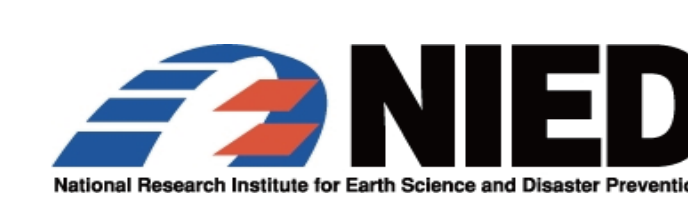


# Recent progress of Japan's regional downscaling project (SI-CAT) and CORDEX Asia Empirical-Statistical Downscaling (ESD)



Koji DAIRAKU

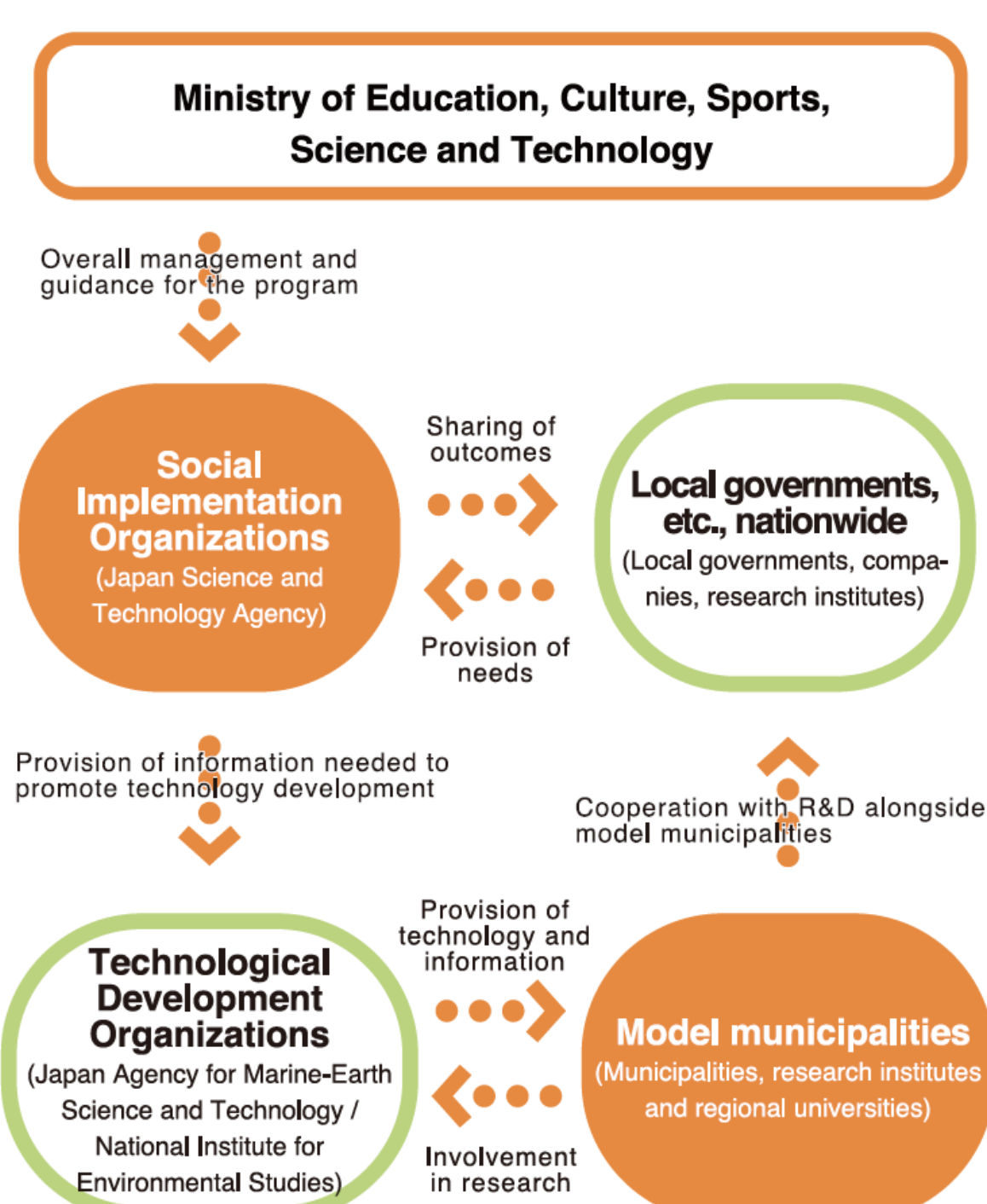
National Research Institute for Earth Science and Disaster Resilience, Japan



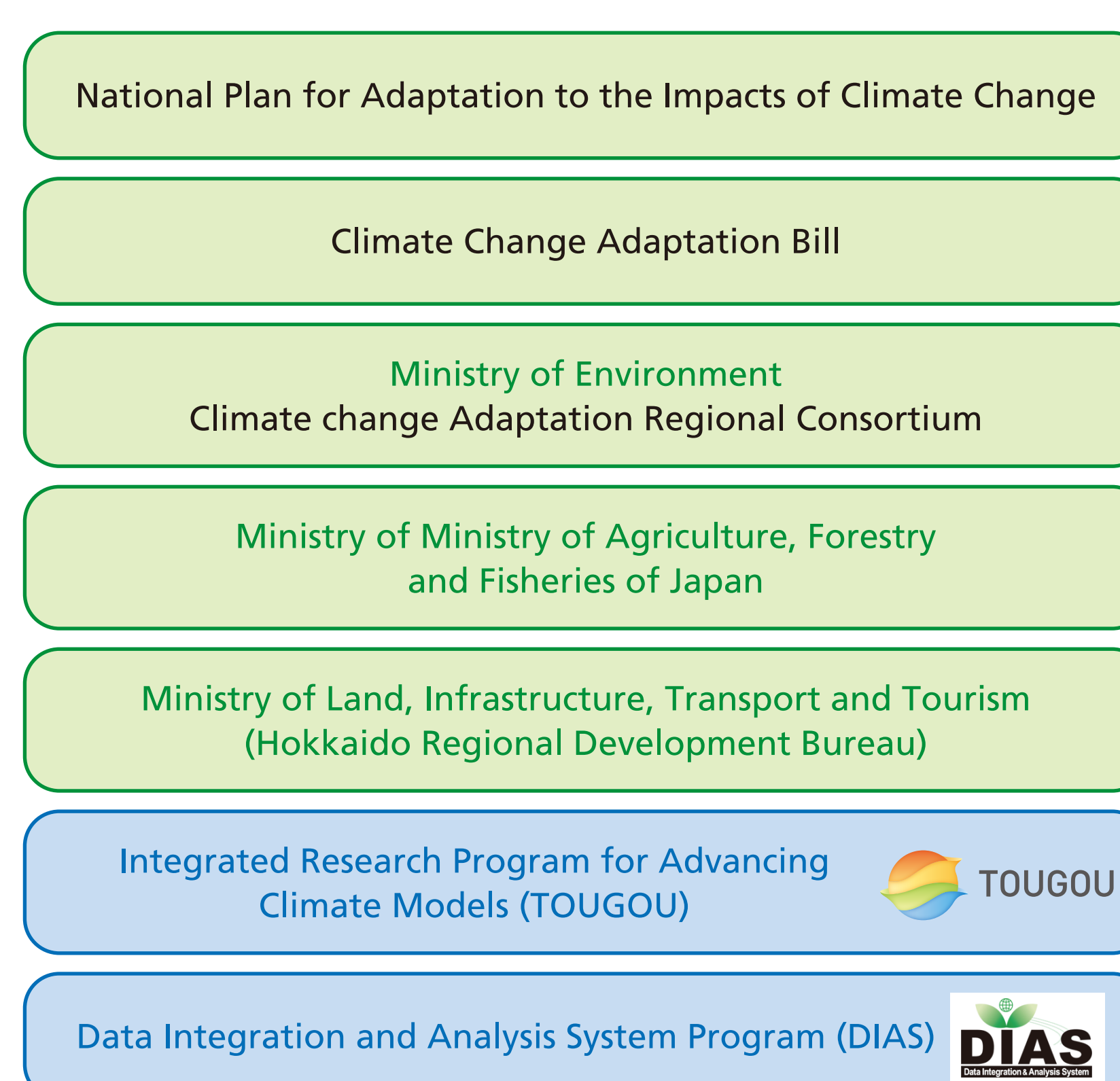
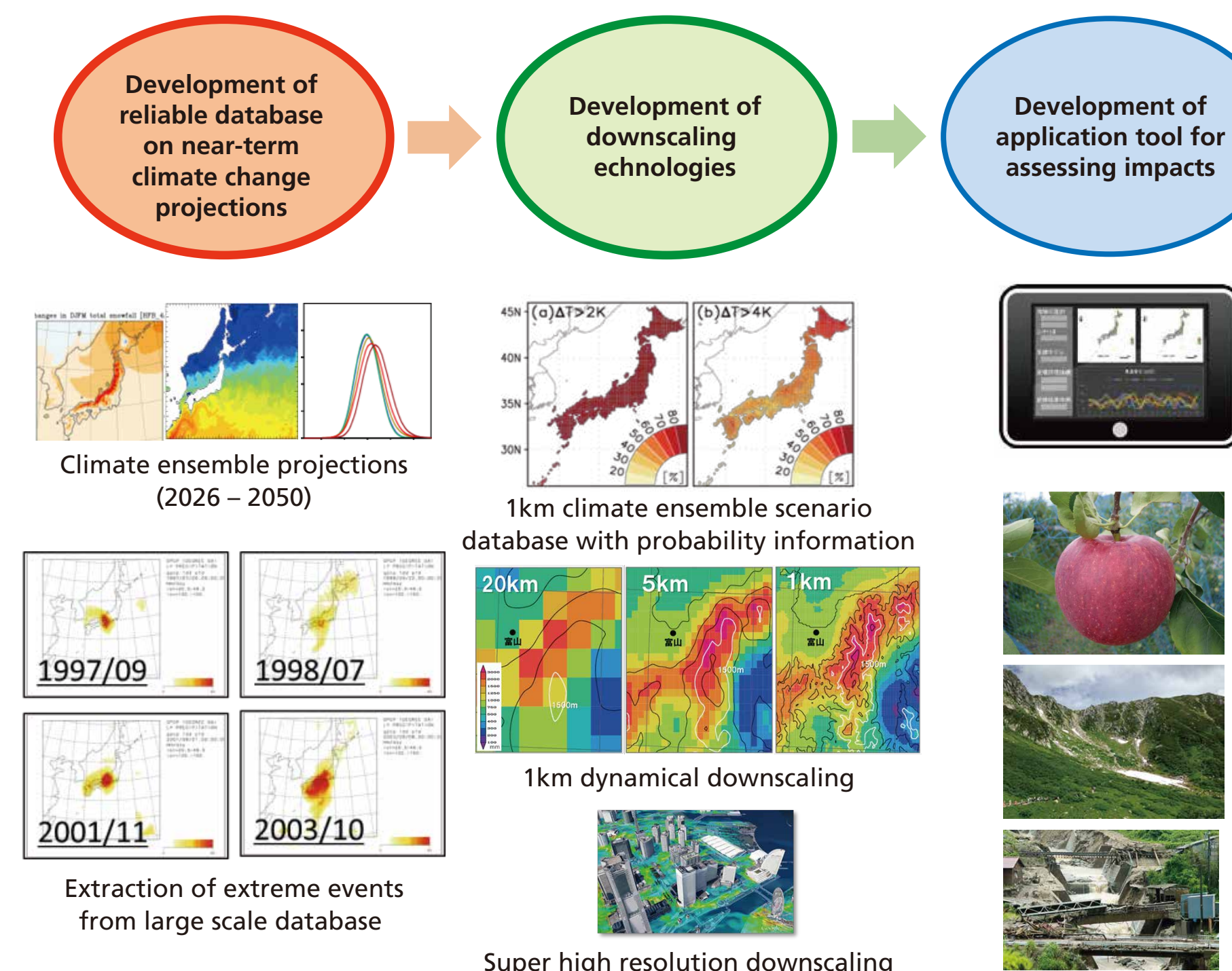
## SI-CAT The Social Implementation Program on Climate Change Adaptation Technology



### SI-CAT Framework



### SI-CAT Technology Development Organizations

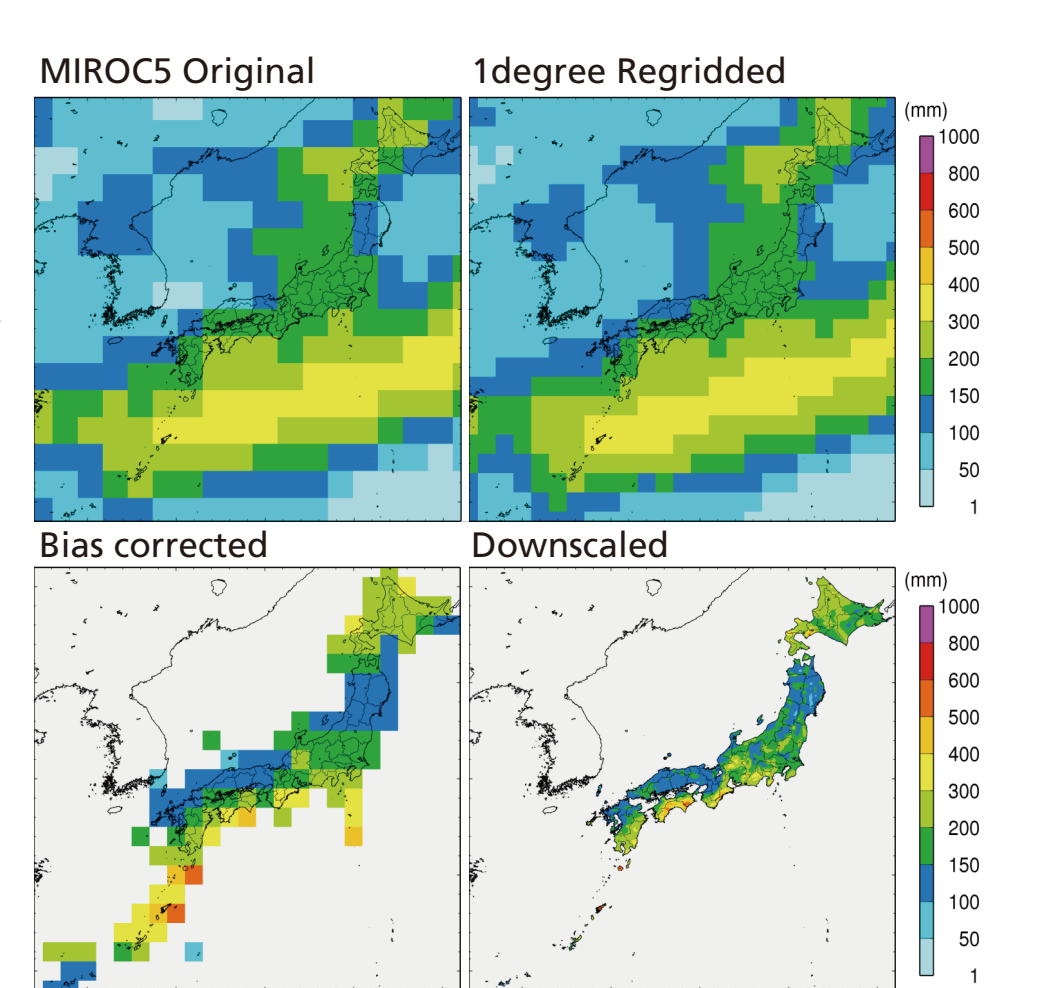


### Hi-resolution multi-ensemble statistical downscaling regional climate scenarios

Multi-model ensemble regional climate scenarios with 1km horizontal grid-spacing over Japan are developed by using CMIP5 GCMs and a statistical downscalings (e.g., Bias Corrected Spatial Disaggregation (BCSD)) to investigate uncertainty of projected change associated with structural differences of the GCMs for the periods of historical climate (1950-2005) and near term climate (2026-2050).

#### ESD Output Sample

(BCSD, Wood et al. 2002, Wood et al. 2004, Maurer et al. 2008)



### A Case of Model Municipalities (GIFU)

Need to adapt climate change impacts and social structure change

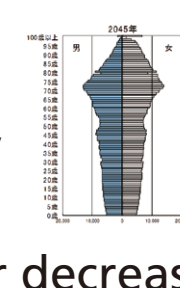
#### Risk of Climate change

ex) Nagara river basin: Big Population (860,000)  
Weak flood control  
High risk of flood and draught



#### Social Structure Change

- Population : decrease and aging rapidly
- Local community: shrink and weaken
- Local economy: tax payer and consumer decrease



#### Local adaptation scenarios (Who should do what for future)

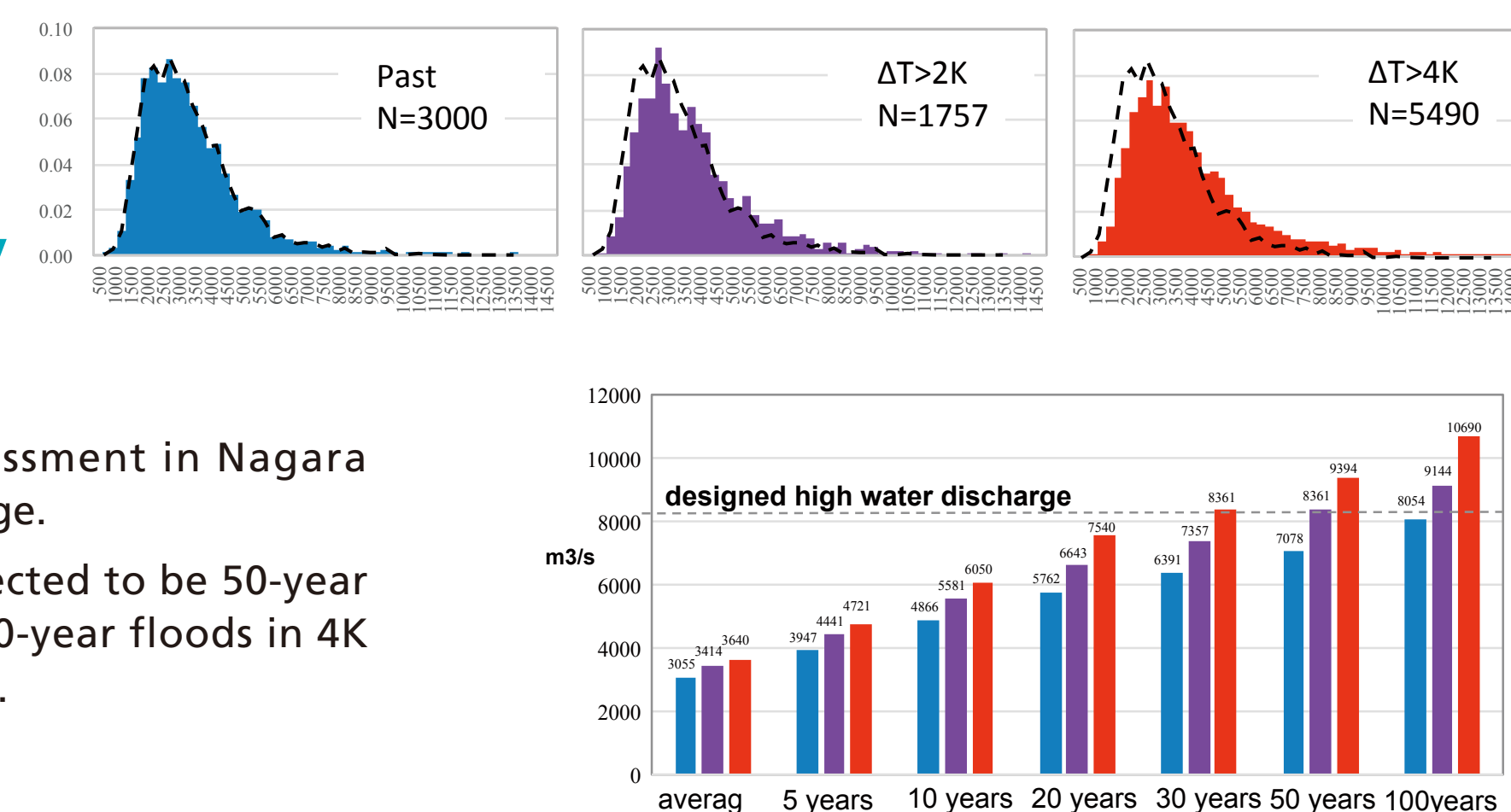
- SI-CAT Technological Development Organization
  - Near term hi-resolution climate change projections
  - Impact assessments
- SI-CAT Social Implementation Organization
  - Stakeholder analysis
  - Social adaptation scenarios based on social structure changes

#### SI-CAT: model municipality [Gifu Univ. + Gifu Pref.]

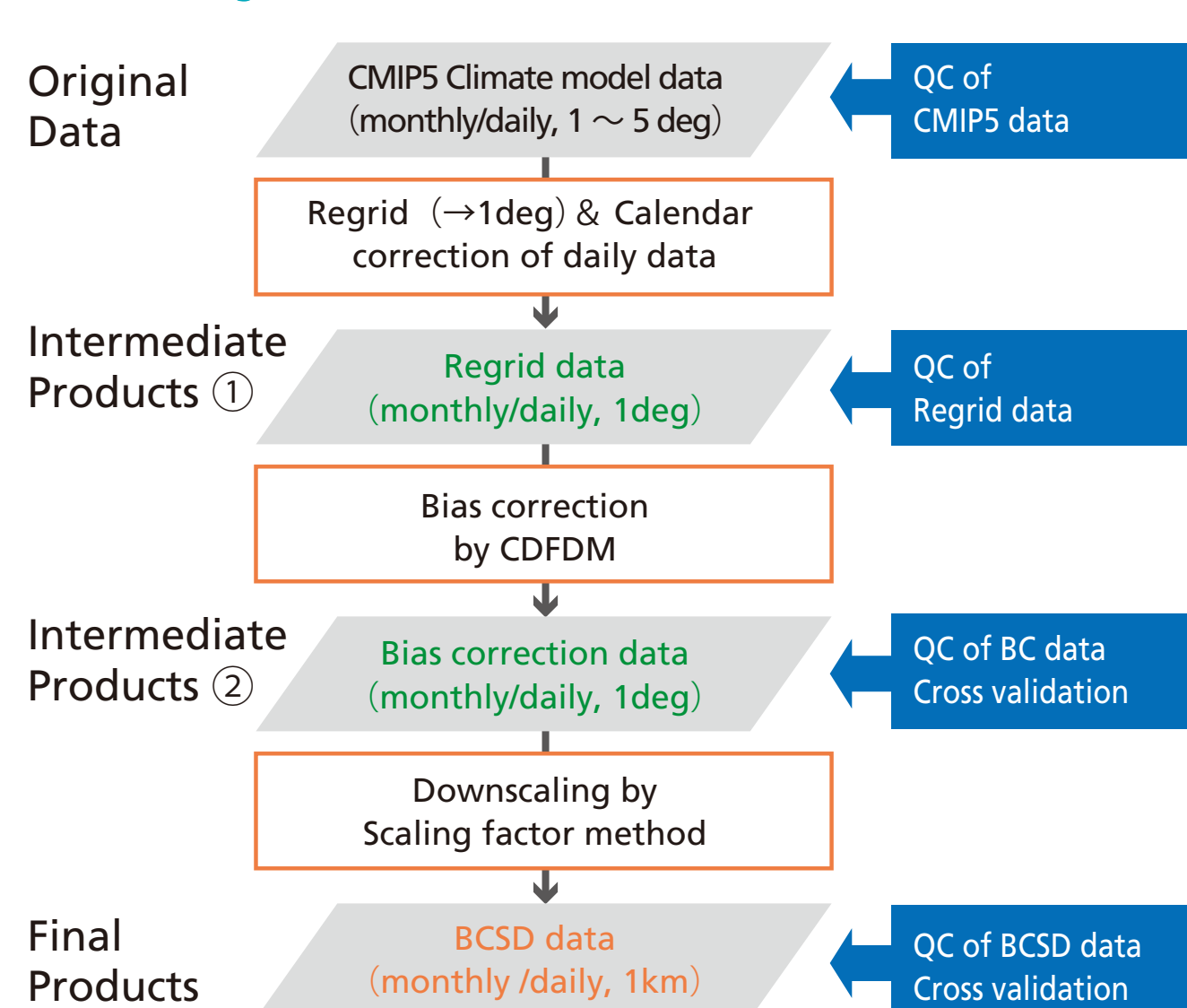
- Risk assessment of flood and landslide in Nagara river basin
  - Flood discharge projection based on ensemble climate change projection database
  - Comprehensive flood control
  - Risk assessment of landslides
- Consideration of adaptation scenario (based on risk assessment (Hazards and social changes))
  - Stakeholder meetings
  - Co-design of local adaptation scenarios by stakeholders

#### Examples of prediction of flood probability in Nagara basin

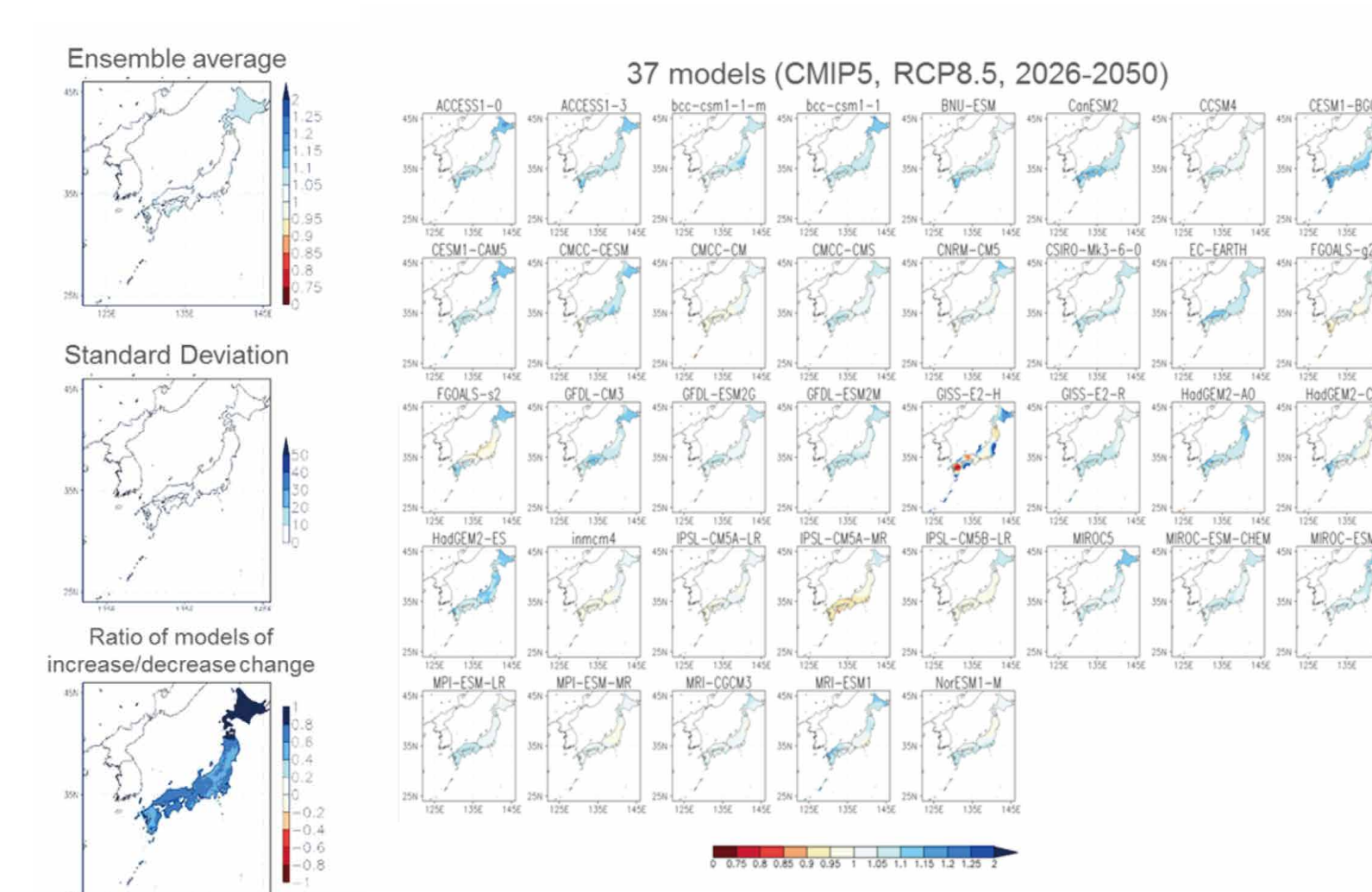
- Quantitative flood assessment in Nagara basin under climate change.
- 100-year floods are projected to be 50-year floods in 2030, and be 30-year floods in 4K global warming scenarios.



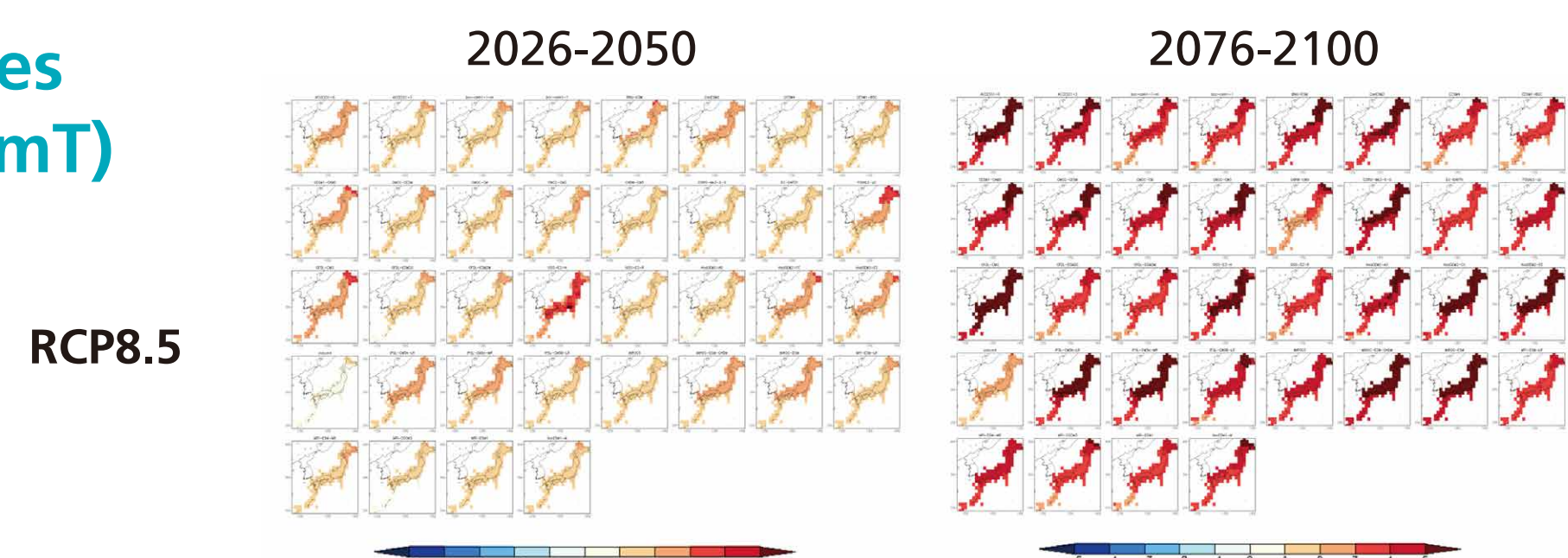
#### Data Processing and Quality Check



#### Projected future change of annual precipitation(pr, Daily)



#### Projected changes (Annual mean 2mT)



#### Stakeholder Collaboration to develop a product to meet the needs



## CORDEX Asia Empirical-Statistical downscaling (ESD)

### CORDEX Asia- ESD group



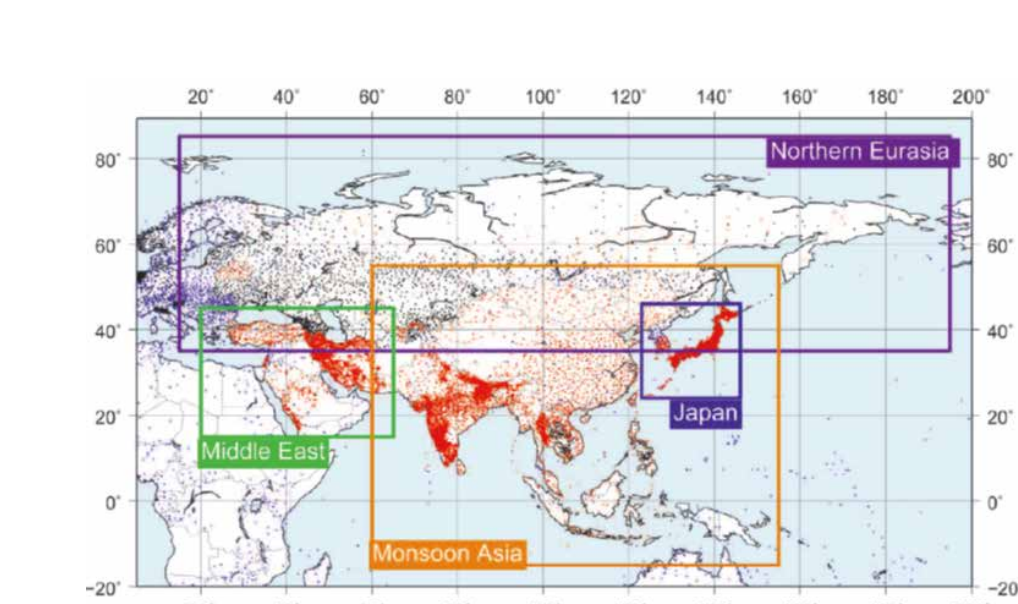
- Integrating the science and application of downscaling activities in Asia (EA, SEA, SA etc.) to provide regional climate information and service for risk assessment and IPCC AR6.

- Case studies of inter-comparison of multi-ESD methods in small domain and a common benchmark for investigating uncertainty of regional climate scenarios.

#### CORDEX Asia- ESD group Related Meetings

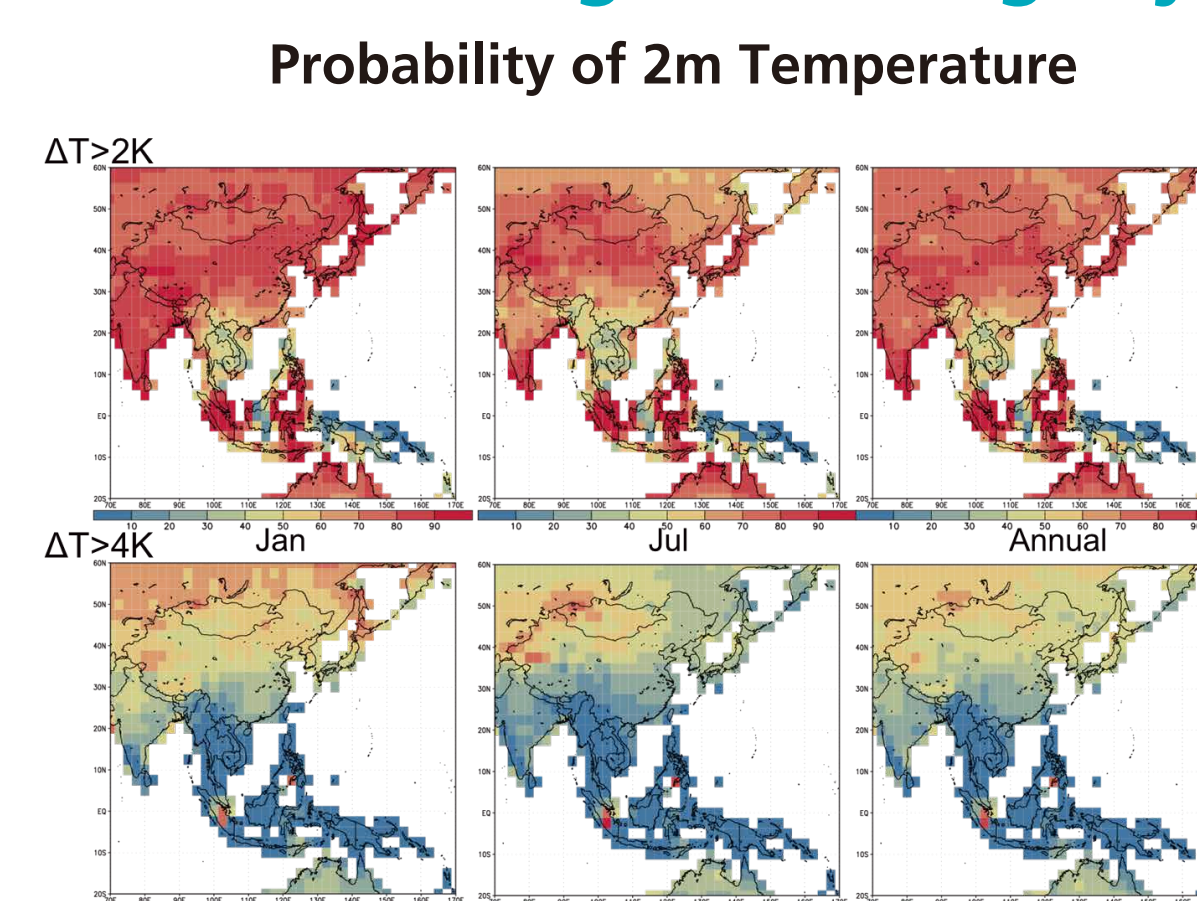
- The 4th CORDEX Science and Training workshop in East Asia, 23-26 Nov 2015, Beijing
- The 2nd ESGF training workshop, 23-25 Feb 2016, Jeju
- 4th Workshop of the Southeast Asia Regional Climate Downscaling (SEACID)/ CORDEX Southeast Asia Project & Discussion on the Formation ESD Group in CORDEX Asia, 23-25 Nov 2016, Hanoi
- UNFCCC(SBSTA46) Research Dialogue(RD9), 10 May 2017, Bonn
- International Workshop on Climate Downscaling Studies, 2-4 Oct 2017, Tsukuba
- 2017 TCCIP International Workshop: (I) Statistical Approach to Climate Change Studies, 28-29 Nov 2017, Taipei

### Possible common protocol for Pan-Asia ESD



ESD for Pan-Asia with 0.25 degree  
Rain gauge distribution for APHRO\_V1101 (year: 1998)

### Contribution to the report of MOFA for G7 Working Group on Climate Change and Fragility



Contributed to the report by the Ministry of Foreign Affairs in Japan for G7 Working Group on Climate Change and Fragility

(Sep 6th 2017 press release)  
[http://www.mofa.go.jp/oc/ch/page25e\\_000149.html](http://www.mofa.go.jp/oc/ch/page25e_000149.html)

### Summary

To meet with the needs of stakeholders such as National/local governments, spatio-temporal comprehensive and consistent information is necessary and useful for decision making to adapt climate change impacts.

#### Co-Design of adaptation measures by stakeholders

SI-CAT has been developing reliable technologies to find climate change adaptation measures in collaboration with natural/ social scientists and local government.

#### Regional Climate Scenario (Near-term, 1km grid, with Uncertainty Information)

We develop a large number of multi-model ensemble near-term (2026-2050) regional climate scenarios with 1km horizontal grid-spacing over Japan by dynamical and statistical downscaling methods.

#### Share the Data, Knowledge, and Techniques

Based on the SI-CAT experiences, the CORDEX Asia ESD group enhances and integrates the science and application of downscaling activities in Asia by sharing and exchanging data, knowledge, and techniques.

Acknowledgements: This study was supported by the SOUSEI Program and SI-CAT Program of the Ministry of Education, Culture, Sports, Science, and Technology of Japan (MEXT).