

# PREDICTION OF TOKAI EARTHQUAKE DISASTER DAMAGE IN HAMAMATSU CITY AND THE COMPARISON TO THE PREDICTION REPORT OF SHIZUOKA PREFECTURE GOVERNMENT USING GIS

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## Abstract

It is commonly believed that a gigantic earthquake (Tokai Earthquake) could occur in Shizuoka Prefecture in the near future. The Shizuoka Prefecture Government made the prediction report of Tokai Earthquake disaster damage. But this report does not pay attention to the ground conditions. The authors make a prediction map using GIS of Tokai Earthquake disaster damage in Asada-cho and Hirosawa Ni-chome in the central Hamamatsu City and revealed the location of dangerous houses and dangerous points in road networks in each town. These information could be useful when people try to find escape routes in an earthquake.

**Keywords:** GIS, Tokai Earthquake, Disaster Damage Prediction, Hamamatsu City

## 1. Introduction

It is commonly believed that a gigantic earthquake (Tokai Earthquake) could occur in Shizuoka Prefecture in the near future. The Shizuoka Prefecture Government made the prediction report of Tokai Earthquake disaster damage (Shizuoka prefecture, 2001). But this report does not pay attention to the ground conditions.

## 2. Study Areas

Shizuoka Prefecture is located in the center of Japan and Hamamatsu City is located in the west of Shizuoka Prefecture. In April of 2007, Hamamatsu City and the cities and the towns in the vicinity merged and created New Hamamatsu City. But the data used in this study are mainly based on the old Hamamatsu City Area, and Hamamatsu City means Old Hamamatsu City Area in this study as shown in Figure 1.

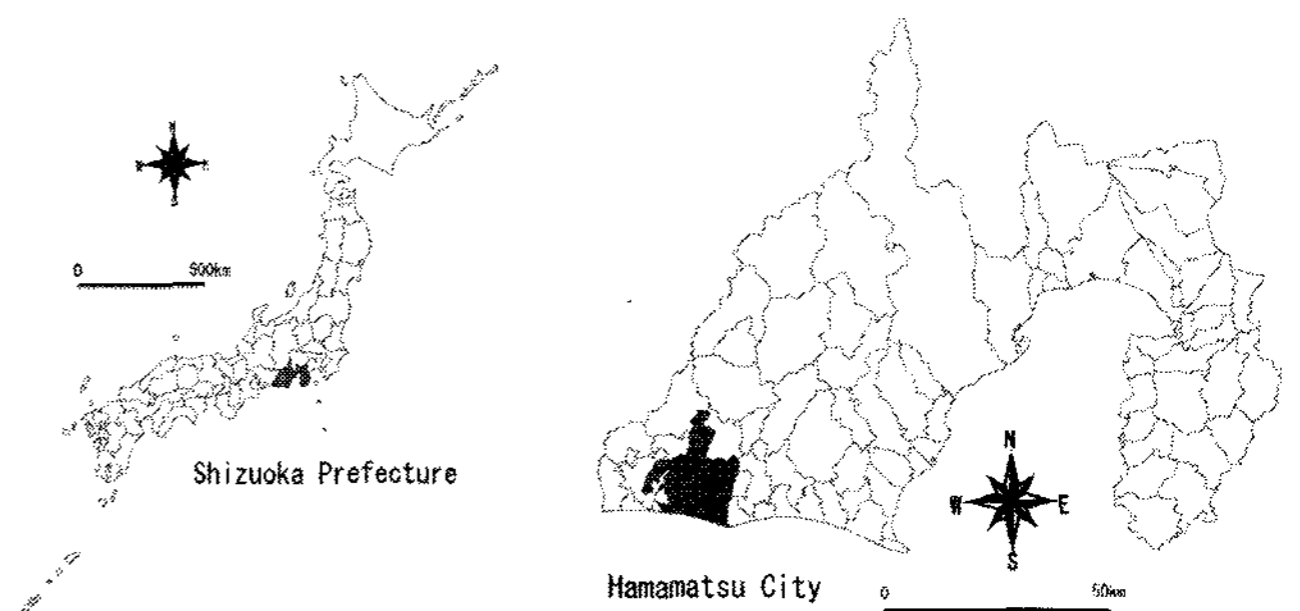


Figure 1 Location of Shizuoka Prefecture and Hamamatsu City

At first, the high ratio areas of wood houses are extracted because the earthquake damage of these are considered greater. This figure shows that these areas are found in the center of Hamamatsu City as shown in Figure 2.

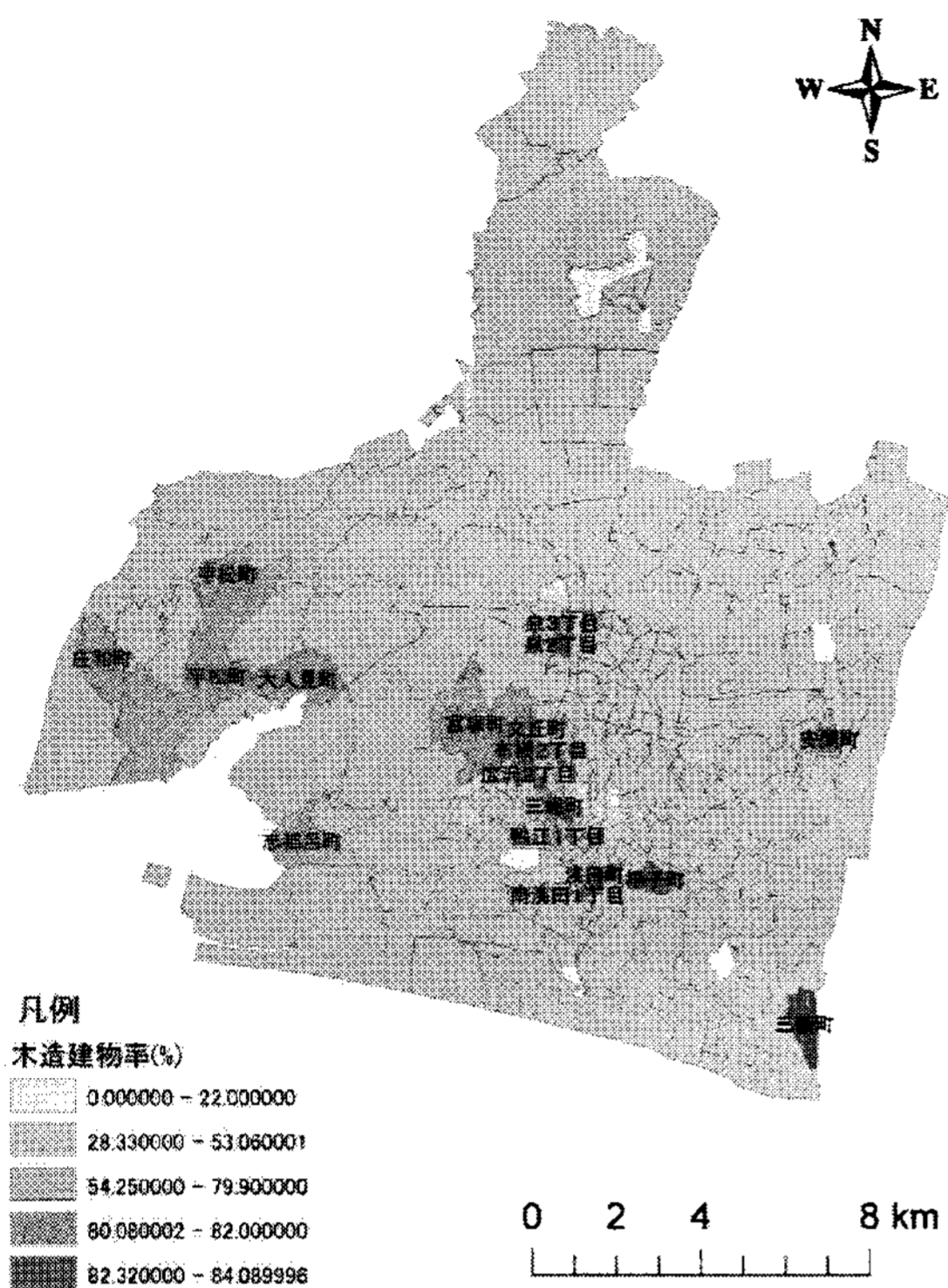


Figure 2 High ratio areas of wooden houses

Number of wooden house / number of all houses (%)

Then, the high ratio areas of old person population are extracted in the central area, because the human damage of these is considered greater. Finally, Asada-cho and Hirosawa Ni-chome are chosen as the study area as shown in Figure 4.

The ground condition of Asada-cho is natural levee and backmarsh and that of Hirosawa Ni-chome is diluvial upland proved based on the Digital Ground Condition Map of Hamamatsu City made by Iwasaki et al (2004) as shown in Figure 3.

### 3. Data and Methods

Digital map of each houses of the study area published by Zenrin Company is used and the ages of each house is examined by eye observation based on photograph of sample houses whose ages are already known as shown in Figure 5 and Figure 6.

Damage estimation is done using the function for

damage estimation shown by Mura0 and Yamazaki (2000) based on the ages of houses and buildings.

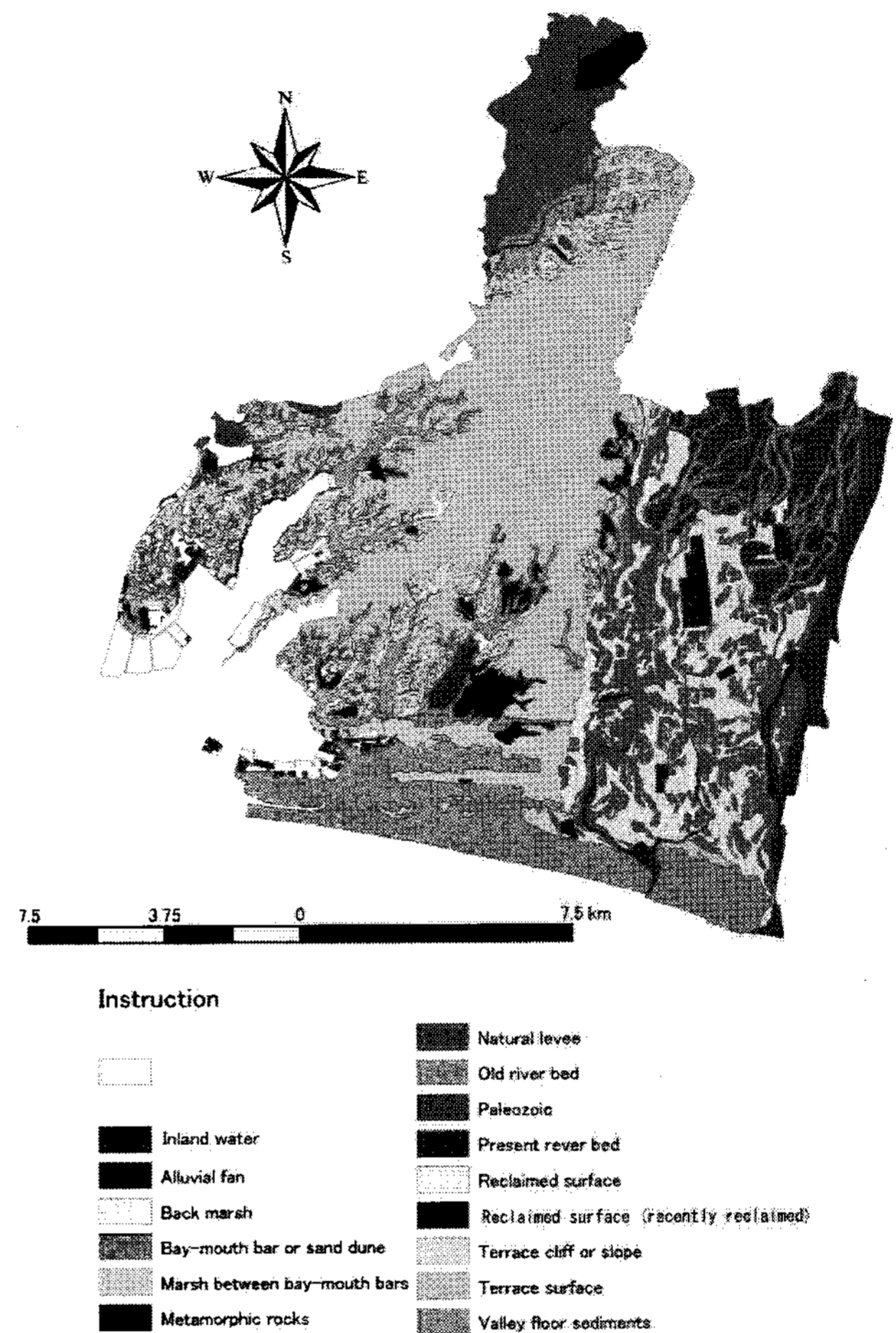


Figure 3 Land Condition Digital Map ( Iwasaki et al, 2004)

### 4. Results

The results are shown in Table 1 and Table 2. In these figures, destroyed means completely destroyed and damaged means partly damaged. Wooden means wooden house, S-building means steel framework building and RC-building means reinforced concrete building.

The damage of Asada-cho is greater than that of Hirosawa Ni-chome. This is because old house are dominant in Asada-cho. Asada-cho is located on natural levee and backmarsh and the damage could be greater, if we take the ground condition into consideration.

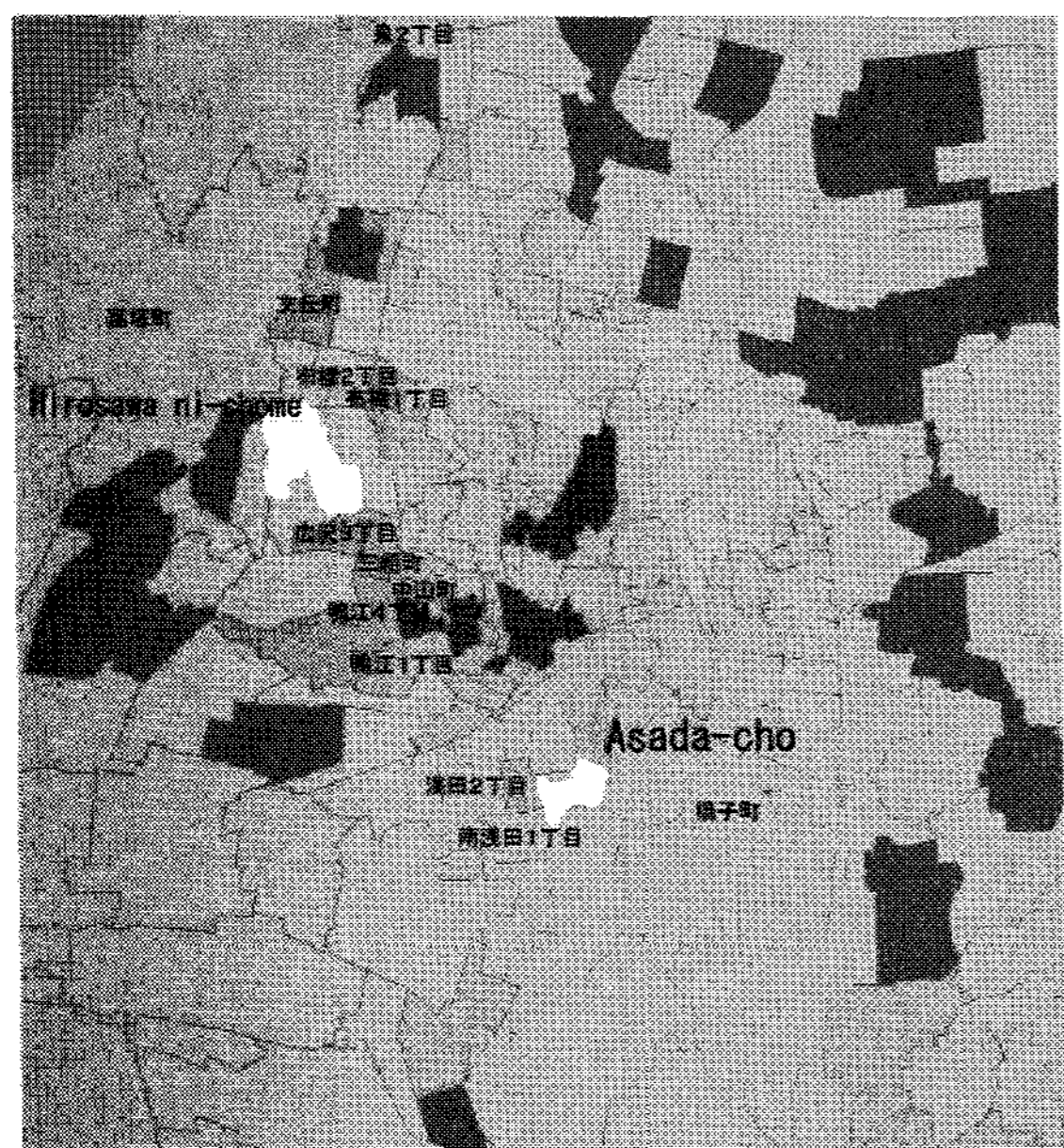


Figure 4 High ratio area of old person (older than 59 years old) population and the selected study area (Asada-cho and Hirokawa Ni-chome)

Table 1 Damage estimation in Asada-cho

	Wooden	S-building	RC-building
Destroyed(1) Number of houses	16.77	1.02	0.39
Damaged(2) Number of houses	96.75	3.85	1.72
Ratio of (1)	6.08	4.08	1.34
Ratio of (2)	35.05	15.4	5.93

Table 2 Damage estimation in Hirokawa Ni-chome

	Wooden	S-building	RC-building
Destroyed(1)	18.66	0.43	0.36
Damaged(2)	143.05	1.85	1.314
Ratio of (1)	2.91	2.87	0.80
Ratio of (2)	22.32	12.33	2.92

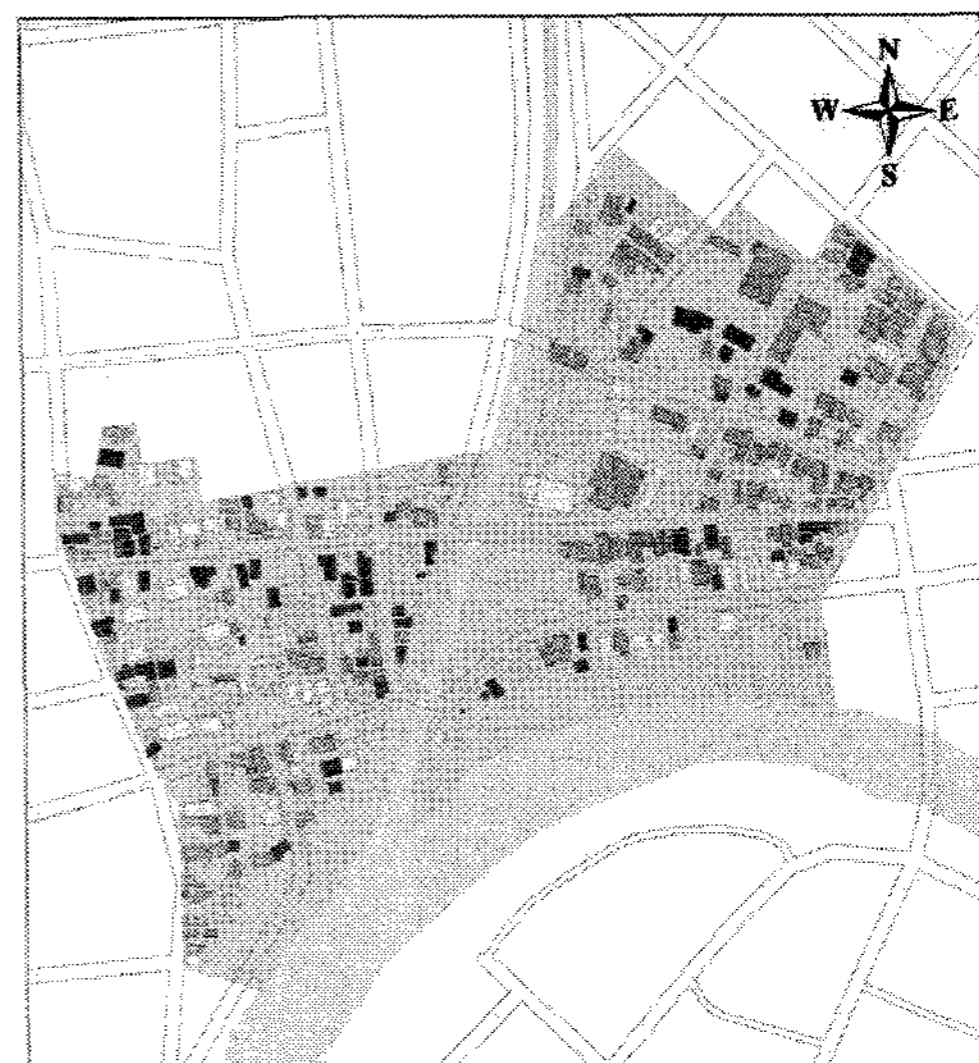


Figure 5 Estimated ages of each house in Asada-cho  
From above: no data available: new to 10 year old: 11~20 year old: 21~40 year old: more than 41 year old.

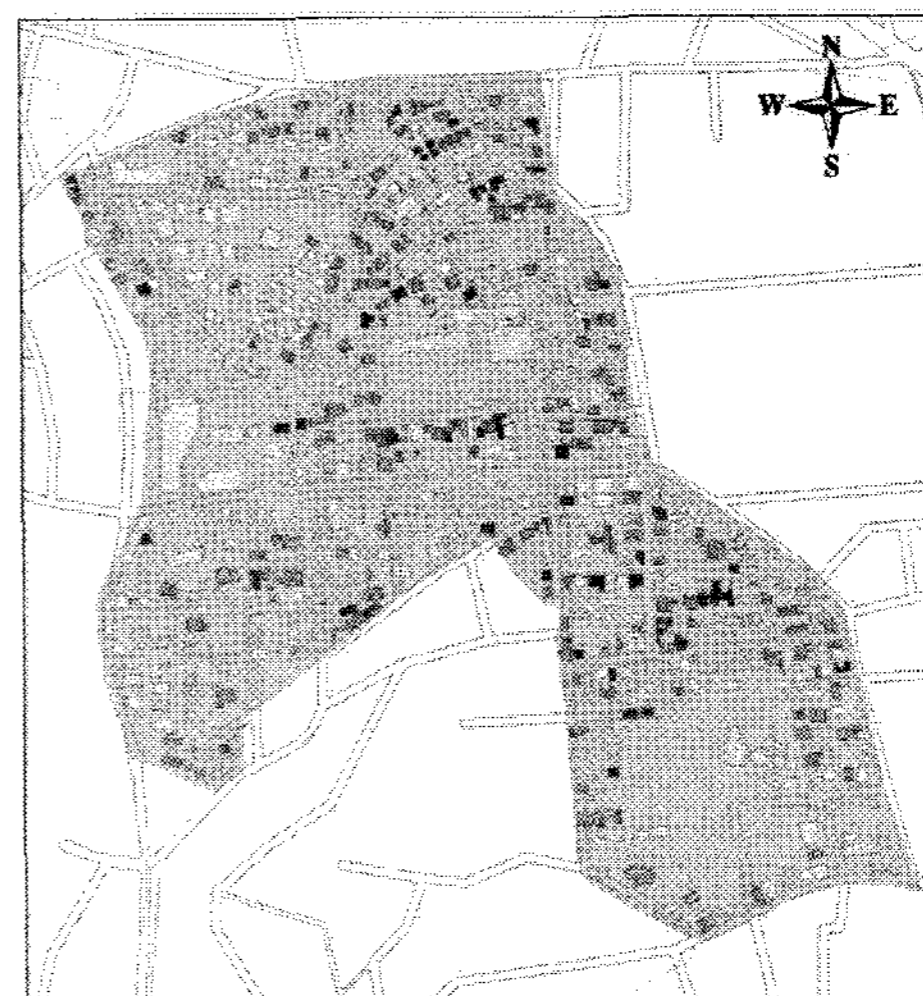


Figure 6 Estimated ages of each house in Hirokawa Ni-chome.

From above: no data available: new to 10 year old: 11~20 year old: 21~40 year old: more than 41 year old.

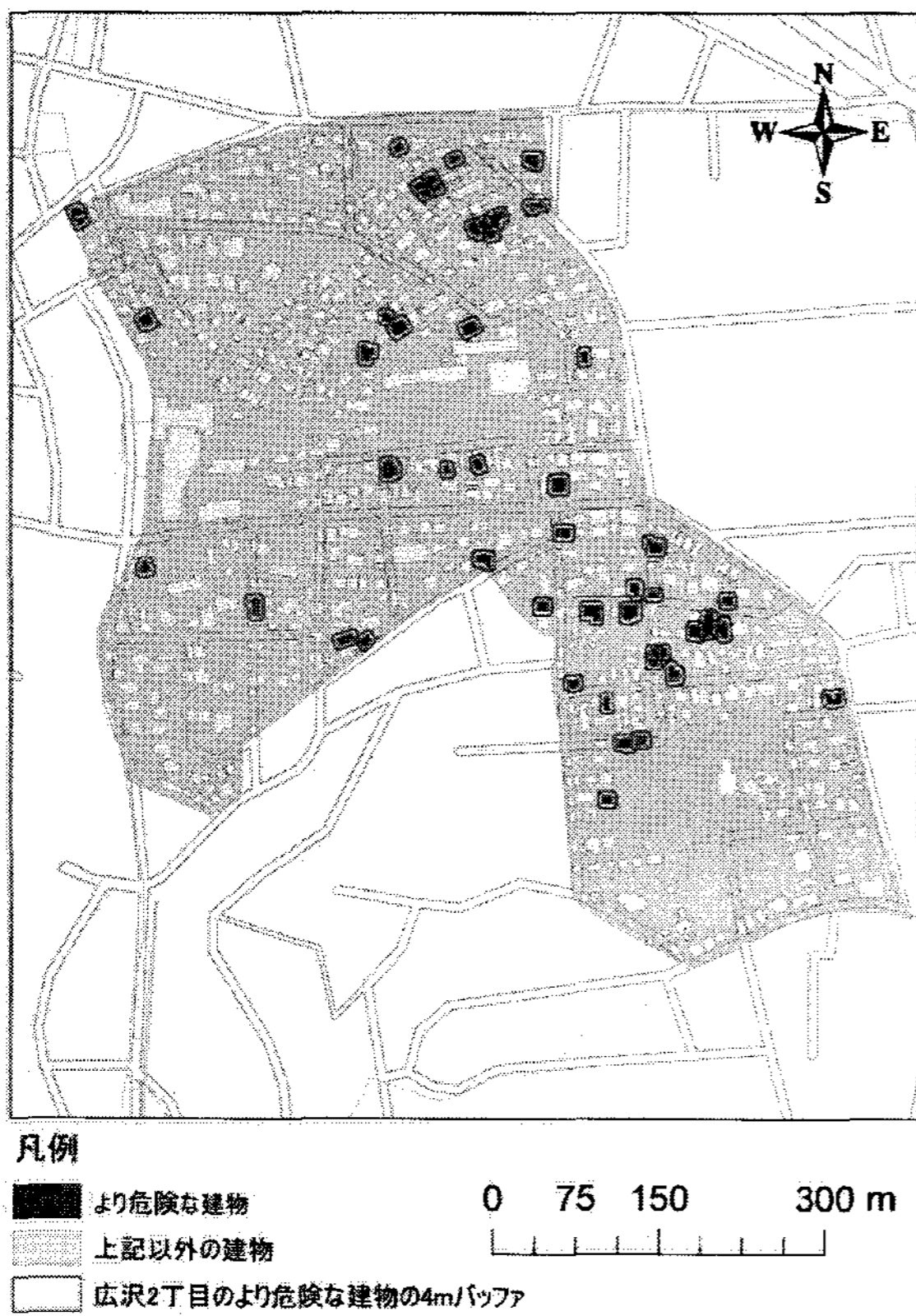


Figure 7 Dangerous areas in Hirosawa Ni-chome

Red house: more than 40 year old and very dangerous

Red circles mean the 4-meter buffers from the red houses

## 5. Discussion and Conclusions

In Figure 7 and 8, red house mean more than 40 year old and very dangerous ones, because these could be destroyed when a big earthquake occurs. Red circles mean the 4-meter buffers from the red houses, these areas mean house debris could expand when red house are destroyed. Figure 7 and 8 shows the dangerous points of road networks of each town. Especially, Figure 8 shows that main roads in Asada-cho could be closed by expanding house debris.

The results of the comparison to The Third Prediction Report of Shizuoka Prefecture Government are as follows:

1. Our damage estimation of Hirosawa Ni-chome is less than the report because this town is located on diluvial upland and the damage could be less than the report.

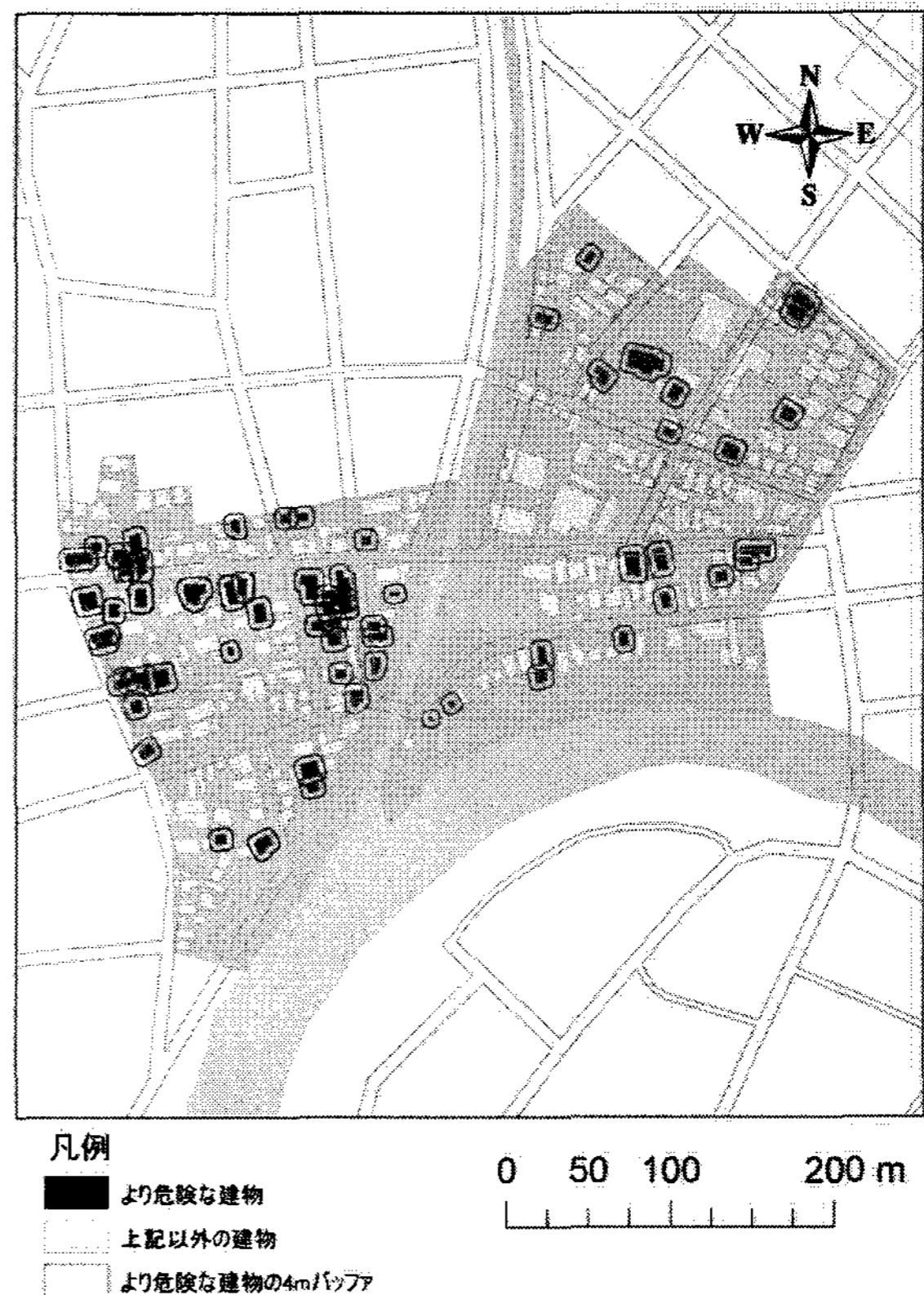


Figure 8 Dangerous areas in Asada-cho

2. Our damage estimation of Asada-cho is greater than the report, because old houses became older now and the report which is made in 2001 is already out of date. the damage could be greater, if we take the ground condition into consideration.

## References

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