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South East Asia
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Technical Strategies for PV in SEA

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Global greenhouse gas emissions by sector

This is shown for the year 2016 – global greenhouse gas emissions were 49.4 billion tonnes CO₂eq.

Energy use in Industry (24.2%)
Transport (16.2%)
Road Transport (11.9%)
Energy use in buildings (17.5%)
Commercial (6.6%)
Residential buildings (12.5%)
Unallocated fossil fuel combustion (7.6%)
Energy in Agriculture & Fishing (1.7%)
Cement (3%)
Energy in Agriculture, Forestry & Land Use (18.4%)
Waste (5.2%)
Industry (5.2%)
Deforestation (1.5%)
Livestock & manure (5.8%)
Crop burning (1.2%)
Iron and steel (7.2%)
Chemicals (2.2%)
Other industry (10.6%)
Wastewater (1.3%)

OurWorldInData.org – Research and data to make progress against the world’s largest problems.

Source: Climate Watch, the World Resources Institute (2020).

Licensed under CC-BY by the author Hannah Ritchie (2020).
If I were going there I wouldn’t start from here . . .

SMART ENERGY COUNCIL
Global CO₂ pathways for 1.5°C using IPCC AR6 Remaining Carbon Budgets

Future pathways for 1.5°C with different probabilities
p=17%, RCB=900GtCO₂
p=33%, RCB=650GtCO₂
p=50%, RCB=500GtCO₂
p=67%, RCB=400GtCO₂
p=83%, RCB=300GtCO₂
p=probability, RCB=Remaining Carbon Budget from 2020 (2021 emissions are assumed equal to 2019)

© @Peters_Glen • Data: Global Carbon Budget, IPCC AR6 WG1 Table SPM.2, own calculations
Climate Change

Atmospheric $\text{CO}_2$ at Mauna Loa Observatory

Scripps Institution of Oceanography
NOAA Earth System Research Laboratory

PARTS PER MILLION

YEAR

Weather and Climate Extremes

A Summary of key findings from the United Nations Intergovernmental Panel on Climate Change’s (IPCC) Sixth Assessment Report (AR6) on the Physical Science Basis

Not just the Pacific, but South East Asia
Once in 100 year extreme sea level events will occur annually or more frequently at up to a quarter of the Pacific region by 2050.

By 2050, Pacific island shorelines may retreat 40m. Abrupt climate change events could contribute an additional 1 metre of sea level rise.

Sea level would rise between locked in by 2050:
- 0.25 m
- 0.10 m

by 2100:
- 0.55 m
- 0.28 m

by 2150:
- 1.00 m

Marine heatwaves will continue to increase in frequency, duration, and intensity. 5.40 m low confidence processes for a very high-emission scenario.

SMART ENERGY COUNCIL
Rainfall & Water Availability

The Western and Equatorial Pacific are likely to experience more rainfall.

Drier conditions are projected for the subtropical Southern and Eastern Pacific.

20% decline in groundwater availability projected in Federated States of Micronesia by 2050.

With high sea level rise, expect more than a 50% decline.

Although the Pacific will become wetter, fresh water availability will decline due to salt water intrusion from sea level rise.

Extreme rainfall events would become more frequent and intense with additional warming.

Extreme rainfall events could intensify by about 7% per degree of warming.

There is a 1 in 2 chance of drought conditions increasing in the Pacific.

Higher temperatures increase the rate of evaporation, further contributing to lowered freshwater availability and increased water stress.
Table 2: Existing Installed Energy Capacity (Percentage of Energy Mix)

<table>
<thead>
<tr>
<th>Country</th>
<th>Coal</th>
<th>Gas</th>
<th>Oil</th>
<th>Hydro-power</th>
<th>Small-scale hydropower</th>
<th>Biomass</th>
<th>Geothermal</th>
<th>Renewables</th>
<th>Nuclear</th>
<th>Other</th>
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<tbody>
<tr>
<td>Brunei (2017)</td>
<td>–</td>
<td>99.0</td>
<td>0.5</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>0.5</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Cambodia (2020)</td>
<td>30.2</td>
<td>–</td>
<td>2.5</td>
<td>62.3</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>3.5</td>
<td>–</td>
<td>1.5</td>
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<td>Indonesia (2018)</td>
<td>57.0</td>
<td>29.0</td>
<td>1.6</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>12.4</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Lao PDR (2020)</td>
<td>19.0</td>
<td>–</td>
<td>–</td>
<td>79.0</td>
<td>1.0</td>
<td>1.0</td>
<td>0.1</td>
<td>–</td>
<td>–</td>
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<tr>
<td>Malaysia (2017)</td>
<td>44.0</td>
<td>38.0</td>
<td>1.0</td>
<td>16.0</td>
<td>–</td>
<td>–</td>
<td>0.5</td>
<td>0.5</td>
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<tr>
<td>Myanmar (2016)</td>
<td>3.0</td>
<td>35.6</td>
<td>1.0</td>
<td>60.3</td>
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<td>–</td>
<td>–</td>
<td>0.1</td>
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<tr>
<td>Philippines (2017)</td>
<td>50.0</td>
<td>22.0</td>
<td>4.0</td>
<td>10.0</td>
<td>–</td>
<td>1.0</td>
<td>11.0</td>
<td>1.0</td>
<td>–</td>
<td>1.0</td>
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<tr>
<td>Singapore (2017)</td>
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<td>94.9</td>
<td>0.7</td>
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<td>–</td>
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<td>0.3</td>
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<td>1.0</td>
<td>5.0</td>
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<td>–</td>
<td>–</td>
<td>19.0</td>
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<td>Viet Nam (2018)</td>
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<td>India (2019)</td>
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<td>6.4</td>
<td>1.9</td>
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<td>1.2</td>
<td>–</td>
<td>1.8</td>
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<td>2.7</td>
<td>25.1</td>
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<td>6.1</td>
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<td>1.3</td>
<td>–</td>
<td>12.3</td>
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<td>57.2</td>
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<td>1.4</td>
<td>17.8</td>
<td>5.3</td>
<td>–</td>
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<tr>
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<td>9.2</td>
<td>19.3</td>
<td>0.1</td>
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</table>

Note: All values are rounded up. Information for Cambodia, Lao PDR, and Viet Nam is installed capacity. This table is based on Weatherby, ‘Renewable Energy in Southeast Asia,’ 16. Source: IEA country profiles; ‘ERIA 2020 Outlooks for Individual Countries’; and ‘Mekong Infrastructure Tracker.’

Must decarbonise with growing demand.
Variable Renewable Energy – PV Needs Planning

Source: ASEAN Centre for Energy
PV in SEA - Needs

• Planning
• Training
• Collaboration
• Commitment