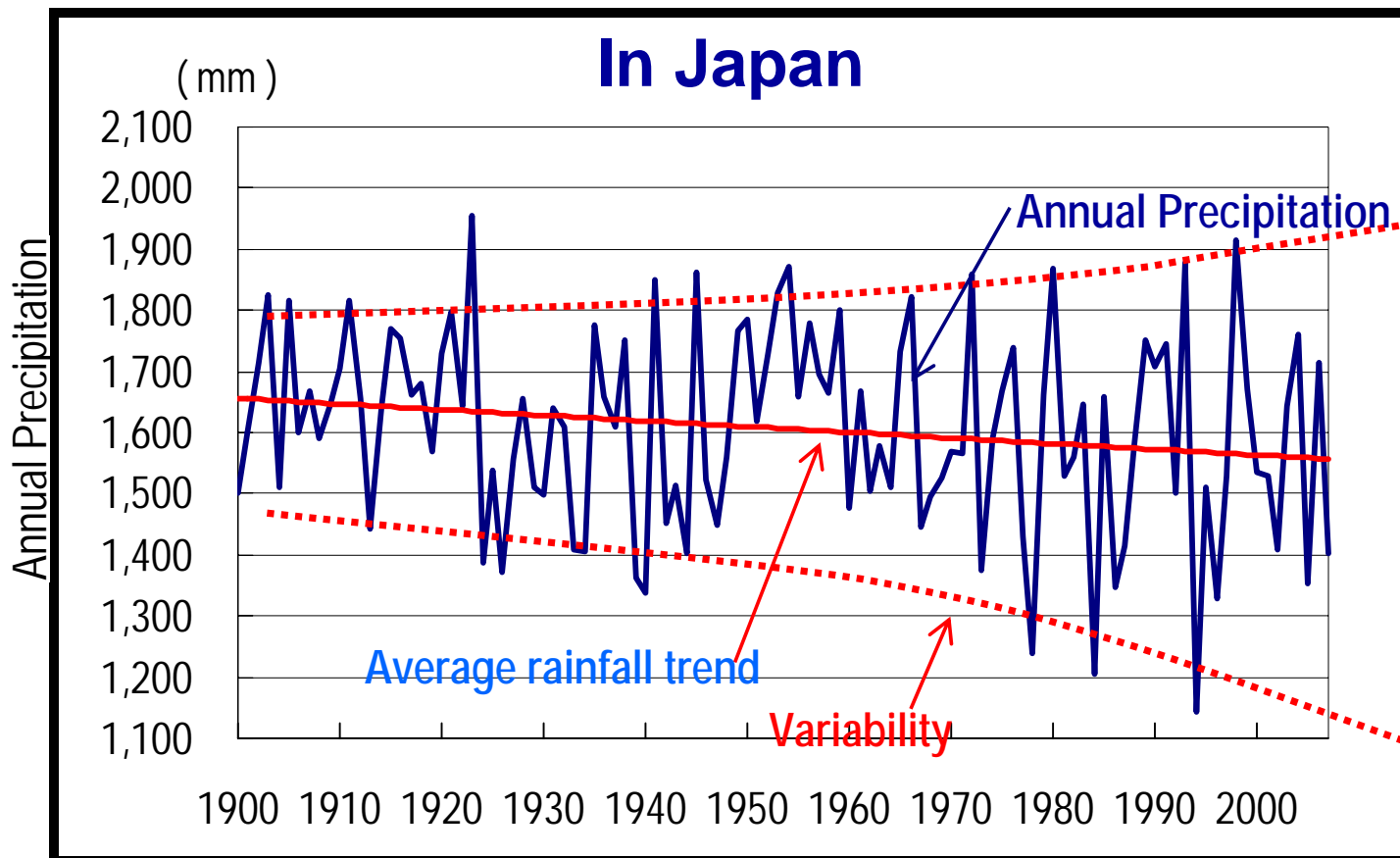


# Variability of extreme events is increasing

due to climate change

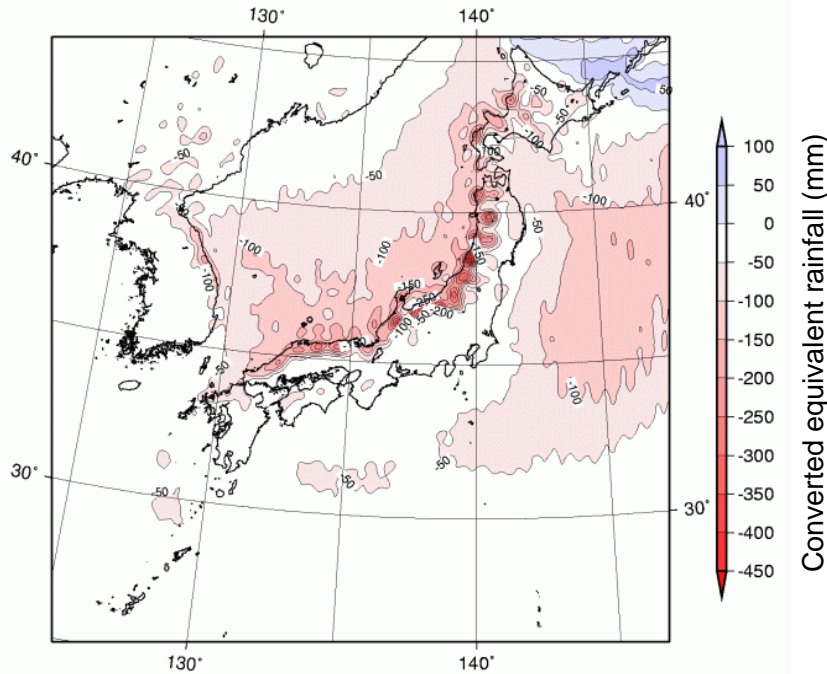


# Climate change prediction

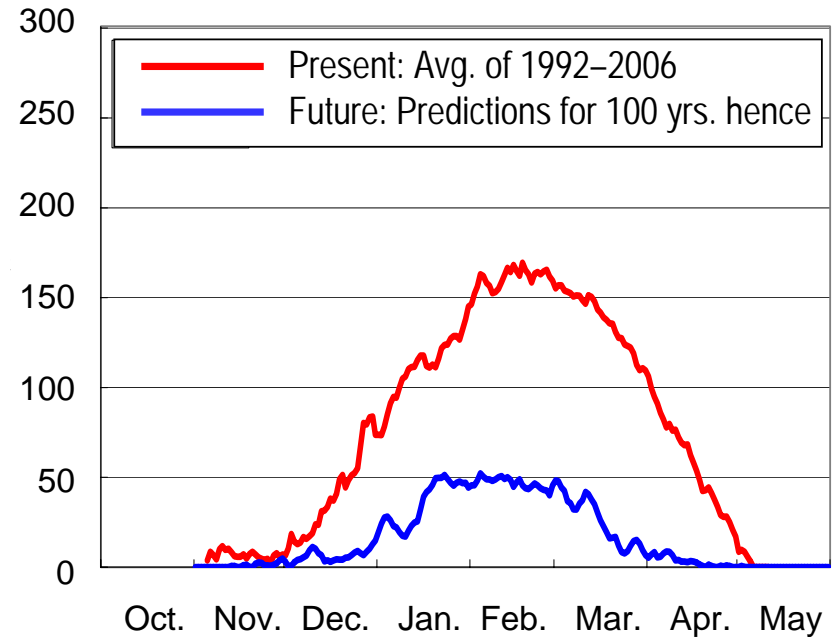
## —Snowfall—

**Snowfall will dramatically decrease in the northern regions.**

In a 100 years' time, the upstream catchments of the Tone River will have considerably less snow depth.



Snow depth (cm)



Changes in annual snowfall  
(avg. of 2081 2100) (avg. of 1981 2000)

Snow depth changes  
expected 100 years hence (Fujiwara)

Source: Global warming projection vol. 6 (JMA)

# Prolonged droughts are expected

due to climate change

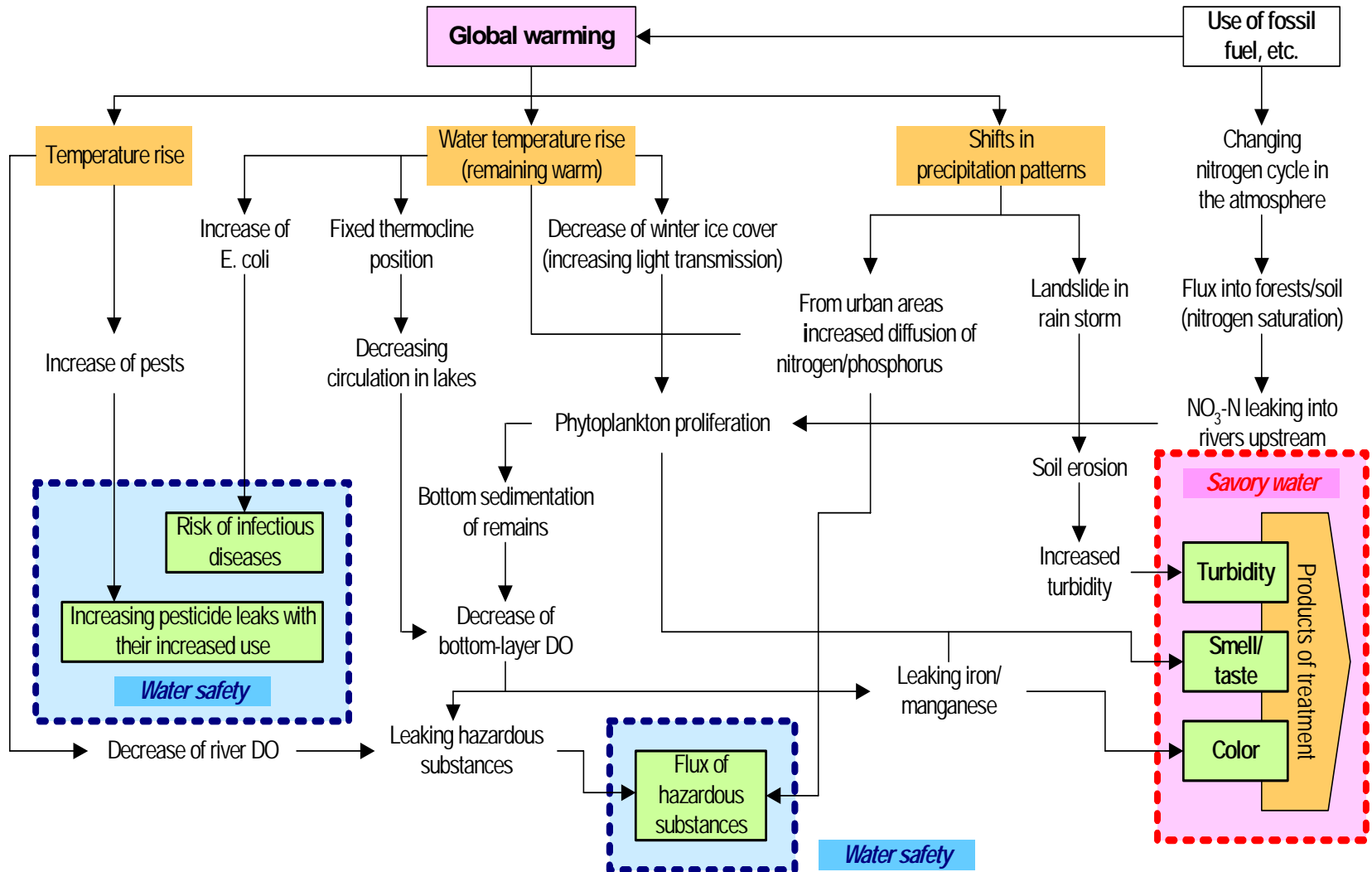
River Basin	Dam	Irrigation period pattern	Drought periods at present state (days/10yrs)	Drought periods at around 2050 (days/10yrs)
Ishikari	Taisetsu	Advanced by 0-10 days	About 60 days	About 30-70 days
	Chubetsu	Advanced by 0-10 days	About 30 days	About 130-180 days
<b>Tone</b>	<b>8 dams</b>	Advanced by 0-40 days	About 30 days	About 100-110 days
		Deferred by 0-60 days	About 30 days	About 90-120 days
Chikugo	Matsubara/ Shimouke	Advanced by 0-5 days	About 50 days	About 70 days
		Deferred by 0-30 days	About 50 days	About 70-80 days

Droughts mitigated

Droughts exacerbated

# Impacts of Climate Change on water quality

## due to climate change



# Basic point of view for promoting IWRM

Addressing adaptation to climate change and social change

## *Addressing climate change*

Prepared for more frequent, extreme events

Coping with changed hydrological/ environmental situation

## *Addressing Social needs*

Coordinated use of water resources

Ensuring safe water supply and sanitation



## *Policy Framework to ensure adaptation to climate change through IWRM*

Integrating management of water demand and supply

Integrating water facility planning, designing and operation

Information sharing and stakeholders' participation

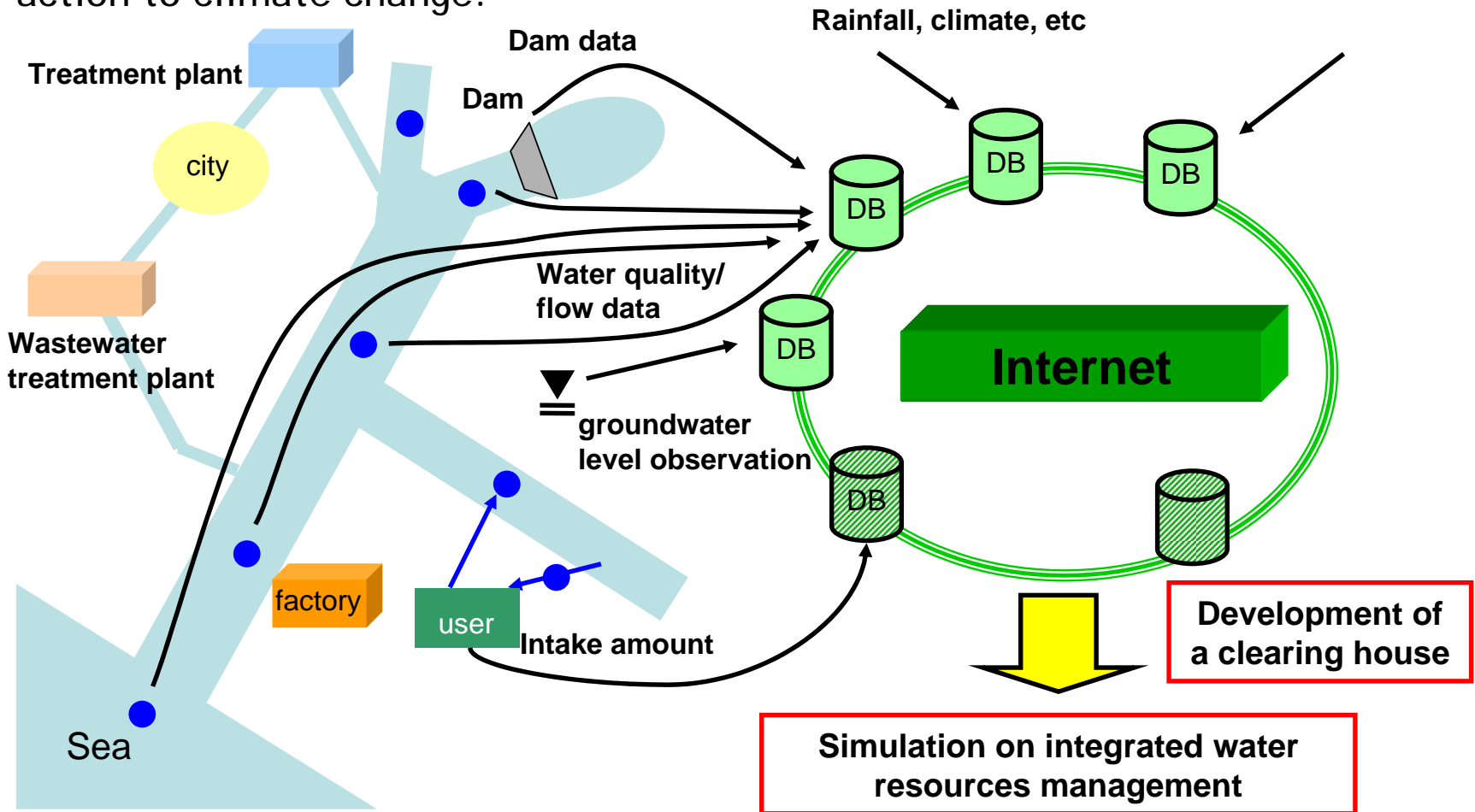
Integrating management of surface water and ground water

Integrating management of water quantity and quality

# Information sharing and stakeholders' participation

## Information system to involve stakeholders in IWRM:

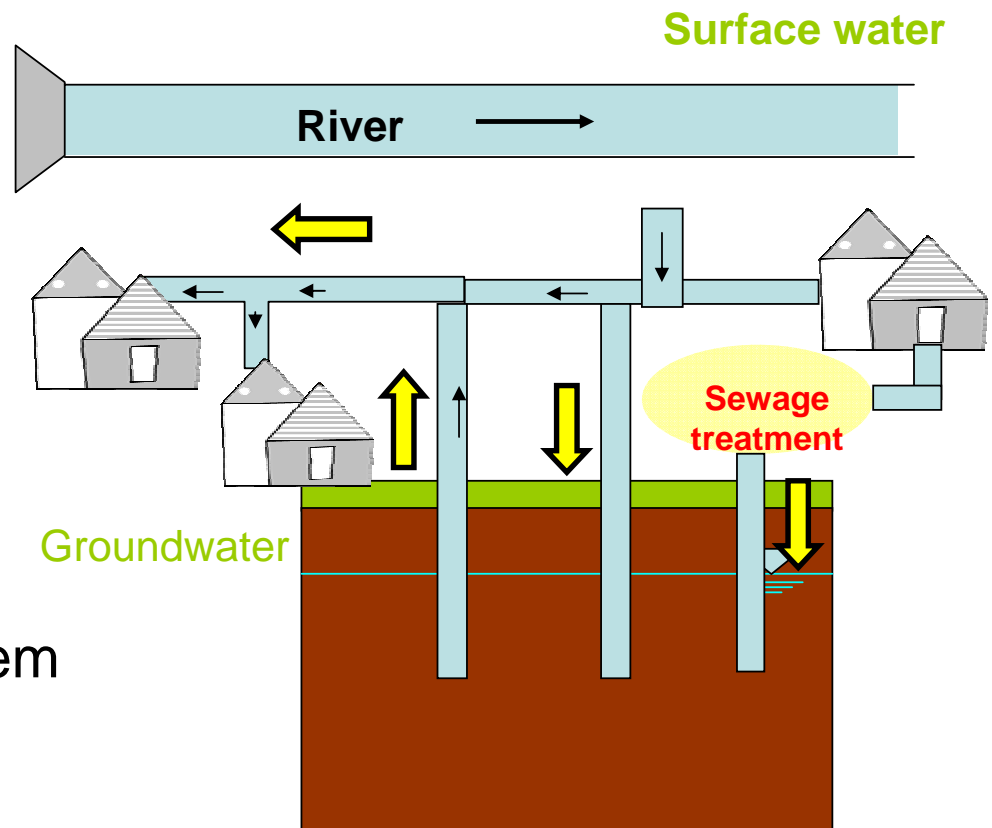
In decision making, consensus building, awareness raising, etc. for adaptation action to climate change.



# Integrating monitoring, withdrawal, and recharge of surface water and ground water

## Required sub-action

- ✓ Policy and regulatory framework
- ✓ Groundwater Monitoring and assessment
  - ✓ Groundwater level
  - ✓ Groundwater quality
  - ✓ Withdrawal amount
- ✓ Coordination mechanism between managers
- ✓ Information Sharing System



# Integrated management of water quantity and quality

Effective management by many stakeholders for effective and smooth implementation.

