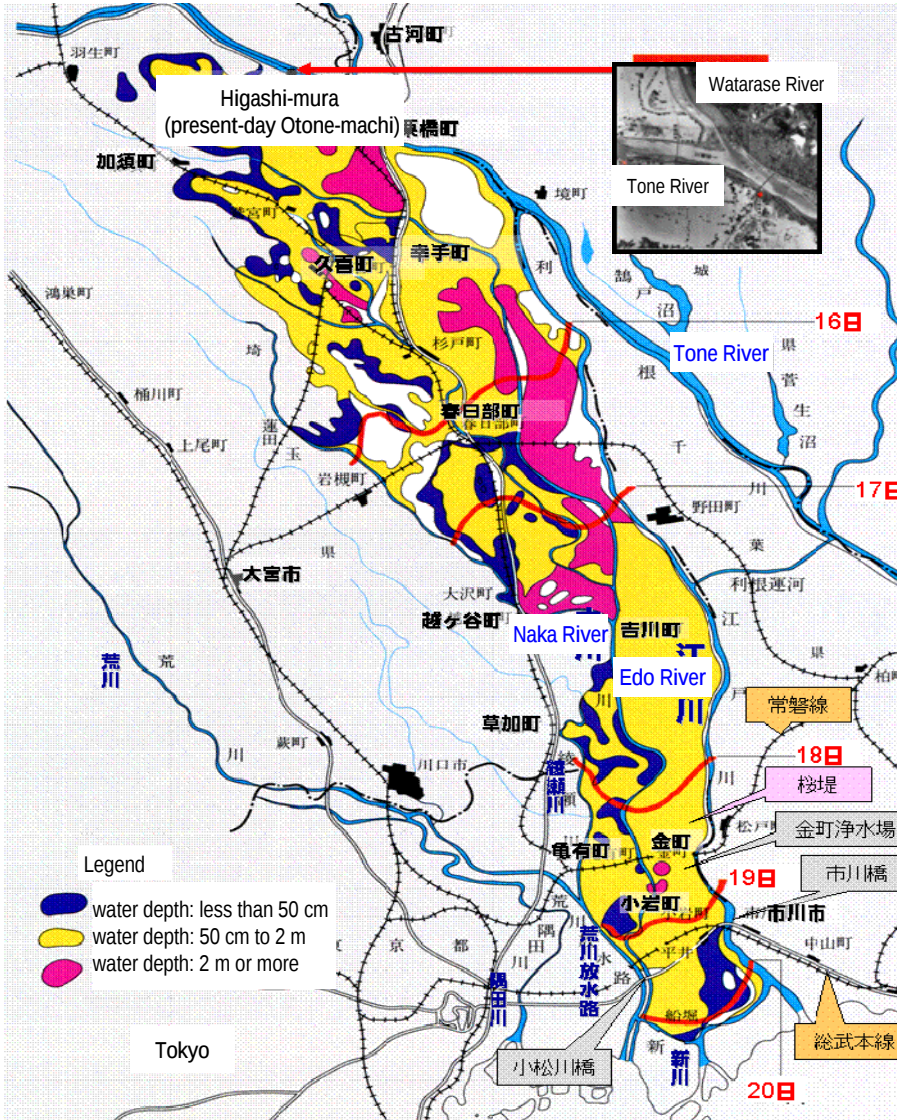


1. Japan's basic flood protection system

2. Preparedness for major floods

- Past major floods and state-level efforts
- Role of MLIT

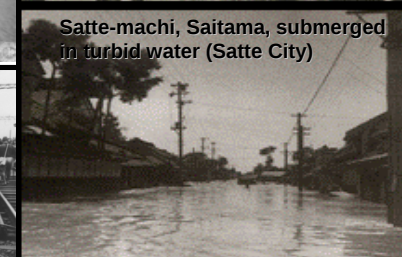
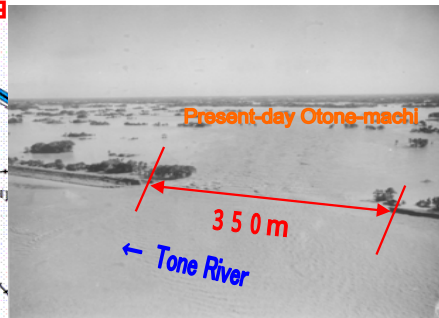
Flood caused by Typhoon Kathleen (1947)



Inundation due to a breach in the right-bank levee of the Tone River in the Shinkawadori area in Azuma-mura (present-day Otone-machi), Saitama Prefecture

	Tokyo	Chiba	Saitama	Gunma	Ibaraki	Tochigi	Total
Dead (persons)	8	4	86	592	58	352	1,100
Injured (persons)	138		1,394	315	23	550	2,420

Number of completely or partially destroyed houses: 31,381
House inundation: 303,160 houses
Farmland inundation: 176,789 ha



Storm surge caused by Ise Bay Typhoon (1959)

Flood damage in Aichi and Mie prefectures caused by Ise Bay Typhoon

	National total	Aichi and Mie	
Number of people killed or missing	5,012	4,533	91%
Number of injured people	69,538	63,670	92%
Number of affected people	1,887,723	1,110,057	59%
Number of totally or partially destroyed houses	177,574	125,591	71%
Number of houses washed away	16,580	15,386	93%
Number of flooded houses	359,178	196,256	55%
Farmland washed away or buried	14,662hectare	6,325ha	43%
Farmland submerged	295,264hectare	89,503ha	32%
Estimated amount of damage	¥47,857,470,000	¥13,189,080,000	30%
Number of boats/ships washed away or sunk	2,481	2,069	83%

Searching a stranded house

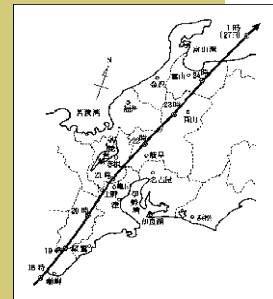
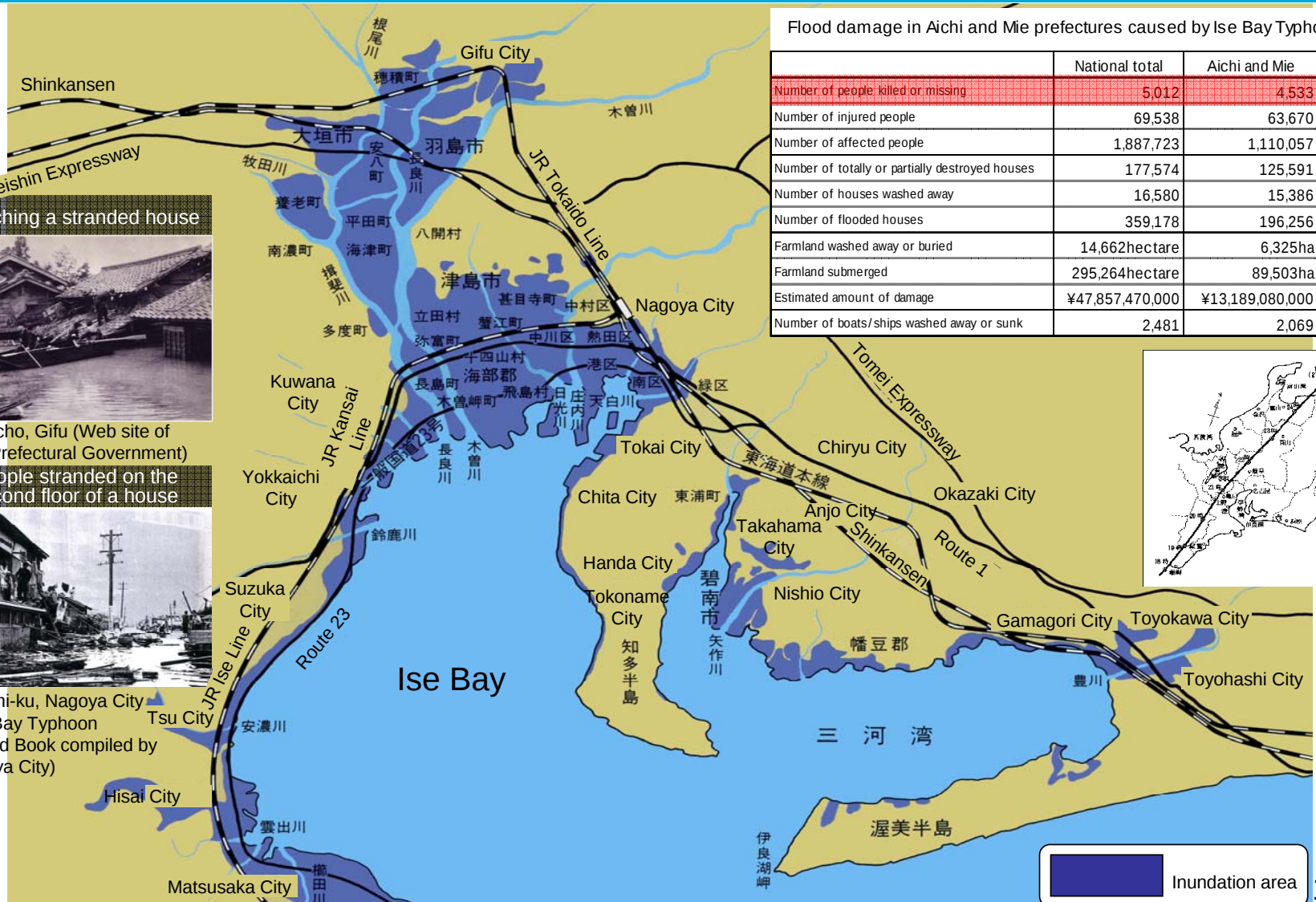


Yoro-cho, Gifu (Web site of
Gifu Prefectural Government)

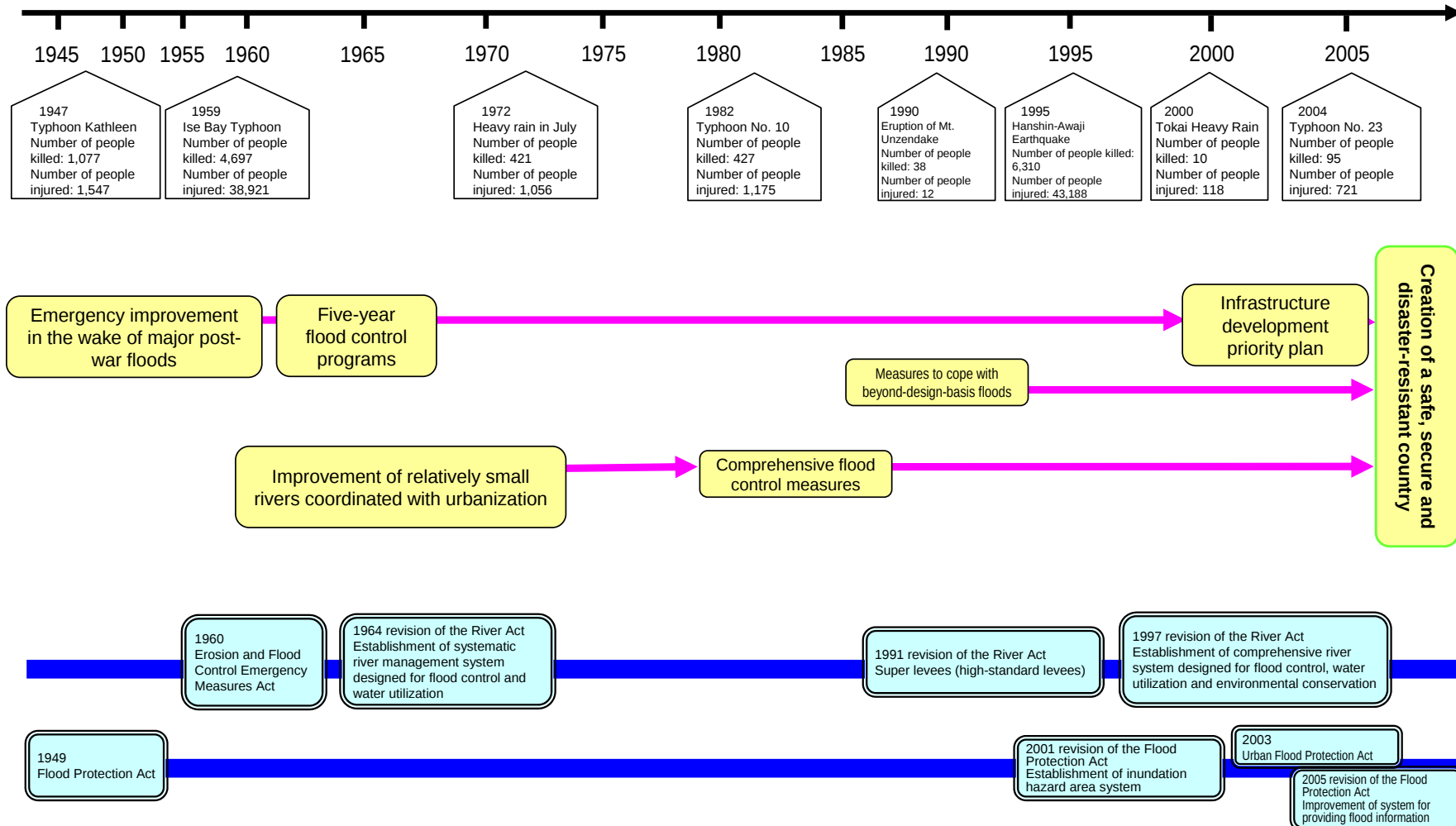
People stranded on the
second floor of a house



Minami-ku, Nagoya City
(Ise Bay Typhoon
Record Book compiled by
Nagoya City)



History of river improvement



Characteristics of flood damage in recent years

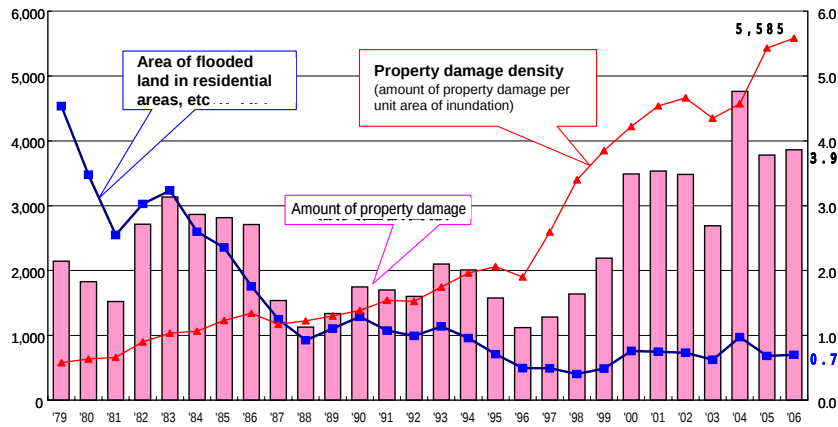
The area of inundation has decreased, but the amount of flood damage shows an increasing trend.

The amount of flood damage is on the increase.

→ Although the area of inundation had been on the decrease because of flood control measures, it has been showing a slightly increasing trend in recent years. Mainly because of the urbanization of flood-prone areas and the increase in flood-vulnerable property, the amount of damage has been showing a tendency to increase.

Flood damage density (10,000 yen/ha)
Amount of property damage per ha of inundation area (2000 prices)

Property damage (100 billion yen)
Flooded land area (10,000 ha)



Notes: 1. Averages in the last five years
2. The amount of property damage and flood damage density include business interruption loss.
3. Source: 2006 Flood Statistics combined by River Bureau, Ministry of Land, Infrastructure, Transport and Tourism
4. 2000 prices



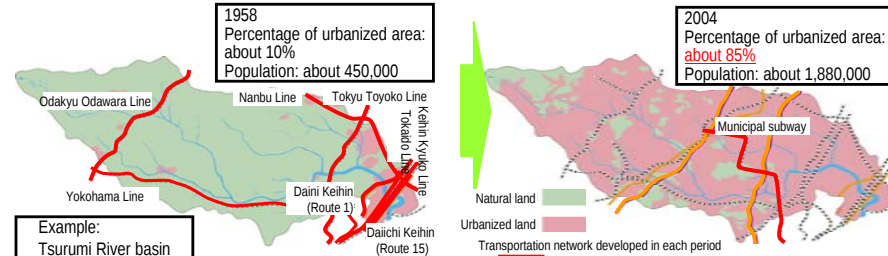
If submerged in water, even if only once, electronic appliances are rendered useless.



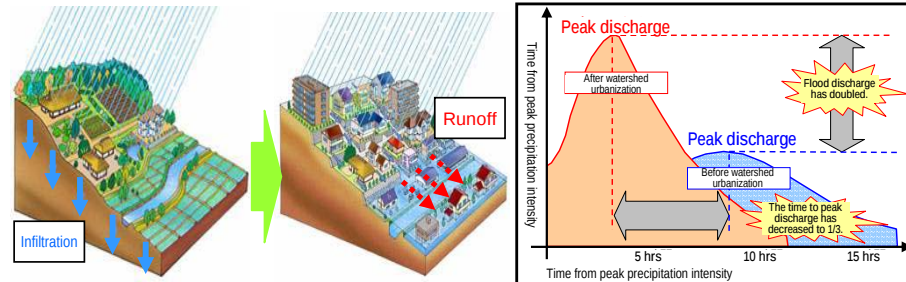
Having absorbed water, insulation materials have become useless.

Watershed urbanization causes flood risk to increase.

As a result of railway and arterial road network construction, which began around 1960, watersheds today are crisscrossed with railways and roads. The resultant urbanization has caused the water retention and detention functions of the watersheds to decline.



As runoff increases, the time to peak runoff decreases.



Increasingly intensive land use (e.g., subways, underground streets) has given rise to new types of inundation damage such as flooding of underground spaces.



Tokyo Metro's Azabu Juban Station (October, 2004)



Fukuoka municipal subway (July, 2003)

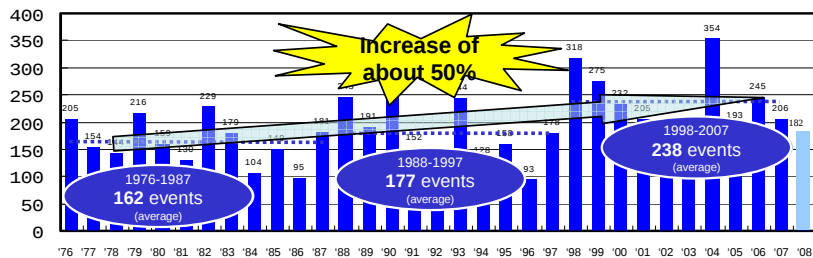
Increasing frequency of heavy rains: The trend is expected to continue.



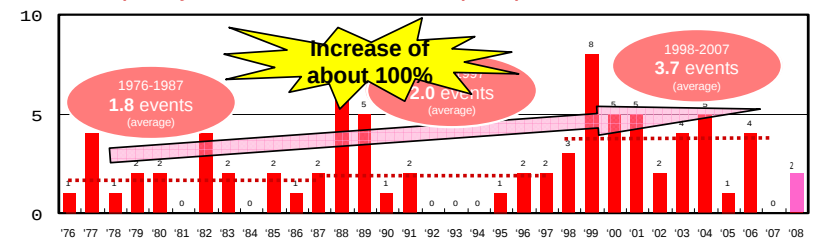
Ministry of Land, Infrastructure,
Transport and Tourism

Both hourly rainfall and daily rainfall tend to increase.

Annual frequency of 50 mm/hour or more precipitation events (per 1,000 locations)

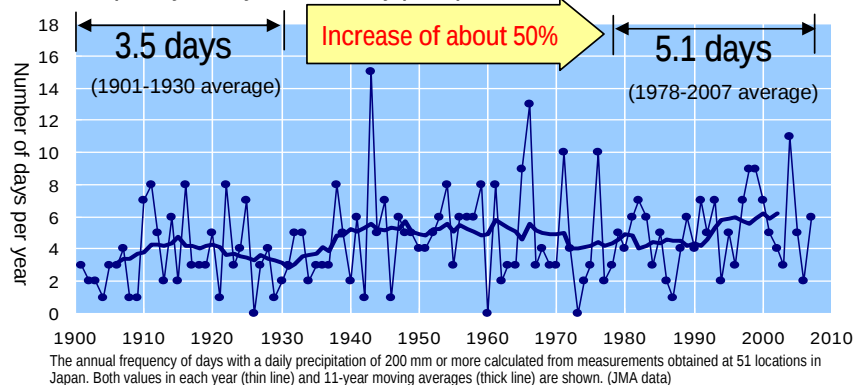


Annual frequency of 100 mm/hour or more precipitation events (per 1,000 locations)



*The annual frequency of precipitation events with different hourly precipitations was calculated from AMeDAS data obtained from about 1,300 locations in Japan.
*The 2008 data are data obtained on or before September 2, 2008.

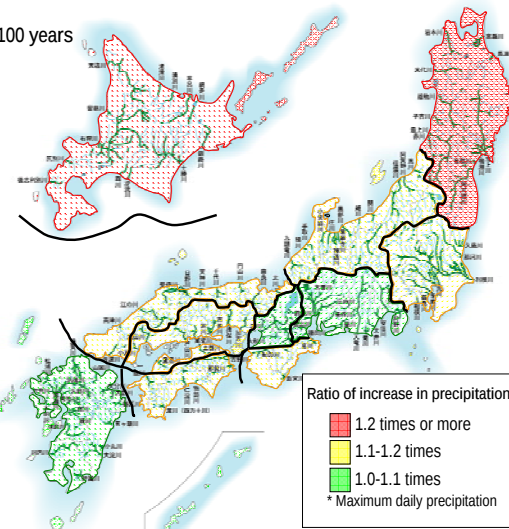
Annual frequency of days with a daily precipitation of 200 mm or more



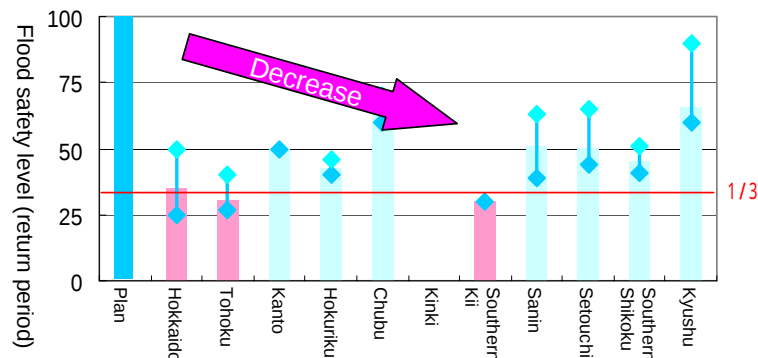
In future, **precipitation is likely to increase throughout the country.**

Projections of increase in daily precipitation in 100 years

Hokkaido	1.24
Tohoku	1.22
Kanto	1.11
Hokuriku	1.14
Chubu	1.06
Kinki	1.07
Southern Kii	1.13
Sanin	1.11
Setouchi	1.10
Southern Shikoku	1.11
Kyushu	1.07



The level of flood safety will decline because of a future increase in precipitation. For example, in some regions such as **Hokkaido and Tohoku**, the target level of flood safety of 1/100 will decrease to about 1/30 so that **the flood safety level will decrease to about 1/3 of the target level.**



Consecutive occurrence of major flood and mass-movement disasters

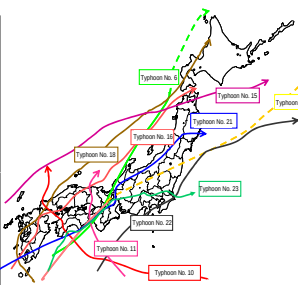
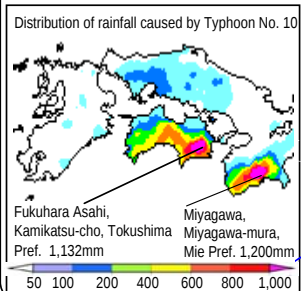


Ministry of Land, Infrastructure,
Transport and Tourism

Heavy rainfall events with a total rainfall exceeding 1,000 mm have occurred almost every year mainly in Kyushu,
causing flood and mass-movement disasters.

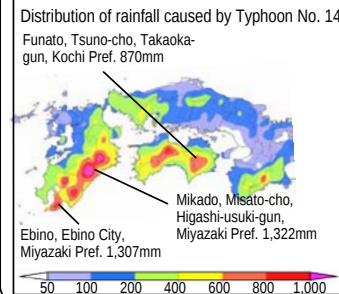
2004

- A record number (10) of typhoons made landfall in Japan (three or more times as many typhoons as in the average year). During Typhoon No. 10 (July to August), hourly rainfalls of more than 100 mm were observed in the Shikoku region. In Tokushima Prefecture, a total rainfall of more than 1,000 mm was recorded.
- The Fukui Heavy Rain (July) caused a levee breach along the Asuwa River. Typhoon No. 23 (October) caused levee breaches and overtopping along the Yura and Maruyama rivers, inflicting tremendous damage in Kyoto, Hyogo and other parts of the Kinki region.
- Fukui Heavy Rain: 4 people killed, 4,052 houses flooded above floor level, 9,674 houses flooded below floor level, etc.
- Typhoon No. 23: 43 people killed, 13,041 houses flooded above floor level



2005

- Typhoon No. 14 (Sept. 4 to 6) caused heavy rains with a total rainfall of 1,000 mm or more in southern Kyushu.
- A number of rivers including the **Oyodo and Gokase rivers** flooded, causing serious damage in the Kyushu region.
- In the Chugoku region, the bankful stage was exceeded in the Ota and other rivers.
- Typhoon No. 14: Kyushu region: 19 people killed, 3 people missing, 3,960 houses flooded above floor level, 5,085 houses flooded below floor level
- Chugoku region: 4 people killed, 1,678 houses flooded above floor level, 2,969 houses flooded below floor level



Flooding of the Oyodo River (Miyazaki City, Miyazaki)



Debris flow in the Kamishiiba area (Shiiba-son, Miyazaki)



2006

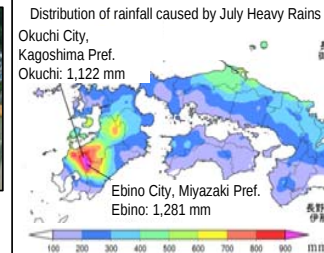
- In parts of the Kyushu region, total rainfalls in seven days from July 18 to July 24 of more than 1,200 mm were recorded. The **Sendai and Komenotsu rivers** flooded, causing serious damage in southern Kyushu.
- A strong bai-u front in July remained stationary over a large area including the Kyushu and Hokuriku regions, and the heavy rains induced by this front caused floods in many areas.
- July Heavy Rains: 5 people killed, 899 houses flooded above floor level, 2,674 houses flooded below floor level



Sendai River (Satsuma-cho, Kagoshima)



Debris flow in the Shimodenakama area (Hishikari-cho, Kagoshima)



2007

- Typhoon No. 4 (July 2 to 17) caused a total rainfall of more than 1,000 mm in the Kyushu region. Rainfalls more than two times as much as the monthly average were recorded in many areas.
- The **Midori and other rivers** flooded to cause tremendous inundation damage in many areas.
- Typhoon No. 4: 3 people killed, 169 houses flooded above floor level, 1,152 houses flooded below floor level



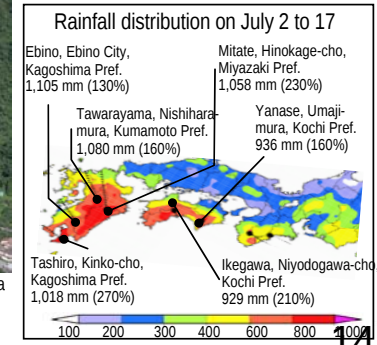
Flooding of the Midori River (Kosa-machi, Kumamoto)



Flood flow in the Midori River (Kosa-machi, Kumamoto)



Debris flow in the Futagawa area (Tsurumizu City, Kagoshima)



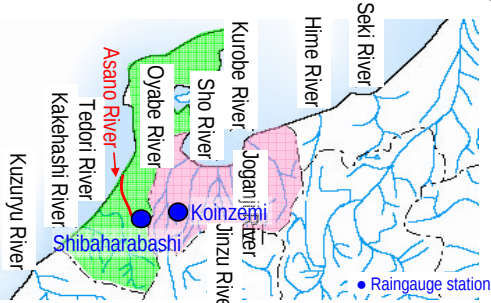
Damage caused by localized heavy rains

Flood damage in 2008

The heavy rains on July 28, 2008, and at the end of August brought about localized heavy rains with an hourly rainfall of more than 100 mm and caused inundation damage in many parts of the country.

Damage caused by the flooding of the Asano River in July, 2008, in Ishikawa Prefecture and Nanto City in Toyama Prefecture

Hourly rainfalls of 132 mm and 114 mm were recorded at the Koinzemi raingauge station (Nanto City) and the Shibaharabashi raingauge station (Kanazawa City), respectively.



* Koinzemi raingauge station (MLIT)

* Shibaharabashi raingauge station (Ishikawa Pref.)



Driftwood accumulated at the Asanogawa Bridge (Kanazawa City)

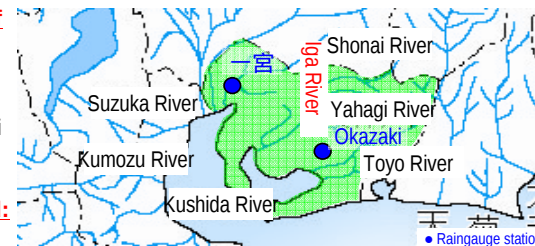


Two houses partially destroyed by a landslide (Nanto City)

In Kanazawa City, the flooding of the Asano River left 507 houses flooded above floor level and 1,476 houses flooded below floor level. A total of 55 landslides occurred in Ishikawa and Toyama prefectures, causing damage to 20 houses.

Flood damage in Okazaki City, Aichi Prefecture, caused by the heavy rains at the end of August, 2008

A record hourly rainfall of 146.5 mm (previous record: 55 mm) was observed at the Okazaki raingauge station (Okazaki City, Aichi Pref.), and another record rainfall of 120 mm (previous record: 76 mm) was observed at the Ichinomiya raingauge station (Ichinomiya City, Aichi Pref.).



Inundation in Iga-cho, Okazaki City

In Okazaki City, 620 houses were flooded above floor level, and 705 houses were flooded below floor level.