CORDEX-SEA Multi-scales Climate Downscaling and Simulations for Impact Assessment

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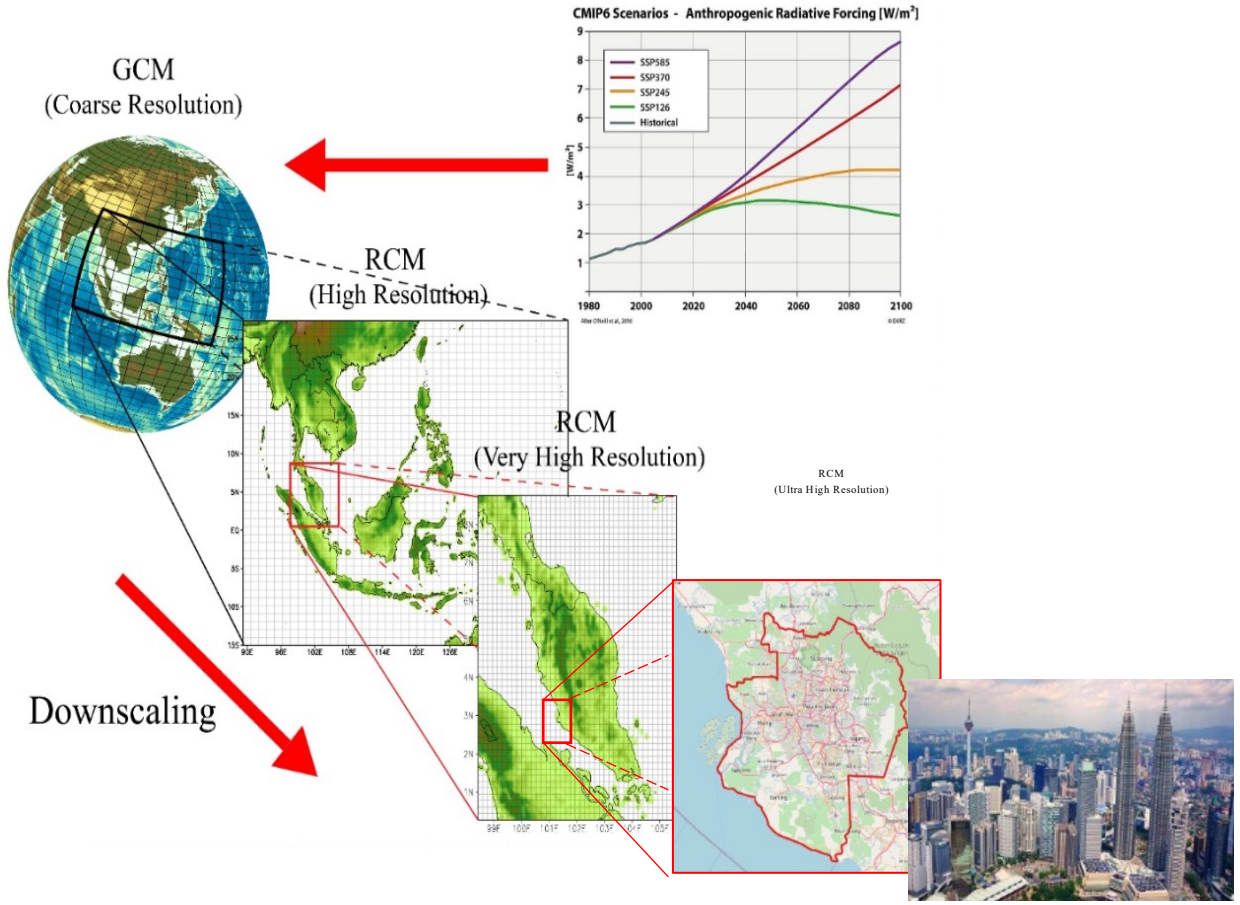
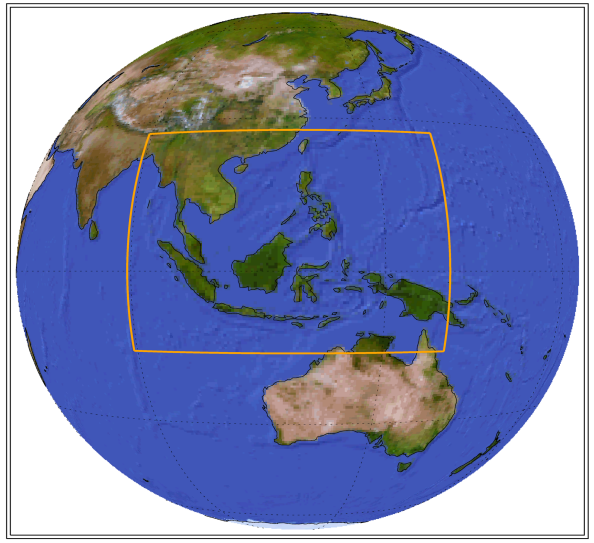
Climate Downscaling and CORDEX-SEA

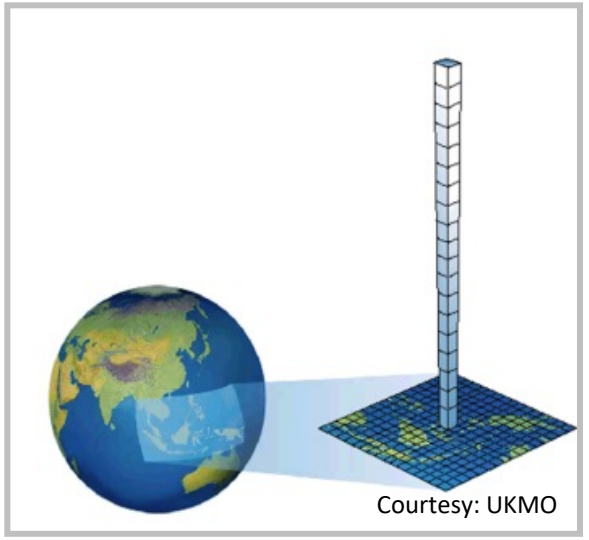
- Local climate projection – facilitate local CC impact assessment.
- Global > Local scale– cascading of modeling processes.
- Uncertainties are introduced at each modeling levels.
- Run multiple downscaling simulations and create ensemble with uncertainty ranges.
- Practically expensive – multi agencies collaborations (regional and internationals)



The Southeast Asia Regional Climate Downscaling (SEACLID) / CORDEX Southeast Asia Project

14 Countries, 20 Institutions

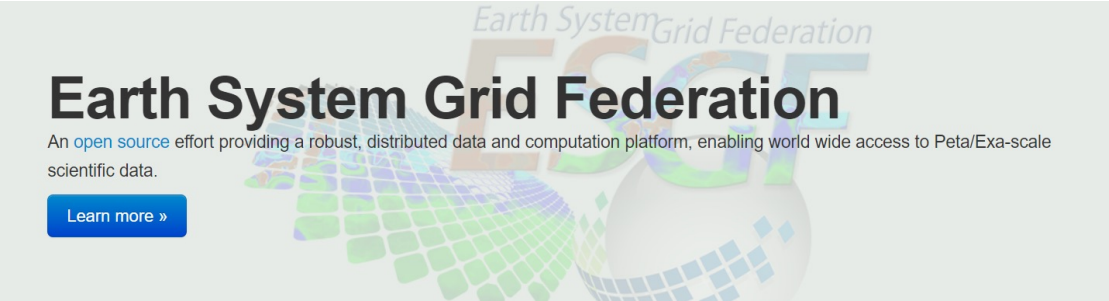




(http://www.ukm.edu.my/seaclid-cordex)

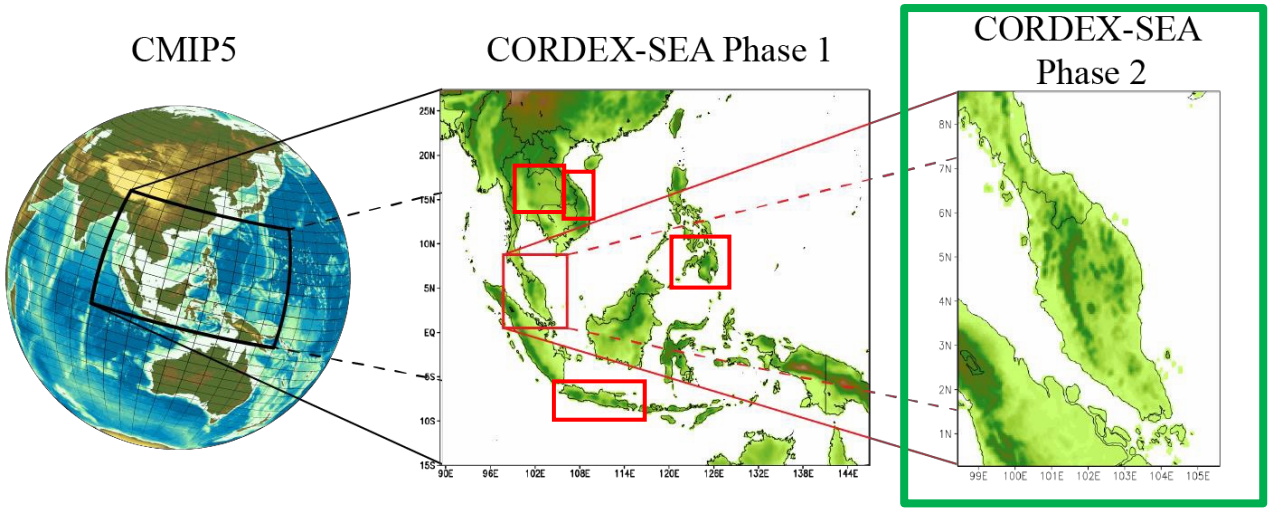
CORDEX-SEA Simulation Output

- Phase 1 (25 km, CMIP5 driven) > completed in 2017
- 18 different GCM/RCM couplet.
- >3500 simulation years.
- > 200TB of raw simulation out.
- Output (selected subset) distributed via ESGF @ https://esgf.llnl.gov/
- Phase 2 (5 km, subregions, CMIP5 driven) > completed in 2022.
- Phase 3 (25 km CMIP6 driven) > ongoing



ESGF
Earth System Grid Federation

Simulations Information



Supported by:

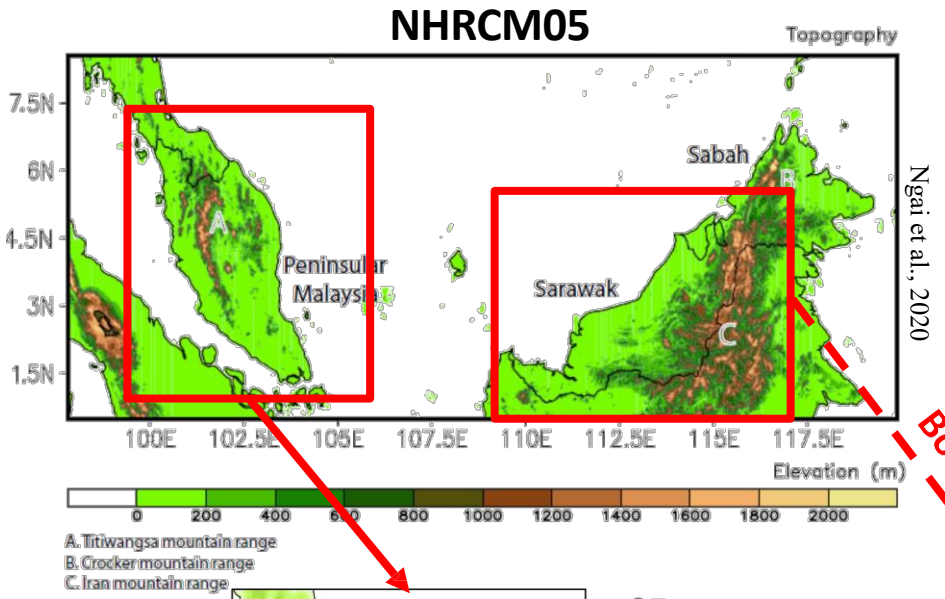
in preparing the model forcing fields

- Domain covers the **whole Peninsular Malaysia** (98.44 °E – 105.61°E, 0.26 °N – 8.76 °N)
- Downscaled **3 CMIP5 GCMs** (RCP4.5 & RCP8.5):
  i. EC-EARTH (European's GCM)
  ii. MPI-ESM-MR (German's GCM)
  iii. HadGEM2-ES (UK's GCM)
- Time slice run: **1970 – 2005**, **2011 - 2039**, **2040 - 2069**, **2070 – 2099**

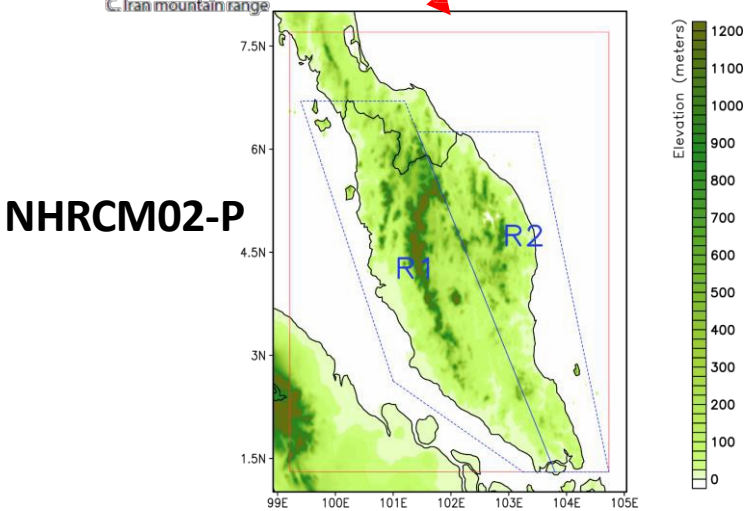
- RCM used: **RegCM-NH version 4.7**
- Resolution: → **5km × 5km** (160 × 190 grids); ↑ **18 levels**
- All physical settings same as CORDEX-SEA phase 1 simulation except:
  i. CPS: **MIT Emanuel (Land) + Kain Fritsch (Ocean)**;
  ii. Land surface scheme: **CLM4.5**

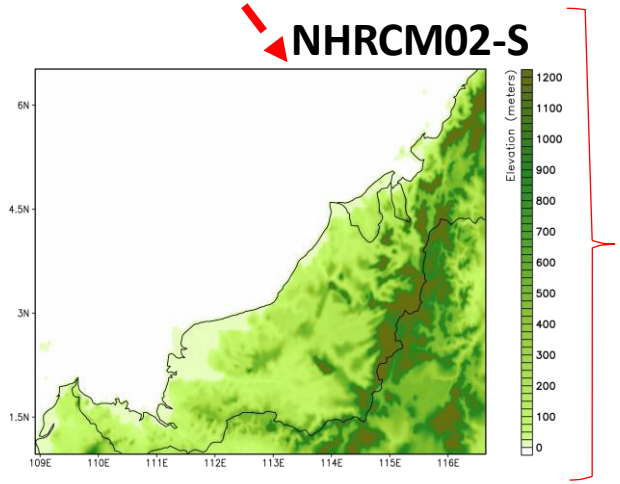
The changes were in hope to reduce the strong wet bias in CORDEX-SEA phase 1 simulations

Contributed Simulations by MRI Japan (via SOUSEI and TOUGOU)



Bonus run





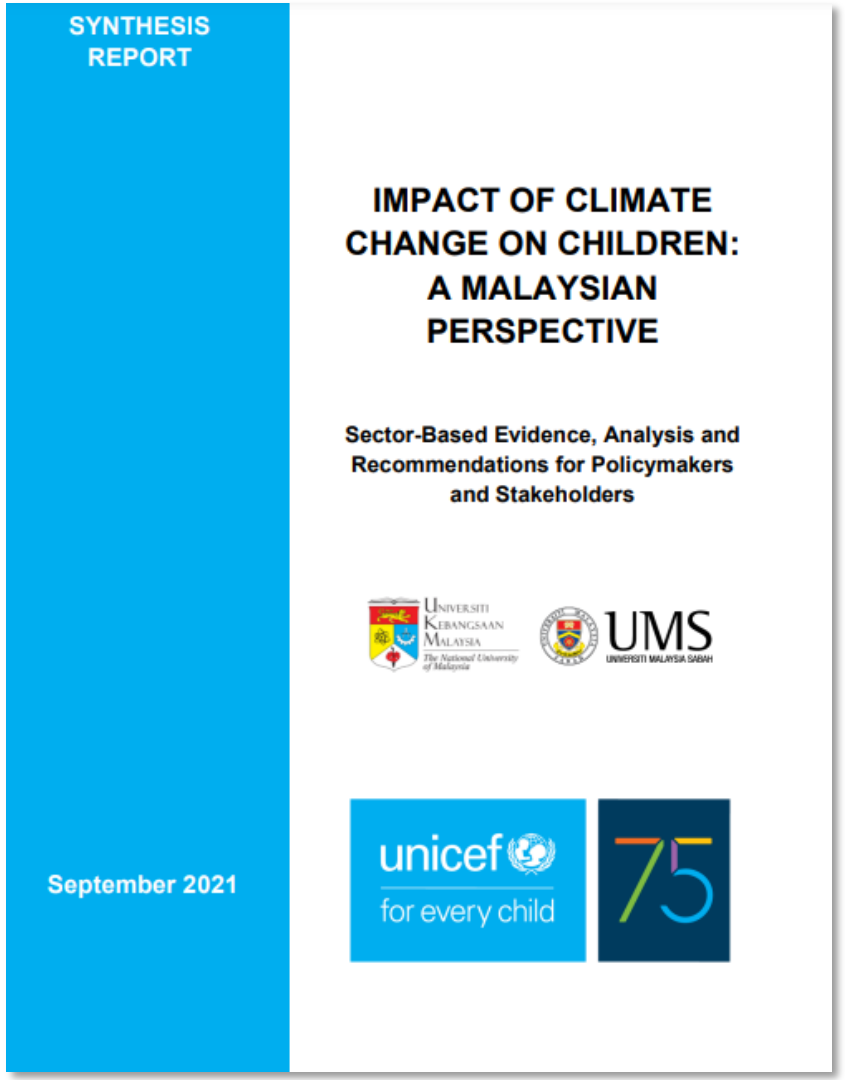
- 3 runs contributed:
  i. **5km × 5km** (NHRCM05) – whole Malaysia
  ii. **2km × 2km** (NHRCM02-P) – Peninsular Malaysia
  iii. **2km × 2km** (NHRCM02-S) – East Malaysia (Sarawak)
- RCM used: MRI NHRCM
- Forced by **MRI-AGCM3.2** (20km × 20km), **RCP8.5**
- Time slice run: **1979 – 2002**, **2079 – 2100**

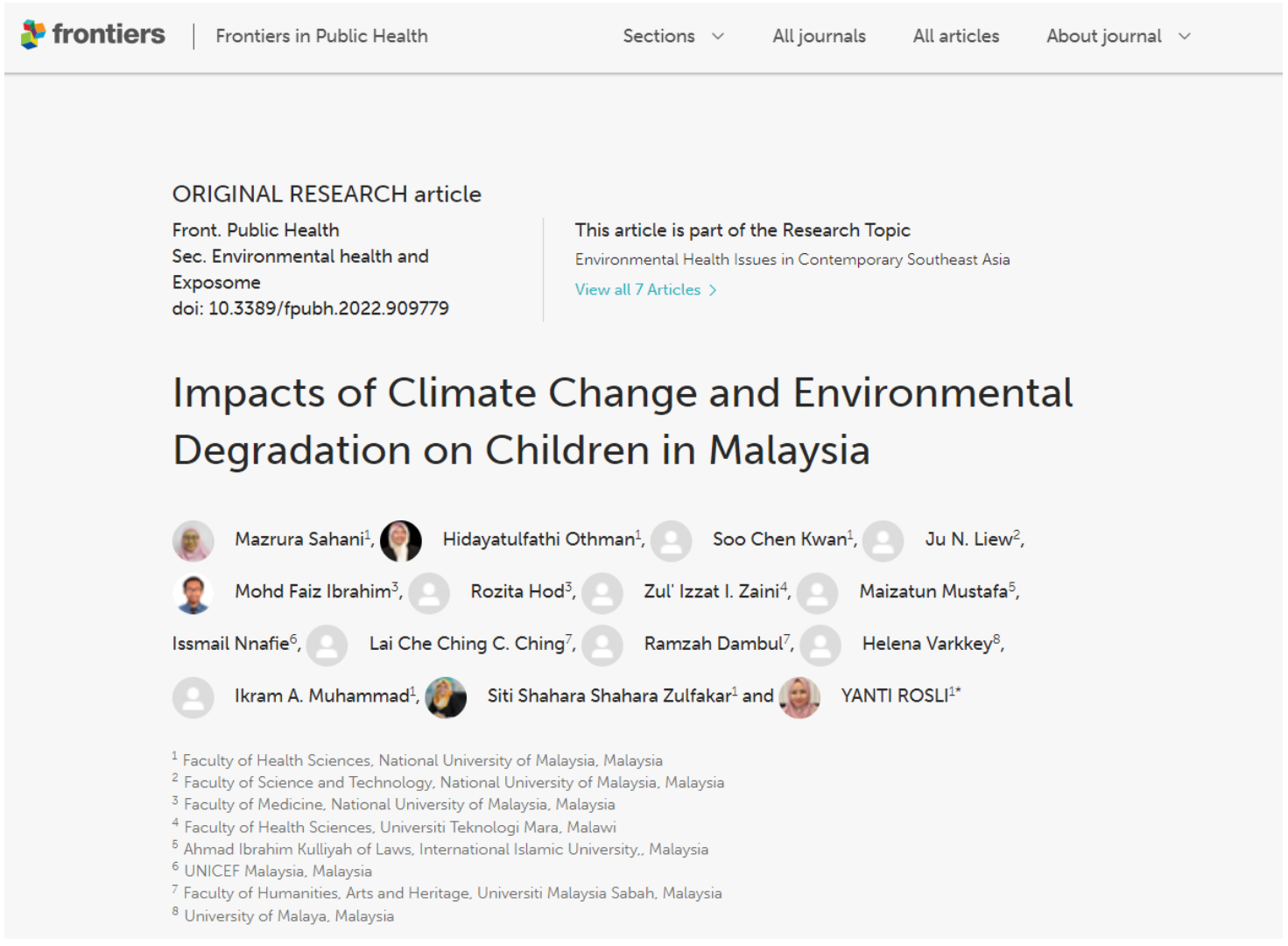
- NHRCM05 uses modified Kain-Fritsch as its CPS, but **NHRCM02 is a convective permitting simulation**.

Result will not be discussed here.

National/Local Projects That Make Use of CORDEX-SEA Datasets

Impact of Climate Change on Children (UNICEF)





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doi: 10.3389/fpubh.2022.909779

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Impacts of Climate Change and Environmental Degradation on Children in Malaysia

Mazrura Sahani[1], Hidayatulfathi Othman[1], Soo Chen Kwan[1], Ju N. Liew[2], Mohd Faiz Ibrahim[3], Rozita Hod[3], Zul' Izzat I. Zaini[4], Maizatun Mustafa[5], Issmail Nnafie[6], Lai Che Ching C. Ching[7], Ramzah Dambul[7], Helena Varkkey[8], Ikram A. Muhammad[1], Siti Shahara Shahara Zulfakar[1] and YANTI ROSLI[1*]

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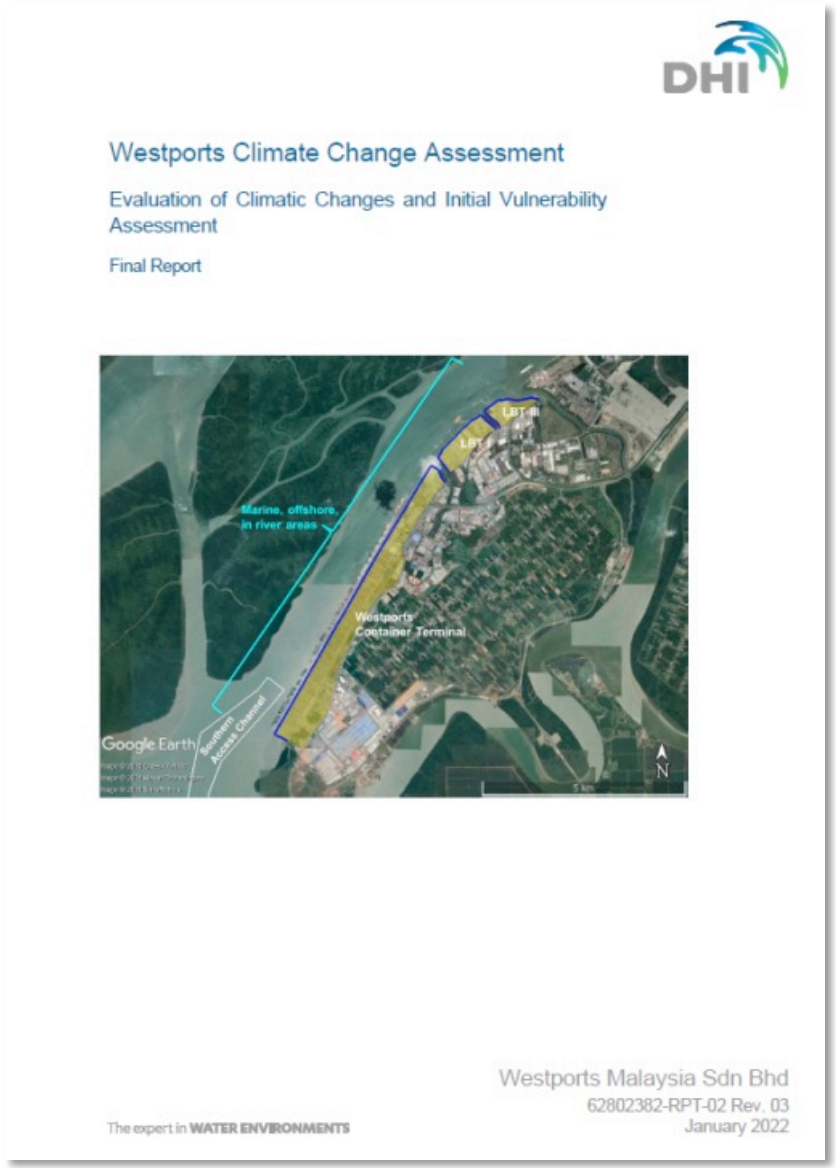
[7] Faculty of Humanities, Arts and Heritage, Universiti Malaysia Sabah, Malaysia
[8] University of Malaya, Malaysia

Malaysia Port Climate Change Assessment



- The CORDEX-SEA winds/pressure is used to drive the wave model.
- Rainfall and temperature extreme changes were analyzed to examine the future physical risk of the infrastructure investment.

Impact of Climate Change on Oil Palm

UKM PAKARUNDING

ASSESSMENT OF THE CURRENT STATES OF OIL PALM ASSOCIATED CLIMATE VARIABILITIES AND CHANGES AS WELL AS FUTURE PROJECTION IN MALAYSIA

FINAL REPORT

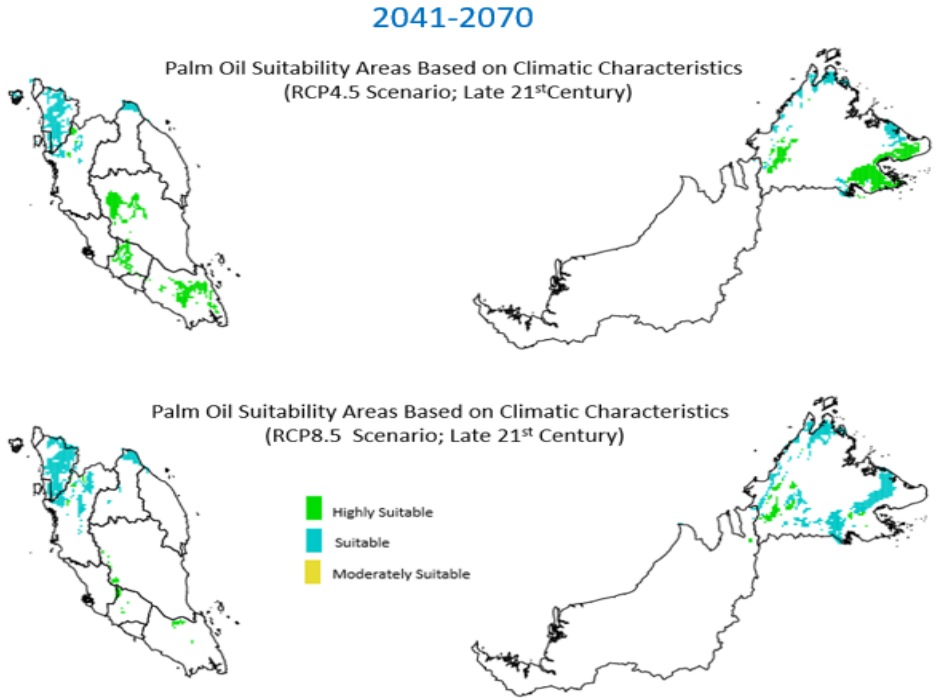
AUGUST 2020

Prepared for:

Solidaridad Malaysia

Solidaridad

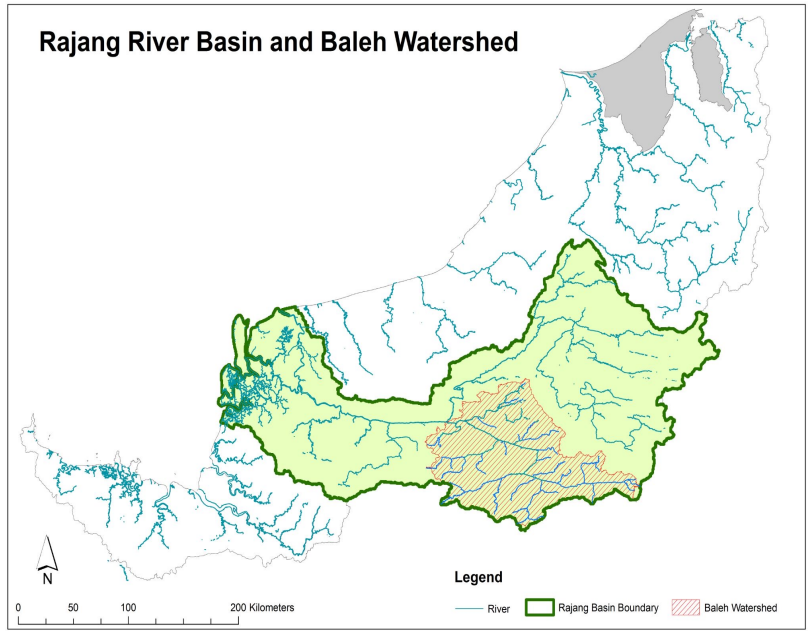
- The CORDEX-SEA simulations are used to examine the changes of climate optimal for oil-palm growth.

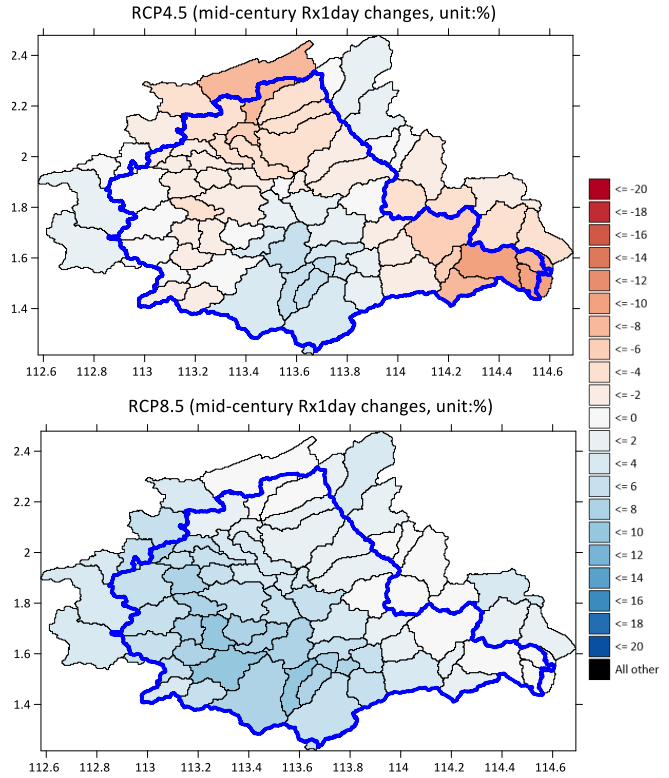


Climate Change Vulnerability Assessment for Integrated Watershed Management

Baleh Watershed Climate Vulnerability Analysis Report

- Changes in future climate extremes are overlayed with underlying watershed elements (land use, ethnography, socio-economy, ecology and environment and hydrology) to determine the vulnerability.





Remarks

- Climate change projection information are mostly used ‘qualitatively’.
- Lack of guideline on how the downscaled climate projection information can be used (sectoral specific).
- In general, lack of synergy between different research communities > difficulty in communicating data users and providers.
- Required more innovative tools to facilitate communications.

The End