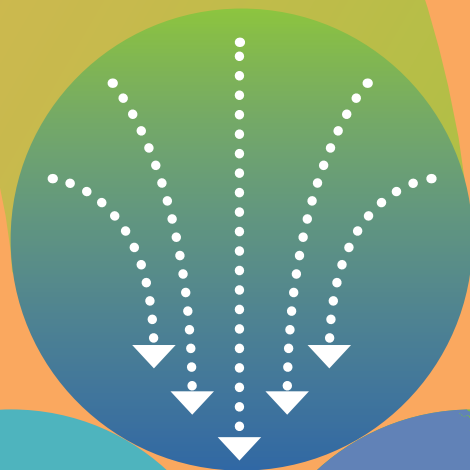


ASEAN economies' exposure to climate transition risks

Applying taxonomy to enhance climate disclosures



The views set out in this paper are those of the authors and may not represent the views of the advisers or their organisations.

Glossary

ADB	Asian Development Bank
AMS	ASEAN member states
AuM	assets under management
ASEAN	Association of Southeast Asian Nations
BCIS	Bloomberg Industry Classification Systems
BIS	Bank for International Settlements
BSP	Bangko Sentral ng Pilipinas
CBAM	carbon border adjustment mechanism
COP	Conference of the Parties (of the United Nations Framework Convention on Climate Change)
ESG	environment, social and governance
GFANZ	Glasgow Financial Alliance for Net Zero
GWh	gigawatt-hour (of energy)
IEA	International Energy Agency
ISSB	International Sustainability Standards Board
MDB	multilateral development bank
Mt	megaton
OJK	Otoritas Jasa Keuangan (Financial Services Authority Indonesia)
PV	photovoltaic
LLC	limited liability company
PLN	Perusahaan Listrik Negara (Indonesian power utility)
PPAs	power purchase agreements
SBV	State Bank of Vietnam
TCFD	Task Force on Climate-Related Financial Disclosures
SIC	standard industrial classification
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
V20	Vulnerable Twenty

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Summary

This report aims to increase the awareness of ASEAN financial policymakers and market participants about the threat posed by climate transition to commercial and public finances. ASEAN Member States' (AMS) Joint Statements on Climate Change to the UNFCCC COPs and individual NDCs reflect the region's ambitions to contribute towards global climate targets. But the efforts to meet the carbon reduction targets both by ASEAN countries and by investors and trading partners may pose challenges for ASEAN economies.

Transmission of climate risk

Climate change manifests in the real economy either as physical risks: damage or disruption through climate change events or as transitional risks: in the form of policy, technology development and sentiment changes as society transitions to a lower-carbon economy. Figure 2 shows how physical and transition risks are transmitted through the micro-economy (households and businesses) and the macroeconomy (national and international). These eventually manifest as financial risks to lenders and investors.

In AMS local and international factors are possible sources of transition risks. The demand for coal, despite the short-term post-COVID-19 increase in demand in 2020, is likely to fall internationally as countries look to reduce emissions and international investors come under pressure to divest. Policies like carbon pricing and carbon border tariff adjustments could reduce demand for carbon-intensive ASEAN exports. The continued fall in the price of solar PV modules and storage will increase renewable power take-up and put downward pressure on wholesale power prices, impacting thermal power stations' utilisation rates and profitability. Substantial numbers of new fossil-fuel power plants are planned in AMS (though many will be cancelled), creating a transition risk on the financial system spanning decades. Investors in competitive energy markets will bear the cost of this stranding of carbon-intensive assets. Or it could be borne by electricity suppliers or consumers depending on how the energy market is regulated. Long term power purchase agreements may transfer these risks to consumers. In countries where carbon-intensive companies are government-owned, such as Malaysia's Petronas or Indonesia's PLN, the transition risks might be borne by the tax-payer. Fitch Ratings' Sovereign Rating Model suggests a fall by one notch by 2040 and two or three by 2050 for a major oil exporter.

Analysis of AMS exposure to carbon risk

One way to quantify financial risks stemming from a high dependence on fossil fuels is to look at data about how carbon-intensive sectors are financed. We extracted data on large, syndicated loans by AMS entities from the Refinitiv database and categorised these according to the international Standard Industrial Classification of economic activities (SIC) to aggregate across high-carbon activities that include mining, some parts of manufacturing and the power sector. The data are partial and only cover large, syndicated loans, but they provide insight into the extent of carbon-intensive borrowing, its distribution across AMS, and the proportion financed by foreign capital. We sought to answer the following questions:

- How large are the debts to carbon-intensive sectors as a share of total borrowing and GDP?
- Do domestic or foreign investors supply money?
- Is this debt in the private sector or public sector?
- When are the loans and bonds scheduled for refinancing?

We looked at the data submitted to the central bank in Indonesia, the Philippines and Viet Nam. The results are given in Table 2 (page 11). These submissions do not disaggregate data beyond broad-brush industrial classification. This gives an indication of the size of the risk exposure but not the level of lending within the sector to transition away from fossil fuels. The data for bond issuance had even less industrial disaggregation.

The data from the commercial databases was at the individual deal level and used different proprietary industrial classification systems to tag each loan. However, the classification systems again either did not discriminate between energy-intensive sectors that were carbon neutral (like generation through solar PV) or carbon-intensive (like fossil fuel). The classification system did have suitable disaggregation in some cases, but it was misapplied.

Table 3 (page 12) aggregates the 1051 corporate loans extracted from the Refinitiv database. Because Refinitiv excludes many loans, the total lending for the three countries is lower than in ES1. There are also differences in classification, making the comparison between individual items difficult. These problems in comparison across data sources underline the importance of developing a taxonomy to allow comparison of climate risks on agreed and standardised definitions. A similar analysis was done on bond data from Bloomberg's commercial database. This was compared to top-down data on corporate bond issuance gathered by Asia Development Bank.

The databases contain other valuable fields, including the start date and tenor of loans and bonds, their currency, and the names of the lending banks in the case of loans. These allowed us to infer whether loans were domestic or overseas. The data on bonds discriminated between local currency issuance and foreign currency issuance. We also looked at the three largest entities borrowing money in each country. In Indonesia, these were state-owned; in the Philippines, they were private sector, and in Viet Nam, there was a mixed picture.

We find that:

- 1.** Carbon-intensive corporates raise more finance from bonds than loans, particularly Malaysia.
- 2.** Around a quarter of corporate bond issuance in the region is from carbon-intensive sectors.
- 3.** Approximately 50% of the loans within our dataset will need to be refinanced; this figure rises to around 60% by 2030 and 85% by 2035.
- 4.** Countries like Indonesia, whose bond market has been historically reliant on foreign investors, will need to consider how the decreasing institutional investor appetite for coal will impact their borrowing costs.
- 5.** For countries where fossil fuel-sector borrows locally, central banks must immediately consider how transition risks will affect investors balance sheet, as this may pose a substantial risk to the stability of the financial system.
- 6.** Therefore, central banks need to think about how these very large entities which are collectively borrowing about 15% of all credit in the country are going to be refinanced.
- 7.** The debt markets in ASEAN have high exposure to the fossil fuel industry. Net-zero climate transition strategies will become increasingly prominent in the financial sector and in countries worldwide. Financial regulators must be cautious of the risk that continued financing in this sector can create for their economies.

ASEAN central banks and taxonomies

Commonly used classification systems like government statistical offices' SICs or proprietary classification systems like BICS are ill-suited to discriminating between activities that pose transition risk and those that do not. In the ASEAN region, central banks are playing a leadership role in developing official taxonomies.

The ASEAN Taxonomy Board and the central banks of Malaysia - BNM, Singapore - MAS and Indonesia's regulator - OJK, have all released early iterations of their taxonomies. For these taxonomies to be helpful in assessing and managing transition risks, they would need to define not just sustainable ("green") activities but also non-sustainable activities ("brown") (for loans or use of proceeds bonds) and transition taxonomies to assess entity-level strategies to decarbonise a firm's operations. Such transition taxonomies are important for industrial sectors, like steel, where fully 'green' technologies are not viable or technically feasible, but where innovation and investment can introduce Paris Agreement aligned industrial processes.

To further accelerate this process, we recommend central banks:

- Develop taxonomies to help banks and other investors understand the transition risks from harmful "brown" activities. We would contend that to be decision-useful, definitions of "brown" should be expanded beyond activities that are already illegal and be applied to activities that risk being stranded.
 - Suggest entity level transition taxonomies to allow banks monitor if borrowers are developing, monitoring and on-track in delivering strategies to reduce their carbon risks in line with agreed targets.
 - Suggest green and transition taxonomies that are based on scientific advice to ensure they are sufficiently robust to deliver agreed climate goals.
- Help incentivise transition plans whilst operating within their remit by applying the taxonomies to encourage and ease the issuance of green bonds, transition bonds and other innovative financial instruments through asset purchase programmes or other policy purchases of assets. For example, in 2020, the ECB started accepting sustainability linked bonds as collateral.¹
 - Require financial institutions to make climate risk disclosures, using the definitions of green, transition and brown assets from the official taxonomy described above and setting out strategies to manage climate risks and the steer finance to firms mitigating these risks. These can follow the recommendations of the TCFD

1. Introduction

This report aims to increase the awareness of ASEAN financial policy decision makers and market participants about the threat posed by climate transition to commercial and public finances. We assess the financial risks stemming from a high dependence on fossil fuels by looking borrowing by carbon intense activities within the ASEAN region and how high carbon investment is financed. We have extracted data on large, syndicated loans by AMS entities.

The ASEAN member states (AMS) continue to demonstrate commitment to addressing climate change. The ASEAN State of Climate Change Report states that the region must enhance mitigation actions to aim for net-zero emissions as soon as possible in the latter half of the 21st century and to meet the global Paris Agreement goal of 1.5–2°C.²

To accomplish this, ASEAN will need to develop a transition management vision for how fossil fuel-related industries involved in mining, processing, power generation and material use can smoothly and inclusively transition to a new mode powered by low-carbon technologies, this is particularly the case regarding energy generation, which is a primary driver of the ASEAN’s climate footprint and a sector that is rife with climate-transition risk. Figure 1 below illustrates the composition of each ASEAN country’s electricity generation mix and the total production of electricity, showing that fossil fuels in particular coal and natural gas, are the primary sources of fuel for electricity generation for all countries except Cambodia and Lao PDR.

Not only does this configuration contribute substantially towards the ASEAN region’s overall carbon footprint, but, as this paper will show, it implies that many of the region’s energy utilities may face increasing financial pressures due to climate-transition risks. This report seeks to increase awareness among ASEAN financial regulators and decision makers about the potential threats to financial stability and economic growth posed by climate change and the global transition towards a low-carbon world. Our objective is to provide policymakers with credible arguments and market data about the looming transition risks in ASEAN. Our findings are targeted at ASEAN central banks and financial regulators and other financial market participants.

Borrowers and local financial institutions should be encouraged to begin developing ambitious and credible climate transition strategies so they can maintain their creditworthiness in a climate-changing world.

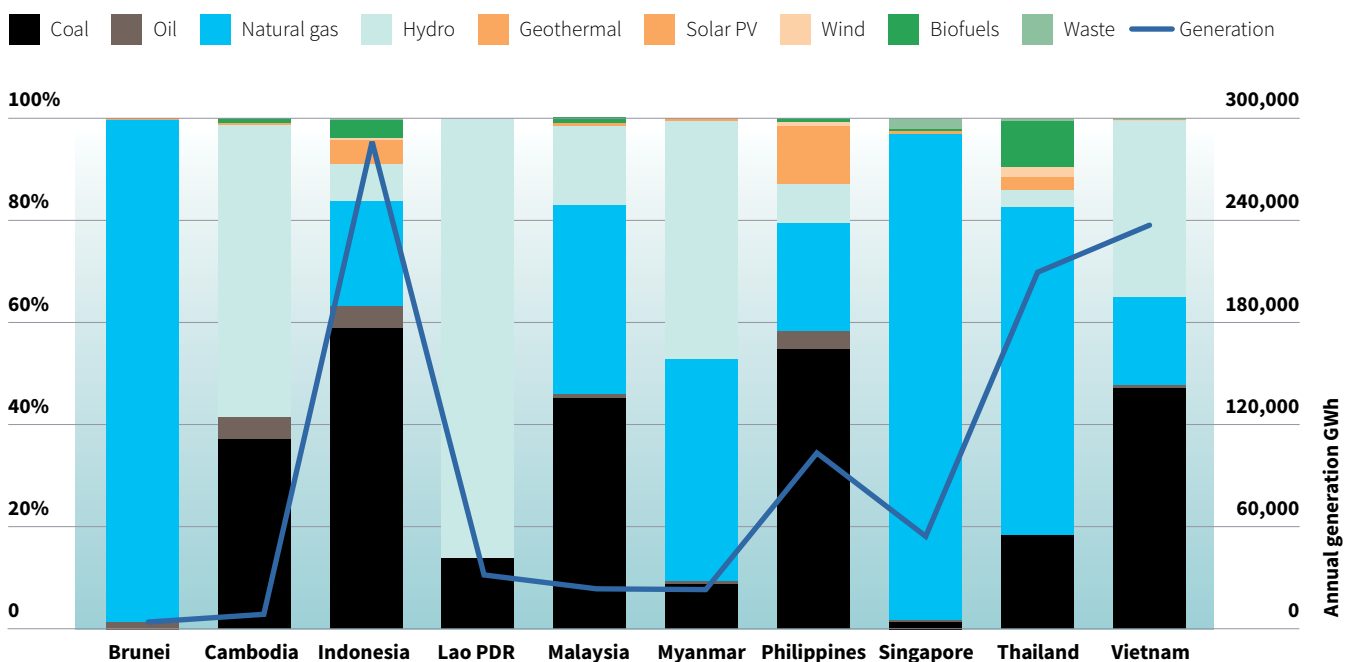
Motivating the relevant stakeholders to participate in this transition will require building more awareness about the risks and challenges the climate transition presents. We supplement our insights with some recommendations on how the ASEAN Taxonomy, along with monetary policy and prudential regulation, can help to reduce these risks.

Governments and the private sector are making efforts to end coal financing. Indonesia, Philippines, and Viet Nam have signed the COP26 Global Coal to Clean Power Transition Statement.

Indonesia has suggested that it could bring forward its phase out of coal-fired power plants to 2040 (from 2056) if it gets sufficient financial help from the international community to wind down and retire existing plants. With the support of the initiatives such as the Asian Development Bank’s Energy Transition Mechanism to help Asia transition away from coal, we have a chance to meet the Paris Agreement targets. Understanding the risks of not doing so, but also the challenges that will occur as this transition happen will be critical pieces of information for policymakers.

Chapter 2 of this document describes how transition and physical risks from climate change can transmit through the real economy to impact on financial stability. Chapter 3 illustrates how international and local risks might manifest in the ASEAN economies. Chapter 4 undertakes quantitative analysis of the borrowing and bond issuance in ASEAN economies to assess the extent of financial institutions’ exposure to transition risks. Chapter 5 discusses climate risk and weaknesses in the data could be addressed through developing decision useful taxonomies which AMS central banks and regulators are in the process of developing. These could better equip authorities and carbon intensive companies monitor and manage their risk exposures.

Figure 1: Fuel mix and totals for ASEAN electricity generation



2. Transmission of climate-related risks and impact on financial stability

Climate change manifests in the real economy either as physical risks: damage or disruption through extreme climate events or as transitional risks: in the form policy, technology development and sentiment changes as society transitions to a lower carbon economy. These can be transmitted into financial risks through the impacts on businesses and households and through their impacts on the macroeconomy. This paper is focused on transition risks where much of the early policy and modelling work has taken place.³

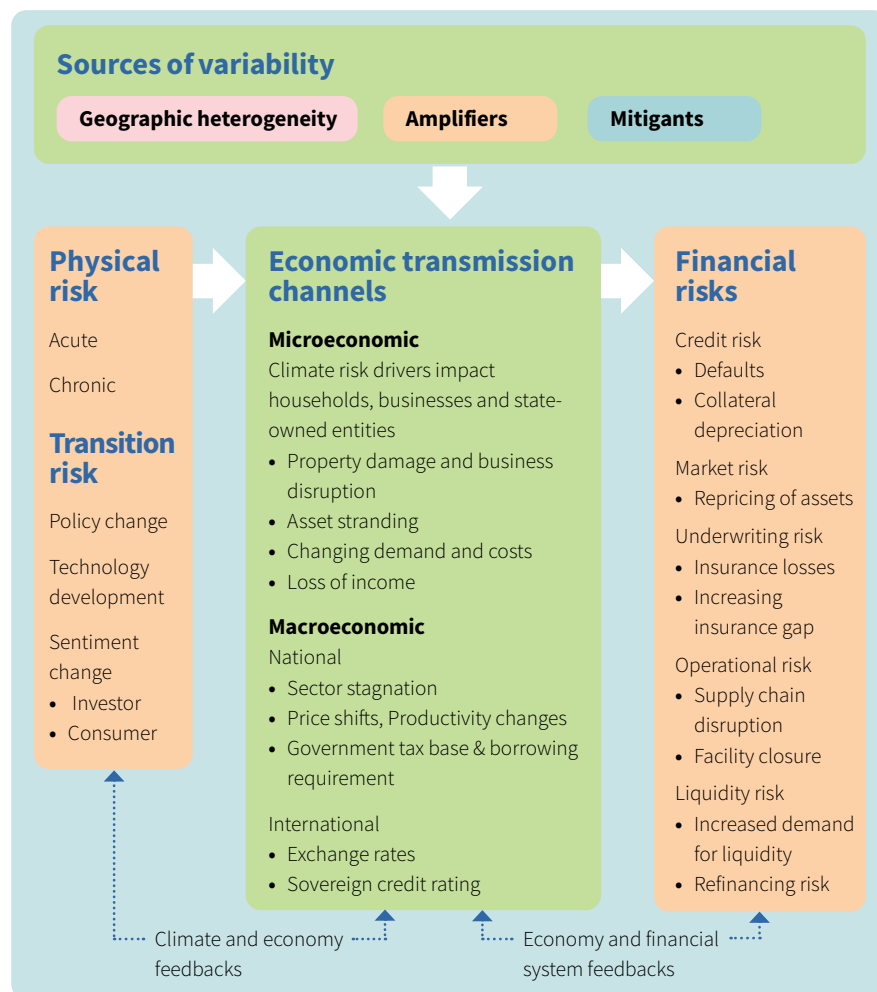
- Policy change can drive transition risk through introduction of carbon pricing, removal of fossil fuel subsidies, bans on certain technologies and so on. Speed of introduction can exacerbate the risks – sudden introduction of climate policies (such as in the NGFS disorderly transition scenario of late action), could create a financial shock in affected sectors, causing asset stranding and high cost of compliance.
- Technological development in renewable energy, energy storage, electrification and smart technology can reduce the market share or utilisation rates of electricity generators with higher marginal production costs including thermal power plants. As the cost of renewable technologies falls and the share of renewable generation capacity rise thermal power plants' economic viability will worsen.
- Changes in public sentiment can reduce demand for certain products, such as internal combustion engine (ICE) vehicles and meat. It can also lead to changes in investment, as retail investors and pension holders request greener investments and divestment from fossil fuels.

These three risk drivers are also closely interlinked, for example, technological development and price competitiveness of renewable energy is supported by policies such as feed-in-tariffs to bring costs in line with fossil fuel-fired power. Public sentiment can also drive technology uptake, with consumers willing to pay a premium on green products, and drive policymaking as the electorate demand environmental action.

Climate physical risks are also very important, especially in several of the ASEAN economies which are highly vulnerable to climate risks.

Figure 2 shows a stylised depiction of how physical and transition risks on the right-hand side of the diagram are transmitted through the micro-economy (households and businesses) and the macroeconomy (sector-level, changes in price and exchange rates, and credit worthiness of the sovereign). Impacts on microeconomic agents create financial risks for investors and lenders in stocks and corporate bonds, while impacts such as carbon pricing, productivity change and sovereign credit rating downgrade occur in the broader

Figure 2: Transmission pathways of climate-related risks



macroeconomy. These result in traditional financial risks such as credit and liquidity risks.

The extent to which transition risks result in financial risks depends on the real economy's vulnerability and on real economy-financial economy feedbacks like a worsening credit rating raising the cost of finance. Vulnerability is linked to the percentage of fossil fuels in the energy mix, level of international lending and investment and domestic banks' exposure to assets vulnerable to transition risks. Energy market structure can also make a significant difference. For instance, in countries where energy generation is rewarded by a regulated price based on a pre-agreed rate of return on investment ("regulated asset base" pricing of power) rather than whole energy market consumer rather than investors will bear the costs of transition risks.⁴

Risk transmission channels will also vary widely depending on a country's reliance on foreign investors – net fossil fuel exporters will have very different vulnerabilities to net importers who may find benefits from a global reduction in demand but will be highly exposed to price shocks. Similarly, foreign market exposure will impact how much risk can be transmitted through changes in

exchange rate and currency valuations. Transition risks are more likely to have an impact on financial stability when they are suddenly realised in the economy – for example a sudden removal of fossil fuel subsidies, however incremental changes can have an impact too. For example, increasing renewable energy installations, even if not seeming to account for a large proportion of the energy mix, can reduce the working hours required of a coal plant.⁵ This would impact profitability and pose potential default risk if profit margins are already tight, therefore posing a risk to the lender.

Transmission of risks to local banks will occur more through the microeconomy if fossil fuel assets are mostly privately owned, and through the macroeconomy if publicly owned. This is because reduced profitability of a state-owned energy company will directly reduce government revenue, increasing its borrowing requirements.

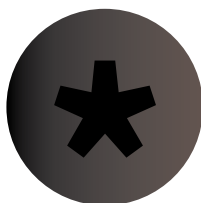
The interconnectedness of the global financial system means that financial risks can be transmitted globally, as seen during the Asian Financial Crisis and Global Financial Crisis. Economies are also exposed to transition risks, such as changes in investor sentiment, that materialise overseas.

3. Global and local drivers of transition risk

The ASEAN region is economically and culturally diverse and it is expected that the transition risks and impacts of climate change will not be distributed equally between the ASEAN nations. While all ASEAN nations are vulnerable to the impacts of climate change, the pathways for transition risk will be unique to each country.

ASEAN economies are exposed to a wide-range of global and local climate-related transition risks. The extent to which these risks impact a country will vary according to national characteristics and the configurations of local economies but will also be subject to the influence of policies such as carbon border taxes proposed in the EU and the changing sentiments of investors globally. Understanding these risks is the first step to managing them. This section highlights the global drivers of transition risk which are most likely to impact the individual AMS and the ASEAN as a whole.

Government policy presents coal-related market risk



The global coal industry is at a critical juncture.

In 2020, global coal demand fell by 4.4% as economies were shut down by COVID-19. The ensuing economic recovery resulted in a 9% rebound for coal-fired generation in 2021.⁶ In the short run, coal-dependent economies have benefitted from Asia's urgent need to ramp up power generation to rebuild their economies, and various geopolitical events have leaned favourably towards ASEAN's coal sector. For example, China's ban on Australian imports directly increased demand for Indonesian coal.

However, countries are sending strong signals about their transition strategies to meet the Paris Agreement objectives. Europe and the USA have already peaked their coal-based power generation. Despite the short-term gains from short-term recovery efforts, coal's share of the global power mix in 2021 was approximately 36% – 5 percentage points below its 2007 peak. There is a slow, but steady phase out of coal globally. China, which accounts for approximately one-third of global coal consumption, has announced its target to reach net-zero by 2060. China's Taxonomy for sustainable finance excludes investments in coal-based generation from its green infrastructure plans.

Fossil fuel exporters are expected to see declining demand as countries decarbonise their energy systems. The Inevitable Policy Response projects global fossil fuel use falling by as much as 60% and coal demand to fall 75% by 2050.⁷ The IEA has found that to limit global warming to 1.5°C,

there can be no new development of fossil fuel fields from 2021 and that unabated coal power must be phased out by 2040 and electricity generation to be net zero by 2040.⁸

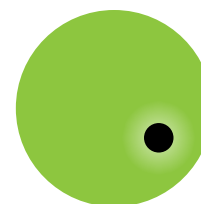
Countries will need to reconsider how they plan fiscal income and expenditure in an era of transition away from coal. Indonesia is a large fossil fuel exporter, exporting USD30.4bn of mineral fuels; mineral oils and products of their distillation; bituminous substances; mineral waxes in 2021. Its largest importer is China (USD11.4bn), which has set a net zero target of 2060.⁹

90% of ASEAN coal is exported by Indonesia, while 7% is exported by Viet Nam. Indonesia is the world's top exporter of coal, exporting 405 Mt in 2020,¹⁰ and China's largest overseas supplier. Coal is especially exposed to transition risks due to global coal-fired power phaseouts. The IEA predicts a 1.9% annual decline in global thermal coal trade over the next three years as China and India raise domestic production to reduce import reliance, and as the European Union, Japan and Korea reduce their coal-fired power generation.¹¹ Ultimately, global transition plans to meet the Paris Agreement will result in stranded asset risk as coal producers face shrinking markets.

The current war in Ukraine has seen widespread sanctions applied to Russia, and European/global attempts to rapidly reduce purchases of Russian energy exports. This may lead to an increase in demand for ASEAN fossil fuels - the EU has signalled that it needs to diversify its imports away from Russia. However, the situation is highly volatile and uncertain and, combined with long-term EU decarbonisation plans, cannot be relied on by fossil fuel exporters for long term economic security. The IEA's 10-point plan for cutting the EU's dependency on Russia does include ramping up LNG imports but does not include fuel switching from gas to coal, due to the emissions impact of such a move.¹² The EU's REPowerEU plan for independence from Russian gas before 2030 also includes diversifying gas supplies, but largely focuses on renewables and energy efficiency measures.¹³

Therefore, countries such as Indonesia that may experience windfall sales in the short term, should think about using these profits to diversify their economy, as the war is unlikely to slow decarbonisation trajectories.

Technological advancements create asset stranding risk



Asset stranding occurs when tangible and intangible assets are under-utilised or become prematurely obsolete due to the green transition or economic nonviability. Stranded assets are generally considered to be those assets which at some time prior to the end of their economic life (as assumed at the investment decision point), are no longer able to earn an economic return (i.e. meet the company's internal rate of return), as a result of competition from cheaper sources, changes associated with the transition to a low-carbon economy (lower than anticipated demand / prices).¹⁴

Fossil-powered countries will increasingly face stranded asset risks. In some markets, renewable energy facilities have become competitive against carbon-intensive energy assets, irrespective of supportive policy tools such as carbon pricing or command-and-control environmental regulation.¹⁵ For countries such as Viet Nam, building new solar PV could become cheaper than operating existing coal plants as early as this year.¹⁶

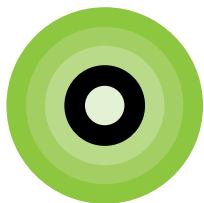
Power plants under construction and planned in Southeast Asia as of 2020 will more than double the region's fossil fuel power generation capacity. Southeast Asia's power sector emissions will increase by 72% from 2020 to 2030 and long-term committed emissions will double, if all fossil fuel plants under development are built.¹⁷

Moreover, in Indonesia, Viet Nam, and the Philippines, projected electricity generation from fossil fuel plants under development, combined with generation from renewable capacity targets and existing power capacity, will exceed future national electricity demand. As a result, fossil fuel plants will likely be underutilized and/or become stranded assets while also potentially crowding out renewable energy deployment.¹⁸

If the energy supply in ASEAN outstrips demand, curtailment will be expected. Curtailment in competitive electricity markets might leave coal power generators at risk of being underutilised and facing early closure. But in regulated market generators are often allowed a guaranteed rate of return on investment irrespective of whether the power company is only partially utilised and consumers pay the cost of stranded capacity. This, and the global shift away from coal will also have long-term implications for producing countries. Ultimately, technological changes may be considered by central banks as market and credit risk. Technological innovation that results

in a decline in renewable energy costs reduces the market share and pricing power of fossil fuel-fired power companies and other companies in the value chain. The reduced sales and profits of “brown” companies lead to decreased asset value (market risk) and/or higher default rates and loss given default (credit risk) for FIs.¹⁹

PPAs present liability risk which impedes the transition



Navigating the climate-transition will not be straightforward. Existing contractual arrangements and policies may pose frustrate the process. For example, power purchase agreements could pose a lock-in challenge for ASEAN nations. The reliance on long-term PPAs to support coal power investments, while historically helping to stabilise energy costs and supply, will also restrict the ability of governments to transition away from high-emissions coal assets without severe financial damage. Not only do PPAs on fossil fuels discourage renewable energy investment and increase the likelihood of a disorderly transition and such a transition’s associated risks, it also threatens financial stability.

Indonesia, Philippines and Viet Nam are the first targets of ADB’s energy transition mechanism, which aims to buy and retire high-emissions coal fired power. However, these countries have complex coal lock-in, with 66%, 58% and 83% of installed coal power under ten years old respectively and with a combined coal pipeline of 45GW. There is a danger that as older plants are retired, many plants will still enter the generation mix, backed by long term PPAs.²⁰ Therefore it is important that the risks posed by PPAs, long term offtake agreements and the investment pipeline is taken into account when exiting coal on the journey to net-zero.

Carbon price pose policy risk to credit and liquidity

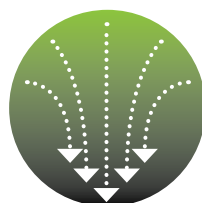


Carbon pricing is becoming an increasingly popular tool for capturing the negative externalities associated with carbon-intensive industries and processes. Governments around the world, including in the ASEAN region are at various stages of adopting carbon prices either through carbon taxes or emissions trading schemes.²¹ However the European Union has stated that there is a risk of carbon leakage as the means of production are transferred from the markets with carbon prices to other countries with weaker actions on emission reductions, or because products manufactured in countries with carbon prices, are replaced by more carbon-intensive imports.

If this leakage continues to persist, the EU has proposed a Carbon Border Adjustment Mechanism (CBAM), for selected sectors.²² The introduction of a CBAM compliant with World Trade Organization rules could significantly dampen the export competitiveness of local manufactures in the medium to long-term. The CBAM would impose a carbon price on imports equivalent to the price experienced by local producers in markets where carbon prices exist and would likely result in reductions in the competitiveness of exporting manufacturers in countries that have not internalized the cost of carbon.²³

Worse still, this transition risk is also particularly impactful, because unlike a local carbon tax or ETS, the revenue from the pricing is captured by the importing nation putting their local manufacturers on an equal footing. To mitigate this risk to the exporting country, exporting government will have to decide whether to introduce national carbon pricing or allow their exporters to face higher taxes when entering markets with existing carbon prices like the EU.²⁴

Investor sentiment risk constrains liquidity



ASEAN companies are dependent on international financial markets which are undergoing dramatic change in investor sentiment and behaviour. The transition risks mentioned above are increasingly driving institutional investors to reduce their fossil fuel exposure – the members of the Glasgow Financial Alliance for Net Zero (GFANZ) who account for USD130tn AuM, have made strong commitments to phasing out their investments in fossil fuels.²⁵

This is particularly the case for coal finance, where over 100 globally significant banks, insurers, asset managers and asset owners have announced coal divestment.²⁶ Indonesian and other ASEAN coal companies (coal mine owners, operators and coal-fired utilities) could increasingly face external financial constraints. Combined with falling demand, this could increase loan defaults, constraining balance sheets and creating liquidity problems.²⁷

Local fossil fuel companies that borrow from international lenders are likely to see an increasing cost of capital as demand for their bonds/equity decreases, or lenders demand higher interest rates. International banks have seen shareholder revolts over fossil fuel funding, with investor resolutions resulting in phase-out commitments – see the HSBC 2021 coal phase-out commitment which was prompted by shareholder action.²⁸

ASEAN nations may find it increasing difficult to finance their activities and/or face an increasing cost of capital, to the extent that they continue to rely on international capital markets to finance fossil fuel activities. This reflects an increasing trend among major international banks and other financial institutions towards of Environment, Social and Governance (ESG) investing, partly driven by increasing regulation. The principles laid out by the Task Force on Climate-Related Financial Disclosures (TCFD) in 2017 have been influential in forcing financial institutions to build capacity within organization to assess, measure and ultimately manage their climate physical and transition risks. Such disclosures are often voluntary but there is an increasing push to make these mandatory, spearheaded by the EU and China.

There are also moves towards greater standardisation of disclosures at an international level, which will increase the transparency with which firms report these risks and increase comparability across different markets for international investors. The International Financial Reporting Standards Foundation announced the formation of a new International Sustainability Standards Board (ISSB) at COP26 to develop a comprehensive global baseline of high-quality disclosures around climate and other sustainability issues intended to bring transparency, accountability and efficiency to financial markets around the world.²⁹ Retail investors are also putting pressure on financial institutions to offer green financial products, which do no environmental harm and meet climate objectives.

Credit Risk

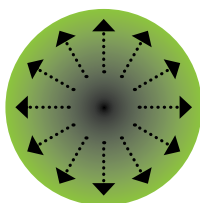


Fossil fuel exporters could also face significant creditworthiness risks which can be compounded by investors pre-emptively demanding a higher risk premium.³⁰ Cost of capital has consistently proven a barrier to growth in developing countries as lower credit scores place them at a disadvantage in international money markets. Climate-related risks are likely to exacerbate this. Physical risks have been shown to have increased cost of capital in vulnerable countries – by 117bp in the V20, costing USD62bn in higher external interest payments over 10 years,³¹ but transition risks will also have an impact as international lenders look to reduce their fossil fuel exposure.

ASEAN nations face financial related risks due to reducing investor appetite for fossil fuel assets and increasing costs of capital across the economy. These risks may appear on banks’ balance sheets as traditional financial risks such as credit and market risk.

Compounding of Risks to the Financial System

A growing carbon bubble



There are a number of financial risks to ASEAN countries arising from a continued dependence on fossil fuels in its energy mix, and which are likely to accumulate under a business-as-usual approach as regional energy demand increases driven by fast economic growth. The risk of a carbon bubble in the valuation of regional fossil fuel companies will increase. If investors believe that fossil fuel reserves and physical infrastructure can continue to be commercialised, the stocks of the underlying companies are likely to be overvalued - a so-called carbon bubble. This creates a risk that a step-up in climate policy or faster adoption of low carbon technology could lead to a sudden fall in the value of fossil fuel bond and share prices, and an increase in the proportion of non-performing loans.

Regional economic stability

At the ASEAN regional level, there is a direct risk to financial stability of these economies from non-performing loans and the value of financial assets held by banks and other financial institutions, particularly as ASEAN countries seek closer financial integration. In 2015, ASEAN countries adopted a regional ASEAN Bank Integration Framework (ABIF) to allow banks qualified in one member jurisdiction to operate freely in another. This is intended to promote an easier flow of capital between member countries to increase economic efficiency through economies of scale, network externalities and greater competition through the entry of foreign banks.

At present, larger private fossil fuel companies in the region rely on international capital markets which transfers the risk of stranded fossil fuel assets from the domestic banking system to international lenders. However, this could change going forward with a greater regional concentration of cross-border funding if regional banks are preferred over foreign banks. This also increases the potential channels of financial contagion so that stranded fossil fuel asset risks in one ASEAN country could pose a financial risk to domestic banks in another, and raise systemic financial risks in the region as a whole.

National economic stability

Fossil fuel exporters such as Indonesia are expected to see a declining external demand for fossil fuels, leading to loss of GDP, government revenue and export receipts. Whether it is a coal-fired power generator that is unable to compete with the falling cost of renewable energy, or the coal mine operator who faces a shrinking export market, the climate transition will increase the risk of asset stranding for firms in the fossil fuel industry.

This can result in further risk of NPAs on the balance sheets of both local and international lenders. It is expected that the capital available for these assets will shrink as international investors look to decarbonise their portfolios. Multilateral Development Banks (MDBs) have also publicly announced their plans to end coal investments. Local lenders (for example national development banks) that step in to plug the financing gap for coal assets will be left with stranded assets.

Increasing sovereign risk can affect the central bank and commercial bank balance sheets through several transmission channels which can lead to losses on government debt and a weakening of a bank's balance sheet. Higher sovereign risk reduces the value of collateral and central bank liquidity. Sovereign downgrades flow through to domestic bank ratings, increasing wholesale funding costs. Such impacts were seen in some nations following the Global Financial Crisis.³²

Credit rating and sovereign risk impacts will be felt across the economy. Countries with high fossil fuel exposure, may experience capital constraints across the economy, as investment appraisals will consider the country's sovereign risk.³³ This can pose a challenge to financing the transition, given the scale of investment needed to finance renewable energy development, electrification etc.

Sovereign borrowing costs

For some ASEAN countries, the state is heavily involved in the ownership and development of fossil fuel resources and there are implications for sovereign bond ratings. For example, in Malaysia, state-owned Petronas controls and develops the country's oil and gas reserves. It has generated 20% of Malaysian government revenue in the past three years, and generates substantial foreign currency earnings through oil and gas exports. In Indonesia, state-owned PLN, has a monopoly over electricity generation and supply the majority of which is coal based. For these countries, there could be an increase in the risk premium attached to their sovereign debt, reflecting climate risk considerations and/or the willingness of other governments and private investors to hold these assets. In fact, the 20 sovereigns with the highest ratio of net fossil fuel exports to GDP suffered a median net downgrade of 1.6 notches 2015-2020 and two defaulted. Fitch Ratings' Sovereign Rating Model suggests a fall by one notch by 2040 and two or three by 2050 for a major oil exporter.³⁴

For example, Australia was warned by government advisers that if it did not adopt a net zero strategy, its cost of borrowing could increase significantly. They predicted that the country's cost of capital could increase 100 basis points in an adverse climate-change scenario without a net zero strategy.³⁵

A report by Fitch Ratings finds that climate change stranded-asset risk is material for sovereign creditworthiness and ratings. The impact could be higher for some sovereigns in the event of additional shocks such as financing stress, devaluation or political instability, or lower in the event of strong fiscal consolidation and/or successful economic diversification. Although Fitch Ratings has not yet downgraded any country's Sovereign Rating based on climate change stranded-asset risk, or broader transition risks, it does expect that such risks will lead to more ratings changes as and when the effects of physical and transitional risks of climate change become clearer, closer and more material. For countries dependent on international investors this will become increasingly important over time.³⁶

Sources of vulnerability will vary between ASEAN economies. For example, losses by state-owned fossil fuel companies, will result in direct government revenue losses, whereas in countries where the risk sits with the private sector, risk transmission will occur through loan defaults and loss of value of private sector assets. This will determine the central bank response. When vulnerability is concentrated in the public sector, the central bank will need to assess its government bond exposure. When it is concentrated in the private sector, the central bank may more easily reduce its exposure to the risk – changing risk weightings or capital requirements on fossil fuel assets.

A number of central banks have highlighted that climate risk and impacts will be considered in their investment decisions alongside standard criteria of liquidity, credit risk and return considerations. For example, in September 2021, the Bank of Finland announced a goal of carbon neutrality by 2050 for its investment activities, which will involve restricting investments in fossil fuel companies, and hinted that the goal extends to sovereign debt purchases for their foreign exchange reserve fund.³⁷ This increases the risk of higher sovereign risk premium attached to the debt of countries that are not seen to be aligning their growth strategies with their Paris Agreement commitments.³⁸

4. Quantitative analysis of loan and bonds data

In chapters 2 and 3 we argue that as ASEAN countries and the world transition to a low carbon energy system, fossil-fuel companies will become vulnerable to climate transition risks and have negative consequences on their creditors. This chapter examines the scale and nature of this issue.

Energy is a strategically important sector; in some countries, notably Indonesia, governments have taken a large direct stake in the sector. Hence any climate transition risks might sit on the government's balance sheet through implicit or actual guarantees. Transition risks will often crystallise when the loans or bonds mature and the company seeks refinancing. This is when investors re-evaluate whether and at what price it offers finance.

The chapter undertakes quantitative top-down and bottom-up analysis of loans and bonds data. This seeks to answer the following questions:

- How large are the debts to carbon intense sectors as a share of total borrowing and GDP?
- Is money supplied by domestic or foreign investors?
- Is this debt in the private-sector or public-sector?
- When are the loans and bonds scheduled for refinancing?

	GDP 2020 (USD bn)	Ownership of fossil-fuel sectors	Fossil-fuel trade balance
Indonesia	1,059	Public ownership	Exporter of coal, oil and gas
Philippines	362	Private	Importer of fossil fuels
Viet Nam	272	Mixed public and private	Importer of fossil fuels

A more detailed analysis of three countries, Indonesia, Philippines, and Viet Nam, provides a flavour of how climate transitions risks manifest in countries with markedly different sizes, patterns of government ownership and share of energy in their exports. The table above summarises these differences.

This chapter includes results of analysis of loans and bonds data. The analysis uses:

a. top-down data on the total lending obtained from i. Bank for International Settlements (BIS), ii. central banks and iii. Asia Development Bank's (ADB's) publication Asian Bond Monitor, and

b. bottom-up, deal-level data from public databases: corporate loans from Refinitiv-Eikon and bonds issued by energy intensive sectors from Bloomberg.

The top-down and bottom-up data both have strengths and weaknesses. Top-down data gives a complete and up-to-date picture of overall picture of lending and issuance. However, there is little sectoral disaggregation, so it is not possible to discern exposure to transition-vulnerable assets. These data provide little insight into how much is lent to say, renewable vis-à-vis fossil-fuel power producers. But it does provide context about the materiality of observed exposures to carbon-intensive sectors.

The bottom-up deal level data uses information gleaned from individual loans and bond issuances. But the picture is incomplete as the Refinitiv database only captures large or syndicated loans. This is particularly an issue in sectors where individual loans are small such as agriculture. A second weakness is the database captures the sum originally borrowed, not the outstanding balance. Overall, the loans data probably overstates the amount of money still owed for individual transactions but understates the number of transactions.

Bloomberg focuses on bonds that are listed on public exchanges and tend to have weaker coverage of countries with substantial private placements. We only extracted data for carbon intensive corporates.

Aggregate lending to, and bond issuance by the ASEAN corporate sectors

Figure 3 shows the distribution of USD783bn non-government outstanding bond issuance across the major ASEAN economies.³⁹ This comprises USD524bn local currency and USD258bn foreign currency bonds (there were incidentally USD1,288bn of government bonds outstanding at the end of 2021). Malaysia and Singapore are the largest regional issuers of bonds. Local currency bonds predominate, except in Indonesia where the local currency bond market is underdeveloped.

Figure 4 shows the same economies' banks provided USD1,745bn of credit, over twice the amount of corporate bond issuance. All the countries, except Malaysia, rely much more on bank credit than bond issuance to provide corporate credit. We excluded lending to financial corporations from the lending data, but it is included in the bond data.

Figure 3: Local and foreign currency outstanding corporate bonds at Q3 2021

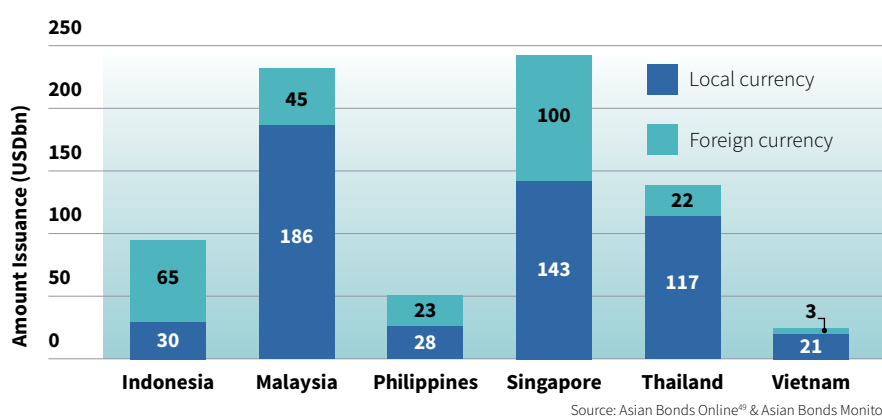
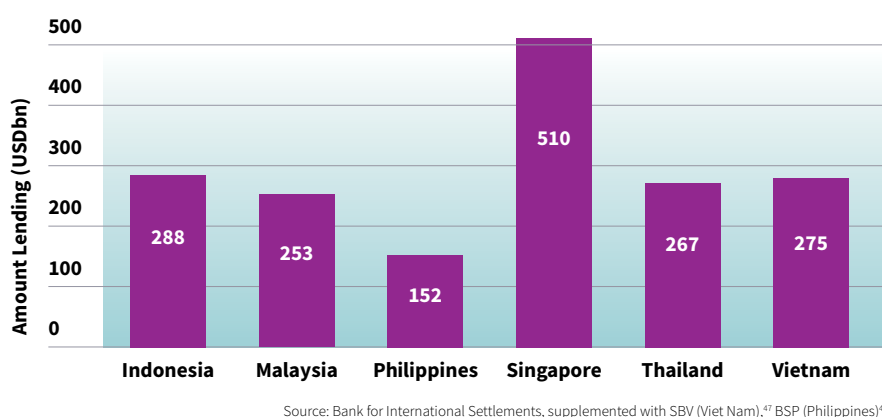


Figure 4: Lending to non-financial corporates in major ASEAN economies, Q2 2021



We made a top-down assessment of the outstanding bank lending as reported to the national central banks to obtain a more detailed industrial breakdown than could be gleaned from the BIS data. Data had a good level of industrial disaggregation in Indonesia and Philippines, but little disaggregation in Viet Nam. Table 1 summarises the findings for the three countries of focus. Indonesian data reported loans in Indonesian Rupiah and FCX. This showed a radically different pattern across sectors with 76% of outstanding debt to mining, 57% to electricity and gas supply being in foreign currency. For the other sectors only around 10% of lending was in foreign currency. The total lending to Indonesian broad-brush carbon intensive sectors was around USD124bn at the end of 2021, USD57bn for Philippines and USD132bn in Viet Nam. This provides a useful check against the deal-level bottom-up data described later.

Bottom-up data extracted from databases

Table 2 sets out information about the loans and bonds that were extracted from the two databases. These are only a subset of total debt in the economies for the reasons given. Loans recorded in Refinitiv represents around 20% of bank credit. Bonds in Bloomberg represent 25% of bond issuance.

It is hard to draw any firm conclusions when comparing Table 1 - which aggregates across the 1051 corporate loans extracted from the Refinitiv database, with the two top-down data-sources depicted in Table 2 - the data banks submit to their supervisor, and Figure 4 data submitted by the AMS to BIS.

Table 1: Outstanding lending to carbon intensive industrial sectors in December 2021 (USDbn)

	Indonesia	Philippines	Viet Nam
Agriculture, Forestry & Fishery	30	5	35
Mining and Quarrying	9	1	
Manufacturing Industry	63	23	85
Electricity and Gas Supply	10	22	
Transportation and storage	12	7	12*

*lending to Viet Nam 'Transportation and storage' also includes telecoms

Sources: Bank of Indonesia, BSP, SBV, exchange rates from xe.com

Total lending from the Refinitiv database is much lower for the three countries than the banks submit to their supervisor in Table 2. There are also differences in classification systems making comparison between individual rows difficult. This underlines the importance of developing a taxonomy to allow comparison of climate risks on agreed and standardised definitions. We therefore make only minimal comparisons across different datasets in the analysis below.

The two databases use different industrial classification systems to categorise individual transactions. These are applied at the 'entity' level and classify the issuer or borrower rather than the purpose of the deal. The Bloomberg data set uses a two-level BICS and its own proprietary four-level BClass system. We used BICS level 2 classes to assign issuers as either Brown or Green. The Brown sectors included industries like 'Airlines' and 'Integrated oil'. The Green sectors comprised 'renewable energy' and 'waste and environmental services'.

The Refinitiv database categorises borrowers using four-level SIC, NAIC and its own proprietary 'sector' class. Many of the renewable energy loans were misclassified so it was not possible to aggregate green lending. The level 3 SIC classification was used to identify brown sectors. The codes are listed in the Annex. In practice, the Refinitiv data was better classified for our purpose, and it was easier to identify the 'brown' economy. Because of misclassifications of individual deal level records neither database was suitable for identifying pure-play green companies.

The full list of our definitions of green and brown is given in Annex 1.

Table 2: Aggregate data on large corporate debt, values in (USD bn)

Country	Refinitiv loans		Bloomberg bonds (by carbon intensive sectors)	
	Number	Value	Number	Value
Brunei Darussalam	2	0.4		
Cambodia	3	0.1	2	
Indonesia	228	76	440	51
Lao PDR	21	6	24	1
Malaysia	105	38	1,217	79
Myanmar			1	
Philippines	64	20	298	13
Singapore	398	140	103	15
Thailand	129	24	378	38
Viet Nam	101	34	69	1
Grand Total	1,051	338	2532	198

Source: Authors' analysis of the Refinitiv and Bloomberg datasets

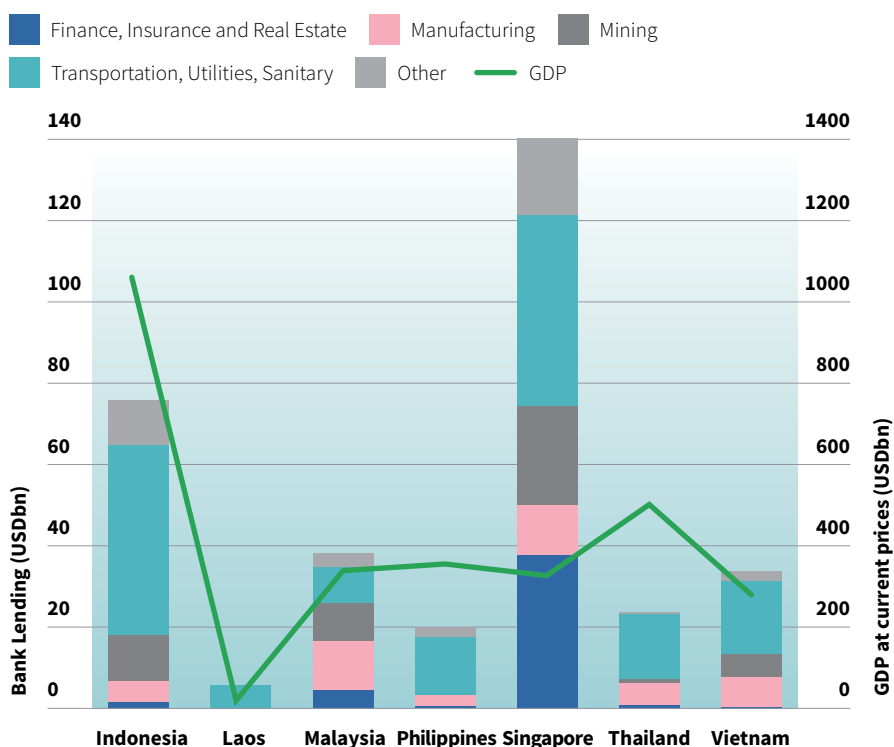
Borrowing and bond issuance of the carbon intensive sectors

Figures 5 and 6, drawn from our bottom-up analysis, show the value of corporate loans and bonds extracted from the database relative to GDP across the ASEAN economies by broad level 1 BICS and SIC classification.

Figure 5 shows recorded bank lending to corporates is large as a share of GDP in Singapore, Viet Nam and Malaysia. Singapore has by far the largest value of corporate loans, almost double the next highest, Indonesia. Across ASEAN, 'Transportation, Communication, Electricity, Gas and Sanitary Services' is the largest borrower receiving USD158bn of the USD338bn lending; the mining sector receives USD51bn of lending, the second highest sector.

Table 3 looks at the quantity of lending to carbon-intensive ("brown") sectors as set out in the Annex in the major ASEAN countries and contrasts it with all other 'large corporate loans' recorded on the database. Across the region, 47%, USD159bn out of USD338bn, of the large loans are to energy intensive sectors: 25% to the utilities, 19% to fossil fuel extraction and production. This varies significantly between countries with 79% of Singapore credit to non-carbon intensive activities and at the other extreme one third of Vietnamese and all of Laos's lending to non-energy intensive activities. Malaysia is unusual in the high level of exposure to fossil-fuel production 40% of corporate bank lending.

Figure 5: Corporates loans* by broad sector



Compared to the total corporate lending as reported to the central bank (identified in Figure 4) lending to carbon intensive sectors is 16% in Indonesia, 10% in Philippines and 9.5% in Vietnam.

The total lending to energy intensive sectors identified in Refinitiv is USD159bn which is lower than the USD198bn bond issuance identified from the Refinitiv data. This suggests that bond investors (in international currency) are bearing a high level of transition risk.

Table 3: Bank lending to carbon-intensive sectors (USD bn)

	Indonesia	Lao PDR	Myanmar	Philippines	Singapore	Thailand	Viet Nam	TOTAL
Agricultural Production- Crops	0	0	0	0	0.3	0	0	0.3
Chemicals and Allied Products	0.5	0	1.8	0	0	0.9	3.2	6.4
Coal Mining	4.6	0	0	0	0.1	0.2	0.8	5.7
Electric, Gas, and Sanitary Services	34.5	5.7	2.8	12.1	4.5	9.5	14.7	84
Oil and Gas Extraction	5.2	0	9.2	0	23.8	0.7	4.9	43.9
Petroleum Refining and Related Industries	0	0	9.9	2.5	0.5	0.1	0	13
Pipelines, Except Natural Gas	0	0	0	0	0	0	0.5	0.5
Primary Metal Industries	0.3	0	0.1	0	0	0.3	1.8	2.4
Stone, Clay, Glass, and Concrete Products	2	0	0	0.3	0	0.2	0.2	2.8
Total Energy Intensive	47	5.7	23.9	15	29.2	11.9	26.1	159
Other loans on Refinitiv database	29.1	-	14.4	5.4	110.6	11.7	7.7	179

Figure 6 shows how the USD197bn of bonds issued from the region was split by country and BICS sector. Malaysia (USD79bn) is the largest issuer followed by Indonesia (USD51bn) and Thailand (USD30bn). Data for Viet Nam and Philippines cannot be relied upon as there the size of issuance was missing for three-quarters of the bonds listed in the database.

Combining results from the Bloomberg bottom-up data and the Bonds online top-down data, bond financing by energy intensive companies of USD 197bn represents around a quarter of all the USD783bn corporate bonds issued in the region.

Can ASEAN debt be refinanced?

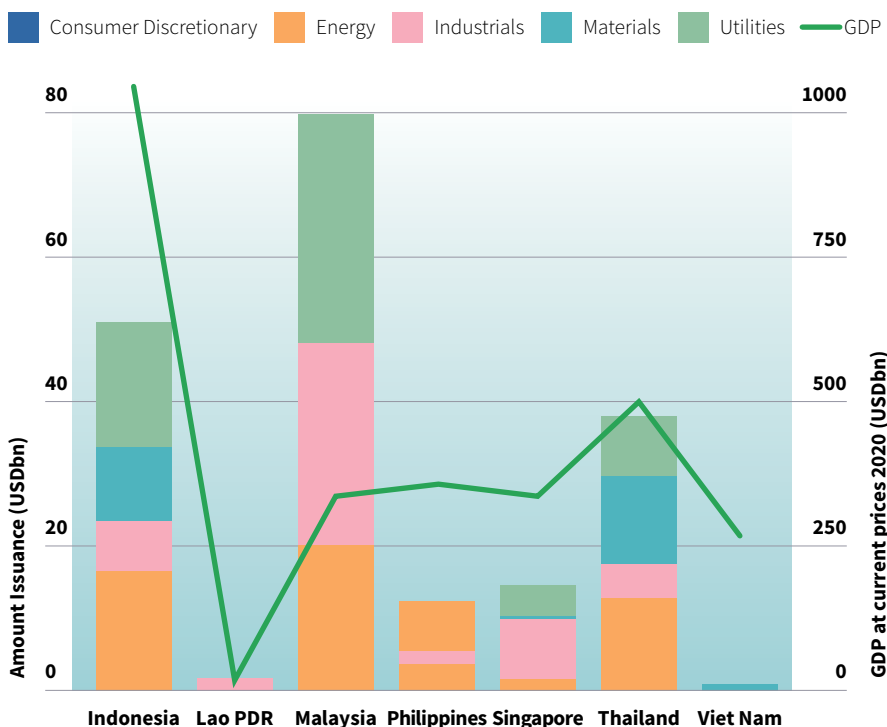
Loan and bond financing for constructing long term infrastructure assets like power stations, mines and energy production is of much shorter duration than the life of the assets. The loans will need to be refinanced or rolled over. Accessing funds to refinance represents a 'network risk' since if the sentiment for investing in the class of asset has changed, the borrower may face very different terms and conditions.

To understand if this is a risk, we need look at whether the funding for corporate borrowing is sourced locally or internationally, whether the lenders are likely to be willing to refinance the debt and timing of refinancing.

Loans

Figure 7 shows that, except in Thailand, most of the large corporate loans in ASEAN are in foreign currency, chiefly USD at 61% and just 31% in local currency. In many ASEAN countries, the domestic banks are small and lightly capitalised and do not have the balance sheets to make large corporate loans.

Figure 6: Outstanding carbon intensive sector bond issuance and GDP



Over 100 banks are named in the loan documents as arranger, sole lender or participant. The most commonly named, ranked by frequency, were Kasikornbank Public Co Ltd, Bank of Tokyo-Mitsubishi UFJ Ltd, BNP Paribas SA, Bank of Ayudhya Ltd, Australia & New Zealand Banking Group Ltd (ANZ), Japan Bank for International Cooperation, Bank of China Ltd, DBS Bank Ltd, Export-Import Bank of Korea and CTBC Bank Co Ltd. Of these, only three of these are headquartered in the region. Several of these

international banks have signed up to UNEP's net-zero banking alliance and will be under pressure to cease lending to fossil fuel projects from their stakeholders.

Data on the duration of the loan was available for 923 of the 1051 loan records. The average tenor of loans is 9 years. Loan tenor ranges from 6 years in Singapore (where almost half of borrowers were in the business sector) to 10 years in other countries. The average tenor of all the loans is 11 years, and 14 years for loans to infrastructure.

Figure 7: Proportion of bank lending in different currencies

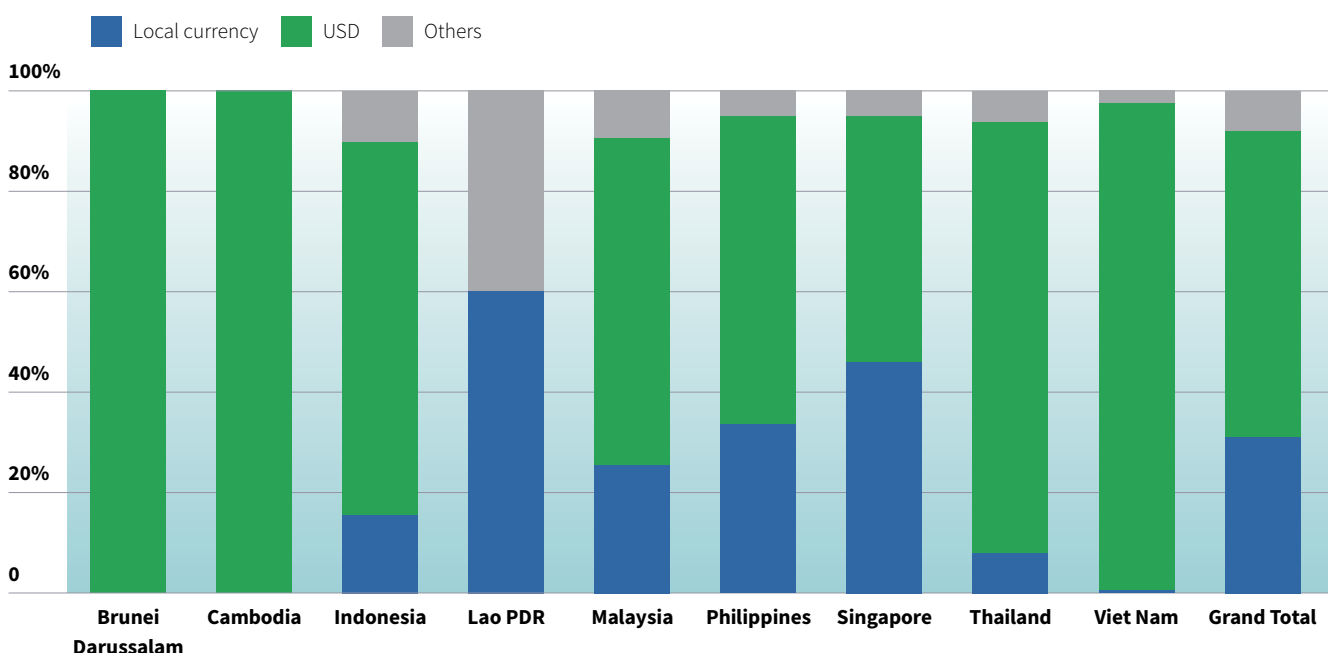


Figure 8: Value currently outstanding energy intensive sector loans by maturity year

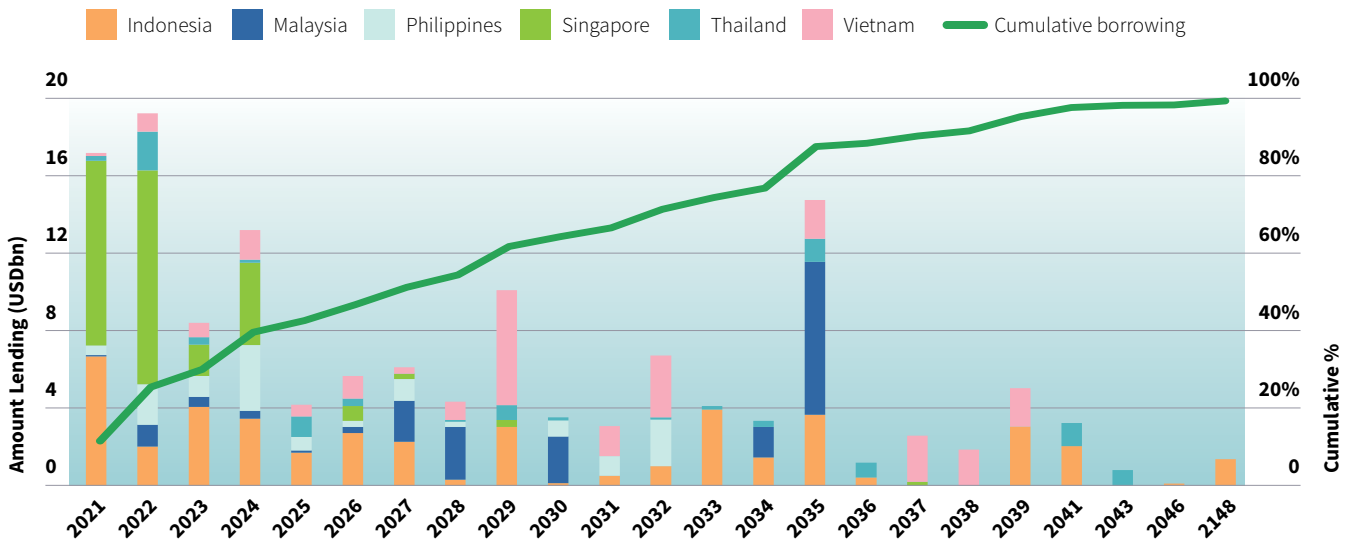


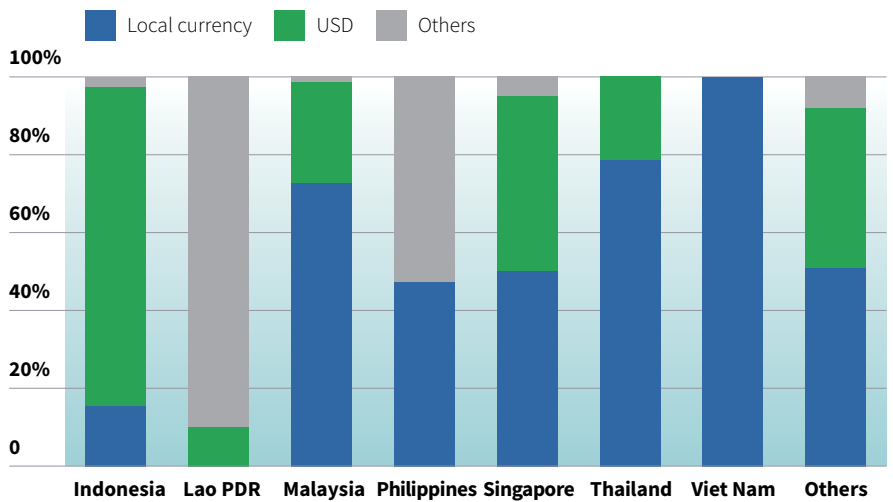
Figure 8 shows that around half of energy intensive sectors loans are due for refinancing by 2027, and 75% by 2034. Only 115 of the 396 loans to infrastructure have maturity dates beyond 2030; 119 of these loans mature by 2025.

Bonds

The corporate bond markets of several countries make much greater use of local currencies, especially Malaysia, Viet Nam and Thailand. The corporate bond markets outside of Malaysia are quite small and the average size of bond USD89mn well below benchmark size for international investors. As we see in Figure 3, except for Indonesia, bonds are most commonly issued in local currency. According to Asia Bond Monitor,⁴⁰ more than 90% of local currency bonds are purchased by domestic investors and so any climate risks are held locally.

Figure 9 shows that by 2027 around half the outstanding bonds issued by energy intensive companies will need to be refinanced, and 75% by 2030. This is true across all the major ASEAN countries.

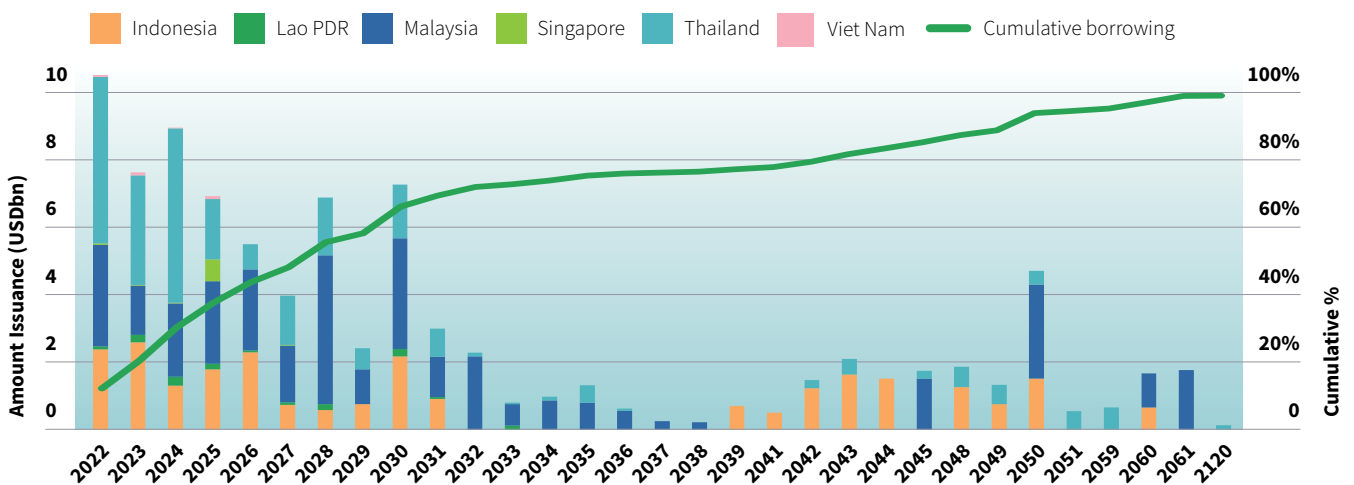
Figure 9: Currency of outstanding carbon intensive corporate bonds



The average tenor of the bonds is 10 years, and this is skewed by Malaysia's average of 12 years. In all other countries the tenor is fewer than 10 years. Altogether, only 20% of the bonds had maturities beyond 2030, and about 50% beyond

2025. Most issuers will need to refinance their borrowing within eight years. Since many of these bonds are held domestically, this could pose a significant risk to financial stability.

Figure 10: Value currently outstanding carbon intensive sector bonds by maturity year



Major borrowers in target countries

Loans

Table 4 lists the corporates that are the three largest borrowers in three ASEAN countries.

In Indonesia, many of the borrowers are either special purpose companies or Joint Ventures of the state-owned electricity and oil companies Perusahaan Listrik Negara (PLN) and Pertamina that play such a central role in the Indonesian economy. PLN has secured a USD500mn green loan to fund hydro and geothermal development from international banks guaranteed by the World Bank's guarantee agency⁴¹ showing a foreign investors appetite for a transition narrative backed by on the ground investment. Both SOEs have put out a transition roadmap but are still largely reliant on coal technology or gas as a transition fuel.

Indonesia's biggest corporate borrower – with USD14.3bn of loans - is the state-owned integrated electricity utility PLN which monopolises the distribution of power. It operates 40 GW of (mostly coal-fired) power stations but plans to stop building new coal plants in 2023. Much of the existing generation capacity is underutilised. Customer tariffs are subsidised by the government so risks of stranding sit with the public. The next two largest biggest corporate borrowers are public-private partnership entities that build and operate Indonesia's coal fired plants: Indo Raya Tenaga (USD 4.6bn) and Bhimasena Power Indonesia (USD3.4bn). Such state owned enterprises' usual investors are pension funds, sovereign wealth funds, insurers and banks from within southeast Asia. If western financial institutions exit coal finance there may be a systemic risk of stranded coal assets⁴². Indonesia's state-owned oil and gas producer Pertamina borrows USD4.5bn. Many smaller companies operate Indonesia's coal

Table 4: three largest corporate borrowers in three ASEAN countries

Country	Company	Loans (USD bn)	Sector	Ownership
Indonesia	Perusahaan Listrik Negara (Persero) Pt	14.3	Power	State
	Indo Raya Tenaga Pt	4.6	Power	SOE
	Pertamina (Persero) Pt	4.5	Oil	State
Viet Nam	Nghi Son Refinery And Petrochemical LLC	4.9	Oil mid-stream	25% State; 75% private
	Long Son Petrochemicals Co Ltd	3.2	Petro-Chem	Private
	Viet Nam Electricity (EVN)	3.1	Power	State
Philippines	Petron Corp	2.4	Oil	Private
	Atimonan One Energy Inc	2.2	Power	Private
	SMC Consolidated Power Corp	1.3	Power	Private

mines. Independent assessment suggests these coal mines face a large debt maturity wall in 2022 and lacked clear refinancing plans.⁴³

In Philippines the largest borrower is the private sector oil refining and distribution company Petron Corp at USD2.4bn. The next two largest borrowers are the private electricity utilities Atimonan One Energy Inc (USD2.2 bn) and SMC Consolidated Power Corp (USD1.3bn). Power Sector Assets and Liabilities Management Corp (PSALM) borrows USD1.1bn and is a government owned non-bank financial corporation established to manage the privatisation of National Power and the orderly management of the debt taken to finance its losses.

In Viet Nam the largest borrower is Nghi Son Refinery and Petrochemical LLC (USD3.2bn) which is part-owned by the government owned PetroViet Nam. Long Son Petrochemicals Company Limited (LSPCL) is externally owned by the Siam Cement Group (SCG) of Thailand. Viet Nam electricity is the government owned vertical

electricity provider. Many of the planned new coal plants have been cancelled or postponed. There are several independent, foreign owned power generators that develop and run thermal or solar plants. These are also substantial borrowers, for instance Van Phong Power Co under-construction 1.3 GW coal-fired plant has borrowed USD2.0bn. These developments are being challenged by the government's policy of switching from thermal plant to solar and wind - Power Development Plan 8. This policy aims to increase the share of renewables to 47 percent by 2030.

Bonds

For the three focus countries we looked at some of the largest fossil fuel issuers:

Indonesia's largest issuers of bonds are the government owned oil and gas producer Pertamina (USD14bn) and Asahan Aluminium Persero (USD5bn), a state-owned aluminium smelter with associated hydropower production.

Table 5: Bond issuance by fossil-fuel intensive sectors in the major ASEAN economies (USDbn)

	Indonesia	Lao PDR	Myanmar	Philippines	Singapore	Thailand	Viet Nam	Total
Airlines	-	-	-	-	-	-	0	0
Automobiles Manufacturing	-	-	-	0	-	-	0	0
Chemicals	2	-	-	0	0	5	-	7
Construction Materials	0	-	-	-	-	7	-	7
Exploration & Production	3	-	1	-	-	2	-	6
Integrated Oils	14	-	14	-	-	4	-	32
Metals & Mining	7	-	-	-	-	0	0	7
Oil & Gas Services & Equipment	0	-	3	-	2	0	-	5
Power Generation	1	1	18	5	1	5	-	31
Refining & Marketing	-	-	1	4	-	6	-	11
Grand Total	26	1	37	9	3	30	0	95

In Philippines, SMC Global Power Holdings USD4.2bn, San Miguel Corporation and Petron (the country's oil refining and marketing company, controlled by SMC) are the three largest issuers. SMC is a vertically integrated power company with 2,200 MW thermal coal and gas plants and 345 MW hydroelectric power. It is discontinuing its planned construction of three further coal fired plant following the government's ban on greenfield coal projects. The fourth largest issuer Aboitiz Power Corp is a power generator and distributor which is seeking to rebalance its generation portfolio to half thermal, half renewable by 2030 and is investing heavily in solar PV.⁴⁴

In Viet Nam there is no significant issuance of corporate bonds listed on the database. However, AsianBondsOnline data shows corporate bonds outstanding in February 2022 to be USD27.44bn.⁴⁵ This resource does not give issuer details.

Outside of the three main countries of interest, Malaysia has a well-developed corporate bond market. Its biggest issuer is the government owned Petronas Capital Ltd (USD13.75). There are also some major power company issuers, including Sarawak Energy (USD 3.3bn) a thermal power provider, Sarawak Hydro (US 1.4 bn) and Jimah East Power Sdn Bhd (USD2.1bn) a 2,000 MW coal fired power station. The company is owned by the state of Sarawak and serves the state's population.

We also sought to identify the amount of borrowing by pure-play green companies that were solely engaged in low carbon activities like renewable power generation. Across the ASEAN countries, USD3.4 bn was lent to such companies, these were chiefly hydropower generators in Lao PDR (USD2.7bn), Viet Nam (USD0.36 bn) and Indonesia (USD0.26bn).

ASEAN bond investor populations also vary significantly between AMS. Asia Bond Monitor data finds that foreign investors are significant holders of Indonesian, Malaysian and Thai bonds. However, local currency bonds issued Viet Nam and Philippines governments see limited foreign investment.⁴⁶ This suggests that Indonesia may be more exposed to international investor sentiment and divestment risks than Viet Nam and Philippines. However, domestic investors, particularly pension funds and insurers, may also be greening their investment strategies.

Key findings

The overview of industrial disaggregation of lending and bonds data shows:

- Carbon intensive corporate raise finance more from bonds than loans across the region, and particularly Malaysia.
- Around a quarter of corporate bond issuance in the region is from the carbon intensive sectors.
- 62% of lending is to large corporates is to carbon intensive Mining and Utility, Transport sectors.
- The figure is higher in Indonesia (76%), Philippines and Viet Nam (both 71%) and lower in Malaysia and Singapore.
- Loans are largely issued in foreign rather than the local currency. Thailand is the exception where two-thirds of borrowing is in local currency.
- Across the region the bond market is half in local currency (51%) and half in foreign currency, though this picture varies substantially between countries; for instance, in Indonesia over 80 percent of bond issuance is in USD.
- In Philippines the largest carbon intensive companies are private sector; in Indonesia they are government owned and in Viet Nam there is a mixture.
- Within the next four years, approximately 50% of the loans within our dataset will need to be refinanced, this figure rises to approximately 60% by 2030 and 85% by 2035.
- Countries such as Indonesia whose bond market has been historically reliant on foreign investors will need to consider how the decreasing institutional investor appetite for coal will impact their borrowing costs.
- For countries where fossil fuel-sector borrows locally, central banks must immediately consider how transition risks will affect investors balance sheet, as this may pose a substantial risk to the stability of the financial system.

5. ASEAN central banks, taxonomy development and reducing climate transition risks

This report identifies the sources and transmission mechanisms of transition risks that operate in the ASEAN region. The post-COVID-19 surge in energy prices, and the region's growth in electricity demand to an extent masks longer term secular trends away from fossil fuels globally. But the fall in demand for fossil fuel is likely to manifest over the coming years.

The region is currently highly dependent on fossil fuels for electricity generation and has one of the world's youngest fleets of fossil fuel power plant. Many more plant are in construction to meet growing electricity demand. This means that these long-lived assets are likely to remain on balance sheets after the world has largely decarbonised posing transition risks to investors in the fossil fuel supply chain.

A rapid diversification away from coal in power generation is necessary to reduce the transition risks facing ASEAN economies. The Philippines has already made strides towards the transition by banning greenfield coal power. As we see in Chapter 4, loans to carbon intensive sectors account for between 9.5% of corporate lending in Viet Nam and 16% in Indonesia. We also note that many of these carbon intensive sectors depend on foreign banks or government to supply them with capital.

Can taxonomies be help investors steer finance to encourage sustainability through green bonds and green loans? Can they also help foreign investors, under pressure to green their portfolios, identify suitable investments? Can they help large fossil-fuel companies finance their strategies to decarbonise their assets by replacing carbon intensive with carbon neutral activities?

In the ASEAN region, central banks are playing a leadership role in the development of official taxonomies. The ASEAN Taxonomy Board, comprising finance ministries, regulators, central banks amongst others, has released a high-level set of principles⁵⁰ for ASEAN member states to use when developing their own taxonomies. The central banks of Malaysia - BNM,⁵¹ Singapore – MAS⁵² and Indonesia's regulator – OJK⁵³ have all released early iterations of their taxonomies. Significantly, Malaysia's principles-based taxonomy identifies certain activities that should be prohibited from being bank financed like illegal deforestation leading to release of CO2 from the soil. Indonesia's taxonomy also discusses red (prohibited) as well as green activities.

The Indonesian taxonomy activities are defined using the Indonesia's Standard Industrial Classification (SIC) system. But as we found in Chapter 3 the classification systems like government statistical offices' SICs, or proprietary

classification systems like BICS are ill-suited to discriminating between activities that pose transition risk and those that do not. They are organised around the product being produced, not whether fossil-fuels or renewable energy are used in the production process. The same is true of transport manufacture and use which does not separate between internal combustion engine vehicles and EVs. We found we could not easily determine whether individual loans or bonds were green or brown without examining the activities of the borrower or issuer itself. Banks and supervisors would encounter similar problems when using existing commercial data sources or the filings that local banks submit to their supervisors.

To remedy this, taxonomies would need to define sustainable ("green") and non-sustainable activities ("brown") (for loans or use of proceeds bonds). We found that many of the largest issuers and borrowers in AMS were large quasi-monopoly companies that had a mixture of fossil fuel and renewable assets. Finance through stocks, loans and most bond issuance is to the entity and the publicly visible documentation does not specify how the finance will be used. To assess exposure to transition, lenders' credit analysts will need to understand entity level strategies to decarbonise the borrowers operations. Conceptual work to define such entity level transition is underway.⁵⁴ ASEAN countries would need to develop comprehensive transition plans towards a greener economy, and these should be formulated as early as possible to allow for a gradual transition to avoid the sorts of economic shocks set out in Chapter 2. Such credible transitions are the sort of information that international investors are keen to invest in. The transition plans should include steps to facilitate the reallocation of labour to other sectors, including capacity building, a road map of alternative revenue mobilization, such as carbon tax, and additional financial regulation for bank capital buffers, given risks from stranded assets.

We have discussed measures central banks can take using their policy toolkit in a previous publication.⁵⁵ But ASEAN central banks can also assist their economies transition through the development and application of taxonomies. The taxonomies under development identify green activities that support the national environmental priorities. For these taxonomies to be helpful in assessing and managing transition risks, they would need to define not just sustainable ("green") activities but also non-sustainable activities ("brown") (for loans or use of proceeds bonds) and transition taxonomies to assess entity-level strategies to decarbonise a firm's operations. Such transition taxonomies

are important for industrial sectors, like steel, where fully 'green' technologies are not viable or technically feasible, but where innovation and investment can introduce Paris Agreement aligned industrial processes.

To further accelerate this process, we recommend central banks:

- Develop taxonomies to help banks and other investors understand the transition risks from harmful "brown" activities. We would contend that to be decision-useful, definitions of "brown" should be expanded beyond activities that are already illegal and be applied to activities that risk being stranded.
- Suggest entity level transition taxonomies to allow banks monitor if borrowers are developing, monitoring and on-track in delivering strategies to reduce their carbon risks in line with agreed targets.
- Suggest green and transition taxonomies that are based on scientific advice to ensure they are sufficiently robust to deliver agreed climate goals.
- Help incentivise transition plans whilst operating within their remit by applying the taxonomies to encourage and ease the issuance of green bonds, transition bonds and other innovative financial instruments through asset purchase programmes or other policy purchases of assets. For example, in 2020, the ECB started accepting sustainability linked bonds as collateral.⁵⁶
- Require financial institutions to make climate risk disclosures, using the definitions of green, transition and brown assets from the official taxonomy described above and setting out strategies to manage climate risks and the steer finance to firms mitigating these risks. These can follow the recommendations of the TCFD

Now is the time to act. A substantial portion of ASEAN debt is due for refinancing in the coming years. Ensuring that future borrowing is aligned with the ASEAN's transition plans to net-zero will help to ensure that these borrowers/issuers remain resilient to the climate transition.

Annex 1 – Classification used by Bloomberg and Refinitiv databases to identify green and brown sectors

Bloomberg Industrial Classification System (BICS) Level 1 and Level 2

Communications
Wireless Telecommunications Services
Wireline Telecommunications Services
Consumer Discretionary
Airlines
Automobiles Manufacturing
Casinos & Gaming
Department Stores
Educational Services
Home Improvement
Restaurants
Retail - Consumer Discretionary
Consumer Staples
Food & Beverage
Supermarkets & Pharmacies
Energy
Exploration & Production
Integrated Oils
Oil & Gas Services & Equipment
Refining & Marketing
Renewable Energy
Financials
Banks
Commercial Finance
Consumer Finance
Financial Services
Real Estate
Industrials
Aerospace & Defense
Electrical Equipment Manufacturing
Industrial Other
Machinery Manufacturing
Manufactured Goods
Railroad
Transportation & Logistics
Waste & Environment Services & Equipment
Materials
Chemicals
Construction Materials Manufacturing
Containers & Packaging
Forest & Paper Products Manufacturing
Metals & Mining
Technology
Semiconductors
Utilities
Power Generation
Utilities

Refinitiv

The Refinitiv database was more finely disaggregated and used SIC levels 2 and 3 with 52 and 100 categories respectively. We defined the brown sectors using the following SIC 3 sectors:

Field Crops, Except Cash Grains
General Farms, Primarily Crop
Agricultural Chemicals
Drugs
Industrial Organic Chemicals
Miscellaneous Chemical Products
Plastics Materials and Synthetic Resins, Synthetic Rubber, Cellulose
Soap, Detergents, and Cleaning Preparations; Perfumes, Cosmetics, and Other Toilet Preparations
Metal Forgings and Stampings
Miscellaneous Products of Petroleum and Coal
Petroleum Refining
Iron and Steel Foundries
Miscellaneous Primary Metal Products
Primary Smelting and Refining of Nonferrous Metals
Rolling, Drawing, and Extruding of Nonferrous Metals
Steel Works, Blast Furnaces, and Rolling and Finishing Mills
Cement, Hydraulic
Glass and Glassware, Pressed Or Blown
Glass Products, Made of Purchased Glass
Bituminous Coal and Lignite Mining
Coal Mining Services
Ferroalloy Ores, Except Vanadium
Iron Ores
Miscellaneous Metal Ores
Chemical and Fertilizer Mineral Mining
Miscellaneous Non-metallic Minerals, Except Fuels
Crude Petroleum and Natural Gas
Natural Gas Liquids
Oil and Gas Field Services
Combination Electric and Gas, and Other Utility Services
Electric Services
Gas Production and Distribution
Pipelines, Except Natural Gas

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