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January 4, 2018

Approved By
Asia and Pacific Department

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FISCAL ANCHORS: OPTIONS/TRADEOFFS[1]

This note sets out options to demonstrate how the authorities could supplement their cash balance target (two months of total spending) and public debt limit (30 percent of GDP) with an anchor to help discipline annual budget decisions (especially during a period when debt is well below the 30 percent threshold). The note introduces the current fiscal framework and effective fiscal rules based on international experiences, including the characteristics of each rule. It also discusses the need for a new fiscal anchor, given high revenue volatility, high infrastructure needs, and the country's exposure and vulnerability to natural disasters. Staff suggests a target for the overall fiscal deficit of 1.5 percent of GDP as a possible fiscal anchor, which would strike a balance between safeguarding debt sustainability and addressing the severe infrastructure gap.

A. Background

1. During the program period from June 2010 to March 2016, the program cash balance was successfully kept above the target floor set as one of qualitative performance criteria.[2] Staff recommended using the program cash balance as a fiscal anchor to maintain the balance above two months of recurrent spending, aim to cover the cyclicality in revenue and expenditure flows, potential contingent liabilities, and as a buffer against large shocks. In the 2016 Article IV consultation and the fifth and sixth reviews under the ECF arrangement, staff encouraged the authorities to keep the government's broader cash balance at a minimum of two months of total spending.[3] Staff also advised the authorities to anchor fiscal plans over the medium-long term to a non-commodity primary deficit target of 2.5 percent of GDP. The authorities intended to establish quarterly internal fiscal targets when the ECF-supported program expires, but without much progress.

2. The cash reserve position has deteriorated due to a more expansionary fiscal policy. On the revenue side, despite greater export duties proceeds from a buoyant logging sector and higher-than-expected yields from the sale of fishing licenses, overall revenue in 2016 was weighed down by lower goods tax collection due to lower fuel prices and widespread exemptions, including income tax exemptions for members of parliament. On the expenditure side, recurrent expenditure in 2016 was slighter higher than in 2016 budget, due to the increase in compensation of employees. As a result, at end-2016, the program cash balance—a performance criteria under the ECF arrangement —fell from SI$694 million (equivalent to 3.6 months of recurrent spending) at end-2015 to SI$412 million (2.0 months of recurrent spending). The government's broader cash balance at end-2016 was SI$552 million, or equivalent to 1.9 months of total spending, which is

[1] Prepared by Hidetaka Nishizawa (APD).

[2] The program cash balance is defined as the sum of government deposits held at the CBSI and the commercial banks minus unpaid payment orders and unpresented checks. The CBSI and the commercial banks have been used as a proxy for the program cash reserve from 2016 onwards.

[3] The broader cash balance is defined as the program cash balance plus the reserves in the government consolidated deposit account equivalent to SI$140 million. Total spending is defined as total expenditure, excluding grant-funded expenditure.

lower than the 2-month target recommended under the program. The cash position has continued to worsen: as of July 2017, the program cash balance stood at SI$363 million (1.7 months of recurrent spending).

3. On current policies, the debt sustainability analysis indicates that public debt-to-GDP ratio would rise above the government's target of 30 percent by 2028. The breach is primarily driven by high disbursement schedule and continued expansionary policy. Once the authorities have placed the fiscal position on a firmer footing, it would also be a good time to consider the type of fiscal rule that would be appropriate for Solomon Islands to maintain discipline, enable a response to natural disaster shocks and help promote development.

B. Solomon Islands Current Fiscal Framework

4. The current fiscal framework contains a number of elements designed to limit borrowing and safeguard debt sustainability (see Table 1).

5. The Public Financial Management Act (PFMA) 2013 restricts government borrowing so that it cannot be used to finance recurrent expenditures. The PFMA also allows the government to only enter into new borrowing for high priority infrastructure and development initiatives in line with the its development and debt policies, but this does not apply where short-term borrowing is necessary to deal with exceptional circumstances like a major economic shock or a natural disaster (see Box 1).

Box 1. Solomon Islands: Exceptional Borrowing and Contingency Warrants in the Budget

The Public Financial Management Act (PFMA) 2013 allows short-term borrowing to deal with exceptional circumstances like a major economic shock or a natural disaster. In the 2017 budget, the government planned to undertake short-term borrowing up to SI$100 million (about 1.0 percent of GDP). However, given a small domestic market, it is not clear whether the government secured the funding.

In addition, the country's budget allows for an issuance of contingency warrants for unforeseen expenditures, including from national emergencies and disaster. The 2017 budget provides for SI$85 million (1.8 percent of total expenditure) recurrent and development contingency warrants. This amount is appropriate, judging from selected country experiences which suggest that contingency provision, which is used for immediate liquidity support, should be set at a small amount of total expenditure, typically 2 percent (IMF, forthcoming). The PFMA stipulates that the use of contingent warrants should be tabled in the next sitting of National Parliament and disclosed within 30 days after it is tabled.

However, contingent warrants are not budgeted, resulting in a cut in other expenditures or revenue increases to fund unforeseen expenditure in the event of the shocks. The authorities should include contingency warrants for unforeseen expenditures in the budget in line with international best practice. Furthermore, if a disaster does not occur, this allocation could be saved in a contingency fund for natural disasters, which would enable swift disbursement in the aftermath of the disaster. The fund would be set up once fiscal buffers have been rebuilt.

6. The Debt Management Strategy (DMS) sets the thresholds for debt sustainability indicators. The new debt management framework was introduced in 2012 and revised and strengthened in September 2016, by establishing a new policy and guidelines on direct borrowing, on-lending and guarantees. The DMS stipulates a limit for the public debt-to-GDP ratio and debt service to domestically-sourced revenue ratio set respectively at 30 percent and 10 percent. Furthermore, the DMS requires the government to aim for its risk of debt distress to be no more than moderate under the joint IMF/WB debt sustainability framework for low-income countries (LIC DSF). The government decides annual borrowing limits to ensure that debt sustainability indicators remains below the thresholds under the worst-case scenario over a 15-year projection period. In the 2017 budget, the annual borrowing limit is SI$900 million (about 8.8 percent of GDP); SI$600 million was set for Tina hydropower project, while the remaining SI$300 million is earmarked for other purposes, including the undersea cable project.[4]

7. The Medium Term Fiscal Strategy (MTFS) outline the current economic situation and outlook as well as the economic and fiscal strategies to raise long-term economic growth and improve living standards. The MTFS sets the financial direction of the government for the following five years. The MTFS describes two main objectives for the government: 1) structural reform to improve the business environment; and 2) an affordable and sustainable budget which limits debt to a manageable level, improves government decision-making processes, and focuses on achieving the development goals. The MTFS is also supposed to set out revenue and expenditure projections as well as the expenditure growth path consistent with achieving a balance budget.[5] The MTFS was developed in 2008 and updated annually. But the MTFS has not been published since 2014.

Table 1. Solomon Islands: Current Fiscal Framework

Commitment under the program	Public Financial Management Act (PFMA) 2013	Debt Management Strategy	Annual Budget
Broader cash balance should cover at least 2 months of total spending. <At end-2016, 1.9 months>	Restriction on government borrowing to finance planned budget deficits in the recurrent expenditure <In 2016, current balance is 6.8% of GDP>	Limits of outstanding of Treasury bills (SI$40 million for a operational limit and SI$100 million for a policy limit) Limits for the public debt-to-GDP ratio (30%) and debt service to domestically-sourced revenue ratio (10%) <7.9% and 2.7%, respectively in 2016>	Annual borrwoing limits in the budget <SI$900 million in the 2017 budget>

Sources: IMF staff.

[4] The worst-case scenario assumes 30 percent depreciation in the Solomon Islands dollar against all foreign currencies.

[5] The balanced budget in the government paper should be carefully interpreted. Financing items, which are below-the-line items in the Government Financial Statistics (GFS) framework, are showed in above-the-line items in the budget. For example, loan disbursement is recognized as revenue and the usage of loan proceeds to purchase goods or services are recognized as expenditure. Principal and interest payments on loans are recognized as expenditure.

8. However, in the current circumstances, the targets under the fiscal framework are not binding and have not been sufficient to maintain fiscal discipline.

- ***Current balance.*** The current balance, defined as government revenue (excluding grants) minus recurrent expenditures (excluding the grant-funded recurrent expenditure), currently has a surplus of 6.8 percent of GDP in 2016, much higher than the government target of zero percent. As a result, the PFMA is not binding at present. But much of the growth in spending has been in government-funded development spending which has expanded substantially in recent years, including through spending on the constituency development funds, with development spending exceeding the surplus on the current balance.
- ***Public debt ratio.*** Debt ratios are currently well below the thresholds, and so they do not provide sufficient guidance for annual budget planning.[6]

9. This suggests the guidance on the debt ratio and current balance could be supplemented by a fiscal anchor that would provide more disciplined guidance for the annual budget cycle. The following discusses the pros and cons and tradeoffs for different rules for Solomon Islands.

C. The Need for a New Fiscal Anchor

10. The authorities' first priority should be to tackle current public financial management problems and rebuild the cash buffer. Once the cash balance is back to a level that is needed to cope with day to day management, then the authorities could begin to consider the fiscal anchor that would be most appropriate for them, consistent with the debt limit to anchor annual fiscal plans.

11. Fiscal anchors can help governments to contain fiscal deficits and avoid public debt accumulation in the medium term. The current framework—of a cash reserve balance target—provides an anchor for short-term cash management and liquidity, but does not provide short-term guidance for fiscal policy, does not enable adjustment over the cycle or in response to shocks, and does not anchor fiscal policy over the medium and long term. The debt limit is helpful in maintaining debt sustainability but it needs to be supplemented by an anchor for annual budgets, especially when the authorities are far away from meeting the debt limit.

12. Fiscal anchors can help the government address revenue volatility and recurrent spending rigidity (Cabezon and others, 2015). The country's revenue volatility is extremely high among the Pacific Islands countries due to volatile logging revenues, as well as fishing license fees. The share of recurrent expenditure as percent of GDP remains elevated, partly due to high cost of providing public service in remote and dispersed islands. Development expenditure accounts for 13.6 percent of GDP, much lower than the average (32 percent) of low-income countries, which may contribute to lower real GDP per capita growth. The combination of revenue volatility and recurrent expenditure rigidity promotes the procyclicality of fiscal policy. Enhancing fiscal frameworks by using fiscal anchors can avoid fiscal procyclicality by saving windfall revenues in good times and vice versa.

[6] The public debt is just 7.9 percent of GDP at end-2016, while debt service to domestically-sourced revenue ratio is just 2.7 percent in 2016

13. Fiscal anchors can help the government create policy space for spending on infrastructure and human capital (Cabezon and others, 2015). Solomon Islands is one of the poorest small states with GDP per capita much lower than the median for the small Pacific Islands, and has a large infrastructure gap with a limited access to electricity and the Internet. The government needs to have enough space to scale up infrastructure investment and ensure spending on health and education so as to support higher and inclusive growth.

14. Fiscal anchors can provide a guide for fiscal policy to build fiscal buffers to enhance resilience to the shocks, including national disaster shock. Given the country's exposure and vulnerability to natural disasters and climate change, fiscal buffers should be built during normal times. In the event of disasters, fiscal buffers provide immediate liquidity for disaster relief. Large disasters may lead to the temporary breach of fiscal targets by damaging the revenue base and requiring huge expenditure for recovery and reconstruction, even though the country is expected to receive grants or concessional loans from multilateral or bilateral creditors.

D. Effective Fiscal Rules from International Experiences

15. There are four types of fiscal rules (IMF, 2009; Schaechter and others, 2012). The rules are defined as a permanent constraint of fiscal policy through simple numerical limits on budgetary aggregates. Based on the characteristics of each rule, many countries use a combination of fiscal rules.

- Budget balance rules (BBRs) set a specific target in overall balance, structural or cyclically adjusted balance, and balance "over the cycle". BBRs provide clear operational targets and help safeguard debt sustainability. All balances except the overall balance take into account economic shocks, which requires the estimation of adjustments through the output gap. Thus, those rules are difficult to communicate and monitor. Under the balance "over the cycle" rule, corrective actions could be postponed to the end of cycle. The golden rule (GR), which targets the overall balance net of capital expenditures to safeguard public investment spending, is less linked to debt sustainability.
- Debt rules (DRs) set an explicit limit or target for public debt in percent of GDP. DRs ensure a direct link to debt target and are easy to communicate and monitor. However, when debt is well below its ceiling, DRs do not provide sufficient guidance for fiscal policy. This is the case for Solomon Islands, where its current public debt level is just 7.9 percent of GDP, while the debt ceiling is 30 percent.
- Expenditure rules (ERs) set limits on total, primary, or current spending in absolute terms, growth rates, or in percent of GDP. ERs are relatively easy to communicate and monitor. ERs do not have a direct link to debt sustainability, as ERs do not contain the revenue side. However, ERs can provide an operational tool to trigger the required fiscal consolidation with sustainability when ERs are accompanied by BBRs or DRs.
- Revenue rules (RRs) set ceilings or floors on revenues. RRs can improve tax policy and administration, but setting targets can be challenging as revenues are affected by the business cycle. RRs are not directly connected to debt sustainability, as RRs do not contain the spending side.

16. For commodity exporters, fiscal rules need to take into account two important characteristics of these economies: (i) the volatility of commodity price and (ii) the depletion of natural resources (IMF, forthcoming).

(i) Rules to cope with price volatility and achieve macroeconomic stability.

- These rules are particularly relevant for countries with long reserve horizons where resource exhaustibility is not a primary concern. They reduce the procyclicality of fiscal policy by delinking expenditure from volatile revenue resources. There are several rules aimed at saving revenues when the prices are high. Revenue split rules set aside a predetermined percentage of revenues. Price smoothing rules mean that the difference between actual resource revenues and the revenues consistent with the commodity reference price is saved. Expenditure rules, which set limits on total, primary, or current spending in absolute terms, growth rates, or in percent of GDP, can contain spending growth during price booms.

(ii) Rules to ensure fiscal sustainability and an equitable intergenerational allocation of resources.

- These rules are relevant for countries with relatively short reserve horizons where resource exhaustibility is a huge concern. Its main purpose is to determine the amount of savings for current and future generation. The Permanent Income Hypothesis (PIH) approach, the most commonly-used, implies that the intertemporal budget constraint is satisfied when the non-resource primary deficit is constant and equal to the return on total wealth. The PIH approach set a constant benchmark for the non-resource primary deficit that preserves wealth over time. The "bird-in-hand" approach is a tighter version of the PIH approach, implying that only the interest income generated from accumulated financial assets is spent.

17. Fiscal anchors should be designed and tailored to specific country objectives (Tumbarello, 2015). Countries whose fiscal objective is to control the accumulation of debt or assets can target on overall or primary balance, but this may not address a procyclicality of fiscal policy. (i.e. volatile revenue may lead to volatile expenditures) Countries with a fiscal target on a modified balance can achieve a fiscal objective to control volatility of expenditures, but may have little control of accumulation of debt or assets. A limit on the growth of spending would contribute to smooth expenditures, resulting in a reduction of economic volatility and saving accumulation, but it may limit the flexibility to respond to shocks. A debt target would maintain sustainability and allow maintaining buffers, but it may imply that fiscal policy may be procyclical. A target on assets or net of debt would allow building buffers against shocks, or savings for future generation, but it may impose spending cuts and limits on investments (see Table 2 and 3).

Table 2. Solomon Islands: Examples of Anchors, Targets, and Rules

Objectives:	Build buffers	Manage volatility	Increase potential growth
Anchors:	Net financial assets/net debt	Modified balance	Capital spending
Targets:	Floor on the fiscal balance	Modified Balance &/or limit on expenditure growth	Floor on capital spending + limit on current balance
Fiscal rule:	Legally binding targets and institutions to guarantee meeting the targets		

Sources: IMF staff.

Table 3. Solomon Islands: Type of Targets: Objectives and Trade-offs

Target	Objective	Trade off
Overall or primary balance	Control the accumulation of debt or assets	In case revenue are volatile, expenditures may be volatile (Pro-cyclicality)
"Modified" balance	Control volatility of expenditures	Little control of accumulation of debt/assets (endogenous)
Limit on the growth of spending	Smooth expenditures and so reduces economic volatility; allows accumulating savings	Limit the flexibility to respond to shocks
Debt	Maintains sustainability and allows maintaining buffers	Implies that fiscal policy may be pro-cyclical (you need to keep deficit under control)
Assets (net of debt)	Allows building buffers against shocks, or save for future generations	May impose spending cuts and limits on investment

Sources: IMF staff.

18. Effective implementation of fiscal rules requires strong public financial management (PFM) systems (IMF, 2009). Reliable data and a minimum technical forecasting capacity are needed to ensure sufficient degree of accuracy in budgetary aggregates to prevent risks that large deviation from the announced fiscal policy stance undermine the credibility of fiscal rules. Also, comprehensive budget reporting systems should be developed to cover as many aggregates as possible and to produce and publish in-year and end-year reports in a timely manner. This makes effective internal and external monitoring of the implementation of the rules possible and allows the government to consider the necessity of policy changes.

19. Effective fiscal rules generally have four conditions: (i) relevant objective, (ii) simplicity and transparency, (iii) resilience in the face of shocks, and (iv) enforceability (IMF, 2014).

- (i) The most common objective of fiscal rules is to preserve debt sustainability. The rules should be well designed to address the issues facing countries.
- (ii) Complicated fiscal rules with multiple numerical targets, broad exemptions, and limited coverage of the public sectors are difficult to monitor and easily circumvented.
- (iii) Fiscal rules should be flexible enough to respond to adverse shocks, including natural disaster shock. An escape clause that allows for the temporary breach of fiscal rules as part of

the response to shocks provides flexibility in the rules. Ideally, fiscal rules should include specific provisions for how fiscal targets would be adjusted in the event of shocks and how policies would be bought back in line with fiscal rules in the post-shock periods. The current fiscal framework in Solomon Islands allows for exceptional borrowing and an issuance of contingent warrants to deal with exceptional circumstances.

- (iv) Fiscal rules with automatic correction mechanisms can enhance their enforceability. A "debt brake" requires fiscal adjustment in case of ex post deviations from the rule.

20. Fiscal rules can be supported by a number of arrangements (Schaechter and others, 2012). International experience suggests most of the BBRs, DRs, and ERs are established through statutory norms, followed by political commitments and coalition agreements. Fiscal responsibility laws, which set out procedural and transparency requirements, have especially expanded to the emerging market economies. Independent fiscal council are established in some countries to assess and monitor the implementation and impacts of fiscal policy. In Solomon Islands, the Public Accounts Committee under the Parliament have examined the government's fiscal policy (see Box 2).

Box 2. Solomon Islands: Public Accounts Committee (PAC)

The Public Accounts Committee (PAC), which is under the National Parliament of Solomon Islands, examines the public accounts and reports the results of such examination to the Parliament. The PAC consists of eight Members of Parliaments and is headed by the former Deputy Prime Minister, with eight secretariats and one technical advisor from UNDP. The PAC can summon any public officer to give information on any explanation or to produce any records or documents which the PAC requests. Another responsibility is to consider the draft estimates prepared by the government in support of the Annual Appropriation Bill. The PAC can summon the accounting officers and technical staff of ministries and departments to produce background information and explanation in relation to draft estimates.

Once the government implement fiscal rules, the PAC would become an institution to monitor the implementation. Given limited resources, it is more realistic to use the current assets than to create another independent fiscal agency.

E. Possible Application of Some Fiscal Anchors for the Solomon Islands

21. Given the rising public debt trajectory, a need for infrastructure development, and the authorities' capacity, staff suggests the following numerical fiscal rule.

- **BBRs, overall fiscal deficit (1.5 percent of GDP):** We assume that the government takes interim steps to rebuild the broader cash balance during 2017-2022, as described in the Article IV consultation paper, and continues to implement fiscal consolidation measures and curtail development expenditure financed by external creditors to maintain fiscal deficit of around 1.5 percent of GDP (see Table 4).

Table 4. Fiscal Adjustments to Fiscal Balance 2017-37
(In percent of GDP relative to the baseline)

	2017	2018	2019	2020	2021	2022-37
Revenue	**0.3**	**0.85**	**0.85**	**0.85**	**0.85**	**0.85**
Tax Revenue	0.30	0.85	0.85	0.85	0.85	0.85
Income and profits	0.05	0.10	0.10	0.10	0.10	0.10
Reducing stock of tax arrears	0.20	0.70	0.70	0.70	0.70	0.70
International trade and transactions	0.05	0.05	0.05	0.05	0.05	0.05
Expenditure	**-0.40**	**-0.90**	**-0.90**	**-0.90**	**-0.90**	**-0.90**
Recurrent spending	-0.10	-0.35	-0.35	-0.35	-0.35	-0.35
Compensation of employees	-0.05	-0.10	-0.10	-0.10	-0.10	-0.10
Other recurrent spending	-0.05	-0.25	-0.25	-0.25	-0.25	-0.25
Development spending	-0.30	-0.55	-0.55	-0.55	-0.55	-0.55
CDFs	-0.10	-0.20	-0.20	-0.20	-0.20	-0.20
Other development spending	-0.20	-0.35	-0.35	-0.35	-0.35	-0.35
Total Savings	**0.7**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**

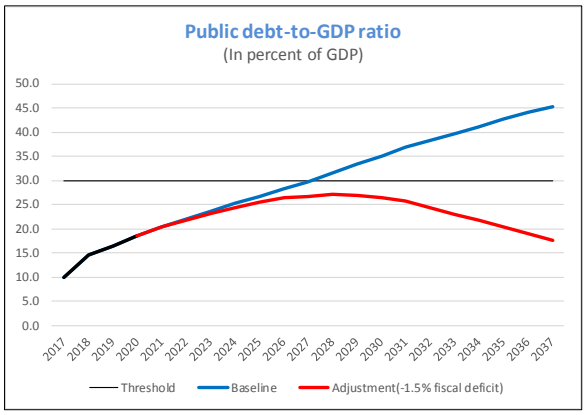
Source: Staff estimates.

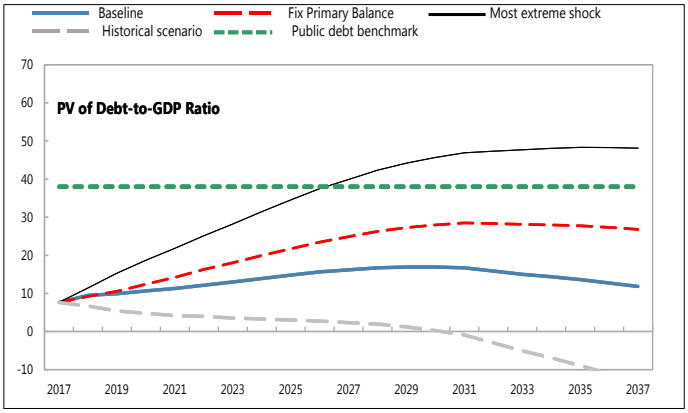
- **BBRs, non-commodity primary deficit (4 percent of GDP):** The 1.5 percent fiscal deficit would correspond to the 4.6 percent non-commodity primary deficit on average, but it is probably best to err on the side of conservatism since the non-commodity primary balance may not control a buildup of debt overall. The target is weaker than previous recommendation of 2.5 percent of GDP but would still be consistent with maintaining debt sustainability.

22. Given that public debt remains relatively low for the next ten years, the authorities may consider the following rule, which is less linked to debt sustainability, to safeguard public investment spending and reduce the procyclicality of fiscal policy.

- **ERs, constraints on recurrent expenditure, excluding grant-funded recurrent expenditure (25.0 percent of GDP).** The authorities need to review public wage bills, which account for around 39 percent of recurrent expenditure.

23. The 1.5 percent overall fiscal deficit target would ensure fiscal sustainability, meet high infrastructure demands, and maintain fiscal buffer to cope with the procyclicality of fiscal policy, unforeseen spending, potential contingent liabilities, and large shocks, such as natural disaster. Complying with the target would keep the public debt-to-GDP ratio and its present value below the government's target of 30 percent and 38 percent thresholds respectively under the debt sustainability framework for low-income countries. It would also maintain cash balance above two months of total spending over the projection period (2017–37). Stress tests under the framework indicate that the only most extreme shock would breach the threshold.[7]





[7] The most extreme stress test is the test that yields the highest ratio on or before 2027. The framework conducts five test: 1) Growth shock (real GDP growth is at historical average minus one standard deviations in 2018–19), 2) Primary Balance shock (Primary balance is at historical average minus one standard deviations in 2018–19, 3) Combination of 1) and 2) using one half standard deviation shocks, 4) One-time depreciation shock (one-time 30 percent real depreciation in 2018), 5) Non-debt flows shock (10 percent of GDP increase in other debt-creating flows in 2018). The results show that the most extreme shock is 1) Growth shock and that debt trajectories for other shocks do not exceed the threshold during the projection period (2017–37).

F. Policy Recommendations

24. The government should consider introducing an additional fiscal anchor, a long-term target to ensure fiscal and debt sustainability. The target of overall fiscal deficit at 1.5 percent of GDP would strike a balance between safeguarding debt sustainability and addressing infrastructure gaps. It has the benefit of simplicity and comprehensiveness. A stronger fiscal framework would also help to avoid fiscal procyclicality by saving windfalls revenue in good times and vice versa.

25. Given Solomon Islands vulnerability to natural disasters, the fiscal anchor should include an escape clause that allows for the temporary breach of fiscal rules as part of the response to shocks such as natural disasters. It should include specific provisions for how targets would be adjusted in the event of a shock and how policies would be brought back afterwards. Also, the fiscal anchor should include a "debt brake" that requires fiscal adjustment in case of ex-post fiscal policy slippages. The Public Accounts Committee (PAC) under the National Parliament of Solomon Islands can play an important role in monitoring the implementation of fiscal anchor.

26. Contingency warrants for unforeseen expenditures, including from natural disasters, should be included in the budget in line with international best practices. Furthermore, if a disaster does not occur, this allocation could be saved in a contingency fund for natural disasters, which would enable swift disbursement in the aftermath of the disaster. The fund would be set up once fiscal buffers have been rebuilt.

27. The Medium Term Fiscal Strategy (MTFS) should be updated annually and published. The five-year strategy should include specific fiscal measures to achieve fiscal targets and identify, disclose, and manage fiscal risks, including one stemming from natural disaster. The MTFS should continue to outline economic and fiscal strategies to promote long-term economic growth.

28. At the same time, public financial management should be strengthened to ensure effective implementation of fiscal rules. The Fund's technical assistance will continue to support the authorities in implementing better cash flow forecasting and improving budget revenue forecasting. The authorities should produce and publish the Mid-Year Budget Review and the Final Budget Outcome in the predetermined time frame. Donor-funded development expenditure needs to be included in the budget aggregates with the enhanced quality of grant data. The Ministry of Finance and Treasury should strengthen the capacity to compile GFS now conducted by the central bank.

29. Over the longer term the domestic debt market should be developed and thought would need to be given to the appropriate limit on the level of the treasury bills. The current low operational limit in the debt management strategy for treasury bills (SI$40 million or about 0.4 percent of GDP) and a policy limit (SI$100 million or about 1 percent of GDP) for the outstanding stock of Treasury bills, is very limited but is a reflection of previous defaults on government debt. Over time developing a larger treasury bill market would help support both fiscal policy and financial deepening.

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PUBLIC INVESTMENT IN THE FACE OF NATURAL DISASTERS: A MODEL APPLICATION TO SOLOMON ISLANDS[1]

The infrastructure gap in Solomon Islands is severe, even when compared against other small developing states. Furthermore, building and maintaining adequate levels of infrastructure is a challenge due to the high frequency of natural disasters. This paper applies the Debt-Investment-Growth (DIG) model to help illustrate the outcomes of different profiles of public investment and evaluate macroeconomic and financial implications of alternative investment programs, financing strategies, as well as institutional capacity in managing public investment. To deepen the understanding of macroeconomic implications, the model is further extended by incorporating shocks of high vulnerability to natural disasters. The findings show the benefits of climate and natural disaster resilient infrastructure on fiscal indicators, investment and growth. Further, the findings underline the benefits of PFM reforms that strengthen public investment management as well as the importance of tapping external concessional financing from development partners to support debt sustainability and greater discipline in investment spending.

A. Public Investment Scaling-Up to Address Infrastructure Gap

1. The infrastructure gap in Solomon Islands is severe, even when compared against other small developing states. Less than half of the population—and only 15 percent of rural inhabitants—has access to electricity and 59 percent of households in the country have to travel long distances to access water. While over a third of the population owns a mobile phone, a mere 3 percent of the population has access to internet, with internet cost among the highest in the Pacific.[2] And for a country that consists of many widely dispersed islands, there are only two shipyards that can service vessels,[3] and intra-island communication is made more difficult by the fact that only an estimated 3 percent of roads is paved.[4] By many measures of infrastructure access, Solomon Islands also lags most of its peers, including among Pacific island countries that share many of Solomon Islands' challenges, among which are geographical dispersion, vulnerability to natural disasters, low capacity, weak institutions, political instability, and revenue volatility.[5]

2. Building and maintaining adequate levels of infrastructure are rendered more challenging by the high frequency of natural disasters. Solomon Islands is one of the most vulnerable countries to natural disasters—cyclones, earthquakes, tsunamis, floods, and droughts—even by the standards of Pacific island economies, a group that is already highly prone to natural disasters relative to the rest of the world. IMF staff estimates based on EM-DAT International Disaster Database show that Solomon Islands is hit, on average, by a natural disaster inflicting

[1] Prepared by Fazurin Jamaludin (APD), Ricardo Marto (RES), and Irene Huan Zhang (APD), with input from Dawit Tessema (SPR).

[2] Solomon Islands 2012–13 Household Income and Expenditure Survey, pp. xi-xii.

[3] Solomon Islands Government, National Development Strategy 2016–30, 2015, pp. 22–5.

[4] CIA World Factbook.

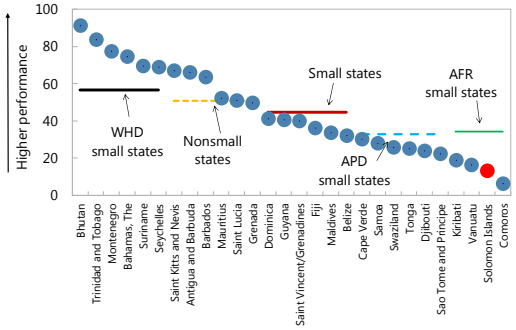
[5] Solomon Islands Medium-Term Development Plan 2016–20.

damage and losses equivalent to more than 3 percent of GDP or affecting more than 5 percent of the population once every 6–7 years. In Solomon Islands' worst episodes of natural disasters, the devastation amounted to 14 percent of GDP and affected more than half of its population. The 2014 flood—the most recent large natural disaster—inflicted damage and losses equivalent to 5 percent of GDP, and partly contributed to the closure of the country's only gold mine, hitherto a major driver of economic growth.

3. The Solomon Islands Medium-Term Development Plan 2016–20 (MTDP) identifies the development and upgrade of infrastructure as a top priority. The MTDP outlines the implementation of the first phase of the National Development Strategy 2016–35, which sets out long-term development objectives. Under the MTDP, the government seeks to build and upgrade physical infrastructure and utilities with an emphasis on improving access to productive resources and markets, Solomon Islanders have access to essential services. Under the 2017 Budget, the cumulative amount of two planned large infrastructure projects—the Tina River hydropower plant and the submarine cable between Honiara and Sydney—which are slated for implementation between 2017 and 2022, is equivalent to around a quarter of the GDP, marking a significant scaling up of capital spending.

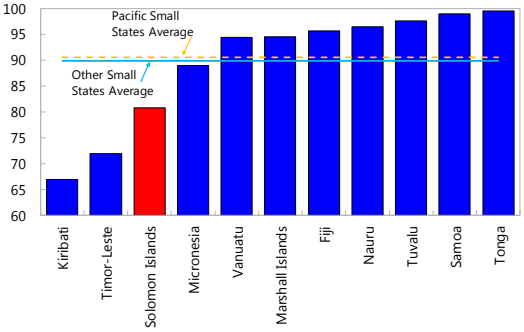
Solomon Islands lag peers in access to basic infrastructure, including electricity

Infrastructure Quality: Electricity Generation Per Capita, 2014
(Percentile ranks)



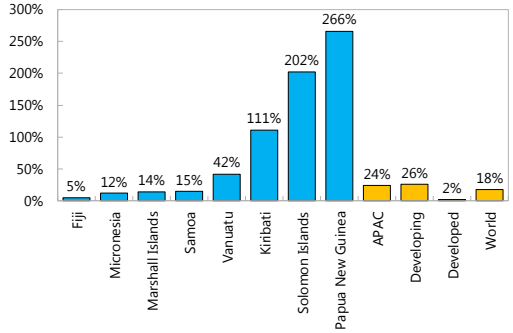
…water access…

Water Access, 2015
(In percent of population with access)



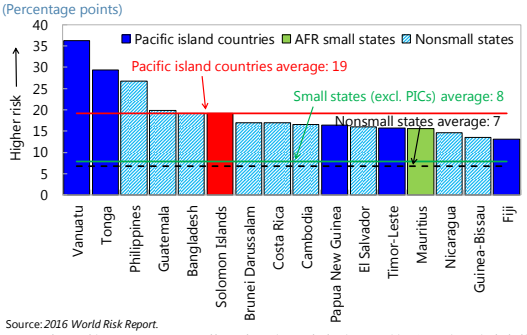
…and connectivity, as well as basic amenities.

Fixed broadband prices
(In percent of GNI per capita)



Solomon Islands is also among the world's most vulnerable countries to natural disasters.

Natural Disaster Risks: World Risk Index, 2016
(Percentage points)



Source: *2016 World Risk Report.*
Note: Index combines exposure to natural hazards, coping, and adaptive capacities. Samoa is not included in the database.

4. A tailored application of the Debt-Investment-Growth (DIG) model helps illustrate the outcomes of different profiles of public investment and inform policy discussions.[6] Solomon Islands has been identified as a pilot case under the IMF's Infrastructure Policy Support Initiative (IPSI). The DIG Model is part of a suite of tools available under the IPSI package[7] that could be tapped to help countries evaluate macroeconomic and financial implications of alternative investment programs and financing strategies, as well as bolster institutional capacity in managing public investment. In applying the DIG model to Solomon Islands, we aim to take into account the country's characteristics, including capacity constraints, high vulnerability to natural disasters, and limited access to financing. While the simulation findings are driven, to some degree, by the assumptions made under different scenarios, the model provides a framework for thinking through the macroeconomic effects of public investment scaling up.

B. The Debt-Investment-Growth (DIG) Model: Incorporating the Implications of Natural Disasters

5. The Debt-Investment-Growth (DIG) model was developed to study the macro-economic impact of public investments in low-income countries. The model focuses on evaluating investment-growth linkages, public external and domestic debt accumulation, fiscal policies to ensure debt sustainability. The model is a dynamic general equilibrium framework of a small open economy featuring both traded and non-traded goods sectors. In the original application of the model to a typical Sub-Saharan African country, the results suggested that well executed high-yielding public investment could meaningfully stimulate growth and be self-financing in the long run. On the other hand, Buffie et al suggested that poor execution, delayed fiscal policy reactions, or persistent negative exogenous shocks can result in unsustainable debt dynamics.

6. To study the macroeconomic challenges portrayed by the high vulnerability to natural disasters, we applied the model developed by Marto, Papageorgiou, and Klyuev (forthcoming).[8] Their model extends the DIG framework by allowing the government to invest in both standard infrastructure (e.g. roads) and adaptation capital (e.g. seawalls), as well as to save resources in an external contingency fund that can be used to finance reconstruction activities. In addition to allowing standard infrastructure to function better or more regularly (e.g. roads can be used for more days per year), adaptation capital reduces the damages inflicted by a natural disaster and depreciates at a lower rate. Natural disasters influence the economy through the following channels: (i) permanent damages to public infrastructure; (ii) permanent damages to private capital (tradable and non-tradable sectors can be disparately affected); (iii) temporary losses of productivity; and (iv) increased inefficiencies in public investment during the reconstruction process. In an application to Vanuatu and the ensuing challenges caused by cyclone Pam, they found that

[6] "Public Investment Growth, and Debt Sustainability: Putting Together the Pieces" by Edward E. Buffie, Andrew Berg, Catherine Pattillo, Rafael Portillo, and Luis-Felipe Zanna, IMF Working Paper WP/12/144.

[7] The IPSI package includes five analytical tools: (i) Public Investment Management Assessment (PIMA) that assesses the quality of public investment management practices; (ii) Debt-Investment-Growth (DIG) model; (iii) PPP Fiscal Risk Assessment Model (P-FRAM) to help countries better select public-private partnership projects; (iv) Medium-term Debt Management Strategy (MTDS); and (v) Debt Sustainability Assessments (DSA), with the last two already routinely undertaken in many low-income-countries.

[8] "Building Resilience to Natural Disasters: An Application to Small Developing States," by Ricardo Marto, Chris Papageorgiou, and Vladimir Klyuev (forthcoming).

investing in adaptation infrastructure could prove useful as a complement to conventional infrastructure as it raises the marginal product of private capital, crowding in private investment, while helping withstand the impact of natural disasters. The findings further underlined the important role that could be played by development partners, including through grants, as well as through support in building resilience, to help ensure debt sustainability.

C. Simulations and Findings

7. We conducted three simulations taking into account Solomon Islands' vulnerability to natural disasters, low public investment efficiency, and limited access to financing. All three simulations consider some form of scaling-up of infrastructure spending for a five-year period. In Figure 1, we compared the outcomes of investing in conventional infrastructure in contrast to natural disaster-resilient (adaptation) infrastructure. In Figure 2, we look at how PFM reforms can affect the outcomes of public investment, and in Figure 3, we consider the effects of different types of financing for the public investment program given Solomon Islands' limited access to funding.

8. In these simulations, we explicitly considered the impact of a natural disaster shock. To simplify the narrative, we assumed that the country is hit by a natural disaster after the five-year period of scaled-up infrastructure spending. The natural disaster shock is assumed to inflict an average damage equivalent to 20 percent of GDP, with effects lasting three years. We further considered that the government aims to fully rebuild the damaged infrastructure in a horizon of about 6 to 8 years.

9. The model also optimizes the level of financing from the different sources of funding available to Solomon Islands. In this model, we assumed that Solomon Islands has access to the following methods of financing the additional infrastructure spending: (i) domestic borrowing; (ii) external concessional loans; (iii) grants; (iv) higher taxes; and (v) prioritizing public spending away from recurrent spending towards capital spending. We also assumed that grant financing increased by an additional 2 percentage points during the scaling-up period compared to the steady state. We further assumed that to fund new investment, the government would split the burden equally between higher taxation and lower recurrent spending.

Simulations: Set-up

10. Simulation 1: Conventional vs. Adaptation infrastructure. In Figure 1, we considered a scaling-up of public infrastructure spending during a five-year period under two scenarios. In the first scenario, we assumed that public spending is allocated towards building conventional infrastructure, with spending sustained at 4 percent of GDP above steady-state levels for five years. In the second scenario, we looked at the same quantum of scaling-up with natural disaster-resilient infrastructure. Under the adaptation infrastructure scenario, the model calibrates for the different rates of public capital depreciation implied by conventional and natural disaster-resilient infrastructure. Climate-proof infrastructure is expected to be associated with a lower rate of capital depreciation. On the other hand, in the case of disaster-resilient infrastructure, the costs are likely to be higher and implementation more complex. Consequently, disaster-resilient infrastructure projects can be expected to require more time and resources than their conventional counterparts.

11. Simulation 2: PFM reform vs. no PFM reform. In the second simulation, we maintained the assumptions under Figure 1, but looked at a scenario under which the authorities decided to invest in natural disaster-resilient infrastructure. We further considered two scenarios. In the first, adaptation infrastructure was developed under a baseline scenario. In the second scenario, the same investment is pursued in the context of meaningful progress in PFM reform. With PFM reform, we assumed a higher level of returns on public investment as the average quality of public investment is expected to increase with improved public investment management. In the same way, we also assume that PFM reform leads to higher public investment efficiency.

12. Simulation 3: Domestic borrowing vs. external concessional financing. We further considered the relative merits of relying on domestic borrowing and external concessional financing to fund adaptation infrastructure. We considered three situations: (i) full reliance on external concessional financing; (ii) full reliance on domestic borrowing; and (iii) a combination of the two where financing is equally split. For this simulation, we assumed the same level of grants as in the other simulations, and that taxation and spending policies remain unchanged.[9]

Simulation: results[10]

13. Simulation 1: The benefits of climate-proof/natural disaster-resilient infrastructure are clear in the case of Solomon Islands.

- **Fiscal deficit**. Due to our assumptions, the fiscal burden during the scaling-up period is identical. However, when natural disaster hits, adaptation infrastructure results in lower repair costs as damages are expected to be relatively limited, which in turns leads to a lower fiscal deficit. Although an extreme natural disaster shock implies a spike in fiscal deficit due to reconstruction regardless of the type of infrastructure, the costs of rehabilitation with adaptation infrastructure are appreciably lower than with conventional infrastructure. While the cost of maintaining or repairing adaptation infrastructure is likely to be higher than conventional infrastructure on a per unit basis—due to more expensive material and higher levels of skills involved—due to its resilience, adaptation infrastructure will likely require less frequent repairs/maintenance. This suggests that even in the absence natural disasters, the long-run average maintenance/repair costs of adaptation infrastructure are likely to be associated with a relatively lower fiscal burden, compared to conventional infrastructure.
- **Public debt**. The model-based results suggest that higher fiscal spending triggered by post-disaster response and reconstruction is likely to result in a higher public borrowing with conventional infrastructure compared to adaptation infrastructure, especially when we consider the higher financing needs resulting from lower post-disaster government revenue. While the actual quantum of additional borrowing may be lower—in the model, the level of grants to revert to the steady state after the scaling-up period, but grants from bilateral and multilateral development partners are likely to increase post-disaster—in relative terms, adaptation infrastructure is associated with lower public debt in the long term.

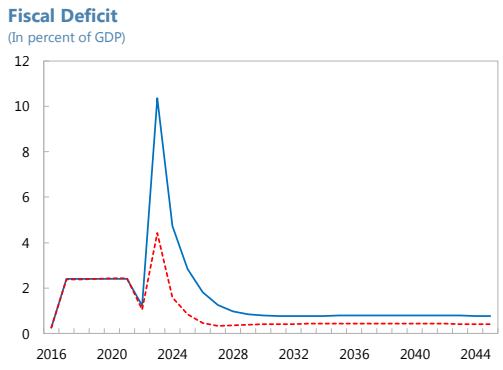
[9] We also ran simulations for different combinations of taxation and recurrent spending cuts. The results for Solomon Islands are mixed, with unclear implications.

[10] For the purpose of this section, we select some of the most relevant findings for Solomon Islands.

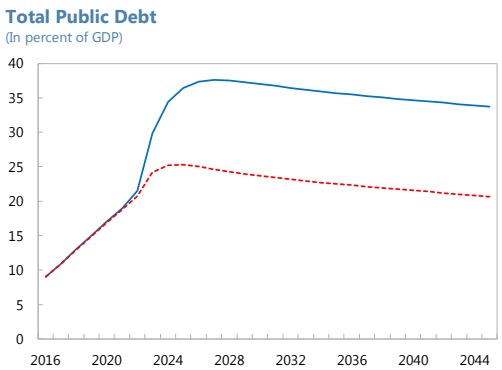
- **Private investment**. In the near term, the simulation results suggest that conventional infrastructure gives a higher boost to private investment compared to adaptation infrastructure. One interpretation of this result is that, the complexity of adaptation capital projects means that it takes longer for these projects to become operational, and to contribute towards boosting economic productivity, compared to conventional infrastructure. On the other hand, by cushioning the economy from the worst excesses of a natural disaster, adaptation infrastructure may also contribute towards raising households' and firms' *confidence* in the long-term prospects of the economy, which motivates higher private investment. This can help explain the bigger boost to private investment from adaptation infrastructure in the medium and long term, relative to conventional infrastructure.
- **Growth**. The results for broader economic performance largely echoes those for private investment. The natural disaster-related drop in real GDP growth relative to the steady state is contained in the case of adaptation infrastructure. The confidence effect is also likely at work in the medium and long run, boosting long-term growth.

Figure 1. Selected Results Simulation 1

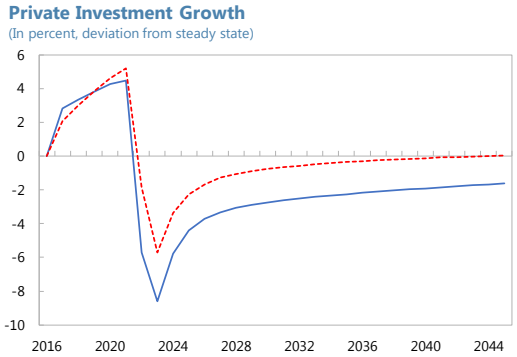
Disaster-resilient and climate-proof lowers the fiscal burden post-disaster and in the long run…



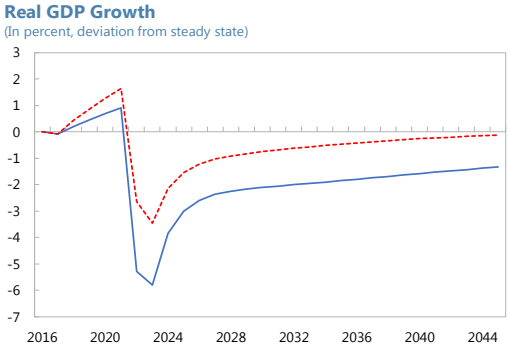
…with analogous implications for public borrowing and long-term public debt levels.



The confidence effects of complex adaptation capital projects for private investment come with a delay …



…but disaster-resilience clearly benefits growth post-disaster and in the long run.



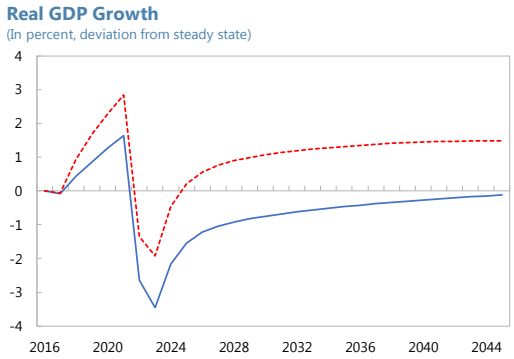
Blue line = conventional infrastructure; red line = adaptation infrastructure

14. Simulation 2: Meaningful PFM reform that strengthens public investment management can amplify the benefits gained from investing in adaptation infrastructure:

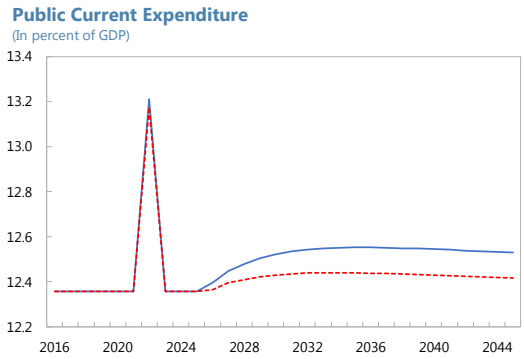
- **Growth**. Higher-quality public investment could be expected to lead to higher capital efficiency, and thus contributing more towards lifting economic productivity. However, the simulation results suggest that the gains from higher capital efficiency increase very gradually and are only fully realized in the medium and long run.
- **Recurrent expenditure and fiscal deficit.** Under Figure 2, the model projects a modest reduction in public recurrent expenditure as well as a lower fiscal deficit in the long term. A lower capital depreciation cost associated with higher-quality capital projects implies lower maintenance costs, which in turn allows for potential savings in terms of recurrent spending.[11] This brings down fiscal spending and improves the fiscal position in the long run.
- **Public debt**. Public debt, while remaining unchanged in the short term, is lower in the long term, in line with lower recurrent spending, a stronger fiscal position, and stronger growth under the PFM reform scenario.

Figure 2. Selected Results Simulation 2

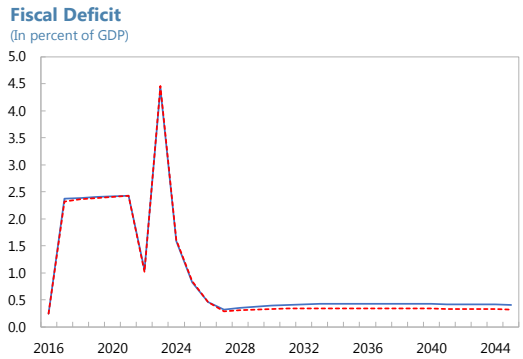
Higher quality of public investment results in greater productivity gains from new infrastructure



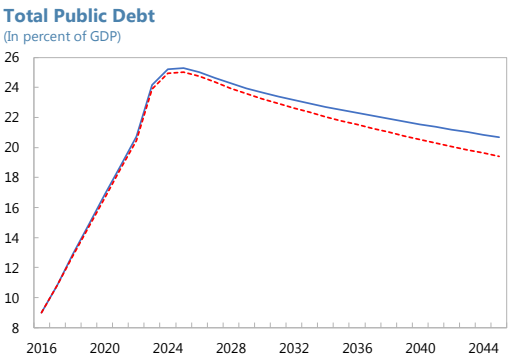
Slower depreciation associated with higher-quality infrastructure helps lower maintenance costs…



…allowing lower expenditure…



…and lower public debt.



Blue line ="no reform" scenario; red line = PFM reform scenario.

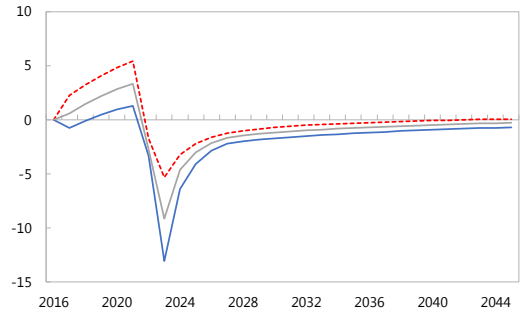
[11] The Government Finance Statistics Manual 2014 distinguishes between repair and renovation (classified as spending on fixed assets, or capital spending) and maintenance, which is part of expense (recurrent spending).

15. Simulation 3: When funding infrastructure investment, tapping external concessional loans yields more favorable results than resorting to domestic borrowing:

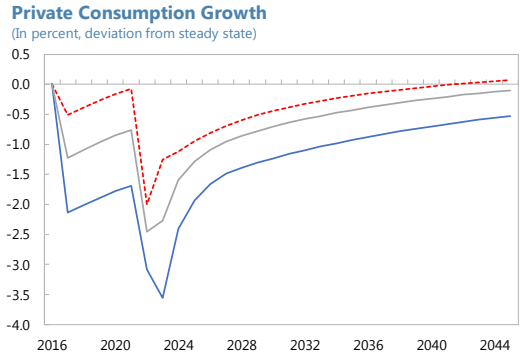
- **Private investment and private consumption**. The model-based results suggest that a heavy reliance on domestic borrowing to finance public investment leads to lower private sector activity, especially in the short and medium term. This is mostly likely due to the crowding-out of the private sector, and is particularly true in the aftermath of a natural disaster.
- **Growth and fiscal deficit**. The model suggests that the crowding-out of the private sector caused by heavy domestic borrowing results in lower real GDP growth in the medium term. However, the downward pressure on economic activity is more marked in the long term. The cost of domestic financing in Solomon Islands is one of the highest among Pacific island countries especially in comparison to external concessional financing. The higher debt service on domestic loans implies that more fiscal resources need to be channeled away from productive uses in the long run, thus weighing on economic growth even though the fiscal position outcome is similar under all financing options.

Figure 3. Selected Results Simulation 3

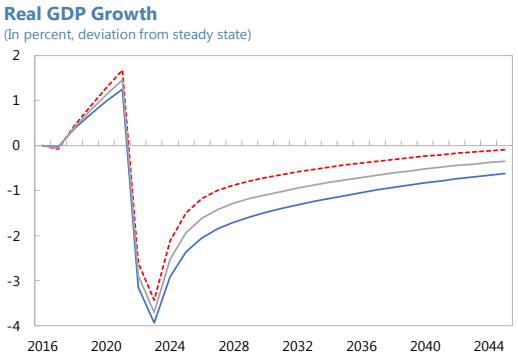
Borrowing domestically to finance infrastructure projects crowds out private investment…



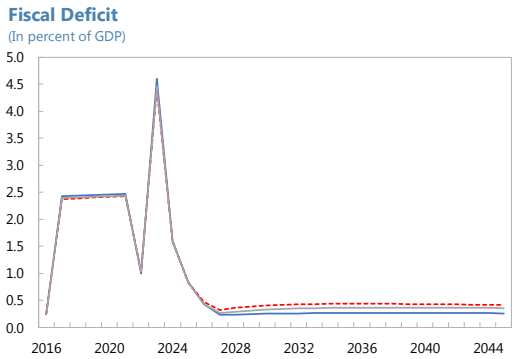
…with spillovers into private consumption…



…and the burden of higher debt service weighs on long-term growth…



…despite broadly similar fiscal position outcomes.



Blue line = only domestic debt; red line = only external concessional debt; gray = equal split between the two

D. Policy Implications

16. Reprioritizing public spending towards developing disaster-resilient infrastructure can yield long-term dividends. While building adaptation infrastructure may impose a higher fiscal burden and may require more time and resources, in the long term, climate-proof infrastructure can help cushion the economy from the worst effects of natural disasters, thus limiting the contraction in economic activity. Investing in disaster-resilient infrastructure can also instill greater confidence in the long-term prospects of the economy, which can go a long way towards fostering private investment and potential growth. The resilience of adaption infrastructure also implies a healthier fiscal position in the long run as well as lower levels of indebtedness. In the case of Solomon Islands, this further stresses the importance of improving the quality of public spending and optimizing spending composition. In this context, the national budget could aim at further rationalizing recurrent spending to create more space for allocating more resources to capital spending.

17. Timely PFM reforms, including those targeted at strengthening public investment management, can boost the gains from infrastructure investment. Stronger PFM would help improve the quality and efficiency of public investment and raise the gains from better infrastructure. But given that PFM reforms require time to bear fruit reforms should be pursued without delay. Solomon Islands should build on the progress it made on PFM reforms under the Extended Credit Facility arrangement—the passing of the PFM Act and the draft Procurement Rules and Regulations—and continue efforts to further strengthen public investment management. Improving the transparency and accountability of development spending channeled through the Constituency Development Funds (CDF) will contribute in this regard. In this context, the publication of the report of the 2012 audit of the CDFs, and more importantly, regular audits of these funds, will go a long way towards improving governance. Efforts to increase awareness of the selection criteria and the decision-making process on the use of these funds will also help increase transparency. In addition, the forthcoming Pacific Region Infrastructure Facility (PRIF) report on public investment management practices in Solomon Islands could help shed some light on potential areas for improving the transparency and quality of public investment.

18. The model-based findings suggest that Solomon Islands should seek, to the extent possible, external concessional financing from development partners. Apart from the high domestic financing costs—due to structural factors—which imply high debt service costs, domestic borrowing also weighs on economic growth as the private sector is crowded out. Tapping external concessional financing for large infrastructure projects would also support debt sustainability and support greater discipline in investment spending. The discipline of debt sustainability monitoring by creditors may also allow for the transfer of skills and knowledge from development partners and stakeholders, which could further support capacity building efforts, especially given the complexity of disaster-resilient infrastructure projects. Over the longer term, developing domestic markets and financial deepening will also be important to mobilize domestic savings to finance long-term economic growth.

E. Base Case Calibration

Table 1. Country Specific Parameters
(In percentage)

Definition	Value
User fees for infrastructure services (percent of recurrent costs)	5.0
Public infrastructure investment to GDP ratio	8.0
Public adaptation infrastructure investment to GDP ratio	0.0
Consumption tax rate (VAT)	10.0
Public domestic debt to GDP ratio	0.5
Public concessional debt to GDP ratio	8.5
Public external commercial debt to GDP ratio	0.0
Grants to GDP ratio	10.0
Other revenue to GDP ratio	4.0
Government savings to GDP ratio	0.0
Remittances to GDP ratio	0.3
Private external debt to GDP ratio	10.3
Real interest rate on public domestic debt	3.0
Trend per capita growth rate	3.0
Imports to GDP ratio	52.3
Value added in non-tradable Sector	43.1

Sources: IMF Staff.

Table 2. Key Assumptions

Definition	Value
Initial return on standard infrastructure investment	15.0
Initial return on adaptation infrastructure investment	40.0
Efficiency of public infrastructure investment	30.0
Steady state efficiency of public infrastructure investment	30.0
Share of public debt adj. between commercial external and domestic (=100 when only domestic debt is used)	5.0
Capital's share in value added in the tradable-sector	40.0
Capital's share in value added in the non-tradable sector	55.0
Depreciation rate in tradable and non-tradable sector	5.0
Depreciation rate of public capital (standard infrastructure)	15.0
Depreciation rate of public capital (adaptation infrastructure)	3.0

Sources: IMF staff.

For Table 1, all the values are calculated based on the latest available macroeconomic indicators of Solomon Islands. Table 2 shows the key assumptions made in the simulations. The following discussion shows the rational for each assumption.

- *Return on standard infrastructure investment*. The World Bank estimates the median return of its infrastructure projects in various sub-categories is around 17 percent–31 percent[12]. Based on that estimate, we picked 15 percent as initial return for standard infrastructure investment to be on the low-return scenario.
- *Return on adaptation infrastructure investment*. According to Bresch (2014), the adaptation infrastructure investment can avoid up to 65 percent projected losses in developed countries.[13] The paper also shows an example of adaptation investment in India could avert 50 percent of the loss from a potential drought. In Solomon Islands case, we used 40 percent as the initial return on adaptation investment, considering the low development level of the country.
- *Efficiency of Public Infrastructure Investment.* For the base case, we assume the efficiency is 30 percent, which is relatively lower than other low-income countries. In Figure 2, we increased the number to 80 percent, considering that the PFM reform will increase the efficiency to a level that is consistent with other low-income countries.
- *Share of public debt adj. between commercial external and domestic.* Solomon Islands have low capability to borrow from domestic debt, therefore, we keep the ratio at a low level of 5 percent. *Capital's share in value added.* Referring to Buffie et al. (2012), data on factor shares can be found in social accounting matrices assembled by Global Trade Analysis Project (GTAP) and the International Food Policy Research Institute (IFPRI)[14]. The GTAP5 databases suggest a capital share of 55–60 percent in non-tradable sectors, and 35-40 percent in the tradeable sectors. Therefore, we set 40 percent and 55 percent respectively for tradable and non-tradable sectors.
- *Depreciation rate.* Our choice of the depreciation date is in line with Buffie et al. (2012).

[12] "Cost-Benefit Analysis in World Bank Projects", by Independent Evaluation Group, 2010.

[13] "Climate Adaptation: Seizing the Challenge, Chapter 2: Economics of Climate Adaptation", by David Bresch, World Economic Forum, 2014.

[14] "Public Investment Growth, and Debt Sustainability: Putting Together the Pieces" by Edward E. Buffie, Andrew Berg, Catherine Pattillo, Rafael Portillo, and Luis-Felipe Zanna, IMF Working Paper WP/12/144.

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