OPPORTUNITIES AND CHALLENGES OF LOGISTICS IN A HYPER-AGED SOCIETY

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Introduction

The ageing population has been an important issue in recent all over the world. According to a report of World Health Organization (WHO, 2012), the world's population of people 60 years of age and older has doubled since 1980 and is estimated to reach 2 billion by 2050. The proportion of the world's population over 60 years will still double from about 11% to 22% between 2000 and 2050. Moreover, the number of people aged over 80 years will quadruple in the same period. By 2050 the world will have almost 400 million people aged over 80 years.

A country or a society is defined as an ageing society if the number of its people aged 65 years and over exceeds 7%. With 14%, the society is defined as an aged society. If the proportion reaches at 21%, it is referred as a hyper-aged society. Among the nations, Japan is the first country that stepped in a hyper-aged society, although "Aging Society White Paper" of Japan and several glossaries note that the definitions of those terms were not technically defined.

Although longevity is a reason for celebration, an ageing society has some challenges. Japan, as a hyper-aged society, has also some issues in the fields of health and welfare, pension, industry, and so on. This paper focuses on the last-mile issue of logistics. This is because there are so many people who have difficulties in buying something. They are called in Japan as "*shopping refugees*" or restricted shoppers. As the number of retailers has been decreasing specifically in rural areas due to decline of demand, older people appear to be in distress. There is a tendency that the elderly is referred as shopping refugees, although the elderly has been considered as a new considerable market.

Many studies on logistics have been released specifically to increase efficiency of logistics activities. Almost of them tend to cover from suppliers to retailers, but final customers are not covered. That might be because the final customers generally take the commodities home by themselves when they go shopping. In an ageing society, however, it is essential that logistics focus more on the process to the final customers, i.e. the last-mile. This paper, therefore, aims at identifying the opportunities and challenges of logistics in a hyper-aged society of Japan. Last-mile issues of logistics are addressed and the measures for the last-mile issues are reviewed. A possibility for a certification mark system is also considered after some challenges are discussed.

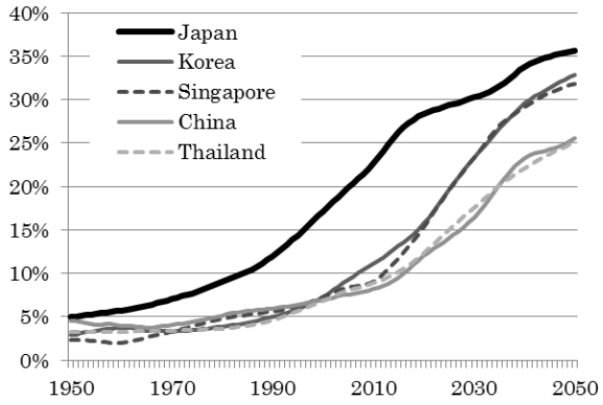

Figure 1: The proportion of 65 years and over in five Asian countries
Data: United Nations, Department of Economic and Social Affairs, Population Division (2011). World Population Prospects: The 2010 Revision, CD-ROM Edition.

Ageing population and last-mile issue of logistics

Ageing population

Japan was put on an ageing society in 1970. The proportion of people aged 65 years and over was 7.0% in 1970. The proportion has been increasing steadily and rapidly. The number went to 14.4% in

1995 and 21.4% in 2008. It is expected to increase to 35.6% in 2050. The trend of ageing population is not unique to Japan in Asia. United Nations estimates that Korea and Singapore will step in a hyper-aged society in 2027, China and Thailand in 2037. The proportion is expected to be 33% in Korea, 32% in Singapore, 26% in China and 25% in Thailand by 2050 (See Figure1). It is possible to say that those Asian countries will have the same issues of Japan in near future.

Declining retailers in Japan

The number of retailers in Japan hit the pick in early 1980s and has been decreasing steadily. They decreased by 34% to about 1.1miillion in 2007 from the peak (about 1.7million in 1982) and even by 24% from about 1.5 million in 1972(See figure 2). It is said that the decrease resulted from the decline of demand due to law birth-rate and ageing population. This is supported by comparisons over the proportion of the elderly, the change rate of populations, and the decreasing rate of the number of retailers. This paper examined their relations by area (47 Japanese prefectures) with data of the commercial statistics (METI, 1972~2007) and the population statistics (Statistics Bureau, 1970~2010).

When we pick up the top 10 areas by the highest proportion of the elderly, the highest decrease ratio of population, and the highest decrease ratio of retailers, respectively, we can see many areas that appears in all group, as shown in table 1. For instance, Akita prefecture has the highest proportion of the elderly (29.5%) as of 2010 and also has the highest ratio in decrease of population between 1970 and 2010 (-12.5%). The decrease ratio of the number of retailers in Akita appears -37.1% where is the second highest decline. In the same way, six areas among the top 10 aged areas are still observed in the top 10 areas of decreasing retailers. (See table 1)

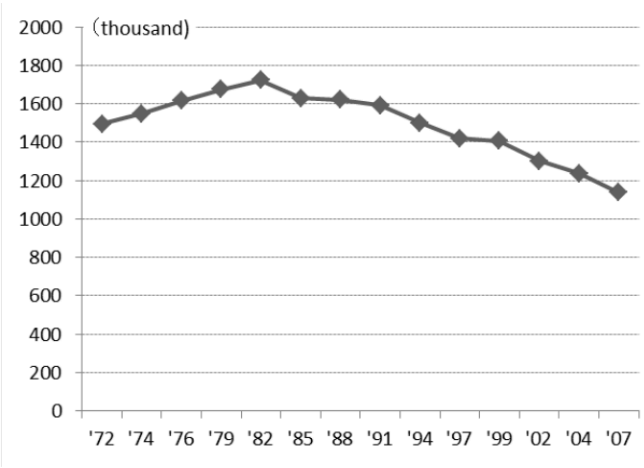

Figure 2: The number of retailers in Japan
Data: Commercial statistics, each year, METI (Ministry of Land, Infrastructure, Transport and Tourism)

Top 10 areas of the proportion of the elderly As of 2010 (A)			Top 10 areas of the decrease of population 1970/2010 (B)			Top 10 areas of the decrease of retailers 1972/2007 (C)		
Area No.*	Name	ratio	Area No.*	Name	ratio	Area No.*	Name	ratio
5	Akita	29.5%	5	Akita	-12.5%	36	Tokushima	-38.6%
32	Shimane	28.9%	42	Nagasaki	-9.1%	5	Akita	-37.1%
39	Kochi	28.5%	32	Shimane	-7.3%	35	Yamaguchi	-35.2%
35	Yamaguchi	27.9%	6	Yamagata	-4.6%	30	Wakayama	-34.8%
6	Yamagata	27.5%	35	Yamaguchi	-4.0%	16	Toyama	-32.8%
3	Iwate	27.1%	30	Wakayama	-3.9%	39	Kochi	-32.4%
30	Wakayama	27.0%	2	Aomori	-3.8%	37	Kagawa	-31.6%
36	Tokushima	26.7%	3	Iwate	-3.0%	6	Yamagata	-31.1%
44	Oita	26.5%	39	Kochi	-2.8%	32	Shimane	-31.0%
20	Nagano	26.4%	46	Kagoshima	-1.3%	38	Ehime	-31.0%

*Area no. is the given number of Japanese prefectures.

Table 1: Top 10 areas by elderly proportion, decrease of population and retailers

Last-mile issues of logistics in a hyper-aged society

Last-mile issues of logistics have been getting common in Japan. The last-mile refers to the process of delivering goods to end-users or the final customers. Regarding the last-mile issues, several studies in humanitarian logistics have been released with aiming at investigating how to deliver the relief goods to the victims of disaster such as the earthquake, tsunami, and so on. The victims appear in the middle of the area where disaster occurred. Transport networks around the disaster area are sometimes damaged or destroyed. That implies that the last-mile to the victims is the hardest and the most significant process in delivering relief goods in order to save them.

In addition to the last-mile issue in emergency, there is another last-mile issue in a hyper-aged society. That is called as "shopping refugees" in literal sense of Japanese or the restricted shoppers. Shopping refugees are those have difficulties in daily shopping because of the deceasing retailers in their neighbourhood, the shrink of public transportation network, and even their physical features. That is a critical issue of logistics because logistics has the mission to provide goods to the right place is needed. Unlike the victims of disasters, they always worry about their daily life because they cannot easily access retailer shops.

Meanwhile, unlike food deserts issue of Europe and U.S, shopping refugees derived from the increasing withdrawal of retail outlets and shrink of public transport in especially sparse rural area of Japan. Several studies call deprived areas with poor access to the provision of healthy affordable food as "food deserts" in Europe and U.S. There is the notion of social exclusion or social deprivation, from where disadvantaged people such as single-parent families and foreign workers are suffering (Wrigley et al., 2003; Yokohari, 2011; Mori, 2013). On the other hand, some studies on "shopping refugees" in Japan pick up the decreasing retailers as primary reason (METI, 2011; Tsurusaka, 2011; Lee, 2013). The trends in the decrease of retailers might continue once the ageing population would keep going as expected by 2050. Another issue in a hyper-aged society would be the burden of carrying goods to their house by the elderly even in a case they happened to access retailers' stores. That is because older people could hardly lift a heavy item or big one and drive a car by themselves.

This paper, therefore, focuses on the matter of shopping refugees as the last-mile issues in a hyper-aged society and identifies the issues in two dimensions as shown in figure 3; (1) a limited accessibility to retail outlets and a difficulty in carrying goods from retail outlets. With those issues, this paper reviews the logistics measure based on the author's previous research (Lee 2013) before considering the challenges of logistics in a hyper-aged society. A certification mark system for bolstering the logistics measures is also discussed.

Figure 3: Last-mile issues in a hyper-aged society from the viewpoint of customers

Logistics measures for last-mile issues

Proposed solutions for the shopping refugees

METI (Ministry of Economy, Trade and Industry 2011) proposed three basic ideas to support the shopping refugees; (1) to set outlets in near place of the shopping refugees, (2) to take goods to the shopping refugees, and (3) to add transportation modes in the shopping refugees' area. There are several municipalities that support private sector to provide a new service based on the above ideas.

To set retail outlets is concerned with commercial policy, while to raise the transportation modes with transport policy. It is not naturally efficient to spend funds in order to lure retailers and transport service into unprofitable areas. Akashi (2011) also points out that it would make no sense for government to commit in attracting retailers to where other retailers are suffering from no profits. Thus, this paper focuses on the ideas to take goods to the shopping refugees and reviews mobile shops and delivery service based on several experiences (Sugita, 2008; Lee, 2013).

Mobile shop
Mobile shops refer to movable outlets literally. It is not built-in so that it can be driven when it is required. This measure appears in types of tailgate outlet and makeshift outlet. The outlets can be operated near or in the very front of customers' door, which gives shopping refugees a physically direct access to outlets and laboriously significant alleviation of carrying goods to their places. Imagine that retailers come close to customers in figure 3.

According to Japan catering car association, tailgate outlets in Japan started in 17 century (the Edo-era) in a practical sense. Almost of them, now, serve cooked food such as lunch box, light meals, and bread and many of them are running around dense cities. On the other hand, some have been operated primarily in sparse areas by local supermarket or grocery stores since late in 1980s. They handle various categories such as fresh foods including meats and vegetables, frozen foods and miscellaneous goods. Sun Plaza, for example, is a local-based supermarket. It introduced mobile shops named Happy Liners in 1985 to drive to sparse areas. Happy Liners used to be one of discrimination strategies to capture a niche market in order to compete against a large-scaled supermarket. Happy Liners use an altered small bus with a refrigerator in it (See Picture1). In addition, mobile convenience stores appeared in sparse areas after the East Japan earthquake in March 2011. They were put into the affected areas from humanitarian perspective. Seven-Eleven Japan, for instance, started introducing a mobile convenience store in May 2011. It operates 34 specially developed vehicles in 16 prefectures as of March 2013. Mobile department stores also appeared.

Picture1: Happy Liner and its inside
Source: Sun Plaza Website (permitted by Sun Plaza)

Another type of mobile shops would be makeshift outlets. This is not necessary to be a building-based outlet. Makeshift outlets have been common in Japan. There are few cases for shopping refugees, though. Here is a case introduced at the request of public side. Nisshin-city asked some grocery retailers to give a makeshift outlet at a park around a housing estate in where many the elderly lived. The outlet is open at 2 points on every Wednesday except a rainy day.

Home-delivery service
Delivery service can be used both when the elderly has no accessibility to retail outlet and when they have heavy goods at a store. Elderly people order goods on the phone, facsimile, or internet and even in person at a store. They, then, only wait the goods in their home. Home-delivery service is carried out by retailers and logistics providers. Delivery service is operated in several types with respect to the delivery fees; no charge with minimum payment, no charge for only the elderly, a specified amount per use, and monthly fee with unmetered use.

Delivery service is common in Japan for e-commerce has been getting popular. Now, it is proposed as one of customer service of retailers. Several large-scaled retailers, for instance *Aeon* and *Itoyokado*, have their own on-line store as well as off-line store and they do delivery service by themselves. Customers can go on-line shopping to get daily convenience goods at their home. They also use the delivery service when they bought speciality goods at off-line store.

Meanwhile, there is an experiment conducted by several small private stores as a type of co-delivery system. Sugita (2008) introduce the experiment of "delivery community" organized by 10 stores in a

shopping plaza in a rural area of Chiba. Firstly, customer *i* ordered through phone directly to store *m* and *n*. Secondly, stores pass the commodities to delivery community. Finally, a delivery man delivers the commodities to customer *i* (See Figure 4). Elderly people can use this service for no charges. Since almost users of this service are the elderly in this area, delivery community cannot enjoy the profit. The community says that this service is more like volunteer work for neighbours.

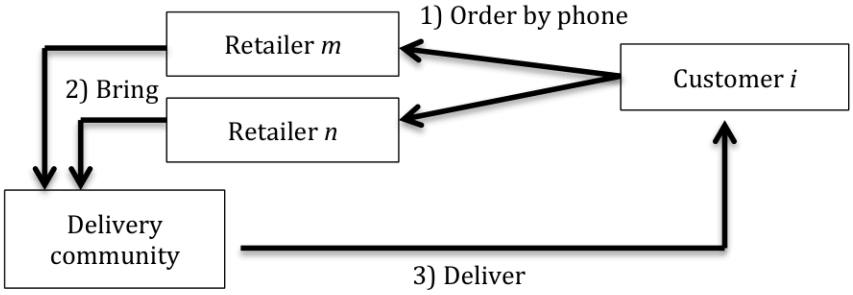

Figure 4: Co-delivery system in an experience of "delivery community"

In recent, meal delivery service has expanded nationwide. Many municipalities have conducted meal delivery service as one of welfare programs. That has an effect on the increase in the number of business. In 2000, Seven-Eleven Japan started meal delivery service named *Seven Meal*. CO-OP also has started the service in 2007 before introducing mobile shops in 2009. *Izumiya*, a franchising supermarket, has just started meal delivery service in 2012.

Challenges for the last-mile issues

Profitability

Measures for the last-mile issues have some challenges although they should be taken for ageing population. It would be profitability that makes retailers hesitate to take the measures. Retailers such as supermarket, who operate physical stores in a self-service type, have won the customers through the customer satisfaction, i.e., the price competitiveness and various categories of commodity. That has been subject to motorization. Customers drive to a large-scaled store and they can purchase whatever they want at the single store. Large-scaled store used to be located in the suburbs with a lot of parking lots and customers could use free parking during their shopping.

In a hyper-aged society, however, parking lots would not be an important matter any longer. It is because the elderly do not drive a car due to their physical features. Retailers have to shift their business strategies corresponding with the times. Nemoto (2013) points that retailers have enhanced to attract customers to the stores but retailers in a hyper-aged society should try to come close to customers. Shopping refugees, unfortunately, would be a significant market. Retailers will fade out unless they support the shopping refugees now, as Nemoto emphasized. Mobile shops will be a new type of retail outlets in a hyper-aged society, under the concept of coming to customers. E-commerce also has been expanding its business and is expected to be more popular way for shopping in Japan.

It is generally true that the measures for the last-mile issues or shopping refugees' issues are prone to be thought as less-profitable business in Japan. There are, though, some companies that have developed a new business model for the elderly and have increased the revenue and profits of the business. For example, *Watami* launched the meal home-delivery business after the acquisition of *Takushouku* in 2008, and according to IR report of FY 2012, *Watami* enjoyed a year-on-year 48% increase of sales and 25% increase of profits in meal delivery business. The meal delivery business accounts for 26% of total sales and also 26% of total profits in 2012. The numbers increased from 20% and 22% respectively in 2011.

Corporate social responsibility

After the East Japan earthquake occurred in 2011, many researches on emergency logistics have been taken. These are from the perspective of humanitarian logistics. They focus more on delivering relief goods in speed than reducing cost or expanding profit. Humanitarian logistics is required to go beyond profitability (Ernst, 2003) because its mission is to alleviate the suffering of vulnerable people (Thomas and Kopczak, 2005).

Retailing as well as logistics is recognized as an infrastructure for a society, which have an impact on the mission of retailers. The *Seven & i* group, for example, states that "we aim to be a corporate group that contributes to building an even better society by focusing on measures to resolve social issues and strategically developing them into business." It adds that "seven & i group has attempted to create new services for supporting daily shopping, utilizing the store networks, and the logistics and information systems that has developed over many years."

The corporate social responsibility (CSR) has been promoted, focusing on the environment issue for a decade or two in Japan. Companies were managed to develop the measures for environment protection. With regard to greenhouse gas emissions, for instance, companies have to take special equipment on their vehicles or replace with other vehicles that are fuelled by natural gas or electric power. In addition, large-scaled companies also have to make a plan to reduce the emission of CO2 and submit the report on the result. Companies should follow regulations and social requirements from the perspective of CSR, in spite of the fact that those activities often results in cost increases. Many companies, moreover, make another investment to appeal their activities to society.

CRS has repeatedly changed in response to the situation of a society. It is essential that the last-mile issues should be significantly considered in a hyper-aged society. In other words, the measures for the last-mile issues are necessary to be identified again from the perspective of CSR.

Workforce

Measures for the last-mile issues have another big challenge. From the above experiences, it is found that the workforce has an important role on conducting the measures. The drivers for mobile shops are also charge in sales, cash register, and sometimes customer service. They often restrain themselves from leaving the working point because there is no one to be working with. It is not easy to reinforce investment in the measures with adding staffs. Volunteers are strongly helpful to take the measures.

In humanitarian logistics, there are many stakeholders such as government, aid agencies, other NGOs, volunteers, donors, logistics providers and occasionally military. Last-mile issues in ageing society would be improved with volunteers' workforce. In early 1980s, Asai et.al (1983) points out "volunteers have a central role in community since there is an increase of the aged in Japan". In the practical sense, some retailers tell that they are operating mobile shops and/or home delivery service as a volunteer's activity from the humanitarian perspective with their mission to contribute to society.

Aoyama (2003) shows an experience that volunteers are involved in a meal delivery service of welfare center. The delivery is operated by a couple of a staff of the center and a volunteer. Volunteers participate just one time a week, which means volunteer member is fixed on the day of the week. The staff drives to elderly person's house and the volunteer hands the meal to elderly person. Volunteers can realise changes in elderly person and make a report to the center, which leads to a prevention of incidents.

We have a question how volunteers can be recruited. A survey on volunteer activity asked 354 citizens of *Hirosaki* city "do you participate in welfare-related volunteer activity?" and got responses of 9% of proactive involvement, 35% of involvement if asked, 32% of want but cannot right now, and only 7% of do not want (Rausch 1996). Suzuki et.al (2003) also clarified many volunteers and networks of NPOs for disaster relief were established after the Great Hanshin earthquake in 1995. That implies people have willingness to participate in volunteer activity if they know the information.

Another resource for volunteers would be seniors. Old people themselves also can make important contributions to society as volunteers and active participants in the workforce. It is also possible to involve young people. Asai and Hattori (2012) indicate that education programs for helping the shopping refugees. They show practical experiences of mobile shops on bicycle-drawn cart that managed by college students and high school students.

A consideration of a certification mark system for last-mile logistics

Eco-rail mark and eco-ship mark system

Logistics originated from military activities and has extended its application to business activities. In early 2000s, environment-friendly logistics or green logistics has been identified in Japan. Basic directions of logistics policy in Japan are presented in Comprehensive Logistics Policy that settled in

1997. Japanese government presented a policy direction to "logistics for social demand" in its 1st revision in 2001. Since social demand includes global warming, environmental concerns and resource circulation, the term of "green logistics" firstly appears as a policy direction in the 2nd revision in 2005.

Under these basic directions, environment-related acts were revised to regulate the emission of greenhouse gas, which have a significant impact on transportation. Companies are forced to endeavour to raise the transportation efficiency with a high loading ratio and/or cooperative transportation. Government and industries, whereas, tried to develop a certification mark system to promote modal-shift. They provide this system as one of incentives. If a company is certified as an environment-friendly business with its efforts for modal-shift, the company can use the certification mark such as *eco-rail mark* or *eco-ship mark* to appeal its efforts to customers (See figure 5). The company expects that customers choose its products from the credit of CRS. Related to eco-rail mark system, Japanese government (MILT) say that "the eco-rail mark system aims to contribute to the ecology movement by encouraging more consumers to support businesses who actively use railway freight transportation".

Figure 5: Eco-rail mark (left), Eco-ship mark (center) and Eco-mark (right)
Source: website of MLIT and JEA

A consideration of application to Humanitarian logistics

The above mark system tends to include all stakeholders on supply chain, i.e. government, companies, and customers as public. Companies respond to public demand and the public prefer those companies' products, under the regulation and incentives of government. This structure would be applied to encourage the last-mile logistics measures. Unfortunately, the effects of the mark system on business profits or customer's behaviour are not reported yet. That might be because eco-rail mark system started in 2005 and eco-ship mark system in 2008.

We can refer to eco-mark system started earlier than eco-rail mark. Eco-mark system has been operated by Japan Environment Association (JEA) since 1989 (See figure 5). According to the JEA's customers monitoring survey on eco-mark items, about 18% of consumers (N=929) in 2000 consciously make a decision to buy things by eco-mark. The ratio goes up to about 23% (N=1665) in 2002 and 54% (N=553) in 2004 (the latest survey). The survey in 2002 tells that about 37% of consumers (N=1184) are willingly buy eco-mark items even a bit more expensive than the same type of product and about 53% in the same price. The similar results are observed in another survey. A questionnaire in 2005 (N=125) by Yoshioka and Horisawa (2006) shows the result that 19% of consumers buy eco-mark items even in higher price and 62% in the same price.

In recent, humanitarian logistics or relief logistics have been considered worldwide, as mentioned earlier. Japan, an earthquake-prone country, also is discussing logistics in emergency. Now is the time to identify the humanitarian logistics again in a hyper-aged society. There are many people who have difficulties in daily life as well as at the time of disaster. As the efforts on the environment-friendly logistics have been made by all stakeholders, the efforts on the last-mile logistics should be made from the humanitarian perspective by all stakeholders including volunteers.

One of the trials could be a certification mark system as learned from environment-friendly logistics. Some companies are now trying to provide essential goods to restricted shoppers, struggling for the mission of logistics against business performance. When their efforts are recognized to public and the recognition links to the companies' competition, more companies would try to take measures for the last-mile issues as one of humanitarian logistics and finally vulnerable people would less appear.

Conclusion

This paper reviewed the measures for the last-mile issues. The measures are expected to be opportunities of new business model in a hyper-aged society although they have some challenges in operation. There is a positive possibility to resolve the challenges with all stakeholders of humanitarian

logistics from the lessons of many logistical experiences. The most important thing is the recognition of the humanitarian logistics in ageing world. WHO (2012) points out that 80% of older people in the world will live in developing countries by 2050. The quicker some measures of logistics are taken in Japan as the first hyper-aged society, the more countries could apply.

For further study, suitable items and areas for specific measures such as mobile shops and delivery service or others will be identified. In addition, it is necessary to clarify how to involve all stakeholders in the last-mile logistics. Moreover, it is also desirable to discuss the ways in more detail to conduct the measures.

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