

## Best Practice of Flood Hazard Map in Japan

### 1. Hazard map in Japan

There are about 1,500 municipalities in Japan, which need to prepare flood hazard map. 510 municipalities have already made and disclosed FHM by the printed material and 181 municipalities published it through internet (As the end of Dec. 2006). In this connection, 232 municipalities published Tsunami hazard map and 56 municipalities published Tidal hazard map among the target 657 municipalities (As of the end of March 2007).

### 2. “Ubiquitous Hazard Mapping Project”

Ministry of Land, Infrastructure and Transport (MLIT) decided to set up sign of disaster information such as flood water depth and flood evacuation shelter in the urban area. These signs will not only assist inhabitants but also tourists and foreigners for evacuation.

MLIT is implementing to designate and publish inundation hazardous areas and Municipalities are promoting to produce Flood hazard map by Flood fighting Act to secure smooth

and prompt evacuation and to mitigate the flood damages. MLIT decide to promote “Ubiquitous Hazard Mapping Project” in the urban area.

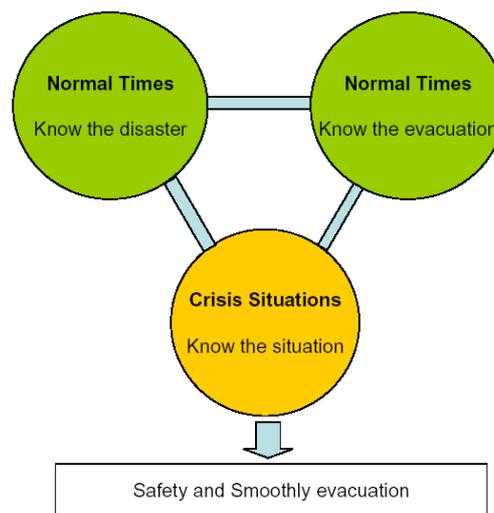
“The study committee for guideline on flood sign” and “The study committee for flood pictogram design” have been discussing up to now. “Guidance for Ubiquitous Hazard Mapping Project” based on the result of these study committees is published for river administrators and municipalities.

Specifically three flood disaster signs, “Flood Water Depth”, “Flood Evacuation Shelter” and “Levee” were determined and standardized across the nation. In addition, MLIT have applied for JIS (Japanese Industrial Standards) and will make efforts to define these sign as ISO standards.

Flood Water Depth



This pictogram shows probable flood area



### Flood Evacuation shelter



This pictogram shows safe building in case of flood disaster

### Levee



This pictogram shows protection area against flood, in other words, inundation area in case of flood.

### Images in the town

Sign is attached to electric pole directly.



### 3. An example in Toyooka City, Hyogo Prefecture

#### (1) Devastating flood and rehabilitation

##### · Damages

Strong and large-sized Typhoon TOKAGE landed to Kochi Prefecture at about 13:00 of 20 Oct. and again landed to Izumi-Sano City, Osaka Prefecture before 18:00. The rain total by typhoon and seasonal rain front exceeded 300mm in North of Kinki Region, and Tokai Kou-Shin-Etsu district and it became the heavy rain in the wide range.

Much damage such as tidal waves, heavy rains, mudslides and floods were caused in the nation by Typhoon TOKAGE in the nation. Its human and housing damages were as followings:

- death tools: 95 - missing: 3 - injured: 552
- complete collapse: 893 - half collapse: 7,764 - partial damaged home 10,841

New Toyooka City had much housing damages as followings and it make up 50% of total of Hyogo Prefecture.

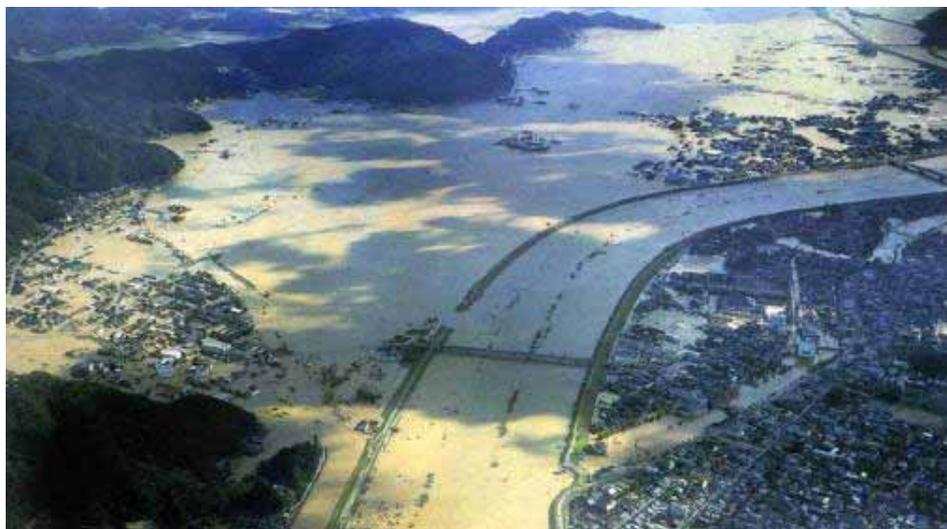
- death tools: 7 ( 6 by flood and 1 by land slide) - injured: 51
- complete collapse: 333 - serious half collapse: 1,082 - half collapse: 2,651
- partial damaged home 292
- above the floor level inundation: 545 - under the floor level inundation: 3,326

Toyooka City was designated as devastated area by Disaster Relief Act on 21 Oct., by Natural Disaster Victims Relief Law on 31 Oct. and by Act concerning Special Financial Aid to Deal with Major Disaster on 1 Dec. (As for Disaster Relief Act appointment old Takeno Town is excluded.)

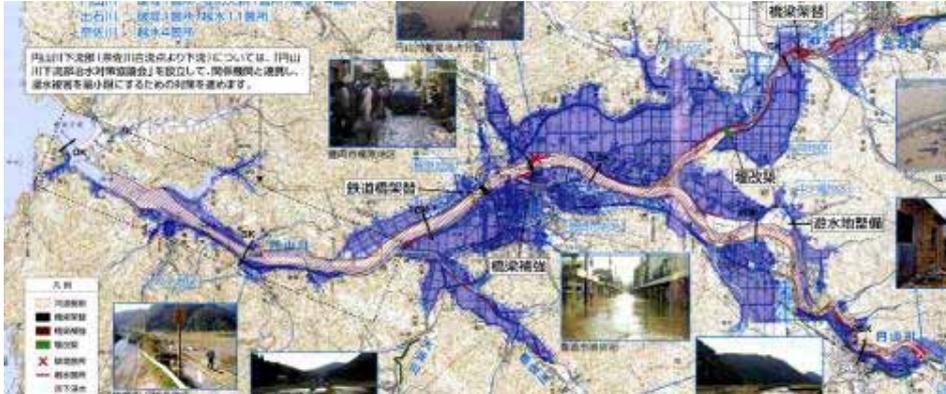
6 persons were deceased by flood. One person was deceased by the flood with the house which flowed out due to the dyke break. Two persons were involved in the flood while moving car. Two persons were drowned by the flood in swollen river. One person was discovered inside the house where it submerged.

As for the 51 injured persons, some of them fall down by the strong wind and others were hit by flying something.

Flood damages in Tooyoka City (Maruyama River) in Oct. 2004

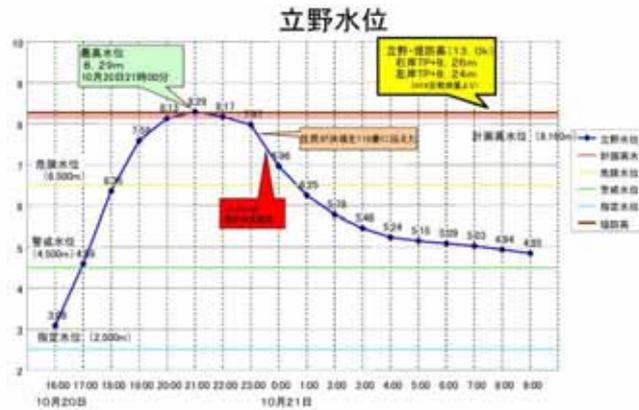


### Inundated area ( Blue area )



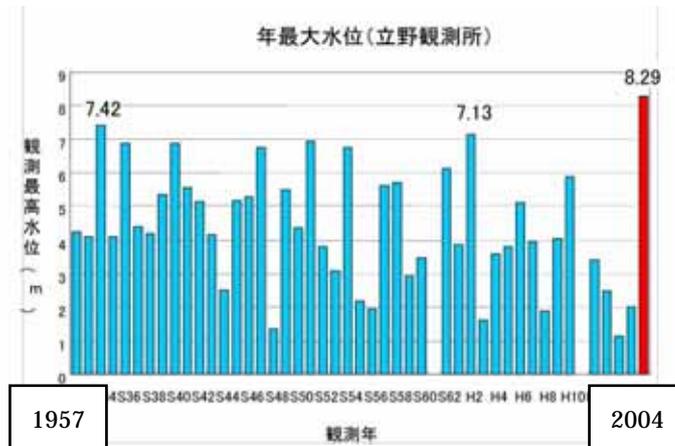
Water level at Tatsuno water gauge station in Maruyama River rose from 20<sup>th</sup> Oct. afternoon and arrived in highest high-water level 8.29m at 21:00. In the stage of lowering of water level, levee was broken after 23:00.

### Water level at Tatsuno water gauge station in Maruyama River



Highest high-water level 8.29m by Typhoon TOKAGE is annual maximum water level for past 48 years.

### Annual maximum water level at Tatsuno water gauge station in Maruyama River



• Rehabilitation

( MLIT )

Emergency Flood Control Project 2004-2014JFY (Total cost 90 billion Yen)

From 2004 to Middle of June 2005

- Structural Measures :

- Rehabilitation of broken point of the embankment,
- Levee heightening in Akasahi and Asakura,
- Levee heightening to H.W.L. +0.5m in embanked section

- Non-Structural Measures :

- Publication of inundations map by Typhoon TOKAGE, assistance to prepare flood hazard map,
- Provision of River image,
- Announcement of alert through cellular telephone,
- Establishment of “Disaster Information Committee in Maruyama River”,
- Functional enhancement of disaster prevention facilities

by 2009JFY

- Implementation of emergency project for serious damage
- Excavation of river channel
- Banking
- Measures for landside water
- Bank strengthening
- Reconstruction of bridges • Reconstruction of weirs
- Building a coalition in area

by 2014JFY

- Flood control basin project

<http://www.kkr.mlit.go.jp/toyooka/kinkyu/index.html> (Japanese version)

Broken point of embankment as of 21 Oct. 2004



Completion of rehabilitation as of 15 June 2005



( Hyogo Prefecture )

Hyogo Pref. adapted the construction method in consideration of ecology of Japanese giant salamander and have been implementing disaster restoration projects such as damaged river, road facilities and agricultural facilities with due considerations to preserve Japanese giant salamander as special protected animal and

Their staffs asked local children to stand sponsor for each water dog so that children raise awareness on river environment. (Usually ordinary people are prohibited to touch Japanese giant salamander directly.)

In addition to these structural measures, Hyogo Pref. is implementing Non-structural measures such as 1.Provision of inundation hazardous areas and shelter information on flood, sediment disaster, tsunami, high tide, 2. Preparation of CG hazard maps included real-time information of rainfall and water level in river for local residents. And Pref. have communication in the meeting to explain to local residents and school training to make active use of these information.

<http://www.hazardmap.pref.hyogo.jp/HazMap/top.htm> ( Japanese version )

### Flood and damage in Toyooka City

(Izushi River, right tributary of Maruyama River) in Sep. 2004



## Preservation activity of Japanese Giant Salamander



( Toyooka City )

- Building emergency temporarily housing
- Assistance of settlement
- Establishment of organization and disaster management system
- Disposal of garbage caused by flood
- Implementation of disaster restoration works
- Establishment of Regional Plan for Disaster Prevention
- Making study for procedures collecting and conveying information
- Production, distribution and publication of Hazard map [http://www3.city.toyooka.lg.jp/bousaimap/index\\_ie.html](http://www3.city.toyooka.lg.jp/bousaimap/index_ie.html) ( Japanese version )
- Flood fighting drill
- Workshop and Symposium for disaster prevention
- Radio communications for disaster prevention and administration
- Communication system for the people with hearing difficulties (FAX multicasting service )
- Promotion for damaged commerce, industry and tourist industry
- Implementation of Disaster restoration works related agricultural and forestry/  
Promotion for agriculture and forest industry
- Education (mental health care, counseling)
- Memorize services and events
- Others
  - fire facilities(outboard, rowboat, generator, pump, precipitation information service equipment
  - natural disaster victims relief fund
  - equipment in headquarter and branch offices
  - stockpiles in shelters

- questionnaire survey

(2) Flood hazard map

Flood hazard map in the center of Toyooka City is shown in next figure. Purplish area where flood water depth would be 5.0m or more, blue area would be 2.0m or more, but less than 5.0m, light blue area would be 1.0m or more, but less than 2.0m, green area would be 0.5m or more, but less than 1.0m and yellow area would be less than 0.5m. Red figures are substantial buildings as shelter, which have a few floors whose height is higher than assumed flood water depth. Blue figures are shelters, which can be used as shelter in case of comparable flood to Typhoon TOKAGE in 2004.



• Let's prepare evacuation map of my home!

The Hazard map of Toyooka City is designed to prepare evacuation map by each household and "Let's prepare evacuation map of my home!" is included in it.

Four steps to prepare map are described as followings:

STEP 1 Where is your house?

Assumed maximum flood water depths in case of dike break are separated by color on the reverse of map. Firstly, you need to find your house and confirm assumed flood water depth.

STEP 2 Where is your shelter?

Secondly, you need to confirm your shelter and route to it. You need to avoid to use route near river or seepy point.

STEP 3 Let's walk and confirm evacuation route with your family.

Let's walk to shelter with your family. On the way to shelter, you need to check hazardous places with disaster map so that you can confirm route which is safe and easy to evacuate.

STEP 4 Let's prepare evacuation map of my home!



“Ubiquitous Hazard Mapping Project”

Two types of signboard, “Flood Water Depth” and “Flood Evacuation shelter”, among “Ubiquitous Hazard Mapping Project” were installed in Toyooka City. MLIT and Hygo Prefecture established “Flood water Depth” signboards in the city. Toyooka City set 101 “Flood Evacuation shelter” signboards at each shelter.

( Installation location of ”Flood Water Depth” signboards )



( An Example of “Flood Evacuation shelter” signboard )

Toyooka City East Office Annex



( An example of ”Flood Water Depth” signboard )

Toyooka National highway branch office  
Toyooka Office of River and National Highway, MLIT



( The features of signboard )

An example of Signboard at Kinosaki Community Center

The image shows two vertical signboards. The top signboard is brown with white text and a green shelter icon. It indicates a 300m distance to Kinosaki elementary school as an evacuation shelter. It includes a QR code for disaster information and historical flood data from Typhoon Tokage in 2004. The bottom signboard is brown with blue text and a blue water level icon. It shows a ground height of 0.4m and historical flood water depth from Typhoon Tokage in 2004. Both signboards have a brown background and are marked with numbered callouts (1-9) pointing to specific features.

(1)	(1) Place, Direction and Distance of nearest shelter from signboard
(2)	(2) English for foreign tourist etc
(3)	(3) Disaster information QR code for celler phone
(4)	(4) Inundation water depth by Typhoon TOKAGE in 2004
(5)	(5) Assumed water depth by Toyooka City Disaster Map
(6)	(6) Ground height is shown by water level of Kinosaki water gauge station
(7)	(7) Inundation water depth by Typhoon TOKAGE in 2004
(8)	(8) Inundation water level by Typhoon TOKAGE in 2004
(9)	(9) Brown board was adapted in scenic important area

### (3) Schedule and challenges

MLIT, Hyogo Prefecture and Toyooka City continue to co-ordinate plan, location etc through coordinating committee. Necessary evacuation shelters will be installed by Toyooka City. And MLIT and Hyogo prefecture continue to establish “Flood Water Depth” signboard in the city. Concerned member intend to collect public opinions whether it is easy for inhabitants to understand these signboard, or not.

We have found following challenges:

- It takes much time to get agreement by administrator to set signboard.
- It is necessary for us to spend much time to select location.