NUS National University of Singapore | Saw Swee Hock School of Public Health

Climate Risk and Vulnerability Assessment: *Methodologies for Evidence-Based Health System Adaptation*

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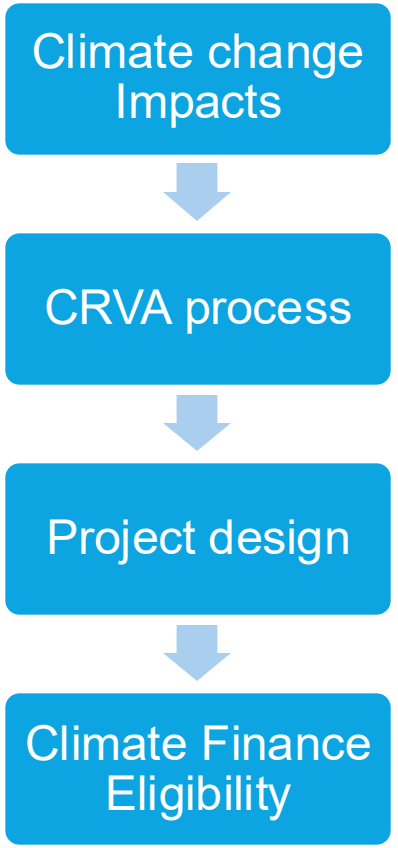
Disclosure: I work as a consultant for ADB

Why CRVA? The Foundation for Type 2B Projects

CVRAs transform climate risks into actionable, finance-ready health system adaptations

- Climate finance projects for health require an **evidence-based** design rooted in epidemiology, clinical medicine, and climate science
- A CRVA provides a **systematic approach** to identify, prioritize, and address climate vulnerabilities
- Ensures alignment with **climate finance requirements** and national adaptation priorities
- Moves beyond anecdotal evidence to **quantified, projectable risk**



The CRVA Framework: Three Interconnected Components

Risk = Hazard × Exposure × Vulnerability (minus Adaptive Capacity)

1. HAZARD ASSESSMENT

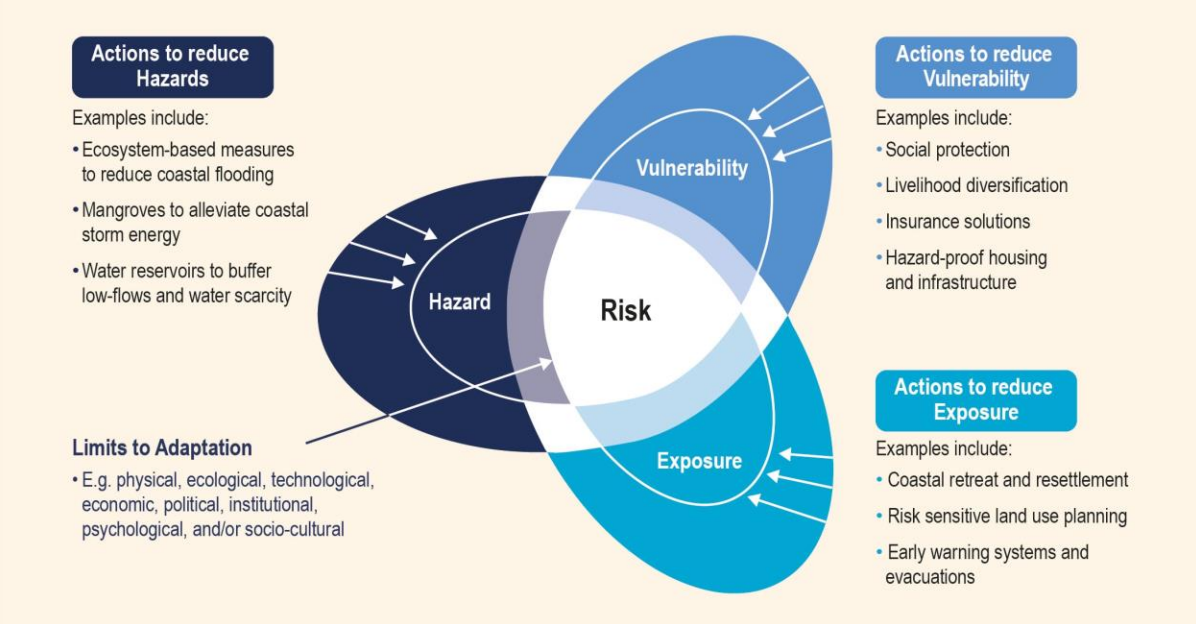
- What climate threats affect health systems?
- When, where, and with what intensity?

2. EXPOSURE ASSESSMENT

- Which health facilities, populations, and services are exposed?
- What is the magnitude and distribution of exposure?

3. VULNERABILITY & ADAPTIVE CAPACITY

- How sensitive are exposed elements to climate hazards?
- What existing capacity exists to adapt and respond?



Source: *IPCC*

Hazard Assessment - Tools and Data Sources

Multiple climate models and hazard platforms provide projections for informed planning

1. CMIP6 Climate Models

- Latest climate projections (SSP scenarios)
- Temperature, precipitation, extreme events
- https://esgf-node.llnl.gov/projects/cmip6/

2. World Bank Climate Portal

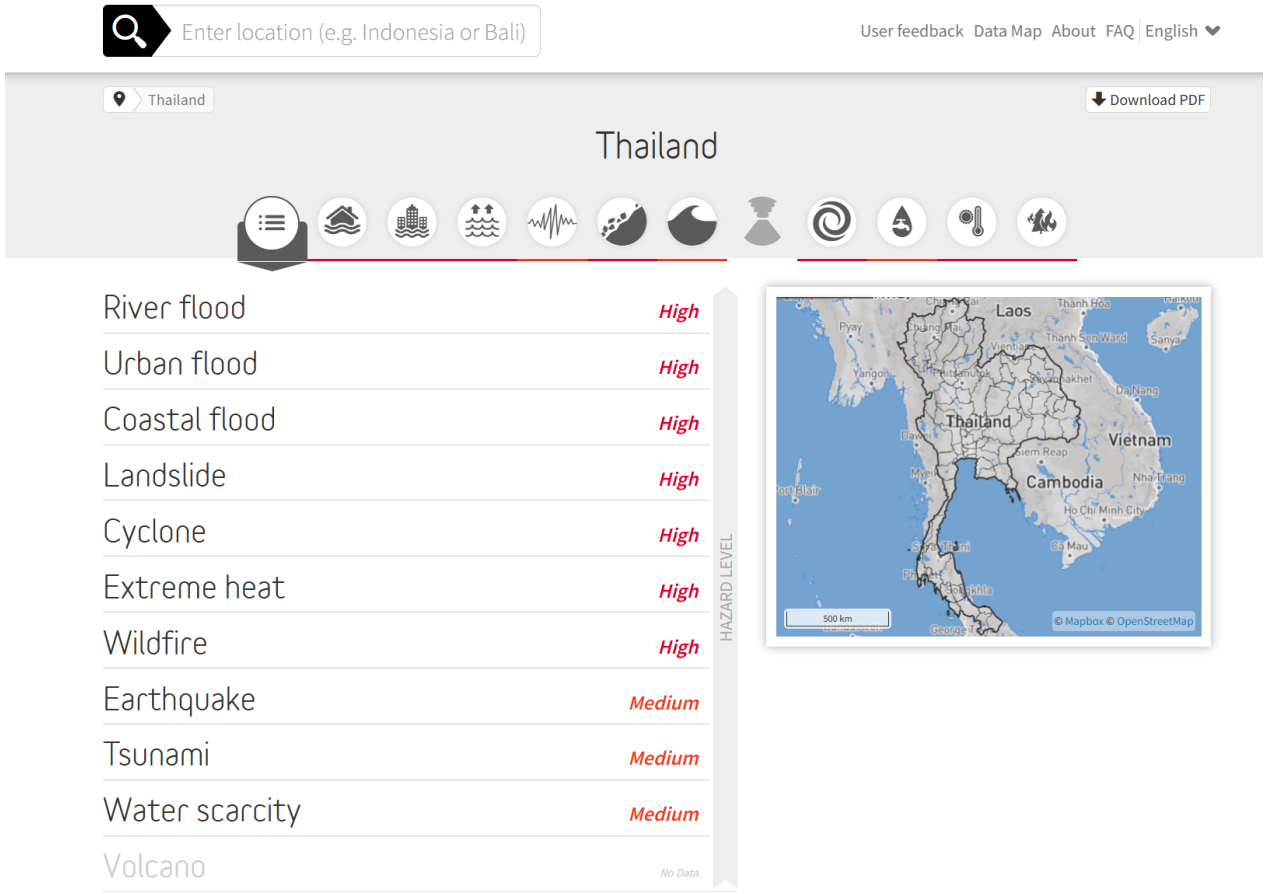
- Country-specific, user-friendly
- https://climateknowledgeportal.worldbank.org/

3. ThinkHazard!

- Rapid multi-hazard screening
- https://thinkhazard.org/

PLUS: National climate data (Met agencies, NAPs)

- **Priority Hazards:** Heat extremes | Floods | Cyclones | Drought | Sea-level rise



Exposure Assessment - Mapping Health System Assets

Spatial mapping of health assets enables targeted adaptation planning

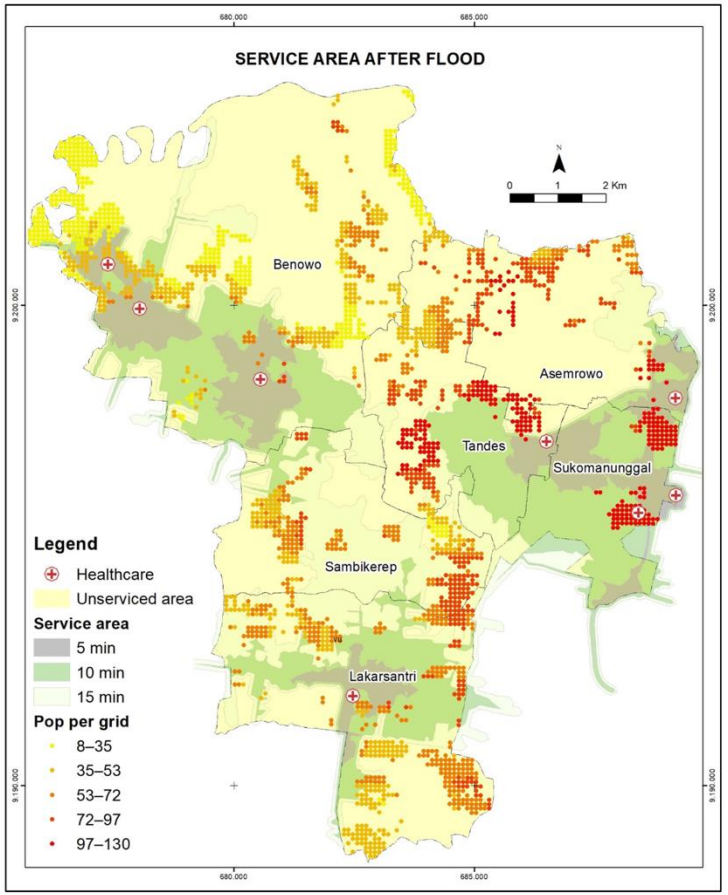
WHAT TO MAP:

Infrastructure & Services

- Facility locations and types (GIS)
- Population served and catchment areas
- Critical support systems (power, water, access)

ASSESSMENT TOOLS:

- **GIS Platforms:** QGIS, ArcGIS, OpenStreetMap
- **Health Data:** MoH facility registries, DHIS2, DHS
- **Satellite Imagery:** Google Earth Engine, Copernicus



Nurwatik et al. 2022. ISPRS Int J. Geo-Inf

Vulnerability and Adaptive Capacity Assessment

Understanding sensitivity and existing resilience identifies where adaptation creates greatest impact

VULNERABILITY DIMENSIONS:

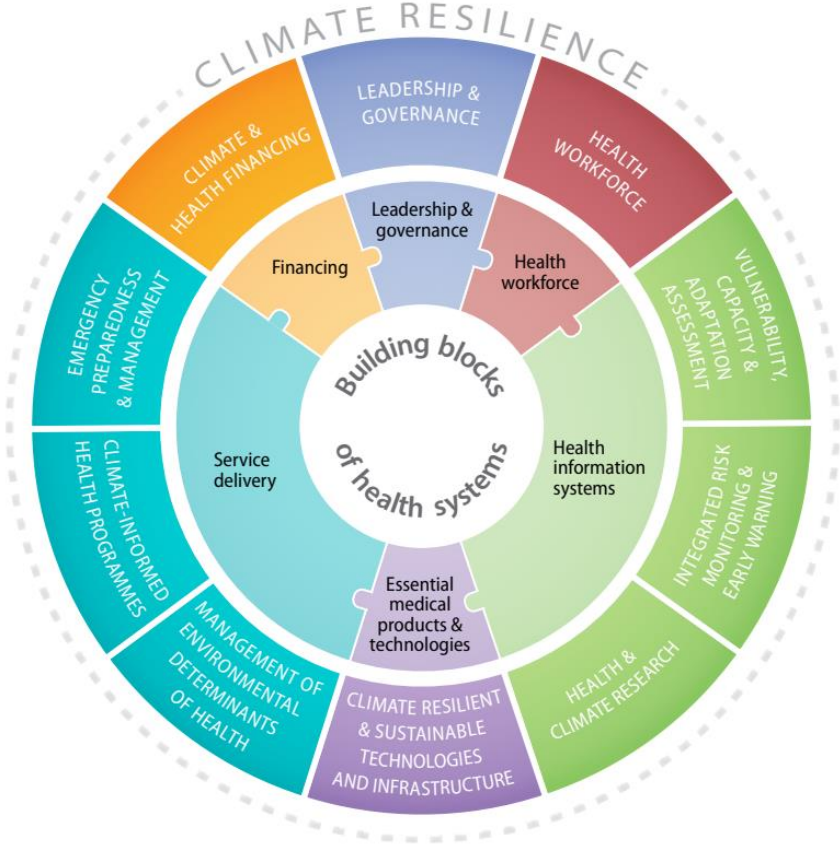
- **Structural:** Building design, age, location characteristics
- **Operational:** Backup power, water storage, medical supplies, emergency protocols
- **Population:** Climate-sensitive disease burden, access barriers, vulnerable groups

ADAPTIVE CAPACITY:

- **System-Level:** Climate-health governance, early warning systems, disaster plans, financing
- **Facility-Level:** Business continuity, staff training, maintenance budgets

ASSESSMENT METHODS:

- Facility surveys and inspections
- Key informant interviews
- Policy/document review
- Historical event analysis



Source: WHO

From Assessment to Action

Integration turns assessment into prioritized adaptation investments

THE PROCESS:

Risk Scoring: Combine hazard, exposure, vulnerability for each facility

- Simple ratings: Low/Medium/High
- Identify highest-risk facilities and populations

Prioritization: Balance multiple factors

- Risk level + population served + service criticality + feasibility

Define Adaptations:

- **System-Level:** Early warning, workforce training, infrastructure standards
- **Facility-Level:** Retrofitting, backup power, water systems

CVRA OUTPUTS → TYPE 2B PROJECT:

- Priority investment plan
- Climate baseline & projections
- Quantified finance needs
- Monitoring framework

Real-World Application - Lao PDR Green Primary Care CVRA

Lao PDR Green Primary Care Project

Project Scope:

- 5 provinces, 27 facilities assessed
- First Type 2B health project in Southeast Asia

Key findings:

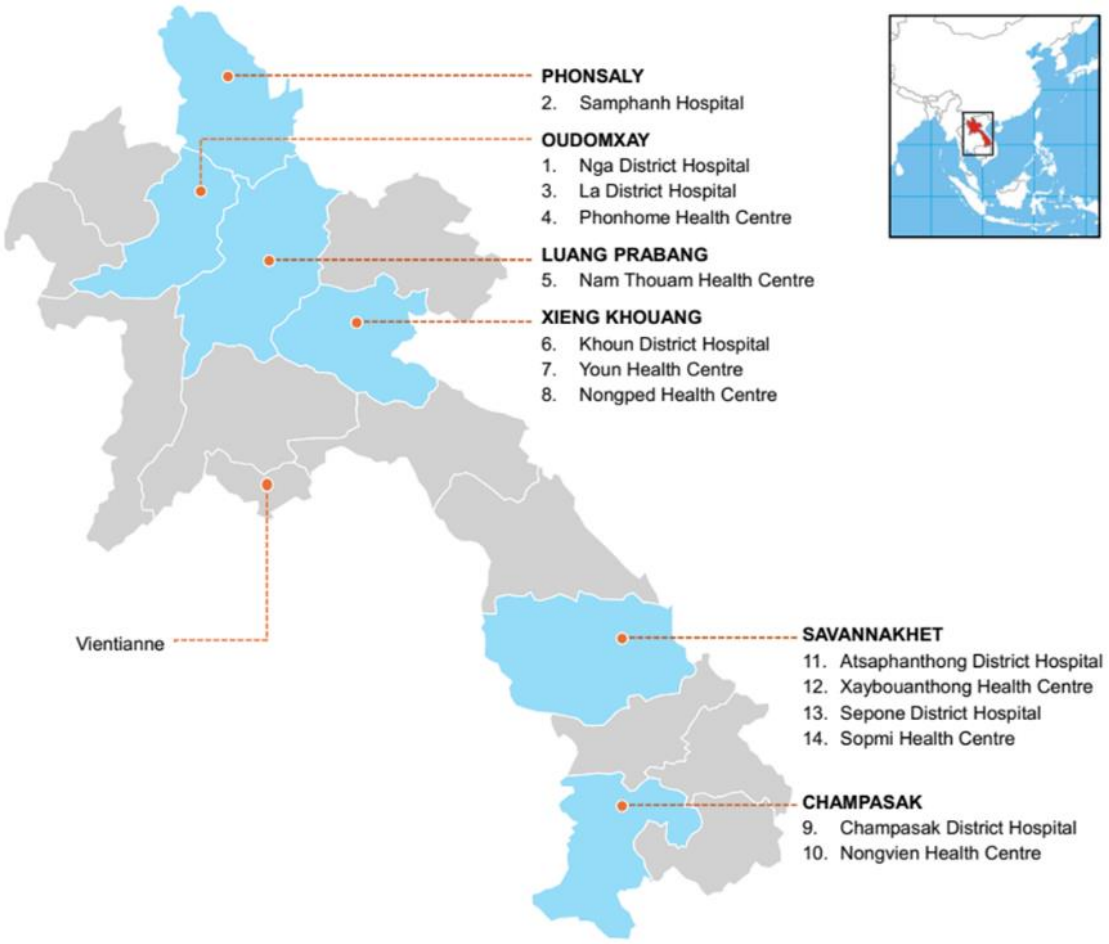
- Climate: Temperature +1.2-1.7°C by 2050 | Extreme heat days: 4 → 26-38/year
- Vulnerabilities: Only 1% of facilities have protection measures | 2018 floods: $7.5M damage

Adaptations identified:

- Climate-resilient infrastructure upgrades
- Enhanced backup power and WASH systems
- Climate-health workforce training

Lessons learned:

- Strong collaboration with MoH
- Balanced rigor with policy timelines
- CRVA catalyzed project development



Key Takeaways

1. **CVRA is foundational** for Type 2B eligibility and climate finance access
2. **Systematic but flexible** Framework: Hazard → Exposure → Vulnerability → Integration Adapt to country context and data availability
3. **Tools are accessible:** CMIP6, World Bank Portal, ThinkHazard, QGIS, WHO frameworks No need for proprietary models
4. **From assessment to action,** CVRA should directly inform project design. System-level interventions create transformation. Keep it practical - don't let perfection delay decision

Thank you.

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