# Space Analysis of a Traditional Town for Designing Evacuation Routes considering Probability of Building Collapse

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#### ABSTRACT

Analysis of evacuation routes for traditional buildings is important. In this study, we considered the evacuation routes using the probability of building collapse and analyzed the open space of traditional town. We considered evacuation routes from traditional houses to designated refuge places, and analysis the relationship of open space and evacuation routes.

Keywords : probability of rubble flow, residents, traditional buildings, evacuation routes

#### 1. Introduction

It is important to analysis the evacuation routes from the calculation results of the probability of rubble flow (hereafter, PRF). These calculation results, it is possible to analyze the coverage area of the emergency vehicle and analysis the evacuation routes from residents of the house. We must consider the evacuation routes the event of a disaster and tell about it to residents. To create evacuation routes that assumed disaster is able to create a safe escape route than the current evacuation routes. In this study, the results of PRF, we should create spatial proposals for creating a safer new evacuation routes.

#### 2. Methodology

#### 2.1 Study model area

Our study model area is the whole of Hizenhamasyuku located in Kashima city, Saga prefecture, Japan. The boundry of the area we use is described in a survey report of Preservations District of Traditional Buildings for Hizenhamsyuku[1]. The town is partially preserved with two important preservation districts of traditional buildings. At the bottom of this target area, active fault that Sae fault (the maximum seismic intensity is 6-plus) exists.

#### 2.2 Calculation of PRF

It is necessary to calculate the PRF. Based on height of building, we calculate width of rubble flow (see, Figure 1) [2]. We apply the collapse probability of an earthquake on the calculation result. The result is PRF.

#### 3. Spatial proposals evacuation routes

There are four designated refuge places,Hama Elementary School (H.E.S.), Tobu Junior High School (T.J.S.), Garyugaoka Gym (G.G.), and Kongo Temple (K.T.). We analyze evacuation routes leading to these four places.Here, we show the results of the analysis in case of H.E.S.(see, figure 2):

In case of the analysis of road to H.E.S., there are basicallyonly two roads from traditional houses to Hama Elementary School. Then, both of roads also have high value of PRF, so that these roadscould be dangerous because of the narrow width of the roads and old ages of the buildings along the roads. When an earthquake occurs, overlap of rubble flow of the building is not so big, but PRF is high enough.Therefore, we will not be able to pass the road 1 of the road to Hama Elementary School. Yet, we 8

will be able to pass another route to Hama Elementary School through a park in front of H.E.S. When an earthquake, such a park is very needed for evacuation.

### 4. Summary

We calculated PRF of the whole area of Hizenhamasyuku, considering the Sae active fault recently found near the area and structure of the traditional buildings, then analyzed of evacuation routes. We hope that the result is useful in finding the optimum evacuation routs for self and mutual aid as well as for public aid in the area. Additionally, the flow of the analysis can be applied to the other traditional towns with local heritages.

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Fig.1 Calculation result of PRF (see, [2])



Figure 2. PRF of Surroundings of a refuge place