HEST
Hydro-Environmental System Lab.
Tohoku University

SI-CAT

Social Implementation Program on
Climate Change Adaptation Technology

Adaptation effect for flood in whole Japan using GCMs with scenarios

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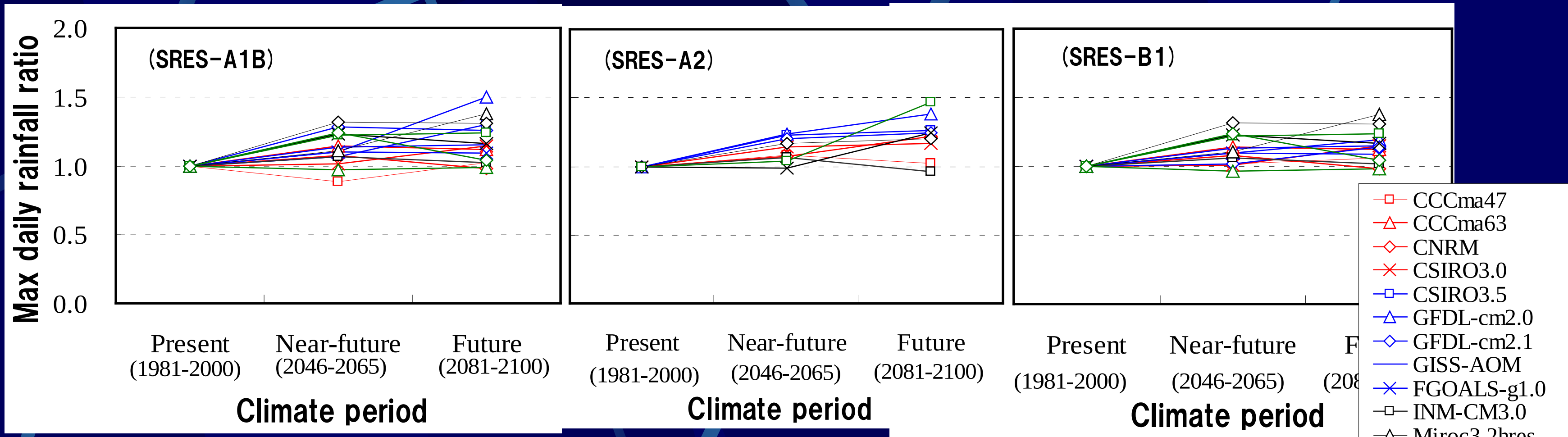
Background

- Climate change affects Japan rain
  - Increase of heavy downpour
  - Recent record-break rainfalls
- Drought
- Flushed flood
  - Slope corruption

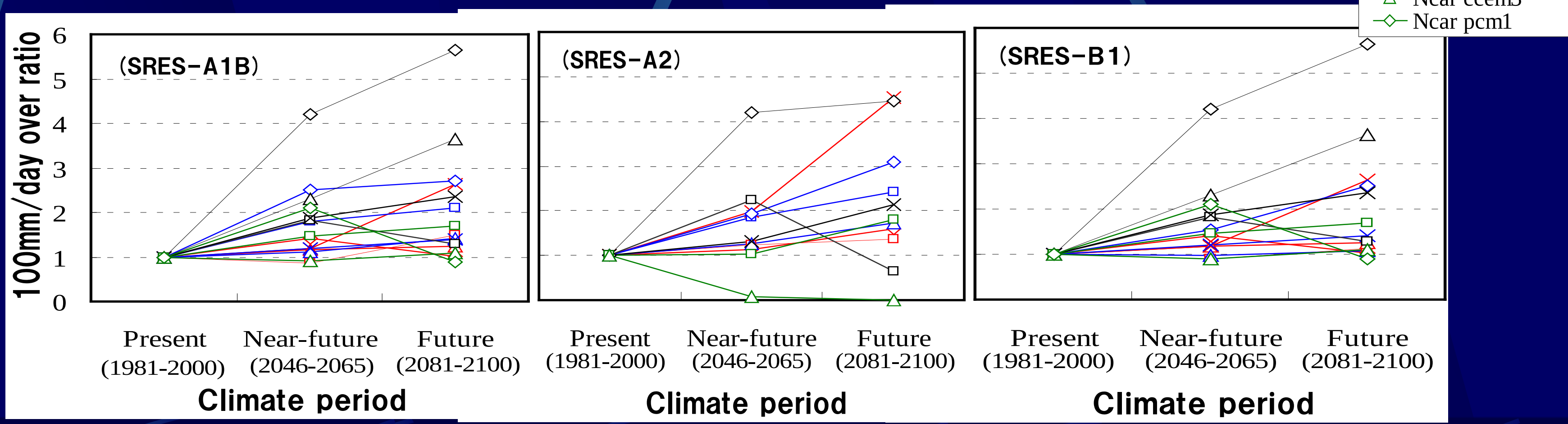
Worse water quality

More difficult water management!

Background



Variation ratio of maximum daily rainfall



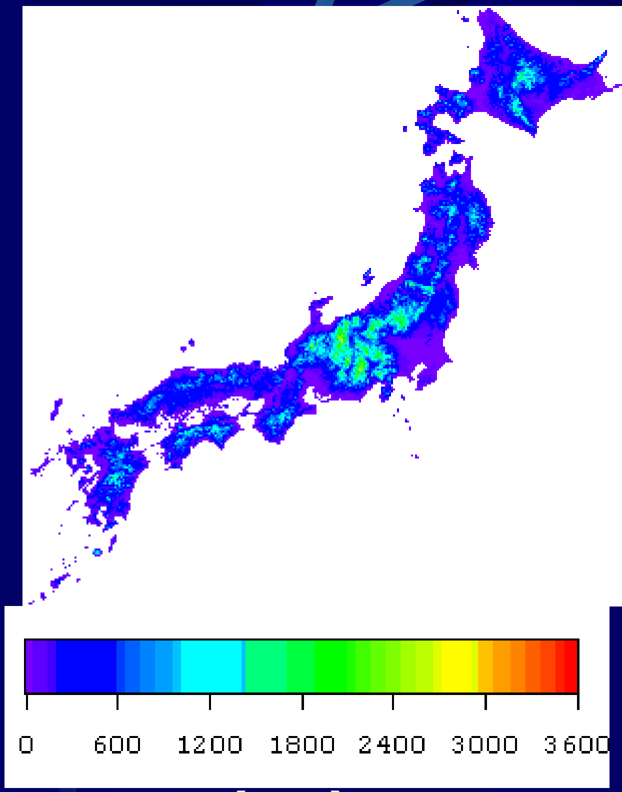
Variation ratio of daily rainfall over 100mm/day

Background

- What will flood change in the future?
- How much is adaptation cost?
- How should we think about adaptation?
  - Flood and inundation simulation
  - Unit cost of damage for each landuse
  - Damage map

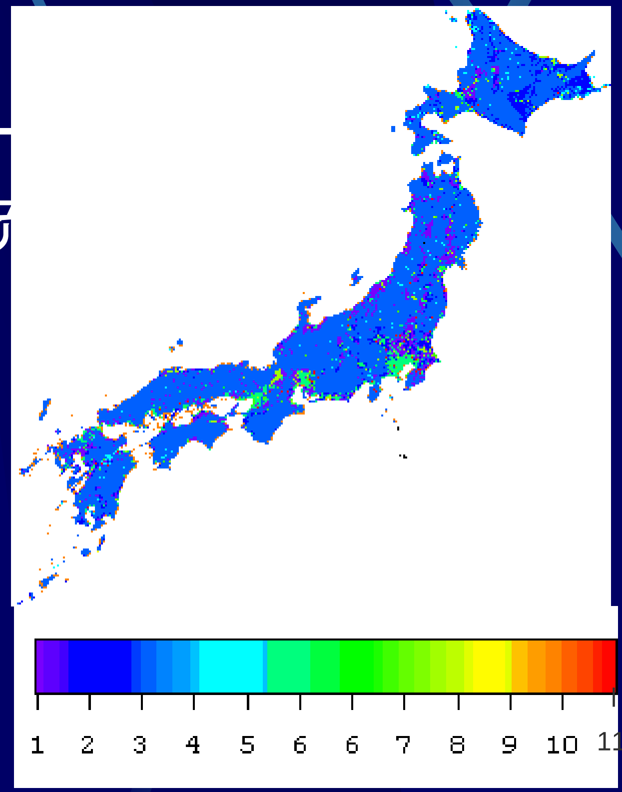
Estimation of flood damage

1）Elevation data

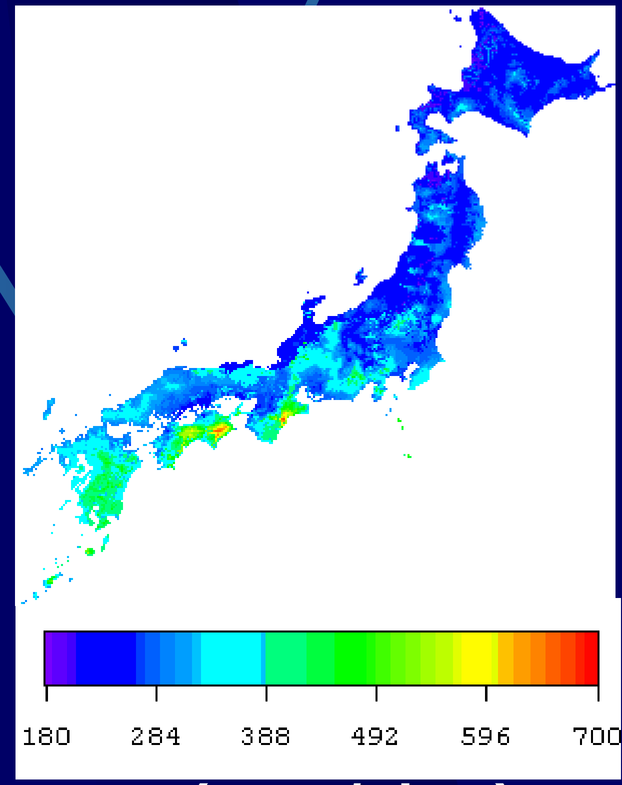


(m)

2）Landuse data



3）Probability rainfall



(mm / day)

Landuse number : 1) paddy 2) crops 3) forest 4) bare 5) building 6) Traffic area 7) other areas 8) water body 9) coastal area 10) sea 11) golf course

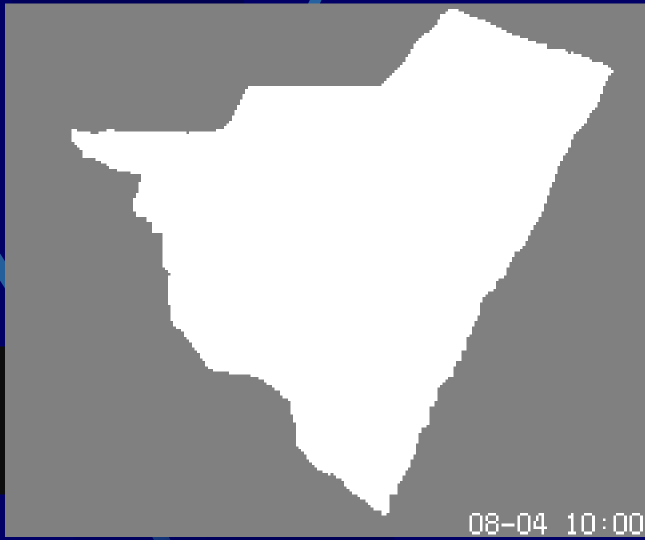
Estimation of flood damage

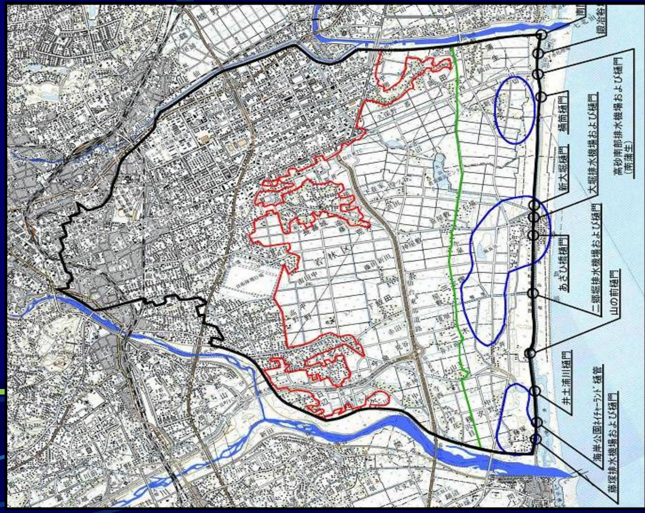
- Flood simulation

Landuse	roughness
Agri., forest	0.060
Traffic	0.047
Others	0.050
Building	0.050
Water body	0.020

Water depth

WD 0.0m, 0.5m, 1.0m
WD 1.5m, 2.0m, 2.5m



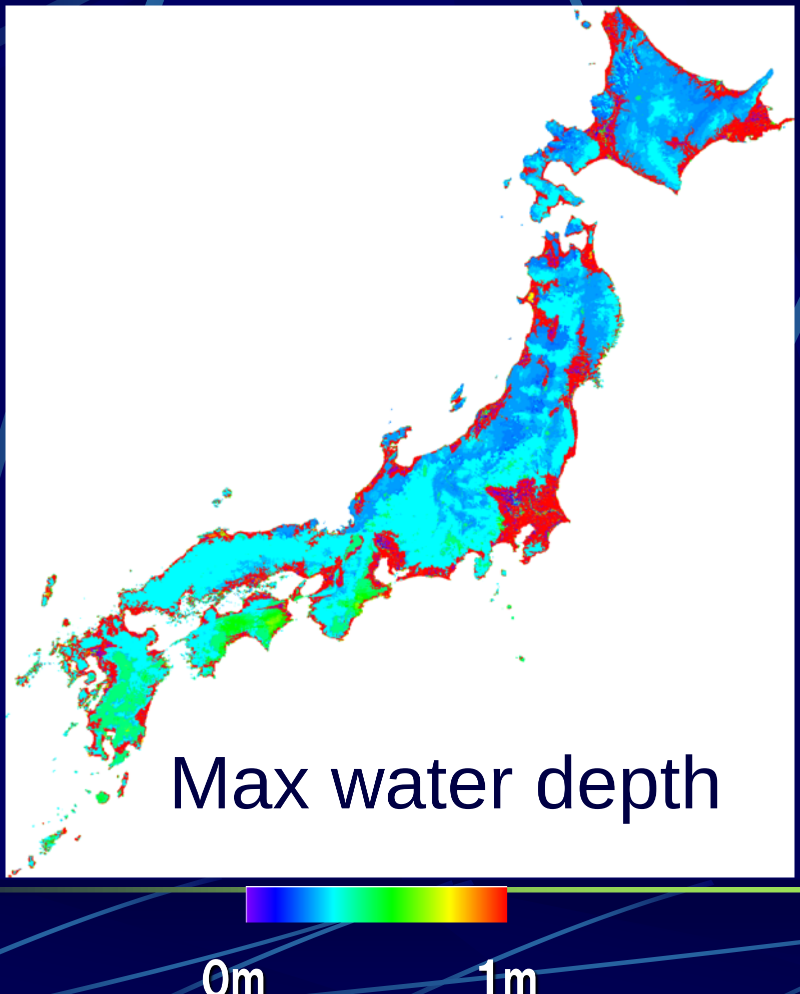


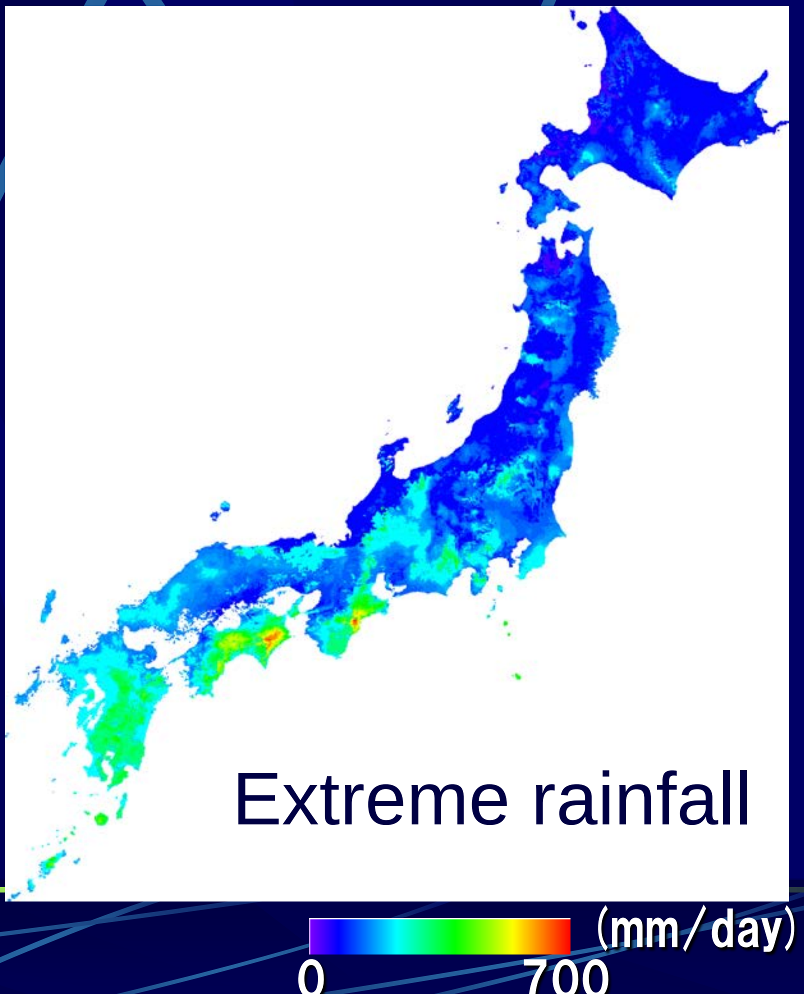
Estimation of flood damage Model

Input： Rainfall, 4 GCMs and 3 RCPs
Duration： Present, near future, far future
Resolution： 1km
Model： 2D non-uniform flow
Roughness according to landuse
Damage cost estimation： MLIT flood economic manual
Analysis： Obtaining water depth and inundation period
Damage ratio functions for landuse
Flood protection level > 30 years return period
General assets only
Bias correction of damage cost for present value
Use of relationship between probability rainfall and discharge along river

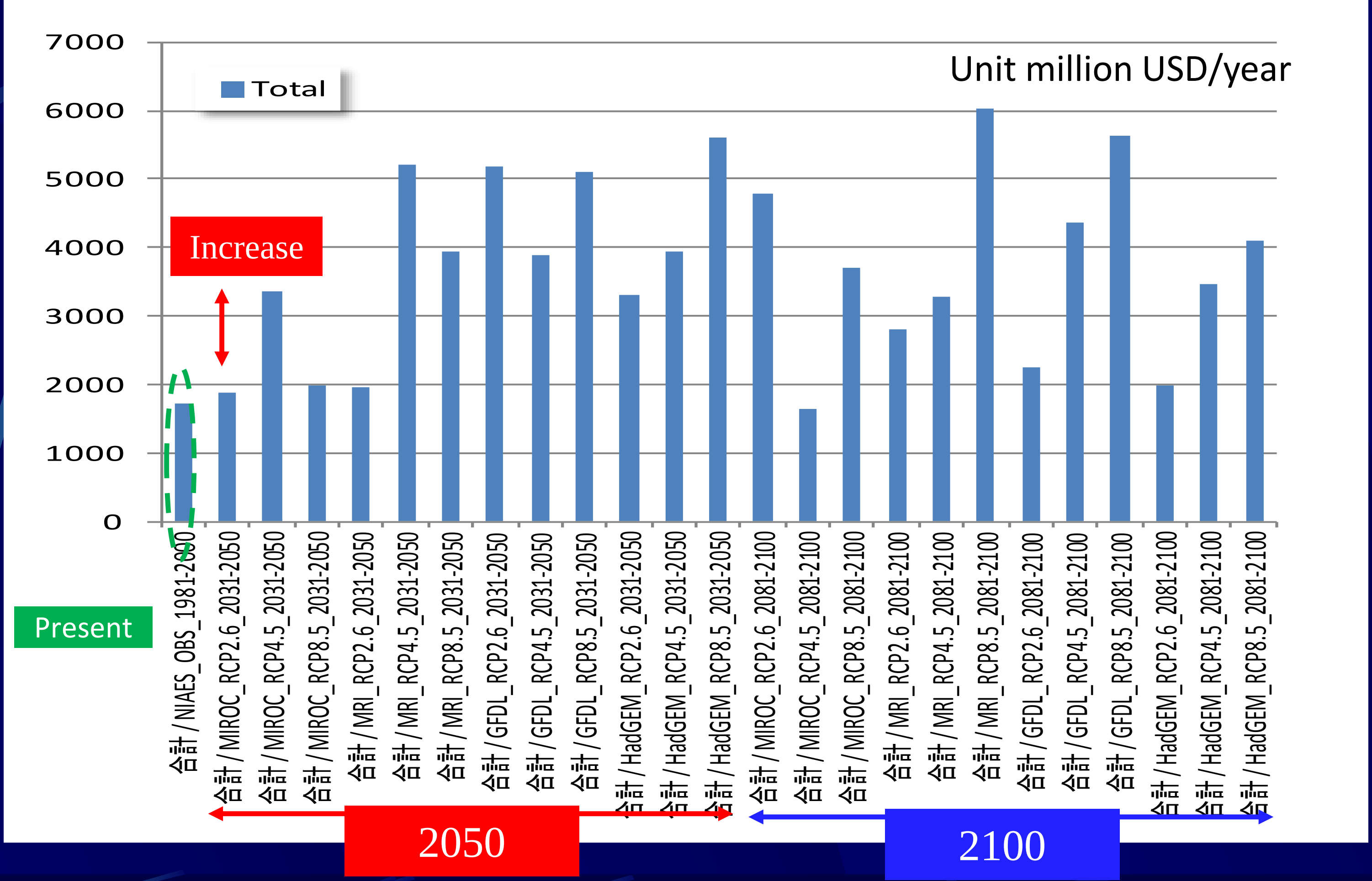
Estimation of flood damage Results

Estimation in case of 100years return period



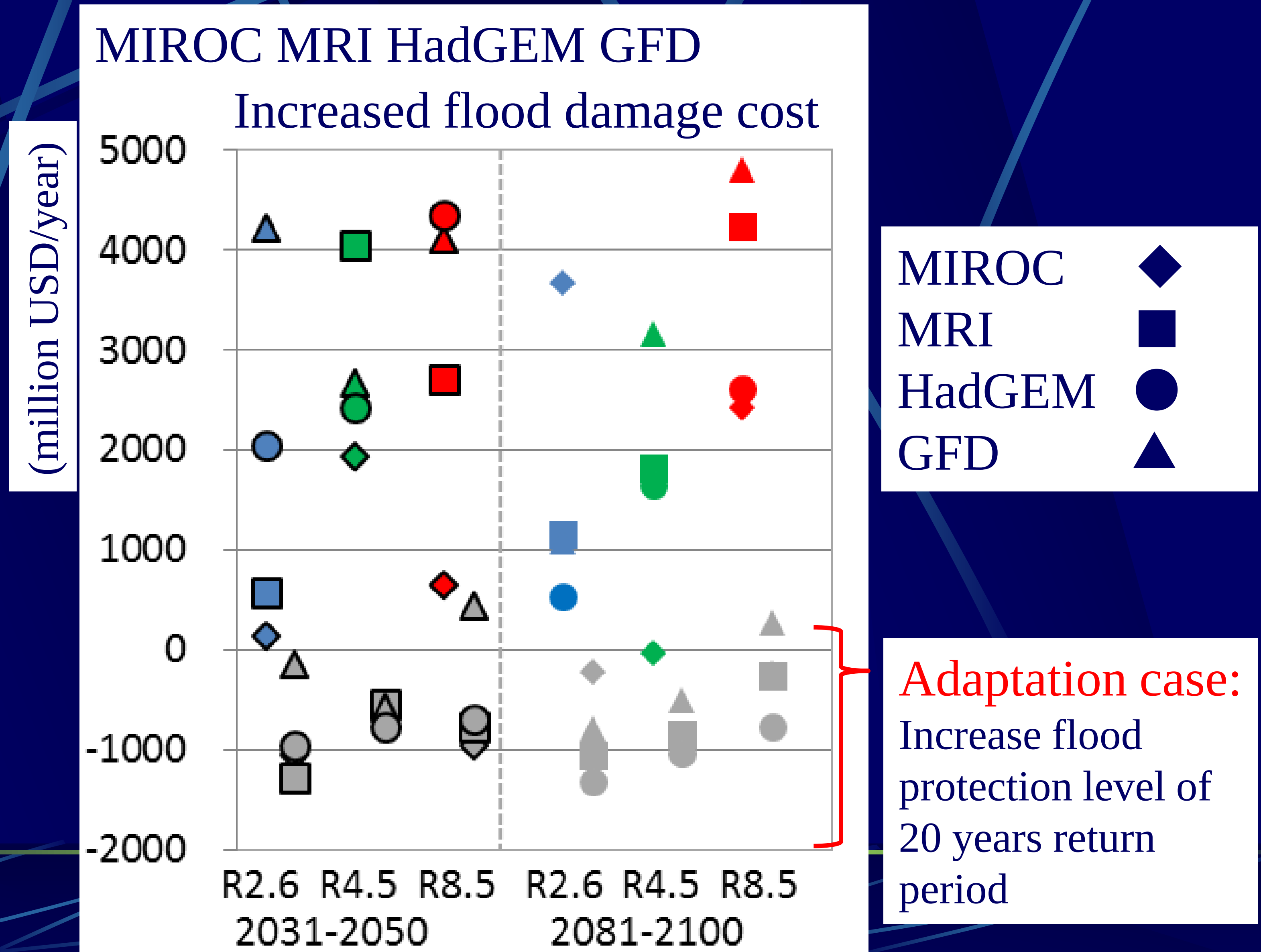


Estimation of flood damage Results



Expected flood damage using multi-GCM

Discussion on adaptation



Summary

- From physical damage to economic damage
  - Easy to compare with different disasters
  - Many cases
  - Use for policy
- From impact to adaptation studies
  - Easy to compare with mitigation cost

Appendix

- Notes
  - Use of Maximum daily rainfall for each scenarios and each period
  - Single model application
  - Regional detailed information is not reflected.
  - Not clear effects of global warming