

# South Asia Heat Risk Assessment Lab

Use these slides as table handouts (print 1 set per table).

What participants will do:

- Allocate weight across vulnerability and exposure categories to create a “national formula”
- Score Exposure (1-3) and Vulnerability (1-3) for each area
- Apply a Hazard scenario score (1-3) and compute Risk =  $H \times E \times V$

# How to use these cards

## Step-by-step (recommended)

1) Calculate weights: Split 100 unit across the 5 vulnerability categories.

- Weight = unit ÷ 100 (e.g., 60 unit → 0.60).

2) Exposure: Score each category 1-3, multiply by weights, use the sum score as the overall exposure score for each area.

3) Vulnerability: Score each category 1-3, multiply by weights, use the sum score as the overall vulnerability score for each area.

4) Hazard scenario score: Use the shared scenario (1-3).

5) Risk = Hazard × Exposure × Vulnerability.  
Rank areas and identify top drivers.

## Score meanings (1-3)

1 = Low (limited issue)

2 = Medium (noticeable concern)

3 = High (dominant concern)

If two areas feel close, decide quickly and document your reason.

## Default conversion (for Vulnerability index)

Compute:  $\Sigma(\text{CategoryScore} \times \text{Weight})$ . Range ≈ 1.0-3.0

Convert to Vulnerability score:

- 1.0-1.6 → 1 (Low)
- 1.7-2.3 → 2 (Medium)
- 2.4-3.0 → 3 (High)

# Indicator Definitions (quick reference)

Use to keep scoring consistent across tables

## Exposure indicators

- People concentration: population density / crowding / people in heat-prone zones.
- Built heat load (LST/built-up): impervious surfaces and heat retention (urban heat island).
- Housing/roof prevalence: roof material and ventilation affecting indoor temperatures.
- Shade/green cover: NDVI/tree canopy/shade access that reduces radiant heat and cools air.

## Hazard indicators (scenario-based)

- Tmax anomaly: temperature above local normal (captures “unexpected severity”).
- Humid heat: Heat Index / WBGT proxy (reduced evaporative cooling).
- Hot nights (Tmin): limited overnight recovery; increases cumulative stress.
- Duration: multiple consecutive days increases risk even at similar Tmax.

## Vulnerability categories

- Demographics: groups with higher heat sensitivity (elderly, young children, pregnancy).
- Health status: chronic illness, disability, medications affecting thermoregulation.
- Work/Livelihood: outdoor/manual work and limited ability to shift work hours.
- Housing/Settlement: insulation, ventilation, crowding, settlement layout.
- Socio-economic & access: poverty, social protection, transport, affordability, service access.

## Common scoring pitfalls

- Do not double-count the same factor unless agreed (e.g., housing can affect both exposure and vulnerability- be explicit).
  - Distance to health facility is not the same as access (cost, transport, crowding).
  - A “low exposure” place can still be high risk if vulnerability is high and hazard is severe.
- Write down your assumptions (1 sentence) to make scoring transparent.

# Vulnerability Weighting Worksheet

Create your “national formula” for Vulnerability

## Compute weights

Vulnerability category	Unit (0-100)	Weight ( $\div 100$ )	Notes / examples
Demographics	<input type="text"/>	<input type="text"/>	Elderly, young children, pregnancy
Health status	<input type="text"/>	<input type="text"/>	Chronic illness, disability
Work/Livelihood	<input type="text"/>	<input type="text"/>	Outdoor/manual work, shiftability
Housing/Settlement	<input type="text"/>	<input type="text"/>	Tin roofs, crowding, ventilation
Socio-economic & access	<input type="text"/>	<input type="text"/>	Poverty, transport, affordability

**Check: Total must be equal 100**

**Total:**

Formula reminder: Vulnerability Index =  $\Sigma(\text{CategoryScore} \times \text{Weight})$

# Exposure Weighting Worksheet

Create your "national formula" for Vulnerability

## Compute weights

Exposure category	Unit (0-100)	Weight ( $\div 100$ )	Notes / examples
Population concentration	<input type="text"/>	<input type="text"/>	Population density, crowding
Built Heat Load(LST/built up)	<input type="text"/>	<input type="text"/>	Chronic illness, disability
Housing/Roof prevalence	<input type="text"/>	<input type="text"/>	Outdoor/manual work, shiftability
Shade/Green cover	<input type="text"/>	<input type="text"/>	Tin roofs, crowding, ventilation

**Check: Total must be equal 100**

**Total:**

Formula reminder: Exposure Index =  $\Sigma(\text{CategoryScore} \times \text{Weight})$

# Area A: Urban Informal Settlement

“The Urban Slum” • High crowding • Tin/sheet roofs • Very low shade

## Exposure

### Factors Affecting Urban Heat Exposure

1. High people concentration with dense lanes and limited airflow
2. Very high built heat load from impervious surfaces and heat islands
3. Common use of tin/sheet metal roofs trapping heat
4. Very low shade and green cover with few trees and limited public shade

Driver: Exposure driven by crowding, roof material, and low shade

## Discussion prompt (1 minute)

- Which single factor is the biggest driver here?
- Does “distance to hospital” fully capture access in this area?
- What is one feasible protection action for this area?

## Participant scoring (write on printout)

### Exposure Category scores (1-3):

	Score	Weight	Weighted Score
People concentration	<input type="text"/>	<input type="text"/>	<input type="text"/>
Built Heat Load(LST/built up)	<input type="text"/>	<input type="text"/>	<input type="text"/>
Housing/Roof prevalence	<input type="text"/>	<input type="text"/>	<input type="text"/>
Shade/Green cover	<input type="text"/>	<input type="text"/>	<input type="text"/>
Exposure score (Sum of all final score)	<input type="text"/>		

# Area A: Urban Informal Settlement

“The Urban Slum” • High crowding • Tin/sheet roofs • Very low shade

## Vulnerability

### Common Example Community Vulnerabilities

1. 15% children under 5 years
2. 70% engaged in outdoor/manual labor
3. Approximately 2 km distance to hospital
4. High poverty and limited social protection
5. Unreliable electricity and limited water storage
6. Crowded living conditions

Driver: Vulnerability due to poverty, heat entrapment, limited cooling

## Discussion prompt (1 minute)

- Which single factor is the biggest driver here?
- Does “distance to hospital” fully capture access in this area?
- What is one feasible protection action for this area?

## Participant scoring (write on printout)

### Vulnerability Category scores (1-3):

	Score	Weight	Weighted Score
Demographics	<input type="text"/>	<input type="text"/>	<input type="text"/>
Health status	<input type="text"/>	<input type="text"/>	<input type="text"/>
Work/Livelihood	<input type="text"/>	<input type="text"/>	<input type="text"/>
Housing/Settlement	<input type="text"/>	<input type="text"/>	<input type="text"/>
Socio-economic & access	<input type="text"/>	<input type="text"/>	<input type="text"/>

**Vulnerability score**  
**(Sum of all final score)**

# Area B: Rural Hill / Remote

“The Rural Hill” • Dispersed households • Long travel to care • High elderly share

## Exposure

### Key Environmental Factors

1. Low people concentration with dispersed households
2. Low-medium built heat load due to mixed surfaces
3. Mixed stone and wood housing varying by insulation
4. High shade and green cover providing cooling
5. Modest built heat as likely exposure driver

Exposure may rise on sun-exposed slopes

## Discussion prompt (1 minute)

- If hazard lasts 3-5 days, what fails first here?
- How does remoteness change “risk” even with lower exposure?
- What data would you want to improve this profile?

## Participant scoring (write on printout)

### Exposure Category scores (1-3):

	Score	Weight	Weighted Score
People concentration	<input type="text"/>	<input type="text"/>	<input type="text"/>
Built Heat Load(LST/built up)	<input type="text"/>	<input type="text"/>	<input type="text"/>
Housing/Roof prevalence	<input type="text"/>	<input type="text"/>	<input type="text"/>
Shade/Green cover	<input type="text"/>	<input type="text"/>	<input type="text"/>
Exposure score (Sum of all final score)	<input type="text"/>		

# Area B: Rural Hill / Remote

“The Rural Hill” • Dispersed households • Long travel to care • High elderly share

## Vulnerability

### Key Vulnerability Factors

1. 35% elderly population (>65)
2. 50% engaged in agriculture with sun exposure
3. Approximately 25 km distance to hospital
4. Medium poverty and social protection levels
5. Limited coping services and cooling options
6. Transport constraints affecting access

Vulnerability due to elderly, access barriers, and limited services

## Discussion prompt (1 minute)

- If hazard lasts 3-5 days, what fails first here?
- How does remoteness change “risk” even with lower exposure?
- What data would you want to improve this profile?

## Participant scoring (write on printout)

### Vulnerability Category scores (1-3):

	Score	Weight	Weighted Score
Demographics	<input type="text"/>	<input type="text"/>	<input type="text"/>
Health status	<input type="text"/>	<input type="text"/>	<input type="text"/>
Work/Livelihood	<input type="text"/>	<input type="text"/>	<input type="text"/>
Housing/Settlement	<input type="text"/>	<input type="text"/>	<input type="text"/>
Socio-economic & access	<input type="text"/>	<input type="text"/>	<input type="text"/>

**Vulnerability score**  
**(Sum of all final score)**

# Area C: Planned / Gated Area

“The Gated City” • Better insulation • Reliable services • Landscaped shade

## Exposure

- People concentration: Medium.
- Built heat load (LST/built-up): Medium (paved surfaces, but planned layout).
- Housing/roof prevalence: Concrete with better insulation/ventilation.
- Shade/green cover: Medium (landscaped; private shade).

Likely exposure drivers: paved areas + daytime heat; some night-time heat retention.

## Discussion prompt (1 minute)

- When would this area become high risk?
- Does reliance on AC change vulnerability during power outages?
- What would make exposure “high” in planned areas?

## Participant scoring (write on printout)

### Exposure Category scores (1-3):

	Score	Weight	Weighted Score
People concentration	<input type="text"/>	<input type="text"/>	<input type="text"/>
Built Heat Load(LST/built up)	<input type="text"/>	<input type="text"/>	<input type="text"/>
Housing/Roof prevalence	<input type="text"/>	<input type="text"/>	<input type="text"/>
Shade/Green cover	<input type="text"/>	<input type="text"/>	<input type="text"/>
Exposure score (Sum of all final score)	<input type="text"/>		

# Area C: Planned / Gated Area

"The Gated City" • Better insulation • Reliable services • Landscaped shade

## Vulnerability

- Demographics: ~10% mixed.
- Livelihood/work: ~5% outdoor workers.
- Access to care: ~1 km to hospital.
- Poverty/social protection: Low.
- Coping capacity: reliable power; fan/AC access; water availability.

Likely vulnerability drivers: mainly hazard intensity; vulnerability generally lower.

## Discussion prompt (1 minute)

- When would this area become high risk?
- Does reliance on AC change vulnerability during power outages?
- What would make exposure "high" in planned areas?

## Participant scoring (write on printout)

### Vulnerability Category scores (1-3):

	Score	Weight	Weighted Score
Demographics	<input type="text"/>	<input type="text"/>	<input type="text"/>
Health status	<input type="text"/>	<input type="text"/>	<input type="text"/>
Work/Livelihood	<input type="text"/>	<input type="text"/>	<input type="text"/>
Housing/Settlement	<input type="text"/>	<input type="text"/>	<input type="text"/>
Socio-economic & access	<input type="text"/>	<input type="text"/>	<input type="text"/>

**Vulnerability score**  
(Sum of all final score)

# Scoring Sheet (table worksheet)

Compute Impact = Hazard × Exposure × Vulnerability and rank areas

**Hazard scenario (agree one score for all area):**

Tmax anomaly +5°C • high humidity and warm nights • duration 3+ days

Hazard score (1-3):

area	Exposure (1-3)	Vulnerability (1-3)	Impact (H×E×V)	Rank	Top 2 drivers
Area A	<input type="text"/>				
Area B	<input type="text"/>				
Area C	<input type="text"/>				

**Interpretation : 1-6 = Moderate | 7-14 = High | 15-27 = Critical**