



Economy and Environment Program for Southeast Asia

Hotspots!

*Mapping Climate Change
Vulnerability
in Southeast Asia*

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Herminia Francisco**



Canadian International
Development Agency

Agence Canadienne de
Développement International

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EEPSEA was established in May 1993 to support research and training in environmental and resource economics. Its objective is to enhance local capacity to undertake the economic analysis of environmental problems and policies. It uses a networking approach, involving courses, meetings, technical support, access to literature and opportunities for comparative research. Member countries are Thailand, Malaysia, Indonesia, the Philippines, Vietnam, Cambodia, Lao PDR, China, and Papua New Guinea.

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FOREWORD

By Richard Fuchs

Climate change isn't something just for scientists, politicians, diplomats and academics. It's an issue that people in communities in SE Asia already know about and sense is important on an everyday basis in their lives. While scientists and academics contributed to this book, our intended audience is the people on the ground with real tangible social and economic assets at stake in mitigating and adapting to climate change.

Whether Cyclone Nargis in Myanmar or its cousin, Cyclone Ondoy in Manila, SE Asia's storms seem to be creating more victims and greater damage. We notice the mudslides near Jakarta, and the recent flooding in Manila and Phnom Penh. As our cities continue to grow, what was originally understood as a rural problem takes on a very urban character and threat. Because of their growing urban population, more people are put at risk. It also means that our cities, with their administrative, logistical and planning capacity, might just be able to help us adapt to the climate change challenge.

We know that local government officials and local planners want better information about the reality of climate change. There's also a very real desire to move the conversation about climate change from the celestial and the global down to the practical and everyday. That's why we produced this book!!!

Called "Hotspots! — Mapping Climate Change Vulnerability in Southeast Asia", this publication includes the already published regional assessment on who is most at risk in SE Asia. As a special addition, we have included the country-by-country maps and analysis that have been so compelling in generating discussion when we launched the maps in Manila, Phnom Penh, Jakarta and Hanoi over the past year.

My appreciation goes to Dr. Hermi Francisco and Dr. Arief Yusuf for their commitment, perseverance and imagination in making this project so successful, and with very little resources. Without their leadership on this major international issue, this tool for local use would not have been possible.

Read, understand, share, discuss, and make change!

Richard Fuchs
Regional Director
SE Asia-IDRC
Singapore

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The authors are fully responsible for any errors in this assessment.

Table of Contents

Forewords by Richard Fuchs	2
Abstract	4
Introduction	5
Objectives	5
Methodology and data	5
Climate change vulnerability map of South-east Asia	11
Country level vulnerability analysis	17
Cambodia	18
Philippines	24
Thailand	32
Vietnam	40
Lao PDR	47
Indonesia	53
Malaysia	68
Concluding remark	74
References	74
Appendix: Data Sources	75
About the authors	83

Hotspots!

Mapping Climate Change Vulnerability in Southeast Asia

ABSTRACT

This publication provides information on the sub-national areas (regions/districts/ provinces) most vulnerable to climate change impacts in Southeast Asia. This assessment was carried out by overlaying climate hazard maps, sensitivity maps, and adaptive capacity maps following the vulnerability assessment framework of the United Nations' Inter-governmental Panel on Climate Change (IPCC).

The study used data on the spatial distribution of various climate hazards in 590 sub-national areas in Indonesia, Thailand, Vietnam, Lao PDR, Cambodia, Malaysia, and the Philippines. Based on this mapping assessment, all the regions of the Philippines; the Mekong River Delta in Vietnam; almost all the regions of Cambodia; North and East Lao PDR; the Bangkok region of Thailand; and West Sumatra, South Sumatra, West Java, and East Java of Indonesia have been found to be among the most vulnerable regions in Southeast Asia.

The drivers of vulnerability vary across and within countries. The high level of vulnerability of Indonesia's urban hotspots, for instance, is due largely to their high population density (sensitivity). In the Philippines and Vietnam, vulnerability is mainly due to high exposure to climate hazards. Within these countries, the vulnerability of some provinces is, however, more attributable to low adaptive capacity. In Cambodia and Lao PDR, 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.

INTRODUCTION

The United Nations Climate Change Conference held in Bali, Indonesia, in December 2007 acknowledged, among other things, the need for enhanced action on adaptation and the provision of financial resources for it. This, in turn, implies the need for financial and technology transfer from the rich to the poor countries. In general, most developing countries in Asia have the least capacity to adapt to climate change and are therefore in need of whatever external support they can get to build their capacity (Francisco 2008).

As the long history of international climate change agreements tells us, resource transfers from rich to poor countries not only require a common and shared vision among the countries, but also involve long and complex political processes. Acknowledging the fact that in a resource-constrained world, there is a benefit and cost to every action, it is then essential for the resources available to be well targeted to the people who need them the most; those located in the areas most vulnerable to climate change.

The identification and characterization of the vulnerable communities and sectors were identified as priority concerns by the participants of the EEP-SEA Climate Change Adaptation Conference held in Bali in February 2008. Identification of the most

vulnerable groups by way of determining the most vulnerable regions within countries and in Southeast Asia as a whole is thus an urgent task for development agencies. This paper addresses this need.

OBJECTIVES

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 external donors in better targeting their support towards climate change efforts. The specific objectives are as follows:

1. To identify which sub-national areas/units (regions, provinces, or districts, depending on the availability of the data) of Southeast Asian countries (Thailand, Vietnam, Laos, Cambodia, Indonesia, Malaysia, and Philippines) are the most vulnerable to climate change.
2. To show these vulnerable areas in a map for ease of reference of interested parties.

METHODOLOGY AND DATA

Identifying climate change vulnerability requires a clear conceptual framework. We started by adopting the concept contained in the Third Assessment Report of the IPCC where 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, p.995). Vulnerability can thus be defined as a function of exposure, sensitivity, and adaptive capacity as illustrated below.

Vulnerability = f(exposure, sensitivity, adaptive capacity)

In the IPCC report, 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”*; and adaptive capacity is defined as *“the ability of a system to adjust to climate change (including climate variability and extremes), to moderate the potential damage from it, to take advantage of its opportunities, or to cope with its consequences”*.

We used the above conceptual framework to do a ‘quick’ assessment of the ‘current’ vulnerability of selected Southeast Asian countries based on past as well as the most recently available data. We emphasize the term ‘quick’ as this effort should be considered as a first cut of sorts since this work was largely dependent on whatever information we could get from public sources (such as the internet) and climate change experts in the region. We used the inputs of a select group of climate and social scientists from the region, obtained through a Cli-

mate Change Experts Consultation Meeting held with them in Bangkok in the middle of 2008.

The main limitation of our assessment was our inability to factor in projections of climate change and socio-economic conditions for the coming years. However, given that the future trajectory of climate change events and socio-economic conditions is so uncertain, we feel that such an analysis would be hard to sell in any case. It is far more reliable to use historical data as current vulnerability levels are likely to worsen rather than improve. Naturally, there is room for fine-tuning this assessment to take into account scientifically acceptable projections on future climate change impacts as well as projected changes in socio-economic conditions.

There is also a room to consider other indicators of adaptive capacity beyond those determined by our experts’ consultation and the availability of relevant data. The role of social institutions and enabling policies in particular was seen as critical in defining adaptive capacity. Province-level indicators such as the budget allocated for climate change and number of local organizations supporting climate change-related efforts should also be included in future analysis. Given more time and resources, detailed sub-national information on the various indicators of adaptive capacity should be collected. We shall, however, leave such improvements to

future studies on this topic. Our motivation in coming up with this map was to provide some indications on how the limited (developmental and research) resources available for adaptation work could be best directed across countries in the region and across sub-national areas within a country. The identification of specific adaptation support or research for the different locales should subsequently be carried out.

In our study, we made certain assumptions regarding the three main determinants of vulnerability and allocated equal weighting to exposure, sensitivity, and adaptive capacity in explaining the concept. The weights given to the determinants of adaptive capacity also varied, depending on the importance they played in improving community resilience. The framework used in this study allows for different weights to be attached to the various parameters, a point which should be of interest to other researchers who are interested in using it for future studies on this topic.

Vulnerability Assessment

To identify the vulnerable regions, we constructed an index of the climate change vulnerability of sub-national administrative areas in seven countries in Southeast Asia, i.e., Vietnam, Laos, Cambodia, Thailand, Malaysia, the Philippines, and Indonesia. The assessment considers 590 sub-national areas comprising 341 districts (*kabupaten/kota*) in Indonesia, 19 provinces (*khet*) in Cambodia, 17 provinces

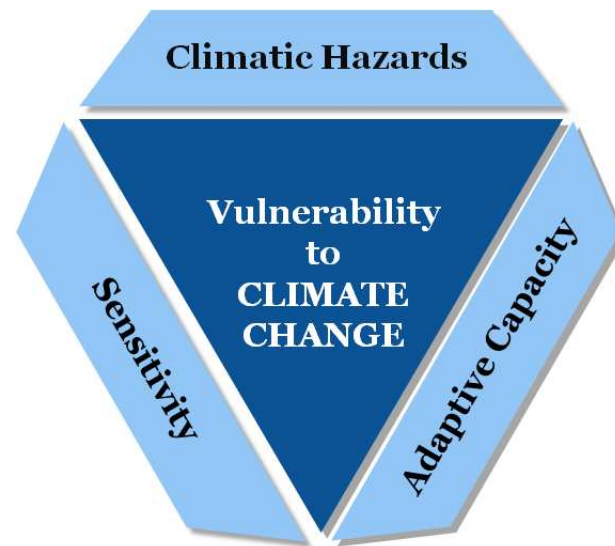


Figure 1. Conceptual framework

(*khoueng*) in Lao PDR, 14 states (*negeri*) in Malaysia, 74 provinces in the Philippines, 72 provinces (*changwat*) in Thailand, and 53 provinces (*tin*/*thanh pho*) in Vietnam.

The climate change vulnerability index was derived through the following steps:

- ▶ We assessed exposure using information from historical records of climate-related hazards as we considered past exposure to climate risks as the best available proxy for future climate risks.
- ▶ We obtained climate hazard maps for five climate-related risks: tropical cyclones, floods,

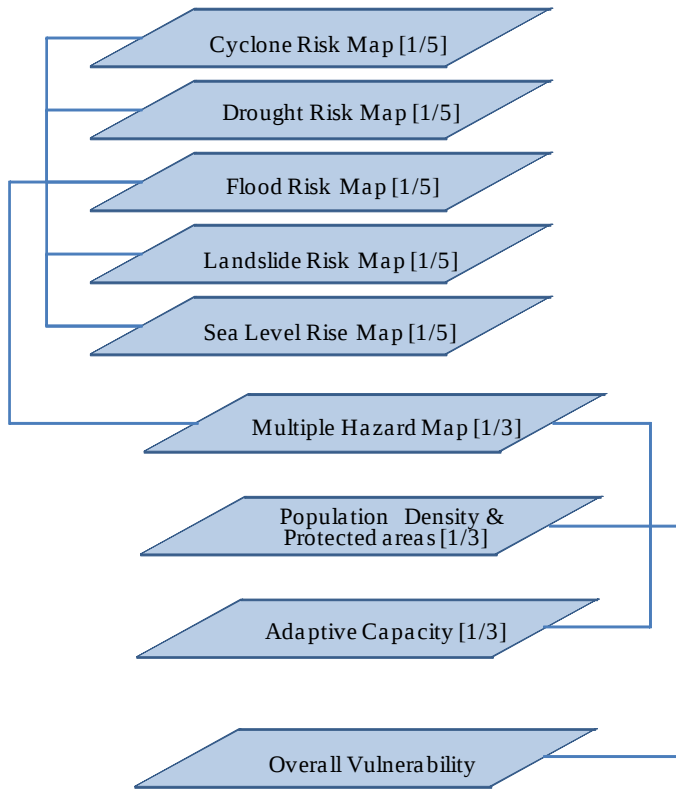


Figure 2. Method used in deriving the climate change vulnerability index

landslides, droughts, and sea level rise.

$$Z_{i,j} = \frac{X_{i,j} - X_i^{MIN}}{X_i^{MAX} - X_i^{MIN}}$$

- ▶ We used population density as a proxy for human sensitivity to climate-hazard exposure. The assumption here 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, we also included ecological sensitivity of the region using biodiversity information as a proxy variable. A biodiversity-rich region, measured by the percentage of protected areas, is thus considered here as more vulnerable than other areas to climate hazards, other things being equal.
- ▶ We constructed an index of adaptive capacity as a function of socio-economic factors, technology, and infrastructure.

Based on the above, we constructed an index of the overall climate change vulnerability of the region. Figure 1 illustrate our framework, and figure 2 illustrates the steps we took in constructing the index.

Generating the Component Maps for the Vulnerability Assessment

As shown in Figure 1, we derived the overall climate change vulnerability index by overlaying a series of maps. These maps are described below.

(Please refer to Appendix for the sources of the data used in this vulnerability mapping project.)

Climate hazard maps

First, we obtained maps (in grid/raster format) for five different climate hazards: the frequency of droughts, floods, and cyclones, for about 20 years (1980-2000/1/3), physical exposure to landslides, and inundation zones of a five-meter sea level rise. The maps of these five hazards are given in Appendix 2.

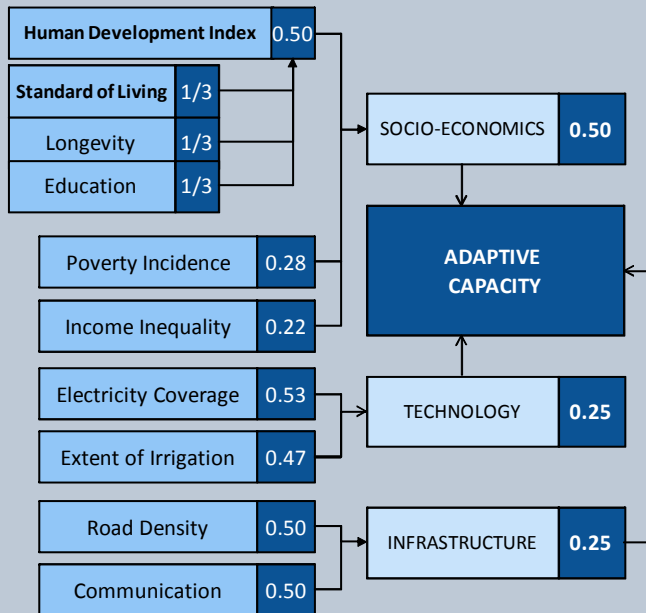


Figure 3. Adaptive capacity assessment

Then, to make the maps comparable, we normalized each of them using the following formula:

where $Z_{i,j}$ is the standardized climate hazard of type i of region j ; $X_{i,j}$ is the unstandardized climate hazard of type i of region j ; X_i^{MAX} is the maximum value of the climate hazard indicator over region j , and X_i^{MIN} is the minimum value of the climate hazard indicator over region j . A similar standardization method is used by the UNDP to calculate the Human Development Index.

Thirdly, we used the simple average of the five standardized climate hazard indicators, thus overlaying all five hazard maps onto one single multiple hazard map. Since we did not have knowledge of the degree of importance of each hazard in assessing the vulnerability, we assumed equal weights for all.

Human and ecological sensitivity maps

We obtained the population density maps from the Urban Extent Database (GRUMP version 1) of the Center for International Earth Science Information Network (CIESIN), which showed the number of people per square kilometer in 30-arc-second (1-km) resolution. We converted the unit of observation from the 1-km resolution into province/district by averaging across administrative boundaries. This produced maps of average population density for each of the provinces/districts in the region. These were used as indicators of human sensitivity.

The ecological sensitivity map was obtained using data on protected areas from the Terrestrial Ecoregions GIS Database of the World Wildlife Fund (WWF). We calculated the share of area within each province/district designated as protected areas over the total land area of the province/district.

The overall sensitivity map encompassing both human and ecological factors was derived using the weighted averages of the standardized values of population density and protected area (as a share of total area) for each of the provinces/districts. We chose to use a higher weight of 0.70 for population density (with 0.30 for protected areas) because of the higher importance we attached to human sensitivity.

Adaptive capacity map

Adaptive capacity is defined as the degree to which adjustments in practices, processes, or structures can moderate or offset potential damage or take advantage of opportunities (from climate change). It can be written in equation form as follows:

Adaptive Capacity = f(socio-economic factors, technology, infrastructure)

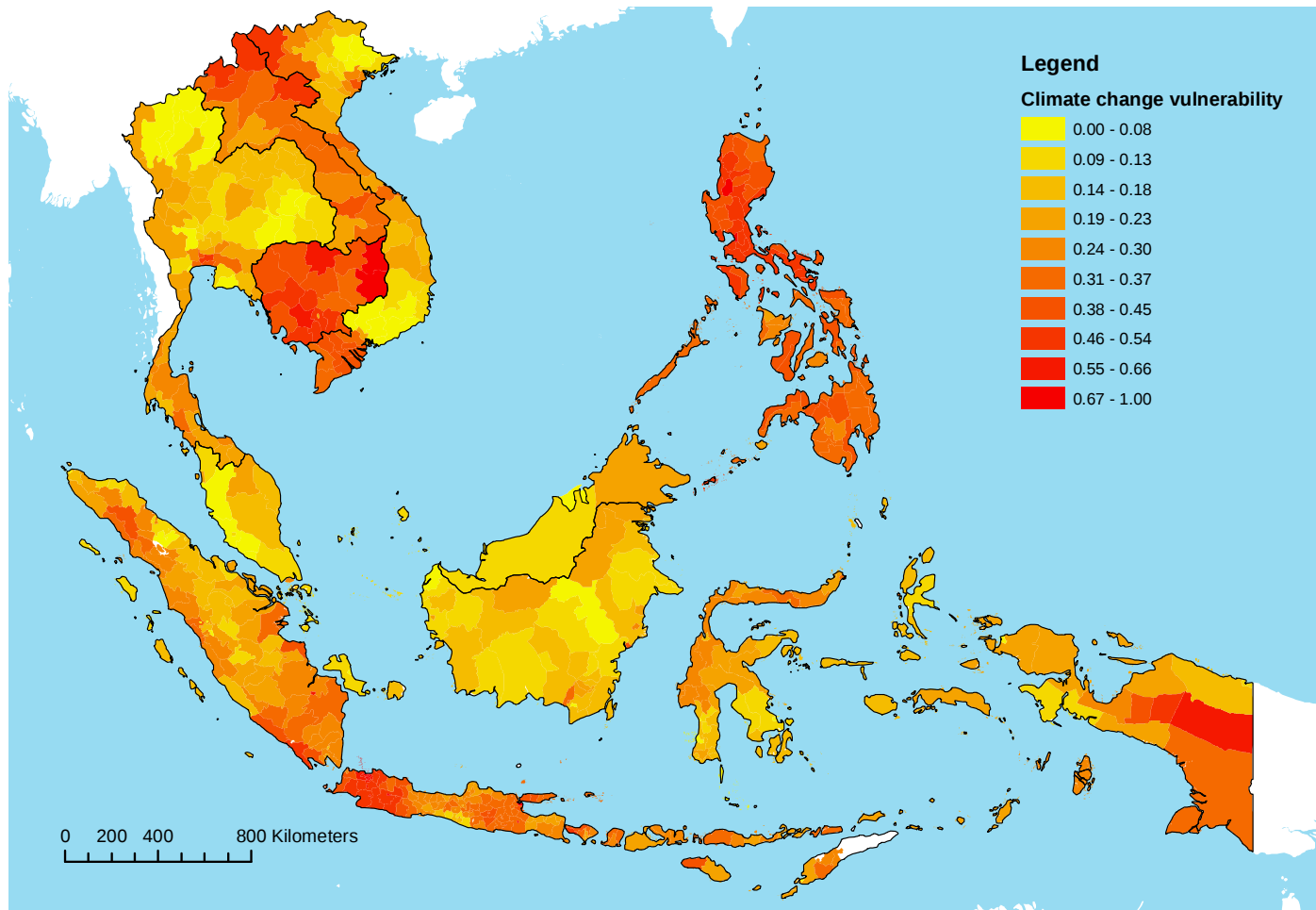
The Climate Change Experts Consultation Meeting held in Bangkok in mid-2008 resulted in an operational framework to measure adaptive capacity, using selected indicators. We used 'expert opinion polling' to arrive at the weights assigned to the various cli-

mate change indicators shown in Figure 3.

Overall Climate Change Vulnerability Map

To obtain the overall index of climate change vulnerability, we averaged each of the normalized indicators of exposure (multiple hazard risk exposure), sensitivity (human and ecological), and adaptive capacity. To identify the vulnerable areas, we ranked the regions according to the index and divided the list into four equal parts. Those provinces/districts falling in the fourth quartile were considered the vulnerable areas and further classified as mildly vulnerable, moderately vulnerable, or highly vulnerable.

Climate Change Vulnerability Map of Southeast Asia



Highlight of the Southeast Asia Vulnerability Map

The most vulnerable areas in the region were identified as those falling within the top quartile of the Southeast Asian standard. These areas include: all the regions of the Philippines; the Mekong River Delta in Vietnam; almost all the regions of Cambodia; North and East Lao PDR; the Bangkok region of Thailand; and West Sumatra, South Sumatra, West Java, and East Java of Indonesia. The exposure of the Philippines is more extreme compared to other Southeast Asian countries in that it is not only exposed to tropical cyclones (especially in the northern and eastern parts of the country) but also to many other climate hazards particularly floods (such as in central Luzon and southern Mindanao), landslides (due to the terrain of the country), and droughts.

In general, these results confirm commonly-held suspicions that the most vulnerable regions in Southeast Asia include the Mekong River Delta in Vietnam and Bangkok due to their exposure to sea level rise, and the northern part of the Philippines due to its exposure to tropical cyclones.

Notwithstanding this, some surprises did arise. For instance, in Cambodia, although most regions are not highly exposed to climate hazards, except

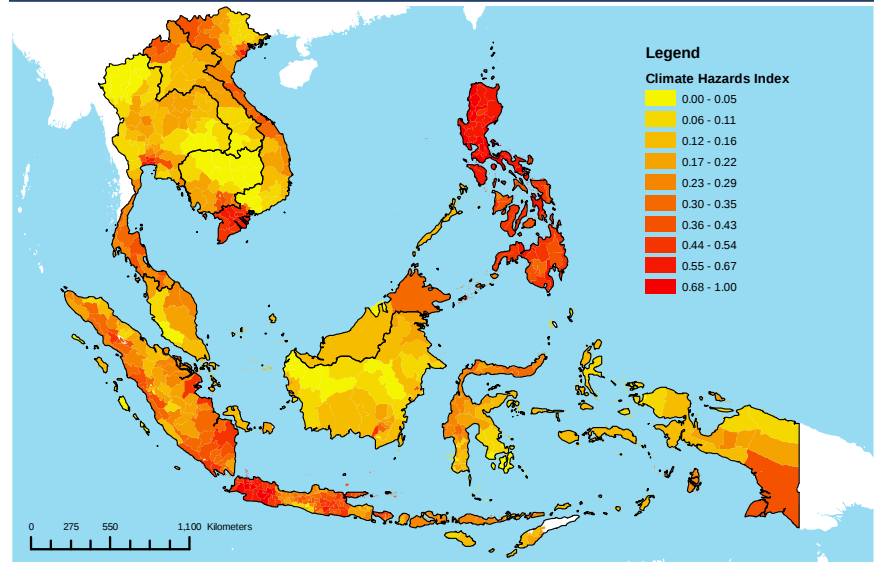
those sharing borders with the Mekong River Delta in northern Vietnam (which is susceptible to flooding and sea level rise), almost all the provinces in Cambodia were found to be vulnerable due to their low adaptive capacity.

In the overall assessment, however, the districts of Jakarta in Indonesia come out as the top most vulnerable regions in Southeast Asia. Central Jakarta ranks first in the overall vulnerability assessment even though it has the highest adaptive capacity index. This is because this district is the intersection of many climate-related hazards. It is frequently exposed to regular flooding but most importantly, it is highly sensitive because it is among the most densely-populated regions in Southeast Asia. Areas in western Java are also highly vulnerable due to exposure to multiple hazards (namely, floods and landslides) as well as having high population densities.

Adaptive capacity seems to play important role in determining the spatial pattern of vulnerability. Low adaptive capacity has made Cambodia among the most vulnerable countries in the region despite its relatively low exposure to climate hazards. On the other hand, the high adaptive capacity of the eastern coast of Vietnam, which is susceptible to cyclones, has moderated its vulnerability; hence, it is not included as one of the most vulnerable areas in Southeast Asia.

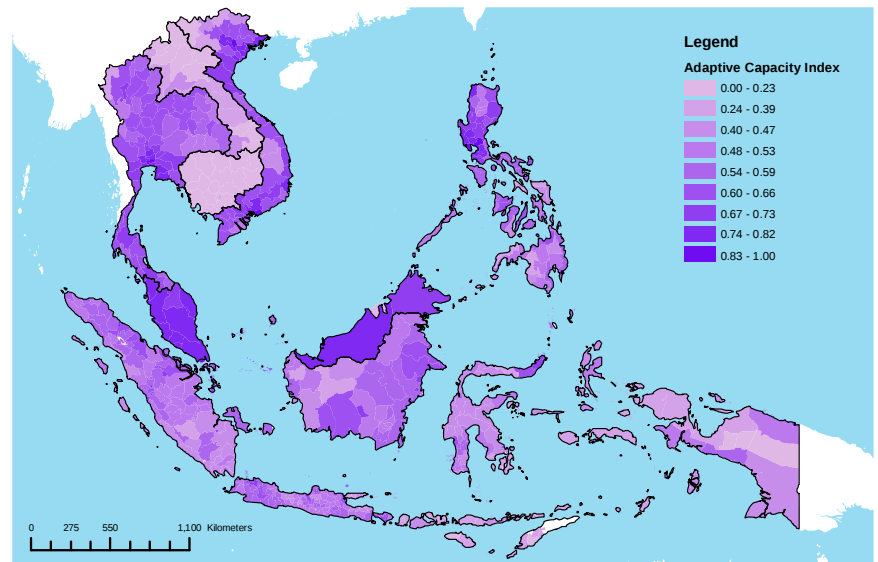
Climate Hazards Index

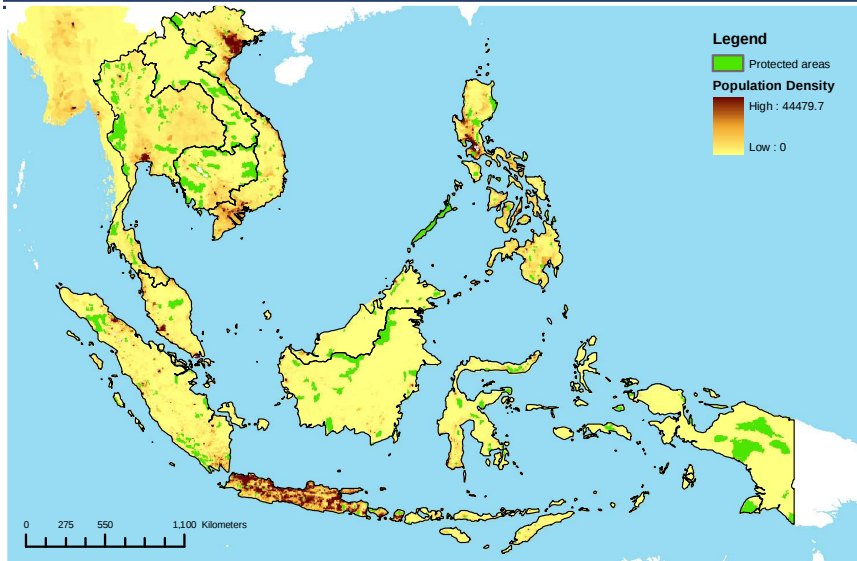
The overall climate hazard map shows the combination of climate-related hazards (tropical cyclones, floods, landslides, droughts, and sea level rise) and the hotspots in Southeast Asia. The latter includes the north-western and Mekong region of Vietnam, the coastal regions of Vietnam facing the South China Sea, Bangkok and its surrounding areas in Thailand, practically all the regions of the Philippines, and the western and eastern parts of Java Island, Indonesia.



Index of Adaptive Capacity

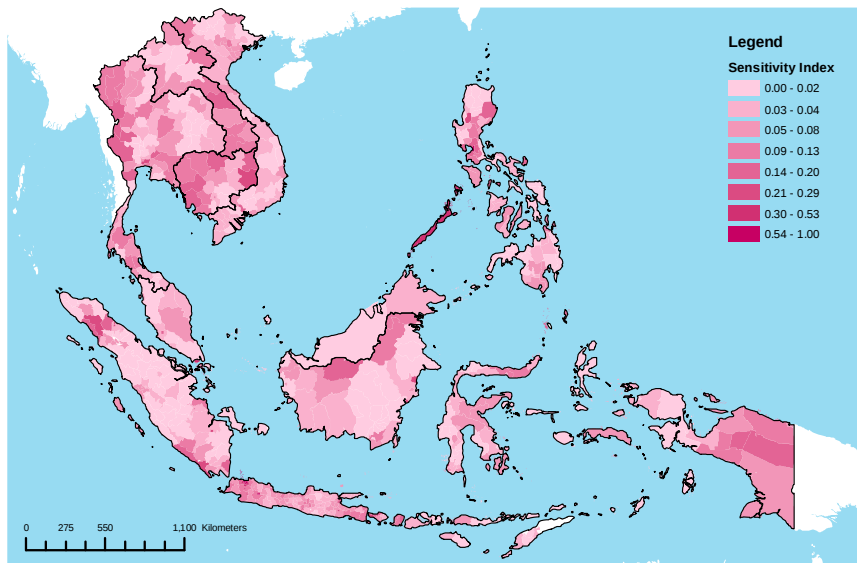
The map shows the adaptive capacity of Southeast Asia. Overall, areas with relatively high adaptive capacity lie in Thailand, Malaysia and Vietnam whereas areas with relatively low adaptive capacity are mostly found in Cambodia and Lao PDR.





Population Density and Protected Areas

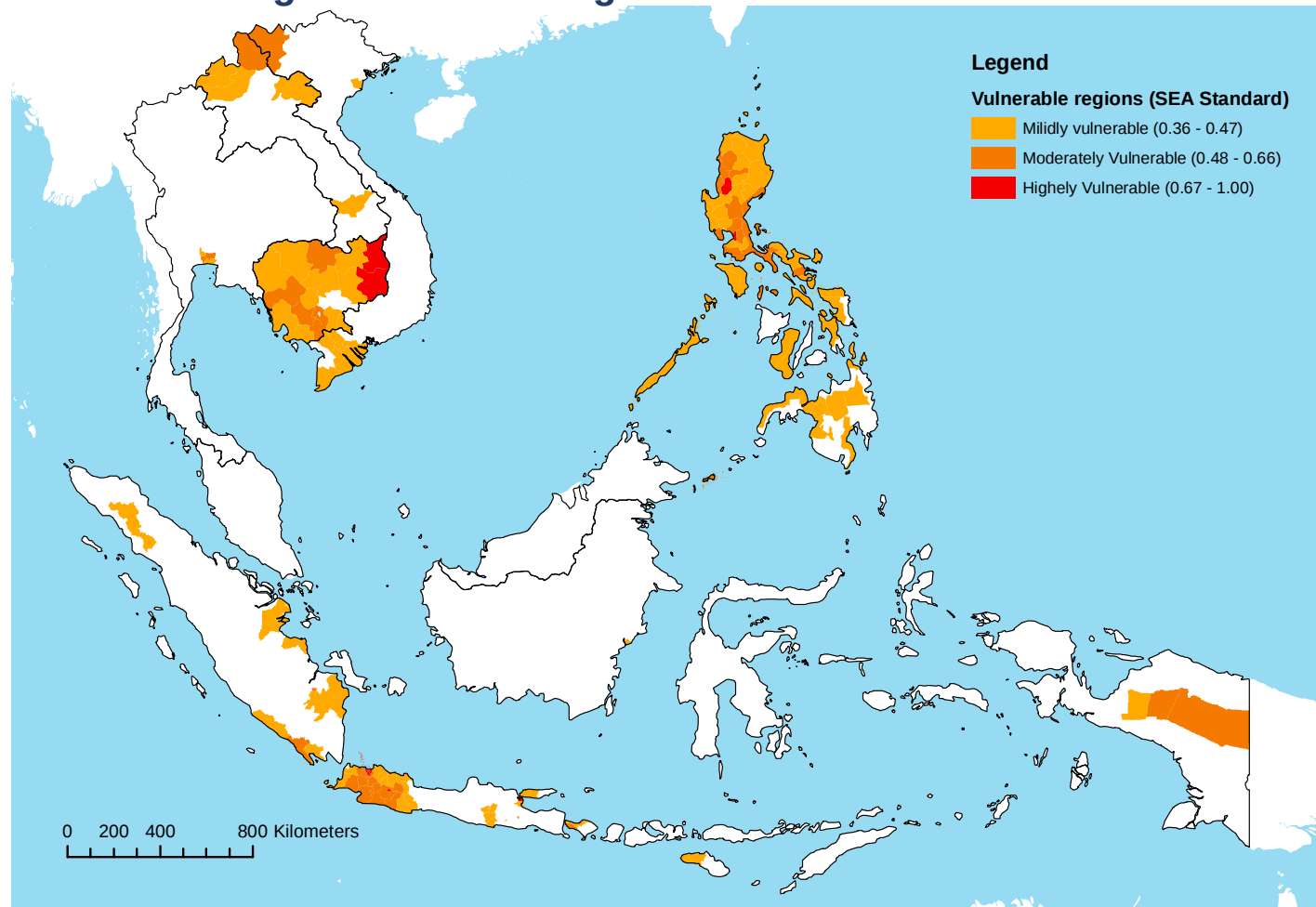
The figure shows that Java is the most densely populated island in the region. Other highly populated areas are northeastern Vietnam (around the capital), Bangkok, and around the national capital of the Philippines. Thailand, Cambodia, and Lao PDR have relatively more protected areas compared to other countries in the region.



Index of Sensitivity

The overall sensitivity map encompassing both human and ecological factors was derived using the weighted averages of the standardized values of population density and protected area (as a share of total area) for each of the provinces/districts with higher weight (0.7) given to human sensitivity. In general area with high population density such as the country's capital like Jakarta, Manila, Bangkok become among the most sensitive regions. Some regions such as Palawan (of the Philippines), eastern part of Thailand, and Western Sumatera become sensitive due to high extent of protected areas.

Climate Change Vulnerable Regions in Southeast Asia



List of Vulnerable Regions in Southeast Asia

Note: The figures inside brackets are the rank across 590 provinces/districts in Southeast Asia

Cambodia

Mondol Kiri (9)
 Rotanakiri (11)
 Kampong Spoe (14)
 Preah Vihear (20)
 Takev (33)
 Kandal (36)
 Pouthisat (39)
 Kampot (55)
 Kampong Chhnang (56)
 Prey Veng (58)
 Kaoh Kong (83)
 Svay Rieng (89)
 Stoeng Treng (92)
 Kampong Thum (98)
 Batdambang (100)
 Siemreab-O-Mean(103)
 Kracheh (138)

Indonesia

Central Jakarta (1)
 North Jakarta (2)
 West Jakarta (3)
 East Jakarta (4)
 South Jakarta (5)
 Kota Bandung (6)
 Kota Surabaya (8)
 Kota Bekasi (12)
 Kota Bogor (13)
 Kota Depok (15)
 Kota Palembang (17)
 Tangerang (18)
 Kota Tangerang (19)
 Kota Malang (21)
 Jayawijaya (22)
 Kota Sukabumi (23)
 Bogor (24)
 Puncak Jaya (25)
 Garut (26)
 West Lampung (28)
 Lebak (34)
 Bandung (37)
 Sumedang (40)
 Jembrana (48)
 Cianjur (52)
 Sukabumi (53)
 Karawang (62)
 Bekasi (66)
 Bangkalan (72)
 Pandeglang (78)
 Sidoarjo (81)
 Purwakarta (84)
 Paniai (85)
 Majalengka (86)
 Buleleng (87)
 Tanjung Jabung (88)
 Ponorogo (91)
 Tanggamus (95)
 Kota Blitar (102)
 Tasik Malaya (109)
 South Bengkulu (110)
 Kota Madiun (117)
 Sampang (119)
 Kota Balikpapan (120)
 Serang (124)
 West Sumba (125)
 South East Aceh (126)
 Indramayu (128)
 Magetan (129)
 Madiun (131)
 Dairi (132)
 Ogan Komering Hilir (135)

Ciamis (136)
 Indragiri Hilir (140)
 Trenggalek (143)
 Subang (145)

Lao PDR

Phongsali (43)
 Houaphan (59)
 Louang Namtha (61)
 Oudomxai (67)
 Saravan (115)
 Bokeo (133)

Philippines

Manila (7)
 Benguet (10)
 Batanes (16)
 Ilocos Sur (27)
 Rizal (29)
 Bataan (30)
 Batangas (31)
 Bulacan (32)
 Abra (38)
 Albay (41)
 Quezon (42)
 Nueva Ecija (44)
 La Union (45)
 Aurora (46)
 Mountain (49)
 Tawi-Tawi (50)
 Romblon (51)
 Laguna (54)
 Camarines Sur (57)
 Sorsogon (60)
 Nueva Vizcaya (63)
 Cavite (64)
 Occidental Mindoro (65)
 Ilocos Norte (68)
 Kalinga-Apayao (70)
 Isabela (71)
 Zambales (73)
 Davao Del Sur (74)
 Camarines Norte (75)
 Catanduanes (76)

Surigao Del Norte (80)
 Misamis Occidental (82)
 Pampanga (90)
 Lanao Del Sur (94)
 Lanao Del Norte (97)
 Northern Samar (99)
 Oriental Mindoro (104)
 Ifugao (105)
 Pangasinan (106)
 Leyte (111)
 Negros Oriental (112)
 Bukidnon (116)
 Quirino (118)
 Zamboanga Del Norte (121)
 Tarlac (122)
 Negros Occidental (123)
 Marinduque (130)
 Western Samar (134)
 Cagayan (137)
 Masbate (139)
 Camiguin (141)
 Palawan (142)
 Agusan Del Sur (144)
 Maguindanao (147)

Thailand

Krung Thep (47)
 Samut Prakan (93)
 Nonthaburi (107)

Vietnam

Lai Chau (35)
 Dong Thap (69)
 Vinh Long (77)
 Can Tho (79)
 Tra Vinh (96)
 Soc Trang (101)
 An Giang (108)
 Tien Giang (113)
 Ben Tre (114)
 Thai Binh (127)
 Minh Hai (146)



Country Level Vulnerability Analysis



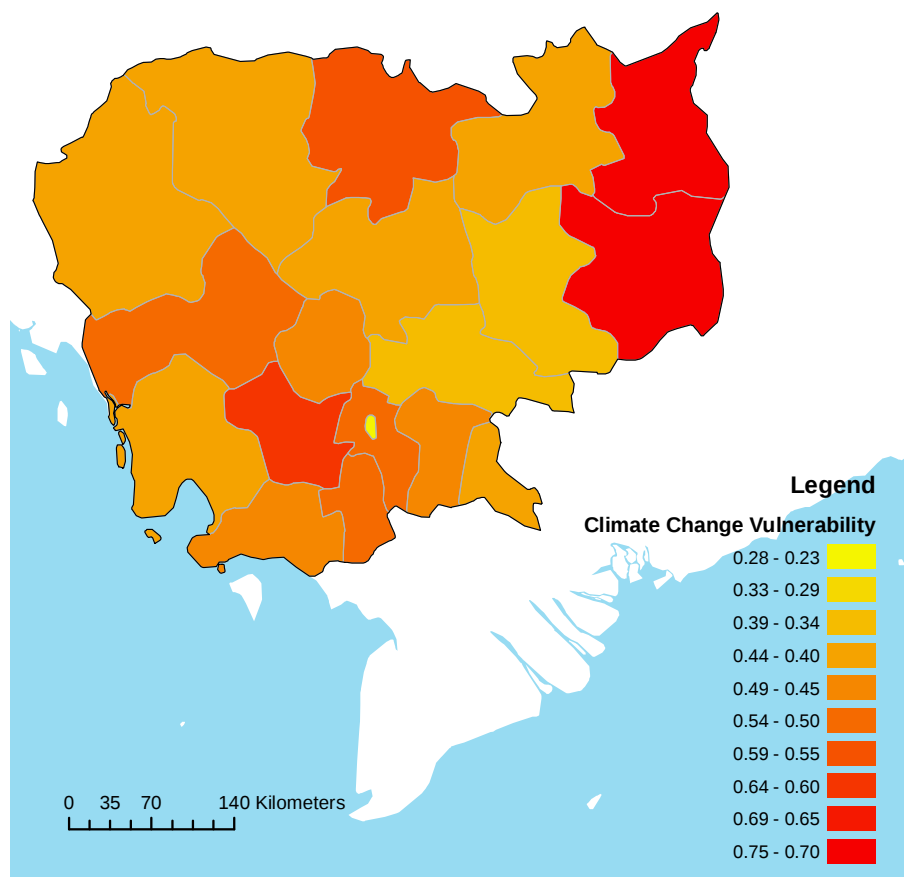
Cambodia

Cambodia at a glance

	Unit	Cambodia	ASEAN
CO2 Emissions (2004)	MtCO2e	3.5	943.8
CO2 Emissions Per Person (2004)	tCO2e	0.3	1.7
CO2 Emission intensity	tCO2e Eq./Mill. \$Intl 2005	194.2	452.5
Size of economy	Million \$Intl 2005	22,313	2,303,451
Income per capita	\$Intl 2005 Per Person	1,572	4,115
Education	Index	59.1	78
Energy use per capita	Tonnes Oil Eq. Per Person	0.4	0.9
Governance	Index	26.1	32.1
Population	Thousands of People	14,197	560,240
Fossil fuel reserves	Total MtCO2e Eq.	--	33,419
Land are impacted by human	Sq. Km.	77,123	1,626,633

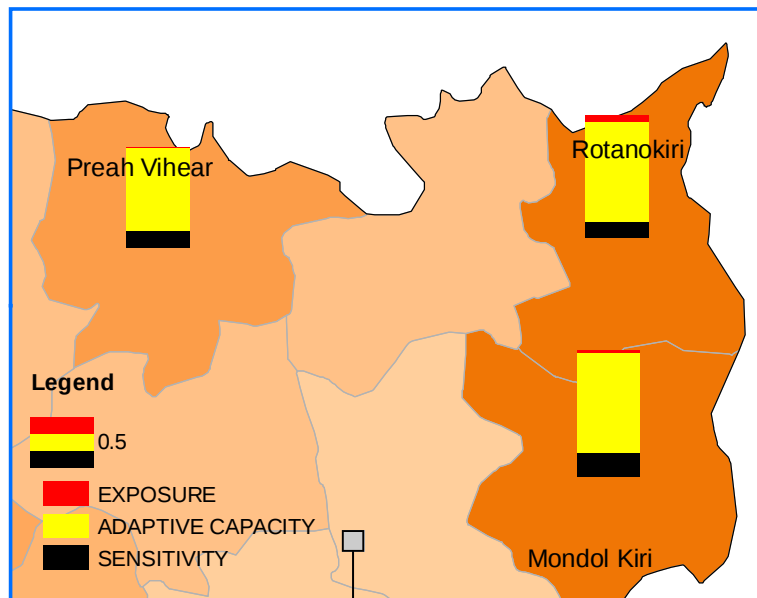
Source: World Resource Institute (2010)

Climate Change Vulnerability Map of Cambodia

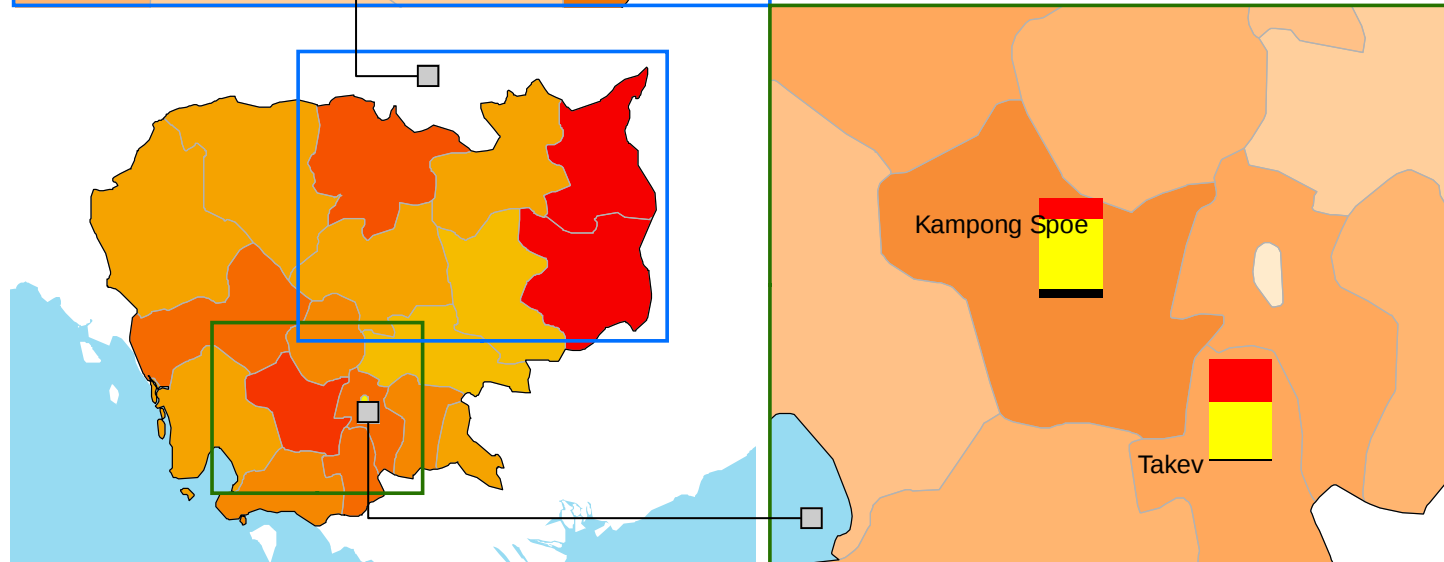


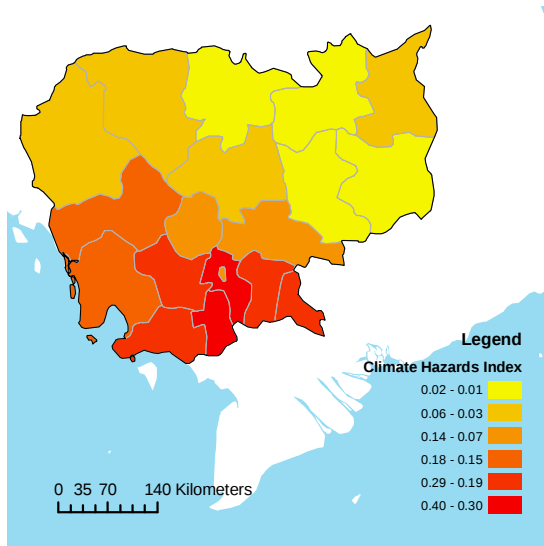
The mapping assessment, which was carried out for each of the 19 provinces of Cambodia, found that seven provinces in Cambodia belonged to the top 50 most vulnerable regions in Southeast Asia, out of the 590 regions that were assessed. Of these seven, the top three are the provinces of Mondulakiri, Ratanakiri, and Kampong Soe. The vulnerability of the Cambodian provinces can be attributed mainly to the low adaptive capacity of their inhabitants. This is not surprising considering the fact that Cambodia is among the least developed countries in the region.

The top five vulnerable provinces in Cambodia lie in the east (Ratanakiri and Mondulakiri), north (Preah Vihear), and south (Kampong Soe and Takev). The dominant feature of their vulnerability is their low adaptive capacity, especially the provinces in the east. Mondulakiri and Ratanakiri are relatively less developed compared to

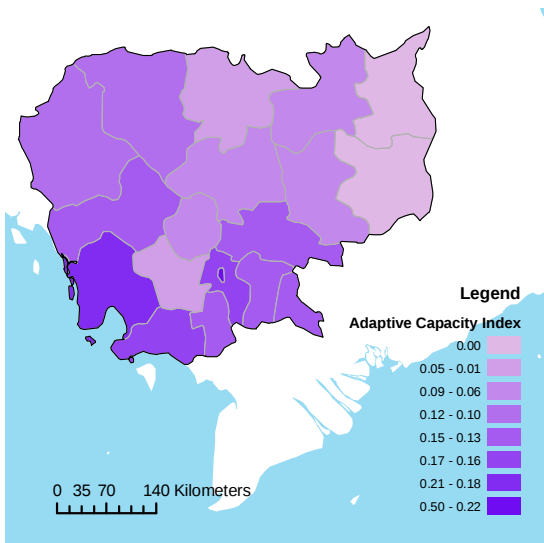


other provinces in Cambodia and have the lowest human development indices as well as the highest incidences of poverty. They are among the areas with the lowest adaptive capacity in Southeast Asia. What adds to their vulnerability is their ecological sensitivity as they have large protected areas, especially Mondulkiri. Exposure to climate hazards is higher in the south where the provinces suffer frequent flooding. The Province of Takev is especially at risk from sea level rise due to its closeness to the Mekong River Delta.



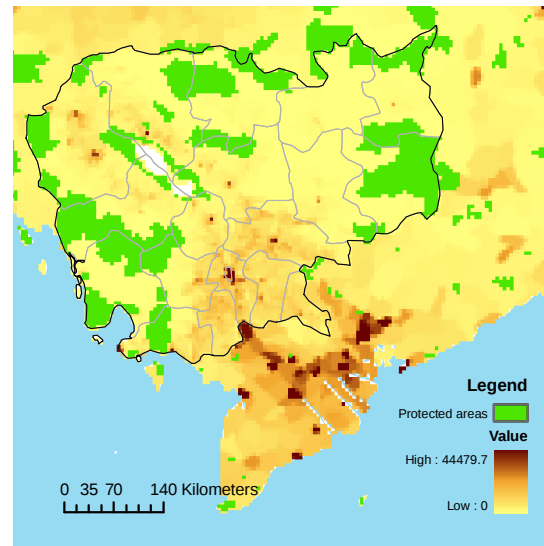


Climate Hazard Index

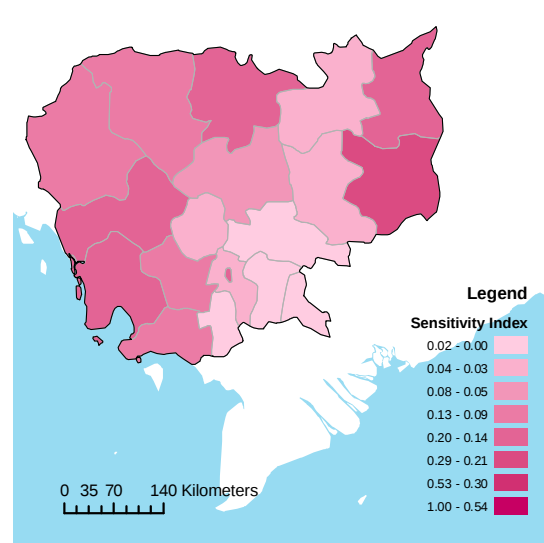


Adaptive Capacity Index

Population Density and Protected Areas

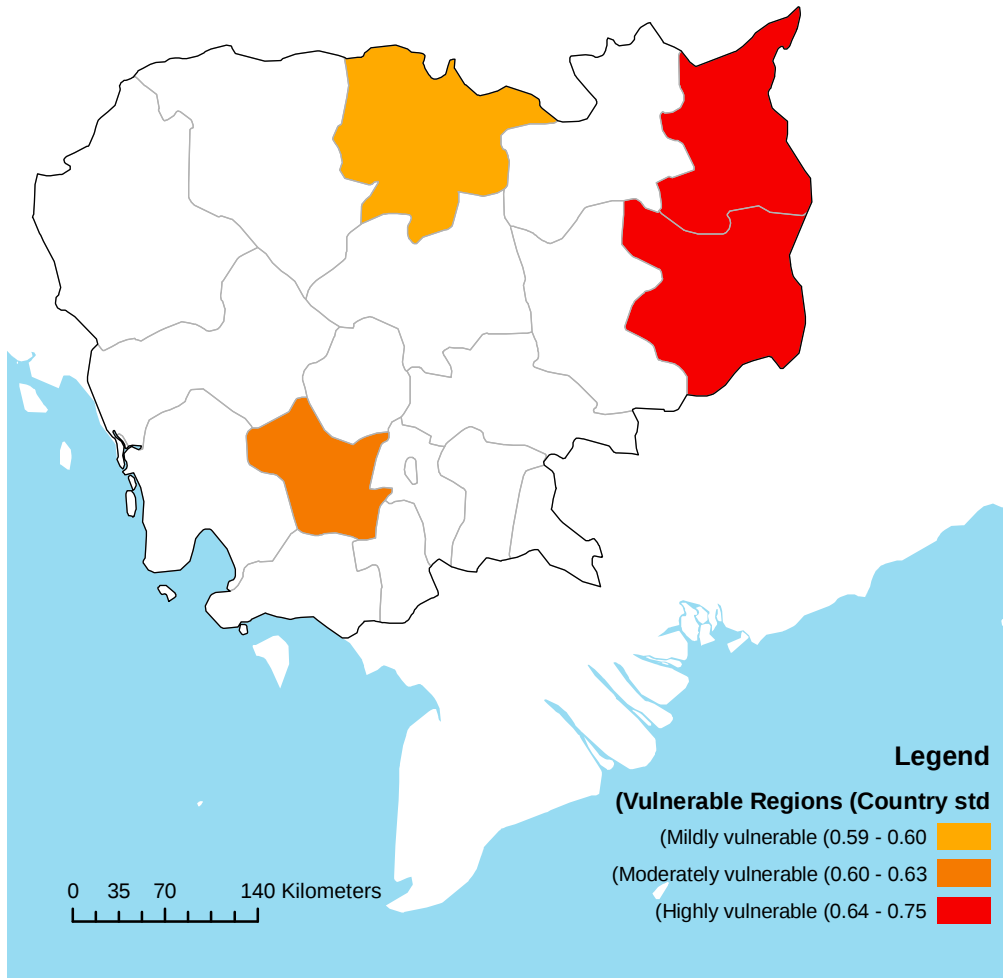


Sensitivity Index



Vulnerability Ranking of Provinces in Cambodia

- Mondulkiri (1)
- Rattanakiri (2)
- Kompong Speu (3)
- Preah Vihear (4)
- Takev (5)
- Kandal (6)
- Pursat (7)
- Kampot (8)
- Kompong Chhnang (9)
- Prey Veng (10)
- Koh Kong (11)
- Svay Rieng (12)
- Stung Treng (13)
- Kompong Thom (14)
- Battambang (15)
- Siem Reap (16)
- Kratie (17)
- Kampong Cham (18)
- Phnum Penh (19)



Climate Change Vulnerable Regions in Cambodia

No	Country	Province/District	Vulnerability	Country Rank	SEA Rank	Exposure	Country Rank	SEA Rank	Sensitivity	Country Rank	SEA Rank	Adaptive Capacity	Country Rank	SEA Rank
1	Cambodia	Mondulkiri	0.75	1	9	0.02	16	572	0.24	1	27	0.00	18	589
2	Cambodia	Rattanakiri	0.72	2	11	0.05	13	545	0.16	6	53	0.00	19	590
3	Cambodia	Kompong Speu	0.63	3	14	0.22	6	332	0.11	9	96	0.05	16	587
4	Cambodia	Preah Vihear	0.59	4	20	0.01	18	578	0.16	5	47	0.04	17	588
5	Cambodia	Takeo	0.51	5	33	0.37	2	179	0.01	16	450	0.14	7	574
6	Cambodia	Kandal	0.51	6	36	0.40	1	156	0.02	15	396	0.17	3	566
7	Cambodia	Pursat	0.50	7	39	0.17	8	388	0.18	3	40	0.13	9	577
8	Cambodia	Kampot	0.47	8	55	0.22	5	324	0.12	7	80	0.16	4	568
9	Cambodia	Kompong Chhnang	0.46	9	56	0.14	9	435	0.04	12	261	0.09	14	584
10	Cambodia	Prey Veng	0.46	10	58	0.29	3	240	0.01	17	467	0.14	6	573
11	Cambodia	Koh Kong	0.43	11	83	0.18	7	378	0.19	2	33	0.21	2	562
12	Cambodia	Svay Rieng	0.42	12	89	0.23	4	313	0.01	18	477	0.15	5	572
13	Cambodia	Stung Treng	0.42	13	92	0.02	17	573	0.04	13	280	0.08	15	586
14	Cambodia	Kompong Thom	0.41	14	98	0.04	15	557	0.06	11	192	0.09	13	583
15	Cambodia	Battambang	0.41	15	100	0.06	12	540	0.11	8	86	0.12	10	580
16	Cambodia	Siem Reap	0.40	16	103	0.05	14	549	0.09	10	112	0.11	11	581
17	Cambodia	Kratie	0.36	17	138	0.01	19	585	0.02	14	372	0.09	12	582
18	Cambodia	Kampong Cham	0.34	18	171	0.08	11	506	0.01	19	478	0.14	8	575
19	Cambodia	Phnum Penh	0.23	19	314	0.12	10	462	0.17	4	44	0.50	1	403



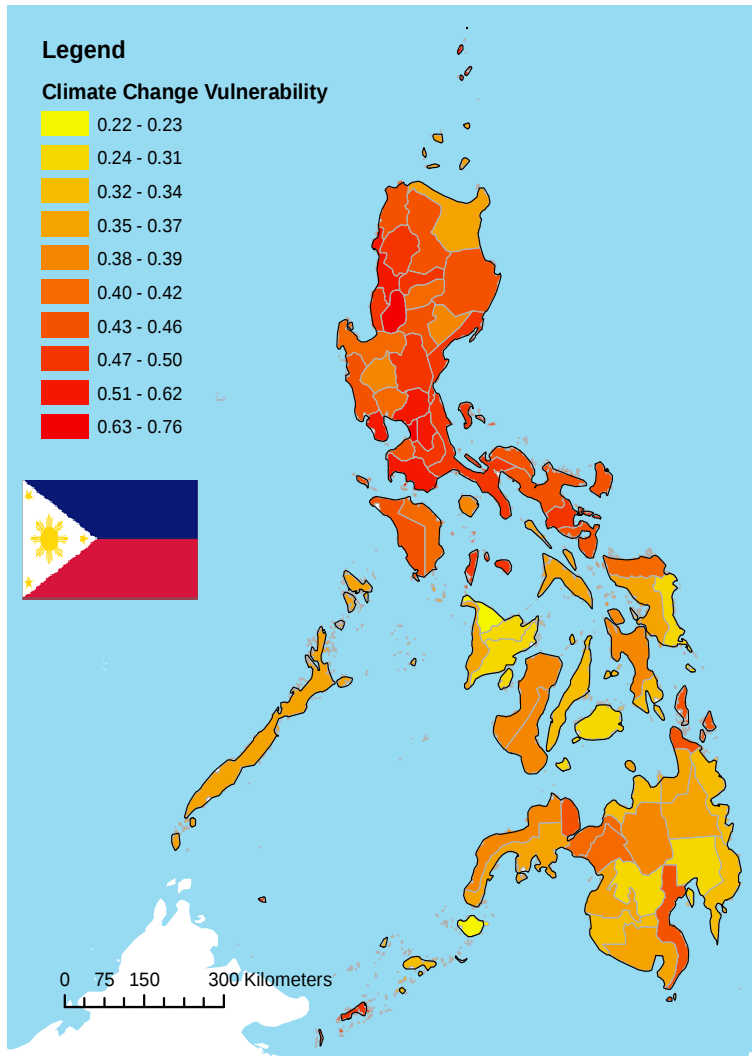
Philippines

Philippines at a glance

	Unit	Philippines	ASEAN
CO2 Emissions (2004)	MtCO2e	79.2	943.8
CO2 Emissions Per Person (2004)	tCO2e	0.9	1.7
CO2 Emission intensity	tCO2e Eq./Mill. \$Intl 2005	344.7	452.5
Size of economy	Million \$Intl 2005	263,610	2,303,451
Income per capita	\$Intl 2005 Per Person	3,027	4,115
Education	Index	85.8	78
Energy use per capita	Tonnes Oil Eq. Per Person	0.5	0.9
Governance	Index	33.9	32.1
Population	Thousands of People	87,099	560,240
Fossil fuel reserves	Total MtCO2e Eq.	779	33,419
Land area impacted by human	Sq. Km.	253,534	1,626,633

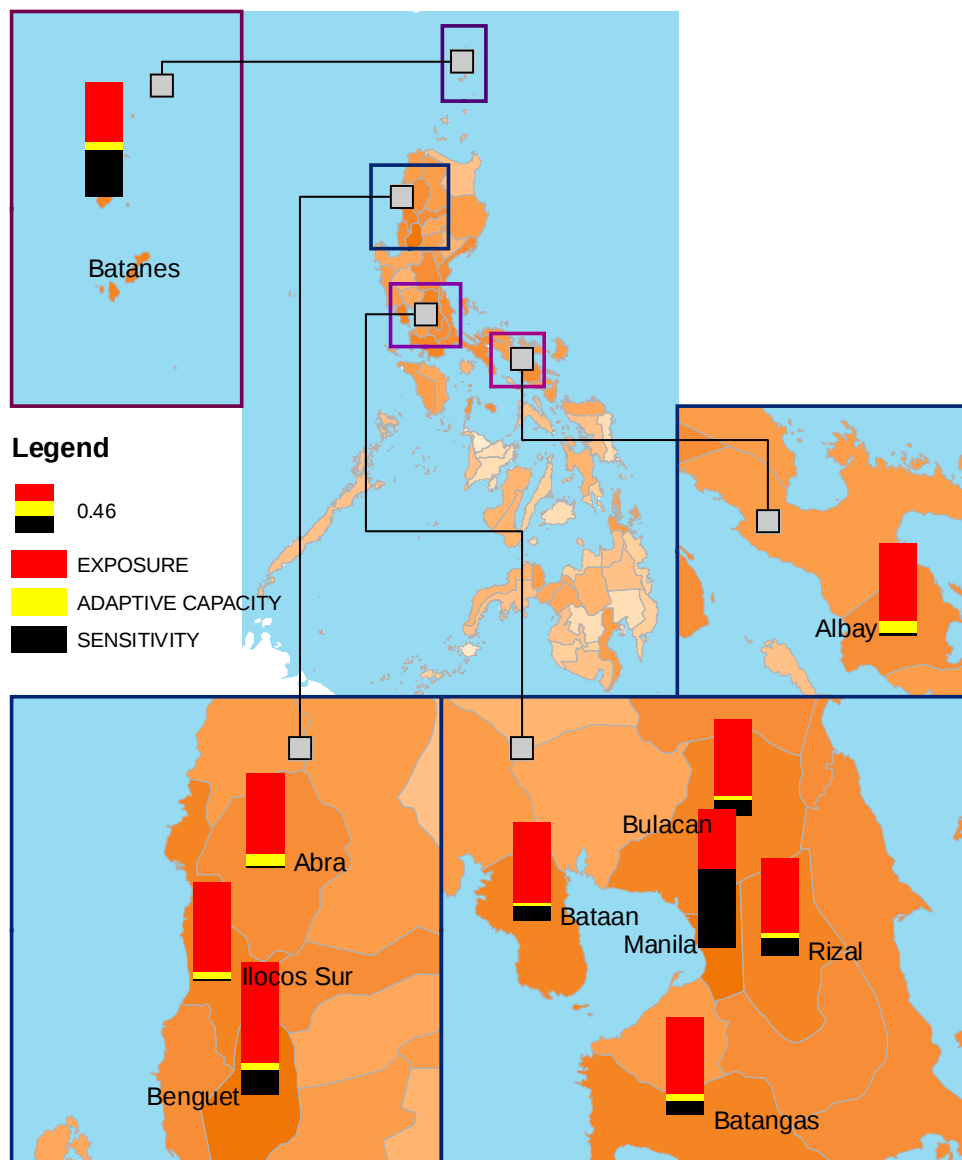
Source: World Resource Institute (2010)

Climate Change Vulnerability Map of Philippines

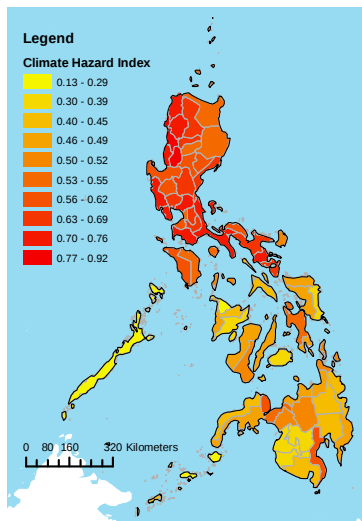


The mapping assessment was carried out for each of the 74 provinces of the Philippines. Sixteen provinces of the Philippines ranked among the top 50 most vulnerable in Southeast Asia. High exposure to climate hazards, especially tropical cyclones, floods, and landslides, is the dominant factor behind the vulnerability of these provinces. Manila, the country's capital, is the most vulnerable province in the country and the seventh in Southeast Asia.

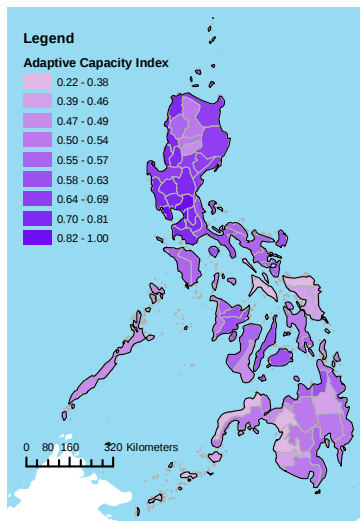
The top 10 vulnerable provinces are located in Luzon in the north of the country. The top five are Manila, Benguet, Batanes, Ilocos Sur, and Rizal, all in the northeast. The vulnerability of all these provinces is dominated by high exposure to climate hazards, except for Manila where the dominant factor is its high sensitivity due to its high population density.



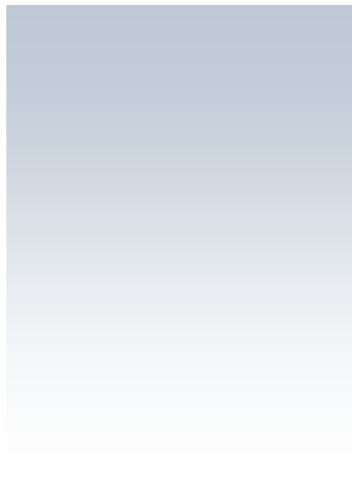
The provinces in the most northern Luzon islands (Abra, Ilocos Sur, and Benguet) experience frequent typhoons, droughts, and landslides. The vulnerable provinces in the vicinity of Manila (Manila, Bulacan, Bataan, Rizal, and Batangas), on the other hand, are less exposed to landslides, but record frequent flooding on top of typhoons and droughts. The province of Albay, facing the Philippine Sea, is among the most exposed to typhoons and ranks 10th in terms of overall vulnerability in the country.



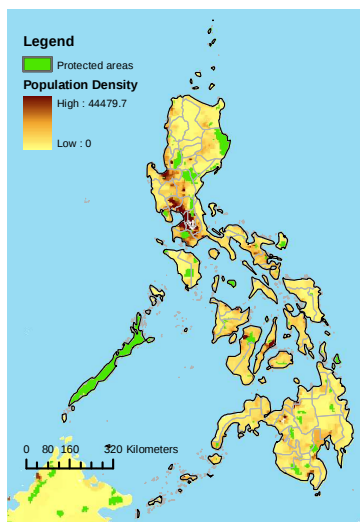
Climate Hazard Index



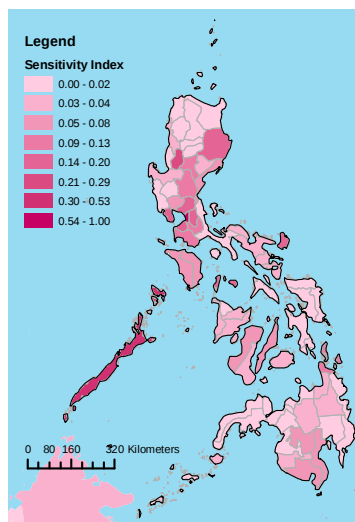
Adaptive Capacity Index

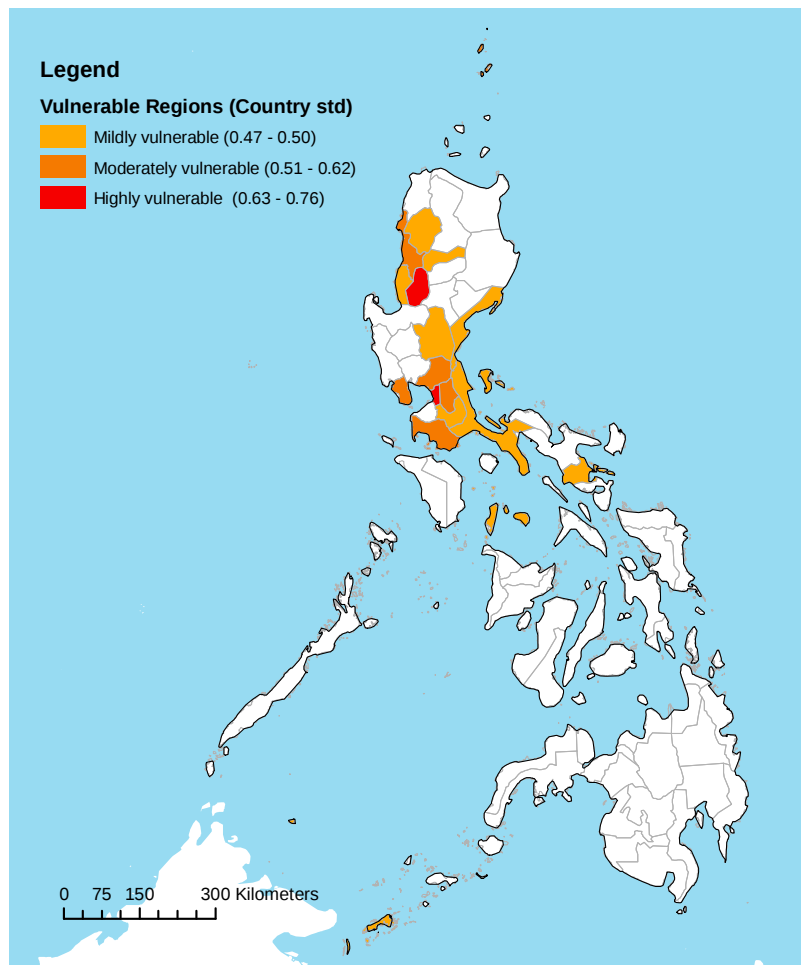


Population Density and Protected Areas



Sensitivity Index





Climate Change Vulnerable Regions in Philippines

Vulnerability Ranking of Provinces in Philippines

Manila (1)	Ifugao (38)
Benguet (2)	Pangasinan (39)
Batanes (3)	Leyte (40)
Ilocos Sur (4)	Negros Oriental (41)
Rizal (5)	Bukidnon (42)
Bataan (6)	Quirino (43)
Batangas (7)	Zamboanga DN (44)
Bulacan (8)	Tarlac (45)
Abra (9)	Negros Occide.(46)
Albay (10)	Marinduque (47)
Quezon (11)	Western Samar (48)
Nueva Ecija (12)	Cagayan (49)
La Union (13)	Masbate (50)
Aurora (14)	Camiguin (51)
Mountain (15)	Palawan (52)
Tawi-Tawi (16)	Agusan Del Sur (53)
Romblon (17)	Maguindanao (54)
Laguna (18)	Antique (55)
Camarines Sur (19)	South Cotabato (56)
Sorsogon (20)	Zamboanga Del Sur (57)
Nueva Vizcaya (21)	Agusan Del Norte (58)
Cavite (22)	Misamis Oriental (59)
Occidental Mindoro (23)	Cebu (60)
Ilocos Norte (24)	Davao Oriental (61)
Kalinga-Apayao (25)	Southern Leyte (62)
Isabela (26)	Sulu (63)
Zambales (27)	Sultan Kudarat (64)
Davao Del Sur (28)	Surigao Del Sur (65)
Camarines Norte (29)	Eastern Samar (66)
Catanduanes (30)	Siquijor (67)
Surigao Del Norte (31)	Davao Del Norte (68)
Misamis Occidental (32)	North Cotabato (69)
Pampanga (33)	Capiz (70)
Lanao Del Sur (34)	Iloilo (71)
Lanao Del Norte (35)	Bohol (72)
Northern Samar (36)	Basilan (73)
Oriental Mindoro (37)	Aklan (74)

No	Country	Province/District	Vulnerability	Country Rank	SEA Rank	Exposure	Country Rank	SEA Rank	Sensitivity	Country Rank	SEA Rank	Adaptive Capacity	Country Rank	SEA Rank
1	Philippines	Manila	0.76	1	7	0.54	38	78	0.73	1	2	1.00	1	1
2	Philippines	Benguet	0.73	2	10	0.92	1	2	0.24	4	26	0.72	13	71
3	Philippines	Batanes	0.62	3	16	0.54	36	73	0.43	2	10	0.69	17	99
4	Philippines	Ilocos Sur	0.53	4	27	0.82	2	3	0.03	33	342	0.72	14	74
5	Philippines	Rizal	0.52	5	29	0.69	12	21	0.16	6	52	0.78	6	30
6	Philippines	Bataan	0.52	6	30	0.73	6	10	0.14	10	63	0.85	2	7
7	Philippines	Batangas	0.51	7	31	0.70	9	15	0.12	12	79	0.73	11	63
8	Philippines	Bulacan	0.51	8	32	0.70	11	18	0.15	7	55	0.83	3	13
9	Philippines	Abra	0.50	9	38	0.74	4	7	0.01	69	500	0.57	34	280
10	Philippines	Albay	0.50	10	41	0.70	8	14	0.04	27	291	0.57	32	270
11	Philippines	Quezon	0.50	11	42	0.74	5	8	0.01	62	463	0.58	31	247
12	Philippines	Nueva Ecija	0.49	12	44	0.67	15	25	0.11	13	82	0.71	15	78
13	Philippines	La Union	0.49	13	45	0.76	3	6	0.02	50	422	0.72	12	70
14	Philippines	Aurora	0.48	14	46	0.68	13	23	0.07	19	152	0.66	19	133
15	Philippines	Mountain	0.48	15	49	0.68	14	24	0.01	55	441	0.53	46	344
16	Philippines	Tawi-Tawi	0.48	16	50	0.44	60	135	0.01	63	470	0.22	74	560
17	Philippines	Romblon	0.48	17	51	0.51	43	90	0.18	5	35	0.53	49	349
18	Philippines	Laguna	0.47	18	54	0.65	18	35	0.11	15	97	0.74	9	53
19	Philippines	Camarines Sur	0.46	19	57	0.66	16	26	0.02	37	380	0.56	40	299
20	Philippines	Sorsogon	0.46	20	60	0.65	17	34	0.03	35	371	0.55	43	316
21	Philippines	Nueva Vizcaya	0.46	21	63	0.60	24	51	0.11	14	85	0.66	20	134
22	Philippines	Cavite	0.45	22	64	0.60	23	49	0.13	11	65	0.77	7	33
23	Philippines	Occidental Mindoro	0.45	23	65	0.59	28	56	0.07	18	149	0.55	42	314
24	Philippines	Ilocos Norte	0.45	24	68	0.72	7	13	0.01	56	445	0.78	5	25
25	Philippines	Kalinga-Apayao	0.45	25	70	0.64	19	37	0.00	74	562	0.53	50	351

No	Country	Province/District	Vulnerability	Country Rank	SEA Rank	Exposure	Country Rank	SEA Rank	Sensitivity	Country Rank	SEA Rank	Adaptive Capacity	Country Rank	SEA Rank
26	Philippines	Isabela	0.44	26	71	0.55	31	65	0.14	9	61	0.67	18	122
27	Philippines	Zambales	0.44	27	73	0.70	10	16	0.01	68	497	0.74	8	49
28	Philippines	Davao Del Sur	0.44	28	74	0.59	26	53	0.05	24	240	0.55	44	319
29	Philippines	Camarines Norte	0.44	29	75	0.62	21	43	0.03	34	348	0.57	33	274
30	Philippines	Catanduanes	0.44	30	76	0.52	40	84	0.14	8	59	0.60	27	224
31	Philippines	Surigao Del Norte	0.43	31	80	0.51	42	88	0.10	16	98	0.51	57	374
32	Philippines	Misamis Occidental	0.43	32	82	0.61	22	48	0.01	59	452	0.52	55	366
33	Philippines	Pampanga	0.42	33	90	0.64	20	41	0.05	21	207	0.81	4	17
34	Philippines	Lanao Del Sur	0.42	34	94	0.50	44	92	0.02	44	402	0.38	68	516
35	Philippines	Lanao Del Norte	0.41	35	97	0.55	30	64	0.01	58	451	0.49	60	426
36	Philippines	Northern Samar	0.41	36	99	0.49	46	96	0.01	70	513	0.38	69	520
37	Philippines	Oriental Mindoro	0.40	37	104	0.55	33	68	0.04	25	252	0.56	36	286
38	Philippines	Ifugao	0.40	38	105	0.54	37	77	0.02	52	428	0.48	61	436
39	Philippines	Pangasinan	0.40	39	106	0.60	25	52	0.03	32	320	0.69	16	97
40	Philippines	Leyte	0.39	40	111	0.54	35	72	0.02	48	417	0.53	47	345
41	Philippines	Negros Oriental	0.39	41	112	0.51	41	86	0.02	41	394	0.47	62	448
42	Philippines	Bukidnon	0.39	42	116	0.52	39	83	0.04	28	295	0.53	48	347
43	Philippines	Quirino	0.39	43	118	0.57	29	60	0.02	42	397	0.65	21	145
44	Philippines	Zamboanga Del Norte	0.38	44	121	0.44	58	132	0.01	64	471	0.37	70	527
45	Philippines	Tarlac	0.38	45	122	0.59	27	54	0.02	47	414	0.73	10	61
46	Philippines	Negros Occidental	0.38	46	123	0.48	48	104	0.08	17	138	0.56	37	291
47	Philippines	Marinduque	0.37	47	130	0.55	32	67	0.01	61	457	0.60	28	227
48	Philippines	Western Samar	0.37	48	134	0.48	49	105	0.01	72	527	0.45	64	473
49	Philippines	Cagayan	0.37	49	137	0.54	34	71	0.02	45	405	0.65	22	148
50	Philippines	Masbate	0.36	50	139	0.41	62	150	0.01	66	480	0.36	71	529

No	Country	Province/District	Vulnerability	Country Rank	SEA Rank	Exposure	Country Rank	SEA Rank	Sensitivity	Country Rank	SEA Rank	Adaptive Capacity	Country Rank	SEA Rank
51	Philippines	Camiguin	0.36	51	141	0.49	47	97	0.01	54	433	0.52	54	365
52	Philippines	Palawan	0.36	52	142	0.13	74	447	0.36	3	13	0.49	59	411
53	Philippines	Agusan Del Sur	0.36	53	144	0.43	61	142	0.03	30	315	0.44	67	486
54	Philippines	Maguindanao	0.36	54	147	0.37	67	178	0.02	51	425	0.34	72	536
55	Philippines	Antique	0.35	55	150	0.47	50	110	0.02	39	389	0.52	53	363
56	Philippines	South Cotabato	0.35	56	154	0.44	59	134	0.05	20	197	0.53	52	354
57	Philippines	Zamboanga Del Sur	0.35	57	157	0.47	54	117	0.02	43	401	0.51	58	380
58	Philippines	Agusan Del Norte	0.35	58	158	0.49	45	94	0.02	36	375	0.60	29	231
59	Philippines	Misamis Oriental	0.34	59	169	0.47	53	115	0.01	53	432	0.55	41	310
60	Philippines	Cebu	0.34	60	170	0.46	55	123	0.05	23	215	0.61	25	203
61	Philippines	Davao Oriental	0.34	61	173	0.47	51	112	0.00	73	537	0.54	45	330
62	Philippines	Southern Leyte	0.33	62	176	0.47	52	114	0.01	65	474	0.56	38	293
63	Philippines	Sulu	0.32	63	188	0.29	71	242	0.02	46	406	0.31	73	546
64	Philippines	Sultan Kudarat	0.32	64	190	0.38	66	174	0.03	31	317	0.46	63	470
65	Philippines	Surigao Del Sur	0.32	65	197	0.45	57	130	0.01	71	525	0.56	39	295
66	Philippines	Eastern Samar	0.31	66	207	0.36	68	181	0.02	49	419	0.44	66	481
67	Philippines	Siquijor	0.31	67	208	0.45	56	126	0.01	60	456	0.62	24	189
68	Philippines	Davao Del Norte	0.30	68	214	0.41	64	153	0.01	67	481	0.52	56	372
69	Philippines	North Cotabato	0.29	69	224	0.35	70	189	0.05	22	212	0.53	51	353
70	Philippines	Capiz	0.29	70	225	0.41	63	151	0.02	38	388	0.60	26	222
71	Philippines	Iloilo	0.28	71	237	0.39	65	169	0.03	29	311	0.63	23	176
72	Philippines	Bohol	0.28	72	248	0.36	69	187	0.04	26	282	0.59	30	240
73	Philippines	Basilan	0.23	73	309	0.24	73	296	0.02	40	390	0.45	65	477
74	Philippines	Aklan	0.22	74	346	0.28	72	250	0.01	57	447	0.57	35	282



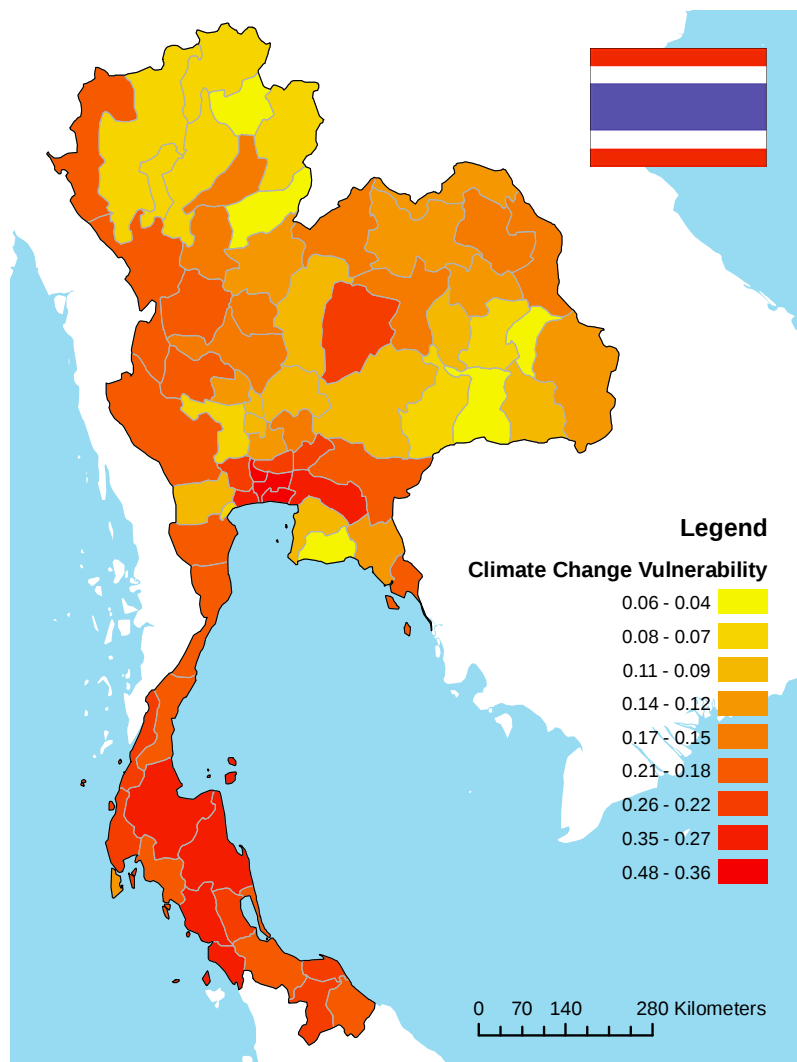
Thailand

Thailand at a glance

	Unit	Thailand	ASEAN
CO2 Emissions (2004)	MtCO2e	231.2	943.8
CO2 Emissions Per Person (2004)	tCO2e	3.5	1.7
CO2 Emission intensity	tCO2e Eq./Mill. \$Intl 2005	557.3	452.5
Size of economy	Million \$Intl 2005	445,741	2,303,451
Income per capita	\$Intl 2005 Per Person	6,702	4,115
Education	Index	81.4	78
Energy use per capita	Tonnes Oil Eq. Per Person	1.6	0.9
Governance	Index	39.3	32.1
Population	Thousands of People	66,507	560,240
Fossil fuel reserves	Total MtCO2e Eq.	2815	33,419
Land are impacted by human	Sq. Km.	321,810	1,626,633

Source: World Resource Institute (2010)

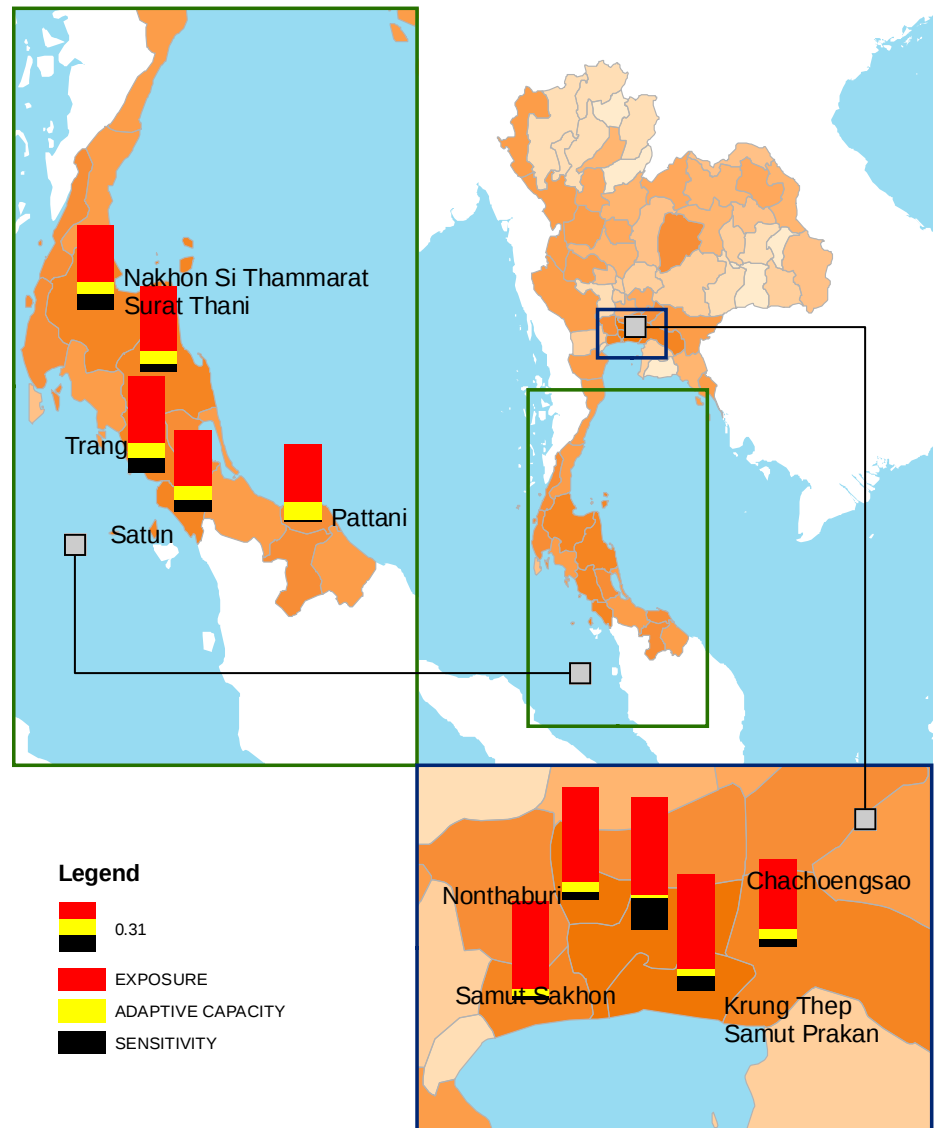
Climate Change Vulnerability Map of Thailand

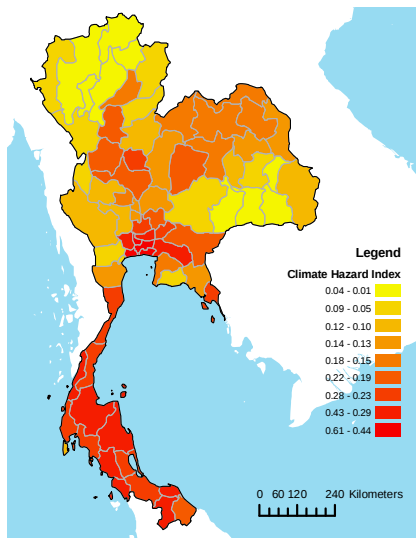


The assessment was carried out for each of the 72 provinces of Thailand. The top 10 most vulnerable provinces in Thailand are those surrounding the Bangkok area and those located in the south. The provinces around Bangkok are Krung Thep, Samut Prakan, Nonthaburi, Samut Sakhon, and Chachoengsao. These provinces are highly exposed to the threats of sea level rise and frequent floods. They are also deemed sensitive areas due to their high population densities, especially in the case of Krung Thep which is the most vulnerable province in the country.

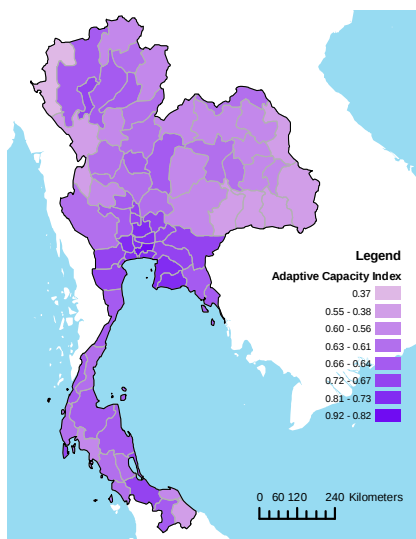
On the other hand, the vulnerable provinces located in southern Thailand are Nakhon Si Thammarat, Surat Thani, Satun, Trang, and Pattani. The provinces of Trang, Satun and Surat Thani are relatively more exposed while drought is the most dominant hazard in the provinces of Chumphon and Phattalung.

In general, however, Thailand has a higher adaptive capacity compared to other countries in South-east Asia.



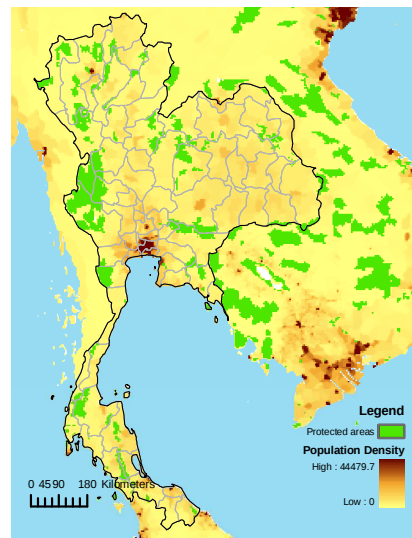


Climate Hazard Index

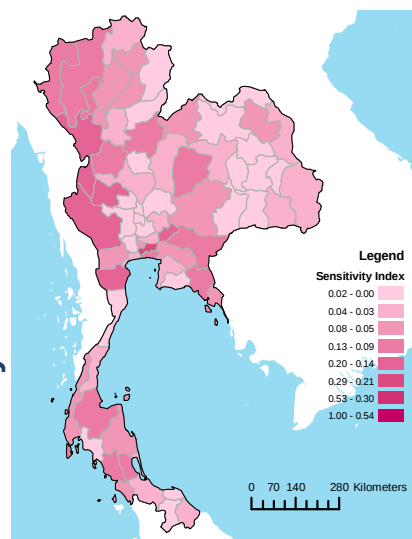


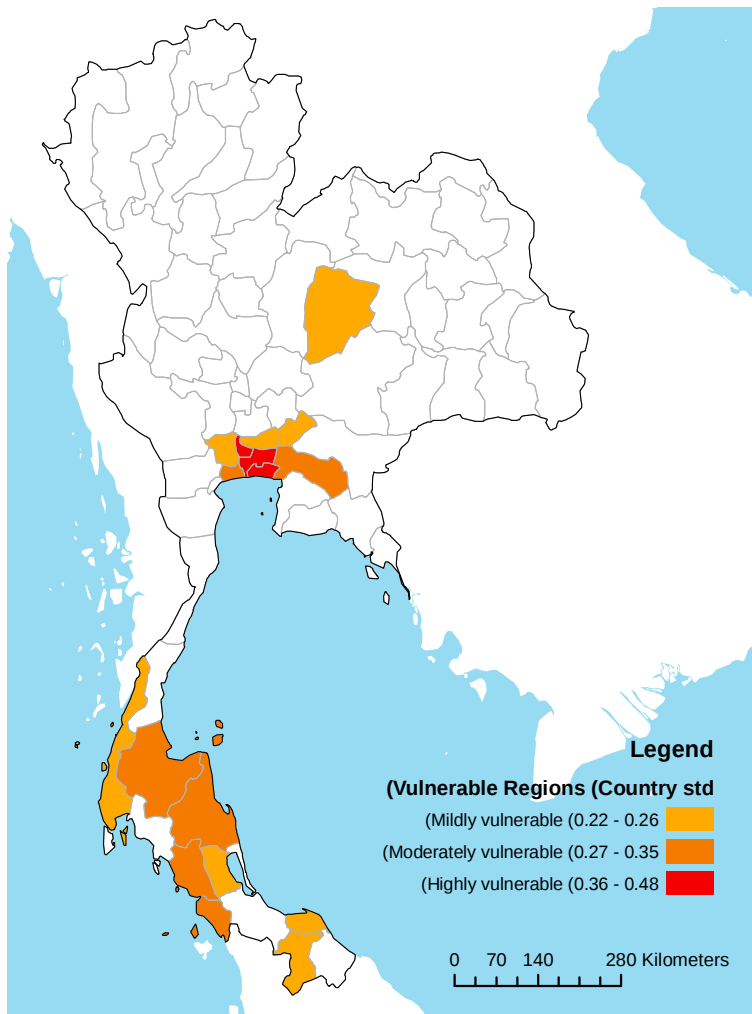
Adaptive Capacity Index

Population Density and Protected



Sensitivity Index





Climate Change Vulnerable Regions in Thailand

Vulnerability Ranking of Provinces in Thailand

Krung Thep (1)	Khon Kaen (38)
Samut Prakan (2)	Nakhon Phanom (39)
Nonthaburi (3)	Phrae (40)
Samut Sakhon (4)	Phitsanulok (41)
Trang (5)	Chanthaburi (42)
Chachoengsao (6)	Phra Nakhon Si Ayutthaya (43)
Nakhon Si Thammarat (7)	Udon Thani (44)
Surat Thani (8)	Nong Khai (45)
Satun (9)	Phuket (46)
Pattani (10)	Ubon Ratchathani (47)
Ranong (11)	Kalasin (48)
Nakhon Nayok (12)	Chai Nat (49)
Nakhon Pathom (13)	Phetchabun (50)
Phatthalung (14)	Lop Buri (51)
Yala (15)	Chon Buri (52)
Chaiyaphum (16)	Maha Sarakham (53)
Phangnga (17)	Nakhon Ratchasima (54)
Pathum Thani (18)	Sing Buri (55)
Chumphon (19)	Ang Thong (56)
Uthai Thani (20)	Ratchaburi (57)
Kamphaeng Phet (21)	Sisaket (58)
Phetchaburi (22)	Nan (59)
Tak (23)	Roi Et (60)
Trat (24)	Lampang (61)
Prachuap Khiri Khan (25)	Suphan Buri (62)
Kanchanaburi (26)	Chiang Mai (63)
Narathiwat (27)	Buriram (64)
Mae Hong Son (28)	Lamphun (65)
Prachin Buri (29)	Chiang Rai (66)
Songkhla (30)	Samut Songkhram (67)
Krabi (31)	Uttaradit (68)
Sukhothai (32)	Surin (69)
Loei (33)	Phayao (70)
Phichit (34)	Rayong (71)
Sakon Nakhon (35)	Yasothorn (72)
Saraburi (36)	
Nakhon Sawan (37)	

No	Country	Province/District	Vulnerability	Country Rank	SEA Rank	Exposure	Country Rank	SEA Rank	Sensitivity	Country Rank	SEA Rank	Adaptive Capacity	Country Rank	SEA Rank
1	Thailand	Krung Thep	0.48	1	47	0.61	1	47	0.20	1	31	0.92	1	4
2	Thailand	Samut Prakan	0.42	2	93	0.59	3	57	0.09	13	119	0.77	5	35
3	Thailand	Nonthaburi	0.40	3	107	0.59	2	55	0.05	29	209	0.74	8	55
4	Thailand	Samut Sakhon	0.35	4	159	0.54	4	70	0.03	47	364	0.78	4	29
5	Thailand	Trang	0.33	5	179	0.41	6	152	0.09	11	117	0.63	38	175
6	Thailand	Chachoengsao	0.30	6	216	0.43	5	136	0.05	27	205	0.72	10	73
7	Thailand	Nakhon Si Thammarat	0.29	7	226	0.40	7	162	0.05	30	217	0.64	33	161
8	Thailand	Surat Thani	0.29	8	231	0.35	10	192	0.10	9	107	0.66	22	128
9	Thailand	Satun	0.28	9	240	0.35	11	193	0.07	20	145	0.63	36	173
10	Thailand	Pattani	0.26	10	263	0.36	9	185	0.02	54	430	0.58	57	255
11	Thailand	Ranong	0.26	11	274	0.33	14	208	0.06	22	165	0.64	31	159
12	Thailand	Nakhon Nayok	0.25	12	280	0.26	18	278	0.13	6	70	0.68	18	107
13	Thailand	Nakhon Pathom	0.25	13	286	0.39	8	170	0.02	52	415	0.74	9	56
14	Thailand	Phatthalung	0.23	14	316	0.24	22	303	0.11	7	94	0.63	37	174
15	Thailand	Yala	0.23	15	322	0.34	12	202	0.00	72	536	0.64	34	165
16	Thailand	Chaiyaphum	0.22	16	332	0.21	26	335	0.09	10	116	0.56	63	296
17	Thailand	Phangnga	0.22	17	336	0.25	19	289	0.07	21	160	0.61	48	212
18	Thailand	Pathum Thani	0.22	18	337	0.33	13	203	0.03	46	363	0.75	7	47
19	Thailand	Chumphon	0.21	19	354	0.27	16	269	0.04	39	293	0.61	49	213
20	Thailand	Uthai Thani	0.21	20	358	0.11	51	483	0.17	3	41	0.56	64	305
21	Thailand	Kamphaeng Phet	0.20	21	366	0.20	29	351	0.10	8	105	0.61	47	202
22	Thailand	Phetchaburi	0.20	22	370	0.14	40	429	0.17	4	43	0.69	16	100
23	Thailand	Tak	0.20	23	371	0.08	56	509	0.17	5	45	0.53	69	355
24	Thailand	Trat	0.20	24	375	0.25	20	294	0.05	33	242	0.64	32	160
25	Thailand	Prachuap Khiri Khan	0.19	25	385	0.28	15	257	0.01	59	468	0.66	24	139

No	Country	Province/District	Vulnera- bility	Country Rank	SEA Rank	Expo- sure	Country Rank	SEA Rank	Sensi- tivity	Country Rank	SEA Rank	Adaptive Capacity	Country Rank	SEA Rank
26	Thailand	Kanchanaburi	0.19	26	391	0.09	54	501	0.18	2	34	0.63	39	179
27	Thailand	Narathiwat	0.19	27	395	0.21	27	338	0.03	41	327	0.55	65	318
28	Thailand	Mae Hong Son	0.19	28	396	0.05	63	543	0.09	17	125	0.37	72	524
29	Thailand	Prachin Buri	0.19	29	397	0.20	30	352	0.09	15	121	0.68	19	108
30	Thailand	Songkhla	0.18	30	399	0.26	17	277	0.03	42	333	0.71	13	85
31	Thailand	Krabi	0.18	31	407	0.24	21	298	0.01	63	486	0.59	54	239
32	Thailand	Sukhothai	0.17	32	415	0.20	28	348	0.03	45	354	0.58	58	256
33	Thailand	Loei	0.16	33	430	0.16	36	397	0.06	24	184	0.59	53	235
34	Thailand	Phichit	0.16	34	431	0.23	23	305	0.01	70	511	0.64	30	157
35	Thailand	Sakon Nakhon	0.16	35	433	0.16	37	398	0.05	32	223	0.57	59	266
36	Thailand	Saraburi	0.16	36	435	0.22	25	323	0.03	40	308	0.71	11	82
37	Thailand	Nakhon Sawan	0.15	37	446	0.19	31	367	0.03	43	340	0.62	43	187
38	Thailand	Khon Kaen	0.15	38	448	0.18	32	383	0.04	37	285	0.62	46	192
39	Thailand	Nakhon Phanom	0.15	39	452	0.13	44	440	0.04	34	262	0.53	68	350
40	Thailand	Phrae	0.15	40	457	0.16	38	402	0.05	25	194	0.64	35	166
41	Thailand	Phitsanulok	0.14	41	464	0.11	49	471	0.09	16	123	0.62	44	190
42	Thailand	Chanthaburi	0.14	42	468	0.12	47	458	0.09	18	128	0.65	27	144
43	Thailand	Phra Nakhon Si Ayutthaya	0.14	43	470	0.23	24	306	0.01	56	436	0.79	3	23
44	Thailand	Udon Thani	0.14	44	476	0.17	33	389	0.01	57	440	0.60	51	230
45	Thailand	Nong Khai	0.14	45	481	0.17	34	390	0.02	51	413	0.62	45	191
46	Thailand	Phuket	0.13	46	485	0.12	48	468	0.09	12	118	0.69	17	103
47	Thailand	Ubon Ratchathani	0.13	47	490	0.11	52	484	0.04	38	292	0.53	66	338
48	Thailand	Kalasin	0.13	48	494	0.14	42	433	0.02	53	427	0.57	60	272
49	Thailand	Chai Nat	0.12	49	505	0.17	35	396	0.01	69	506	0.65	26	143
50	Thailand	Phetchabun	0.11	50	509	0.12	46	456	0.04	35	266	0.66	23	137

No	Country	Province/District	Vulnerability	Country Rank	SEA Rank	Exposure	Country Rank	SEA Rank	Sensitivity	Country Rank	SEA Rank	Adaptive Capacity	Country Rank	SEA Rank
51	Thailand	Lop Buri	0.10	51	522	0.14	43	438	0.01	71	522	0.63	41	183
52	Thailand	Chon Buri	0.10	52	523	0.15	39	410	0.03	44	345	0.77	6	36
53	Thailand	Maha Sarakham	0.10	53	529	0.11	50	475	0.01	61	482	0.60	50	220
54	Thailand	Nakhon Ratchasima	0.10	54	530	0.06	62	539	0.05	28	208	0.57	61	277
55	Thailand	Sing Buri	0.10	55	531	0.14	41	432	0.01	58	444	0.70	15	90
56	Thailand	Ang Thong	0.09	56	533	0.13	45	455	0.01	55	434	0.68	21	115
57	Thailand	Ratchaburi	0.09	57	536	0.09	55	505	0.05	26	201	0.68	20	109
58	Thailand	Sisaket	0.09	58	542	0.04	65	563	0.04	36	279	0.52	70	360
59	Thailand	Nan	0.08	59	552	0.07	60	522	0.01	67	494	0.57	62	283
60	Thailand	Roi Et	0.08	60	553	0.08	58	518	0.01	64	487	0.58	56	253
61	Thailand	Lampang	0.07	61	556	0.04	64	559	0.06	23	174	0.64	29	155
62	Thailand	Suphan Buri	0.07	62	558	0.09	53	500	0.01	65	492	0.65	25	141
63	Thailand	Chiang Mai	0.07	63	560	0.01	70	577	0.08	19	135	0.65	28	149
64	Thailand	Buriram	0.07	64	563	0.02	67	571	0.01	62	483	0.49	71	414
65	Thailand	Lamphun	0.06	65	570	0.01	71	581	0.09	14	120	0.71	12	84
66	Thailand	Chiang Rai	0.06	66	571	0.03	66	564	0.02	48	374	0.58	55	252
67	Thailand	Samut Songkhram	0.06	67	572	0.07	59	520	0.02	49	378	0.70	14	87
68	Thailand	Uttaradit	0.06	68	573	0.06	61	537	0.01	68	505	0.63	40	181
69	Thailand	Surin	0.05	69	575	0.02	68	574	0.01	66	493	0.53	67	342
70	Thailand	Phayao	0.05	70	578	0.01	72	583	0.05	31	222	0.62	42	185
71	Thailand	Rayong	0.04	71	580	0.08	57	510	0.02	50	412	0.81	2	16
72	Thailand	Yasothon	0.04	72	583	0.02	69	575	0.01	60	476	0.60	52	232

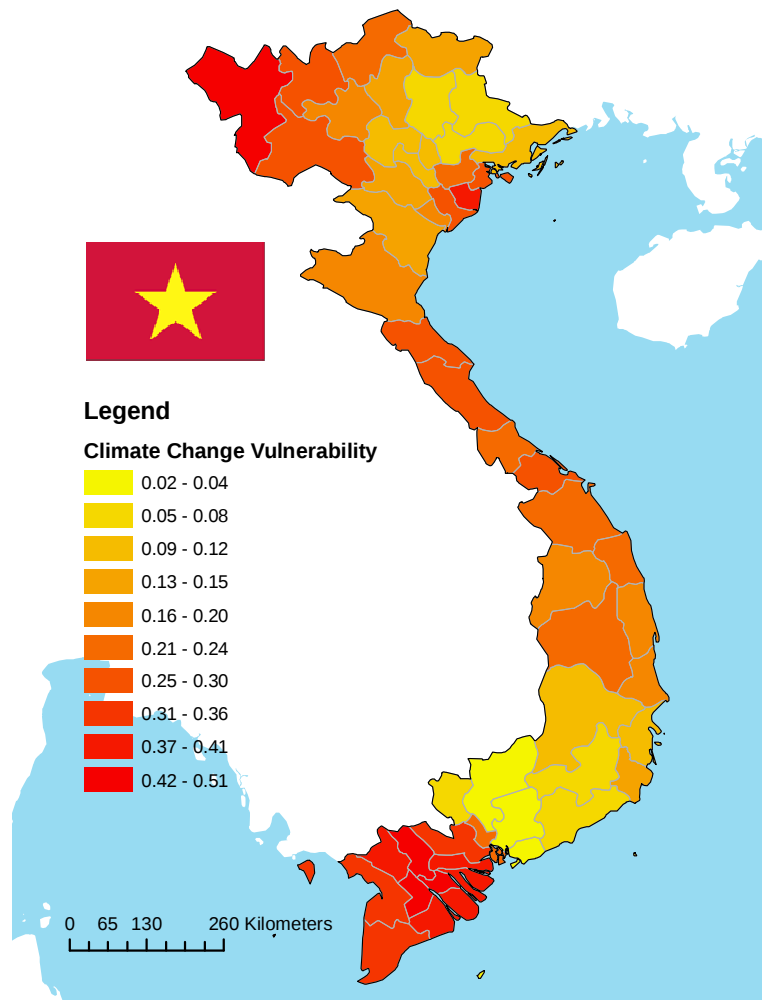


Vietnam

Vietnam at a glance

	Unit	Vietnam	ASEAN
CO2 Emissions (2004)	MtCO2e	92.4	943.8
CO2 Emissions Per Person (2004)	tCO2e	1.1	1.7
CO2 Emission intensity	tCO2e Eq./Mill. \$Intl 2005	480.4	452.5
Size of economy	Million \$Intl 2005	192,728	2,303,451
Income per capita	\$Intl 2005 Per Person	2,291	4,115
Education	Index	76.1	78
Energy use per capita	Tonnes Oil Eq. Per Person	0.6	0.9
Governance	Index	32.6	32.1
Population	Thousands of People	84,137	560,240
Fossil fuel reserves	Total MtCO2e Eq.	2313	33,419
Land are impacted by human	Sq. Km.	184,325	1,626,633

Source: World Resource Institute (2010)

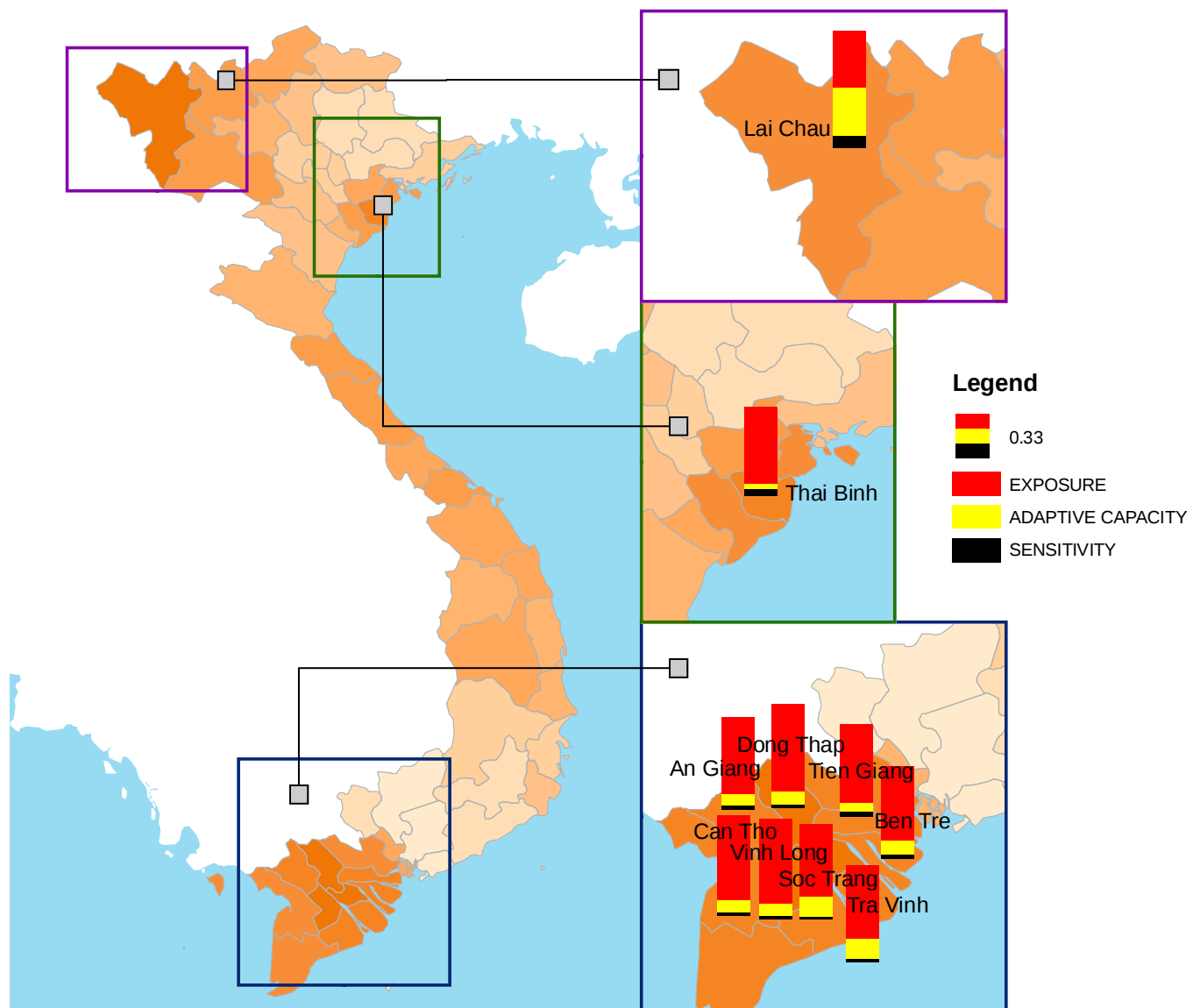


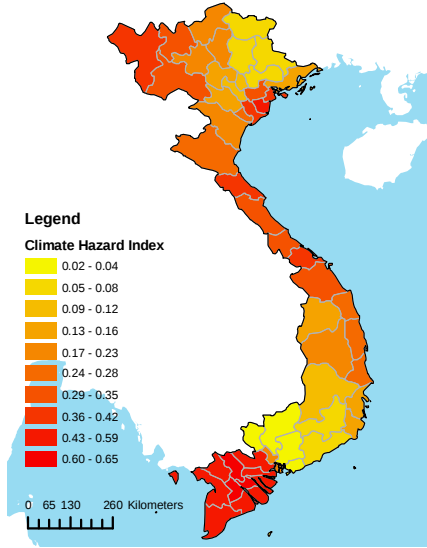
Climate Change Vulnerability Map of Vietnam

The mapping assessment revealed that the vulnerability of Vietnam was mainly attributed to its exposure to climate hazards. The assessment was carried out for each of the 53 provinces of Vietnam.

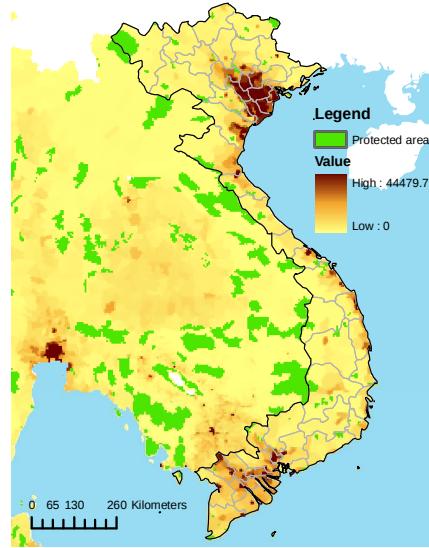
Vietnam's 10 most vulnerable provinces are among the top 25% most vulnerable regions in Southeast Asia. Eight of these 10 provinces are located around the Mekong River Delta. They are Dong Thap, Vinh Long, Can Tho, Tra Vinh, Soc Trang, An Giang, Tien Giang, and Ben Tre. These regions are at greatest risk from sea level rise. Some of them such as Dong Than, Can Tho, and Vinh Long, also experience frequent flooding. Many of these regions are densely populated. The two remaining vulnerable regions are Lai Chau and Thai Binh, located in the north of Vietnam. Lai Chau, in particular, is highly exposed to drought, mildly exposed to landslides, and has a high sensitivity from having a large protected area. It is the province with the least adaptive capacity among the 10 provinces.

Unlike its closest neighbours Cambodia and Lao PDR, low adaptive capacity is generally less dominant in determining the vulnerability of Vietnam's provinces with the exception of Lai Chau Province.

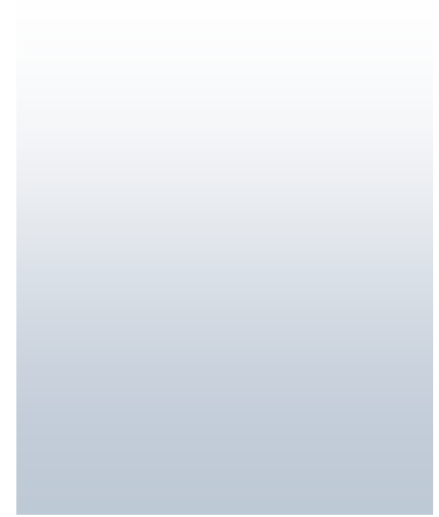




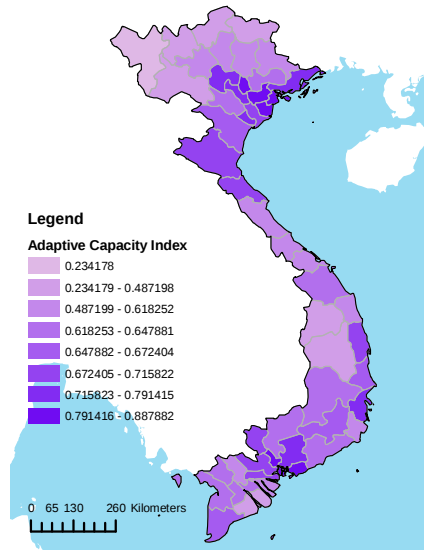
Climate Hazard Index



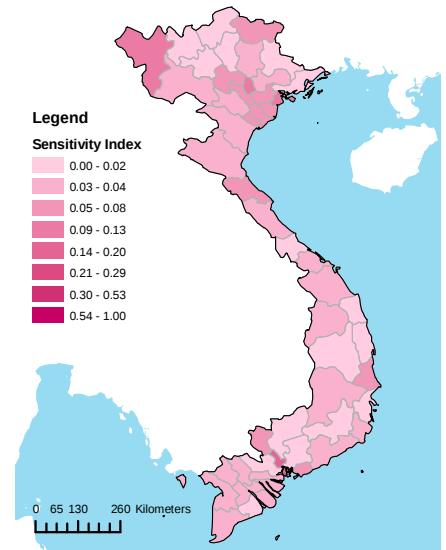
Population Density and Protected Areas

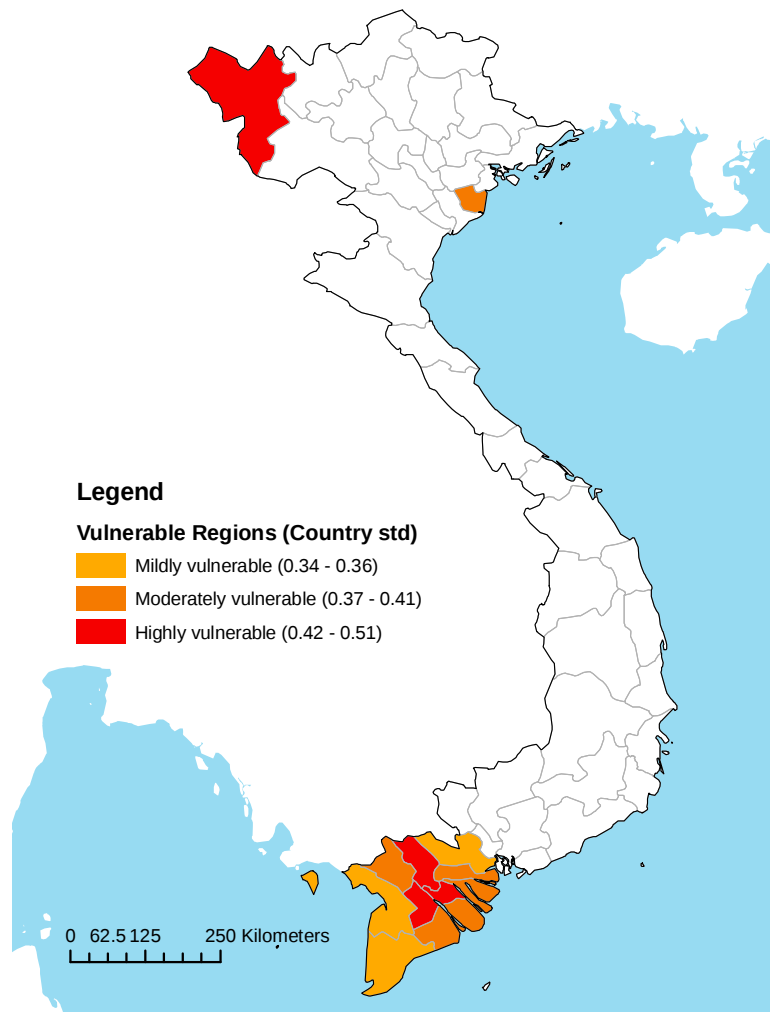


Adaptive Capacity Index



Sensitivity Index





Climate Change Vulnerable Regions in Vietnam

Vulnerability Ranking of Provinces in Vietnam

Lai Chau (1)	Yen Bai (32)
Dong Thap (2)	Kon Tum (33)
Vinh Long (3)	Thanh Hoa (34)
Can Tho (4)	Tuyen Quang (35)
Tra Vinh (5)	Cao Bang (36)
Soc Trang (6)	Hoa Binh (37)
An Giang (7)	Ninh Thuan (38)
Tien Giang (8)	Dac Lac (39)
Ben Tre (9)	Ha Noi (40)
Thai Binh (10)	Vinh Phu (41)
Minh Hai (11)	Ha Tay (42)
Long An (12)	Quang Ninh (43)
Kien Giang (13)	Khanh Hoa (44)
Thua Thien Hue (14)	Bac Thai (45)
Son La (15)	Ha Bac (46)
Ha Tinh (16)	Lang Son (47)
Lao Cai (17)	Binh Thuan (48)
Hai Phong (18)	Tay Ninh (49)
Nam Ha (19)	Lam Dong (50)
Quang Binh (20)	Song Be (51)
Hai Hung (21)	Ba Ria-Vung Tau (52)
Ho Chi Minh (22)	Dong Nai (53)
Ha Giang (23)	
Quang Tri (24)	
Gia Lai (25)	
Quang Nam-Da Nang (26)	
Quang Ngai (27)	
Nghe An (28)	
Phu Yen (29)	
Ninh Binh (30)	
Binh Dinh (31)	

No	Country	Province/District	Vulnerability	Country Rank	SEA Rank	Exposure	Country Rank	SEA Rank	Sensitivity	Country Rank	SEA Rank	Adaptive Capacity	Country Rank	SEA Rank
1	Vietnam	Lai Chau	0.51	1	35	0.42	13	144	0.10	3	106	0.23	53	557
2	Vietnam	Dong Thap	0.45	2	69	0.65	1	27	0.03	32	359	0.61	35	200
3	Vietnam	Vinh Long	0.43	3	77	0.64	3	40	0.03	28	351	0.63	32	171
4	Vietnam	Can Tho	0.43	4	79	0.64	2	39	0.03	29	352	0.64	26	152
5	Vietnam	Tra Vinh	0.41	5	96	0.55	7	66	0.02	37	393	0.49	45	423
6	Vietnam	Soc Trang	0.40	6	101	0.54	9	75	0.02	39	416	0.48	46	431
7	Vietnam	An Giang	0.40	7	108	0.57	5	62	0.04	17	289	0.64	28	158
8	Vietnam	Tien Giang	0.39	8	113	0.59	4	58	0.04	18	298	0.70	17	93
9	Vietnam	Ben Tre	0.39	9	114	0.55	8	69	0.03	23	321	0.57	44	262
10	Vietnam	Thai Binh	0.38	10	127	0.57	6	63	0.06	10	186	0.81	6	19
11	Vietnam	Minh Hai	0.36	11	146	0.52	11	82	0.03	21	309	0.66	23	136
12	Vietnam	Long An	0.34	12	162	0.53	10	79	0.02	41	424	0.69	18	98
13	Vietnam	Kien Giang	0.34	13	166	0.49	12	93	0.02	34	377	0.63	31	169
14	Vietnam	Thua Thien Hue	0.30	14	213	0.42	14	149	0.04	20	300	0.61	39	214
15	Vietnam	Son La	0.30	15	215	0.31	22	221	0.03	25	326	0.39	51	513
16	Vietnam	Ha Tinh	0.30	16	220	0.40	15	155	0.07	5	146	0.71	14	79
17	Vietnam	Lao Cai	0.29	17	229	0.32	20	214	0.02	38	403	0.41	50	501
18	Vietnam	Hai Phong	0.29	18	230	0.39	16	166	0.09	4	111	0.81	5	18
19	Vietnam	Nam Ha	0.28	19	236	0.39	17	168	0.06	9	180	0.71	15	81
20	Vietnam	Quang Binh	0.26	20	262	0.35	18	194	0.03	26	347	0.58	43	250
21	Vietnam	Hai Hung	0.24	21	302	0.35	19	195	0.06	7	166	0.82	4	15
22	Vietnam	Ho Chi Minh	0.23	22	319	0.23	29	308	0.16	1	48	0.82	3	14
23	Vietnam	Ha Giang	0.23	23	323	0.19	34	369	0.01	45	454	0.36	52	531
24	Vietnam	Quang Tri	0.22	24	335	0.31	21	220	0.00	53	530	0.60	41	221
25	Vietnam	Gia Lai	0.22	25	345	0.21	31	333	0.01	43	448	0.43	49	496

No	Country	Province/District	Vulnerability	Country Rank	SEA Rank	Exposure	Country Rank	SEA Rank	Sensitivity	Country Rank	SEA Rank	Adaptive Capacity	Country Rank	SEA Rank
26	Vietnam	Quang Nam-Da Nang	0.22	26	347	0.30	23	235	0.03	33	369	0.65	24	146
27	Vietnam	Quang Ngai	0.21	27	362	0.28	25	261	0.02	40	421	0.60	40	219
28	Vietnam	Nghe An	0.20	28	373	0.28	24	252	0.03	22	312	0.70	16	86
29	Vietnam	Phu Yen	0.20	29	377	0.25	28	287	0.04	15	258	0.66	22	127
30	Vietnam	Ninh Binh	0.19	30	388	0.27	26	273	0.05	12	202	0.77	9	32
31	Vietnam	Binh Dinh	0.17	31	410	0.27	27	274	0.01	49	465	0.72	13	75
32	Vietnam	Yen Bai	0.17	32	413	0.23	30	316	0.01	42	446	0.61	37	208
33	Vietnam	Kon Tum	0.16	33	428	0.14	39	434	0.03	24	323	0.47	47	450
34	Vietnam	Tanh Hoa	0.15	34	460	0.20	32	357	0.03	31	357	0.67	20	121
35	Vietnam	Tuyen Quang	0.14	35	462	0.19	33	364	0.01	50	473	0.62	34	193
36	Vietnam	Cao Bang	0.14	36	480	0.07	47	529	0.05	11	198	0.46	48	464
37	Vietnam	Hoa Binh	0.13	37	486	0.15	36	408	0.04	19	299	0.65	25	150
38	Vietnam	Ninh Thuan	0.12	38	497	0.13	40	445	0.02	35	381	0.59	42	241
39	Vietnam	Dac Lac	0.12	39	508	0.12	41	465	0.04	16	268	0.62	33	188
40	Vietnam	Ha Noi	0.11	40	513	0.10	43	489	0.12	2	77	0.89	1	6
41	Vietnam	Vinh Phu	0.11	41	520	0.14	38	430	0.05	13	221	0.78	8	27
42	Vietnam	Ha Tay	0.10	42	521	0.12	42	469	0.07	6	148	0.79	7	21
43	Vietnam	Quang Ninh	0.10	43	526	0.16	35	406	0.01	47	461	0.74	12	54
44	Vietnam	Khanh Hoa	0.09	44	537	0.15	37	416	0.01	48	462	0.76	10	39
45	Vietnam	Bac Thai	0.08	45	551	0.08	44	513	0.02	36	387	0.61	36	204
46	Vietnam	Ha Bac	0.07	46	557	0.07	46	528	0.03	27	350	0.64	30	167
47	Vietnam	Lang Son	0.07	47	565	0.07	48	530	0.01	44	449	0.61	38	210
48	Vietnam	Binh Thuan	0.07	48	568	0.06	49	536	0.03	30	356	0.64	29	163
49	Vietnam	Tay Ninh	0.07	49	569	0.04	50	556	0.06	8	176	0.69	19	104
50	Vietnam	Lam Dong	0.05	50	576	0.07	45	526	0.01	52	507	0.67	21	123
51	Vietnam	Song Be	0.04	51	584	0.03	52	565	0.01	51	491	0.64	27	156
52	Vietnam	Ba Ria-Vung Tau	0.02	52	587	0.02	53	570	0.05	14	228	0.84	2	8
53	Vietnam	Dong Nai	0.02	53	588	0.04	51	558	0.01	46	459	0.76	11	43



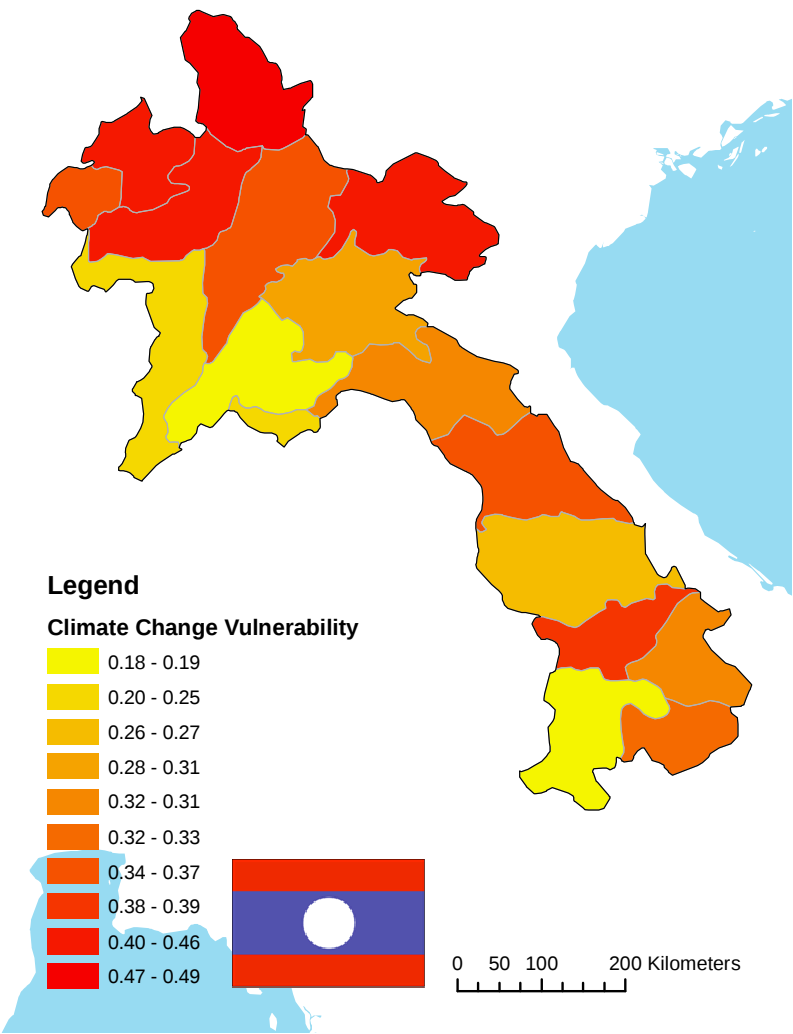
Lao PDR

Lao PDR at a glance

	Unit	Lao PDR	ASEAN
CO2 Emissions (2004)	MtCO2e	1.4	943.8
CO2 Emissions Per Person (2004)	tCO2e	0.2	1.7
CO2 Emission intensity	t CO2e Eq./Mill. \$Intl 2005	154.6	452.5
Size of economy	Million \$Intl 2005	10,624	2,303,451
Income per capita	\$Intl 2005 Per Person	1,776	4,115
Education	Index	55.3	78
Energy use per capita	Tonnes Oil Eq. Per Person	--	0.9
Governance	Index	22.6	32.1
Population	Thousands of People	5,983	560,240
Fossil fuel reserves	Total MtCO2e Eq.	--	33,419
Land area impacted by human	Sq. Km.	16,562	1,626,633

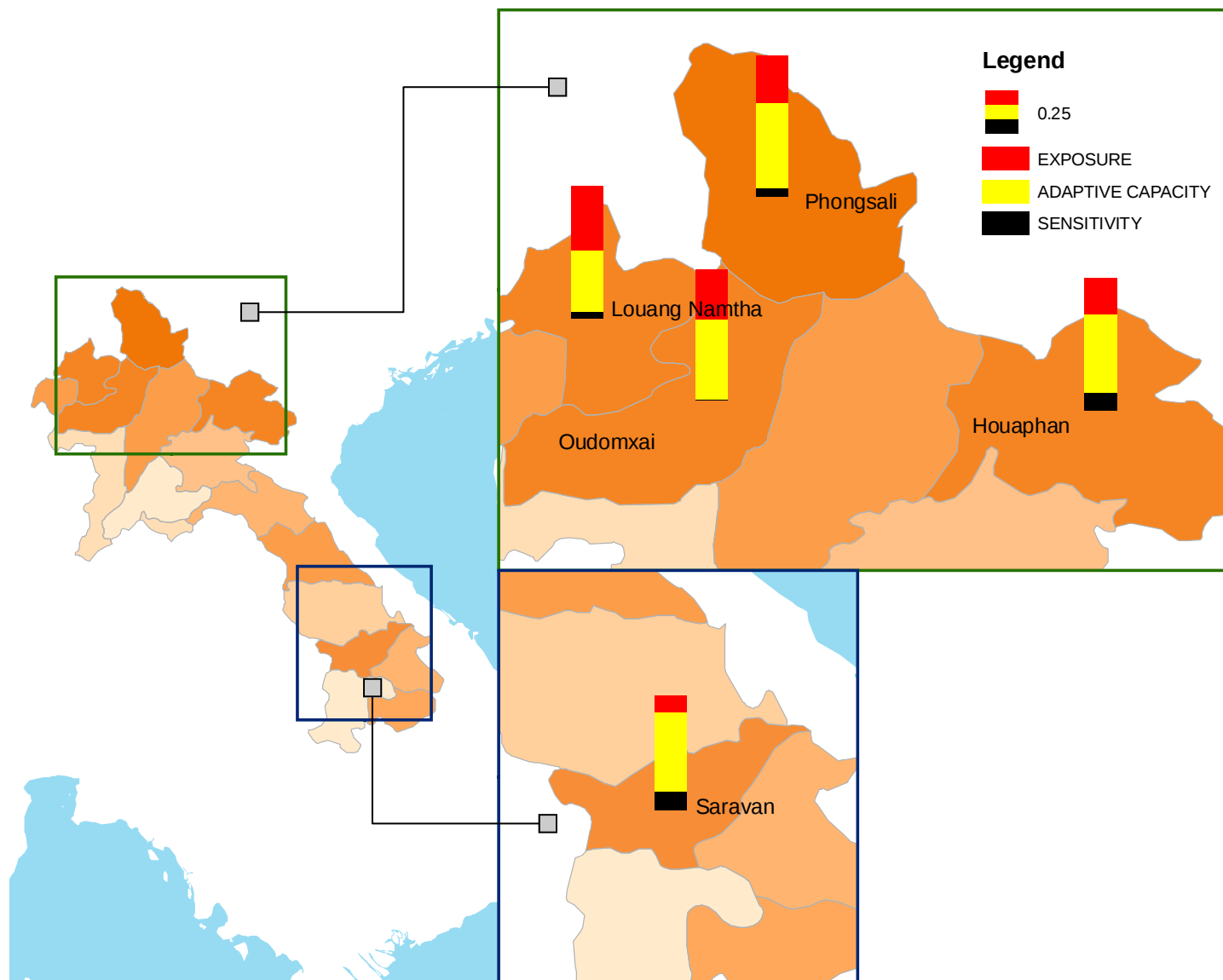
Source: World Resource Institute (2010)

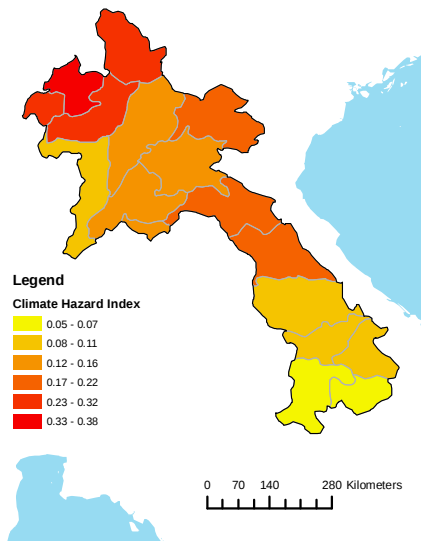
Climate Change Vulnerability Map of Lao PDR



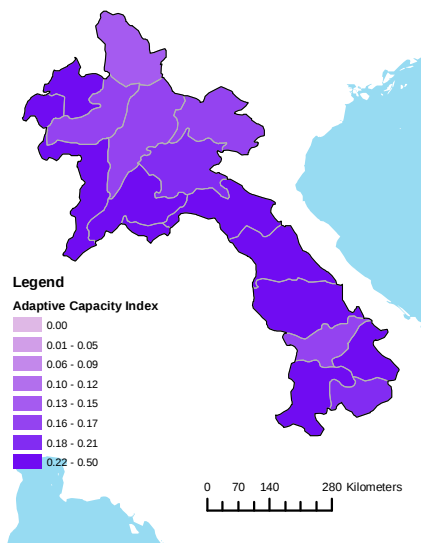
The assessment was carried out for each of the 17 provinces of Lao PDR. Six provinces in Lao PDR belong to the top 25% of the most vulnerable regions in Southeast Asia. Like Cambodia, low adaptive capacity is the dominant factor in the vulnerability of Lao PDR due largely to poverty.

Among the top five vulnerable provinces in Lao PDR, four are located in the northern part of the country. The three most vulnerable provinces here are Phongsali, Houaphan, and Louang Namtha where the frequency of droughts is relatively high. These three provinces are among the least developed not just in Lao but also in South-east Asia. Phongsali has the lowest adaptive capacity compared to the other provinces and is the province most vulnerable to climate change in the country.



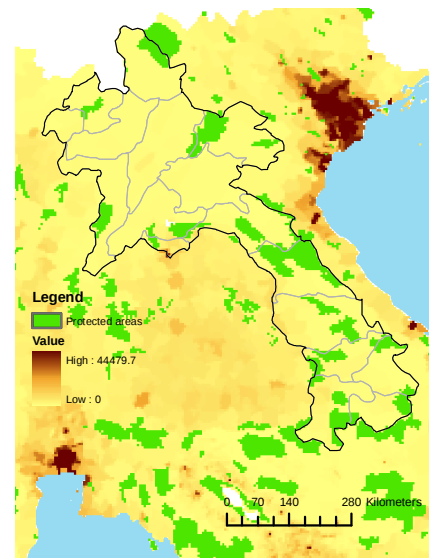


Climate Hazard Index

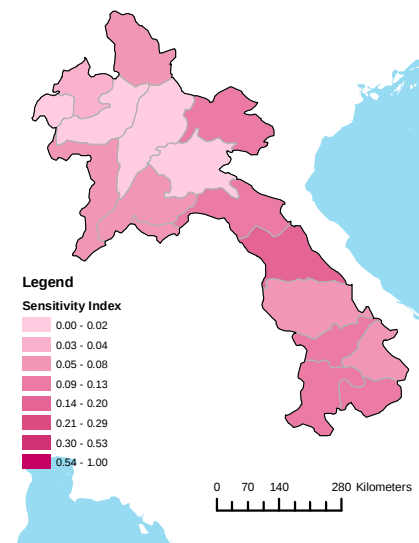


Adaptive Capacity Index

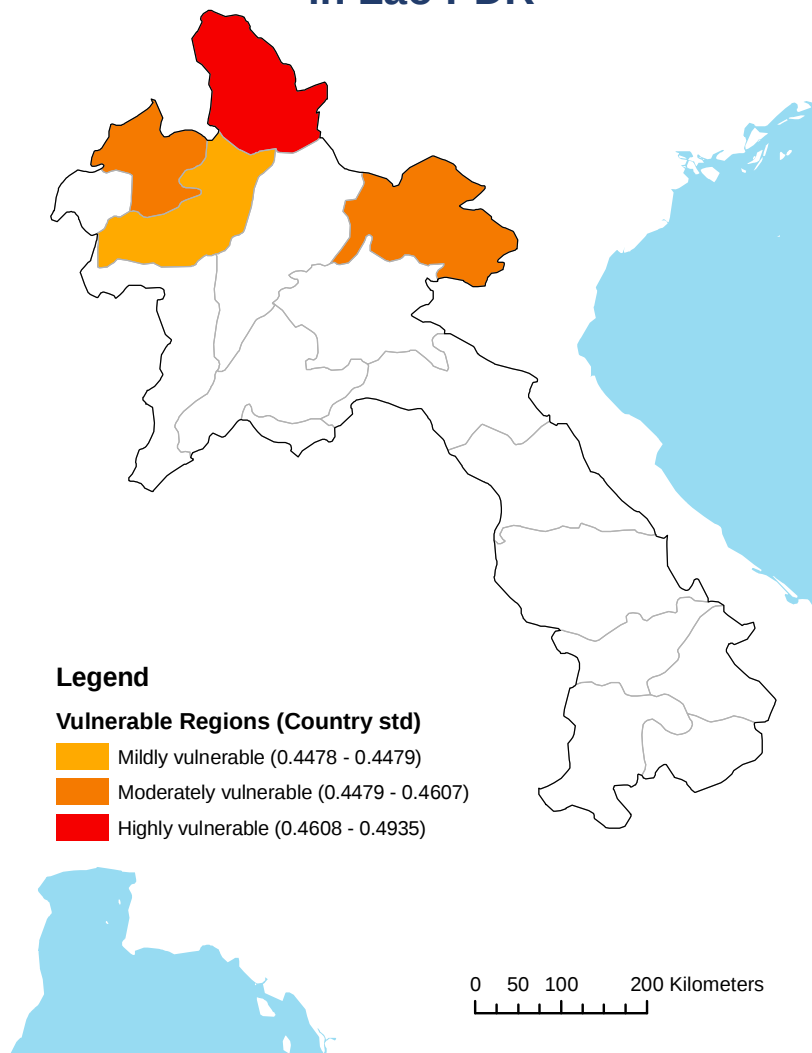
Population Density and Protected Areas



Sensitivity Index



Climate Change Vulnerable Regions in Lao PDR



Vulnerability Ranking of Provinces in Lao PDR

Phongsali (1)
Houaphan (2)
Louang Namtha (3)
Oudomxai (4)
Saravan (5)
Bokeo (6)
Khammouan (7)
Louangphrabang (8)
Attapeu (9)
Xekong (10)
Borikhamxai (11)
Xiangkhoang (12)
Savannakhet (13)
Viangchan (14)
Xaignabouri (15)
Vientiane (16)
Champasak (17)

No	Country	Province/District	Vulnerability	Country Rank	SEA Rank	Exposure	Country Rank	SEA Rank	Sensitivity	Country Rank	SEA Rank	Adaptive Capacity	Country Rank	SEA Rank
1	Lao PDR	Phongsali	0.49	1	43	0.28	4	249	0.06	10	193	0.14	17	576
2	Lao PDR	Houaphan	0.46	2	59	0.22	5	328	0.11	2	91	0.16	14	569
3	Lao PDR	Louang Namtha	0.46	3	61	0.38	1	171	0.04	13	270	0.22	9	559
4	Lao PDR	Oudomxai	0.45	4	67	0.30	3	237	0.00	16	581	0.15	16	571
5	Lao PDR	Saravan	0.39	5	115	0.10	13	491	0.11	3	95	0.15	15	570
6	Lao PDR	Bokeo	0.37	6	133	0.32	2	212	0.01	15	499	0.26	8	555
7	Lao PDR	Khammouan	0.35	7	156	0.18	7	370	0.18	1	36	0.33	4	542
8	Lao PDR	Louangphrabang	0.35	8	160	0.14	10	431	0.01	14	455	0.16	13	567
9	Lao PDR	Attapeu	0.33	9	184	0.07	16	519	0.10	5	103	0.19	12	565
10	Lao PDR	Xekong	0.31	10	205	0.11	12	473	0.07	9	158	0.21	10	561
11	Lao PDR	Borikhamxai	0.31	11	206	0.20	6	347	0.09	6	127	0.31	5	545
12	Lao PDR	Xiangkhoang	0.31	12	209	0.15	9	418	0.00	17	585	0.20	11	564
13	Lao PDR	Savannakhet	0.27	13	255	0.10	14	493	0.07	8	155	0.26	7	554
14	Lao PDR	Viangchan	0.25	14	287	0.16	8	399	0.07	7	150	0.36	3	530
15	Lao PDR	Xaignabouri	0.24	15	305	0.10	15	494	0.05	12	241	0.28	6	552
16	Lao PDR	Vientiane	0.19	16	380	0.14	11	439	0.05	11	230	0.41	1	500
17	Lao PDR	Champasak	0.18	17	404	0.05	17	548	0.10	4	99	0.40	2	510



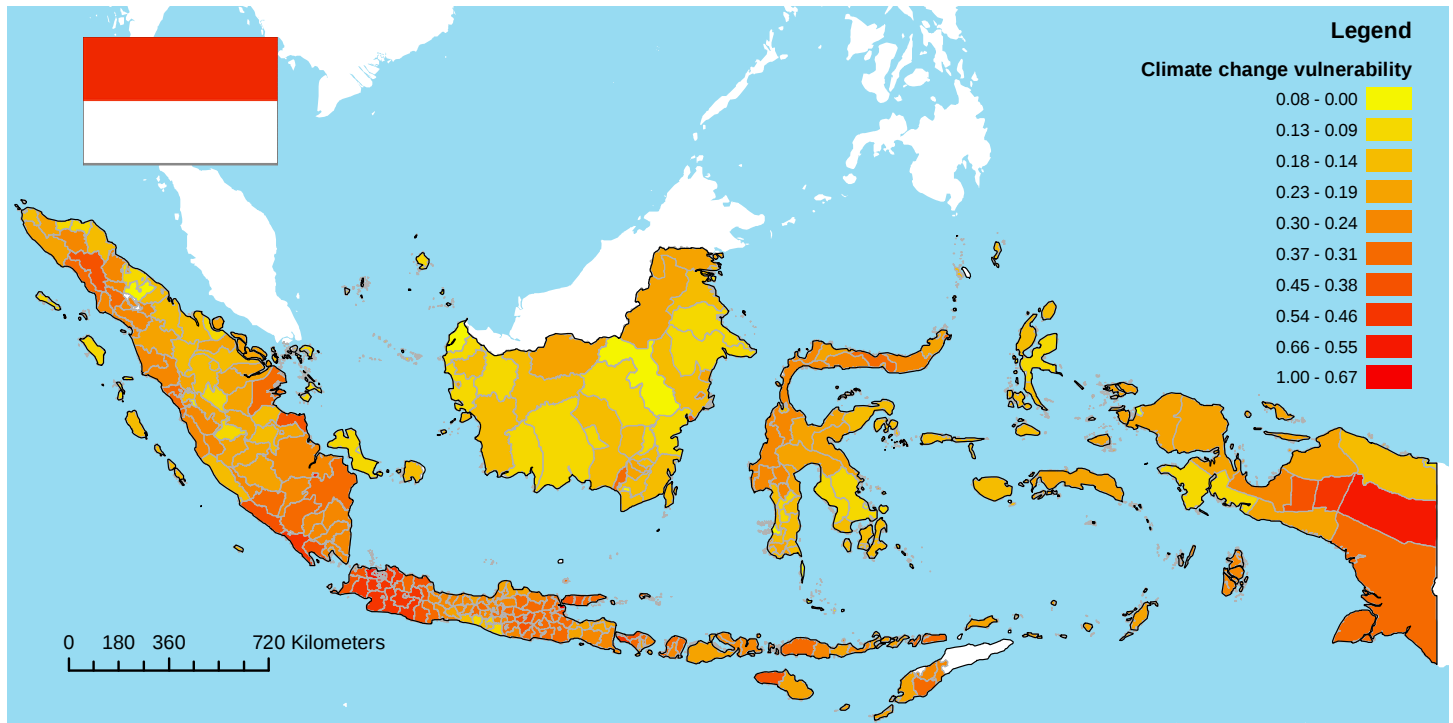
Indonesia

Indonesia at a glance

	Unit	Indonesia	ASEAN
CO2 Emissions (2004)	MtCO2e	340.8	943.8
CO2 Emissions Per Person (2004)	tCO2e	1.6	1.7
CO2 Emission intensity	tCO2e Eq./Mill. \$Intl 2005	510.8	452.5
Size of economy	Million \$Intl 2005	743,949	2,303,451
Income per capita	\$Intl 2005 Per Person	3,335	4,115
Education	Index	78.1	78
Energy use per capita	Tonnes Oil Eq. Per Person	0.8	0.9
Governance	Index	32.3	32.1
Population	Thousands of People	223,042	560,240
Fossil fuel reserves	Total MtCO2e Eq.	16562	33,419
Land are impacted by human	Sq. Km.	535,500	1,626,633

Source: World Resource Institute (2010)

Climate Change Vulnerability Map of Indonesia

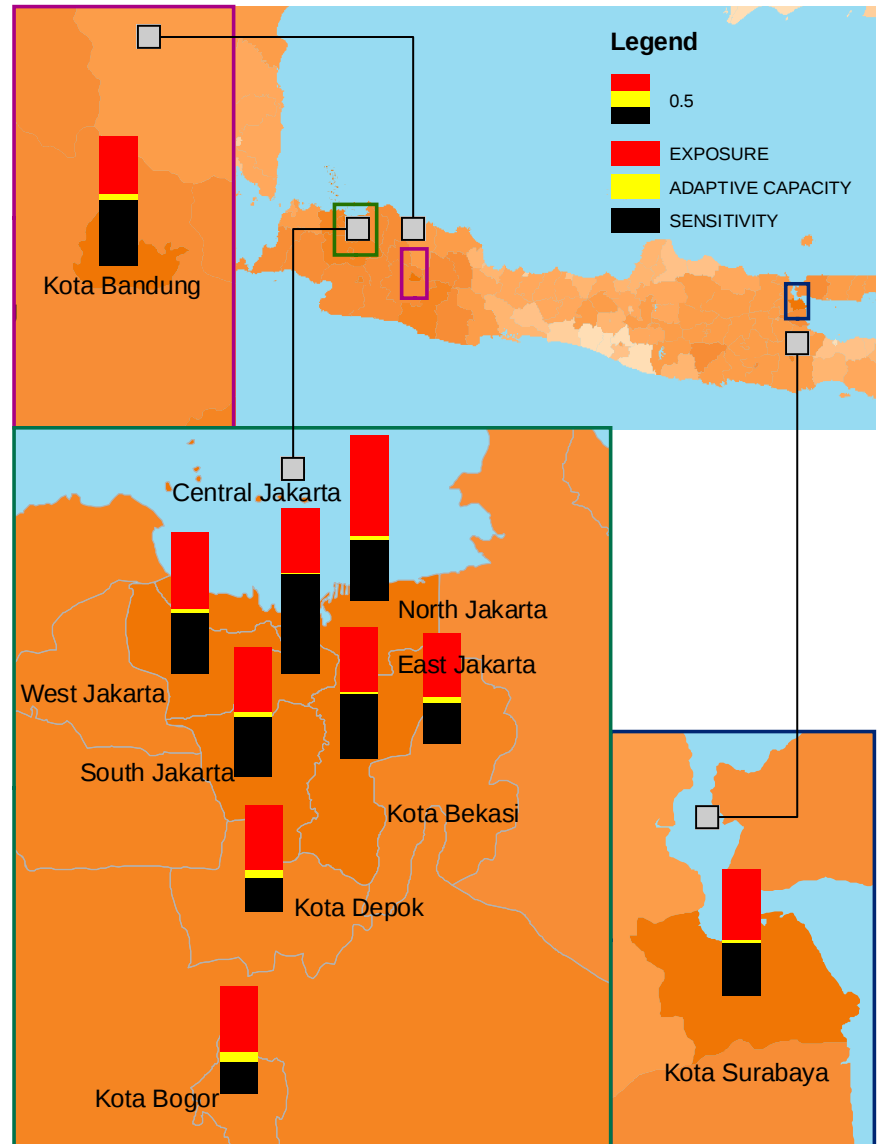


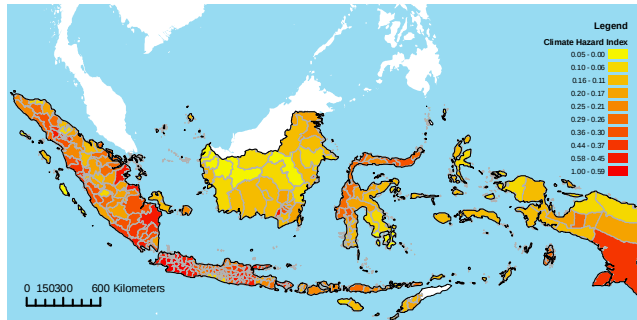
The assessment was carried out for 341 districts in Indonesia. Seven of the 10 most vulnerable districts in the country belong to the top 10 most vulnerable regions in Southeast Asia. The other three are Mondulkiri of Cambodia, and Manila and Benguet of the Philippines. In contrast to almost all the vulnerable regions in other countries, Indonesia's most vulnerable regions are lo-

cated in Java Island which is one of the most populated areas in the world. This makes it rank high in respect of human sensitivity to climate change.

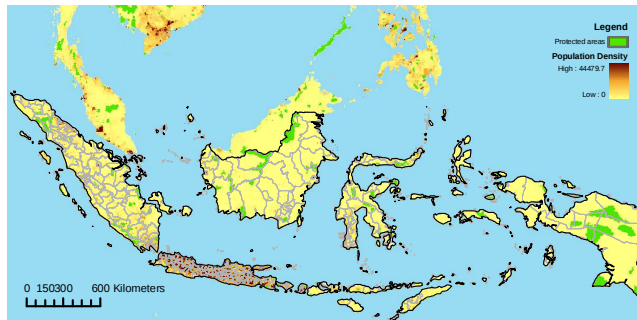
The five districts of Jakarta Province emerged as the top most vulnerable areas in Indonesia. The five districts are: Central Jakarta, North Jakarta, West Jakarta,

East Jakarta, and South Jakarta. They are also the top most vulnerable regions in Southeast Asia. The Jakarta area is the most intensely exposed to floods and is at high risk of being submerged due to sea level rise, especially the northern and western sections. Although it is the most developed region in Indonesia and scores high in terms of adaptive capacity, its high population density makes it very sensitive to climate change impacts.





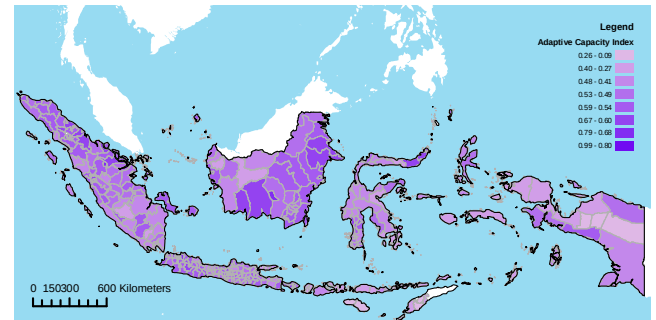
Climate Hazard Index



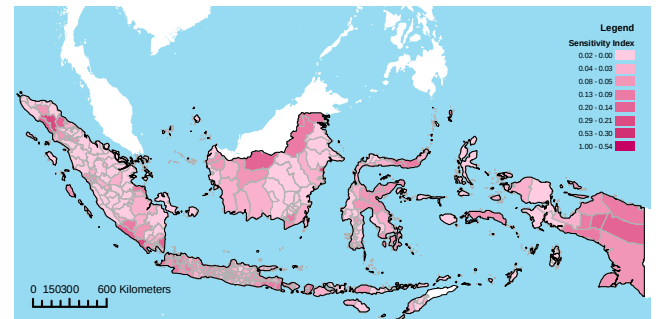
Population Density and Protected Areas

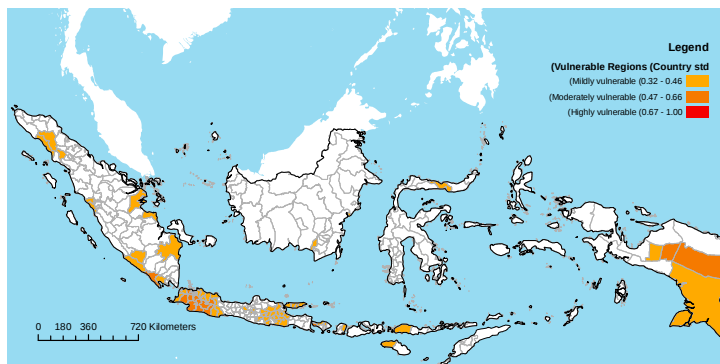


Adaptive Capacity Index



Sensitivity Index





Climate Change Vulnerable Regions in Indonesia

Vulnerability Ranking of Provinces in Indonesia

Central Jakarta (1)	Sampang (43)	Tulungagung (86)
North Jakarta (2)	Kota Balikpapan (44)	Ogan Komering Ulu (87)
West Jakarta (3)	Serang (45)	Karanganyar (88)
East Jakarta (4)	West Sumba (46)	Kota Surakarta (89)
South Jakarta (5)	South East Aceh (47)	Gresik (90)
Kota Bandung (6)	Indramayu (48)	Wonosobo (91)
Kota Surabaya (7)	Magetan (49)	Tabanan (92)
Kota Bekasi (8)	Madiun (50)	Bloora (93)
Kota Bogor (9)	Dairi (51)	Kota Bitung (94)
Kota Depok (10)	Ogan Komering Hilir (52)	Southern Central Timor (95)
Kota Palembang (11)	Ciamis (53)	Sragen (96)
Tangerang (12)	Indragiri Hilir (54)	Kota Temate (97)
Kota Tangerang (13)	Trenggalek (55)	West Lombok (98)
Kota Malang (14)	Subang (56)	Kota Pasuruan (99)
Jayawijaya (15)	Kota Banjarmasin (57)	Alor (100)
Kota Sukabumi (16)	Nganjuk (58)	Tulang Bawang (101)
Bogor (17)	Malang (59)	Way Kanan (102)
Puncak Jaya (18)	Kediri (60)	Karo (103)
Garut (19)	Lamongan (61)	Langkat (104)
West Lampung (20)	Gorontalo (62)	North Lampung (105)
Lebak (21)	Ngawi (63)	Toba Samosir (106)
Bandung (22)	Manggarai (64)	Pasaman (107)
Sumedang (23)	Jombang (65)	Kota Samarinda (108)
Jembrana (24)	Kota Kediri (66)	Bolaang Mongondow (109)
Cianjur (25)	East Lombok (67)	Kuningan (110)
Sukabumi (26)	Merauke (68)	Kota Mojokerto (111)
Karawang (27)	Sumenep (69)	Musi Banyuasin (112)
Bekasi (28)	Bojonegoro (70)	Tuban (113)
Bangkalan (29)	Pamekasan (71)	Kota Medan (114)
Pandeglang (30)	Kota Padang (72)	Tana Toraja (115)
Sidoarjo (31)	Lahat (73)	Grobogan (116)
Purwakarta (32)	South Aceh (74)	Brebes (117)
Panai (33)	Bilar (75)	Tegal (118)
Majalengka (34)	Temanggung (76)	Kota Jambi (119)
Buleleng (35)	Bangli (77)	South Lampung (120)
East Tanjung Jabung/Tanjung	Padang Pariaman (78)	Donggala (121)
Jabung (36)	Kota Padang Panjang (79)	East Lampung (122)
Ponorogo (37)	Boyolali (80)	Majene (123)
Tanggus (38)	Mojokerto (81)	Klaten (124)
Kota Bilar (39)	Wonorejo (82)	Kendal (125)
Tasik Malaya (40)	Agam (83)	Pasubalingga (126)
South Bengkulu (41)	Pasuruan (84)	Nabire (127)
Kota Madiun (42)	Barito Kuala (85)	

Banjarnegara (128)	Muara Jambi (207)	Kutai (285)
Sukoharjo (129)	Situbondo (208)	Kulon Progo (286)
Semarang (130)	Kota Gorontalo (209)	Ketapang (287)
Jember (131)	Minahasa (210)	Nias (288)
Solo (132)	Kota Ujung Pandang (211)	Fak Fak (289)
Kota Cilegon (133)	Rembang (212)	Kuantan Sengingi (290)
Central Lampung (134)	Badung (213)	Pontianak (291)
Mondailing Natal (135)	Morowali (214)	Kendari (292)
Pekalongan (136)	Kota Pontianak (215)	Soppeng (293)
Kota Yogyakarta (137)	Sarolangun (216)	Gunung Kidul (294)
Pemalang (138)	Kota Cirebon (217)	Tabalong (295)
Banyuwangi (139)	Kapuas Hulu (218)	Bangka (296)
Dompu (140)	South Tapanuli (219)	East Kotawaringin (297)
Central Tapanuli (141)	Piddie (220)	Kota Bengkulu (298)
Rejang Lebong (142)	Bengkalis (221)	Purworejo (299)
North Tapanuli (143)	East Flores (222)	Kota Tebing Tinggi (300)
Karangasem (144)	Kota Pekalongan (223)	Kota Tarakan (301)
Central Lombok (145)	Pati (224)	Sidenreng Rappang (302)
Northern Central Timor (146)	Kota Salatiga (225)	Kota Probolinggo (303)
Demak (147)	Malinau (226)	West Kotawaringin (304)
Central Aceh (148)	Tebo/Bungo Tebo (227)	Kota Dumai (305)
Belu (149)	Indragiri Hulu (228)	Kota Binjai (306)
Kerinci (150)	Kota Manado (229)	Sleman (307)
South-East Maluku (151)	West Aceh (230)	Deli Serdang (308)
South Pesisir (152)	Sorong (231)	North Aceh (309)
Magelang (153)	Gowa (232)	Karimun (310)
Toli-Toli/Buol Toli-toli (154)	Sawah Lunto/Sijunjung (233)	Kota Tanjung Balai (311)
Mamuju (155)	Bantul (234)	Berau (312)
Ngada (156)	Kota Pekanbaru (235)	Simeulue (313)
Cilacap (157)	Barro (236)	Kepulauan Riau (314)
Enrekang (158)	Aceh Besar (237)	Kolaka (315)
Boalemo (159)	Natuna (238)	Central Halmahera (316)
Sikka (160)	Maros (239)	Sanggau (317)
Polewali Mamasa (161)	Banjar (240)	Bungo (318)
Aceh Singkil (162)	Muna (241)	Bireuen (319)
Kudus (163)	Siak (242)	Kota Jayapura (320)
Muara Enim (Liot) (164)	South Barito (243)	Bengkayang (321)
Bima (165)	Batanghari (244)	Kota Palangka Raya (322)
Cirebon (166)	Buru (245)	East Kutai (323)
Pacitan (167)	North Bengkulu (246)	North Barito (324)
Lumajang (168)	Kota Metro (247)	Pasir (325)
Limapuluh Kota (169)	Belitung (248)	Pangkajene Kepulauan (326)
Sumbawa (170)	North Hulu Sungai (249)	Selayar (327)
East Sumba (171)	Bulukumba (250)	Simalungun (328)
Kota Semarang (172)	Sangihe Talaud (251)	Kota Kupang (329)
Kota Sibolga (173)	Kota Tegal (252)	Kota Sorong (330)
Bondowoso (174)	Jeneponto (253)	Sambas (331)
Tapin (175)	Landak (254)	West Kutai (332)
Gianyar (176)	Kota Batam (255)	Kota Pangkal Pinang (333)
Ende (177)	Jayapura (256)	Kota Pare Pare (334)
Jepara (178)	Tanah Datar (257)	Kota Banda Aceh (335)
Pelalawan (179)	Kota Mataram (258)	Kota Bukit Tinggi (336)
South Hulu Sungai (180)	Central Hulu Sungai (259)	Kota Banjar Baru (337)
Kota Bontang (181)	Labuhan Batu (260)	Kota Kendari (338)
Batang (182)	Pinrang (261)	Kota Pematang Siantar (339)
Kota Magelang (183)	Kota Ambon (262)	Kota Sawah Lunto (340)
Merangin (184)	Wajo (263)	Kota Payakumbuh (341)
Nunukan (185)	West Tanjung Jabung (264)	
Kota Sabang (186)	Kota Palu (265)	
Central Maluku (187)	Kota Baru (266)	
Kupang (188)	Banggai (267)	
North Luwu (189)	Kampar (268)	
Luwu (190)	North Maluku (269)	
Bantaeng (191)	Asahan (270)	
West South-East Maluku (192)	Rokan Hilir (271)	
Buol (193)	Kapuas (272)	
Kota Solok (194)	Kapuas (272)	
Probolinggo (195)	Buton (273)	
Kota Bandar Lampung (196)	Sinjai (274)	
Musi Rawas (197)	Kepulauan Mentawai (275)	
Lembata (198)	Bulongan (276)	
Poso (199)	Kebumen (277)	
Banyumas (200)	Banggai Kepulauan (278)	
Yapen Waropen (201)	Rokan Hulu (279)	
Manokwari (202)	Bone (280)	
Klungkung (203)	Takalar (281)	
Kota Denpasar (204)	Sintang (282)	
Mimika (205)	East Aceh (283)	
Biak Numfor (206)	Tanah Laut (284)	

No	Country	Province/District	Vulnera- bility	Country Rank	SEA Rank	Expo- sure	Country Rank	SEA Rank	Sensi- tivity	Country Rank	SEA Rank	Adaptive Capacity	Country Rank	SEA Rank
1	Indonesia	Central Jakarta	1.00	1	1	0.65	11	28	1.00	1	1	0.99	1	2
2	Indonesia	North Jakarta	1.00	2	2	1.00	1	1	0.61	5	6	0.79	8	22
3	Indonesia	West Jakarta	0.86	3	3	0.77	3	5	0.61	4	5	0.78	10	31
4	Indonesia	East Jakarta	0.79	4	4	0.65	11	28	0.64	3	4	0.84	4	9
5	Indonesia	South Jakarta	0.78	5	5	0.65	11	28	0.60	6	7	0.78	9	26
6	Indonesia	Kota Bandung	0.77	6	6	0.58	24	59	0.65	2	3	0.70	36	95
7	Indonesia	Kota Surabaya	0.75	7	8	0.70	7	17	0.53	7	8	0.84	5	10
8	Indonesia	Kota Bekasi	0.66	8	12	0.64	18	38	0.40	10	12	0.71	30	83
9	Indonesia	Kota Bogor	0.63	9	13	0.65	11	28	0.33	12	15	0.61	86	209
10	Indonesia	Kota Depok	0.63	10	15	0.65	11	28	0.34	11	14	0.66	53	129
11	Indonesia	Kota Palembang	0.61	11	17	0.72	6	12	0.25	22	25	0.72	24	67
12	Indonesia	Tangerang	0.61	12	18	0.78	2	4	0.13	45	71	0.56	139	300
13	Indonesia	Kota Tangerang	0.61	13	19	0.65	11	28	0.33	13	16	0.76	12	42
14	Indonesia	Kota Malang	0.58	14	21	0.49	36	99	0.45	8	9	0.74	16	51
15	Indonesia	Jayawijaya	0.57	15	22	0.20	202	353	0.15	36	57	0.09	341	585
16	Indonesia	Kota Sukabumi	0.56	16	23	0.62	21	45	0.26	18	21	0.66	58	138
17	Indonesia	Bogor	0.54	17	24	0.72	5	11	0.10	67	110	0.59	104	244
18	Indonesia	Puncak Jaya	0.54	18	25	0.20	201	350	0.18	29	39	0.12	340	579
19	Indonesia	Garut	0.53	19	26	0.73	4	9	0.06	112	185	0.54	159	326
20	Indonesia	West Lampung	0.52	20	28	0.45	54	125	0.25	20	23	0.40	302	506
21	Indonesia	Lebak	0.51	21	34	0.69	9	20	0.04	159	257	0.50	213	399
22	Indonesia	Bandung	0.50	22	37	0.69	10	22	0.08	76	131	0.61	85	207
23	Indonesia	Sumedang	0.50	23	40	0.69	8	19	0.06	101	169	0.59	105	245
24	Indonesia	Jembrana	0.48	24	48	0.48	39	102	0.25	19	22	0.62	79	197
25	Indonesia	Cianjur	0.47	25	52	0.64	17	36	0.05	118	195	0.55	153	320
26	Indonesia	Sukabumi	0.47	26	53	0.62	21	45	0.08	80	136	0.54	160	327
27	Indonesia	Karawang	0.46	27	62	0.63	19	42	0.05	137	229	0.55	146	308
28	Indonesia	Bekasi	0.45	28	66	0.62	20	44	0.09	68	113	0.70	35	94
29	Indonesia	Bangkalan	0.44	29	72	0.52	28	80	0.03	205	336	0.38	308	514
30	Indonesia	Pandeglang	0.43	30	78	0.52	29	81	0.11	60	93	0.54	164	332
31	Indonesia	Sidoarjo	0.43	31	81	0.51	30	85	0.16	31	49	0.67	49	120
32	Indonesia	Purwakarta	0.43	32	84	0.60	23	50	0.05	140	234	0.60	88	215
33	Indonesia	Paniai	0.43	33	85	0.26	158	284	0.09	71	122	0.20	338	563
34	Indonesia	Majalengka	0.43	34	86	0.57	25	61	0.04	168	272	0.52	180	359
35	Indonesia	Buleleng	0.43	35	87	0.50	33	91	0.13	44	69	0.58	113	259

No	Country	Province/District	Vulnerability	Country Rank	SEA Rank	Exposure	Country Rank	SEA Rank	Sensitivity	Country Rank	SEA Rank	Adaptive Capacity	Country Rank	SEA Rank
36	Indonesia	East Tanjung Jabung	0.42	36	88	0.47	43	108	0.12	52	81	0.49	226	415
37	Indonesia	Ponorogo	0.42	37	91	0.54	26	74	0.04	184	297	0.49	232	421
38	Indonesia	Tanggamus	0.41	38	95	0.49	35	98	0.07	95	161	0.45	275	472
39	Indonesia	Kota Blitar	0.40	39	102	0.49	36	99	0.13	47	73	0.63	73	182
40	Indonesia	Tasik Malaya	0.40	40	109	0.54	27	76	0.03	192	313	0.54	156	323
41	Indonesia	South Bengkulu	0.39	41	110	0.37	83	176	0.13	42	67	0.42	297	499
42	Indonesia	Kota Madiun	0.39	42	117	0.47	46	113	0.13	41	66	0.66	55	131
43	Indonesia	Sampang	0.38	43	119	0.39	77	164	0.03	211	344	0.33	327	541
44	Indonesia	Kota Balikpapan	0.38	44	120	0.40	75	161	0.21	25	30	0.70	37	96
45	Indonesia	Serang	0.38	45	124	0.46	52	122	0.08	85	142	0.51	192	377
46	Indonesia	West Sumba	0.38	46	125	0.10	288	487	0.02	226	379	0.12	339	578
47	Indonesia	South East Aceh	0.38	47	126	0.33	100	205	0.22	24	29	0.56	143	304
48	Indonesia	Indramayu	0.38	48	128	0.46	49	119	0.04	156	254	0.48	249	442
49	Indonesia	Magetan	0.38	49	129	0.51	32	89	0.04	172	276	0.57	119	267
50	Indonesia	Madiun	0.37	50	131	0.49	38	101	0.04	185	301	0.52	185	368
51	Indonesia	Dairi	0.37	51	132	0.48	41	106	0.05	138	231	0.53	173	343
52	Indonesia	Ogan Komering Hilir	0.37	52	135	0.47	44	109	0.01	265	495	0.45	276	474
53	Indonesia	Ciamis	0.37	53	136	0.49	34	95	0.04	164	265	0.57	126	278
54	Indonesia	Indragiri Hilir	0.36	54	140	0.48	42	107	0.02	247	429	0.49	234	424
55	Indonesia	Trenggalek	0.36	55	143	0.47	45	111	0.03	218	362	0.51	207	393
56	Indonesia	Subang	0.36	56	145	0.48	40	103	0.04	176	283	0.57	122	271
57	Indonesia	Kota Banjarmasin	0.35	57	148	0.51	31	87	0.06	104	172	0.74	17	52
58	Indonesia	Nganjuk	0.35	58	149	0.46	51	121	0.03	190	307	0.52	188	371
59	Indonesia	Malang	0.35	59	151	0.44	58	131	0.06	108	179	0.54	157	324
60	Indonesia	Kediri	0.35	60	152	0.45	53	124	0.05	144	238	0.54	162	329
61	Indonesia	Lamongan	0.35	61	153	0.46	50	120	0.03	189	306	0.52	178	357
62	Indonesia	Gorontalo	0.35	62	155	0.30	118	229	0.10	61	100	0.37	316	525
63	Indonesia	Ngawi	0.35	63	161	0.44	59	133	0.03	212	349	0.49	225	413
64	Indonesia	Manggarai	0.34	64	163	0.27	144	264	0.05	149	246	0.29	334	551
65	Indonesia	Jombang	0.34	65	164	0.43	64	141	0.06	117	191	0.53	171	340
66	Indonesia	Kota Kediri	0.34	66	165	0.43	63	140	0.17	30	46	0.93	2	3
67	Indonesia	East Lombok	0.34	67	167	0.23	172	310	0.13	40	64	0.34	321	534
68	Indonesia	Merauke	0.34	68	168	0.37	84	177	0.06	116	190	0.43	288	489
69	Indonesia	Sumenep	0.34	69	172	0.39	78	165	0.02	228	383	0.42	296	498
70	Indonesia	Bojonegoro	0.34	70	174	0.43	61	138	0.02	229	384	0.50	220	407

No	Country	Province/District	Vulnerability	Country Rank	SEA Rank	Exposure	Country Rank	SEA Rank	Sensitivity	Country Rank	SEA Rank	Adaptive Capacity	Country Rank	SEA Rank
71	Indonesia	Pamekasan	0.33	71	175	0.38	80	172	0.04	163	264	0.45	280	479
72	Indonesia	Kota Padang	0.33	72	177	0.45	56	128	0.07	88	147	0.69	40	106
73	Indonesia	Lahat	0.33	73	178	0.31	110	218	0.12	51	78	0.47	260	455
74	Indonesia	South Aceh	0.33	74	180	0.29	130	245	0.18	28	38	0.54	163	331
75	Indonesia	Blitar	0.33	75	181	0.43	62	139	0.04	187	304	0.54	169	337
76	Indonesia	Temanggung	0.33	76	182	0.42	65	143	0.04	160	259	0.55	152	317
77	Indonesia	Bangli	0.33	77	183	0.47	47	116	0.02	234	398	0.60	90	217
78	Indonesia	Padang Pariaman	0.33	78	185	0.42	67	146	0.05	145	239	0.56	141	302
79	Indonesia	Kota Padang Panjang	0.33	79	186	0.47	48	118	0.04	154	251	0.68	43	112
80	Indonesia	Boyolali	0.33	80	187	0.36	86	182	0.10	63	102	0.55	148	311
81	Indonesia	Mojokerto	0.32	81	189	0.42	69	148	0.06	114	188	0.59	103	243
82	Indonesia	Wonogiri	0.32	82	191	0.40	72	158	0.03	213	353	0.49	223	410
83	Indonesia	Agam	0.32	83	192	0.39	79	167	0.07	89	151	0.57	124	275
84	Indonesia	Pasuruan	0.32	84	193	0.36	88	184	0.06	100	168	0.49	237	428
85	Indonesia	Barito Kuala	0.32	85	194	0.45	57	129	0.00	303	549	0.54	166	334
86	Indonesia	Tulungagung	0.32	86	195	0.42	66	145	0.04	165	267	0.58	111	257
87	Indonesia	Ogan Komering Ulu	0.32	87	196	0.38	81	173	0.07	91	154	0.56	137	297
88	Indonesia	Karanganyar	0.32	88	198	0.40	74	160	0.05	129	216	0.56	142	303
89	Indonesia	Kota Surakarta	0.31	89	199	0.26	154	279	0.25	21	24	0.74	18	59
90	Indonesia	Gresik	0.31	90	200	0.42	68	147	0.05	125	210	0.62	81	199
91	Indonesia	Wonosobo	0.31	91	201	0.36	89	186	0.04	173	277	0.46	270	466
92	Indonesia	Tabanan	0.31	92	202	0.40	71	157	0.07	92	156	0.63	68	170
93	Indonesia	Blora	0.31	93	203	0.41	70	154	0.02	240	409	0.51	195	381
94	Indonesia	Kota Bitung	0.31	94	204	0.33	101	206	0.16	34	54	0.68	41	110
95	Indonesia	Southern Central Timor	0.31	95	210	0.18	218	376	0.02	246	426	0.23	337	558
96	Indonesia	Sragen	0.31	96	211	0.35	91	190	0.05	139	233	0.48	244	437
97	Indonesia	Kota Ternate	0.31	97	212	0.45	55	127	0.01	255	458	0.63	70	177
98	Indonesia	West Lombok	0.30	98	217	0.18	215	372	0.11	53	83	0.33	325	539
99	Indonesia	Kota Pasuruan	0.30	99	218	0.17	229	392	0.29	14	17	0.64	64	154
100	Indonesia	Alor	0.30	100	219	0.27	147	267	0.01	256	460	0.32	328	543
101	Indonesia	Tulang Bawang	0.30	101	221	0.36	87	183	0.01	285	528	0.44	282	482
102	Indonesia	Way Kanan	0.30	102	222	0.32	105	211	0.02	242	411	0.40	303	507
103	Indonesia	Karo	0.30	103	223	0.43	60	137	0.02	245	423	0.63	67	168
104	Indonesia	Langkat	0.29	104	227	0.27	149	270	0.15	35	56	0.57	121	269
105	Indonesia	North Lampung	0.29	105	228	0.34	98	201	0.03	222	368	0.46	273	469

No	Country	Province/District	Vulnerability	Country Rank	SEA Rank	Exposure	Country Rank	SEA Rank	Sensitivity	Country Rank	SEA Rank	Adaptive Capacity	Country Rank	SEA Rank
106	Indonesia	Toba Samosir	0.29	106	232	0.37	82	175	0.05	147	244	0.59	99	236
107	Indonesia	Pasaman	0.29	107	233	0.36	85	180	0.00	300	546	0.48	248	441
108	Indonesia	Kota Samarinda	0.29	108	234	0.40	73	159	0.05	152	249	0.68	44	113
109	Indonesia	Bolaang Mongondow	0.28	109	235	0.32	104	210	0.10	66	109	0.60	95	228
110	Indonesia	Kuningan	0.28	110	238	0.34	94	197	0.05	151	248	0.54	161	328
111	Indonesia	Kota Mojokerto	0.28	111	239	0.40	76	163	0.05	133	224	0.70	34	92
112	Indonesia	Musi Banyuasin	0.28	112	241	0.31	109	217	0.04	180	288	0.47	258	453
113	Indonesia	Tuban	0.28	113	242	0.33	99	204	0.03	219	365	0.49	233	422
114	Indonesia	Kota Medan	0.28	114	243	0.23	170	307	0.26	17	20	0.92	3	5
115	Indonesia	Tana Toraja	0.28	115	244	0.34	96	199	0.01	262	485	0.46	267	462
116	Indonesia	Grobogan	0.28	116	245	0.31	108	216	0.03	191	310	0.47	257	452
117	Indonesia	Brebes	0.28	117	246	0.28	139	258	0.05	128	214	0.44	286	487
118	Indonesia	Tegal	0.28	118	247	0.26	156	281	0.09	75	130	0.47	261	456
119	Indonesia	Kota Jambi	0.27	119	249	0.30	126	239	0.12	50	76	0.66	59	140
120	Indonesia	South Lampung	0.27	120	250	0.30	121	232	0.03	204	335	0.45	277	475
121	Indonesia	Donggala	0.27	121	251	0.27	143	263	0.03	203	334	0.41	298	502
122	Indonesia	East Lampung	0.27	122	252	0.20	200	349	0.14	39	62	0.47	255	449
123	Indonesia	Majene	0.27	123	253	0.33	102	207	0.01	273	509	0.47	264	459
124	Indonesia	Klaten	0.27	124	254	0.28	142	262	0.08	83	140	0.50	211	397
125	Indonesia	Kendal	0.27	125	256	0.31	111	222	0.04	155	253	0.51	197	383
126	Indonesia	Purbalingga	0.27	126	257	0.28	140	259	0.05	121	200	0.47	263	458
127	Indonesia	Nabire	0.27	127	258	0.18	223	382	0.04	186	302	0.31	331	548
128	Indonesia	Banjarnegara	0.27	128	259	0.30	122	233	0.04	183	296	0.48	240	432
129	Indonesia	Sukoharjo	0.26	129	260	0.28	136	254	0.10	65	108	0.58	115	261
130	Indonesia	Semarang	0.26	130	261	0.34	97	200	0.04	158	256	0.60	96	229
131	Indonesia	Jember	0.26	131	264	0.22	185	327	0.11	58	90	0.48	250	443
132	Indonesia	Solok	0.26	132	265	0.36	90	188	0.00	287	531	0.55	150	313
133	Indonesia	Kota Cilegon	0.26	133	266	0.35	92	191	0.08	82	139	0.74	15	48
134	Indonesia	Central Lampung	0.26	134	267	0.31	107	215	0.03	217	361	0.51	209	395
135	Indonesia	Mandailing Natal	0.26	135	268	0.31	114	225	0.00	306	552	0.45	279	478
136	Indonesia	Pekalongan	0.26	136	269	0.30	125	238	0.05	127	213	0.53	177	356
137	Indonesia	Kota Yogyakarta	0.26	137	270	0.00	338	586	0.41	9	11	0.70	33	91
138	Indonesia	Pemalang	0.26	138	271	0.26	157	283	0.06	113	187	0.46	272	468
139	Indonesia	Banyuwangi	0.26	139	272	0.28	134	251	0.08	78	133	0.56	133	289
140	Indonesia	Dompu	0.26	140	273	0.23	174	312	0.02	236	400	0.36	319	532

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141	Indonesia	Central Tapanuli	0.26	141	275	0.30	117	228	0.01	276	515	0.46	271	467
142	Indonesia	Rejang Lebong	0.26	142	276	0.31	113	224	0.04	169	273	0.54	167	335
143	Indonesia	North Tapanuli	0.26	143	277	0.34	95	198	0.00	294	540	0.54	168	336
144	Indonesia	Karangasem	0.25	144	278	0.31	112	223	0.02	231	386	0.51	198	384
145	Indonesia	Central Lombok	0.25	145	279	0.14	256	437	0.09	73	126	0.34	322	535
146	Indonesia	Northern Central Timor	0.25	146	281	0.13	262	448	0.00	292	538	0.25	336	556
147	Indonesia	Demak	0.25	147	282	0.27	150	271	0.06	106	175	0.51	199	385
148	Indonesia	Central Aceh	0.25	148	283	0.29	131	246	0.06	97	163	0.57	128	281
149	Indonesia	Belu	0.25	149	284	0.17	232	395	0.02	235	399	0.30	333	550
150	Indonesia	Kerinci	0.25	150	285	0.34	93	196	0.00	289	533	0.57	127	279
151	Indonesia	South-East Maluku	0.25	151	288	0.27	153	276	0.01	250	437	0.43	293	494
152	Indonesia	South Pesisir	0.25	152	289	0.32	106	213	0.00	301	547	0.51	203	389
153	Indonesia	Magelang	0.25	153	290	0.29	128	243	0.05	122	203	0.56	136	294
154	Indonesia	Toli-Toli/Buol Toli-toli	0.25	154	291	0.30	123	234	0.01	279	519	0.48	238	429
155	Indonesia	Mamuju	0.24	155	292	0.28	135	253	0.00	326	573	0.44	284	484
156	Indonesia	Ngada	0.24	156	293	0.24	169	304	0.00	298	544	0.38	311	518
157	Indonesia	Cilacap	0.24	157	294	0.29	132	247	0.05	148	245	0.55	151	315
158	Indonesia	Enrekang	0.24	158	295	0.27	148	268	0.05	153	250	0.51	200	386
159	Indonesia	Boalemo	0.24	159	296	0.23	177	317	0.03	221	367	0.41	300	504
160	Indonesia	Sikka	0.24	160	297	0.24	165	299	0.01	270	503	0.40	305	509
161	Indonesia	Polewali Mamasa	0.24	161	298	0.27	152	275	0.01	260	479	0.44	283	483
162	Indonesia	Aceh Singkil	0.24	162	299	0.25	159	285	0.04	179	287	0.48	247	440
163	Indonesia	Kudus	0.24	163	300	0.30	115	226	0.06	99	167	0.66	57	135
164	Indonesia	Muara Enim (Liot)	0.24	164	301	0.30	116	227	0.02	227	382	0.55	149	312
165	Indonesia	Bima	0.24	165	303	0.23	179	319	0.01	253	443	0.39	307	512
166	Indonesia	Cirebon	0.24	166	304	0.22	182	322	0.09	74	129	0.51	202	388
167	Indonesia	Pacitan	0.24	167	306	0.27	145	265	0.02	241	410	0.48	243	435
168	Indonesia	Lumajang	0.23	168	307	0.19	207	360	0.11	54	84	0.52	182	362
169	Indonesia	Limapuluh Koto	0.23	169	308	0.30	119	230	0.03	216	360	0.58	112	258
170	Indonesia	Sumbawa	0.23	170	310	0.23	178	318	0.03	199	328	0.43	289	490
171	Indonesia	East Sumba	0.23	171	311	0.11	278	474	0.00	323	570	0.26	335	553
172	Indonesia	Kota Semarang	0.23	172	312	0.18	220	379	0.20	26	32	0.74	19	60
173	Indonesia	Kota Sibolga	0.23	173	313	0.28	138	256	0.07	93	157	0.64	63	153
174	Indonesia	Bondowoso	0.23	174	315	0.22	184	326	0.03	202	332	0.43	295	497
175	Indonesia	Tapin	0.23	175	317	0.30	120	231	0.00	325	572	0.53	175	348

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176	Indonesia	Gianyar	0.23	176	318	0.30	124	236	0.05	120	199	0.66	56	132
177	Indonesia	Ende	0.23	177	320	0.23	175	314	0.00	291	535	0.40	301	505
178	Indonesia	Jepara	0.23	178	321	0.25	161	290	0.06	98	164	0.56	130	285
179	Indonesia	Pelalawan	0.22	179	324	0.25	160	286	0.02	239	408	0.49	231	420
180	Indonesia	South Hulu Sungai	0.22	180	325	0.27	151	272	0.00	304	550	0.48	242	434
181	Indonesia	Kota Bontang	0.22	181	326	0.07	312	531	0.28	15	18	0.67	50	124
182	Indonesia	Batang	0.22	182	327	0.23	176	315	0.06	110	182	0.52	184	367
183	Indonesia	Kota Magelang	0.22	183	328	0.29	128	243	0.05	133	224	0.65	60	142
184	Indonesia	Merangin	0.22	184	329	0.28	137	255	0.00	316	563	0.51	206	392
185	Indonesia	Nunukan	0.22	185	330	0.19	208	361	0.09	70	115	0.52	187	370
186	Indonesia	Kota Sabang	0.22	186	331	0.29	127	241	0.01	286	529	0.55	145	307
187	Indonesia	Central Maluku	0.22	187	333	0.15	243	415	0.06	115	189	0.38	309	515
188	Indonesia	Kupang	0.22	188	338	0.12	275	467	0.02	230	385	0.30	332	549
189	Indonesia	North Luwu	0.22	189	339	0.20	199	346	0.05	123	204	0.46	265	460
190	Indonesia	Luwu	0.22	190	340	0.24	164	297	0.03	197	324	0.50	214	400
191	Indonesia	Bantaeng	0.22	191	341	0.19	209	362	0.05	141	235	0.44	285	485
192	Indonesia	West South-East Maluku	0.22	192	342	0.14	250	424	0.00	299	545	0.31	329	544
193	Indonesia	Buol	0.22	193	343	0.22	188	331	0.00	330	577	0.41	299	503
194	Indonesia	Kota Solok	0.22	194	344	0.33	103	209	0.01	251	439	0.69	38	102
195	Indonesia	Probolinggo	0.22	195	348	0.20	204	355	0.05	136	227	0.46	269	465
196	Indonesia	Kota Bandar Lampung	0.21	196	349	0.21	194	341	0.12	49	75	0.67	51	125
197	Indonesia	Musi Rawas	0.21	197	350	0.18	219	377	0.00	310	556	0.37	318	528
198	Indonesia	Lembata	0.21	198	351	0.13	263	449	0.00	302	548	0.31	330	547
199	Indonesia	Poso	0.21	199	352	0.19	213	368	0.05	119	196	0.46	268	463
200	Indonesia	Banyumas	0.21	200	353	0.22	187	330	0.05	132	220	0.51	210	396
201	Indonesia	Yapen Waropen	0.21	201	355	0.10	286	485	0.05	130	218	0.33	323	537
202	Indonesia	Manokwari	0.21	202	356	0.14	255	436	0.02	244	420	0.33	324	538
203	Indonesia	Klungkung	0.21	203	357	0.27	146	266	0.03	209	341	0.60	93	225
204	Indonesia	Kota Denpasar	0.21	204	359	0.18	224	384	0.16	33	51	0.72	23	66
205	Indonesia	Mimika	0.21	205	360	0.15	246	420	0.13	48	74	0.54	165	333
206	Indonesia	Biak Numfor	0.21	206	361	0.17	231	394	0.06	103	171	0.46	274	471
207	Indonesia	Muara Jambi	0.21	207	363	0.24	166	300	0.02	232	392	0.52	183	364
208	Indonesia	Situbondo	0.20	208	364	0.15	239	411	0.08	79	134	0.47	256	451
209	Indonesia	Kota Gorontalo	0.20	209	365	0.28	133	248	0.03	201	331	0.67	46	116
210	Indonesia	Minahasa	0.20	210	367	0.28	141	260	0.03	194	318	0.66	52	126

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211	Indonesia	Kota Ujung Pandang	0.20	211	368	0.08	302	512	0.27	16	19	0.83	7	12
212	Indonesia	Rembang	0.20	212	369	0.21	195	342	0.04	166	269	0.51	193	378
213	Indonesia	Badung	0.20	213	372	0.23	171	309	0.07	90	153	0.66	54	130
214	Indonesia	Morowali	0.20	214	374	0.11	276	470	0.06	105	173	0.39	306	511
215	Indonesia	Kota Pontianak	0.20	215	376	0.25	162	292	0.07	86	143	0.75	14	46
216	Indonesia	Sarolangun	0.20	216	378	0.22	183	325	0.00	324	571	0.48	252	445
217	Indonesia	Kota Cirebon	0.20	217	379	0.13	257	441	0.18	27	37	0.73	21	64
218	Indonesia	Kapuas Hulu	0.19	218	381	0.06	314	533	0.14	38	60	0.45	278	476
219	Indonesia	South Tapanuli	0.19	219	382	0.25	163	295	0.01	280	520	0.54	155	322
220	Indonesia	Piddie	0.19	220	383	0.23	173	311	0.01	278	518	0.51	191	376
221	Indonesia	Bengkalis	0.19	221	384	0.26	155	280	0.00	311	557	0.58	110	254
222	Indonesia	East Flores	0.19	222	386	0.14	251	425	0.02	225	376	0.40	304	508
223	Indonesia	Kota Pekalongan	0.19	223	387	0.13	257	441	0.16	32	50	0.68	45	114
224	Indonesia	Pati	0.19	224	389	0.21	190	336	0.04	175	281	0.55	144	306
225	Indonesia	Kota Salatiga	0.19	225	390	0.18	220	379	0.11	56	88	0.67	47	118
226	Indonesia	Malinau	0.19	226	392	0.11	282	479	0.11	57	89	0.50	215	401
227	Indonesia	Tebo/Bungo Tebo	0.19	227	393	0.22	181	321	0.00	320	567	0.51	205	391
228	Indonesia	Indragiri Hulu	0.19	228	394	0.18	217	375	0.04	177	284	0.50	217	404
229	Indonesia	Kota Manado	0.18	229	398	0.20	203	354	0.10	62	101	0.71	27	76
230	Indonesia	West Aceh	0.18	230	400	0.21	189	334	0.00	333	580	0.50	222	409
231	Indonesia	Sorong	0.18	231	401	0.09	295	498	0.04	167	271	0.37	317	526
232	Indonesia	Gowa	0.18	232	402	0.17	228	391	0.04	182	294	0.48	239	430
233	Indonesia	Sawah Lunto/Sijunjung	0.18	233	403	0.18	227	387	0.03	196	322	0.49	236	427
234	Indonesia	Bantul	0.18	234	408	0.13	264	451	0.09	72	124	0.52	181	361
235	Indonesia	Kota Pekanbaru	0.17	235	409	0.24	167	301	0.03	198	325	0.69	39	105
236	Indonesia	Barru	0.17	236	411	0.20	205	356	0.01	274	512	0.51	196	382
237	Indonesia	Aceh Besar	0.17	237	412	0.22	180	320	0.00	332	579	0.57	125	276
238	Indonesia	Natuna	0.17	238	414	0.21	193	340	0.01	249	435	0.56	135	292
239	Indonesia	Maros	0.17	239	416	0.16	237	405	0.03	208	339	0.49	224	412
240	Indonesia	Banjar	0.17	240	417	0.11	283	480	0.11	55	87	0.57	116	263
241	Indonesia	Muna	0.17	241	418	0.04	327	561	0.08	81	137	0.37	314	522
242	Indonesia	Siak	0.17	242	419	0.24	168	302	0.00	321	568	0.62	80	198
243	Indonesia	South Barito	0.17	243	420	0.20	197	344	0.00	331	578	0.53	174	346
244	Indonesia	Batanghari	0.17	244	422	0.19	211	365	0.00	317	564	0.51	201	387
245	Indonesia	Buru	0.17	245	423	0.12	274	466	0.00	337	586	0.38	310	517

No	Country	Province/District	Vulnerability	Country Rank	SEA Rank	Exposure	Country Rank	SEA Rank	Sensitivity	Country Rank	SEA Rank	Adaptive Capacity	Country Rank	SEA Rank
246	Indonesia	North Bengkulu	0.17	246	424	0.16	233	400	0.01	271	504	0.47	262	457
247	Indonesia	Kota Metro	0.17	247	426	0.17	229	392	0.06	107	178	0.60	92	223
248	Indonesia	Belitung	0.16	248	427	0.22	186	329	0.00	313	559	0.58	109	251
249	Indonesia	North Hulu Sungai	0.16	249	429	0.19	210	363	0.00	308	554	0.53	176	352
250	Indonesia	Bulukumba	0.16	250	432	0.12	272	463	0.06	102	170	0.50	218	405
251	Indonesia	Sangihe Talaud	0.16	251	434	0.08	300	508	0.13	46	72	0.57	118	265
252	Indonesia	Kota Tegal	0.16	252	436	0.18	220	379	0.05	133	224	0.63	71	178
253	Indonesia	Jeneponto	0.16	253	437	0.08	301	511	0.02	237	404	0.37	315	523
254	Indonesia	Landak	0.16	254	438	0.01	334	579	0.05	124	206	0.33	326	540
255	Indonesia	Kota Batam	0.16	255	439	0.12	269	459	0.13	43	68	0.72	26	72
256	Indonesia	Jayapura	0.16	256	440	0.07	309	524	0.10	64	104	0.48	241	433
257	Indonesia	Tanah Datar	0.16	257	441	0.15	238	409	0.07	94	159	0.61	82	201
258	Indonesia	Kota Mataram	0.16	258	442	0.00	338	586	0.22	23	28	0.62	77	195
259	Indonesia	Central Hulu Sungai	0.16	259	443	0.18	226	386	0.01	283	524	0.52	186	369
260	Indonesia	Labuhan Batu	0.16	260	444	0.21	192	339	0.01	281	521	0.60	89	216
261	Indonesia	Pinrang	0.15	261	445	0.20	198	345	0.01	261	484	0.60	97	233
262	Indonesia	Kota Ambon	0.15	262	447	0.21	191	337	0.03	223	370	0.67	48	119
263	Indonesia	Wajo	0.15	263	449	0.18	225	385	0.01	266	496	0.53	170	339
264	Indonesia	West Tanjung Jabung	0.15	264	450	0.18	214	371	0.00	318	565	0.54	158	325
265	Indonesia	Kota Palu	0.15	265	451	0.20	196	343	0.02	233	395	0.64	62	151
266	Indonesia	Kota Baru	0.15	266	453	0.16	234	401	0.02	224	373	0.55	147	309
267	Indonesia	Banggai	0.15	267	454	0.11	281	478	0.06	111	183	0.51	190	375
268	Indonesia	Kampar	0.15	268	455	0.20	206	358	0.00	288	532	0.59	102	242
269	Indonesia	North Maluku	0.15	269	456	0.12	271	461	0.01	277	517	0.43	287	488
270	Indonesia	Asahan	0.15	270	458	0.19	212	366	0.01	259	472	0.60	94	226
271	Indonesia	Rokan Hilir	0.15	271	459	0.15	244	417	0.00	315	561	0.49	229	418
272	Indonesia	Kapuas	0.15	272	461	0.15	240	412	0.00	336	584	0.50	221	408
273	Indonesia	Buton	0.14	273	463	0.01	336	582	0.05	142	236	0.35	320	533
274	Indonesia	Sinjai	0.14	274	465	0.11	285	482	0.04	188	305	0.49	235	425
275	Indonesia	Kepulauan Mentawai	0.14	275	466	0.05	325	555	0.06	96	162	0.43	294	495
276	Indonesia	Bulongan	0.14	276	467	0.18	216	373	0.00	340	589	0.57	117	264
277	Indonesia	Kebumen	0.14	277	469	0.10	290	490	0.04	157	255	0.49	227	416
278	Indonesia	Banggai Kepulauan	0.14	278	471	0.07	307	521	0.00	314	560	0.37	313	521
279	Indonesia	Rokan Hulu	0.14	279	472	0.14	249	423	0.00	319	566	0.50	219	406
280	Indonesia	Bone	0.14	280	473	0.12	270	460	0.01	272	508	0.47	259	454

No	Country	Province/District	Vulnerability	Country Rank	SEA Rank	Exposure	Country Rank	SEA Rank	Sensitivity	Country Rank	SEA Rank	Adaptive Capacity	Country Rank	SEA Rank
281	Indonesia	Takalar	0.14	281	474	0.09	298	504	0.05	146	243	0.48	251	444
282	Indonesia	Sintang	0.14	282	475	0.03	331	568	0.05	150	247	0.38	312	519
283	Indonesia	East Aceh	0.14	283	478	0.16	235	403	0.01	258	466	0.57	129	284
284	Indonesia	Tanah Laut	0.14	284	479	0.13	266	453	0.05	131	219	0.58	106	246
285	Indonesia	Kutai	0.13	285	482	0.14	253	427	0.03	215	358	0.58	114	260
286	Indonesia	Kulon Progo	0.13	286	483	0.12	273	464	0.03	195	319	0.53	172	341
287	Indonesia	Ketapang	0.13	287	484	0.07	311	527	0.04	178	286	0.44	281	480
288	Indonesia	Nias	0.13	288	487	0.11	279	476	0.01	275	514	0.48	245	438
289	Indonesia	Fak Fak	0.13	289	488	0.13	261	446	0.00	341	590	0.51	208	394
290	Indonesia	Kuantan Sengingi	0.13	290	489	0.11	280	477	0.00	312	558	0.47	254	447
291	Indonesia	Pontianak	0.13	291	491	0.15	241	413	0.00	290	534	0.56	134	290
292	Indonesia	Kendari	0.13	292	492	0.06	315	534	0.03	210	343	0.43	292	493
293	Indonesia	Soppeng	0.13	293	493	0.15	245	419	0.01	267	498	0.56	131	287
294	Indonesia	Gunung Kidul	0.12	294	495	0.10	289	488	0.03	220	366	0.51	194	379
295	Indonesia	Tabalong	0.12	295	496	0.14	248	422	0.00	329	576	0.56	138	298
296	Indonesia	Bangka	0.12	296	498	0.15	242	414	0.00	305	551	0.58	108	249
297	Indonesia	East Kotawaringin	0.12	297	499	0.13	265	452	0.03	207	338	0.60	98	234
298	Indonesia	Kota Bengkulu	0.12	298	500	0.13	257	441	0.06	109	181	0.70	32	89
299	Indonesia	Purworejo	0.12	299	501	0.09	297	502	0.03	206	337	0.51	204	390
300	Indonesia	Kota Tebing Tinggi	0.12	300	502	0.03	329	566	0.15	37	58	0.65	61	147
301	Indonesia	Kota Tarakan	0.12	301	504	0.16	236	404	0.03	200	330	0.70	31	88
302	Indonesia	Sidenreng Rappang	0.12	302	506	0.10	293	496	0.04	174	278	0.56	140	301
303	Indonesia	Kota Probolinggo	0.12	303	507	0.08	304	515	0.08	77	132	0.62	78	196
304	Indonesia	West Kotawaringin	0.11	304	510	0.11	277	472	0.04	161	260	0.63	72	180
305	Indonesia	Kota Dumai	0.11	305	511	0.14	252	426	0.00	296	542	0.60	91	218
306	Indonesia	Kota Binjai	0.11	306	512	0.08	304	515	0.11	59	92	0.73	20	62
307	Indonesia	Sleman	0.11	307	514	0.04	326	560	0.09	69	114	0.57	123	273
308	Indonesia	Deli Serdang	0.11	308	515	0.11	284	481	0.04	171	275	0.64	66	164
309	Indonesia	North Aceh	0.11	309	516	0.10	294	497	0.00	322	569	0.50	216	402
310	Indonesia	Karimun	0.11	310	517	0.13	267	454	0.00	327	574	0.57	120	268
311	Indonesia	Kota Tanjung Balai	0.11	311	518	0.15	247	421	0.04	170	274	0.77	11	34
312	Indonesia	Berau	0.11	312	519	0.14	254	428	0.00	339	588	0.62	75	186
313	Indonesia	Simeulue	0.10	313	524	0.05	324	554	0.00	328	575	0.43	290	491
314	Indonesia	Kepulauan Riau	0.10	314	525	0.12	268	457	0.01	282	523	0.61	87	211
315	Indonesia	Kolaka	0.10	315	527	0.07	308	523	0.01	284	526	0.49	230	419

No	Country	Province/District	Vulnerability	Country Rank	SEA Rank	Exposure	Country Rank	SEA Rank	Sensitivity	Country Rank	SEA Rank	Adaptive Capacity	Country Rank	SEA Rank
316	Indonesia	Central Halmahera	0.10	316	528	0.07	310	525	0.00	334	582	0.48	246	439
317	Indonesia	Sanggau	0.09	317	532	0.05	318	544	0.03	214	355	0.52	189	373
318	Indonesia	Bungo	0.09	318	538	0.06	316	535	0.00	307	553	0.49	228	417
319	Indonesia	Bireuen	0.09	319	539	0.10	287	486	0.00	338	587	0.59	101	238
320	Indonesia	Kota Jayapura	0.09	320	540	0.06	313	532	0.05	126	211	0.62	76	194
321	Indonesia	Bengkayang	0.09	321	541	0.01	337	584	0.05	143	237	0.47	253	446
322	Indonesia	Kota Palangka Raya	0.09	322	543	0.13	260	444	0.01	263	488	0.71	29	80
323	Indonesia	East Kutai	0.09	323	544	0.10	292	495	0.02	243	418	0.63	69	172
324	Indonesia	North Barito	0.09	324	545	0.08	299	507	0.00	297	543	0.56	132	288
325	Indonesia	Pasir	0.09	325	546	0.10	291	492	0.00	335	583	0.59	100	237
326	Indonesia	Pangkajene Kepulauan	0.08	326	548	0.05	319	547	0.01	252	442	0.52	179	358
327	Indonesia	Selayar	0.08	327	549	0.01	335	580	0.00	293	539	0.43	291	492
328	Indonesia	Simalungun	0.08	328	550	0.08	303	514	0.01	254	453	0.58	107	248
329	Indonesia	Kota Kupang	0.08	329	554	0.05	320	550	0.08	84	141	0.71	28	77
330	Indonesia	Kota Sorong	0.07	330	555	0.02	333	576	0.01	268	501	0.46	266	461
331	Indonesia	Sambas	0.07	331	559	0.04	328	562	0.00	295	541	0.50	212	398
332	Indonesia	West Kutai	0.07	332	561	0.05	317	541	0.00	309	555	0.55	154	321
333	Indonesia	Kota Pangkal Pinang	0.07	333	562	0.09	296	499	0.01	257	464	0.68	42	111
334	Indonesia	Kota Pare Pare	0.07	334	564	0.05	321	551	0.04	162	263	0.64	65	162
335	Indonesia	Kota Banda Aceh	0.07	335	566	0.08	304	515	0.04	181	290	0.72	22	65
336	Indonesia	Kota Bukit Tinggi	0.07	336	567	0.05	321	551	0.07	87	144	0.75	13	44
337	Indonesia	Kota Banjar Baru	0.05	337	577	0.05	321	551	0.01	264	489	0.61	83	205
338	Indonesia	Kota Kendari	0.05	338	579	0.03	332	569	0.02	238	407	0.61	84	206
339	Indonesia	Kota Pematang Siantar	0.02	339	586	0.03	329	566	0.01	248	431	0.72	25	68
340	Indonesia	Kota Sawah Lunto	0.02	340	589	0.00	338	586	0.01	269	502	0.63	74	184
341	Indonesia	Kota Payakumbuh	0.00	341	590	0.00	338	586	0.03	193	314	0.84	6	11



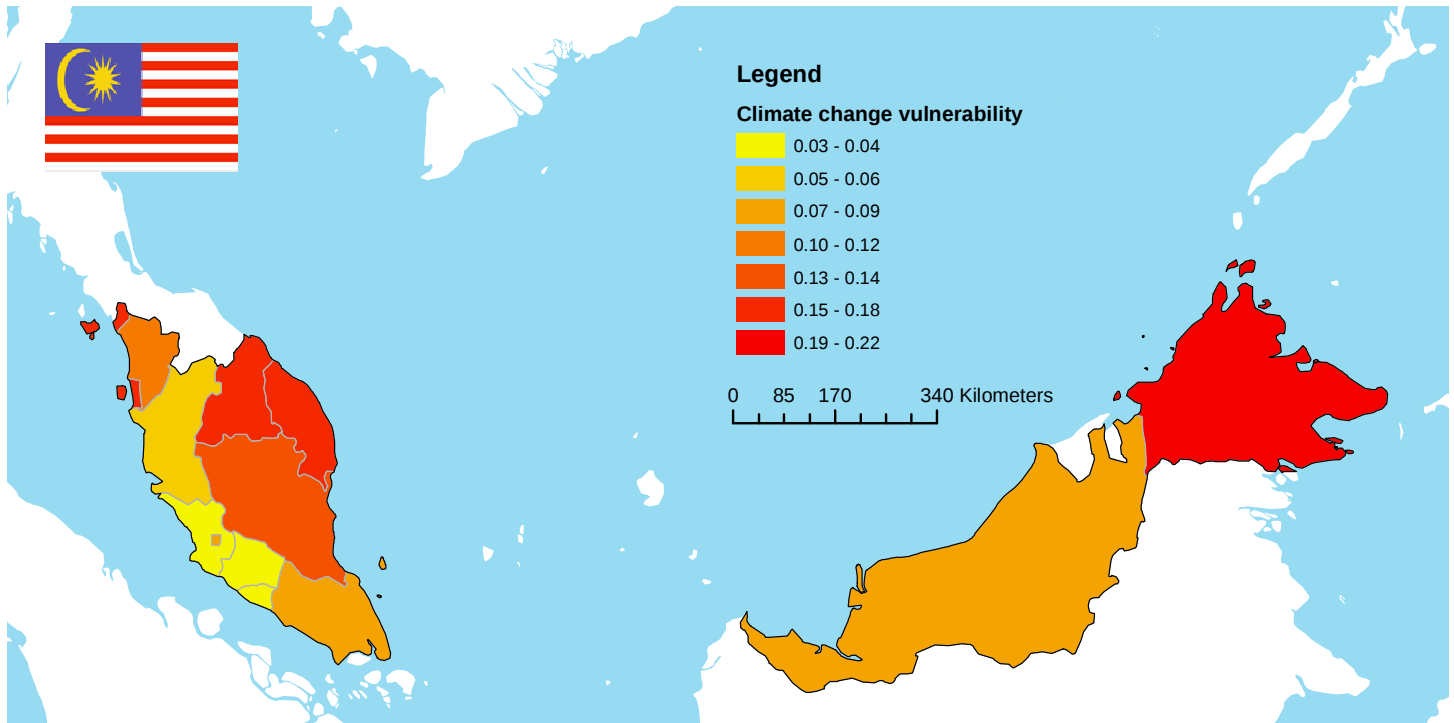
Malaysia

Malaysia at a glance

	Unit	Malaysia	ASEAN
CO2 Emissions (2004)	MtCO2e	140.8	943.8
CO2 Emissions Per Person (2004)	tCO2e	5.6	1.7
CO2 Emission intensity	tCO2e Eq./Mill. \$Intl 2005	485.7	452.5
Size of economy	Million \$Intl 2005	318,708	2,303,451
Income per capita	\$Intl 2005 Per Person	12,205	4,115
Education	Index	79.2	78
Energy use per capita	Tonnes Oil Eq. Per Person	2.6	0.9
Governance	Index	57.1	32.1
Population	Thousands of People	26,114	560,240
Fossil fuel reserves	Total MtCO2e Eq.	7588	33,419
Land are impacted by human	Sq. Km.	94,294	1,626,633

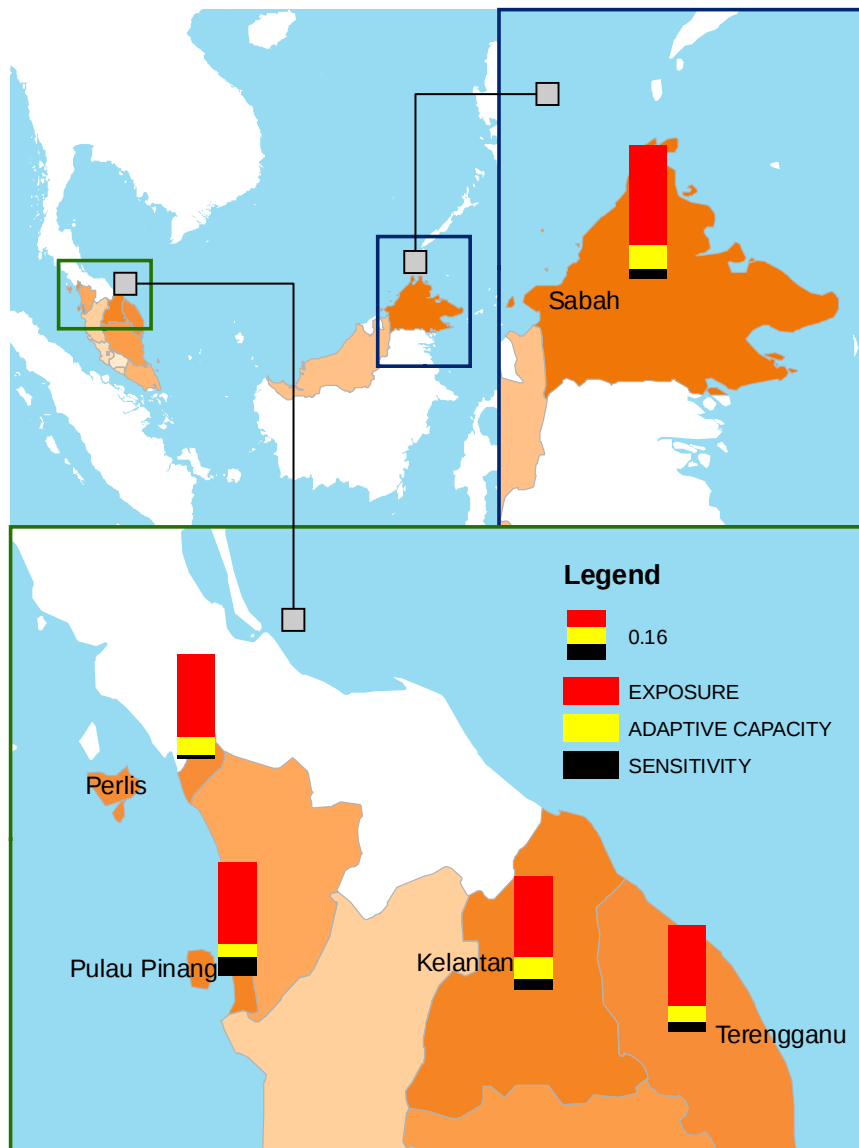
Source: World Resource Institute (2010)

Climate Change Vulnerability Map of Malaysia

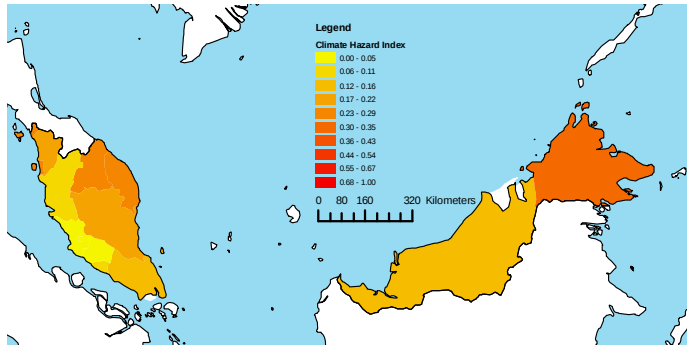


The assessment was carried out for each of the 14 states of Malaysia. The adaptive capacity of the Malaysian states is relatively high compared to the other assessed regions in Southeast Asia. This explains the relatively low vulnerability of Malaysia to climate change hazards.

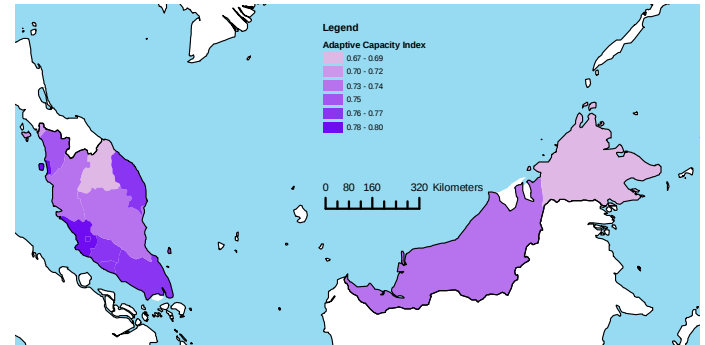
Nevertheless, the top five states in terms of climate change vulnerability in the country are: Sabah, Pulau Pinang (or Penang), Kelantan, Terengganu, and Perlis. Sabah, Kelantan, and Perlis are exposed to relatively frequent droughts while floods occur relatively frequently in Kelantan and Perlis.



For the five states, the contribution of the exposure factor in the vulnerability index is more dominant than the sensitivity and adaptive capacity factors. With the exception of Pulau Pinang, the other four states are not so densely populated. This is in sharp contrast to Malaysia's neighbour, Indonesia, where population density plays a dominant role in its vulnerability rating.

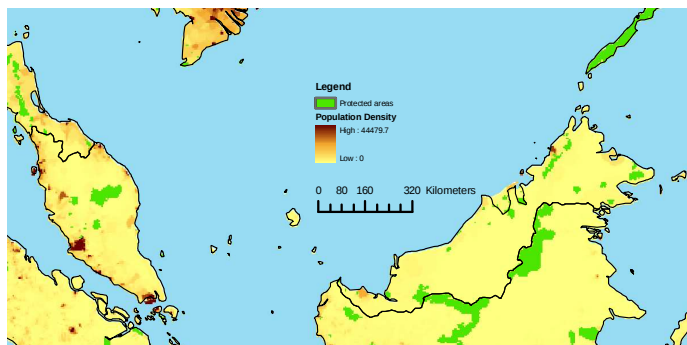


Climate Hazard Index

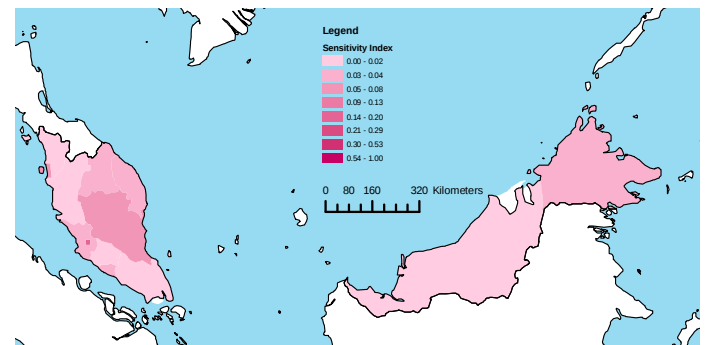


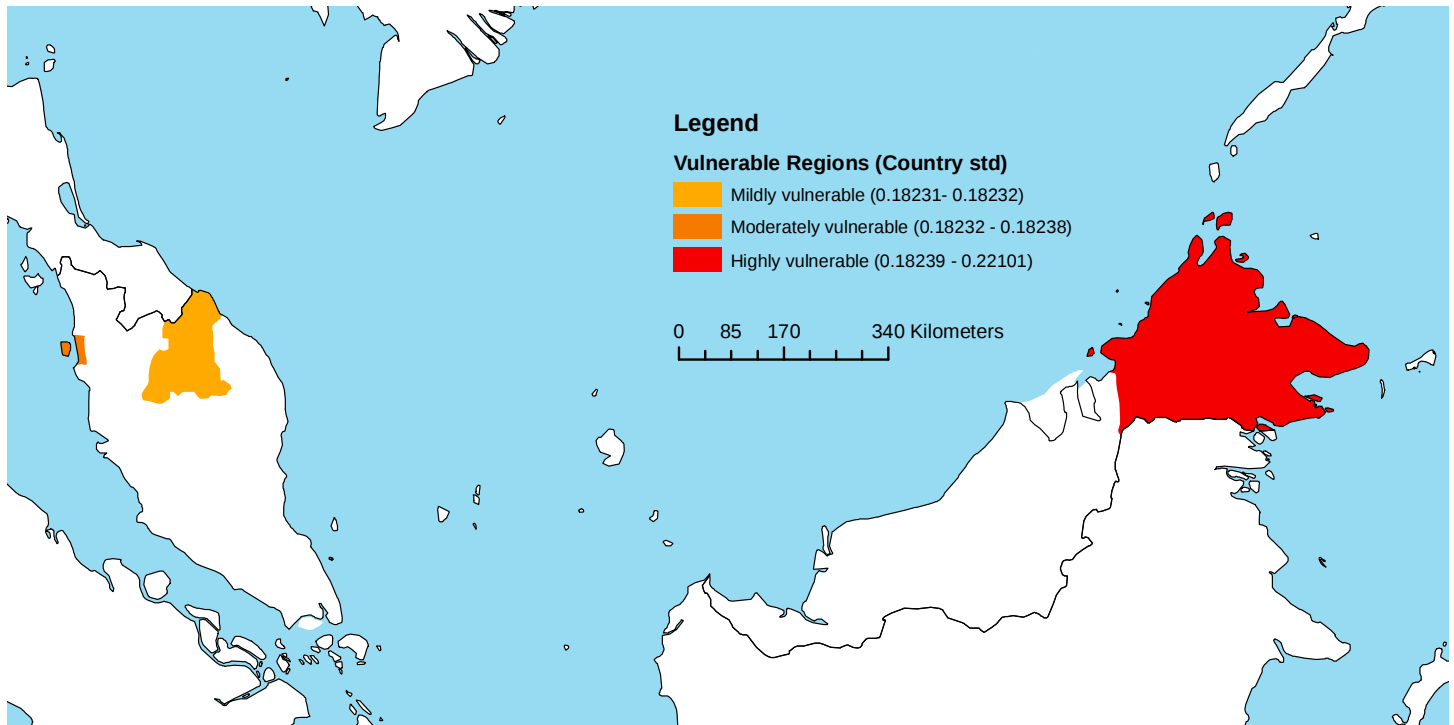
Adaptive Capacity Index

Population Density and Protected Areas



Sensitivity Index





Climate Change Vulnerable Regions in Malaysia

Vulnerability Ranking of States in Malaysia

Sabah (1)	Johor (9)
Pulau Pinang (2)	Sarawak (10)
Kelantan (3)	Perak (11)
Terengganu (4)	Selangor (12)
Perlis (5)	Melaka (13)
Pahang (6)	Negeri Sembilan (14)
Kedah (7)	
Kuala Lumpur (8)	

No	Country	Province/District	Vulnera- bility	Country Rank	SEA Rank	Expo- sure	Country Rank	SEA Rank	Sensi- tivity	Country Rank	SEA Rank	Adaptive Capacity	Country Rank	SEA Rank
1	Malaysia	Sabah	0.22	1	334	0.31	1	219	0.03	7	346	0.67	14	117
2	Malaysia	Pulau Pinang	0.18	2	405	0.25	3	288	0.06	2	177	0.79	2	24
3	Malaysia	Kelantan	0.18	3	406	0.25	5	293	0.04	4	303	0.69	13	101
4	Malaysia	Terengganu	0.17	4	421	0.25	4	291	0.03	6	329	0.76	6	40
5	Malaysia	Perlis	0.17	5	425	0.26	2	282	0.01	10	469	0.72	12	69
6	Malaysia	Pahang	0.14	6	477	0.18	7	374	0.05	3	232	0.74	11	58
7	Malaysia	Kedah	0.12	7	503	0.19	6	359	0.01	11	475	0.75	8	45
8	Malaysia	Kuala Lumpur	0.09	8	534	0.00	14	586	0.17	1	42	0.80	1	20
9	Malaysia	Johor	0.09	9	535	0.15	8	407	0.01	12	490	0.77	5	38
10	Malaysia	Sarawak	0.08	10	547	0.13	9	450	0.01	9	438	0.74	9	50
11	Malaysia	Perak	0.06	11	574	0.09	10	503	0.01	13	510	0.74	10	57
12	Malaysia	Selangor	0.04	12	581	0.05	13	546	0.03	5	316	0.78	3	28
13	Malaysia	Melaka	0.04	13	582	0.06	11	538	0.02	8	391	0.77	4	37
14	Malaysia	Negeri Sembilan	0.03	14	585	0.05	12	542	0.01	14	516	0.76	7	41

Concluding Remark

The identification of the areas most vulnerable to climate change risks in Southeast Asia is among the most urgent of policy needs. This mapping assessment responded to such need by identifying which regions in seven Southeast Asian countries were the most vulnerable to climate change, and mapping them. We gathered data at province and district levels from various sources and integrated them in a consistent and meaningful manner to produce a map indicating the areas most vulnerable to climate change. Despite data limitations, it is expected that the output of this analysis will be useful to policy-makers and donors in better targeting financial resources towards adaptation measures undertaken in Southeast Asia.

Equally important is the possibility of using the vulnerability framework and approach adopted in this study for vulnerability assessments done at the commune or municipality level. The identification of local-level parameters for the various components of vulnerability will require consultation with and the participation of various sectors/groups in the respective communities and local government units in order for the exercise to be truly participatory, holistic and reflective of real challenges on the ground.

References

- Francisco, H. A. 2008. Adaptation to Climate Change: Needs and Opportunities in South-east Asia. *Asean Economic Bulletin*. 25 (1).
- IPCC (Inter-governmental Panel on Climate Change). 2001. J. McCarthy; O. Canziani; N. Leary; D. Dokken; and K. White (eds) In *Climate Change 2001: Impacts, Adaptation, and Vulnerability*. Cambridge University Press. Cambridge.
- Peduzzi, P.; H. Dao; and C. Herold. 2005. Mapping Disastrous Natural Hazards Using Global Datasets. *Natural Hazards*. 35 (2). 265 - 289.
- World Resources Institute, 2010. *Climate Analysis Indicators Tool (CAIT) Version 7.0*. Washington, DC:

Appendix: Data Sources

The data used in this vulnerability assessment came from different sources and in various formats such as the GIS map format (both grid/raster and SHP) and EXCEL data format. A detailed explanation of the sources of the data and how the figures were calculated is given below.

Sub-national Administrative Areas

Data on sub-national administrative areas was available in ESRI SHP format. For sub-national administrative areas (such as provinces), the data came from the GEODATA portal (the Environmental Database; <http://geodata.grid.unep.ch/extras/datasetlist.php>). Since Indonesia was the biggest country in terms of area, instead of using provinces as the unit of analysis, we used districts instead. The data on district administrative boundaries for Indonesia was obtained from BAKOSURTANAL (or the National Coordinating Body for Land Surveys).

In all, there were 590 sub-national areas/units in this assessment which were made up of 341 districts (kabupaten/kota) in Indonesia, 19 provinces (khet) in Cambodia, 17 provinces (khoueng) in Lao PDR, 14 states (negeri) in Malaysia, 74 provinces in the Philippines, 72 provinces (changwat) in Thailand, and 53 provinces (tinh/thanh pho) in Vietnam.

Climate Hazards

Frequency of tropical cyclones, floods, and droughts, and exposure to landslides

The frequency of tropical cyclones, floods, and droughts was measured in terms of number of events per year. The cells in the maps indicate the number of events, divided by the number of available years (between 1980-2000 for droughts, 1980-2001 for floods, and 1980 and 2003 for cyclones). Details on the construction of this map can be obtained from Peduzzi, Dao and Herold (2005). The data in grid map format is available from the PREVIEW website at: http://www.grid.unep.ch/activities/earlywarning/preview/data/preview/index_about.php.

The map of exposure to landslides is based upon the dataset from the Norwegian Geotechnical Institute (NGI). The hazards mapping of NGI incorporates a range of data including slope, soil, soil moisture conditions, precipitation, seismicity, and temperature. Shuttle Radar Topography Mission (SRTM) elevation data at 30-arc-second resolution is incorporated. Hazard values 4 and below are considered negligible and only values from 5–9 are utilized for analysis. To ensure compatibility with other datasets, 1 is added to each of the values to produce a hazard ranking ranging from 6–10. This dataset is the result of the collaboration among the Center for Hazards and Risk Research (CHRR), the Norwegian Geotechnical Institute (NGI), and the

Columbia University Center for International Earth Science and Information Network (CIESIN).

Sea Level Rise

The inundation zone map of a five-meter sea level rise was obtained from the Centers for the Remote Sensing of Ice Sheets (CReSIS) at the University of Kansas, USA, and Haskell Indian Nations University, USA. Sea level rise or inundation zones were determined from the Global Land One-km Base Elevation (GLOBE) digital elevation model (DEM) (https://www.cresis.ku.edu/research/data/sea_level_rise).

Population Density

The population density map was obtained from the Urban Extent Database (GRUMP version 1) of the Center for International Earth Science Information Network (CIESIN), Columbia University (<http://sedac.ciesin.columbia.edu/gpw>); the International Food Policy Research Institute (IFPRI); the World Bank; and Centro Internacional de Agricultura Tropical (CIAT). The data is in geographic coordinates of decimal degrees based on the World Geodetic System spheroid of 1984 (WGS84) in 30-arc-second (1-km) resolution.

Biodiversity: Areas Declared as National/Protected Parks

Data on national/protected parks as well as maps were obtained from the Terrestrial Ecoregions GIS Database of the World Wildlife Fund (WWF) at <http://www.worldwildlife.org/science/data/item1875.html>.

Adaptive Capacity

Human Development Index

The Human Development Index (HDI) was calculated using the following formula:

$$\begin{aligned} \text{HDI} = & (1/3)*[\text{Standard of Living Index}] \\ & + (1/3)*[\text{Life Expectancy at Birth Index}] \\ & + (1/3)*[\text{Education Index}] \end{aligned}$$

The Standard of Living Index was calculated using the Gross Domestic Regional Product (GDRP) per population (per capita), standardized using Purchasing Power Parity (PPP) for the year 2005. The GDRP data was obtained from different sources, while the PPP exchange rate was obtained from the World Bank's World Development Indicators (WDI).

The Life Expectancy at Birth data was obtained from various sources such as country reports on the Human Development Index of the United Nations Development Program (UNDP).

Education was measured using literacy rates, the data of which was obtained from various sources such as the UNDP's country reports on the HDI.

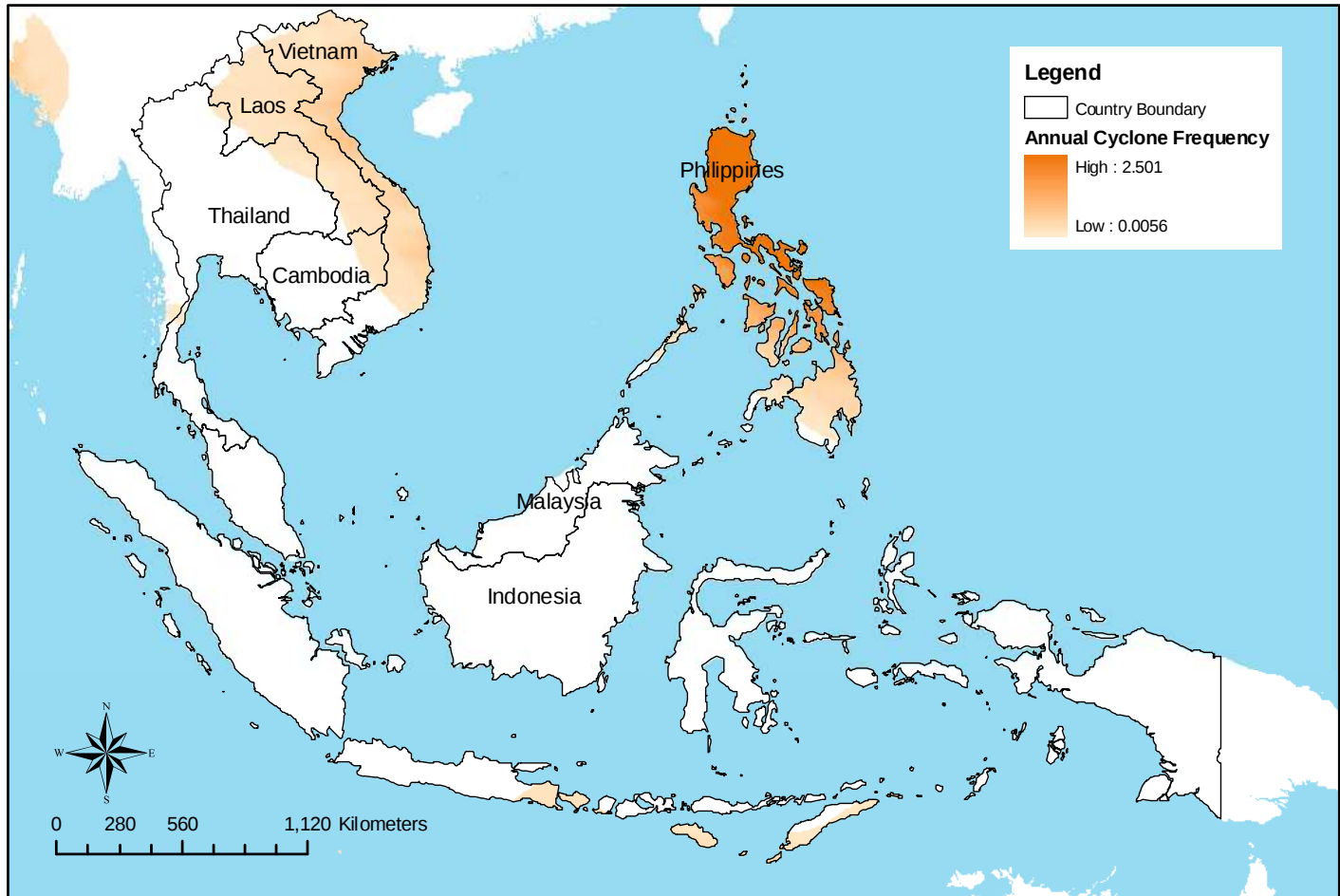
The index of each of the three components of the HDI was calculated following the methods used by the UNDP.

Poverty incidences and inequality (Gini coefficient)

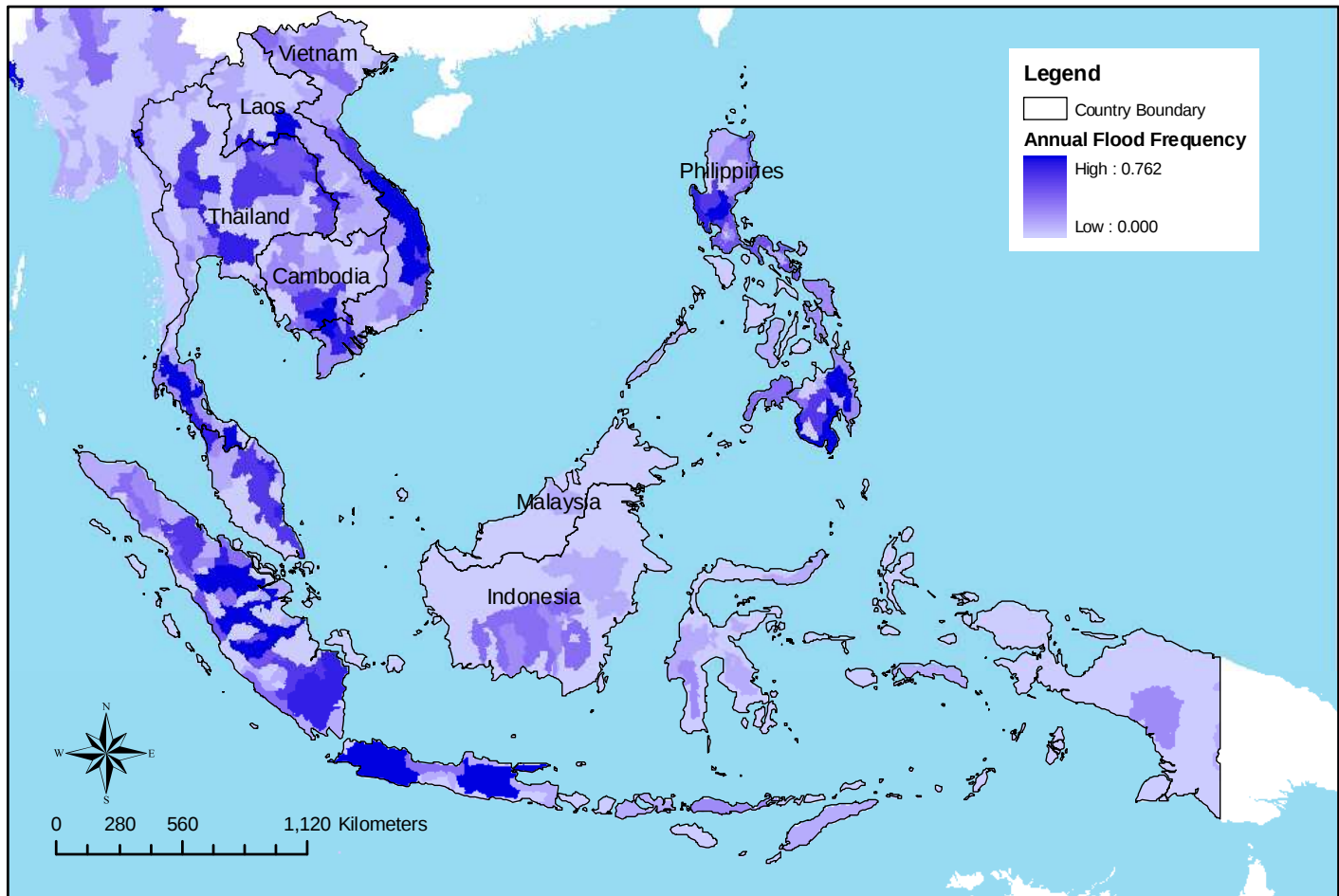
Poverty incidences and the Gini coefficients for each of the provinces/districts of Vietnam, Malaysia, Cambodia, the Philippines, and Thailand were obtained from various sources such as the UNDP's country reports on the HDI and the Asian Development Bank (ADB). For Indonesia and Lao PDR, their poverty incidences and Gini coefficients were calculated directly using the Indonesian Socio-economic Survey (SUSENAS) and the Lao Socio-economic Survey (LECS3) data, respectively.

Technology and infrastructure

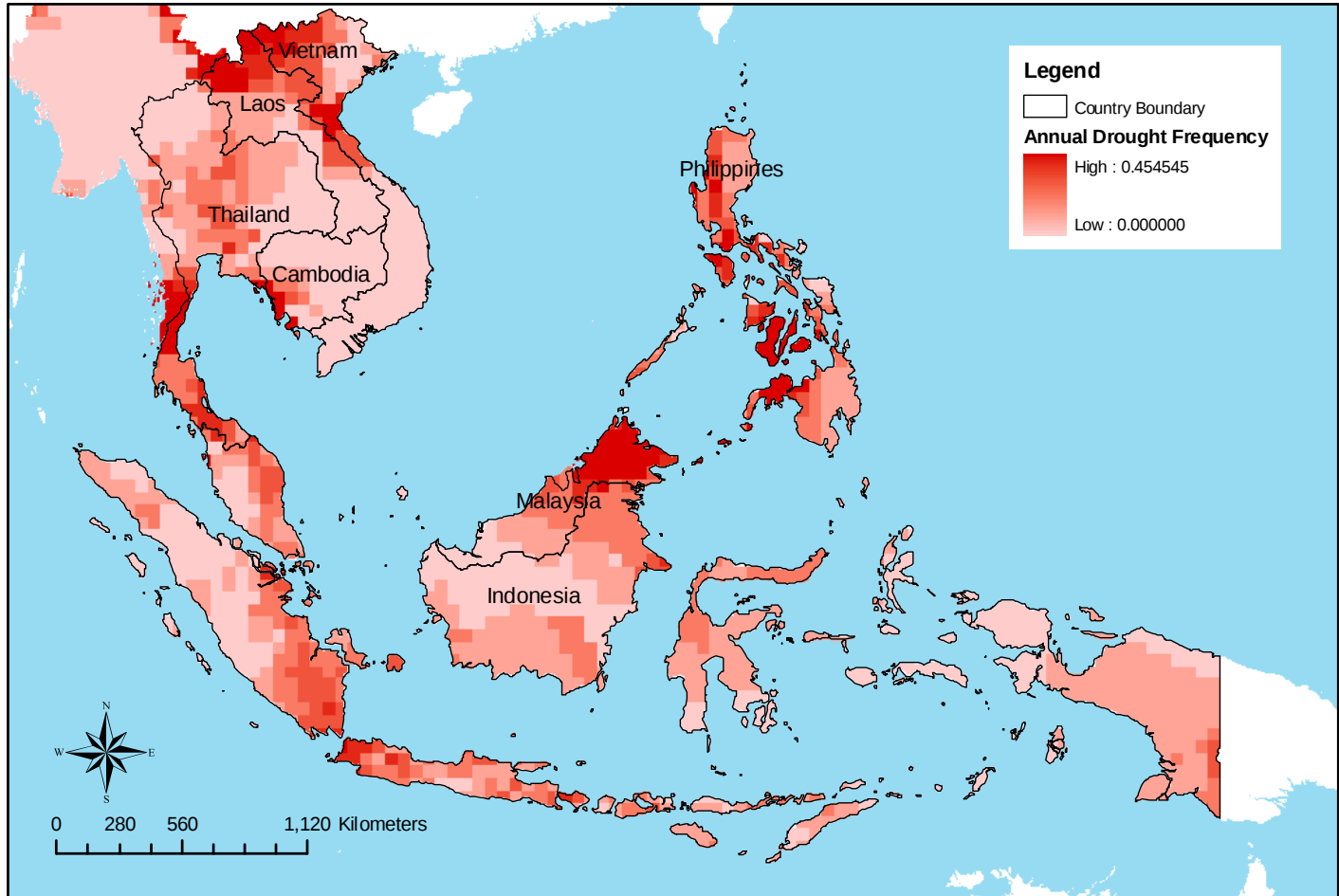
We defined electricity coverage as the percentage of household with access to electricity, and the extent of irrigation as the percentage of irrigated agricultural land. Road density was defined as the length of road per square kilometer. Communication was defined as the number of fixed phone lines per person. The data for all these came from various sources including the websites of the national statistics offices of the different Southeast Asian countries.



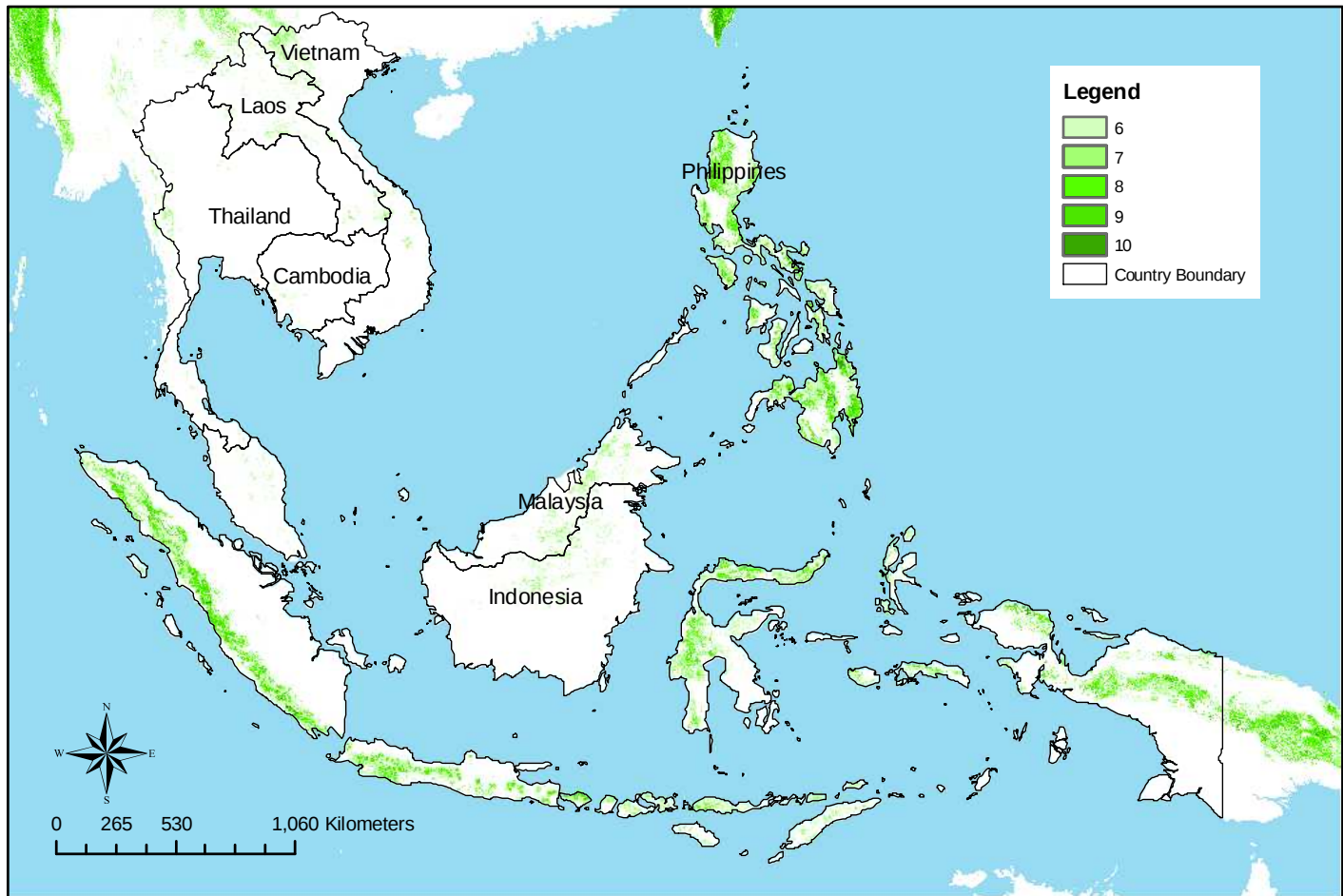
Tropical cyclone frequency (event per year from 1980-2003), Source: UNEP-PREVIEW



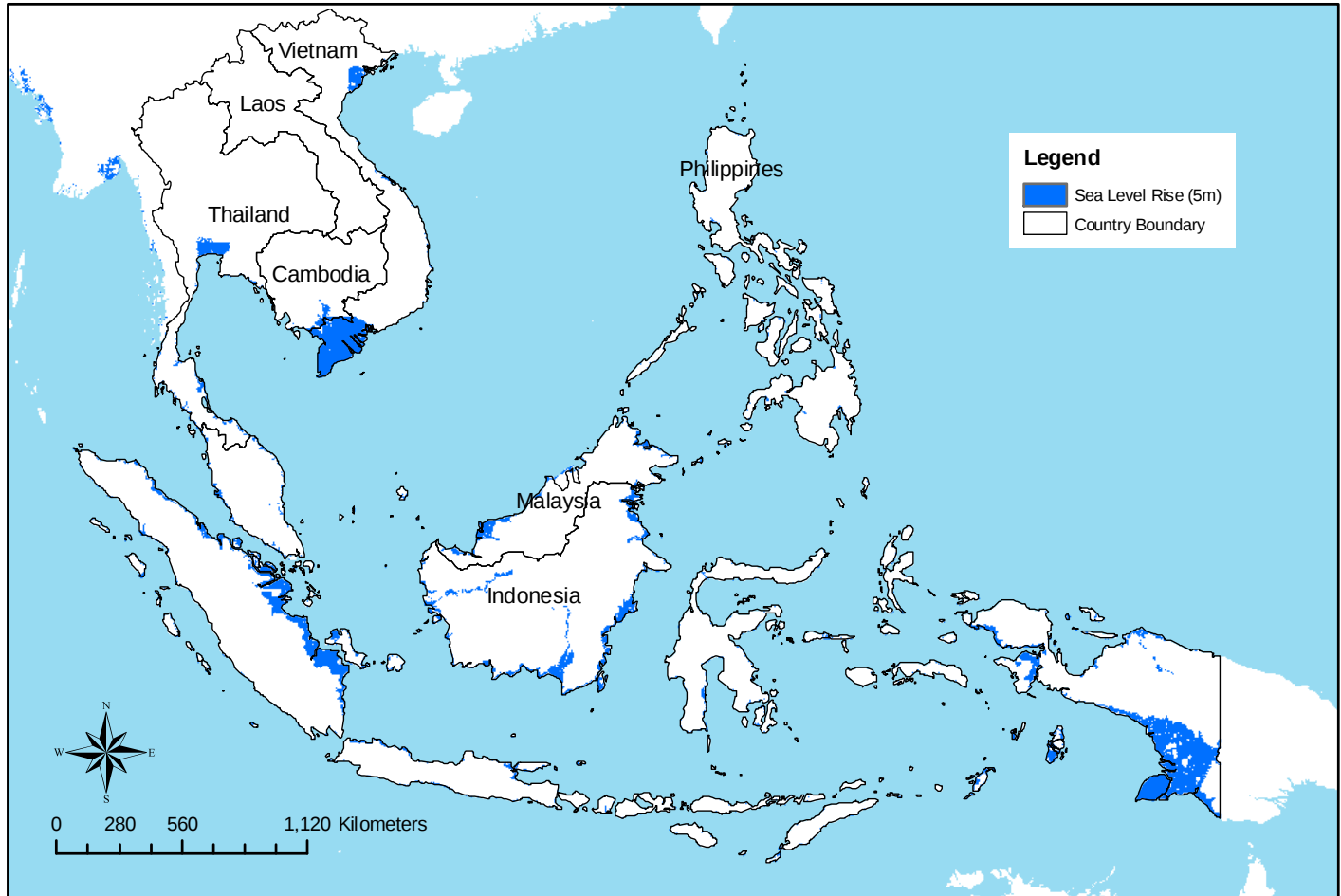
Flood frequency (event per year from 1980-2001), Source: UNEP-PREVIEW



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



Landslide exposure (2005), Source: UNEP-PREVIEW



Sea level rise (5-m inundation zone), Source: CRESIS

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