Mapping Climate Change Vulnerability in Southeast Asia

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Hotspots!
Mapping Climate Change Vulnerability In Southeast Asia

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Objective:

- The general objective of this study is to identify which regions in Southeast Asia are the most vulnerable to climate change.

- It is expected that this information will be useful to policy-makers of the region as well as to external donors in better targeting their support towards climate change efforts.

The Conceptual Framework:

- Vulnerability is defined as:

  “The degree to which a system is susceptible to, or unable to cope with the adverse effects of climate change, including climate variability and extremes.

Vulnerability is a function of the *character, magnitude, and rate of climate variation* to which a system is exposed, its *sensitivity*, and its *adaptive capacity*” (IPCC 2001).
Vulnerability = f (exposure, sensitivity, adaptive capacity)

- Exposure is defined as:
  
  “The nature and degree to which a system is exposed to significant climatic variations”.

- Sensitivity is defined as:

  “The degree to which a system is affected, either adversely or beneficially, by climate-related stimuli”.

- Adaptive capacity is defined as:

  “The ability of a system to adjust to climate change, to moderate the potential damage from it, to take advantage of its opportunities, or to cope with its consequences”.
Methodology:

- To identify the vulnerable regions, an index of the climate change vulnerability of 590 subnational administrative areas in seven countries in Southeast Asia (i.e. Vietnam, Laos, Cambodia, Thailand, Malaysia, the Philippines, and Indonesia) was developed.

- This assessment was carried out by overlaying climate hazard maps, sensitivity maps, and adaptive capacity maps.

- The main limitation of this assessment was the inability to factor in projections of climate change and socio-economic conditions.
**Vulnerability = f (exposure, sensitivity, adaptive capacity)**

**Exposure:**

- Exposure is assessed using information from historical records of climate-related hazards as past exposure to climate risks is considered as the best available proxy for future climate risks.

- Climate hazard maps are obtained for five climate-related risks: tropical cyclones, floods, landslides, droughts, and sea level rise.
Hazard Map 1: Cyclone

Tropical cyclone frequency (event per year from 1980-2003), Source: UNEP-PREVIEW
Hazard Map 2: Flood

Flood frequency (event per year from 1980-2001), Source: UNEP-PREVIEW
Hazard Map 3: Drought

Drought frequency (event per year from 1980-2000), Source: UNEP-PREVIEW
Hazard Map 4: Landslide

Landslide exposure (2005), Source: UNEP-PREVIEW
Hazard Map 5: Sea level rise

Sea level rise (5-m inundation zone), Source: CRESIS
Climate Hazards Index
Vulnerability = f (exposure, sensitivity, adaptive capacity)

**Sensitivity:**

- Population density was used as a proxy for *human sensitivity* to climate-hazard exposure.
  The assumption is that regions that are relatively less inhabited will be less vulnerable compared to regions with high population densities, given the same degree of exposure to climate hazards.

- In addition to the human aspect of vulnerability, *ecological sensitivity* of the region was also included using biodiversity information as a proxy variable. A biodiversity-rich region, measured by the percentage of protected areas, is thus considered as more vulnerable than other areas to climate hazards, other things being equal.
Sensitivity Index
Vulnerability = f (exposure, sensitivity, adaptive capacity)

Adaptive Capacity:

Adaptive Capacity = f (socio-economic factors, technology, infrastructure)
Adaptive Capacity Index
Vulnerability = f (exposure, sensitivity, adaptive capacity)

Climate Change Vulnerability in Southeast Asia
Climate Change Vulnerability in Southeast Asia
Indonesia

Legend
Climate Change Vulnerability
0.00 - 0.06
0.09 - 0.13
0.14 - 0.18
0.19 - 0.23
0.24 - 0.30
0.31 - 0.37
0.38 - 0.45
0.46 - 0.54
0.55 - 0.66
0.67 - 1.00

Scale: 0 180 360 720 Kilometers
Key Conclusions:

- The drivers of vulnerability vary across and within countries.

The high level of vulnerability of Indonesia’s urban hotspots is due largely to their high population density (sensitivity). In Vietnam, vulnerability is mainly due to high exposure to climate hazards (exposure). In Cambodia, low adaptive capacity is the main reason for their high level of vulnerability.

- What these findings show is that policy actions need to be tailored to specific local drivers of vulnerability conditions.