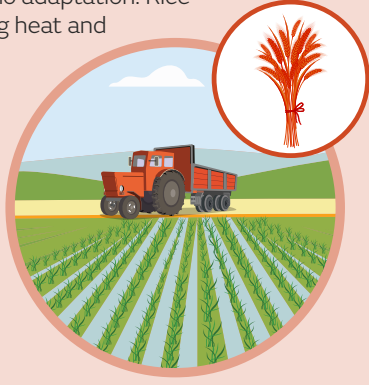


Climate risks identified for the Southeast Asia region by the 2050s

Agriculture and food security

- The yields of most crops in Southeast Asia will decline with no adaptation. Rice yields are likely to fall by 3-10% by the 2050s due to growing heat and water stress, with Cambodia, Myanmar, and Viet Nam experiencing the largest losses.
- The productivity of agricultural workers in Southeast Asia will decline because of heat-humidity stress. A 3°C rise in temperature could reduce agricultural labour capacity in the region by 30-50%, with the biggest impacts likely in Cambodia, Thailand, and Viet Nam.
- Inland aquaculture and livestock production in Southeast Asia will be negatively affected by rising temperatures and climate extremes, threatening food and income needs and reducing export revenue.
- Southeast Asian food insecurity could increase as agricultural output and prices become more variable. Longer-term price rises could undermine food affordability for the poorest groups, including growing numbers of urban poor, subsistence-orientated farmers, and landless tenants.



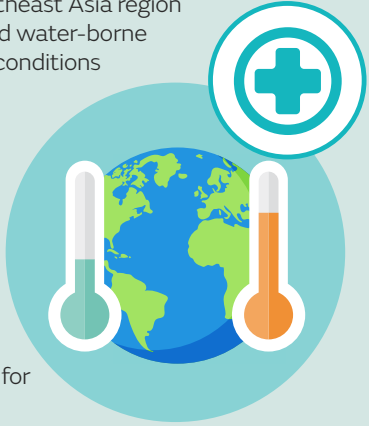
Water resources and water-dependent services

- Delivering and managing water for different users and uses will become more difficult as supplies become more variable and competition for water increases in Southeast Asia.
- Higher peak flows and flood risks in the densely populated Mekong River Basin, in Southeast Asia, will increase the need for transboundary cooperation on dam releases. Mitigating risks from sea-level rise and saline intrusion in the Mekong Delta will also require the maintenance of sediment and salt-flushing river flows to downstream areas.
- Dependence on more climate-resilient groundwater supplies will increase further in Southeast Asia as river flows become more variable. About 60-65% of households in Southeast Asia and the Pacific already depend on groundwater for drinking.
- Drinking water quality is at risk in Southeast Asia from more intense flooding and rising temperatures, especially where access to safely managed drinking water and sanitation is limited – Myanmar, Lao PDR, Cambodia, Indonesia, and Timor-Leste.



Health

- The health outcomes sensitive to climate change in the Southeast Asia region include heat stress and heat-related mortality, diarrhoeal and water-borne diseases, undernutrition, vector-borne diseases, and health conditions linked to air pollution.
- Continental Southeast Asia will experience one of highest cumulative exposures to heatwave events and heat-related mortality of any global region. The elderly, infants, pregnant women, people living in informal settlements, and outdoor labourers are most vulnerable to heat stress.
- Higher levels of air pollution linked to heat extremes and elevated forest/peat fire risks are likely across Southeast Asia. Air pollution is already one of the leading causes of mortality in the region, and among the top three risk factors for all-cause mortality in Myanmar, Lao PDR, Cambodia, and Timor-Leste.
- The prevalence of diarrhoeal and water-borne diseases (key contributors to child stunting) will increase in Southeast Asia where floods spread dangerous pathogens and contaminate unprotected water sources. Southeast Asia already has one of the highest levels of child stunting in the world, especially Lao PDR (28%), Indonesia (31%), and Timor-Leste (45%).
- The seasonality and spatial range of vector-borne diseases such as malaria and dengue will change across Southeast Asia, with new areas of exposure in cooler mountains and potential declines in hotter lowlands.



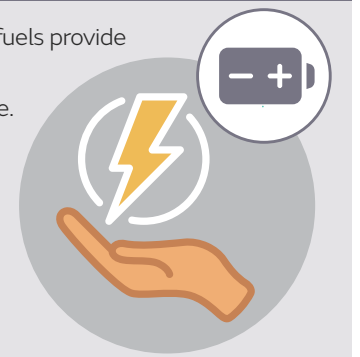
Infrastructure and settlements

- Climate risk and poverty will increasingly coincide in fast-growing urban areas in Southeast Asia where robust infrastructure provision lags behind urban expansion. Households living in informal settlements are most exposed to flooding and heat.
- Over 20 million urban residents are at high risk from flash floods in Southeast Asia, mainly in Viet Nam (10 million), Cambodia (4 million) and Indonesia (3 million). In densely populated coastal areas, flood risks will be amplified by more damaging typhoon-related storm surges and rising sea levels, exacerbated by land subsidence.
- Transport and communication systems in Southeast Asia will face greater damage and disruption from climate extremes, especially floods. Annual damages to Southeast Asian regional road and rail networks from floods and typhoons are estimated at USD 2.2 billion and could increase significantly to the 2050s.
- Coastal ports important for maritime trade in Southeast Asia will be exposed to more intense typhoons and floods that exceed operational design standards. Current port-specific climate risks across 18 ports in Philippines are estimated at USD 196 million per year.



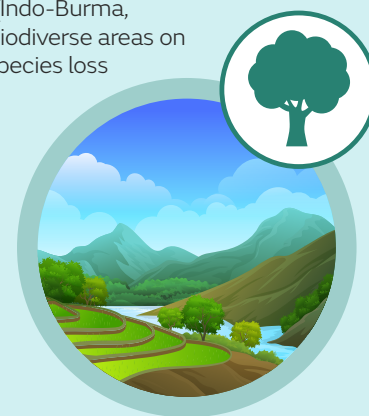
Energy

- Electricity generation from thermal power plants in Southeast Asia will likely be reduced by water availability/reliability constraints. Thermal power plants burning fossil fuels provide most of the region's electricity but need reliable water supplies for cooling.
- Electricity generation from Southeast Asian hydropower plants could become less reliable as river flows become more variable and upstream storage/diversions increase. Hydropower capacity on the Mekong is set to triple by 2040.
- Solar and wind power across Southeast Asia will be less affected by climate change, although solar outputs are sensitive to changes in the frequency of very warm, cloudy or hazy conditions. Wind turbines could be damaged by more intense typhoons and higher wind speeds.
- Demand for cooling will surge across Southeast Asia, accounting for 30-40% of peak summer loads by 2050 as temperatures rise, household incomes increase, and air conditioning expands. Higher demands will stress power systems, including fragile distribution networks facing further damage and disruption from climate extremes.



Environment

- The Southeast Asian region's four biogeographical hotspots (Indo-Burma, Sundaland, Wallacea, and Philippines) are among the most biodiverse areas on the planet, but climate change is exacerbating habitat and species loss from agricultural and urban encroachment.
- Biome boundaries in Southeast Asia will shift northward and mountain treelines will shift upward as temperatures rise. Fragmented ecosystems will be most at risk from climate-related losses, threatening livelihood support and wider ecosystem services valued at USD 14 trillion.
- Southeast Asian forests are at risk from increasing drought-related dieback and forest fires. Both the length of wildfire seasons, and the areas that are susceptible to them, may increase as a result of higher temperatures and heat extremes.
- The drainage of tropical swamps and peatlands for agriculture, combined with higher temperatures, will increase the risk of peatland fires in Southeast Asia. Peat fires, mainly in Indonesia and Malaysia, generate seasonal cycles of transboundary haze that account for 8% of global fire carbon emissions and persistent cycles of transboundary haze.
- Ecosystems across Southeast Asia provide valuable services that sustain local livelihoods, contribute to wider socio-economic support functions and help mitigate climate change. Across the Asia-Pacific region, the value of terrestrial ecosystems is estimated at USD 14 trillion, with USD 1.7 trillion in Indonesia alone. Roughly 58% of Southeast Asia's forests threatened by loss could potentially be protected with nature-based carbon credits.



Blue economy and the marine environment

- Damage and destruction of coastal and marine environments, exacerbated by climate change, threatens the livelihoods of 625 million people dependent on the blue economy across the Association of Southeast Asian Nations (ASEAN) ten member states.
- Seagrass meadows, coral reefs, and mangrove forests across Southeast Asia face further damage from rising sea temperatures, sea-level rise, more intense typhoons, and ocean acidification. Reef bleaching in the Coral Triangle (Philippines, Malaysia, Indonesia), a globally significant biodiversity hotspot, threatens the livelihoods of over 100 million people.
- Southeast Asian marine fisheries, including marine aquaculture, will be negatively affected by higher sea temperatures and ocean acidification, amplifying pressures from overfishing, pollution, and habitat destruction. Fish account for over 60% of dietary protein in Indonesia, but higher sea temperatures could reduce catch potential by 13-29% to the 2050s.
- The tourism industry generated roughly 12% of Southeast Asian regional GDP before 2019, but revenues are jeopardised by climate-related degradation of marine and coastal habitats, including coral reef bleaching.



*footnote: Unless otherwise stated, all statements refer to the Southeast Asia region and up to the 2050s time period.

View the full report here:

<https://www.metoffice.gov.uk/services/government/international-development/southeast-asia-climate-risk-report>

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