

## Summary Report of the CARE for SEA megacities: Training workshop Perdana KLCC, Kuala Lumpur, Malaysia 14-16 May 2024

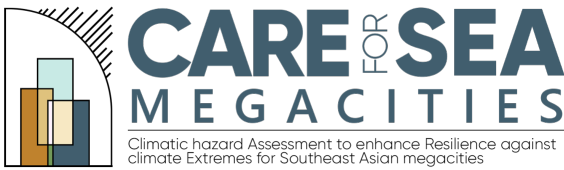
The “Climatic hazard Assessment to enhance Resilience against climate Extremes for Southeast Asian megacities (CARE for SEA megacities)” project is the latest activity under the Southeast Asia Regional Climate Downscaling / Coordinated Regional Climate Downscaling Experiment Southeast Asia (SEACLID / CORDEX-SEA) collaboration. Started in October 2023, this three-year project is funded by the Asia-Pacific Network for Global Change Research (APN). CARE for SEA megacities 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.

Following the inception workshop and stakeholder consultation in Bangkok, Thailand last November 2023, a three-day training workshop on empirical statistical downscaling (ESD) and urban climate downscaling was held in Kuala Lumpur, Malaysia on 14-16 May 2024. With support from APN and WCRP CORDEX, the workshop was hosted by Universiti Kebangsaan Malaysia (Malaysia), with Manila Observatory (Philippines) as co-organizer.

The workshop aimed:

1. To introduce city-scale urban modeling approaches, including empirical statistical downscaling (ESD), Land Surface Physics-Based Downscaling (LSP-DS), and Weather Research and Forecast-Urban (WRF-Urban);
2. To build capacity of CARE for SEA megacities research team in applying different downscaling methods, in preparation for generating city-scale climate change projections for SEA megacities; and
3. To discuss city-scale resolution downscaling framework for SEA, including protocol for ESD simulations, specifically for CORDEX-SEA.

This in-person training workshop has both lecture and hands-on sessions on ESD, Land Surface Physics-Based Downscaling (LSP-DS) and urban modeling, which will be used in generating city-scale climate hazard information for the CARE for SEA megacities project. The training workshop was primarily for members of the CARE for SEA megacities project team, who will be conducting the urban downscaling simulations.



The session during the first day (May 14, 2024) has three lectures on ESD. In the first lecture, Assoc. Prof. Dr. Juneng Liew discussed a brief introduction of ESD—including the advantages and issues of using the ESD approach—and showcased two methods (BiasAdjustCXX by Benjamin Thomas Schwertfeger and pyClim-SDM by Spanish Meteorological Agency (AEMET), Hernanz et al. 2023) for the hands-on session. For the second lecture, Prof. Shamsuddin Shahid discussed the different ESD methods that are being used to study the future climate. Lastly, Dr. Rasmus Benestad introduced the new “Norwegian” approach in downscaling, which is a hybrid approach that involves a combination of both RCMs and ESD, and uses nine levels of evaluation for ensuring reliability of the results. At the end of the session, questions such as what ESD methods should be used for the CARE for SEA project and what appropriate validation metrics should be used for ESD were raised.

The second day (May 15, 2024) started with Prof. Dr. Fei Chen’s lecture on Noah-MP land/hydrology community model. Topics discussed include the model’s development and improvements throughout the years, the different applications of the model—from uncoupled land surface hydrometeorological process studies to coupled numerical weather prediction and decadal regional climate studies—and its ability to capture extreme precipitation events based on the paper of Rasmussen et al. (2023). It was followed by a lecture on the LSP-DS approach and a hands-on tutorial of the High-Resolution Land Data Assimilation System (HRLDAS) given by Assoc. Prof. Dr. Doan Quang Van.

The last day of the workshop (May 16, 2024) was focused on discussions to coordinate the downscaling activities of CORDEX-SEA, and the next steps for the CARE for SEA project. Updates on the status of the CMIP6 downscaling runs were discussed, as well as considerations for data storage, and data sharing for the analysis and eventual dissemination to stakeholders. The experiment design for the city-scale resolution downscaling for SEA and targets for the coming months were also thoroughly discussed in this session.



**Participants of the CARE for SEA megacities: Training workshop, Perdana KLCC, Kuala Lumpur, Malaysia, 14-16 May 2024**

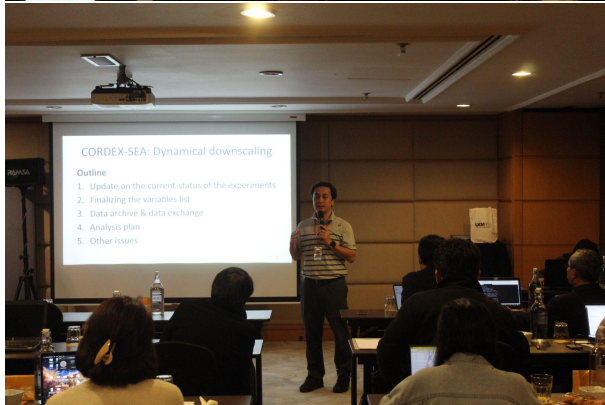


**Lectures, hands-on, and discussion sessions during the three-day CARE for SEA megacities: Training workshop**



# CARE FOR SEA MEGACITIES

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



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