North America: 5,961 MtCO₂
Central America: 177 MtCO₂
South America: 1,074 MtCO₂
Europe: 5,306 MtCO₂
Middle East: 2,726 MtCO₂
Rest of Asia: 4,040 MtCO₂
ASEAN+3: 14,930 MtCO₂
Oceania: 434 MtCO₂

Source: Global Carbon Atlas; AMRO staff.

Note: Bubbles represent each region’s share to global fossil fuel emissions in 2021. Boundaries, states, and other information shown on the above map do not imply any judgment on the part of AMRO concerning the legal status of any territory or the endorsement or acceptance of such boundaries.
What are the macro-financial implications of transitioning out of a high-carbon economy?

What are the opportunities for transitioning into a carbon-neutral economy?

(How) Can finance facilitate the transition?

Key messages and policy recommendations
What are the macro-financial implications of transitioning out of a high-carbon economy?
Macro-financial implications of transitioning out of a high-carbon economy

Key to the transition is appropriately pricing carbon emissions—yet without ready low-carbon alternatives, this could see a sustained increase in inflation.

ASEAN+3, World: Fossil Fuels in Primary Energy Consumption, 2021
(Percent of total primary energy consumption)

Selected ASEAN+3: Fossil Fuel Subsidies, 2021
(Percent, average subsidization rate)

Selected ASEAN+3: Status of Carbon Pricing Policies, 2022

Source: BP Statistical Review of World Energy (2022); AMRO staff calculation.


Source: Andriansyah and Hong (2022); World Bank; AMRO staff compilation.
Carbon pricing—and border carbon adjustments, or “BCAs”—could substantially reduce the relative competitiveness of ASEAN+3 exporters.

Top 20 Economies: Carbon Dioxide Emissions Embodied in International Trade, 2018
(Million tons of carbon dioxide)

- China
- United States
- Russia
- India
- Germany
- Korea
- Japan
- Canada
- Singapore
- Taiwan Province of China
- Mexico
- Vietnam
- Thailand
- France
- Malaysia
- United Kingdom
- Spain
- Turkey
- Poland
- Australia

Rest of the world, 62.1
ASEAN+3 ex China, 17.8
China, 20.1

Source: OECD.Stat, AMRO staff calculation.

ASEAN+3: Estimated Impact of CBAM on GDP and Exports to the European Union, 2030
(Percent change from baseline)

Initial coverage scenario
- 5 targeted sectors: aluminum, cement, electricity generation, fertilizers, iron and steel

Source: AMRO staff.
Deep and rapid structural adjustments required by net zero will result in stranded assets, which could have implications on ASEAN+3 financial stability.

### ASEAN+3 and Selected Economies: Exposure to Stranded-Asset Risk, 2019

<table>
<thead>
<tr>
<th>Country</th>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iraq</td>
<td>1.00</td>
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<tr>
<td>Libya</td>
<td>0.97</td>
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<td>Kazakhstan</td>
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<td>Qatar</td>
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</tr>
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<td>Brunei</td>
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</tr>
<tr>
<td>Kuwait</td>
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</tr>
<tr>
<td>Saudi Arabia</td>
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</tr>
<tr>
<td>Oman</td>
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<tr>
<td>Nigeria</td>
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</tr>
<tr>
<td>Vietnam</td>
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<tr>
<td>Cambodia</td>
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<tr>
<td>China</td>
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<tr>
<td>Malaysia</td>
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<tr>
<td>Thailand</td>
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</tr>
<tr>
<td>Korea</td>
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</tr>
<tr>
<td>Philippines</td>
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</tr>
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<td>Japan</td>
<td>0.29</td>
</tr>
<tr>
<td>Singapore</td>
<td>0.15</td>
</tr>
</tbody>
</table>

The 10 most exposed economies include Iraq, Libya, Kazakhstan, Qatar, Brunei, Kuwait, Saudi Arabia, Oman, Nigeria, and Vietnam.

### Embedded Emissions in Fossil Fuel Assets of Listed Companies, by Primary Location, 2022

<table>
<thead>
<tr>
<th>Country</th>
<th>Coal</th>
<th>Oil</th>
<th>Gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN, HK</td>
<td>250</td>
<td>200</td>
<td>150</td>
</tr>
<tr>
<td>US</td>
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<td>150</td>
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<tr>
<td>IN</td>
<td>150</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>RU</td>
<td>100</td>
<td>50</td>
<td>25</td>
</tr>
<tr>
<td>SA</td>
<td>50</td>
<td>25</td>
<td>10</td>
</tr>
<tr>
<td>UK</td>
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<td>0</td>
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<tr>
<td>CA</td>
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<td>AU</td>
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<tr>
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</tbody>
</table>

### ASEAN+3: Climate Change-Related Loans, by Economy, 2021

<table>
<thead>
<tr>
<th>Economy</th>
<th>Transport</th>
<th>Mortgage loans</th>
<th>Development and construction</th>
<th>Industry</th>
<th>Energy systems</th>
<th>Agriculture, forestry, and land use</th>
</tr>
</thead>
<tbody>
<tr>
<td>AU</td>
<td>0.15</td>
<td>0.29</td>
<td>0.30</td>
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<td>0.34</td>
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<tr>
<td>CA</td>
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<td>0.43</td>
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<td>0.30</td>
<td>0.30</td>
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<tr>
<td>HK</td>
<td>0.43</td>
<td>0.34</td>
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<td>0.29</td>
<td>0.29</td>
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<tr>
<td>KR</td>
<td>0.70</td>
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<td>0.31</td>
<td>0.31</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>LA</td>
<td>0.70</td>
<td>0.43</td>
<td>0.31</td>
<td>0.31</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>MY</td>
<td>0.70</td>
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<td>0.31</td>
<td>0.31</td>
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<tr>
<td>VN</td>
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<td>0.43</td>
<td>0.31</td>
<td>0.31</td>
<td>0.31</td>
<td>0.31</td>
</tr>
</tbody>
</table>

Source: Peszko and others (2020).

Source: Carbon Tracker (2022); AMRO staff calculation.

Note: AU = Australia (Sydney); CA = Canada (Toronto); CN = China (Shanghai and Shenzhen); HK = Hong Kong; ID = Indonesia (Jakarta); IN = India (Mumbai); JP = Japan (Tokyo); RU = Russia (Moscow); SA = Saudi Arabia (Riyadh); UK = United Kingdom (London); US = United States (New York).

Source: National authorities via Haver Analytics; AMRO staff calculation.

Note: BN = Brunei; CN = China; HK = Hong Kong; ID = Indonesia; JP = Japan; KH = Cambodia; KR = Korea; LA = Laos PDR; MM = Myanmar; MY = Malaysia; PH = Philippines; SG = Singapore; TH = Thailand; VN = Vietnam.
Protecting ASEAN+3’s long-term growth while transitioning away from fossil fuels will depend largely on future energy efficiency gains.

Note: Note: BN = Brunei; CN = China; HK = Hong Kong; ID = Indonesia; JP = Japan; KH = Cambodia; KR = Korea; LA = Lao PDR; MM = Myanmar; MY = Malaysia; PH = Philippines; SG = Singapore; TH = Thailand; VN = Vietnam.
What are the opportunities from transitioning into a carbon-neutral economy?
The net-zero transition holds prospects of expanding markets for the ASEAN+3, especially in clean energy and low-emissions products.

**World: Levelized Costs of Electricity, by Selected Technology**  
(2021 US dollars per kilowatt-hour)

**ASEAN+3: Renewable Electricity Generation**  
(Percent of total generation)

**ASEAN+3: Upcoming Clean Hydrogen Projects, as of October 2022**  
(Number of units)

Source: International Renewable Energy Agency; AMRO staff calculation.  
Note: BN = Brunei; CN = China; HK = Hong Kong; ID = Indonesia; JP = Japan;  
KH = Cambodia; KR = Korea; LA = Lao PDR; MM = Myanmar; MY = Malaysia; PH = Philippines; SG = Singapore; TH = Thailand; VN = Vietnam.

Source: International Energy Agency; AMRO staff calculation.  
Note: CN = China; KR = Korea; ID = Indonesia; JP = Japan; MY = Malaysia; SG = Singapore; VN = Vietnam.

Opportunities from transitioning into a low-carbon economy

Adoption of electric vehicles in ASEAN+3 will help spur investments and bring about the needed transformation in the region’s auto industry.
ASEAN+3 can leverage existing technological expertise and abundant mineral resources to meet robust demand for energy storage and critical minerals.
Carbon capture can help minimize the risks from asset stranding, while carbon offsetting can create new financial assets from natural endowments.

ASEAN+3 and Selected Economies: Average Age of Existing Coal Plants, 2020

- United States
- Russia
- Europe
- South Africa
- India
- Plus-3
- ASEAN

ASEAN+3 and Selected Economies: Available Credits from Hosted Carbon Offset Projects, July 2022

- Carbon offsetting can help minimize the risks from asset stranding, while carbon offsetting can create new financial assets from natural endowments.

Source: International Energy Agency; AMRO staff calculations.

Note: BR = Brazil; CD = Democratic Republic of Congo; CN = China; ID = Indonesia; IN = India; KE = Kenya; KH = Cambodia; KR = Korea; LA = Laos; MM = Myanmar; MY = Malaysia; PE = Peru; PH = Philippines; SG = Singapore; TH = Thailand; TR = Turkey; US = United States; VN = Vietnam.
(How) Can finance facilitate the transition?
ASEAN+3 financial markets are increasingly adopting “green” products and practices to facilitate the transition—but more needs to be done.
More transition financing is required for sectors with non-green, high-carbon activities

Carbon Performance Alignment with Paris Agreement Benchmarks in 2030, by Sector
(Percent of companies per sector)

- Shipping
- Aluminum
- Diversified mining
- Paper
- Steel
- Cement
- Autos
- Airlines
- Electricity and utilities
- Oil and gas

- Below 2 degrees
- 2 degrees
- Paris pledges/ Not aligned
- No or unsuitable disclosure

ASEAN+3: Outstanding Transition Bonds
(Billions of US dollars, end of period; share of outstanding sustainable bonds)

- Dec-17
- Dec-18
- Dec-19
- Dec-20
- Dec-21
- Jun-22

- Japan
- China
- Hong Kong
- Share of outstanding sustainable bonds (right axis)

Source: Dietz and others (2021).

Source: AsianBondsOnline, Asian Development Bank; AMRO staff calculation.
Key takeaways and policy recommendations
• All ASEAN+3 economies have made commitments to mitigate climate change. Key to mitigation is to put an appropriate price on carbon emissions.

• But with the region relying mainly on fossil fuels, carbon pricing carries implications for inflation and export competitiveness in the medium to long term.

• Some economies also face substantial risks from stranded assets, with potential consequences for regional financial stability.

• The sooner scalable, reliable, and affordable low-carbon alternatives become available for ASEAN+3, the less painful and costly the transition away from fossil fuels will be.
Indeed, the road to net zero is rich in opportunity. Many economies in the region are already well-placed to leverage their existing comparative advantage in areas of technology, manufacturing, natural resources, and financial services to reap the economic benefits from the transition. By mobilizing private capital, ASEAN+3 can realize the economic gains from the net zero transition while minimizing its negative impact on growth. Comparable standards and frameworks across the region for sustainable finance instruments will be crucial in accessing much-needed financing.
Policy recommendations

For individual economies

- Utilize climate-informed public expenditure and fiscal tools for an orderly transition
- Enhance the ability of the financial system to mobilize green and low-carbon financing
- Maintain the integrity of green markets and instruments through transparency and standards-setting
- Strengthen cross-government agency coordination to ensure alignment with a credible economy-wide, long-term transition strategy

For the region

- Accelerate energy cooperation and cross-border renewable energy exchange
- Explore regional green project developments, harnessing the power of public-private partnerships
- Strengthen regional sharing of knowledge and innovative technologies to promote widespread rollout
- Advance green finance networks

2050
Thank you.

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