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



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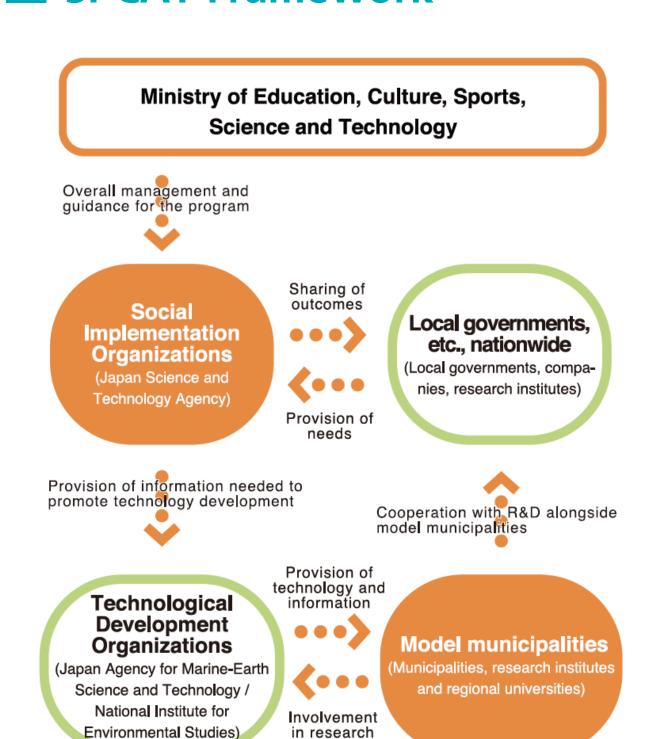
National Research Institute for Earth Science and Disaster Resilience, Japan



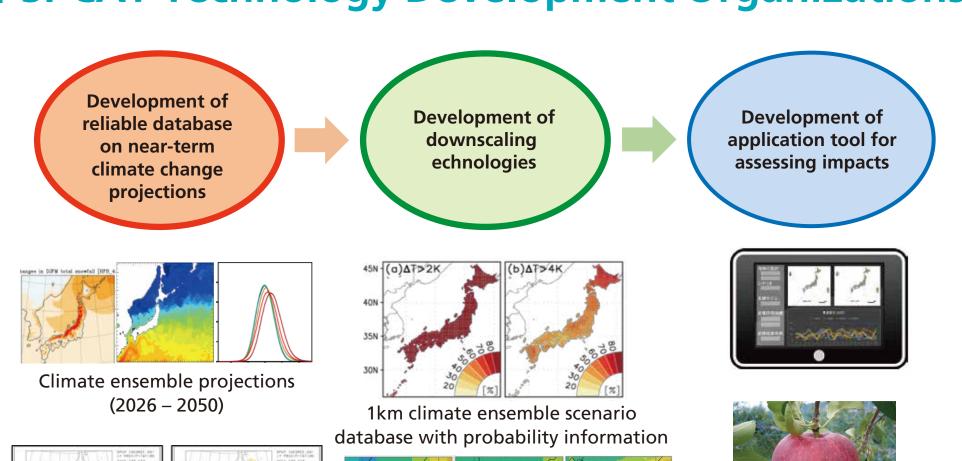
The Social Implementation Program on Climate Change Adaptation Technology



SI-CAT Framework



SI-CAT Technology Development Organizations



1km dynamical downscaling

Super high resolution downscaling

Data



Climate Change Adaptation Bill

National Plan for Adaptation to the Impacts of Climate Change

Ministry of Environment Climate change Adaptation Regional Consortium

Ministry of Ministry of Agriculture, Forestry and Fisheries of Japan

Ministry of Land, Infrastructure, Transport and Tourism (Hokkaido Regional Development Bureau)

Integrated Research Program for Advancing



Climate Models (TOUGOU)



Data Integration and Analysis System Program (DIAS)



Hi-resolution multi-ensemble statistical downscaling regional climate scenarios

1997/09

2001/11

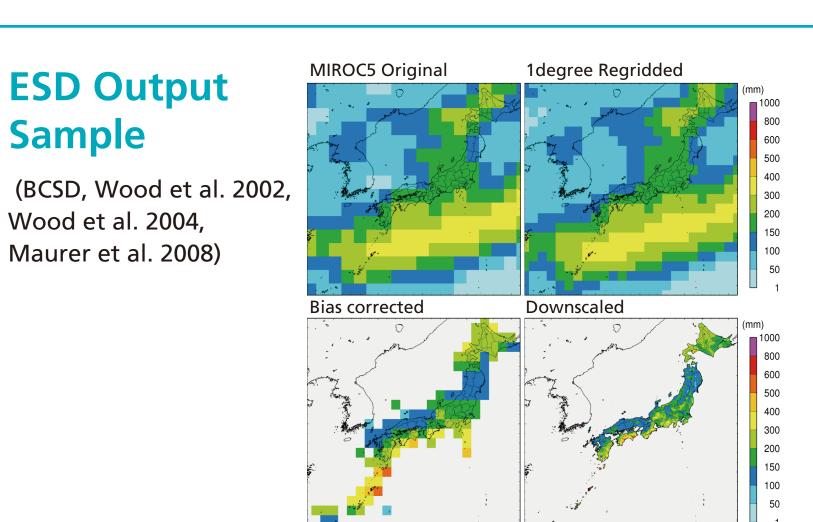
1998/07

2003/10

Extraction of extreme events

from large scale database

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).



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

based on social structure

changes

SI-CAT Social Implementation Organization Stakeholder analysis

Social adaptation scenarios

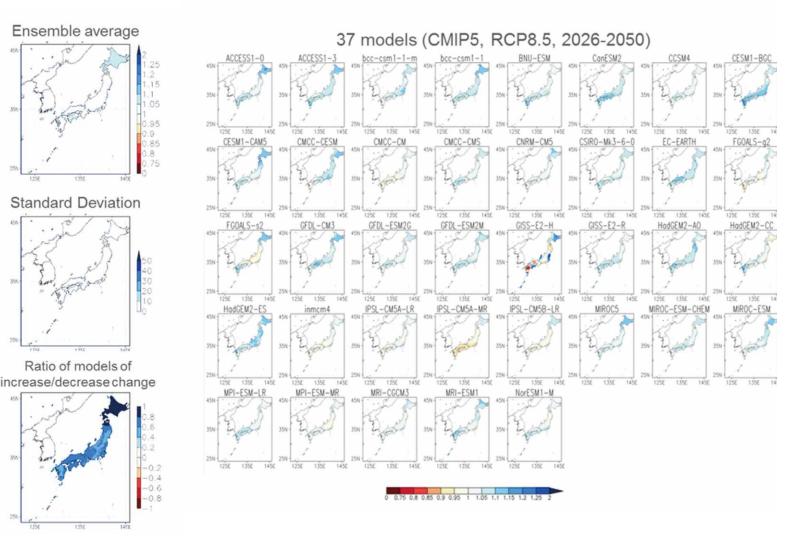
SI-CAT: model municipality [Gifu Univ. + Gifu Pref.] Risk assessment of flood and landslide

- 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

Quality Check QC of CMIP5 Climate model data Original CMIP5 data (monthly/daily, $1 \sim 5 \text{ deg}$) Data Regrid $(\rightarrow 1 \text{deg}) \& \text{Calendar}$ correction of daily data Intermediate QC of Regrid data Products 1 Regrid data (monthly/daily, 1deg) Bias correction by CDFDM Intermediate QC of BC data Bias correction data Products 2 Cross validation (monthly/daily, 1deg) Downscaling by Scaling factor method Final **BCSD** data QC of BCSD data

(monthly /daily, 1km)

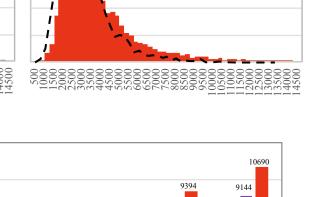
Projected future change of annual precipitation(pr, Daily)



Examples of prediction of flood probability in Nagara basin

N=3000

ΔT>2K N=1757



∆T>4K

N=5490

- 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.

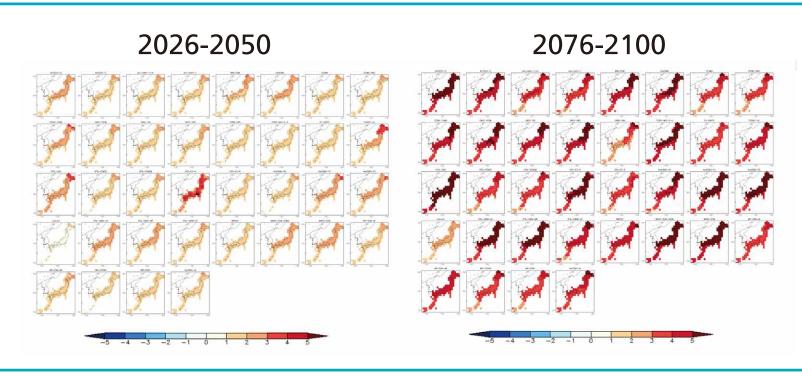
designed high water discharge

Projected changes (Annual mean 2mT)

Products

Data Processing and

RCP8.5



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

Climate Data Processing

SI-CAT Climate Scenario WG

local governments

Private Companies

Scientists



Climate Information

PRODUCT 1km ensemble climate scenario database









CORDEX Asia Empirical-Statistical downscaling (ESD)

CORDEX Asia- ESD group

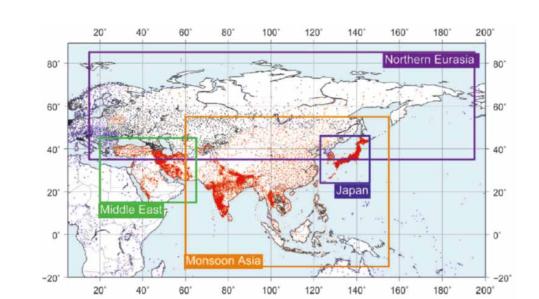


• Integrating the science and application of downscaling activities in Asia (EA, SEA, SA etc.) to provide regional climate information and service for risk assessment and IPCC AR6.

Cross validation

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

Possible common protocol for Pan-Asia ESD



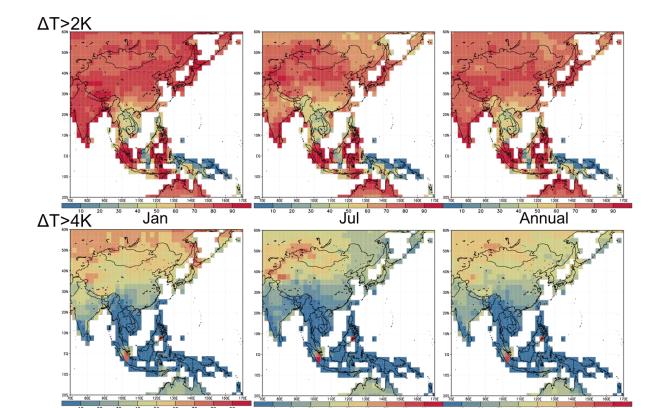
ESD for Pan-Asia with 0.25 degree Rain gauge distribution for APHRO_V1101 (year: 1998)

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 (SEACLID)/ 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

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

Probability of 2m Temperature



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/ic/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.

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