# A Study on Communication Tool for Urban Disaster Prevention Using Multimedia

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## Abstract

The Hyogoken-Nanbu Earthquake caused serious damage in Hanshin-area in Japan, on 17, Jan., 1995. This damaged area had already been pointed out by Environmental Karte made by Kobe-City Office 20 years ago. The aim of this study is to construct the system that notice efficient widely information related to urban disaster prevention to the inhabitant. Firstly, we collect the basic data related to the urban planning. And the risk for disaster in the district scale is ranked is by GIS. In this research, The following results were obtained: Firstly, the index is limited by the presence of a variety of basic information which composes the risk rank. Secondly, in the present state, to maintain of information is uneven depending on each administrative division. Thirdly, it is possible to treat the maps of various scale and adequate information by using the system that we constructed. And the present state photograph of the forecast danger part is added to the explanation. So that, we can explain information visually.

## 1.Introduction

The Hyogoken-Nanbu Earthquake caused the largest damage to one of the most modern and vast urban areas in Japan, Hanshin-area, on 17, Jan., 1995. This damaged area had already been cleared by Environmental Karte made by Kobe-City Office 20 years ago. However, this information has not spread among the inhabitants. One of the reasons is that information transmission media were then undeveloped. If

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the inhabitants had been able to obtain information enough to understand the situation, damage due to the earthquake might have been reduced. Figure 1 shows the building dilapidation risk designated by an environmental karte. Figure 2 shows the region where the building was completely destroyed due to the earthquake. The agreement became numerically clear by comparing both.

In the background of these, two problems described as follows can be deduced. First, it was important to notice the result of an environmental karte at that time to the inhabitant in the region widely. Second, better means to notice information efficiently is necessary.

Therefore, the purpose of this research is as follows:

1. Collection of the basic information for urban planning. And examination of the data maintenance situation in the present state.
2. Making of the information for urban disaster prevention at the district level using the GIS. And proposition of the means to notice the result to the inhabitant efficiently.

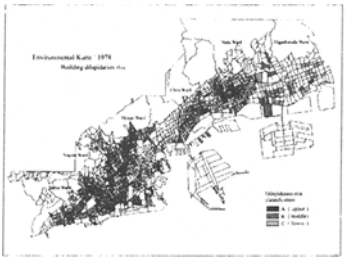


Figure.1 Environmental karte
Building dilapidation risk

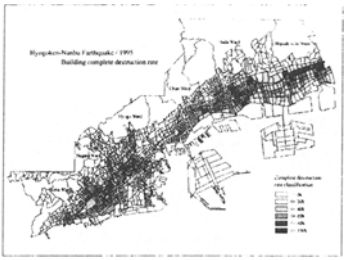


Figure.2 Hyogoken-Nanbu Earthquake
Building complete destruction rate

2. Collection of the information for urban disaster prevention.

The material to calculate a risk of the region should be collected. Next information and its means and media which relates to disaster prevention at the district level should be grasped. And the ideal way of information in future should be considered. The data that We collected is summarized below to calculate a disaster dangerous degree.

Table.1 Basic database of urban planning

| |
|---|
| **i) Map database** |
| Building form database<br>(Reduced scale 1/2500) |
| **ii) attribute database** |
| **Buiding and Block code,Building and Land usage, Building structure, Number of floors, Building and total floor area, Number of houses, Address, Block area** |

## 3. Survey of information maintenance by the municipal corporation

When a plan is made, it is necessary to investigate the actual condition of the object. Map and statistical data variously in the urban planning field are once made by basic survey of urban planning which the urban planning law determined in 5 years in Japan. However those basic data are influenced in proportion to the necessity of each administrative divisions, and the maintenance of the data is various by the difference of the management system in the municipality. There are many problems that it does not have the common basis. Here, the basic information for urban planning upgrading situation in our country is summarized below. (Table.2)

Table.2 Basic survey of city planning enforcement situation in Japan

| Item | Enforcement situation |
|---|---|
| Building area by the structure | Forced: **23.8%** Occasionaly:**14.0%**, No:**49.7%** |
| Land use map | Forced: **80.9%** Occasionaly: **9.9%**, No: **5.4%** |
| Roads map | Forced: **58.9%** Occasionaly:**20.4%**, No:**15.6%** |
| Building age record | Forced: **25.0%** Occasionaly:**22.0%**, No:**45.3%** |
| Soil map | Forced: **10.2%** Occasionaly:**15.3%**, No:**65.9%** |

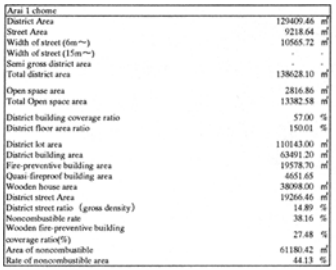
As the Table.2 indicates, as it is the enforcement situation is not uniform. Also, it is an important problem about whether or not the data are digitalized to treat on GIS. It is requested that data is upgraded effectively as we are able to obtain necessary information right away.

## 4. Construction of calamity risk judgment system using GIS

Various indexes on the environment in the region are combined on GIS. The result is output in the form of an image and the numeric data.(figure.3-6)
Here, individual numeric information which composes the evaluation item is controlled besides figure information. Therefore, the part controlled by the judgment of the information operator according to the work situation is large. Even if automation is developed considerably, manual operations are still necessary.

Figure.3 Existing land use map

Figure.4 Fire fighting operation difficult zone map



| Arai 1 chome | | |
|---|---|---|
| District Area | 129409.46 | ㎡ |
| Street Area | 9218.64 | ㎡ |
| Width of street (6m~) | 10565.72 | ㎡ |
| Width of street (15m~) | - | - |
| Semi gross district area | - | - |
| Total district area | 138628.10 | ㎡ |
| Open space area | 2816.86 | ㎡ |
| Total Open space area | 13382.58 | ㎡ |
| District building coverage ratio | 57.00 | % |
| District floor area ratio | 150.01 | % |
| District lot area | 110143.00 | ㎡ |
| District building area | 63491.20 | ㎡ |
| Fire-preventive building area | 19578.70 | ㎡ |
| Quasi-fireproof building area | 4651.65 | |
| Wooden house area | 38098.00 | ㎡ |
| District street Area | 19266.46 | ㎡ |
| District street ratio (gross density) | 14.89 | % |
| Noncombustible rate | 38.16 | % |
| Wooden fire-preventive building coverage ratio(%) | 27.48 | % |
| Area of noncombustible | 61180.42 | ㎡ |
| Rate of noncombustible area | 44.13 | % |

Figure.5 District basic data

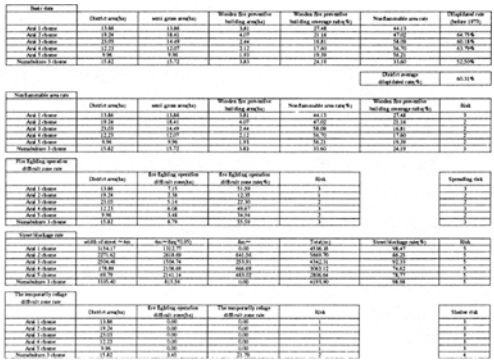


Figure.6 Urban calamity danger rate

## 5. Web site for the communication tool for urban disaster prevention

It is not the one concluding all only in people who have expertise in the urban planning field. The urban planning exchanges from the initial step also by general people and goes repeatedly in the discussion. Both of them, sharing knowledge is important. Then, the merit of the internet technology is used.

In this research, the inhabitant is targeted. The treatment method of information becomes important from that. The web site to notice information to the citizens widely is made.

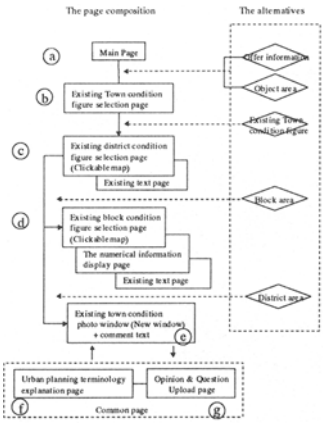



Figure.7 System flow chart

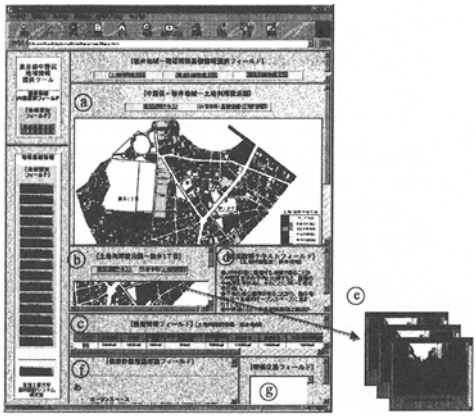


Figure.8 Prototype Web site

**Fig.8-a flame :** It is possible to see the basic information for urban planning

and urban disaster prevention of the district scale. It is compared in block unit, and a around environment grasps the present condition of the danger.

- **Fig.8-b flame :** It is possible to see the basic information related to urban planning and urban disaster prevention of the individual building scale. And, more detailed information is provided, and present grasping is made possible.
- **Fig.8-c flame :** It is possible to see the image data of a and b flame with numerical value data here.
- **Fig.8-d flame :** Characteristics under the present condition and a problem are enumerated by the sentence.
- **Fig.8-e window :** The picture taken in the spot is indicated with the comment. And, a detailed explanation is added to the vague color map information.
- **Fig.8-f flame :** The special term of the city planning and the index of risk rank are explained.
- **Fig.8-g :** It is possible to notice it right away, in the case that feel question and also want to express the opinion.

## 6. Discussion

When information for the urban planning is noticed on the web site, a variety of effect and the problem point are thought by the present state. A main anticipated points are described as follows

**Effects:**

- Map on various scales corresponding to the content of transmission is used. The expression in range corresponding to the necessity is possible from each some blocks to surrounding of own house by that. It is possible to see them in one window on the web site.
- The photograph of the present state of the forecast danger part is added to the explanation. It can be understood that the risk rank in numerical value to which the image is not gripped easily sight in doing so.
- When an old paper map was updated, it was necessary to update all. The digitalized map is good only in the correction of the change part. Waste is suppressed from these in respects of time, work, and cost, etc.

**Problems:**

- A lot of people will express various opinions to the urban planning by using the internet. It is necessary to establish the technique objectively evaluated to the plan to arrange those opinions efficiently.
- On a technological side, compatibility with the web site is not good for map information on the vector type data. Therefore, interactively to search and to display necessary information, a highly developed technology is needed.

## 7. Conclusion

In this research, we collected various information for urban planning and constructed GIS systems by using them. In this system, attribute information was made to link with the figure information, and it became possible that it was indicated interactively on the web site. It became possible by this that important information was noticed effectively for the inhabitant. And it has been understood through the research that the index is limited by the presence of a variety of basic information which composes the risk rank. In the present state, the maintenance situation of information is uneven depending on each administrative division. It is necessary to maintain information often used in a lot of municipalities. Moreover, it is necessary to open such information to the public widely within the range which privacy permits. It will become possible that the web site which we made efficiently gets information in comparison with method of delivery by the conventional paper media. It is expected that it is one of the very efficient tools in urban planning field of which the information joint ownership of the interpersonal is important. In the time, maintenance of the database and information service using web site described in advance will fulfil the important role, when the understanding of the citizen is urged.

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