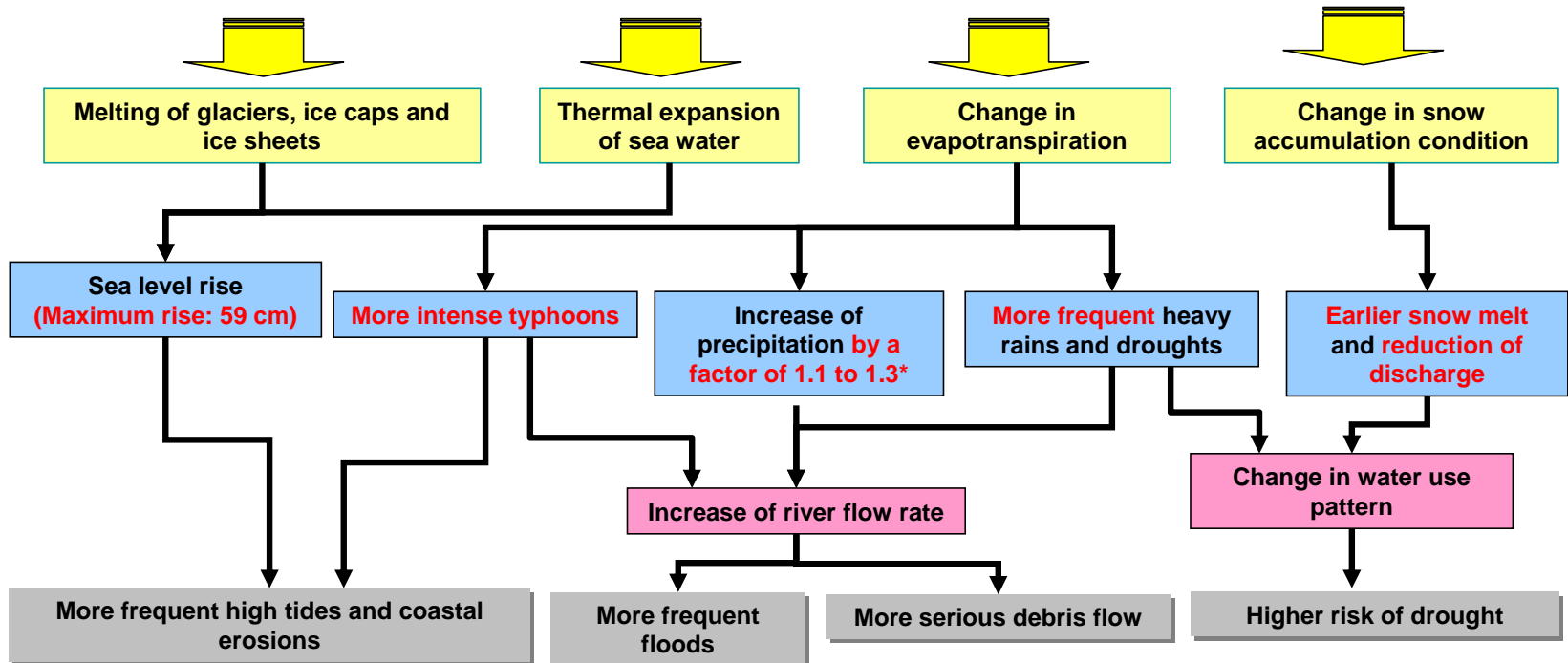


# Mechanism of global warming and climate change

## 2. Impacts of climate change

Large volumes of greenhouse gas emissions cause CO<sub>2</sub> concentration in the air to rise and increase heat absorption, resulting in temperature rise. Thus, global warming occurs.





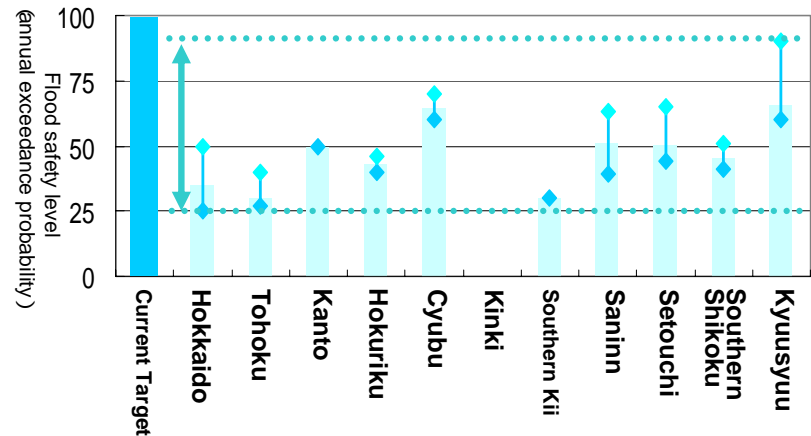
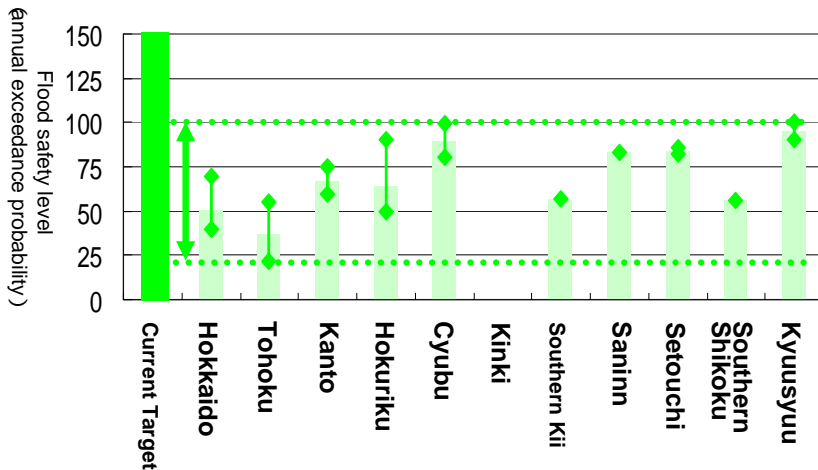
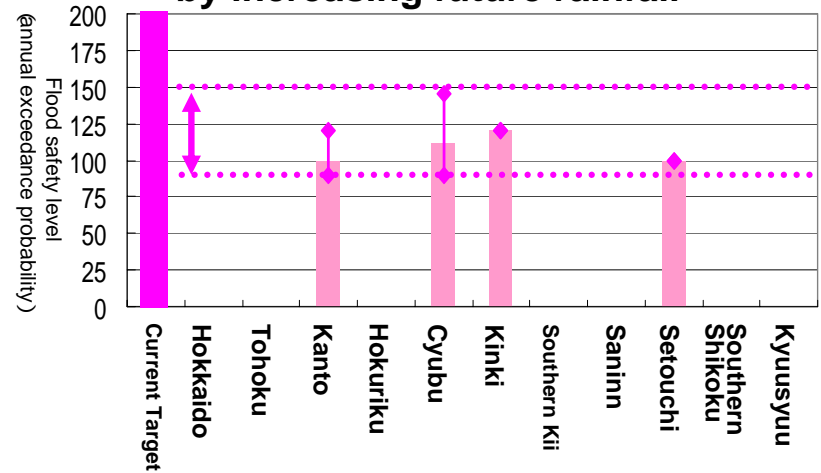
# Declining the degree of safety level

## 2. Impacts of climate change

Impact for flood safety level by changing rainfall after 100 years

Region	1/200 ( CurrentTarget )		1/150 ( CurrentTarget )		1/100 ( CurrentTarget )	
	Future flood safety level(annual exceedance probability)					
	Number of river system		Number of river system		Number of river system	
Hokkaido	-	-	1/40 ~ 1/70	2	1/25 ~ 1/50	8
Tohoku	-	-	1/22 ~ 1/55	5	1/27 ~ 1/40	5
Kanto	1/90 ~ 1/120	3	1/60 ~ 1/75	2	1/50	1
Hokuriku	-	-	1/50 ~ 1/90	5	1/40 ~ 1/46	4
Cyubu	1/90 ~ 1/145	2	1/80 ~ 1/99	4	1/60 ~ 1/70	3
Kinki	1/120	1	-	-	-	-
Southern Kii	-	-	1/57	1	1/30	1
Saninn	-	-	1/83	1	1/39 ~ 1/63	5
Setouchi	1/100	1	1/82 ~ 1/86	3	1/44 ~ 1/65	3
Southern Shikoku	-	-	1/56	1	1/41 ~ 1/51	3
Kyusyu	-	-	1/90 ~ 1/100	4	1/60 ~ 1/90	14
<b>All Japan</b>	1/90 ~ 1/145	7	1/22 ~ 1/100	28	1/25 ~ 1/90	47

Declining the degree of safety against flood by increasing future rainfall



Circled number is number of calculated river system

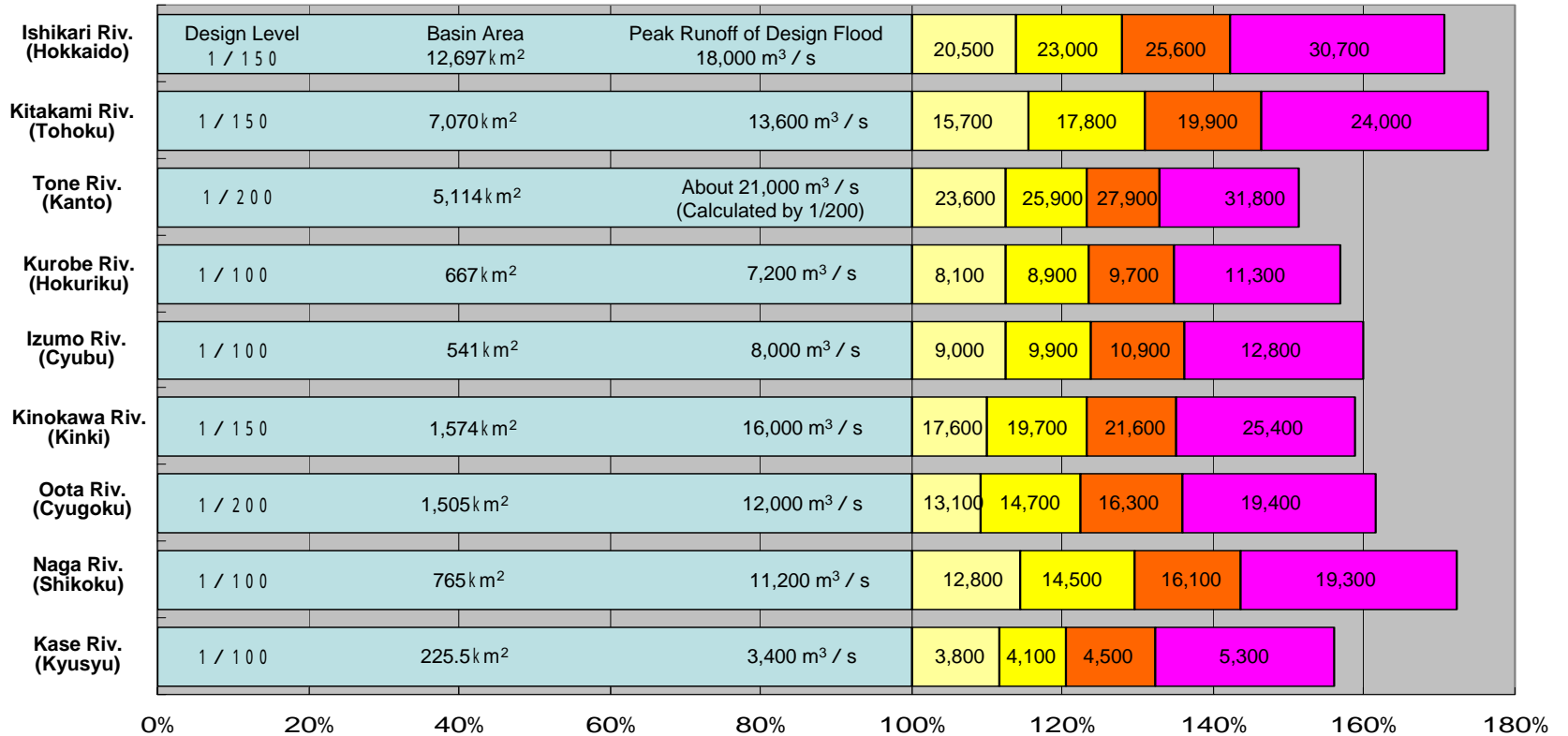
# Changes of peak runoff by future rainfall

## 2. Impacts of climate change

Estimations of future rainfall are about  $\times 1.1 \sim \times 1.5$  compare to current rainfall. Peak runoff will be estimated about  $\times 1.1 \sim \times 1.7$  compare to current peak runoff in 9 major rivers.

### Design Rainfall

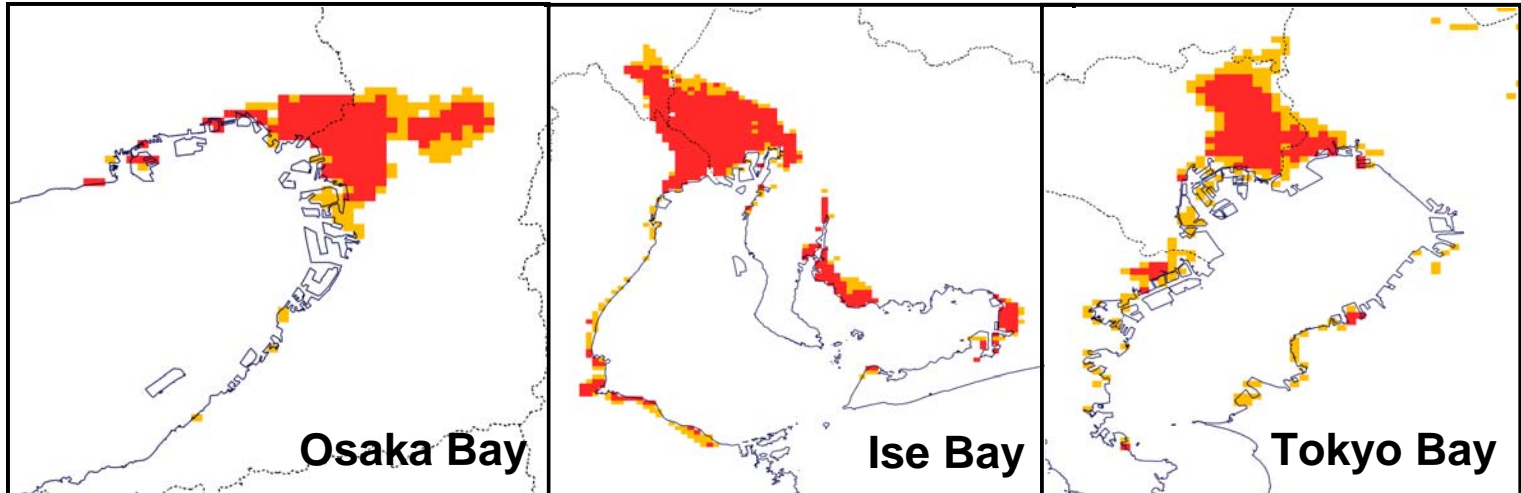
$\times 1.0$   $\times 1.1$   $\times 1.2$   $\times 1.3$   $\times 1.5$



# Impacts of sea level rise

## 2. Impacts of climate change

### below-sea-level areas in Three Large Metropolitan Areas (Tokyo Bay, Ise Bay and Osaka Bay)



**Areas with flood risks due to high tides will increase.**

\*Prepared by the River Bureau based on the national land-use digital information.

\*Shown are the areas at elevations lower than sea level shown in a three-dimensional mesh (1 km x 1 km). Total area and population are based on three-dimensional data.

\*No areas of surfaces of rivers or lakes are included.

\*A premium of 60% is applied to the potential flood risk area and to the population vulnerable to flood risk in the case with a one-meter rise of sea level.

	Present	After sea level rise	Rate of increase
Area (km <sup>2</sup> )	559	861	1.5
Population (Million)	3.88	5.76	1.5