2010 - 2020 10 YEARS

CBRN Centres of Excellence
An initiative of the European Union

CBRN and climate change: Perspectives from Southeast Asia

9th International Meeting of the National Focal Point
Brussels, Belgium, 13-14 June 2023

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United Nations Interregional Crime and Justice Research Institute

- 10 countries
- Association of Southeast Asia Nations **(ASEAN)**
- **About 688 M** population (8.6% of the world population)
- Third largest economy in Asia and the fifth largest economy in the world.

Southeast Asia (SEA) region – Disaster prone

- **It is one of the most vulnerable regions in the world caused by** natural disasters, and climate change impacts.

Drought **Typhoon / cyclone** **Flooding**

Climate change driven hazards

- **High temperature/ global warming** accelerates the water cycle (i.e. heavy rain, increase humidity and stronger storms and waves i.e. Extreme weather)
- **Cyclone/ Typhon** are more frequent
- Together with **sea level rising** in many coastal towns ⟹ Frequent flooding. In 2022, many countries in SEA encountered massive flood.

(Alessandro Rizzi/iStock)

Climate change driven hazards

- Rising sea level in many SEA countries – (Global average – 2-3mm/ year)

Table 3.6. Observed Change in Sea Level in Southeast Asia

	Change in sea level	Source
Indonesia	Increased by 1–8 mm/yr depending on location	SME (2007)
Philippines	Increasing in major coastal cities with Manila exhibiting the highest increase	Yanagi and Akaki (1994), Perez (1999), Hulme and Sheard (1999)
Singapore	No observable trends toward higher mean sea level so far	Ho (2008)
Thailand	Trending higher in recent years	Jesdapipat (2008)
Viet Nam	Increasing by 2–3 mm/yr	Cuong (2008)

Source: Compiled by ADB study team.

The Economics of Climate Change in Southeast Asia: A Regional Review (ADB 2009)

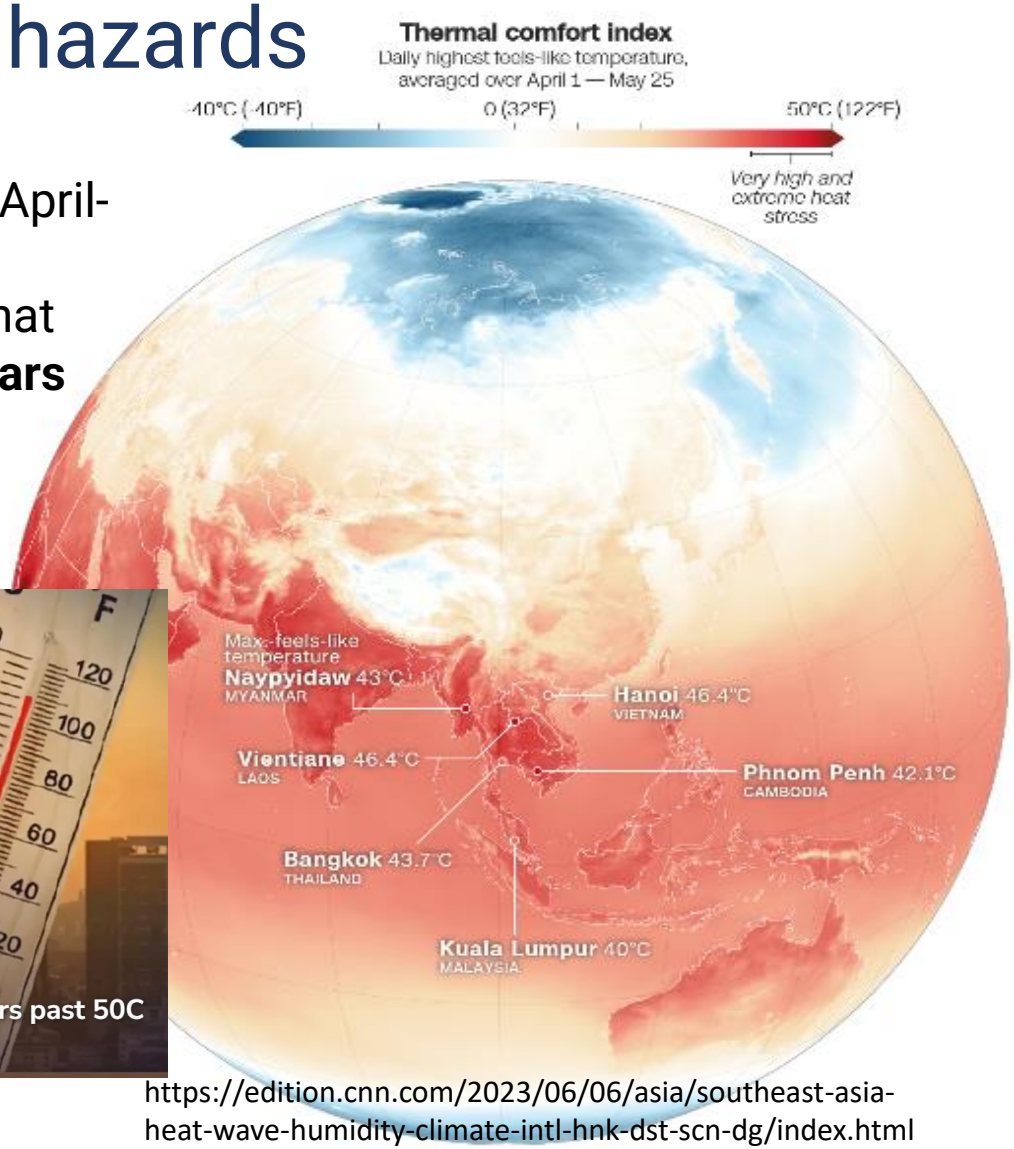
- **Gulf of Thailand-** 1.4–12.7mm/year (1985 – 2009)
- **In Manila Bay -**15mm/ year of sea level rise (1960-2012)

Climate risk country profile– Thailand / Philippines (ADB 2021)

- >152 M people in SEA countries (>20% of the population) are living within areas experiencing flood events (The disaster riskscape across SEA. Asia-Pacific disaster report 2019 UN ESCAPE)
- Consequences of the flood are enormous, not only immediate effects but also long-term effects on livelihoods, water, food, psychology, society, health, and economy ----------

Climate change driven hazards

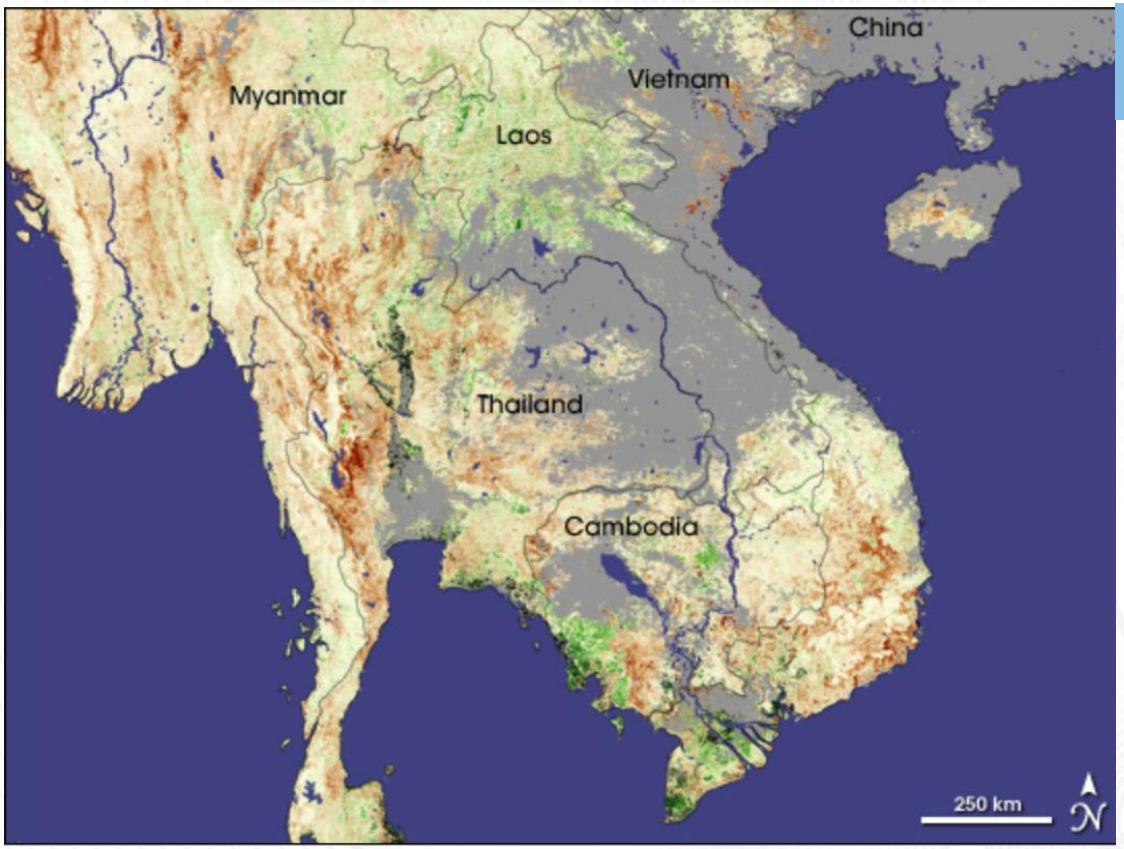
- **Extreme heatwave**
  Many countries in SEA region during April-May 2023
- World Weather Attribution reported that this heat wave was a **once-in-200 years** event.
- Hospitalization increased during the heatwave period



https://edition.cnn.com/2023/06/06/asia/southeast-asia-heat-wave-humidity-climate-intl-hnk-dst-scn-dg/index.html

Climate change driven hazards

- Drought



https://earthobservatory.nasa.gov/images/14733/drought-in-southeast-asia

With little rain falling in late 2004 and early 2005, Southeast Asia is in severe drought.

A picture of one of the NASA satellites showing signs of vegetation anomaly during the drought period in the SEA region

- >389 M of the SEA country population (~60% of the population) are living within areas that experience drought events. (The disaster riskscape across SEA. Asia-Pacific disaster report 2019 UN ESCAPE)

Climate impact risks- *Fatality, economy, food security* ⟶ National security

- **Germanwatch** (Global Climate Risk Index 2021) ranked **three ASEAN countries** among the 10 most affected countries (**fatality and economic losses**) by e**xtreme weather events** over the last 2 decades.

Table 2: The Long-Term Climate Risk Index (CRI): The 10 countries most affected from 2000 to 2019 (annual averages)

CRI 2000-2019 (1999-2018)	Country	CRI score	Fatalities	Fatalities per 100 000 inhabitants	Losses in billion US$ PPP	Losses per unit GDP in %	Number of events (2000–2019)
1 (1)	Puerto Rico	7.17	149.85	4.12	4 149.98	3.66	24
2 (2)	Myanmar	10.00	7 056.45	14.35	1 512.11	0.80	57
3 (3)	Haiti	13.67	274.05	2.78	392.54	2.30	80
4 (4)	Philippines	28.17	859.35	0.93	3 179.12	0.54	317
5 (14)	Mozambique	25.83	125.40	0.52	303.03	1.33	57
6 (20)	The Bahamas	27.67	5.35	1.56	426.88	3.81	13
7 (7)	Bangladesh	28.33	572.50	0.38	1 860.04	0.41	185
8 (5)	Pakistan	29.00	502.45	0.30	3 771.91	0.52	173
9 (8)	Thailand	29.83	137.75	0.21	7 719.15	0.82	146
10 (9)	Nepal	31.33	217.15	0.82	233.06	0.39	191

due to climate change

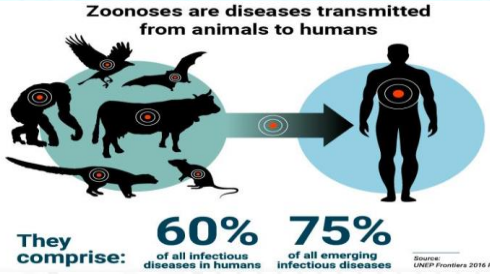
Asia Development Bank (ADB) predicts, by 2050

- Rice yield in the Mekong river delta to be decline by 6-12%
- Indonesia, Philippines, Thailand and Vietnam – reduce rice production by up to 50%

due to climate change

Climate impact CBRN risks: Human health

1. Increased the threat of zoonotic diseases



- **Nipah virus** spillovers from bats to humans occur after long droughts in Malaysia resulting in the loss of bats' habitat, subsequently bats moved to a new habitat closer to humans i.e. fruit orchards and pig farming areas (pigs- intermediate host).

Outbreaks happened in Malaysia and Singapore in 1998-1999. Ref: Myaing. Climate change and emerging zoonotic diseases. Kohn Kaen University Veterinary Journal 21: 172-82: 2011.

- Outbreak of **leptospirosis** in humans is associated with increases in rodent populations after heavy rainfalls or during floods.
- Outbreak of **Anthrax** in humans after heavy rainfalls or during floods.

2. Worsen vector-borne disease transmission

Vectors (mosquitoes, flies, mites) carry causal organisms. e.g., **dengue (DG), Chikungunya, Zika, malaria, West Nile, etc.**

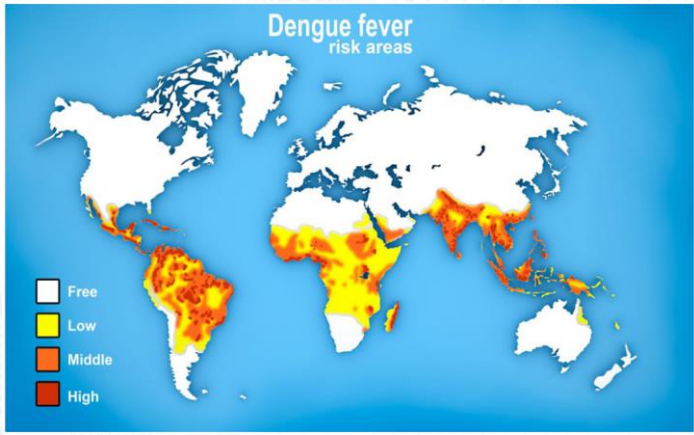
What happens to vector* (Mosquitoes) *for DG virus due to climate change?

- ***Warm and humid temperatures***

  - increases the survival & egg development
  - accelerates the growth of the larvae and decreases the time to maturity
  - bites more frequently

ASEAN region has seen a 46% increase in DG cases from 2015 to 2019. (WHO)

→ **Expand DG season and affected areas**



https://www.healthdirect.gov.au/dengue-fever

- ***During heavy rain and humid,*** mosquito population increased
- ***During drought,*** people collect and save water in containers that can provide breeding places for mosquitoes.

Warm and humid temperature also enhance DG virus replication within mosquitoes

3. Contaminating water/ food with “B” materials

- Waterborne disease outbreaks (e.g., Diarrhoeal, cholera, salmonellosis, E. coli, Leptospirosis etc.)
- Foodborne disease outbreaks (e.g., Hepatitis A, norovirus infection, salmonellosis, etc.)

4. Contaminating environment with “C”/“RN” materials

- Hazardous chemicals - fertilizers, metals, pesticides, others (e.g., legacy chemicals)
- RN hazard - rare in SEA region

5. Air pollution

- Increase pulmonary inflammation, bronchitis, exacerbations of asthma, and other lung diseases (Direct)
- Increase airborne infection (e.g., TB, influenza, measles, Neisseria meningitidis) due to escalating use of airconditioning rooms

6. Destroying healthcare facilities

- Resulting weak health care system, contaminated CBRN waste/ material dispersing in the environment

A hospital flooded in 2015 in Malaysia.
>60 government hospitals and clinics were destroyed by the flood.

Indonesia, on December 16, 2017.

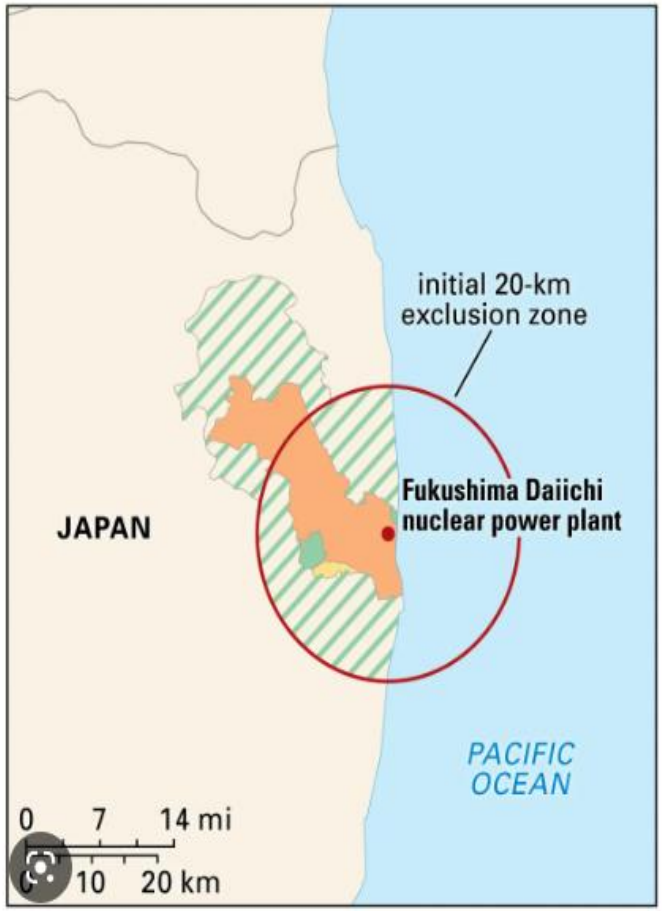
https://www.aa.com.tr/en/asia-pacific/two-dead-buildings-damaged-by-indonesia-earthquake/1006495

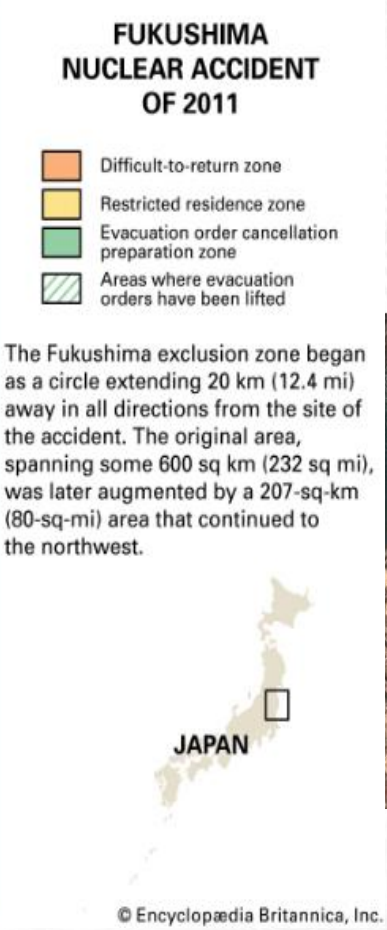
Hospital destruction after Palu, Indonesian island of Sulawesi earthquake 28 Sept 2018

OCHA/Anthony Burke | The UN Secretary-General António Guterres inspects damage to Anutapura public hospital, in Palu on the Indonesian island of Sulawesi, following an earthquake and tsunami in September. (12 October 2018)

Climate impact CBRN risks: Natural Hazards Triggering Technological (NATECH) events

Example 1. Environment contaminated with RN materials when nuclear power plant was destroyed





Example 2. Hazardous chemical factories damage and contaminate the environment

Level 4 Hurricane Harvey damaged refineries and petrochemical plants, resulting in the leakage of 2 million liters of oil and chemicals and other environmental and economic losses (2017).

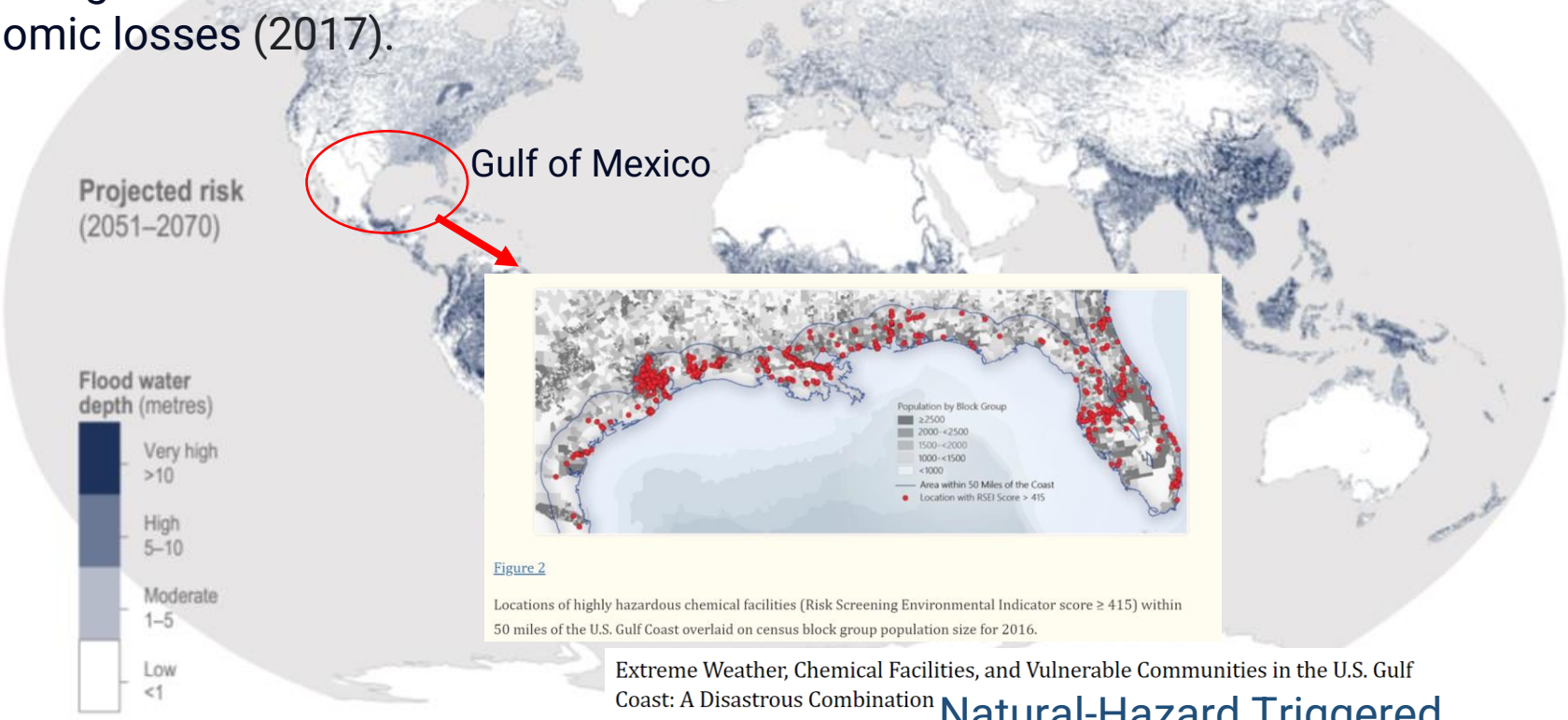


Figure 2

Locations of highly hazardous chemical facilities (Risk Screening Environmental Indicator score ≥ 415) within 50 miles of the U.S. Gulf Coast overlaid on census block group population size for 2016.

Extreme Weather, Chemical Facilities, and Vulnerable Communities in the U.S. Gulf Coast: A Disastrous Combination

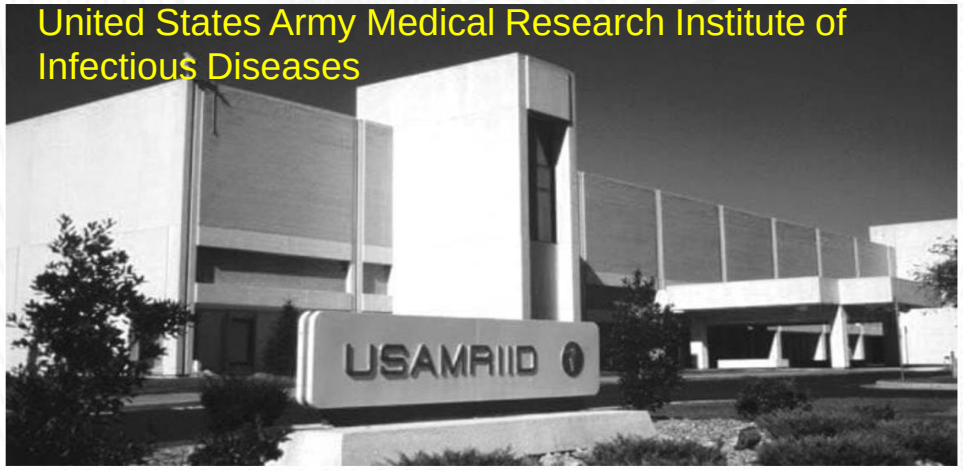
Susan C. Anenberg[✉1] and Casey Kalman[1]

Figure AI.44a | Risk of historical and projected river flooding.

Natural-Hazard Triggered Technological (NATECH) accident

Example 3. Could contaminate the environment with “bio/ R” materials when bio laboratories and imaging centers are flooded

(2nd June 2018) due to heavy rainfall



United States Army Medical Research Institute of Infectious Diseases

FIGURE 7-1 Swine carried down stairs at the University of Texas Medical Branch illuminated by lantern for transport to Houston as a result of Hurricane Ike

SEA region: Damage of hazardous coal mines subsequently contaminate the environment

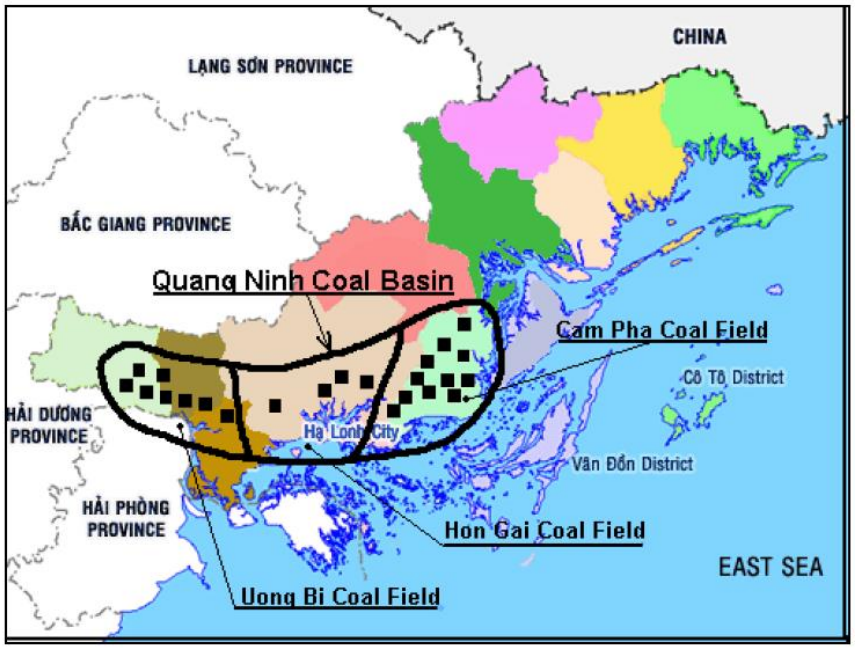
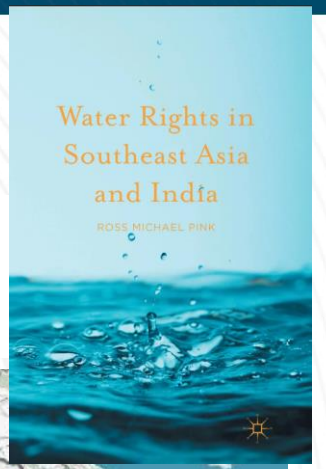


Figure 1: Location of the Quangninh coal basin [1]

Ref: Bui X-N et al. Mining technology for deep surface coal mines in Quangninh. Conference paper 2008. Research Gate

https://www.thenewhumanitarian.org/news/2015/08/07/flooded-mines-cause-toxic-sludge-vietnam

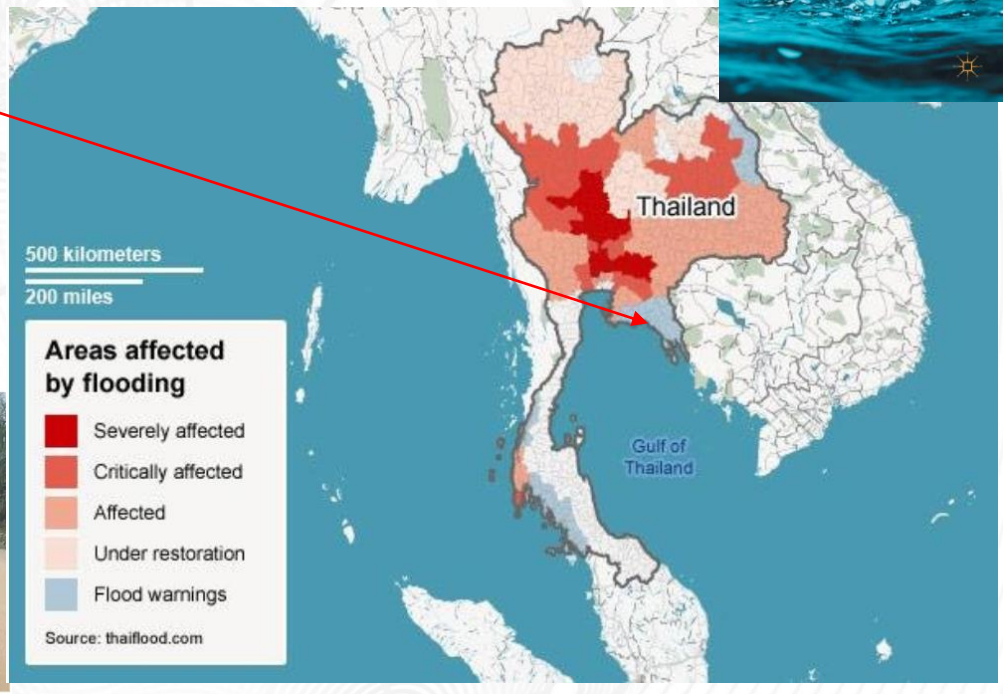
SEA region: Danger of hazardous chemical factories situated in frequently flooded areas



Water Rights in Southeast Asia and India pp 187–206

Map Ta Phut Industrial Estate in Rayong Province 2011 flood

117 industry factories, including 45 petrochemical plants, 2 oil refineries, 8 coal-fired power stations, 12 chemical fertilizer factories and iron and steel facilities.



Security forces wading through flood waters in Surat Thani province in southern Thailand, following days of heavy rains. (AFP Photo)

Numerous Thai rivers have been found to contain 30–60 times more pathogens, heavy metals, and poisons than safety regulations allow.

ASEAN's strategic action plan for climate change

2. Approach

AWGCC Action Plan (2019-2025) serves as the basis of the **ACCSAP**, guided by the prioritised actions for mitigation and adaptation in **ASEAN Climate Vision 2050**

ASEAN Community Vision 2025

- ASEAN Socio-Cultural Community Blueprint 2025

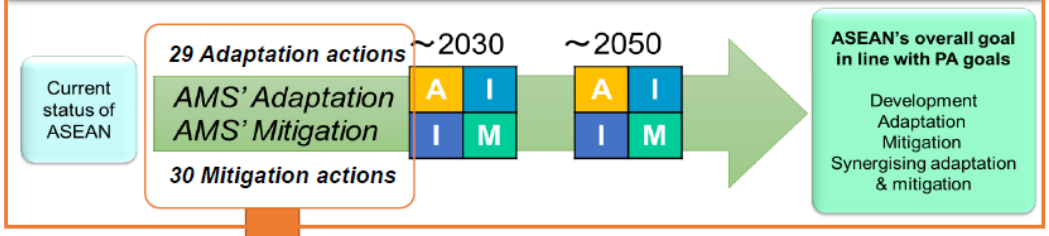
ASEAN Strategic Plan on Environment (ASPEN) 2016-2025

- Strategy priority 5: Climate Change

AWGCC Action Plan 2019-2025

1. Climate Change Adaptation
2. Long-term Planning & Assessment of NDCs
3. Climate Change Mitigation
4. Climate Modelling and Assessment
5. MRV and Stocktake of GHG emissions
6. Climate Finance and Market
7. Cross-sectoral Coordination
8. Technology Transfer

ASEAN Climate Vision 2050 shown in ASCCR



Prioritised actions guided by long-term regional climate vision (net-zero emission)

ASEAN Climate Change Strategic Action Plan 2023–2030 (ACCSAP)

Cross-pillar, cross-sector, and cross-country coordination ➔ Mainstreaming CC Actions

Sectoral / cross-sectoral plans

Sectoral plans:
Energy: APAEC 2016-2025 (7 areas and strategies for each area); **Food, Agriculture, and Forestry**: SP-FAF 2016-2025 (7 areas and strategies for each area); **Transport**: ASEAN Transport Strategic Plan 2016-2025 (5 areas and strategies for each area); **Infrastructure**: Master Plan on ASEAN Connectivity 2025 (5 strategic areas and 6 core areas), etc.

Cross-sectoral plans:
Finance: ASEAN Taxonomy for Sustainable Finance, etc.

6

Ref: ASEAN climate change strategic action plan 2023-2030 (ACCSAP) : Launch of the guiding document

Conclusions

- Climate change-related CBRN risks in some areas of SEA countries are almost inevitable
- Urgency in addressing – Prevent, Prepare, Response, business continuity plan for those risks
- Commitment and collaborative work - governments, the private sector, civil society, NGOs, individual ----------
- Strengthening the capacity and capability of countries together with partners

It takes a village to address this issue.

Thank you for your attention!

CBRN CoE Regional Secretariat for SEA 10th Anniversary Event, 23-24 March 2023