Flood Management in Japan

1. Comprehensive Flood Control Measures
2. Provision of River information
3. Responses to the Niigata Torrential Rain Disaster
4. About ICHARM
5. Responses to 2011 Thailand Floods
6. Outline of the Tsunami-Resilient City
July 2004 torrential rain caused inundation in large areas, resulting in extensive damages (Fatalities were 15 and approx. 21,000 buildings were damaged in Niigata prefecture※).

Inundation caused by Ikarashi River levee failure (Sanjo City, Niigata Prefecture)

※: Niigata Disaster Management Office (March 23, 2005)
Damages caused by 2004 Niigata Torrential Rain Disaster

Inundation caused by Ikarashi River levee failure (Sanjo City, Niigata).

Inundation due to Kariyata River levee failure (Mitsuke City, Niigata)

Inundation due to Kariyata River levee failure (Nakanoshima Town, Niigata)
River Improvements in consideration of 2004 Disaster

River improvements were implemented in consideration of July 2004 flood.
- Shinano River (L=34.2km) (2004 – 2009)
- Ikarashi River (L=3.9km) (2004 – 2010)
- Kariyata River (L=24.5km) (2004 – 2010)

Downstream of Shinano River
- Shimohachimai District

Ikarashi River Tokiwa Bridge

Kariyata River Nakanoshima Bridge

Levee Improvement
- (March 2009)

Widening & Excavation
- (December 2010)
Raising Public Awareness by Disseminating “Easy to Understand” Disaster Prevention Information such as Hazard Maps

Measures in consideration of 2004 torrential rain

Hazard Map - Sanjo City Torrential Rain Disaster Handbook -
On-Site Display of Past Inundation Levels (Marugoto-Machigoto Hazard Map)

Measures in consideration of 2004 torrential rain

Closest evacuation shelter

Maximum inundation depth expected at the location
Early Warning “Area Mail”
Provides disaster information such as Earthquake Early Warnings issued by the Japan Meteorological Agency and disaster and evacuation information issued by national and regional public institutions to subscribers in afflicted areas.
- Each base station simultaneously transmit mail to all users in the coverage area.
- Information can be received without the impact of line congestion as it uses cell broadcast service (CBS).

Simultaneously sent to areas with potential risk of disasters
- A pop-up window appear on the screen.
- Earthquake Early Warnings and Disaster/Evacuation Information are informed by different ringing tone.
- Saved in the receive mail box with a special icon.
Emergency Announcement FM Radio

It can be automatically switched on/off by central control (community broadcast or public administration) and can make announcements with high volume. It is equipped with rechargeable batteries, and receive broadcasts even during power-outage.
Disaster Prevention Training in consideration of 2004 Disaster

【Comprehensive Disaster Prevention Training】
Sanjo City is conducting a comprehensive disaster prevention training every year in June, lead by the fire department. All community firefighters in Sanjo City participate and visit homes of those people with special needs.

【Community Disaster Prevention Drills】
Local communities within Sanjo City conduct their own evacuation drills with the firefighters.

【Voluntary Disaster Prevention Organizations】
40 to 50 voluntary disaster prevention organizations were established after the 2004 flood disaster.

Photos: May 2010 Shinaogawa-Karyu Water Disaster Drills
Establishment of Standards for Evacuation Orders

In order to promote smooth evacuation actions, reference to water levels for evacuation orders have been established and categorization of water levels based on risk levels have been implemented.

<table>
<thead>
<tr>
<th>Risk level</th>
<th>Water Level and Risk Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 5</td>
<td>▼ Flooding occurs</td>
</tr>
<tr>
<td>Level 4</td>
<td>▼ Flooding nearly occurs</td>
</tr>
<tr>
<td>Level 3</td>
<td>▼ Evacuation should be decided</td>
</tr>
<tr>
<td>Level 2</td>
<td>▼ Flood is cautionary</td>
</tr>
<tr>
<td>Level 1</td>
<td>▼ Flood fighters act</td>
</tr>
<tr>
<td></td>
<td>▼ Flood fighters stand by</td>
</tr>
</tbody>
</table>

Top of Levee

River

Houses

Levee

Low Flow Channel

Flood Channel
Installation of X Band MP Radar

X Band MP Radar is being installed in urban areas to enforce real-time observation of localized torrential rainfall, so called “guerilla rainfall”, and to mitigate damages.

Compared to the conventional radar (C Band Radar) observation with higher frequency (x5) and higher resolution (x16) is possible. Time required for dissemination is reduced from 5-10 minutes to 1-2 minutes.

【Conventional Radar (C Band Radar)】
【X Band MP Radar】

High Frequency (x 5)
High Resolution (x16)
Precipitation Information by X Band MP Radar

- X Band Radar enables higher resolution observation (250m grid) due to shorter wave length.

<table>
<thead>
<tr>
<th>C Band Radar (longer wave length)</th>
<th>X Band Radar (shorter wave length)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enable observation of long distance</td>
<td>Detailed observation is possible but with smaller observation range</td>
</tr>
</tbody>
</table>

- MP (Multi-Parameter) Radar captures the configuration of rain drops and accurately estimate precipitation amount, and does not require correction using ground gauges. ⇒ Information can be disseminated with almost no lag time.

<table>
<thead>
<tr>
<th>Multi Parameter Radar</th>
<th>Changing configuration of rain drops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertically polarized wave</td>
<td>3mm</td>
</tr>
<tr>
<td>Horizontally polarized wave</td>
<td>5mm</td>
</tr>
<tr>
<td></td>
<td>8mm</td>
</tr>
</tbody>
</table>

By transmitting two types of waves (vertical and horizontal) the configuration of rain drops can be captured.
Improvement of flood prevention facilities and enhancement of warning/evacuation procedures lead to reduction of damages

- In July 2011 the Shinano River Basin in Niigata experienced a torrential rainfall of approx. 1,000mm (cumulative rainfall), the largest rainfall in the recorded history.
- Total rainfall was 1.6 times more than that of July 2004 but both damages to buildings and human casualties were reduced dramatically.

<table>
<thead>
<tr>
<th>Total Rainfall 1)</th>
<th>Building Damages 2)</th>
<th>Number of fatalities or missing 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total rainfall 647mm</td>
<td>9,778 buildings 90% reduction</td>
<td>12 persons 90% reduction</td>
</tr>
<tr>
<td>2004.7 2011.7</td>
<td>421 buildings</td>
<td>1 person</td>
</tr>
</tbody>
</table>

1) Kasabori rain gauge station
   2011.7: Produced by Niigata Prefecture based on “First Niigata and Fukushima Rain Disaster Management Research Committee (Jul. 2011)”
3) Shinano River Downstream, Ikarashi River, Kariyata River Disaster Rehabilitation Emergency Project Pamphlet (Shinano Karyu River Office, Niigata Prefecture)