



## **STUDY ON CHANGE IN CONSUMER'S NEEDS AND INTERRUPTION OF LIFELINES AFTER EARTHQUAKES IN KUSHIRO, JAPAN**

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### **ABSTRACT**

Two earthquakes (January 15th 1993 and October 4th 1994) hit Kushiro successively and thus caused severe damages of lifelines. Sales data of supermarkets in Kushiro clearly indicated difficulties in everyday lives of citizens encountered with the earthquakes. The Hyogo-ken-nanbu earthquake, which occurred on January 17th 1995, also gave a considerably psychological effect on the citizens of Kushiro even where is far from Hyogo prefecture. This fact was reflected on the sales data that stockpiles for earthquake disaster and emergency goods were sold well. Sales data of a supermarket before and after an earthquake would be indicative of tracing the change in citizens' needs which were dependent on the recovery of damaged lifelines.

### **KEYWORDS**

Supermarket; lifeline damage; sales data; purchase trend.

### **INTRODUCTION**

#### Object

For elucidating the influence of earthquakes on everyday life of citizens, we were interested in the sales data on commercial products before and after an earthquake. For this purpose sales data compiled in computerized registers of supermarkets will be a good choice. Consumer's need will have changed just after an earthquake, especially when lifelines are heavily damaged by the earthquake.

Since the 1993 Kushiro-oki earthquake, we have continued to monitor the sales data of a supermarket at Kushiro. In the present paper, we have attempted to summarize and to analyze the sales data before and after the Kushiro-oki earthquake. We have also examined the influence of other two earthquakes, the 1994 Hokkaido-toho-oki earthquake and the 1995 Hyogoken-nanbu earthquake, on the variation of consumer's needs at Kushiro.

#### Method

We collected the sales data on some categories of commercial products. Numbers of commercial products

sold as a function of time would be influenced by the extent of damage caused by an earthquake. We then tested the relations of the sales data with the extent of recovery of lifelines. We also interviewed store managers of supermarkets after an earthquake on goods sold well and strategy of the stores toward earthquake disasters.

### Outline of Kushiro city

Kushiro is the center city of eastern Hokkaido and has population of about 200,000. Kushiro's leading industries are fisheries and paper manufactures. It seems Kushiro is characterized by two points. a) Kushiro Marsh spreads behind the city which is the largest marshland in Japan. In June 1993, the city hosted the 5th Ramsar Conference of Contracting parties. b) Since the 1993 Kushiro-oki earthquake, the municipal officials are being in drill on disaster-prevention program. The program was presented in Table 1. The disaster-prevention program has now been firmly founded in citizens in Kushiro. Therefore, we can assume that Kushiro is one of the advanced cities in Hokkaido in view of disaster prevention. Figure 1 shows locations of investigation points, supermarkets and damaged-lifeline areas.

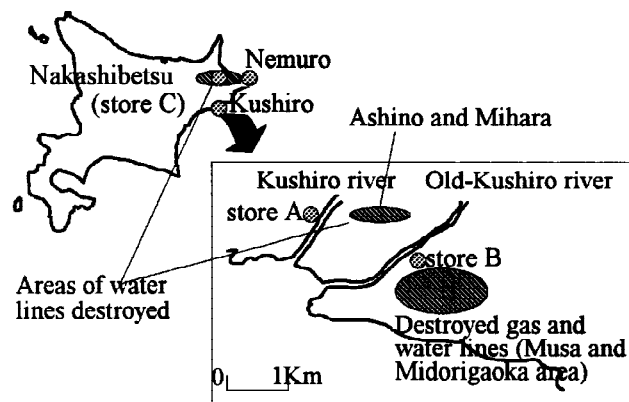


Fig. 1. A map indicating investigation points, supermarkets and damaged-lifeline areas.

Table 1. Disaster-prevention program in Kushiro city.

	Disaster-Prevention Program
Kushiro-oki earthquake (Jan. 15, 1993)	<ul style="list-style-type: none"> <li>• Making tsunami hazard map</li> <li>• Setting up indication boards of shelters</li> <li>• Disposing technical officers of disaster prevention</li> </ul>
Hyogo-ken-nanbu earthquake (Jan. 17, 1995)	<p><u>From April, 1995</u></p> <ul style="list-style-type: none"> <li>• Utilization of primary school classrooms for stock yard of emergency provisions</li> <li>• Making an agreement with 7 hotels for using their lobbies as shelters for tsunami</li> </ul> <p><u>From September, 1995</u></p> <ul style="list-style-type: none"> <li>• Carrying out disaster drills and re-examining drills' contents</li> <li>• Setting a day at which pupils in primary and junior high schools have a relief lunch</li> </ul> <p><u>From November, 1995</u></p> <ul style="list-style-type: none"> <li>• Making an agreement with supermarkets to provide stored supplies to the city office in case of emergency.</li> </ul>

## OUTLINE OF LIFELINE DAMAGE

### 1993 Kushiro-oki earthquake

Gas: Just after the earthquake, gas supply was stopped at Musa and neighboring area. As many as 9301 houses were suffered from the earthquake. Also 90 houses in public apartments in Otanoshike suffered gas-line damage after the earthquake (Fig. 1). About three weeks were required for recovery of gas line. Table 2 shows the extent of gas-service recovery with time (Kushiro city, 1993).

Table 2. Extant of gas-service recovery with time.

days	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
opened	daily count				440	269	581	4	371	201	239	640	863	719	1048	1289	769	831	141	177	26	33	
valves	total				660	1100	1369	1950	1954	2325	2526	2765	3405	4268	4987	6035	7324	8093	8924	9065	9242	9268	9301

Water: The earthquake destroyed tap waterlines, especially at the terrace districts of Midorigaoka, Kaizuka, and Musa. Water supply was not restored until January 20th, thus forcing 926 of households to spend inconvenient days.

Electric power: Just after the quake, 4600 houses of Musa and Midorigaoka districts (total 9300 houses) lost power, however two thirds of 4600 houses received the electric service at 10:00 p.m. All the power service was recovered on the early morning of January 16th.

### 1994 Hokkaido-toho-oki earthquake

Gas: After the earthquake, five gas-leak troubles were reported in the city but there were no severe troubles and damages.

Water: The earthquake destroyed tap waterlines, 90 households in public apartments in Ashino and Mihara districts and especially in Nemuro area were heavily damaged. Water supply was required for 10 days for recovery.

Electric power: Just after the shaking 13,460 households mainly in Kushiro and Nemuro area lost power, however 1,100 population in Kushiro city received the service an hour later. Other areas of power service was recovered till the morning.

### 1995 Hyogoken-nanbu earthquake

As Hyogo-ken-nanbu earthquake was far from Kushiro city, there were no direct damages in the city. In spite of no damages, Japan's worst natural catastrophe in Kobe since the 1923 Great Knato earthquake also gave a considerably psychological effect on the citizens of Kushiro. This fact will be described later.

In Hyogo prefecture especially at Kobe city and Awazi Island most of the lifeline facilities were stopped. Total numbers of damaged households were 850 thousands in gas services, 910 thousands in electric power and 990 thousands in water supply. Power service required a week for its recovery but other two services needed long time for restoration; about 2 months for water and 3 months for gas.

## ROLE OF SUPERMARKET AND CITIZENS' DEMANDS AFTER EARTHQUAKES

### 1993 Kushiro-oki earthquake

A chain store B advanced its opening hours from 10:00 a.m. to 8:00 a.m. and set up emergency sale for two

days. At the store B, most showcases were not fell down and merchandises were firmly retained in the showcases. But some showcases having casters moved to another place, and part of bottled goods and cosmetics in fixed showcases fell down on to floor.

After shaking, the most staffs rapidly came up to the store and worked to clean the floor and to adjust respective departments for opening of the next day. This supermarket has an ordering system which is controlled by the head office for collecting order data from branch stores. The system applied in disaster. Thus a store manager decided to open the store, only by confirming that the staff members were all be ready. The ordered merchandise were soon sent from the head office and other stores through suitable routes in due time. After the store reopened, certain goods such as delicatessen and instant foods were quickly sold, the amounts of which were two to three times as much as those before the earthquake.

Two days after the earthquake, cleaning goods were sold by advertisement of "Emergency sale", and dishes and plates were also provided with a flat price. An announcement "tableware bargain sale will open on 23rd" was made on the day.

#### 1994 Hokkaido-toho -oki earthquake

After the shaking, in a store C, most staffs rapidly came up to the store and cleansed each departments according to the direction that the store was to open the door next day. Their works continued until midnight. As almost departments had been cleansed, the store opened at 11:00 a.m. and sold foods (mainly bread and milk), batteries, flashlights, paper glasses and dishes in a flat price at outside place for parking. From 12:00 p.m. they opened the first floor. As Kushiro and Nakashibetu areas locate at the middle of Kushiro Marshland, river water is municipal-water resources. The river water is so clean and delicious that citizens are not familiar with buying bottled water or tea. However, bottled water readily sold out and breads were sold three times as much as usual days. As the opening sales for 12th anniversary was to be held next day, amounts of goods were supplied enough for satisfying citizens' needs.

#### 1995 Hyogoken-nanbu earthquake

To answer citizens' needs the store A made an emergency counter for providing goods since February. Items sold well were food, water, portable gas equipment, buckets, candles, fasteners to secure furniture to the wall, and batteries. The manager of the store A answered to our interviews as follows; (a) bottled water 'Rokko no mizu' (the best seller in bottled waters) was unavailable by the Great Hanshin earthquake, but other brands of bottled water sold well. (b) hard tacks were out of stock. (c) buckets and plastic containers were being sold well but the latter were not supplied fully from makers.

#### Citizens' demands after earthquakes

Figure 2 shows the variation in numbers of products on January 1993 and 1992 (Watanabe *et al.*, 1995). It seems that store A has received lesser damages from the earthquake because its location is far from damaged area. Kamaboko ( fish paste stick ) , milk, dry noodles occupy high percentage in ratio of numbers and composition of sold products. On the other hand, preservative foods, pickles, daily products, basic seasonings, frozen foods, general merchandise, small electric articles and dishes show high ratio in numbers in 1993 within those in 1992. Though store A was not distinctly effected by the lifeline damage on sales activity, a certain subdivided items such as dairy, grocery, and general merchandise tended to be sold well.



## RESULTS

The damage caused by the Kushiro-oki earthquake is characterized by the destruction of gas supply. About three weeks were required for its recovery. Because of the gas-supply destruction, next products were sold well; (a) delicatessen (b) instant foods which are not required to use gas for cooking (c) portable gas equipment and (d) emergency tools and supplies.

The feature of the Hokkaido-toho-oki earthquake was also in the damage of water supply which was suspended for nearly a month at the district of around Kushiro. The sales data indicated an increase in numbers of flashlight, batteries, canned foods and bottled water.

Kushiro citizens were experienced inconvenient days by the lifeline damages and long recovery process which was caused by the Kushiro-oki earthquake. After other two earthquakes, the following sales trend is clearly seen; citizen became to pay attention to disaster prevention, such as stockpiles for earthquake disaster and for emergency goods. According to lifeline damage and the change in citizens' purchase trend, local supermarkets tried to respond to these citizens' needs. Even in Kobe city, the most damaged area of the Hyogo-ken-nanbu earthquake, several supermarkets reopened on January 18th. These facts suggest that retailing stores such as supermarkets and convenient stores have an important role in keeping raw foods in their refrigerators as an emergency stock yard for citizens. Figure 3 shows the numbers of local governments in Hokkaido at which emergency goods are being prepared. However, we can not say that we have enough stocks for disasters. Because of limited spaces for holding stocks, local governments will be impossible to provide enough places for the stocks. This is because citizens' needs will be rapidly and will greatly change in time depending on the extent of lifeline recovery. Since the Hyogoken-nanbu earthquake, it seems that citizens tend to allow an opinion; be ride out for at least 3 days by their own efforts. No public service for emergency responds instantaneously toward citizens' needs as retailing stores do.

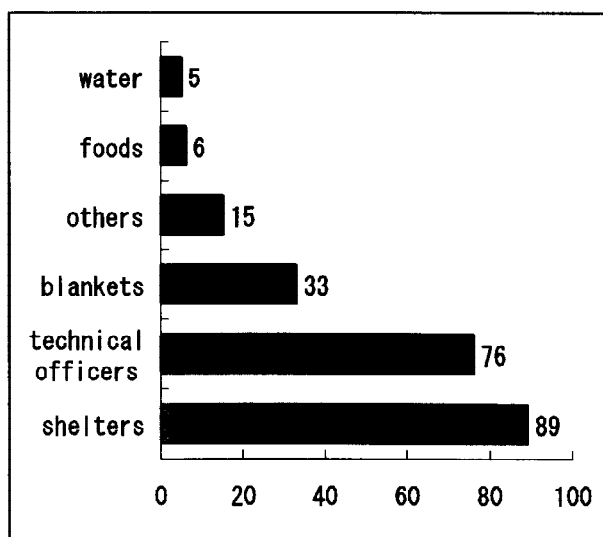


Fig. 3. Numbers of local governments(Hokkaido) at which emergency goods are being prepared.

## CONCLUSION

Sales data of retailing stores indicated clearly a certain relation between the recovery of lifeline damages and citizens' needs. Variations in sold items depended on the lifeline damages. Even when an earthquake occurred in other area and caused no severe damage on a city, a distinct trend in the city has been seen in sales data representing that emergency goods and emergency tools were sold well. Hence, it was reasonably concluded that the sales data of supermarkets were indicative of tracing the extent of the restoring process of damaged lifelines and of reflecting the psychological effect of an earthquake on citizens.

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