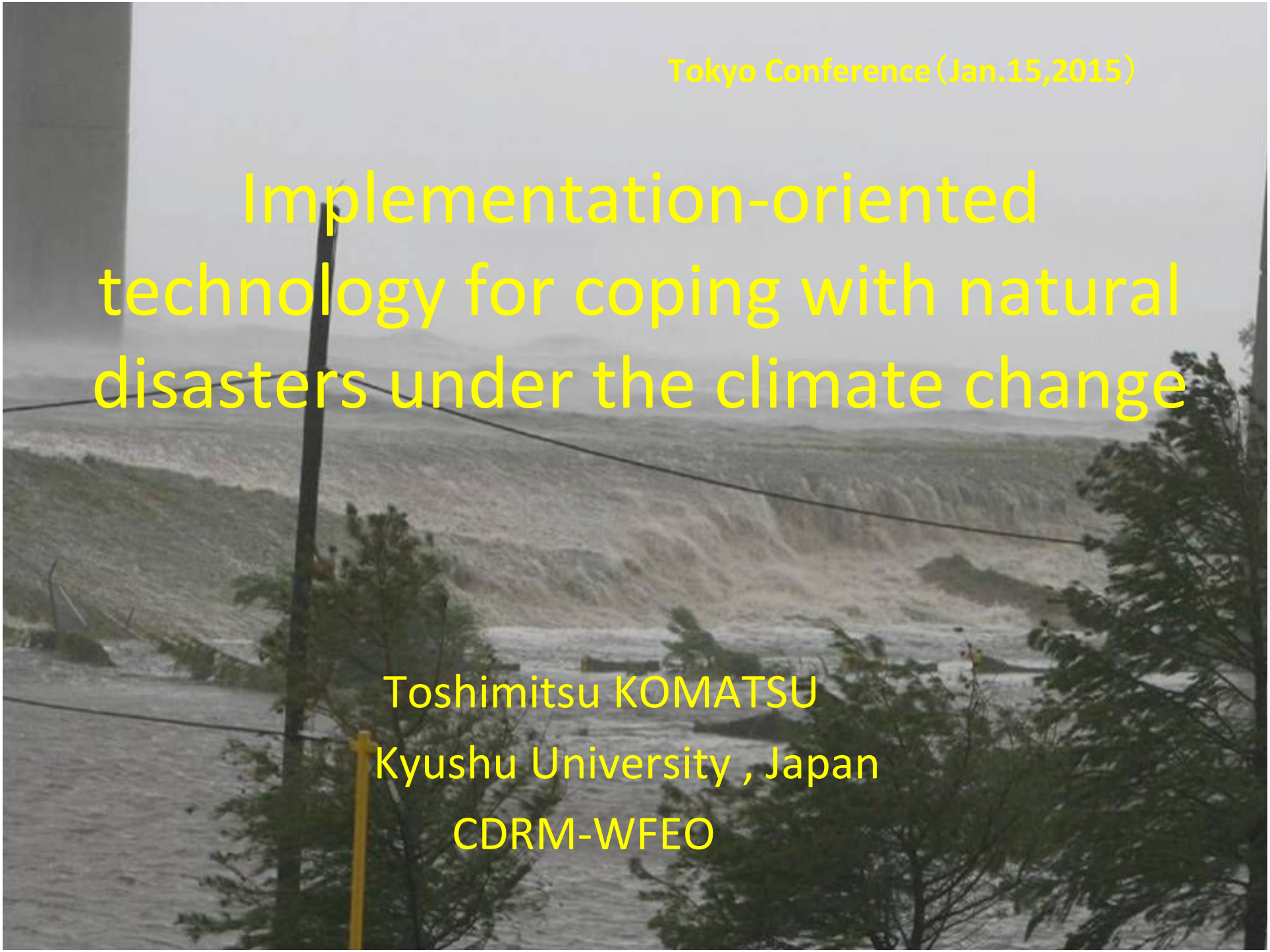

Tokyo Conference（Jan.15,2015）

Implementation-oriented technology for coping with natural disasters under the climate change

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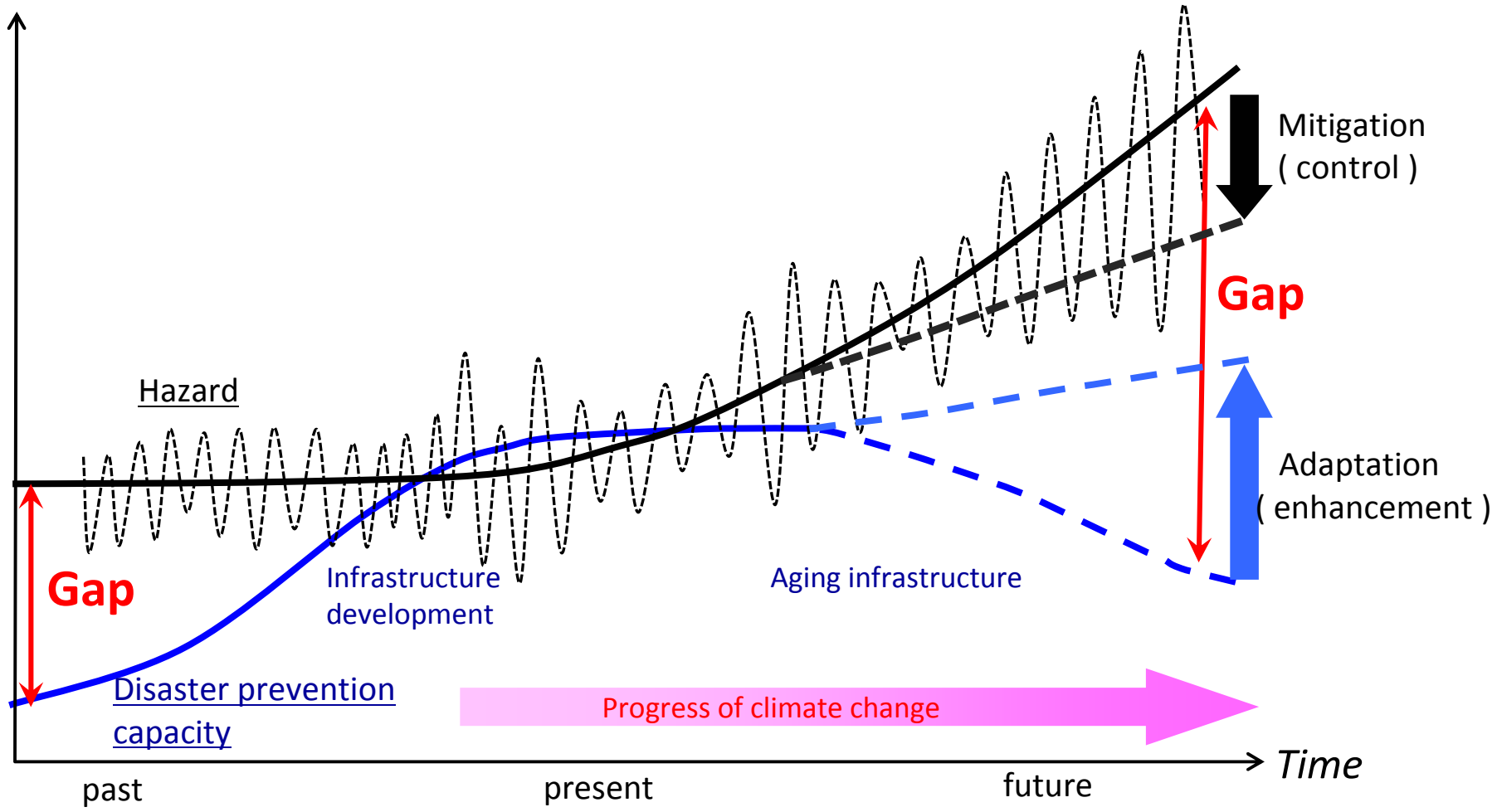
Relationship between natural hazard and disaster prevention capacity



The large gap will bring our society much more terrible damage than we expect to be.

Northern Kyushu Flood Disaster ,2012 Japan

堤防決壊　　【平成２４年７月１４日出水】
矢部川水系矢部川右岸７ｋ３００付近

The collapse of embankment brought serious damage. There was no difference in the water level between the inside and the outside of the river.

The debris flow disaster in Hiroshima city , Japan（Aug.20,2014）

There is **a specific threshold(limit)** in each disaster site.

If the hazard exceed **a specific threshold** , a serious disaster occurs, but unless exceed ,disaster damage remain small.

Flood disasters and landslides have the side of “ **All or Nothing** “

This is a characteristic of water–related disasters.

The climate change is letting the natural hazard easily exceed this threshold.

How can we prevent such serious disasters in the increasing hazard?

We need to raise the threshold to keep security of life and property from the perspective of engineering.

Under increasing hazard the aspect of disaster has been changing. Therefore **flexible and dynamic correspondence** is required.

We need not just the adaptation but the **『adaptive adaptation』** and the **implementation-oriented technology** for coping with the new increasing hazard.

The technology developed should be

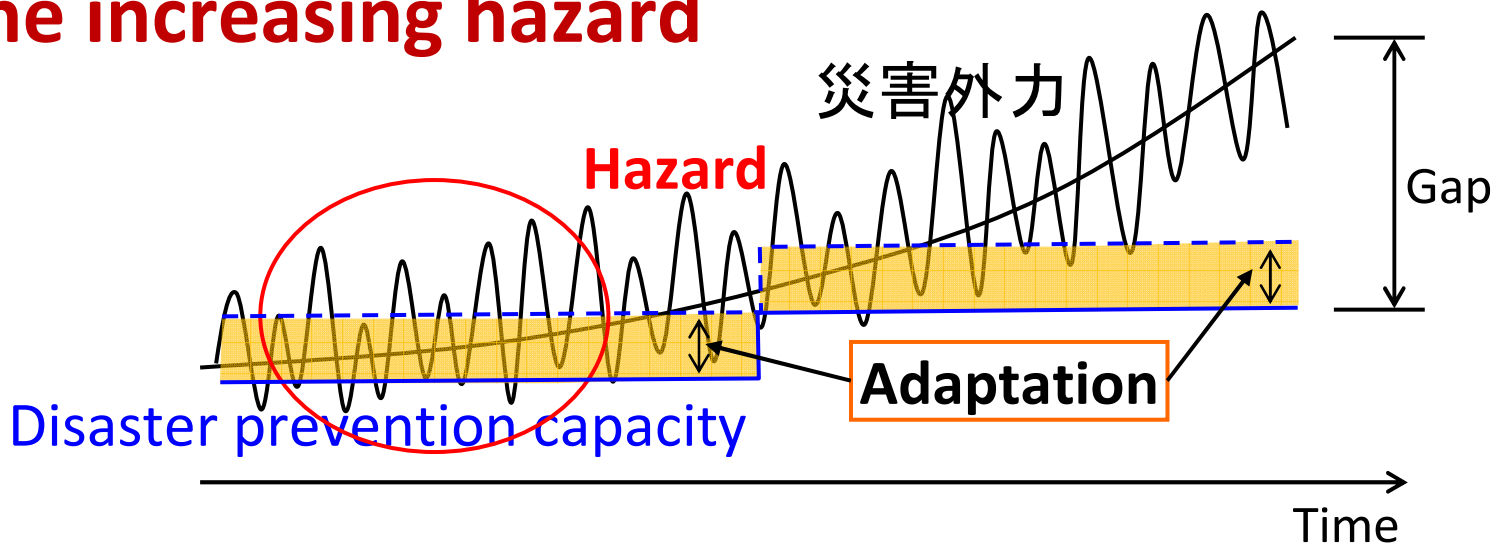
(1) in harmony with the surrounding nature.

(2) flexible and adjustable for applying to the adaptive adaptation.

(3) reversible if necessary.

(4) efficient and economical.

Concept of adaptive adaptation under the increasing hazard



Adaptive adaptation

Progress of global warming → Estimation of increase of hazard

This process is important.

Determination of adaptation measures and implementation

A good cycle for operation should be established.

Against new situation of disaster

Implementation oriented technology

- New technologies on
  - Storm surge
  - Torrential rainfall
  - Automobile society
  - **Dry dam (flood control)**
  - Sedimentation
  - Driftwood
  - . . .
- Lessons from traditional measures (wisdom of earlier people)
- Education for disaster prevention
- Construction of Social capital

For flood control under the increasing hazard (as an example)

Flood control by a dam at a point is quite efficient and economical compared with river embankment raising which must be constructed along a line.

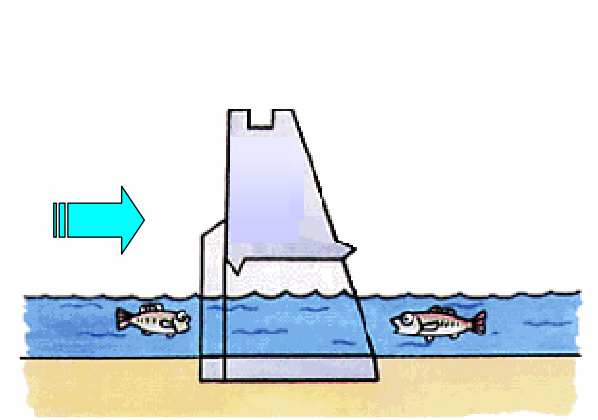
But it is very difficult to build new huge dams from the current tone of society.

We have proposed **a group of small scale dry dams** for flood control.

Because a dry dam harmonizes with the surrounding nature.

▪*A dry dam as one of concreate countermeasures against the climate change*

Normal condition



Flood condition

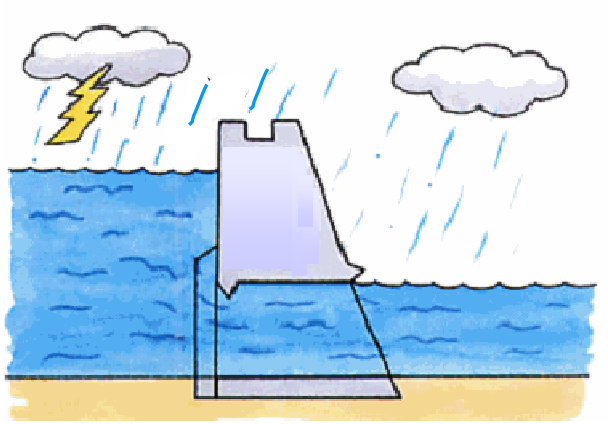


Fig. Masudagawa Dry Dam

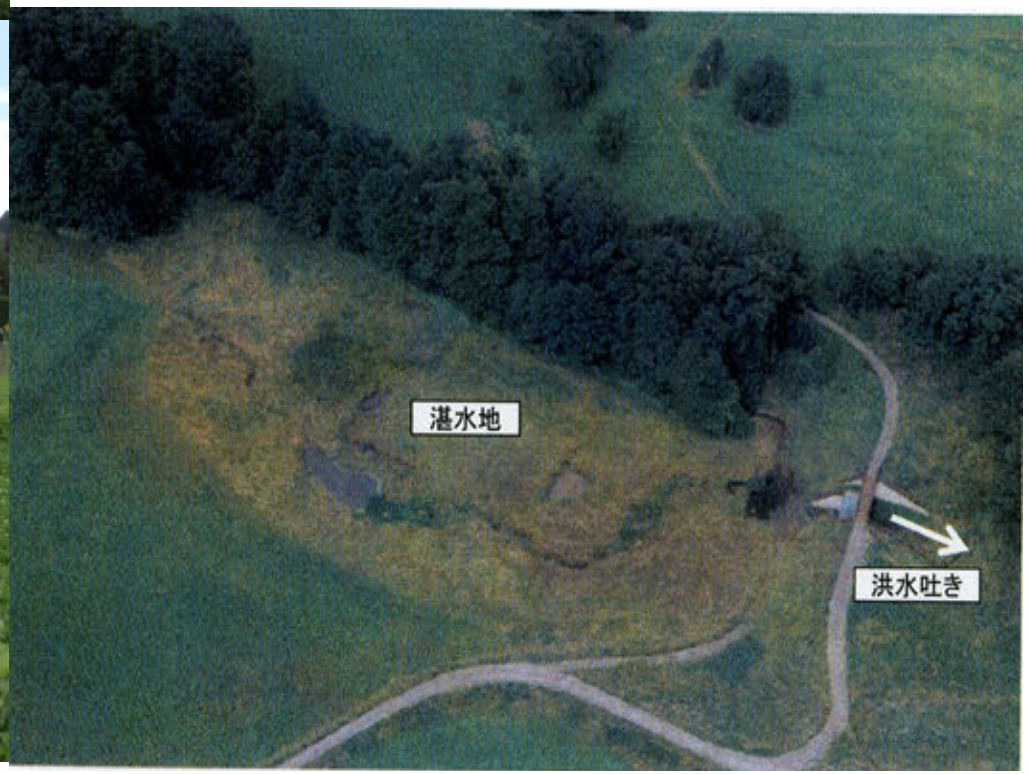
▪*In a dry dam spillways without slide gates are provided at the almost same level as that of river bed, flowing water at all time without impoundment. Accordingly sediment and fish can pass through the dam body, loading little burden on natural environment.*

▪**A dry dam can cut the peak of flood by storing flood water temporarily.**

Small scale dry dams in Austria

The dam body constructed by earth looks like a natural hill.

The dam body harmonizes with the surrounding landscape



An earth fill type small scale dry dam

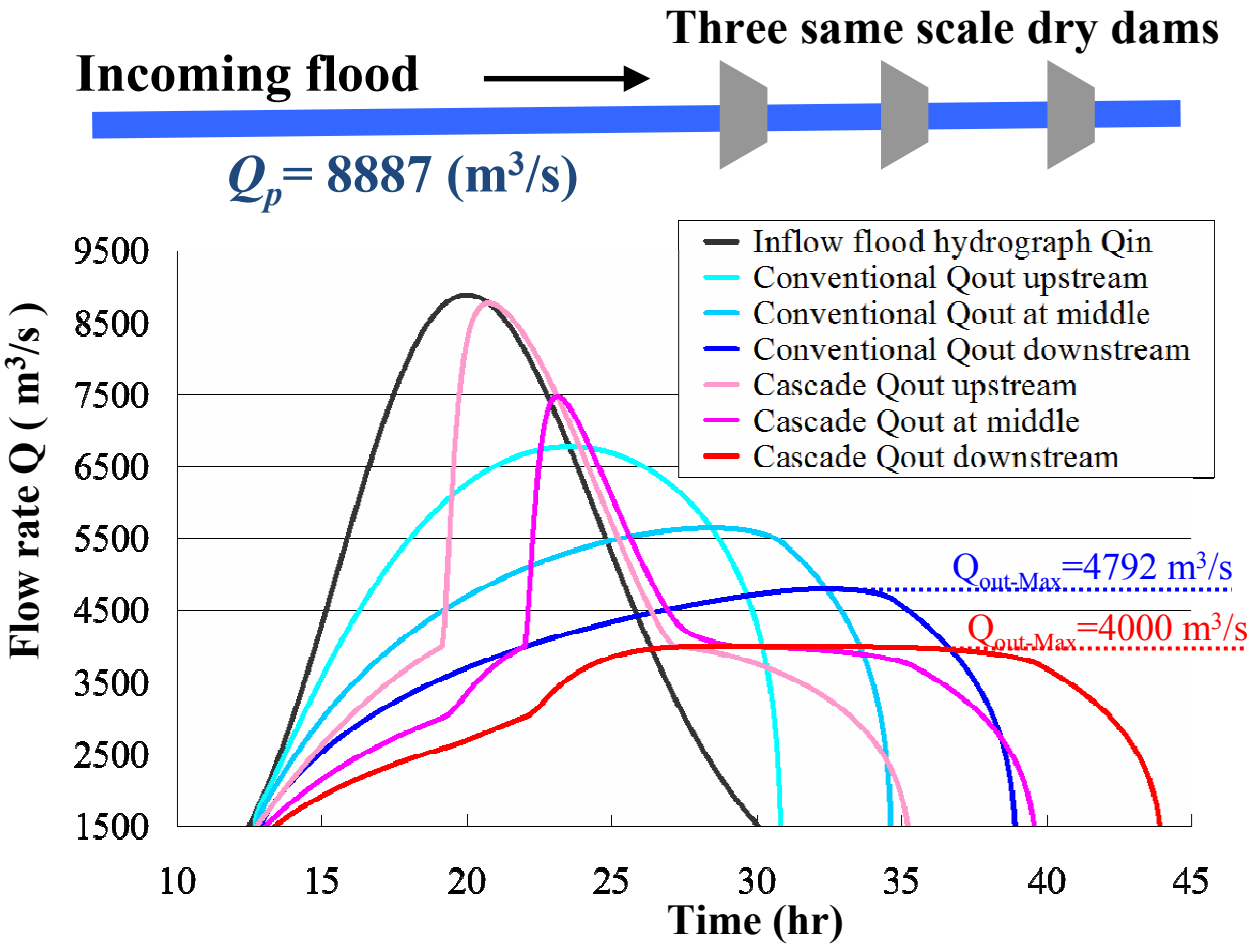
Gabriachbach Eichengrund overall view

We have proposed the use of a group of small scale dry dams constructed in series along a river and a new dam operation system called Cascade method.

Dry dams constructed in series for flood control

Cascade method

Photo. A dry dam in Austria



- In Cascade method a series of dry dams is constructed along a river and upstream dams are allowed to overflow from emergency spillways.
- This method can be applied to existing water storage dams with human operation and lead to more efficient flood control..

Process of Adaptive adaptation in flood control

Progress of global warming

↓ Computer simulation

Increases of amount and intensity of rainfall

↓ Computer simulation

Estimation of increments of flood waters

↓ **New technology is required.**

Determination of appropriate adaptation measure and evaluation of its effect

↓

Execution of adaptation measure

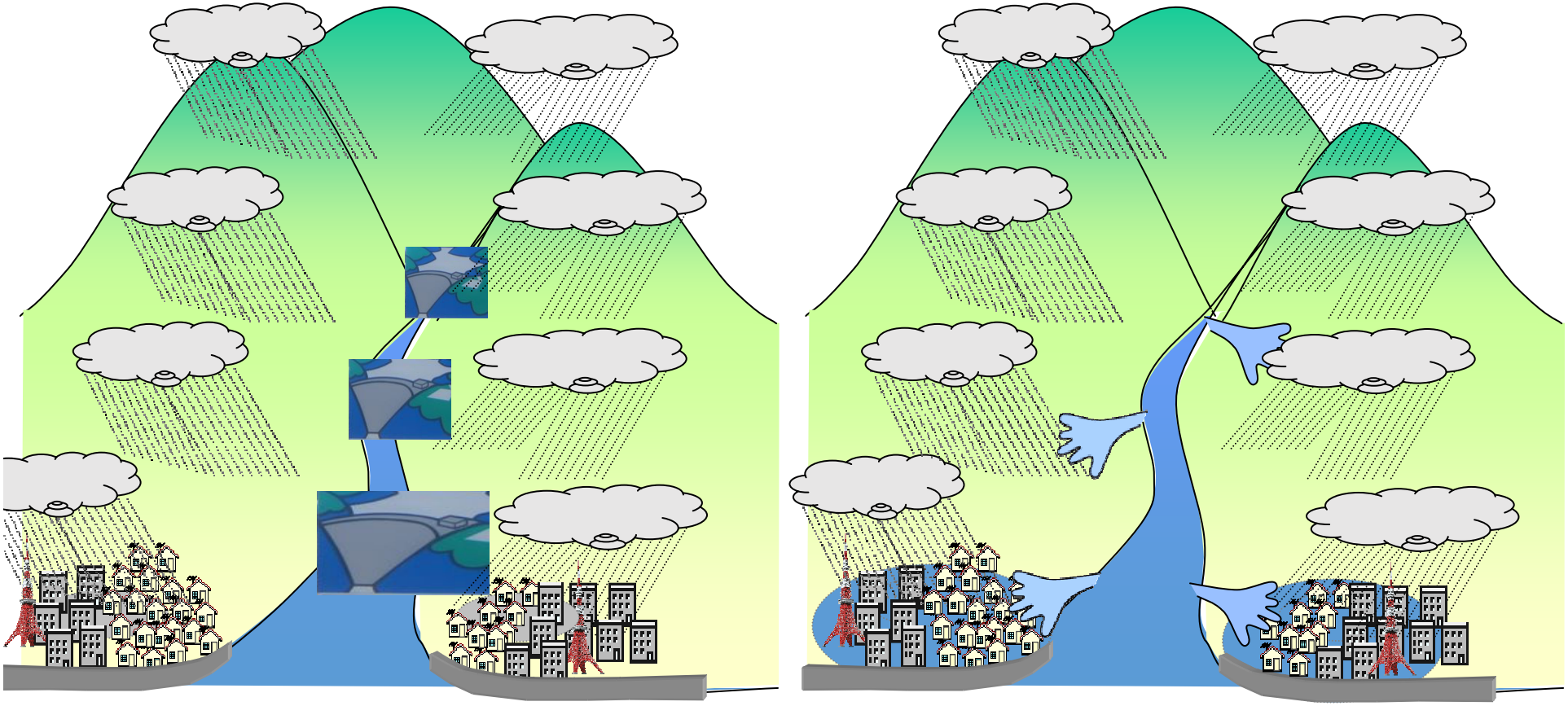
By way of precaution against increasing hazard in the future

If flood amount required to be controlled is increased to 1.1-1.2 times due to the climate change (Ministry of the Environment prediction), **one or a few small scale dry dams with capacity of only increment** should be constructed in the upstream of the existing flood control system by using **the linear characteristic of the Cascade method.**

In response to the increase in disaster hazard, we can adapt measures adaptively to new situations.

With a group of dry dams

Without a dam



Flood control by a group of small scale dry dams

Conclusions

(1) Under the increasing hazard due to the climate change, we need the **adaptive adaptation** and implementation-oriented technology which is flexible and adjustable.

(2) As one of adaptation measures, we have proposed the use of a group of small scale dry dams and the new dam operation system called the Cascade method to reduce damage not only from floods but also from flood surges due to natural dam breaks.

(3) The flood control using the Cascade method is remarkably more effective than the conventional one. The new concept allows overflowing from the emergency spillway of the upstream dams constructed in series except for the most downstream dam.

(4) In response to the increase in disaster hazard, we can adapt measures adaptively to new situations.

"Tomorrow I will live, the fool dose say: today itself's too late; the wise lived yesterday."

American sociologist Charles Horton Cooley

“明日は何とかなると思うのは愚か者。今日でさえもう遅すぎるのに。賢者は昨日のうちに済ませている。“

米国の社会学者　チャールズ・クーリー

Thank you for your kind attention!!