

Location Selection of the Welfare Institution for the Elderly in Nagasaki City Using GIS

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Abstract: Japan is one of the countries where the number of the elderly people is most rapidly increasing. This study aims to locate the suitable areas for the lodgings of elderly people, using Geographical Information System (GIS). We focused on the areas where the residents can live a usual and customary life, which includes walking, shopping, hospitalizing etc. Combining the geographical and municipal data along with some other information obtained from social factors, we performed selection of the optimal locations for welfare institutions. Out of 413 areas within Nagasaki City three different areas were found suitable for such elderly people lodging.

Keywords: GIS, Welfare institution, Nagasaki.

1. Introduction

In Japan, the population of elderly people is increasing very rapidly. Throughout the world, Japan is ranked number three in the order of countries having highest number of elderly people [1].

According to statistical figures of year 2002, 18.5% of Japanese population is above 65 years of age. By the year 2050, it is expected that the elderly population will reach 35.7% of Japanese population. It clearly reflects the fact that, one out of every third citizen of Japan will become 65 years old or more. Moreover, as of year 2000, the number of elderly people, who are living alone, estimated as about 3 million. It is expected that this figure will become 5 million people by the year 2020.

If we drop down to the figures of Nagasaki City the situation is even more alarming. As on year 2000, the population of elderly people (equal to or above 65 years of age) in Nagasaki City is 80 thousand or 19.1% of the total population of the city. Thus the elderly rate of Nagasaki City is surpassing the national average.

Accordingly, given the sharp rise in the number of elderly people in Nagasaki City, it is a matter of great concern and importance not only to give proper care and attention to elderly people, but also to ensure that they can go out to meet the need of their daily life without remaining confined in their houses even when they can move. Thus establishment of welfare institutions where

elderly people feel free to live a comfortable and active life is needed. But if we check the case of Nagasaki City, the welfare institutions are largely located in areas from where movement to hospital, shopping malls etc. is very difficult and time consuming for the users.

In the backdrop of the scenario portrayed above, this study aims at selecting best possible location for the establishment of welfare institution in Nagasaki City by using GIS.

2. Field Survey

This study investigates the welfare institutions for the elderly people in which they stay and can live a usual life, for example, they can go out by themselves.

1) Directly Interview of Elderly People

We have carried out investigation divided into two categories. First is concerning the elderly persons daily life and the next is where these institutions should be built in the future.

With respect to the first category of questions, we have found that:

- (1) The average range in which the elderly people can walk around is within 500m.
- (2) Main means of movement used are walking, buses, and taxis.
- (3) The places usually they moves by walking are parks, stores, hospitals, and bus stops.

With respect to the second category of questions, we have found that:

- (1) Most of the elderly people want stores, hospitals, parks, and bus stops to be near to the residing welfare institution, and some even demand banks, schools, and police station to be near.
- (2) They want the stores to be of shopping malls type, and the hospitals to be of general ones.

Table 1. Location of welfare institutions and availability of facilities.

Institution Name	Going-out Number	Altitude (meter)	Shopping malls	Hospital	Park	Bus stop
A	35	4	○	○	○	○
B	21	19	○	○	○	○
C	10	292	×	×	×	○
D	40	3	○	○	○	○
E	20	119	○	×	×	○
F	15	288	×	×	×	○
G	40	8	○	×	○	○
H	20	16	○	○	×	○
I	20	90	○	×	○	○

Note: ○: Each facility exists within 500 meter.
 ×: Each facility doesn't exist within 500 meter.

2) The Current Situation

Table 1 shows the location of the institutions, facilities available within 500m and the average numbers of elderly people go out from the particular institution.

The result indicates that, the number of people going out is higher in institutions located near different facilities than the institutions, which are not.

In the institutions B and I, few people goes out, because there are steep slopes in front of the institution. Some of the elderly did not mind the altitude or slope if there were shopping malls nearby. But it is difficult to check these comments as there is no shopping malls near the institutions built in the high altitude of hilly areas.

3. Input Data and Processing Method

As also revealed from the interview survey that the elderly people wants to stay in the same areas where they stayed till now, we have divided the Nagasaki City into 413 areas to check whether these areas have the necessary facilities to accommodate elderly peoples living in the region with necessary daily life services.

1) Input Data

In this study, we used Digital data from Geographical Survey Institute [2], [3] and spatial data from ZENRIN CO., Ltd [4].

Date are inputted and created as follows.

- (1) The number of shopping malls, hospitals, parks, and bus stops (hospitals are limited to general hospital)
- (2) The data on direction and slope of roads from the safety point of view.
- (3) The number of police stations and fire service stations.
- (4) Altitude
- (5) Aging rate of each town [5].

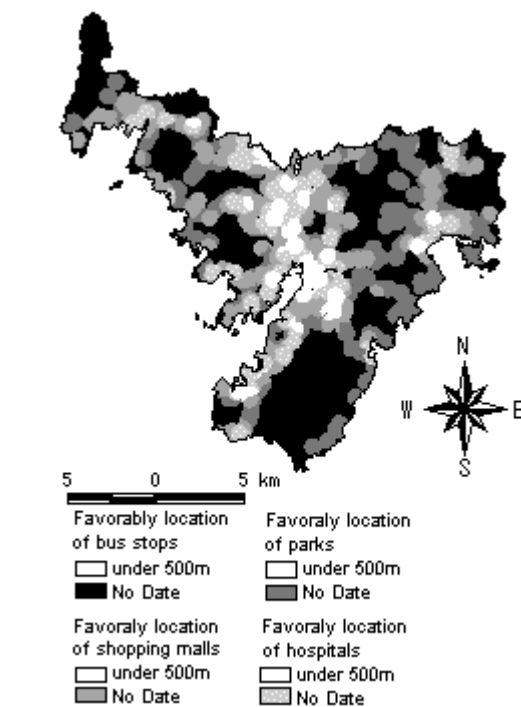


Fig.1. The results of the 500m conditions

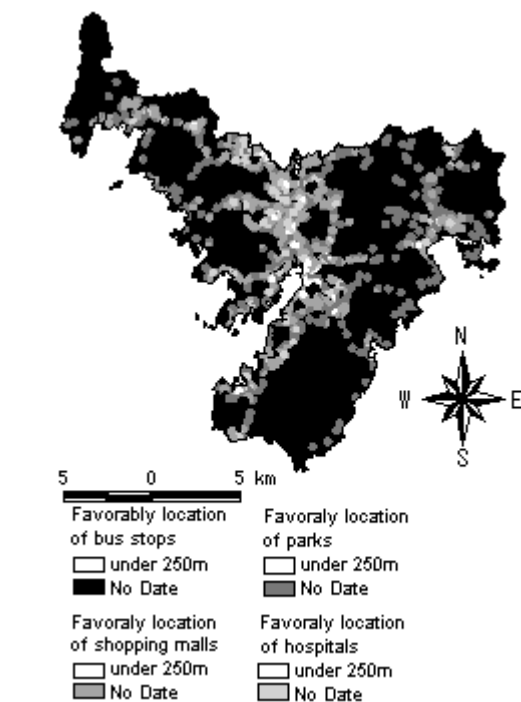


Fig.2. The results of the 250m conditions

2) Processing Method

Firstly, with respect to the input data in number (1) mentioned in 1), we carried out the buffer analysis of 250m and 500m from each data. For the 250m, it is considered by researchers as an easy distance to move by walking for elderly people [6]. While 500m, it was revealed from the direct interview of the elderly peoples. Fig. 1 and 2 show the result of 500m and 250m. The white area

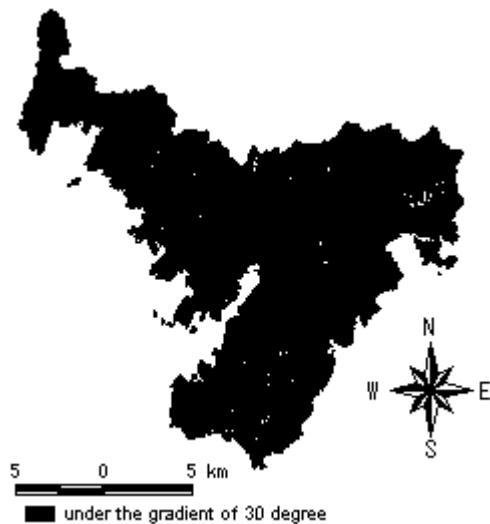


Fig.3. The results of the gradient under 30 degree

which is shown in each figure, is the selected area from interview of the elderly peoples. Fig. 1 and 2 show the result of 500m and 250m. The white area which is shown in each figure, is the selected area from the over-lay analysis.

Secondly, The results of the gradient under 30 degree conditions are shown in Fig.3. We have taken these structures, since Landslide Control Act of Japan enforces this condition as a standard for construction. Moreover, the data on parks used in (1) are significant in the respect of security.

Thirdly, analyzed the data by using over-lay analysis, and selected all the places meeting geographical conditions (facilities and requirements mentioned above) as the candidate area for welfare institutions to build.

Fourthly, reduced the number of the candidates derived above from the viewpoint of security. Data on the location of police and fire service stations and road conditions are used to attain this objective. In addition to this, data on altitude and aging rate are also verified.

4. Results

The results of the analysis are shown in Fig.4. Accordingly, it was found that the areas matching all the geographical and facility conditions within 500m are 237 out of 413. While in the case of 250m scale, 107 areas match the set conditions. Out of these 107 areas, 19 have police stations and 13 have fire service stations or similar facilities nearby. There are 5 areas with both sorts of facilities nearby. But 2 areas are very dangerous, because of high flow of traffic. The rest are less than 100m in altitude. Since there are police stations and fire service stations within 500m, elderly people can avail necessary services in case of emergency.

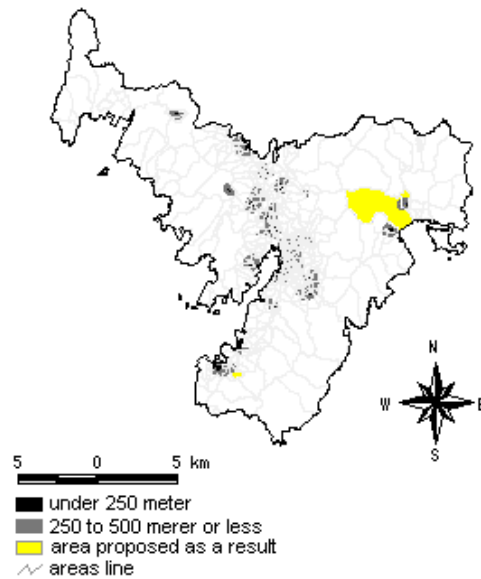


Fig.4. Selected area for the welfare institution

5. Conclusion

In this study we have used four types of data considered as the most vital for daily life of elderly peoples and attempted for selection of location for welfare institutions in Nagasaki City. As a continuation to this study, in future we would like to add more specific data through questionnaire survey and convert them into numerical values depending on the merit of different facilities e.g., existence of police or fire service stations nearby etc.

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