 2013

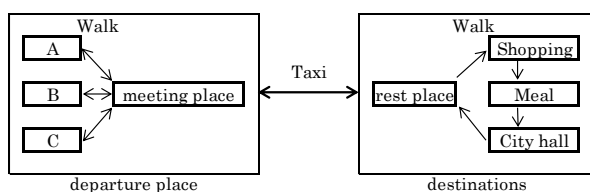


Fig.3: The image of shared taxi service use.

sources) made by the author

Figure 3 shows the image of group taxi service use. The users utilize taxis from assembly points located within their communities and are transported to their destinations, where individuals are free on their own. Their return home originates from the assembly points

located at destinations. Since the assumption of this research is that the public administration provides subsidies with taxi coupons, group registration is required in advance.

The amount of fares to be paid by individuals varies with the use of the group taxi service, depending on the number of passengers carried by a single taxi, with the burden of fares reduced as the number of passengers is increased. Figure 4 shows the relationship between the ride distance and per person fare when specific full-size vehicles (passenger capacity of nine persons) are used.

The figure clearly indicates that the per person fare varies depending on the number of passengers on a ride. For a ride distance of ten kilometers, for instance, the per person burden of fare is about 400 yen with nine passengers (maximum number) while it is about 700 yen with five passengers. If a public administration subsidy of 500 yen per person per ride is provided to supplement such fares, the per person burden of fare with five passengers becomes 200 yen. This is considerably cheaper in comparison with ordinary bus fares.

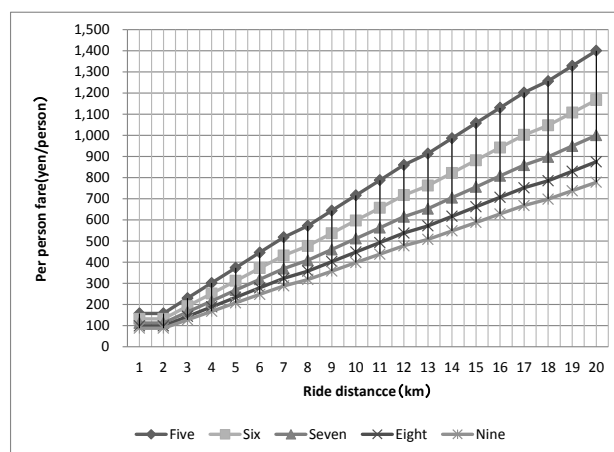


Fig.4: The relationship between the ride distance and per person fare when specific full-size vehicles are used

sources) made by the author

5. Summary and results of group taxi service social experiment

(1) Characteristics of district targeted for social

experiment

Jonan District of Maebashi City was selected as the district targeted for the social experiment of this research. The reason for this choice was that this area with inconvenient public transportation and has no major commercial facilities or general hospitals, and the potential for implementing the group taxi service was considered highly viable. (Figure 5)

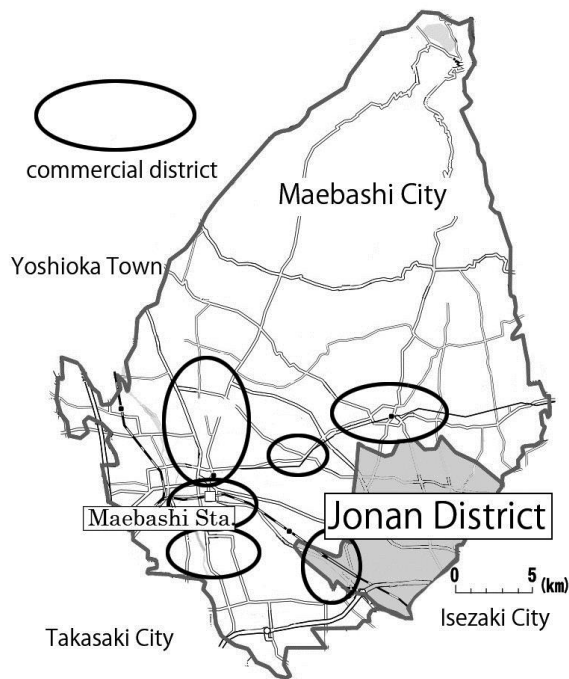


Fig.5: The district targeted for social experiment (Jonan District of Maebashi City)

sources) It is made the author based on Geographical Survey Institute publication map¹⁶⁾.

(2) Summary and evaluation of group taxi service social experiment

The summary of the social experiment conducted during the fiscal year 2013 is shown in Table 4. In implementing the social experiment, a number of briefing meetings were conducted within the district to request cooperation for the social experiment. It was possible to conduct the social experiment on a total of five occasions as a result. The participants were requested to bear the cost of 500 yen per occasion (for a round trip) and the

difference was paid by the research expenditure budget, since the service assumes public administration subsidy and personal expense once it is fully implemented. The destinations were day spas and large scale commercial facilities, with the lengths of stay being about three to five hours.

Table4: Summary and evaluation of shared taxi service social experiment

sources) made by the author

2013	May	July	August	September	November
residents' association	Arako-machi	Ninomiya-machi	Anzen-Anshin-group	Tsurugaya-machi	Izumisawa-machi
meeting - place	Syuraku-center	Ninomiya Shrine	Jyounan-public hall	Tsurugaya public hall	Izumisawa-public hall
destinations	commercial facility	A day spa	Maebashi-city center of commerce	commercial facility	commercial facility
distance(km)	11.2	4.5	8.7	10.1	8.9
number of people	26	10	9	13	8
number of vehicles	Extra large 2	Standard 3	Extra large 1		
	Standard 2		Standard 1		
outward and homeward journeys.	round - trip		one way - trip	round - trip	
taxi fares (yen)	41870	13440	4030	16590	9050
individual personal expense (yen)	13000	5000	2250	6500	4000
income and expenditure(yen)	-28870	-8440	-1780	-10090	-5050
In the case, providing a subsidy of 500 yen one way per person, the amount of personal expense(one-way)(yen)	610	344	0	276	131

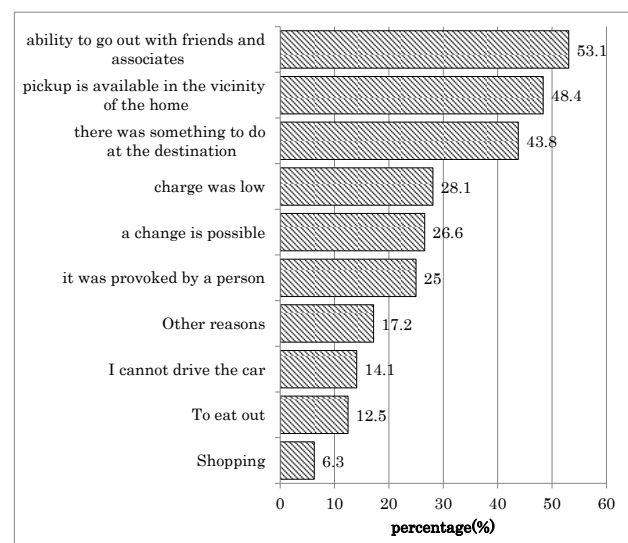


Fig6: The reason of the social experiment participation

sources) made by the author

Maebashi City conducted a social experiment on the group taxi service during the period from March 1, 2014 to April 30, providing a subsidy of 500 yen one way per person. This means that since a subsidy of 1,000 yen per person is provided when the service is used for a round trip, the amount of personal expense for the round trip became about 0 to 600 yen, as shown in Table 3.

Figure 6 shows the question results about the users' (66 persons) reasons for participating in the social experiment (up to three responses accepted). The "ability to go out with friends and associates" was the most commonly given response with 53%, followed by the fact that "pickup is available in the vicinity of the home" for 48% and "there was something to do at the destination" for 44%.

6. Examination of taxi and bus rides

Since the group taxi service presumes use by groups, using it for a hospital visit is difficult. The taxi and bus ride service is a method that presumes use with a small number of passengers. A parking lot must be made available near a bus stop or railway station in suburban areas for park and bus ride service. There is no need to organize a parking lot with the taxi and bus ride service proposed by this research, since a taxi is used from homes to the nearest bus stops.

Figure 7 shows the operating routes (eastern, western, southern, and northern routes) and details of the community bus (My Bus) operating within Maebashi City. The operating routes include general hospitals and large commercial facilities. Furthermore, it is possible to transfer from one route to another at Maebashi Station and a central commercial district.

A day pass makes it possible to freely transfer routes for only 300 yen. Figure 8 shows the method for using the group taxi service, which allows the use of a taxi for a ride directly to a destination but also the use of the taxi and bus ride service, which makes it possible to reduce the fare.

An example presented in Figure 7 shows the establishment of transfer points (point 1 to point 5) where a user can take a taxi from home and transfer onto a community bus for the ride thereon, which would require taxi fare and bus fare. If the user is a disabled person, the use of the Hired Car Welfare Coupon is accepted. Since the taxi fare becomes free for a range of about two kilometers from the transfer point, the burden on the passenger becomes the bus fare alone. This means that such a passenger can travel for one whole day for 300 yen, provided that the destinations are on the operating routes of community buses.

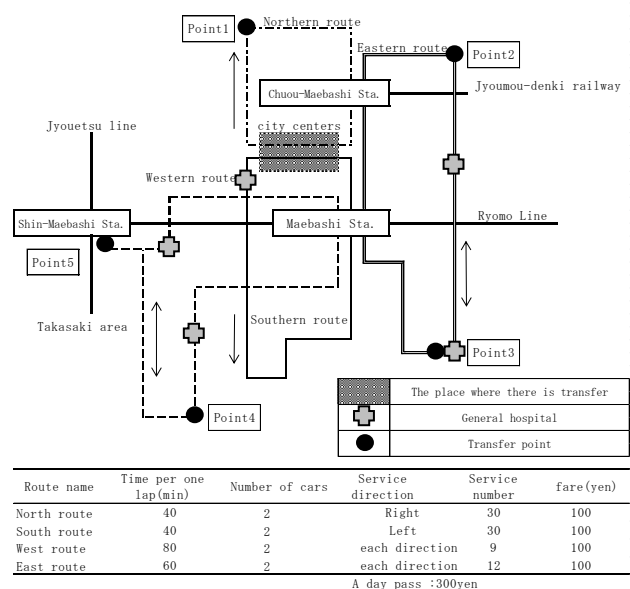


Fig.7: The operating routes and details of the community bus (My Bus) operating within Maebashi City sources) made by the author

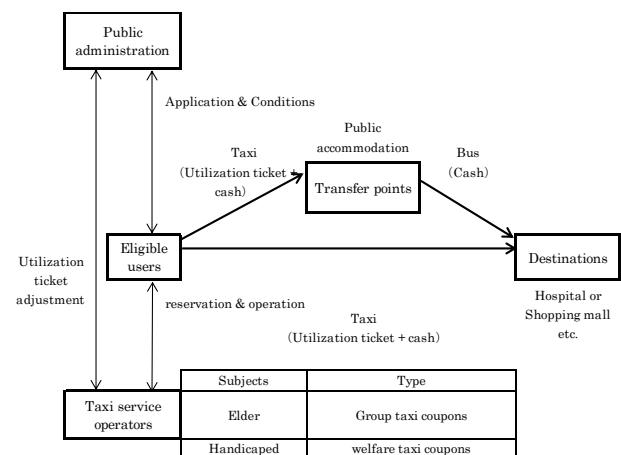


Fig.8 The method for using the shared taxi service sources) made by the author

7. Issues relating to implementation of group taxi service

The group taxi service proposed by this research cannot be considered public transportation in a pure sense, due to limited eligible users. The establishment and maintenance of conventional public transportation had been conducted primarily by public administration but the group taxi service proposed by this research was created with the assumption that regional residents will be playing a principal role in taking action. It is therefore hoped that the awareness that this is "their own transportation service" and that an attitude for resolving operational issues as their own problems will arise. There are, however, a number of issues for actual implementation of the service, as described below.

(1) **Implementation areas:** A decision must be made on what standard should be used to make decisions, with consideration for characteristics of the area.

(2) **Conditions of eligibility:** Conditions of eligibility may include age or whether a user has a driver's license. Stricter conditions result in fewer users, while lax conditions can potentially lead to greater public finance burden. Since the group taxi service is expected to play a role in revitalizing local communities, it is desirable to have people of a diverse range of age groups using the service, but careful discussion is needed.

(3) **Usage charge:** The charge for group taxi service would be covered by the public administration subsidy and personal expense. Increasing the public administration subsidy too much will result in a problem with regard to the gap in price with fares of scheduled buses and must therefore be decided with consideration for the relationship with existing public transportation.

(4) **Application group:** Since applications for using the group taxi service are made by groups, it would be necessary to have a group leader for each group. Since group movements may result in groups with mixtures of elderly and disabled persons, it is essential that personnel who can be proactively involved with the operation of

such groups be secured.

We want to show the following contents as a plan of present writer on the basis of the above. For the purpose, it is necessary to get consensus such as community resident, city government, the bus and taxi company at the same time to inspect future social experiment result.

1. The restriction is arranged at age (around 70 years old is desirable)
2. The restriction is arranged in area (area with inconvenient public transportation)
3. The number of people of one ride is not limited
4. The simultaneous use with the Hired Car Coupon Subsidy Welfare Project is enabled
5. The restriction is not arranged about the destination
6. Charge from administration is constant amount per capita.

8. Summary and future issues

This research conducted a field study on the potential for implementing a group taxi service. It used taxis as a strategy for providing support to individuals in area with inconvenient public transportation as well as the elderly and disabled persons for their outings, taking Maebashi City of Gunma Prefecture as a case example. The principal conclusions derived are described below.

1. The possibility that a group taxi was the one of the mass transit which was useful in area with inconvenient public transportation was confirmed.

2. The research proposed an implementation of group taxi service as an outing support strategy for the elderly and disabled persons. Issues were derived through actual social experiments. The "ability to go out with friends and associates" was the most often cited as the purpose of taking part by the participants, indicating that such service contributes to the improvement of camaraderie among the participants.

3. Group taxi service can be used by a single person but the issue in such instances would be that the individual personal expense becomes greater. The taxi and bus ride

service was proposed as a measure to handle this. Since the service levels provided by bus and railway services vary depending on area, however, it is necessary to implement measures that are suitable for actual situations in individual areas.

4. The implementation area, conditions for limiting eligibility of users, and usage charges must be carefully examined to suit the actual situations in the local area when implementing group taxi service.

5. We carry out a social experiment about "taxi & bus ride" and want to inspect problems for the practical application in future by evaluating it from point such as service cost, a patron burden, the satisfaction level.

——— References ———

- 1) Policy Research Institute, Ministry of Agriculture, Forestry and Fisheries Ministry of Agriculture, Forestry and Fisheries: The present conditions and correspondence direction of the issue of food access, 2012
- 2) Shinriki Kiyoshi , FUKUDA Hiroatsu , Wang Yupeng: A study on the sustainability of the shared-taxi operation, architecture Kyushu Branch report in Japan, pp.321-324, 2012
- 3) Shinriki Kiyoshi : A Consideration of Setting a Shared-taxi Routes, The Proceedings of Research Institute for Social Cultures 69, pp.75-92, 2012
- 4) Saki Kawaguchi , Junya Hashimoto, Koji Katsumoto: Study on Transportation Mode for Sustenance of Regional Community, Summaries of technical papers of Annual Meeting Architectural Institute of Japan (Tohoku), pp.635-636, 2009
- 5) Saki Kawaguchi , Junya Hashimoto, Koji Katsumoto: A Study on Estimation of the Shared-Taxi's Cost Based on the Availability Level, Summaries of technical papers of Annual Meeting Architectural Institute of Japan (Hokuriku), pp.505-506, 2010
- 6) Hiroyuki Yamashita, Fumihiko Nakamura, Toshiyuki Okamura: A Study on the Applicability of Omni-Taxi to keep Mobility in Aging Society, Papers of Research Meeting on Civil Engineering Planning, No .32, 2005
- 7) Toshiya Nobuoka, Kazuhiko Mori: Present conditions and problem of the going out support of the elderly person in the area, Memoir of Kinki branch of Architectural Institute of Japan, pp. 621-624, 2007
- 8) Research on local government support to the mobility and shopping of the elderly, Research Institute for Local Government, 2013, 3
- 9) Hirokazu Kato, Social Roles of Taxis Positioned as Public Transport, Papers of Research Meeting on Civil Engineering Planning, Vol.49, CD-ROM(128), 2014.6
- 10) Gunma Prefecture Statistics Information System, <http://toukei.pr-ef.gunma.jp/>
- 11) Health Welfare Statistics annual report, Gunma pref, 2013
- 12) Maebashi city public transport master plan, Maebashi city, 2012
- 13) Automobile Inspection & Registration Information Association, <http://www.airia.or.jp/number/index.html>
- 14) Tsutomu Meguro , Akira Yuzawa:, A Study on Gradual Evaluation of Bus Operation System consider Financial Burden : A Case Study in NUMATA City Gunma Pref. towns and villages carryall in consideration of a financial burden, Journal of the City Planning Institute of Japan 46(1), 77-87, 2011
- 15) Akira Yuzawa: A study on role of social capital for advance regional force, Journal of architecture and planning 76(666), 1423-1432, 2011
- 16) Geospatial Information Authority of Japan, <http://www.gsi.go.jp/index.html>