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Sustainable Finance

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Climate- and Nature-related Macro-financial Risks in Southeast Asia

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The SEACEN Centre – National Bank of Cambodia – IMF-STI Peer-Learning
Seminar

“Climate Challenges and Financial Stress Tests”

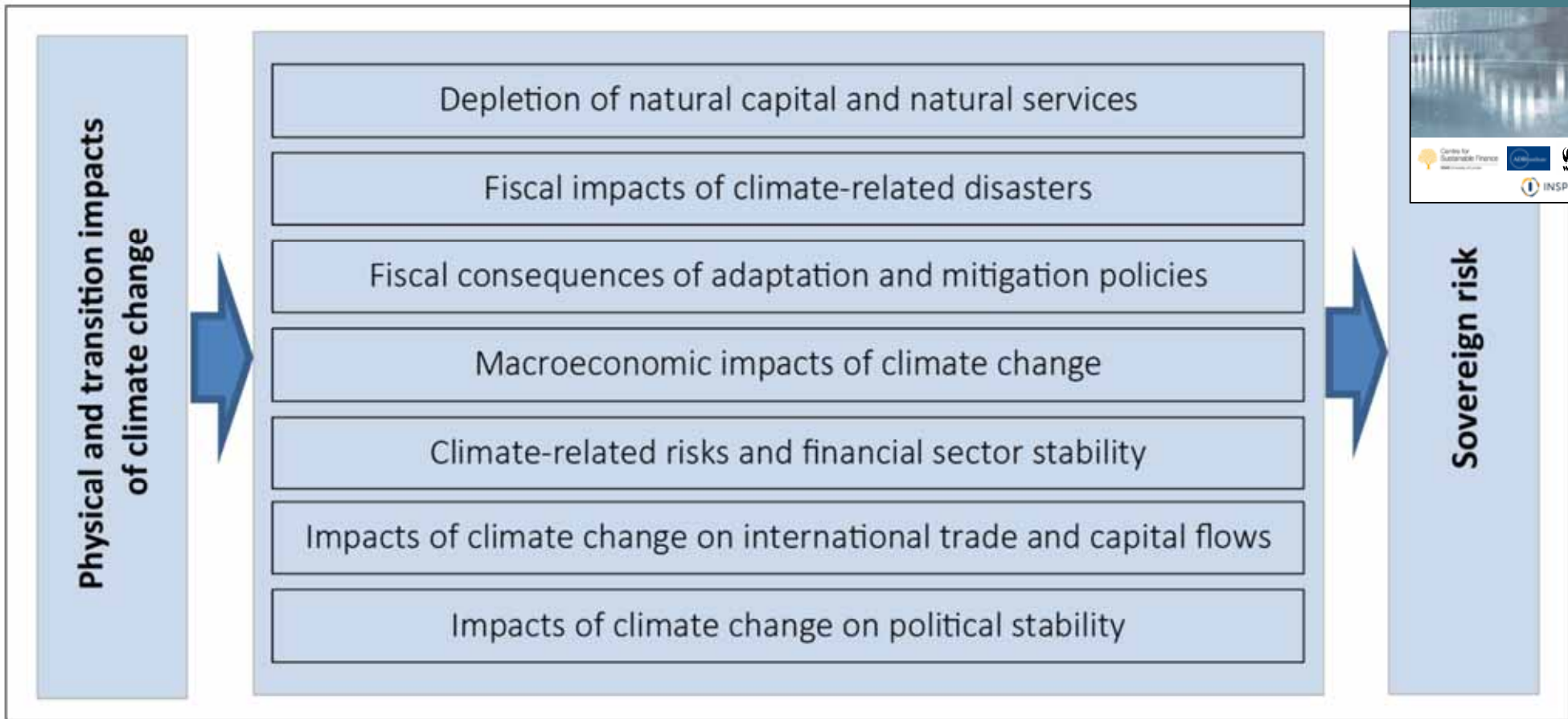
Siem Reap, 6 December 2022

Outline

1. Transmission channels of risk
2. Climate-related risks in Southeast Asia
3. Nature-related risks in Southeast Asia
4. Climate vulnerability and the cost of capital

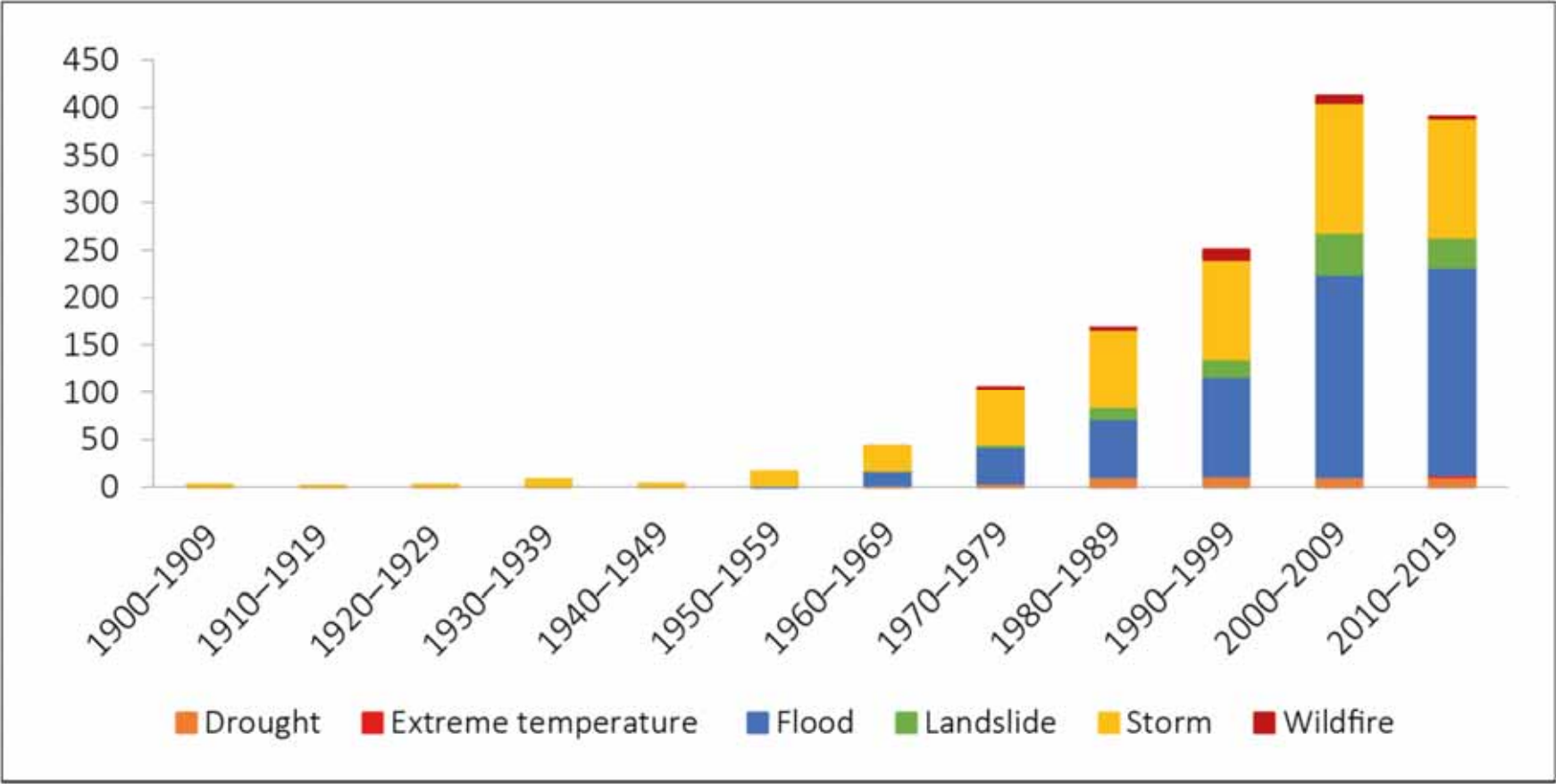
Transmission Channels of Risk

Transmission channels from climate change to sovereign risk



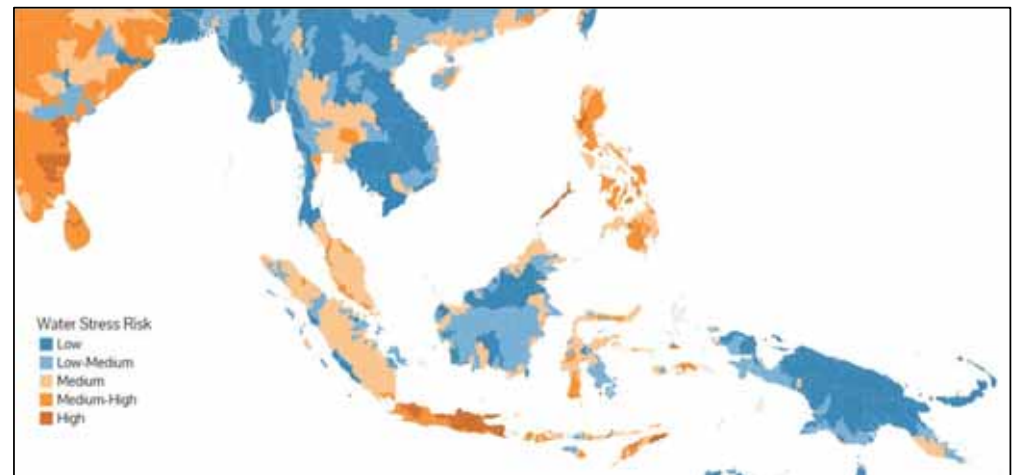
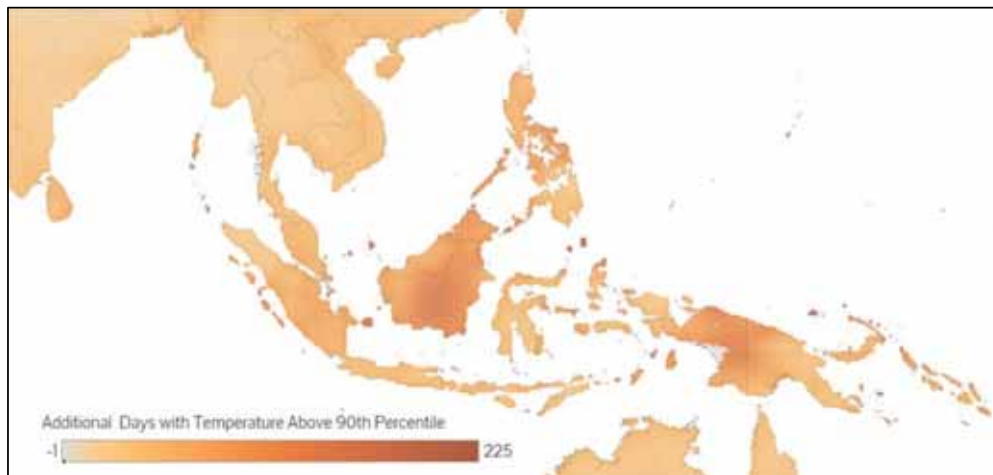
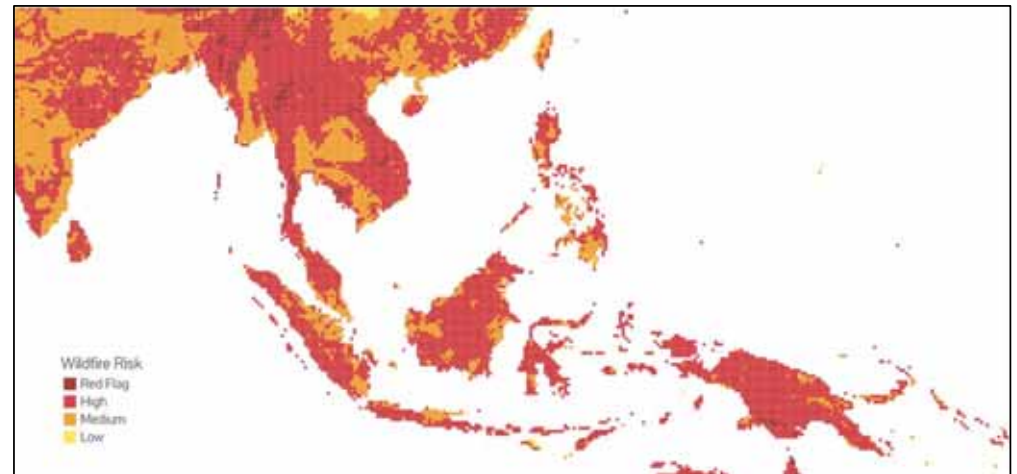
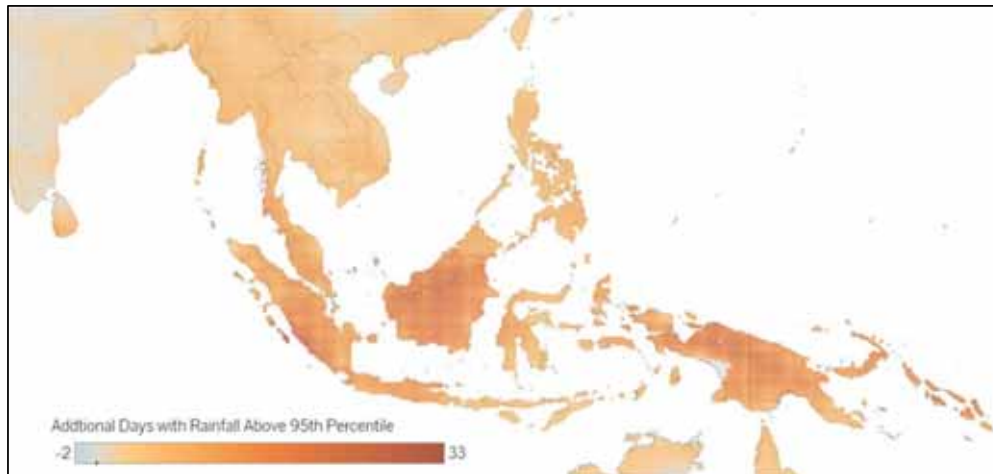
Climate-related Risks in Southeast Asia

Historical occurrences of extreme weather events in ASEAN



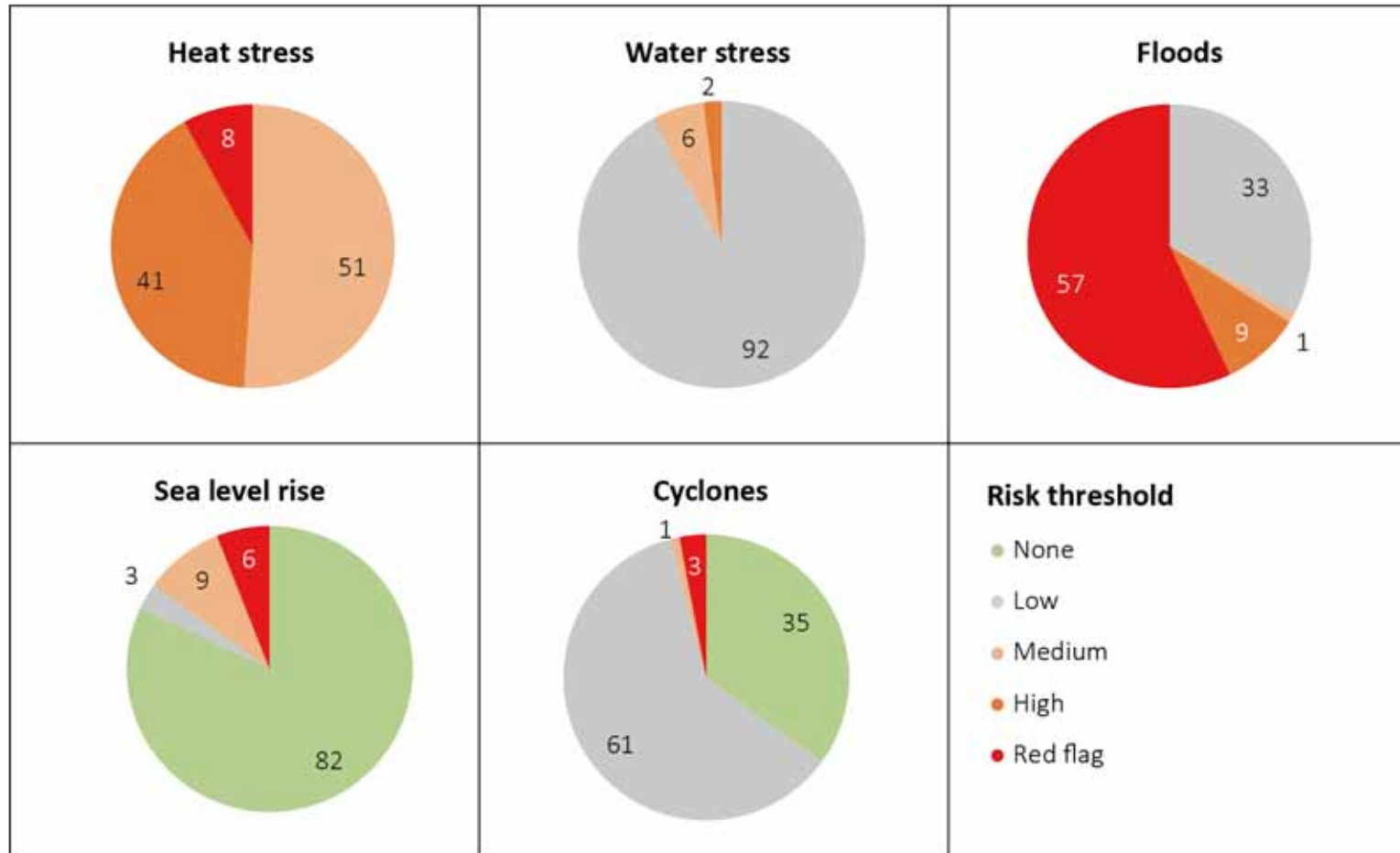
Source: Volz et al (2020).

Climate risks in Southeast Asia



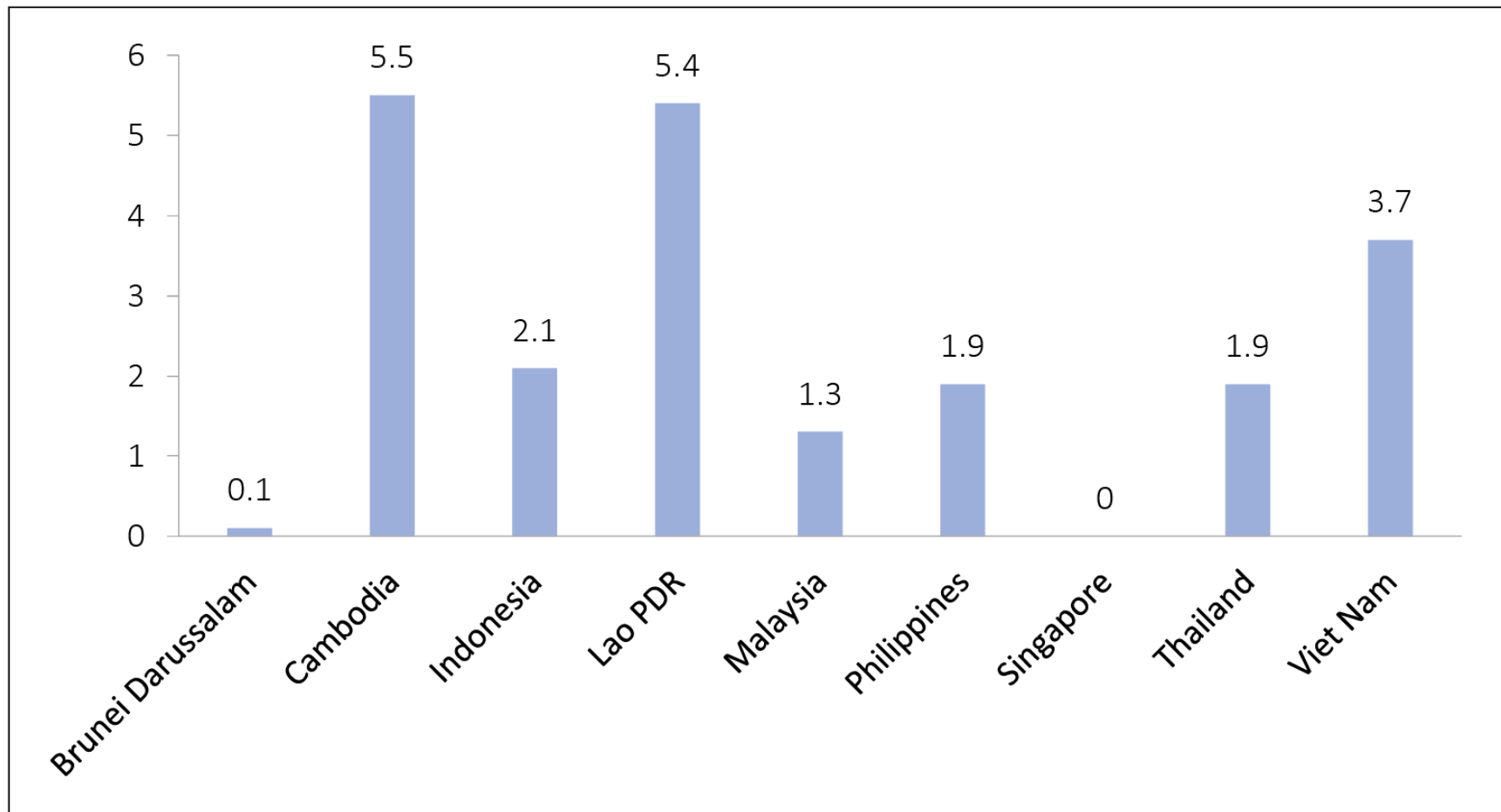
Source: Volz et al (2020).

Proportion of ASEAN transport infrastructure exposed to climate hazards



Source: Volz et al (2020).

Average annual agricultural loss due to climate change as percentage of GDP



Source: Volz et al. (2020).

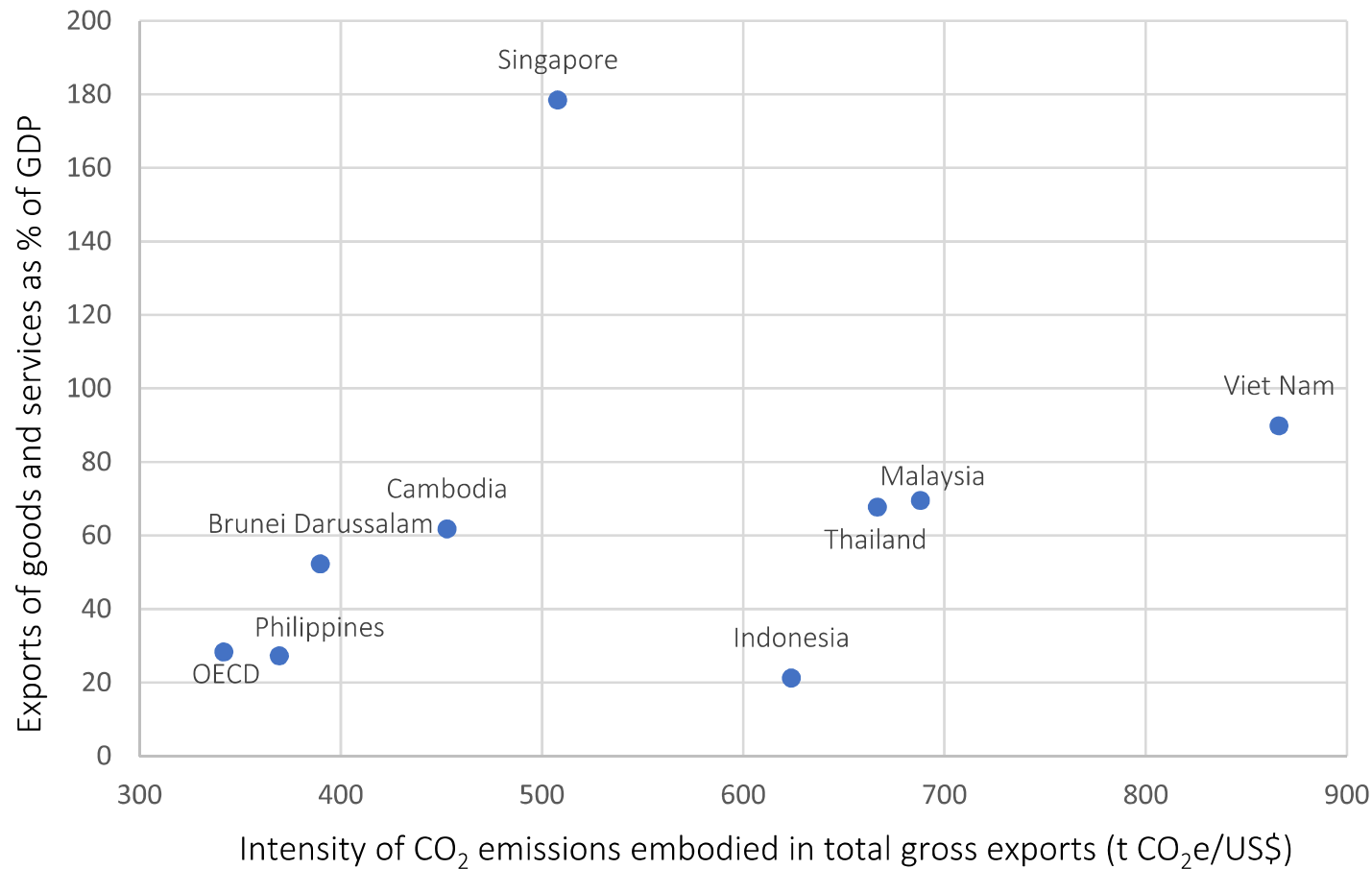
Physical climate risks manifesting as credit risks for banks

- The severe floods in **Thailand** in 2011 impacted borrowers' credit profiles and ability to repay debt.
 - The Bank of Thailand had to step in to support flood-affected borrowers by allowing banks to maintain pre-flood credit ratings, reduce interest rates, delay repayment amounts, and extend repayment periods for these borrowers.
- In 2020, the worst drought in 40 years drove up the level of NPLs in the **Thai** banking industry.
- In **Cambodia**, NPLs in the agriculture sector increased in 2018 due to natural disasters, rising to 8.2%, which was considerably higher than other sectors such as manufacturing (4.1%) and construction (4.2%) and the overall rate of 2.8%.
- In the **Philippines**, the agriculture, hunting, forestry, and fishing sector grew by only 0.8% in 2018 (compared to a 4% in 2017), due to the 19 typhoons that hit the Philippines.
 - The BSP provided temporary rediscounting relief measures to banks in calamity-affected areas.
- In December 2012, cooperative banks in the **Philippines** saw their NPLs rise to 19.84% compared to 9.49% six months earlier, largely due to typhoons, leading the BSP to grant regulatory relief (e.g. reduced loan loss provisions) to banks so they could assist customers affected by extreme weather events.

Impacts of climate change on int'l trade

- Supply chains at risk
 - With more than 70%, the share of network trade in total manufacturing exports is much larger in Southeast Asia than in any other region of the world.
 - Besides disaster risk, manufacturing is also facing heat stress, water stress
- Risks to agricultural exports
 - Agricultural exports – which account for 24% of exports in Indonesia, 17% in Myanmar, 17% in Lao, 12% in Thailand, 11% in Vietnam, 10% in Cambodia, 9% in Malaysia – are partly at risk due to global warming.
- Risks to tourism
 - Travel and tourism account for 22% of total exports in Thailand, 20% in Cambodia, 11% in Lao PDR, 10% in Myanmar, 8% in Malaysia, 7% in Indonesia.
 - Sea level rise will hurt coastal tourism & heat stress and other natural hazards may diminish the attractiveness of Southeast Asia as a tourist destination.
- Fossil fuel exports at risk
 - 84.4% of Brunei's total exports are in fossil fuels, 17% in Indonesia and Myanmar.
 - In the absence of mineral fuel trade, Indonesia's deficit in its goods trade would have been 1.8% of GDP instead of 0.8% of GDP in 2018.

Carbon footprint of exports (t CO₂e/US\$) vs. exports of goods and services as share of GDP (%) for ASEAN countries and OECD in 2015



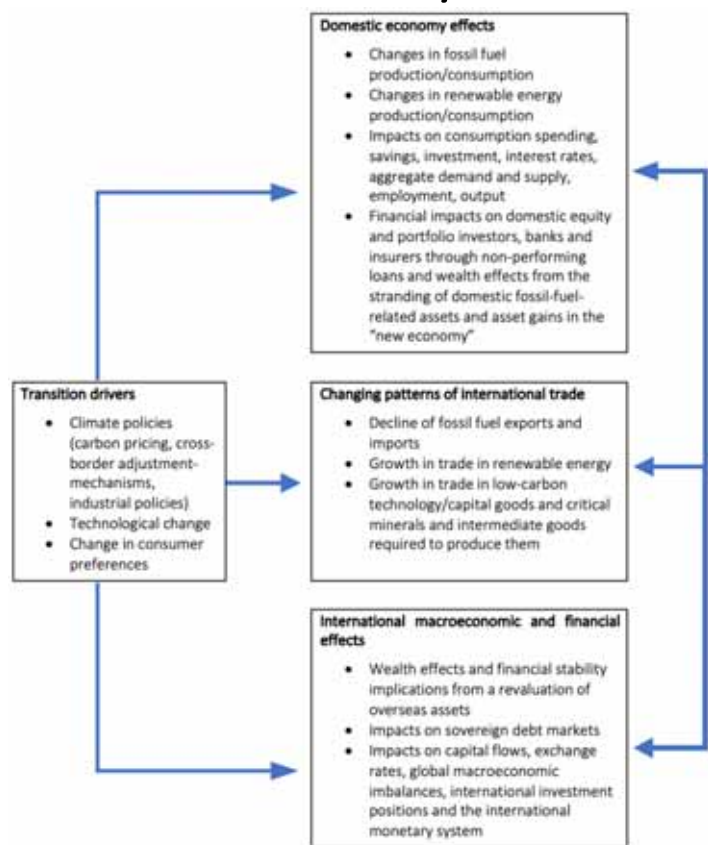
Source: Beirne et al. (2021).

Transition risk in Indonesia

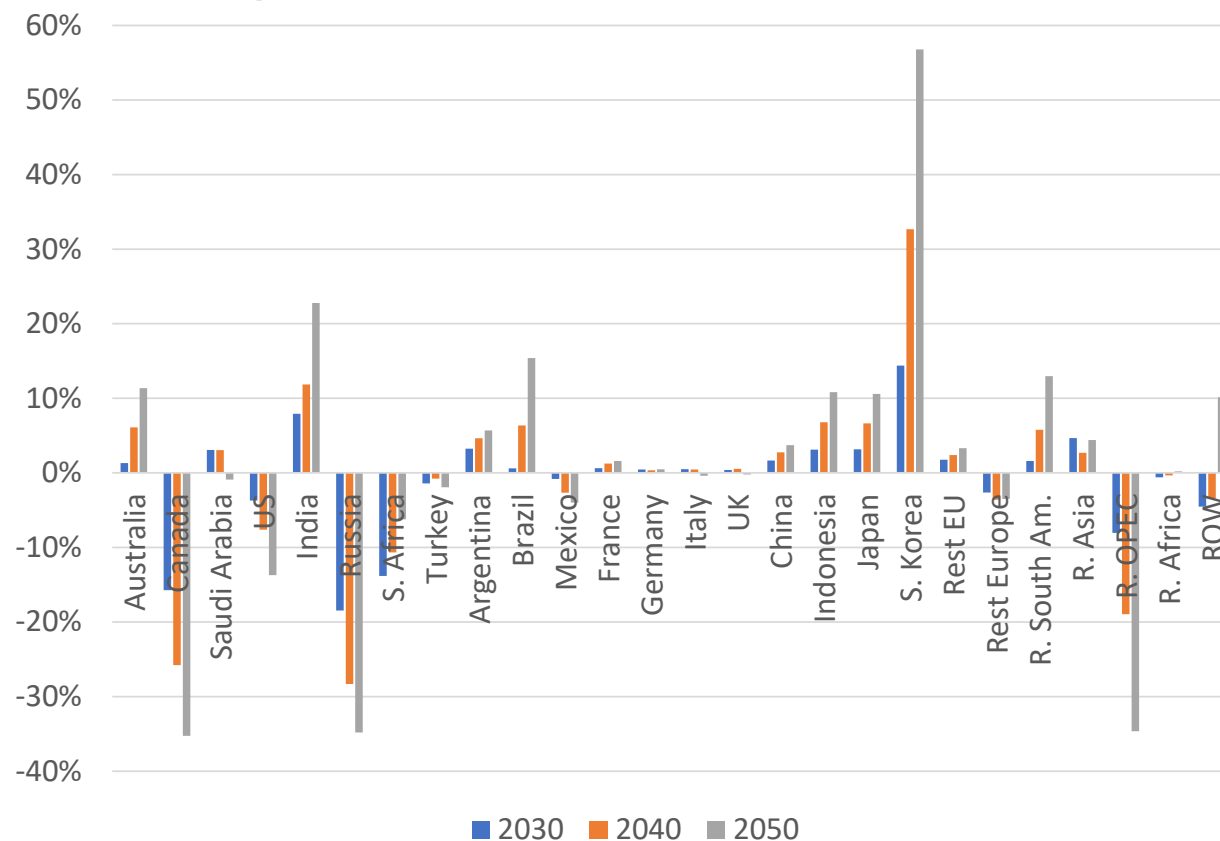
- For Indonesia, economic activities related to the fossil fuels and palm oil sectors are particularly exposed to transition risks.
- The oil, gas and coal related sector accounted for 7.2% of total GDP in 2019, providing direct employment to more than 1.4 million workers (1.1% of the total workforce).
 - Indonesia is the world's largest coal exporter, with over 60% of its total coal production being exported in 2019, accounting for around 10% of total exports.
 - Indonesia's public finances rely heavily on royalties from oil, gas and coal mining, constituting 7.5% of total government revenue in 2019.
- Indonesia is also the world's largest palm oil exporter with a 55% share in total global exports.
 - The plantation sector accounts for 3.3% of Indonesia's total GDP, contributing to about 10% of Indonesia's export earnings.

Transboundary climate-related risks: Modelling the impacts of a decarbonisation of the world economy on trade and finance

Transboundary effects



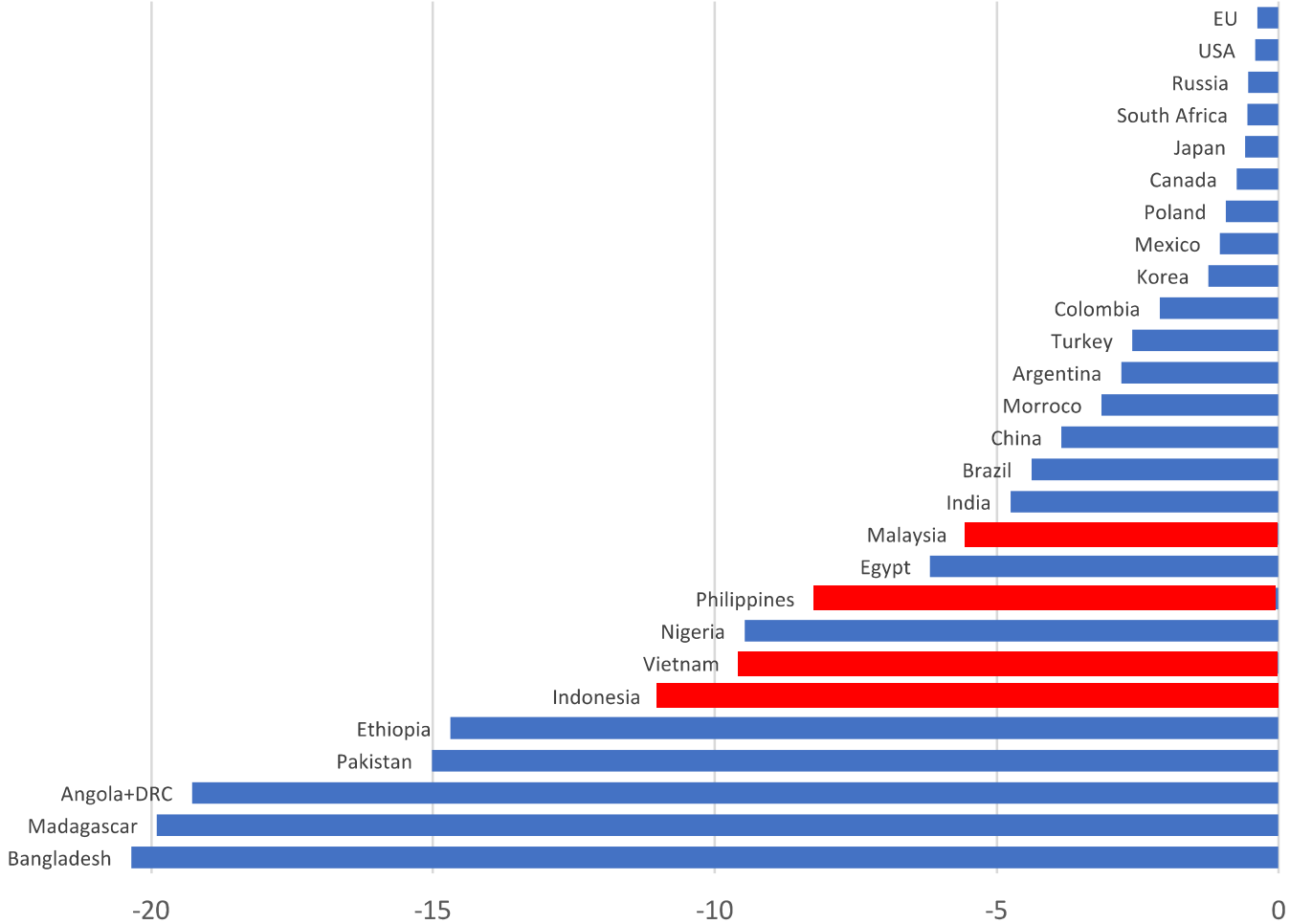
Change in trade balances relative to GDP



Source: Volz, Campiglio, Espagne, Mercure, Oman, Pollitt, Semieniuk & Svartzman (2022).

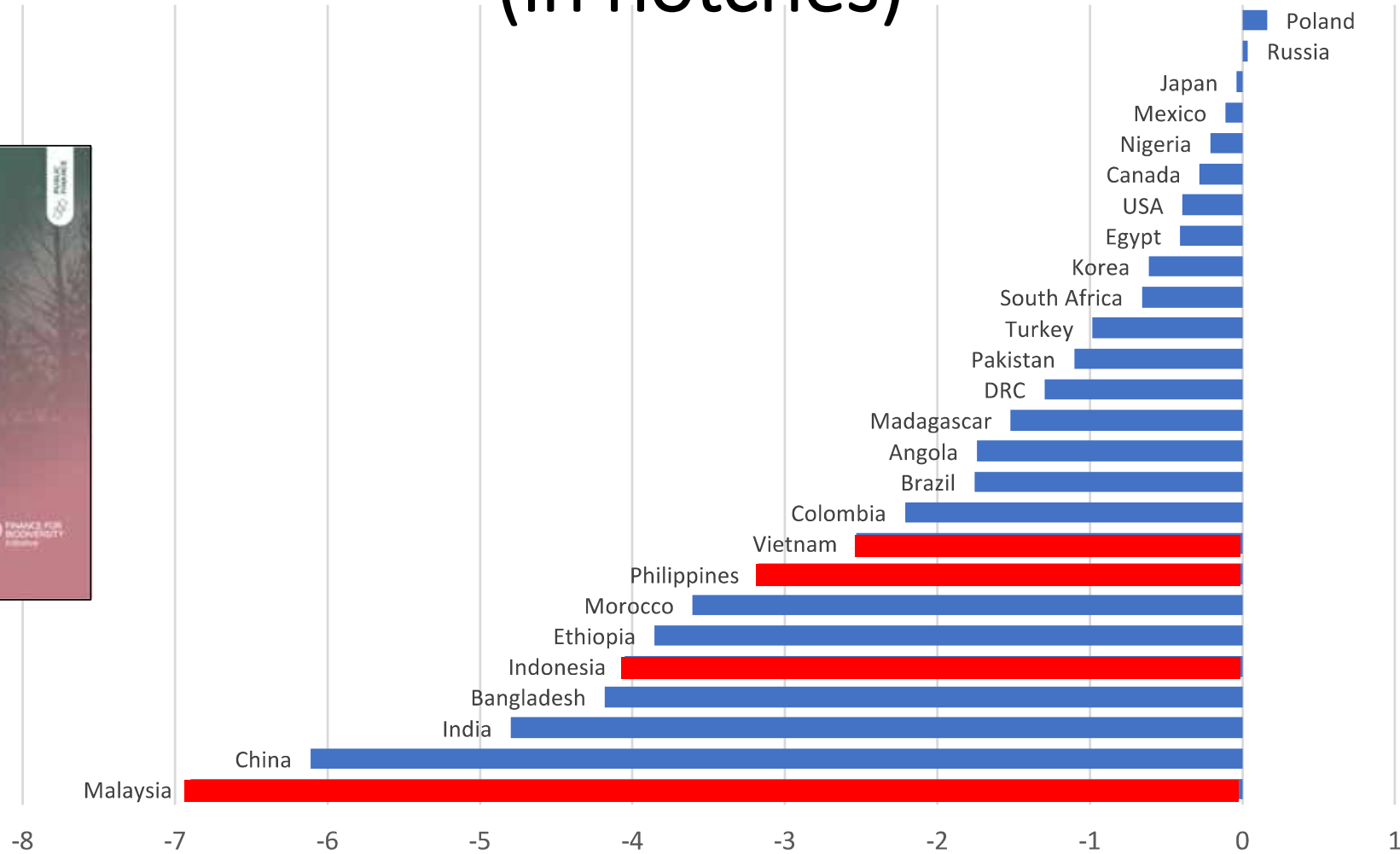
Nature-related Risks in Southeast Asia

Change in 2030 GDP under a partial ecosystem collapse scenario compared with the no-tipping point scenario (% of GDP)



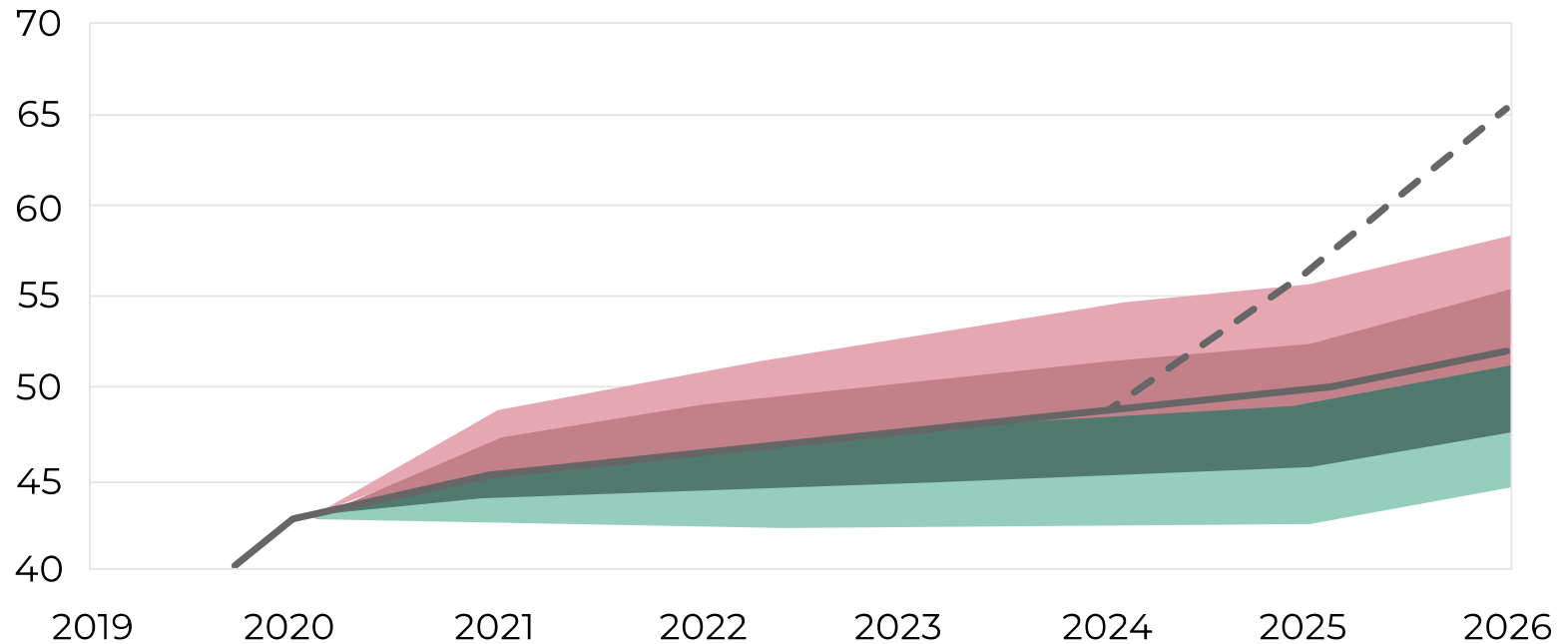
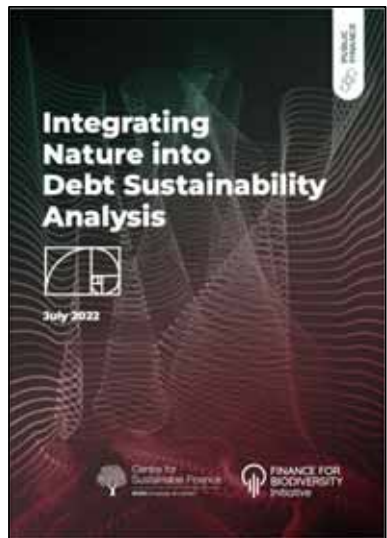
Source: World Bank (2021).

Rating changes due to partial nature collapse (in notches)



Source: Agarwala et al. (2022).

Evolution of debt-to-GDP ratio in Indonesia (%) under a partial ecosystem collapse scenario

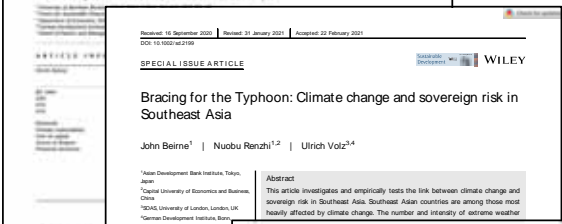
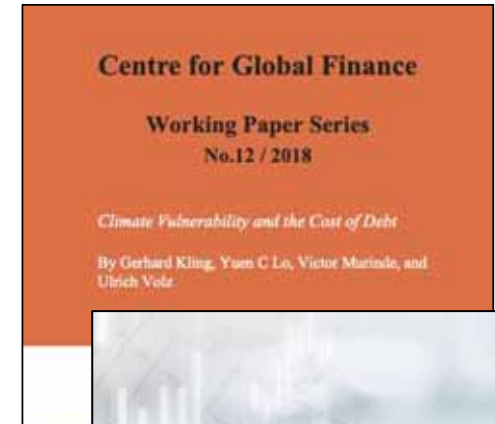


Source: Kraemer and Volz (2022).

Climate Vulnerability and the Cost of Capital

Climate change drives up the cost of capital in climate vulnerable countries

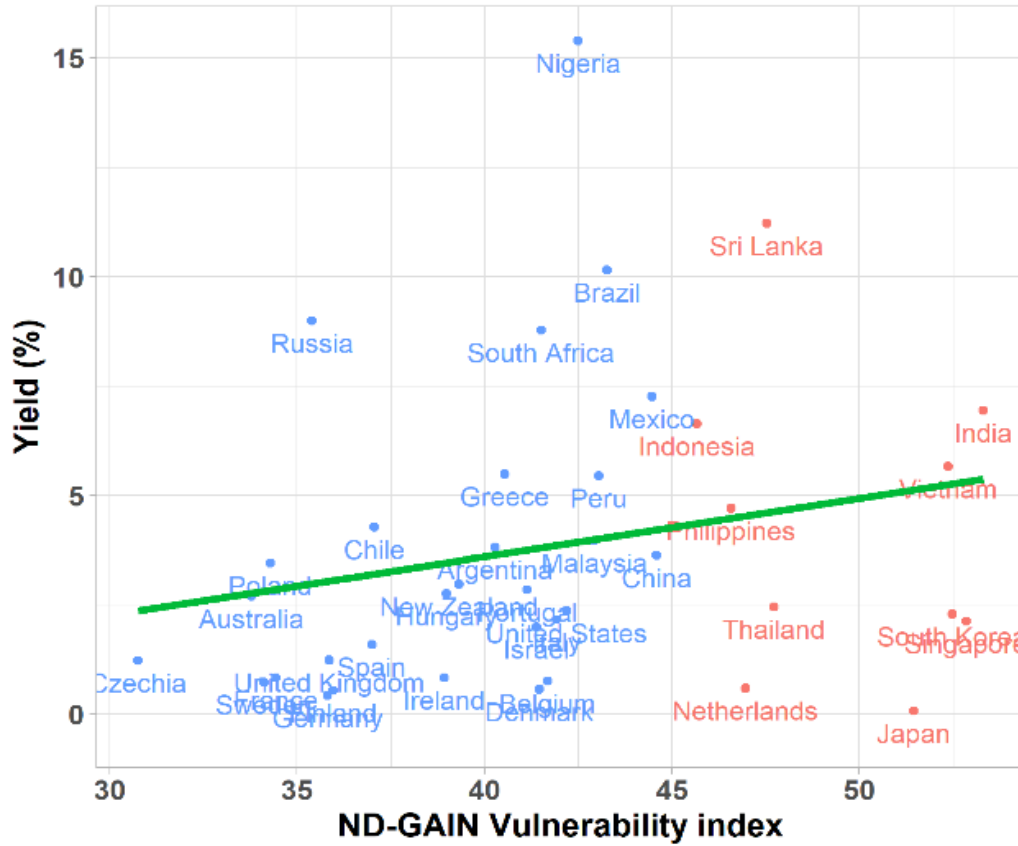
- Governments and firms in climate vulnerable countries incur a risk premium on their debt.
- Serious implications for capacity to invest in climate adaptation and resilience, growth & development prospects, and debt sustainability.



Empirical analysis of role of climate vulnerability and resilience to the cost of sovereign borrowing

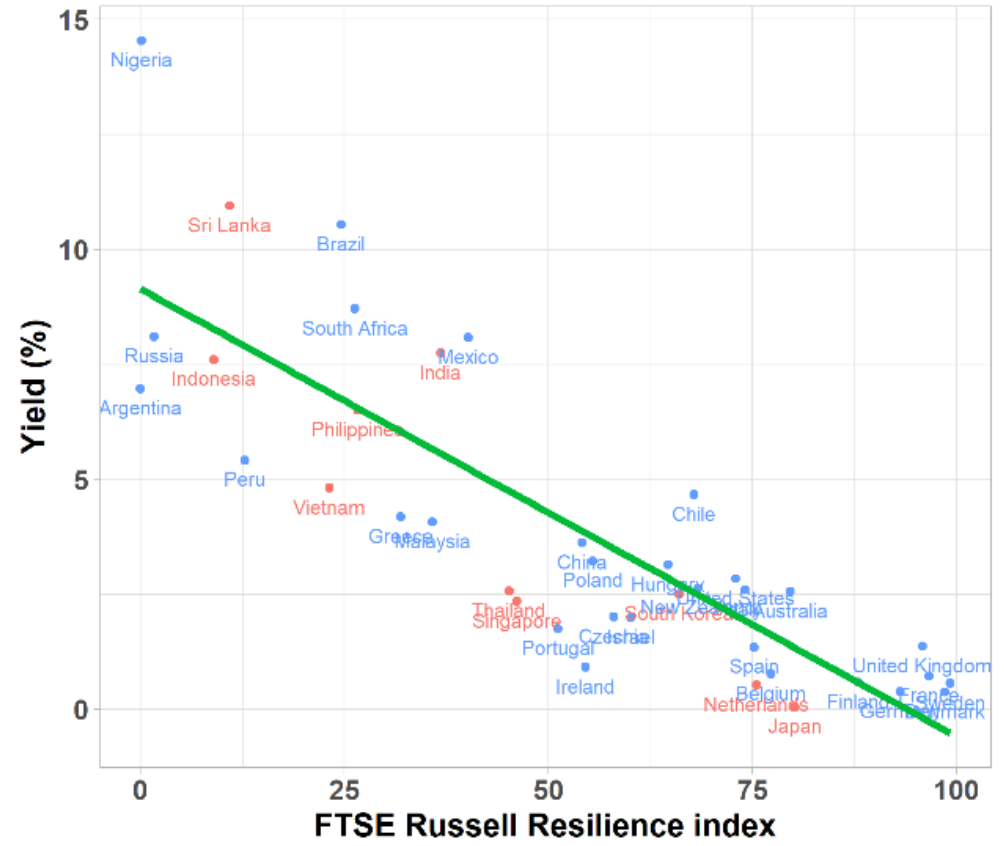
- Using quarterly data, we use a fixed effects panel model over the period from 2002Q1 to 2018Q4 across 40 advanced and emerging economies.
 - The panel model estimated enables us to assess the effect of climate risk vulnerability and resilience to climate risk on sovereign bond yields, controlling for a large set of domestic macroeconomic factors and two global factors.
- A structural panel VAR is used to examine the response of sovereign bond yields to shocks to climate vulnerability and resilience.
 - The panel SVAR is implemented across the same 40 countries as before, but over the period from 2007Q1 to 2017Q4 in a balanced set-up.

Cost of debt and ND-GAIN Vulnerability index, 2017



• High Risk • RoW — Linear trend

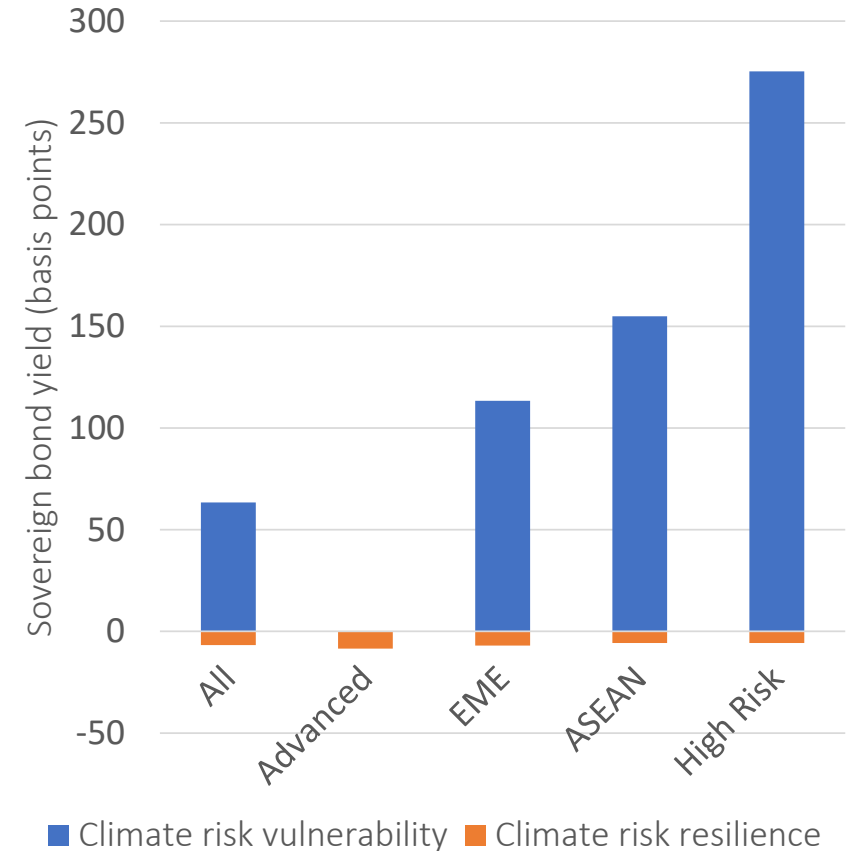
Cost of debt and FTSE Russell Resilience index, 2018



• High Risk • RoW — Linear trend

Empirical findings I

- Vulnerability to climate risk and resilience to climate risk have significant effects on sovereign bond yields.
- Increases in vulnerability and lower resilience to climate risks lead to rises in bond yields.
- The premium on sovereign bond yields from rising climate risk vulnerability is highest for the high risk group at 275 basis points, compared to 155 basis points for ASEAN and 113 basis points for other EMEs.
- The effect of vulnerability on bond yields for advanced economies is not statistically significant.
- The magnitude of the effect of climate risk resilience on bond yields is substantially lower than that of climate risk vulnerability.

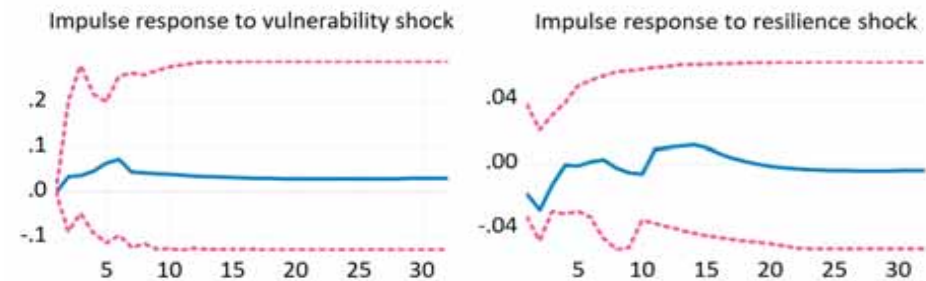


Source: Volz (2020).

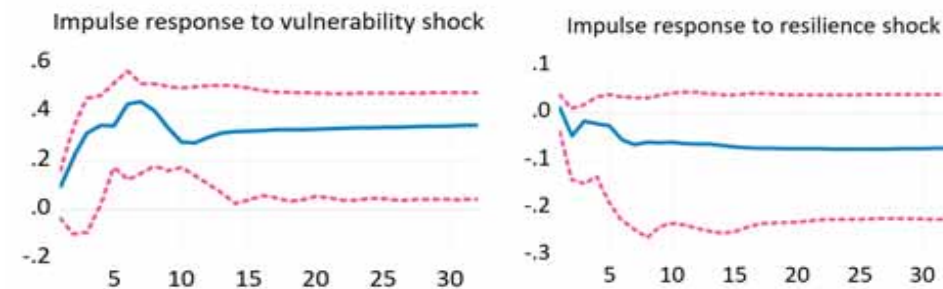
Empirical findings II

- Impulse response analysis shows that sovereign bond yields respond positively to a positive shock imposed on climate risk vulnerability, and negatively to a positive shock on resilience.
- The shock becomes permanent after around 12 quarters.
- The magnitude of effects is notably larger for economies in the high risk category.

Advanced economies

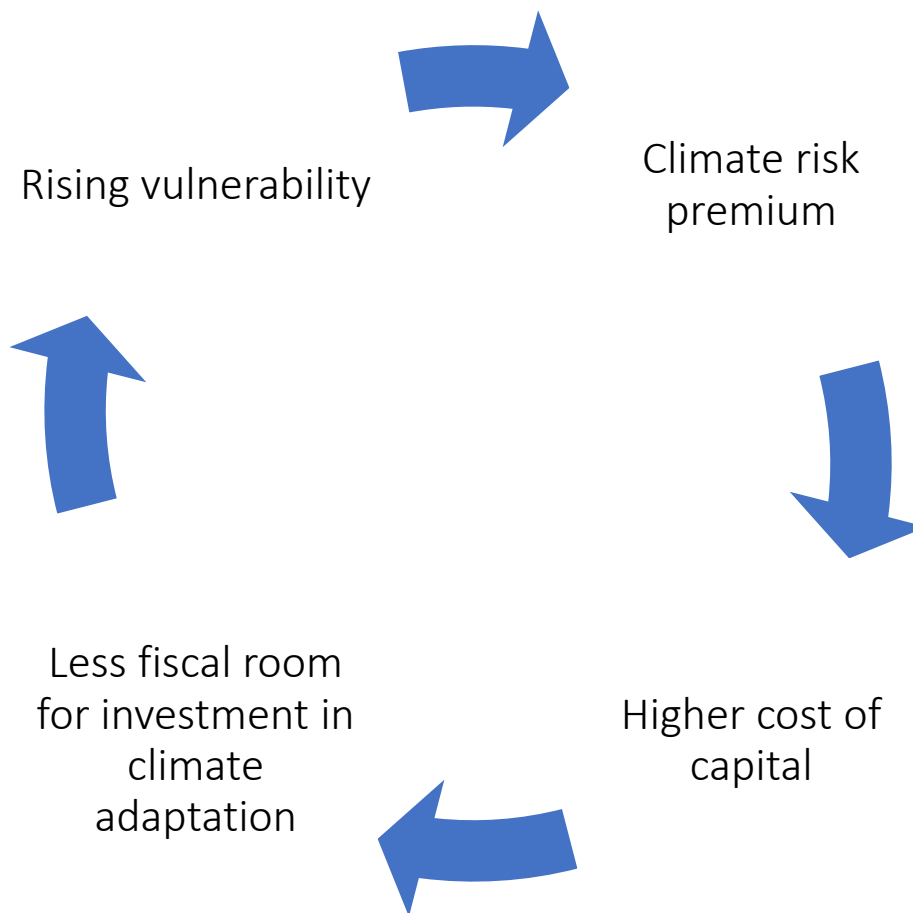


High risk economies



Source: Volz (2020).

The vicious circle of climate vulnerability and the cost of capital



Source: Volz (2018).

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