UNESCO Chairs Webinar
World Water Day

River Basin Water Management under Climate Change Impact and History of Policy

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Contents

1)How Japan reached to the current system regarding the allocation of water resources.

2)How river basin committee worked in past.

3)What is the impact of climate change and what is the current policy for river basin management in Japan.

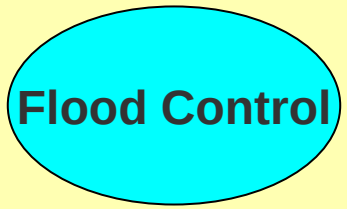
4)How we are renovating infrastructures like dams to maintain water resources and flood control capacity.

River Act and Amendment

● Historical Right of Agriculture
● Development of Water Resource for Ecomony

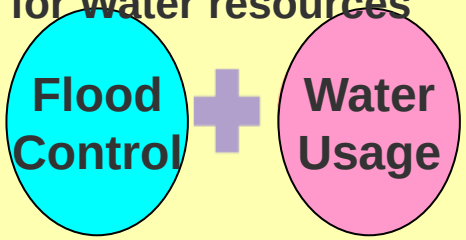
In 1896

Modern River Administration Started



In 1964

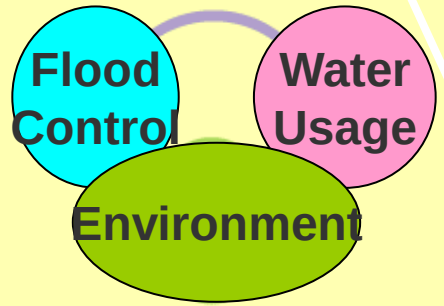
Integrated Administration at Each River Basin for Flood Control and for Water resources



In 1997

Mitigation and protection of River environment

Participant of citizen



● Peoples' Awareness
● Participation of citizens

Water for prosperity and peace

History of water resources

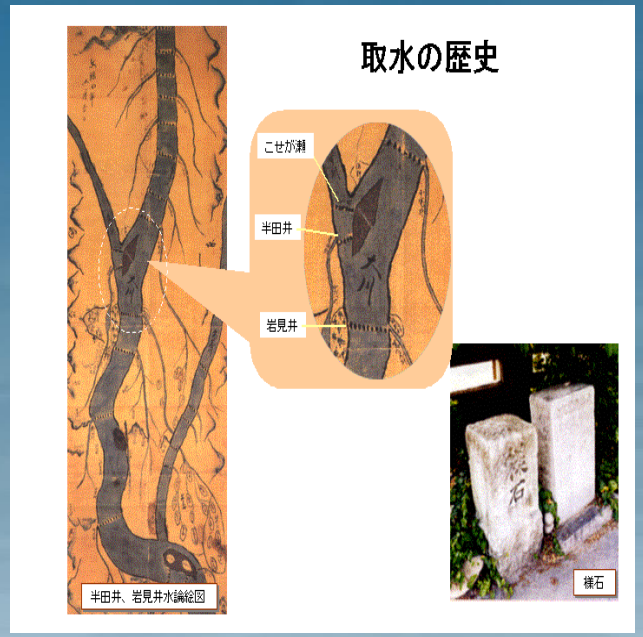
- From ancient time to Edo era
  major use is for paddy field

- From Meiji era until now
  industrial use increased

- Domestic and Industrial use tripled
  from 1960's to 2000's

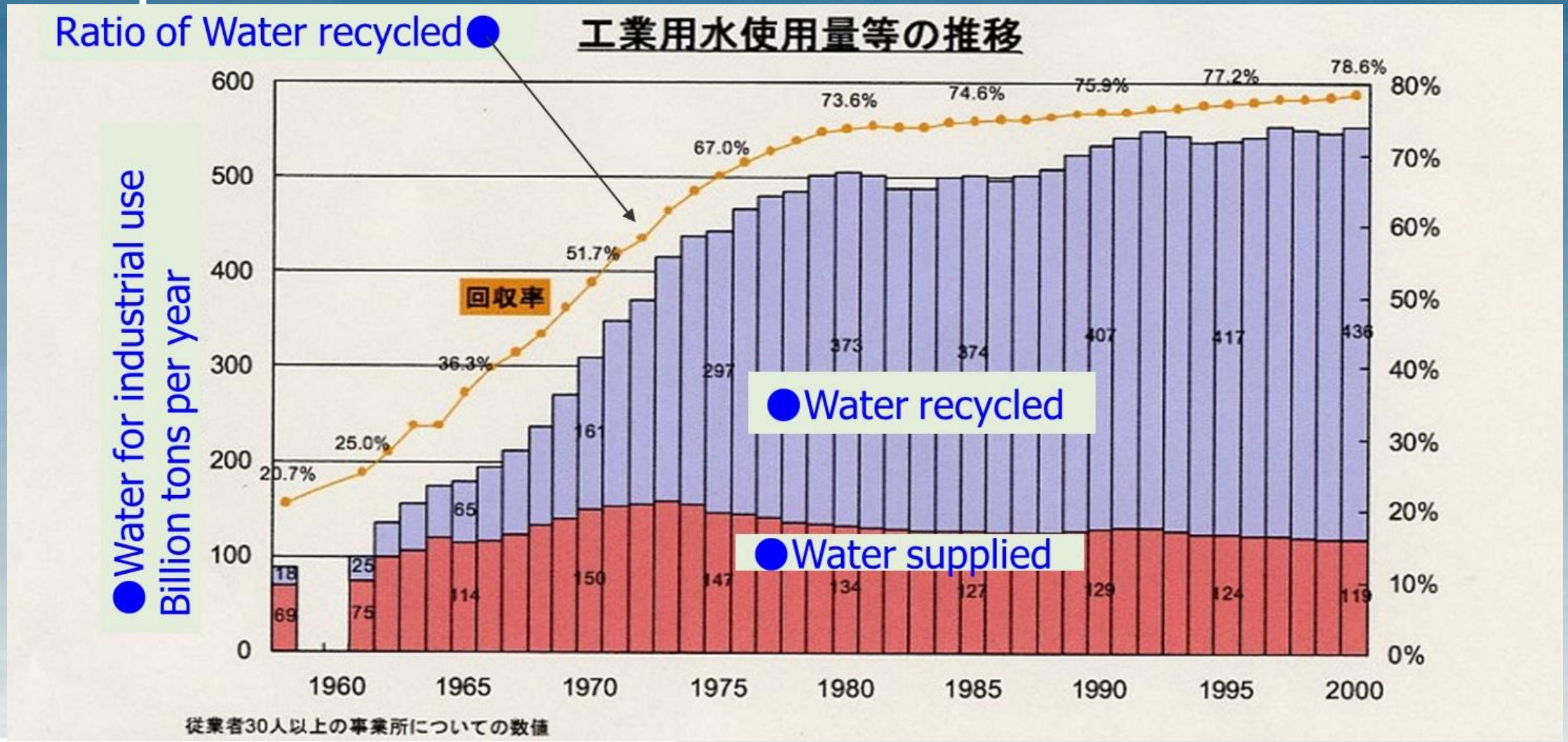
- Recently
  Domestic use is stable
  Industrial use reduced by cyclic use of water

- Reform of small dams for water resources and flood control



Water for prosperity and peace

●Water of industrial usage of Japan



Water for prosperity and peace

Data of MTEI, JSAPAN

Water resources allocation Systems, and Drought Management

- Based on Act on Advancement of Water Resources Development, at designated seven River Basins ,which are mostly metropolitan areas, Integrated Water Resource Developments were executed to fulfill the predicted water demand in future.

- Any kind of Right to Use Water has to obtain permission, as well as the permission to construct dams and other facilities.
- Right to Use Water can be categorized to 1) Right to Use Water with permission and 2) Practical Right to Use Water.

- Practical Right to Use Water followed the historical use of water before the River Act established in Meiji Era, which is mostly used for agriculture.
- Practical Right to Use Water also have to obtain permission, however, it is very difficult to change it for the other use.

Water resources allocation Systems, and Drought Management

- At 108 major rivers which are directly operated by the central government, fundamentally Right to Use Water has to be authorized by the permission of Minister who is responsible to the river administration.
- At other rivers governor or mayor is fundamentally has authority to give permission to those who want to obtain right to use Water.

- Adjustment of water demands has to be made among stakeholders to obtain Right to Use Water.
- Permission cannot be given except it is relatively important for the public welfare.
- In case there is a possibility that Right to Use Water may influence other Right to Use Water, adjustment also have to be made among departments at prefectural office for the permission to Right to Use Water by the Minister who is responsible to the river administration.

Participation of Regional Stakeholders

■River Basin Committee for planning

●Planning River Development for the next 20-30 years(1)

Old system

■Every development was planned by administration

New system

■New Law requires administration to listen to the opinion of residences, mayors, specialists

●development policy・・・・Administration determine what level of safety should be kept. But actual development plan is not included.

●development plan・・・・・Initial Plan is planned by river administration, but opinions of residences, mayors, specialist has to be taken.

(Reference)

In Japan, annually, or any other short term basis, special committees for water resources, water quality, disaster management, environmental issues are already conducted.

Participation of Regional Stakeholders

●Process of River Basin Committee

■Committee made opinion paper for the river development planning.

↓

■River Development plan have to take the committee opinion ; administration dose not have to follow the whole opinion exactly ,but most of them should be.

↓

■Initial Plan made by administration "again" have to be explained to residences, mayors

↓

■Based on their opinion initial plan is going to be reviewed, and administration determine the final development plan.

●"Ibo River"
River Basin Committee

- Environmental conflict
- Budget conflict
- Culture and History conflict

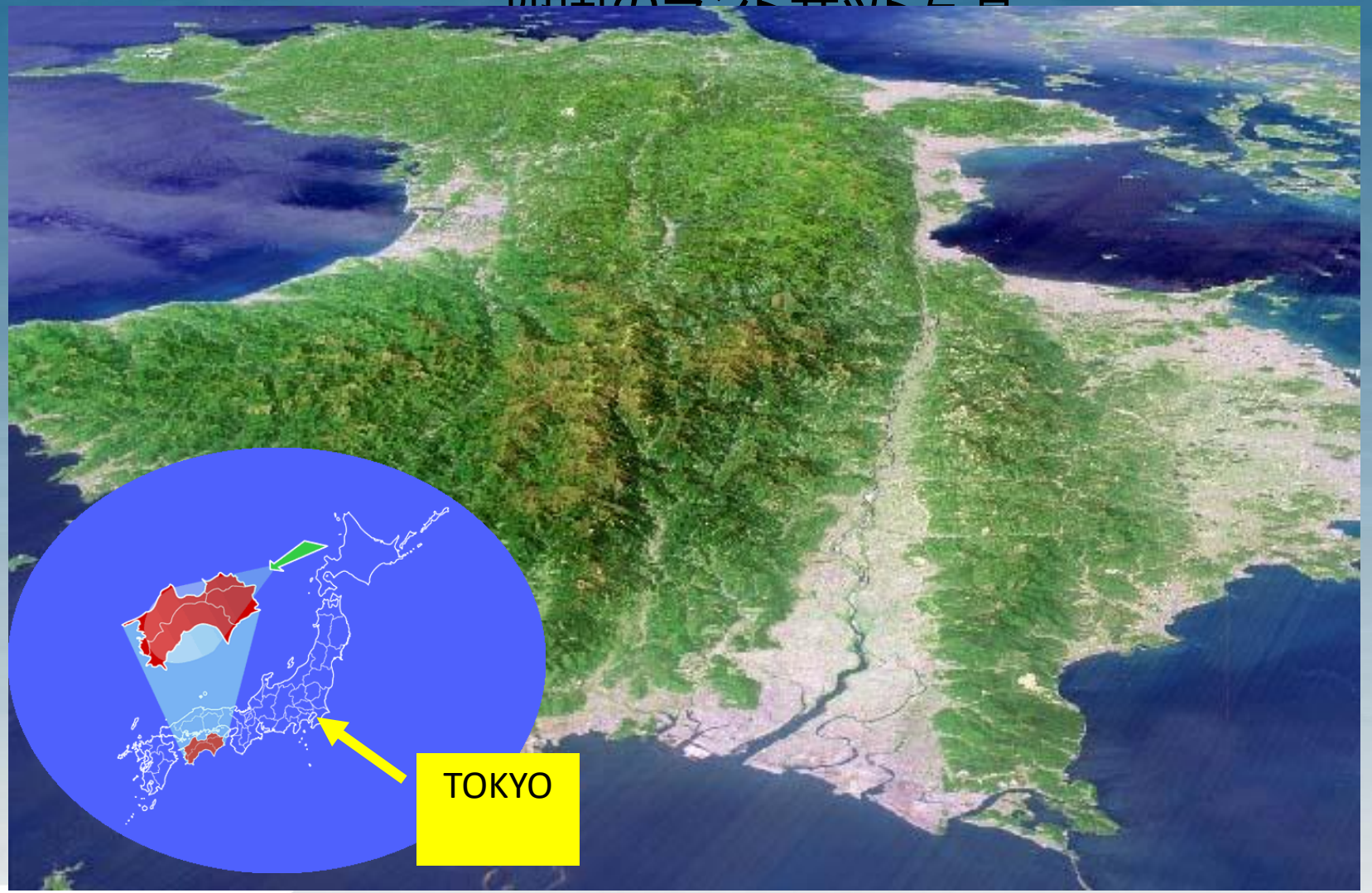
- What's good?
- What's bad?
- What to control?

Actual allocation Systems at Drought

- In case of Drought, voluntary adjustment among stakeholders who have Right to Use Water are expected by River Act.
- Rule for water demand adjustment has to be made at each region since each region has its own complicated circumstances.

- Water demand adjustment committees are established at each river basin which consist of stakeholders such as domestic, agriculture, industry, power generation, central and local government.
- Committee discuss about
  1) the methodology or rule, timing for demand adjustment,
  2) investigation of the water resources, water quality, water demand,
  3) execution of demand adjustment and communication.

Climate Change Evaluation at Shikoku Area



Water for prosperity and peace

Impact evaluation and regional policy

❍Simulate impact of policy by evaluating the effect of changes in water resource fluctuation, amount of water resource, and flood due to climate change

According to the 4th IPCC evaluation report, the degrees of drought and heavy rain are dramatically increasing due to the climate change. In Japan, Yoshino river basin in Shikoku Island is facing severe problems on drought and flood disaster also. It is necessary to understand quantitatively the impacts to the socio economics part and lifestyle as a result of developing **the integrated model named "End to end model" that consists of "scientific climate change model, hydrological model to predict water resource and its fluctuation, and social impact evaluation model"**, in the Yoshino river basin area.

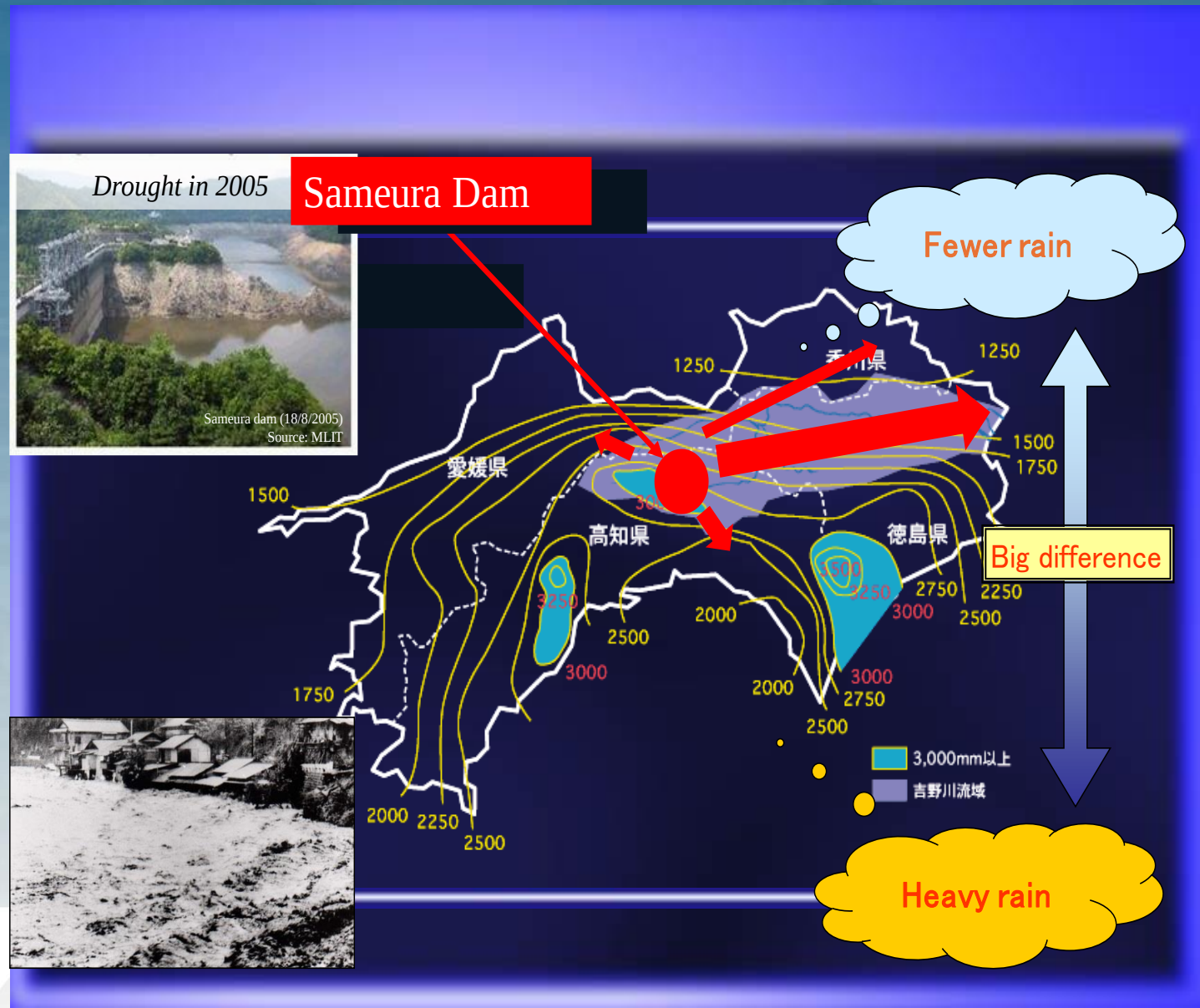
❍Policy Agreement and Regional Management based on information sharing and mutual understanding

Nowadays, the should-be-shared information is not properly shared, only existing information is emphasized. By this reason, effect of policy among the related persons in river basin is still unclear.

In order to form an agreement on regional policy, it is necessary to establish a regional management system by creating information of the policy impact and sharing them.

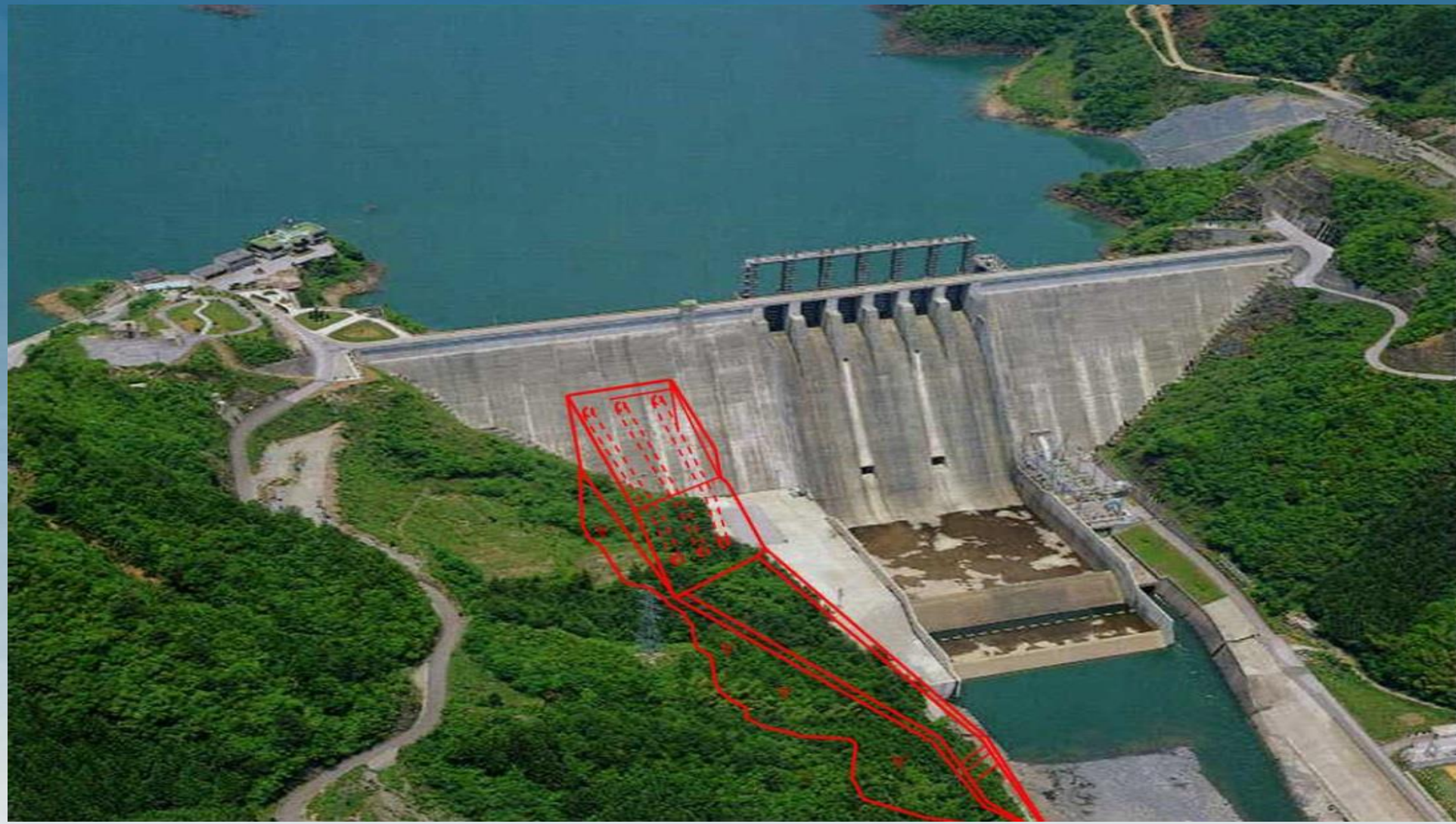
Climate Characteristics of Shikoku Island

Annual Rain Fall Distribution



Water for prosperity and peace

Sameura Dam



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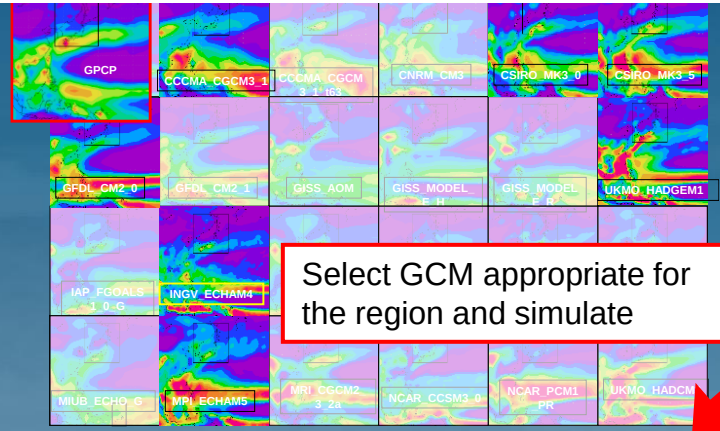
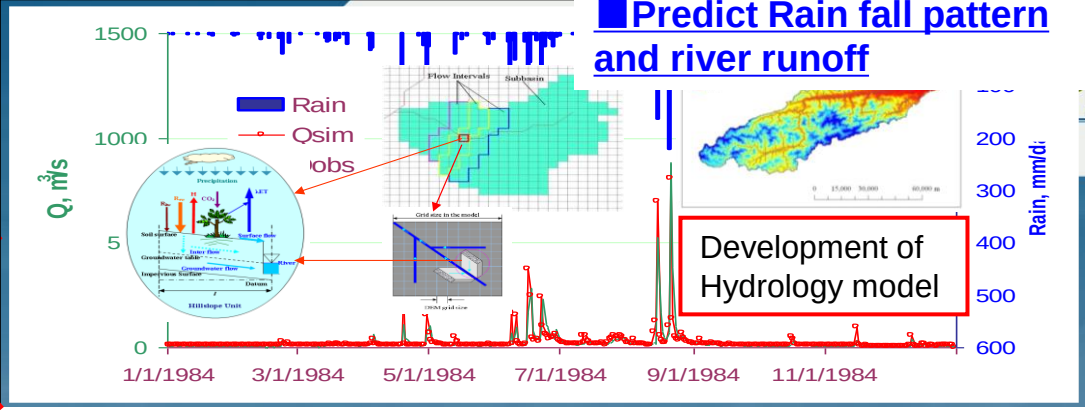
■Climate Change Model simulation



Select GCM appropriate for the region and simulate

■Predict Rain fall pattern and river runoff

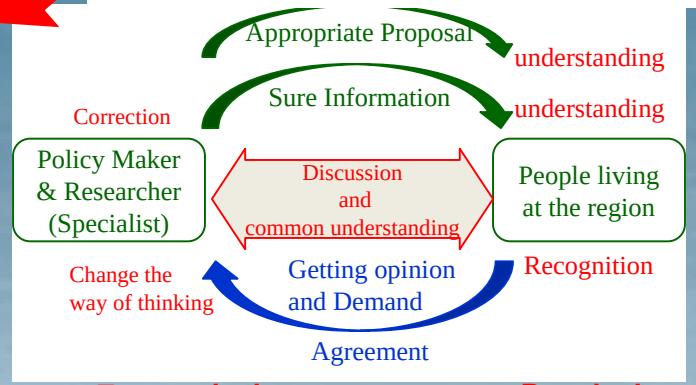


Development of Hydrology model

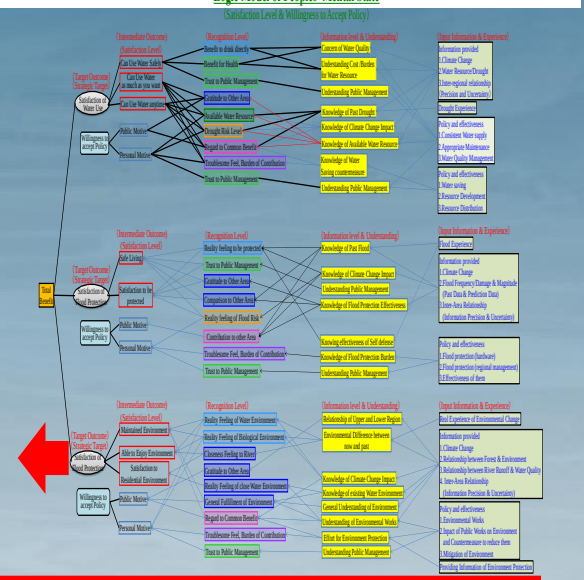
■Available Water Resource and Water Demand

Water Demand ↑↓ Shortage of Resource

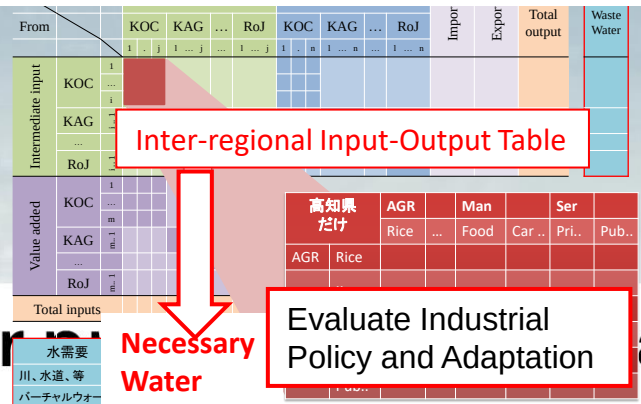
■Discussion Ground



■Login Model of Peoples' Mental State



■Simulation of Water Demand and Policy effectiveness by I-O Table

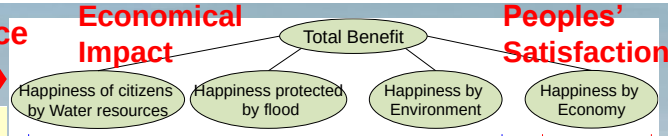


Inter-regional Input-Output Table

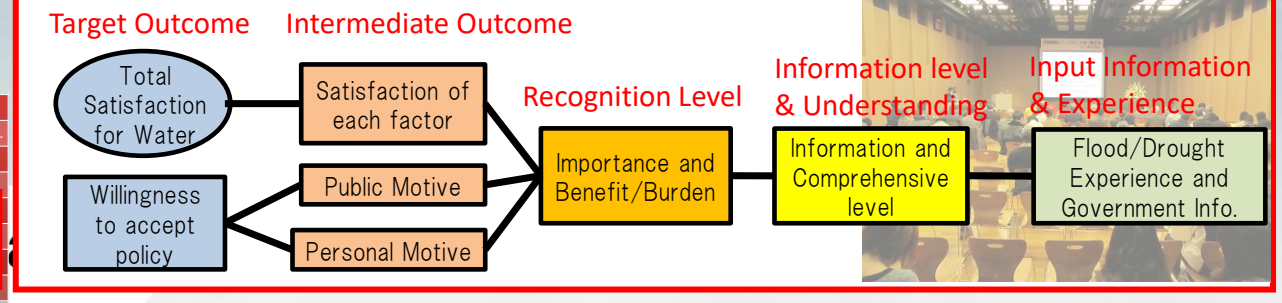
Necessary Water

Evaluate Industrial Policy and Adaptation

Economical Impact / Peoples' Satisfaction

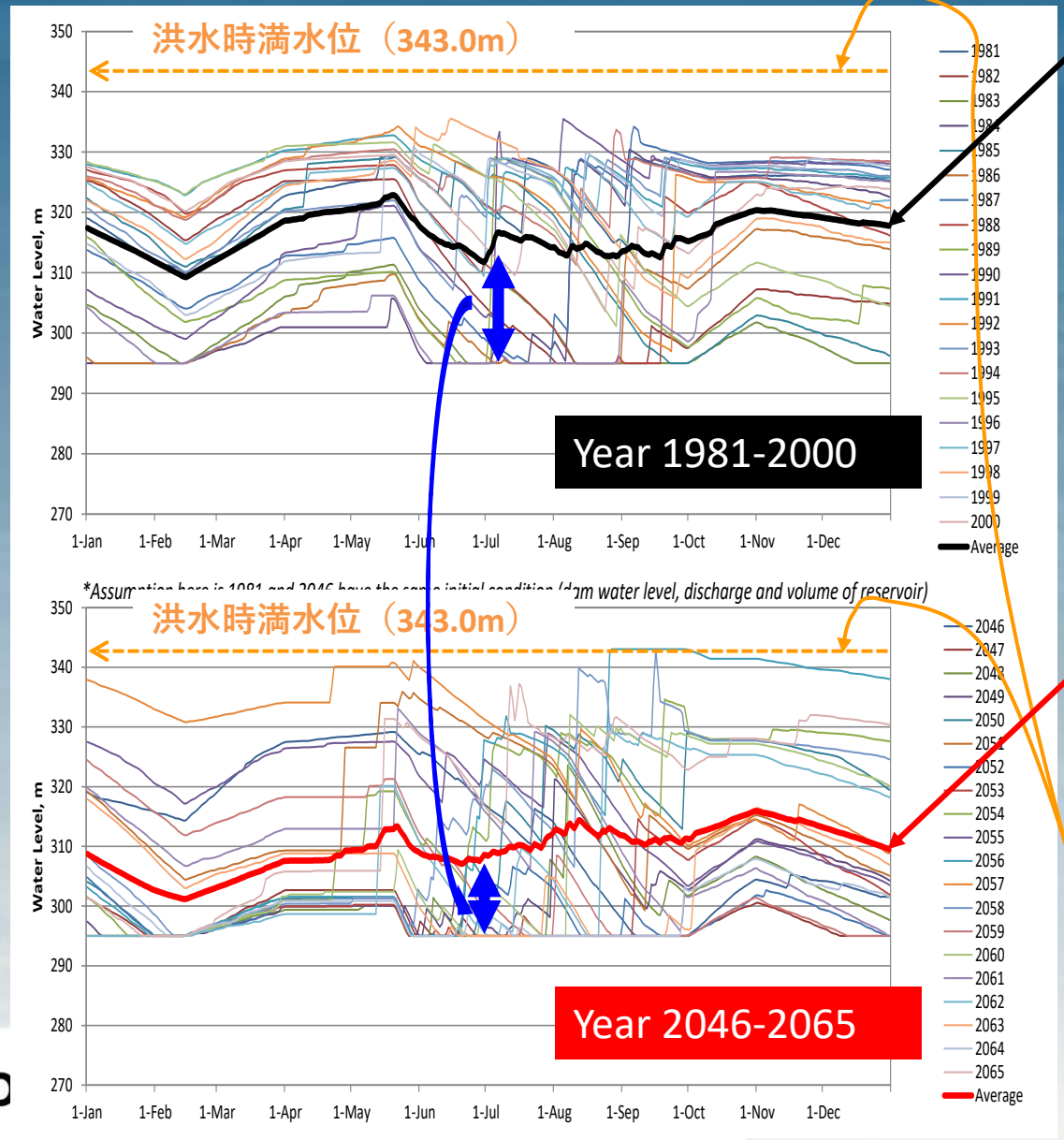


■Evaluation of Logic Model and Policy Agreement Experiment



Water for

Water surface levels at Sameura Dam



Average surface level of year 1981-2000

●Current dam operation rules will give us lower water storage level at year 2046-1065.

●Sameura Dam may not be able to control flooding predicted by some GCMs.

Average surface level of year 1981-2000

Maximum surface level at flooding

Water fo

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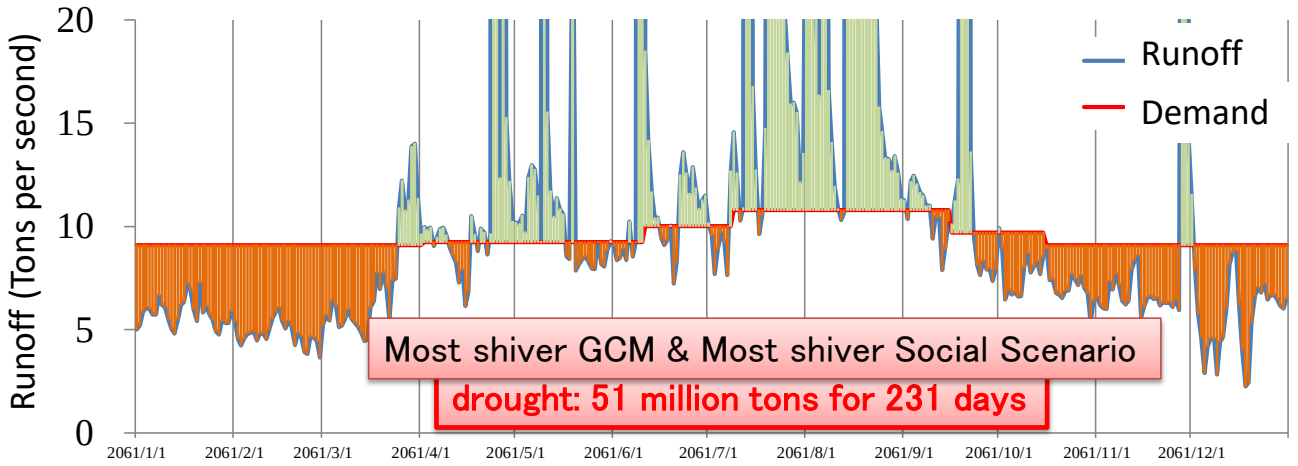
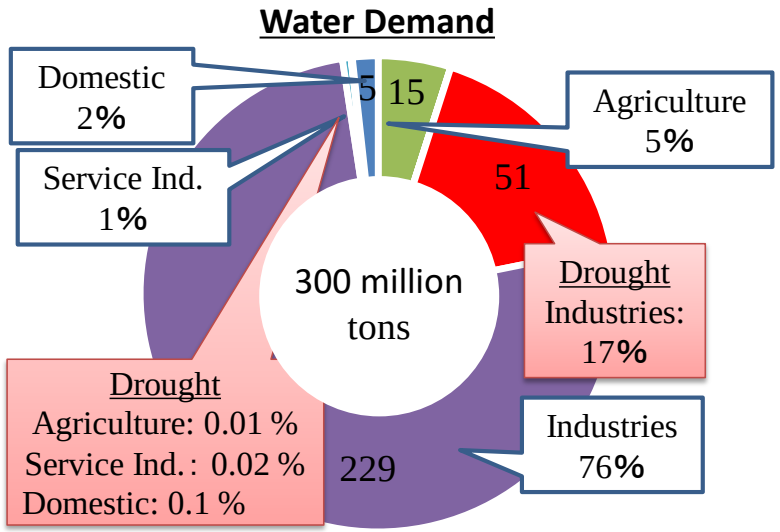
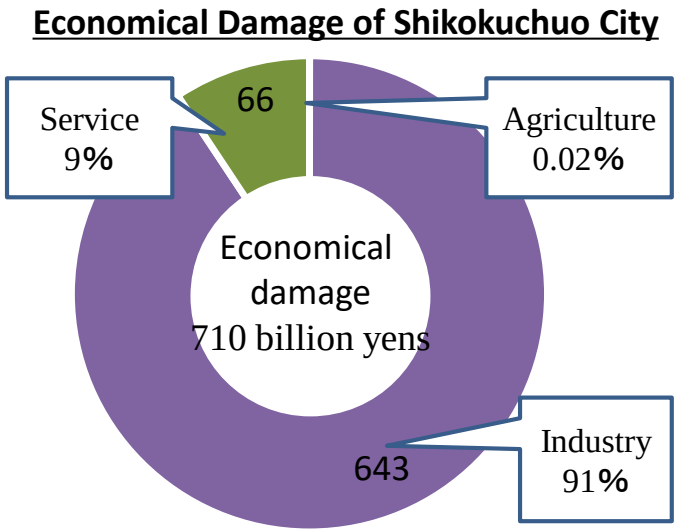
Drought predtced in 2061 of Shikokuchuo City

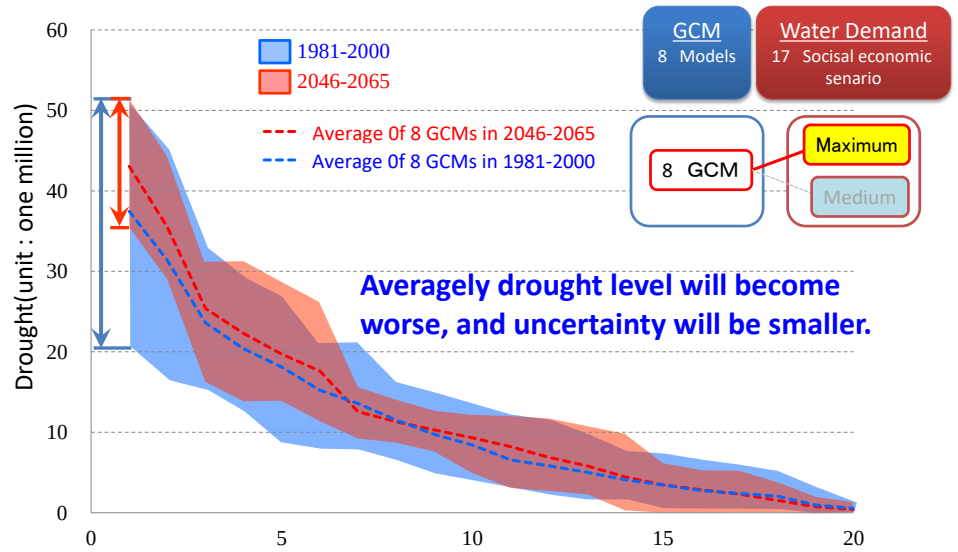




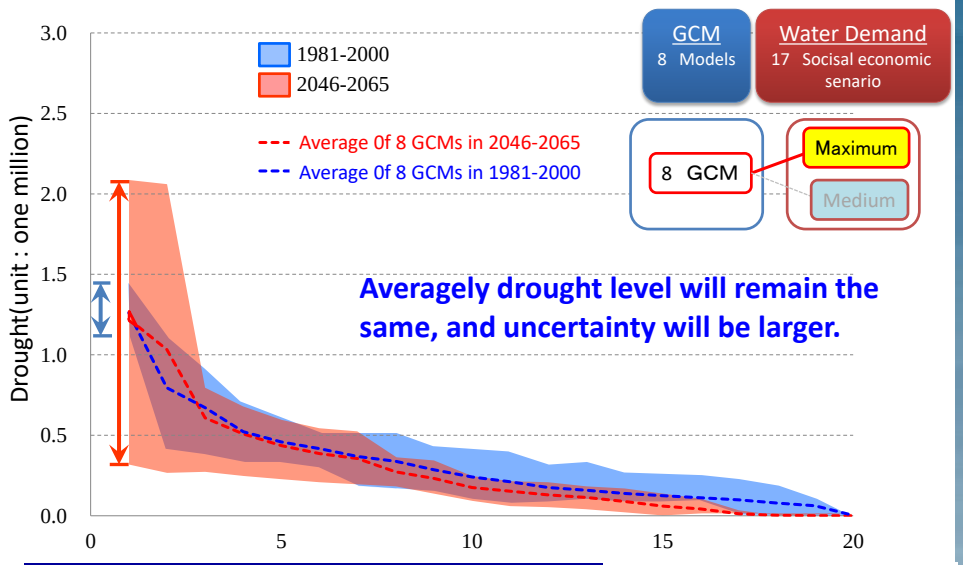


Comparison between Shikoku-Chuo City and Takamatsu City

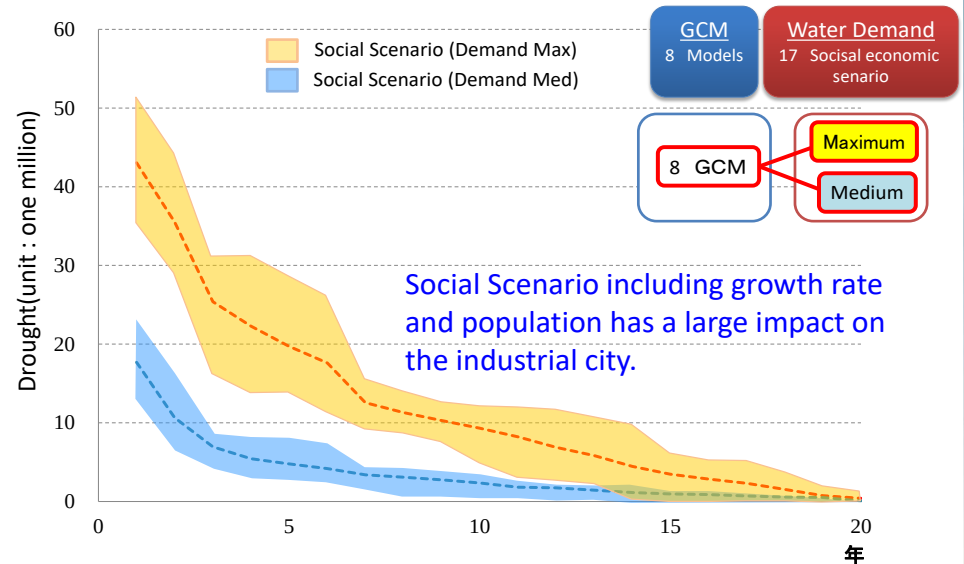
Calculated drought at Shikoku-Chuo City (1981-2000 and 2046-2065)



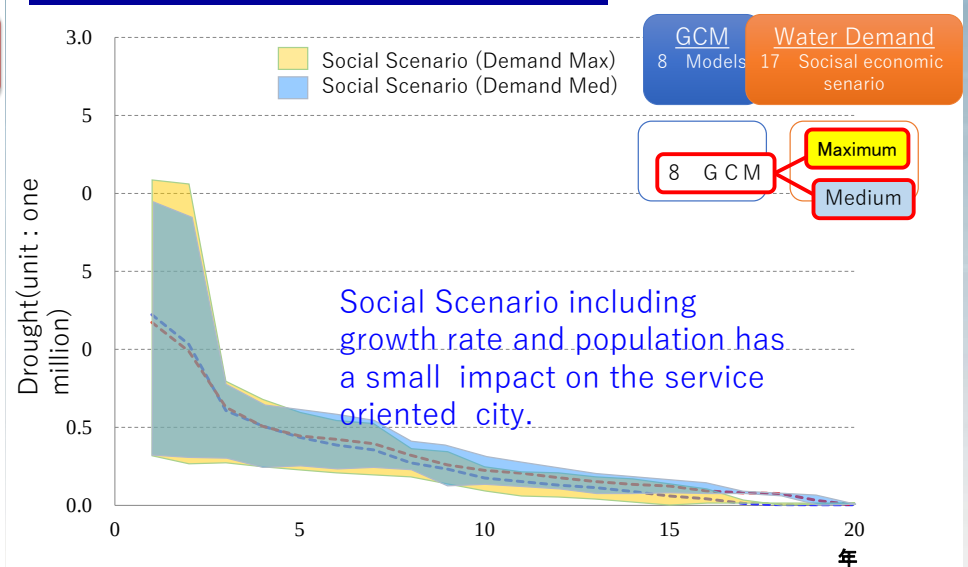
Calculated drought at Takamatsu City (1981-2000 and 2046-2065)



Calculated drought at Shikoku-Chuo City (2046-2065)



Calculated drought at Takamatsu City (2046-2065)



Water fo

How climate change impact on regions?

Climate change is a global phenomena, but their impacts on the regions are quite different among region which is affected by the local characteristics. Rainfall pattern affected by climate change differs due to the geological effect so that even at close regions, Heavy rains and drought also differ very much.

Regions with plenty of rain will obtain more rain averagely, but its uncertainty will also become larger. On the other hand, regions with small rain may obtain less rain averagely, and uncertainty will be smaller.

Influence of regional socio-economic structure such as future growth rate of economy, future population, future farmland area structure has a large impact on water demand. Service industry oriented city has small impact from socio-economic scenario, but manufacturing industry oriented city has a large impact, since increasing water demand of growing economy have a large impact of climate change.

Simulation with combined cases of climate change effect and socio-economic scenario give rather large difference among cities, so that adaptation policy has to be conducted at each local government with each local simulation.

Review of targets for river improvement plans

In order to realize the Basic Policy on River Improvement, the contents of river improvement over the next 20 to 30 years have to be refined by taking into account the effects of climate change.

On the other hand, safety level of the basic policy on river improvement has to be achieved as soon as possible.

When reviewing river improvement menus, rework has to be minimized in case the effects of climate change are increased.

Increased Magnitude of Total Rainfall for Climate Change

For external forces induced by climate change to reflect in the flood control plan at present should be based on the average external force value at a rate of 2 degree rise. Since the possibility cannot be denied, the average external force value at the time of 4 degree rise should be referred for Risk assessment for disaster countermeasures, crisis management operation of river management facilities, etc.

Climate change influence to River Development

	Magnification of Rainfall	Magnification of Runoff	Frequency of flooding
4 degree rising	1.3	1.4	4
2 degree rising	1.1	1.2	2

* Magnification rate of rainfall is calculated by the analytical experiment of climate change which is comparing results of the end of 20th and 21st century.

Enhancement of disaster mitigation and crisis management measures

Since it is sure that the flood risk situation will exceed current facility capacity, basic river improvement basic policies and river improvement plans, various floods not only the basic highwater level and past flood level.

But also the target scale that exceed these levels has to be considered for various measures in the region.

More effective operation, taking into account current climate conditions and near-future climate change is necessary, including the renovation of infrastructures which is the basic policy of Japan, not only for river management but for all infrastructers.

Enhancement of disaster mitigation and crisis management measures

In addition to flood control measures undertaken primarily by river managers, it is necessary to advance the transition to "basin flood control," where an entire river basin, including the floodplain, is considered as one entity.

All stakeholders related to the entire river basin collaborate to reduce flood damage across the entire watershed.

Integration of countermeasures for each level/worst scenario

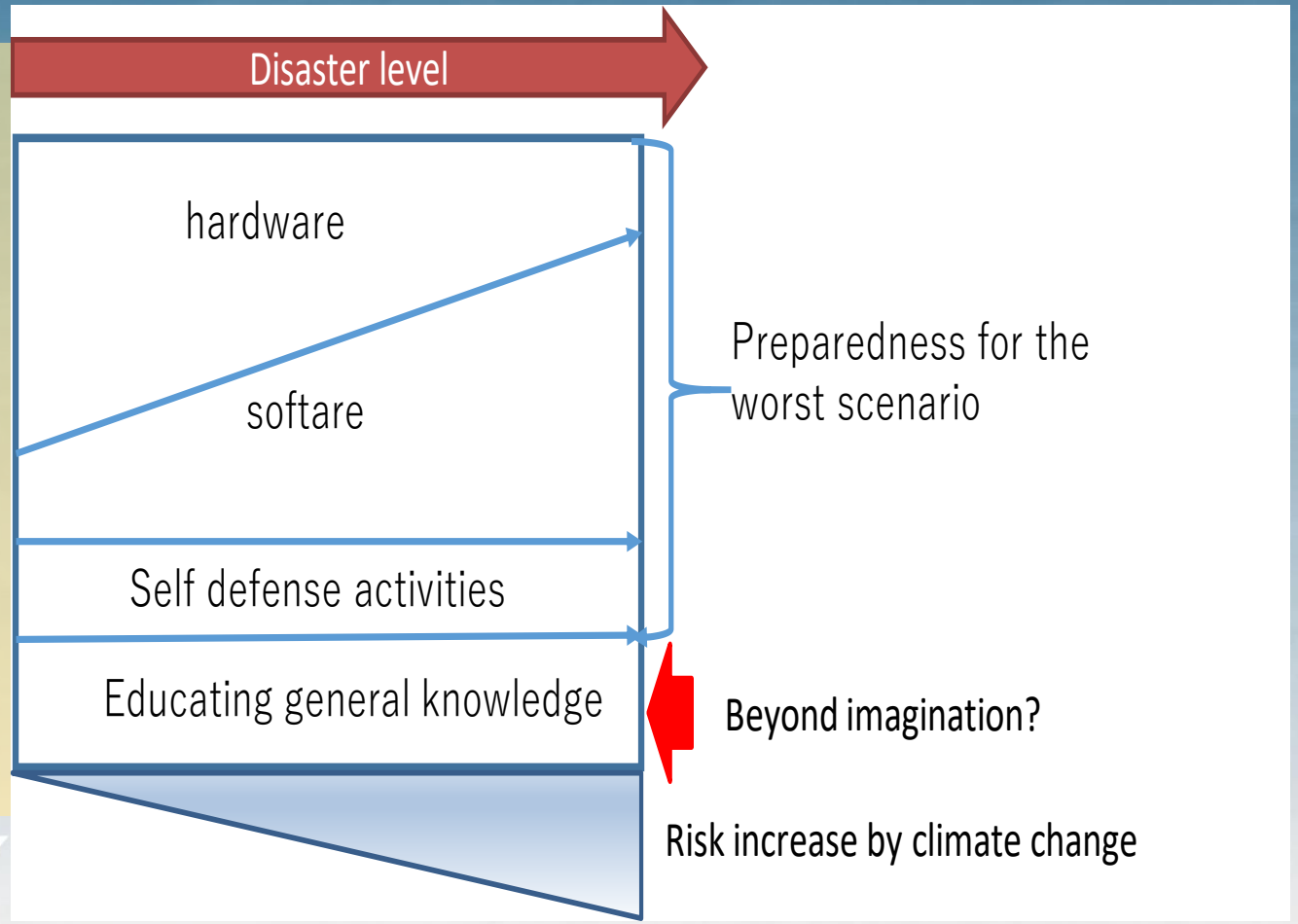
Nature becoming rough
New Design Philosophy Necessary (Climate Change)

Hazard Map is not enough to protect people.

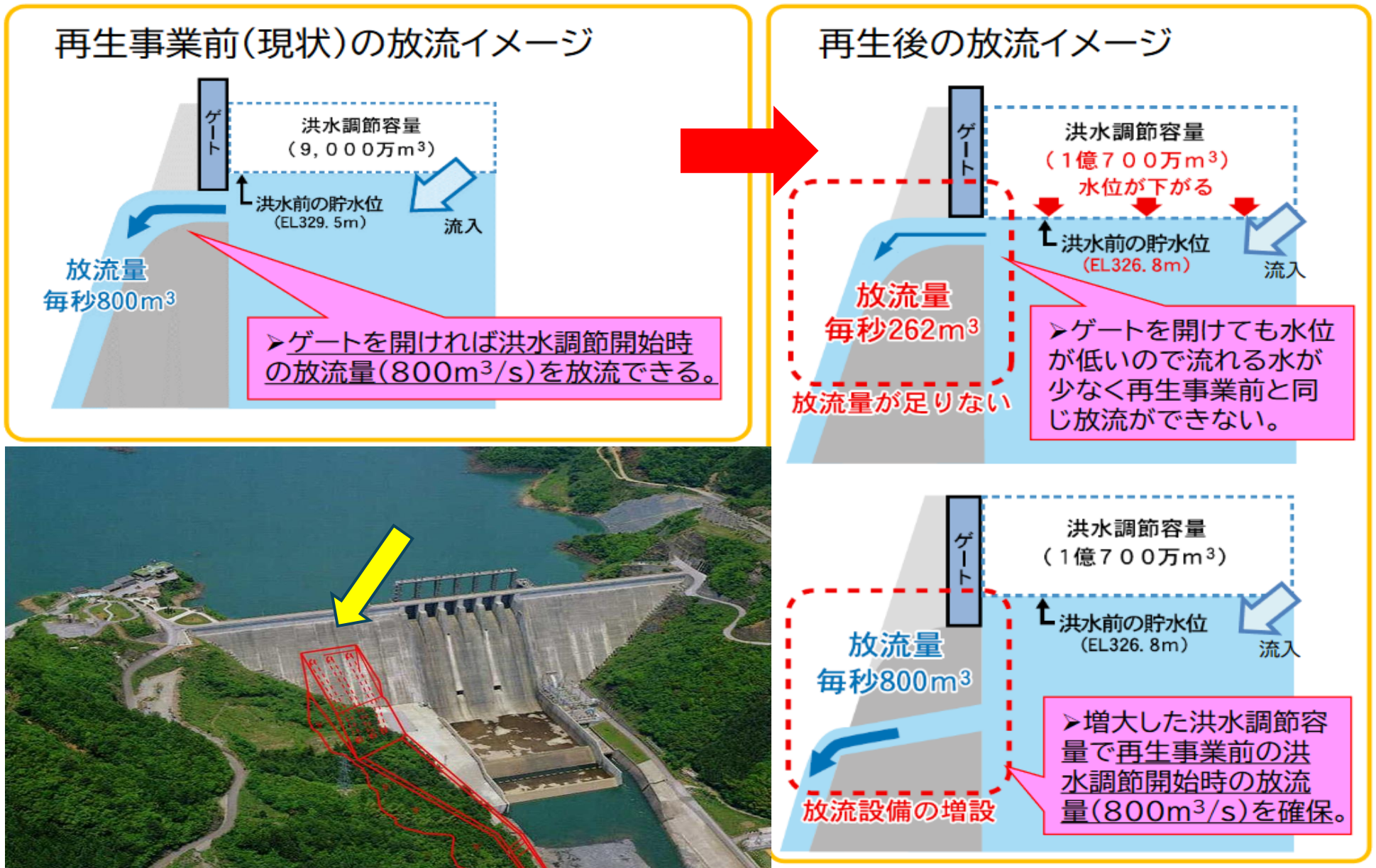
Software and Self defense activities may save people.

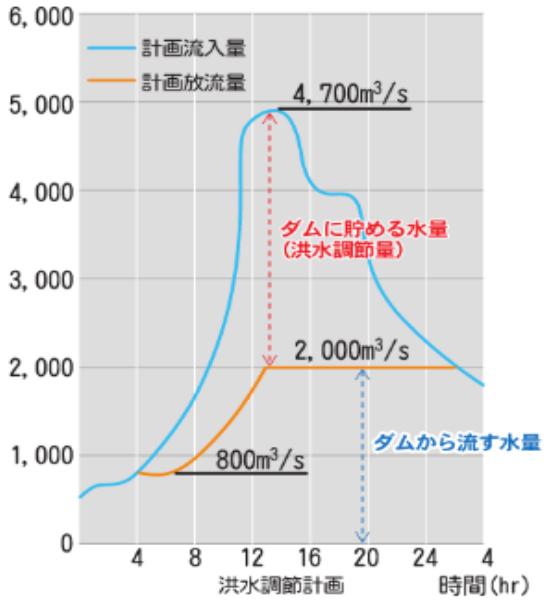
However, people do not endure increasing frequency of damaging disaster.

Improvement of Infrastructure is getting a new issue.



Renovation of Capacity (Flood countermeasure)





洪水調節計画図

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