CARE FOR SEA MEGACITIES
Climatic hazard Assessment to enhance Resilience against climate Extremes for Southeast Asian megacities

WORKSHOP CO-SPONSORS:

Summary Report of the CARE for SEA megacities: Inception workshop and stakeholder consultation

The Berkeley Hotel Pratunam, Bangkok, Thailand
22-24 November 2023

The "Climatic hazard Assessment to enhance Resilience against climate Extremes for Southeast Asian megacities (CARE for SEA megacities)" project is the latest activity under the Southeast Asia Regional Climate Downscaling / Coordinated Regional Climate Downscaling Experiment Southeast Asia (SEACLID / CORDEX-SEA) collaboration. Funded by the Asia-Pacific Network for Global Change Research (APN), this three-year project started in October 2023, and aims to generate city-scale climate hazard information for SEA megacities (Bangkok, Hanoi, Jakarta, Kuala Lumpur, and Manila) under multiple SSP scenarios that will be relevant and useful for policy-making to enhance urban resilience in a globally warmer future.

The three-day inception workshop and stakeholder consultation was held in The Berkeley Hotel Pratunam, Bangkok, Thailand last 22-24 November 2023. With support from APN, WCRP CORDEX and the National Research Council of Thailand, the workshop was hosted by Ramkhamhaeng University (Thailand), with Manila Observatory (Philippines) and Universiti Kebangsaan Malaysia (Malaysia) as co-organizers.

The workshop aimed:

1. To launch the "Climatic hazard Assessment to enhance Resilience against climate Extremes for Southeast Asian megacities (CARE for SEA megacities)" project;
2. To coordinate and discuss updates on the empirical statistical downscaling (ESD) and dynamical downscaling activities of CORDEX Southeast Asia and partners, particularly initiatives that will support CARE for SEA megacities;
3. To explore collaboration with other WCRP activities, particularly the My Climate Risk Lighthouse activity;
4. To identify priority climate hazards in the selected SEA megacities through consultation with local policymakers; and
5. To provide a platform for engagement between climate scientists and researchers, and policymakers

There were 66 in-person and 12 online participants composed of CARE for SEA megacities collaborators and SEACLID/CORDEX-SEA members, partner local policymakers and stakeholders

from each of the SEA megacities, WCRP My Climate Risk colleagues and other participants who are interested in the CORDEX-SEA project.

The three-day inception workshop has eight sessions, with three keynote speeches and 41 presentations in total:

- Session 1: Opening ceremony
- Session 2: Empirical statistical downscaling initiatives in Southeast Asia
- Session 3: Dynamical downscaling activities in Southeast Asia
- Session 4: Urban climate risk: A special session with WCRP My Climate Risk
- Session 5: Climate change scenario in SEA megacities
- Session 6: Climate change impacts, adaptation and planning in SEA megacities
- Session 7: Review of city-scale downscaling methodologies
- Session 8: Discussion on priority climate hazards per SEA megacity

In the opening ceremony session, Dr. Jerasorn Santisirisomboon of RU-CORE gave the welcoming remarks and Dr. Faye Abigail Cruz, project leader of CARE for SEA megacities, gave the opening remarks and agenda setting. Keynote speeches were delivered by Dr. Monthip Sriratana Tabucanon, Senior Adviser of National Research Council of Thailand, who emphasized the different APN goals and highlighted the importance of partnerships to achieve the sustainable development goals, and Prof. Fredolin Tangang, CORDEX-SEA coordinator and CORDEX SAT member, on the progress of CORDEX-SEA after a decade, discussing the group's achievements in contributing to the scientific understanding of regional climate change and providing regional climate change information for stakeholders in Southeast Asia. Dr. Iréne Lake, Director of the International Project Office for CORDEX, delivered her keynote address in the afternoon session, and shared updates on CORDEX and highlights from the ICRC-CORDEX 2023 and WCRP Open Science Conference.

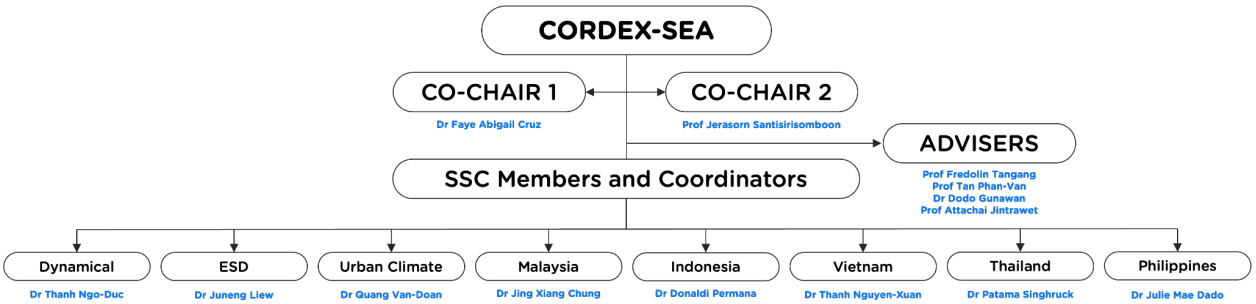
The sessions during the first day (November 22, 2023) showcased research works on empirical statistical downscaling (ESD) and dynamical downscaling in Southeast Asia, including the advantages and challenges of using each method for the region. ESD showed skill in improving climate simulations in the region, but biases can still persist. Downscaling using AI and RCM emulators can be the future of climate downscaling, however more research is still needed. For dynamical downscaling, convective permitting models are expected to improve extreme events simulations and reduce the model spread but the key challenge is the standardization of RCMs, i.e., coupling interfaces, documentation, simulation protocols, best practices, etc. The combination of dynamical and statistical downscaling can be an approach for studying city scale climate change. CORDEX-SEA members also presented research updates on their regional climate downscaling initiative with dynamical downscaling models such as the selection and

standardization of model parameters in preparation for the CMIP6 downscaling for Southeast Asia, as well as updates and outlook on the status of CMIP6 downscaling activities.

The second day (November 23, 2023) started with a continuation of the session on dynamical downscaling activities in Southeast Asia, followed by a special session with WCRP My Climate Risk (MCR). Colleagues from the Meteorological Research Institute (MRI), UK Met Office (UKMO), University of New South Wales Climate Change Research Centre (UNSW CCRC) and Centre for Climate Research Singapore (CCRS) shared their downscaling research activities, which are relevant for the CARE for SEA activities. Speakers during the urban climate risk session with WCRP MCR introduced the MCR community and shared their research work. This session also highlighted the importance of collaboration between climate scientists, social scientists, policymakers, stakeholders and communities to produce better localized adaptation and mitigation plans.

Updates on downscaling for CMIP6 for each country were also discussed including the ranking of models, domain settings, potential usage of newer RegCM version (RegCM version 5, RegCM5), and data sharing. The community has decided that a total of 10 GCMs will be downscaled using RegCM4-NH, with priority placed on downscaling the historical period and SSP3-7.0. To date, the community has completed the downscaling of historical period for the 6 out of 10 GCMs planned, 1 GCM for SSP3-7.0, and 2 GCMs for SSP2-4.5, SSP1-2.6 and SSP5-8.5. In addition to the downscaling of GCMs using RegCM4-NH, the community will also downscale 3 GCMs using the model CCAM in the near future, focusing on downscaling the historical period and SSP3-7.0.

After these sessions, a discussion on the proposed CORDEX-SEA internal structure was facilitated by Prof. Tangang, which was subsequently adopted by the group. The approved internal structure and elected CORDEX-SEA Co-chairs, Advisers and Scientific Steering Group members are shown in the figure below. Furthermore, the group happily welcomed new collaborators to CORDEX-SEA: UKMO, UNSW CCRC, CCRS and the Brunei Darussalam Meteorological Department.



Approved CORDEX-SEA internal structure

The last day of the workshop (November 24, 2023) focused on the climate change scenarios, impacts, adaptation and planning in SEA megacities. All megacities (Jakarta, Kuala Lumpur, Metro Manila, Bangkok, Hanoi) have experienced rapid urbanization and are impacted by climate change such as warmer temperature, lower precipitation, and intensified extreme events. All megacities presented different action plans being done or plans to lessen the contribution of their city to carbon emissions and to increase resilience for the impending impacts of climate change. This session also highlighted the need for collaboration between the stakeholders and CARE for SEA megacities project to share better information with each other.

The last session of the workshop was a breakout group discussion where each city was tasked to identify priority hazards, and discuss considerations in planning for their cities (e.g. time horizons). The identified priority hazard/s for each city are listed below:

- **Jakarta:** Flood, sea level rise, urban heat island, air quality, drought
- **Kuala Lumpur:** Flash flood, rainfall-induced landslides, extreme heat, thunderstorms/wind
- **Metro Manila:** Typhoon, heavy rainfall, drought, heatwave
- **Bangkok:** Heat, flood (river flooding, compound flooding/coastal inundation)
- **Hanoi:** Heavy rainfall, heatwaves and heat stress, cold surge, tropical cyclones

At the end of the session, experiment design for the project was discussed but due to time constraints further details on experiment design, protocols, data sharing, expectation setting on timeline will be discussed in a separate meeting.

Participants of the CARE for SEA megacities: Inception workshop and stakeholder consultation, Bangkok, Thailand, 22-24 November 2023

CARE FOR SEA MEGACITIES

Climatic hazard Assessment to enhance Resilience against climate Extremes for Southeast Asian megacities

WORKSHOP CO-SPONSORS:

Discussion session for each city (Jakarta, Metro Manila, Bangkok, Kuala Lumpur and Hanoi) in the CARE for SEA megacities: Inception workshop and stakeholder consultation

CARE FOR SEA MEGACITIES

Climatic hazard Assessment to enhance Resilience against climate Extremes for Southeast Asian megacities

CORDEX-SEA Co-Chairs, Scientific Steering Group and Advisers

CORDEX-SEA members