



Building synergies in regional climate services for Southeast Asia: The ASEAN Regional Climate Data, Analysis and Projections (ARCDAP) workshop series

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Acknowledgements: Elaine Gao, Lim Li-Sha, All ARCDAP workshop participants



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Background

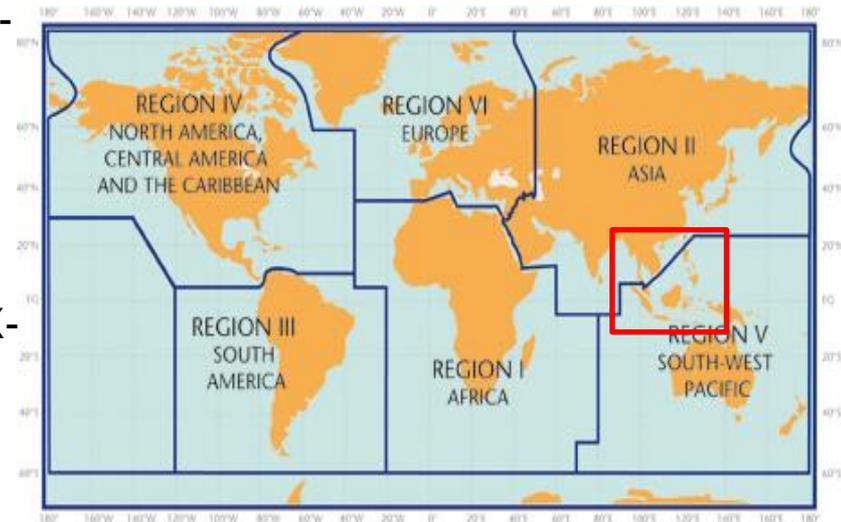


ASEAN – Association of Southeast AsiAn Nations

- Ten countries in two WMO-regions (II & V):
 - Cambodia, Lao PDR, Myanmar, Thailand, and Viet Nam
 - Brunei Darussalam, Indonesia, Malaysia, Philippines and Singapore

Rapidly developing densely populated region: **Vulnerable to climate**

- Established Regional Climate Centre (RCC)-network for SEA (climate services across time-scales)
- Increased production of Climate Change information (too little to too much)
- National Meteorological and Hydrological Services (NMHSs) (top-down national projections) & Academia (bottom-up CORDEX-SEA)
- Burgeoning VIA community
- Large undertaking → straining limited resources



WMO Regions (source: https://www.wmo.int/pages/prog/dra/regional_offices.php)

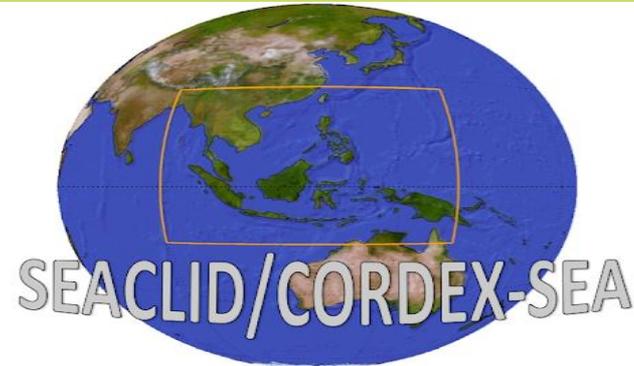
Background

Previous/existing initiatives to coordinate regional climate change projections



Southeast Asia Climate Analysis and Modelling (SEACAM), 2011-2014

- Initiated and funded in 2011 by Singapore with technical support from UK Met Office Hadley Centre
- Enhance regional scientific cooperation and increase scientific capacity among climate researchers



Coordinated Regional Climate Downscaling Experiment-Southeast Asia (CORDEX-SEA), 2013-

- Collaborative project in regional climate downscaling with collaborators from various countries within Southeast Asia
- Streamlined and integrated into the World Climate Research Programme (WCRP) CORDEX experiment

Motivation

- In the last decade, most countries in the region have developed their own climate change projections to support their respective national adaptation plans.
- Prior to the first workshop (Mar 2018), no attempt had been made to **compare and contrast** the various supranational (e.g. CORDEX-SEA) and national studies despite them sharing a number of commonalities.
- Numerous uncertainties and challenges are associated with downscaling global climate projections to the national level.
- Various methods exist to communicate these uncertainties to end-users and a set of **regional best practices** on how to represent them has not been comprehensively developed.
- Some countries still lack the capability to **independently** produce **robust future climate information**.

[Click to view!](#)



Singapore 2nd National Climate Change Study – Phase 1

Executive Summary

November 2014

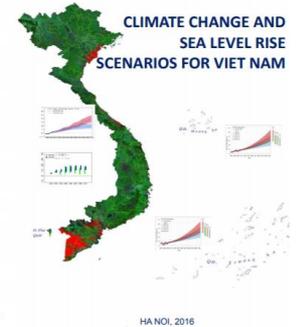
Authors: Charline Marzin¹, Adrian Hines¹, James Murphy¹, Chris Gordon¹, Richard Jones¹

Met Office internal reviewer: Julia Slingo

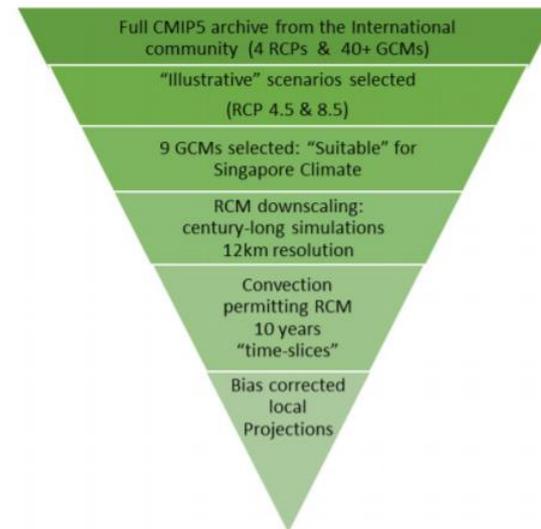
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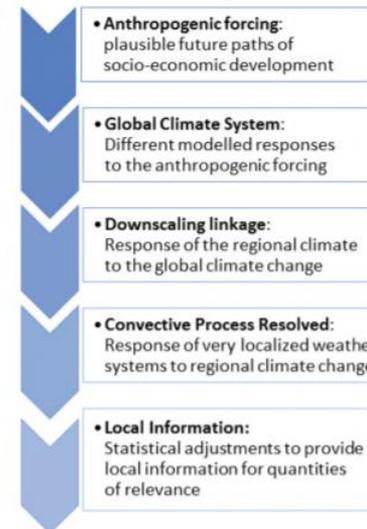
MINISTRY OF NATURAL RESOURCES AND ENVIRONMENT



Numerical Modelling tools



Uncertainties considered



Schematic illustrating the modelling tools relied upon to deliver typical national climate change projections (left) and the uncertainties considered (right) as finer numerical modelling tools are relied upon (source: “Generating Climate Change Rainfall Scenarios for Singapore; A Tale of Scale”, Hassim et al., COSMOS Research Highlights, 2017).

Motivation

Following a proposal from the World Meteorological Organisation (WMO) Regional Association (RA) V working group on climate services, the ASEAN Regional Climate Data, Analysis and Projections (ARCDAP) workshop series was conceived in 2017 to bridge gaps in regional synergies.

ARCDAP's organising and supporting organisations:



ARCDAP-1

Originally called “Best Practice Workshop on Climate Change Projections and their Applications in ASEAN Countries”, 20 – 23 March 2018, Singapore



Objectives

1. Compare and contrast the (regional/national) studies for the region
2. Recommend guidelines for best practices in the generation of scenarios
3. Scoping activity of Climate Projections Function in SEA RCC-Network

Participants

- IPCC Secretary, regional NMHSs, CORDEX-SEA Chairs and other regional/local university researchers, international: CSIRO & BoM (Australia), UK Met Office
- AHA Centre (disaster risk), ICRISAT (agriculture), Global Water Partnership-SEA & Mekong River Commission (water resources), RIMES, Pacific-Australia CCSAP (community engagers), national decision-makers

ARCDAP-1

Workshop sessions

1. National Projections and Regional Initiatives

(NMHSs/Research Institutes)

2. Regional scientific issues

(ENSO, Monsoon, Sea Level Rise, Diurnal cycle of Convection)



3. End-user perspectives of climate information

(Requirements, adaptation planning, resilience)

4. Group Discussions

(Science & applications, best practice guidelines)
"Do we have consensus on key emerging issues?"



ARCDAP-1

Challenges identified

1. National projections & regional initiatives

- Diversity of approaches
- Limited communication of scenario and other uncertainties



- Need to standardize GCM selection/downscaling
- Wider ranging experiments to further encompass contrasting projections.

2. Regional scientific issues

- Incomplete understanding of key drivers (e.g. ENSO, monsoons under CC)
- Lack of understanding of the sensitivities of regional projections to model formulation



- More studies on regional-specific effects
- Regional model intercomparison/process studies

3. End-user perspectives of climate information

- Institutions tasked with handling climate information are not well equipped
- Growing number of regional platforms for climate-based information sharing upstream producers are not aware of



- Climate scientists to focus on developing and training of models/indices with more practical applications
- Consolidate communications platform into a centralised regional entity

4. Bridging science and applications

- Regional coordination effort in promoting end user engagement through developing a framework
- Demonstration projects for bridging science and applications
- Innovative communication tools (well designed websites/education materials) to propagate climate information

[Read more in the workshop summary + full report](#)



ARCDAP-2

25 – 29 March 2019, Singapore

Objectives

1. Train participants in the use of ClimPACT2 and in doing so improve sector-relevant extreme indices
2. Improve and standardise regional understanding of gridded products available
3. Assess the representation of regionally-relevant large-scale processes in gridded products
4. Improve estimates and model assessments of climate change mean, variability, and extremes
5. Encourage data sharing, so as to build a regional community of data and knowledge



Participants

- Regional NMHSs, regional/local university researchers: National University of Singapore & Singapore Management University, international universities/institutes: CIMH, ECMWF, NOAA, UNSW
- Hydro-Informatics Institute (water resources, disaster risk), Mekong River Commission (water resources)

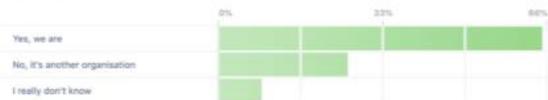
ARCDAP-2

Workshop sessions

1. ClimPACT2 and ET-SCI Indices

(Lectures led by experts followed by hands-on sessions with real station data; feedback on ClimPACT2)

Question 01 Is your organisation responsible for generating OFFICIAL climate projections for your country? (Mandatory)



Question 02 What gridded datasets do/did you use to analyse long-term rainfall climate trends/evaluate climate models?

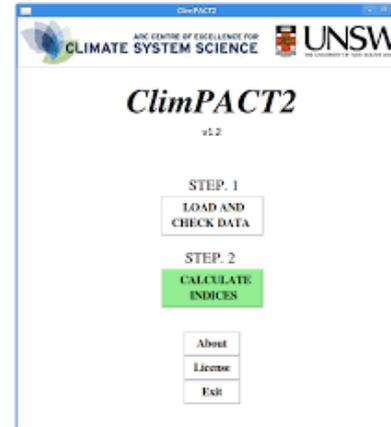
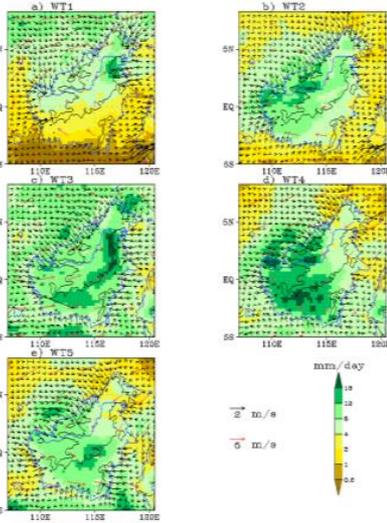
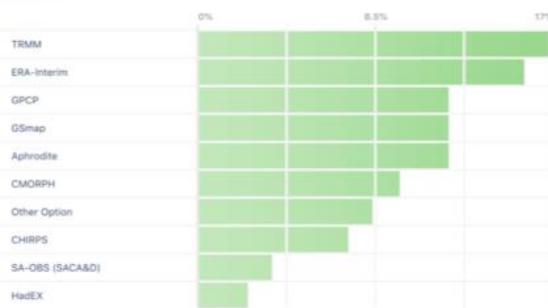


TABLE 2. Summary of significant trends across countries

Country	Station	Period	Variable	Trend
Brunei	Brunei International Airport	1980 – 2018	TMm	↑
			SPL-3	↑
Cambodia	Kampong Cham	1985 – 2015	TXx	↑
			TNn	↑
Lao PDR	Pakse	1971 – 2018	TXx	↑
			TNn	↑
Malaysia	Kota Bharu	1989 – 2018	R20mm	↑
Myanmar	Dawei	1971 – 2018	TXm	↑
			TX10p	↓
			SU	↑
			HWf-Tx90	↑
			HWn-EHF	↑
Mandalay	Mandalay	1972 – 2018	SPL-3	↑
			SPL-SPEI-6/12	↑

ClimPACT2 UI (source: "ClimPACT2 User Guide", Alexander and Herold, 2016).

2. Gridded Products

(Comparing their representation of large-scale processes, extreme indices and gathering participants' perspectives on them)

3. Data and knowledge sharing

(Regional cooperation and collaboration)

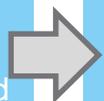


ARCDAP-2

Challenges identified

1. Station data and ET-SCI Indices

- Need for robust station datasets for the calculation of extreme indices and validation/ improvement of observational products
- Current literature on extreme indices lacks a sectoral and regional focus on Southeast Asia.



2. Gridded Products

- While reanalysis products capture circulation fields well, satellite products are still needed to capture precipitation and cloud cover.
- Important that countries continue to share knowledge pertaining to publicly available gridded products.



3. Recommendations for ClimPACT2 Software Improvement

- Facilitate comparison between stations and varying spatial scales.
- Relax strict missing data requirements in ClimPACT2 to enable the use of more datasets.
- Improve presentability of the in-house plots generated.

Recommendations

- NMHSs should continue to improve their observational networks and continue work on quality control and homogenisation.
- A peer-reviewed paper looking at the regional trends in the ET-SCI indices should be published.
- Each NMHS encouraged to contribute to the HadEX3 dataset → 61 stations' indices contributed to "Development of an updated global land in-situ-based dataset of temperature and precipitation extremes: HadEX3", Dunn et al., 2020 (submitted to JGR-A).

- Need for both products to be combined in climate process studies.
- Each NMHS encouraged to contribute to an upcoming publication evaluating and the latest gridded products available for the region.

[Read more in the workshop summary + full report](#)

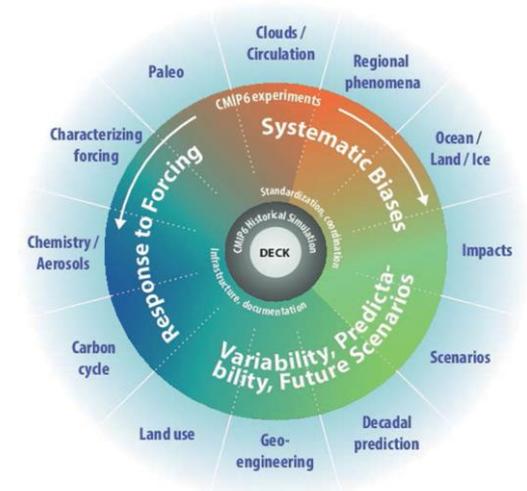


ARCDAP-3

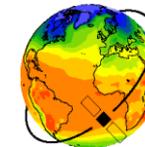
Originally planned for 17 – 21 Feb 2020, Singapore (Currently postponed due to COVID-19)

Objectives

1. Assess the status of regional understanding of the CMIP databases (CMIP5 and 6).
2. Obtain a shared understanding of CMIP's current status and latest developments of CMIP6.
3. Learn how to use certain tools for CMIP model evaluation (ESMValTool).
4. Work towards developing a common framework for studying key regional climate processes across a range of climate models.
5. Develop a common understanding of suitable global climate models that can be relied upon for the ASEAN region.
6. Discuss and develop a regional consensus on most relevant emission scenarios to use for regional climate change projections.
7. Link the developed understanding about CMIP databases with existing and on-going projects that generate downscaled climate projections across the ASEAN region.



CMIP6 experiment design (source: "Overview of the Coupled Model Intercomparison Project Phase 6 (CMIP6) experimental design and organization", Eyring et al., Geoscientific Model Development, 2016).



ESMValTool

Earth System Model Evaluation Tool

[View Concept Note](#)

Thank you

More about our work:



Further enquires may be posted to [Gerald LIM@nea.gov.sg](mailto:Gerald_LIM@nea.gov.sg)