

Managing Spatial Information to Utilize Disaster Records for Community Safety

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ABSTRACT

It is important to determine specific regional characteristics in order to develop local community strategies against disasters. This paper outlines a study that deals with methods for gathering spatial information about past disasters and providing disaster warnings to various communities in order to help develop safe communities in Yokohama, Japan. In the study, local citizens were asked at neighborhood meetings to provide graphic descriptions of known disasters in their local communities on paper maps. Consequently, the characteristics of their recognition of regional disasters (especially storms) and the methods for accumulating and utilizing such disaster records for community safety were clarified. This paper also proposes methods for transforming disaster records into spatial information in a GIS for the purpose of developing local community safety strategies. The spatial information collected about disasters in each community was recorded as regional history.

INTRODUCTION

Japan is an earthquake-prone country. In addition, it faces the risk of typhoons and torrential rains from around June through October and of snow in winter. Thus, there are many kinds of hazards in Japan.

This paper proposes methods for accumulating spatial information about various past disasters in each community, thereby improving the information reliability and providing disaster warnings in order to help develop safe local communities in Yokohama, Japan.

The local governments have designated neighborhood municipal elementary and junior high schools as local disaster-prevention shelters, where people who cannot return to their homes during or after a disaster can reside for a certain time. In this study, the communities around 26

local disaster-prevention sites in Hodogaya Ward are used as objects. Located in the center of the city of Yokohama and with a population of more than 200,000, Hodogaya Ward has a high residential density and an area of 21.8 square kilometers. Due to many steep slopes and two streams in particular, a number of places are at the risk of storms. Residents are advised to beware of damage from gales and floods during such calamities. Heavy rains can cause a rise in the river water level, landslides, and inundation. In the event of heavy rains, it is advisable to stay away from riverbanks and precipices, which may pose dangers.

THE USE OF THE METHOD

We have used two principal methods: the collection of various disaster maps and lists as official records and the investigation of residents who identified the disasters in the region. The former method will produce objective information, and the latter will produce various types of subjective information based on individual experiences and cognitive space. Moreover, we examined a method to adjust the differences between these types of information in order to improve the information reliability.

The official maps and lists contain information on the areas that suffered flooding, landslides, and inundation of houses above and below the floor level, along with the dates of the disasters. The collected records serve as spatial information by using ArcGIS to search for disaster events in each community. Residents can confirm concrete past local disaster events at the community level. The investigation essentially involved requesting for a plot the house on the regional paper map, for graphical descriptions of the disaster events on the map, and for detailed descriptions of the disasters. The simple medium of a paper map was selected for all residents, although it was possible to collect disaster information online by using GIS in the field of information technology. This was because the digital divide still exists for the elderly, people with disabilities, and people in the low income bracket, who typically tend to require assistance in the event of a disaster. The collected drawing records, including unclear expressions, serve as spatial information by using ArcGIS to search for various events in the community and improve the information reliability. Local governments and communities can understand the vulnerable site to natural disaster in order to take measures to prevent their recurrence.

The investigation itself covered the following questions:

- 1-1. Please draw the site of your house on the map.
- 1-2. Please draw the site and date of past disaster events (Flood or Landslide etc.) you knew on the map.
- 1-3. Please draw the site of rainwater pools and of the sewage overflow when it rain heavily on the map. (Sign of Disaster)
- 1-4. Please draw the sign of disaster else on the map.

- 2-1. This is a map of past disasters (flooded area, buildings inundated and landslide site, Fig.2) based on the official records. Do you know the events?
- 2-2. How do you think that these disaster records open to public?



Fig.1: Scene of the Investigation at Neighborhood Meeting

EXAMPLE OF ANALYSIS

We investigated at 13 meetings and total 217 people filled out the questionnaire in 2006. 95.4% of the respondents plot their house and 61.3% drew the disaster events or signs of disaster on the map. When the distance between the house and site of disaster was calculated, 18.3% drew the events within 100 meters and 28.7% drew over 500 meters. They were divided in extent of their cognizance of disaster.

Relationships between the respondent's attributes and the disaster events they described on the map are as follows. Self-employed persons drew the events they knew cover wide area more than other occupation. Residents living in their own house with many families, staying more than 20 years, and having some experiences as disaster victims have tendency to describe many events cover wide area. There is possibility that such people will be a key person for the community safety. The simple medium of a paper map are useful for accumulation of disaster records, because most of them are elders. It is important to make a paper map easy to read and handle. For instance, a suitable scale for the paper map used in the investigation is 1/7,000 and over. The collected drawing records, including unclear expressions, serve as spatial information by using ArcGIS to search for various events in the community and improve the information reliability. Such spatial information will be useful for Local governments and communities in understanding the vulnerable site to natural disaster in order to take measures to prevent their recurrence. It is also important to transmit the information to the other communities and next generation. Fig.4 shows the flow of managing spatial information to utilize disaster records for community safety.



Fig.2:
Past Disaster Map
based on the
Official Records

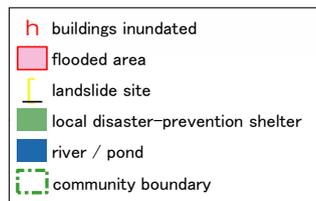


Fig.3:
Past Disaster (red mark) and
Sign of Disaster (blue mark) Map
based on Response of Residents

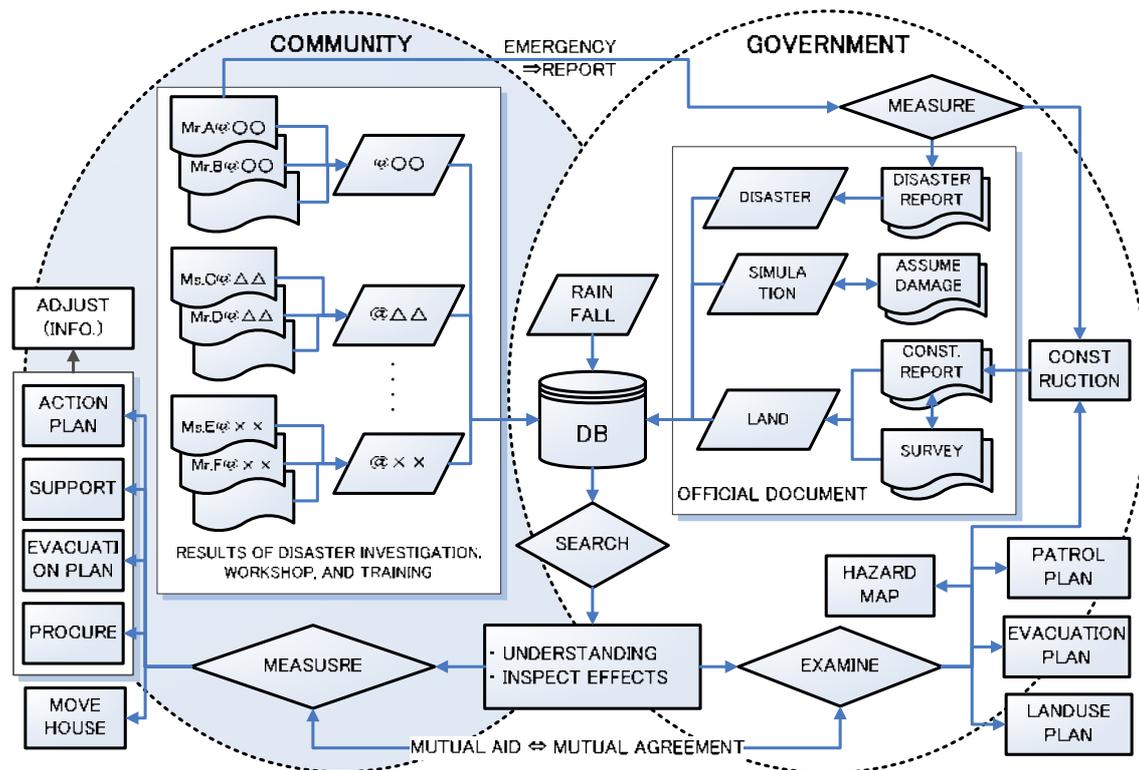


Fig.4: Flow of Managing Spatial Information to Utilize Disaster Records for Community Safety

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