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BRUNEI DARUSSALAM

SELECTED ISSUES

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BRUNEI DARUSSALAM

SELECTED ISSUES

August 25, 2023

Approved By
Asia and Pacific Department

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ADDRESSING CLIMATE CHANGE MITIGATION, REVENUE DIVERSIFICATION IN BRUNEI DARUSSALAM: ROLE OF CARBON PRICING[1]

This Selected Issues Paper (SIP) discusses the potential role of carbon pricing for climate mitigation and revenue diversification strategy in Brunei Darussalam. Carbon pricing schemes are gaining momentum worldwide, including in Asia. The paper provides guidance on the choice between carbon taxes and emissions trading systems (ETSs) and their design.

The paper compares the impact of several mitigation policies modelled for illustration in Brunei Darussalam. All policies reduce carbon dioxide emissions below baseline levels by 10-50 percent by 2030, with most of the reductions coming from the power generation and industry sectors. The policies also raise revenues equivalent to 1.6-7.2 percent of GDP above the baseline in 2030. The policy yielding the most of emissions reduction and the most revenues is the combination policy of a carbon tax reaching $50 per tonne by 2030 and the fuel subsidies phase-out. The policy yielding smallest emissions reduction and revenues is feebates.

A. Introduction

1. Brunei Darussalam's business cycle is highly synchronized with global oil price cycles. The petroleum sector accounts for over half of the country's gross domestic product (GDP). As a fossil fuel dependent economy— with oil and gas (O&G) constituting about 80 percent of exports and 88 percent of fiscal revenues—, energy price variation can lead to substantial volatility of the fiscal and external balances and could impact and erode Brunei Darussalam's large financial buffers in cases of sustained global downturns. (2016 Article IV, Appendix II and IV).

2. Brunei Darussalam would benefit from revenue diversification, including through adoption of carbon pricing and other environmental taxes, as a strategy for stabilizing fiscal and external balances. The collapse in fiscal revenue due to the sharp loss in oil and gas revenue, is evident during periods of energy price and/or hydrocarbon production shocks. A sudden and prolonged fall in energy prices between 2015/2016 -2017/18 and temporarily during the pandemic

Table 1. Brunei Darussalam: Fiscal Development 1/

	2018/19	2019/20	2020/21	2021/22	2022/23
	(Percent of GDP)				
Revenue	32.7	26.4	12.6	24.1	28.3
Oil & Gas	26.4	19.8	7.7	20.2	24.5
Non-Oil & Gas	6.3	6.5	5.0	3.9	3.9
Expenditure	32.5	31.9	32.6	29.2	26.7
Current	29.8	29.5	31.3	28.1	25.7
Capital 2/	2.7	2.4	1.3	1.1	1.0
Overall Balance 3/	0.2	-5.6	-20.0	-5.1	1.6
Non-O&G Balance (% of Non-O&G GDP)	-53.5	-49.5	-46.1	-44.3	-39.2
			(millions of BND)		
Nominal GDP	18,453	18,385	16,241	19,802	22,333
Nominal non-O&G GDP	8,103	8,418	9,098	10,103	11,272

Sources: Brunei authorities, IMF staff estimates

1/ Fiscal year: April-March.

2/ Some of the decline in capital spending is a result of re-classification of some spending to current spending in line with GFSM and shifting of spending outside the budget process.

3/ In absence of government debt and interest payments, this is also primary balance.

[1] Prepared by Karlygash Zhunussova (FAD) and Ritu Basu (APD). The authors are grateful to Brunei Darussalam Country team and Ian Parry (FAD) for helpful comments and suggestions.

in 2020/2021 deepened the loss in fiscal revenues. The authorities have launched a fiscal consolidation plan, but at the cost of continued erosion of capital spending. In addition, the deficit during the pandemic was financed by drawing down external reserves. A growth friendly fiscal consolidation strategy, incorporating revenue diversification to achieve further rationalization of non-O&G fiscal balance is an urgent priority. Adoption of environmental taxes and carbon pricing would help to support this strategy.

3. Brunei Darussalam's Economic Blueprint, launched in early January 2021, provides guidelines on how the country can develop a diversified and sustainable economy. The blueprint is part of the government's Brunei Vision 2035, which aims to diversify the country's economy away from petroleum. It focuses on growth enhancing reforms including, reskilling the labor force, seeking open trade policies, promoting a conducive business environment, good quality infrastructure and governance and sustainable environment. Widening and diversifying the government's fiscal revenue base to ensure financial sustainability, better targeting subsidies and undertaking fiscal consolidation programs through commercialization, privatization and outsourcing services to the private sector are some of the policy priorities that were emphasized.

4. Non-O&G revenue mobilization would reduce dependence on the oil and gas sector and volatility of public finances. The authorities plan to expand excise taxes on goods with negative health and environmental externalities. The tax system should be broadened in line with the O&G sector development, including through adoption of goods and services tax (GSTs) and a carbon tax. Active asset management on government lands and building and recalibration of property taxes will also increase fiscal revenue (Article IV 2022).

5. Brunei Darussalam has identified domestic carbon pricing as one of the country's key strategies of the 10-pillar strategy, for driving the transition toward achieving a low-carbon and climate-resilient economy. Carbon pricing is enshrined in Brunei Darussalam's National Climate Change Policy (BNCCP), launched in 2020, and the carbon-pricing instrument encompassed in pillar 6 is expected to be launched by 2025. It is planned to be applicable to all industrial facilities emitting carbon beyond a carbon emissions limit threshold. Significant progress has been made against the 10 strategies of BNCCP and most of the 2021 target set by the authorities have been met. The authorities have taken steps such as introducing a Standards and Labelling Act for energy efficiency and launching a pilot program for electric vehicles. Discussion on an institutional framework for carbon trading and carbon pricing and policies on Zero Routine Flaring and As Low As Reasonably Practicable to reduce emissions from industrial sector is underway. The authorities also have general targets by 2035 for increasing the share of renewables, electric vehicles, forest cover and capacity to adapt to climate change, enhance awareness and mandatory monthly and annual reporting of carbon inventory and reduce emissions from the power sector through electricity conservation measures.

6. As a small country located along the coast, Brunei Darussalam's exposure to climate change remains significant. The Adaptation and Resilience Working Group of Brunei Darussalam, which works to develop the nation's National Adaptation Plan, has identified potential risks caused by climate change which includes forest fires, extreme hot weather, landslides, haze, flooding, flash

flood and sea rise level. Realization of these risks can cause key strategic areas across the country could be under water. Additional fiscal space will also allow to attend to some of the needed adaptation spending.

7. This SIP discusses the potential role of carbon pricing as part of both revenue diversification and climate mitigation strategy for Brunei Darussalam. Comprehensive carbon pricing provides across-the-board incentives to reduce energy use and shift to cleaner energy sources and is a critical price signal for redirecting investment to clean technologies. There are many technical issues however in the choice of the carbon pricing instrument, particularly between carbon taxes and Emission Trading Systems (ETS). The paper discusses the main issues and how other countries are addressing them and presents an extensive quantitative assessment of the emissions, fiscal, and economic impacts of carbon taxes, ETS, feebates, and fossil fuel subsidy reform.

8. The SIP is organized as follows. The next section discusses the rationale for carbon pricing and issues in the design of, and choice between, carbon taxes and ETSs. The following section provides a quantitative assessment of carbon pricing in Brunei Darussalam.

B. Carbon Pricing: Rationale, Instrument Choice, and Design Issues

Rationale

9. Carbon pricing is one of the key considerations for Brunei Darussalam's mitigation strategy. The most important rationale for carbon pricing is that, if comprehensively applied, it promotes (by reflecting the cost of carbon emissions in the prices of fuels, electricity, and goods) the full range of behavioral responses across households, firms, and sectors for reducing energy use, improving energy efficiency and shifting toward cleaner energy sources. It also equates the incremental reward for reducing emissions, thereby striking a cost-effective balance across behavioral responses. In contrast, other mitigation instruments in and of themselves, like emission rate standards and clean technology subsidies, promote a narrower range of behavioral responses. These instruments could be combined in packages that could promote a wider range of responses from pricing—but not all of them (e.g., regulations cannot induce people to drive less). The policy combination would also be more administratively complex and less cost effective (see Box 1).

10. Carbon pricing has other attractions as it:

- Mobilizes a valuable source of revenue, which can be used to help meet climate, social, or broader fiscal objectives;
- Provides the critical price signal for mobilizing innovation into, and deployment of, clean technologies; and
- Generates domestic environmental co-benefits, such as a reduction in local air pollution mortality (though other mitigation instruments can produce similar benefits).

Box 1. Behavioral Responses Promoted by Alternative CO_2 Mitigation Policies

Comprehensive carbon pricing promotes the following responses:

- *Power generation*: shifting (both in terms of new investment and the daily dispatch mix) from natural gas, from these fuels to renewables, and perhaps to hydrogen and fossil generation with carbon capture and storage (in line with Pillar 4: renewable energy, Pillar 5: power management);
- *Industry*: reducing CO_2 and electricity intensity (e.g., through mandating carbon reporting for industries, implementing a usage-based electricity tariff scheme, energy-efficient appliances, LED streetlights and electric vehicles), and output levels (in line with Pillar 1: industrial emissions);
- *Transportation*: shifting to more efficient internal combustion engine (ICE) vehicles, from ICE vehicles to electric (or other zero emission) vehicles, and reducing vehicle miles travelled. (however, no policies are in place to support sustainable transport plans, according to the International Renewable Energy Agency (IRENA)) (in line with Pillar 3: electric vehicles); and
- *Buildings*: reducing CO_2 intensity, electricity intensity, and energy demand (e.g., through energy efficient construction, improving the energy efficiency of appliances).

Non-pricing mitigation instruments promote a narrower range of behavioral responses or lagged rather than immediate responses. Even within a sector, these instruments do not promote the full and immediate range of behavioral responses, for example:

- Renewable portfolio standards and feed-in tariffs for renewables only promote shifting from fossil to renewable generation,
- Emission rate regulations, or feebates, for new vehicles reduce emissions from the on-road fleet gradually over time as the fleet turns over (e.g., they do not accelerate retirement of old vehicles) and they do not reduce vehicle miles travelled; and
- Incentives for net zero new buildings reduce emissions from the building stock very gradually (given that typically less than 2 percent of the building stock is replaced each year).

In practice, non-pricing mitigation instruments will be used to complement and reinforce carbon pricing. Although less efficient, non-pricing instruments may have greater acceptability as they avoid significant and politically sensitive increases in energy prices—unlike carbon pricing, they do not involve the pass through of carbon tax revenues or allowance rents into energy prices. Non-pricing instruments like feebates may have a key role in kick-starting de-carbonization of hard-to-abate sectors, particularly transportation and buildings. Policymakers need to strike a balance between carbon pricing (the most efficient but perhaps most politically challenging instrument) and other (less efficient but frequently more acceptable) reinforcing instruments.

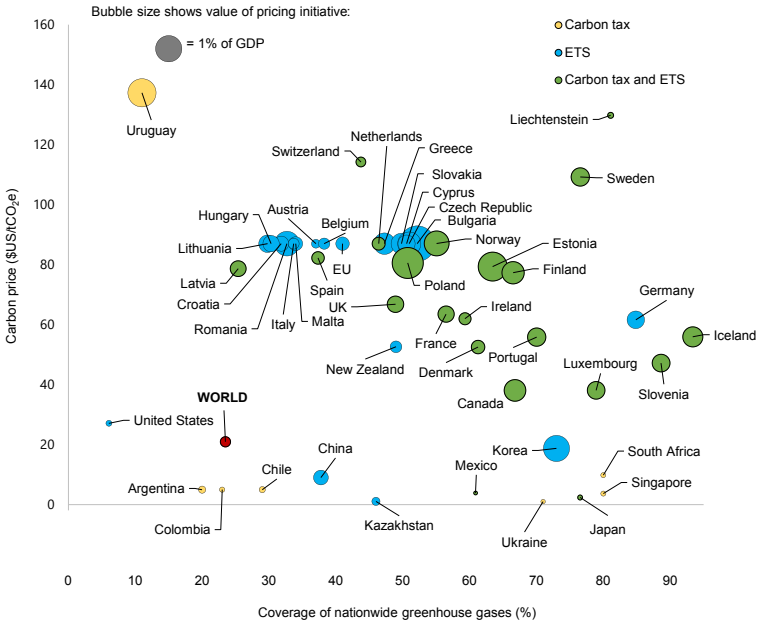
———————————

Prepared by: Ian Parry, Simon Black, Karlygash Zhunussova.

11. There is increasing momentum for carbon pricing globally and in the Asian region, though there are large cross-country differences in coverage rates and prices. Figure 1 summarizes carbon pricing schemes operating in 45 countries, accounting for national and sub-national pricing initiatives and, for EU countries, the EU ETS. At the national level, 21 carbon taxes and 6 ETSs have been implemented. There are also many sub-national pricing schemes, the largest being California's ETS. Major pricing initiatives were recently launched in China and Germany, prices in the EU ETS are currently around $100 per tonne, and Canada has committed to an equivalent US$140 price by 2030. Other countries in Asia with carbon pricing include Indonesia, Japan, Korea,

and Singapore while carbon pricing is under consideration in Thailand and Vietnam. GHG emissions subject to (national and sub-national) carbon pricing however, vary, from below 30 percent in some cases to over 70 percent in others (e.g., Canada, Germany, Korea, Sweden) while economywide average prices in 2022 varied from below $5 to $130 per tonne (Sweden). 28 percent of global GHGs are formally subject to pricing and the average price across schemes is $20 per tonne.

Figure 1. National or Regional Carbon Pricing Schemes, 2022



Sources: WBG (2021); IMF staff calculations; National sources.
Notes: EU ETS includes Norway, Iceland, and Liechtenstein. Prices are a weighted average between schemes.

Instrument Choice and Design Issues

The discussion below draws from Parry and others (2022).

12. Carbon taxes (generally under the purview of finance ministries) are easier to administer than ETSs (generally under the purview of environment ministries). Carbon taxes can be integrated midstream (i.e., after fuel refining and processing) into collection procedures for existing fuel taxes and extended to other fossil fuels and are among the easiest of all taxes to collect. All but one of the 21 existing national carbon taxes are applied midstream (Annex 1). Under the Income Tax (Petroleum) Act of 1963, oil and gas companies operating in Brunei Darussalam are subject to a fixed 55 percent petroleum income tax rate[2]. This legislation follows the general pattern of most Middle East oil-producing countries. Brunei Darussalam does not have a sales or excise tax on fuel[3]. Under the carbon pricing strategy, it aims to launch an ETS. ETSs typically require more sophisticated administration as new capacity is required to monitor both downstream emissions and emissions trading markets. Usually there is a pilot phase to establish emissions measurement, reporting and verification systems, allowances exchange platforms, and to simulate trading. ETSs may have more limited coverage as they have often been applied to large power and industrial firms,[4] though ETSs can also be applied midstream to transportation and building fuel suppliers (e.g., these sectors are covered in the German and Korean ETSs and are proposed for inclusion in the

[2] This is a production tax rather than a consumption tax, i.e., it is not passed forward into higher consumer prices.

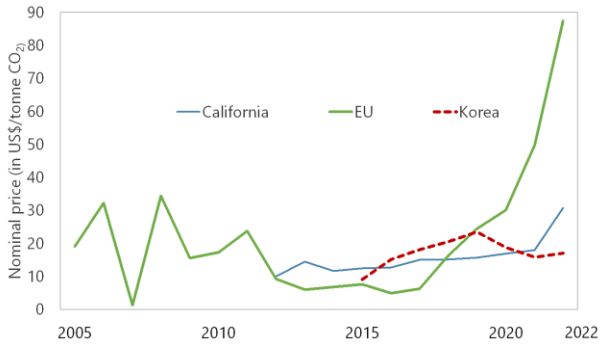
[3] See Deloitte, International Tax: Brunei Darussalam Highlights 2022, Updated January 2022

[4] For administrative reasons, small scale emitters in these sectors are excluded, but their share in emissions is generally modest.

EU ETS). Although in principle carbon pricing should comprehensively cover CO_2 emissions across all fuels and sectors, in practice pricing emissions from coal, or from the power and industrial sectors, are usually the biggest priorities as they account for the bulk of emissions reductions under economywide pricing. Starting 2025 Brunei Darussalam plans to reduce carbon intensity from all industrial sectors and new power utilities.

13. In their pure forms, carbon taxes provide certainty over emissions prices while emissions are determined by market forces, and vice versa for ETSs. Certainty over emissions is attractive if policymakers want to meet an emissions target in a future year but price uncertainty can deter private innovation in, and adoption of, clean technologies, especially those (e.g., renewables plants) with high upfront costs and long-range emissions reductions. Indeed, allowance[5] prices in ETS schemes in California, the EU, and Korea have shown significant volatility to date (Figure 2). ETSs can however be combined with price stability mechanisms like price floors which can help to provide robust incentives for clean technology investments.[6] Carbon taxes may need periodic adjustment to maintain progress on emissions goals, so in practice differences between the two approaches may be less pronounced.

Figure 2. Allowance Price Volatility in ETSs



Sources: World Bank, Carbon Prices Dashboard 2022; CarbonCredits.com, Carbon Prices Today; Korea Exchange, Market Data System; and IMF staff calculations.

14. Revenue raising and using practices may differ across instruments, with carbon tax revenues more likely to be used in general budgets and ETS revenues more likely to be earmarked for environmental purposes. Revenues have been fully used for general purposes in 16 carbon tax schemes and partially or fully earmarked for environmental spending in only five cases (Annex 1). In the early phases of ETSs (e.g., EU, Korea), allowances have been freely allocated to affected firms to help build support for the program and address competitiveness concerns — however, where free allowances are granted to power generators this can result in large windfall profits as firms may have greater scope for passing allowance prices forward in higher consumer prices.[7] In other ETS cases (e.g., California, Germany) allowances have been auctioned from the start.

[5] ETSs require firms to acquire allowances for their emissions or the carbon content of their fuel supply with the government controlling the supply of allowances and market trading of allowances establishing the emissions price.

[6] These mechanisms can be implemented, for example, through minimum prices when allowances are auctioned (e.g., in the California ETS there is a reserve price for allowance auctions that rises annually at 5 percent in real terms) (see Flachsland and others (2018) for further discussion of price floor mechanisms).

[7] Even with free allowances, however, a significant portion of the potential carbon pricing revenues could accrue indirectly to the finance ministry to the extent profits are subject to corporate, and ultimately personal, income taxes.

Where allowances in ETSs are auctioned, the revenues are more often earmarked for environmental spending—this applies, at least partially, in five of the seven ETS schemes (Annex 1).

15. There is much at stake in terms of economic efficiency in how carbon pricing revenues are used. Productive uses of revenues can produce large gains in economy efficiency which can help to offset the negative effects of higher energy prices on economic activity. For example, using revenues for public investments for Sustainable Development Goals (e.g., in health, education, infrastructure) strengthens the economy. Earmarking revenues for environmental investment can be efficient if such investments are fully integrated in robust public investment management systems. In contrast, returning revenues in universal or targeted lump-sum transfers to households or firms forgoes efficiency benefits (See Annex 2 for further discussion).

16. In principle, a carbon tax and ETS—if applied to the same sectors, with the same price, and prior to allocation of revenues—would impose the same distributional burdens across household income groups. This is because a carbon price generally has the same impact on the price of fuels, electricity, and other consumer goods regardless of whether it takes the form of a tax or an ETS. Distributional burdens, when measured against households' annual consumption, are mildly regressive (i.e., imposing a slightly larger burden relative to consumption on lower income households than wealthier households) in some cases,[8] though the opposite applies too.

17. An ETS does not provide the same opportunities for addressing efficiency and distributional objectives as carbon taxes if allowances are freely allocated or auction revenues are earmarked. Under carbon tax schemes revenues generally accrue to the general budget (Annex 1). In contrast, under ETSs with free allowance allocations the policy rents are instead reflected in enhanced profits for firms receiving those allocations and ultimately the rents may accrue to shareholders and workers in these industries (the former at least are concentrated in higher income households). Revenue from allowance auctions[9] in the German ETS are used for transition assistance to vulnerable households, workers, and regions which largely forgoes efficiency benefits[10] but has helped to enhance the overall acceptability of the ETS.

18. Political economy is a major factor in determining the choice between carbon pricing instruments and their respective designs. ETSs may be more feasible politically than taxes, especially where permits are freely allocated to affected firms. Such firms may wield significant political power due to effective coordination and lobbying of policymakers. Some jurisdictions have progressively reduced free allocations (e.g., 30 percent of allowances in the EU ETS were freely

[8] Parry and others (2022), Figure 8.

[9] All revenues from the ETS go into the Government's "Climate and Transformation Fund" (KTF). The fund is used to support measures under the climate protection program such as GHG reduction programs and direct assistance to industry or households (e.g., reducing the "Renewable Energy Surcharge" on electricity).

[10] Such as those from increasing the returns to work effort or investment through lowering taxes on labor and capital income or funding investments with favorable benefit/cost ratios.

allocated in 2020 compared with 80 percent in 2013). To some degree, carbon taxes can be designed to mimic the effect of free allocation by using revenues for targeted relief to firms.

19. As with all taxes, carbon taxes can be politically challenging to implement, though revenue recycling, communications strategies, and identification of key stakeholders can build support. While carbon taxes (and broader reforms of energy prices) have sometimes faced political backlash from affected firms and citizens, the same can be said for many other reforms to fiscal systems. Additionally, ETSs are not necessarily more or less popular politically with households (e.g., Australia's ETS was repealed in 2014 in response to opposition). However, what does appear to be important for ensuring the durability of carbon tax is effective and inclusive communication alongside pragmatic use of revenues. The anticipation of negative distributional outcomes may create public opposition to carbon pricing and makes the design of targeted support measures (e.g., for low-income households) critical, underscoring the need for thorough analysis (e.g., to quantify the targeted measures required).

20. Under a carbon tax, the government can align the price trajectory with emissions targets, while alignment can be automatic under an ETS. Carbon tax trajectories can be set equal to price paths needed to bring emissions in line with mitigation targets, which can be inferred with some confidence for the near to medium term from estimates of future BAU emissions and the responsiveness of emissions to pricing.[11] Periodic forward-looking adjustment of tax rates can maintain alignment with emissions goals. For an ETS, price alignment is automatic if the emissions cap is set to meet a country's mitigation commitment (e.g., the EU ETS cap is reduced by 2.2 percent a year in line with 2030 emissions targets for the power/industrial sector).

21. Carbon taxes are more compatible with reinforcing mitigation instruments and variants of them may be more practical for other sectors beyond energy. Overlapping instruments (e.g., feebates) that reinforce some of the mitigation responses of pricing will be needed for hard-to-abate sectors like transportation and buildings. When combined with a carbon tax, these instruments reduce emissions without affecting the tax rate. In contrast, under a pure ETS with emissions fixed by the cap overlapping instruments reduce the emissions price without affecting emissions. As discussed in Annex 3, carbon tax variants can also be extended to broader emissions sources like forestry.

22. ETS may have their own appeal, however. ETSs help achieve emissions targets with more certainty, are a more natural instrument where mitigation policy is under the purview of environment ministries, and free allowance allocation may help to garner industry support.

23. In principle, ETSs and carbon taxes exist on a continuum and can theoretically be designed to replicate each other. For example, an ETS with a price floor and/or a price ceiling makes the ETS look more like a carbon tax, loosening the quantity restriction on emissions (and

[11] Emissions projections boil down to assumptions about future GDP growth, income elasticities for energy products, rates of technological change (e.g., that improves energy efficiency or the productivity of renewables), and future energy prices.

hence the emissions certainty) to enhance price certainty within the system. However, in practice the choice between ETSs and carbon taxes remains substantive, with the choice usually determining key design choices of the carbon price instrument (e.g., whether it is midstream or downstream, raises revenues, or fixes emissions quantities or prices). Table 2 provides a summary comparison of carbon taxes and ETSs.

24. Under a hybrid approach, an ETS could address emissions from the power and industry sector and the carbon tax could address emissions from the transportation and building sectors. These hybrid approaches have been used elsewhere—for example, in the EU power and industry sectors, emissions are covered by the EU-wide ETS while several member states (e.g., Denmark, Finland, France, Ireland, Portugal, Sweden) have applied national carbon taxes to the transportation and building sectors. Cost effectiveness would require aligning carbon prices across tax rates and ETSs, for example by setting a trajectory of price floors under the ETS equal to the trajectory of carbon tax rates. It would generally not make sense to apply a carbon tax and ETS to the same emissions base as this would duplicate administration and the tax may simply lower the price of emissions allowances without affecting emissions (if they are fixed by the cap).

Table 2. Brunei Darussalam: Summary Comparison of Carbon Taxes and ETSs

Design issue	Instrument	
	Carbon tax	ETS
Administration	Administration is more straightforward (for example, as extension of fuel taxes)	May not be practical for capacity constrained countries
Uncertainty: price	Price certainty can promote clean technology innovation and adoption	Price volatility can be problematic; price floors, and cap adjustments can limit price volatility
Uncertainty: emissions	Emissions uncertain but tax rate can be periodically adjusted	Certainty over emissions levels
Revenue: efficiency	Revenue usually accrues to finance ministry for general purposes (for example, cutting other taxes, general investment)	Free permit allocation may help with acceptability but lowers revenue; tendency for auctioned revenues to be earmarked
Revenue: distribution	Revenues can be recycled to make overall policy distribution neutral or progressive	Free allowance allocation or earmarking may limit opportunity for desirable distributional outcomes
Political economy	Can be politically challenging to implement new taxes; use of revenues and communications critical	Can be more politically acceptable than taxes, especially under free allocation
Competitiveness	Border carbon adjustment more robust than other measures (for example, threshold exemptions, output-based rebates)	Free allowances effective at modest abatement level; border adjustments (especially export rebate) subject to greater legal uncertainty
Price level and emissions alignment	Need to be estimated and adjusted periodically to align with emissions goals	Alignment of prices with targets is automatic if emissions caps consistent with mitigation goals
Compatibility with other instruments	Compatible with overlapping instruments (emissions decrease more with more policies)	Overlapping instruments reduce emissions price without affecting emissions though caps can be set or adjusted accordingly
Pricing broader GHGs	Amenable to tax or proxy taxes building off business tax regimes; feebate variants are sometimes appropriate (for example, forestry,	Less amenable to ETS; incorporating other sectors through offsets may increase emissions and is not cost effective

Source: Parry and others (2022). Green indicates an advantage of the instrument; orange indicates neither an advantage or disadvantage; red indicates a disadvantage of the instrument.

25. Carbon taxes or ETSs would allow countries to participate in internationally coordinated pricing regimes, for example among Southeast Asian countries. International price coordination facilitates a scaling up of carbon pricing by addressing concerns about competitiveness

and policy uncertainties that can deter countries when they act unilaterally. Pricing might be established initially for the power and industry sectors, given that most emissions reductions would come from these sectors. International price coordination requirements would be most naturally met through a carbon tax but ETSs could be accommodated (as they are under the prototype federal pricing requirements in Canada) by underpinning the ETS with a floor price or by setting caps to generate expected domestic emissions prices in line with international pricing requirements.[12]

26. Carbon pricing can also be extended to non-carbon GHG emissions (for example, methane). This would allow abatement costs across GHGs to be equalized and promote cost-effective mitigation. The agricultural sector would see the largest impact (since it is the primary source of non-CO_2 GHGs) and competitiveness concerns would need to be addressed through revenue recycling. Proxy taxes could be used in the medium-term to address administrative and compliance barriers (see Parry et al. 2022b for design considerations).

Tradable Emission Rate and Feebate Alternatives for Power and Industry

27. A tradeable performance standard (TPS) for the power and industry sectors would not raise revenue but would address competitiveness concerns and promote many of the behavioral responses of carbon pricing. Under this approach, the government could set a required CO_2 emission rate per unit of output for each major industry, and power generation, and all firms within the industry are required to meet the industry standard—though firms can fall short of required standards if they buy sufficient credits from other firms that exceed those standards. Indeed, credits could be tradable across the firms in different industries, which will promote a common credit price and equalization of incremental abatement costs across industries. A TPS can promote the same behavioral responses to reduce emissions intensity as under carbon pricing, but it does not promote the same consumer demand response because there is no pass through of carbon tax revenue or allowance rents into higher prices for electricity and industrial products. Canada has successfully implemented a federal TPS (applying for the industrial sector and where provincial/territorial polices for industrial emissions are not applied).[13]

28. Feebates are the fiscal analogue of a TPS. Feebates apply a sliding scale of fees on firms in an industry with emission rates above a pivot point emission rate for the industry and a sliding scale of rebates for firms with emission rates below the pivot point.[14] If the pivot point—which is

[12] Regional price coordination could also be built up through linking existing ETSs, but there are downsides. Linking (where permits traded under one ETS are allowable under another) would theoretically promote cost effectiveness at the regional level through harmonizing permit prices across countries. However, linking also perpetuates design characteristics (e.g., a carbon price ceiling in one ETS becomes the price ceiling in the linked ETS), reduces the ability of governments to achieve domestic targets, and can create significant administrative complexity and uncertainty.

[13] See www.canada.ca/en/services/environment/weather/climatechange/climate-action/pricing-carbon-pollution/output-based-pricing-system.html.

[14] Specifically, firms in an industry would be subject to a fee equal to a CO_2 price, times the difference between their CO_2 per unit of output and the industry wide pivot point CO_2 per unit of output, times the firm's production level. Elements of feebates are common in vehicle tax systems to promote penetration of cleaner vehicles. See Parry (2021) for a broad discussion of feebates.

determined by the government—is set equal to the industry average emission rate, and updated over time, the feebate will be approximately revenue neutral. Feebates automatically promote cost effectiveness within an industry without the need for trading markets as all firms face the same incremental reward for reducing emissions—the emissions price in the feebate. Furthermore, emission prices can be harmonized across different feebate schemes to promote cost-effectiveness across industries. Like TPSs, feebates do not charge the average firm for their remaining emissions and therefore do not promote consumer demand responses.

29. The pros and cons of feebates versus TPSs are mostly analogous to those for downstream taxes and ETSs. Feebates:

- Provide certainty over the emissions price, while regulations provide certainty over the industry-wide average emissions rate;
- Are automatically cost effective across firms within industries and across industries (if feebate prices across schemes are harmonized), while tradable emission rate standards require liquid credit trading markets with a significant number of market traders to be cost effective;
- Are compatible with overlapping policies as they provide ongoing incentives for all firms (regardless of whether they are paying fees or receiving rebates) to cut emissions.

Again, however, TPSs can be made more feebate-like by combining them with out-of-compliance fees, and subsidies for going beyond standards, and for firms not participating in credit trading.

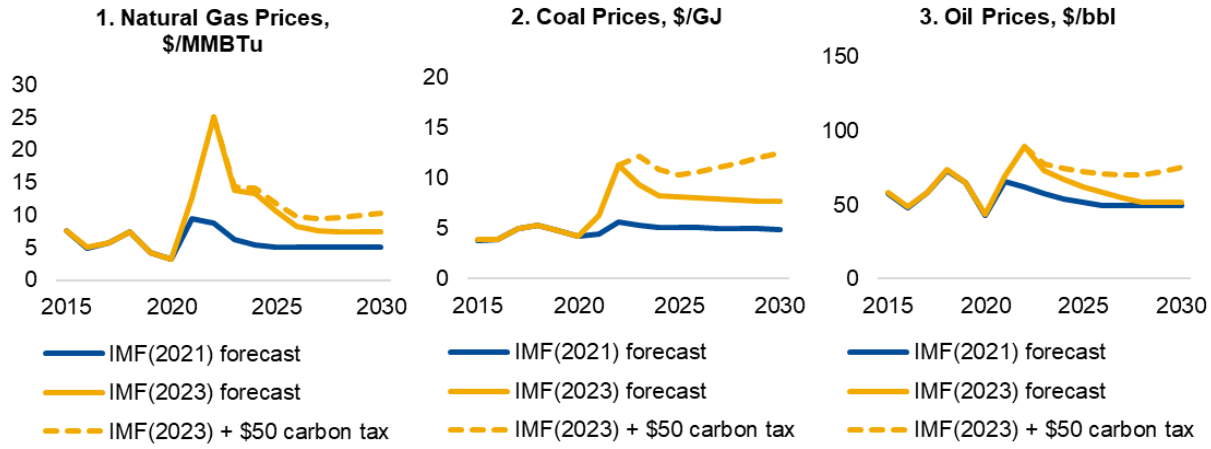
C. Quantitative Assessment of Carbon Pricing in Brunei Darussalam

30. The quantitative assessment of carbon pricing is based on the Climate Policy Assessment Tool (CPAT). CPAT is a spreadsheet-based model providing projections of fuel use and GHG emissions for the major energy sectors in 188 countries. The impacts of carbon pricing and other mitigation policies depend on their proportionate impacts on future fuel prices and the price responsiveness of fuel use in different sectors. The former is based off international energy price forecasts and emissions factors while the latter is parameterized to the mid-range of existing modelling literature and empirical evidence on fuel price elasticities. The model is linked to input-output tables to infer impacts on production costs in different industries, consumer prices, and burdens on household income groups. CPAT, which was developed jointly by IMF and World Bank staff, is widely used in IMF surveillance, cross-country, and technical assistance reports (see Annex 4 for more details).

31. Timing. Carbon pricing would raise the price of carbon intensive fuels and might be timed to progressively phase in as global energy prices recede from their peak levels. Global gas, coal, and oil prices increased significantly between mid-2020 and mid- 2022 with the recovery in global energy demand, weak energy investment, and disruptions following the Russian invasion of Ukraine. However, with the waning of energy prices, introducing carbon pricing on top of receding energy prices could be politically easier. Projections suggest that much of the recent price surges will likely

be reversed as demand and supply adjust over time. Phasing in a $50 carbon price on top of these projected (albeit very uncertain) prices would imply 2030 O&G prices would be 16 and 59 percent below mid-2022 levels, while coal prices would be 11 percent higher (Figure 3). Indeed, without carbon pricing (or related measures), the impact of higher baseline energy prices is limited, because the price increases are not expected to be permanent.

Figure 3. Trends in International Energy Prices



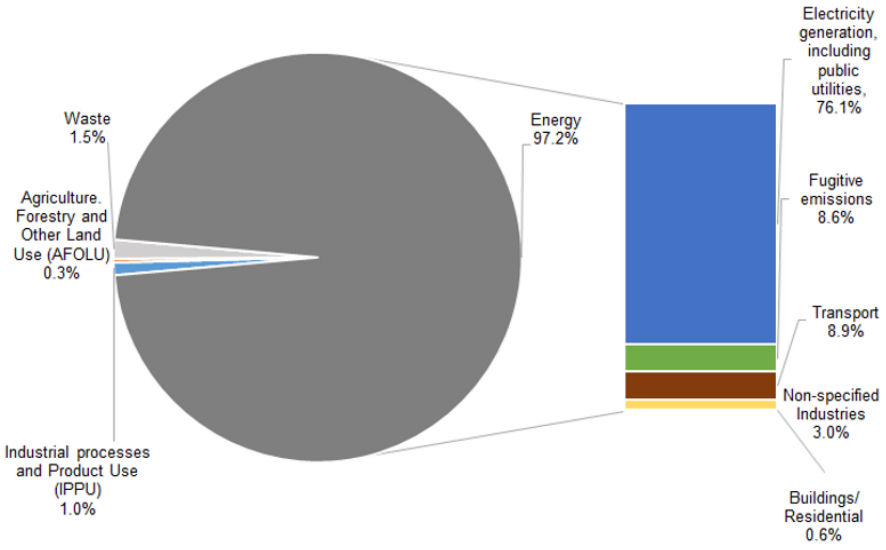
Source: IMF staff estimates.

32. The authorities have taken steps to address global warming and submitted an unconditional target for cutting greenhouse gas (GHGs) to 20 percent below baseline levels in 2030 in the Nationally Determined Contribution (NDC). The NDC uses 2015 as reference year (emissions of 11.6 $MtCO_2e$) and committed to a reduction in GHG emissions by 20 percent relative to Business-As-Usual levels in 2030 (See Box 2).

Box 2. Climate Commitments (UNFCCC 2023)		
		Updated NDC
GHG target		20 percent reduction of GHG emissions by 2030 relative to BAU
GHG Coverage		CO2, CH4 NO2
Timeframe		1 January 2021- 31 December 2030
Conditionality elements		Unconditional NDC only
Targets by Mitigation Sector		
Energy.		At least 30 percent renewable share of energy power generation mix by 2035; at least 10 percent GHG emissions reduction in the power sector through energy efficiency and conservation both on supply and demand side; impose carbon price on all industrial facilities by 2025
Transport.		60 percent EV share of total annual vehicle sales by 2035
Industry.		Addressing venting, flaring and fugitive emissions through relevant policies such as Zero Routine Flaring and "As low as reasonable possible" (ALARP) where relevant.
Forest.		Increase forest reserves from 41 percent to 55 percent by increasing carbon sink through reforestation with a target of planting 500,000 trees by 2035
Waste management		Reduce municipal waste to landfills to 1kg/person/day by 2035
Sector coverage		(1) Energy (2) IPPU (3) Agriculture (4) FOLU (5) Waste

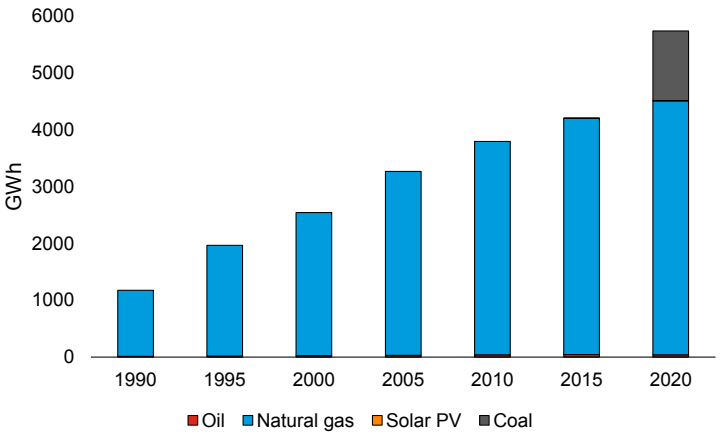
33. Energy-related emissions accounted for 97.2 percent of Brunei Darussalam's 13.6 $MtCO_2$ GHG emissions in 2022. The largest polluting sector in Brunei Darussalam is power generation and own-use by the energy industries (54.6 percent), followed by power generation – public utilities (21.5 percent), fugitive emissions (8.6 percent), transport (8.9 percent), non-specified industries (3.0 percent), industrial processes (1.0 percent), waste (1.5 percent), agriculture (0.3 percent), and buildings (0.6 percent). (Figure 4).[15]

Figure 4. GHG Emissions in 2020 by Source



Sources: IMF/EDGAR/FAO/UNFCCC.

Figure 5. Electricity Generation by Source, 1990-2020



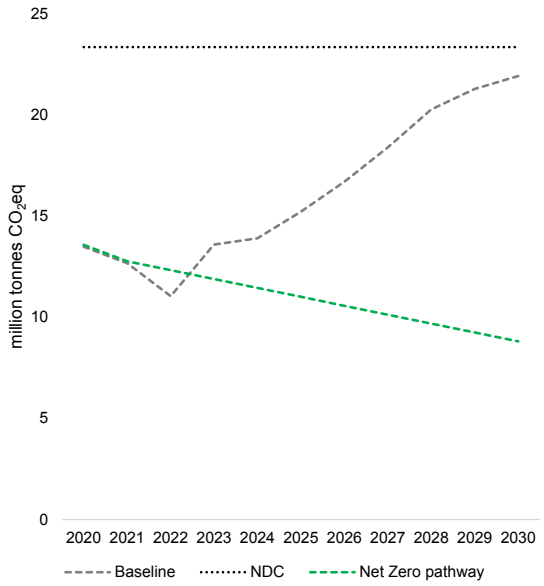
Source: IEA

[15]Preliminary updates by the Measurement Reporting and Verification (MRV) team under the Brunei Climate Change Secretariat.

34. Natural gas remains the main fuel for electricity generation despite the renewable energy target set by the authorities. According to IEA, the share of natural gas in electricity generation was 78 percent in 2020, down from nearly 99% in 1990. In supporting the growth of downstream industry, the introduction of coal as a power generation source was required in order to meet growing energy demand. This resulted in coal as the second largest source of power in 2020 at 28% after natural gas, with the former being more emissions-intensive per unit of generated electricity compared to the latter. . Solar, which generated only 2 GWh in 2020, is about 0.03 percent of electricity, remains low and has not changed since 2015 (Figure 5). Brunei Darussalam has a highly ambitious target to increase the share of renewables to at least 30 percent of the power generation capacity by 2035 from the current less than one percent.

35. According to BAU projections, Brunei Darussalam will meet its unconditional GHG target of 23.6 MtCO2e in 2030 but will need to cut emissions to stay in line with declared Net Zero Emissions target by 2050. IMF staff project GHG emissions will increase 73 percent from 12.7 MtCO2e in 2021 to 21.9 MtCO2e in 2030 (i.e., 26 percent lower than the authorities' projection of 29.5 MtCO2e). The emissions increase is driven by a projected increase in GDP (21 percent) over the period, and an increase in the energy intensity of GDP (68 percent).[16]During COP 27, Brunei Darussalam announced a move towards Net Zero by 2050. Linear extrapolation of this target shows that economy-wide emissions should be around 8.8 MtCO2e or 60 percent reduction to BAU scenario. The exact time frame for reaching the 2030 emissions target remain uncertain and Brunei Darussalam will need reliable information on: (i) BAU emissions projections at economywide and sectoral level; and (ii) the costs of cutting emissions below BAU levels. Both are sensitive to assumptions about underlying factors (e.g., income elasticities for energy products, future BAU energy prices, fuel price responsiveness). The SIP presents scenarios and pathways for reaching the 2030 emission target under different assumptions. Two of the scenarios are considering carbon tax (reaching $50 per tonne in 2030, one of them is combined with phase-out of subsidies) that cover all sectors. Two scenarios consider covering only power and industry sectors as the biggest emitting sectors (ETS

Figure 6. GHG Emissions Projections and Targets



Source: IMF staff estimates.

[16] This reflects improvements in energy efficiency as new (more efficient) capital gradually replaces older capital and a (standard) assumption that energy and agricultural demand grows by less than in proportion to GDP.

and feebates). Two scenarios include the reform of explicit fossil fuel subsidies which, according to IMF estimates, reach about $0.5 bn in 2020 (Parry and other 2021).

36. The following analysis focuses on comparing the impact of different mitigation policies on emissions, electricity generation, revenues, development co-benefits, and prices.

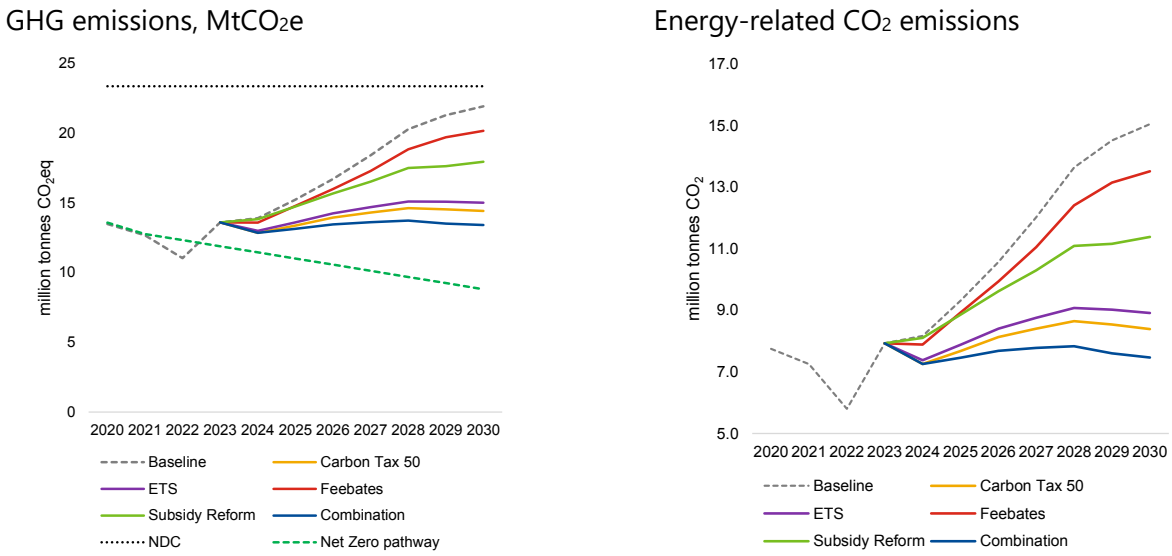
- **Carbon tax 50:** an explicit carbon tax starting from $20 per tonne in 2024 and rising linearly to $50 per tonne in 2030, covering power, industry, transport, and buildings sectors;
- **ETS:** an ETS (emissions trading system) starting from $20 per tonne in 2024 and rising linearly to $50 per tonne in 2030, covering power and industry;
- **Feebates:** feebates system in the power and industry sector, starting from $20 per tonne in 2024 and rising linearly to $50 per tonne in 2030;
- **Subsidy reform:** fossil fuel subsidy reform that phases out consumer- side subsidies for fossil fuels starting from 2024 linearly in the period of five years;
- **Combination:** an explicit carbon tax starting from $20 per tonne in 2024 and rising linearly to $50 per tonne in 2030, covering power, industry, transport, and buildings sector, combined with the fossil fuel subsidies reform (starting from 2024 linearly over five years).

37. CPAT is calibrated to be consistent with modeling literature on the key parameters. CPAT is routinely used for cross-country and individual country assessments of mitigation policies. Covering over 200 countries, CPAT provides projections of fuel use and CO2 emissions for the four major energy sectors—power, industry, transport, and buildings. Fuel and electricity price responsiveness is parameterized to be broadly consistent with empirical evidence and results from energy models (fuel and electricity price elasticities over the longer term are generally between -0.5 and -0.8). Carbon emissions factors by fuel product are from IIASA (Wagner 2020), and emissions in 2019 are calibrated to match those of implied by UNFCCC GHG and emissions in 2020-1 calibrated to match those of EC-JRC (Crippa and others 2022), Global Carbon Budget (Friedlingstein and others 2021), and various sources.

Emissions Analysis

38. Carbon taxes and the ETS have the most significant impact on emissions. The feebates, and fossil fuel subsidy reform, however, due to limited sectoral and fuel coverage, have less impact (Figure 7). Total energy-related CO_2 emissions are reduced by 44, 41, 10, 24, and 50 percent relative to baseline in 2030 in Carbon tax 50, ETS, Feebates, Subsidy Reform, and Combination scenarios, respectively. As indicated above, even the baseline GHG emissions are lower than the country's NDC target level. Under all scenarios the country would benefit from implementing other non-carbon pricing measures to reach the pathway to Net Zero.

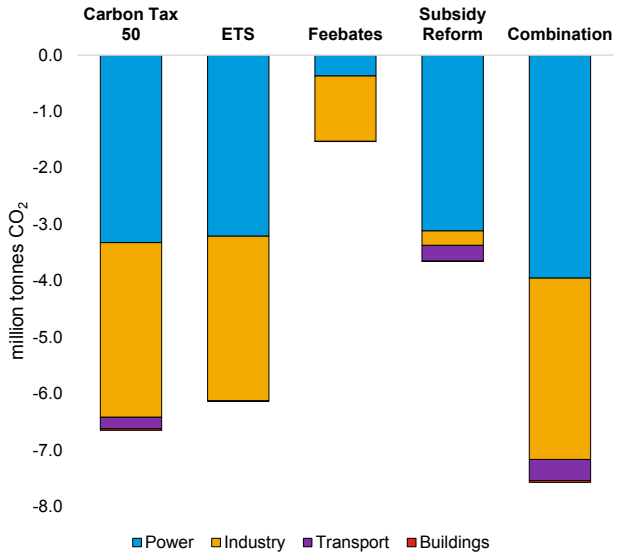
Figure 7. The Impact of Mitigation Policies on Emissions



Source: IMF staff using CPAT.

39. In all scenarios, most of the reductions in CO_2 emissions on a sectoral level come from the power sector and industry. Industry and power sector account for the most CO_2 emissions reductions in all scenarios (varying from 24-85 percent for the power sector and 7-76 percent for industry). Transport accounts for less than 10 percent of emissions reductions in 2030, followed by buildings sector with 1 percent of the reduction (Figure 8). The results largely depend on the shares of sectors in the emissions and the price responsiveness of emissions in different sectors. Power and industry are the biggest emitting sectors and usually are more responsive to carbon pricing, compared to transport and buildings sectors, which are less responsive to carbon pricing and have smaller shares in total emissions.

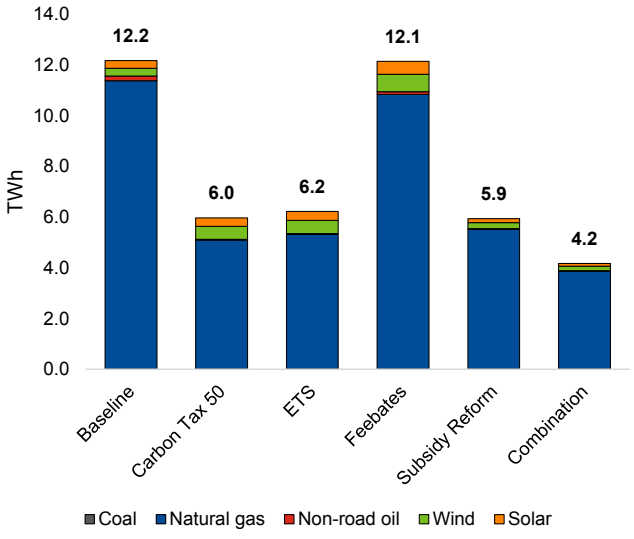
Figure 8. The Impact of Mitigation Policies on Emissions by Sector



Source: IMF staff using CPAT.

40. Carbon tax 50 and the ETS will increase the share of renewables in the electricity mix the most. The share of renewable will reach about 14 percent of electricity generation in 2030 in the Carbon tax 50 and the ETS scenarios. Other scenarios will reach about 7-10 percent in 2030. These results fall far less that the government's plan to increase the capacity of renewables to 30 percent by 2035 (Figure 9).

Figure 9. Electricity Generation by Fuel in 2030

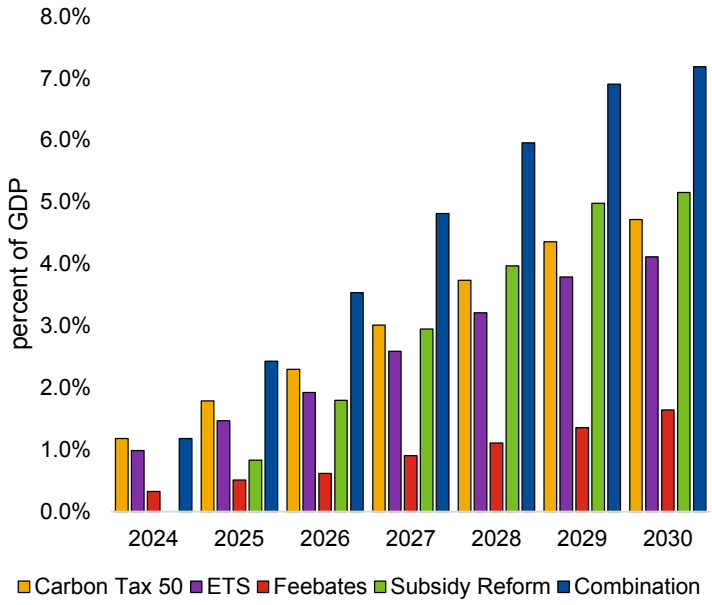


Source: IMF staff using CPAT.

Fiscal and Macro Implications

41. Carbon pricing might be a significant source of additional revenues,[17] raising up to 7 percent of GDP in 2030 on top of BAU. In 2030 alone, the Feebates scenario would bring additional 1.6 percent of GDP in savings in the budget, compared with 7.2 percent of additional revenues from the Combination scenario (Figure 10). Cumulatively over seven years (2024-2030), the revenues collected/budget savings compared to the baseline revenues vary from $1.1 billion in the Feebates (the Feebates is a revenue-neutral mechanism, however, due to the erosion of the subsidized base, the Feebates would still generate budget savings) scenario to $5.5 billion in the Combination scenario.

Figure 10. Revenues Raised by Scenario, Compared to Baseline



Source: IMF staff using CPAT.

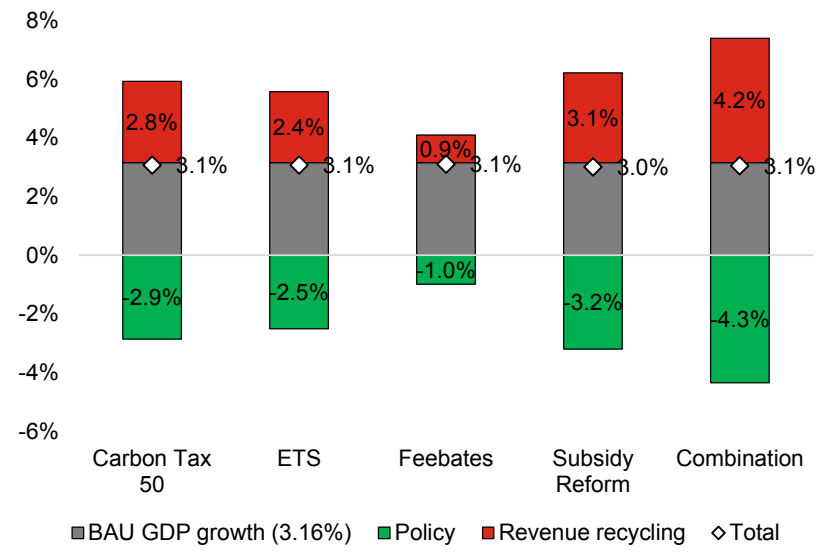
42. Higher carbon pricing would have a negative impact on GDP growth, but this could be partially or totally offset with effective revenue recycling. The potential negative impact on GDP growth[18] in 2030 without any measures to counteract this impact is 2.9, 2.5, 1.0, 3.2, and 4.3 percentage points in the Carbon Tax 50, ETS, Feebates, Subsidy Reform, and Combination scenarios, respectively. However, in an illustrative scenario, where 75 percent of revenues collected

[17] Revenue calculations include the effect of tax base erosion from the carbon tax. The calculations exclude the impact of a system of offsets starting in February 2023, which may bias the calculations upwards.

[18] The impacts of mitigation policies on GDP (and the general equilibrium effects of changes in GDP affecting energy demand) in CPAT are modelled using fiscal multipliers. Estimates of fiscal multipliers, defined here as the percent change in GDP in subsequent years of the policy from a percent change in tax increases/cuts and/or spending increases/cuts from a one percent of GDP change in energy taxes. These fiscal multipliers are extracted for over 100 countries from the WB's main macrostructural model (MFMOD) in addition to empirically estimated multipliers using a long dataset on the relationship between changes in taxes and GDP over time. See Scholder (2022)

from the carbon tax are recycled effectively through productive public investment, and 25 percent are recycled through targeted cash transfers, the negative impact would almost be completely offset, reducing it to just 0.1-0.2 percentage points. The extent of the reversal of the negative impact on GDP growth will depend on the value of the Keynesian fiscal multiplier of the policies chosen to recycle revenues from carbon pricing (Figure 11).

Figure 11. Impact on GDP Growth in 2030



Source: IMF staff using CPAT.

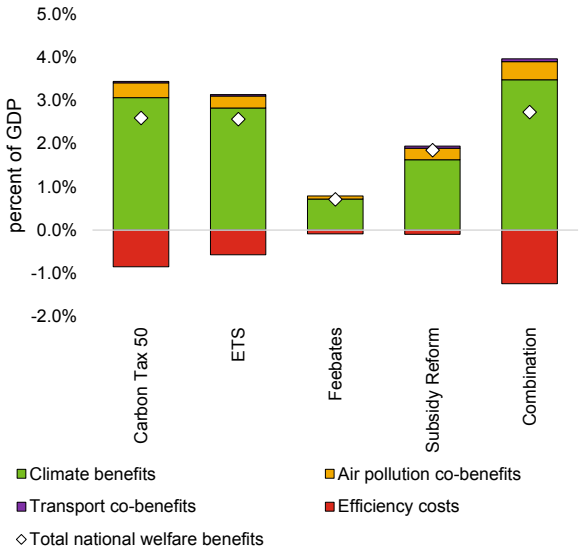
43. Mitigation policies would impose a relatively small economic cost in Brunei Darussalam equivalent to about 0.1-1.2 percent of GDP in 2030 and they are offset by domestic environmental co-benefits. Economic costs reflect pure mitigation costs[19], primarily the annualized costs of using cleaner but more expensive technologies instead of fossil-based technologies (net of any savings in lifetime energy costs). 85-100 percent of the domestic environmental co-benefits reflect fewer local air pollution deaths[20] and 9-15 percent reductions in traffic congestion and accident externalities[21]. Adding the global climate benefits valued at $75 per tonne increases environmental benefits from 0.1-0.5 to 0.8-4.0 percent of GDP (Figure 12).

[19] Estimation of economic costs is made under specific assumptions on emissions projections and responsiveness of emissions to carbon pricing (reflecting marginal abatement cost curves). See Black and others (2022) on methodology for estimating the economic costs.

[20] The cumulative number of avoided deaths from air pollution between 2024-2030 is about 30 persons, compared with baseline mortality of around 90.

[21] See Parry and others (2014) on methodologies for quantifying the broad range of environmental impacts of fossil fuel use on a country-by-country basis.

Figure 12. Economic Costs and Domestic Environmental Co-Benefits in 2030



Source: IMF staff using CPAT.

Prices Analysis

44. Direct carbon pricing (carbon taxes and ETS) is likely to put upward pressure on energy prices, while the impact of Subsidy reform and Feebates is lower. Weighted average coal prices would increase by 41, 37, 41 percent compared to baseline in the Carbon tax 50, ETS, and Combination scenarios, respectively. Coal prices would not be affected by Subsidy reform and Feebates. Coal, however, is an intermediate input used by firms rather than directly consumed by households. Electricity prices would increase about by 2-10 cents per kilowatt hour (or 71-288 percent compared to baseline in 2030) in all scenarios. Gasoline prices would grow by 36-94 percent relative to baseline (excluding the Feebates scenario), while diesel price increases would be slightly higher – 54-189 percent relative to the baseline.

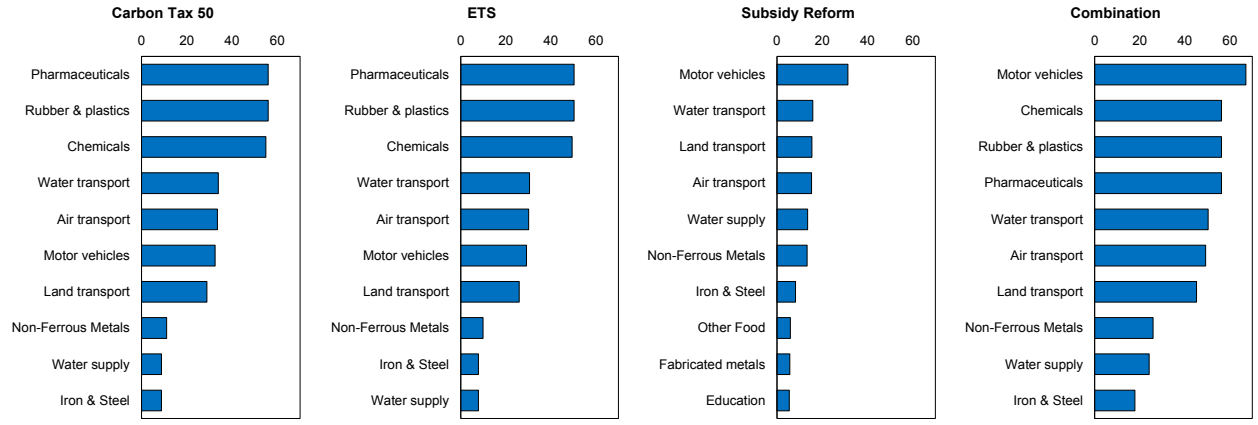
Table 3. Brunei Darussalam: Impact on Energy Prices by Scenario

Fuel	Unit	2023	Baseline	Carbon Tax 50	ETS	Feebates	Subsidy Reform	Combination
Electricity	$/kWh	0.08	0.03	0.06	0.06	0.04	0.10	0.13
Coal	$/GJ	17.1	11.6	16.4	15.9	11.6	11.6	16.4
Natural gas	$/GJ	4.7	2.6	5.4	5.1	2.6	2.6	5.4
Oil	$/bbl	72	53	76	74	53	53	76
Gasoline	$/lit	0.57	0.30	0.42	0.41	0.30	0.47	0.59
Diesel	$/lit	0.52	0.23	0.36	0.35	0.23	0.52	0.66
LPG	$/lit	0.37	0.17	0.25	0.24	0.17	0.33	0.42
Kerosene	$/lit	0.46	0.32	0.44	0.43	0.32	0.36	0.48

Source: IMF staff using CPAT.

45. Mitigation policies would also lead to increases in the cost of industrial production, which may raise competitiveness concerns, [22] especially for energy-intensive, trade-exposed (EITE) industries. Production cost increases have three components. First, industrial firms will incur a direct tax payment, or allowance purchase requirement, for emissions they continue to emit directly. Second, firms will incur abatement costs to the extent they cut emissions, for example, by switching to cleaner (but costlier) technologies and fuels. Third, they incur an indirect payment for carbon charges on emissions embodied in their inputs, especially electricity. Overall, carbon pricing in 2030 would increase production costs for pharmaceuticals, chemicals and transport the most.

Figure 13. Percent Change in Output Prices by Scenario in 2030
(output price increase, %)



Source: IMF staff using CPAT.

46. Measures to address competitiveness concerns include, in the absence of international coordination, to only impose carbon charges on firms' emissions above a threshold level (as in South Africa), though this partial exemption effectively lowers the average carbon charge, which undermines mitigation incentives. Another possibility is to return revenues collected from EITE industries in the form of output-based rebates to those industries—operationally, this scheme acts like a TPS or feebate approach discussed above. A further possibility, under an ETS not a carbon tax, is to provide free allowance allocations to EITE industries. One drawback from all these approaches is that they reduce the potential government revenue raised from carbon pricing.

47. The table below summarizes the main results across different scenarios, which might be helpful to weigh different trade-offs in the decision-making process.

[22] While it is not a focus of this study, addressing competitiveness concerns might include policies such as border carbon adjustment (BCA) or free allowances allocation for EITE industries in case of ETS.

Table 4. Brunei Darussalam: Summary					
Scenario	**Carbon Tax 50**	**ETS**	**Feebates**	**Subsidy Reform**	**Combination**
Covered Sectors	All	All	Power and industry	All	All
Energy-Related CO_2 Emissions reduction in 2030, % to a BAU	44.2	40.8	10.2	24.3	50.4
Cumulative CO_2 Emissions Reductions in 2024-2030, MtCO2	26.2	23.8	6.4	12.7	30.2
Additional Fiscal Revenues Raised in 2030 or Budget Savings[1], % of GDP	4.7	4.1	1.6	5.2	7.2
Cumulative Additional Fiscal Revenues Raised in 2024-2030, bn USD	3.6	3.1	1.1	3.4	5.5
Impact on GDP Growth in 2030, percentage points deviation from the BAU growth	-0.09	-0.09	-0.05	-0.15	-0.11
Electricity Price Increase in 2030, percent from the BAU price	79	71	3	179	288
Electricity Price Increase in 2030, percent from the current price	-22	-26	-55	22	69
Pure Abatement Costs, % of GDP	-0.85	-0.57	-0.09	-0.10	-1.24
Domestic Co-Benefits (transport, air pollution, climate), % of GDP	3.4	3.1	0.8	1.9	4.0
[1] Includes the base erosion effect. Price projections start from 2022 onwards.					

D. Conclusion

48. Given Brunei Darussalam's goal to reach Net Zero by 2050, the gap between the Net-Zero emissions pathway and the reduced levels of emissions by scenario remains. There are several additional policies that might help to close it. Such policies include:

- Pricing or similar schemes for GHG emissions beyond the energy sector: for example, methane fee (to help reducing fugitive emissions),
- Promoting the development and growth of domestic innovation, adoption, and production of low-carbon technologies:
    - To accelerate capital turnover: targeted subsidies for retrofitting buildings, accelerated depreciation, and low-carbon, long-life capital goods,

- To accelerate learning-by-doing externalities: production subsidies (declining over time or with production levels), Carbon Contracts for Differences (CCfds),
- To address network externalities: public investment in enabling infrastructure (for example, smart grids, charging stations, public transportation),
- To lower financing costs: feed-in tariffs; power purchase agreements,
- To boost research: intellectual property protection, R&D subsidies and tax credits, accelerated depreciation for R&D, grants to universities and research labs.

49. Prospects for an effective and politically acceptable mitigation and revenue diversification strategy with carbon pricing as the centerpiece can be enhanced by a comprehensive approach with several key elements. These include:

- A balance between carbon pricing and other mitigation instruments—especially feebates or TPSs—at the sectoral level that are less efficient than pricing but likely have greater acceptability;
- Recycling of carbon pricing revenues in ways that boost the economy (e.g., through lowering taxes on work effort or funding socially productive investments), making sure that benefits are equitably distributed across households;
- Recycling revenues to boost public investments in clean technology infrastructure networks (e.g., grid updates to accommodate renewables) and/or investments for adaptation that would not be provided privately;
- Market reforms to enhance competition and investment in the main energy sectors;
- Just transition measures to assist vulnerable groups, such as stronger social safety nets or tax reliefs for low-income households, assistance programs for displaced workers and at-risk regions;
- Measures to limit impacts of carbon pricing on industrial competitiveness;
- Financial sector support for the low-carbon transition.[23]

Extensive upfront consultations with stakeholders and information campaigns to inform the public of the rationale for reform can help build political support. Reforms should also be phased in progressively to give households and firms time to adjust. Recent increases in fossil fuel prices, while likely transitory in nature, are at least to some extent another reminder of the need for low-carbon energy transition to shield the economy from recurrent fuel price shocks, but they also underscore the importance of a comprehensive and inclusive approach to reform to protect the vulnerable and gain social and political support.

[23] See the 2020 *Sustainable Finance Framework* 2020 and 2021 *Environmental and Social Risk Management Framework*.

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Annex I. Brunei Darussalam: Further Details on Carbon Pricing Schemes

Annex I. Table 1. Further Details on National, Subnational and Regional Level Carbon Pricing Schemes in Operation

Country/ Region	Year Introduced	Coverage of Energy Sectors				Coverage Rate, all GHGs (percent)	Price, $/tonne	Revenue/ Rent, % GDP	Point of Tax/ Regulation	Revenue Use
		Power	Industry	Transport	Buildings					
Carbon Taxes										
Argentina	2018	✓	✓	✓		20	5	0.070	Midstream	General budget
Colombia	2017	✓	✓	✓	✓	23	5	0.04	Midstream	Environmental spending
Chile	2017	✓	✓			29	5	0.05	Downstream	General budget
Indonesia	2022	✓				26	2	0.05	Midstream	General budget
Singapore	2019	✓	✓			80	4	0.04	Midstream	General budget
South Africa	2019	✓	✓	✓	✓	80	10	0.04	Midstream	General budget
Ukraine	2011	✓	✓		✓	71	1	0.05	Midstream	General budget
Uruguay	2022		✓	✓		11	127	1.15	Midstream	General budget, environmental spending
ETSs										
EU	2005	✓	✓			41	87	0.26	Downstream	General budget, environmental spending
Austria	2005	✓	✓			37	87	0.11	Downstream	General budget, environmental spending
Belgium	2005	✓	✓			38	87	0.19	Downstream	General budget, environmental spending
Bulgaria	2005	✓	✓			52	87	1.82	Downstream	General budget, environmental spending
Croatia	2005	✓	✓			32	87	0.33	Downstream	General budget, environmental spending
Cyprus	2005	✓	✓			51	87	0.43	Downstream	General budget, environmental spending
China	2013, 2014, 2016, 2021	✓				38	9	0.32	Downstream	Environmental spending proposal
Czech Republic	2005	✓	✓			51	87	0.78	Downstream	General budget, environmental spending
Germany	2005, 2021	✓	✓	✓	✓	85	62	0.44	Mid & Downstream	Environmental spending
Greece	2005	✓	✓			47	87	0.66	Downstream	General budget, environmental spending
Hungary	2005	✓	✓			30	87	0.39	Downstream	General budget, environmental spending
Italy	2005	✓	✓			34	87	0.18	Downstream	General budget, environmental spending
Kazakhstan	2013	✓	✓		✓	46	1	0.10	Downstream	General budget
Korea	2015	✓	✓	✓	✓	73	19	0.99	Downstream	Environmental spending
Lithuania	2005	✓	✓			30	87	0.44	Downstream	General budget, environmental spending
Malta	2005	✓	✓			34	87	0.28	Downstream	General budget, environmental spending
New Zealand	2008	✓	✓	✓		49	53	0.20	Downstream	General budget, environmental spending
Romania	2005	✓	✓			33	87	0.89	Downstream	General budget, environmental spending
Slovakia	2005	✓	✓			50	87	0.64	Downstream	General budget, environmental spending
US	2009, 2012, 2018, 2021	✓	✓	✓	✓	7	24	0.05	Up & Midstream	General budget, direct transfers, environmental spending
Hybrid										
Canada	2019	✓	✓	✓	✓	67	38	0.16	Downstream	Tax cuts, environmental spending
Denmark	1992, 2005	✓	✓	✓	✓	62	52	0.29	Mid & Downstream	General budget
Estonia	2000, 2005	✓	✓			63	79	1.26	Mid & Downstream	General budget
Finland	1990, 2005	✓	✓	✓	✓	67	77	0.76	Mid & Downstream	General budget, tax cuts
France	2005, 2014	✓	✓	✓	✓	56	64	0.41	Mid & Downstream	General budget, environmental spending
Iceland	2005, 2010	✓	✓	✓	✓	93	56	0.62	Mid & Downstream	General budget
Ireland	2005, 2010	✓	✓	✓	✓	59	62	0.23	Mid & Downstream	General budget,direct transfers, environmental spending
Mexico	2014, 2020	✓	✓	✓	✓	61	4	0.02	Midstream	General budget
Japan	2010, 2011, 2012	✓	✓	✓	✓	77	2	0.05	Midstream	Environmental spending
Latvia	2004, 2005	✓	✓			25.4	79	0.39	Midstream	General budget
Liechtenstein	2005, 2008	✓	✓	✓	✓	81	130	0.60	Mid & Downstream	General budget
Luxembourg	2005, 2021	✓	✓	✓	✓	79	38	0.048	Mid & Downstream	General budget
Netherlands	2005, 2021	✓	✓			46	87	0.270	Mid & Downstream	General budget
Norway	1991, 2005	✓	✓	✓	✓	55	87	0.94	Mid & Downstream	General budget
Poland	1990, 2005	✓	✓	✓	✓	51	81	1.45	Mid & Downstream	Environmental spending
Portugal	2015, 2005	✓	✓	✓	✓	70	56	0.52	Mid & Downstream	General budget, environmental spending
Slovenia	1996, 2005	✓	✓	✓	✓	89	47	0.48	Mid & Downstream	General budget
Spain	2005, 2014	✓	✓		✓	37	82	0.25	Mid & Downstream	General budget, environmental spending
Sweden	1991, 2005	✓	✓	✓	✓	77	109	0.52	Mid & Downstream	General budget
UK	2013, 2021	✓	✓			49	67	0.42	Downstream	General budget, tax cuts
Switzerland	2008	✓	✓		✓	44	114	0.16	Midstream	Tax cuts, direct transfers, environmental spending

Source: Parry and others (2022).

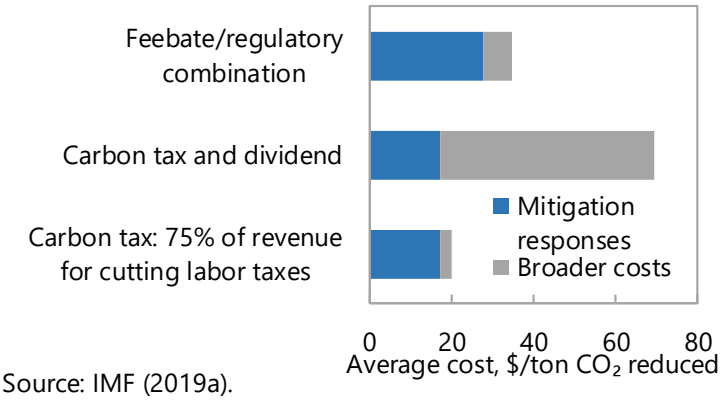
Note: Revenue/rent excludes revenue loss from erosion of prior fuel tax bases. Values combine national, subnational and regional pricing. Mexico does not include subnational pricing schemes due to lack of coverage data.

Annex II. Brunei Darussalam: The Economic Importance of Using Carbon Pricing Revenues Productively

1. Carbon pricing imposes two sources of cost on the economy. First is the cost of the mitigation responses themselves, for example, firms producing with cleaner but more expensive technologies or households using less fuel than they would otherwise prefer. Second is the broader macroeconomic costs. Higher energy prices tend to slightly contract overall economic activity as they increase the general price level, which in turn reduces the real returns to work effort and investment, compounding distortions in factor markets created by taxes on labor and capital income. These costs can be largely offset (or perhaps more than offset in some cases) by using carbon pricing revenues to increase economic efficiency, for example by lowering taxes on work effort or funding productive investments.[1]

2. A recent assessment for the United States (Annex II. Figure 1) suggests that an ETS with free allowance allocation and emissions price of $50 per tonne, or the equivalent carbon tax with revenues returned in lump-sum dividends to households[2] is about twice as costly—for a given nationwide emission reduction—as a combination of feebates to reduce emission rates. This is because feebates have much smaller impacts on energy prices and therefore have much smaller macroeconomic costs. The most cost-effective policy however is an ETS with allowance auctions, or a carbon tax, with the bulk of revenues used to cut distortionary taxes on labor and business income and increase economic efficiency.

Annex II. Figure 1. Economic Efficiency Costs of Alternative Mitigation Instruments for the United States
($50/Ton Carbon Tax), 2030



Source: IMF (2019a).
Note: Policies reduce economywide CO_2 emissions 22 percent below BAU.

3. Table A1 provides more discussion of alternative options for the use of carbon pricing revenues in terms of implications for economic efficiency, distributional incidence, administrative burdens, and political acceptability.

[1] A substantial analytical literature has explored these interactions (see, for example, Goulder and others, 1999, and Parry and Williams, 2012).

[2] Dividends have no efficiency benefits as they do not increase the real return to work effort or investment.

Annex II. Table 1. Options for Using Carbon Tax Revenues

Instrument		Metric			
		Impact on Economic Efficiency	Impacts on Income Distribution	Administrative Burden	Political Feasibility
General Revenue Uses	Public investment	Potentially significant (high fiscal multipliers, especially for low-carbon investments)	Can disproportionately benefit low-income households (for example, if provides basic education, health, infrastructure), but depends on implementation	Modest; requires strong public investment management	Can be popular, with green investment especially favored in climate-concerned countries
	Tax reductions	Can improve incentives for work effort and investment and reduce incentives for the black economy and tax evasion	Can be designed to be progressive (for example, via increases in personal income tax thresholds)	Minimal	Popular with beneficiaries (for example, households for personal cuts, firms for corproate income tax cuts)
	Deficit reduction	Lowers future tax burdens and macro-financial risk	Depends on country circumstances	Minimal	Does not garner politcal support
Assistance to Households	Universal lump-sum transfers	Forgoes efficiency benefits (for example, no enhanced incentive for work effort)	Progressive (disproportionately benefits the poor)	New capacity may be needed (but should be manageable)	Mixed, with some households/firms favouring or disliking lump-sum transfers
	Means-tested cash transfers or social assistance	Forgoes efficiency benefits, but typically requires only a small share of revenues	Effective at helping low-income groups if transfers are well targeted or if social safety nets are comprehensive	Low if builds on existing capacity, otherwise significant	Generally popular
	Direct assistance for household energy bills	Forgoes efficiency benefits; reduction in environmental effectiveness depending on design	Provides partial relief for households (but does not help with indirect pricing burden)	Low if builds on existing capacity, otherwise significant	Generally popular

Source: IMF staff.

Note: Green, orange, and red indicate an advantage, neither an advantage or disadvantage, and a disadvantage of the revenue use, respectively.

Annex III. Brunei Darussalam: Pricing Schemes for Broader Sources of GHGs

1. **Forestry**. Ideally, forestry and land use policies would promote the main channels for increasing carbon storage including reducing deforestation, afforestation, and enhancing forest management (e.g., planting larger trees, increasing rotation lengths). To the extent forest coverage is expanded this can, moreover, generate other environmental co-benefits beyond carbon storage such as reduced risks of water loss, floods, soil erosion, and river siltation.

A national feebate program could cost-effectively promote all responses for increasing carbon storage without a fiscal cost to the government. The policy would apply to landowners—most importantly those at the agricultural/forestry boundary—a fee given by:

> [CO_2 rental price] × [carbon storage on their land in a baseline period ─ stored carbon in the current period]

This scheme would reward all three channels for enhancing carbon storage, either through reduced fees or increased subsidies. Periods here could be defined as averages over multiple years given that carbon storage might be lumpy during years when harvesting occurs. Feebates can be designed—through appropriate scaling of the baseline over time[1]—to be revenue-neutral in expected terms. And a feebate could be administered based on the registry of landowners used for business tax collection.[2]

Feebates could involve rental payments, rather than large upfront payments for tree planting, given that changes in carbon storage may not be permanent. The problem with one-off, upfront payments is that afforestation may be reversed—for example, a new tree farm receiving an upfront rebate may be subsequently harvested or destroyed (by fires, pests, windstorms), requiring complex, ex-post re-payment procedures to provide adequate incentives for maintaining the land-use change. Feebates have become more practical with advances in monitoring technologies. Forest carbon inventories are estimated through a combination of satellite monitoring, aerial photography, and on-the-ground tree sampling.[3]

2. **Agriculture**. Around fourth fifths of methane emissions in the Philippines are from the agricultural sector and these emissions account for about 70 percent of total GHGs from agriculture.

[1] See Parry (2020) for details.

[2] Feebates bear some resemblance to environmental services payments programs that were first introduced in Costa Rica (see www.fonafifo.go.cr/en). Costa Rica's scheme involves payments to develop and maintain forests but does not apply fees for reductions in forest coverage.

[3] See www.forestcarbonpartnership.org.

Two thirds of agricultural methane emissions are from rice cultivation[4] and one-third from livestock operations. The other main GHG from agriculture is nitrous oxide, primarily from soils.

Emissions reductions should be balanced by the need to enhance food production and food security, especially in the face of a global food supply shock. The main channel for reducing rice paddy emissions is to reduce water intensity through, for example, periodic draining. Increasing livestock productivity (e.g., through breed switching), and shifting to alternative feed (e.g., with seaweed additive) can reduce methane releases from enteric fermentation and methane/nitrous oxide emissions from manure.

Pricing of agricultural GHGs is trickier but could be based on farm-level output or input data, default emissions factors,[5] and rebates for farmers demonstrating mitigation actions (e.g., drainage of rice paddies). Revenues from the fee might be recycled to the sector to help address competitiveness concerns.

3. Waste. There is a limited range of behavioral responses to reduce methane emissions from the waste sector. At landfill sites these include collection and flaring of methane leaks and at the consumer/industrial level, they include reducing the demand for packaging and food, enhanced recycling, and composting of organic waste. The case for pricing methane from waste is less compelling than for pricing GHGs from other sectors. For one thing, it is more practical to mimic the effects of a tax with regulation given the very limited number of (readily observable) mitigation responses. In addition, downstream methane taxes would not promote reductions in the supply of waste—these require fiscal or regulatory incentives at the household and industrial level. And the 389 waste sites in the Philippines are publicly managed and it is more natural to set standards, rather than apply taxes, to public enterprises.

[4] Methane is released when flooded fields prevent oxygen from penetrating the soil, creating conditions for methane-emitting bacteria.

[5] See IPCC (2019).

Annex IV. Brunei Darussalam: Climate Policy Assessment Tool

1. CPAT provides, on a country-by-country basis for 200 countries, projections of fuel use and CO_2 emissions by major energy sector.[1] This tool starts with use of fossil fuels and other fuels by the power, industrial, transport, and residential sectors[2] and then projects fuel use forward in a baseline case using:

- GDP projections;[3]
- Assumptions about the income elasticity of demand and own-price elasticity of demand for electricity and other fuel products;
- Assumptions about the rate of technological change that affects energy efficiency and the productivity of different energy sources; and
- Future international energy prices.

In these projections, current fuel taxes/subsidies and carbon pricing are held constant in real terms. The impacts of carbon pricing on fuel use and emissions depend on: (i) their proportionate impact on future fuel prices in different sectors; (ii) a simplified model of fuel switching within the power generation sector; and (iii) various own-price elasticities for electricity use and fuel use in other sectors. For the most part, fuel demand curves are based on a constant elasticity specification.

2. The basic model is parameterized using data compiled from the International Energy Agency (IEA) on recent fuel use by country and sector.[4] GDP projections are from the latest IMF forecasts.[5] Data on energy taxes, subsidies, and prices by energy product and country is compiled from publicly available and IMF sources, with inputs from proprietary and third-party sources. International energy prices are projected forward using an average of IEA and IMF projections for coal, oil, and natural gas prices. Assumptions for fuel price responsiveness are chosen to be broadly consistent with empirical evidence and results from energy models (fuel price elasticities are typically between -0.5 and -0.8). Carbon emissions factors by fuel product are from IEA. The domestic environmental costs of fuel use are based on IMF methodologies.[6]

[1] CPAT was developed by IMF and World Bank staff and evolved from an earlier IMF tool used, for example, in IMF (2019a and b). For descriptions of the model and its parameterization (see IMF (2019b Appendix III, and Parry and others. 2021), and for further underlying rationale see Heine and Black (2019).

[2] International aviation and maritime fuels are excluded from the model and from computations of fossil fuel subsidies.

[3] GDP projections exclude the negate growth effects of global climate change.

[4] IEA (2021). Any fuel consumption that could not be explicitly allocated to a specific sector was allocated apportioned based on the relative consumption by sector in a given country.

[5] A modest adjustment in emissions projections is made to account for partially permanent structural shifts in the economy caused by the pandemic.

[6] See Parry, Black and Vernon (2021).

3. One caveat is that the model abstracts from the possibility of mitigation actions (beyond those implicit in recently observed fuel use and price data) in the baseline, which provides a clean comparison of policy reforms to the baseline. Another caveat is that, while the assumed fuel price responses are plausible for modest fuel price changes, they may not be so for dramatic price changes that might drive major technological advances, or rapid adoption of technologies like carbon capture and storage or even direct air capture, though the future viability and costs of these technologies are highly uncertain. The model also does not explicitly account for the possibility of general equilibrium effects (e.g., changes in relative factor prices that might have feedback effects on the energy sector), and changes in international fuel prices that might result from simultaneous climate or energy price reform in large countries. Parameter values in the spreadsheet are, however, chosen such that the results from the model are broadly consistent with those from far more detailed energy models that, to varying degrees, account for these sorts of factors.

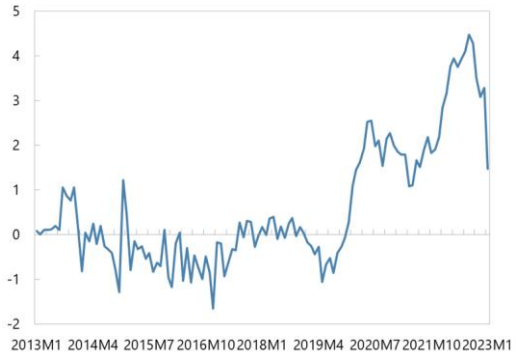
DECOMPOSING THE INFLATION DRIVERS IN BRUNEI[1]

Inflation in Brunei has been on the rise since 2021, raising concerns about its potential impact on the economy. This appendix seeks to analyze the drivers of inflation in Brunei by employing a structural vector autoregression (SVAR) model. By disentangling demand-side and supply-side factors, we aim to understand the relative importance of different inflation causes and their implications for economic policy. Our estimation reveals that the inflation uptick in Brunei over recent quarters is driven by a combination of demand and supply factors.

A. Introduction

1. Since 2021, Brunei has experienced a notable increase in inflation. Historically, inflation in Brunei is low and stable. However, since 2020 a variety of factors have led to rising inflation in Brunei. Average headline inflation increased from -0.4 percent before the pandemic, to 1.7 percent in 2021 and 3.7 percent in 2022. Even though inflation has come down in 2023, it is useful to investigate the causes behind the recent rise in inflation given the unusually large magnitude.

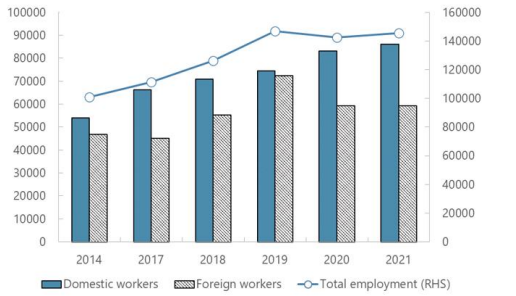
Figure 1. Consumer Price Index
(y/y change, in percent)



Sources: Brunei authorities; and IMF staff calculations.

2. There are multiple potential drivers behind the recent rise in inflation. The potential causes of the inflation surge come from both supply and demand sides, many of which are shared globally. On the supply side, the global supply chain disruption following widespread COVID-19 lockdowns and travel restrictions increased production and shipping costs world-wide. The impact of COVID-19 and of the Ukraine war on global commodity supplies also led to increases in the prices of key commodities, including agricultural products. Consistent with these observations, food and transport prices in Brunei have increased substantially during the pandemic period.[2] In addition, reduced mobility and heightened health concerns during the pandemic caused disruptions in labor markets in many countries, contributing to increased production costs and higher prices for goods and services.

Figure 2. Private Sector Employment and Composition
(in number of persons)



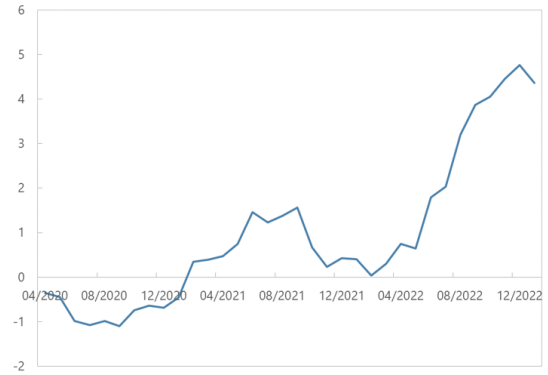
Sources: Brunei authorities; and IMF staff calculations.

[1] Prepared by Natasha Che (APD).

[2] Food price increased 5.1 percent y/y in 2022, while the increase in transport price peaked in 2021 at 5.9 percent EoY.

Specifically, Brunei, where foreign workers contributed to half of the private sector employment[3] before the pandemic, saw a 20 percent drop in foreign labor employment after the pandemic started. On the demand side, the fiscal and monetary responses to COVID-19, while helping to support businesses and households during the crisis, could have potentially increased domestic demand, putting upward pressure on inflation. More importantly, after the pandemic restrictions were gradually lifted starting late 2021, consumers who had been unable to spend during the pandemic could spend again. This release of pent-up demand could in some cases temporarily outpace the ability of businesses to expand production, leading to increased price pressure especially for domestic non-tradables, the demand for which was significantly hampered during the COVID-19 lockdown. This is consistent with the observed price surge for the hospitality sector in Brunei, after the country reopened in mid-2022.

Figure 3. Price Index of Restaurants and Hotels
(y/y change, in percent)

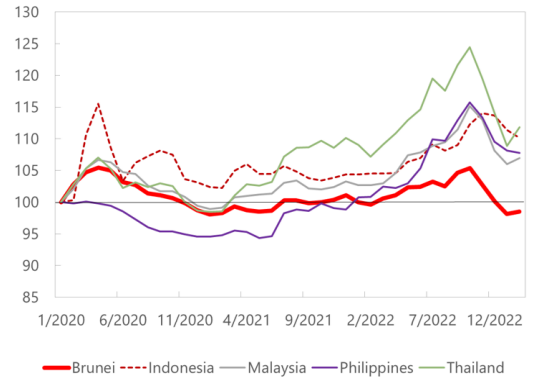


Sources: Brunei authorities; and IMF staff calculations.

3. Aside from these factors, there are other drivers for inflation such as passthroughs from exchange rate depreciation. The impact of depreciation is not specially studied in this appendix. But this factor may have less importance in Brunei's recent inflation surge compared to in some other countries in the region since the depreciation of Brunei dollar against the USD after the pandemic has been mild.

B. Methodology

Figure 4. Exchange Rate Index Against USD
(2020M1=100, higher=depreciation)



Sources: Brunei authorities; and IMF staff calculations.

4. To evaluate the relative importance of different causes of inflation in Brunei, we employ a structural vector autoregression (SVAR) model to separate inflation and GDP growth drivers into supply and demand factors. The SVAR model is particularly suitable for our analysis as it enables us to identify and quantify the impact of various shocks on the economy while accounting for the dynamic interdependence between variables. By imposing a set of identifying restrictions, the SVAR model allows us to disentangle the effects of demand and supply shocks on inflation. Specifically, variation in quarterly GDP and CPI is used to identify orthogonal supply and demand shocks. The output and inflation series are each modeled to be a function of four elements: (i) a constant, (ii) their own past histories, (iii) demand shocks, which are characterized by movements of both GDP and CPI in the same

[3] The private sector includes employment by the government-linked companies (GLCs).

direction, and (iv) supply shocks, which are characterized by movements of GDP and CPI in opposite directions. By imposing definitions (iii) and (iv) on the data, we use the two observed time series (GDP and CPI) to extract the two unknown series (demand shocks and supply shocks).[4]

5. The model derives supply and demand shocks by imposing certain assumptions regarding the behavior of GDP and prices in response to these shocks. These assumptions are then used to decompose headline inflation into supply- and demand-driven components. Following Kilian and Lütkepohl (2017), we stack output and inflation of a country into a vector Y_t, which is a function of a constant c, two lags of itself, and an error term E_t with variance Σ:

$$Y_t = c + B_1 Y_{t-1} + B_2 Y_{t-2} + E_t \quad (1)$$

Assuming that each component of E_t is homoscedastic and serially uncorrelated, and defining A_0 as the square root of Σ, we could rewrite the equation:

$$Y_t = c + B_1 Y_{t-1} + B_2 Y_{t-2} + A_0 U_t \quad (2)$$

Here, $A_0^{-1} E_t = U_t$. U_t are orthogonal shocks and $VAR(U_t) = I$.

To ensure that the resulting series U_t has the correct interpretation, we impose restrictions on its coefficients, so that the demand shock component rises when both GDP and CPI rise, and the supply shock rises when GDP falls but CPI rises (after controlling for the constant and lagged terms in each case). We rewrite the equation in component form, where S_t are supply shocks and D_t are demand shocks

$$\begin{pmatrix} GDP_t \\ CPI_t \end{pmatrix} = \begin{pmatrix} c_1 \\ c_2 \end{pmatrix} + \begin{pmatrix} b_{11}^1 & b_{12}^1 \\ b_{21}^1 & b_{22}^1 \end{pmatrix} \begin{pmatrix} GDP_{t-1} \\ CPI_{t-1} \end{pmatrix} + \begin{pmatrix} b_{11}^2 & b_{12}^2 \\ b_{21}^2 & b_{22}^2 \end{pmatrix} \begin{pmatrix} GDP_{t-1} \\ CPI_{t-1} \end{pmatrix} + \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix} \begin{pmatrix} S_t \\ D_t \end{pmatrix} \quad (3)$$

We then impose the sign restrictions:

$$\begin{pmatrix} GDP_t \\ CPI_t \end{pmatrix} = \begin{pmatrix} c_1 \\ c_2 \end{pmatrix} + \begin{pmatrix} b_{11}^1 & b_{12}^1 \\ b_{21}^1 & b_{22}^1 \end{pmatrix} \begin{pmatrix} GDP_{t-1} \\ CPI_{t-1} \end{pmatrix} + \begin{pmatrix} b_{11}^2 & b_{12}^2 \\ b_{21}^2 & b_{22}^2 \end{pmatrix} \begin{pmatrix} GDP_{t-1} \\ CPI_{t-1} \end{pmatrix} + \begin{pmatrix} + & + \\ - & + \end{pmatrix} \begin{pmatrix} S_t \\ D_t \end{pmatrix} \quad (4)$$

Intuitively, positive supply and demand shocks both increase output, but supply shocks reduce inflation whereas demand shocks increase it.

To find a matrix A_0 that satisfies these restrictions, we use a Cholesky decomposition of Σ to generate an initial candidate $\tilde{A}_0$. We then jitter this by a random matrix Q to create a new candidate $\hat{A}_0 = \tilde{A}_0 Q$, where Q is a random orthogonal matrix that preserves the key property $\hat{A}_0 \hat{A}_0^{-1} = \Sigma$. We repeat this process with new draws of Q until we find a candidate $\hat{A}_0$ that satisfies the sign restrictions in equation (4).

[4] One caveat of the model is that it assumes domestic supply and demand conditions are the main drivers of inflation, which overlooks the fact that price movement can be driven by external supply and demand factors as well, especially for small open economies like Brunei where inflation can be significantly affected by import prices. In addition, there is extensive price control measures on basic goods such as food and fuel products in Brunei, which could make headline inflation numbers less sensitive to the underlining shocks.

With the process for generating viable A_0 coefficients in hand, we proceed to estimate the overall VAR. For this, we employ a standard numerical Bayesian approach, specifically Gibbs sampling. We define $b = vec(B)$ as the vectorization of all the model coefficients, and rewrite equation (1) as $Y_t = X_t B + E_t$ for simplicity, where $X_t = \{1, Y_{t-1}, Y_{t-2}\}$.

We set a starting value Σ_0 equal to the identity matrix, and then draw a first attempt b_1 from a multivariate normal distribution $f(b|\Sigma)$ with mean $\hat{b} = vec((X'X)^{-1}(X'Y))$ and variance $\hat{v} = \Sigma_0 \otimes (X'X)^{-1}$. Next, we draw a first attempt at the variance Σ_1 from an inverse Wishart distribution $f(\Sigma|b)$ with scale parameter $(Y - XB_1)'(Y - XB_1)$ and T degrees of freedom, where B_1 is b_1 reshaped to make it conformable with X_t. We then use these estimated B_1 and Σ_1 to calculate the historical division of inflation between supply and demand shocks and store the estimates.

We repeat the previous two steps 1000 times (discarding the first 100 iterations to remove the influence of the initial estimate Σ_0) and take the mean value of the coefficients across the remaining iterations to generate our overall estimates.

C. Data

6. We used Brunei's quarterly data on CPI and real GDP in the estimation. The sample period is from 2011Q1 to 2022Q3. The data series are seasonally adjusted. We then apply y/y change to the adjusted series to generate inflation and real GDP growth. Due to the presence of a large oil and gas (O&G) sector, the operation of which does not necessarily respond to Brunei's domestic supply and demand conditions, we estimated two versions of the model, using real GDP and real non-O&G GDP series respectively.[5]

D. Results

7. The estimation shows that the inflation uptick in Brunei over the recent quarters are driven by both demand and supply factors. Figure 5 presents two versions of the decomposition exercise for inflation and real GDP growth, using total real GDP and non-O&G real GDP respectively. The green and blue bars represent the contributions of supply and demand shocks to inflation and output respectively. The yellow bars are the contribution from lagged dependent variables. Regarding the inflation decomposition, here are some of the key points to note:

- The increase in inflation in 2022 was driven by a combination of supply and demand factors. Notably, demand pressure has increased in 2022, when the economy reopened, compared to the year prior. This is more clearly seen in the version using non-O&G real output, which arguably better responds to domestic demand conditions, since the O&G sector's output is mostly exported. This result is consistent with other countries' experiences that post-pandemic reopening tends to foster a temporary surge in domestic demand. Overall, the result using non-O&G real output in the estimation shows that the supply factors explained about 38 percent of CPI inflation in 2022, while the demand factors explained about 31 percent.

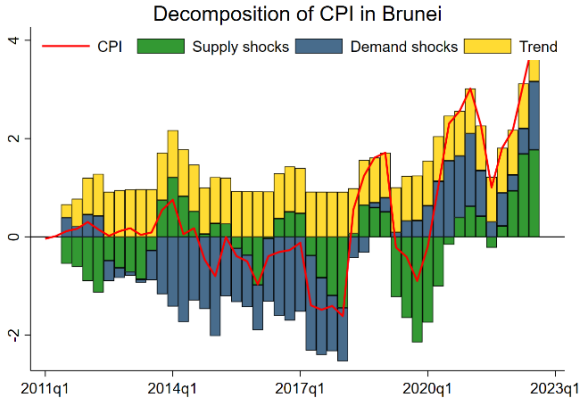
[5] The non-O&G GDP series is derived by subtracting the real outputs of oil and gas mining and manufacture of liquified gas and methanol industries from the real GDP series, and then applying seasonally adjustment.

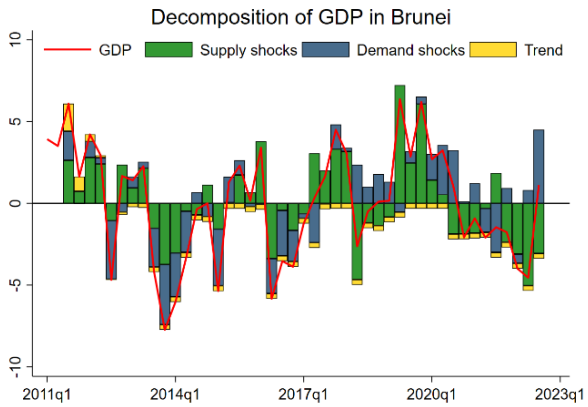
- The inflation decomposition using non-O&G GDP also shows that the uptick in inflation in 2021, when the economy was mostly in lockdown, was primarily driven by supply bottlenecks. The result using non-O&G real output in the estimation shows that the supply factors explained about 45 percent of inflation in 2021, while the demand factor explained about 7 percent.
- After the economy reopened in 2022, the result indicates that the supply disruptions continued to contribute significantly to inflation in Q2 and Q3. In this regard, it's interesting to compare Brunei's inflation decomposition with that of its neighbor, Singapore (Figure 6). Compared to Singapore, supply bottleneck had a more pronounced impact on inflation in Brunei for 2022. One possible explanation is that even after reopening, it still took time for domestic production capacity to recover to the pre-pandemic level, including for foreign workers who powered Brunei's domestic service sector to return. This explanation is consistent with the relatively modest output growth post-reopening in Brunei's non-tradable sector (e.g., construction and services) so far.

8. The real output decomposition paints a picture of the supply-demand dynamics consistent with the inflation decomposition. The results for the real GDP decomposition (Figure 1, right column) show that supply disruptions have been a drag on output growth in recent quarters, while demand factors have a positive contribution to growth. This is consistent with the fact that O&G sector output growth has been held back by infrastructure maintenance despite the surge in O&G prices during 2022, while the growth in non-O&G output, though seeing a boost after the reopening, is still modest so far.

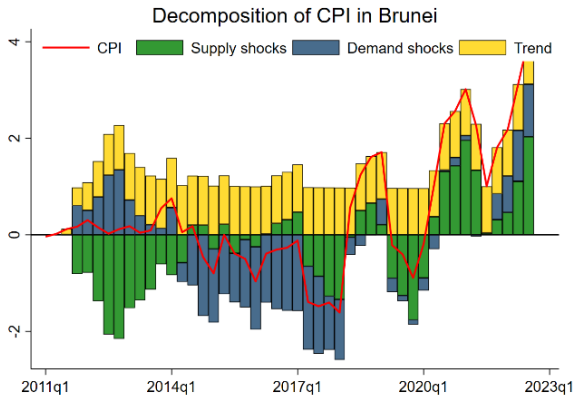
Figure 5. Decomposition of Inflation and GDP Growth in Brunei

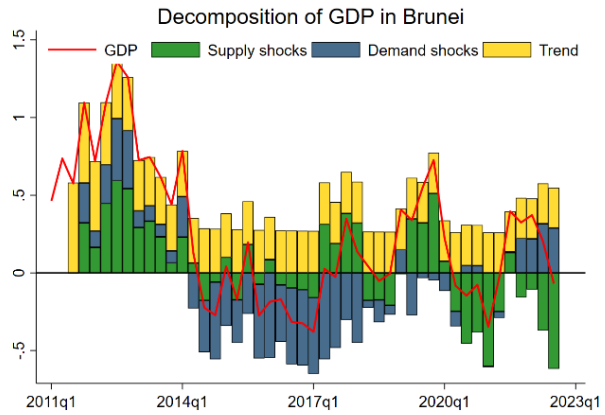
(Using Total Real GDP)





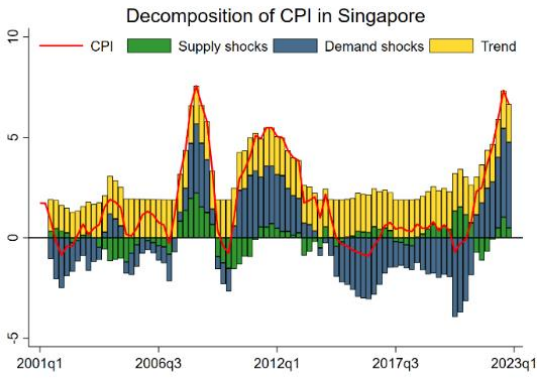
(Using Non-O&G Real GDP)

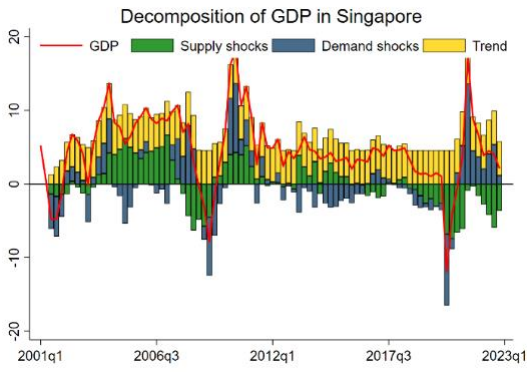




Source: IMF staff estimates.

Figure 6. Decomposition of Inflation and GDP Growth in Singapore





Source: IMF staff estimates.

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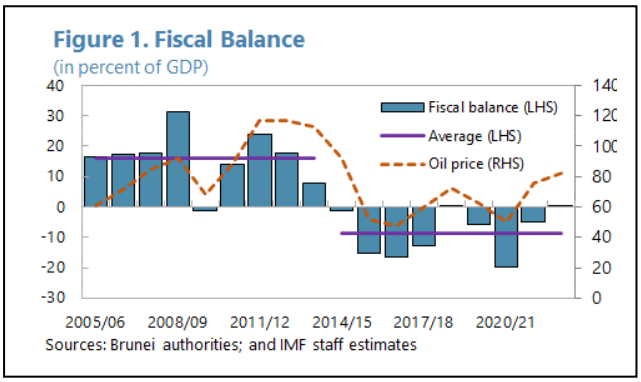
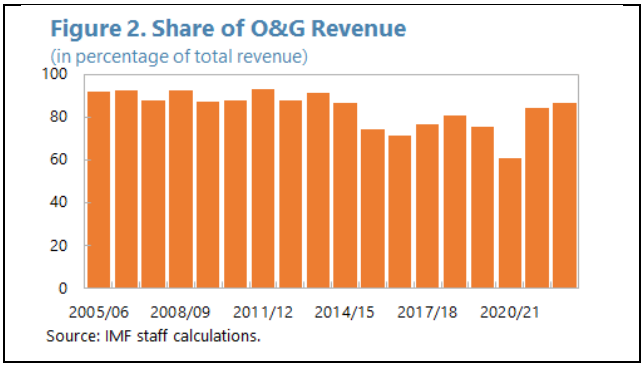
DESIGNING AN EQUITABLE AND SUSTAINABLE FISCAL STRATEGY FOR BRUNEI[1]

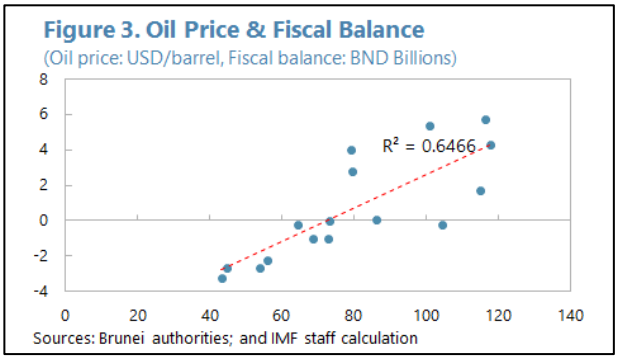
Brunei's fiscal sustainability hinges on fiscal prudence as the volatility of the oil and gas (O&G) prices, secular decline in O&G production[2] and global decarbonization efforts put pressure on its finances. The persistent gap between the baseline expenditure path and the sustainable spending levels that would ensure inter-generational equity highlights the need for accelerating fiscal consolidation efforts. Using a broad-based revenue diversification strategy, including carbon pricing together with wage and subsidy reforms could be an effective way forward. In addition, efficient and growth-friendly investments in health, education and green and resilient infrastructure are helpful considerations. Strengthening fiscal frameworks and institutions would be a critical complement to these reforms.

A. Introduction

1. Brunei's fiscal position is heavily dependent on O&G sector, making it vulnerable to global energy price changes. Revenue from O&G sector accounts for 84 percent of the total revenue on average from FY2005/06 to FY2022/23. Given expenditure rigidities, especially for current expenditures (excluding royalty payments),[3] as well as the significant impact of O&G price developments on the revenue outturns, Brunei's overall fiscal balance is strongly tied to fluctuations in international O&G prices. The increasing volatility and unpredictability of O&G prices in recent years exacerbate the challenges for Brunei. Recent sharp declines in O&G prices have gradually reduced fiscal buffers and/or led to reductions in capital spending.







[1] Prepared by Vybhavi Balasundharam (FAD) and Jonghyun Kim (APD).

[2] Proven reserves are likely to be depleted in 27 years (BP Statistical Review of World Energy 2021), subject to a production capacity of 110 thousand barrels a day and assuming no further discovery of oil fields.

[3] Wages and salaries, pensions, royalty payments, and annually recurrent charges account for 82 percent of the total expenditure on average from FY2005/06 to FY2022/23. While royalty payments comove with oil prices, the rest (wages & salaries, OCAR and charged expenses excluding royalty payments) do not respond strongly to oil price changes.

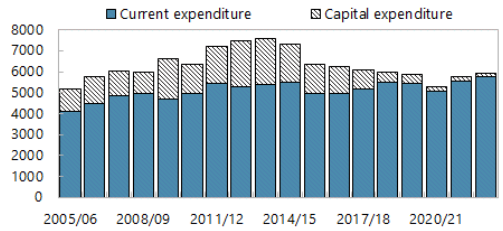
2. Brunei has mostly run a fiscal deficit since FY2014/15 with the fall in O&G prices and domestic production challenges, and potential downside risks in the global energy market cast a shadow over O&G revenue in the medium-to long-term. The government has run an average deficit of -8.3 percent of GDP since FY2014/15[4] and the non-O&G primary deficit has averaged around -53.9 percent of non-O&G GDP. The gradual depletion of the finite O&G reserves, further domestic production disruptions, reduction in global O&G prices reflecting a plausible global downturn and the push for global transition to net zero emissions by 2050, are additional risks that calls for fiscal consolidation efforts to secure long-term fiscal sustainability as well as intergenerational equity.

3. The 3-year Fiscal Consolidation Program (FCP) was launched in FY2018/19, but its scope is narrow and implementation was limited by the COVID-19 pandemic. The FCP focuses on improving efficiency in the provision of public services through corporatization, PPPs, and consolidation and merging of different agencies to reduce duplication. It requires line ministries to review their existing policies and to undertake relevant reforms to promote efficiency. The COVID-19 pandemic has delayed these expenditure rationalization efforts, but the government remains committed to the implementation of the different initiatives under the FCP.

4. Despite the additional spending pressures from the pandemic, the authorities have continued to make progress on fiscal consolidation. The non-O&G deficit declined to -39.2 percent of non-O&G GDP by FY2022/23 from -60.0 percent in FY2017/18. But unexpected fiscal support to help households and firms affected by the pandemic and the surge in food and fuel prices hindered the consolidation efforts. Specifically, the quality of fiscal adjustment was impacted and mostly achieved by cutting capital spending, which is important to foster physical and human capital accumulation, facilitate diversification and long-term growth.[5] The start of the decline in public investment since 2013 coincides with the downward turn in investment quality perception with Brunei now lagging both Advanced Economies and Petroleum Producers. The consolidation efforts are expected to slow down further in FY2023/24 as the government increases productive investments to address scarring from the pandemic.

Figure 4. Current VS Capital Expenditure

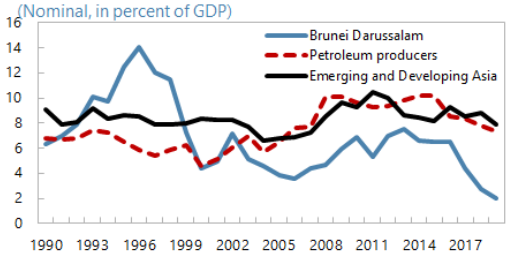
(Millions BRN$)



Sources: Brunei authorities; and IMF staff estimates

Figure 5. Public Investment

(Nominal, in percent of GDP)



Sources: IMF staff calculation

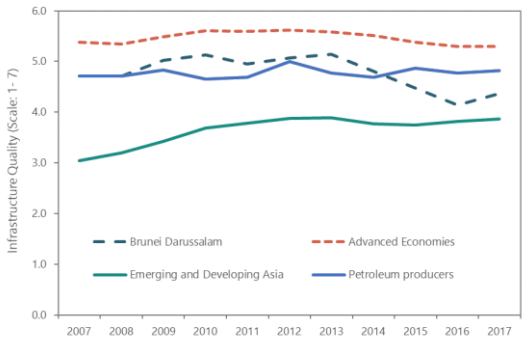
Source: Based on World Economic Forum which surveys business leaders' impressions of the quality of key infrastructure services. While this indicator provides a measure of the quality of infrastructure assets, it is affected by individual perception biases.

[4] Two notable exceptions are FY2022/23 and FY2018/19, when the government ran small surpluses with a rebound in oil prices.

[5] The government had increasingly used government-linked companies (GLCs) for public investment. However, the data on GLCs as well as the sovereign wealth funds are not available, which hinders the possibility of a comprehensive fiscal sustainability analysis for the wider public sector.

B. Analysis: Equitable and Sustainable Fiscal Frameworks

Figure 6. Investment Quality Perception
(Indicator between 0-7, 7 being the best)



Source: Based on World Economic Forum which surveys business leaders' impressions of the quality of key infrastructure services. While this indicator provides a measure of the quality of infrastructure assets, it is affected by individual perception biases.

5. Establishing a Long-term Fiscal Anchor. The Permanent Income Hypothesis (PIH) analysis is the most common approach to identify a sustainable spending path for resource-rich countries like Brunei.[6] The PIH provides the framework to address intertemporal choices. Under the PIH, 1) *the net wealth*—measured as net financial wealth (financial assets minus debt)[7] plus resource wealth (the present value of future O&G revenues)—is estimated[8], and 2) *the PIH norm* – i.e. the "sustainable" flow of income from this wealth that can be spent each year while keeping wealth (adjusted for inflation and sometimes, population growth) constant is determined. Table 1 presents the key assumptions for determining the net wealth and the corresponding PIH norm. The baseline scenario is based on the trajectory implied by current policy settings and assumes robust global O&G demand with 1% increase of O&G prices every year in the long run (beyond 2028) while the O&G output is constant at the average level between 2026 and 2028.Under a more radical downside scenario in line with the IEA's Net Zero Emissions by 2050 (NZE) scenario[9], the O&G production is set to decline 70 percent between 2030 and 2050, and O&G prices[10] are assumed to gradually decrease to 24 USD/barrel and 3.95 USD/MBtu due to global decarbonization pressures.

[6] The PIH model—a standard framework for commodity exporters—has merits, but there are some important caveats. These include its reliance on accurate estimates of long-term commodity prices, its compatibility with very low net financial assets (high net debt) which can carry risks, and its exclusion of both physical assets from the definition of net wealth and feedback effects of public investment on growth.

[7] The financial assets are held in the Consolidated Fund. It provides capital transfers on an annual basis to the extra budgetary funds, though there are no explicit rules on Fund allocation. The extrabudgetary funds includes the General Reserve Fund (GRF) which is connected to the sovereign wealth fund of Brunei managed by the Brunei Investment Agency, and the Sustainability Fund, which includes three sub-funds - the Fiscal Stabilization Reserve Fund (FSRF), Retirement Fund and Strategic Development Capital Fund (SDC). The PIH analysis assumes that the government can access resources from the Consolidated Fund as needed. The lack of transparency on these Funds limits the accuracy of our assessment.

[8] Note Brunei has no sovereign external debt issuance and very little short-term domestic debt issuance, mainly to develop the domestic capital markets rather than to meet the financing needs. Hence, we assume no debt for Brunei.
[9] This NZE maps out a way to achieve a 1.5°C stabilization in the rise in global average temperatures, alongside universal access to modern energy by 2030.

[10] IEA crude oil price (USD/barrel) is used for oil price, and the average of natural gas prices across U.S., EU, China, and Japan (USD/MBtu) is used for gas price.

Table 1. Brunei Darussalam: Key Assumptions Under Scenarios		
Variable	**Baseline**	**Downside**
O&G output	IMF baseline projections (up to 2028)	IMF downside projections[1] (up to 2028)
	Constant (From 2029 to 2050)	Decrease 70% by 2050 (From 2029 to 2050)
Oil price (USD/barrel)	IMF baseline projections (up to 2028)	IMF downside projections (up to 2028)
	Increase 1% every year (From 2029 to 2050)	Decrease to $24 by 2050 (From 2029 to 2050)
Gas price (USD/MBtu)	IMF baseline projections (up to 2028) & historical averages	IMF downside projections (up to 2028)
	Increase 1% every year (From 2029 to 2050)	Reach to $3.95 by 2050 (From 2029 to 2050)
Interest rate[2]	2.6%	
Population growth rate[3]	0.42%	
Long-term inflation rate	1.0%	
Gov't share in O&G revenue[4]	37.0%	

Source: IMF staff estimates and projections.
1/ The followings are key deviations of the downside projection from the baseline: [a)] 1 standard deviation fall in O&G prices 2024-2028; [b)] 10% reduction in O&G output volume 2023-2028; [c)] Inflation for 2023 kept at 2022 level (higher than baseline); [d)] reduction in FDI, imports, taxes (import duty, corporate tax), credit growth 2023-2028
2/ Average between 2023 and 2028 of the risk-free domestic real interest rate.
3/ Average between 2020 and 2050 based on the population estimates and projections of World Bank.
4/ Average between 2018 and 2022.

6. A fiscal anchor can help guide the needed fiscal consolidation in the medium-term and ensure a long-term sustainable fiscal framework. Using the Excel-based template developed by IMF on "How to Design a Fiscal Strategy in a Resource-Rich Country", we present results from three alternative fiscal strategies for the use of public resource wealth. The anchor is based on the PIH analysis, i.e., as a constant non-O&G fiscal balance (NRFB) consistent with financing needs not exceeding the sustainable flow of income from net wealth. The alternative long-term fiscal anchors follow the different concepts of long-term sustainability for resource-rich countries and depend on the views on intergenerational equity:

- *Non-O&G fiscal balance as a constant share of non-O&G GDP*. The NRFB is constant over time as a percent of non-O&G GDP. This implies total consumption as a share of non-O&G GDP remains constant over time, ensuring consumption smoothing across generations and avoids unsustainably high levels of consumption at any period.

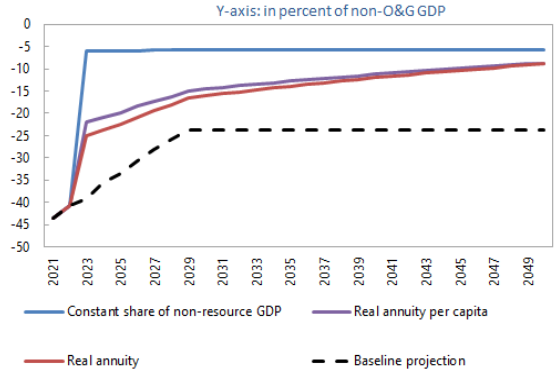
- *Real annuity*. The NRFB is constant over time in real terms. This ensures the aggregate consumption across present and future generations is constant in real terms, although in per capita terms, the future generations might have less consumption per capita as the population grows.

- *Real annuity per capita*. The NRFB is constant over time in real per capita terms. This ensures the aggregate consumption across present and future generations is constant in real per capita terms. The per capita might be relevant in countries where there is a large expatriate population or significant population growth is expected. As long as the population is growing, the PIH norm with a deficit constant in real per capita terms will be lower than the deficit constant in real terms.

While the analysis here relies on the concept of PIH, some resource-rich economies like Norway use the Bird-in-hand (BIH). The BIH framework restricts spending to the interest gains on the accumulated financial wealth in the natural resource investment fund itself and is not based on permanent income concepts which permits bringing forward consumption of (uncertain) future resource revenue by including future O&G wealth. The BIH framework is a more parsimonious approach, relevant for countries with heavy reliance on revenues from the O&G sector and whose proven reserves are expected to deplete in the foreseeable future. However, it might not be appropriate for countries that need to finance productive investment opportunities in the near-to-medium term to transition and diversify. There is no one-fits-all approach.

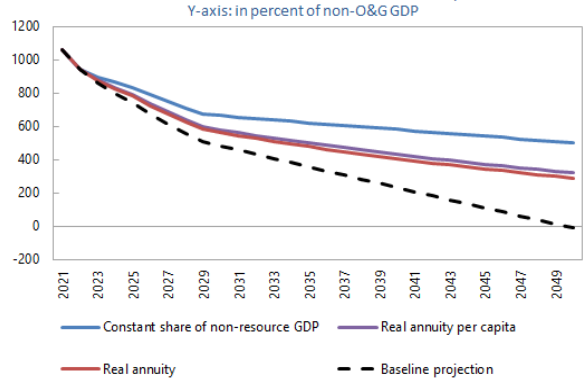
7. Alternative fiscal anchors indicate a significant need for fiscal prudence through the extended projection period. Panel A presents the results for the PIH norms under a scenario with immediate transition to the fiscal anchors in 2023 and Panel B presents the corresponding implications for total net wealth.

Figure 7. Non-O&G Fiscal Balance (NFRB)
Transition Scenario: Anchor attained immediately
Y-axis: in percent of non-O&G GDP



Source: IMF staff estimates.

Figure 8. Total Net Wealth
Transition Scenario: Anchor attained immediately
Y-axis: in percent of non-O&G GDP

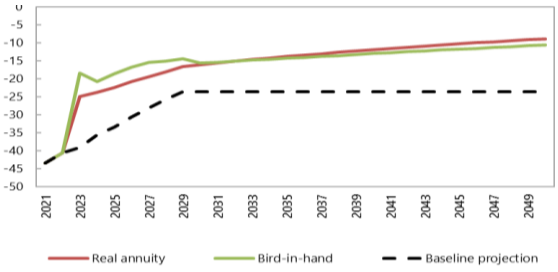


Source: IMF staff estimates.

- The most conservative fiscal anchor would be the PIH norm with a deficit as constant share of non-O&G GDP at around 6 percent of non-O&G GDP and is likely the least feasible as it would impose a too sharp adjustment of nearly 35 percent of non-O&G GDP in 2023.

- A PIH norm with a deficit constant in real terms (real annuity) has the smallest gap to the baseline and is likely the most feasible as it would impose the least adjustment. It allows for a much higher deficit during the transition period, thereby enabling the financing of development and diversification spending which can result in higher growth potential and benefit all future generations. The cost of such an approach though is that the deficit would need to be reduced below the PIH norm with a deficit as a constant non-O&G of 6 percent of non-resource GDP in the very long-term. Coincidentally, for Brunei, the PIH norm derived from constant annuity in real terms is closely aligned with the BIH approach, which is a very prudent approach.

Figure 9. Non-O&G fiscal balance (NFRB)
(Transition Scenario: Anchor attained immediately
Y-axis: in percent of non-O&G GDP)



Source: IMF staff estimates.

Given that the current baseline differs significantly from all long-term PIH fiscal anchors, requiring at least an adjustment of 15 percent in 2023 (under the PIH norm of a constant annuity in real terms), the gap will need to be closed with a fiscal adjustment or "transition" during the medium-term.

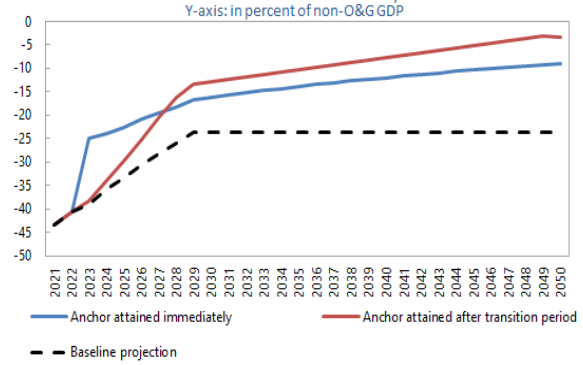
8. A gradual and sustained consolidation path could help Brunei feasibly transition to the sustainable fiscal path in the long-term while maintain macroeconomic stability. Under a transition scenario for the PIH norm of a constant annuity in real terms, the NRFB would need to be at -16 percent of non-O&G GDP in 2028, compared to -26 percent in the baseline – requiring an additional 10 percentage point (ppt) of non-O&G in consolidation during the medium-term. While this gradual transition scenario allows for additional public investments in the medium-term and would also leave time to design supporting fiscal reforms to reduce the non-O&G deficit, it comes at the cost of reduced fiscal space and more fiscal prudence in the long-term. Specifically, beyond the medium-term, the constant real annuity would imply a continued and gradual adjustment of about 0.5 of non-resource GDP annually under the gradual transition scenario compared to around 0.3 ppt in the immediate transition scenario. This is based on the conservative assumption of no long-term growth dividends from the addition spending.

9. Fiscal risk analysis and regular re-assessments of the PIH would be critical given the uncertainty about the assumptions.[11] The identified fiscal framework should be adjusted based on the materialization of the real interest rate (r) - real GDP growth (g) dynamics. Specifically, the higher the real GDP growth, the lower the deficit. Conversely, the higher the real interest rate, the higher the permanent deficit that can be financed by the returns from accumulated financial wealth. A reversal to low interest rates in the longer-term, would imply that the sustainable deficit path might be lower than expected. Also, a lower than envisaged public spending efficiency could result in lower-than-expected growth and affect the assessment of sustainable deficit. In contrast, under a gradual

[11] Lack of data availability, including on the GLCs and the sovereign wealth funds limits the scope for a more comprehensive fiscal risk analysis.

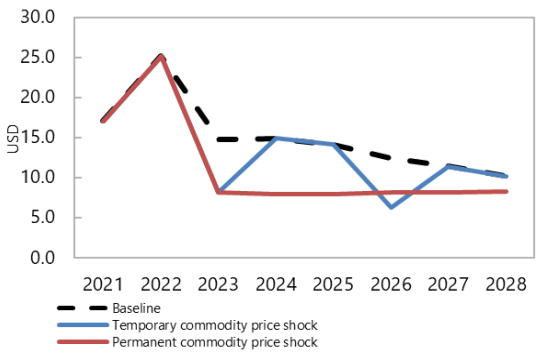
transition scenario, the government can boost public investment which could yield higher growth rate in the long-term, thereby translating to higher income for the future generations.

Figure 10. Non-O&G fiscal balance (NFRB)



Source: IMF staff estimates.

Figure 11. Total Commodity Revenues

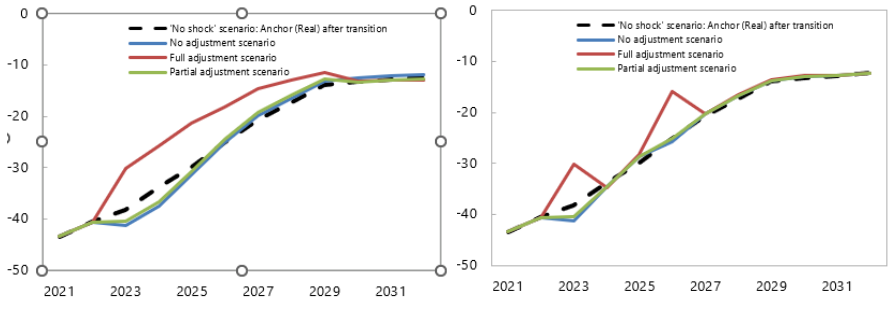


Source: IMF staff estimates.

10. The framework should also be robust to potential shocks to resource revenue. To test the robustness of the fiscal anchors, two shocks are implemented, i) a permanent reduction in oil price equal to half the price of 2023 and a 10 percent reduction in exchange rate, ii) a temporary reduction in oil prices equal to half the projected prices in 2023 and 2026 combined with a 10 percent depreciation in exchange rate in 2023.[12] Three adjustment strategies to the shock are considered: i) no adjustment (in which the pre-shock nominal path for spending is unchanged), ii) full adjustment (in which spending is reduced one-to-one with the shortfall in resource revenue, and iii) partial adjustment (in which spending is reduced to offset the shortfall in resource revenue but up to a maximum annual limit of 2 percent of total expenditures.[13] Panel A presents the results of the permanent shock and Panel B presents the temporary shock, both indicate robustness of the real annuity fiscal anchor with the fiscal path not deviating substantially from fiscal sustainability under the partial and no adjustment scenario.

Figure 12. Non-O&G Fiscal Balance

(percent of non-O&G GDP)

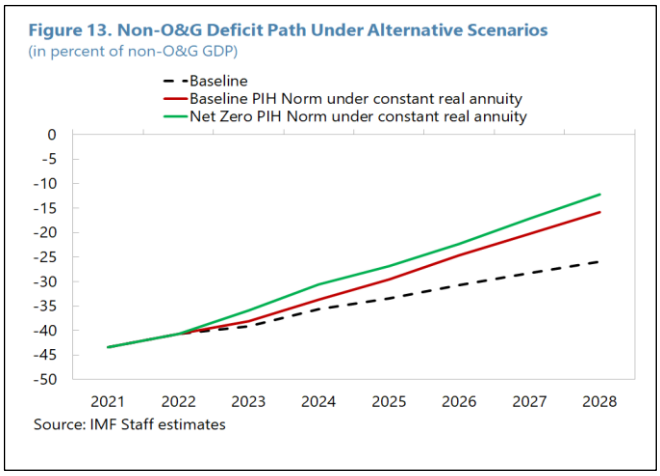


Source: IMF staff estimates.

[12] Brunei is not as exposed as its neighbors to losses from natural disasters, and hence, the robustness to a natural disaster shock is not tested.

[13] In these simulations, any resource revenue shortfall not offset with spending reductions is assumed to be met first by drawing down liquid assets and second through new borrowing (once liquid assets are exhausted).

11. A downside scenario that assumes the globe meets its Net Zero target by 2050 would imply higher adjustment needs for Brunei. Specifically, in the transition scenario, the lower demand for O&G and the lower global prices would imply that Brunei would need to adjust by an additional 4 percent of GDP by 2028 and further fiscal prudence in the long-term. These results also highlight the sensitivity of the anchor to the O&G sector assumptions and emphasize the importance of the regular re-calibration of the framework to more accurately reflect the market trends and fiscal risk analysis incorporating climate risks.



C. Conclusion

12. A well-designed consolidation program can help attain the fiscal anchor in the medium-term while mitigating short-term growth and distributional impacts. Consolidation measures include broad- based revenue diversification, including, carbon pricing[14], containment of public sector wage and employment, reduction in tax expenditures and untargeted subsidies [15] :

- Tax reforms—Many Gulf Cooperation Council (GCC) economies have taken important strides in terms of non-O&G revenue mobilization efforts and lend helpful guidance on possible steps for Brunei (see Table 2 and Table 3).

- Expenditure rationalization—The composition of expenditure adjustment matters because capital spending cuts are less effective than reductions in transfers and wages according to the empirical literature such as de Rato (2004) and Biggs, Hasset, and Jensen (2010). Kumar, Leigh, and Plekhanov (2007) find that contractionary effects of fiscal consolidation in the short-term are largest when it involves cuts in productive expenditure on health, education, infrastructure, public order and safety, and public administration, which are also essential for long-term growth. Similarly, estimated multipliers associated with spending on renewable (1.1-1.5) are larger than fossil fuel energy investments (0.5-0.6) with over 90 percent probability (Batini et al., 2021), which in turn could address transition risks.

[14] See SIP on Addressing Climate Change Mitigation, Revenue diversification in Brunei Darussalam: Role of Carbon pricing.

[15] For example, Saudi Arabia aims to eliminate energy subsidies by 2030 and fuel prices are linked to global prices since 2015 in UAE and 2016 in Qatar to reduce subsidies on diesel and gasoline. As a result of the reforms, UAE and Qatar have the lower energy subsidies amongst the GCC countries at around 1 percent of GDP in 2021 (IMF, 2022).

Table 2. Brunei Darussalam: Tax Rates by Type			
Type of tax	**Rates**	**Type of Tax**	**Rates**
Corporate income tax (Petroleum income tax)	18.5% (55%)	VAT or Sales tax	N.A.
Branch tax	18.5%	Real property tax	N.A.
Capital gains tax	0%	Transfer tax	N.A.
Individual income tax	0%	Inheritance/estate tax	N.A.
Withholding tax	0% (resident), 2.5~10% (non-resident)	Net wealth/worth tax	N.A.
Source: Deloitte International Tax Brunei Darussalam Highlights 2022			

Table 3. Brunei Darussalam: Broadening Tax Base in GCC Economies	
Country	**Taxes Introduced**
United Arab Emirates (UAE)	Excise tax (2017, tobacco & tobacco products 100 percent, carbonated drinks 50 percent, energy drinks 100 percent), Excise tax (2018, sweetened drinks 50 percent, electronic smoking devices & tools 100 percent, liquids used in electronic smoking devices & tools 100 percent), VAT (2018, 5 percent), federal corporate tax for local businesses (2023, 9 percent)
Bahrain	VAT (2019, 5 percent → 2022, 10 percent), Excise tax (2017, Tobacco products & energy drinks 100 percent, carbonated drinks 50 percent)
Saudi Arabia	VAT (2018, 5 percent → 2020, 15 percent), Real Estate Transaction Tax (2020, 5 percent), Excise tax (2017, tobacco & tobacco products, carbonated & energy drinks), Excise tax (2019, sugar-sweetened beverages & e-cigarettes), fees/taxes (hotel stays, visas, cinemas, and vacant land)
Source: PricewaterhouseCoopers (PwC) Worldwide Tax Summaries	

13. The growth-friendly fiscal consolidation can be more successful when supported by strong institutions. The fiscal consolidation program underpinned by a credible medium-term fiscal framework (MTFF); and sound public financial management (PFM) systems to strengthen fiscal discipline are examples of supporting fiscal institutions. Transparency (for example, through broad fiscal coverage, realistic macro-forecasts, regular publication of fiscal plans and outcomes (e.g., Saudi Arabia) including the fiscal adjustment target (e.g., Bahrain), and public debate) is key to inform on potential fiscal risks and can improve program design (Balasundharam et al., 2023). Building strong budgetary institutions takes time and is effective when prioritized early on and well sequenced to yield the gains of fiscal consolidation.

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BRUNEI FINANCIAL SECTOR[1]

The financial sector in Brunei is stable, dominated by banks and has strong capital buffers and abundant liquidity. Domestic lending shows signs of recovery, particularly in the corporate sector. The authorities have taken initiatives to strengthen risk-based supervision and macroprudential policy to prevent systemic risk in line with the ambitious Financial Sector Blueprint 2016-25.

1. The financial sector in Brunei is dominated by banks and has large capital buffers and abundant liquidity. Total financial system assets represented around 108 percent of GDP as of the end of 2022 of which the banking sector accounts for 82 percent. There are seven commercial banks two domestic banks and five foreign bank branches), and one Islamic trust fund[2]. The two largest domestic banks dominate the market[3], and the largest bank is Islamic. Banks are relatively profitable, well-capitalized and liquid. As of end–2022, the capital adequacy ratio in aggregate was about 20.2 percent of risk weighted assets, well above the minimum requirement of 10 percent; and liquid asset ratio was 43.8 percent. Nonperforming loans (NPLs) have been on a declining trend since 2011[4] until 2022, and dropped further possibly reflecting a rise in oil prices after 2020 and the government's support related to the COVID-19[5]. However, the NPL (net of provisions) to capital ratio increased from 4.9 percent to 5.5 percent, reflecting a decline in provision coverage[6].

Table 1. Brunei Darussalam: Financial Soundness Indicators 1/
(In percent)

	2016	2017	2018	2019	2020	2021	2022
Capital Adequacy 2/							
Regulatory capital to risk-weighted assets	21.5	18.9	19.3	20.1	20.8	21.5	20.2
Tier 1 capital to risk weighted assets	23.2	18.2	18.9	19.7	20.5	21.2	20.0
NPL net of provisions to capital	7.8	4.4	7.8	6.5	6.1	4.9	5.5
Assets Quality							
NPL to total loans	5.9	4.4	5.7	4.6	4.7	3.6	3.3
NPL net of provisions to total loans	3.3	1.6	2.9	2.4	2.4	1.9	2.1
Provision coverage (specific provisions to total NPLs)	43.3	62.8	49.5	48.2	48.2	47.5	37.8
Profitability (Annualized)							
Return on assets (before tax)	1.0	1.4	1.5	1.8	1.5	1.3	1.3
Return on equity (after tax)	6.5	8.9	11.2	12.5	10.6	8.6	9.5
Non-interest expense to gross income (efficiency ratio)	53.6	51.5	48.9	47.2	50.7	57.1	56.7
Liquidity							
Liquid assets to total assets	50.4	51.0	51.7	46.5	48.2	45.5	43.8
Liquid assets to total deposits	60.0	60.0	61.8	55.2	60.2	54.1	51.8
Liquid assets to demand and Savings deposits (nonbank customers)	115.0	115.2	126.0	103.2	95.9	84.1	95.1
Loans to deposits ratio	35.8	34.5	35.7	37.6	38.9	37.4	36.5

Source: BDCB.
1/ Data excludes finance companies, which is classified as depository corporations. Numbers are for Q4 of each year.
2/ Capital adequacy ratios differ between 2016 and 2017, mainly due to the implementation of Basel II risk weighting in 2017.

[1] Prepared by Shohhei Kawase (OAP).

[2] In addition, there is one bank operating with a restricted banking license. In 2017, a bank specializing in financing for micro, small and medium enterprises (MSMEs) was established, funded entirely by the Ministry of Finance and Economy, but its loans outstanding were only 12 million BND or 0.05 percent of the total financial sector assets as of the end of 2021 (ADB, 2022).

[3] The largest and second largest banks account for 46 percent and 15 percent of total financial assets, respectively, as of the end of 2022. (Respective banks' financial statements for 2022)

[4] Publicly available data show that in 2011 NPL to total loans was 7.6 percent.

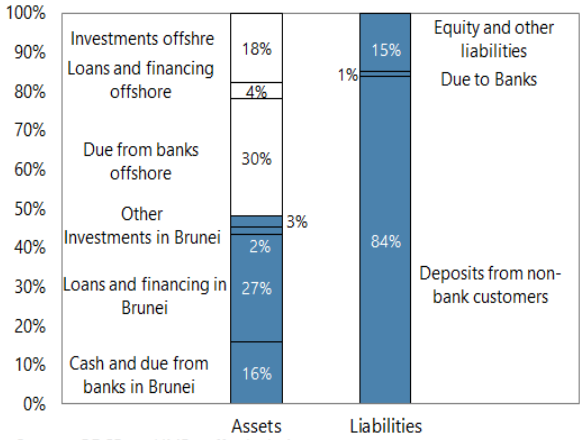
[5] The NPLs dropped in 2017 and increased in 2018, partly as the largest bank wrote off large NPLs in 2017 and increased NPLs as the effect of the adoption of International Financial Reporting Standard 9 (IFRS9) in 2018.

[6] NPL net of provision increased from 118 million Brunei dollars (BND) in 2021 to 135 million BND in 2022, while gross NPL decreased from 225 million BND in 2021 to 218 million in 2022.

2. A sizable portion of bank assets are invested abroad. Banks are largely funded by domestic deposits[7]. Deposits up to 50,000 Brunei dollars (BND) are covered by the deposit protection scheme, which constituted 14 percent of total deposits in 2017[8]. Loans and financing to domestic borrowers represented only 27 percent of total banking assets in 2022. 52 percent of the banking sector assets as of the end of 2022[9] were invested abroad in the form of offshore investments or placements with financial institutions abroad. These are typically denominated in Singapore dollar to avoid the foreign exchange (FX) mismatch risk, or the United States dollar with a large part being hedged[10].

3. The nonbank financial sector is small. Finance companies[11] accounted for 8 percent of total financial sector assets in 2022, and closely connected to the banking sector: two finance companies are wholly owned by the largest bank and the second largest bank[12]. There are 11 insurers and Takaful operators, accounting for 8 percent of total financial sector assets in 2022. Except for cash placed in banks, their assets are mostly invested overseas in corporate and government debt securities (55 percent) and stocks (29 percent) in 2017. The link between the bank and insurance sectors appears limited, while the largest bank has 31 percent share in a Takaful operator (covering automobile, life and endowment), and an Islamic

Figure 1. Banking Sector Balance Sheet
(In percent)



Sources: BDCB; and IMF staff calculations.
Note: as of the end of 2022.

Table 2. Brunei Darussalam: Financial Sector Assets by Type

Financial Institutions	No. of FIs	Amount of assets 1/ (Billion BND)	Share of Total Asset (Percentage)
Deposit-taking institutions	**10**	**21.6**	**91.6**
Banks	**8**	**19.4**	**82.1**
Conventional	6	7.2	30.4
Islamic	2	12.2	51.8
Finance Companies	**2**	**2.2**	**9.5**
Insurance Companies	**11**	**2.0**	**8.4**
Conventional	7	1.4	5.8
Takaful	4	0.6	2.6
Total	**21**	**23.6**	**100**

Source: BDCB 2021 Annual Report.
1/ As of the end of 2021

[7] Deposits from non-bank customers do not include non-residents' deposits, and foreign currency deposits accounted for 14.4 percent of total deposits of the banking sector in 2021.

[8] Banks and finance companies are covered according to the website of the Brunei Darussalam Deposit Protection Corporation.

[9] The authorities.

[10] According to the financial statement for 2022 of the largest bank, it held the USD-denominated assets amounting to around 5.2 billion BND, equivalent to around 20 percent of total banking sector assets, but its net exposure was reported to -0.2 billion BND by the use of foreign currency hedge.

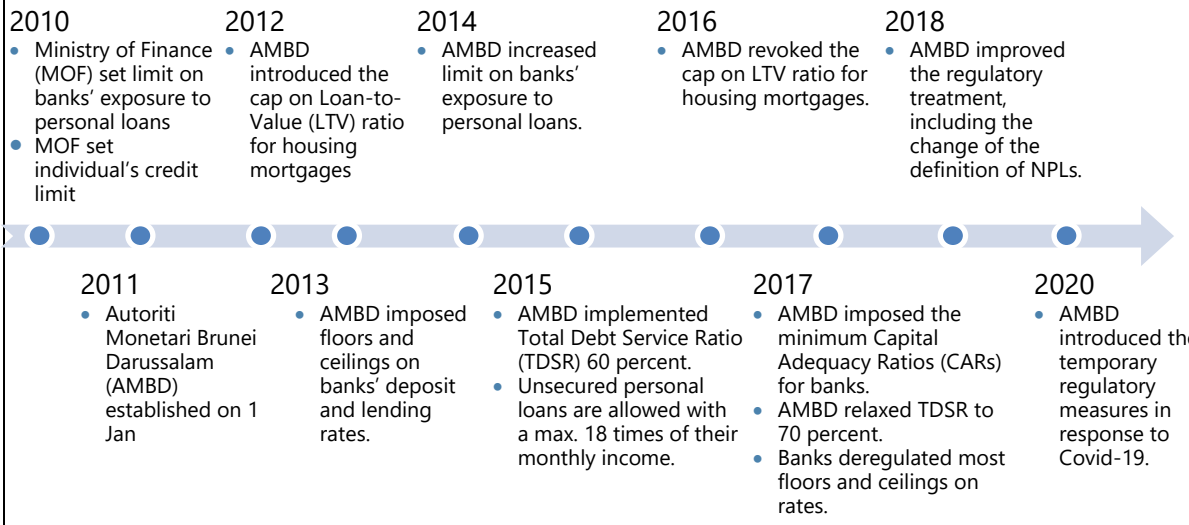
[11] Finance companies take certain types of deposit and deal primarily with car financing. In principle, institutions that take customer deposits should be treated like banks but, for the purpose of this appendix, we describe banks as those excluding finance companies as used also by BDCB because of data limitation and dominance of banks in the financial sector. Finance companies have several restrictions to accept certain deposits or grant certain credit by article 18 of the Finance Companies Act.

[12] Banks' Financial Statement for 2022.

trust fund owns two Takaful operators. Securities markets are not developed, and a plan is underway to establish a stock exchange in Brunei.

4. The Brunei Darussalam Central Bank (BDCB) is strengthening its surveillance and regulatory frameworks[13]. The move involves many initiatives to strengthen its microprudential framework. Risk-based supervision has been implemented and undertaken on-site supervision, starting with insurance in 2017, banks in 2018 and, capital markets in 2019[14]. BDCB has been making progress with the implementation of all three pillars of the Basel II framework[15]. In addition, BDCB has been using macroprudential tools, especially to address household indebtedness in the country, including the cap on loan-to-value (LTV) ratio in 2012[16] and Total Debt Service Ratio (2015)[17] (Figure 2). In response to the COVID-19, the authorities introduced temporary regulatory measures in April 2020, including the concessionary regulatory treatment, which had been effective until June 2022. Further, BDCB has been strengthening its macroprudential policy, which includes the regular risk assessment using selected risk indicators starting from 2019, macro stress tests for the

Figure 2. Timeline of Macroprudential and Microprudential Policies and Other Financial Sector Regulations in Brunei



Sources: BDCB and Sources: the IMF's integrated Macroprudential Policy (iMaPP) Database, originally constructed by Alam et al. (2019), and OECD (2021).

[13] It is the central bank established in 2011 and the integrated supervisor of the financial sector overseeing banks, insurance companies and securities market. The 2010 BDCB order provides its four principal objectives: price stability, financial stability, efficient payment system, and financial sector developments.

[14] Source: BDCB Financial Stability Report 2018, 2019, 2020 and BDCB's 2022 Article IV responses.

[15] The Pillar I requirement became effective from 15 March 2017 and requires all banks both conventional and Islamic banks to maintain a minimum capital adequacy ratio (CAR) of 10 percent. This requirement was extended to finance companies in 2022. Under the Pillar II requirement, banks are required to prepare an Internal Capital Adequacy Assessment Process (ICAAP) and to submit the ICAAP documents on an annual basis since 30 June 2019. Additionally, banks have been required to provide enhanced disclosure on risk and capital management in line with the requirement under the Pillar III since March 2019.

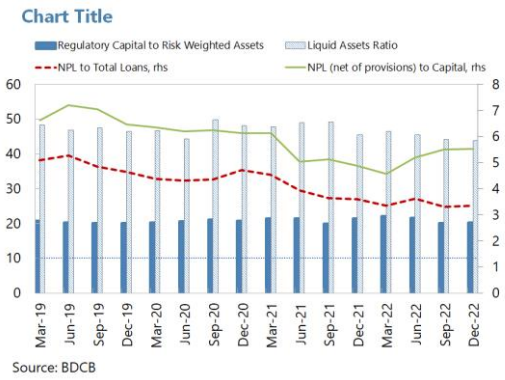
[16] The cap was revoked on December 2016.

[17] TDSR limits borrowers' monthly total debt obligation (a numerator) as a proportion of net monthly income (a denominator).

banking sector was initiated in 2019, and the designation of the domestic systemically important bank(s) (D-SIBs) in 2020, where D-SIBs are required to have additional capital buffer from the start of 2023. BDCB also included in the Financial Sector Blueprint 2016-2025 the implementation of the wider regulatory frameworks of Basel III as the medium-to-long term target.

5. The following trends are observed upon analyzing the financial soundness indicators and balance sheet of banks.

Figure 3. Trends of Selected Financial Soundness Indicators (In percent)

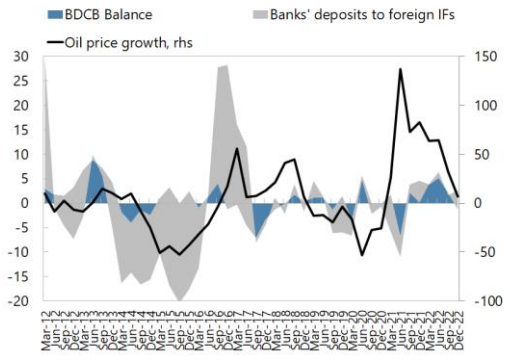


Source: BDCB

a. Recently the Capital Adequacy Ratio (CAR) declined and the NPL (net of provisions) to capital ratio increased. The CAR declined from 21.5 percent in Q4 2021 to 20.2 percent in Q4 2022 mostly due to an increase in risk-weighted assets. The NPL (net of provisions) to capital ratio increased from 4.9 percent to 5.5 percent, reflecting a decline in provision coverage due mainly to the write-off of NPL accounts.

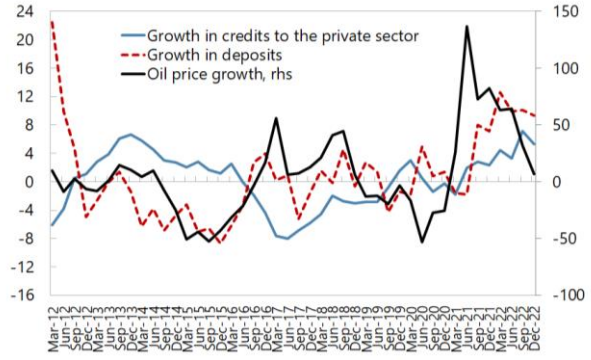
b. As a resource rich economy, Brunei's banking sector is affected by changes in oil prices. Banks' regulatory and excess reserve balance at the BDCB and deposits offshore increases in line with oil price increases (Figure 4). While deposits of banks have a high correlation with oil price movements, credit to the private sector shows a weak correlation which reflects the fact that banks place or invest increased deposits offshore rather than extend domestic credit (Figure 5). Credit risk can emerge if NPLs increase following an oil price decline and the economy deteriorates. VAR results show that NPL growth increases 0.455 percentage point with a lag of three quarters after one percentage point decline in oil price growth, indicating credit risk increases when oil price decreases with some lag.[18]

Figure 4. Banks' Liquidity and Oil Price
(In percentage change, y/y)



Sources: BDCB; and IMF staff calculations

Figure 5. Banks' Susceptibility to Oil Price
(In percent, y/y)

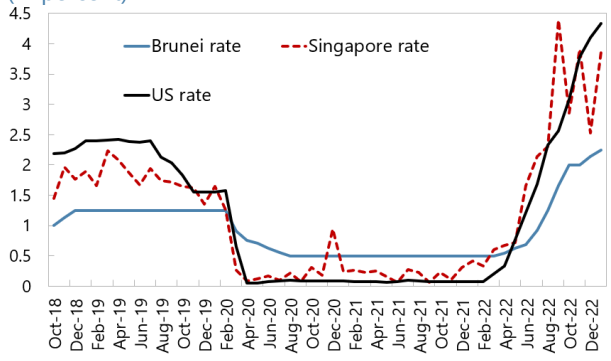


Sources: BDCB; and IMF staff calculations

[18] Please see a note on the VAR model applied.

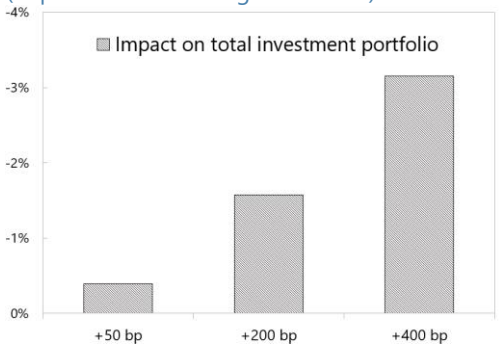
c. Accumulated foreign currency-denominated assets and investments in the banking sector portfolio may pose market (including interest risk) and liquidity risks to banks.[19] Banks' investment portfolio amounts to around 20 percent of the total assets, and they are exposed to potential market risks (Figure 6). A stress test on investment portfolio of the largest banks in Brunei under scenarios of interest rate hikes suggests, based on approximations of asset maturity data form the investment portfolio available in published financial statements, that total capital to risk-weighted assets of banks could be reduced by 3.2 percent, resulting in 16.4 percent under the most severe case (Figure 7)[20]. In addition, a large share of assets is held offshore (Figure 1) and, during a global crisis, foreign banks might ringfence these assets and prevent Brunei banks from accessing them, suggesting a possible liquidity risk.

Figure 6. Interbank Overnight Interest Rates
(In percent)



Sources: Haver analytics, and IMF staff calculations.
Note: For Brunei, a mid-rate of standing deposit and lending facilities is displayed.

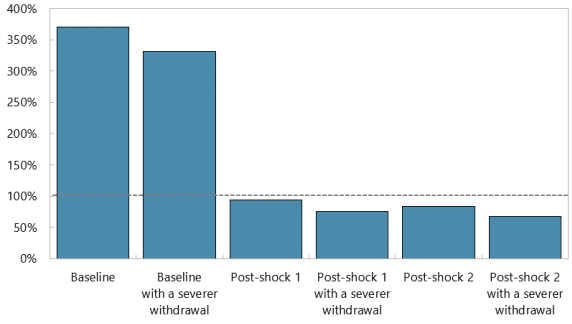
Figure 7. Mark-to-Market Losses for the Largest Banks by Interest Rate Hikes
(In percent of risk-weighted assets)



Sources: Banks' Financial Statements and IMF staff calculations.

d. Liquid assets are abundant, but banks are exposed to potential liquidity risks considering the large portion of their liquid assets are placed offshore. Banks are predominantly funded by deposits, and the loan-to-deposit ratio is 36 percent in 2022. A large part of these deposits is invested offshore, in the forms of deposits to foreign financial institutions and investment in securities. (Figure 1). Reflecting such Brunei banks' structure, they are exposed to potential liquidity tail risks related to the availability of liquidity placed offshore in times of extreme stress. A liquidity stress test for the seven commercial banks suggests that with assumed 10 percent

Figure 8. Stress Test Impact on Bank Liquidity Coverage Ratio
(In percent)



Sources: Banks' Financial Statements and IMF staff calculations.
Note: Presented results are for aggregated seven commercial banks in Brunei, excluding the Islamic Trust Fund. Baseline is calculated as available domestic and foreign liquid assets with maturity up to one month divided by an outflow of 10 percent of domestic liabilities plus 5 percent of foreign liabilities (or 20 percent of foreign liablites, for Baseline with a severer withdrawal). The case of Post-shock 1 is calculated as available domestic liquid assets with maturity up to one month divided by the same outflows used in the baseline. The case of Post-shock 2 is calculated as 80 percent of available domestic assets with maturity up to one month divided by the same outflows used in the baseline.

[19] Based on seven commercial banks' financial statements.

[20] See a note on the interest rate stress test.

run on its domestic liabilities, mostly deposits from non-financial domestic customers, and 5 percent run on other liabilities, it may not be able to maintain a liquidity coverage ratio of 100 percent if liquidity placed offshore is not available, while the ratios become over 300 percent if they are available (Figure 8).[21]

e. **Credit growth to corporates (non-households) has been in an upward trend**, while credit growth to households is still moderate[22]. Systemic vulnerability indicators for Brunei (Table 3)[23], suggest that real growth of bank loans to corporate are higher than their past performances (showing darker color in Table 3). Domestic corporate loans have shown higher growth recently, mainly driven by the downstream O&G sector in the manufacturing sector and the construction sector (Figure 9). The manufacturing and construction sectors represent the largest and the third largest share in the banks' exposures to the domestic corporate sector. Given their high NPL share in the past, credit risk may increase, especially if oil prices decline and the economy deteriorates (Figure 10).

Table 3. Brunei Darussalam: Systemic Vulnerability Indicators

		2019				2020				2021				2022		
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
Economy-wide	Credit-to-GDP gap from H-P trend															
	Change in ratio of credit to private sector to GDP															
	Real growth of credit to private sector															
Households	Bank loans to households-to-GDP ratio															
	Other financial institutions loans to households-to-GDP ratio															
	Real growth of bank loans to households															
Corporates	Bank loans to corporates-to-GDP ratio															
	Real growth of bank loans to corporates															

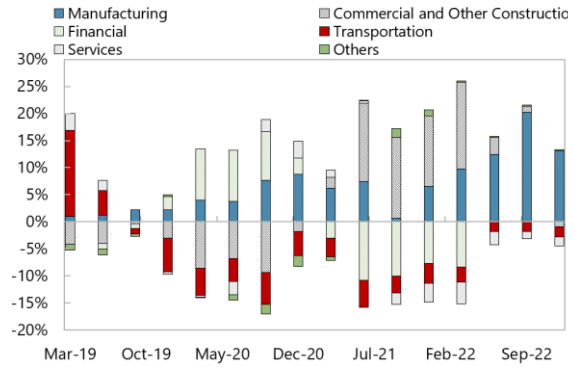
Source: IMF Systemic Risk Tracker.
Note: The darker the color, the higher the vulnerability, compared to each indicator's historical performance during 2000Q1 – 2022Q3. Some indicators have a short dataspan; for example, other financial institutions loans to households-to-GDP ratio is only available after 2019Q3.

[21] See Annex III on the liquidity stress test. The tests are based on the Liquidity Coverage ratio (LCR) concept and rest on a lot of assumptions. The Basel III LCR standards have not been implemented in Brunei but are expected to be introduced from 1st July 2024 after consultations with the industry. . The authorities are currently discussing with the industry on the implementation of Basel III LCR and how banks calculate the Net Cash Outflow components and High-Quality Liquid Assets for the LCR.

[22] Loans to the household sector represented 50.4 percent of domestic lending in 2022. Domestic credit growth to households was 1.3 percent in 2022, recovered from negative growths during the pre-pandemic, but it has not recovered to the level before the COVID-19. The total household debt to the banking sector, at 12.4 percent of GDP, is low compared to peers, but this number does not include mortgage lending by the government to its employees, which offers the interest-free mortgage loan for government employees (around 40 percent of total labor force).

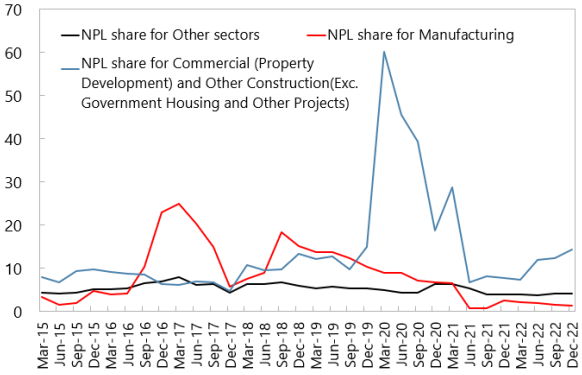
[23] Systemic vulnerability indicators show darker color if they worsen or indicate higher risk compared to their own historical performances.

Figure 9. Contribution to Total Credit Growth for Non-Households (In percent, y/y)



Sources: BDCB and IMF staff calculations

Figure 10. NPL Share by Sector: Non-Households (In percent)



Sources: BDCB and IMF staff calculations

6. The authorities have taken measures to enhance financial stability including by strengthening risk-based supervision, under the Basel II framework as well as building risk assessment capacity. The authorities have implemented all three pillars of the Basel II. Risk-based supervision framework was further strengthened by designating domestically systemic banks (D-SIBs- two so far) and by imposing additional capital buffer requirement for D-SIBs starting in 2023. BDCB has been using macroprudential tools to address sectoral risks, but instruments currently available and used in Brunei are fewer than those for peer countries (Table 4).

Table 4. Brunei Darussalam: Macroprudential Measures in Selected Peers

	BRN	SGP	IDN	MYS	PHL	THA	VIM	OMN	SAU	UAE
Basel III capital buffers 1/		•	•	•	•	•		•	•	•
Basel III leverage ratio		•	•	•	•			•	•	
Dynamic provisioning					•					
Liquidity ratios, Limits to loan-to-deposit ratio and/or FX positions		•	•	•	•			•	•	•
Limits on credit growth/volume, and/or other restrictions on loan characteristics	•	•	•	•	•		•	•	•	
Borrower-based measures 2/	•	•	•	•	•	•		•	•	•
Reserve requirements for macroprudential purposes and other measures 3/	•	•	•	•	•				•	•

Sources: the IMF's integrated Macroprudential Policy (iMaPP) Database, originally constructed by Alam et al. (2019), and OECD (2021).
1/ Including countercyclical capital buffer and capital conservation buffer. 2/ Including loan-to-value (LTV) ratios, debt-service-to-income(DSTI) ratios, and others. 3/ Including limits on single client exposures or other restrictions on housing loans.

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Annex I. Note on the VAR Model Applied

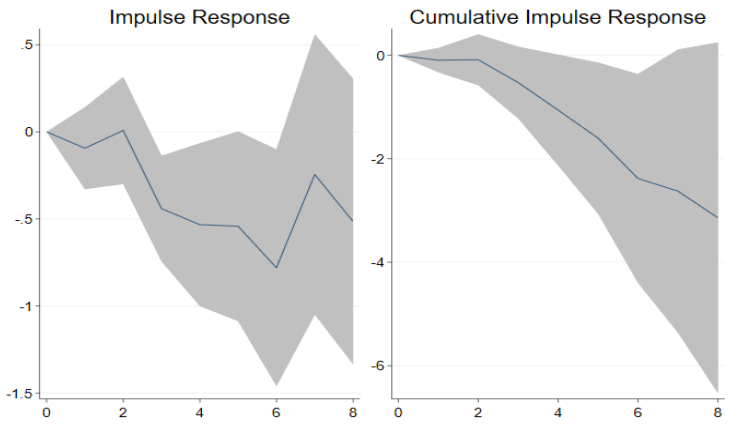
1. We employ a vector autoregressive (VAR) model to assess the relationship between oil prices and financial variables in Brunei. The data used in this analysis are the oil price, NPL, and credit to the private sector by banks from 2011 to 2019 in quarterly frequency. The model is the following:

$$Y_t = c + \sum_{i=1}^{5} A_i Y_{i,t-i} + \varepsilon_t, \qquad \varepsilon_t \sim W.N.(\Sigma)$$

where Y_t is a vector of n endogenous variables, c is the n-element vector of constants, A_i are matrices of coefficients, and ε_t is the n-element vector of random disturbances, where $i = 1, \dots, 5$, $t = 1, \dots, T$, and $n = 1, 2, 3$. The endogenous variables are oil price growth y/y, growth y/y of gross NPL, and growth of bank credit to the private sector y/y. The number of lags is selected to capture credit cycle with a constraint of the relatively short time frame, in line with AMRO (2018)[1].

2. The VAR results show that NPLs growth increases with some lags after a decline in oil prices, indicating credit risk increases when oil price decreases. As oil price growth increases by one percentage point, it results in a decrease of 0.455 percentage points in NPLs growth after three quarters. On the other hand, oil price growth does not have a significant correlation with credit growth although the estimates had right signs. This reflects that banks are likely to place or invest offshore rather than extend domestic credit when deposits increase by strong oil prices.

Annex I. Figure 1. Response of NPLs Growth to One Percentage Increase in Oil Prices
(In percentage points)



Source: IMF staff estimates.

3. Nevertheless, some limitations of the models should be noted. Data are available between 2011 and 2022, but we excluded data after the COVID-19 pandemic because NPL are likely to be affected by the strong government support. The quarterly data between 2011 and 2019 may not be sufficiently long for oil price and financial cycles. The estimates show limited stability due to the limited data size and possibly omitted explanatory variables related to regulatory actions and business cycles.[2]

[1] ASEAN+3 Macroeconomic Research Office, 2018. "Annual Consultation Report Brunei Darussalam -2018".

[2] The Business Sentiment Index that measures the level of business confidence/sentiment in Brunei are available but is only from August 2020.

Annex II. Note on the Interest Rate Stress Test

1. We implemented a stress test on the two largest banks in Brunei under scenarios of interest rate hikes by 50, 200, and 400 basis points, considering the uncertainty in global financial markets. The financial data for banks were extracted from respective financial statements that are publicly available. The scenario of the largest interest rate hike is set in line with the largest change in the monthly average of Singapore's interbank overnight rate during 2022, from 0.3 percent in February to 4.4 percent in September, reflecting the status of Singapore markets under the Brunei's currency board arrangement with SGD and the fact that over 80 percent of investments by banks in Brunei were made offshore in 2020[1].

2. The stress test suggests possible vulnerabilities to investment portfolios of the largest banks in terms of interest rate risks. Based on publicly available information from financial statements, bank's investment portfolio, including in government sukuks, was broken down into those with maturities of up-to 1 year, 1-3 years, 4-5 years, and 6-10 years, and it was assumed that final redemption dates for respective portions are the end of the 1st year, 3rd year, 5th year, and 10th year. The discount rate and coupon rate were set at the average of Singapore's interbank overnight rate during 2022. Then, we calculated durations for 1) the investment portfolio subject to mark-to-market pricing, and 2) total investment portfolio, for each bank. These durations were used to derive sensitivities of the investment portfolios to the interest rate increases.

[1] The Financial Stability Report 2020.

Annex III. Note on the Liquidity Stress Test

1. We implemented a stress test on seven commercial banks in Brunei under a scenario of severe withdrawals of deposits and other liabilities. The financial data for banks were extracted from respective financial statements that are publicly available[1]. For stress scenarios, 1) an outflow of 10 percent of domestic liabilities plus 5 percent of foreign liabilities (scenario X), and 2) an outflow of 10 percent of domestic liabilities plus 20 percent of foreign liabilities (scenario Y) are assumed to take place during the next month.

2. The stress test suggests plausible vulnerabilities to tail liquidity risks, considering the large banking sector portfolio invested abroad. We calculated available liquid assets that can be used to fill assumed outflows during the next month and computed Liquidity Coverage Ratio (LCR) using the formula below.

$$LCR = \frac{Available\ Liquid\ Assets\ (under\ a\ Preshock, a\ postshock1\ or\ a\ postshock2)}{Assumed\ Outflow\ (under\ a\ scenario\ X\ or Y)}$$

where available liquid assets are 1) domestic and foreign liquid assets[2] with maturity up to one month for a baseline (or a pre-shock), 2) domestic liquid assets with maturity up to one month as a severe case (or a post-shock 1), and 3) 80 percent of domestic liquid assets with maturity up to one month as a more severe case (or a post-shock 2). Post-shocks are given considering possible obstacles to access offshore liquidity in times of extreme stress. Liquid assets with maturity up to one month are estimated for banks that do not disclose detailed maturity information for their financial assets[3].

[1] Data for the Islamic Trust Fund, which is one of two Islamic banks in Brunei, is not available for public.

[2] Domestic liquid assets include cash-in-hands, deposit balance with BDCB, investment in government sukuks. Foreign liquid assets include placements with foreign banks including deposits with their parent banks located offshore, and investment offshore.

[3] For example, placement with banks having maturity up to 3 months are divided by 3 for the amount with maturity up to one month.

DIGITALIZATION IN BRUNEI AND SINGAPORE[1]

1. The authorities launched the Digital Economy Master Plan 2025 in June 2020 and continue to accelerate digital transformation.

- **Vision:** Smart nation through digital transformation
- **4 Strategic thrusts:** Industry digitalization, Government digitalization, Thriving Information and Communications Technology (ICT) industry, Manpower and talent development
- **5 Strategic enablers:** Smart nation platform, Digital data policy and governance framework, Policy and regulatory framework, Cybersecurity, Research and Development (R&D) and innovation in digital technologies
- **3 Flagship projects:** the National Information Hub (NIH) Project, the Digital Identity Project, the Digital Payment Hub Project
- **9 Priority areas:** Energy, Agri-food, Financial services, Business services, Education, Health, Tourism, Halal, Logistics & transportation

2. Brunei is making progress in the flagship projects as well as several initiatives under the second priority.

Flagship Projects

- **The National Information Hub (NIH) Project:** to enable secure sharing and use of data within the government, was launched in June 2021. To date, 10 Data Providers and 11 Data Users, consisting of Government stakeholder agencies have used this platform. In 2023, 16 Government and non-Government agencies, including financial institutions are expected to participate in it.
- **The Digital Identity Project:** to enable individuals to access a range of government services online, is expected to be ready for implementation by 2023
- **The Digital Payment Hub Project:** to allow seamless and instant transaction among consumers expected to be ready for its implementation and use at the end of this 2023

Other Initiatives

- **Commercial launch of the Unified Smart Metering System** (for both the Smart Electric Meter and the Smart Water Meter)

[1] Prepared by Jonghyun Kim and Shohhei Kawase.

- **Agreement on joint investment in an undersea cable system in Southeast Asia** (expected to be ready by 2025 3Q)

- **The FinTech Regulatory Sandbox** was launched in 2017 with the set-up of the FinTech Office, to stimulate innovations in the financial sector and several FinTech companies have been approved including, Beep Digital Solutions, which is one of the approved Payment System Operators (PSOs) by BDCB.

- The government is also upgrading the Treasury Accounting and Financial Information System (TAFIS 2.0), which will enable the Ministry of Finance and Economy (MOFE) to start using a new chart of accounts aligned with Government Finance Statistics.

3. In 2023 budget, several allocations will continue to be made available to support the endeavors.

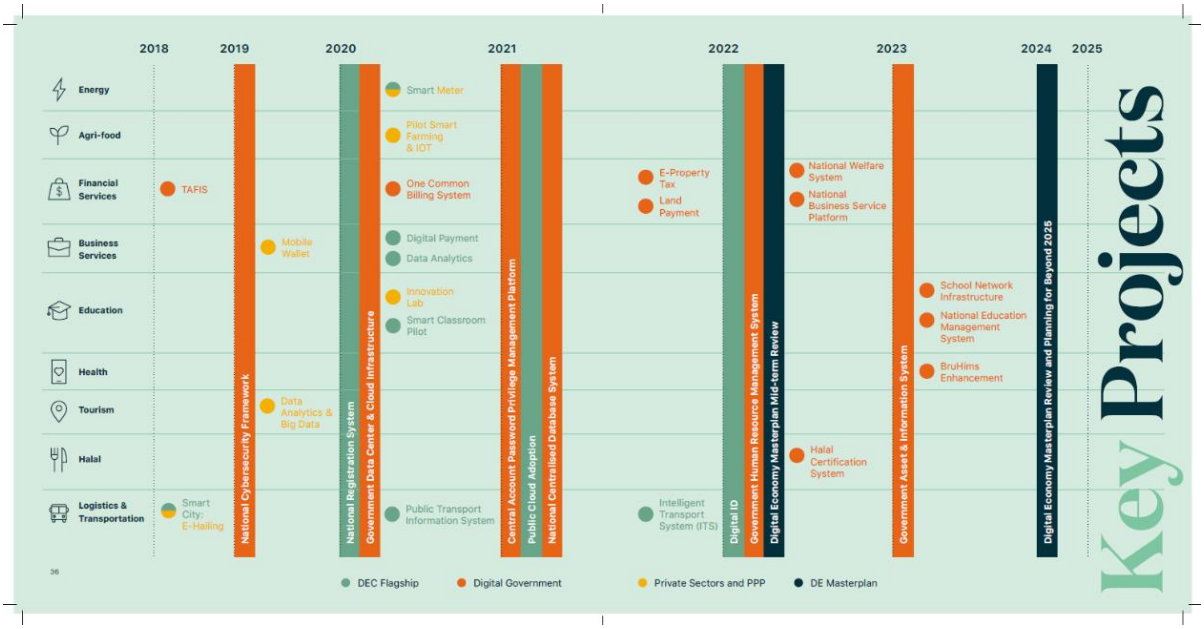
- Government Data Centre and Cloud Infrastructure($1.9M), IT Central Procurement project, National Education Management System($2M), Phase II and III of the BruHealth System($18M), Bru-HMS Level 1,2&3 Support and Maintenance Service($3.4M)

4. However, overall progress is insufficient due to various reasons, with the impact on industry and economy limited so far.

- The Digital Identity Project and the Digital Payment Hub Project which will serve as the backbone of the eco-system are not ready for use yet.

- Projects of the private sectors and Public-Private Partnership (PPP) are concentrated in the early years of the Digital Economy Master Plan period, and all projects from 2021 are driven by the public sector.

Figure 1. Key Digitalization Projects



Source: Digital Economy Masterplan 2025

- The absence of specific data protection legislation or statutory law[2] hinders business opportunities involved in collection, use, disclosure, and other processing of personal data, given the extensive integration of personally identifiable databases held by the government.[3]

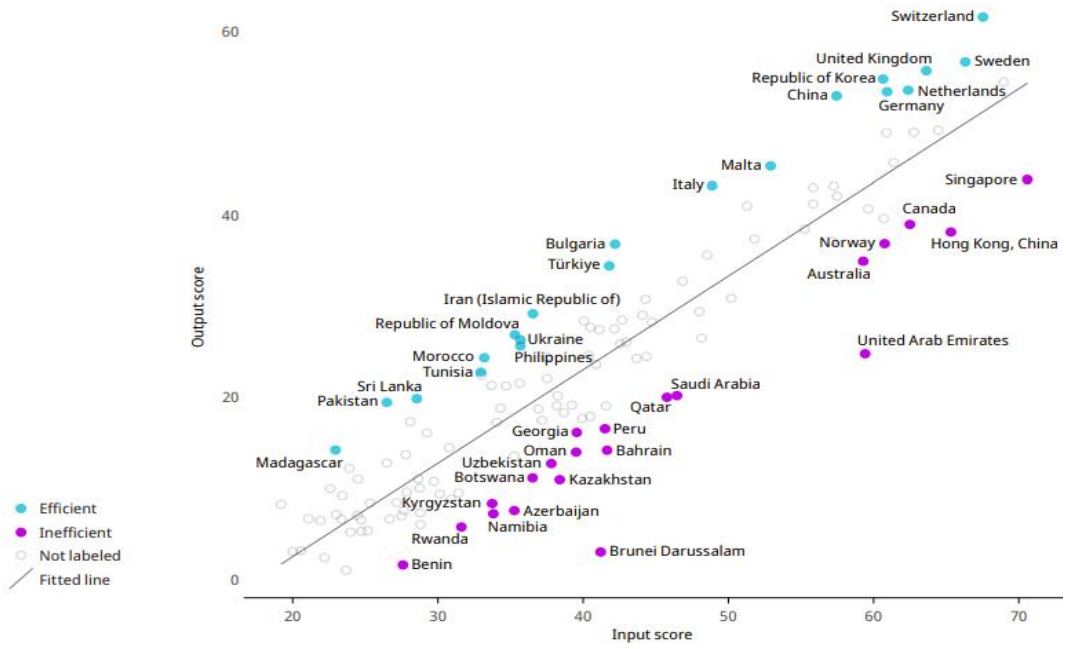
- Insufficient depth of the private sector implies low utilization of the digital technologies to create new services combined with shallow depth of the private sector. Brunei's rank in Global Innovation Index[4] 2022 fell from 71st in 2019 to 92nd out of 132 countries with input rank 53rd and output rank 129th. In particular, Knowledge & technology outputs (127th), E-participation (93rd), Government online service (80th), ICT access (76th) are notable weaknesses.

[2] The Authority for Info-Communications Technology Industry of Brunei Darussalam (AITI) is currently developing a new law and has drafted the Personal Data Protection Order (PDPO).

[3] Koh KS, Lim HS, Lim J, Wei Y, Minn PY, and Wong J., "Development and implementation of a national mobile health application: a case study from Brunei". J Glob Health 2022

[4] This index is produced by World Intellectual Property Organization (WIPO) and was used in the Digital Economy Master Plan 2025 to show Brunei's digital landscape at the time.

Figure 2. Innovation Input to Output Performance, 2022



Source: Global Innovation Index Database, World Intellectual Property Organization, 2022

5. Singapore launched the Smart Nation initiative in 2014 of which overall structure is similar to the Digital Economy Master Plan 2025 of Brunei.

- **3 Main pillars:** Digital Economy, Digital Government, and Digital Society
- **5 Key domains:** Health, Transport, Urban solutions, Finance, and Education

1. **Health initiatives:** Assistive Technology and Robotics in Healthcare, HealthHub, National Steps Challenge™ & Healthy 365 App, TeleHealth
2. **Transport initiatives:** Autonomous Vehicles, CETRAN[5], Contactless Fare Payment, On-Demand Shuttle, Open Data and Analytics for Urban Transportation
3. **Urban solutions initiatives:** Punggol Smart Town, Smart Nation Sensor Platform[6], Smart Water Meter, OneService App, OneService Chatbot, Smart Urban Planning, Smart Towns, myENV App[7], Elderly Monitoring System, Dengue Hotspots Survey Drones

[5] The CETRAN test circuit enables research and testing of self-driving vehicles before these officially hit the roads.

[6] SNSP is an integrated, nationwide platform that uses sensors to collect essential data that can be analyzed to create smart solutions.

[7] A convenient tool to update the public on the latest environmental news, including PSI readings and dengue outbreak alerts.

4. **Finance initiatives:** GoBusiness[8], Corppass[9], Data Innovation Programme Office, FinTech Sandbox, Networked Trade Platform, SGFinDex[10], SGTraDex[11]
5. **Digital Government Services initiatives:** LifeSG[12], National Digital Identity, CentEx[13], CrowdTaskSG[14], Digital Birth and Death Certificates, HDB Resale Portal

6. Singapore is taking a different approach by focusing more on digital capabilities and business opportunities of the private sector which could also be effective for Brunei in unleashing digital capabilities. Some examples include:

- **The Advanced Digital Solutions** supports the adoption of advanced technologies (e.g., Artificial intelligence, Robotics[15], Blockchain and Internet of Things), and integrated digital solutions (e.g., Business-to-business solutions that integrate inventory management, e-invoicing, and digital payments) helping competitiveness and productivity.

- **The Grow Digital initiative** offers small and medium-sized enterprises (SMEs) digital solutions to expand their businesses through e-commerce platforms, both locally and overseas, creating economies of scale and scope.

- The authorities also support **upskilling of the digital workforce** by a variety of training and reskilling initiatives such as SGUnited Mid-Career Pathways-Company Training (SGUP-CT), SGUnited Skills (SGUS), SkillsFuture Career Transition Program (SCTP), SGUnited Mid-Career Pathways-Company Attachment (SGUP-CA).

7. Singapore (Monetary Authority of Singapore) is also advancing digital innovations in the financial sector, making significant progress.

- Active areas are digital banks, central bank digital currency (CBDCs), cross-border payment systems and use of crypto assets.

[8] GoBusiness is the go-to platform for businesses in Singapore to access Government e-services and resources.

[9] A secure log-in method for business to transact with the Government online.

[10] SGFinDex is the world's first public digital infrastructure to use a national digital identity and centrally managed online consent system to enable individuals to access their financial information held across different government agencies and financial institutions.

[11] SGTraDex is a digital infrastructure that facilitates trusted and secure sharing of data between supply chain ecosystem partners.

[12] LifeSG allows you to easily access Government services, keep up with the latest news and updates, track your applications and more.

[13] The Centre of Excellence (CentEx) allows us to innovate quickly and develop citizen-centric services effectively.

[14] CrowdTaskSG is a web portal for government agencies in Singapore to engage citizens and gather insights through crowdsourcing tasks.

[15] Singapore has become one of the top global users of industrial robots, with its robot density increasing from about 1 operating robot per 1,000 employees in 2008 to 45 operating robots per 1,000 employees in 2018.

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