Climate change and disaster risk in cities

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e-Asia Pacific Science and Technology Conference for Disaster Risk Reduction

15 October 2020

The 6th Assessment cycle of the Intergovernmental Panel on Climate Change

May 2019

Emission inventories

Oct. 2018

Sept. 2019

April 2021

Physical science basis

October 2021

Impact, adaptation and vulnerabilities

April 2022

Synthesis report

Talanoa Dialogue COP24

August 2019

Mitigation

July 2021

Paris Agreement 2023 Global Stocktake

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ipcc INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

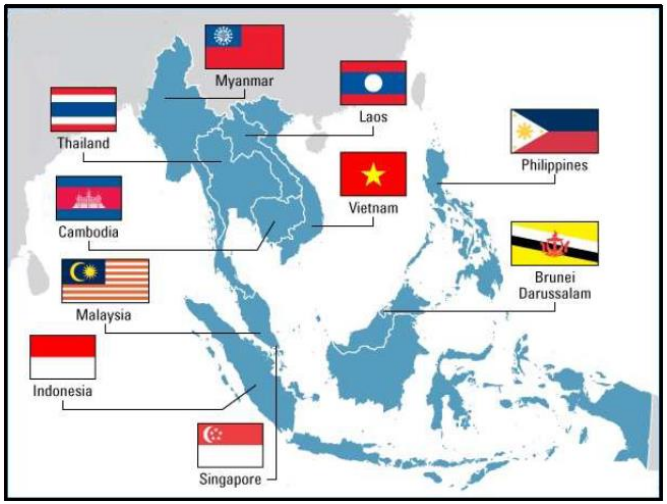
Impacts of global warming 1.5°C

(At 1.5°C compared to 2°C)

- **Less extreme weather** where people live, including extreme heat and rainfall
- By 2100, global mean **sea level rise will be around 10 cm lower** but may continue to rise for centuries
- **10 million fewer people** exposed to risk of rising seas
- Lower impact on **biodiversity and species**
- Smaller reductions in **yields of maize, rice**, wheat
- Global population exposed to increased **water shortages** is up to 50% less
- Lower risk to **fisheries and the livelihoods** that depend on them
- Up to **several hundred million fewer people** exposed to climate-related risk and susceptible to poverty by 2050

Tropical Southeast Asia: projected to experience the largest impacts on economic growth

Is ASEAN ready for a 1.5°C World?



Review of data from AMS (2000–2016):

- Carbon dioxide and particulate matter (PM2.5) are major risk factors for lung cancer
- Increasing use of renewable energy and higher healthcare expenditure per capita expected to reduce the lung cancer prevalence

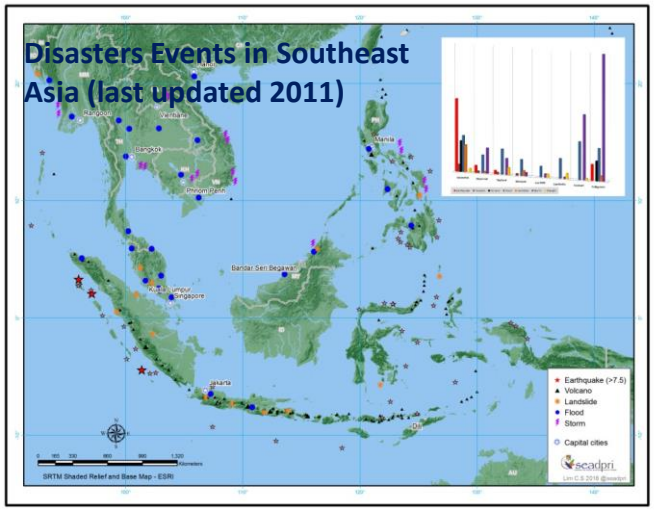
Source: Farhad & Farzad (2020) https://doi.org/10.3390/en13071812; Fong et al. (2020) https://doi.org/10.1002/sd.2097

Region-Specific Projected Impact (extracted from three IPCC Special Reports**)	ASEAN MEMBER STATES (AMS)									
	BD	Cam	Ind	Lao	Msia	Myn	Phi	Sing	Tha	Viet
Heavy precipitation associated with tropical cyclones (medium confidence) [1]	?	🖐	?	🖐	?	🖐	🖐	?	🖐	🖐
Land degradation from combined sea level rise and cyclones jeopardise lives and livelihoods in cyclone prone areas (very high confidence) [2]	🖐	🖐	🖐	NR	🖐	🖐	🖐	🖐	🖐	🖐
Increase in the number of hot days in most land regions, with highest increases in the tropics (high confidence) [1]	🖐	🖐	🖐	🖐	🖐	🖐	🖐	🖐	🖐	🖐
Emergence of unprecedented climatic conditions by the mid to late 21st century (medium confidence) [2]	🖐	🖐	🖐	🖐	🖐	🖐	🖐	🖐	🖐	🖐
Net reductions in yields of maize, rice, wheat, and potentially other cereal crops (IPCC SR 1.5°C) (high confidence) [1]	☺	🖐	☺	🖐	☺	🖐	☺	🖐	☺	☺
Net reductions in the CO_2-dependent nutritional quality of rice and wheat (high confidence) [1]	🖐	🖐	🖐	🖐	🖐	🖐	🖐	🖐	🖐	🖐
Region expected to experience the largest impacts on economic growth due to climate change (medium confidence) [1]	🖐	🖐	🖐	🖐	🖐	🖐	🖐	🖐	🖐	🖐
Increase in frequency, duration, extent and intensity of marine heatwaves by 20 times (RCP2.6, medium confidence) [3]	🖐	🖐	🖐	NR	🖐	🖐	🖐	🖐	🖐	🖐
Significant changes in wave heights and coastal tidal amplitudes and patterns (high confidence) [3]	🖐	🖐	🖐	NR	🖐	🖐	🖐	🖐	🖐	🖐
Decrease in biomass of marine animal communities, production, and fisheries catch potential in all scenarios (high confidence) [3]	🖐	💣	🖐	NR	🖐	🖐	🖐	🖐	🖐	🖐
Decline in ocean net primary production by 7–16% (very likely range) [3]	🖐	💣	🖐	NR	🖐	🖐	🖐	🖐	🖐	🖐
Widespread challenges to fisheries governance in regional hotspots (medium confidence) [3]	?	?	?	NR	?	?	?	?	?	?

☺	High Level of Readiness: Region-specific projected impact is stated in the NC and adaptation measures are a priority.	💣	Low Level of Readiness: Region-specific projected impact is not stated in the NC nor is the associated sector a priority for adaptation.
🖐	Medium Level of Readiness: Region-specific projected impact is not stated in the NC but the associated sector is a priority for adaptation.	?	Low Level of Readiness: Region-specific projected impact has to be in
		NR	Not Relevant: Regic applicable to the AI

Source: Pereira & Shaw 2020 Springer (in press)

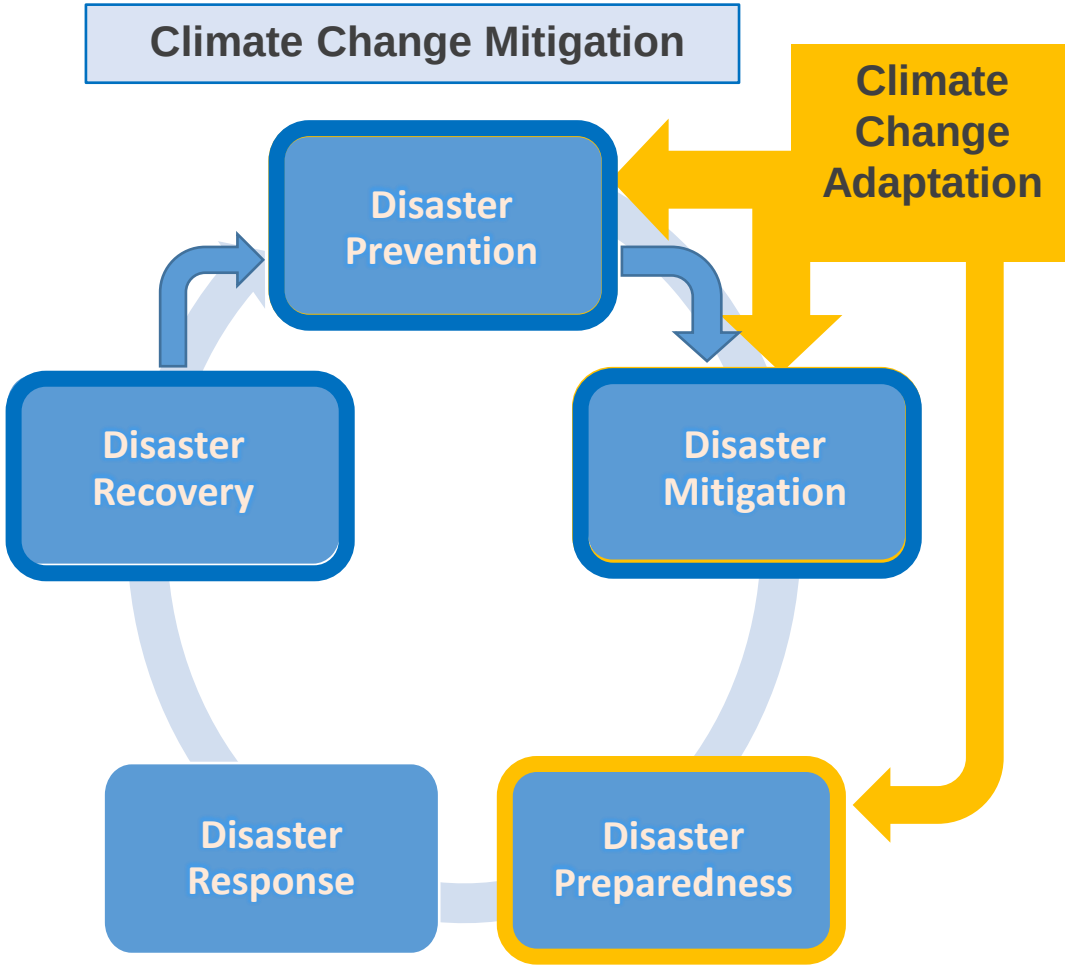
Disaster Risks – Climate Change Linkages



Climate related threats account for 30% of the total GDP damage across cities in the region, where total GDP at risk can be as high as 5% [Source: Cambridge Centre for Risk Studies]

- The landscape for climate and disaster risks in the AMS was collectively costed at **USD 86.5 billion in 2019**, where 97% is associated climate driven hazards (ESCAP 2020).
- Costs associated with <u>physical risks and liability risks</u> AND <u>transition to a low carbon economy</u>
- Synergies between DRR, CCA and CCM – for specific areas, cities, etc.

Disaster Risk Reduction Cycle



Climate change and disaster risk in cities

"Systems of Systems" Approach for assessing the resilience of infrastructure, which links physical and cyber systems through an integration of sensor data from networks, people, and artificial intelligence;

Public-Private Participation in building resilience; moving from science to action; with disaster resilience efforts that include private, public and local government stakeholders as well as the community;

Knowledge Empowered Youths providing better understanding of the DRR, climate change and its challenges; and connect them to senior researchers from multi-disciplinary backgrounds; importance of scientific findings be channelled to peer-reviewed publications – where youth and young professionals offer the best potential to fill knowledge gaps and advance community engagement in the Asia Pacific.

Open Science Communication and Engagement for building resilience in cities, focusing on working across the value chain on hazards; importance of public having access to information on hazards and is also engaged in collecting relevant data;

Source: UNDRR-APSTAAG (2020): Science and Technology Status for Disaster Risk Reduction in Asia-Pacific, United Nations Office for Disaster Risk Reduction – Asia-Pacific Science, Technology and Academia Advisory Group
https://www.undrr.org/publication/status-science-and-technology-disaster-risk-reduction-asia-pacific-2020

City Initiative

Innovate UK MiGHT Newton-Ungku Omar Fund

Disaster Resilient Kuala Lumpur

The first step in adaptation to future climate change – reduce vulnerability and exposure to present climate variability (IPCC 2014)

PHASE 1: METEOROLOGICAL FORECASTING

METEOROLOGICAL PARAMETERS
- Precipitation
- Temperature
- Humidity
- Wind Speed

WP1.1-WP1.2

PHASE 2: HAZARDS MODELLING

GEOPHYSICAL HAZARDS
- Flash floods & floods
- Landslides
- Sink-holes

WP2.1-WP2.5

ATMOSPHERIC HAZARDS
- Strong winds
- Urban heat
- Air pollution

WP2.6-WP2.9

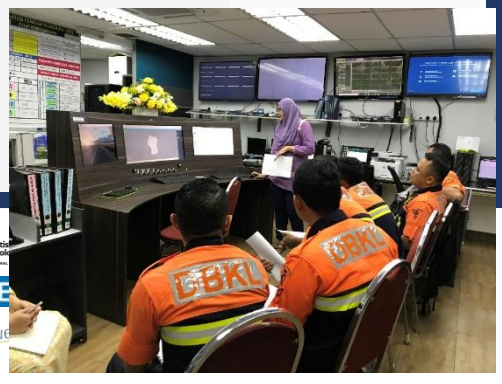
PHASE 3: MULTI-HAZARD FORECASTS

MULTI-HAZARD PLATFORM

Platform for managing and communicating risks in a changing climate

WP3.1-WP3.2

Local Weather Forecasts	Hazard Forecasts	Disaster Alert	Public Warning
300 m x 300 m			



PROJECT LEADERS
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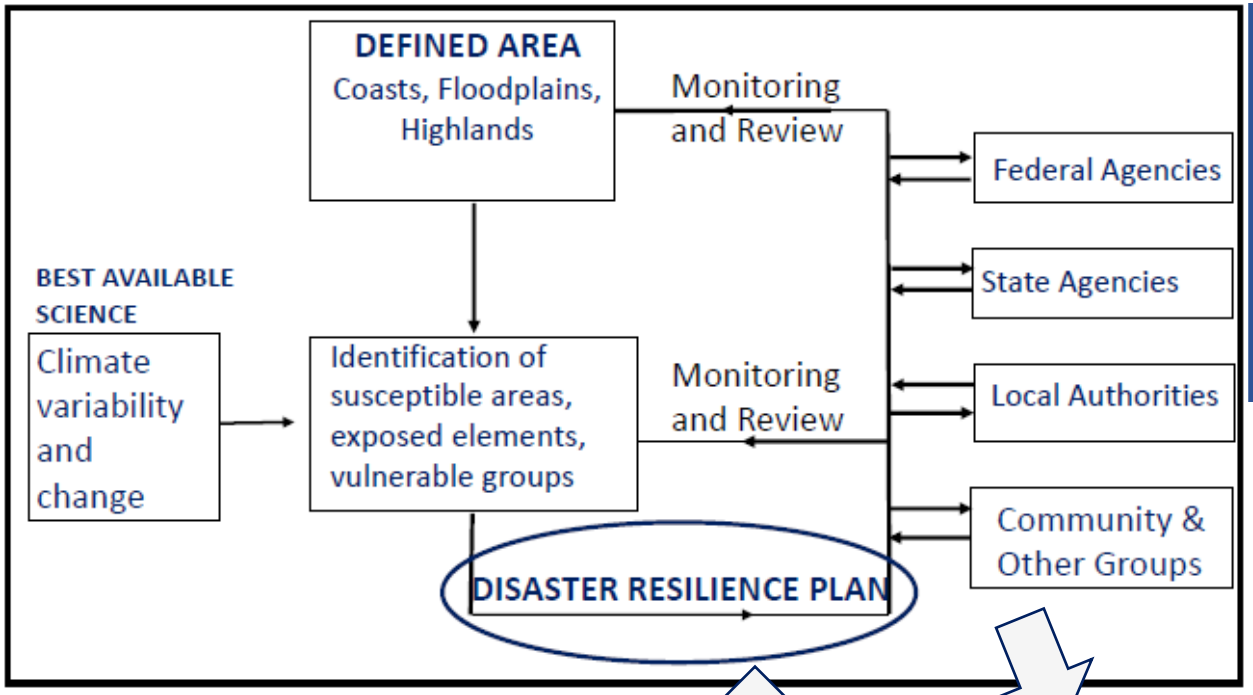
UNIVERSITY OF CAMBRIDGE UCL JBA

Local Initiative

Promotion of Social Entrepreneurship in Disaster Risk Reduction to Build Community Resilience



Key Activity: Develop Disaster Resilience Plans in 4 Pilots: Kuala Selangor, Shah Alam and Ampang Jaya, Selangor & Kpg. Speu, Cambodia

SMART SELANGOR COMMAND CENTRE (SSCC)

UNIT PENGURUSAN BENCANA SELANGOR
PEJABAT SETIAUSAHA KERAJAAN NEGERI SELANGOR

COMMUNITY BASED GIS APPLICATIONS & CROWD SOURCING

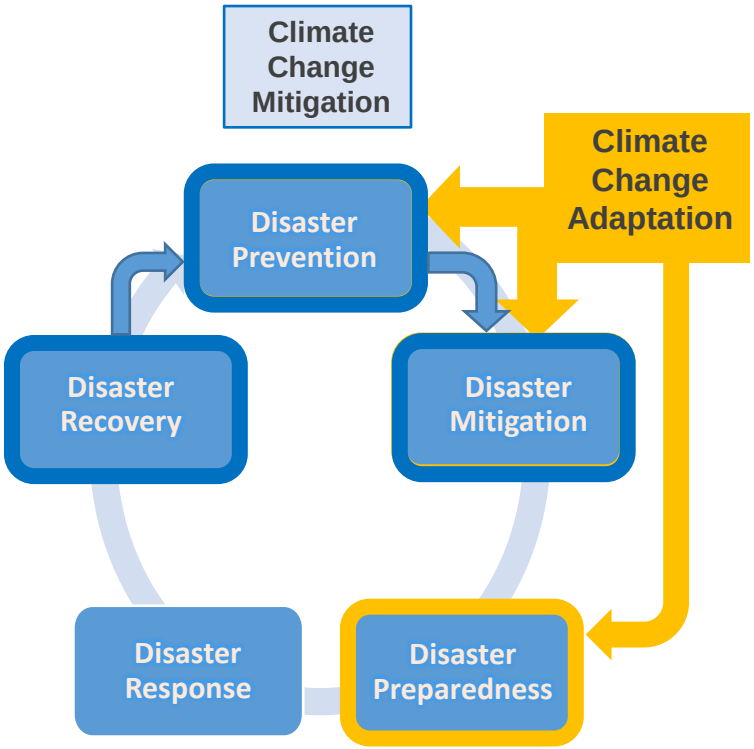
OPEN ACCESS DATA (IDRC Project)

A **spatially contextualised and collaborative approach** to develop local disaster resilience plans, **led by a social entrepreneur**.

http://ancst.org/idrc/

Disaster Risk Reduction cycle as an entry point

Sendai Framework on DRR
SDG 13 on Climate Action
Paris Agreement



Post-COVID-19 – Reset Better

Sendai Framework's "Build back better"

Role of S&T:

- ❑ Learning from previous resets (i.e. WWI and WW2) - support structural changes centered on human well-being and dignity;
- ❑ Promote just and ethical transformation to limit global warming to 1.5ºC;
- ❑ Build resilience from global to local scales; context and area specific needs
- ❑ Address risk across both short-and long term time-scales
- ❑ Enhance digital transformation and connectivity; land-based solutions; promote ecosystem rehabilitation, etc.

“Those who have the privilege to know have the duty to act”.

Albert Einstein

THANK YOU!

seadpri
southeast asia disaster prevention research institute

Asian Network on
Climate Science and Technology
(ANCST)