New Climate Change Adaption Strategy for Water-related Disaster Management in Japan

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Recent Water-related Disasters in Japan

- On September 10th, heavy rain brought on by a typhoon breached the levee of the Kinu River.
- The levee breach caused large-scale flooding in Greater Tokyo area.
- Approximately 40 km^2 of land was flooded, 2 people were killed, and approximately 7,000 houses were inundated.

Damaged House

Concept of Disaster Prevention & Reduction Measures to Date

Measures to Date

■Earthquake & Tsunami

○Building on the experience of the Great Hanshin-Awaji Earthquake and the Great East Japan Earthquake, structural and non-structural measures are promoted against the largest-scale earthquake and tsunami, that has very low probability of occurrence with annual exceedance probability in the range of 0.1%, but could cause catastrophic damage if occurs.

○For relatively frequent earthquakes and tsunamis, damage is prevented by structural measures.

■Flood & Storm Surge

○For large rivers, measures are taken to withstand a heavy rainfall with an annual exceedance probability of 0.5% to 1%.

Basic Strategy for Climate Change Adaption Measures against Water-related Disasters

O Occurrence of heavy rainfall is to increase substantially due to climate change as a result of global warming.

O Floods that exceed the design-basis of the current disaster management measures is predicted to occur more frequently.

＜Climate Change Prediction for the end of 21st Century＞

(1) Precipitation due to heavy rain：Increase by 10.3-25.5% (nation-wide average)

(2) Frequency of hourly precipitation greater than 50mm/hr： Increase to 2.7 times

“Basic Strategy for Climate Change Adaption Measures against Water-related Disasters” was prepared (2015)

Basic Strategy for Climate Change Adaption Measures in the field of Flood Disasters

Basic Concept

"Floods and storm surges that could occur relatively frequently" with annual exceedance probability of greater than 0.5% to 1%

Focus on structural measures to prevent loss of life and property

"Floods and storm surges that are of the largest-scale" with very low probability of occurrence of about 0.1% but could cause enormous damage if occurs

Focus on non-structural measures to at least "protect lives" and "avoid catastrophic damage to social and economic activities"

Amendment of Flood Fighting Act

- Flood Risk Management Act that stipulates measures to minimize flood damages was amended in May.
- This revision aims to introduce disaster reduction measures for the largest-scale floods or storm surges.

Requirement of the revised Act

- Identify and disclose the potential inundation area that could occur in the event of the largest-scale of river flooding, inland flooding or storm surge
- Municipalities designated to be in the inundation area to define in their regional disaster management plans such information as method of disseminating flood forecast information, evacuation facilities/routes, evacuation drills, etc.
- Managers of the underground malls designated in the regional disaster management plans to formulate plans to ensure evacuation routes and to prevent inundation, and to implement evacuation drills

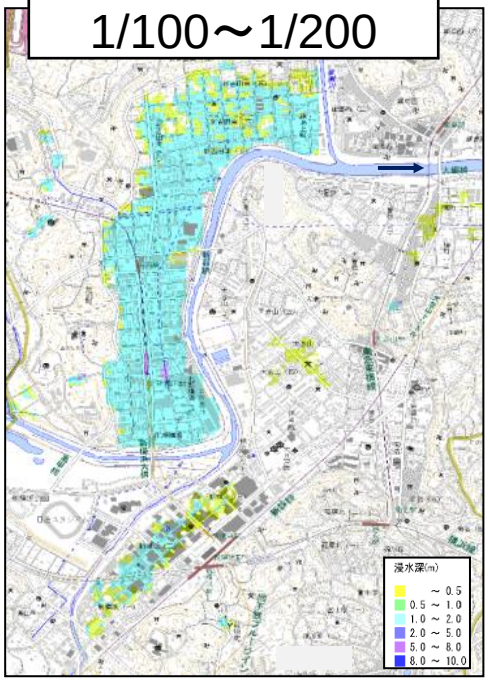
Identification of Inundation Area for Largest-class Flood or Storm Surge

It is mandatory to identify potential inundation area with respect to the largest-scale floods or storm surges, and to create hazard-maps and disseminate them to the public.

Until now

design rainfall the flood control plan is based on

AEP 1/100～1/200



From now on

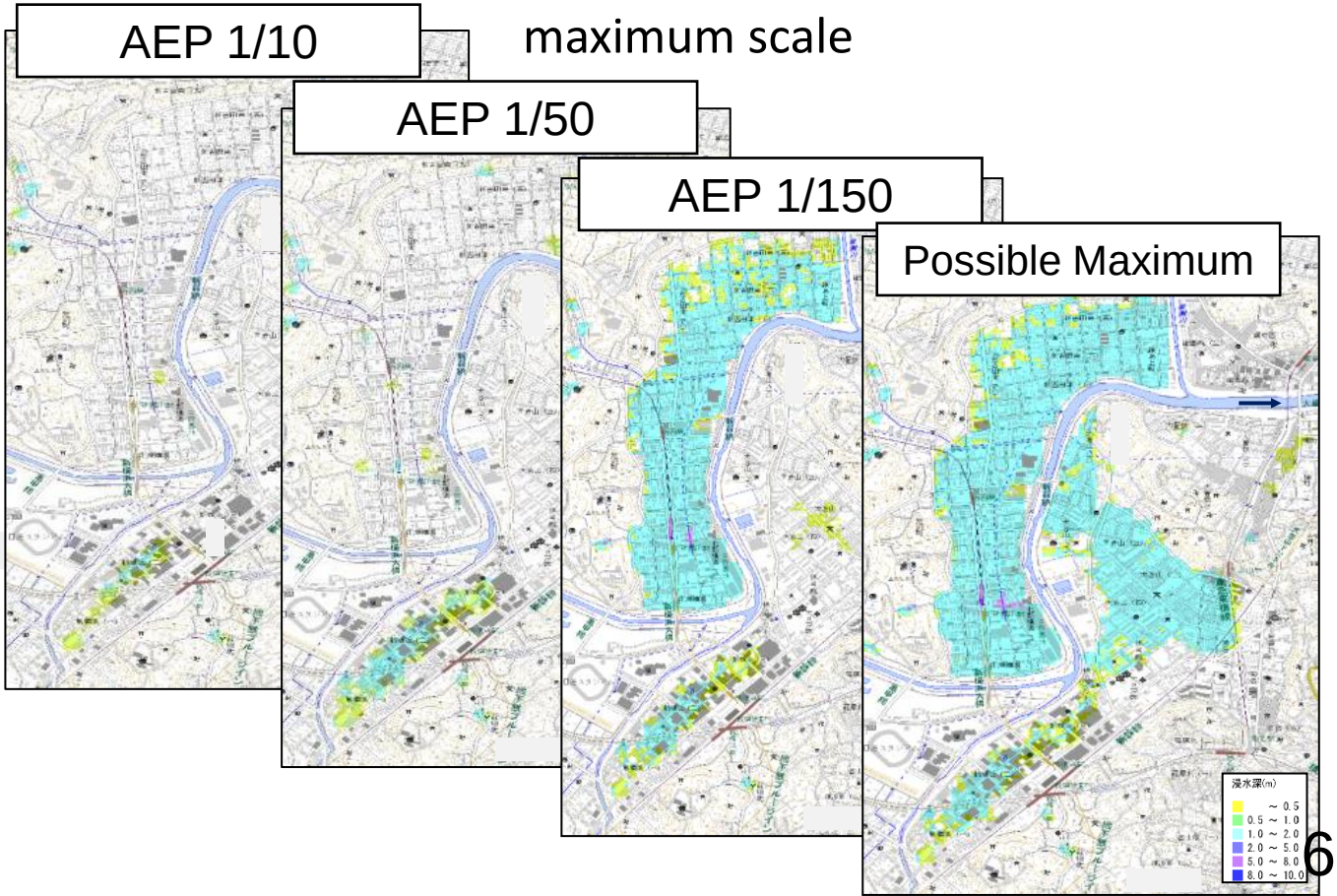
Rainfall of multiple magnitude up to possible maximum scale

AEP 1/10

AEP 1/50

AEP 1/150

Possible Maximum



※ Figures do not necessarily represent actual rivers.

Easy-to-Understand Inundation Risk Information in Town

Signs of the expected inundation depth and evacuation sites are posted at many locations in towns so that people can easily understand inundation risk of the area and the way to evacuate.

Potential Inundation Area
(Kita-Ward, Tokyo (Arakawa River)

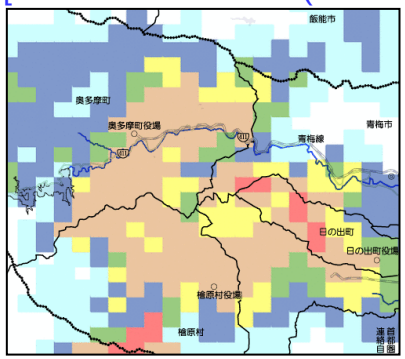
Evacuation Information
(Mitsuke City, Niigata Prefecture)

Providing Information during Disasters

High Resolution Rain Data using X-Band Multi-parameter Radar

Disseminate higher-resolution rain data than conventional radar

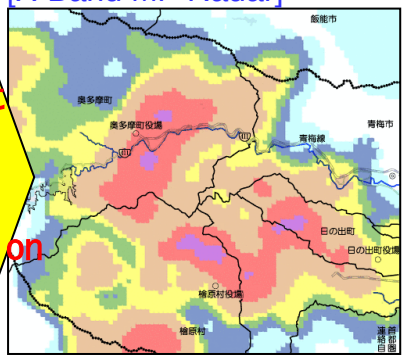
[Conventional Radar (C-Band)]



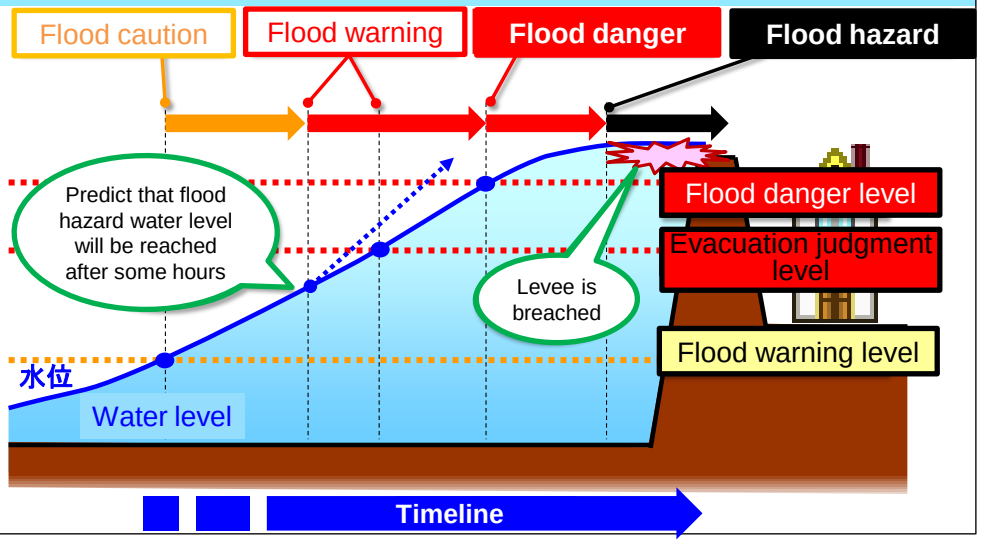
More frequent (X5)

Higher resolution (X16)

[X-Band MP Radar]



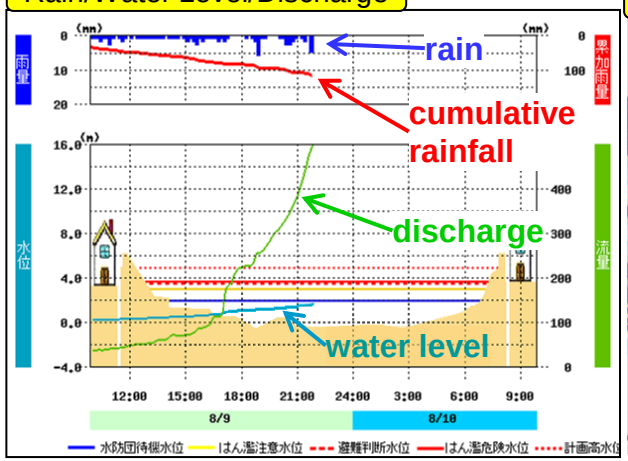
Flood Forecasting



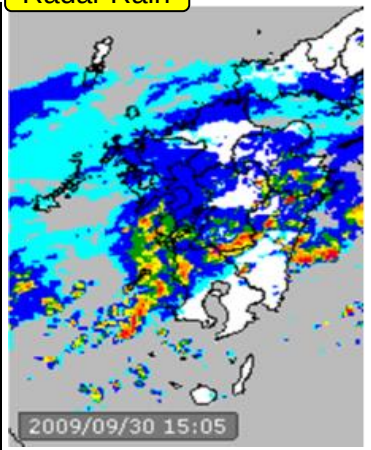
River Information

Real-time water level and rainfall information

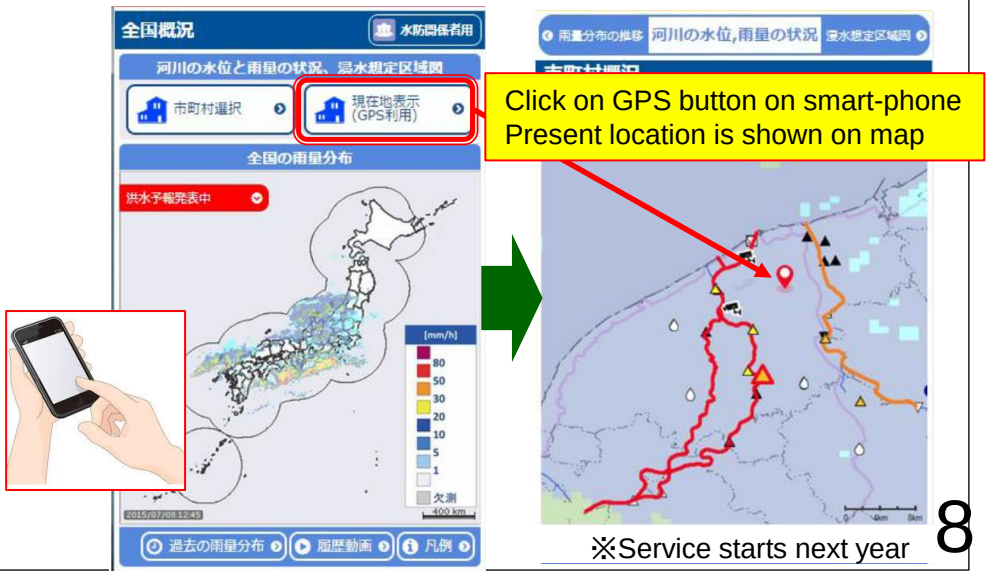
Rain/Water Level/Discharge



Radar Rain



Utilization of cellphones

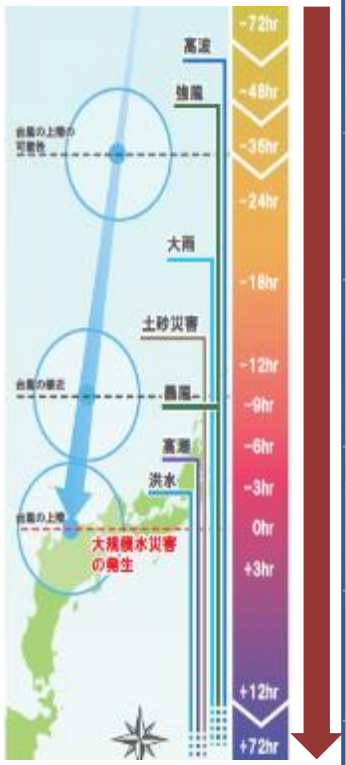


※Service starts next year

Developing Timelines and Implementing Disaster Drills

Prepare a timeline indicating in chronological order the actions that municipalities and other disaster-prevention-related bodies should take in the event of a disaster, and implement disaster drills based on it

Example of Timeline for a flooding caused by typhoon

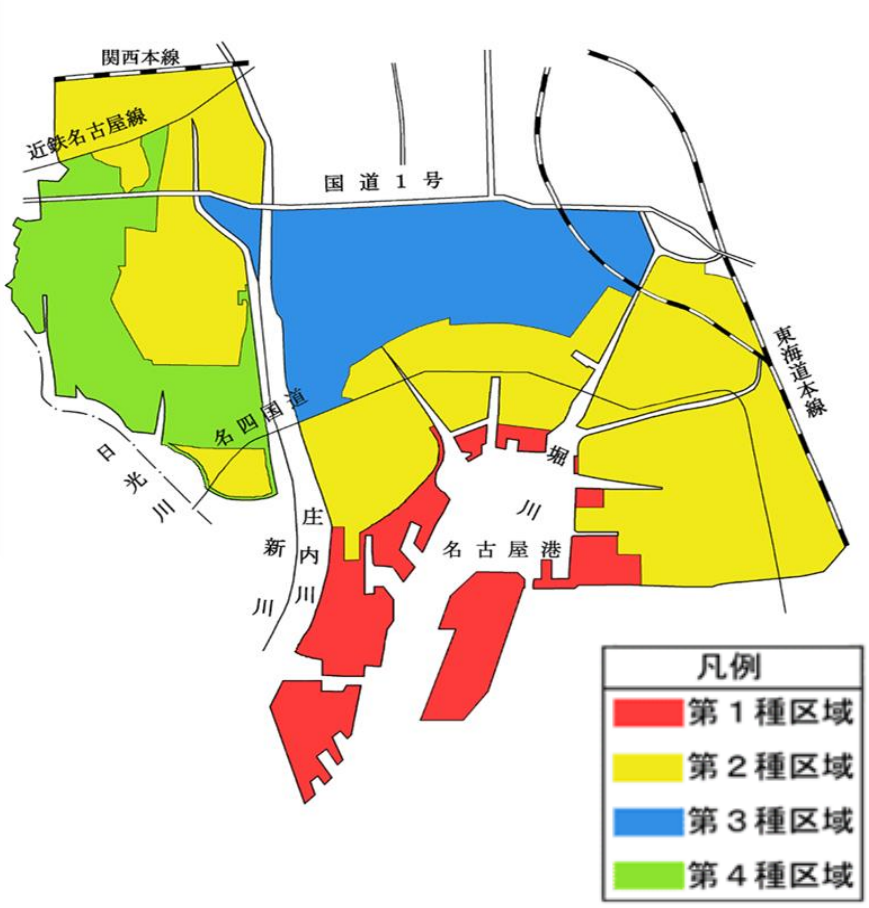


Time until landfall	Weather warnings	MLIT	Municipalities	Residents
3 days	Typhoon info	Organize response team Facility inspection	Organize response team Check emergency goods	Check weather info.
1 day	Heavy rain & flood warning	Early preparation of response	Decide closure of schools, etc Early preparation of shelters	Check evacuation card Check emergency materials
12hr	Flood caution information	Flood fighting warning Dispatch Liaison	Dispatch flood fighters Prepare evacuation shelters	Evacuation of people needing assistance
9hr	Flood warning information	Inspect priority locations for leakages, etc Water-level monitoring	Announce evacuation preparation information	Evacuation of people needing assistance Early evacuation
6hr	Flood hazard information	Hotline	Announce evacuation advisory Evacuation advisory	Begin evacuation Complete evacuation Stay inside for safety
Landfall 0hr	Levee breach	Announcement of breach information and inundation forecast Dispatch TEC-FORCE	Announce evacuation order Evacuation order	Stay inside a building for safety Begin evacuation within the area where flood water could reach

Better Land Use Planning

- In Nagoya, the coastal section is designated as a disaster hazard area based on the lessons learned in the Isewan Typhoon storm surge.
- Height and structures of buildings, and forms of dwellings, etc. are regulated.

■Nagoya City
Coastal Disaster Prevention Area



■Overview of Regulation

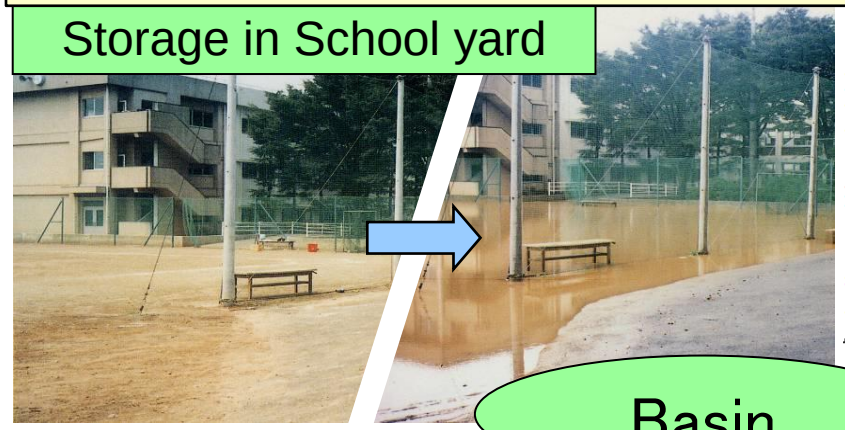
District	Height of 1st Floor	Restriction on Structures
Category I District	>N.P.(+) 4m	Wooden building prohibited
Category II District	>N.P.(+) 1m	Buildings must be at least two-story (One or more rooms on second floor or above) Exception granted if one of the followings applies. 1) At least one room in the building has floor height of N·P(+) 3.5m or higher 2) Two-story building or higher exists within the same land property 3) Evacuation shelter / equipment exists within the floor area of 100m^2 or less
Category III District	>N.P.(+) 1m	None
Category IV District	>N.P.(+) 1m	Buildings must be at least two-story (One or more rooms on second floor or above) Exception granted if one of the followings applies. 1) At least one room in the building has floor height of N·P(+) 3.5m or higher 2) Two-story building or higher exists within the same land property

Reference surface of Nagoya Port (N.P.(+) 0m) = Reference surface of Tokyo Port (T.P.) - 1.412m

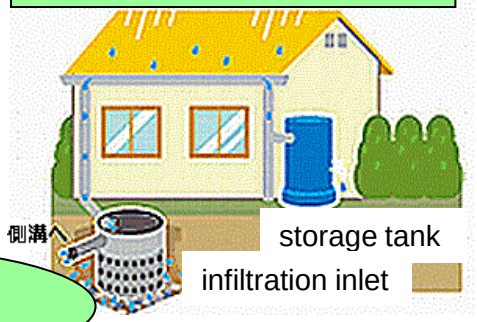
Basin-wide Comprehensive Flood Control Measures

Implement comprehensive flood control measures by combining improvement of rivers and drainage systems together with flood storage using parks, schoolyards, and retarding ponds, as well as infiltration of rainwater through infiltration inlet.

Storage in School yard



Infiltration inlet / Storage tank



Retention basin

Basin

Conservation of land with rainwater detention function

Basin-wide Flood Management

River

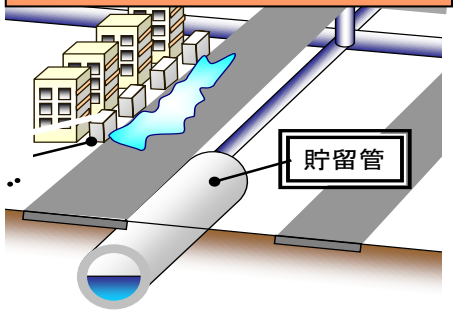
Stormwater drainage

River channel improvement

Flood control facility

Drainage facility

Rainwater storage



Conclusion

- Flood and storm surge disasters are expected to become increasingly severe due to global warming induced climate change.

- The following adaptation measures are needed:
  - ✓ Estimation of inundation with respect to the largest-scale of anticipated floods and storm surges, and the creation and dissemination of hazard maps
  - ✓ Establishment of warning and evacuation systems, and implementation of disaster drills
  - ✓ Improvement of land-use and urban design
  - ✓ Enhancement of rivers and drainage systems
  - ✓ install flood storage and infiltration facilities in the basin

- Mobilize all possible means by incorporating both structural and nonstructural measures throughout the entire basin in order to prevent and reduce flood damage.


Thank you for your attention.