

TRAVEL BEHAVIORAL ANALYSIS OF A LOCAL AREA IN JAPAN - A CASE STUDY OF THE KII PENINSULA -

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Abstract: Surveys of travel behavior in Japan have previously been carried out utilizing two methods. For major metropolitan areas a personal trip survey was utilized, whilst for main road planning, a road traffic survey was utilized. However, a travel behavioral survey for local areas in Japan has not been sufficiently carried out and, therefore, the travel behavior in these areas is not defined. Focusing on the local area in the peninsula region, which is geographically a special environment, this study is aimed at clarifying the travel behavior in this area. For this case study the Gobo-Hidaka area in Wakayama Prefecture was selected. This area is located in the mid western part of the Kii Peninsula and has recently been awarded world heritage status. The aim is to ascertain the actual status of travel behavior in the small cities and surrounding villages of the peninsula area.

Key Words: Travel behavior, Local area, Elderly people

1. INTRODUCTION

Surveys of travel behavior in Japan have previously been carried out utilizing two methods. For major metropolitan areas a personal trip survey was utilized, whilst for main road planning, a road traffic survey was utilized. However, a travel behavioral survey for local areas in Japan has not been sufficiently carried out and, therefore, the travel behavior in these areas is not defined.

Focusing on the local area in the peninsula region, which is geographically a special environment, this study is aimed at clarifying the travel behavior in this area. For this case study the Gobo-Hidaka area in Wakayama Prefecture was selected. This area is located in the mid western part of the Kii Peninsula and has recently been awarded world heritage status (Figure 1). The aim is to ascertain the actual status of travel behavior in the small cities and surrounding villages of the peninsula area.

The fundamental characteristics of the travel behavior in these local peninsula areas, which have previously not been known, could then be defined. These findings can then contribute to forecast the change in the future travel behavior and the environment load in such local areas.

2. THE TRAVEL SURVEY

This survey was carried out in Gobo City (28,000 population and 9,600 households) and Hidaka County, which consists of 10 towns and villages (64,000 population and 21,600

households). The travel survey, which lasted for one week from October 15, 2002 to October 21, 2002, was of the diary form questionnaire type.

The questionnaires were hand delivered by college students to 599 households in the selected area. This represented a sampling rate of 2% of each district. After one week the students returned to the household to collect the completed questionnaires. A total of 535 household questionnaires were collected which equates to an 89% collection rate. However, due to the complexity of the questionnaire, the applicable number of completed household questionnaires was 375. This represents a 63% completion rate. The 375 completed household questionnaires represented a total of 904 individuals over the age of 15 years old. Figures for each town and village are shown in Table 1.

With regard to the age of the individual respondents in this area, Figure 2 shows the results from the National Census carried out in 2000 and also results of this survey. The differences in the results can be attributed to the small sample size of this survey.

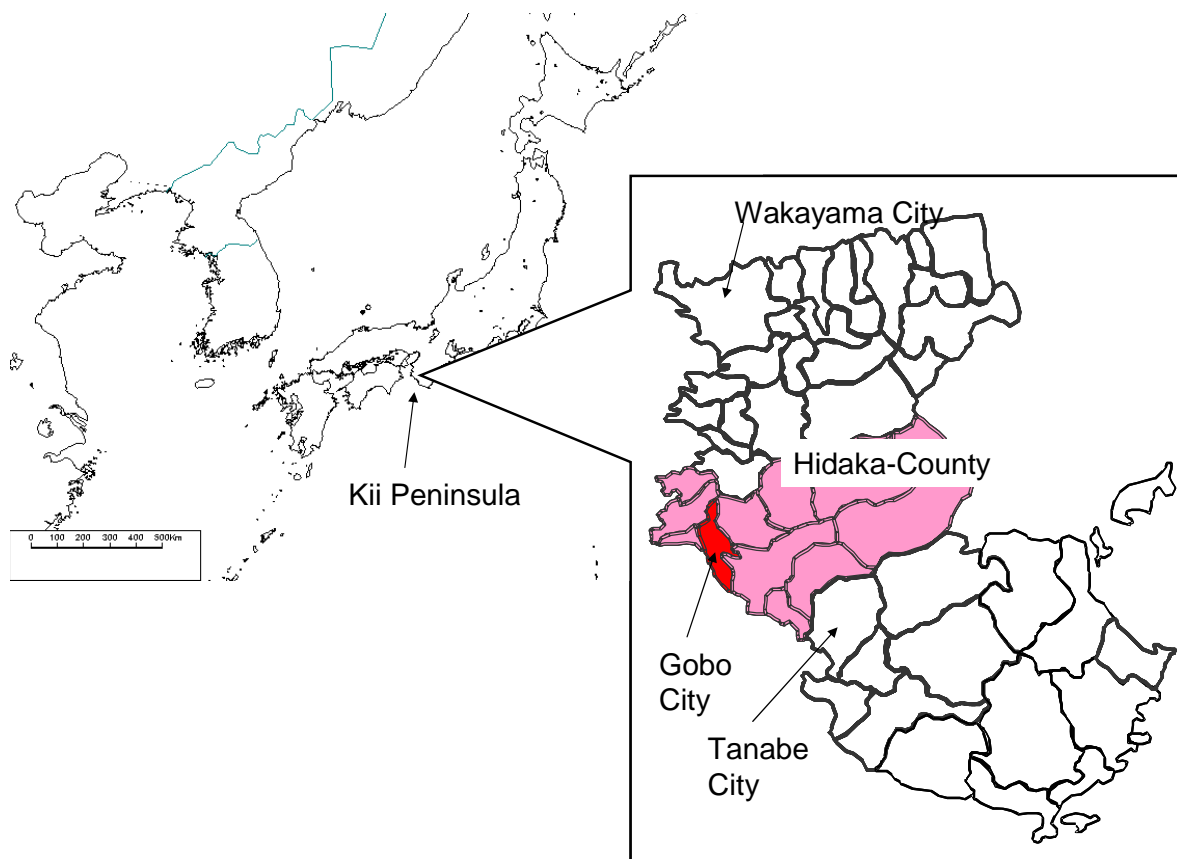


Figure 1. The Study Area

3. BASIC BEHAVIORAL CHARACTERISTICS IN THE STUDY AREA

This chapter examines the basic behavioral characteristics in the Gobo-Hidaka area. In order to compare the personal trip data between weekdays and holidays, the samples on October 16, Wednesday and October 20, Sunday are aggregated. The data from the Personal Trip Survey carried out in 2000 in Wakayama City, which is the capital city of Wakayama prefecture and has a population of 390,000, has been referred to.

Table 1. Distribution and Collection of Questionnaires

Name of Municipalities	No. of Distributed Households	No. of Completion Households	Completion Rate	No. of Collected Individuals
Gobo City	187	115	61%	237
Hidaka County	412	260	63%	667
Mihama Town	65	35	54%	78
Hidaka Town	48	27	56%	75
Yura Town	41	35	85%	77
Kawabe Town	44	27	61%	85
Inami Town	54	36	67%	97
Minabe Town	55	36	65%	94
Nakatsu Village	18	13	72%	24
Miyama Village	19	11	58%	30
Ryujin Village	34	21	62%	53
Minabegawa Vil.	34	19	56%	54
Total	599	375	63%	904

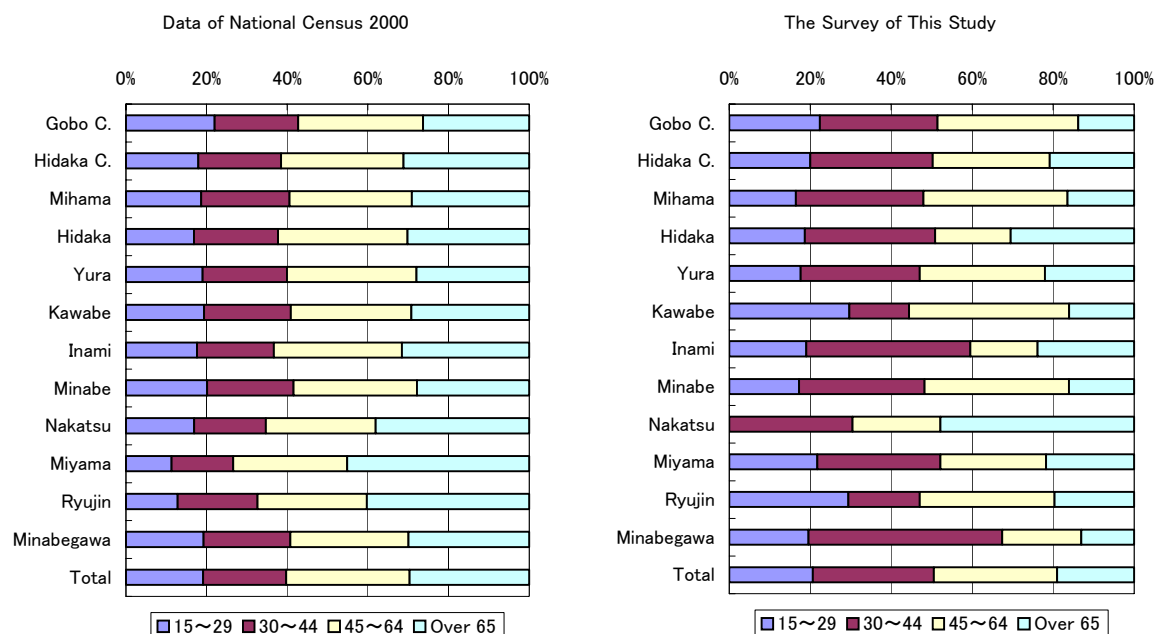


Figure 2. Comparison of Age Structure

a) Trip generation

The ratio of going out in Gobo City and Hidaka County is higher than Wakayama City (Figure 3). For Gobo City and Hidaka County, the ratio of going out is lower for holidays than weekdays. Figure 4 shows the net number of trips per person per day. The figure for weekdays in Gobo is higher than Wakayama, however, the figure for Hidaka is lower than Wakayama. The figure for holidays in Gobo is lower than weekdays but in Hidaka it is almost same. This shows a higher mobility in this area.

b) Modal share of trip

Figures 5 and 6 show the modal share of trip on weekdays and holidays in the study area. The modal share for the railway and bus services is very low, especially in Gobo City where there are few bus users. Car is the main transportation mode in this area. Motorbike and bicycle users are greater in Gobo, but it is interesting to note that walkers are greater in Hidaka County. On holidays, car users are greater than weekdays and other modes are fewer.

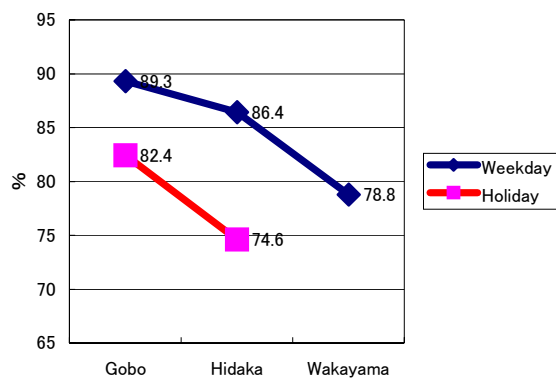


Figure 3. Ratio of Going Out

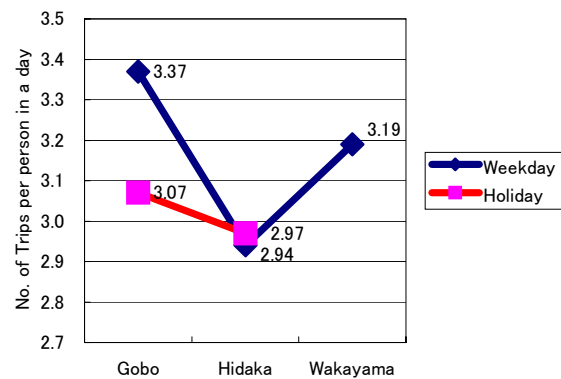


Figure 4. The Number of Trips per Person

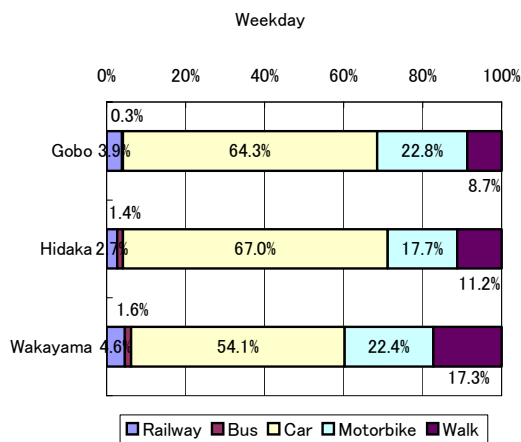


Figure 5. Modal Share of Trip on Weekday

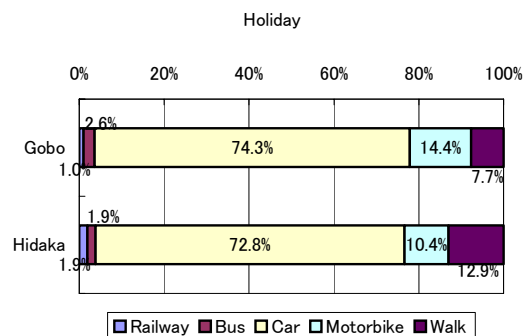


Figure 6. Modal Share of Trip on Holiday

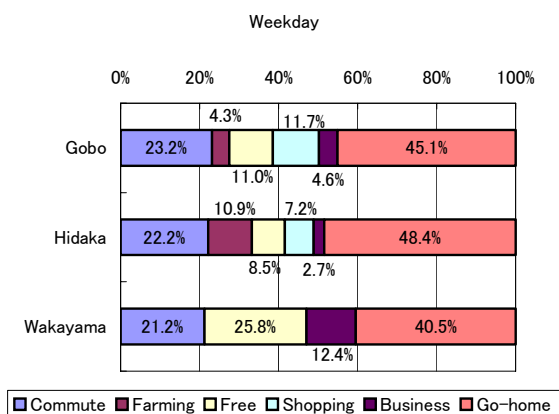


Figure 7. Purpose of Trip on Weekday

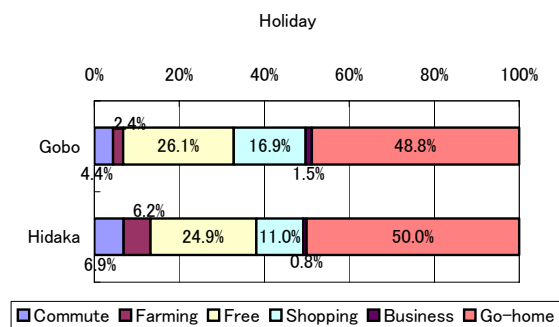


Figure 8. Purpose of Trip on Holiday

c) Purpose of trip

Figures 7 and 8 detail the purpose of the personal trips on weekdays and holidays. Compared to Wakayama, the ratio of going-home trips is higher in this area. This means that round trips are greater than chained trips. In Hidaka County the ratio of free and shopping trips is lower on weekdays. However on holidays, the ratios are almost the same in city and county areas.

d) Destination of Trip

To determine the behavioral range of the residents in this area, the destinations are classified into 5 categories, namely: within same municipality, nearest city to Gobo or Tanabe, within

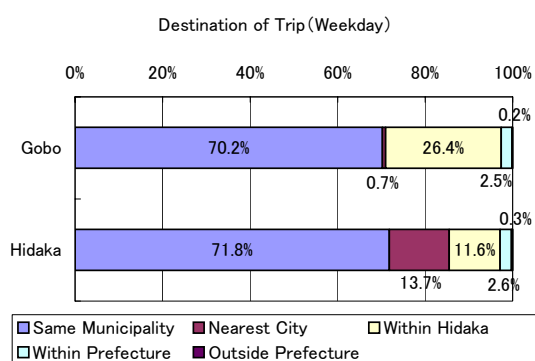


Figure 9. Destination of Trip on Weekday

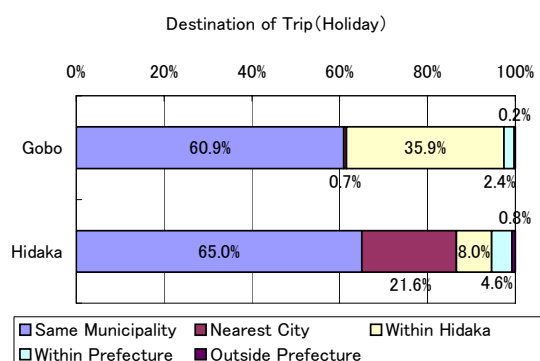


Figure 10. Destination of Trip on Holiday

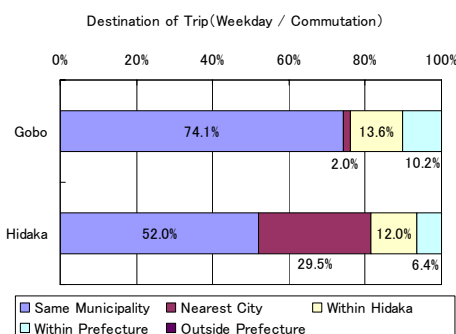


Figure 11. Destination of Commutation Trip on Weekday

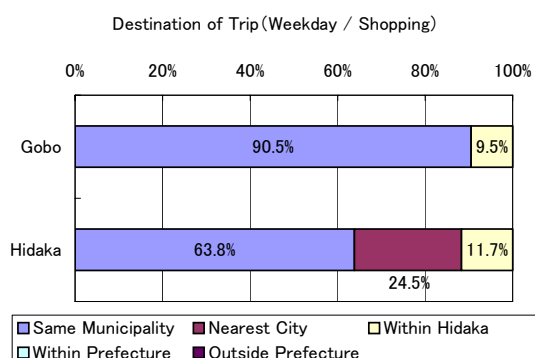


Figure 12. Destination of Shopping Trip on Weekday

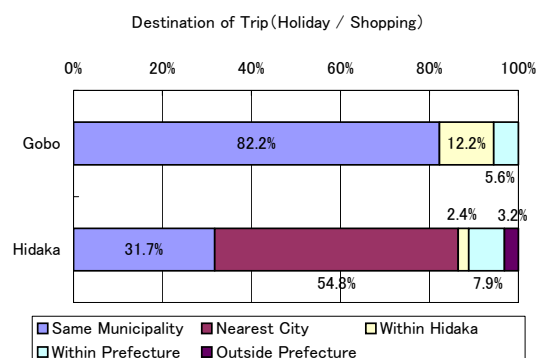


Figure 13. Destination of Shopping Trip on Holiday

Hidaka County, within Wakayama Prefecture except Gobo, Tanabe and Hidaka and outside Wakayama Prefecture.

On weekdays (Figure9), 70% of destinations are within their own municipality and about 97% are within the Gobo and Hidaka areas. This shows that the behavioral range is restricted to the coastal cities and the hinterland in the mountain area. On holidays (Figure 10), the dependence of county area upon city area is higher.

Figure 11 shows the destination breakdown for commutation trips. This shows that 74% of residents of Gobo City work in their city, but only a half of residents of Hidaka county work within their own municipality. This shows the difficulty of finding employment in a county area.

Figure 12 and 13 show the destination breakdown for shopping trips on weekdays and holidays. On weekdays most of the shopping destinations are concluded within the Gobo and Hidaka areas, however, on holidays the range expands to outside of the Gobo and Hidaka areas. This is especially the case in Hidaka county, where about 70 % of residents go outside of their municipality. This shows the high dependence of shopping behavior on city areas.

4. BEHAVIORAL CHARACTERISTICS BY AGE GENERATION

As previously stated, this survey was conducted for one week and as a result a wide range of data supplied by the respondents has been obtained. This chapter examines the differences in the collected data by age generation.

a) Trip generation

Table 2 shows the ratio of going out and the number of trips per day in each area. The data is cross-referenced by age and day of the week. On average the residents in Gobo City go out more than in Hidaka County and the ratio for over 60's in Hidaka is considerably lower. Residents under 18 years of age record high ratios for weekdays, due to school travel, but relatively low ratios on Saturday and Sunday. Other generations record similar ratios throughout the week. With regard to the number of trips per day, residents under 18 years of age in Hidaka County record lower values. This is due to the fact that round trips to school are the main reasons for traveling.

b) Purpose of trip

Figures 14 - 16 detail the purpose of each trip, except going-home trips, for each age generation. For residents under 18 years of age, the main purpose on weekdays is commutation to school and on weekends it is shopping and free trips. For residents from 19 to 59 years of age, commutation and farming are the main purposes on weekdays and shopping and free trips on weekends. For residents over 60 years of age, farming is the main purpose on weekdays and, as with the other age groups, shopping and free trips are the main purpose on weekends.

c) Destination of Trip

Table 2. Ratio of Going Out and the Number of Trips by Generation

		Age	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Ave.
Gobo	Ratio of Going Out	Under 18	96%	96%	96%	96%	96%	78%	81%	92%
		19 – 59	87%	90%	94%	92%	94%	91%	81%	90%
		Over 60	85%	89%	90%	89%	85%	90%	70%	86%
	No. of Trips per Day	Under 18	3.1	3.0	3.2	3.3	3.1	3.7	3.3	3.2
		19 – 59	3.2	3.4	3.4	3.2	3.3	3.4	3.2	3.3
		Over 60	3.5	3.8	3.2	3.2	3.1	3.1	3.3	3.3
Hidaka	Ratio of Going Out	Under 18	92%	97%	94%	98%	95%	73%	69%	88%
		19 – 59	90%	95%	92%	94%	92%	88%	83%	91%
		Over 60	61%	68%	65%	71%	71%	53%	59%	64%
	No. of Trips per Day	Under 18	2.5	2.5	2.6	2.7	2.6	2.8	2.4	2.6
		19 – 59	3.2	3.3	3.2	3.3	3.3	3.3	3.1	3.3
		Over 60	3.1	3.6	3.3	3.2	3.2	2.9	2.7	3.2

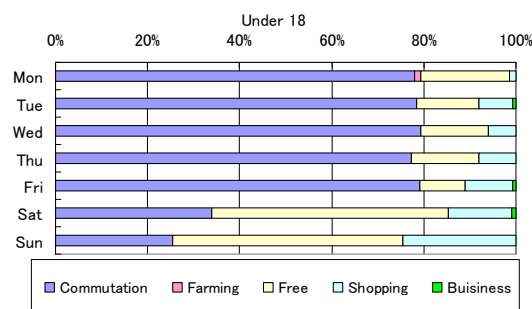


Figure 14. Purpose of Trip under 18 Years Old

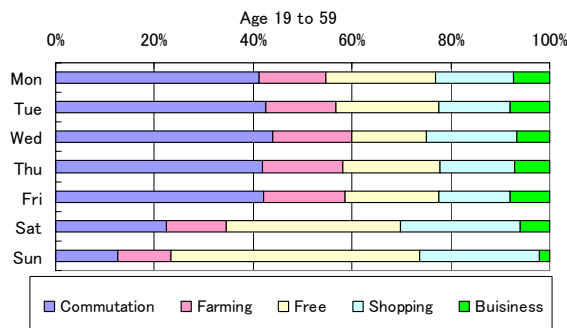


Figure 15. Purpose of Trip from 19 to 59 Years Old

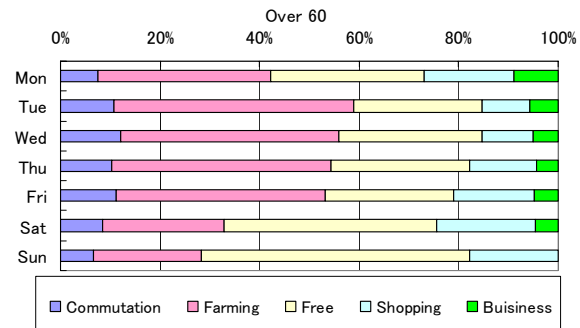


Figure 16. Purpose of Trip over 60 Years Old

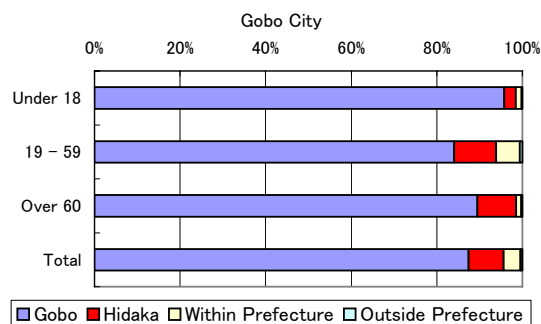


Figure 17. Destination of Trip by Generation (Residents of Gobo City)

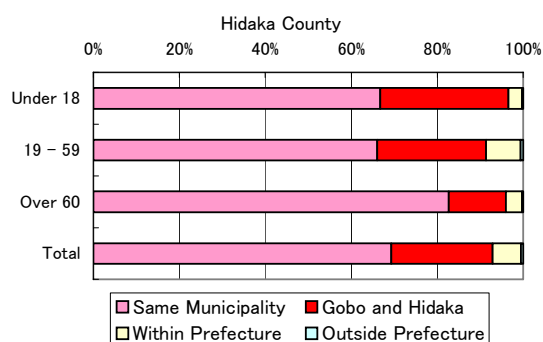


Figure 18. Destination of Trip by Generation (Residents of Hidaka County)

Figures 17 and 18 show the trip destination from the respondents' residence. Over 80% of residents in Gobo City travel within their own area. Whereas in Hidaka County about 30% of residents travel outside their own municipality. However, as residents over 60 years of age find it difficult to travel outside their own area, the ratio of travel within their own municipality is higher than for other age generations.

5. BEHAVIORAL CHARACTERISTICS OF ELDERLY PEOPLE

As can be seen from the above, the transportation behavior of elderly people is quite different from other age generations. Moreover, the transportation behavior of elderly people is different in Gobo City and Hidaka County. As the ratio of elderly people is over 25% in these areas, it is necessary to consider the transportation policy for this group. In this chapter, a more detailed analysis of elderly people's transportation behavior is examined.

a) Trip generation

Table 3 shows the ratio of going out and the number of trips per day in each area. As before the data is cross-referenced by age and day of the week. As there were only 21 samples in Gobo (14 for 60's, 5 for 70's and 1 for over 80's), it is difficult to determine a trend. However, it can be stated that an increase in age tends to decrease the ratio of going out and the number of trips per day.

b) Modal share of trip

Figures 19 and 20 show the modal share of trip for residents in their 60's in Gobo City and Hidaka County. The car is the most common mode of trip sharing in both areas although some of the residents use public transportation. However, as shown in Figures 21 and 22, as residents become older car usage decreases and walking increases. Therefore, the transportation for this age group needs to be reviewed with a view to assisting the transportation mode for this group.

Table 3. Ratio of Going Out and the Number of Trips of Elderly People

		Age	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Ave.
Gobo	Ratio of Going Out	60's	93%	100%	93%	92%	86%	100%	80%	92%
		70's	80%	80%	80%	100%	80%	80%	50%	79%
		Over 80	0%	0%	0%	100%	100%	0%	0%	29%
	No. of Trips per Day	60's	3.5	3.7	3.2	3.4	3.1	2.9	3.2	3.3
		70's	3.5	4.0	3.5	2.8	3.5	3.5	4.0	3.5
		Over 80	0.0	0.0	2.0	2.0	1.0	0.0	0.0	2.5
Hidaka	Ratio of Going Out	60's	79%	77%	76%	81%	85%	65%	71%	76%
		70's	46%	65%	60%	66%	63%	49%	52%	58%
		Over 80	36%	31%	31%	50%	44%	13%	31%	34%
	No. of Trips per Day	60's	3.2	3.7	3.6	3.5	3.5	3.1	3.0	3.4
		70's	3.2	3.4	2.9	3.1	3.0	2.7	2.5	3.0
		Over 80	2.4	2.4	2.0	2.0	2.6	2.0	2.0	2.2

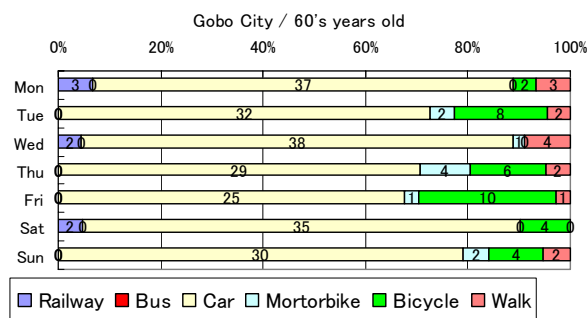


Figure 19. Modal Share of Trip
(Gobo City / 60's Years Old)

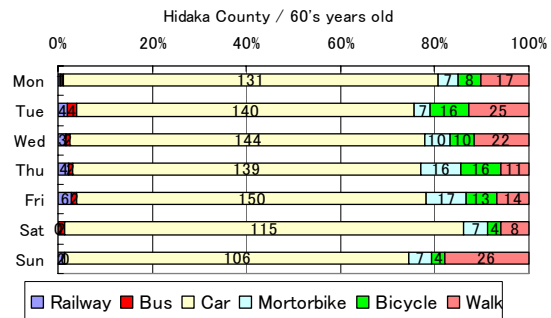


Figure 20. Modal Share of Trip
(Hidaka County / 60's Years Old)

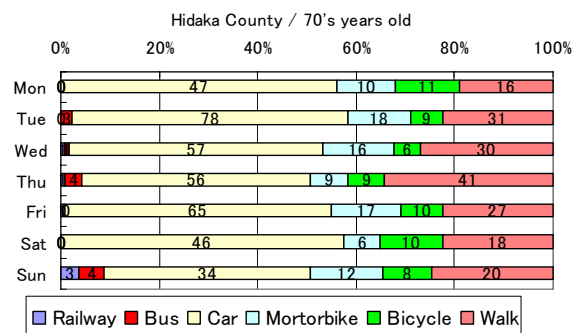


Figure 21. Modal Share of Trip
(Hidaka County / 70's Years Old)

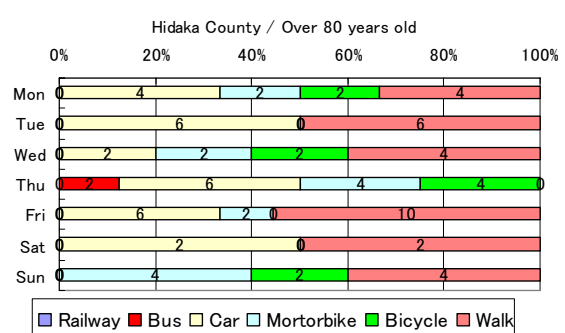


Figure 22. Modal Share of Trip
(Hidaka County / Over 80 Years Old)

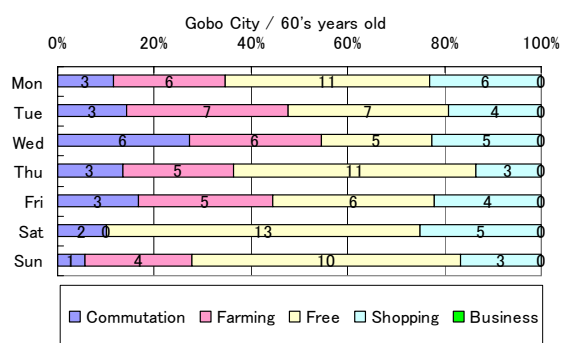


Figure 23. Purpose of Trip
(Gobo City / 60's Years Old)

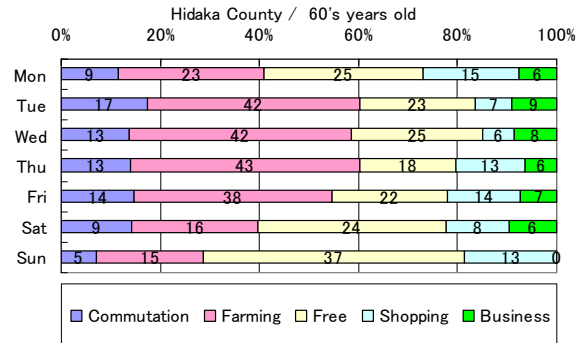


Figure 24. Purpose of Trip
(Hidaka County / 60's Years Old)

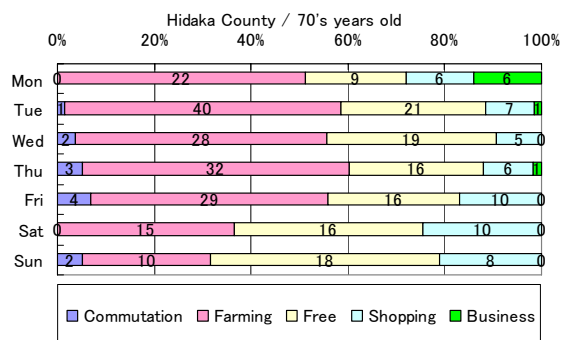


Figure 25. Purpose of Trip
(Hidaka County / 70's Years Old)

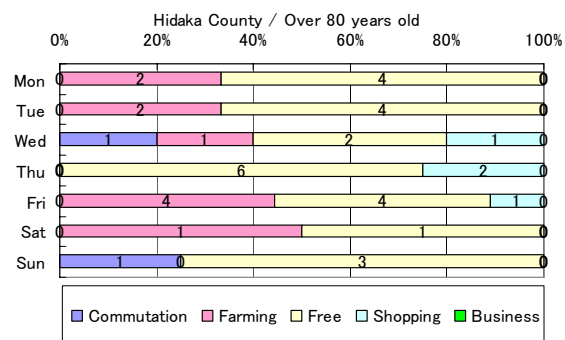


Figure 26. Purpose of Trip
(Hidaka County / Over 80 Years Old)

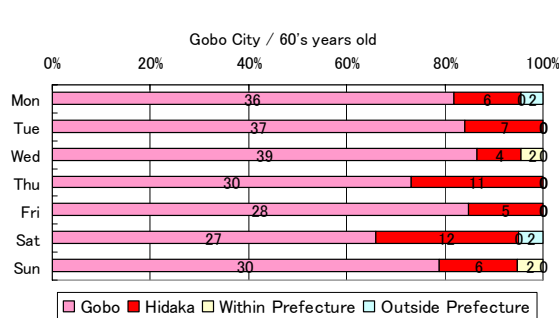


Figure 27. Destination of Trip
(Gobo City / 60's Years Old)

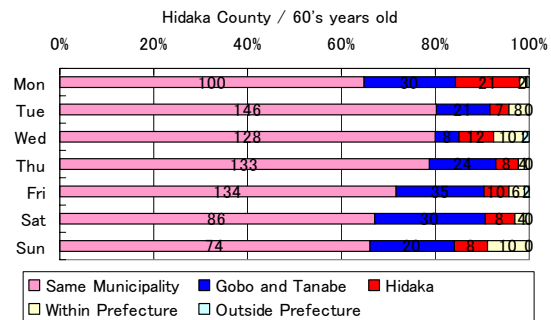


Figure 28. Destination of Trip
(Hidaka County / 60's Years Old)

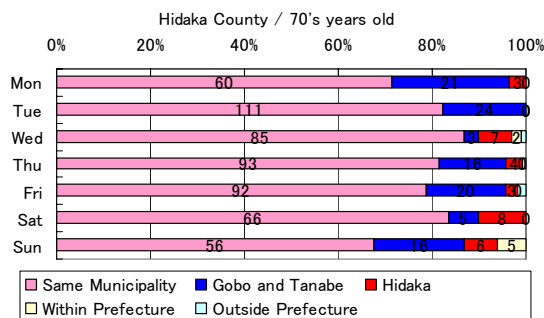


Figure 29. Destination of Trip
(Hidaka County / 70's Years Old)

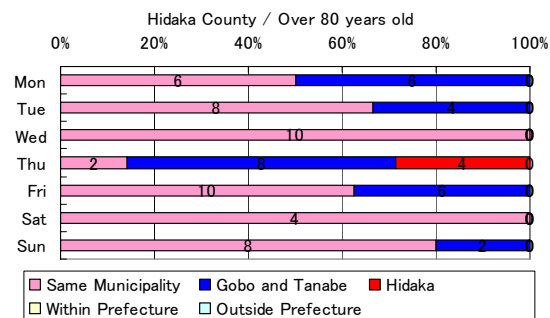


Figure 30. Destination of Trip
(Hidaka County / Over 80 Years Old)

c) Purpose of trip

Figure 23 details the purpose of each trip, except going-home trips, for residents in their 60's in Gobo City. The main purpose is free trips and there is little difference over the week. However, in Hidaka County (Figure 24) farming and free trips are the main purposes on weekdays with free trips becoming the main purpose on weekends. As the residents' age increases the main purposes converge to farming and free trips (Figure 25 and 26).

d) Destination of Trip

Figures 27 - 30 show the destinations of each trip from the residents' residence. Most of the destinations are within their own municipality or the Gobo-Hidaka area. In Hidaka County trips to Gobo City and Hidaka City show a significant share regardless of age. This shows that there is still a necessity to go to the city areas. This is due to the fact specialist facilities such as hospitals as well as major shopping stores only exist in city areas.

6. CONCLUDING REMARKS

This case study focused on the travel behavioral analysis of a local area in Japan, namely the Gobo-Hidaka area in Wakayama Prefecture. From the travel survey conducted in this area the following analytical results were obtained.

a) Trip generation

The travel activity level in this local area is the same as in metropolitan areas. However, those

residents over 60 years of age and who live in the county area tend to go out less than other residents.

b) Modal share of trip

The usage of public transportation is low in this local area. The car is the most common mode of transportation (over 60%) regardless of age. The percentage of residents using a bicycle or motorbike is higher in the city, however the percentage of residents who walk is higher in the county area.

c) Purpose of trip

The purpose of each trip is different between the city and county areas on weekdays however it is the same on holidays. By using a car, residents in county areas can move just as freely as residents in city areas. With regard to elderly people, farming and free trips such as going to hospital are the main purposes.

d) Destination of trip

Concerning trip destinations, about 70% of trips are within the residents own municipality area and about 90% of them are within the selected area. On holidays trips from the county area to the city area are greater than on weekdays.

The fundamental characteristics of the travel behavior in these local peninsula areas, which have previously not been known, have therefore been defined. These findings can now be used in order to aid a forecast in the change in the future travel behavior and the environment load in such local areas. This forecast will require a more detailed analysis to be conducted.

In concluding, I would like to thank three students who have graduated from the department of civil engineering, Wakayama National College of Technology, namely: Mr. Hayato Iriguchi and Mr. Michio Katayama who co-operated in the implementation of the travel behavioral survey of the Gobo-Hidaka area and Mr. Kazuaki Oyabu who provided considerable assistance in analyzing this study.

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