Poster board number: C05

Evaluation of Water Storage Capacity and Adaptation Measures to Reduce Flood Risk and Erosion Potential of Rivers in Toyama Prefecture

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CONCLUSION

- Can we easily evaluate how well each countermeasure reduces flood risk?
- What is the best way to reduce flood risk from rising temperatures in Toyama's rivers?

- The storage function evaluation showed it is easy to evaluate and compare their effectiveness.
- In the Toyama Prefecture, paddy field dam is proved as effective countermeasure, especially in the Oyabe River, which has high score in all evaluations.

INTRODUCTION

PROBLEM

Global warming is raising temperature in Japan and precipitation, leading to more frequent and severe floods. We are working on Basin-wide Flood Control to visualization efforts to show flood risks and the effects of countermeasures, this help people to understand its impact.
However There are various countermeasures for basin-wide flood control! We need to show the effects of these countermeasures, but a general B/C evaluation takes a lot of time and effort.

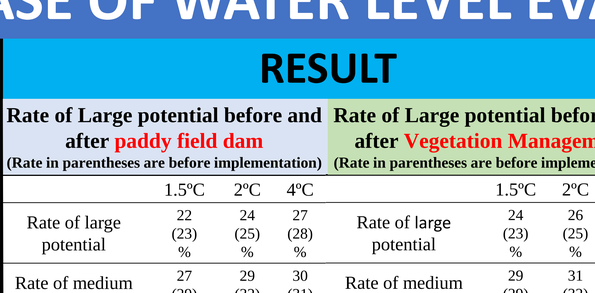
OBJECTIVE

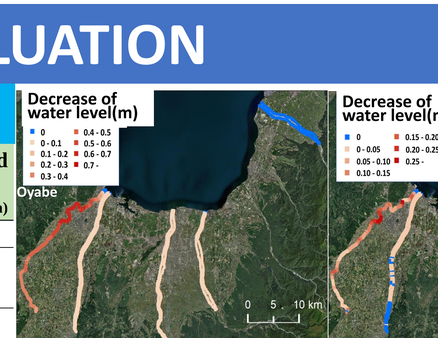
Evaluate countermeasures based on Toyama's river basins and show their effectiveness.

- Can we easily evaluate (storage function evaluation) how well each countermeasure reduces flood risk?
- What is the best way to reduce flood risk from temperature rise in Toyama's rivers?

STUDY AREA

Toyama prefecture in Japan





There is a lot of damage caused by erosion.

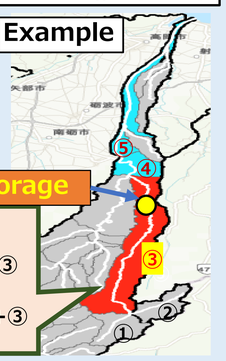
STORAGE FUNCTION EVALUATION

The storage function in a sub-basin scale

Evaluation of Sub-basin storage (mm)

Equivalent Rainfall
= Total storage volume by each countermeasure / Total sub-basin area

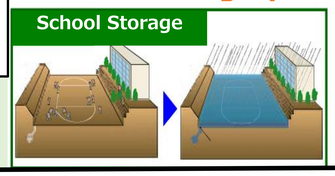
Example



Example Sub-basin ③
Total Sub-basin Area= ①+②+③
Total Storage volume= ③
Equivalent Rainfall= ③/①+②+③

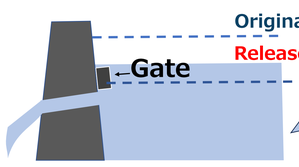
Evaluation of Sub-basin storage / Projected Scale rainfall
It was evaluated by dividing it by the projected scale rainfall.

・School Storage (School Yard Storage)



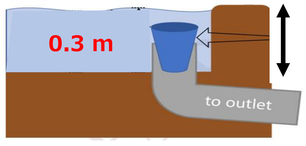
1.School yard area, the national average is used.
2. Storage height as 0.30 m.

・Agriculture Pond Storage



30% of storage capacity for flood control.

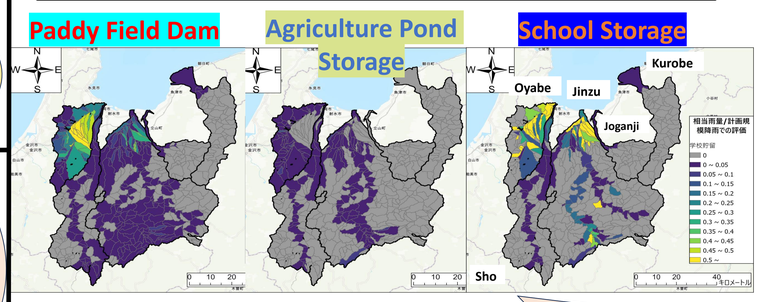
・Paddy Field Dam



1.storage height as 0.30 m.
2. 50 % implement ation area.

RESULT

Sub-basin storage / Projected Scale rainfall



Paddy Field Dam is Effective in Oyabe River. Agriculture pond storage is not effective. School storage is Effective in Jinzu and Oyabe Rivers.

Comparisons can also be made by using simplified methods.

EROSION POTENTIAL AND DECREASE OF WATER LEVEL EVALUATION

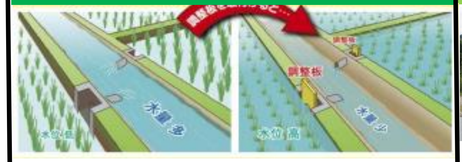
CALCULATION CONDITIONS

■ **Flow rate scale:** d4PDF 4K simulation (150-year probability)

■ **Analysis Model**
・Simulation of rainfall runoff on a single slope(Kure・Yamada)
・Flood Routing simulations for River Channel: 1D unsteady flow analysis

・Erosion potential evaluation methods: Erosion evaluation method of Fujishita et al.

・Paddy Field Dam



We used the model of Chai, Touge, et al. (2020). The implementation rate of paddy field dams was set at 50 %.

・Vegetation Management

We changed Manning's roughness coefficients from high values (0.04-0.06) to 0.03 after the vegetation cutting.

RESULT

Rate of Large potential before and after paddy field dam (Rate in parentheses are before implementation)

	1.5℃	2℃	4℃
Rate of large potential	22 (23) %	24 (25) %	27 (28) %
Rate of medium potential	27 (29) %	29 (32) %	30 (31) %

Rate of Large potential before and after Vegetation Management (Rate in parentheses are before implementation)

	1.5℃	2℃	4℃
Rate of large potential	24 (23) %	26 (25) %	29 (28) %
Rate of medium potential	29 (29) %	31 (32) %	30 (31) %

Paddy Field Dam is Effective in Oyabe River.

Both evaluations indicated that paddy field dams may be effective