Attachment 12

Training in Japan

Rivers in Japan and Outline of River Governance

December 2012

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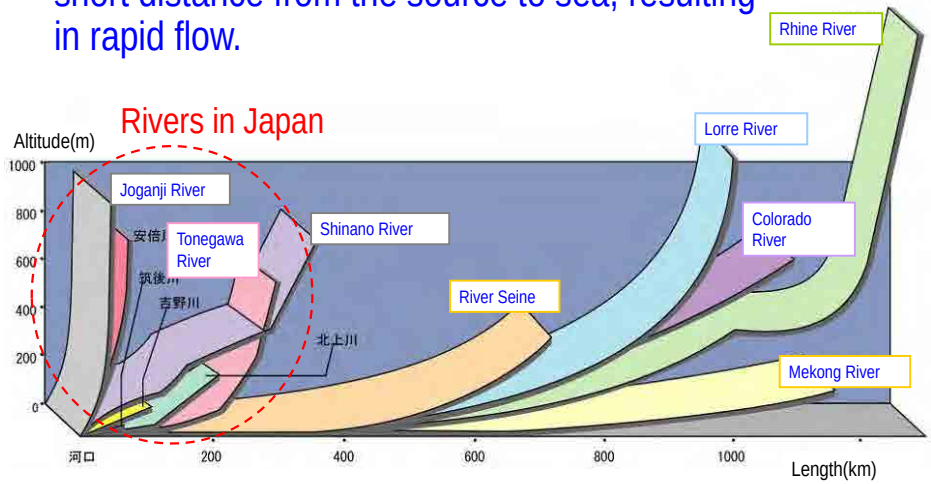
Water and Disaster Management Bureau,
Ministry of Land, Infrastructure, Transport and Tourism (MLIT), Japan

Rivers in Japan and Outline of River Governance

Japan,
A country of mountains

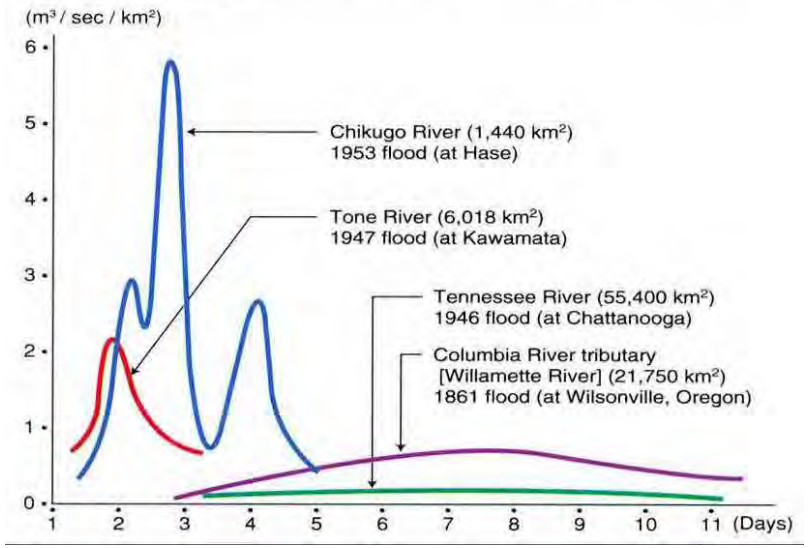
Rivers in Japan are very steep

Many rivers in Japan are very steep with a short distance from the source to sea, resulting in rapid flow.



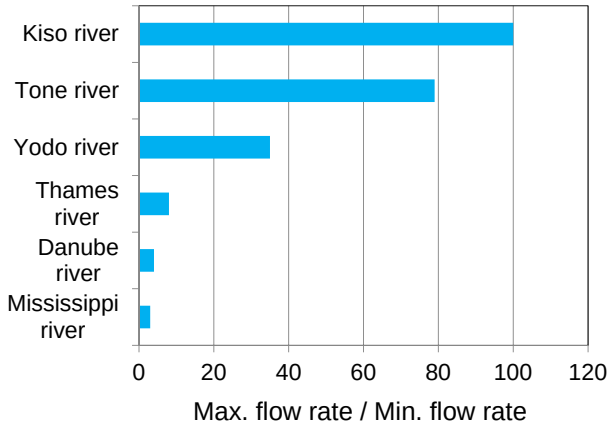
Rapid water level increase of river in Japan

Ratio of flood duration to flood discharge per unit area of catchment discharge. (m^3/sec/km^2)

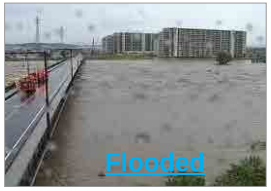


Difference of runoff

Japanese rivers have a large difference of runoff between maximum and minimum flow rates.



Case of Tama River
During Typhoon 9th in 2007)



* Numbers are the ratio between minimum and maximum flow rates.
*Data for Japanese rivers are taken from annual flow tables (H6 - H15) and river guidebooks. Data for overseas rivers are taken from a1995 water resources white paper.

Flood hazardous area caused by high water around three big bays

State of a below-sea-level-area

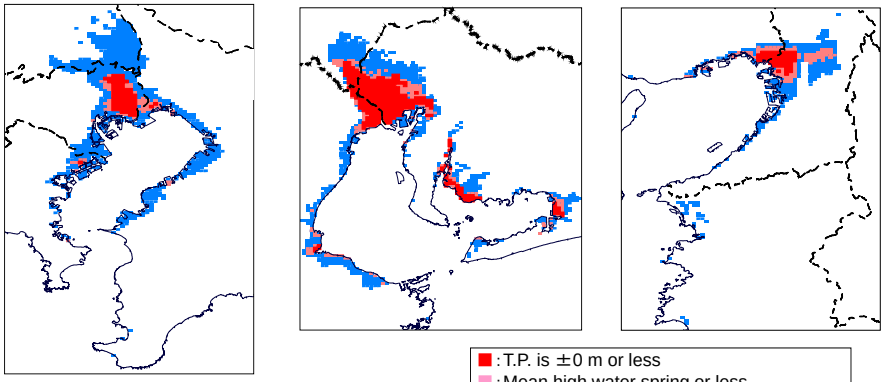
* Values shown in each area and population are for the zone where the tide level is lower than the mean high water spring

Zones around 3 big bays (in total)
Area: 577 km^2
Population: 4.04 million

Tokyo Bay (Yokohama to Chiba)
Area: 116 km^2
Population: 1.76 million

Ise Bay (Kawagoe to Tokai)
Area: 336 km^2
Population: 0.90 million

Osaka Bay (Ashiya to Osaka)
Area: 124 km^2
Population: 1.38 million

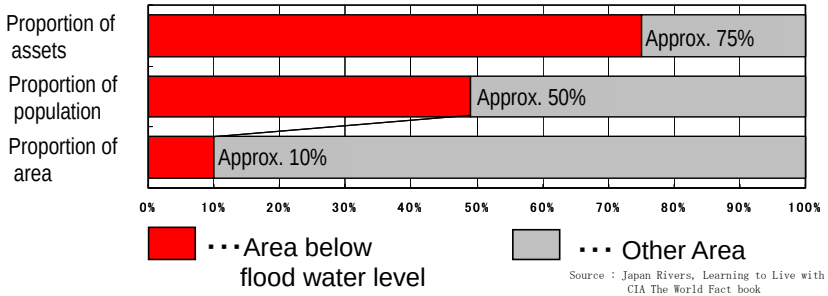


■ : T.P. is ±0 m or less
■ : Mean high water spring or less
■ : Highest high water level (HHWL) or less

* The water surface areas of rivers, lakes and marshes are not included.
* The data was prepared based on the national land numerical information. Cubic mesh (1km x 1km) sea level information of lower than the tide level is displayed.
Areas and populations are summed up based on the cubic mesh.

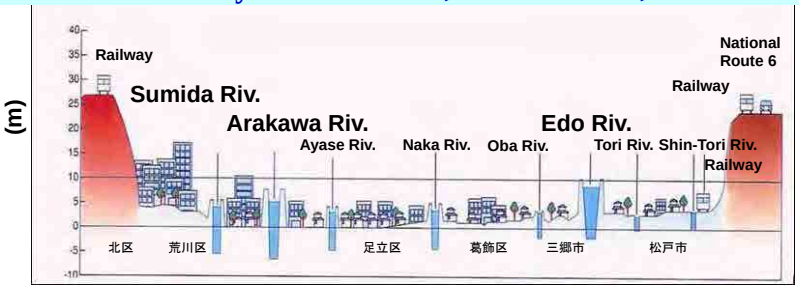
The MLIT prepared this data based on the GSI Map.

Vulnerability of the country to water hazards



Source : Japan Rivers, Learning to Live with River
CIA The World Fact book

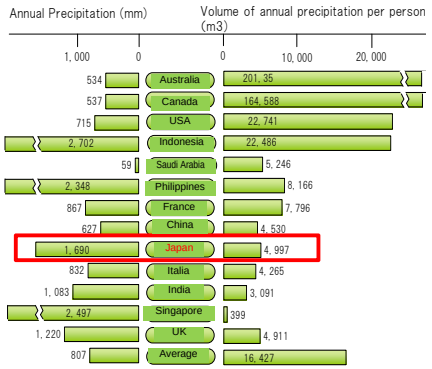
Center area of Tokyo and Edo Riv., Arakawa Riv., Sumida Riv.



Rainfall of Japan and the World

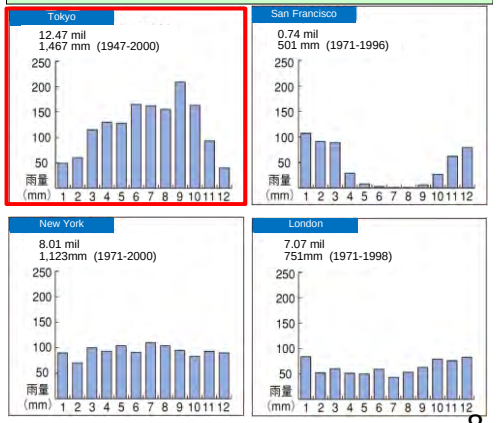
Annual rainfall of Japan is approximately twice as much as the world average, 800mm.
Its volume per person of Japan is a third of the world average because of population and area.
Volume of the precipitation of Japan is concentrated in Plum Rain and Typhoon season

Rainfall



Source : Water resource in Japan , 2009 MLIT

Population and annual precipitation of Metropolitan Cities



Rivers in Japan and Outline of River Governance

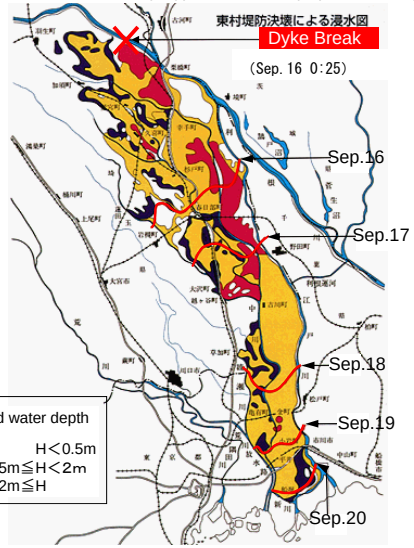
1. Characteristics of Rivers in Japan
2. River Management in Japan
3. Flood Risk Management
   1) Reduction of Flood Damage and Victims – the Japanese Way –
   2) Comprehensive Flood Measures at River Basin Scale
4. Comparison on River Management between Japan and Thailand
5. Conclusion

Floods caused by Typhoon Kathleen (1947) killed more than 1,100 people and submerged over 300,000 houses in the Kanto region.

Typhoon Kathleen, which struck the Kanto region in September 1947, caused dikes of Tonegawa River to collapse, and floods reached as far as Tokyo. It was a major disaster that claimed a toll of over 1,100 lives in 6 prefectures (Tokyo, Chiba, Saitama, Gunma, Ibaraki, and Tochigi) in the Kanto region.

Damage caused by Typhoon Kathleen (September 1947)

Areas inundated by Typhoon Kathleen (September 1947)



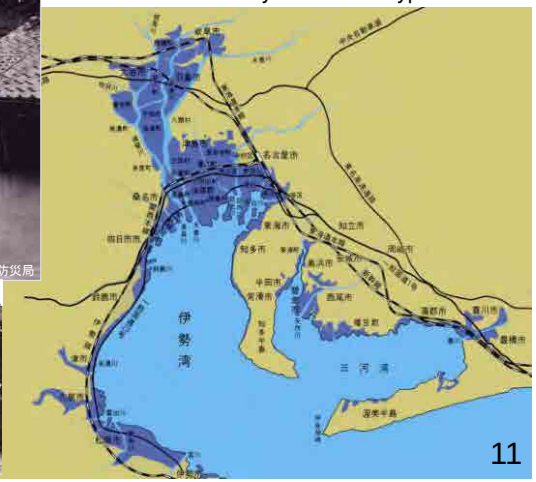
Storm surge caused by the Isewan Typhoon (Typhoon Vera) in 1959 left 5,098 persons dead or missing, 38,921 injured, and some 1.2 million houses damaged.

* Excluding figures for the Kyushu region

- In addition to floods caused by tidal waves and the overflowing of rivers, drifting wood attacked houses, increasing the toll of casualties.
- Until the dikes that had given way were repaired, the sea-level zone continued to be covered with water for more than 120 days, making the damage even more serious.

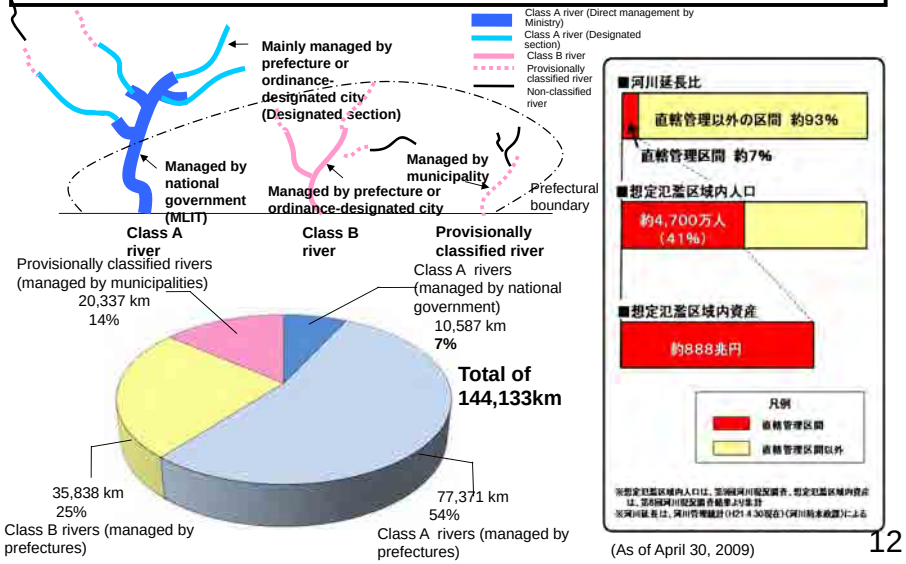
Source: *Jidai ni Hikitsugu ano Kyokun Isewan Taifu* (Handing down the Lessons Learned from the Ise Bay Typhoon to the Next Generation) compiled by the Executive Committee of the 30-year Ise Bay Typhoon Project

Areas inundated by the Isewan Typhoon



River Length Under Management of National and Local Governments

Of the drainage systems that are particularly important for land conservation or the national economy (Class A rivers), highly important sections (about 7% of the total river length) are directly managed by the national government.



(As of April 30, 2009)

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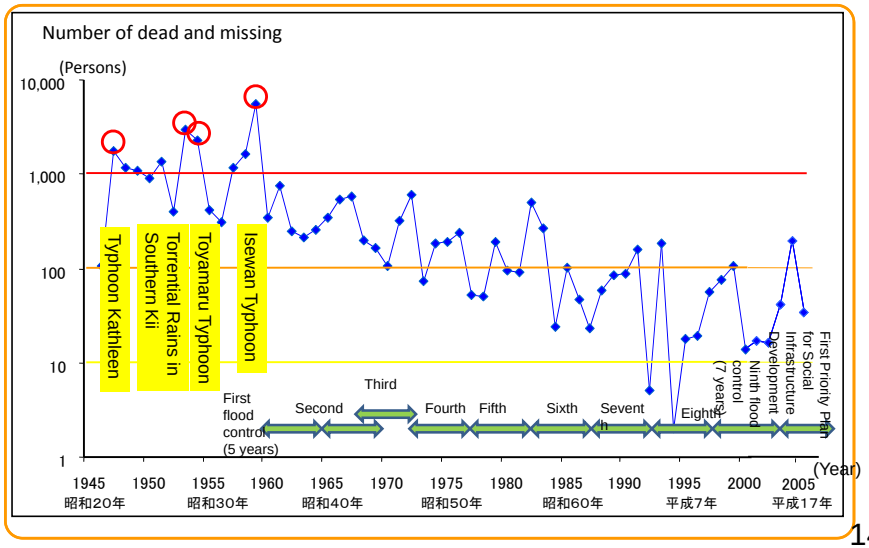
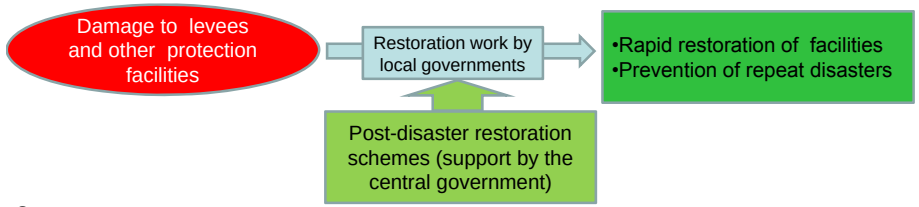
4. A Case of Niigata Torrential Rain Disaster
   1) 2004 Niigata Torrential Rain Disaster
   2) Post-disaster measures and their effectiveness
5. Conclusion

Significant Decrease in Number of Casualties in Japan Due to Implementation of Continuous Flood Control Measures after Large-scale Water Disasters, Aimed at Preventing Recurrence of Disasters



Post-Disaster Restoration Schemes that connects recovery and mitigation

The post-disaster restoration schemes in Japan has positively contributed to preventing repeat disasters and to the steady improvement of the flood safety level.



Coverage
Various public infrastructure facilities (flood control, sabo, landslide prevention, road, port, sewage, park)

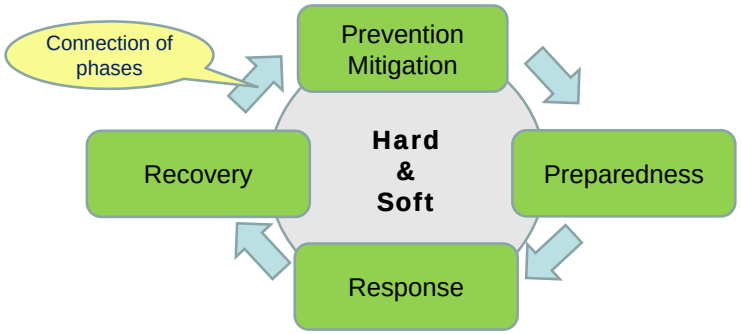
High rate of budget sharing by the central government
2/3 (plus additional assistance to financial situation of local governments)

Rapid budget appropriations
Budget allocation before the next year's budget compilation (usually provided under supplemental budget)

Prevention of repeated disasters
Additional funding for the improvement of the damaged facilities (1/2 by the central government) when a post-disaster restoration project alone is incapable of preventing repeat disasters

Characteristics of Flood Control Measures in Japan

- Focus on the preventive stage
- Holistic approach from preventive stage to emergency response and recovery
- A basin- based comprehensive flood management plan, according to the characteristics of the basin
- Combination of "hard (structural)" and "soft (non-structural" measures



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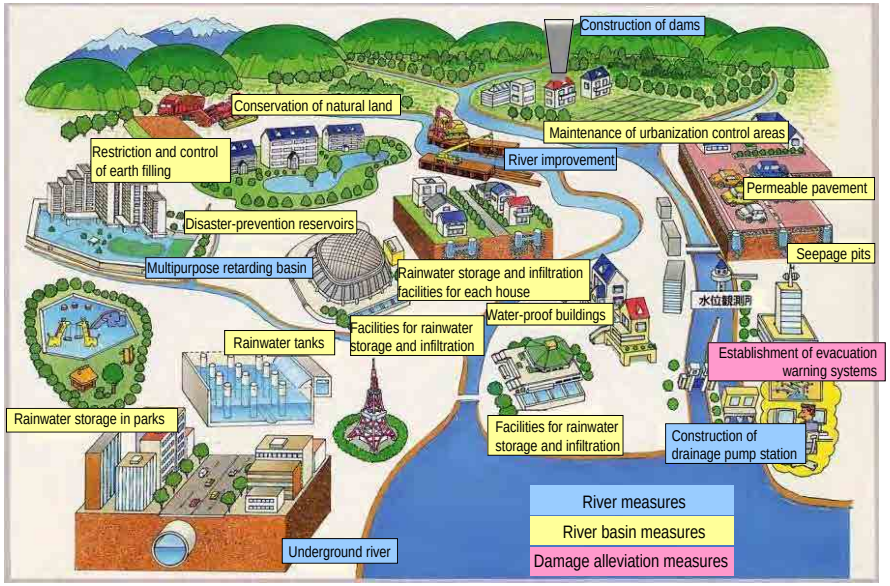
Comprehensive flood control measures

1)River improvement	● River channel improvement ● Construction of dams, retarding basins and discharge channels etc.
2)Measures in river basins	● Maintaining urbanization control areas ● Conservation of fields ● Constructing reservoirs ● Constructing rainwater tanks ● Constructing permeable pavements and seepage pits
3)Measures to alleviate damage	● Establishing the evacuation warning systems ● Maintaining Flood Fighting systems ● Promoting awareness of local residents

Comprehensive Flood Control Measures in a River Basin



Comprehensive flood control measures

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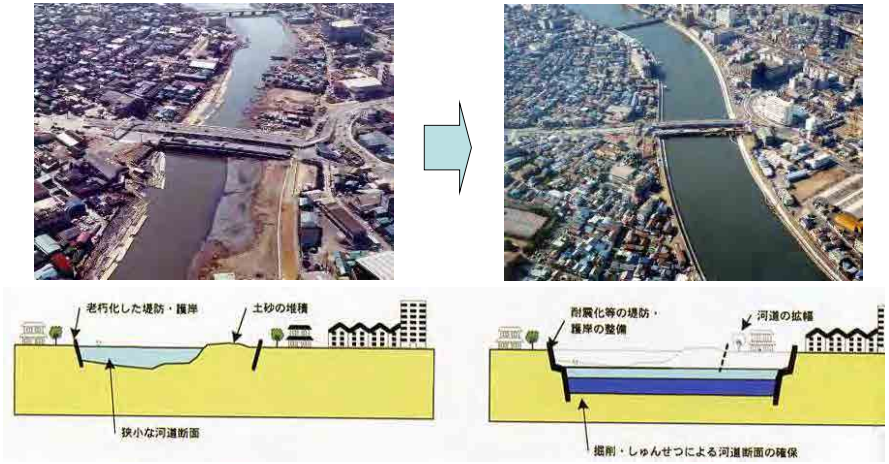
River channel improvement

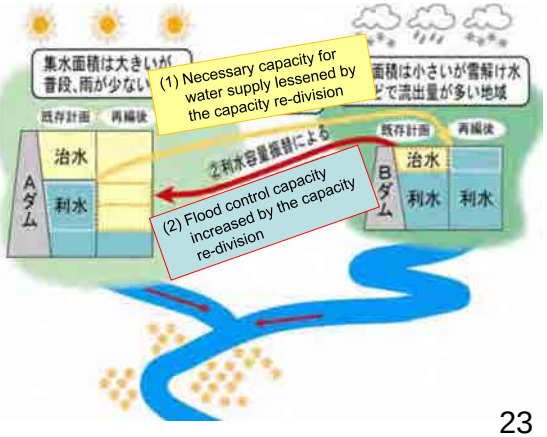


Improvement of dikes

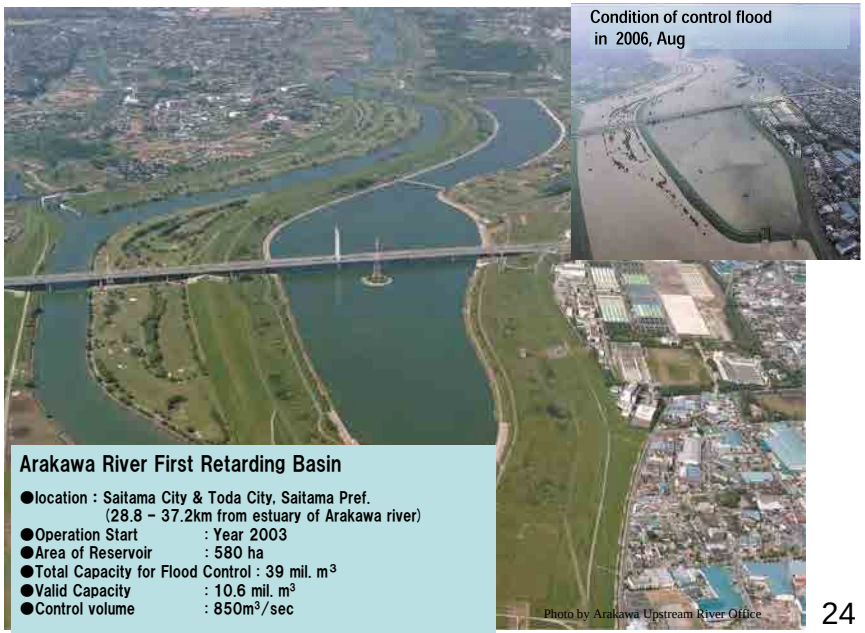
Construction & Operation Improvement of Dams

Integrated operation of existing dams

Optimum capacity re-division of related dams based on present situations of dam operation, precipitation and flow characteristic of each river basin

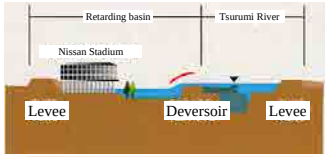


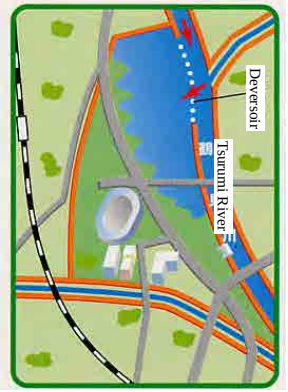
Construction of retarding basins



River Improvement (Construction of Retarding Basin, Discharge Channel, etc.)

Multi-purpose retarding basin of Tsurumi River

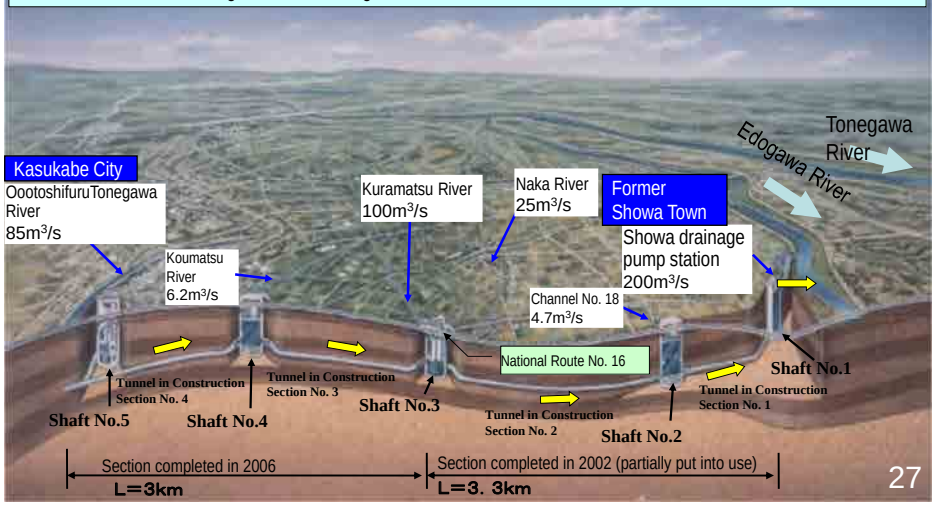




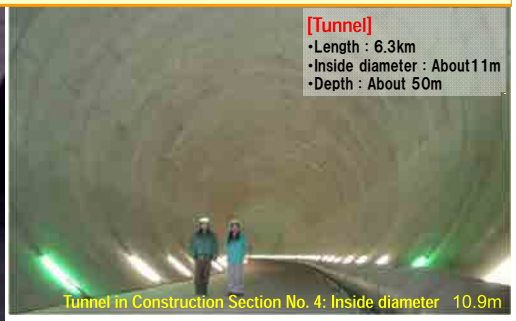
Construction of discharge channel（Hii river floodway）

Construction of discharge channel
(Outer metropolitan area underground discharge tunnel)

[Purpose]
In order to alleviate flood damage to the Naka River basin, which frequently suffers such damage due to its flat terrain and rapid urbanization, the external canal takes in floods of Naka River, Kuramatsu River, OootoshifuruTonegawa River, and other rivers and discharges them into Edogawa River.



Outer Metropolitan Area Underground Discharge Tunnel

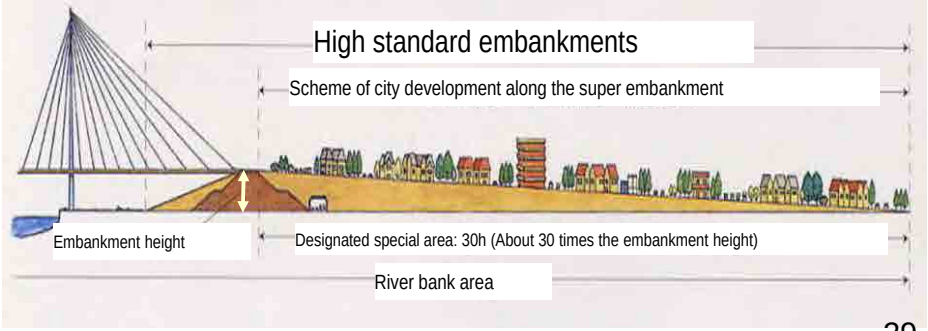


High-standard Embankments (a.k.a. Super Embankments)

- Super embankments have mounding in more extensive urban areas than existing embankments. The advantages of super embankments are:

1) no collapse at floods,
2) no collapse against inundation, and
3) earthquake-resistant.

- River bank land development is strictly restricted pursuant to the River Law. However, the whole slopes at the back of super embankments are designated as the special areas, for which land development is deregulated.



Comprehensive flood control measures

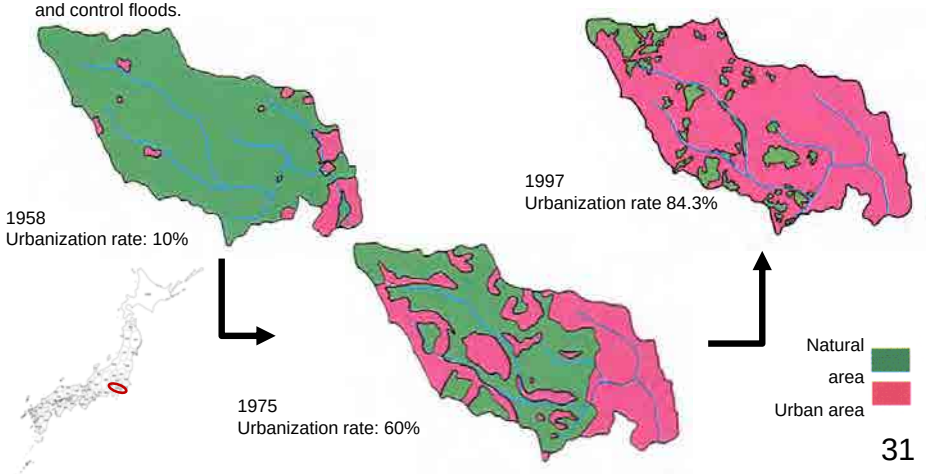
1)River improvement	● River channel improvement ● Construction of dams, retarding basins and discharge channels etc.
2)Measures in river basins	● Maintaining urbanization control areas ● Conservation of fields ● Constructing reservoirs ● Constructing rainwater tanks ● Constructing permeable pavements and seepage pits
3)Measures to alleviate damage	● Establishing the evacuation warning systems ● Maintaining Flood Fighting systems ● Promoting awareness of local residents

The background for the introduction of “Basin Measures”

During the period when population rapidly increased, plateaus and hilly areas near large cities were developed rapidly on a large scale.

Development of plateaus and hilly areas: Tsurumi River (Tokyo and Kanagawa Pref.)

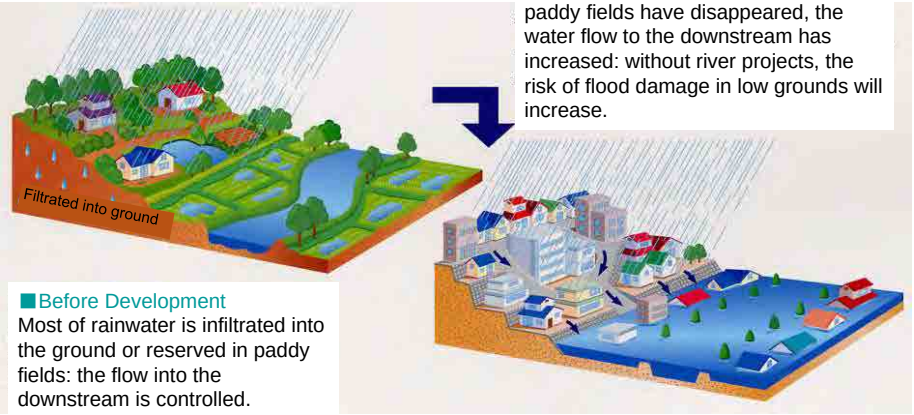
With the demand for housing areas increasing, plateaus and hilly areas in the suburbs of large cities were developed on a large scale, which led to the worsening of the original functions of river basins to retain water and control floods.



The background for the introduction of “Basin Measures”

As the progress of urbanization, the risk of flood on low grounds has been increasing.

■After Development
Since the surface has been covered by concrete or asphalt, and forests and paddy fields have disappeared, the water flow to the downstream has increased: without river projects, the risk of flood damage in low grounds will increase.



■Before Development
Most of rainwater is infiltrated into the ground or reserved in paddy fields: the flow into the downstream is controlled.

Construction of flood control pond

Kirigaoka reservoirs
(Tsurumi river)

Constructing permeable pavements

permeable pavement

permeable tile pavement

Tokyo

Installation of Infiltration facilities

Seepage pits・Seepage trench

Comprehensive flood control measures

1)River improvement

- River channel improvement
- Construction of dams, retarding basins and discharge channels etc.

2)Measures in river basins

- Maintaining urbanization control areas
- Conservation of fields
- Constructing reservoirs
- Constructing rainwater tanks
- Constructing permeable pavements and seepage pits

3)Measures to alleviate damage

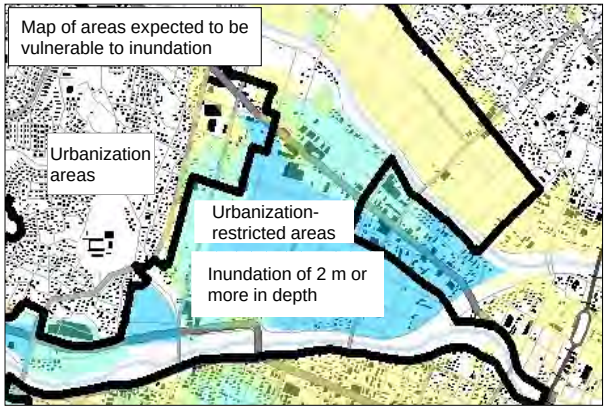
- Establishing the evacuation warning systems
- Maintaining Flood Fighting systems
- Promoting awareness of local residents

Considerations in Land Use Plans

Technical standards for expansion of urban areas which are set forth in the City Planning Act

* Urbanization promotion area
Any areas specified as urbanization promotion areas which are to be urbanized preferentially and systematically within ten years or so will not include, in principle, any areas where disasters may occur due to overflow stream, flood, tsunami, tidal wave, etc. (Excerpt of a Cabinet Order concerning Article 3 of the City Planning Act)

<Case where areas with high risk of inundation are designated as urbanization-restricted areas, and thus limited for use as building land>



Expected depth of flood
- Less than 50 cm
- 50 cm – less than 1 m
- 1 m – less than 2 m
- 2 m – less than 5 m
- 5 m or more

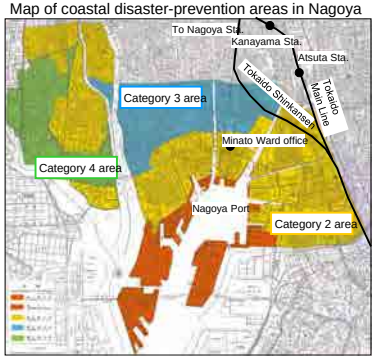
* Flood control basins in urbanization-restricted areas, and farm land and green spaces, etc. which can temporarily reserve and infiltrate rainwater are considered to be effective to reduce the risk of floods in urbanization areas, so that it is effective to maintain such lands as, for example, farm land.

Considerations in Land Use Plans

Article 39 of the Building Standards Act, "System of Disaster Hazard Areas" (Nagoya City)

* Nagoya City has, based on the lessons from Isewan Typhoon in 1959, enacted ordinances in accordance with the Building Standards Act and designated disaster hazard areas.
* The city designated 4 types of coastal disaster-prevention areas as the disaster hazard areas, laying down the restrictions concerning the heights of the first floor of buildings, the use of architectural buildings, etc., and the structures.

Map of coastal disaster-prevention areas in Nagoya



Summary table of coastal disaster-prevention areas in Nagoya city

	Description of area	Height of floor on 1st floor	Restrictions on structure	Graphics
Category 1 area	Areas on the sea side from tide barriers. Chiefly coastal reclaimed industrial area.	N/P (+) 4 m or higher	Any wooden structures will be prohibited. In the areas which are within 50 m from the coastal line or river bank and specified by the mayor, construction of any structural buildings with residential rooms, hospitals, welfare facilities for children, etc. will be prohibited. (Structural buildings other than wooden ones, where the floor height of residential spaces, etc. is N/P (+) 5.5m or higher may be constructed.)	
Category 2 area	Areas already urbanized before Isewan Typhoon, and those urbanized after the typhoon are included. The land as a whole is being used for similar purposes.	N/P (+) 1 m or higher	Any residential spaces will be placed on the second or higher floor. The restriction may be relaxed if any of the following three conditions is satisfied: 1: The floor height of one or more residential spaces on the 1st floor will be N/P (+) 3.5m or higher. 2: A structural building with 2 or more stories will be built on the same premises. 3: An evacuation room and facilities will be installed, if the total floor area is 100 m² or less.	
Category 3 area	Areas already urbanized at the time of Isewan Typhoon, and located inland. Thus they do not require strict regulations	N/P (+) 1 m or higher	—	
Category 4 area	Urbanization-restricted areas	N/P (+) 1 m or higher	Any residential spaces will be placed on the second or higher floor. The restriction may be relaxed if any of the following two conditions is satisfied: 1: The floor height of one or more residential spaces on the 1st floor will be N/P (+) 3.5 m or higher. 2: A structural building with 2 or more stories will be built on the same premises.	

* Where schools, hospitals, meeting grounds, public offices, welfare facilities for children, and other public architectures located in areas of Categories 2 – 4 are concerned, one or more residential spaces will be placed on the architecture with the floor height of the first floor of N・P(+) 2 m or higher, and with the height of N・P (+) 3.5 m or higher.

Provision of river information

Routinely measured river information* is provided in real-time (24hours a day, 365 days a year) to river managers, municipal supervisors, and other state departments.
*Includes various data from radar, rainfall measurement stations, river water level meter stations, dams

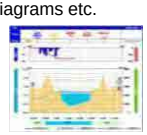
The Ministry of Land, Infrastructure, Transport and Tourism provides river information in real time, 24hours a day, 365 days a year throughout Japan to help protect lives and property from rainfall-induced river and land-based hazards

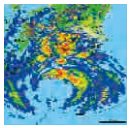
Nationwide data on radar-measured rainfall, river water level/flow rate, ground-level rainfall, dam influx/discharge etc. is measured and sent by telemetry

Data is collected, processed and edited into an easy-to-use form and transmitted

Collection
Data is acquired from 17,300 stations nationwide every 10 minutes.

Processing • Editing
Collected data is processed and edited into easily understood tables, graphs, maps, diagrams etc.



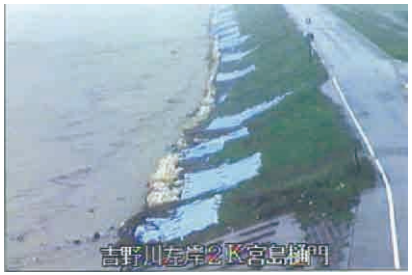


Transmission
Data is provided to each user in an easy-to-use form depending on their needs.
(information by time/location provided as needed)

Sent to river managers, municipalities, state depts. etc. via Internet and cell phone

Flood-fighting (*Suibo*) Activities





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Flood in Thailand in 2011



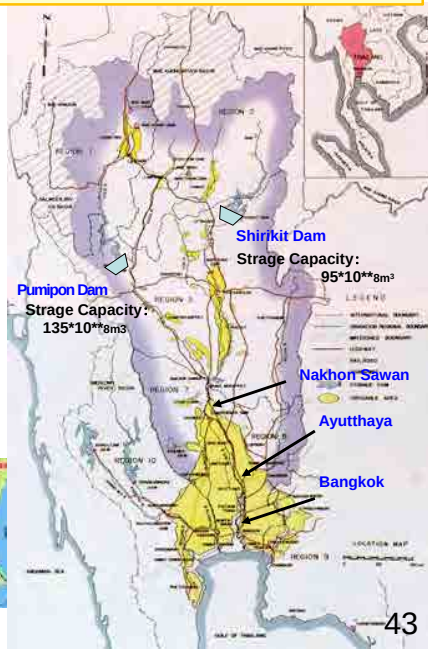

Source: Ministry of Land, Infrastructure, Transport and Tourism, Japan

Chao Phraya and Tone River

	Tone River	Chao Phraya
Basin Area	16,480km^2	159,000km^2
Length	322km	1,100km
Gradient	1/500 ～ 3,000 (120～180km from Mouth) 1/9,000 (Around Mouth)	1/4,000 ～ 5,000 (200～400km from Mouth) 1/50,000 ～ 60,000 (Around Mouth)
Volume of Discharge	17,000m^3/s (Estimated) (180km from Mouth) in 1947	5,950m^3/s (Estimated) (350km from Mouth) in 2006

Low Capacity of Discharge

・Nakhon Sawan 3,000～4,000m^3/s
・Ayutthaya (Up) 1,300m^3/s
・Ayutthaya (Dn) 2,900m^3/s
・Bangkok 3,600m^3/s



History of flood control in Tone River basin

Up to 15th Century, Tone River crossed the Kanto Plain from north to south and flew into Tokyo Bay

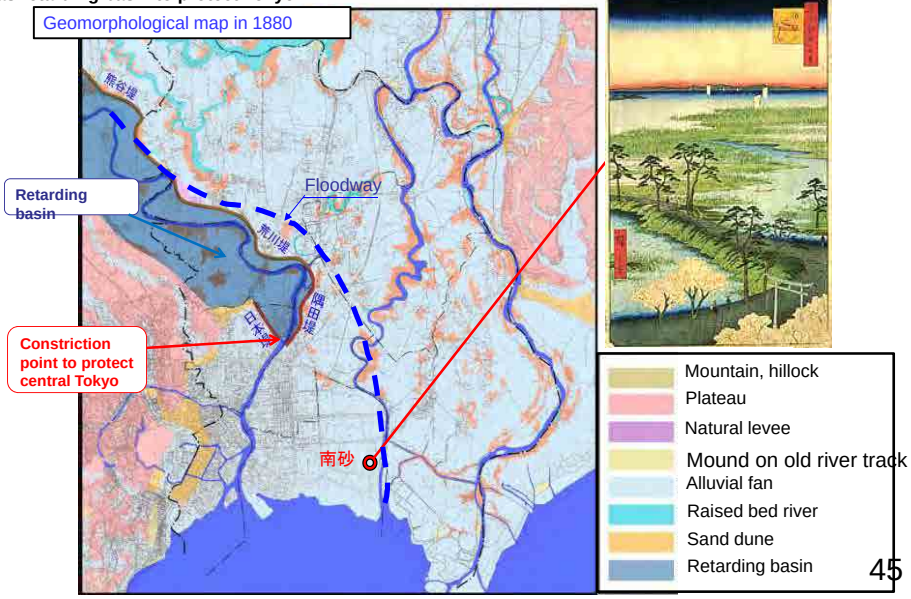
From 1594 to 1654, Tone River was connected by eastward channel to Pacific Ocean

・After the flood in 1910, flood control measures in upper and middle reaches has changed from “flood control allowing inundation” to “sequential levee confinement method”

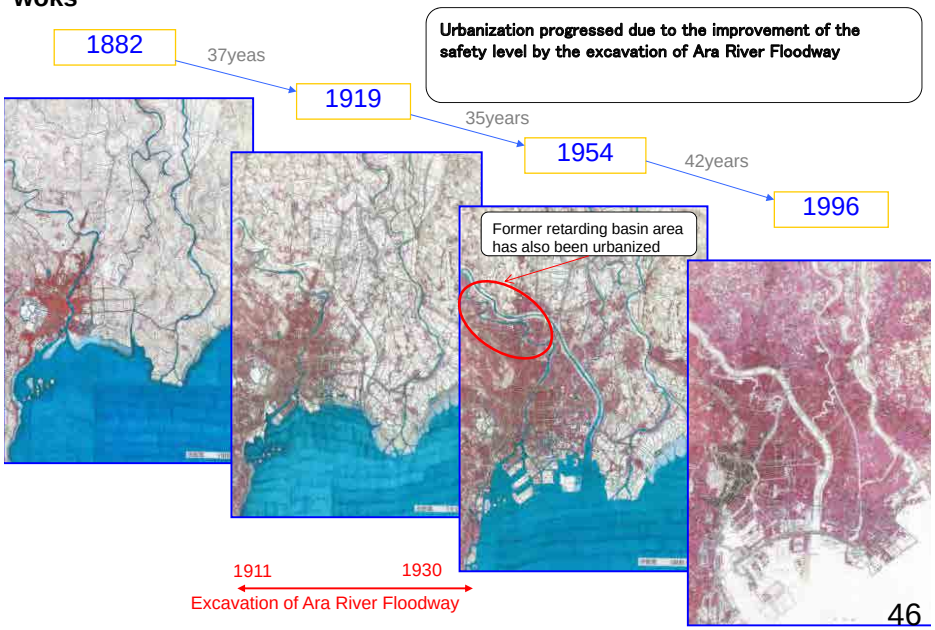
・After this change, the maximum discharge in the Tone River Channel has increased, which became the main challenge of flood control in Tone River Basin

History of flood control in Ara River basin

Up to the beginning of 19th century, upstream area of Tokyo was taken as retarding basin to protect Tokyo



Japanese metropolitan area has developed with flood defense woks

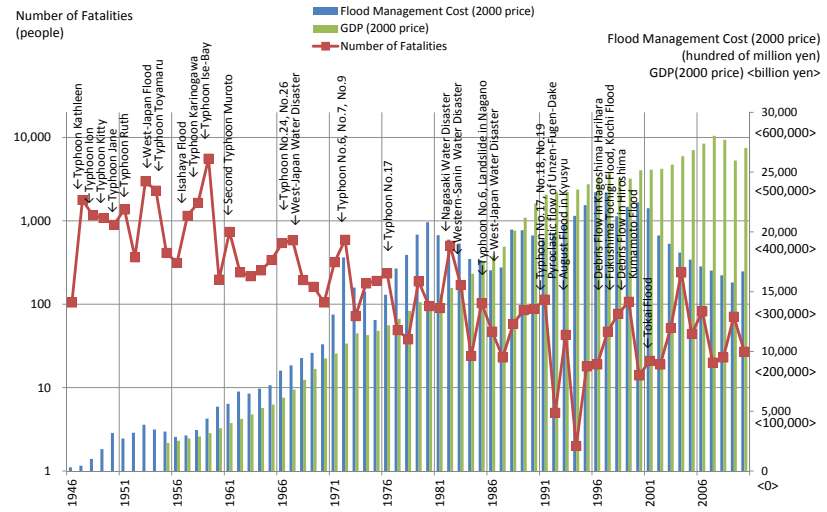


Rivers in Japan and Outline of River Governance

1. Characteristics of Rivers in Japan
2. River Management in Japan
3. Flood Risk Management
   1) Reduction of Flood Damage and Victims – the Japanese Way –
   2) Comprehensive Flood Measures at River Basin Scale
4. Comparison on River Management between Japan and Thailand
5. Conclusion

Effect of Flood Management in Japan

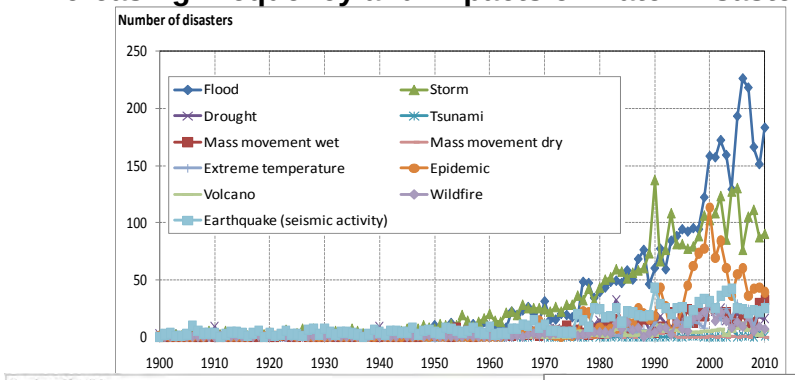
Number of Fatalities by Floods ,
GDP and Budget for Flood Management (2000 price)

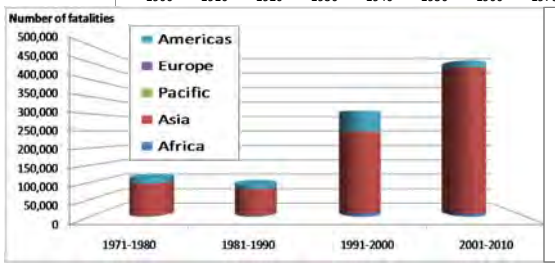


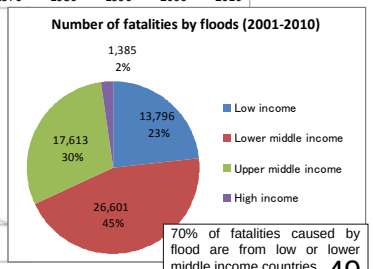
Water-related Disasters Statistics in Japan

*Number of fatalities exclude those who dead by tsunami
*GDP : 1980-2011(2000 price), 1946-1979(1990 price)

Increasing Frequency and Impacts of Water Disasters



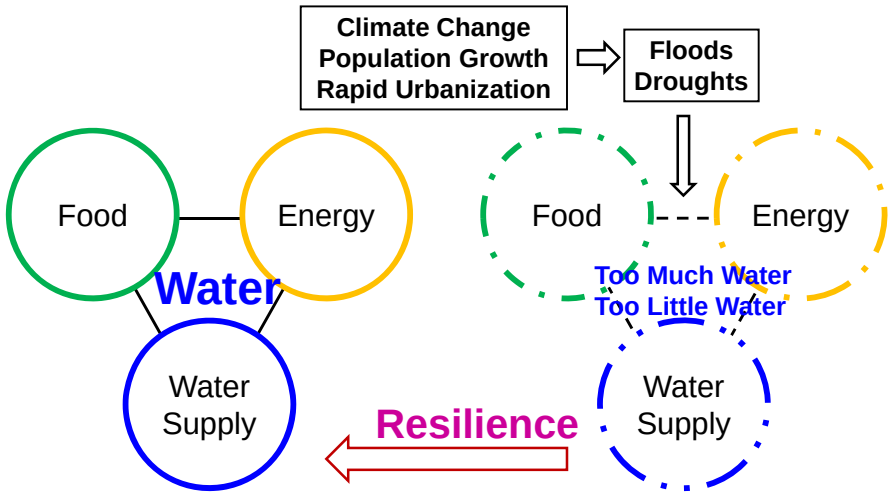




70% of fatalities caused by flood are from low or lower middle income countries.

Source: EM-DAT: The OFDA/CRED International Disaster Database (As of Sept 2010)

Concept of 'Sustainable Development with Water and Disaster'



Water, Food and Energy are keys for Sustainable Development.
Water-related Disaster Risks should be reduced in order to ensure sustainable development

3 Directions for Effective Disaster Management

1. Disaster management into sustainable development

Sustainable development cannot be achieved without appropriate disaster management. It is necessary to assimilate disaster management into development policy-making process.

2. Disaster management at all the phases

Disaster risk reduction should be implemented before a disaster strikes, and then emergency response and quick recovery should be introduced once a disaster occurs. Disaster management is effective when measures are well organized, prepared and implemented in the phase of prevention, preparedness, emergency response, recovery and reconstruction.

3. Disaster management tailored to local conditions

The best combination of structural and non-structural measures including capacity building can be provided as a solution for disaster management by taking account of their applicability to local conditions.

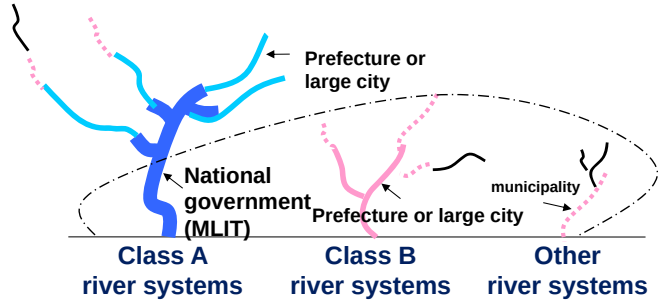
Basic Policy for Water and Disaster Management and Hydroinformatics (ICT for River Management) in Japan

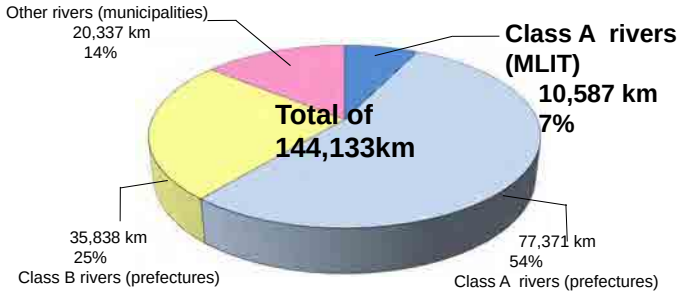
Water and Disaster Management Bureau,
Ministry of Land, Infrastructure, Transport and Tourism

December 2012

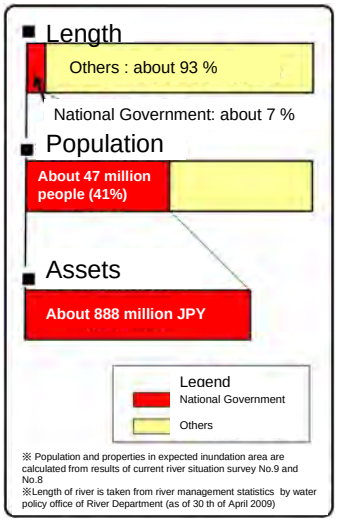
Basin-based managers of rivers and water resources in Japan

About 7% of the total river length are directly managed by the national government (MLIT).





Ratio of MLIT direct management



(As of April 30, 2009)

Forecasting Flooding by Large Rivers

With regard to waterways running through two or more prefecture districts, the Minister of Land, Infrastructure and Transport must indicate the water level or flow rate after flooding, or the areas to be inundated after overflow and the depth, and must notify the situation to the local governors as well as to the general public with the cooperation of news media as necessary. (Article 10 (2) of Flood Control Act)

Before

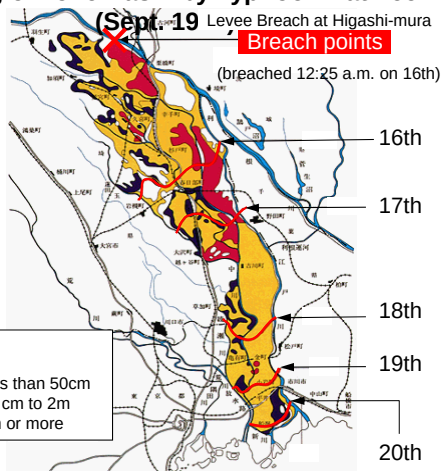
Flood forecasting based only on river water level and flow rate.

After revision

In addition to conventional flood forecasting data, also forecast the areas to be inundated after overflow and the depth so that residents can be evacuated properly.

*The waterways and districts are selected for forecasts of inundation levels considering the population and assets inside the area and the time flood waters are expected to reach the area.

Flooding of Tone Basin by Typhoon Kathleen (Sept. 19



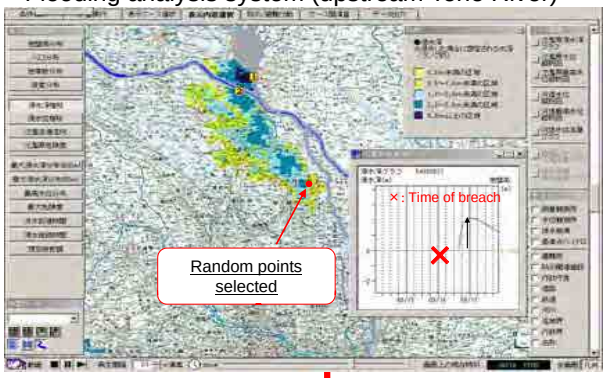
Issuing Flood Forecasts (example for Tone River)

In floods, actual and forecast rainfall, water levels and other data are used to calculate inundation in real time, and the areas and depth of flooding are forecast based on the results.

Flood forecasting steps (guidelines)

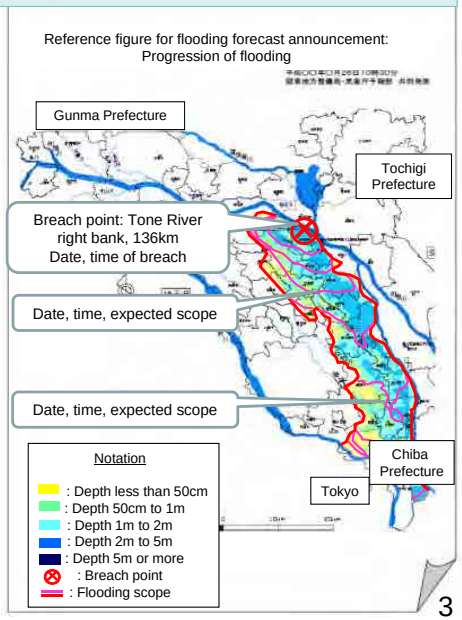
(1) Collect and exchange data
(2) Forecast flooding
(3) Forecast flood levels

Flooding analysis system (upstream Tone River)



(4) Write up announcement
(5) Issue forecast

Reference figure for flooding forecast announcement: Progression of flooding



Improvement of Technical Terms for Disaster Management of Floods, etc.

To provide understandable disaster information aiming to lead appropriate judgment and actions by receivers, following improvements are conducted:

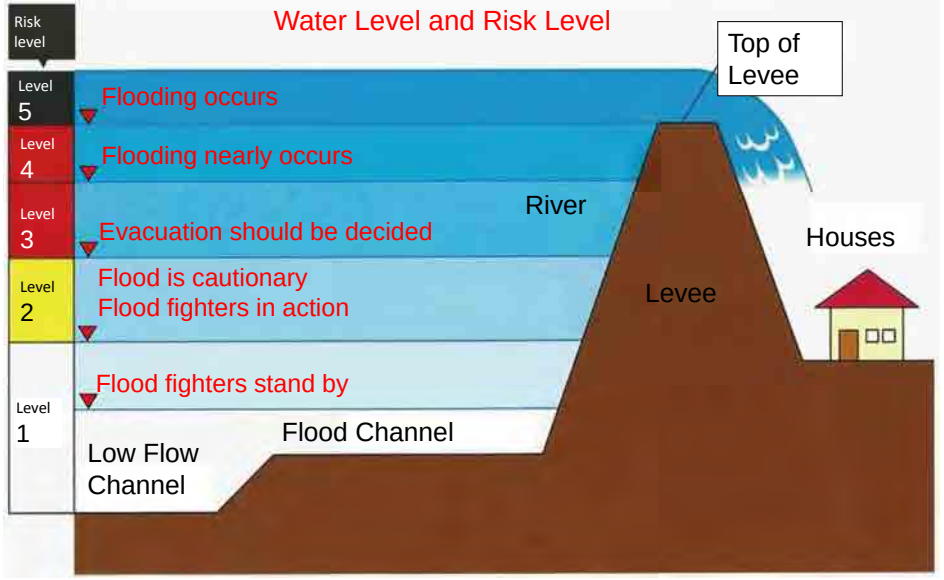
- Setting-up of water levels: To set-up risk level of water levels considering extent of

※To unify the color over the country to recognize the risk level

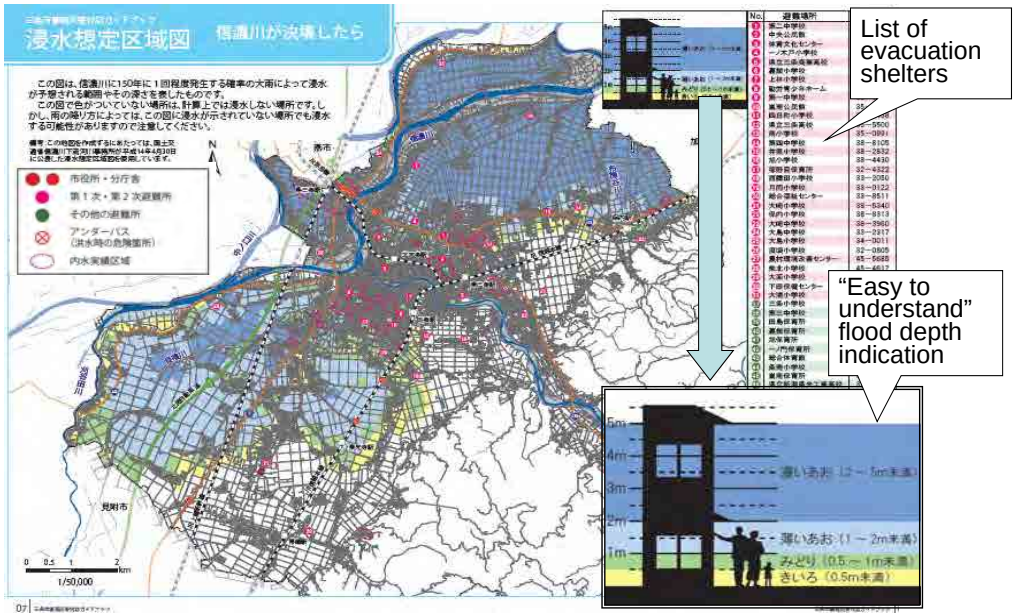
Risk Level	Water level	Rivers designated for flood forecasting Rivers to be known water levels	Action required by local governments and inhabitants
5	Occurrence of inundation	Information of occurrence of inundation in ○○River	Rescue of inhabitants who out slipped for evacuation
4 (Dangerous)	Critical water level of inundation	Information of dangers of inundation in ○○River	Completion of evacuation by inhabitants
3 (Alert)	Warning water level to start evacuation	Information of warning of inundation in ○○River In case that WL has reached the warning water level to start evacuation or is anticipated to reach up to the Critical Water Level of inundation.	Issuance of advice for conducting evacuation
2 (Caution)	Pre-cautious water level of inundation	Pre-cautios water level of inundation in ○○River	Issuance of information for preparation of evacuation
1	Water level for stand-by of flood fighting corp.	Warning for flood fighting	Stand-by of flood fighting corp.

Establishment of Thresholds for Evacuation Orders

In order to promote smooth evacuation actions, thresholds of water levels for evacuation orders have been established. Categorization of water levels based on risk levels have been implemented, as well.



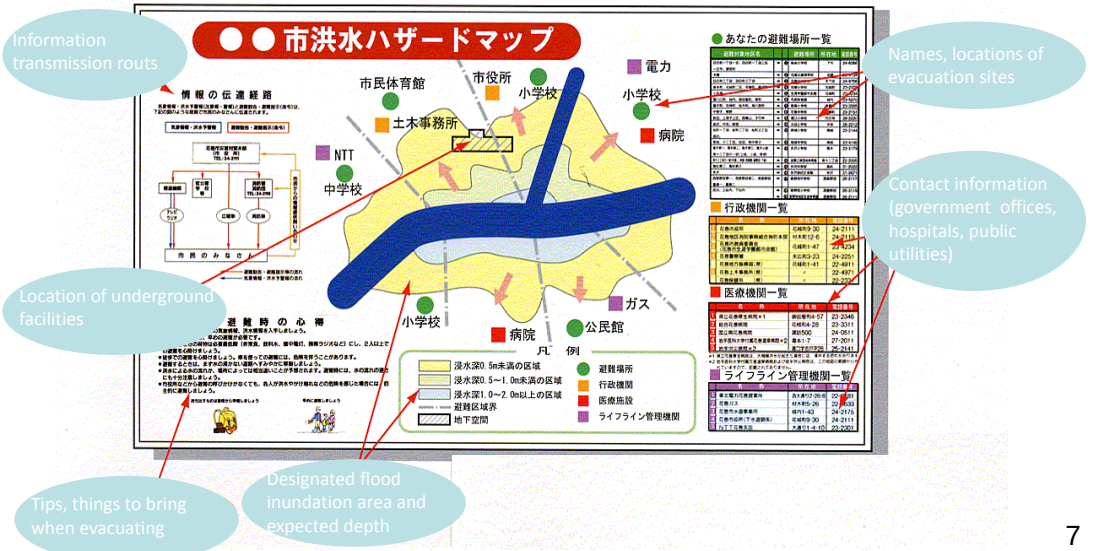
Raising Public Awareness by Disseminating "Easy to Understand" Disaster Prevention Information such as Hazard Maps



Hazard Map - Sanjo City Torrential Rain Disaster Handbook -

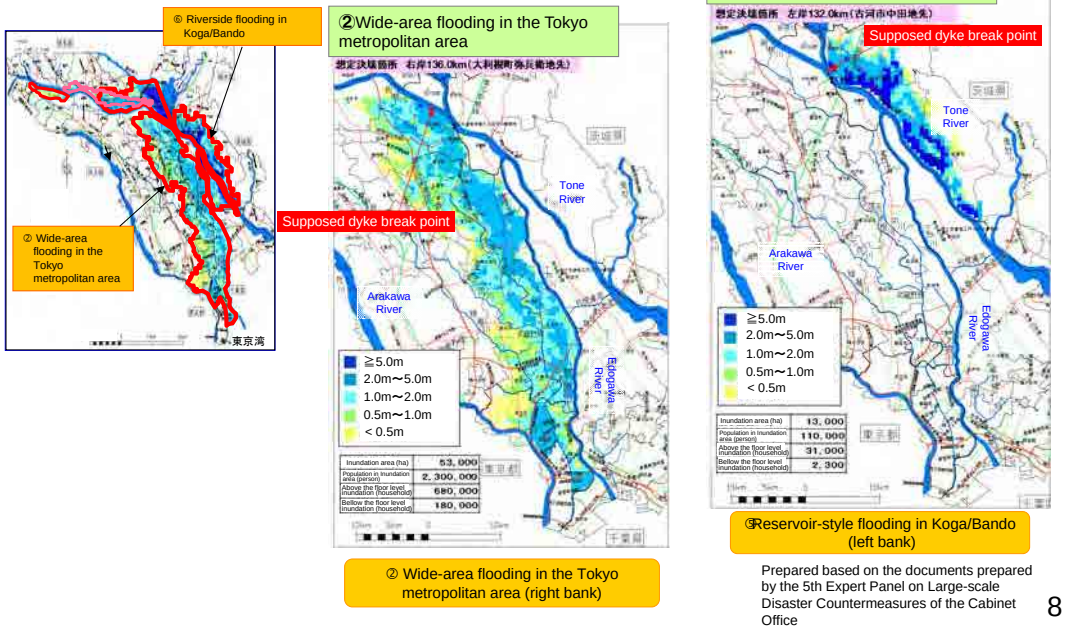
Preparation and dissemination of flood hazard maps

Based on the article 15 of the flood-fighting act, municipalities prepare and disseminate flood hazard maps to residents on the basis of flood inundation area maps.



Measures to avoid breakdowns of pivotal functions

(Tone River etc.)



② Wide-area flooding in the Tokyo metropolitan area (right bank)

⑥Reservoir-style flooding in Koga/Bando (left bank)

Prepared based on the documents prepared by the 5th Expert Panel on Large-scale Disaster Countermeasures of the Cabinet Office

Establishment of Water disaster forecasting center in Regional Development Bureau

Background of the establishment

●Recently, there have been increasing number of heavy rain and localized intensive downpour which exceed existing records of observation. Therefore, faster and more appropriate response by river managers and local public organizations etc. is needed.

●It is necessary to analyze and evaluate water disaster risks and reflect the results to structural and non-structural measures appropriately in order to achieve “0 victim” while the Climate change increases risk of disaster.

Establish water disaster forecasting centers in eight Regional Development Bureaus in April 2009 and in Hokkaido Regional Development Bureau in October 2010.

①Carry out and improve monitoring and forecast of water disaster

②Collect and provide information related to monitoring, forecast, warning of water disaster and information on water level

③Analyze and evaluate impacts of the climate change on water disaster

④Support flood-control managers and river managers of prefectures

Improvement of information systems for gathering and analyzing

○When a disaster occurs, bases are established to collect information and respond to the disaster.

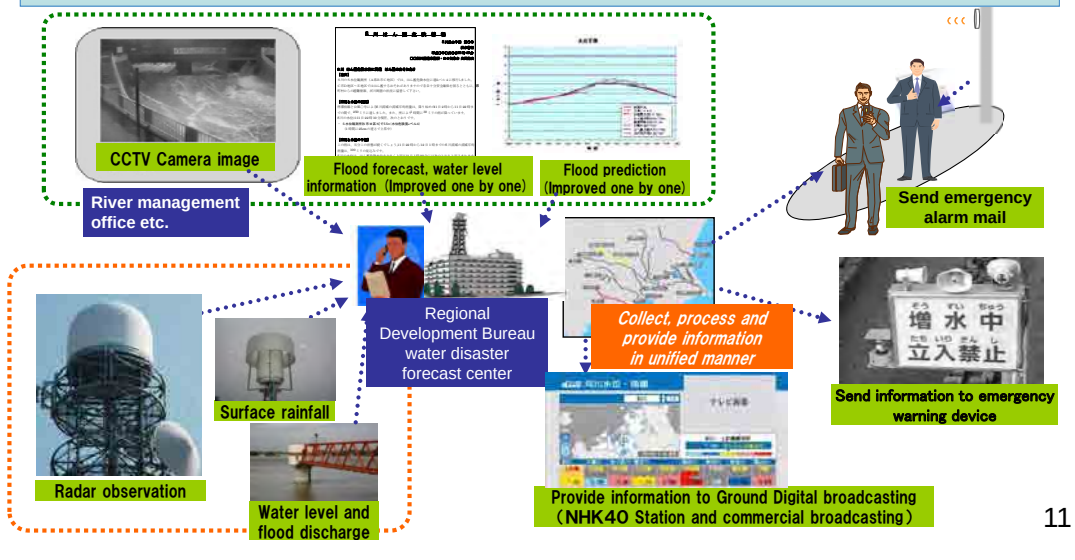
○It is necessary to establish systems to gather, analyze, and share various kinds of information such as water levels, flow rates, and precipitation.

写真：国土交通省関東地方整備局

Collect and Provide Information

●Collect river information such as water level and rainfall (and these forecasts), amount of discharged water from dams, camera images, warning (flood forecast, reaching water level) damages etc. in unified manner when disaster occur, and provide information to national branch offices, local public organizations, disaster control agencies and local residents.

●In order to use these information appropriately in an emergency, carry out promotion of disaster control, maintenance of devices, improvement of information in non-emergency case.



Observation of rainfall and water level by telemeter

■Number of observatory stations to send information by telemeter system

(February 2012)

Jurisdiction	Rainfall	Water level
Water and Disaster Management Bureau, MLIT	2,401	2,263
Prefectures	4,722	4,175
Japan Meteorological Agency	1,291	0
Total	8,414	6,438

CCTV Network service

Enabling real-time access to CCTV images instantly at the ministry, regional development bureaus and related offices

Use CCTV images to plan for disaster countermeasures

Example of video image
(Yodo river in Osaka in 14th of August 2007)

Number of CCTV

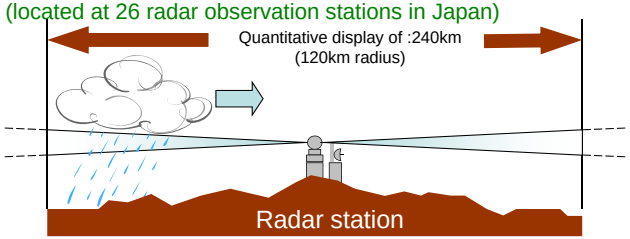
	March 2011				
	Road	River	Landslide prevention	Others	Total
Hokkaido	1,452	957	67	18	2,494
Tohoku	1,258	762	86	90	2,196
Kanto	1,272	1,608	72	142	3,094
Hokuriku	653	615	238	118	1,624
Chubu	1,314	834	124	56	2,328
Kinki	858	900	67	225	2,050
Chugoku	1092	752	15	38	1,897
Shikoku	760	330	36	105	1,231
Kyushu	956	1,351	78	61	2,446
Okinawa	114	56	0	6	176
Total	9,729	8,165	783	859	19,536

(※count only direct management
March 2011 Researched by Electricity and communication office)

Rainfall Observation in the Past

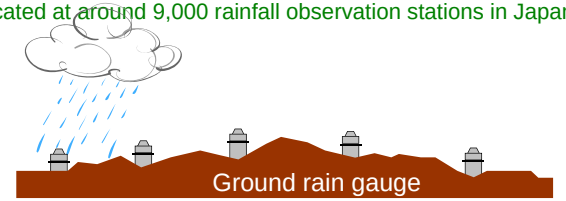
- 26 units of C-band radars monitor across Japan as well as the conventional ground rain gauge, for monitoring the rainfall in a wide-area.
- Although effective for observing frontal heavy rain in a wide-area, detecting sudden intense rainfall in details may be difficult.

Radar rain gauge system
(located at 26 radar observation stations in Japan)

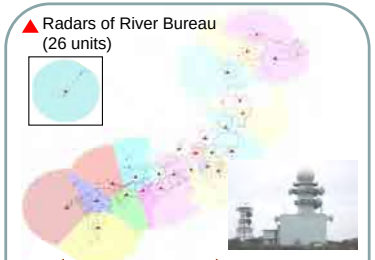


Detects rainfall in a wide-area

Conventional rain gauge system
(located at around 9,000 rainfall observation stations in Japan)



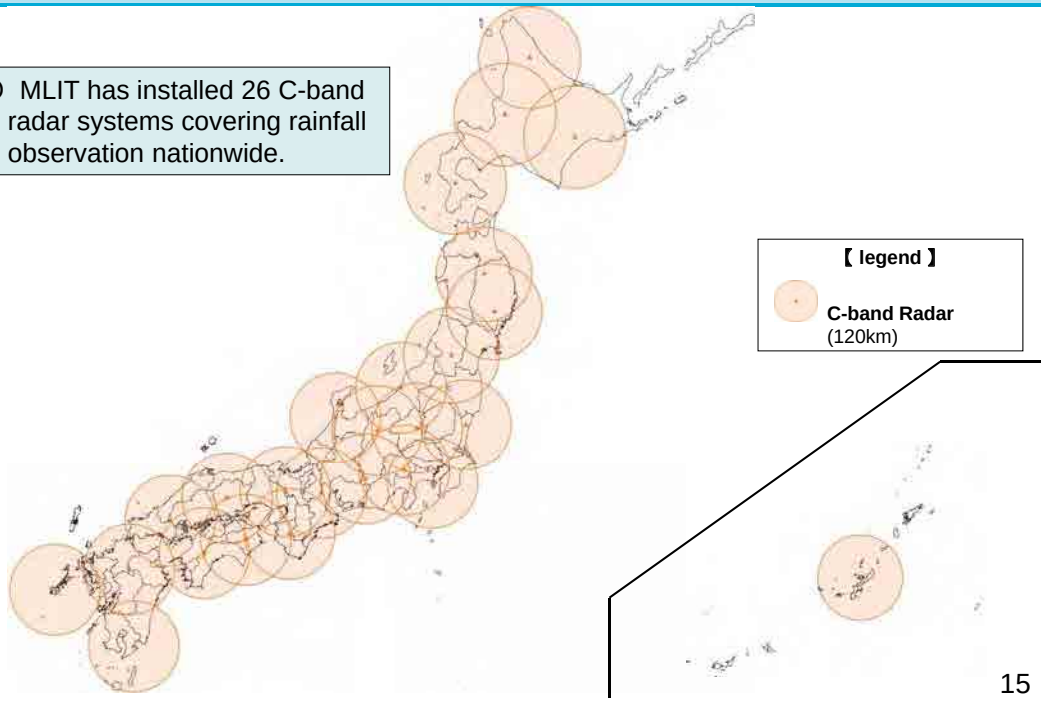
Detects rainfall only at the observation point



Spread of rain area, rainfall intensity are observed every 5 minutes, which enables predict direction of transition of rain area as well as its prosperity and decline

Status of MLIT's C-Band Radar

○ MLIT has installed 26 C-band radar systems covering rainfall observation nationwide.



Flood Disaster caused by Heavy Rain (over total 1,000mm)

国土交通省

Flood and landslide disaster caused by heavy rain (over total 1,000mm) across Japan every year

July, 2006

- Torrential Rain (over total1,200mm)
- 5 dead person, 3,573 flooded houses

	7月豪雨
死者	5名
床上浸水	899棟
床下浸水	2,674棟

Landslide in Kagoshima Pref.

Broken houses by flood in Kagoshima Pref.

July, 2007

- Typhoon no.4 (over total 1,000mm)
- 3 dead person, 1,321 flooded houses

	台風4号
死者	3名
床上浸水	169棟
床下浸水	1,152棟

Flood in Kumamot Pref.

Flood in Kumamot Pref.

July, 2010

- Seasonal Rain (over total 1,200mm)
- 15 dead person, 7,819 flooded houses

	梅雨前線等
死者数	15名
床上浸水	1,806棟
床下浸水	5,813棟

Landslide on pref. road no.74 in Kagoshima Pref.

Landslide under the houses in Kagoshima Pref.

Oct, 2011

- Typhoon no.12 (over total 2,400mm)
- 73 dead person, 27,003 flooded houses

	台風12号
死者	73名
床上浸水	7,836棟
床下浸水	19,167棟

※Oct.19, 2011

Huge damage by flood in Mie Pref.

Huge damage by flood in Wakayama Pref.

Heavy Rain (over 100mm/hr)

国土交通省

Flooded damages caused by heavy rain (over 100mm/hr) across Japan

July,2008 Flooded damages in Ishikawa pref.

Heavy rain (132mm/hr) recorded in Nanto city, Toyama Pref.

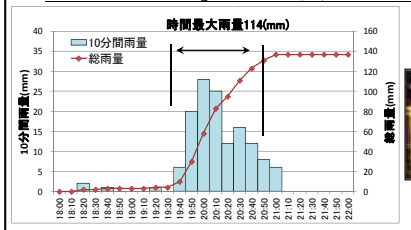
Driftwood under the bridge in Kanazawa city

Broken houses by landslide in Nanto city

Flooded houses damages (over floor; 507, under floor; 1,476) in Kanazawa city
55 landslide and 20 broken houses damages in both of Ishikawa and Tomaya pref.

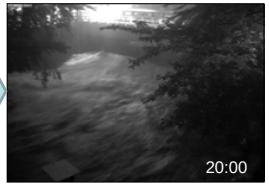
July 5, 2010 Damages caused by short-term torrential rain in Tokyo

- Heavy rain 114mm/hr (Itabashi observation site near Shakujii river)
- Heavy rain 82 mm/hr (青岸橋 observation site near 残堀川)
- Flooded damages caused by Shakujii river
- Flooded houses damages (over floor;58, under floor; 50)



Itabashi observation site

3.45m water level increase in 10 minitues starting 19:50

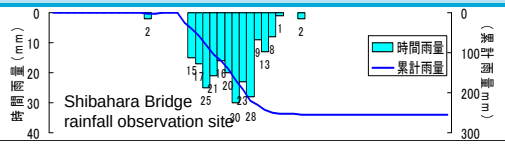


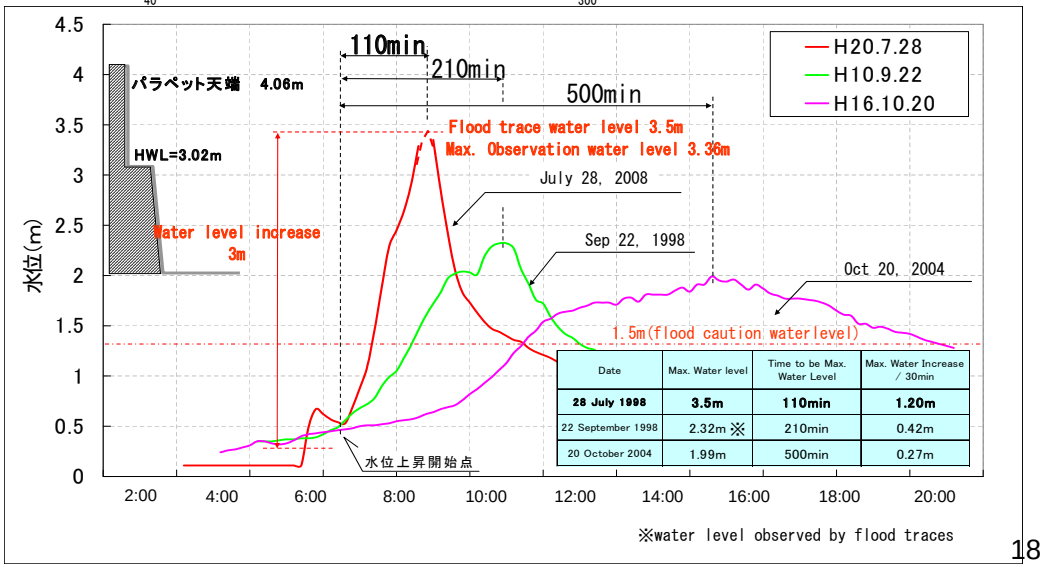
Changes of Shakujii river's water level

Provided by日本気象協会

July 28, 2008, Rainfall and Water Level at Tenjin Bridge of Asano River

国土交通省





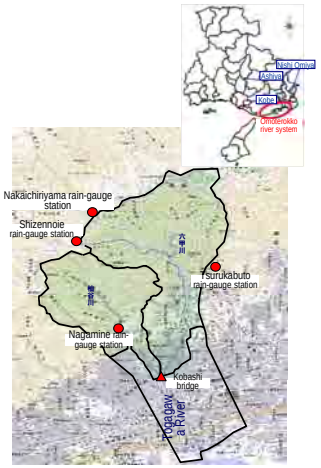
Date	Max. Water level	Time to be Max. Water Level	Max. Water Increase / 30min
28 July 1998	**3.5m**	**110min**	**1.20m**
22 September 1998	2.32m ※	210min	0.42m
20 October 2004	1.99m	500min	0.27m

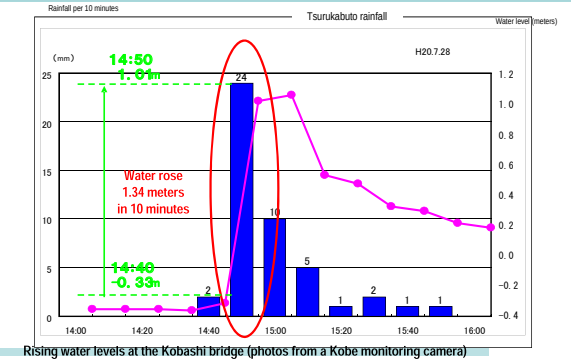
※water level observed by flood traces

Water levels and rainfall at the Kobashi Bridge on the Togagawa River, July 28, 2008

MLIT

- An intense rainstorm hit the Togagawa River basin from 2:30 to 3 p.m. A 10-minute period was particular intense in Nagamine and Tsurukabuto starting at 2:40 p.m.
- At the Kobashi water-level station, the water level rose 1.34 meters in 10 minutes between 2:40 and 2:50, almost simultaneously with the downpour
- Five people were killed, including 3 children, 11 people rescued, and 41 people evacuated





Rising water levels at the Kobashi bridge (photos from a Kobe monitoring camera)

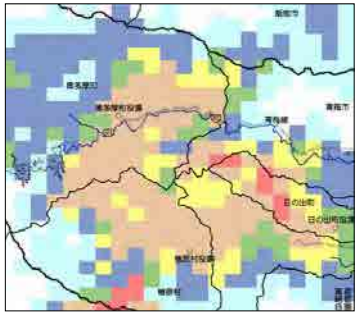
From a Hyogo Prefecture report by the First Small and Mid-Sized River Water Damage Prevention Study WG

XRAIN (X band MP Radar Information Network)

○Introduce XRAIN which has high frequency and high resolution in city areas and strengthen real-time observation in order to reduce damage from heavy rain and localized intensive downpour.

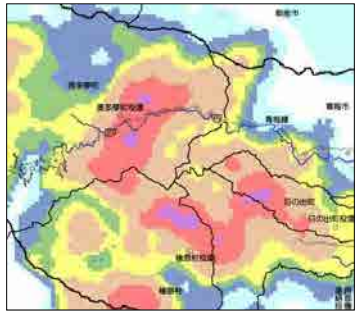
○ XRAIN achieve high frequency (5 times) and high resolution (16 times) observation compared to existing radar (C band radar). Also, XRAIN requires 1～2 minutes to transfer information while C band radar takes 5～10 munities.

【Existing radar(C band radar)】
(minimum observation area:1km mesh, information transfer period:5 min, time for information transfer from observation: 5～10 min



5 times higher frequency
16 times higher resolution

【XRAIN】
(minimum observation area :250 m mesh, information transfer period:1min, time for information transfer from observation: 1～2min)



※C band radar is appropriate for wide area observation (fixed observation radius120km), while XRAIN can be used to observe instantly heavy and localized rains which occur in small area (fixed observation radius60km)

XRAIN (X band MP Radar Information Network)

1. High resolution (Characteristic of X band)

・X band radar has shorter wave length and can perform high resolution observation compared to C band radar
(X band :8～12GHz, C band :4～8GHz)

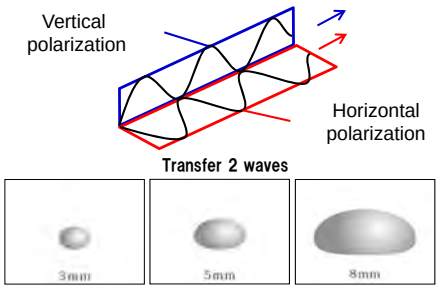
XRAIN
(in Nomi)

Radar antenna(in Saitama)

2. High frequency (Characteristic of MP radar)

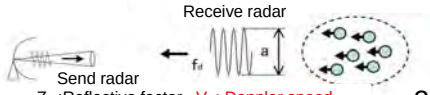
・Measure shapes of raindrops by transmitting two waves and estimate rainfall from flattening and other factors of raindrops.

・Possible to provide rainfall observation data with high accuracy almost instantly without supplemental surface records.



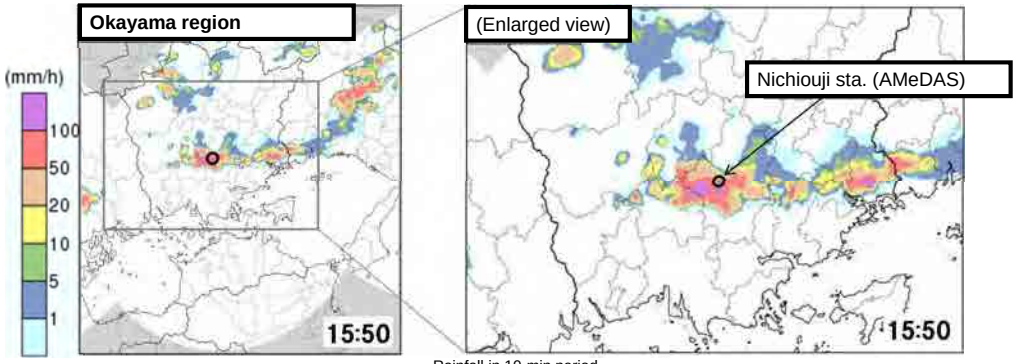
3. Enabling wind observation (Doppler effect)

・Possible to observe wind by measuring speed of raindrops by Doppler effect

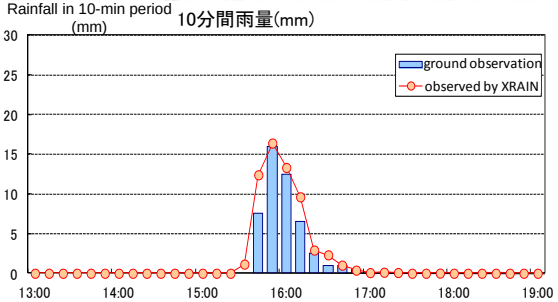


Z_H :Reflective factor V_D: Doppler speed

Example of Observation (Okayama Area: rainfall on 2011/8/12)

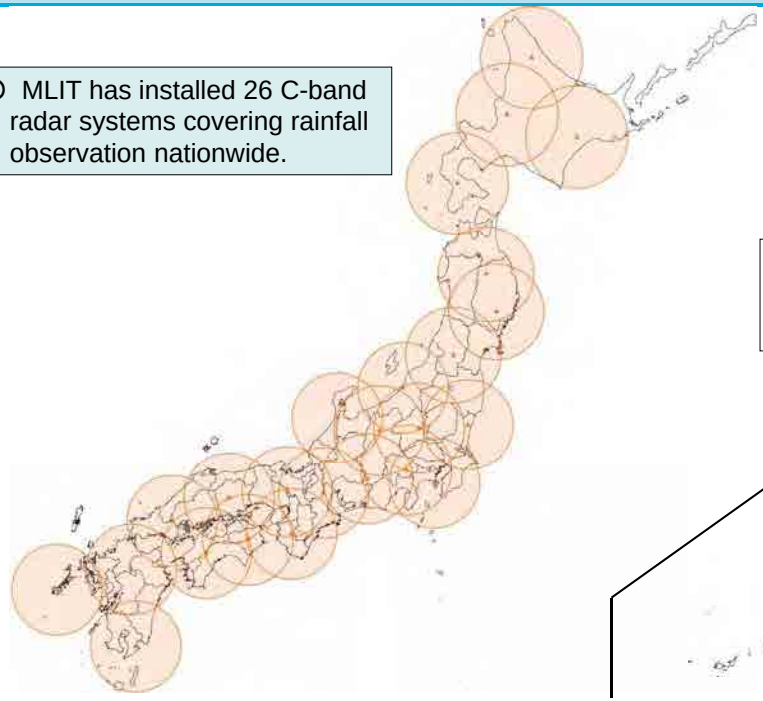


Comparison of precipitation data from XRAIN and ground gauges (at Nichiouji station)



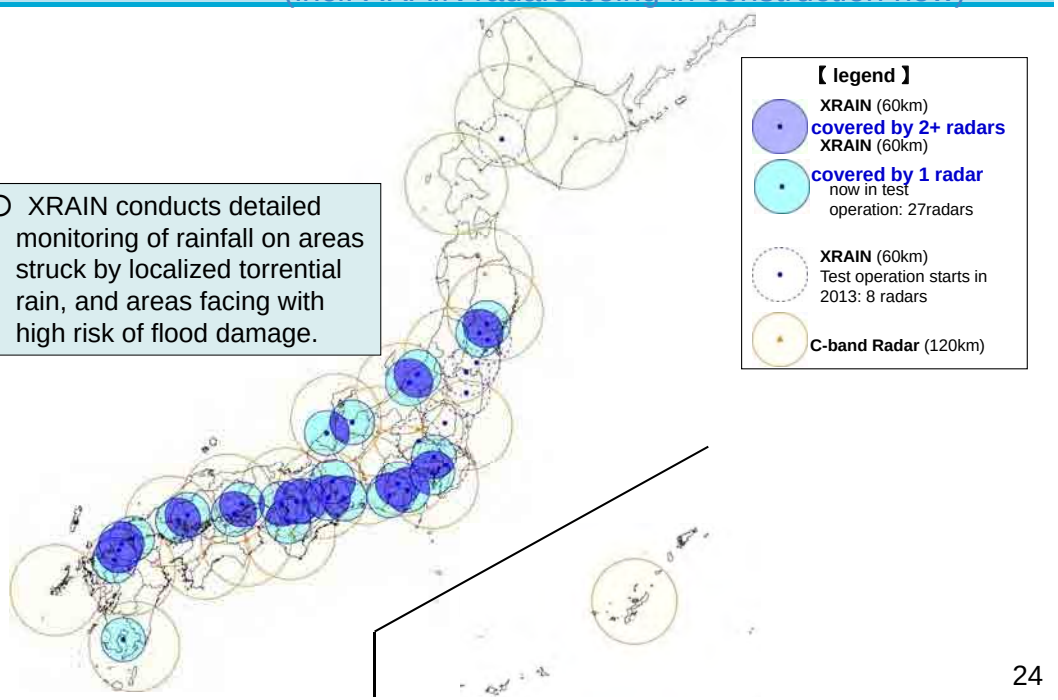
Status of MLIT's C-Band Radar

○ MLIT has installed 26 C-band radar systems covering rainfall observation nationwide.

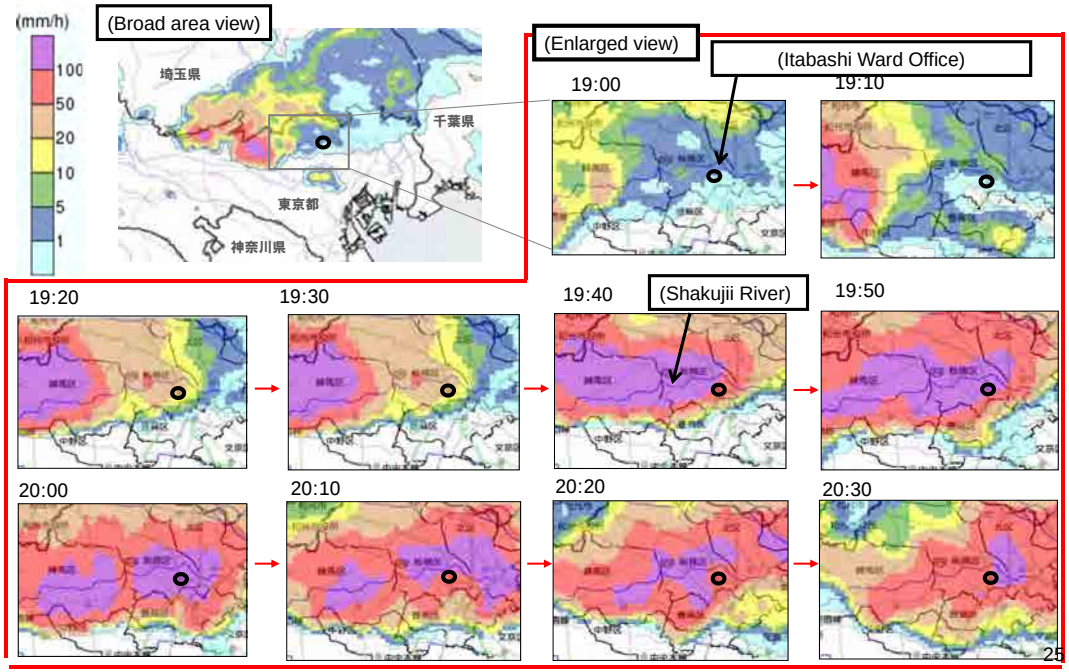


Status of MLIT's C-Band Radar and of XRAIN (incl. XRAIN radars being in construction now)

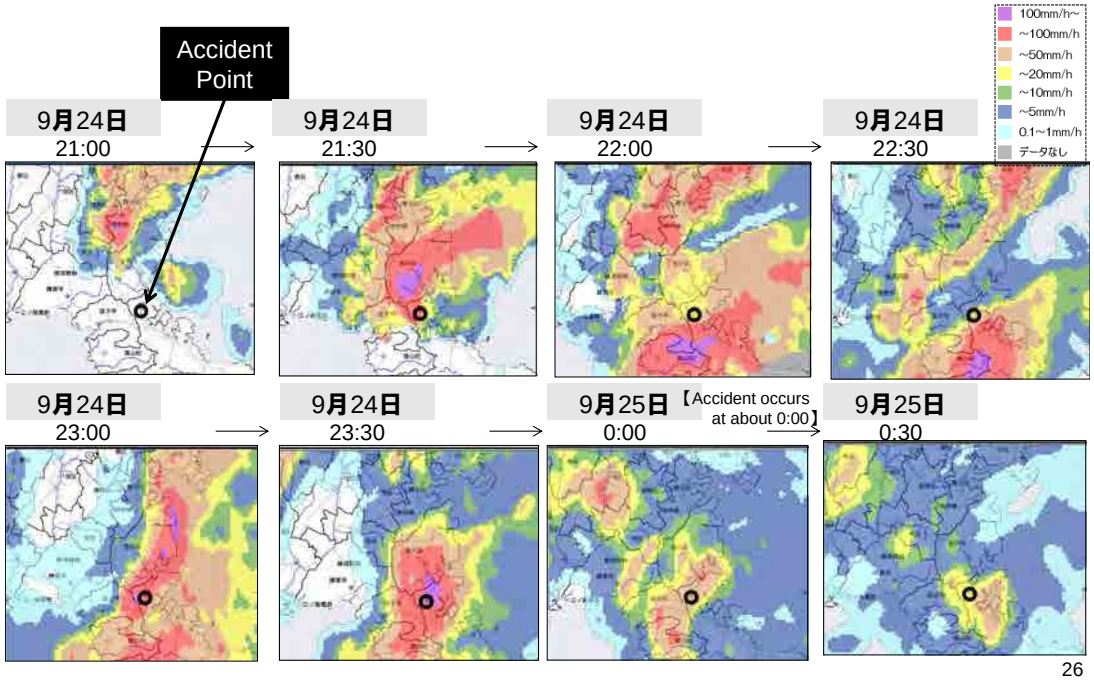
○ XRAIN conducts detailed monitoring of rainfall on areas struck by localized torrential rain, and areas facing with high risk of flood damage.



Example of Observation （Kanto Area: Rainfall on 7/5/2010）



Example of Observation （Kanto Area: rainfall on 9/24/2012）



Development of Flood and Inundation Monitoring System

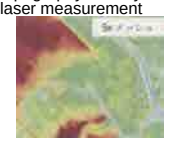
- In addition to detailed rainfall data from XRAIN, broad flood/inundation situations are predicted/monitored by high-precision topography data, flood forecast models, and technology used to grasp real-time inundation.
- Detailed river information is provided to municipalities and residents; can be used to support proper evacuation of residents.

Broad flood/inundation prediction technology

(1) Rainfall observation by **XRAIN**

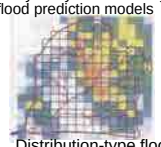
X band **MP** radar

(2) High-precision topography data by aerial laser measurement



Aerial laser survey

(3) High-precision runoff analysis by distribution-type flood prediction models



Distribution-type flood prediction model

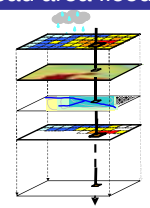
Grasping real-time inundation situation

(4) Grasp of real-time inundation situation using sensors

Inundation meter

Image of real-time inundation situation

Broad area flood and inundation monitoring system



Rainfall
Topography
Inundation situation
Runoff analysis

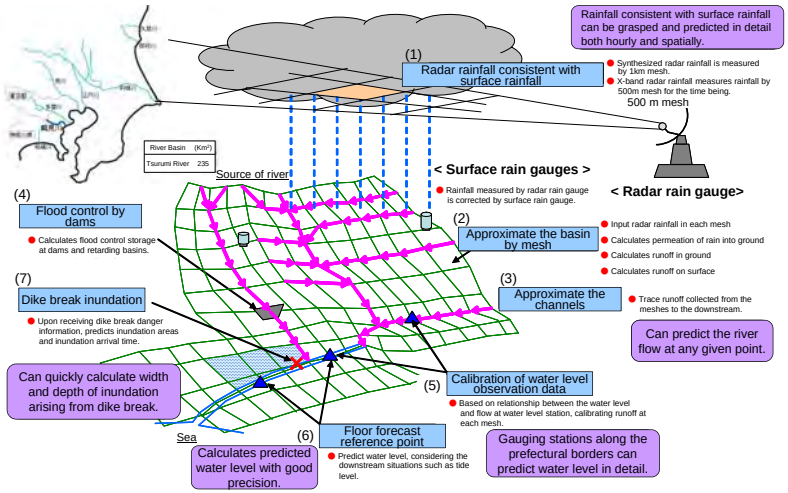
Risk evaluation for river basin by multi-layered risk indicators derived from various technologies

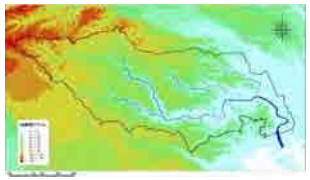
Regional Development Bureaus, Flood Forecast Centers

Providing detailed information to municipalities and residents

Eight bureaus opened since April 2009
Hokkaido Bureau opened in Oct. 2010

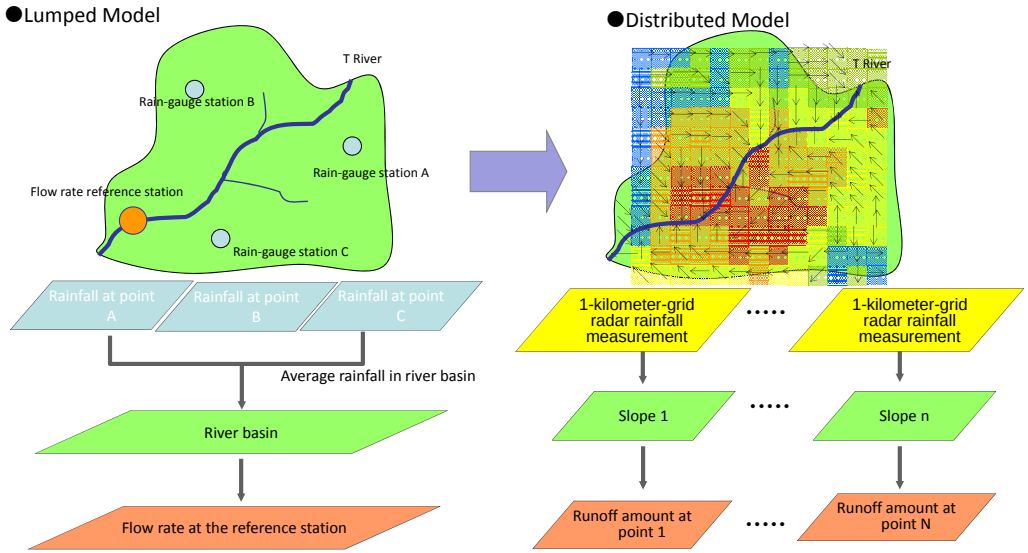
Water level forecast using distributed hydrological model (Example: Tsurumi River)





Condition	Contents
Subject floods	(1) Flood of Sep. 8, 2010 (2) Flood of Dec. 3, 2010
Actual rainfall	Radar rainfall (X band, C band)
Predicted rainfall	Complete prediction (Allocate the actual rainfall.)
Downstream water level	Tide level prediction (mouth of Tsurumi River)
Retarding basin, inland water	To be considered
Prediction points	Jikebashi, Asayamabashi, Toriyama, Takadabashi, Yagamibashi, Ochiaibashi, Kamenokobashi, Futoo, Tsunashima, Sueyoshibashi, Ashihobashi, Tsurumi River Mouth

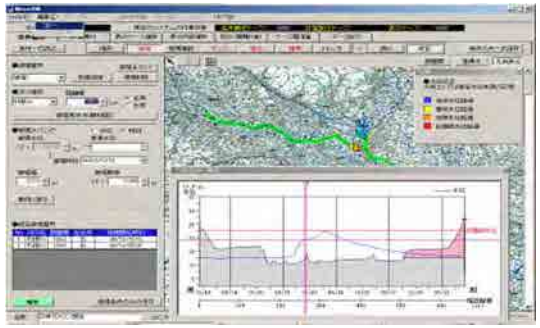
Precise Runoff Analysis Using Distributed Models

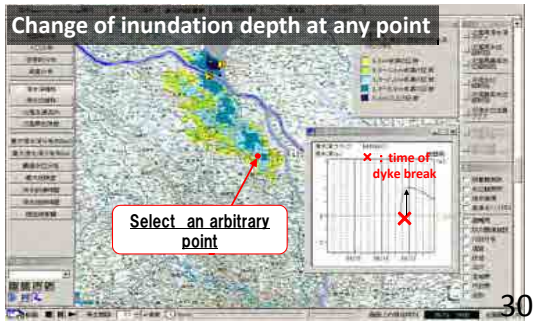


By dividing the river basin into a fine grid and assigning a precise rainfall distribution to each grid, it is possible to calculate the precise runoff at any point in the basin.

Real-time Inundation Simulation

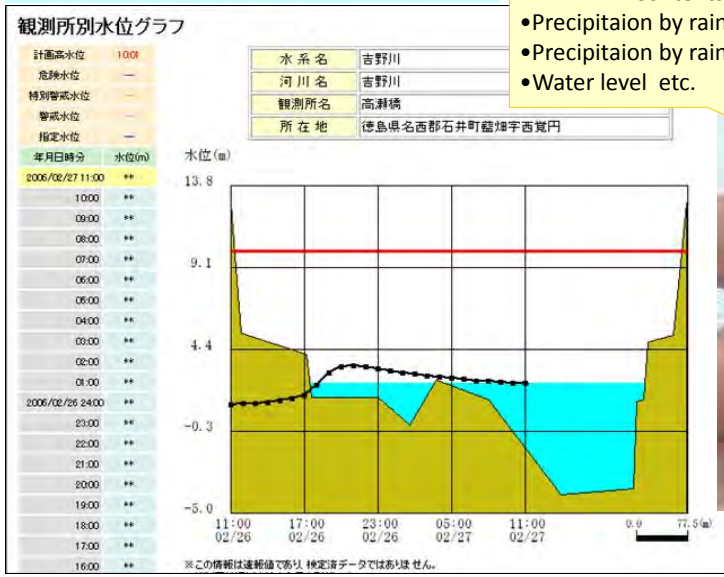
A real-time inundation simulation system provides forecast inundation depth and area based on the information of dyke breach, observed/forecast rainfall and river water level.





Provision of River Information via PC or Mobile Phone

Information through the internet



Information provided via mobile phones

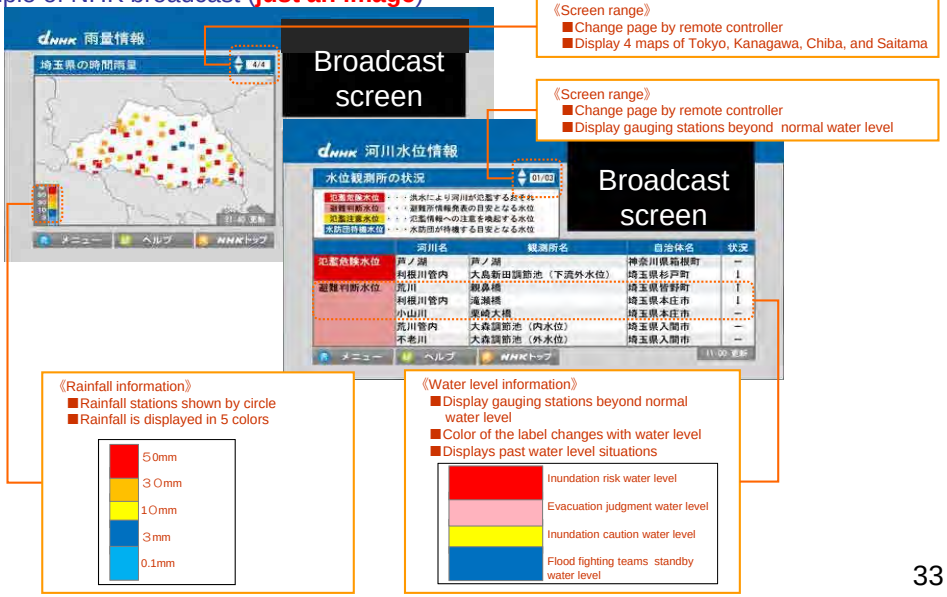
Contents
- Precipitaion by rain gauge
- Precipitaion by rain radar
- Water level etc.

Rainfall observation　Water level observation　Radar

Provision of rainfall and water-level information via digital terrestrial broadcasting

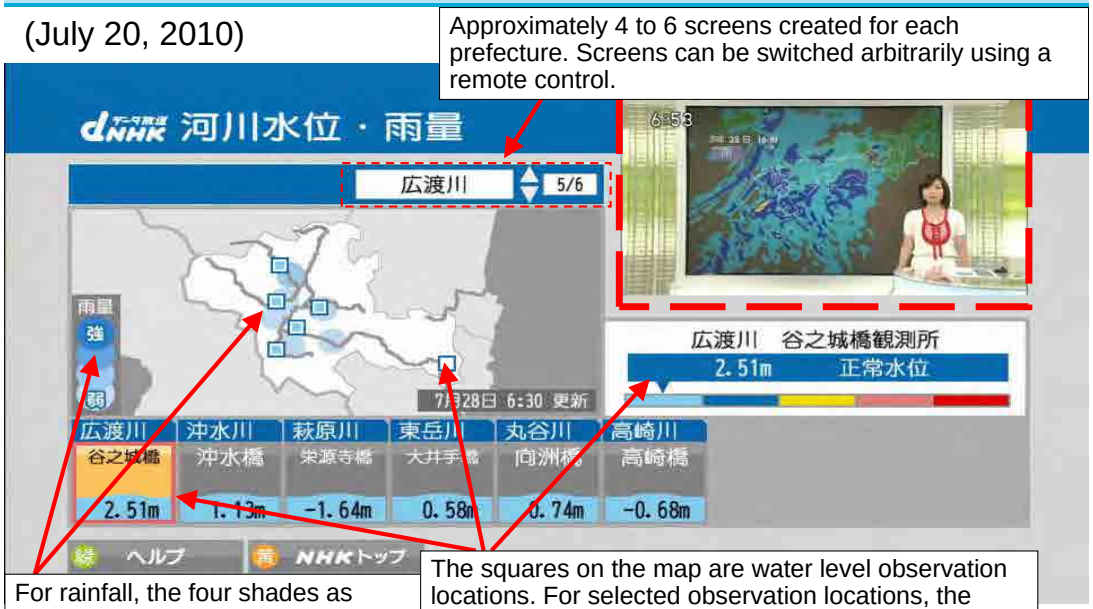
In case of Tokyo, Kanagawa, Chiba, and Saitama

Example of NHK broadcast (**just an image**)



Terrestrial Digital Broadcasting in Kyushu Region

(July 20, 2010)



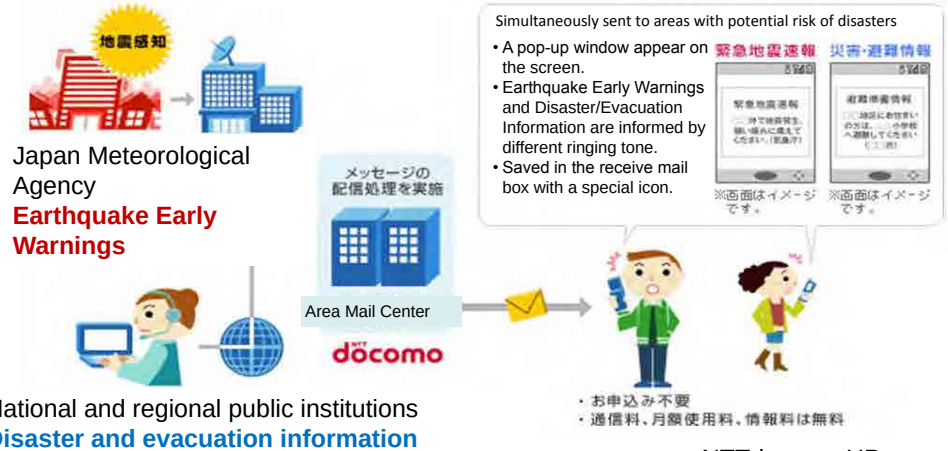
On-Site Display of Past Inundation Levels

(Marugoto-Machigoto Hazard Map)

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).



NTTdocomo HP

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.

Thank you for your kind attention

Information System for River Administration in Japan

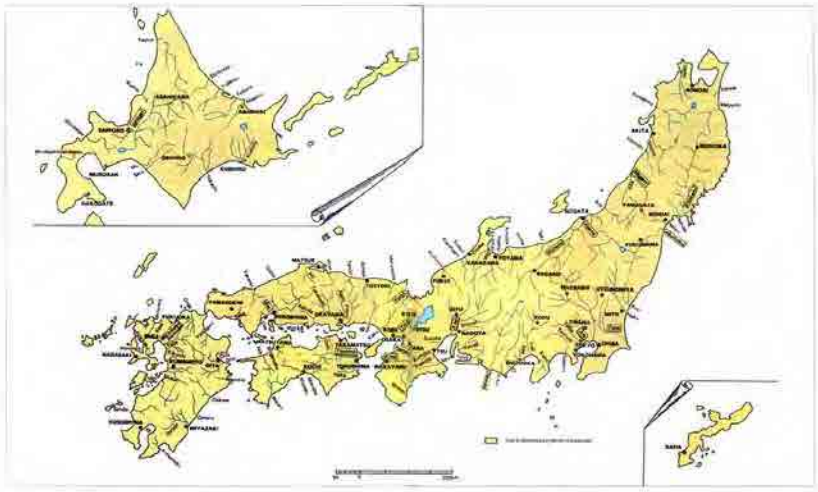
December 2012

Dr. NAKAO, Tadahiko
FRICS

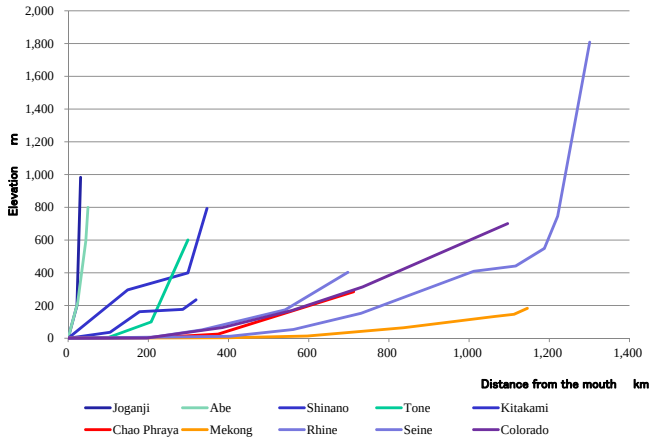
Contents

- Topographic Features of Japan
- Development of Information System
- Information Dissemination to the Public
- Provision of Information other than real-time one

Maps of rivers in Japan

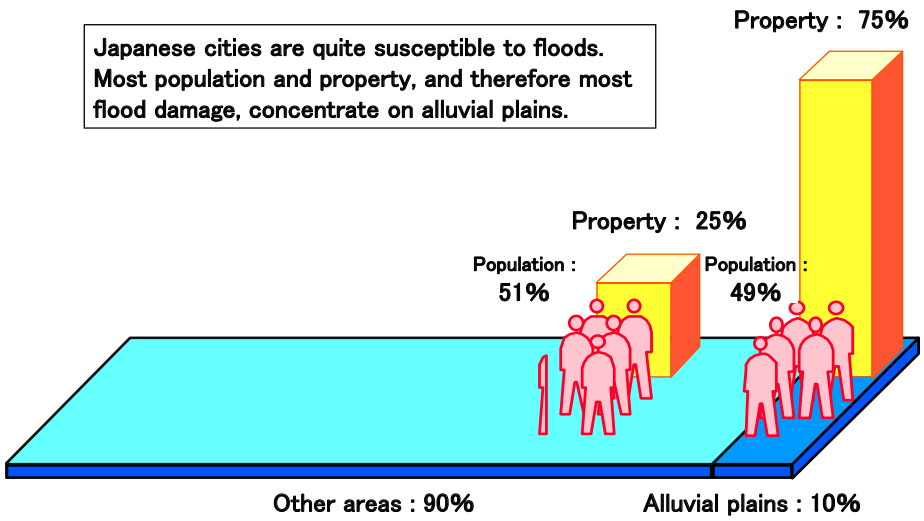


Profiles of Major Rivers in the World



Concentrations of Population and Property on Alluvial Plains

Japanese cities are quite susceptible to floods. Most population and property, and therefore most flood damage, concentrate on alluvial plains.



Flood Forecasting for Flood Fighting & Early Evacuation

Ikarashi R. after 2011 Flood

- Based on Structural Measures,
- Information is essential to save Lives!

A Designated Elevation Mark

Sandbagging was limited to the officially designated elevation.

Development of Legal System

	Law System	Background
ca.1890		Frequent Disaster
1896	River Law (old)	
		Typhoon Kathleen, etc.
1949	Flood Defense Law	
		Water Resources Development
1964	River Law (new)	
		Environment Problems
1997	River Law (major revision)	
		Frequent Urban Flooding
2001	Flood Defense Law (major revision)	
		Again, Frequent Urban Flooding
2005	Flood Defense Law (2nd major revision)	

- Topographic Features of Japan
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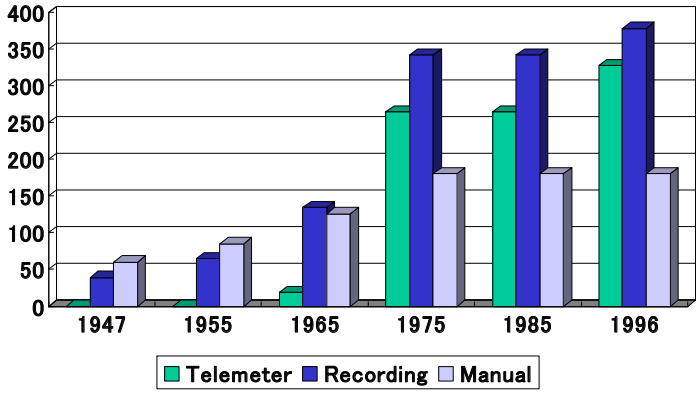
- Provision of Information other than real-time one

River information systems

Water Stage Station

Trend of Measurement Facilities



In Tone River Basin (A=16,840 km^2), including Rainfall and Stage Stations

Sources of Data

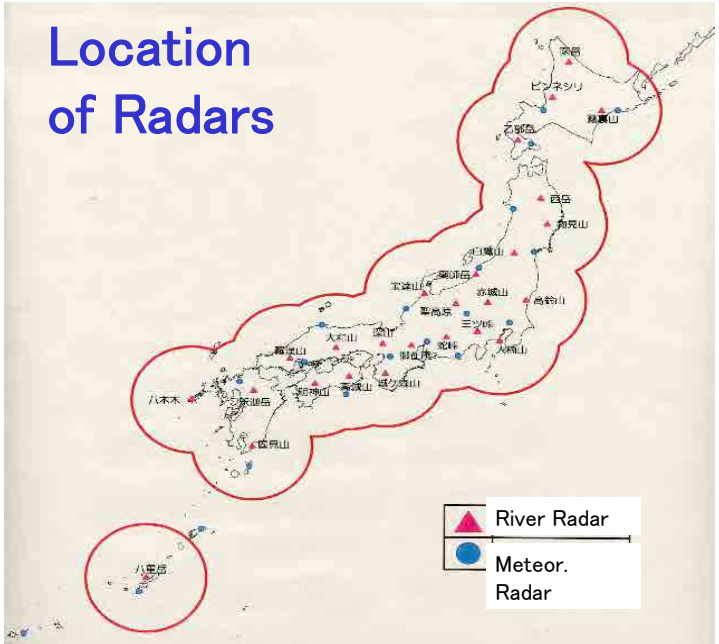
As of March 31, 2010

	River Bureau	Highway Bureau	Met. Agency	Local Govern-ment	Water Corporation, etc.	Total
Radars	26		20			46
TM Rain	2,348	1,182	1,275	4,557	243	9,605
Water Stage	2,132			4,042	88	6,262
Others	1,560	188	87	400	337	2,572
Total	6,066	1,370	1,382	8,999	668	18,485

Most data are updated every 5(radar) or 10(telemeter) minutes

Radar Rain Gage

Location of Radars



Deployment of XRAIN system is now in progress.

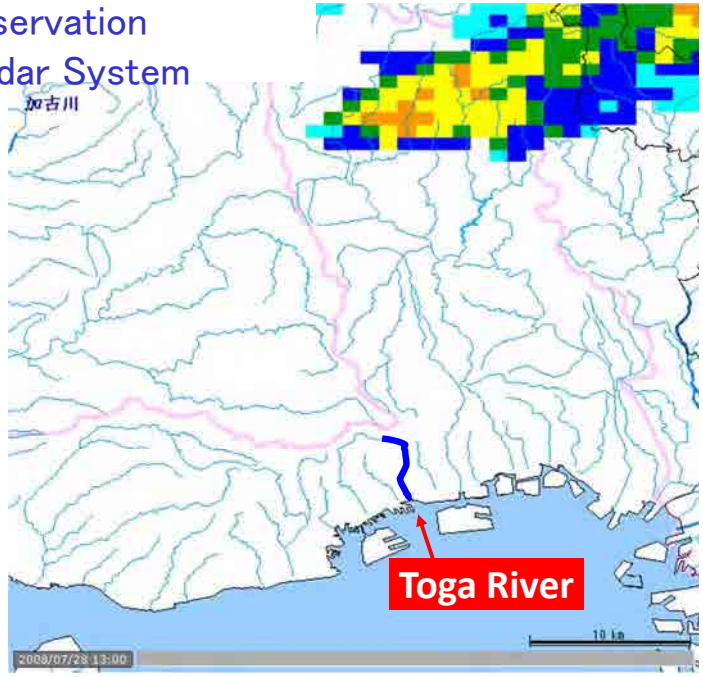
TOGA River
Sudden Flood in 28 July 2008 14:32-16:40

KOBE City http://www17.plala.or.jp/kcamera/movie/demo.html

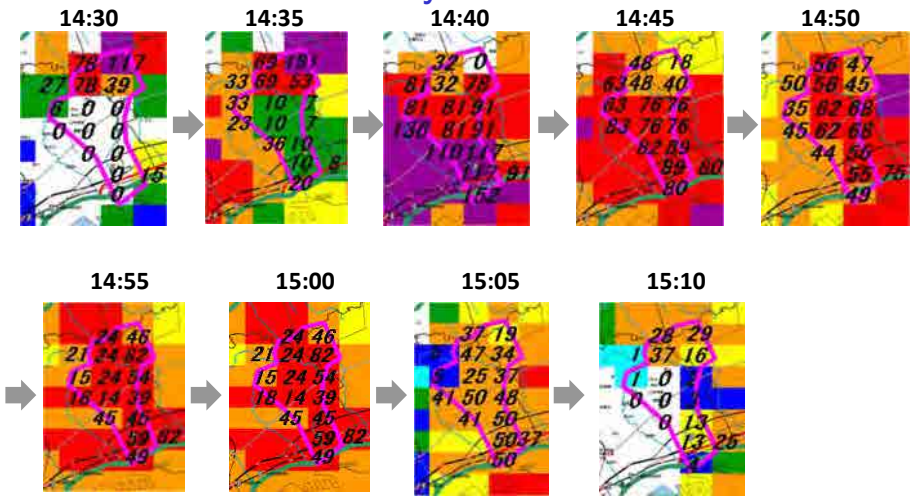
Observation by Radar System

July 28, 2008

13:00-17:00

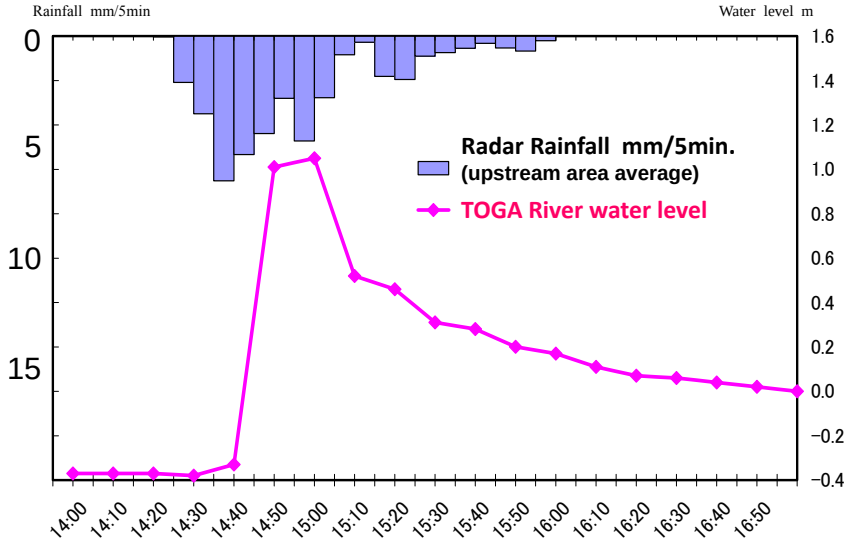


Observation of the Radar Rain Gauge System

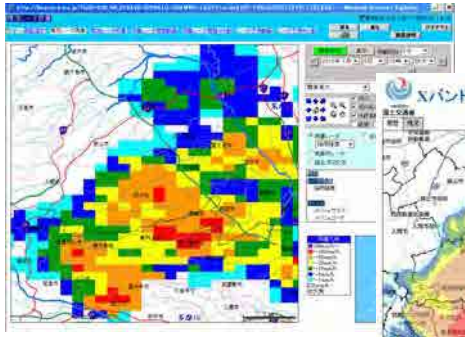


Average rainfall intensity (mm/hr) in 5 min. intervals

Comparison of Hydrograph and Hyetograph calculated from the Radar System on July 28, 2008



Installation of X-band MP Radars (XRAIN)



X-band MP: 250 m/250 m, Every 1 min., With Time lag of 1 min.

Traditional C-band: 1 km/1 km, Every 5 min., with Time lag of 5 to 10 min.

Closed Circuit TV

Display in an Operation Room

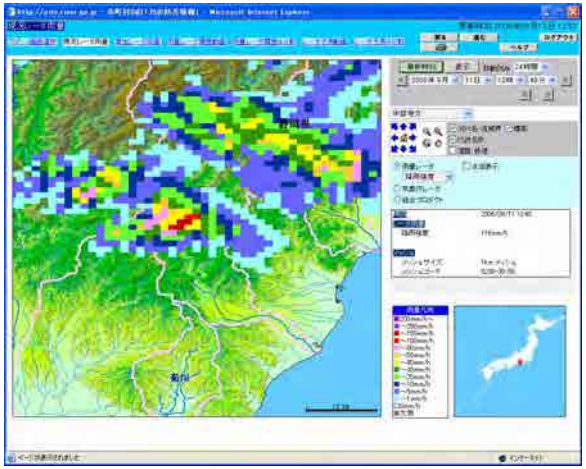
- Topographic Features of Japan
- Development of Information System
- Information Dissemination to the Public
- Provision of Information other than real-time one

Information through Internet for the Public

http://www.river.go.jp/

Image of the Radar Rain gauges

High Resolution of 1km & 5 min

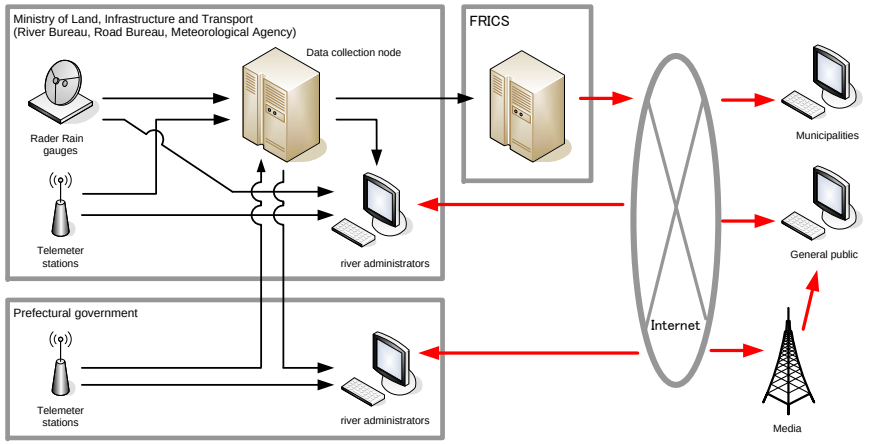


Radar Rain gauges are equivalent to so many Ground Rain gauges

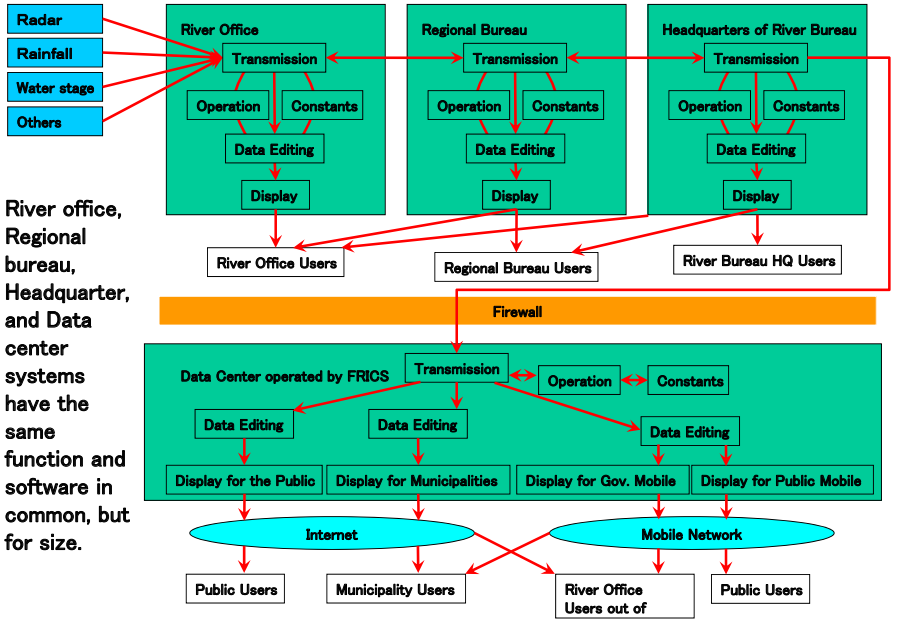
Information through Mobile Phone

http://i.river.go.jp/

Data Flow



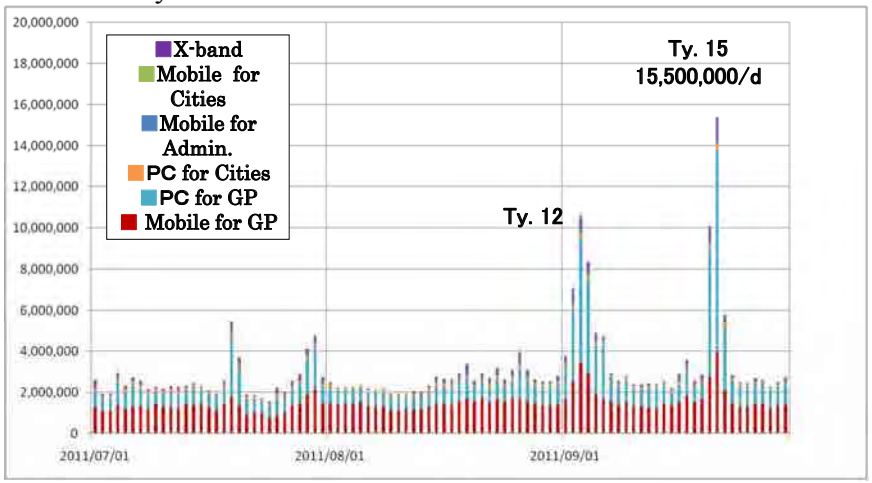
Conceptual Architecture of the Unified River Inf



River office, Regional bureau, Headquarter, and Data center systems have the same function and software in common, but for size.

High Usage on Storm and Flood Days

Daily Accesses of the Internet "River Information"



- Topographic Features of Japan
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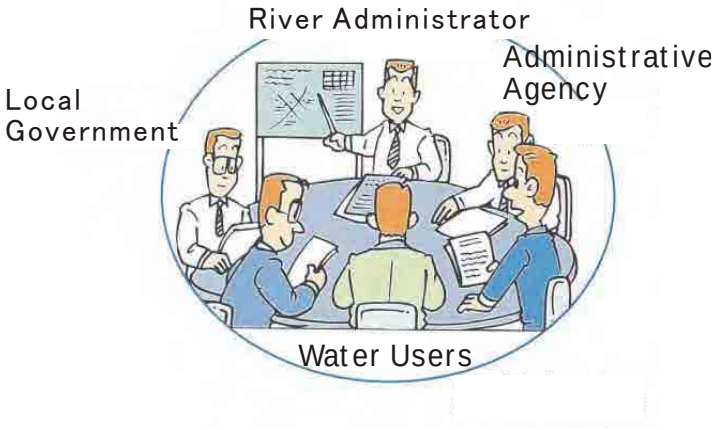
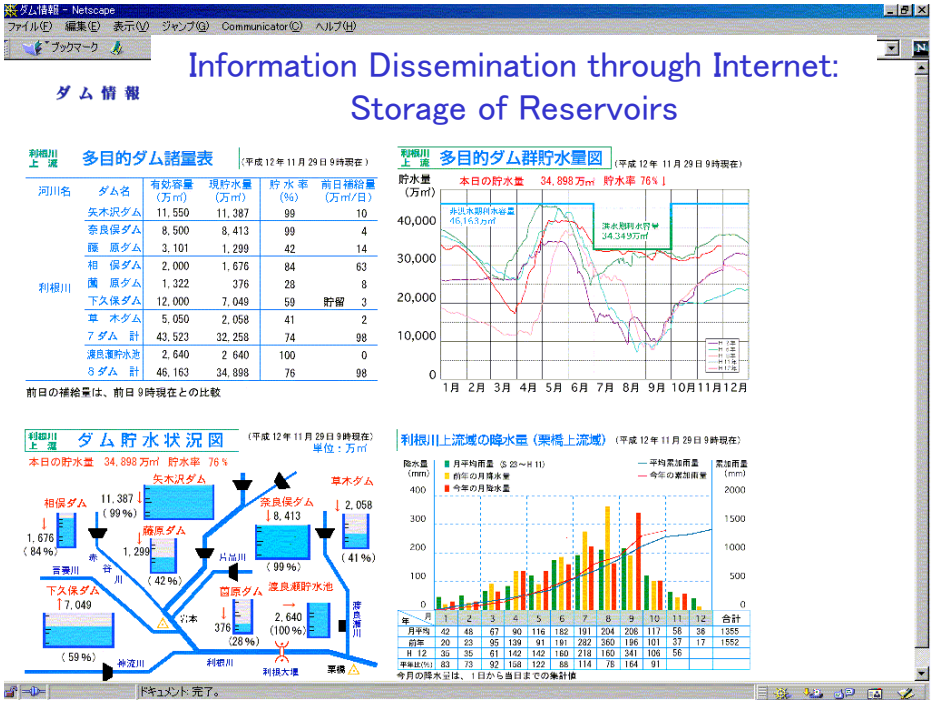
Consultation for Water-use Conciliation

River Information in time of Water Shortage

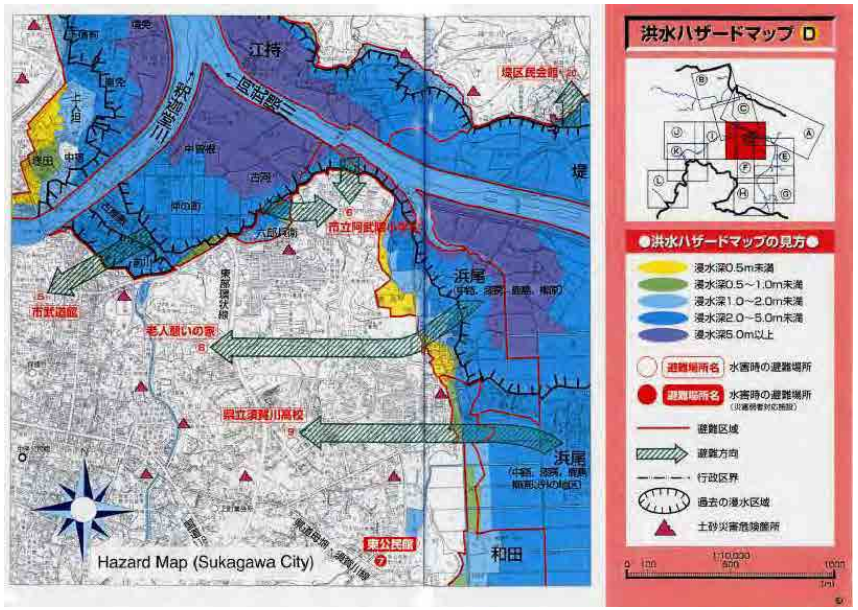


River Administrator shall exert himself/herself to provide necessary information for water use cociliation: River Law Article 53.

Information Dissemination through Internet: Storage of Reservoirs

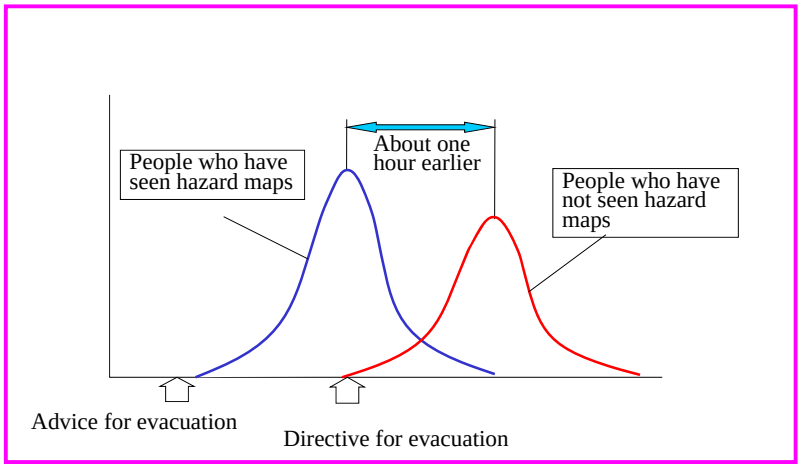


Hazard Map (Sukagawa City)

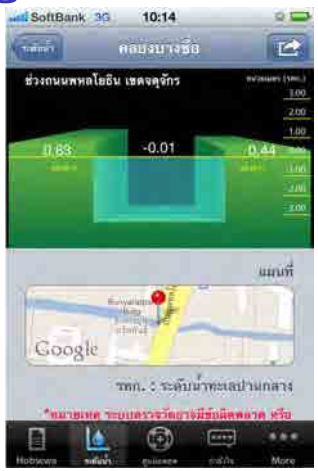


Preparation and promotion of flood hazard maps

People who have seen hazard maps start evacuation about one hour earlier than those who have not



Information provision using iPhone in Bangkok Area



On the GoogleMap, CCTV available

C O N C L U S I O N S

1) Real-time information is essential to cope with torrential floods in Japan.

2) Recent advancement of information & communication technology (ICT) has enabled us to collect and process various information including Radars.

3) Disclosure and dissemination of river information will help both administrators and citizens to cope with water problems.

Thank you for listening.

Is there any question?

Please access via e-mail, too.

nakao@river.or.jp

Introduction of Climate Services by JMA

Tokyo Climate Center (TCC)
Climate Prediction Division (CPD)
Japan Meteorological Agency (JMA)

E-mail: tcc@met.kishou.go.jp

About the Tokyo Climate Center

- The Japan Meteorological Agency (JMA) has been monitoring extreme climate events and the global climate system for two decades. In addition, the Agency operates numerical prediction models for long-rage forecasts and El Niño outlooks.
- JMA established the Tokyo Climate Center (TCC) in 2002 to meet the requirements of NMHSs and contribute to the climate services they provide in the Asia-Pacific region.
- The Center was designated as a Regional Climate Center in Region II of the World Meteorological

Provision of Climate Information

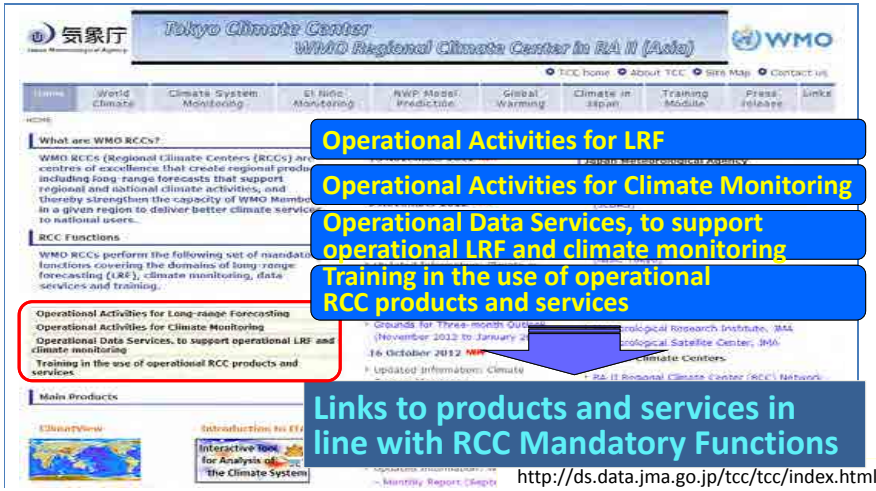
Types of Climate Information and Services
- Global Climate Monitoring & Analysis
- Long-range Forecast
- El Niño Monitoring and Outlook
- Numerical Climate Prediction and Re-analysis
- Climate Change Monitoring and Projection
- Climate Application Services

Tokyo Climate Center (TCC) *<RCC Tokyo>*

Domestic Users in Japan

NMHSs in Asia & Pacific region

Provision of Data and Products via the TCC website



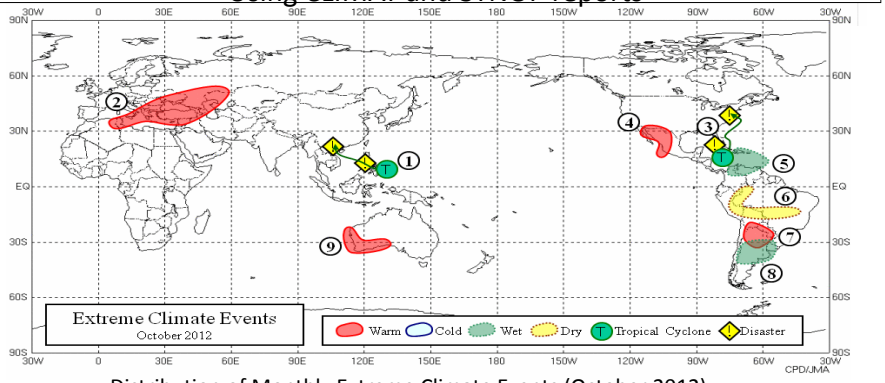
http://ds.data.jma.go.jp/tcc/tcc/index.html

Climate Information and Products

Climate Monitoring & Climate Analysis

Monitoring Extreme Climate Events

Weekly, Monthly, Seasonal and Annual Temperature/Precipitation
Hazardous Climatic Events (Flood/Drought/Tropical Cyclone)
Using CLIMAT and SYNOP reports



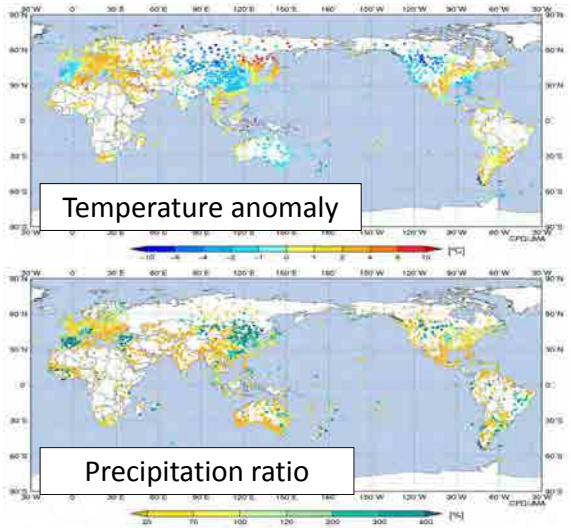
Distribution of Monthly Extreme Climate Events (October 2012)

http://ds.data.jma.go.jp/tcc/tcc/products/climate/index.html

Monitoring Extreme Climate Events

Weekly Temperature anomaly (top) and Precipitation ratio (bottom)

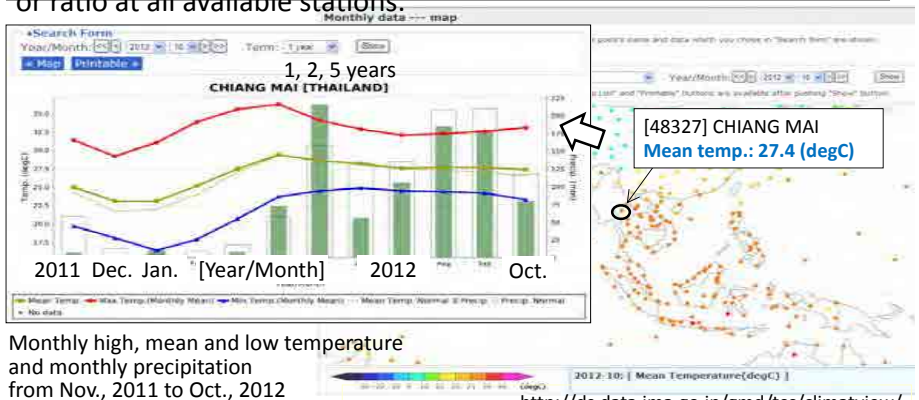
(7 – 13 November, 2012)



http://ds.data.jma.go.jp/tcc/tcc/products/climate/synop.html

ClimatView: Web-based Interactive Tool

ClimatView is a tool overviewing and downloading monthly world climate data. It allows the user to see and obtain monthly mean temperatures, monthly total precipitation amounts and its anomaly or ratio at all available stations.

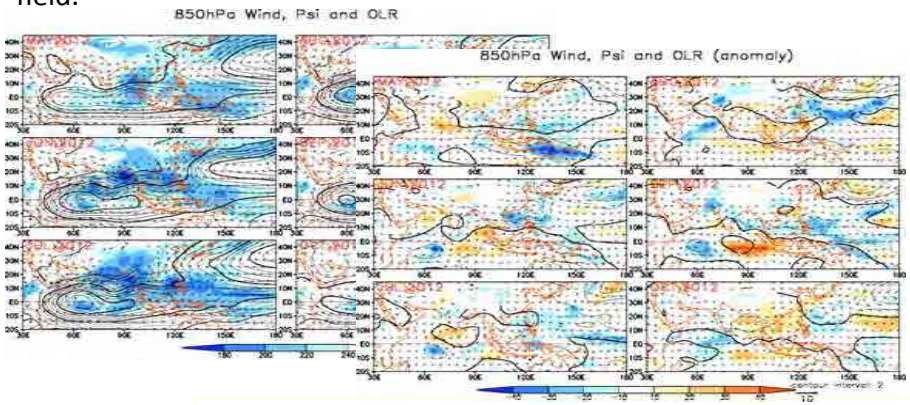


Monthly high, mean and low temperature and monthly precipitation from Nov., 2011 to Oct., 2012 in Chang Mai, Thailand

http://ds.data.jma.go.jp/gmd/tcc/climatview/

Climate Monitoring: Asian Monsoon

For monitoring Asian Monsoon, TCC provides monthly mean and anomaly of Stream Function, Wind and OLR in the 850hPa height field.

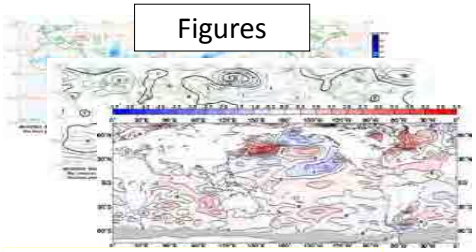


http://ds.data.jma.go.jp/tcc/tcc/products/clisys/ASIA_TCC/map1_mon.html

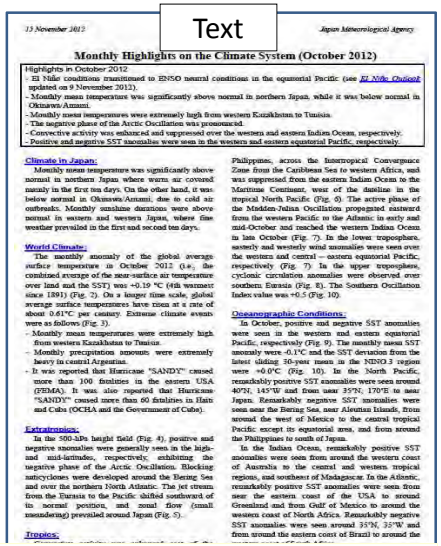
Monthly Highlights on the Climate System

'Monthly Highlights on the Climate System' has been issued as a monthly bulletin focusing on the monthly highlights of the monitoring results.

Figures



Text



Monthly Highlights on the Climate System (October 2012)

Highlights in October 2012

- El Niño conditions transitioned to ENSO neutral conditions in the equatorial Pacific (see *El Niño Outlook* updated on 9 November 2012).
- Monthly mean temperature was significantly above normal in northern Japan, while it was below normal in Okinawa/Amami.
- Monthly mean temperatures were extremely high from western Kazakhstan to Tunisia.
- The negative phase of the Arctic Oscillation was pronounced.
- Convective activity was enhanced and suppressed over the western and eastern Indian Ocean, respectively.
- Positive and negative SST anomalies were seen in the western and eastern equatorial Pacific, respectively.

Data: JRA-25/JCDAS, OLR, COBE-SST.
CLIMAT reports, etc.

http://ds.data.jma.go.jp/tcc/tcc/products/clisys/highlights/index.html

ITACS: Web-based Interactive Tool (for NMHSs)

ITACS (Interactive Tool for Analysis of the Climate System) is a web-based application software for climate analysis.

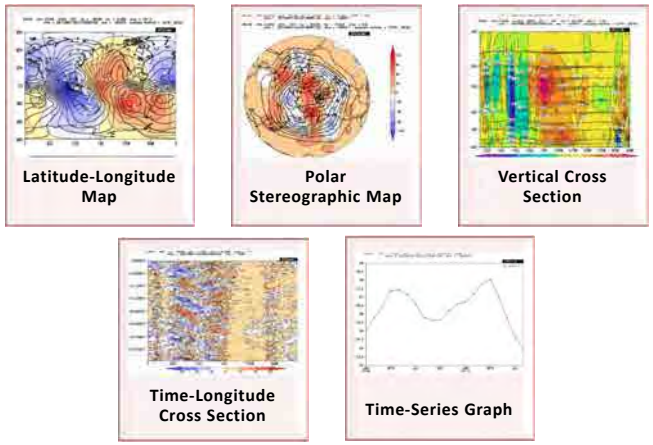
A new version (Version 4) has been developed, enabling users to (1) use the JMA's current operational ocean analysis data, (2) set the detailed graphics setting, and (3) download data in binary format, which is compatible to GrADS.

Data

- Japanese 25-year ReAnalysis (JRA-25) (1979-2004)
- JMA Climate Data Assimilation System (JCDAS) (2004 - Present)
- Daily Sea Surface Analysis for Climate Monitoring (COBE-SST) and Predictions

http://extreme.kishou.go.jp/tool/itacs-tcc2011/

ITACS: Web-based Interactive Tool (for NMHSs)



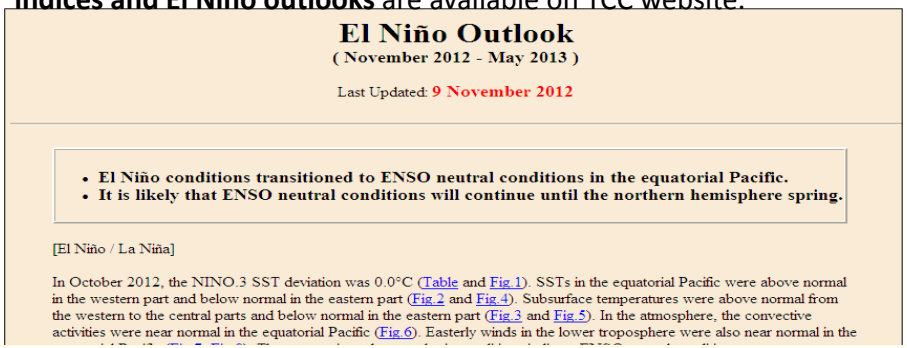
http://extreme.kishou.go.jp/tool/itacs-tcc2011/

El Niño Monitoring & Outlook

El Niño Monitoring & Outlook

JMA operates the Ocean Data Assimilation System and the El Niño Prediction System (an ocean-atmosphere coupled model) for monitoring and prediction of El Niño-Southern Oscillation (ENSO).

Monthly diagnosis reports, ENSO monitoring products, ENSO indices and El Niño outlooks are available on TCC website.



El Niño Outlook
(November 2012 - May 2013)

Last Updated: **9 November 2012**

- **El Niño conditions transitioned to ENSO neutral conditions in the equatorial Pacific.**
- **It is likely that ENSO neutral conditions will continue until the northern hemisphere spring.**

[El Niño / La Niña]

In October 2012, the NINO.3 SST deviation was 0.0°C (Table and Fig.1). SSTs in the equatorial Pacific were above normal in the western part and below normal in the eastern part (Fig.2 and Fig.4). Subsurface temperatures were above normal from the western to the central parts and below normal in the eastern part (Fig.3 and Fig.5). In the atmosphere, the convective activities were near normal in the equatorial Pacific (Fig.6). Easterly winds in the lower troposphere were also near normal in the

http://ds.data.jma.go.jp/tcc/tcc/products/elnino/index.html

El Niño Monitoring & Outlook

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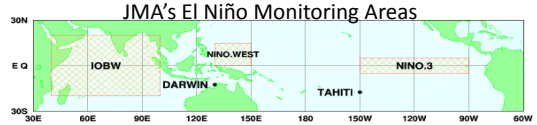
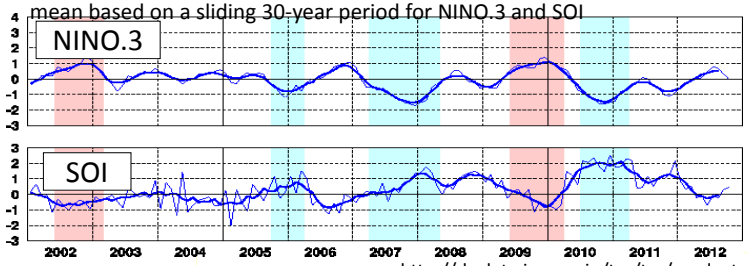
JMA's El Niño Monitoring Areas



Time series of sea surface temperature deviations from the climatological mean based on a sliding 30-year period for NINO.3 and SOI



(Area)
<NINO.3>
[5N-5S, 150W-90W]
<NINO.WEST>
[15N-EQ, 130E-150E]
<IOBW>
[20N-20S, 40E-100E]

http://ds.data.jma.go.jp/tcc/tcc/products/elnino/index.html

El Niño Monitoring & Outlook

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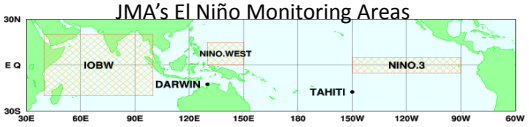
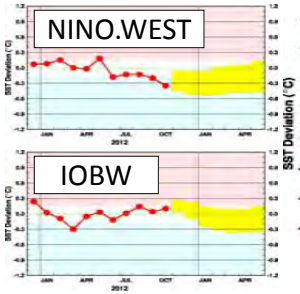
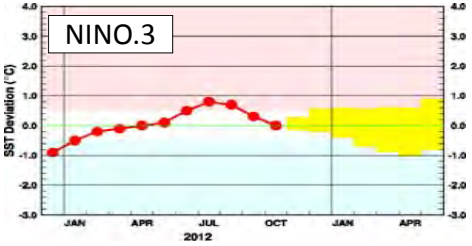
JMA's El Niño Monitoring Areas







(Area)
<NINO.3>
[5N-5S, 150W-90W]
<NINO.WEST>
[15N-EQ, 130E-150E]
<IOBW>
[20N-20S, 40E-100E]

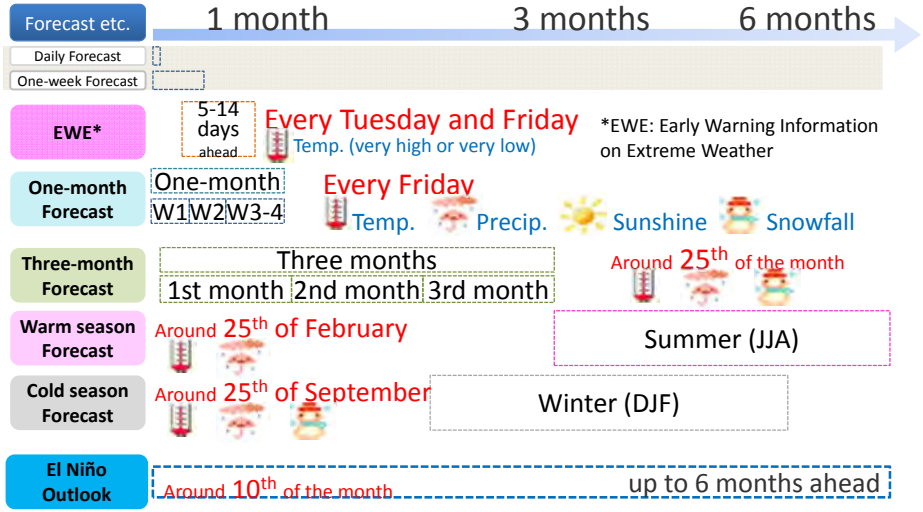
(IOBW: Indian Ocean basin-wide)

Outlook of the SST deviation for JMA's El Niño Monitoring Areas by the El Niño prediction model.

http://ds.data.jma.go.jp/tcc/tcc/products/elnino/index.html

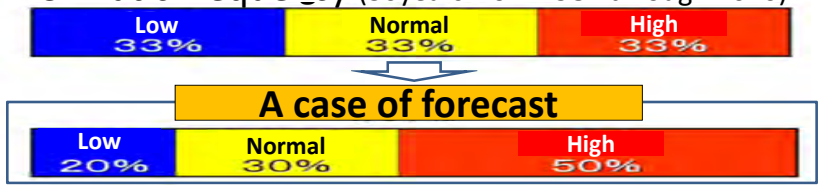
Seasonal Forecast for Domestic Users in Japan

Seasonal forecast in Japan



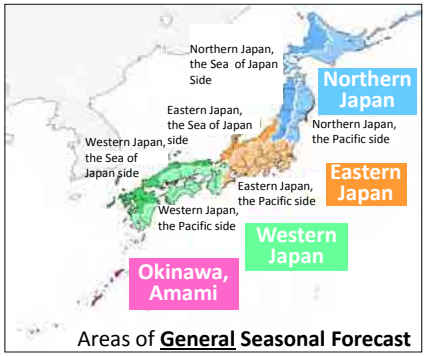
Probabilistic Forecast

- Seasonal forecasts take averages for temperature, precipitation, sunshine hours etc. for 1 or 3 months, warm and cold seasons, dividing each into **"low (little)", "medium" and "high (much)" categories** and predict the chances of appearance for each category.
- Boundary values dividing the three classes are derived from **30 years of data** so that **each category represents 33% of values.** Current boundary values are taken from dat Climatic frequency (30years from 1981 through 2010)



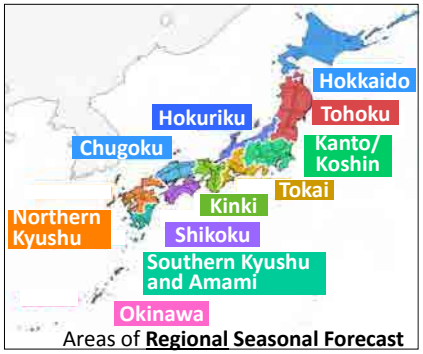
Areas for Seasonal forecast

General Seasonal Forecast



Areas of **General** Seasonal Forecast

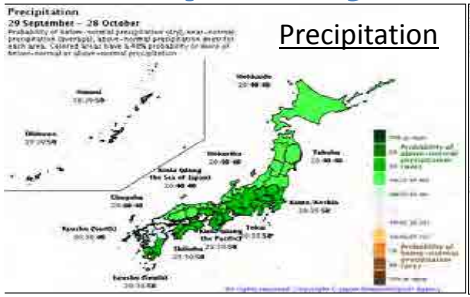
Regional Seasonal Forecast



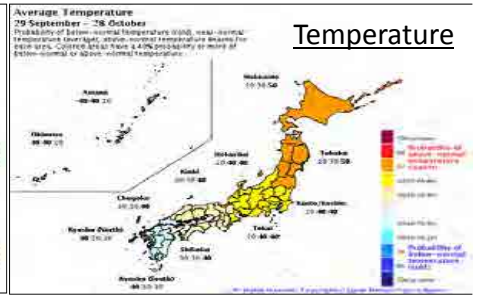
Areas of **Regional** Seasonal Forecast

Examples of Seasonal Forecast

Precipitation



Temperature



One-month forecast for Sept 29 through Oct 28
Issued on 28 September ,2012 , by JMA/Global Environment and Marine Department Announcement
＜Items requiring special care＞
Outlook for very high temperatures in Northern and Eastern Japan for the beginning of the period.
＜Weather forecast for the coming one month period＞
Most probably weather, special temperatures, precipitation, etc for the coming month are as follows.
Across the whole country, weather is expected to change in the period of a few days. The Northern area on the Pacific side, in Western Japan, and Okinawa-Amami should see seasonal average large number of clear days Average temps for the coming month: 50% probability of high temps for NorthJapan; East Japan 40% chance of both seasonal average and high temps; Okinawa-Amami equal 40% chance of normal and low temps. Precipitation 40% chance for normal and high amounts in North and in East and West on the Sea of Japan side, with a 50% chance of high rain for East and West Japan on the Pacific side as well as Okinawa-Amami.
Weekly temperature outlook: in the first week, 80% chance of high temps in North Japan and 60% in Eastern Japan, 50% chance of seasonally

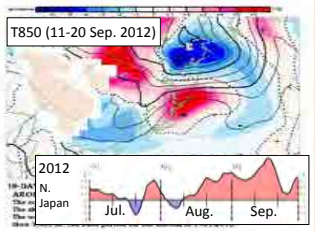
Early Warning Information on Extreme Weather

date	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Tu	Wd	Th	Fr	Sa	Su	Mn	Tu	Wd	Th	Fr	Sa	Su	Mn	Tu

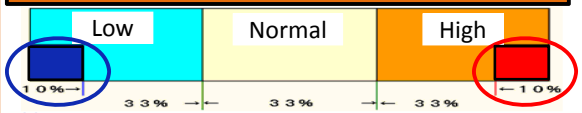
Issue
Tue. & Fri.

Weekly forecast

Heat wave



Early Warning Information on Extreme Weather (EWE)
- Persistent **Heat wave** & **Cold spell** -



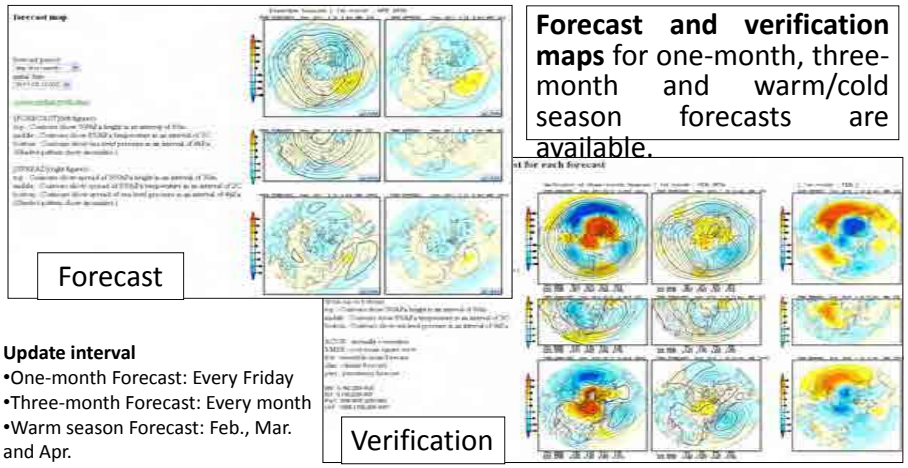
Very Low

EWE is issued when a high probability **(30% or more) of very high or very low seven-day averaged temperature** is predicted.

Very High

Long-range Forecast Products (on TCC website)

Forecast and Verification maps



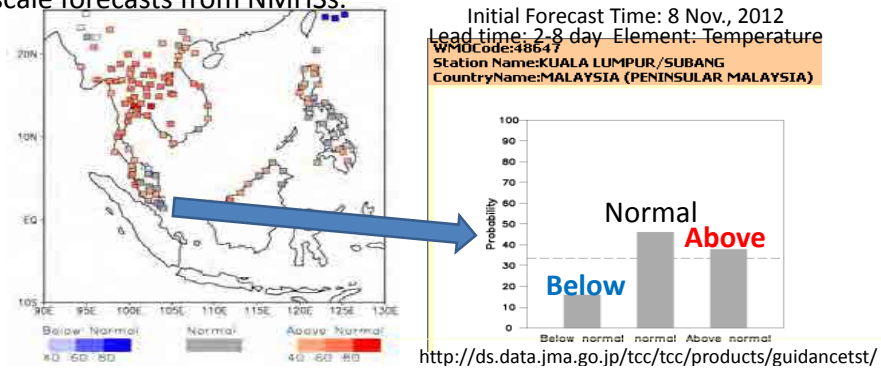
Forecast and verification maps for one-month, three-month and warm/cold season forecasts are available.

Update interval
- One-month Forecast: Every Friday
- Three-month Forecast: Every month
- Warm season Forecast: Feb., Mar. and Apr.
- Cold season Forecast: Sep. and Oct.

http://ds.data.jma.go.jp/tcc/tcc/products/model/index.html

One-month Probabilistic Forecast for Southeast Asia

TCC provides **three-level (tercile) probabilistic forecasts of 2m temperature and total precipitation** at a number of major stations in Southeast Asia, based on the needs of regional and sub-regional scale forecasts from NMHSs.

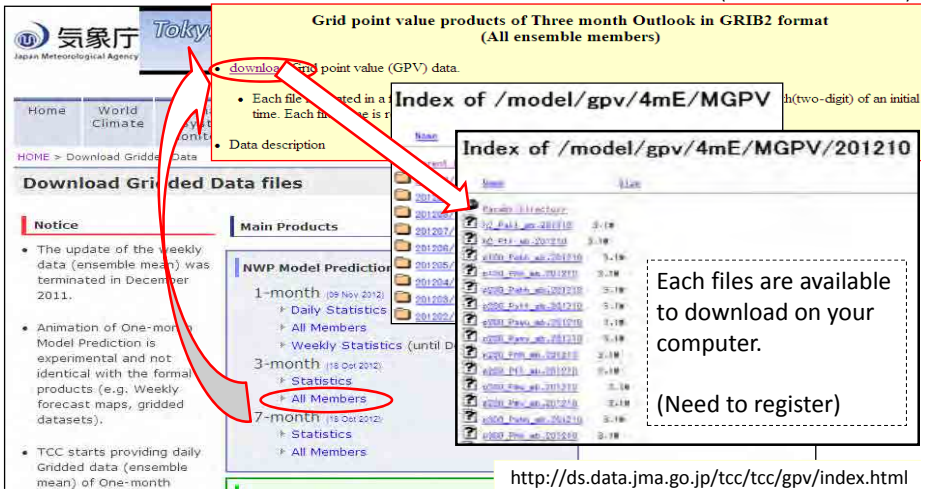


http://ds.data.jma.go.jp/tcc/tcc/products/guidancetst/

Binary gridded data (GPV)

(for NMHSs)

(GPV: Grid Point Value)



http://ds.data.jma.go.jp/tcc/tcc/gpv/index.html

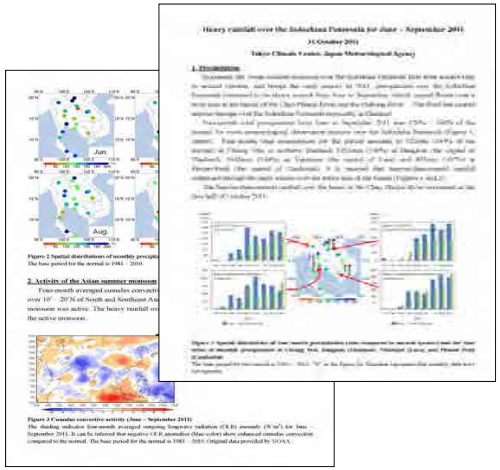
Special report on the extreme climate event & its analysis

Report on the extreme climate event (1)

NMHSs are expected to actively contribute to climate risk management, and must issue appropriate information in a timely manner when extreme events occur. Against this background, **TCC is committed to assisting NMHSs in fulfilling their roles.**

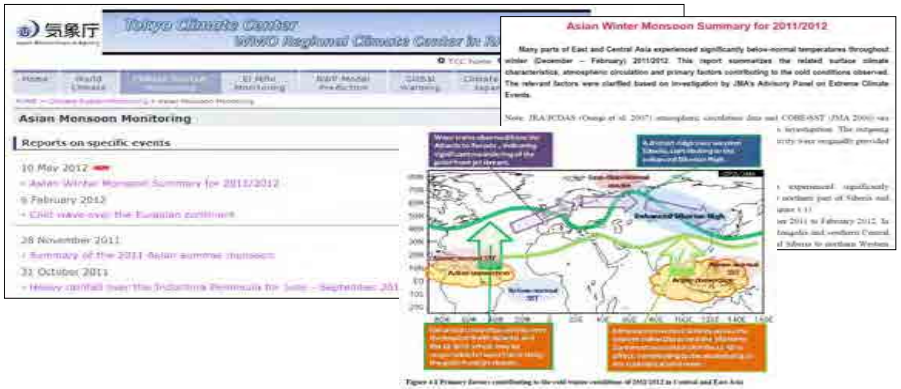
In summer 2011, precipitation over the Indochina Peninsula continued to be above normal from June to September, which caused floods over a wide area in the basins of the Chao Phraya River and the Mekong River. The flood has caused serious damage over the Indochina Peninsula especially in Thailand.

On 31 October, 2011, TCC issued a report entitled "Heavy rainfall over the Indochina Peninsula for June



Information on specific events

In addition to issuing reports as the press release, TCC also provides information, such as summary of the Asian summer monsoon and reports on specific events.

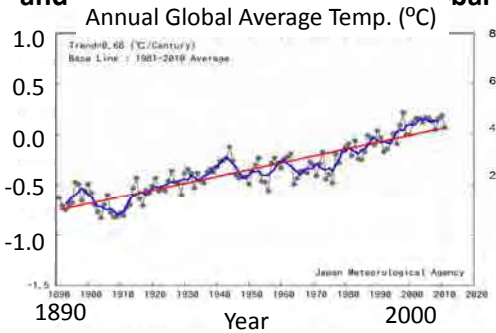


http://ds.data.jma.go.jp/tcc/tcc/products/clisys/ASIA_TCC/index.html

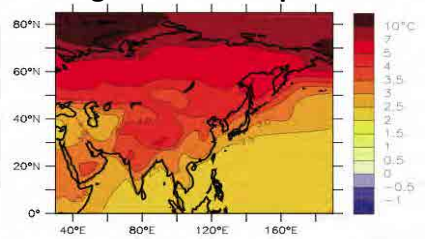
Climate Change Monitoring & Projection

Climate Change Monitoring and Projection

JMA monitors long-term changes in global average surface temperature anomalies for the purpose of monitoring global warming. The TCC website make it available to **see long-term changes in annual and monthly anomalies of the global average surface temperature**.



Annual anomalies of surface temperature averaged over the globe
(Base period for the normal: 1981- 2010)



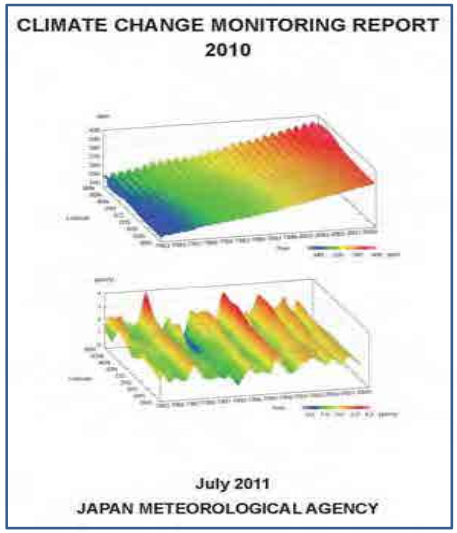
Projection of warming in winter (December-February) for scenario A1B for the period 2080 - 2099 relative to the period 1980 - 1999 conducted using 21 climate models (used the report of working group I to the IPCC Fourth Assessment Report)

http://ds.data.jma.go.jp/tcc/tcc/products/gwp/gwp.html

Climate Change Monitoring Report

JMA has issued **"Climate Change Monitoring Report"** every year informing the latest status of climate change in Japan and the world, greenhouse gases and the ozone layer.

These reports are expected to help readers such as policy makers and researchers to obtain better understanding of the latest status of the climate and further to take measures against the global warming and



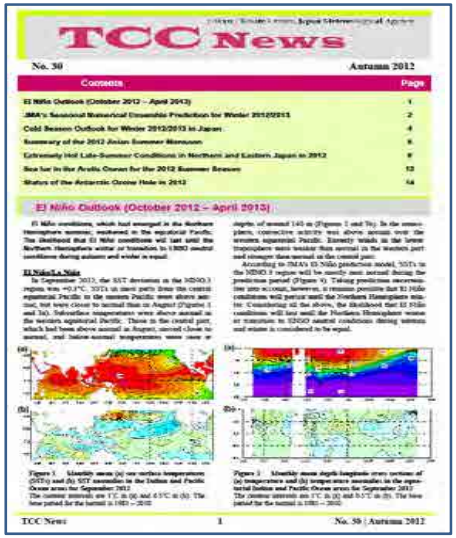
http://www.jma.go.jp/jma/en/NMHS/indexe_ccmr.html

TCC news

TCC news

TCC news is a quarterly newsletter issued in February, May, August and November containing articles on the latest climate information (significant climate events, seasonal outlook, etc.), introduction of TCC's new products and relevant activity.

The latest issue (No. 30) is now available.



http://ds.data.jma.go.jp/tcc/tcc/news/index.html

Capacity Development

Capacity Development

TCC conducts capacity-building activities in its role as RCC.

Annual Training Seminar

Expert visit to NMHSs

Expert visit from NMHSs

TCC Annual Training Seminar

As part of TCC's capacity-building activity in its role as RCC, TCC holds **annual training seminars** on the application of its climate monitoring and prediction products.

Each seminar deals with a different theme depending on TCC's progress in climate and analysis capabilities, such as the introduction of upgraded climate models.

	Theme
Nov. 2008	Climate Information and Forecasting
Dec. 2009	Climate Analysis using Reanalysis Data
Jan. 2011	Application of Seasonal Forecast Gridded Data to Seasonal Forecast Products
Nov. 2011	One month Forecast Products
Nov. 2012	**Climate Analysis Information**

TCC Training Seminar on Climate Analysis Information, 26-30 November, 2012, Tokyo, Japan

TCC Annual Training Seminar

Materials and presentations of past training seminars are available on the TCC website.

Expert visit to NMHSs

Participation of TCC Experts in RCOFs and Expert Visits to NMHSs in Southeast Asia

WMO Regional Climate Outlook Forums (RCOFs) bring together national, regional and international climate experts on an operational basis to produce regional climate outlooks based on input from participating NMHSs, regional institutions, Regional Climate Centres and global producers of climate predictions. By providing a platform for countries with similar climatological characteristics to discuss related matters, these forums ensure consistency in terms of access to and interpretation of climate information.

In 2012, TCC experts participated in two RCOFs. These were the eighth session of the Forum on Regional Climate Monitoring, Assessment and Prediction for Regional Association II (FOCRAII) held in Beijing, China, from 6 to 8 April, and the third session of the South Asian Climate Outlook Forum (SASCOF-3) held in Pune, India, from 19 to 20 April. At both the events, the TCC attendees gave presentations on seasonal predictions based on JMA's numerical model and participated in discussions to produce consensus forecasts.

TCC experts also visited NMHSs in the Philippines, Viet Nam and Lao PDR in March 2012 to provide follow-up for the TCC Training Seminar on one-month forecast held in November 2011, including practical exercises with the Interactive Tool for Analysis of the Climate System (ITACS) and the installation of a module for site-specific probabilistic guidance for one-month forecasting. The experts also discussed and exchanged views with attendees on improving climate services and engaging in possible future cooperation.

Presentation at FOCRA II, Beijing, China

Discussion at Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), Philippines

Exercise at National Center for Hydro-Meteorological Forecasting (NCHMF), Viet Nam

Lecture at Department of Meteorology and Hydrology (DMH), Lao PDR

(TCC news No. 28 (Spring 2012)

http://ds.data.jma.go.jp/tcc/tcc/news/index.html

Expert visit from NMHSs

BMKG expert visit to TCC

One of TCC's main tasks is to assist NMHSs in improving their climate services. In addition to running annual training seminars and arranging expert visits, TCC also receives visitors from NMHSs upon request.

Indonesia's Meteorological, Climatological and Geophysical Agency (BMKG) is currently developing its Climate Early Warning System (BMKG CEWS), which is scheduled to enter operation in 2013. In a related development, JMA commenced operational provision of Early Warning Information on Extreme Weather (EWIEW)* in March 2008 with the aim of contributing to meteorological risk management in climate-sensitive sectors in Japan. To support the effective development of BMKG CEWS, four experts from BMKG visited TCC in July 2012.

During the visit, the BMKG representatives gave informative presentations on their climate services, including those tailored to agriculture in Indonesia. TCC experts then led discussions on a number of relevant issues such as work procedures for the operational climate warning system in Japan and JMA's Ensemble Prediction System (EPS) for seasonal forecasting. Attendees from both organizations engaged in interesting and fruitful discussions on customized climate services and various other issues. The BMKG experts then had exercises on the application of TCC products including gridded EPS data. TCC hopes the visit will contribute to the efficient and effective development of BMKG's planned Climate Warning System.

Presentation by a BMKG expert

Presentation by a TCC expert

Exercises on the application of TCC products

BMKG experts and TCC staff members

(TCC news No. 29 (Summer 2012)

http://ds.data.jma.go.jp/tcc/tcc/news/index.html

General briefings on forecasting operations

7th December 2012

Forecast Department

Japan Meteorological Agency

気象庁 Japan Meteorological Agency JMA

Weather Disasters in Japan

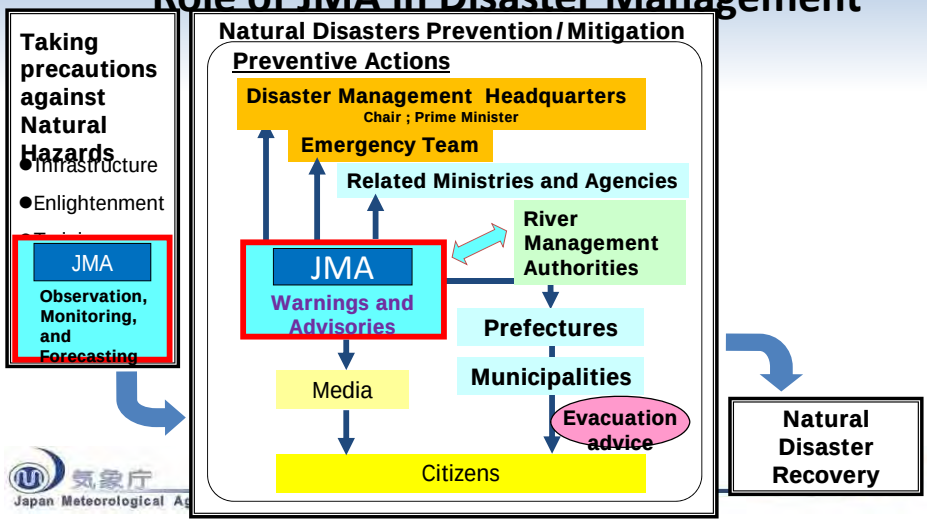



JMA

Weather Disasters in Japan

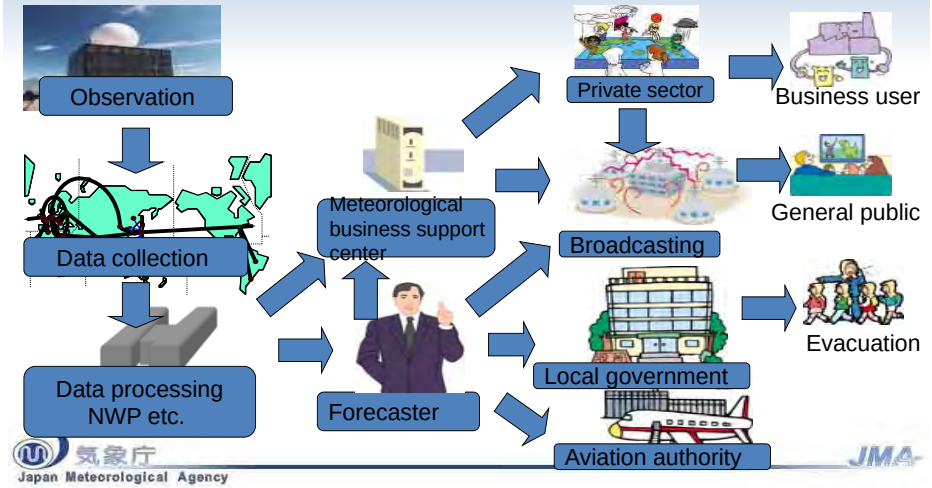



Role of JMA in Disaster Management



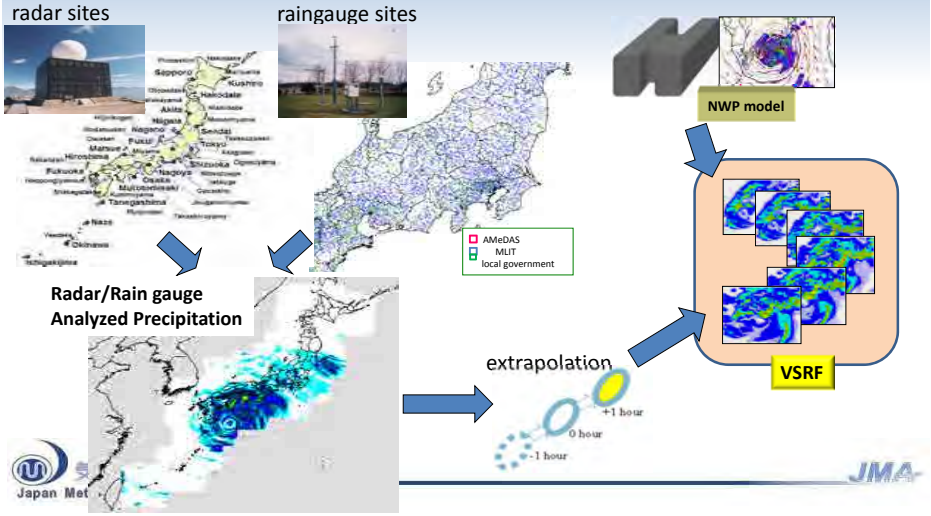
気象庁 Japan Meteorological Agency

Outline of Information flow



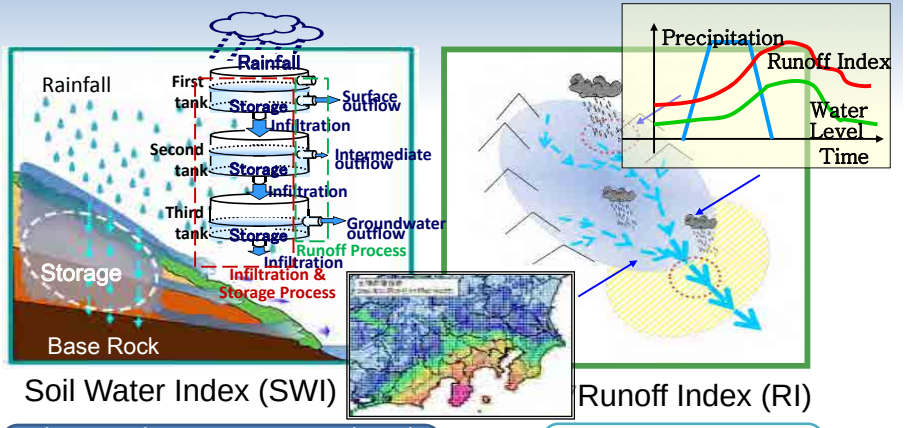
Japan Meteorological Agency

Very-Short-Range Forecasting of Precipitation



Japan Meteorological Agency

From rainfall to disaster related indices



Soil Water Index (SWI)

Runoff Index (RI)

These indices are more related with the disaster than the rainfall amount itself

Indices used for warning / advisory

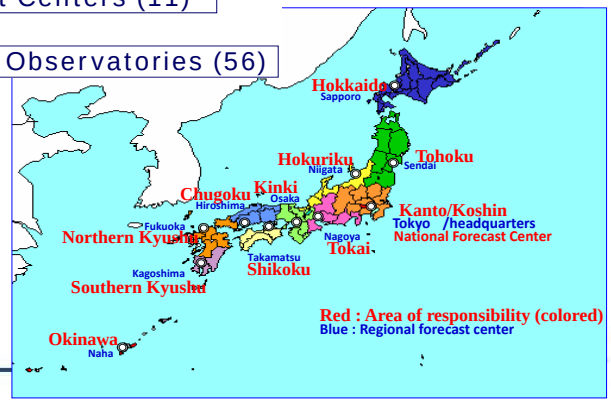
Three Level Structure for Forecast Service

National Forecast Center

Regional Forecast Centers (11)

Local Meteorological Observatories (56)

LMO is responsible for issuance of information on weather disaster prevention such as warnings/advisories for each prefecture



Japan Meteorological Agency

Information supporting evacuation decision

Basic Act on Disaster Control Measures

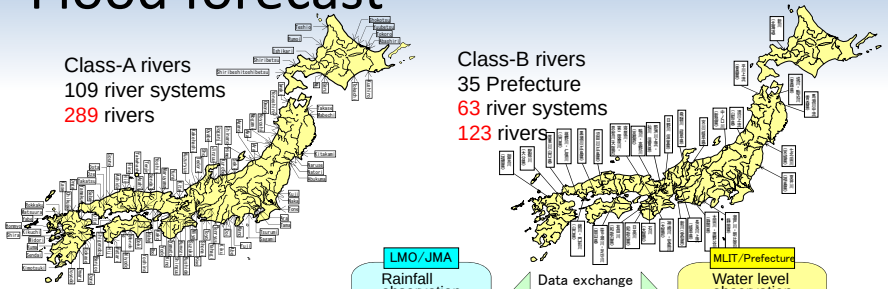
Type of Disaster / Disaster Prevention Measurement	Sediment Disaster by Heavy Rain	Flood Damage by Heavy Rain (by Inundation)	Flood Damage (by River Flooding)		Flood Damage (by Storm Surge)
Evacuation Instruction	Sediment Disaster Alerting Information Per Municipality			Flood Alerting Information Per Designated River	Storm Surge Warning
Evacuation Preparatory Information	Heavy Rain Warning (Sediment Disaster) Per Municipality	Heavy Rain Warning (Inundation) Per Municipality	Flood Warning Per Municipality	Flood Advisory Information Per Designated River	Per Municipality
Starting Disaster Prevention Measures (small size disaster not necessary to evacuate)	Heavy Rain Advisory Per Municipality	Heavy Rain Advisory Per Municipality	Flood Advisory Per Municipality		Storm Surge Advisory

Flood forecast

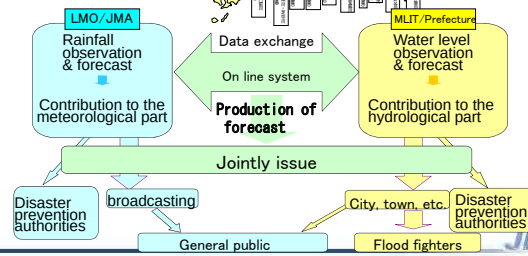
Coordination with disaster prevention authorities

Class-A rivers
109 river systems
289 rivers

Class-B rivers
35 Prefecture
63 river systems
123 rivers

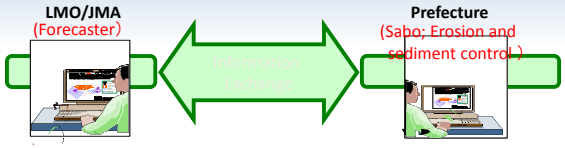


- Joint flood forecast with Water and Disaster Management Bureau of the MLIT for major rivers
- Joint flood forecast with prefectural government for minor rivers



Sediment Disaster Alert

For mitigation of sediment disasters



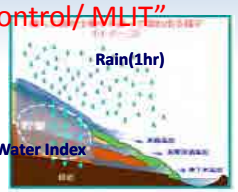
Sediment Disaster Alert

Joint announcement by Prefecture and Meteorological Observatory
Municipality under warning: XX City, YY Town
Risk level of a sediment-related disaster has increased significantly due to heavy rain.
People living in areas prone to sediment-related disasters such as those near cliffs are recommended to early evacuate to safety areas. Pay attention to information [illegible]cipality.

Municipality under warning
Area which experienced earthquake

For more information
(Sabo division of XX prefecture)
(XX Meteorological Observatory)

Joint alert with "Erosion and sediment Control/ MLIT"



- Alert on sediment disaster for each city
- Expected rainfall intensity
- Graphical information in addition to plain text warning

The operational issue has started until March 2008 at all prefecture.

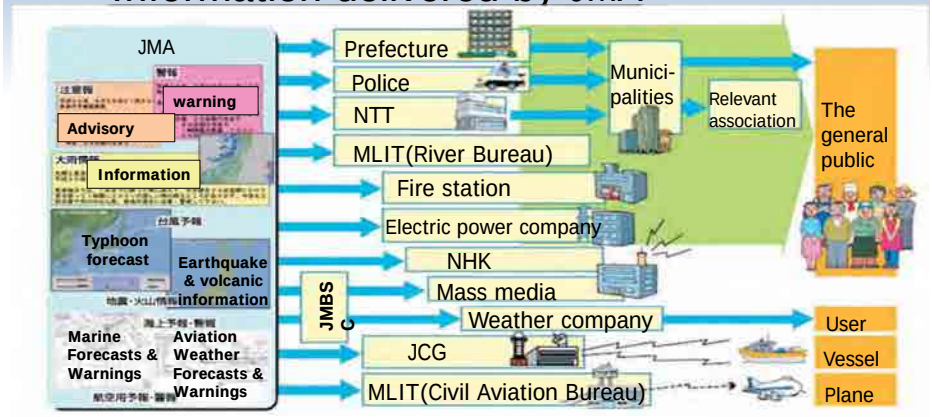
Local Authorities (City and others)

Time-series of information and required actions

(In case of heavy rain)

	Information by LMO	Actions of local government	Actions of general public
Heavy rain is expected in 24 hours	Weather information on heavy rain Outlook, amount of precipitation (24hr), disasters to prepare	Standby of staff members Keep communication	Pay attention to eather information (TV, radio, Internet etc.)
12 hr - 3 hr before heavy rain	Heavy rain advisory	Monitor rainfall etc. in the region	Prepare against heavy rain (check windows, shutters etc.)
Heavier rain is expected	Weather information on heavy rain Condition of rain, outlook, [illegible]	Call attention to general public	Check evacuation route
Torrential rain is expected in 1 hr - 2 hr	Heavy rain warning	Patrol dangerous area Prepare/open evacuation centers Emergency alert	Prepare personal effects for evacuation Keep away from dangerous area Get ready for evacuation
Torrential rain continues	Weather information on heavy rain Intensity of rain, Motion of torrential rain area,		Report local government if unusual phenomena found
Concern of catastrophic sediment disaster	Sediment disaster alert Weather information on record torrential rain	Evacuation instruction Evacuation directive	Evacuation

Information delivered by JMA



JMBSC: Japan Meteorological Business Support Center
NTT: Nippon Telegraph and Telephone Corporation
MLIT: Ministry of Land, Infrastructure, Transport and Tourism
NHK: Japan Broadcasting Corporation
JCG: Japan Coast Guard

Role of Met Service in National Disaster Management

Structural Measures ⟷ integration ⟷ Non-Structural Measures

- No needs for evacuation as long as hazards do not exceed the limit
- The cost is unlimited if we consider the extremely rare cases

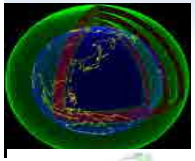
- Residents need to be educated so that they can act properly.
- Coordinated action is crucial

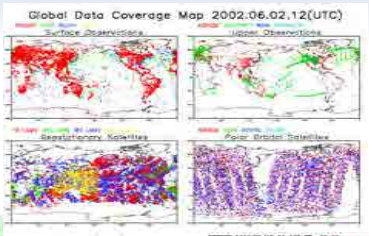
- Two aspects of Collaboration are important for Met service
  - Collaboration in non-structural measures (mass media, evacuation)
  - Collaboration with structural measures (river/coast/sediment control/life lines)

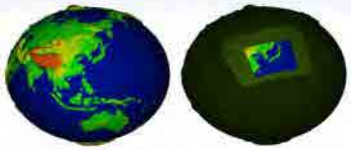
Structural measures — Collaboration — Non-structural measures (Met. service)

Numerical Weather Prediction

Data used in NWP

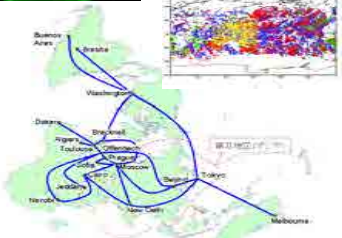




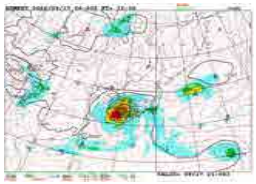


GSM（Grid space 20km） MSM（Grid space 5km）

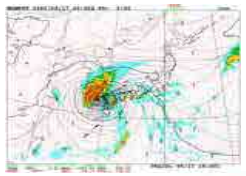
Computed area



Global telecommunication system



Global NWP Model



Meso-Scale NWP Model

気象庁 Japan Meteorological Agency

Japan Meteorological Agency

Warnings and Advisories

Warnings

Storm	Snow storm	Heavy rain	Heavy snow
Storm surge	High waves	Flood	

Advisories

Gale and snow	Gale	Heavy rain	Heavy snow
Dense fog	Thunderstorm	Dry air	Avalanche
Ice accretion	Frost	Low temperature	Snow melting
Storm surge	High waves	Inundation (Flood)	

Example of Criteria for Heavy Rain Warning

	Hokkaido Sapporo City	Tokyo Chiyoda Ward	Wakayama Aritagawa Town
3 hourly rainfall amount	70mm	100mm	170mm

気象庁 Japan Meteorological Agency JMA

Evacuation & Information during a Flood: Based on Recent Research and Initiatives

Crisis & Environment Management Policy Institute

Ichiro Matsuo, Associate Director, Environment
Disaster Prevention Research Institute

Background

■ I believe that to protect the lives of our citizens from natural disasters we must:
1. rebuild a regional (community) disaster prevention system,
2. link disaster prevention information with specific guidance, and
3. ensure everyone take appropriate actions to avoid becoming a victim.

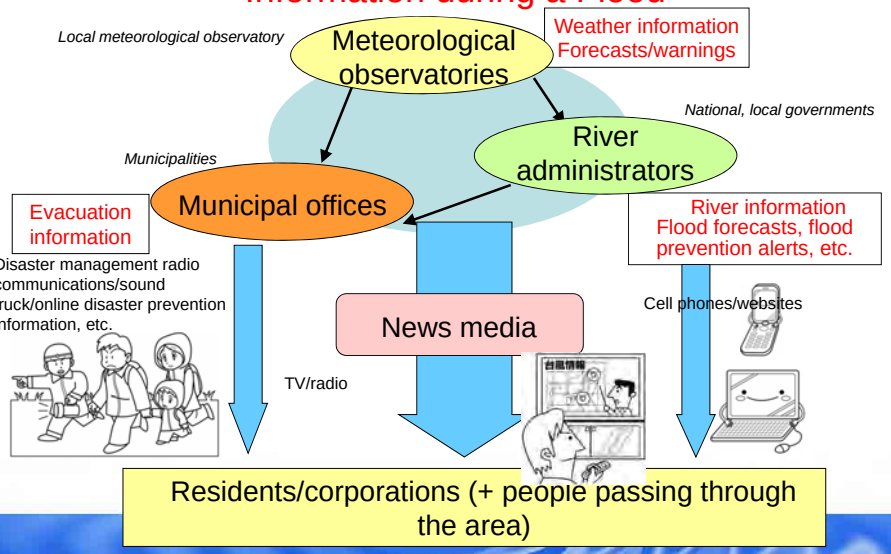
These are the 3 key ingredients of disaster preparedness. Our goal is to research and propose specific measures based on a variety of disaster investigations, and work together with various organizations and individuals in disaster-stricken areas to create communities that can survive in the face of a disaster.

■ So far we have looked at a number of disasters, beginning with the Kobe earthquake of 1995, and including other earthquakes, tsunamis, volcanic eruptions, and floods. We have conducted numerous independent flood investigations across the country, and have joined with communities to implement effective initiatives.

Characteristics of Recent Flood Phenomena

- Extreme rainfall (wide intensity fluctuation)
- Frequent occurrence of local rainfall (downpours) in northern Japan
- Typhoons near Japanese coastal waters
- An increase in severe rainstorms with no window for disaster prevention measures
- Increased flooding of small-and-medium sized rivers and unexpected flood damage (frequent disaster recurrence)
- Landslides occurring in places and at times that are difficult to predict

Sequence of Disaster Prevention Information during a Flood



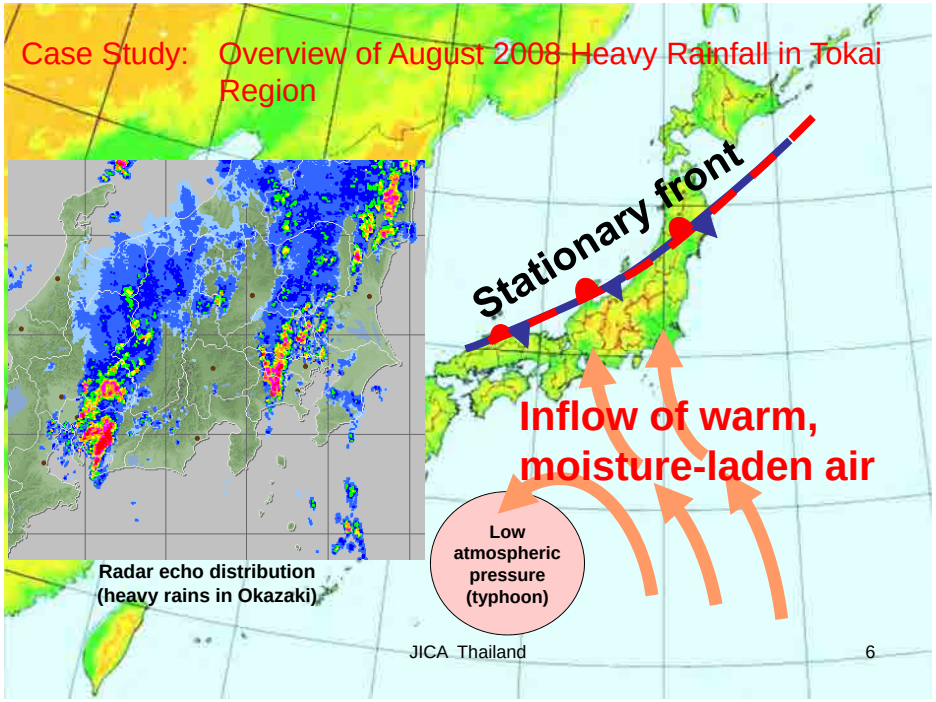
Information and Evacuation in Light of Flood Investigations

Case Study: Late August 2008 Heavy Rainfall in the Tokai Region

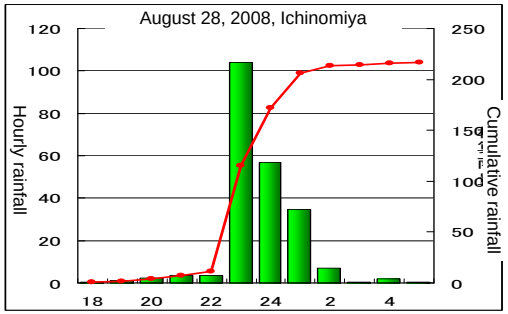
Case Study: 2009 Flooding in Sayo, Hyogo Prefecture

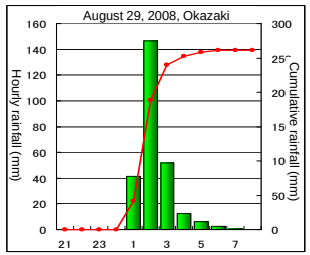
Case Study: Survey of Japanese Companies in Thailand on 2011 Flood

Case Study: Overview of August 2008 Heavy Rainfall in Tokai Region



Summary of Rainfall and Damage





Flood damage in Aichi Prefecture (Japanese government report)
Flooding above floor level: 1,149 homes
Flooding below floor level: 8,060 homes

No. of households advised to evacuate by Nagoya City
Approx. 360,000 homes No. of shelter evacuees: 375 (according to Nagoya City)

Problems Revealed via Municipal and Resident Surveys

1. The heavy rain was local and so unexpected that disaster prevention measures couldn't be implemented.

2. The city was unable to utilize information obtained from residents calling the emergency number (119).

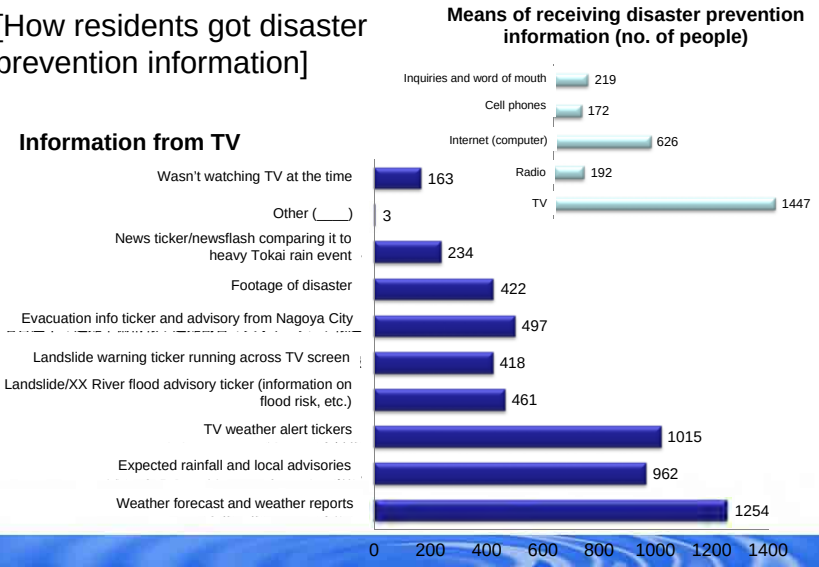
3. The city made announcements regarding evacuation preparations and evacuation advisories but the means of communicating that information to residents was limited since it was the middle of the night.

4. Information sharing between the river administrator and residents was not smoothly implemented.

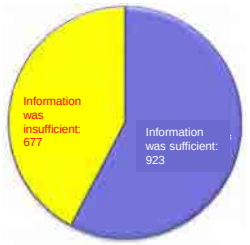
5. Information needed by residents was not shared.

[Based on a Survey of 1600 Nagoya City Residents]

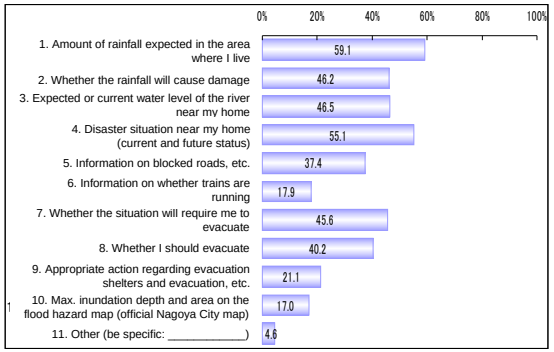
[How residents got disaster prevention information]



[Level of Satisfaction with Information]

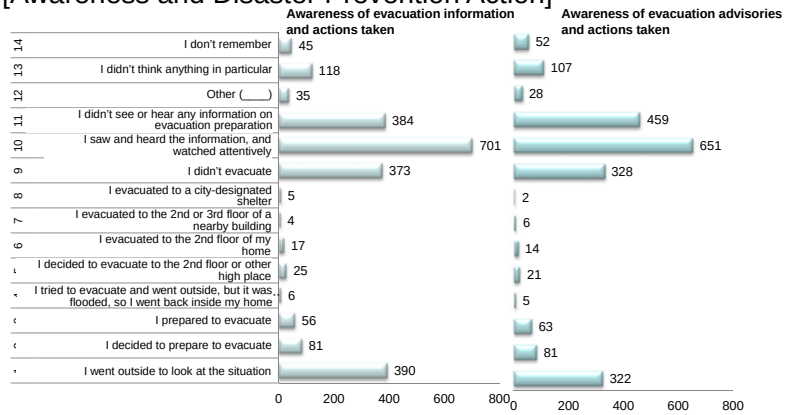


What wasn't well communicated



Surprisingly, nearly 60% said the information was sufficient. There were various reasons why people felt the information was lacking, but in general they wanted local disaster information and instructions on what to do.

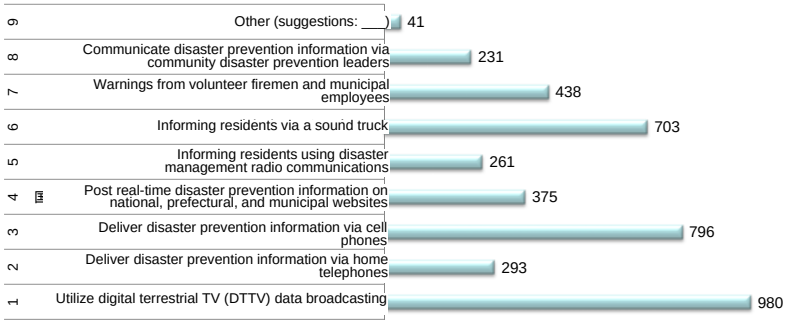
[Awareness and Disaster Prevention Action]



There were 7 people who actually evacuated to city-designated shelters. 41 people voluntarily evacuated to the higher floors of their home or nearby buildings. Over 20 people considered evacuating to higher floors. There were also nearly 150 people who prepared to, and probably would have, evacuated.

[Information Tools, ICT]

Having experienced a disaster, what do you think is the best way to communicate disaster prevention information to the community?



Although there is a strong need for high-tech, many rely on low-tech (people-based) information sharing.
DTTV is promising, how can it fulfill residents' need for more detailed disaster prevention information? Should leverage the strengths of communication tools to send information.

[Disaster-reducing Measures] Based on Answers to Open-ended Questions

◆ I live on the 3rd floor of my condo, so I think it would be even more dangerous to evacuate.

◆ Instead of wards, the prefecture and city should focus on high-risk areas, such as locations along rivers that are at a high risk of disaster and low-lying areas with many detached houses. There is a need for a system that can immediately get information to these areas.

◆ I'd like to have a detailed hazard map of flood-prone areas. The grid cells are too big and hard to make sense of. I'd also like to see a mathematical model developed that could immediately create a simulation and spit out data on flood-prone areas, then have those results publicized on the Internet.

◆ I wish that data broadcasting, etc. were used to deliver more localized information.

◆ I think we need wireless for homes or some kind of media that are directly linked to municipal offices so we can get info. 24 hours a day.

◆ I'd like to see a service that simultaneously delivers information to cell phones. Though posting disaster prevention information on websites is needed, during a disaster we may not be able to access it, so I'd like to see use of sound trucks, disaster management radio communications, and cell phones.

◆ I think disaster prevention measures should be regularly discussed on the ward level, and opportunities be created to talk about evacuation measures. Since there are homes without computers and some that can't be reached by phone, emergency information should be delivered via cell phone.

Initiatives Based on a Study of the 2008 Heavy Rainfall in the Tokai Region

1. Rebuilding an evacuation system

1) A collaborative system among the meteorological office/river and sewer administrators, Nagoya City, and residents
2) Preparation and regional utilization of hazard information on flooding of inland waters and river waters
3) An evacuation plan that includes evacuating high-rise buildings and use of private facilities in the city
4) Reevaluation of evacuation timing and criteria

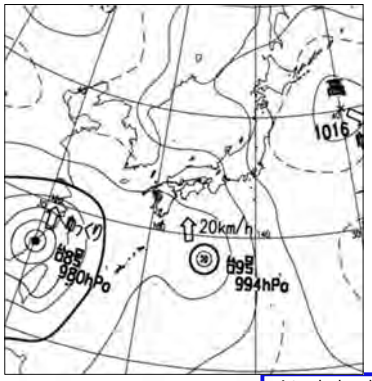
2. Mitigating the impact of a disaster via information

1) Provide specific disaster prevention info. that matches the evacuation plan
2) Share urgent information that residents want via a viewable structure (build a platform)
3) Identify disaster information that gets people to act and how to communicate it via different tools

Case Study: 2009 Flooding in Sayo, Hyogo Prefecture

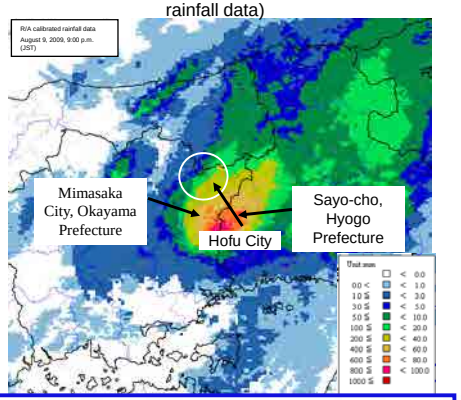
Summary

Surface weather (August 9, 9:00 p.m.)

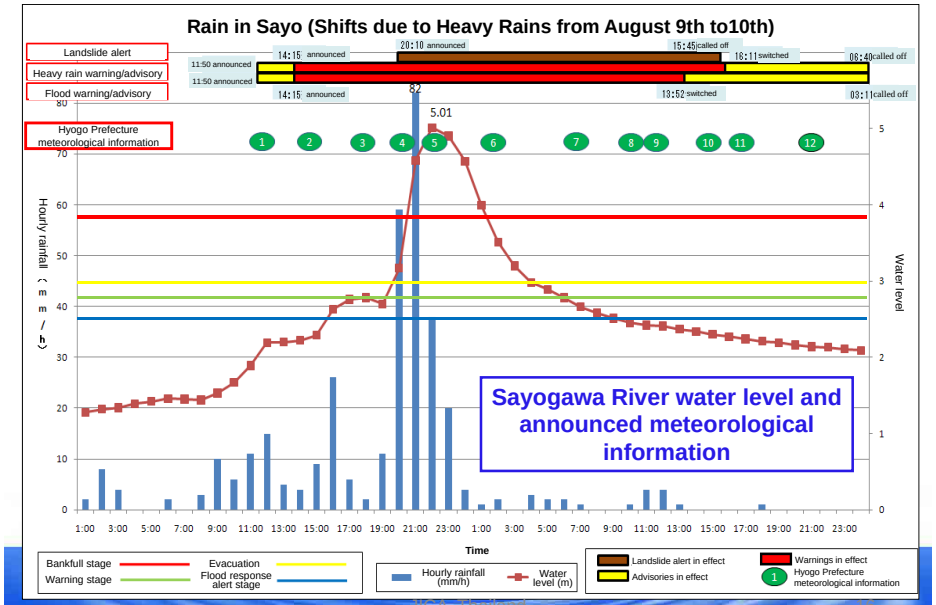


Provided by the Japan Meteorological Agency

Hourly rainfall distribution up to 9:21 p.m. (calibrated rainfall data)



A tropical cyclone that occurred in the south of Japan on the 8th turned into Typhoon Etau on the 9th at 9:00 p.m. as it moved north and then toward southern Shikoku. This tropical cyclone and the extremely moist air surrounding the typhoon caused heavy rains.



Damage (across Sayo-cho)

Source: Asahi.com

Damage/Victims	
■Dead 18	20
■Missing	1
■Injured	1
■Completely destroyed homes	161
■Significantly damaged homes	194
■Partially damaged homes	541
■Flooding above floor level	179
■Flooding below floor level	905
■Flooded hospitals	2
■Damaged roads	322 sites
■Collapsed bridges	16 sites
■River damage	269 sites
○ Inundated	

Kuzaki	Kozuki	Sayo	Hirafuku
1.8m	1.5m	1.5m	1.0m

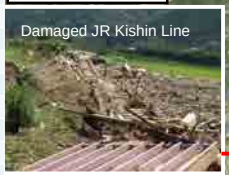
Based on official documents from the Sayo-cho municipal government

Sayo area
3 people's cars were washed away while returning home
1 person, whose car was submerged, was washed away while evacuating on foot
1 person's car was caught in the flood while going to the municipal office for disaster response
1 person returning home by car

Kuchinagatani area
1 construction company employee evacuated by car

9 dead/missing at Makuyama a prefectural public housing project, Hongo area

Persons swept away while evacuating in Sayo area, Sayo-cho
Unable to walk due to disability
Total: 2



Kozuki area
1 person, whose car was submerged, evacuating on foot
1 person was swept away with car

※ The base map is from the Sayo-cho website; most pictures were taken by the author.

Central Sayo-cho

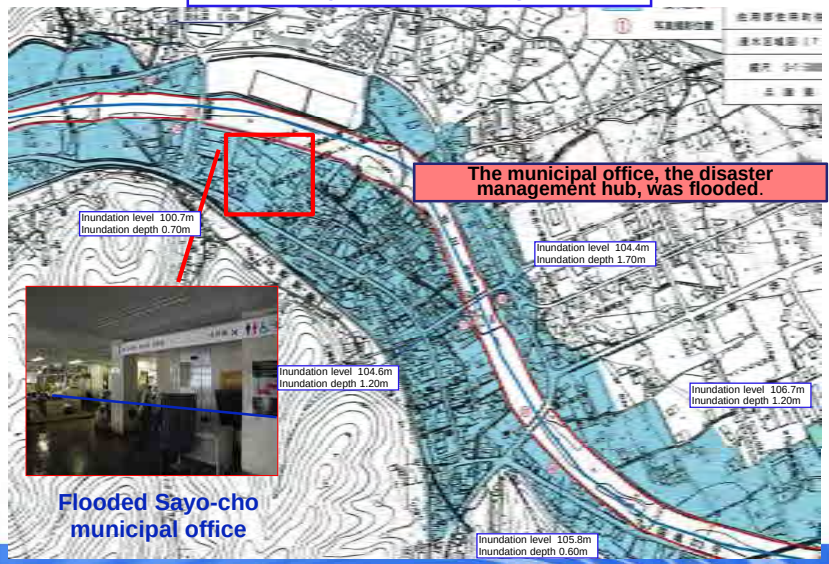
Municipal office entrance, high-water marks

Right bank

Left bank, Sayo

*View from downstream (Sayogawa River), Sayo area

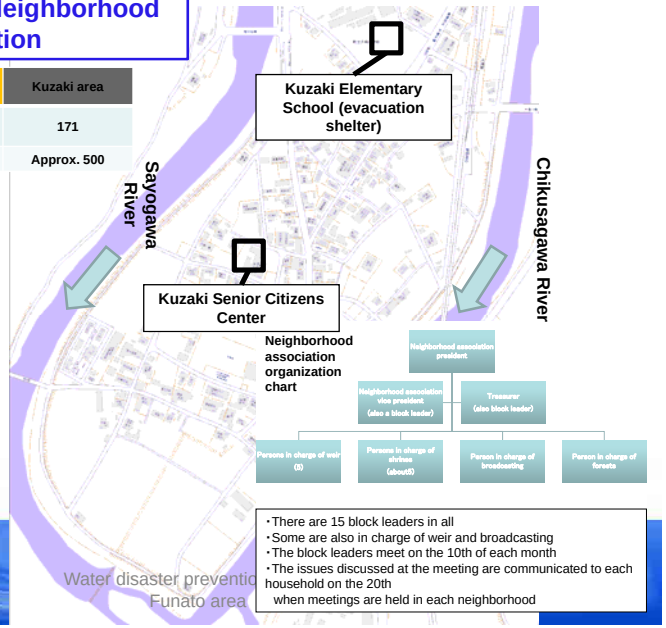
Central Sayo-cho Flooding Records



Kuzaki Area and Neighborhood Association

	Sayo-cho	Kuzaki area
No. of households	7,210	171
Population	20,260	Approx. 500

Primarily office workers and independent businesses



・There are 15 block leaders in all
・Some are also in charge of weir and broadcasting
・The block leaders meet on the 10th of each month
・The issues discussed at the meeting are communicated to each household on the 20th
when meetings are held in each neighborhood

Water disaster preventio
Funato area

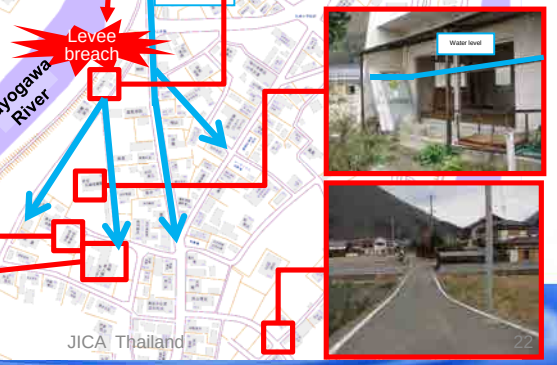
From Overflow to Levee Breach

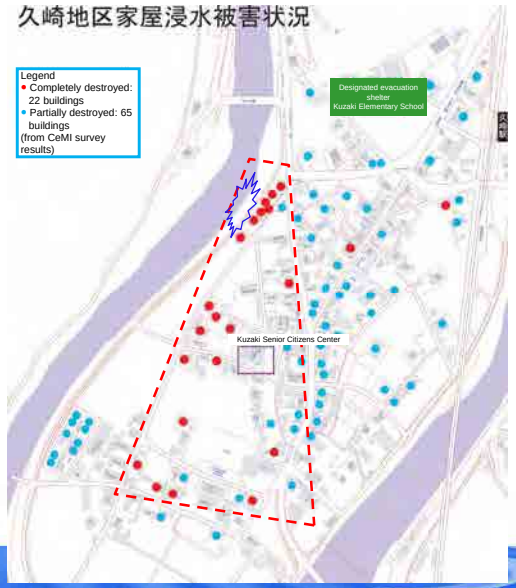
Levee breach site (provided by Kobe Shimbun)

At approx. 9:20 p.m. the Sayogawa River levee broke. While the water was receiving, flooding from the Sayogawa River continued to inundate the district.

Major Damage in the Kuzaki Area

Major Damage in the Kuzaki Area	
Dead/Missing	0
Flooding above floor level	approx. 140 buildings
Damage to businesses	263,760,000 yen





Building Damage Based on a Survey

Only buildings reported as damaged are shown

- Most of the homes near the washed-out levee were completely destroyed.
- A scattering of buildings along the prefectural road in the vicinity of Sayogawa River were completely destroyed.

Kuzaki Area and Neighborhood Association

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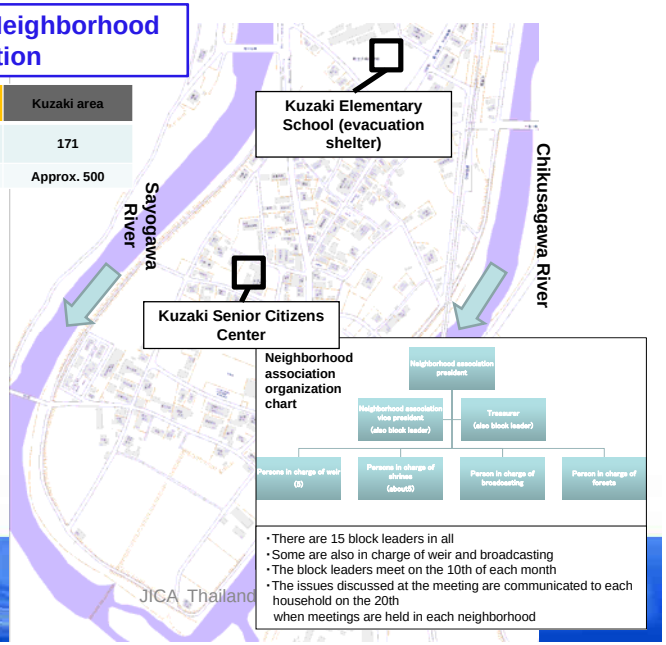
Population	20,260	Approx. 500

Primarily office workers and independent businesses



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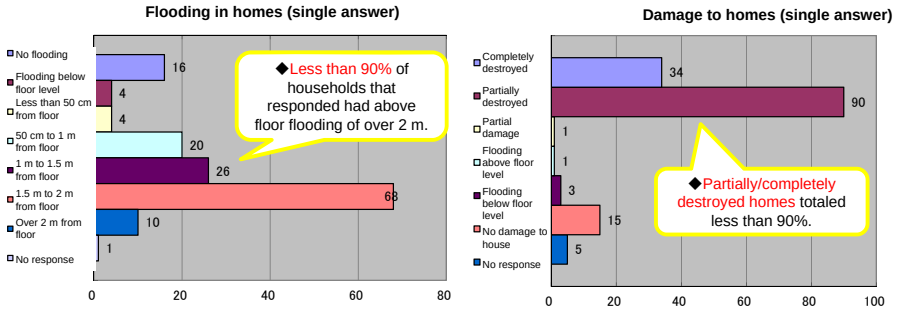
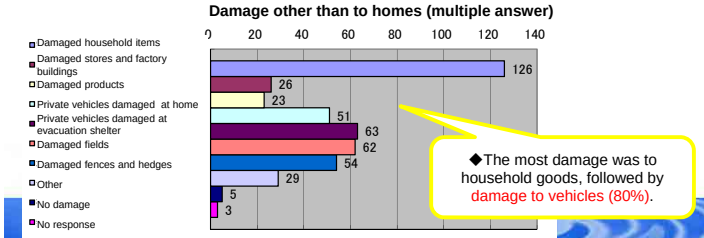
- The issues discussed at the meeting are communicated to each household on the 20th when meetings are held in each neighborhood

Damage in the Kuzaki Area





Actions Taken by Neighborhood Associations

(Based on Interviews with Block Leaders, etc.)

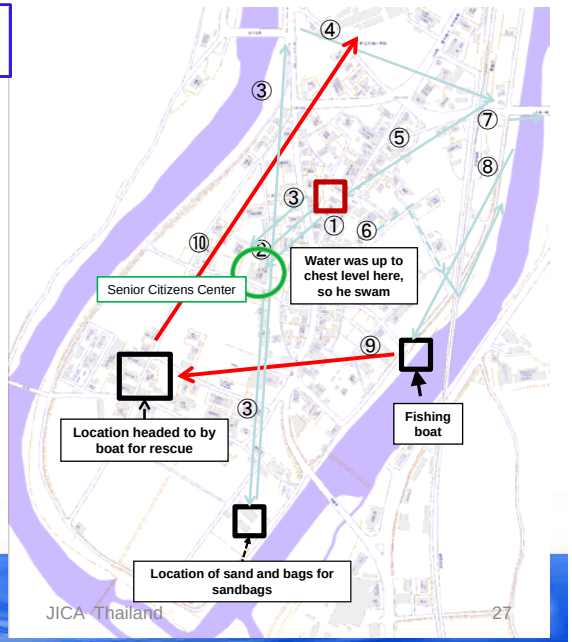
	Disaster and circumstances	Actions of neighborhood association presidents/block leaders	Major actions
Until 5:00 p.m.	Rainfall	・Torrential rain fell until around 3:00 p.m., and several block leaders inspected the river.	Information gathering stage ・River observation, floodgate operation, communication
From 6:00 p.m.	Heavy rains	・Persons in charge of weir gathered in a shed near Nakawatari Bridge. ・They suggested that the neighborhood association president create an emergency management headquarters for Kuzaki.	
From 7:00 p.m.	7:45 p.m. The siren sounds at Enkoji Temple, Sayogawa River	・The neighborhood association president and 4 persons in charge of the weir hold an emergency response meeting at the Senior Citizens Center. ・Some neighborhoods have evacuated residents of one-story homes (at risk during flooding) in advance to Kuzaki Elementary School. ・Block leaders were told to "meet at the Senior Citizens Center at 8:00 p.m."	Shared sense of danger stage ・A sense of danger shared via the neighborhood association ・Gathering of block leaders, advanced evacuation
From 8:00 p.m.	8:00 p.m. Exceeds evacuation stage 8:40 p.m. Exceeds bankfull stage water level Exceeds bankfull stage water level Approaches levee breach	・All block leaders gather at the Senior Citizens Center. ・The decision is made for block leaders to warn residents and volunteer firemen to ask residents to evacuate. ・An attempt was made to use disaster management radio communications at the Senior Citizens Center, but it was not working. ・Some block leaders used lightweight trucks to sandbag the Sasagaoka Bridge, but the sandbags washed away immediately.	Response meeting ・Evacuation support stage ・Meeting of block leaders ・Residents warned to evacuate ・Block leaders stack sandbags, etc.
9:00 p.m. to 11:00 p.m.	Casualties reported in other districts 9:10 p.m. An evacuation advisory is given for some areas 9:20 p.m. An evacuation advisory issued throughout the entire region 9:50 p.m. Peak water level (5.08 m)	・Sudden flooding inundates the 1st floor of the Senior Citizens Center, trapping the neighborhood association president/block leaders. ・Cars used for transportation are rendered inoperable by flooding and barriers on roads. ・A block leader who returned home is trapped by flooding. ・Several cell phones are submerged. ・Senior citizens who failed to escape are rescued by boat.	Disaster measures reach their limit– evacuation stage ・Sudden rise in flood level ・Many block leaders risked their lives

Actions of Block Leaders to Protect the Area

Disaster prevention actions taken by a block leader (Mr. A)

①	At 7:45 p.m., goes to the Senior Citizens Center
②	Warns all neighborhood households for which he is responsible (on foot)
③	Returns to the Senior Citizens Center, retrieves sandbags, and heads to the Sasagaoka Bridge (by car)
④	Goes to shed where persons in charge of weir are gathered
⑤	Goes home to check on safety of family (on foot)
⑥	After checking on family, is swept away by water while heading back to shed (on foot)
⑦	Goes to a car dealer on the other side of the bank to get a car
⑧	Goes where fishing boats are docked
⑨	Heads out to rescue residents via boat
⑩	Picks up residents in boat and goes to evacuation shelter

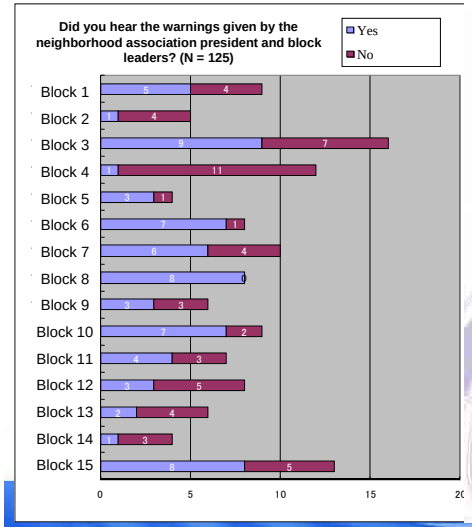
The disaster prevention equipment, such as sandbags and boats, were scattered over a wide area. The elementary school was the only evacuation shelter. He risked his life to save others.

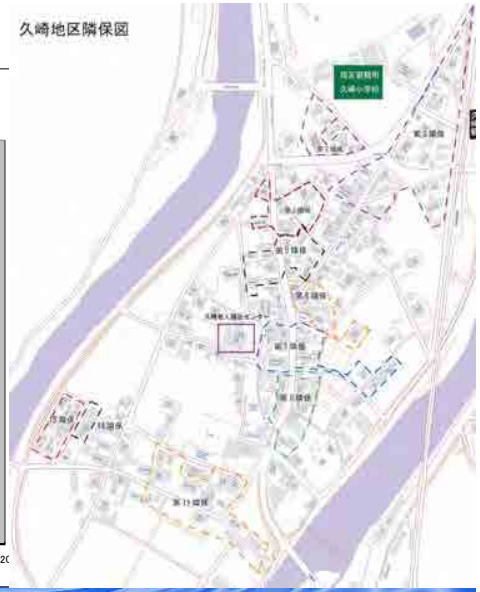


Courageous Actions Taken by 14 Block Leaders to Protect the Area

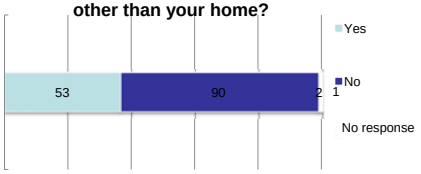
The ● indicates the evacuation shelters to which the block leaders finally went

Acknowledgment of the Block Leader's Warnings

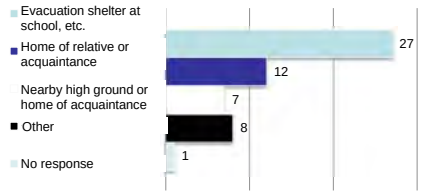




Question: Did you evacuate to a place other than your home?



Question: Where did you evacuate to?

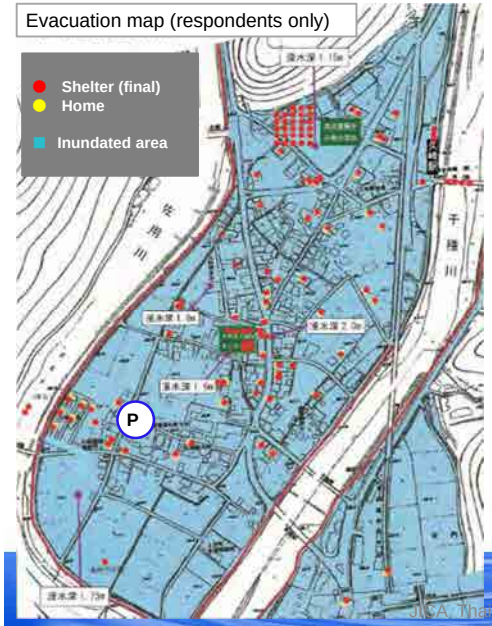


Evacuation Conditions (Avoiding Becoming a Victim)

	Evacuation shelter	Break down	Total
Evacuated to an outdoor location	Evacuated to Kuzaki Elementary School	27	56
	Evacuated to home of family/acquaintance	12	
	Evacuated to high ground/higher elevation	13	
	Other	4	
Home	Evacuated to 2nd floor of home or higher	75	81
	Was on 1st floor of home	6	

There were few evacuees at the designated shelter, Kuzaki Elementary School, but residents used their own judgment to flee to places they considered safe.

Evacuation map (respondents only)



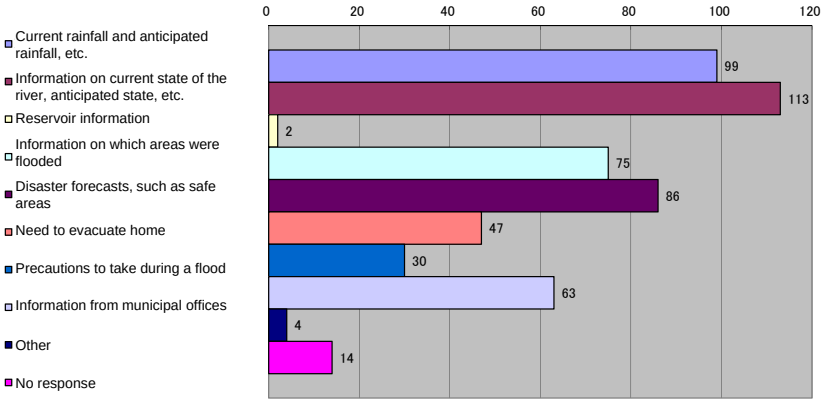
Problems Encountered While Fleeing

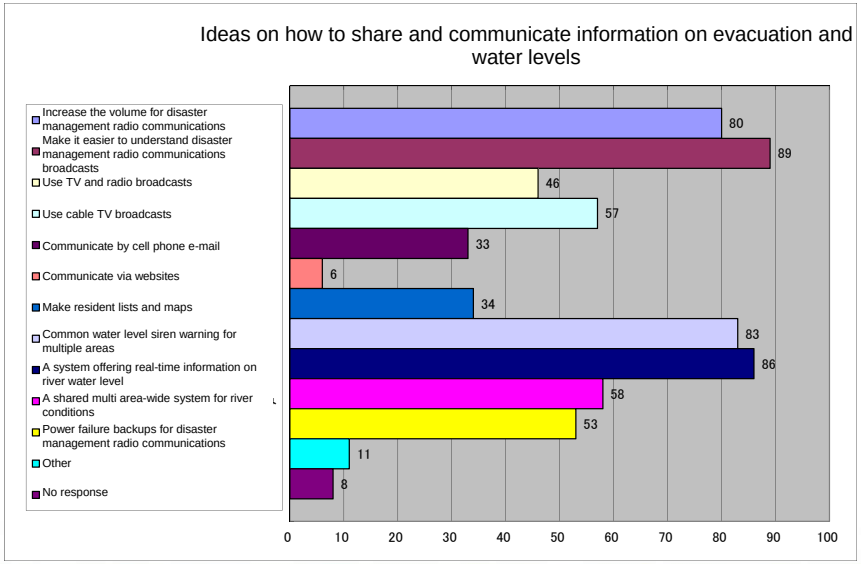
Although there were those who sought shelter at Kuzaki Elementary School because of the warning given by the neighborhood association, many stayed at home or a friend's home. Many decided to seek refuge on the 2nd floor of their home based on flood conditions, etc., but also felt at risk in their home.

The disaster prevention actions taken by block leaders were arduous because the location of the sandbags, boats, etc. were scattered. There was a need for life-saving equipment that would facilitate disaster prevention activities.

Numerous vehicles sustained flood damage, including those taken to the school (evacuation shelter) grounds.

Desired information on the day of the flood





Initiatives in the Kuzaki Area of Sayo-cho (Collaboration with Neighborhood Associations in 2012)

Collaboration with Kuzaki area neighborhood associations

■ Workshops held at the district center

■ Completed and distributed the Disaster Prevention Action and Support Guide to every household

■ Newly built, municipally managed apartments in the district

■ A temporary emergency shelter was built on the 2nd floor

Summary

■ The neighborhood association (a resident volunteer organization) acted to protect the area.

■ Many narrowly escaped death. There are numerous problems that must be solved before another disaster strikes.

- Several evacuation sites should be established in the area, including temporary shelters.
- Equipment, such as rescue boats, life jackets, and ropes, should be stored at shelters.
- Initiatives should be promoted that enable sharing of disaster prevention information among areas in the immediate vicinity.
- Disaster management radio communication equipment should be flood-proof. Always double check. Cell phones are now life-saving tools.
  Cell phone companies should make all cell phones waterproof by default.
- In areas where cars are a necessity, include how they should be used in the evacuation plan.

■ Evacuation plans should be drawn up for each area. Residents should take independent action in cooperation with government initiatives. Experts should create a system that supports those actions.

Case Study: Survey of Japanese Companies in Thailand on 2011 Flood

Survey Targeting Parent Companies of Japanese Overseas Subsidiaries - CeMI Survey

Targeted companies:
Most subsidiaries were parts suppliers. Most supplied raw materials/parts within Thailand, followed by exporters of manufactured products.

Number of suppliers

Companies supplying raw materials

Max	920
Min.	3
Avg.	82

Companies supplying parts

Max	3,600
Min.	5
Avg.	405

Companies supplying manufactured products

Max	1,200
Min.	1
Avg.	166

Number of companies supplying raw materials

Raw materials/parts supplied from within Thailand

Max.	3,700
Min.	3
Avg.	290

Raw materials/parts supplied from outside Thailand

Max.	850
Min.	3
Avg.	76

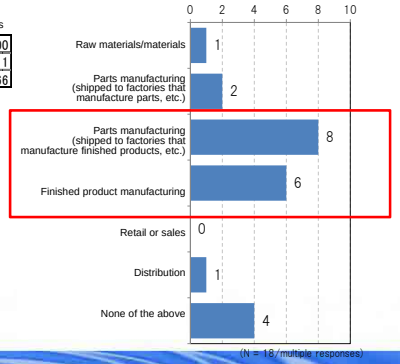
Manufactured products shipped (delivered) within Thailand

Max.	330
Min.	0
Avg.	75

Manufactured products shipped (delivered) outside Thailand

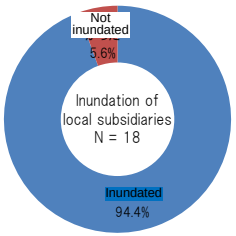
Max.	880
Min.	0
Avg.	115

By supply chain

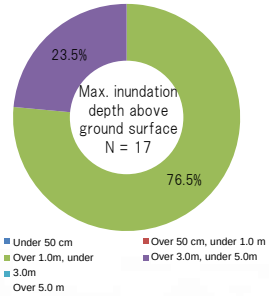


Damage status-1:
When companies indicating they suffered flooding were asked the inundation depth, less than 80% answered 1-3 m, and over 20% answered 3-5 m. In addition, 15 companies indicated they had halted business (operations) over an average of 46 days.

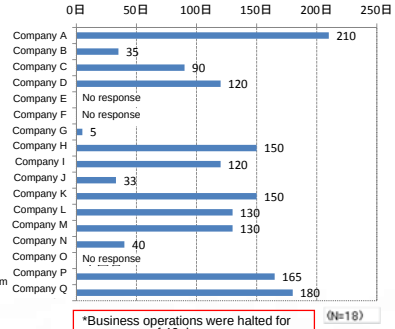
Inundation



Extent of inundation



Period business (operations) suspended



*Business operations were halted for an average of 46 days.

Damage status-2:
Nearly all items correspond to direct damage from flooding. As a result, the majority of indirect damage included difficulty in obtaining raw materials, followed by a reduction in business transactions.

Direct damage

Cost of direct damage

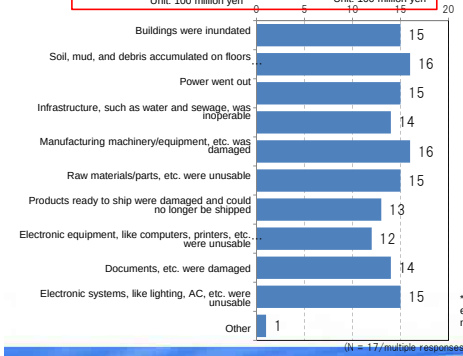
Max.	600
Min.	1
Avg.	151

Unit: 100 million yen

Compensation for direct damage

Max.	270
Min.	1
Avg.	71

Unit: 100 million yen



Indirect damage

Cost of indirect damage

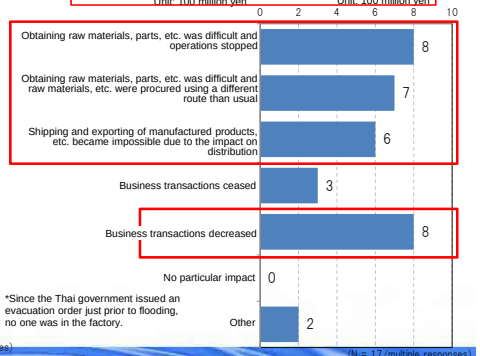
Max.	9
Min.	3
Avg.	6

Unit: 100 million yen

Compensation for indirect damage

Max.	2
Min.	0
Avg.	1

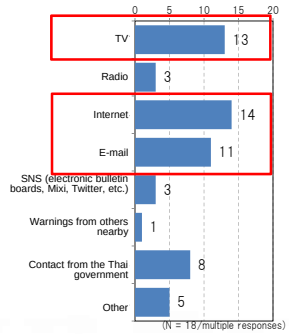
Unit: 100 million yen



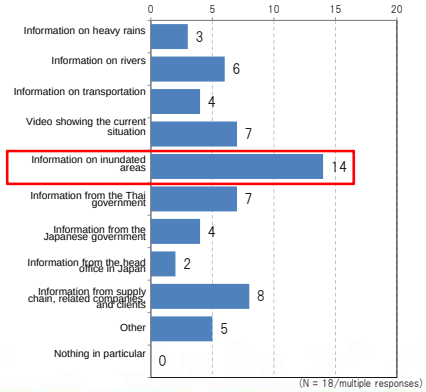
*Since the Thai government issued an evacuation order just prior to flooding, no one was in the factory.

Useful information for coping with the flood:
As a way to cope with the flood, 80% of the companies established a disaster response headquarters either in Thailand or Japan. Many indicated they also used the Internet and TV to obtain information. The most helpful information was about the inundated areas, followed by information from related companies and clients.

Means of obtaining information



Useful information



Suggestions from companies suffering damage:

Suggestions for the Thai government:

- Thai Government: Provide accurate flood risk information
- Thai Government: Develop measures for dams, reservoirs, and industrial complexes
- Thai Government: Initiate infrastructure improvement and flood control measures

Suggestions for the Japanese government:

- Establish systematic government guarantees in the event of a flood
- Lay a strong foundation for alternative production system in cases like this
- Government support in times of disaster for alternative production abroad
- Revise, reduce, and computerize paperwork for establishing alternative production
- Promote Thai-Japanese government cooperation and use of various technologies, etc.

Recent Examples of Initiatives

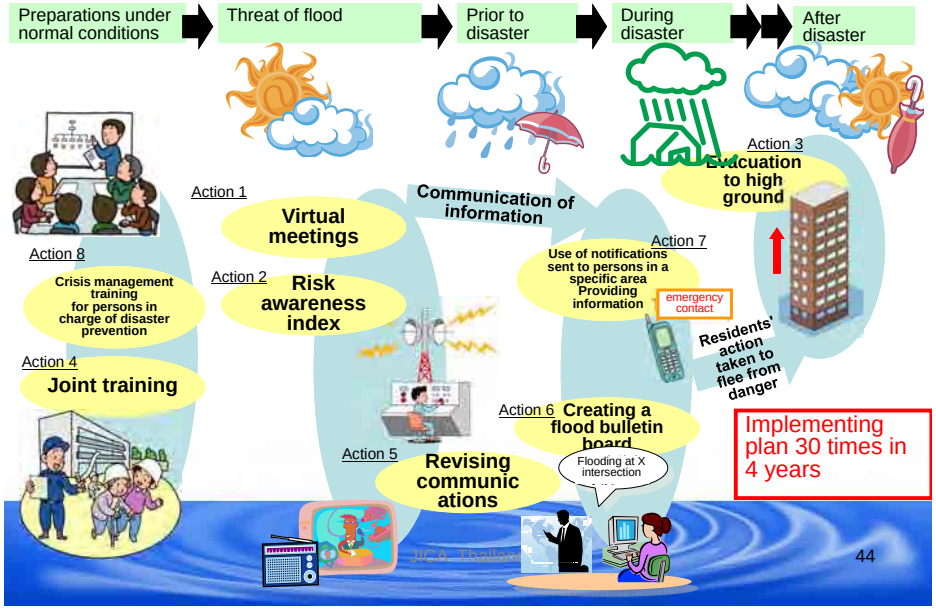
The Nagoya Water Disaster Information Sharing Promotion Coordination Council

Establishment of the Nagoya Water Disaster Information Sharing Promotion Coordination Council

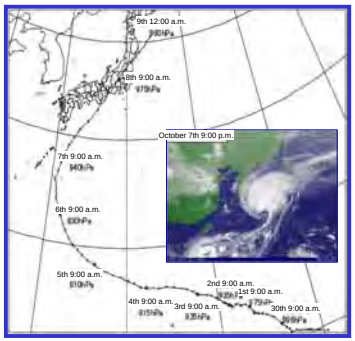
Formed in June 2009, the Nagoya Water Disaster Information Sharing Promotion Coordination Council serves as an umbrella for various disaster prevention organizations. Working against a backdrop of destruction wrought by frequent storms and flooding across Japan, including the torrential Tokai rains of 2000, August 2008, and June 2009, the Council is looking for solutions to problems related to sharing flood and disaster prevention information.

Establishment of the Nagoya Water Disaster Information Sharing Promotion Coordination Council and collaboration

Review Process at Meetings

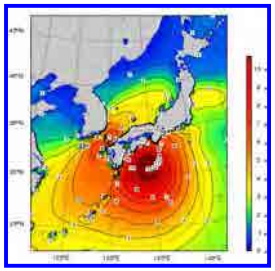


Initiative 1: A Shared Sense of Danger during Typhoon Melor



・The risk awareness index created by the Coordination Council was used widely during the September 29, 2009 Typhoon Melor that struck the Pacific coast.

Map of coastal waves



Low atmospheric pressure
Irago Observatory 956.4 hPa(highest since opening in 1947)
Maximum tide level (TP)
Mikawa Port (Aichi Prefecture) : 3.15 m (highest since Typhoon Vera)
Maximum wind velocity
Nagoya: 17.3 m/s highest in the past 10 years
Irago: 23.2 m/s highest in the past 19 years
Centrair: 32.7 m/s (strongest instantaneous wind speed 44.2 m/s)

2009 Typhoon Melor Aftereffects

The river swelled, causing the collapse (Chita City, Aichi Prefecture)

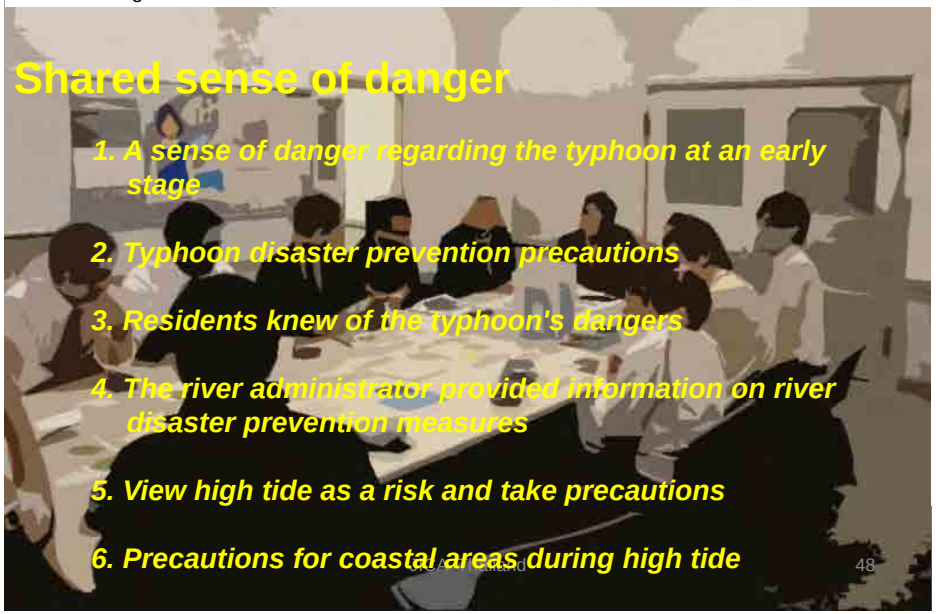
Provided by Chukyo TV

The truck turned over due to strong winds (Toyogawa River, Toyohashi City, Aichi Prefecture)

2009 Typhoon Melor Aftereffects

Provided by Chukyo TV

As Typhoon Melor approached the coast of Japan, the council members (meteorological observatory, news media, municipalities, and river administrator) exchanged information so that the area was able to take unified disaster prevention action through information sharing and a shared sense of danger.



Media warnings were given early!

- If there hadn't been a shared sense of danger...

Normally, newscasts on the typhoon, running from the middle of the night on the 7th (Wed.) to early morning on the 8th (Thur.) would have...

⇒warned people to take precautions <u>after noon on the 7th</u>

- As a result of a shared sense of danger...

On the 5th (Mon.) the shared sense of danger spread

⇒leading to full coverage on the <u>evening news beginning on the 6th</u>

△**"It's important that measures be completed tomorrow during daylight"**

△ "On the night of the 7th, stay in a safe place and don't go out"

△ "Prepare for the typhoon and take all necessary precautions, such as removing items from the veranda!"

These kinds of warnings were repeated from the 6th by every media outlet.

⇒ The news broadcasts occurred 1 day earlier, enabling early measures to be taken

"Keywords" were broadcast by all stations

- Expressions that instill a sense of danger are important in alerts!

△**"Just like Typhoon Vera..."**

⇒ Evoke images of Typhoon Vera and suggest that significant damage will be done (an image of the worst case scenario)

△**"The strongest typhoon in the past 10 years"**

⇒ An image of strong winds like none ever seen before

- News began to spread on the 6th, so the response from various organizations was also quick...

△ Many municipalities decided early on to close elementary schools, etc.

△ Toyota decided to close their factory

⇒ Every media outlet reported this on the 7th

⇒ It subtly drove home the idea of taking action

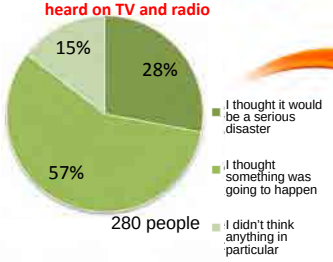
What did the news media communicate?

Provided By: NHK

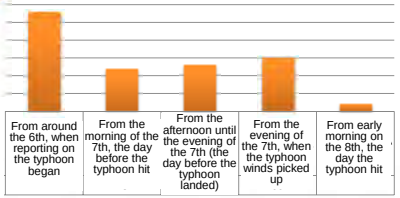
How did the residents cope?

1) Targeted areas: City's 10 wards where evacuation information was announced
2) Men and women 20 years and older who live in the targeted wards
3) 100 samples from each ward for a total of 1,000 people
4) Survey method: An online survey of an Internet research panel
5) Survey period: December 21, 2009 to December 25, 2009

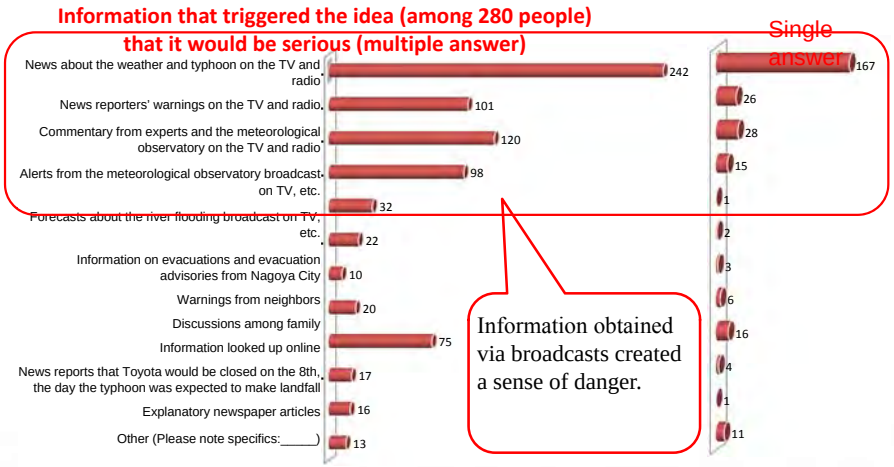
Thoughts about the news reports seen and heard on TV and radio



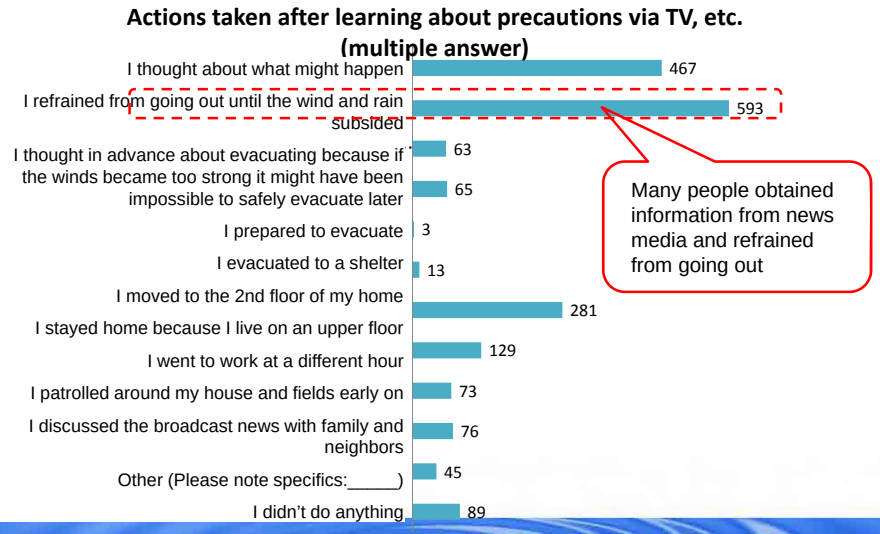
The point at which people thought it'd be a serious disaster



Information instilling a “sense of danger”



Disaster prevention actions taken by residents



Assessment of the shared sense of danger

・The "suppliers" of disaster prevention information and “communicators,” including community disaster prevention organizations and news media, shared information as well as the sense of danger in advance and succeeded in impressing on people the importance of taking disaster prevention actions.

・Collaboration among the meteorological observatory, river administrator, and municipalities led to the early evacuation announcements.

・Most residents got typhoon and disaster prevention information via news media at an early stage and refrained from going outside, which kept the number of casualties down dramatically.

・Essential utilities that participated in information sharing were also able to work well ahead of the storm to smoothly establish in-house disaster prevention systems, etc.

Initiative 2: Revising the City’s Standard Evacuation Communications Aiming for Easy-to-understand Disaster Prevention Information

■Revising standard communications

- Identify problem with current standard communications from Nagoya City

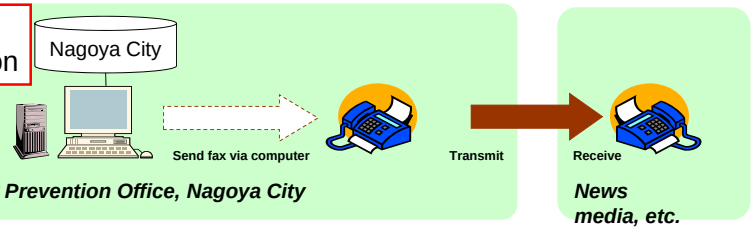
- Review/draft a policy for revising the standard communications
  - Aim for standard communications that are clear and easy to understand
  - Provide information with the changes clearly highlighted
  - Provide the minimum required amount of information
  - Make inputting short and simple
  - Provide easy-to-use information (scripts for reporters, etc.)

Tailor information to news media format

■Support system for information input

A system designed to make providing evacuation information short and simple

System illustration



Initiative 3: Workshops to Boost Residents' Ability to Take Disaster Prevention Measures

1st time	2nd time	3rd time
(1) Introduce: Neighborhood walks, public meetings (Participants: 7 neighborhood association heads) Participants toured the area to learn more about flooding and spoke about the workshops with school district reps.	(2) Training using maps, exchange of ideas (Training session conducted using maps after explanation and guidance. Participants: about 30 people from relevant organizations, Nagoya TV, Chukyo TV, Tokai TV, and NHK) Older versions of maps and hazard maps were used to confirm local areas prone to flooding and potential new evacuation sites, etc.	**(3) Discussions on individual disaster prevention** (Participants: about 30 people from relevant organizations and Chukyo TV) Organized ideas elicited during map training session and discussed individual disaster prevention measures for the community. The Individual Disaster Prevention Rule Book was drafted.
 1. Neighborhood walks	 2. Training using maps	 3. Exchanging ideas

Initiative 4: Promoting Safety in Flood-prone Areas

Phenomenon/ Chronological order		Normal conditions	Heavy rains	Rise in water level	Evacuation
Residential (inhabited) areas	Zoning		High-risk areas	Areas at risk of flooding	Hazard map areas
	Residential (inhabited) sites		High-risk floors ・Underground facilities ・Basements ・Semibasement structures, etc.	Areas at risk of flooding ・Wooden homes ・One-story homes ・1st floor, etc.	Areas at risk of flooding ・Wooden homes ・One-story homes ・1st floor, etc.
Evacuation		Community knowledge/awareness-raising activities ・Measures to increase knowledge under normal conditions (hazard map, Marugoto Machigoto (All Around Town) Hazard Map, city publications, resident workshops, etc.) ・Review method for informing the community ・Reevaluate evacuation shelters, etc.	Voluntarily seek refuge in advance ・Determine high-risk areas ・Know targets (persons needing help during a disaster, etc.) ・Persons needing evacuation assistance ・Method of informing the community, etc.	Preparation for evacuation ・Determine high-risk areas ・Know targets (persons needing help during a disaster, etc.) ・Method of informing the community, etc. (visualization of water level information, clarification of evacuation area)	Evacuation ・Curbing unnecessary evacuation (appropriate action to avoid danger)
					Evacuation order lifted

Summary

My Perspective on Information and Evacuation (Part 1)

- Unlike earthquakes and other disasters, people have time to take flood prevention measures
- Disaster prevention information saves lives and prevents economic damage.
- It's important that residents and organizations increase their awareness about disaster prevention and related information when conditions are normal.
- It is important that government and river administrators quickly provide accurate disaster prevention information.
- Various means and tools should be used to communicate accurate disaster prevention information to residents.
- It is important to communicate disaster prevention information via news media, such as TV. A collaborative system with news media should be reconstructed.

My Perspective on Information and Evacuation (Part 2)

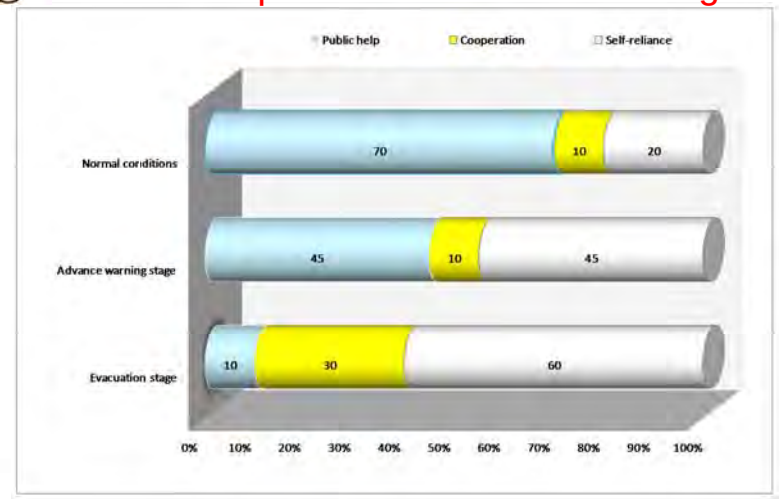
- Those that provide disaster prevention information should tailor communications to meet the needs of the target community.
- People want local disaster prevention information.
- In the future, regional disparities and information literacy will impact the degree of damage from natural disasters. (The uninformed are more vulnerable to disasters.)
- The time will come when all residents will have smartphones. However, during a disaster, sometimes mobile tools become unusable due to power failure, flooding, etc.
- To reduce damage from flooding, the risk of flooding to homes and various organizations has to be reduced.
- We must systematically instill a sense of danger about disasters across the community!

Characteristics According to Type of Disaster

Type of disaster	Possibility of wide-scale disaster	Advance warnings	Window of time to take precautions
Typhoon	○	Yes	◎ several days
Localized heavy rains	×	Yes	△30 min. – 1 hr.
River flooding (overflow)	△ - ○	Yes	○ several hours
High tide	△ - ○	Yes	○ several days
Landslide	×	Yes	×
Earthquake	△ - ○	no	×
Tsunami	○	Yes	× - ○ several minutes or more

We Must Create a Collaborative Community Flood Preparedness System

The Role of Self-reliance, Cooperation, and Public Help at Different Disaster Stages



Raise Awareness Disaster Risks One Notch to Fight Apathy