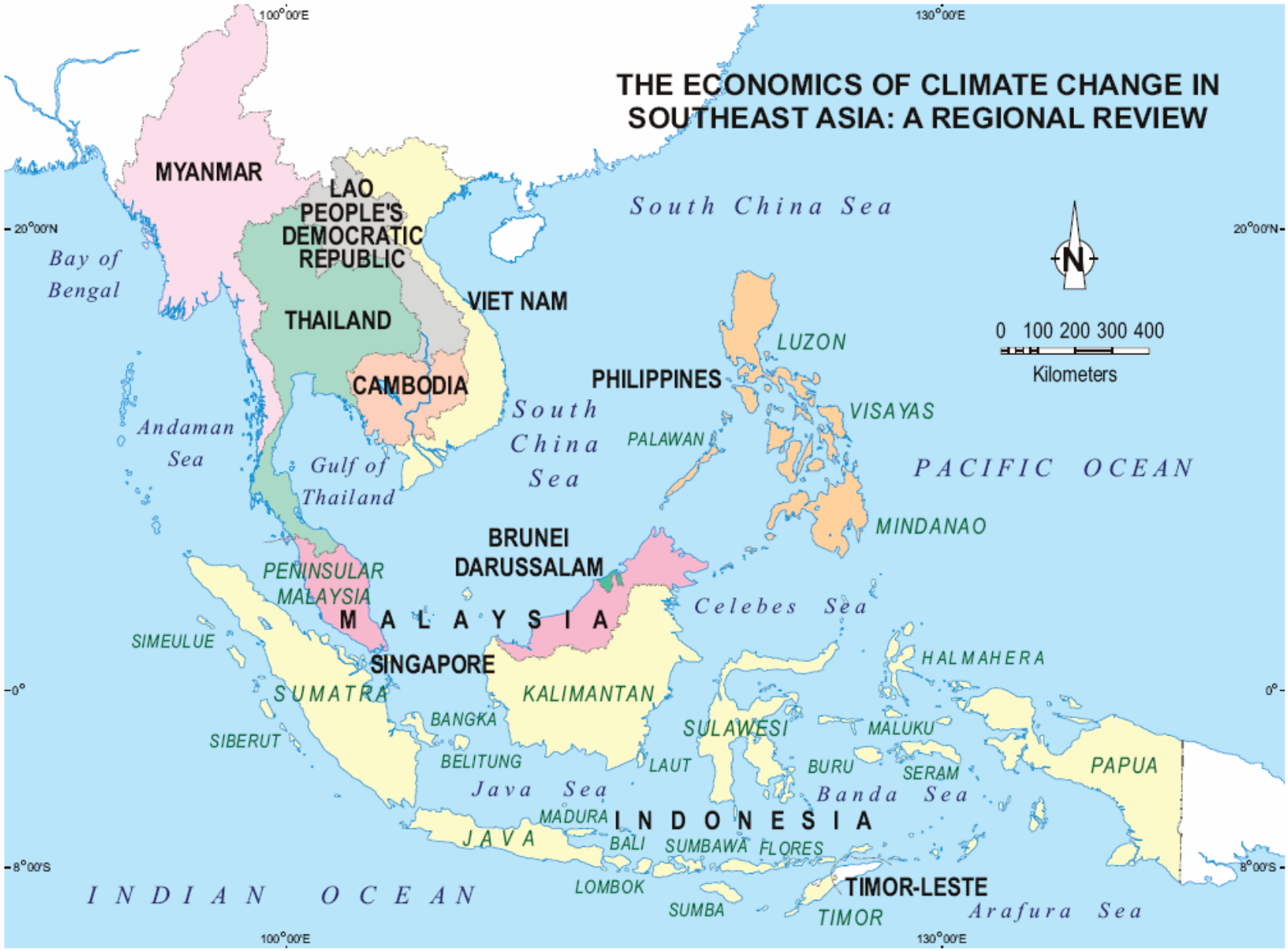
Climate Vulnerabilities in South East Asia

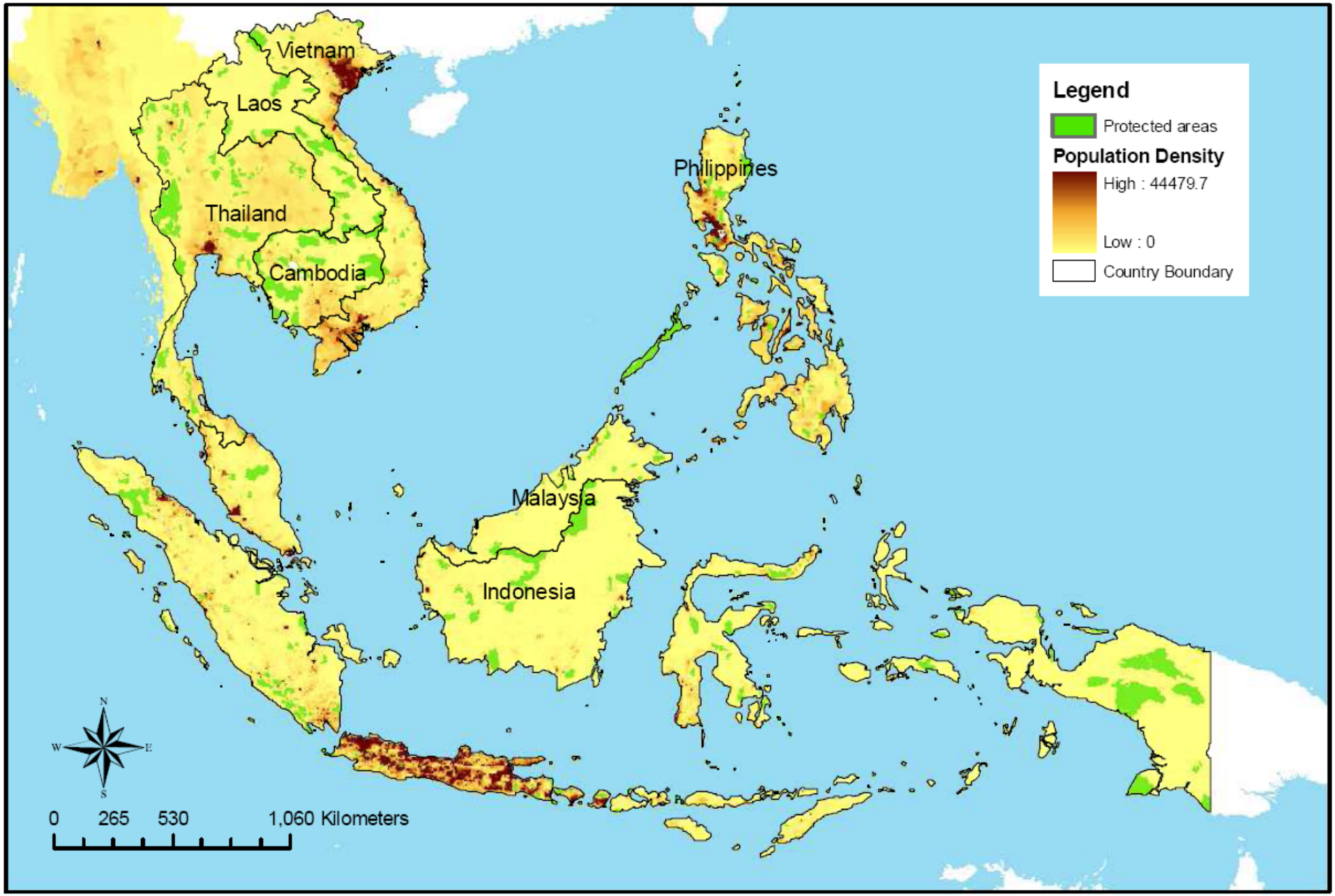
South East Asia



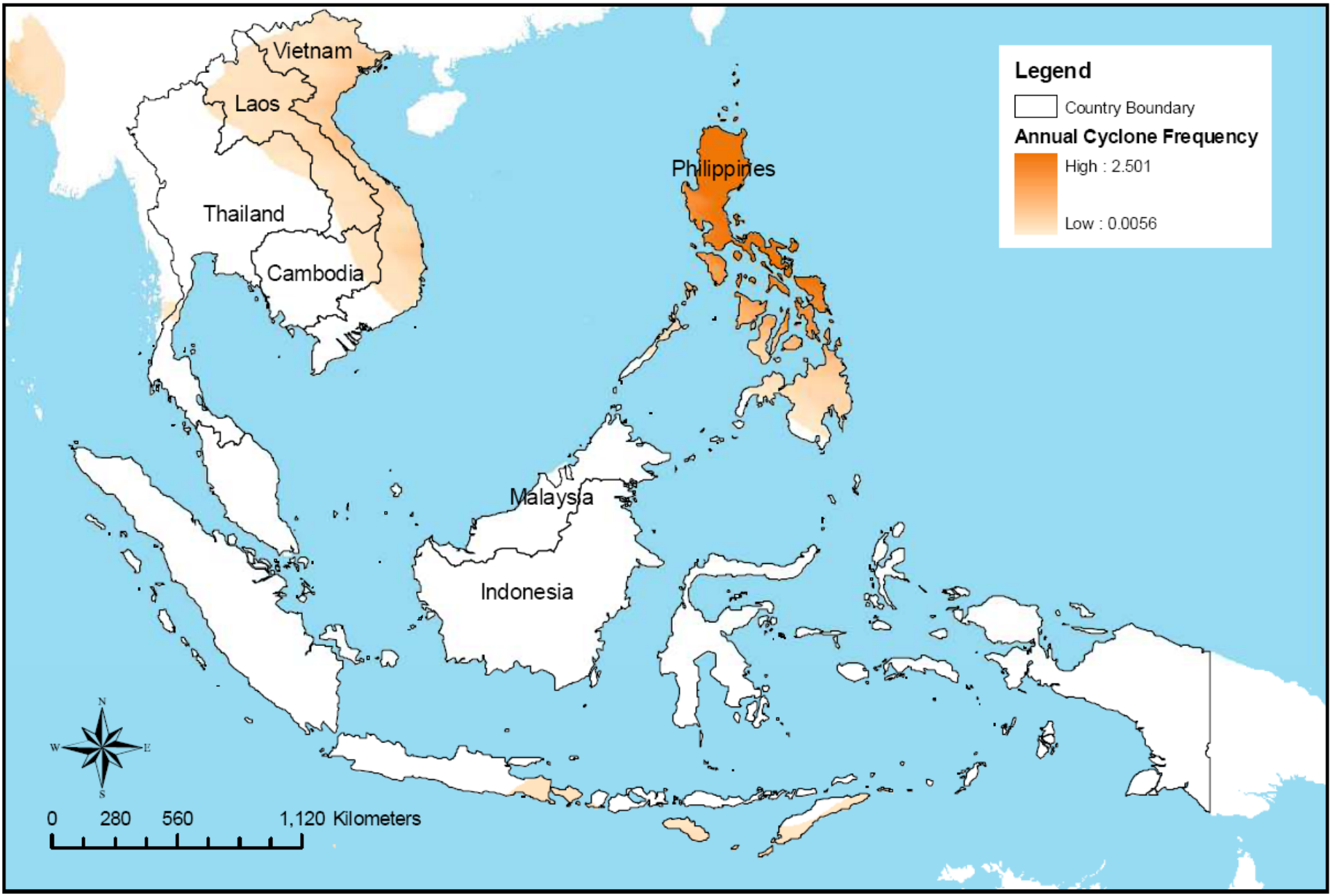
Context of SEA

- One of the world's most vulnerable regions to the impact of climate change
- One of the world's most dynamic and fastest growing regions in past decades. But still faces challenge of eradicating poverty.
- Agriculture remains an important sector accounting for 11% of GDP in 2006 and providing 43.3% of employment in 2004.
- Much of the region's growth is dependent on natural resources
- Urbanization is among the fastest in the world and mostly in coastal areas.

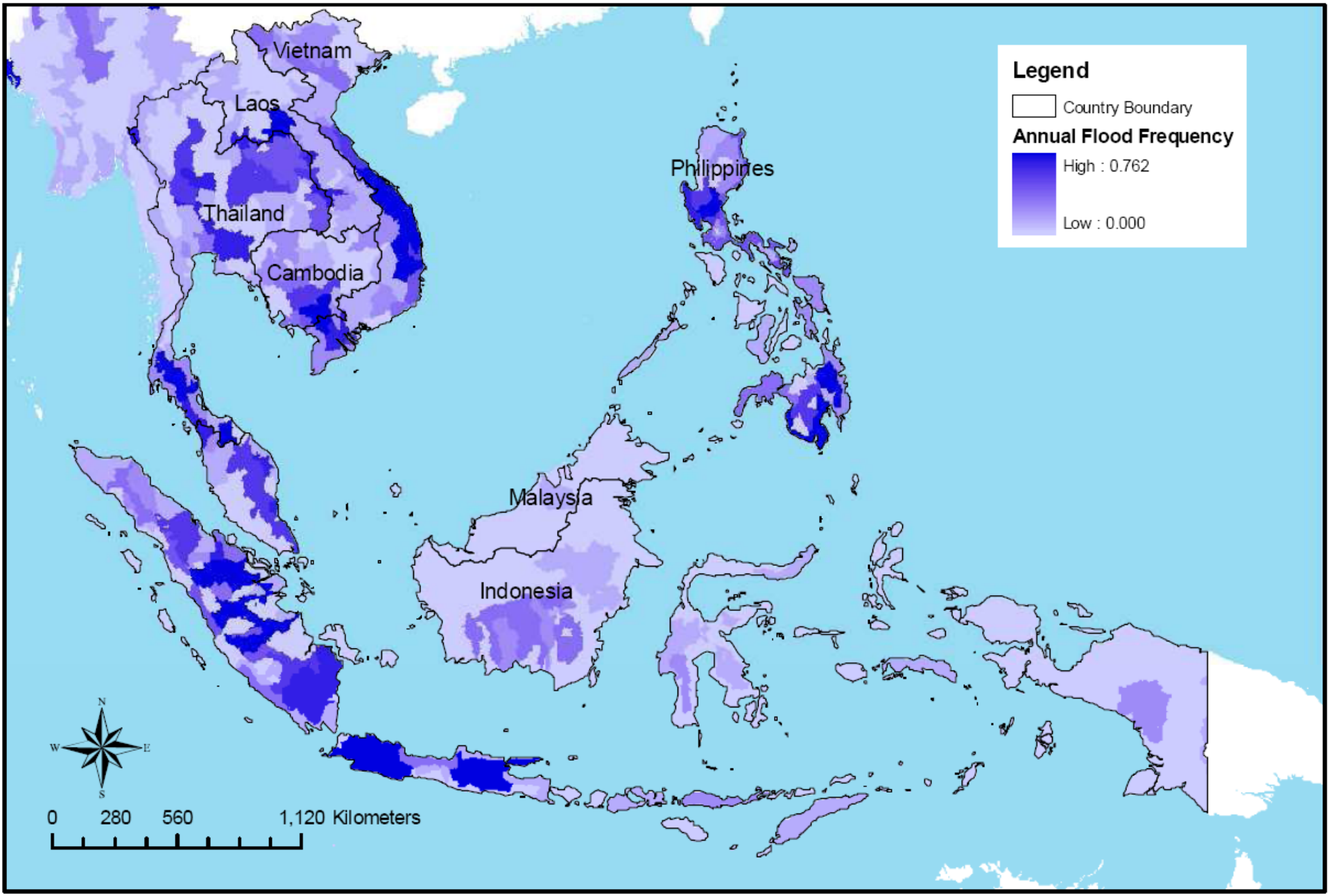
Population Density in SEA



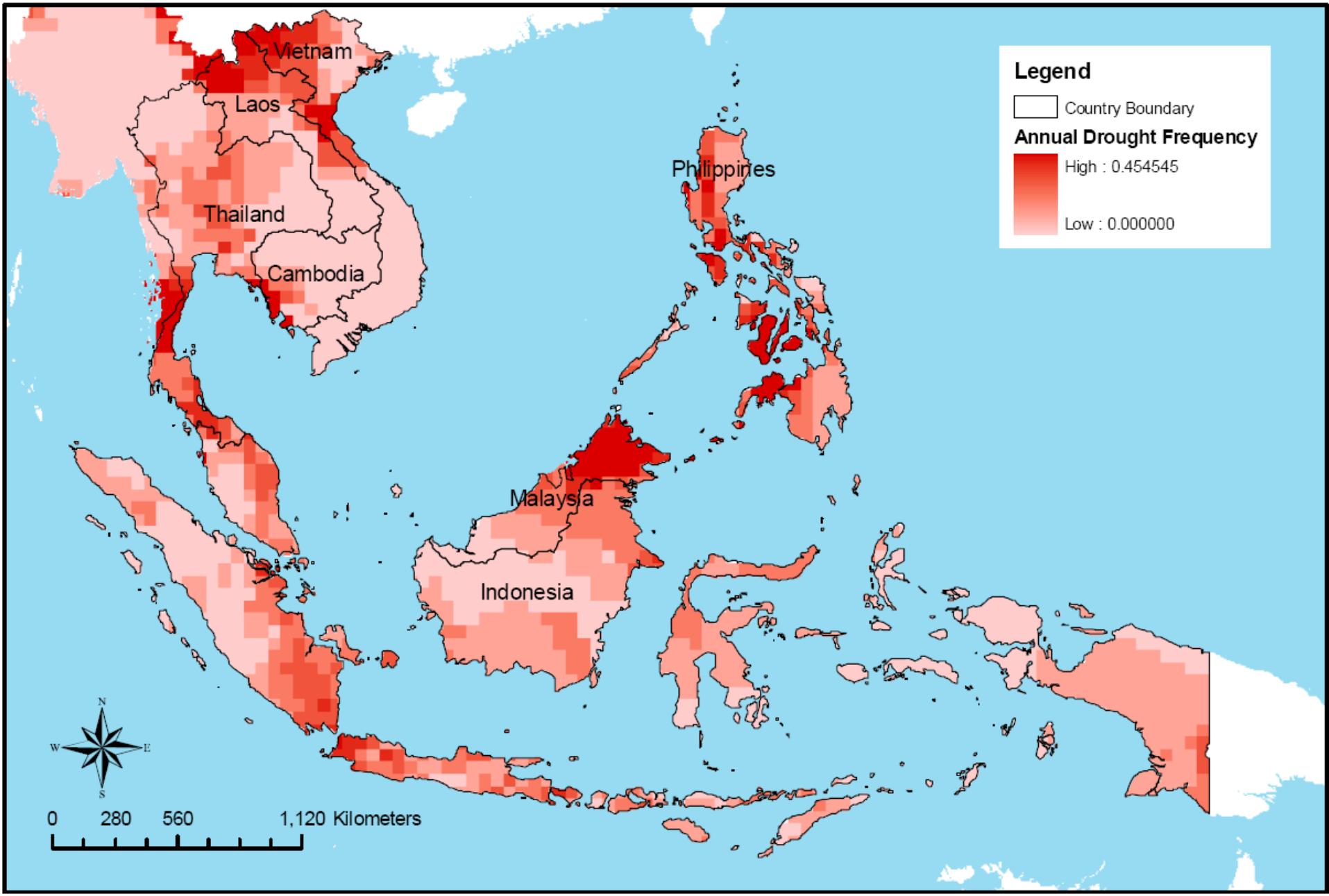
Tropical cyclone frequency (event per year from 1980-2003)



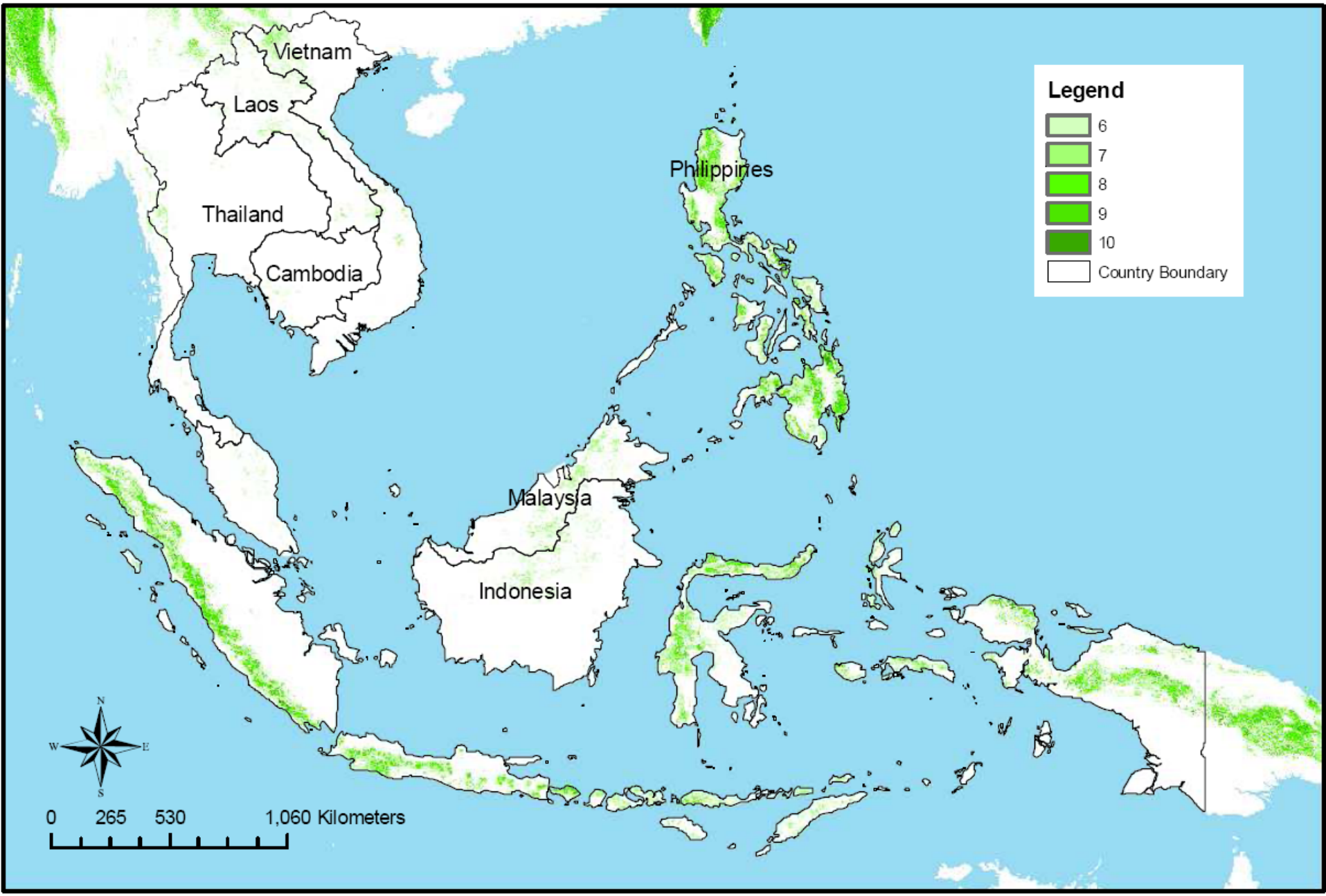
Flood frequency (event per year from 1980-2001)



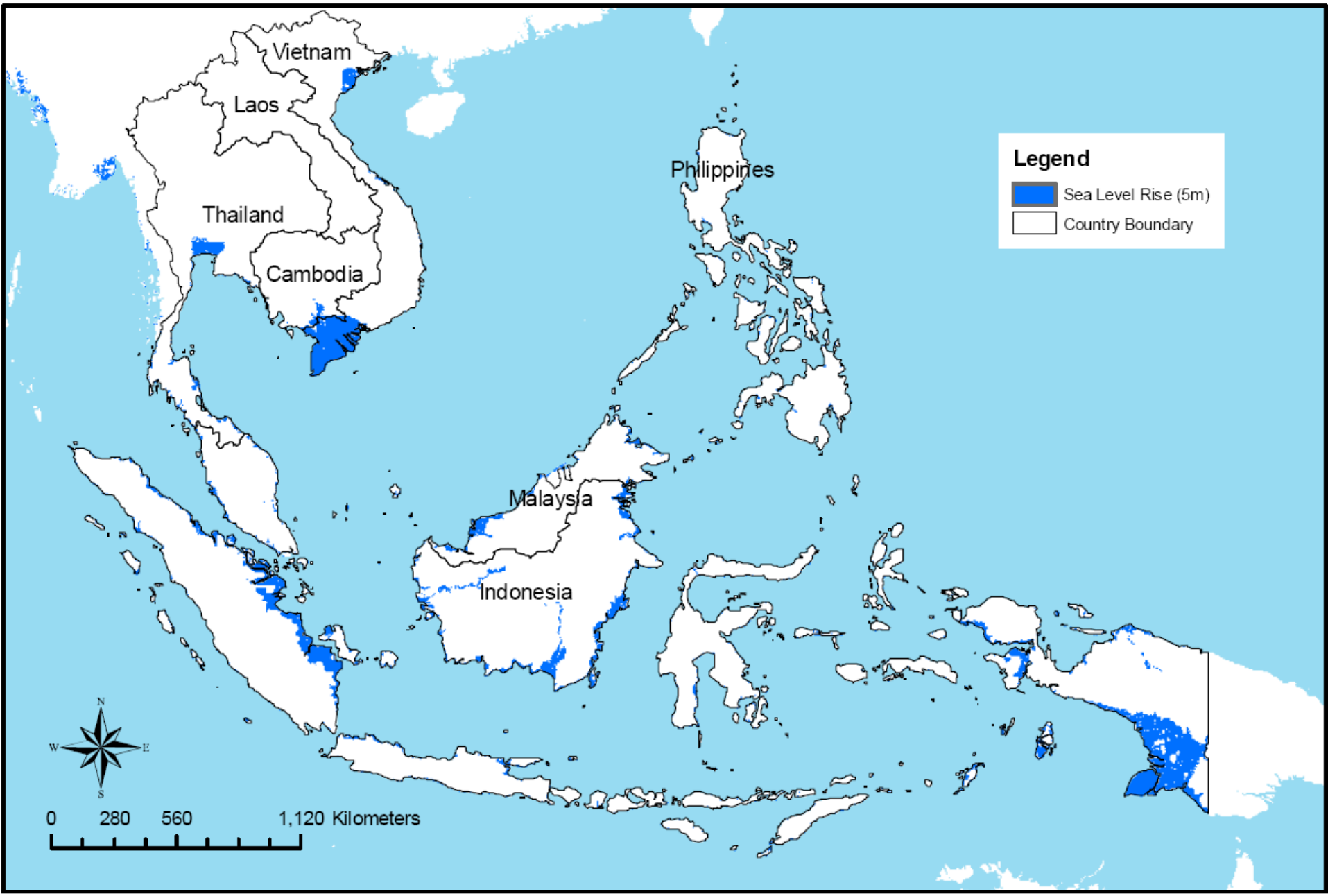
Drought frequency (event per year from 1980-2000)



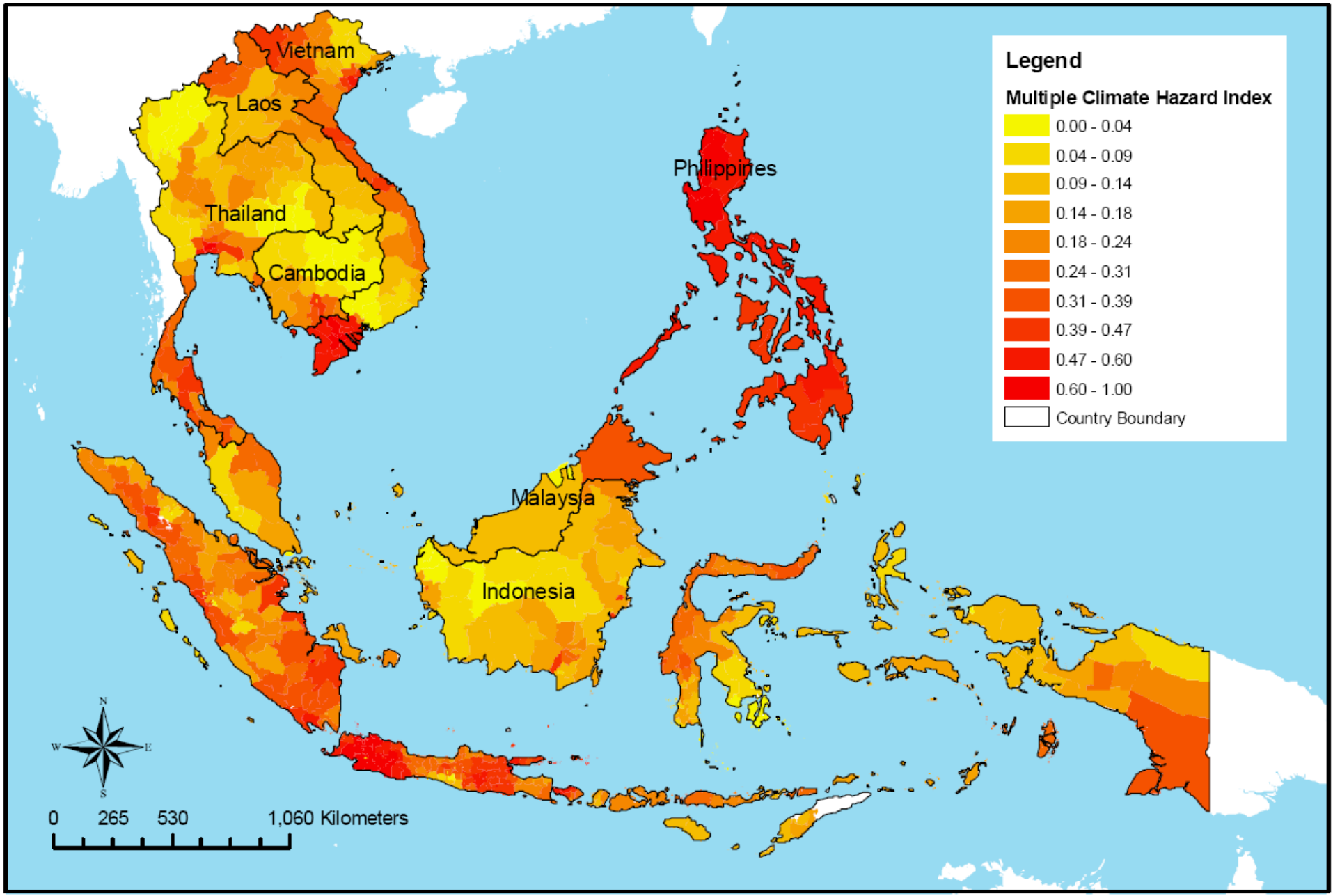
Rainfall induced landslide exposure



Sea Level Rise (5m inundation zone)



Multiple Climate Hazard Index



Climate Hazard Hotspots in SEA

Climate hazard hotspots	Dominant hazards
Northwestern Vietnam	Droughts
Eastern coastal areas of Vietnam	Cyclones, droughts
Mekong region of Vietnam	Sea level rise
Bangkok and its surrounding area in Thailand	Sea level rise, floods
Thailand, Cambodia	Droughts, floods
The Philippines	Cyclones, landslides, floods, droughts
Sabah state in Malaysia	Droughts
Western and eastern area of Java Island, Indonesia	Droughts, floods, landslides, sea level rise

Coping/Adaptive Capacity

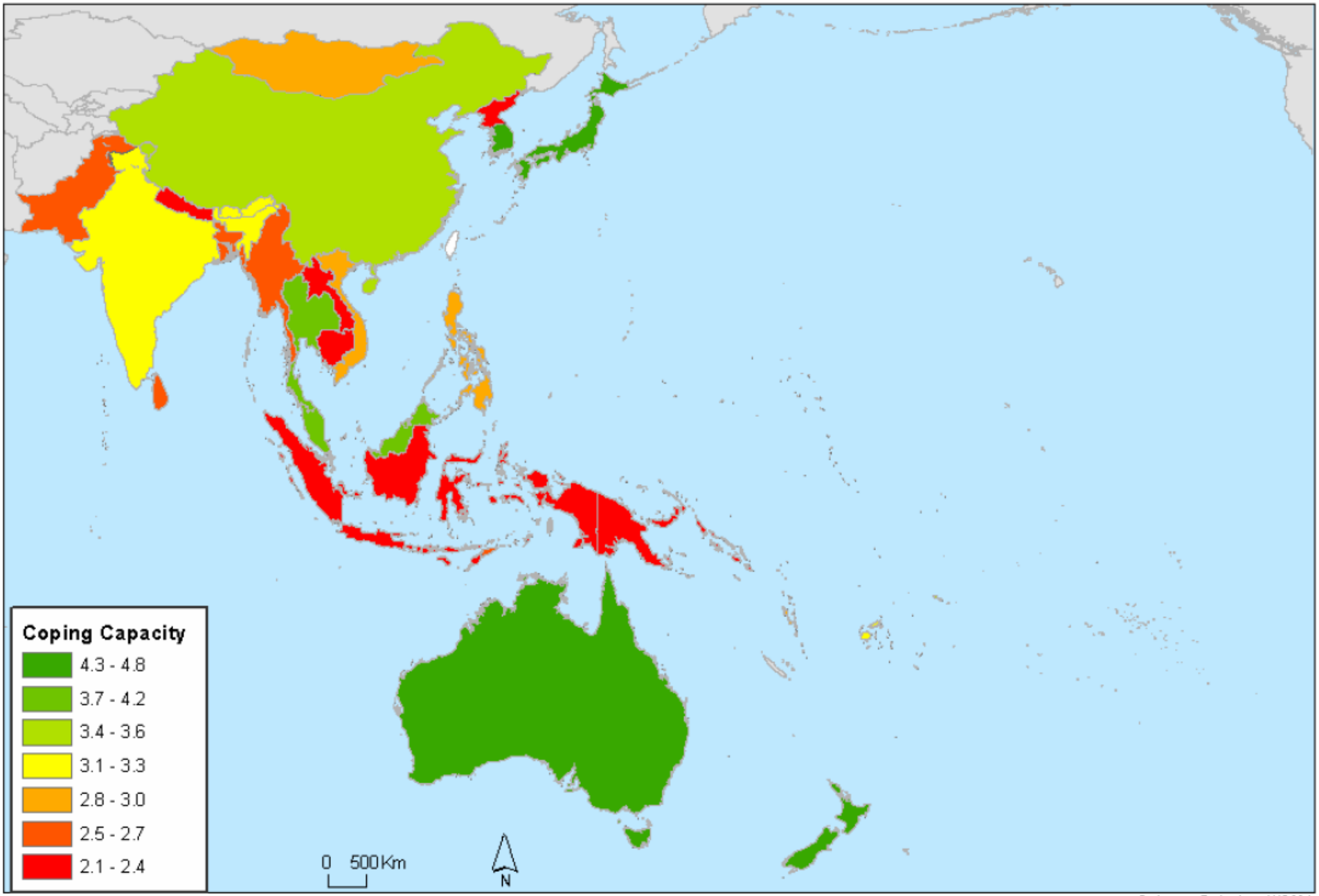
from May '09 NGI-OCHA study
and Jan '09 IDRC, SIDA, CIDA study

May ‘09 NGI-OCHA study

- **Coping Capacity**
  - Hazard evaluation
  - Consequence and vulnerability assessment
  - Awareness-raising activities
  - Sectoral regulations
  - Structural defences
  - Continuity planning
  - Early warning
  - Emergency response
  - Insurance and disaster funds
  - Reconstruction and rehabilitation planning.

Coping Capacity map of South-East Asia and the Pacific *(National Aggregate)*

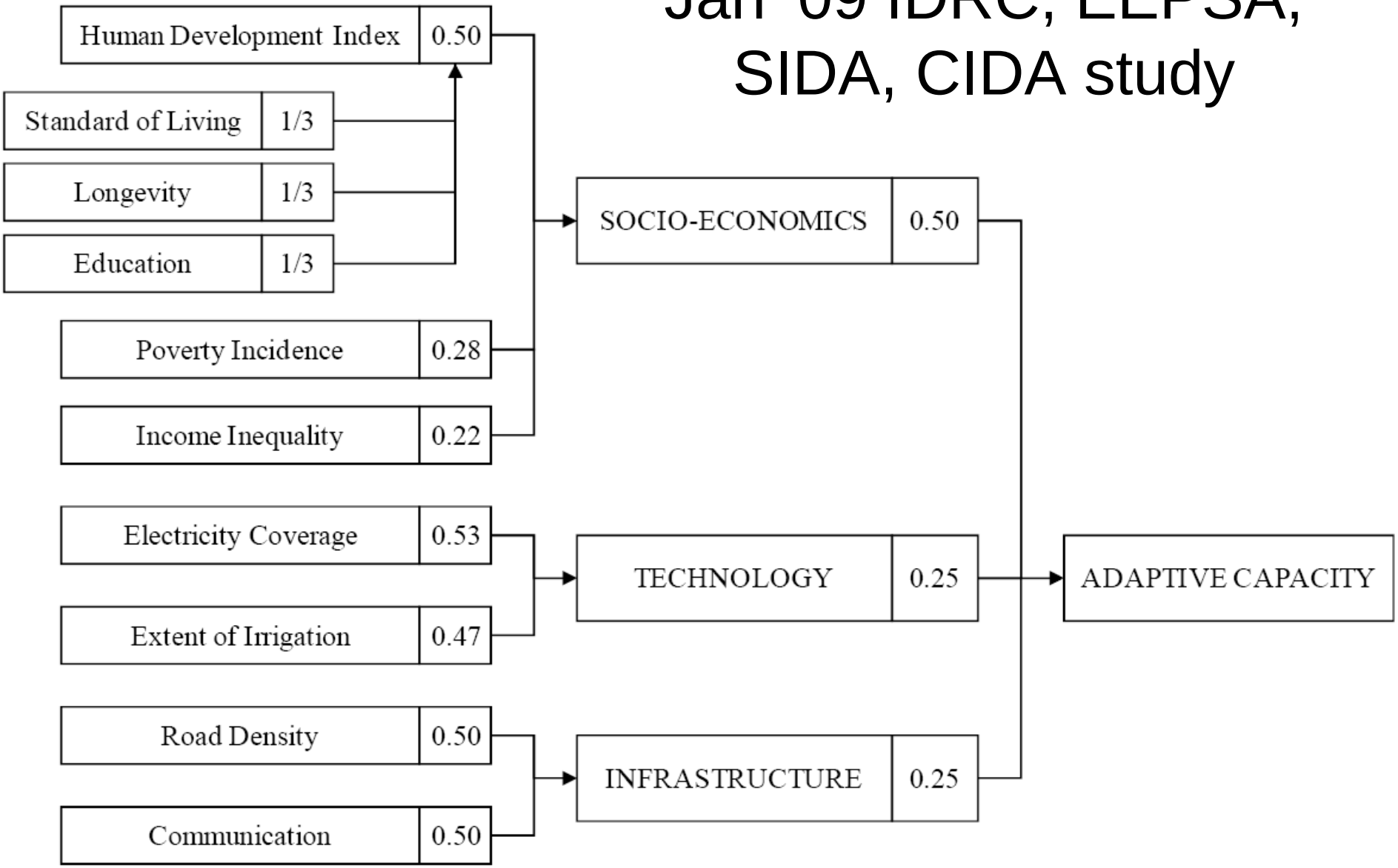
Coping Capacity

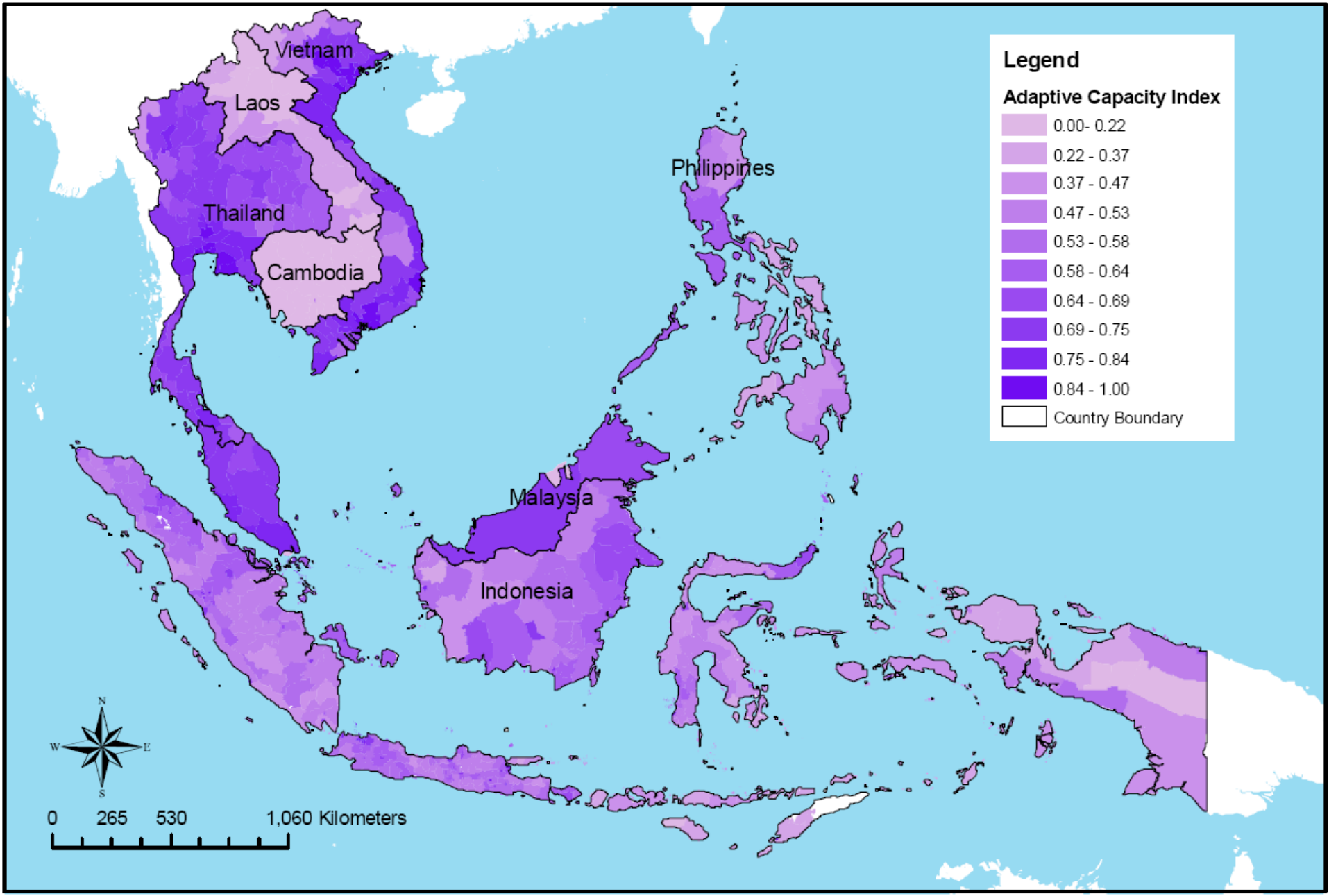


Computed coping capacity indicators for ASEAN countries

	Country aggregate indicator	Pre-event indicator	Post-event indicator
Brunei Darussalam	**4.2**	0.0	4.2
Cambodia	**2.3**	2.3	2.4
Indonesia	**2.3**	2.2	2.5
Lao PDR	**2.4**	3.0	2.1
Malaysia	**4.1**	5.0	3.6
Myanmar	**2.5**	3.5	2.0
Philippines	**2.8**	3.2	2.5
Singapore	**4.5**	0.0	4.5
Thailand	**4.0**	4.5	3.8
Viet Nam	**3.0**	3.0	2.9

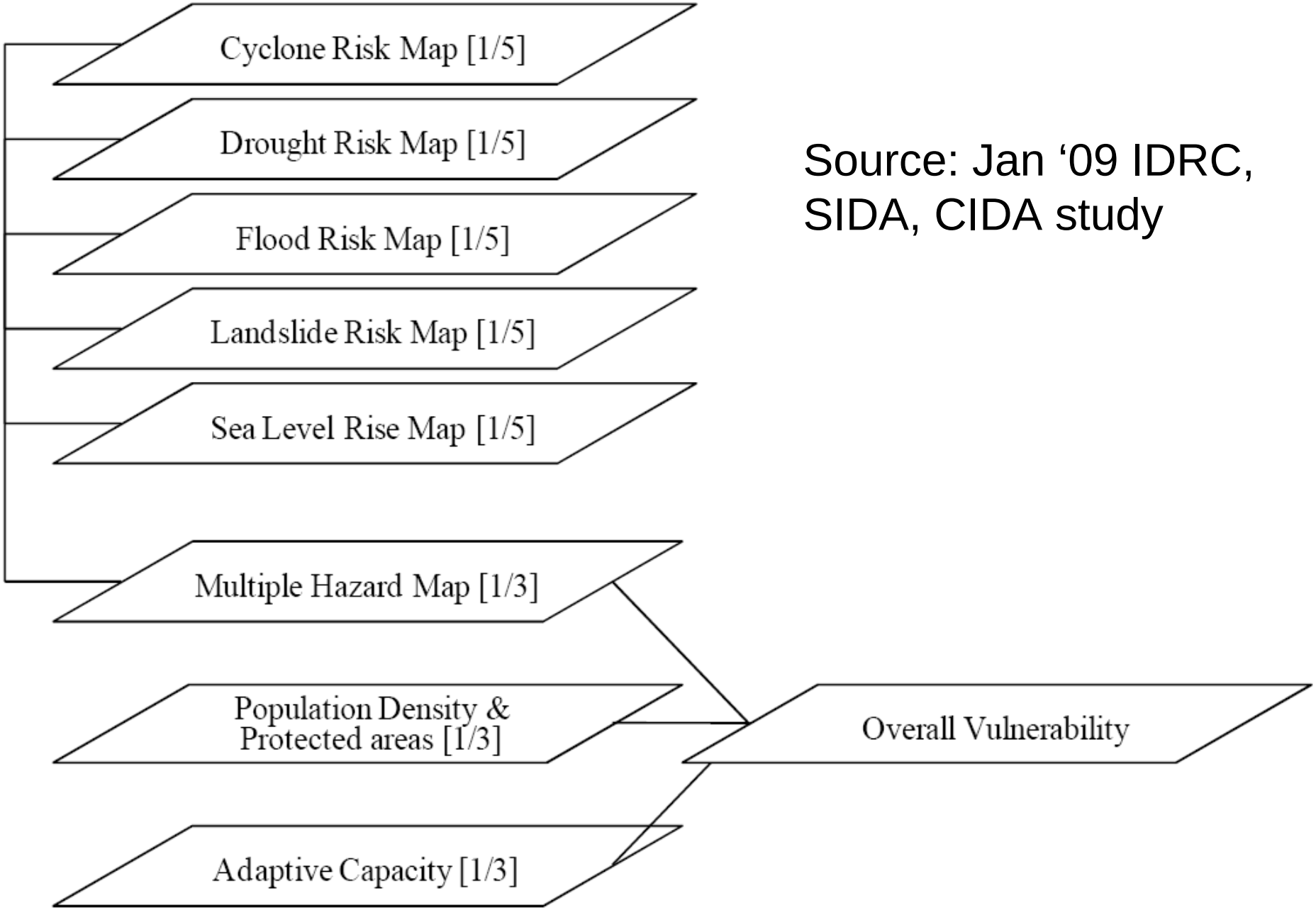
Jan ‘09 IDRC, EEPSA, SIDA, CIDA study




Vietnam
Laos
Thailand
Cambodia
Philippines
Malaysia
Indonesia
Legend
Adaptive Capacity Index
0.00- 0.22
0.22 - 0.37
0.37 - 0.47
0.47 - 0.53
0.53 - 0.58
0.58 - 0.64
0.64 - 0.69
0.69 - 0.75
0.75 - 0.84
0.84 - 1.00
Country Boundary
N
W
E
S
0
265
530
1,060 Kilometers

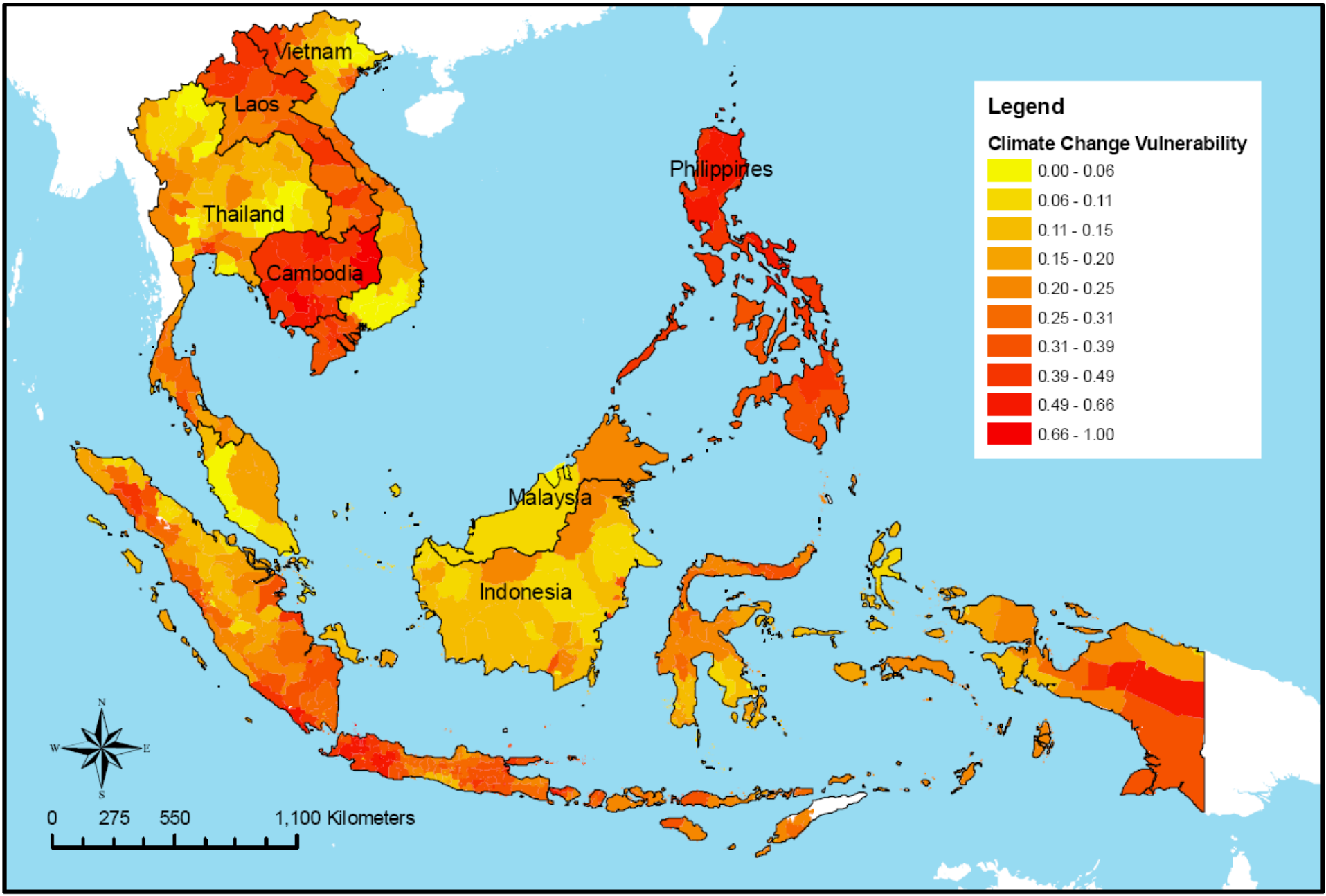
“Vulnerability”

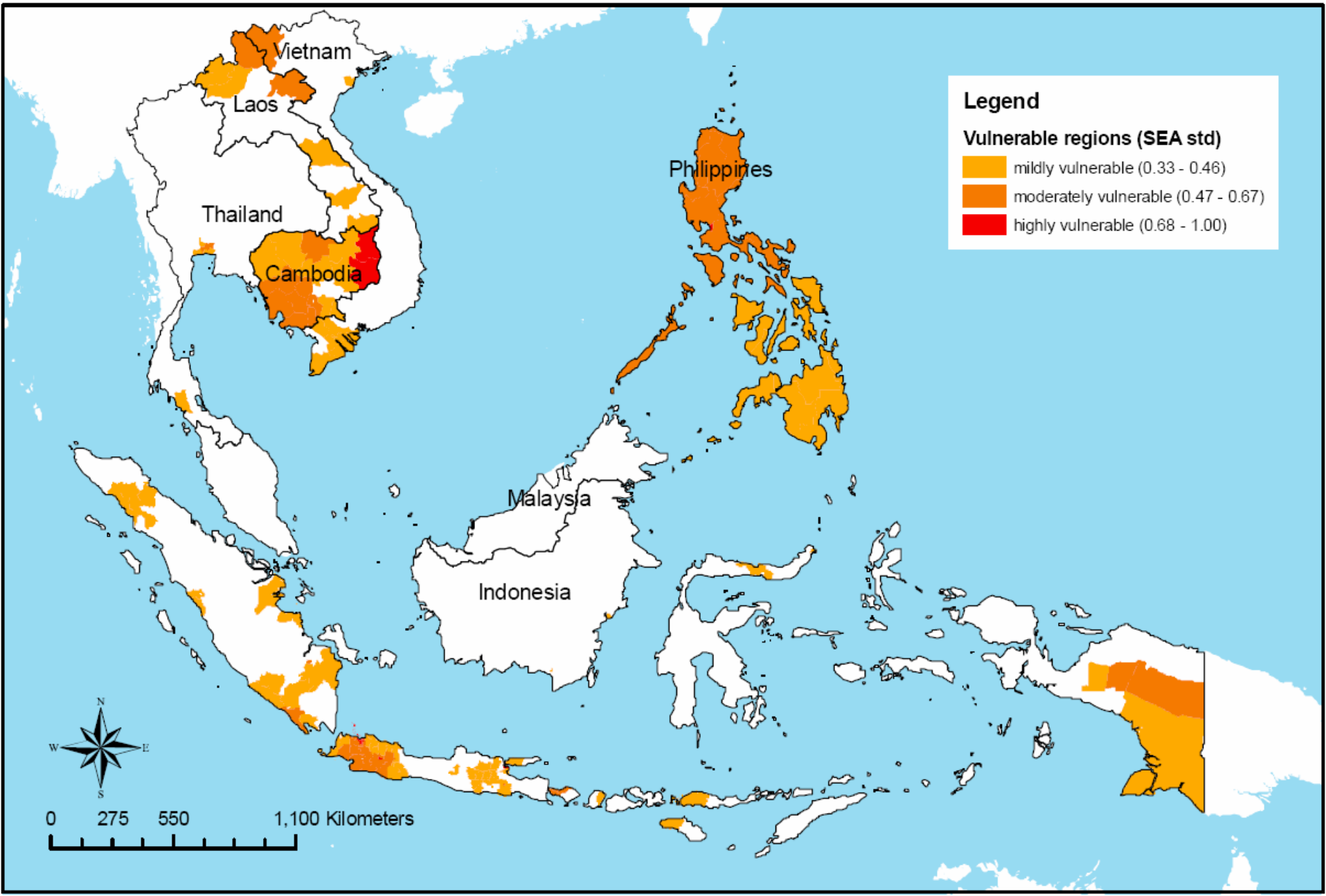
from Jan ‘09 IDRC, SIDA, CIDA study

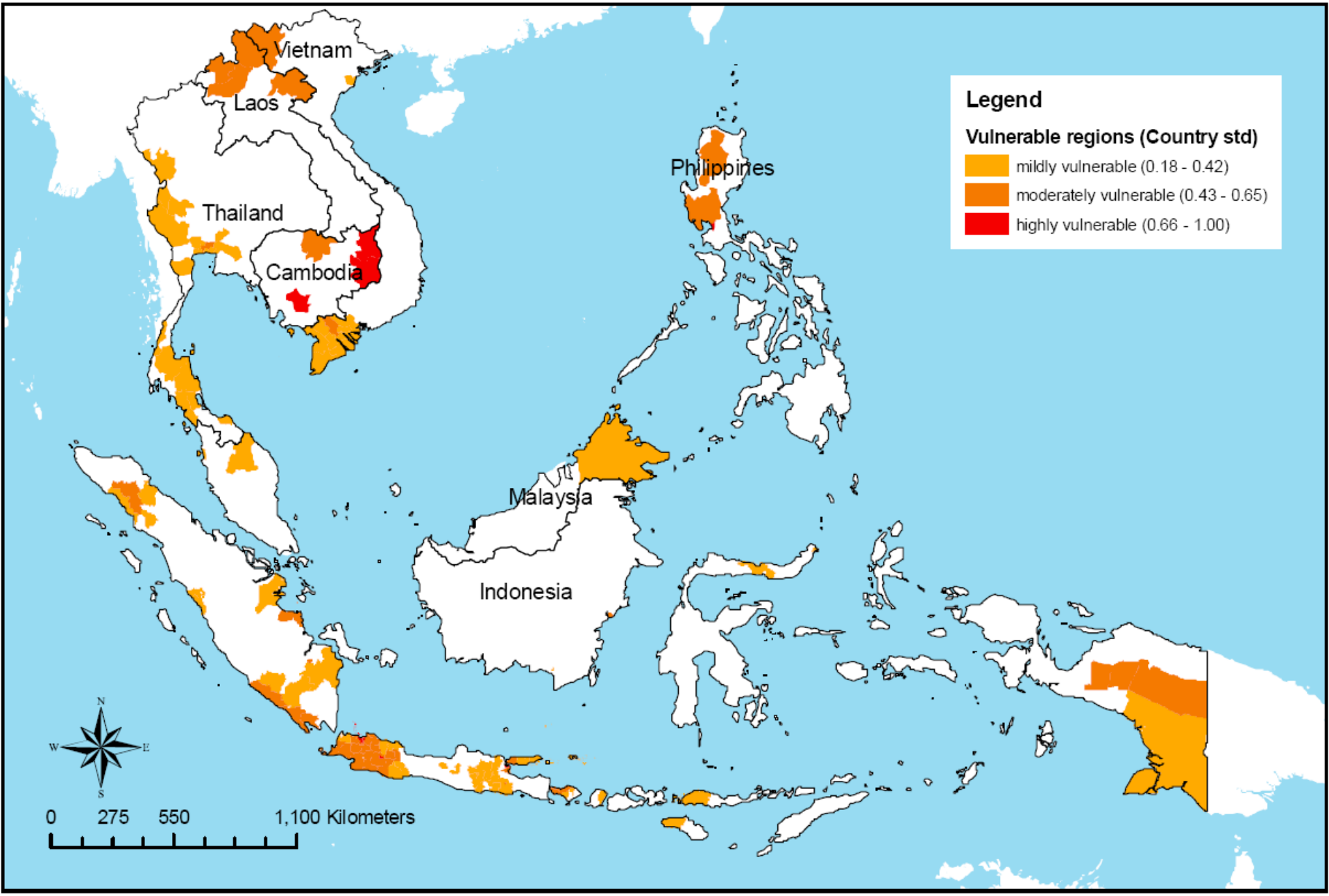


Source: Jan '09 IDRC, SIDA, CIDA study

Method used in deriving the climate change vulnerability index


Vietnam
Laos
Thailand
Cambodia
Philippines
Malaysia
Indonesia
Legend
Climate Change Vulnerability
0.00 - 0.06
0.06 - 0.11
0.11 - 0.15
0.15 - 0.20
0.20 - 0.25
0.25 - 0.31
0.31 - 0.39
0.39 - 0.49
0.49 - 0.66
0.66 - 1.00
N
W
E
S
0
275
550
1,100 Kilometers


Vietnam
Laos
Thailand
Cambodia
Philippines
Malaysia
Indonesia
Legend
Vulnerable regions (SEA std)
mildly vulnerable (0.33 - 0.46)
moderately vulnerable (0.47 - 0.67)
highly vulnerable (0.68 - 1.00)
N
W
E
S
0
275
550
1,100 Kilometers


Vietnam
Laos
Thailand
Cambodia
Philippines
Malaysia
Indonesia
Legend
Vulnerable regions (Country std)
mildly vulnerable (0.18 - 0.42)
moderately vulnerable (0.43 - 0.65)
highly vulnerable (0.66 - 1.00)
N
W
E
S
0
275
550
1,100 Kilometers

Climate Threats and Building Resilience in SEA

Key messages for SEA

- **Average temp increased 0.1–0.3°C/decade** and **sea level rose 1–3 mm/yr** over the last 50 years. Downward trend in precipitation during 1960–2000.
- **Increased frequency and intensity of extreme weather events** is evidence that climate change is already affecting the region.
- **Climate change is likely to intensify in the decades to come**. The region is projected to warm further, become drier still in many parts, particularly in Indonesia, Thailand, and Viet Nam; and experience further rises in sea level.
- **Likely to suffer more from climate change than the global average**. The region therefore has a high stake in taking action.

How will the hazards change and by how much?

from April ’09 ADB Study on the Economics of Climate Change

Observed Temperature Changes in Southeast Asia and Projected Changes in the Future

Table 3.1. Observed Temperature Changes in Southeast Asia

	Temperature change (°C)	Source
Indonesia	Increase of 1.04–1.40°C per century	Rataq (2007)
Philippines	Increase of 1.4°C per century	IPCC (2007)
Singapore	Increasing by about 0.3°C per decade as observed between 1987—2007	Ho (2008)
Thailand	Increase of 1.04–1.80°C per century	Jesdapipat (2008)
Viet Nam	Increase of 1.0°C per century	Cuong (2008)

Source: Compiled by ADB study team.

Table 3.2. Projected Change in Mean Surface Air Temperature for Southeast Asia under A1FI and B1 (with respect to baseline period of 1961—1990), °C

Season	2010—2039		2040—2069		2070—2099	
	A1FI	B1	A1FI	B1	A1FI	B1
December to February	0.86	0.72	2.25	1.32	3.92	2.02
March to May	0.92	0.80	2.32	1.34	3.83	2.04
June to August	0.83	0.74	2.13	1.30	3.61	1.87
September to November	0.85	0.75	1.32	1.32	3.72	1.90
Mean	0.87	0.75	2.01	1.32	3.77	1.96

Source: IPCC (2007).

Observed Precipitation in Southeast Asia and Projected Changes in the Future

Table 3.3. Observed Change in Precipitation in Southeast Asia

	Change in precipitation	Reference
Indonesia	Decrease in annual rainfall during recent decades in some areas	Aldrian (2007)
Philippines	Increase in annual rainfall and in the number of rainy days	Anglo (2006)
Singapore	Decrease in annual rainfall in the past three decades	Ho (2008)
Thailand	Decreasing annual rainfall for the last five decades	Jesdapipat (2008)
Viet Nam	Decrease in monthly rainfall in July-August and increase in September to November	Cuong (2008)

Source: Compiled by ADB study team.

Table 3.4. Projected Change in Precipitation for Southeast Asia under A1FI and B1 (with respect to baseline period 1961–1990), %

Season	2010–2039		2040–2069		2070–2099	
	A1FI	B1	A1FI	B1	A1FI	B1
December–February	-1	1	2	4	6	4
March–May	0	0	3	3	12	5
June–August	-1	0	0	1	7	1
September–November	-2	0	-1	1	7	2
Mean	-1.00	0.25	1.00	2.25	8.00	3.00

Source: IPCC (2007).

Observed Changes in Extreme Events and Severe Climate Anomalies in Southeast Asia

Table 3.5. Observed Changes in Extreme Events and Severe Climate Anomalies in Southeast Asia

Extreme Events	Key Trends	Reference
Heat waves	Increase in hot days and warm nights and decrease in cold days and nights between 1961 and 1998	Manton et al. (2001), Cruz et al. (2006), Tran et al. (2005)
Intense rains and floods	Increased occurrence of extreme rains causing flash floods in Viet Nam; landslides and floods in 1990 and 2004 in the Philippines, and floods in Cambodia in 2000	FAO/WFP (2000), Environment News Service (2002), FAO (2004a), Cruz et al. (2006), Tran et al. (2005)
Droughts	Droughts normally associated with El Niño years in Indonesia, Lao PDR, Myanmar, Philippines, and Viet Nam; droughts in 1997 and 1998 causing massive crop failures and water shortages as well as forest fires in various parts of Indonesia, Lao PDR, and Philippines	Duong (2000), Kelly and Adger (2000), Glantz (2001), PAGASA (2001)
Typhoons	On average, 20 cyclones cross the Philippine area of responsibility with about eight or nine making landfall each year; an average increase of 4.2 in the frequency of cyclones entering the Philippine area of responsibility during the period 1990–2003	PAGASA (2005)

Source: IPCC (2007).

Projected Changes in Extreme Events and Severe Climate Anomalies in Southeast Asia

IPCC (2007) projects the following

- An increase in intense precipitation events and an increase in the inter-annual variability of daily precipitation in the Asian summer monsoon.
- An increase of 10–20% in tropical cyclone intensity.
- Amplification in storm-surge heights, resulting in an enhanced risk of coastal disasters.

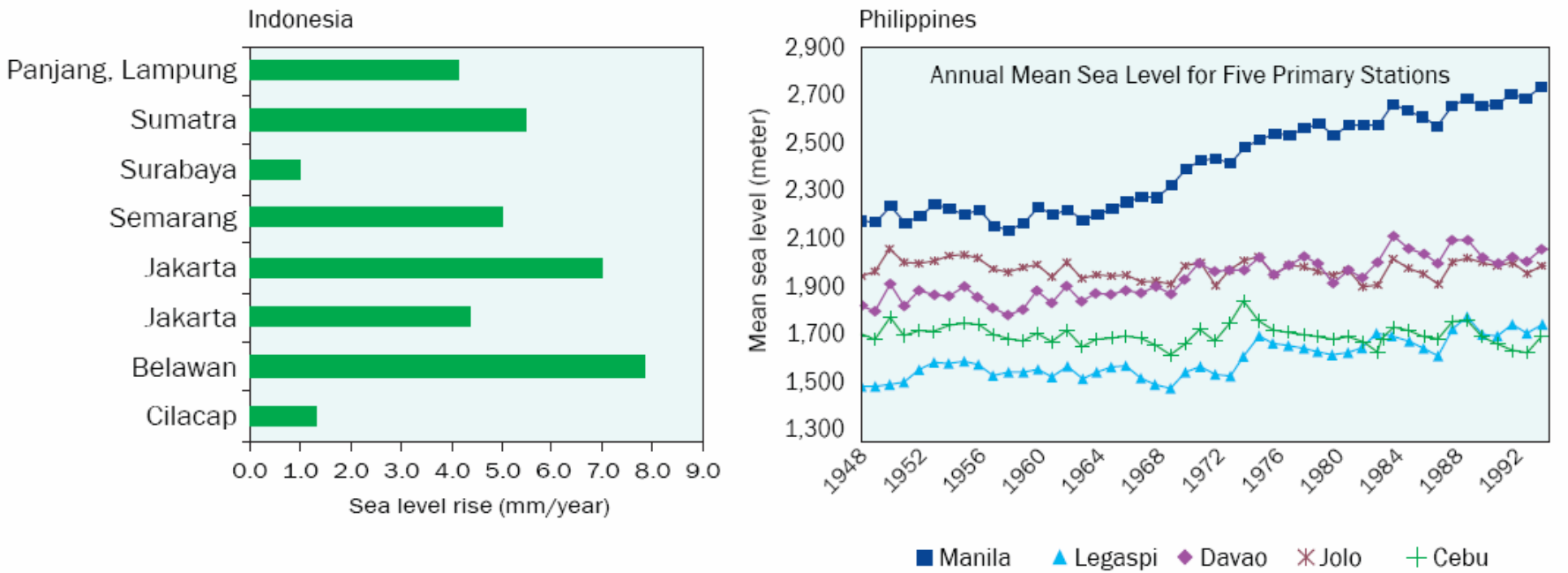
Observed Sea Level Rise in Southeast Asia

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.

Figure 3.6. Sea Level Rise in Indonesia and the Philippines



Sources: Boer and Dewi (2008) for Indonesia, Perez (2008) for Philippines.

Projected Sea Level Rise in Southeast Asia

Table 3.7. Projected Global Average Surface Warming and Sea Level Rise in 2100

Case	Termperature change (°C) (in 2090–2099 relative to 1980–1999) [a]		Sea level rise (meter) (in 2090–2099 relative to 1980–1999)
	Best estimate	Likely range	Model-based range excluding future rapid dynamic changes in ice flow
At constant year 2000 GHG concentration [b]	0.6	0.3–0.9	–
B1 scenario	1.8	1.1–2.9	0.18–0.38
A1T scenario	2.4	1.4–3.8	0.20–0.45
B2 scenario	2.4	1.4–3.8	0.20–0.43
A1B scenario	2.8	1.7–4.4	0.21–0.48
A2 scenario	3.4	2.0–5.4	0.23–0.51
A1FI scenario	4.0	2.4–6.4	0.26–0.59

– = not available.

a These estimates are assessed from a hierarchy of models that encompass a simple climate model, several Earth Models of Intermediate Complexity, and a large number of Atmosphere-Ocean Global Circulation Models (AOGCMs).

b Year 2000 constant composition is derived from AOGCMs only.

Source: IPCC (2007).

Adaptation-DRR Options

from April ’09 ADB Study on the Economics of Climate Change

Key Messages for SEA

- SEA countries have made significant efforts to build adaptive capacity. There remains a **need for enhancing policy and planning coordination across ministries and different levels of government** for climate change adaptation.
- There is also a need for adopting a more **holistic approach to building the adaptive capacity of vulnerable groups and localities and their resilience to shocks**, including developing their capability to diversify local economies, livelihoods, and coping strategies.
- SEA countries have also made encouraging efforts in taking adaptation actions in key sectors. **But most implemented to date have been reactive not proactive, autonomous not well planned.**

Key Messages for SEA
Climate Sensitive Sectors

- In **water resources**, priority is scale up good practices, and apply integrated water management, including **flood control and prevention schemes**.
- In the **agriculture sector**, the priority is to strengthen local adaptive capacity by providing public goods and services, such as **better climate information**, **early warning systems; and explore innovative risk-sharing instruments such as index-based insurance schemes**.
- In the **forestry sector**, the priority is to enhance **early warning systems and awareness-raising programs** to better prepare for potentially more frequent forest fires as a result of climate change.

Key Messages for SEA
Climate Sensitive Sectors

- In the **coastal and marine resources sector**, the priority is to implement integrated coastal zone management plans, including **mangrove conservation and plantation**.
- In the **health sector**, the priority is to expand or establish early warning systems for disease outbreaks, health surveillance, **awareness-raising campaigns**, and infectious disease control programs.
- In the **infrastructure sector**, the priority is to **introduce "climate proofing" of transport-related investments and infrastructure**.

Conclusions

from April ’09 ADB Study on the Economics of Climate Change

Conclusions

- Southeast Asia—highly vulnerable to climate change—is already suffering from its effects, and **the worst is yet to come**.
- If no action is taken, the four countries—Indonesia, Philippines, Thailand, and Viet Nam—could suffer a loss equivalent to more than 6% of GDP annually by 2100, more than double the global average loss.

Conclusions

- SEA countries should continue efforts to enhance climate change resilience by building adaptive capacity and taking technical and non-technical adaptation measures in climate-sensitive sectors.
- Many sectors have adaptation needs but water, agriculture, forestry, coastal and marine resources, and health require particular attention.

Group discussion

- What do you understand by vulnerability to climate change in your own community context?
- Describe top ten vulnerabilities to climate change in your own communities?