



# GEORGIA

## TECHNICAL ASSISTANCE REPORT – UPDATING THE BALANCE SHEET AND QUANTIFYING FISCAL RISKS FROM CLIMATE CHANGE

May 2022

This was prepared by a staff team of the International Monetary Fund. It is based on the information available at the time it was completed in December 2021.

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**International Monetary Fund**  
**Washington, D.C.**

# **Georgia**

## **Updating the Balance Sheet and Quantifying Fiscal Risks from Climate Change**

Jason Harris, Tjeerd Tim, John Zohrab, Viera Karolova, and Jyoti Rahman



**Technical Report**

**March 2022**

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## ABBREVIATIONS AND ACRONYMS

BAU	Business-as-Usual
CCC	Climate Change Council
C-PIMA	Climate-Public Investment Management Assessment
CO <sub>2</sub> eq	Carbon dioxide equivalent
EFF	Extended Fund Facility
EPA	Environmental Protection Agency
FAD	Fiscal Affairs Department
FRMD	Fiscal Risks Management Department
FRS	Fiscal Risk Statement
FST	Fiscal Stress Test
GDP	Gross Domestic Product
GEL	Georgian Lari
GFSM	Government Financial Statistics Manual
GHG	Greenhouse Gas
GSE	Georgian State Electrosystem
IFRS	International Financial Reporting Standards
IMF	International Monetary Fund
INFW	Intertemporal Net Financial Worth
IPCC	International Panel on Climate Change
IPSAS	International Public Sector Accounting Standards
LEPL	Legal Entities of Public Law
LULUCF	Land use, land-use change, and forestry
MEPA	Ministry of Environmental Protection and Agriculture
MESD	Ministry of Economy and Sustainable Development
MoF	Ministry of Finance
MKR	Marabda-Kartsakhi Railway
NAP	National Adaptation Plan
NBG	National Bank of Georgia
NDC	National Determined Contribution
ND FST	Natural disasters fiscal stress test tool
PPA	Power Purchase Agreement
PSBS	Public Sector Balance Sheet
RCP	Representative Concentration Pathway
SOE	State Owned Enterprise
TSA	Treasury Single Account
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar
WB	World Bank
WEO	World Economic Outlook

## PREFACE

At the request of the Ministry of Finance of Georgia, a team from the IMF's Fiscal Affairs Department (FAD) undertook a remote mission during December 1 to December 16, 2021, to update the public sector balance sheet and quantify climate change fiscal risks. The mission team was led by Mr. Jason Harris and included Mr. Tjeerd Tim (both FAD), Mr. John Zohrab (FAD regional advisor), and Mrs. Viera Karolova and Mr. Jyoti Rahman (both FAD short-term experts)

The mission team met from the Ministry of Finance (MoF): Mr. M. Gelashvili (Deputy Minister), Ms. E. Guntsadze (Deputy Minister); Mr. S. Gunia (Head of the Fiscal Risks Management Department FRMD), Mr. V. Chalapeikrishvili (Department of Macroeconomic Analysis and Fiscal Policy Projection), Mr. Skhirtladze (Public Debt and External Financing Department), and Ms. L. Pataraiia, (Treasury).

From public institutions, the mission team met with the Deputy Minister of Regional Development and Infrastructure of Georgia, Ms. M. Giorgobiani, with Ms. S Tsurtsunia (Roads Department of Georgia, Ministry of Regional Development and Infrastructure ), with Deputy Governor Mr. N. Gagua (Bank of Georgia) with Mr. V Tsintsadze (Ministry of Economy and Sustainable Development), Ms. N. Tkhilava and Ms M Tskkhvarazde (Ministry of Environmental Protection and Agriculture), and Mr. A. Aalanishvili (National Environmental Agency).

The mission team also met with Ms. M. Dolidze, Ms. H. Thu Hang, Mr. E. Najdov, Mr. N. Narvind (World Bank), Ms. N. Tevzadse (Caucasus Environmental NGO Network) and representatives from the EU Delegation to Georgia.

The mission undertook a series of working sessions with MoF, MoESD and MoEPA staff where approaches to fiscal and climate change modelling were introduced. The mission team is grateful to Mr Paul Matthews from the UK Office of Budget Responsibility and Mr Mehdi Raissi, the MCD resident representative for Armenia for joining these sessions and presenting on: the UK approach; and '[Long-Term Macroeconomic Effects of Climate Change: A Cross-country Analysis](#)'.

The mission team would like to particularly thank Mr Shota Gunia for his excellent assistance and guidance in undertaking a remote mission, Mr. Selim Cakir, IMF Resident Representative, for his guidance and administrative support, and Mr John Kim for his administrative support. The mission also like to thank Ms. N. Jakhia and Ms. S. Shahnazar for the interpretation support provided.

## EXECUTIVE SUMMARY

**The Georgian Ministry of Finance (MoF) has continued to progress its analysis and reporting of fiscal risks, with its annual Fiscal Risk Statement (FRS) becoming the leading example in the region.** In addition to detailed discussions of risks from SOEs and the balance sheet, amongst other, the December 2020 FRS included for the first time a qualitative discussion on the fiscal risks from climate change. Looking ahead, the government has committed to strengthening that further with the inclusion of quantitative estimates in the 2022 version of the FRS. This report provides the tools and analytical approaches to support that, as well as an update to the public sector balance (PSBS) sheet to identify the impact of the pandemic.

### Public Sector Balance Sheet Update

**Georgia's public sector balance sheet remains in relatively lean and healthy shape, even accounting for the effects of the pandemic.** Assets exceed liabilities, resulting in net worth of 56 percent of GDP, firmly in the mid-range of countries in the IMF database, though few of those have been updated for the impact of the crisis. A major part of the balance sheet are non-financial assets, such as infrastructure, land, and minerals, where valuations remain less reliable, so net financial worth remains the more reliable indicator, sitting at a still respectable minus 46 percent of GDP. There have been continued methodological improvements to the balance sheet, including sectorization of non-market SOEs into the general government, improved financial reporting in the central government, which will shortly incorporate an effort to revalue the non-financial assets of budget organizations and legal entities of public law (LEPLs), and the inclusion of the pension fund into the public sector.

**The pandemic has left its mark, with a roughly 25 percent of GDP expansion of both sides of the balance sheet and a 10 percent of GDP deterioration in net financial worth.** The fiscal deficit expanded to 9 percent of GDP in 2020, due to a combination of policy measures and the operation of automatic stabilizers, whose financing required increased borrowing. However, borrowing exceeded deficit financing needs, as the government and other public sector entities built up precautionary cash reserves, resulting in an expansion of both assets and liabilities. The depreciation of the currency further expanded public debt, though this was partially offset by valuation gains on the National Bank of Georgia's (NBG) foreign reserves. Net worth remained stable, reflecting the ongoing expansion of capital expenditure that predated the pandemic to broadly match the size of the deficit, and some favorable valuation gains on non-financial assets.

**There remain some areas of concern within the balance sheet that deserve continued attention, notably the SOE sector and high degree of foreign exchange exposure.** The impact of the pandemic related depreciation underscores the risks associated with high foreign exchange exposure—with Georgia having one of the highest exposures amongst measured countries. And SOEs continued to underperform in 2020, with losses increasing and equity capital



continuing to erode. While their operating balance in aggregate was around zero, they also experienced currency losses, and continue to rely on on-lending from the government.

## **Fiscal Risks from Climate Change**

**Like all other countries, Georgia is facing major climate changes due to the accumulation of greenhouse gases in the atmosphere leading to rising temperatures.** Average temperatures for Georgia have already risen half a degree, and under the ICPP's projections are likely to further increase between 1.4°C and 4.9°C by 2100, under the Paris Agreement-scenario and the Business-As-Usual (BAU) scenario. This has a wide range of implications, not least increased weather volatility; changes in precipitation patterns leading to increased flooding; more hot days leading to droughts; and glacial retreat impacting on hydro power generation.

**The fiscal impact of climate change is analyzed from three complementary perspectives to understand the full potential impact.** First, the growing impact of higher temperatures on the macroeconomy, which in turn exerts persistent pressure on the public finances. Second, the fiscal cost of more frequent and severe natural disasters, particularly floods, landslides, and droughts which Georgia is already predisposed to. Third, the cost of climate change-related discrete fiscal risks such as those that are already lurking within the balance sheet, including in long-run power contracts, existing infrastructure that will become increasingly at risk, and guarantees and on-lent loans to SOEs that may be affected by changing weather patterns.

**Rising temperatures have increasing implications for both the economy and public finances, that are broadly of the same magnitude as those posed by demographic pressures.** Climate change could reduce GDP per capita by 13 percent by the end of the century, and increase public debt levels by 18 percent of GDP, both relative to baseline. With the impact of more frequent and intense natural disasters are considered, public debt could plausibly reach 111 percent of GDP by 2069 in the absence of policy changes. In a more extreme scenario, higher temperatures and greater volatility would reduce intertemporal net financial worth by 35 percent of GDP. These impacts are large, but manageable over the long run, given continued strong growth under the baseline scenario means that GDP is over four times as large in 2100 as today.

**The MoF has been provided with a methodology to analyze fiscal risks related to climate change, and initial quantitative impacts have been estimated, though these require further refinement.** Recent IMF research provides a link from rising temperatures to GDP growth, and the long-term fiscal projection model previously used to estimate the intertemporal balance sheet has been adapted to estimate climate change pressures. The IMF's natural disaster fiscal stress test tool provides estimates of the impact of floods and droughts. Both can be further refined and tailored to national circumstances, working together with other ministries. The potential effects of climate adaptation that can mitigate these risks can also be incorporated.

**The analysis of discrete risks requires more thorough investigation of contracts, and assessment of future risk exposures of major public infrastructure and SOEs.** This ties in

with the broader PSBS fiscal risk assessment and will require expanding the risk assessment to PPAs and SOEs to consider project risks from force majeure events related to changing rainfall patterns and glacial melting. In tandem with the revaluation effort on non-financial assets, the MoF should create a risk register of public infrastructure against future climate scenarios—much as is done today with the road network. And new infrastructure should be designed with resilience to potential climate scenarios at the front of the decision-making process.

## RECOMMENDATIONS

<b>Public Sector Balance Sheet</b>		
<b>1.1</b>	Institutionalize the updating of the PSBS by including it as an annex to the annual FRS, starting in 2022.	FRMD, 2022
<b>1.2</b>	Implement the SOE reform strategy in order to reduce fiscal risks and improve the returns on equity investments.	MoF, ongoing
<b>1.3</b>	Ensure comprehensive coverage of non-financial assets in the central government consolidated financial statements.	Treasury 2022-23
<b>1.4</b>	Consider the options for revaluing non-financial assets, whether in the consolidated financial statements for central government or for the PSBS separately	Treasury, 2022-23
<b>1.5</b>	Include the Pension Fund’s assets and liabilities to contributors in future disclosures of the PSBS.	FRMD, 2022
<b>Fiscal Risks from Climate Change</b>		
<b>4.1</b>	Use the long-term fiscal projection tool to refine the estimates of baseline and climate scenarios, further refining and tailoring the assumptions and climate shocks to Georgia.	FRMD/MFU 2022
<b>4.2</b>	Work with MESD and MEPA to better tailor the natural disaster shock to Georgian experiences; and match projected disaster scenarios.	FRMD/MFU, 2022
<b>4.3</b>	Examine vulnerabilities of the government budget to climate change risks; including risks related SOES, current and future PPA contracts and other major long-term contracts and contingent liabilities.	FRMD, 2022
<b>4.4</b>	Examine fiscal risks related to climate change transition risks.	FRMD, 2022
<b>4.5</b>	Undertake a C-PIMA, which includes an assessment of if public infrastructure assets registers include climate change-relevant aspects such as an assessment of exposure to climate change risks.	MoF, 2022

# I. PUBLIC SECTOR BALANCE SHEET

**1. Public Sector Balance Sheets provide the most comprehensive picture of public wealth.** By consolidating the entirety of what the public sector owns and owes, PSBSs offer a broader fiscal picture than that provided by fiscal aggregates such as government debt and deficits alone. They bring together all the accumulated assets and liabilities that the government controls. Producing PSBSs provide the basis for improved fiscal management, highlighting opportunities to increase revenues, reduce risks, and improve fiscal policy making.

**2. This report updates, refines and extends Georgia’s PSBS, covering the period 2012 to 2020, crucially showing the full impact of the first stages of the COVID-19 pandemic.** It brings together and consolidates the balance sheets of the central government, local governments, central bank and, most importantly, the non-financial SOEs sector, to give a full picture of the public finances. This year’s update of the PSBS shows the impact of the pandemic, which resulted in a considerable expansion of both assets and liabilities, as well as a slight deterioration in the key aggregates such as net worth and financial worth.

## A. The 2020 Public Sector Balance Sheet

**3. Georgia’s public sector has an estimated net worth of 56.1 percent of GDP in 2020.<sup>1</sup>** Public sector assets are estimated to be worth 160.1 percent of GDP, and liabilities 104 percent of GDP (Table 1.1 and Figure 1.1).<sup>2</sup> The main components of the 2020 Georgia’s PSBS are:

- **Non-Financial Assets** of 102.3 percent of GDP, which include infrastructure, buildings, public holdings of land and mineral resources,<sup>3</sup> as well as the fixed assets and equipment of SOEs, such as railways, powerplants and the water network.
- **Financial Assets** of 57.8 percent of GDP, composed of cash and deposits of 19.6 percent of GDP (including deposits of the General Government of 8.7 percent of GDP of which 2.9 percent of GDP held by the National Bank of Georgia (NBG); the NBG’s deposits of 8 percent of GDP, and deposits of the Pension Fund of 2.5 percent of GDP), debt securities held by the NBG for foreign exchange management (19.6 percent of GDP), loans provided by the NBG to commercial banks under monetary policy instruments (6.5 percent of GDP), and other accounts receivable of the General Government of 6 percent of GDP.

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<sup>1</sup> Net worth, calculated as assets less liabilities, reflects a country’s public wealth, or fiscal solvency. Net financial worth is calculated as financial assets less liabilities and reflects a country’s financial position. Net lending/borrowing is calculated as revenue less expenditure excluding the impact of currency depreciations.

<sup>2</sup> The definition of the general government sector used for the purposes of the following estimates does not reflect the sectorization of SOEs discussed in Section D.

<sup>3</sup> Paragraphs 17-19 below discuss valuation issues in relation to the non-financial assets of budget organizations and legal entities of public law (LEPLs).

- **Liabilities** of 104 percent of GDP, including general government debt securities and loans (62.5 percent of GDP) currency and deposits owed by the NBG (26.1 percent of GDP), estimated pension liabilities of the pay-as-you-go scheme 3.6 percent of GDP, pension liabilities of the cumulative pension scheme 2.5 percent of GDP, and other accounts payables of the General Government 3.7 percent of GDP (mainly payables to employees, accrued interest, and trade credits to suppliers).

**Table 1.1. Georgia: 2020 Public Sector Balance Sheet**  
(percent of GDP)

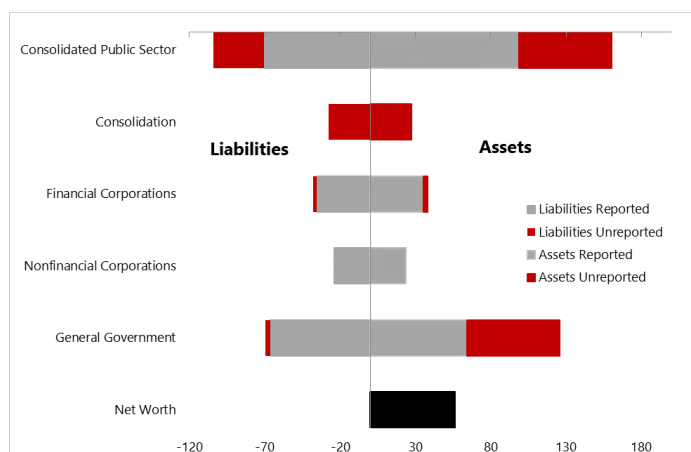
	Central Govt	General Govt	Non-Fin Public Corps	Financial Public Corps	Consolidated Public Sector	Consolidation
<b>Total assets</b>	<b>77.2</b>	<b>125.7</b>	<b>23.9</b>	<b>37.9</b>	<b>160.1</b>	<b>-27.5</b>
<b>Nonfinancial assets</b>	<b>37.0</b>	<b>85.0</b>	<b>17.1</b>	<b>0.2</b>	<b>102.3</b>	<b>0.0</b>
Fixed assets	28.2	52.6	17.1	0.2	70.0	0.0
Land and minerals	6.3	29.8	0.0	0.0	29.8	0.0
Other nonfinancial assets	2.6	2.6	0.0	0.0	2.6	0.0
<b>Financial assets</b>	<b>40.2</b>	<b>40.7</b>	<b>6.7</b>	<b>37.7</b>	<b>57.8</b>	<b>-27.5</b>
Monetary gold and SDRs	0.0	0.0	0.0	1.4	1.4	0.0
Currency and deposits	8.3	8.7	3.7	10.2	19.6	-2.9
Debt securities	2.1	2.1	0.0	19.6	18.9	-2.8
Loans	7.5	7.5	0.5	6.5	9.1	-5.4
Equity and investment fund shares	16.4	16.4	0.0	0.0	0.0	-16.4
Other financial assets	6.0	6.0	2.7	0.1	8.7	0.0
<b>Liabilities</b>	<b>69.1</b>	<b>69.8</b>	<b>23.9</b>	<b>37.9</b>	<b>104.0</b>	<b>-27.5</b>
Currency and deposits, SDRs	0.0	0.0	0.0	26.1	23.2	-2.9
Debt securities and loans	61.8	62.5	13.1	2.6	70.0	-8.2
Equity and investment fund shares	0.0	0.0	9.8	6.6	0.0	-16.4
Insurance, pension, and standardized guarantee schemes	3.6	3.6	0.0	2.5	6.1	0.0
Other accounts payable	3.7	3.7	1.0	0.1	4.8	0.0
<b>Net Financial Worth</b>	<b>-28.8</b>	<b>-29.1</b>	<b>-17.1</b>	<b>-0.2</b>	<b>-46.2</b>	<b>0.0</b>
<b>Net Worth</b>	<b>8.1</b>	<b>55.9</b>	<b>0.0</b>	<b>0.0</b>	<b>56.1</b>	<b>0.0</b>
<b>Revenue</b>	<b>25.6</b>	<b>27.2</b>	<b>7.4</b>	<b>0.9</b>	<b>33.2</b>	<b>-2.3</b>
<b>Expenditure</b>	<b>34.0</b>	<b>36.2</b>	<b>8.3</b>	<b>0.2</b>	<b>42.4</b>	<b>-2.3</b>
Expense	29.2	29.1	7.4	0.2	34.6	-2.3
Net investment in nonfinancial assets	4.7	7.0	0.9	0.0	7.9	0.0
<b>Net lending/borrowing</b>	<b>-8.3</b>	<b>-9.0</b>	<b>-0.9</b>	<b>0.7</b>	<b>-9.2</b>	<b>0.0</b>

Source: Government Finance Statistics, Financial Statements (central government, National Bank of Georgia, Pension Fund), MoF's data on SOEs, and IMF Staff Estimates. The consolidation column refers to intra-flows/stocks between the general government, non-financial, and financial corporations.

Note: General government: budgetary organizations and LEPLs; non-financial public corporations: SOEs controlled by the central and local government; Financial corporations: National Bank of Georgia and the Cumulative Pension Fund. Marabda-Kartsakhi Railway is not included as it is currently classified as a foreign-controlled entity and is therefore not part of Georgia's public sector, according to the GFSM 2014.

4. **The balance sheet also accounts for the 27.5 percent of GDP worth of cross holdings of assets and liabilities across different public sector entities.** These include the government lending to SOEs (5.4 percent of GDP), government deposits at the NBG (2.9 percent of GDP), holdings of the government securities by the NBG (2.8 percent of GDP), and the equity capital of SOEs owned by the government (16.4 percent of GDP). The consolidation of cross-holdings has no impact on net worth as cross-held assets and liabilities are both eliminated).

**Figure 1.1. 2020 Public Sector Assets and Liabilities**



Source: IMF staff estimates

## B. Impact of the Pandemic

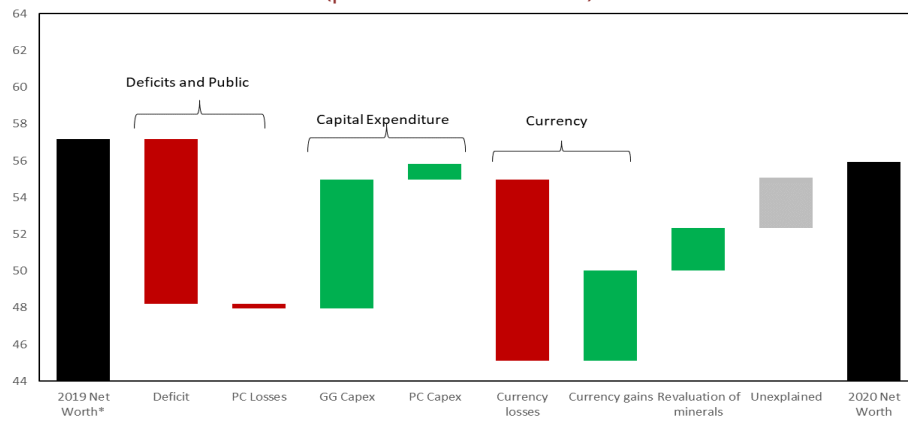
5. **The pandemic had a considerable impact on Georgia’s PSBS, with significant expansion in both assets and liabilities, as well as a sharp deterioration in net financial worth over 2020.** Assets and liabilities expanded by around 25 percent of GDP, primarily due to crisis related actions taken by the government, including:

- **Allowing the automatic stabilizers** to operate, resulting in a 2 percent of GDP decline in revenues relative to previously projected revenues;
- **Policy actions** taken on both the expenditure (3.1 percent of GDP) and revenue side (0.7 percent of GDP) to counter the effect of the pandemic and support the needs of the population. Together, these two elements increased the general government fiscal deficit to 9 percent of GDP, which was financed through increased borrowing.
- **Precautionary increase in liquidity**, where borrowing exceeded deficit financing needs to build up cash deposits both by the central government and, to a lesser extent, by public corporations.
- **Continued infrastructure investment**, with fixed assets increasing by 6 percent of GDP off the back of elevated general government investment over recent years, in an investment surge that predated the pandemic and 0.9 percent of GDP investment by public corporations.

- Large foreign exchange valuation changes**, driven by the 14 percent depreciation of the Lari against the US dollar and 25 percent depreciation against the Euro, resulting in a 9.9 percent of GDP increase in foreign debt, both from the central government and public corporations, partially offset by a 4.9 percent of GDP increase in central bank foreign exchange asset holdings. Over the course of 2021, the Lari has subsequently appreciated, likely reversing much of these valuation changes.

**6. While net financial worth declined by around 14 percent of GDP, net worth was relatively stable, falling by only 1.4 percent of GDP.** This largely reflects the elevated capital expenditure, meaning that the operating balance (revenue less current expense) was 1.4 percent of GDP. The relative stability of net worth provides an example of the benefits of taking a broader view of the public finances using the balance sheet approach, as it contrasts to the nearly 20 percent of GDP increase in debt and general government deficit of 9 percent of GDP. While the level of net worth is clouded by uncertainty over the valuation of non-financial assets, the change over time is more reliable, given that it is largely driven by the operation balance.

**Figure 1.2. Decomposition of Changes in the 2020 Public Sector Net Worth**  
 (percent of 2020 GDP)



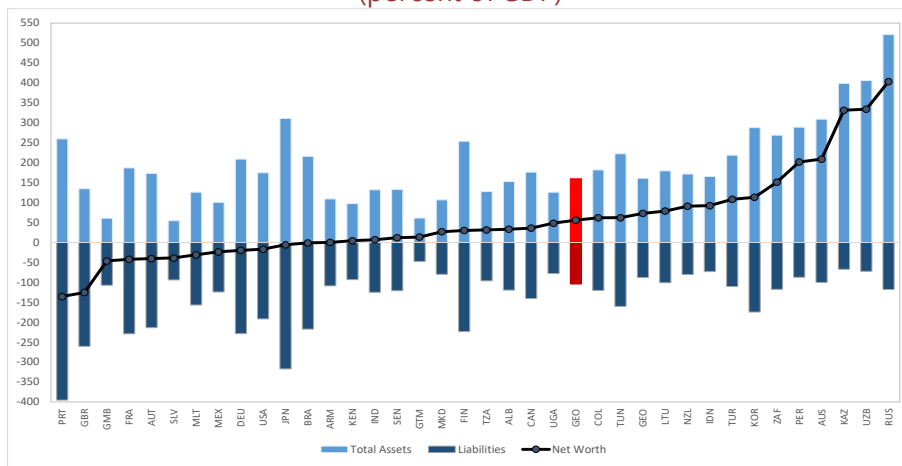
Source: IMF staff estimates.

**7. Other favorable valuation and methodological changes had a cumulative effect of improving net worth by over 5 percent of GDP.** Some of these can be explained—for instance by the sub soil assets—minerals—that have increased in value by 2.3 percent of GDP due to rising commodity prices, as well as exchange rate effects. Some changes relate to the depreciation and some write-offs and other volume changes as reported in the new, IPSAS based financial statements covering the central government (3 percent of GDP). The unexplained changes of 2.7 percent of GDP likely relate to public corporations for which no required detailed information exist.

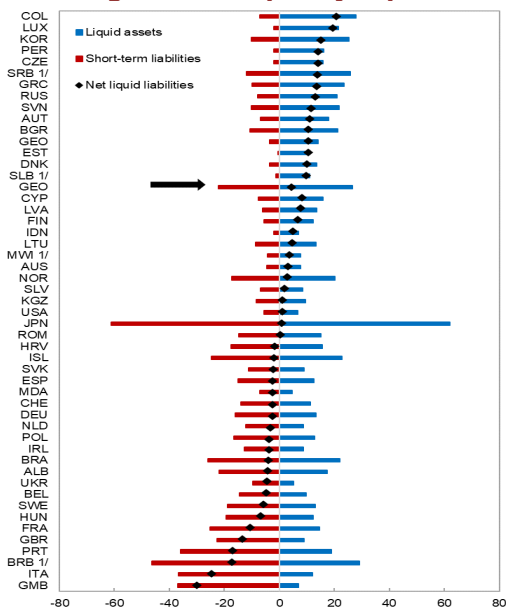
### C. State of Georgia's Public Sector Balance Sheet

8. **Georgia's PSBS remains solid compared to other countries.** With net worth of 56 percent of GDP Georgia is in the middle of countries (Figure 1.3), though estimates for other countries are yet to include the impact of the pandemic. Public sector assets and liabilities are relatively lean as Georgia doesn't have public banks and because the assets and liabilities of the newly established pension fund scheme are still relatively small (2.5 percent of GDP). Georgia's general government liquidity exposure (comparing liquid assets to short-term liabilities) appears relatively comfortable (Figure 1.4).

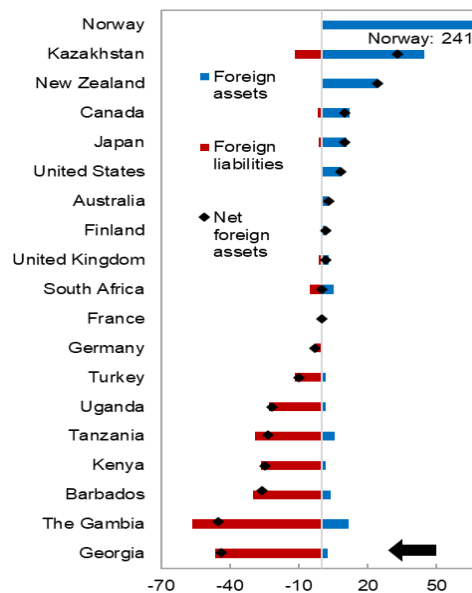
**Figure 1.3. Public Sector Balance Sheet International Comparisons**  
(percent of GDP)



**Figure 1.4. Liquidity Exposure**



**Figure 1.5. Foreign Exchange Exposure**



Source: IMF Public Sector Balance Sheet Database, IMF staff estimates

## 9. However, there are some areas of concern:

- The PSBS shows the effect of high exchange rate exposure. The increase in public debt in 2020 due to exchange rate depreciation was equivalent to 9.9 percent of GDP, of which the increase in the general government debt arising from exchange rate differences was equal to 7 percent of GDP, the debt of NBG (1.6 percent of GDP), and the debt of SOEs, excluding the Marabda-Kartsakhi Railway (MKR)<sup>4</sup> (1.2 percent of GDP);
- The PSBS might not be sufficiently resilient if there were another pandemic in the near future. General government debt has increased from 40.4 to 60 percent of GDP largely as a result of the current pandemic. The recently published 2021 Fiscal Risks Statement (FRS) suggests that debt could increase a further 20 percent in another pandemic in a medium lockdown scenario;
- The PSBS shows the effect of the continuing deterioration in the financial position of SOEs. Their aggregate loss in 2020 was equivalent to 0.9 percent of GDP according to the FRS (based on the income statement<sup>5</sup>). This was well short of an adequate return on equity to compensate for the risk that is the key benchmark of economically efficient investment. Moreover, major SOEs remain under-capitalized<sup>6</sup> and may continue to incur losses, potentially requiring restructuring by debt write-offs or equity injections, both of which will crystallize further in the PSBS the SOEs' poor financial performance;
- The PSBS shows limited effects of the impairment of non-financial assets in 2020. The most notable impairment in recent years (2017 and 2018) was in two large SOEs to bring balance sheet values into line with economic reality. Further impairments can be expected in future for the same reason, as one of the consequences of SOEs' poor financial performance. This also relates to a more general concern that a significant amount of past investment of SOEs might result in losses or low returns, which might require that significant future impairment is likely. Moreover, climate change can be expected to cause substantial impairment of public non-financial assets. Thus, from these perspectives, the valuations of non-financial assets in the PSBS could be optimistic. However, future impairment could be offset by upward revaluations of non-financial assets and equities as a result of the application of accounting policies to permit revaluations.

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<sup>4</sup> According to GFSM 2014, MKR is currently classified as a foreign-controlled entity and is therefore not part of Georgia's public sector, even though it is legally an SOE.

<sup>5</sup> The balance based on the International Financial Reporting Standards (IFRSs) based income statement includes the impact of foreign exchange losses (-1.2 percent of GDP), while the GFS based balance, as reported in Table 1.1., excludes the revaluation gains/losses (such as foreign exchange losses) from revenue and expense. Accordingly, the balance derived from GFS is equal to zero.

<sup>6</sup> The 2019 PSBS mission reported that the average leverage of six large SOEs was 88 percent in 2018, compared with a benchmark of 40 percent. The 2021 FRS reported that, in 2020, 6 major SOEs had leverage ratios classified as very high risk.

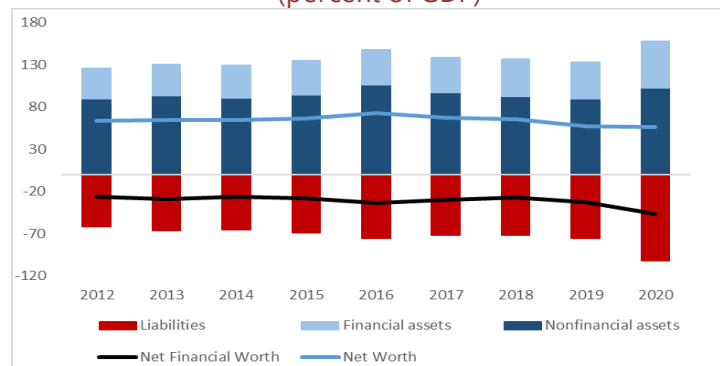


## D. Evolution of the Balance Sheet

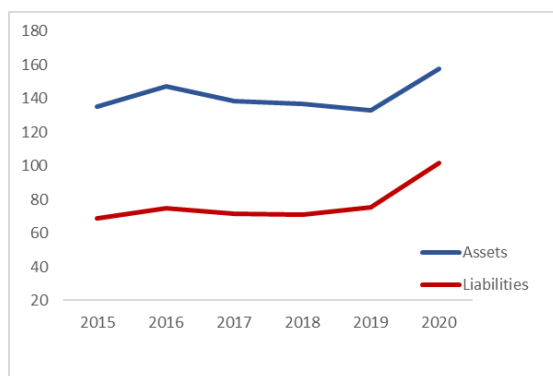
**10. Over the past nine years, the balance sheet has expanded by around a third, although net worth slightly decreased (Figure 1.6).**

- Between 2012 and 2020, assets of the public sector increased from 125.2 percent of GDP to 160.1 percent of GDP (Figure 1.7), largely driven by increases in financial assets (by 22.7 percent of GDP), in particular currency and deposits and debt securities held by the NBG (by 4.7 and 6.9 percent of GDP respectively), and central government's other accounts receivable, such as prepayments for non-financial assets and other goods and services (by 4.3 percent of GDP). The slight decrease in assets in 2019 was caused by the methodological changes implemented in the IPSAS based central government financial statements and by the denominator effect, reflecting strong GDP growth.
- Public sector liabilities increased by 42.9 percent of GDP over the nine years and reached 104 percent of GDP in 2020 (Figure 1.8). This was mainly driven by the increase in government debt (by 23.9 percent of GDP), and deposits and debt securities owed by the NBG (by 9.8 and 5.6 percent of GDP respectively).

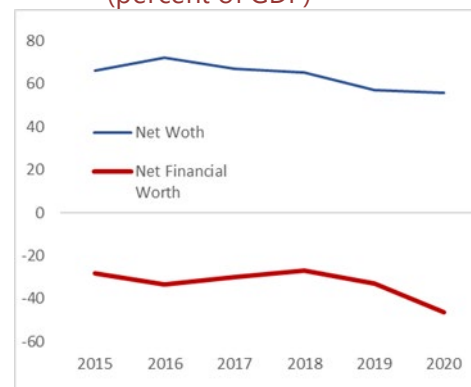
**Figure 1.6. Public Sector Balance Sheet 2012–20**  
(percent of GDP)



**Figure 1.7. Public Sector Assets and Liabilities**  
(percent of GDP)



**Figure 1.8 Public Sector Net Worth**  
(percent of GDP)



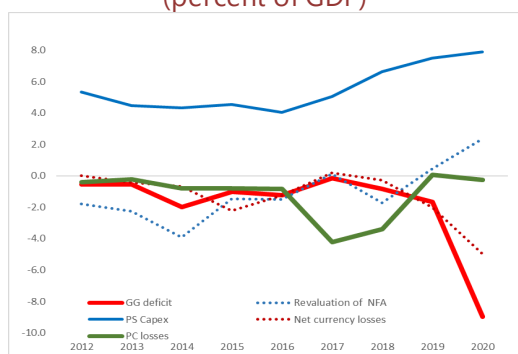
Source: IMF staff estimates

- Net worth of the public sector decreased from 64.1 percent of GDP in 2012 to 56.1 percent of GDP in 2020. (Figure 1.9). The latter was caused by the significant increase of general government debt liabilities (34 percent of GDP) comparing to the smaller increase in the government assets (22.7 percent of GDP) during the period 2012–20. Net financial worth decreased by 8 percent of GDP which mainly resulted from the large increase in the general government debt and to lesser extent by the increase of SOEs' debt.

**11. The evolution of the public sector net worth over the period 2012–20 was impacted by the following factors (Figure 1.9):**

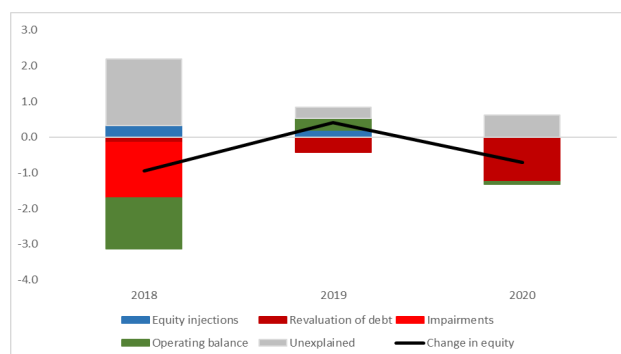
- **Deficits and public corporation losses:** The government ran cumulative fiscal deficits over the nine years of GEL 7.4 billion that were financed through borrowing, thereby increasing government debt. Public corporations ran cumulative deficits of GEL 2.8 billion, in particular in 2017 and 2018, that were also primarily financed through borrowing: either via directly contracted loans, or on lent loans funded through government borrowing; or via equity injections provided by the government (GEL 1.3 billion).
- **Capital Expenditure:** A portion of fiscal deficits was used to finance ongoing government investments in infrastructure and other non-financial assets (cumulative amount of GEL 16.8 billion). Public corporations invested an additional GEL 2.9 billion in non-financial assets. This contributed to the increase of the stock of public non-financial assets, which at the end of 2020 was worth around 102.3 percent of GDP.

**Figure 1.9. Evolution of the Main Factors Impacting Public Sector Net Worth (percent of GDP)**



Source: MoF and IMF staff estimates

**Figure 1.10. Components of Changes in Equity of SOEs (percent of GDP)**



- **Revaluation of non-financial assets:** The outstanding amount of capital stock was also impacted by other factors, such as depreciation, revaluation, and impairments of non-financial assets. The positive impact of the revaluation refers to the increase in the market price of mineral resources by around GEL 5.2 billion during the nine years. On the other hand, the stock of non-financial assets was gradually deteriorating during 2012–20 due to the depreciation of fixed assets and some write-downs and impairments of the assets of public

corporations. The noticeable impairments in 2017 and 2018 refer mainly to write-downs of assets by GSE, Georgia Railway, and Energotrans.

- **Currency gains and losses:** Over the nine years, the currency has depreciated by 97 percent, falling from 1.66 GEL per dollar in 2012, to 3.28 in 2020; the most noticeable depreciations were in 2015 and 2020. These led to the increase of the public sector debt (since around 80 percent of government debt is in foreign currency) and thus decrease of the net worth. Conversely, the revaluation of the NBG foreign exchange reserves led to the increase in the public sector assets and net worth. These holding gains of the NBG offset around half of the impact of the revaluation losses.

## E. Non-Financial Public Corporations

### 12. The losses of SOEs increased and their equity capital has continued to fall in 2020.

The operating balances of SOEs, on a GFSM 2014 basis<sup>7</sup> were close to zero in recent years. The foreign exchange losses increased the level of debt of SOEs and consequently decreased the equity of SOEs (Figure 1.10). Except for the transfer of fixed assets into charter capital of some SOEs, no equity injections occurred since 2018. These injections increased the equity capital by 0.2 percent of GDP in 2019. The unexplained residuals could be explained by an unrecorded increase of SOE equity if central and local governments to SOEs through a transfer of non-financial assets.

**Table 1.2. Georgia: Outstanding On-Lending to Public Corporations (GEL m)**

	Outstanding on-lent value	Operating balance	Total revenue	Ratio of outstanding loan to revenue	
United Water Supply Company	603	-11	72	8.4	
Georgian State Electrosystem (GSE)	508	183	380	1.3	
Engurhesi	264	-29	27	9.7	
Energotrans	223	8	33	6.9	

Source: MoF

**13. State budget on-lending to SOEs remains substantial.** The value of the portfolio as at end-2020 was equivalent to 5.4 percent up GDP, marginally less than the corresponding 5.7 percent of GDP in 2018. It remains almost exclusively denominated in foreign currency, at 98.7 percent even higher than the 97 percent in 2018. The on-lending portfolio raises three issues:

- Where on-loans are a major share of an SOE's borrowings, which is especially the case with GSE, Energotrans, Engurhesi and United Water Supply Company, they prevent the SOEs from

<sup>7</sup> Net operating balance based on the GFSM 2014 methodology, is calculated as total revenues less operating expenses (which includes depreciation and excludes impairments and currency depreciation effects).

being subject to financial discipline, weakening the SOE's incentive to invest efficiently and achieve satisfactory returns, and potentially delaying needed operational and governance reforms and restructuring;

- The cost to SOEs of the on-loans reflects the government's cost of borrowing, with no added margin to align them with debt market pricing. This implicit subsidy potentially weakens further the SOEs' financial and economic incentives to increase financial performance.
- On-loans are a major source of foreign exchange exposure for SOEs, even though three major SOEs have borrowings in foreign currencies from private sources, and a significant portion of revenues and expenses of some SOEs are denominated in foreign currencies.

## F. Methodological Considerations

### **14. The pension fund will accumulate substantial assets which, according to GFSM 2014, are included in the PSBS together with the corresponding liabilities to contributors.**

Established in January 2019, it has already accumulated assets equivalent to 2.5 percent of GDP as at end-2020, which are projected to rise to over 60 percent of GDP by 2050, with liabilities of equal value.<sup>8</sup> The legislation governing the pension fund, and the LEPL pension agency administering it, provides strong protections, both for contributors (against political influence leading to inappropriate investment decisions) and for the Government (against being asked to bail out contributors in the event of inadequate returns). Nevertheless, as reflected in the GFSM 2014 treatment, these risks exist because the pension fund is substantially controlled by the Government.

### Sectorization

**15. The Ministry of Finance performed the sectorization of SOEs in 2019 and identified units operating on a non-market basis.** The sectorization exercise conducted in 2019 examined 241 SOEs and identified 196 entities operating on a non-market basis. The MoF subsequently conducted follow-up work and identified an additional 116 non-market enterprises controlled by local governments for which data were not available during the mission. Thus, out of 357 SOEs in Georgia, 312 enterprises appeared to be non-market producers to be classified in the general government sector. This exercise made Georgia the first country in Central Asia and Eastern Europe to successfully carry out such a comprehensive sectorization of SOEs.

**16. The 2021 Fiscal Risks Statement presented the impact of non-market SOEs on the general government deficit and debt.** The estimates were based on a detailed analysis of the performance of non-market SOEs for 2019 that were conducted in Spring 2021 with the technical

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<sup>8</sup> The pension fund scheme is a defined contribution scheme that is largely mandatory for employed persons in Georgia. The state provides an income-related supplement to the employer and employee contributions. The viability of the scheme will depend, in particular, on the extent to which the returns on the investment of the contributions will generate sufficient retirement income.

assistance of the IMF. The estimated impact of the reclassified SOEs on the 2019 general government deficit and consolidated debt was -0.6 and +1.1 percent of GDP respectively. The compilations were constructed using the full set of financial reporting of SOEs, including the comprehensive balance sheet, income statement, cash flow statement, and notes to the annual reports of individual companies. Contrary to the latter exercise (covering data for 2019), the estimates for 2020 are based on aggregated balance sheet and income statement for 2020. The lack of detailed information may therefore cause some imprecision in the results. Table 1.3 presents the following estimates for 2020, revenue of non-market SOEs accounted for 2 percent of GDP (of which government's subsidies 0.5 percent of GDP) and expenditure accounted for 3.6 percent of GDP, that resulted in the deficit (net borrowing) of -1.5 percent of GDP for 2020. The value of stocks of non-financial and financial assets represented 4.2 and 4.6 percent of GDP respectively (8.8 percent of GDP for total assets); and the value of debt liabilities 3.1 percent of GDP (2.3 percent of GDP on a consolidated basis). As illustrated in Table 1.3, the inclusion of non-market SOEs in the general government sector doesn't change the public sector indicators; it just sets right the picture of the performance of the non-market sector (general government) and the profit-oriented sector (public corporations). Box 1 summarizes the significance of sectorization.

**Table 1.3. Georgia: Impact of Non-Market SOEs on the 2020 Public Sector Balance Sheet** (percent of GDP)

	Pre-sectorization				Post-sectorization				
	General govt	SOEs, NBG, and Pension Fund	Consol	Public sector	General government		Public Corp	Consol	Public sector
					Total consolidated	of which non-market SOEs			
<b>Total assets</b>	<b>125.7</b>	<b>61.8</b>	<b>-27.5</b>	<b>160.0</b>	<b>128.8</b>	<b>8.8</b>	<b>53.0</b>	<b>-21.8</b>	<b>160.0</b>
Non-financial assets	85.0	17.3		102.3	89.2	4.2	13.1		102.3
Financial assets	40.7	44.5	-27.5	57.7	39.6	4.6	39.9	-21.8	57.7
<b>Liabilities</b>	<b>69.8</b>	<b>61.8</b>	<b>-27.5</b>	<b>104.0</b>	<b>72.9</b>	<b>8.8</b>	<b>53.0</b>	<b>-21.8</b>	<b>104.0</b>
o/w debt	69.8	45.4		115.2	72.9	3.1	42.3		115.2
<b>Net Worth</b>	<b>55.9</b>	<b>0.0</b>	<b>0.0</b>	<b>56.0</b>	<b>55.9</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>56.0</b>
<b>Net Financial Worth</b>	<b>-29.1</b>	<b>-17.3</b>	<b>0.0</b>	<b>-46.4</b>	<b>-33.3</b>	<b>-4.2</b>	<b>-13.1</b>	<b>0.0</b>	<b>-46.4</b>
<b>Revenue</b>	<b>27.2</b>	<b>8.3</b>	<b>-2.3</b>	<b>33.2</b>	<b>28.7</b>	<b>2.0</b>	<b>6.2</b>	<b>-1.8</b>	<b>33.2</b>
<b>Expenditure</b>	<b>36.2</b>	<b>8.5</b>	<b>-2.3</b>	<b>42.4</b>	<b>39.3</b>	<b>3.6</b>	<b>4.9</b>	<b>-1.8</b>	<b>42.4</b>
<b>Net lending/borrowing</b>	<b>-9.0</b>	<b>-0.3</b>	<b>0.0</b>	<b>-9.2</b>	<b>-10.5</b>	<b>-1.5</b>	<b>1.3</b>	<b>0.0</b>	<b>-9.2</b>

Source: IMF staff estimates

Note: The post-sectorization sector of public corporations comprises market SOEs, NBG, and the cumulative Pension Fund.

### Box 1. Significance of Sectorization

The authorities included information in the 2020 and 2021 FRS on the sectorization of SOEs between public corporations and general government units. The disclosures followed the advice of the 2019 PSBS mission. These should be continued, improved, and institutionalized, in order to underpin:

- Accurate estimates of the size of the general government sector for the purpose of efficient fiscal policy, in particular in terms of the limits defined by Georgia's fiscal rules;
- The reform of public corporations in line with the authorities' SOE reform strategy. The first stage of the reform is focused on public corporations i.e., SOEs that operate commercially at arm's length from public policy decision-making, and it is essential for the integrity and success of the reform that there is a sound ongoing basis for identifying public corporations; and
- The reform of non-market SOEs in due course, probably after the first stage of the SOE reform is well under way. It will be essential for the design and implementation of this reform that there is a sound basis for identifying SOEs that are general government units.

Source: IMF staff

## Financial Reporting

**17. Significant improvements have been introduced in the financial reporting for the Central Government, increasing the reported size of the balance sheet by 2.7 percent of GDP.** The new IPSAS based consolidated financial statements compiled by the Treasury for 2019 and 2020 incorporated numerous important improvements with respect to the comprehensiveness of the coverage of flows and stocks of the central government and the level of detailed information. For example, concessions and financial leasing increased assets and liabilities by 0.8 percent of GDP; deposits of the autonomous republics, local governments, and LEPLs deposited in the Treasury Single Account (TSA) increased the assets and liabilities of the central government by 1.9 percent of GDP, that is consolidated at the general government level). The non-financial assets reported in Table 1.1 were those of budget organizations and LEPLs, with the exception of minerals which were FAD estimates.

**18. However, the coverage of assets in the budget organization and LEPL financial statements is still not complete.** Examples include administered non-financial assets and loans held by the Ministry of Interior and the Ministry of Infrastructure, and the assets to be sold by the State Property Agency. The Treasury plans to require budget organizations and LEPLs to include these missing assets in their separate financial statements starting in 2022, and for this purpose intends to clarify its accounting instruction. In addition, there are unreported mineral and energy resources and municipal non-financial assets. Comprehensive information on the non-financial assets will become increasingly important in coming years, as it is needed to improve the assessment of the (potential) effects of, and measures to adapt to, climate change.

**19. The value of budget organization and LEPL non-financial assets, as well as some of their equity assets, is underestimated.** Such non-financial assets acquired before the Treasury was established in 1995 are not recognized at all, and those assets acquired after the Treasury's

establishment are recognized at historic cost.<sup>9</sup> Based on the Georgian legislation, revaluations of assets held by the budget institutions and LEPLs should be performed by independent experts, which will be prohibitively expensive for the foreseeable future. This issue needs further examination; even if a centralized approach could be found to perform the revaluations on a cost-effective basis, regular revaluations for the purposes of the statements would need to be conducted on a basis appropriate for an IPSAS-based financial reporting framework. Pending regular revaluations on this basis, using indexes derived from sample data to estimate the revaluations (for the purpose of the PSBS updates only). Revaluation policies will be considered in the forthcoming FAD follow-up capacity development mission for the Treasury.<sup>10</sup> Box 2 elaborates on this issue.

### **Box 2. Revaluation of Budget Organization and LEPL Non-Financial Assets**

IPSASs give two options for accounting policy for every class of non-financial asset – the cost model and the revaluation model. If an organization chooses the revaluation model, then the regular revaluations are required. If the organization chooses the cost model—then the assets are not revalued during the whole of their useful lives.

The Treasury chose the cost model to be the accounting policy for all budget organizations and LEPLs. However, some organizations want to do regular revaluations because they have capacity and resources. First, this is not a good justification for choosing an accounting policy. Secondly, if the Treasury wishes to allow regular revaluations on a partial basis, it should make a change in the accounting regulation and specify the classes of assets to which it will apply and define the accounting policy for those classes of assets specifically to be the revaluation model.

The IMF Working Paper 20/130 by M. Alves, S. De Clerck and J. Gamboa-Arbelaez, *Public Sector Balance Sheet Database. Overview and Guide for Compilers and Users*, discusses non-financial asset revaluation issues from a *GFSM* perspective.

Source: IMF staff

## **Recommendations**

- 1.1** Institutionalize the updating of the PSBS by including it as an annex to the annual FRS, starting in 2022.
- 1.2** Implement the SOE reform strategy in order inter alia to reduce fiscal risks and improve the returns on equity investments.

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<sup>9</sup> Historic costs refer to the acquisition price less depreciation, and less impairments since the adoption of the new IPSAS-based.

<sup>10</sup> Because the majority of SOEs in terms of the value of non-financial assets apply IFRSs or IFRS for Small and Medium-sized Businesses, and their financial statements have been audited for a longer period, the coverage of non-financial assets in their financial statements is understood to be more comprehensive and revaluations more pervasive than is the case for the financial statements of budget organizations and LEPLs.

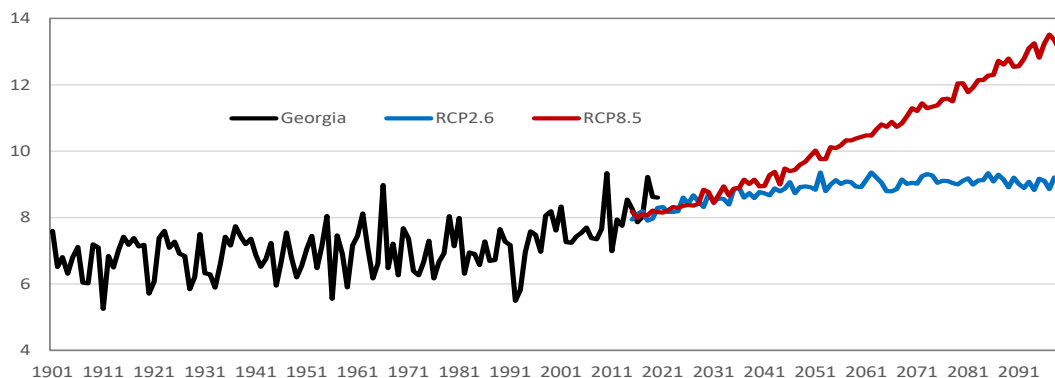
- 1.3 Ensure comprehensive coverage of non-financial assets in the central government consolidated financial statements.
- 1.4 Consider the options for revaluing non-financial assets, whether in the consolidated financial statements for central government or for the PSBS separately.
- 1.5 Include the Pension Fund’s assets and liabilities to contributors in future disclosures of the PSBS.

## II. CLIMATE CHANGE AND GEORGIA

### A. Climate Change Risks in Georgia

20. **The average temperature in Georgia has increased since the 1960s and is projected to rise by more than the global average by the end of the 21st century.** Georgia’s average temperature is already 0.47°C above the long-term average.<sup>11</sup> By the 2090s, Georgia’s average temperature is projected to further increase by between 1.4°C and 4.9°C, compared to the 1986–2005 baseline for emissions pathways (also called representative concentrations pathways, RCP<sup>12</sup>) for a strong climate change mitigation scenario (RCP2.6) and to the business-as-usual (BAU) scenario (RCP8.5), respectively (Figure 2.1). This increase places Georgia in the third quintile of countries with respect to temperature increases. Figure 2.2 shows the projected decrease of frost days and increase of summer days for the RCP-scenarios, compared to the historical average for 1995-2014.

**Figure 2.1. Annual Average Temperature Projections for Georgia**



<sup>11</sup> As published in the 2021 Fourth National Communication of Georgia, the average annual surface air temperature increased throughout the country by 0.25 – 0.58 °C by regions, with an average increase of 0.47 °C.

<sup>12</sup> An RCP is a GHG concentration trajectory that is published by the Intergovernmental Panel on Climate Change (IPCC) and used by climate change research and policy institutions. Different RCPs describe different climate futures, all considered possible depending on the volume of GHG emitted in the years to come. The most commonly used RCPs are RCP2.6, RCP4.5, RCP6, and RCP8.5 – and are labeled after a possible range of radiative forcing values in the year 2100 (2.6, 4.5, 6, and 8.5 W/m<sup>2</sup>). Positive radiative forcing means that the earth receives more incoming energy from sunlight than it radiates to space, resulting in global warming.



**Figure 2.2. Projections for Frost and Summer Days**

	Projected % change of frost days (<0°C)					Projected %change of summer days (>25°C)			
	2030	2050	2070	2100		2030	2050	2070	2100
<b>RCP2.6</b>	-8%	-11%	-12%	-13%	<b>RCP2.6</b>	27%	39%	36%	39%
<b>RCP4.5</b>	-7%	-13%	-16%	-20%	<b>RCP4.5</b>	26%	42%	54%	60%
<b>RCP7.0</b>	-6%	-15%	-21%	-31%	<b>RCP7.0</b>	23%	48%	70%	102%
<b>RCP8.5</b>	-10%	-17%	-28%	-44%	<b>RCP8.5</b>	29%	58%	87%	129%

Source: World Bank Climate Projections, 2021.

**21. Droughts, flooding, and landslides are anticipated to be the most pressing adverse impacts of climate change for Georgia.** In the ‘Fourth National Communication of Georgia under the UNFCCC,’ the government reported that due to its geographical location, complex dissected relief, land cover diversity, and the variety of climate zones, the conditions are set for a wide variety of negative impacts of climate change in Georgia.

**22. Climate change risks will impact the entire economy of Georgia, with key vulnerabilities in the energy sector.** The World Bank (WB, see Box 3) reported that reduced river flow during the summer could reduce power generation during the months of peak energy demand, for example for air conditioning in residential areas. This can be problematic given the dependency on domestically generated hydropower (78 percent of domestically generated electricity in 2015), which will require more energy to be imported, negatively affecting Georgia’s GDP and balance of payments. Additionally, the risk of landslides might have compounding effects as landslides are likely to occur in the vicinity of energy infrastructure.

**Box 3. The Effects of Climate Change in Georgia**

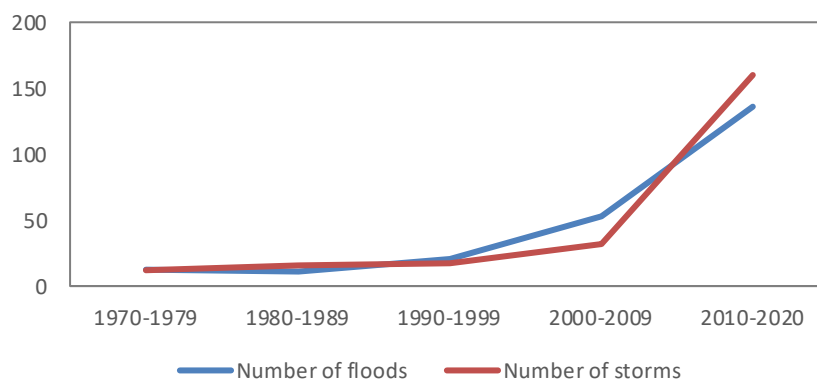
The World Bank’s Climate Risk Country Profile for Georgia identifies key risks for Georgia that may harm its society and economy.

- The frequency of heatwaves is projected to increase significantly by the 2090s under higher emissions pathways, presenting major risks to human health, livelihoods, and biodiversity.
- A rapid retreat of glaciers is expected. This is likely to shift the regional hydrological regime, increasing the risk of flooding and ultimately driving transitions in local ecosystems.
- The effects of rising temperatures on agricultural output could threaten an important source of income and employment in poorer rural areas. This may consequently increase inequality and raise the risk of malnourishment.
- Projected long-term reductions in the flow rates of rivers in Georgia, rising average temperatures, and existing problems in energy distribution networks are expected to increase the risk of water shortages each spring and summer.
- Reduced rivers flow each summer, coinciding with peak energy demand for residential cooling, has important implications for Georgia’s energy supply, which depends primarily on domestic hydropower sources.

Source: World Bank Group; Asian Development Bank. 2021. “Climate Risk Country Profile: Georgia”.

**23. Georgia already suffers significant economic losses due to natural disasters.** The most common disasters are flooding, landslides, and mudflows. In 2015, a widespread flooding in Tbilisi affected the lives of thousands of people and damaged public infrastructure, residential properties, and communication systems. The economic impact was high: the flood caused USD 24.3 million physical damage, USD 4.37 million in financial losses and USD 118 million for recovery (WB, 2017). Table 2.1 summarizes disaster losses for 1991–2020 as recorded in the EM-DAT database,<sup>13</sup> however this data most likely provides an underestimation of the actual costs as historical data is scarce. Figure 2.3 shows the increasing occurrence of floods and storms<sup>14</sup> as recorded by the National Environmental Agency (NEA) in Georgia.

**Figure 2.3. Frequency of Natural Disasters in Georgia**



Source: Department of Geology, NEA.

**Table 2.1. Economic Damages from Natural Disasters in Georgia**

Disaster	Time period	Total affected	Total damage (USD, million)
Flood	1995-2021	166,222	82,753
Drought	2000	696,000	300,594
Storm	2001-2013	8,668	102,580

Source: EM-DAT database.

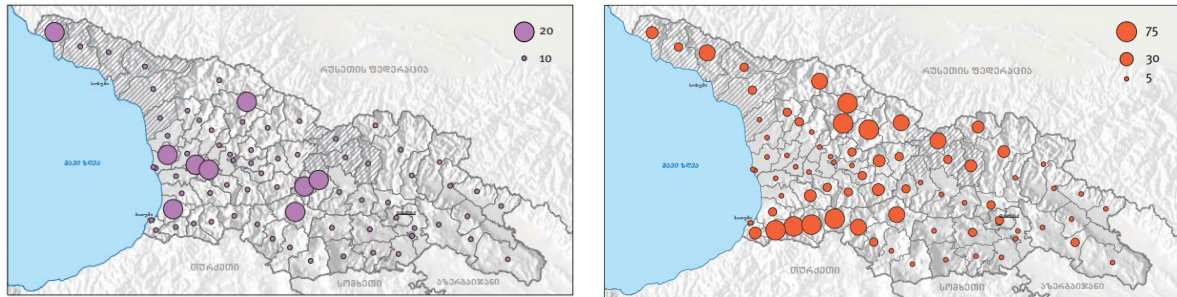
**24. Different parts of Georgia are exposed to different types of natural disasters.** Figure 2.4 shows that, for example, buildings in the western and central parts of Georgia are more exposed to flood hazards, which can be explained by the building density and poor management of riverine flood risk. Buildings in more mountainous areas have a higher exposure to landslides, which their geographical position near glaciers can explain. Figure 2.5 shows possible heterogenous impacts of precipitation and temperature across Georgia.

<sup>13</sup> EM-DAT database, managed by the Universite Catholique de Louvain's Centre for Research on the Epidemiology of Disasters, is a standard data source for the analysis of natural disasters. See: <https://www.emdat.be/>

<sup>14</sup> Drought is excluded from the chart, as this data is not publicly available.

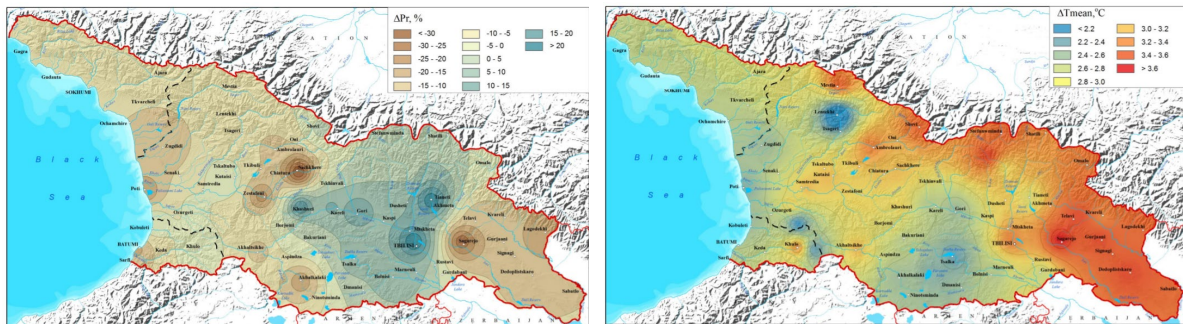
However, in climate-change scenarios, all regions in Georgia will be exposed to the compounded risk of, for example, drought, changing river flows, and higher precipitation variability.

**Figure 2.4. Current Exposure of Buildings to Floods (LHS) and Landslides (RHS)**



Source: CENN, Atlas of Natural Hazards and Risks of Georgia

**Figure 2.5. Projected Changes in Precipitation (LHS) and Temperature (RHS) 2071–2100 v 1971–2000**



Source: Fourth National Communication of Georgia to the UNFCCC, 2021

**25. International risk assessments place Georgia’s exposure to climate and natural disaster risks in the mid-range of countries.** Various research institutes analyze countries’ natural disaster vulnerability and climate change vulnerability. Georgia often scores in the mid-range of countries, which indicates the need to increase its resilience against climate change. The different international risk assessment approaches provide different information; each in its own way provides information about risks related to climate change in Georgia. Two examples:

- The ND-GAIN Index<sup>15</sup> summarizes Georgia’s vulnerability to climate change and other global challenges, and its readiness to improve resilience. Georgia ranks 38th least vulnerable country out of 181 countries. The low vulnerability score (68th least vulnerable country) and high readiness score (33rd most ready country) suggest that adaptation challenges exist in Georgia, but also that Georgia is well positioned to adapt. Over a period of several years, Georgia has consistently increased its economic governance and social readiness and reduced its vulnerability to climate change in six sectors: food, water, health, ecosystem service, human habitat, and infrastructure.

<sup>15</sup> Notre Dame Global Adaptation Initiative, ND-Gain Index: <https://gain.nd.edu/>

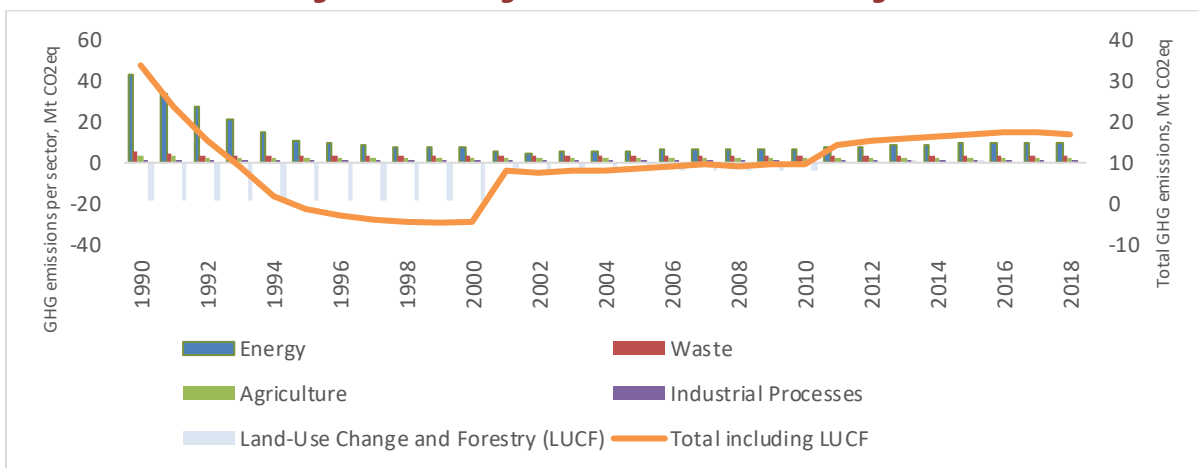
- The INFORM Risk Index<sup>16</sup> identifies specific risks across a country to aid decision-making on prevention, preparedness, response, and a country’s overall risk management of physical hazards. The INFORM Risk Index ranks Georgia as a medium risk country, ranking 91st out of 191 countries (the higher the rank, the higher the risk class).

## B. Climate Change Commitments and Framework

**26. Georgia has pledged to reduce its GHG-emissions and develop an economy that is resilient to climate change.** In line with the Paris Agreement, Georgia’s National Determined Contribution (NDC) aims to contribute to: limiting global warming to well below 2 degrees Celsius, compared to 1990 and increase the adaptative capacity of its economic sectors to the negative effects of climate change; and to implement the required adaptive measures by mobilizing domestic and international resources for the sectors particularly vulnerable to climate change.

**27. To support the international commitments for climate change mitigation, the Georgian government aims to reduce total GHG- emissions.** Despite its relatively small GHG-emission footprint, 0.03 percent of global emissions when signing the Paris Agreement, Georgia has committed to an unconditional objective to reduce GHG emissions by 35 percent below 1990 levels by 2030 excluding LUCF, which is 29.29 Mt CO<sub>2</sub>eq. It has also committed an intended reduction of 50–57 percent, excluding LUCF, which is 19.35–22.50 Mt CO<sub>2</sub>eq. To achieve these goals, the main challenge for Georgia is to prevent further carbonization of its economy beyond the committed targets.

**Figure 2.6. Georgia’s GHG Emissions and Targets**



Source: World Resources Institute, 2021.

**28. The NDC lays out the climate change governance framework, of which key aspects are enshrined in law and decrees.** The Ministry of Environmental Protection and Agriculture

<sup>16</sup> EC, INFORM risk index: <https://drmkc.jrc.ec.europa.eu/inform-index/INFORM-Risk/Country-Profile>

(MEPA) and the Ministry of Economy and Sustainable Development (MESD) are jointly responsible for coordinating of climate change policy. Through a decree the government of Georgia established the Climate Change Council (CCC), which is an advisory body for implementing and tracking the climate change commitments as per the NDC. The CCC is chaired by the Minister of Environmental Protection and Agriculture and consists of representatives from various public sector stakeholders.

**29. To increase its resilience to climate change, Georgia had committed to develop a National Adaptation Plan (NAP).** Climate change adaptation is the process needed to minimize losses and maximize benefits from climate change (IPCC, 2021).<sup>17</sup> See Box 4. Climate adaptation addresses risks from changes both in average climate conditions and in the frequency and intensity of extreme weather, for example by addressing sea-level rise in the coastal region and making infrastructure more resilient to extreme weather events. Georgia has not yet published a comprehensive national climate adaptation plan, and now only has a climate change adaptation plan for the agriculture sector. However, in its updated NDC, the government of Georgia committed to producing a NAP.

#### **Box 4. Climate Change Adaptation and Economic Development**

Article 7 of the Paris Agreement describes climate change adaptation as “the global goal on adaptation of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to sustainable development.” The strong link between development and climate vulnerability suggests that adaptation to climate change should be an integral part of development planning in all countries.

However, in the face of budget constraints, as may be seen in the competing needs for governmental budgetary resources, the decision to allocate resources to climate change adaptation requires accurate information about the net costs of spending on such adaptation. By comparing the costs and climate change risk-mitigating effects of adaptation measures with the costs of unmitigated climate change risks, governments enable themselves to properly analyze the cost effectiveness of climate adaptation measures.

The upfront cost of investing in structural resilience is significant but benefits that typically accrue over the medium to long run can exceed costs by a large margin (IMF, 2019). Adaptation spending on public infrastructure can make the economy resilient against natural disasters and limit a post-disaster upward pressures on public debt—yet in the eyes of some, the cost of climate change adaptation investments seems too expensive, especially as compared to non-climate change adaptation investments. It should be noted, however, that non-climate adaptation investments do not shield the economy from losses caused by the expected occurrence and severity of climate change related natural disasters and that, therefore, even though more expensive adaptation investment may imply higher financing needs in their initial years, they may result in less persistent output losses and smaller reconstruction needs (IMF, 2022).

IMF, 2019, “Building resilience in developing countries vulnerable to large natural disasters.”

IMF, 2022, “Economic principles for integrating climate change adaptation in fiscal policies,” forthcoming IMF working paper

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<sup>17</sup> IPCC. 2021a. “Annex VII: Glossary.” In Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.

### III. FISCAL RISKS FROM CLIMATE CHANGE

**30. The Government of Georgia has progressed its analysis of fiscal risks continually over the past 6 years, bringing its analysis to the leading edge in the region.** In particular, the FRS first highlighted the risks associated with state owned enterprises (SOEs) and power purchase agreements, resulting in positive policy decisions to improve how they are being managed. More recently, the FRS began reporting on risks within the PSBS, and taking a full public sector view of fiscal risks, which has seen it ride out some of the challenges arising out of the pandemic with only minimal impact on public wealth.

**31. The next step for the FRS is to identify, analyze and begin managing the fiscal risks associated with climate change.** The December 2021 FRS did just this, with a qualitative assessment of the major risks associated with climate change. The government has set its sights on further progressing this analysis, and has committed to producing a quantified assessment of those risks in the FRS 2022. This report provides the basic analytical tools and initial results, from which the FRMD, working together with other units of the MoF and MESD and MEPA, can use to better identify, analyze, and quantify those risks.

#### A. The Nature of Climate Change Fiscal Risks

**32. Climate change may affect the main drivers of economic growth by impacting both supply and demand side vulnerabilities.** Supply side vulnerabilities include potential impacts on productivity, land, capital, and labor. Table 3.1 provides example transmission channels as used by the European Commission to analyze the potential impact of climate change risks on debt sustainability. The demand side could be impacted via consumption, investment, and trade effects. Demand side effects may be temporary but may also persist via an ongoing reallocation of resources from productive capital to adaptation investment, which would mean less consumption.

**33. Potentially just as important as economic impacts, the effects of climate change on public finances can also be expected to materialize via various direct and indirect transmission channels.** Direct impacts may occur via increased public spending on, for example, repairing or replacing damaged infrastructure and indirect impacts may occur via disruption of economic activity after a major disaster or the materialization of contingent liabilities affecting distressed (non-) financial public and private institutions. Table 3.2 provides some examples of climate related impacts on public finances due the effects of climate change.

**Table 3.1. Georgia: Transmission Channels to Supply Side**

	<b>Land</b>	<b>Capital</b>	<b>Productivity</b>	<b>Labor volume</b>
<b>EXTREME WEATHER EVENT</b>	<ul style="list-style-type: none"> <li>• Landslides resulting in production input shortages.</li> </ul>	<ul style="list-style-type: none"> <li>• Infrastructure degradation.</li> </ul>	<ul style="list-style-type: none"> <li>• Deterioration in population health.</li> </ul>	<ul style="list-style-type: none"> <li>• Human life losses/mortality rates</li> </ul>
<b>GRADUAL TRANSFORMATION OF THE ENVIRONMENT</b>	<ul style="list-style-type: none"> <li>• Land degradation with reduction in agricultural potential.</li> <li>• Scarce land resources in some regions.</li> </ul>	<ul style="list-style-type: none"> <li>• Faster depreciation of machinery equipment.</li> <li>• Reallocation of resources from productive capital to adaptation investment</li> </ul>	<ul style="list-style-type: none"> <li>• Health care issues</li> <li>• Reduced human performance due to higher temperature.</li> <li>• Resource reallocation to new technologies.</li> </ul>	<ul style="list-style-type: none"> <li>• Loss of hours worked due to extreme temperatures.</li> <li>• Employment and social impacts of climate change policies, resource reallocation.</li> </ul>

Source: European Commission. 2020, "Debt Sustainability Monitor 2019", institutional paper 120.

**Table 3.2. Georgia: Climate Change Related Impacts on Public Finances**

<b>Non-discretionary impact EXOGENOUSLY DRIVEN BY CLIMATE PHENOMENON</b>	<b>Discretionary impact ENDOGENOUSLY DRIVEN BY POLICIES AND INVESTMENTS</b>
<p><b>Direct</b></p> <ul style="list-style-type: none"> <li>• Public spending to replace damaged infrastructure or buildings.</li> <li>• Social transfers to households affected by the natural disaster.</li> <li>• Materialization of explicit contingent liability, e.g., insurance schemes backed by state guarantees.</li> </ul> <p><b>Indirect</b></p> <ul style="list-style-type: none"> <li>• Reduction of tax revenue due to a reduction in economic activity.</li> <li>• Increase of health care spending due to more diseases.</li> <li>• Materialization of implicit contingent liabilities, e.g., support to financial institutions in distress.</li> <li>• Impact on sovereign capacity to pay debt payments obligations over the medium-term, e.g., due to budgetary funds reallocation towards recovery and reconstruction.</li> </ul>	<ul style="list-style-type: none"> <li>• Public investments and subsidies to mitigate climate change</li> <li>• Public investments and subsidies to adapt to climate change</li> <li>• Natural disaster emergency spending, compensation financial losses, and repairing and rebuilding assets.</li> <li>• "Rainy days" funds</li> </ul>

Source: European Commission, 2020, "Debt Sustainability Monitor 2019", institutional paper 120, and IMF staff.

**34. Fully fledged climate change fiscal risk analysis should include the analysis of risks to fiscal sustainability.** Usually, fiscal sustainability reports focus on demography-driven spending such as pensions, health care, social security, and education. However, the effects of climate change may negatively affect the ability of a government to sustain its spending and tax in the long run without threatening government solvency or defaulting on any of its liabilities.

## **B. Approaches to Quantifying Climate Change Fiscal Risks**

**35. Quantifying the magnitude and the probability of a climate change fiscal risk can support governments to understand the potential fiscal impact.** Understanding and quantifying the macroeconomic and fiscal impact of the consequences of climate change allow policy makers to allocate resources appropriately. It can help policy makers to decide how much to spend on, e.g., building ex-ante resilience through better physical infrastructure and how much fiscal space to preserve to deal with the aftermath of a disaster. Countries can rely on a range of techniques to quantify climate change fiscal risks. Commonly used approaches to quantify climate change fiscal risks are described below:

- **Analyzing the economic effects of climate change risks and the subsequent fiscal impact.** Governments can qualitatively identify the economic transmission channels through which the effects of climate change can impact the economy and use economic research and economic modeling to quantify these transmission channels. Subsequently, the government could employ a sensitivity analysis or run alternative scenarios to quantitatively analyze the potential fiscal impact.
- **Analyze the potential fiscal impact of climate-change related natural disasters.** When natural disasters, such as flooding or drought, materialize, they tend to (i) reduce fiscal revenue due to lower tax collection resulting from the impact on economic sectors, and (ii) require government spending for post-disasters recovery and rebuilding efforts. Recent literature (Bayoumi, Quayyum, Das, 2021)<sup>18</sup> suggests that countries that have in place disaster preparedness mechanisms and lower public debt have a lower probability of witnessing a significant drop in economic growth as a consequence of a natural disaster. Government can quantify the potential impact by analyzing historical and projected vulnerabilities to natural disasters and affiliated economic and budgetary costs.
- **Analyzing other discrete fiscal risks related to climate change.** Governments can analyze the potential impact of climate change on specific vulnerabilities within the government budget, including contingent liabilities. For example, they could analyze the potential budgetary implications of reduced power generating capacity of hydropower installations because of drought or reduced river flows, but also the potential implications of both explicit and implicit contingent liabilities related to, e.g., the financial sector of state-owner enterprises.

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<sup>18</sup> Bayoumi T, Quayyum SN, Das S, 2021, "Growth at Risk from Natural Disasters", IMF Working Paper WP/21/234.



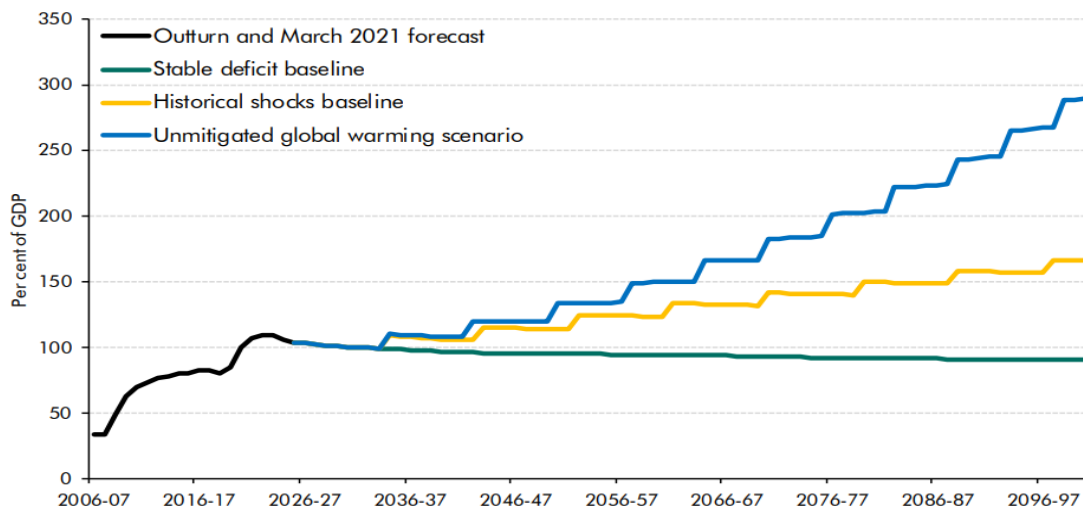
**36. Subsequently, the government can quantify the potential impact of climate change risks on fiscal rules and fiscal sustainability.** Through estimating the potential impact of climate change on economic variables, e.g., GDP growth and government revenue and expenditure, countries can analyze the impact of climate change on their fiscal rules and debt sustainability. For example, the debt-to-GDP ratio could increase if GDP growth slows because of climate change or if the budget deficit increases because of higher expenditure on post-disaster recovery and reconstruction, or a combination of both. Box 5 presents an example of illustrative fiscal scenarios used recently in the United Kingdom (UK).

**37. Because climate change also affects government assets and liabilities, governments could also quantitatively analyze the impact of climate change on their balance sheets.** Natural disasters and gradual changes in the environment, e.g., droughts, could damage or destroy public assets, requiring increased expenditure on maintenance but also increased depreciation rates for public assets because of shorter life cycles.

**Box 5. Climate Change Fiscal Risk Analysis in the UK**

In its Fiscal Risk Report, the UK Office of Budget Responsibility (OBR) outlines the fiscal implications and fiscal risks related to climate change, through discussing the science of climate change, its potential economic and fiscal impact, and illustrating the potential physical, economic, and fiscal risks to the UK from different paths for global warming.

To quantify potential catastrophic risks from unmitigated global warming; the OBR created a long-term fiscal baseline for the budget deficit called 'stable deficit baseline'. Based on historical experiences in the UK and worldwide, the additional impact of periodic fiscal risks was layered on top of that baseline, creating the "historical shocks baseline." Subsequently, the OBR layered the "unmitigated global warming scenario" on top of the scenarios. This scenario builds on the RCP8.5-scenario and assumes the cost of adaptation to climate change to be 0.3 percent of GDP a year and that the cost of natural disasters is twice as large and natural disasters occur twice as frequently. See the chart below (debt-to-GDP on the y-axis).



Source: OBR (2021), "Fiscal Risk Report, July 2021."

## IV. QUANTIFYING CLIMATE CHANGE FISCAL RISKS IN GEORGIA

### A. Climate Scenarios

**38. There are a broad range of climate scenarios that can be applied when assessing fiscal risks, but this report suggests focusing on three key scenarios.**

- **The Paris Agreement scenario**, where international commitments from the Paris Agreement are met. The IPCC describes this scenario as RCP2.6, and its models suggest this is consistent with limiting temperature warming to well below 2 degrees Celsius above pre-industrial levels. For Georgia this translates to a 1.6-degree Celsius rise in 2069 above the 50-year average to 2020.
- **The Business-as-Usual (BAU) scenario**, where the Paris commitments are not implemented, and greenhouse gas emissions continue to rise in line with global economic output. The IPCC describes this scenario as RCP8.5, and its models suggest this would lead to average global temperature increases around 4 degrees above pre-industrial levels. For Georgia, this translates to a 3.65 Celsius degree rise in 2069 above the 50-year average to 2020.
- **The BAU with climate volatility, or the volatile scenario**, where the economic impacts of the increased climate volatility is explicitly modelled in addition to the effects of the rise in average temperatures in line with the BAU scenario. That is, the volatile scenario aims to capture the effects of not just a hotter planet, but also the higher volatility of weather and increased numbers of extreme weather situations that are likely to occur with climate change.

**39. Under the business-as-usual scenario (RCP8.5), Georgia's public finances are likely to significantly worsen over the coming decades.** According to IPCC research, higher temperatures will likely dampen productivity growth, reducing the growth of GDP and tax revenue. With expenditure remaining unchanged, the budget deficit will likely worsen, and public debt will likely rise by around 8 percent of GDP relative to the baseline scenario. In the volatile scenario, the fiscal outcomes will worsen further, with debt increasing 18 percent of GDP relative to baseline. In contrast, a strong climate change mitigation scenario (RCP2.6, or the Paris scenario) presents a relatively benign fiscal outlook, with debt largely matching the baseline scenario.<sup>19</sup> Table 4.1 summarizes potential fiscal implications of climate change under different scenarios.

**40. In addition, more frequent and more severe natural disasters will likely leave lasting fiscal footprints that may not be adequately captured in the three above scenarios.** Climate change will most likely lead to more extreme and more frequent natural disasters, reducing tax

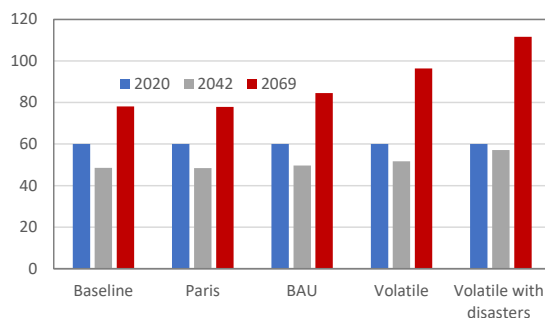
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<sup>19</sup> Unusually, for Georgia the RCP2.6 scenario results in a slight improvement in GDP levels relative to historical trends. This contrasts to the global situation, where the Paris scenario results in a small decrease in global GDP.

revenues while expenditures often rise to meet relief, rehabilitation and reconstruction needs. However, their timing and severity are difficult to predict, given the high uncertainty that surrounds the actual impact of climate change. Therefore, stylized effects of a series of floods and droughts on the primary balance and public debt are layered over the top of the volatile scenario, adding an additional 15 percent of GDP to public debt by 2069.

**Table 4.1. Georgia: Primary Balance and Public Debt**  
(percent of GDP)

Scenario	Primary Balance		Debt	
	2042	2069	2042	2069
Baseline	-1.7	-3.0	48.5	78.1
RCP 2.6 (Paris)	-1.7	-3.0	48.4	77.9
RCP 8.5 (BAU)	-1.8	-3.4	49.7	84.5
RCP 8.5+ $\sigma$ (Volatile)	-2.0	-4.2	51.7	96.4
Volatile with disasters	-3.0	-4.8	57.1	111.6



Source: IMF staff estimates. In 2022, the primary balance is expected to be -2.3 percent of GDP.

**41. Two excel-based analytical techniques are used to simulate the above scenarios.** As well as setting the baseline against which these scenarios are benchmarked, the first analytical technique (the Long-Term Module) captures the slower-building fiscal pressures that are driven by a gradually transforming environment. The second module, (the Disaster Module) simulates fiscal impacts of specific natural disasters. The modules and scenarios are described below. The results are stylized, albeit based on cross-country empirical evidence. There is scope for significant refinement and improvement, some of which are suggested at the end of the section.

**42. These scenarios represent a starting point for climate change fiscal risk analysis, but there is scope for considerable further analysis.** In particular, the scenarios and their economic impact are based on historical relations, though there is potential for impacts to be significantly higher as climate change leads to tipping points that have impacts in excess of past experience. The IMF's Climate Macroeconomic Assessment Program (CMAP) could be used to further this analysis. This would also include a more detailed assessment of climate adaptation costs, which were estimated at around 3 percent of GDP per year for the next decade (2020 Fiscal Monitor).

## B. Long-term Economic and Fiscal Effects of Climate Change

**43. The baseline scenario demonstrates how the long-term fiscal situation may evolve based on current policies in the presence of demographic change, but without any climate change.** In the baseline scenario, real GDP is expected to grow by around 3–3¾ percent a year into the late 2060s. An ageing population leads to higher health and pensions expenditure (see the December 2019 FAD IMF mission report for more details, including on other baseline

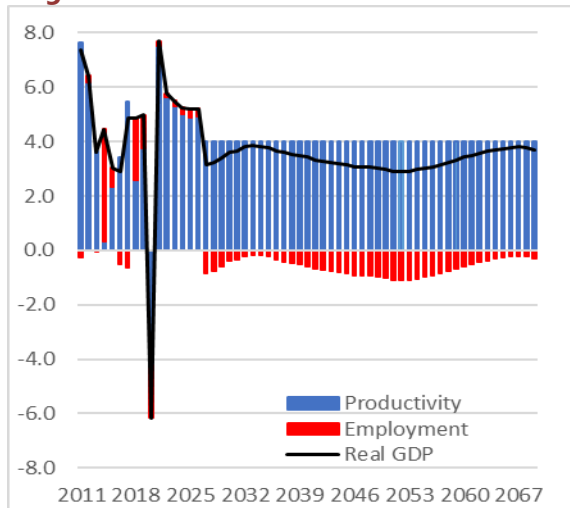
assumptions and methodologies).<sup>20</sup> As a result, a primary balance of -3.0 percent of GDP is projected for 2069, while the debt-to-GDP ratio is set to reach 78.1 percent of GDP (Figure 4.3). This report used the model developed for the December 2019 FAD IMF mission report, and updated it with recent data to calculate the intertemporal balance sheet and economic and macro-fiscal projections.

### Underlying Assumptions

**44. The Long-Term Module uses a labor productivity assumption and the UN’s population projections to set the baseline real GDP trajectory from 2027.** The IMF World Economic Outlook, October 2021 forecasts are used to develop a baseline to 2026 for all macro-fiscal variables. After 2026, economic growth is projected using demographics, labor participation and labor productivity growth. Figure 4.1 shows real GDP growth over time, decomposed into the contributions from employment and productivity growth.

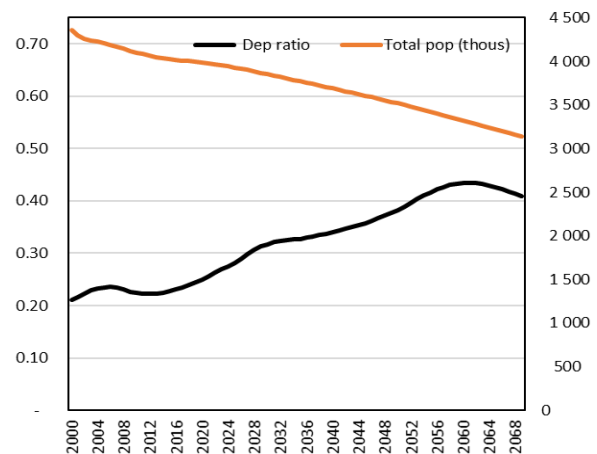
**45. Employment is projected to decline from 2027, in line with the declining working age population in the UN’s medium variant population projections.**<sup>21</sup> Figure 4.2 shows the projected population level and dependency ratio for Georgia. Conceptually, employment growth reflects the stage of the business cycle and the unemployment rate in the near term, changes in the participation rate in the medium term, and a country’s demographic structure in the long term. While Georgia experienced a decline in working age population in the past decade, this has been partly offset by changes in the unemployment and participation rates. Both unemployment and participation rates are assumed to remain unchanged after 2026.

**Figure 4.1. Real GDP Growth and Drivers**



Source: IMF staff estimates.

**Figure 4.2. Demographic Projections**



<sup>20</sup> See the “*Technical Assistance Report - The Public Sector Balance Sheet and State-Owned Enterprises*”, IMF Country Report No. 20/223.

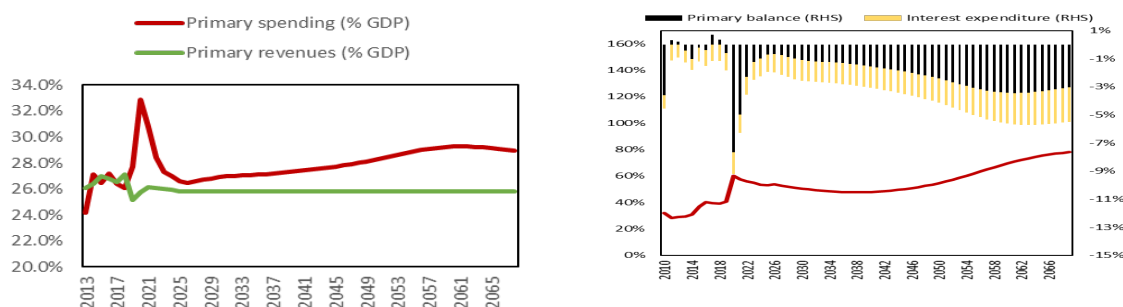
<sup>21</sup> In the Module, the population projection can be adjusted to the Low or High variant.

**46. Labor productivity, defined as GDP per persons employed, is assumed to grow by 4 percent a year from 2027.** This compares with an annual growth of 3.9 percent during 2010–19, which is somewhat lower than the World Bank estimate of 4.5 percent for the same period. Further, the implied labor productivity growth rates in the authorities’ macroeconomic models are in the 4.3–4.5 percent range.<sup>22</sup> As such, there may well be upside risks to the baseline productivity growth assumption as developed during this mission.

**47. Nominal GDP levels and growth rates are derived from the real GDP and an assumed inflation rate of 3 percent.** The inflation assumption is consistent with the authorities’ models, but is lower than 4.5 percent a year growth in the GDP deflator during 2010–19 period.

**48. Revenues are assumed to grow in line with the nominal GDP from 2027, as are expenditures other than health and pensions, which reflect demographic projections.** These are standard ‘no policy change’ assumptions to assess fiscal risks emanating from long term pressures such as demography. The corresponding primary balances, in conjunction with the projected stock of debt as of 2026 and assumptions on the exchange and interest rates, are used to derive the baseline projection of the debt-to-GDP ratio.

**Figure 4.3. Baseline Fiscal Projections**  
(percent of GDP)



Source: IMF staff estimates.

**49. Pension and health spending are projected to increase by 2.4 percent of GDP, in line with demographic factors, and their interplay with pension and healthcare systems.** Spending on healthcare increases as individuals age, so an older population can be anticipated to require greater health care spending. Similarly, as an increased share of the population becomes eligible for pension entitlements, pension spending increases as well. These projections remain consistent with those presented in the report of the IMF mission in 2019.

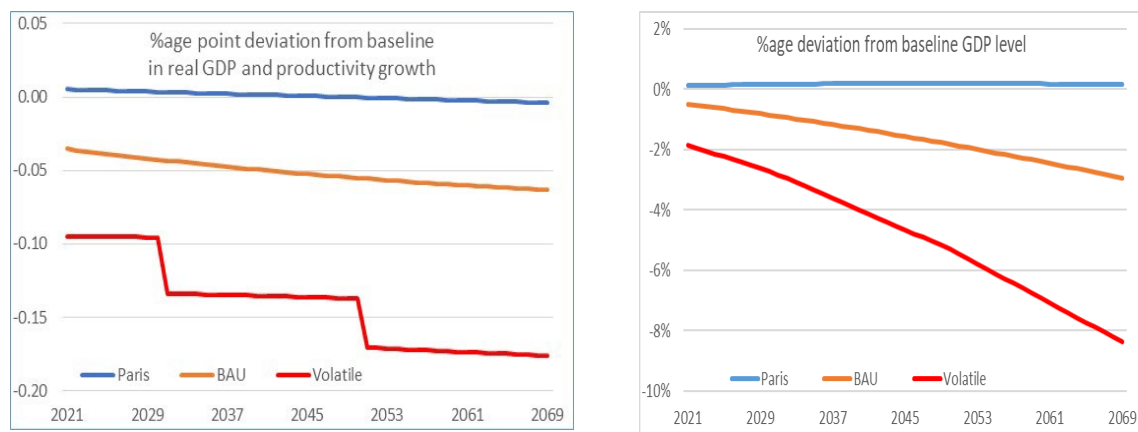
<sup>22</sup> The MoF uses a small open economy DSGE model, built with the support of the IMF, for budget forecasts. In the Model baseline, there is no long run employment growth while real GDP is calibrated to 4.5 percent in the steady state. The MoE uses a dynamic CGE model to analyze, among other things, effects of climate change. There is no long-term employment growth in this model, while long run real GDP growth is 4.3–4.4 percent.

**50. Under the baseline scenario, the primary deficit is projected to increase to around 3 percent of GDP, while the public debt increases to over 78 percent of GDP by 2069.** The baseline fiscal projections are presented in the Figure 4.3.

### Integrating Climate Change Scenarios into the Long-Term Fiscal Model

**51. Estimates from Kahn et al (2021) are used to simulate the effects of climate change on productivity, and thus GDP, in the long term (see Box 6).**<sup>23</sup> As noted, three different scenarios are explored: the Paris scenario of strong global climate change mitigation; the BAU scenario; and the volatile scenario where the effects of increased climate volatility under the BAU scenario are explicitly modelled. Figure 4.4 compares the deviations from baseline in productivity and real GDP growth and levels under these scenarios. The Paris scenario presents a benign climate outlook for Georgia, which is broadly in line with the baseline scenario, and for simplicity is not elaborated on in what follows.

**Figure 4.4. Estimated Effects of Climate Change on Productivity and Real GDP**



Source: IMF staff estimates based on Kahn et al (2021).

**52. The major channels through which climate change<sup>24</sup> can be expected to flow through into lower labor productivity are:**

- **Higher depreciation of the public and private capital stock.** Higher and more volatile temperatures will erode the capital stock, in an ongoing manner, for example higher average temperatures and changing precipitation will degrade roads, rail tracks and machinery and equipment. Additionally, more volatile temperatures and precipitation will lead to greater risks of flooding and other discrete weather events that will damage or destroy assets. This

<sup>23</sup> Kahn ME, Mohaddes K, Ng RNC, Pesaran MH, Raissi M, and Yang J-C, 2019, "Long-Term Macroeconomic Effects of Climate Change: A Cross-country Analysis", *Energy Economics*, 104, pp. 105624/1–13.

<sup>24</sup> Weather refers to atmospheric conditions over short periods of time (e.g., temperature and precipitation). Climate refers to the long-term average and variability of weather. Climate change is a shift "in the state of the climate that can be identified (e.g., via statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer" (IPCC, 2014).

will shorten average life cycles of capital equipment, raising the depreciation rate and reducing the amount of capital stock/slowing capital stock growth.

- **Reduced hours worked.** Due to extreme weather days employees may face a decrease in days they are able to go to work or work effectively. Higher temperatures may also result in worsening health outcomes and therefore an increased number of absentee days.

### Box 6. Summary of Kahn et al (2021)

The authors estimate the long-term effects of weather patterns transformed by climate change on economic activity across countries.

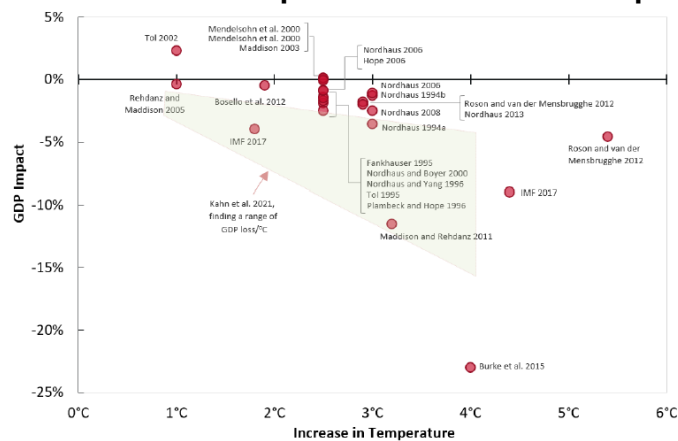
They begin with a theoretical growth model that links “deviations” of temperature and precipitation (i.e., weather) from their long-term moving-average historical norms (i.e., climate) to real GDP per capita growth. This theoretical model is then estimated by using data from 174 countries over 1960-2014. Their econometric technique allows for dynamics, nonlinearity, an implicit model for adaptation, and accounts for the effects on economic activities of changes in the distribution of weather patterns — that is, both averages and variability of temperature and precipitation. They further explore the efficacy of adaptation by tracking the elasticity of per capita GDP to climate variables over time.

The authors’ key findings include the following.

- Per-capita real output growth is adversely affected by persistent changes in the temperature above or below its historical norm.
- A persistent increase in average global temperature by 0.04 °C per year, in the absence of mitigation policies, reduces world real GDP per capita by more than 7 percent by 2100.
- The estimated losses would increase to 13 percent globally if country-specific variability of climate conditions were to rise commensurate with annual temperature increases of 0.04 °C.
- Abiding by the Paris Agreement goals, thereby limiting the temperature increase to 0.01 °C per annum, reduces the loss substantially to about 1 percent.
- While adaptation to climate change can reduce these negative long-run growth effects, it is highly unlikely to offset them entirely.

Figure A compares the authors’ results with other loss estimates from rising temperatures.

**Figure A. Estimates of GDP Impact from Increases in Temperature**



Annual estimates of GDP losses for each of the countries to 2100 under three different scenarios — the Paris, the BAU, and the volatile scenario — are available from the authors.

- **Reduced technological effectiveness of existing industries.** Changing weather patterns will likely impact on the productivity and output of some industries such as agriculture (reduced crop yields due to changing rainfall levels and prolonged heat waves, tourism (reduced number of snow days for ski resorts) and power production (changing water flow patterns for hydropower plants). While alternative approaches may be adopted, these will most probably require increased capital investment and adoption of new technologies.

**53. For simplicity, these channels are built into the labor productivity deviations from baseline rather than being modelled directly.** However, as the MoF's analysis of fiscal risks from climate change becomes more sophisticated, these could be directly modelled by:

- Introducing a physical capital stock accumulation identity into the long-term fiscal model, to directly model the changing depreciation rate and required increase in capital expenditure to offset it. This would allow the decomposition of labor productivity into capital deepening and total factor productivity.
- Broadening the labor input function to include hours worked. The current model directs this channel through labor productivity as the denominator is set at number of employees, rather than the, potentially, more accurate number of aggregate hours worked.
- Introducing production sectoral components within the overall macro-economic models, similar to the approach taken in the natural disaster model (see Box 7). This would allow specific focus on those sectors most likely to be directly impacted by climate change, and would inform the production of policy-relevant information about sectoral policies.

**54. With inflation assumed to remain unchanged, the decline in labor productivity directly impacts nominal GDP.** As noted above, there may be upside risks to the baseline assumption of 3 percent inflation. In addition, climate change could cause spikes in inflation through natural disasters and other supply chain disruptions. Further, climate change may also affect a country's external balances, presenting another potential inflation risk. Some of these issues are briefly discussed below.

**55. These estimates report the impact of climate change on economic growth, rather than levels.** This means that continually increasing temperatures compound the impact on growth. They also allow for a parameter for climate adaptation, which can be used (though not used during this particular mission) to model the impact of increased investment in adaptation through, for example, boosting public infrastructure in flood protection; or changing the technological mix in affected industries by, for example using more climate change resilient crops or develop non-ski resort tourism in Georgia.

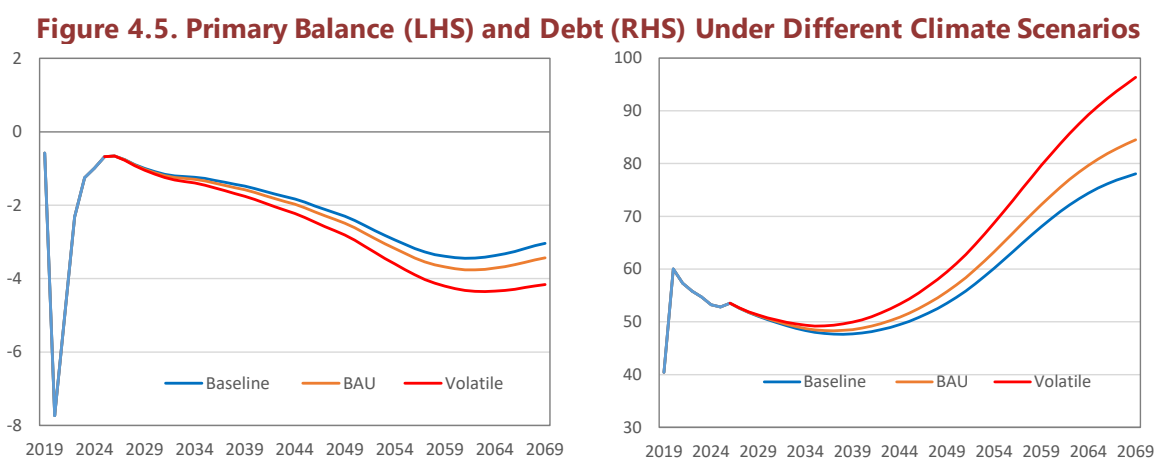
**56. The effect of climate change on real GDP growth is captured in the Long-Term Module as a slowdown in labor productivity growth.** For example, under a scenario of RCP8.5 with greater climate volatility, labor productivity could slow by 0.09 to 0.18 of a percentage point a year, reducing GDP by over 8 percent relative to the baseline in 2069. By 2100, these estimates



are projected to continue to build, reducing GDP per capita by 7 percent under RCP8.5, and over 13 percent under the high volatility scenario.

**57. The fiscal implications of alternative climate scenarios flow through the revenue side of the budget.** Under both the BAU and the volatility scenario, revenue is assumed to decline in line with nominal GDP, so revenue to GDP ratios are held constant. On the other hand, expenditure is assumed to be rigid, and held unchanged in GEL terms from the baseline. The effects of climate change being simulated in these scenarios build up gradually over time, and the changes might not be perceptible enough to affect the annual budget process. The implications of relaxing the spending rigidity assumption are explored below.

**58. Lower macroeconomic growth and widening primary deficits result in gradual but significant increases in the debt to GDP ratios over the next 50 years (Figure 4.5).** Under the BAU and volatile scenarios, primary deficits increase by ½ and 1¼ percent of GDP relative to baseline, leading to debt to GDP ratios 8 and 18 percent of GDP larger by 2069. These impacts will continue to grow into the future.



Source: IMF staff estimates.

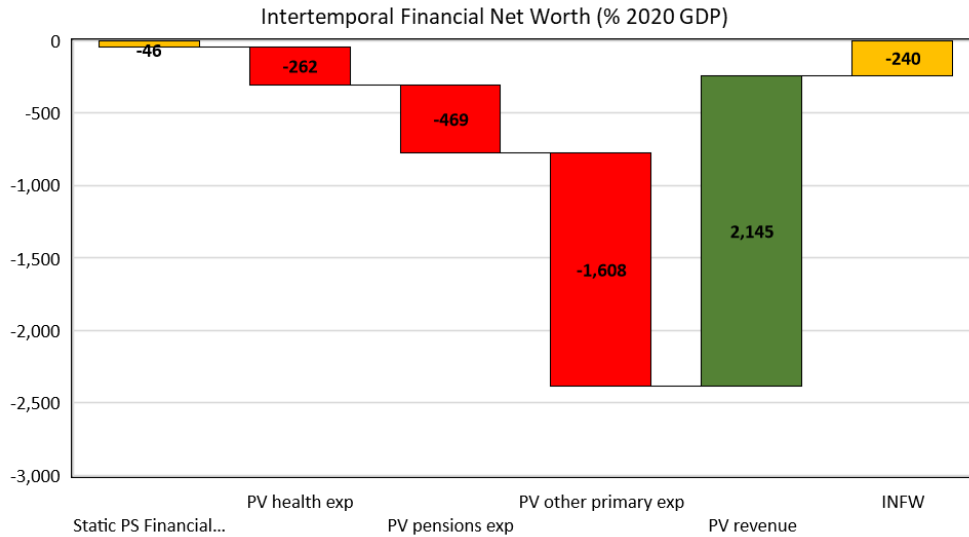
### C. Intertemporal Balance Sheet Effects

**59. The intertemporal balance sheet illustrates the impact of building climate pressures under alternative climate change scenarios on the public finances.** The intertemporal balance sheet combines existing public wealth with the discounted future flows of revenues and spending, providing a guide to how public wealth will fare under alternative climate scenarios with no policy change.

**60. In the baseline scenario, intertemporal net financial worth (INFW) is estimated at minus 240 percent of 2020 GDP under current policy settings.** Adding the discounted flows of primary balances to current net financial worth produces intertemporal net financial worth (INFW); which provides an indication of how well-placed Georgia's current wealth is to absorb future fiscal pressures. An INFW of -240 percent of GDP implies that the future fiscal pressures

implied by current policy settings would further erode public sector wealth. Figure 4.6 shows the decomposition of the INFW into revenue and expenditure components in the baseline.

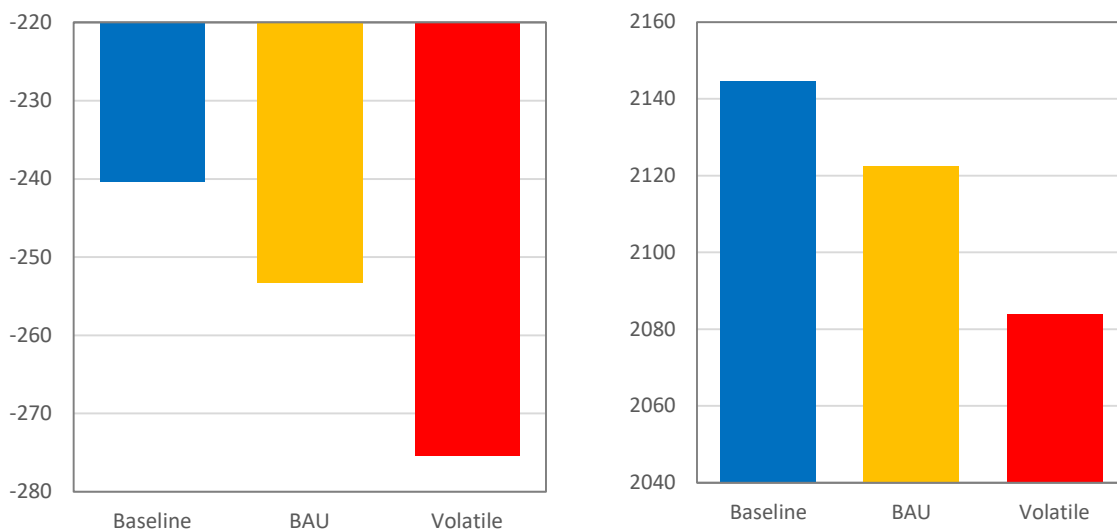
**Figure 4.6. Intertemporal Net Financial Worth**  
(percent of 2020 GDP)



Source: IMF staff estimates.

**61. Intertemporal net worth would be over 35 percent of 2020 GDP lower in the volatile scenario than the baseline.** Under the baseline scenario, INFW is estimated at -240 percent of 2020 GDP. Lower revenues under the two high temperature scenarios would see INFW decline to 253 and 275 percent of 2020 GDP. Figure 4.7 presents the impact of climate change on the INFW.

**Figure 4.7. Intertemporal Net Worth (LHS) and Fiscal Envelope (RHS)**  
Under Climate Change Scenarios (percent of 2020 GDP)



Source: IMF staff estimates.

**62. It is a strong assumption that spending is completely rigid under the climate scenarios, and likely overstates the impact of climate change on INFW.** There are two alternative options in assessing the long-term fiscal impact. The first focuses on the change in discounted future revenue flows. This equates to the fiscal envelope that policy makers have available to fund future provision of services to the population, and is invariant to spending policy choices taken by future policymakers. This measure suggest that the volatile scenario reduces the fiscal envelope by around 35 percent of GDP over the period. An alternative approach built into the model introduces a degree of spending flexibility (that is, relaxes the rigidity) into the expenditure projections, and allows for different degrees of spending adjustment over time.

#### **D. Incorporating the Fiscal Effects of Natural Disasters**

**63. In addition to the gradual dampening of productivity growth over time, climate change is likely to increase the frequency and severity of natural disasters.** Severe natural disasters can disrupt economic activities. Even if real GDP returns to trend, severe disasters can leave a lasting fiscal legacy. These effects are expected to be particularly acute under the volatile scenario, with increased climate volatility came to pass. These risks associated by climate change related disasters can be mitigated and managed through climate adaptation measures, such as increasing the discharge capacity of rivers to prevent damage from river flooding and strengthen or remove public infrastructure in floodplains.

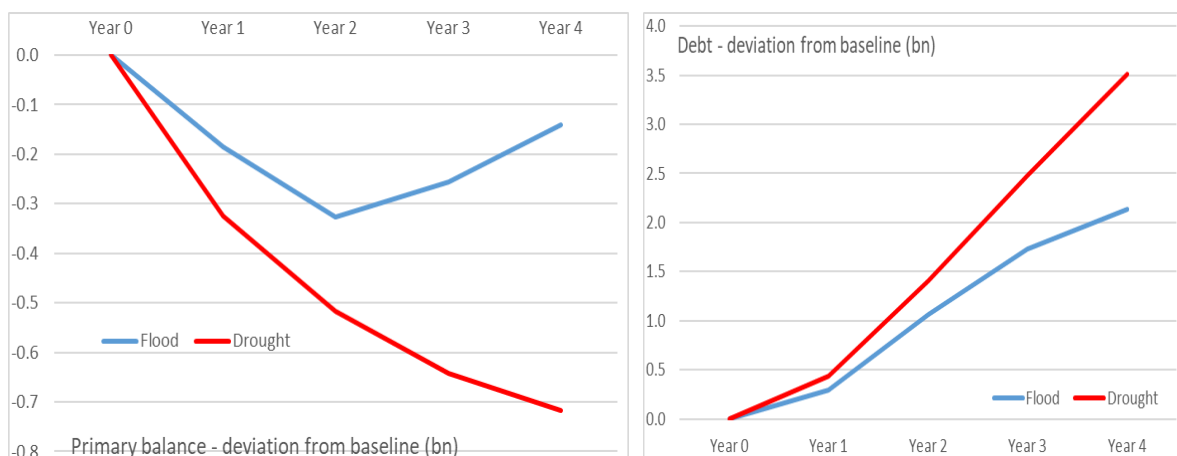
**64. To analyze the fiscal effects of natural disasters, an Excel-based fiscal stress test framework is introduced.** Historically, natural disasters are typically localized events with a temporary impact on GDP. However, severe disasters can reduce revenue by reducing the tax base as well as hamper the operation of the revenue collection agency. In the face of a disaster, there is no reason to cut spending to match the decline in revenue to prevent higher deficits. Indeed, governments may be pressured to increase spending for support, relief and rehabilitation efforts. There is also the possibility of long-term impacts as sufficiently severe disasters reduce the capital stock. The quantitative approach as explained in more detail in Box 7, allows policy advisors to analyze the potential quantitative effects of natural disasters.

**65. Fiscal effects of flood and drought—the two disasters that are relevant for Georgia in the climate change context—are simulated.** The MESD has modelled the effects of climate change induced repeated floods and droughts on the Georgian economy. These results were used to guide to simulate the scenarios.

**66. In the ND FST, droughts have a larger fiscal impact than floods.** Cross-country literature suggests that even a very severe flood is often followed by a strong recovery in economic activities. In some cases, production might even exceed the pre-flood baseline—for example, if soil fertility improves after the flood. In contrast, severe droughts tend to dampen output for an extended period and are typically followed by a tepid recovery. Figure 4.8 shows

that even though a more severe flood is simulated compared with the drought, the latter still leaves a worse fiscal legacy.

**Figure 4.8. Fiscal Effects of Flood and Drought in the Simulated Scenarios**



Source: IMF staff estimates. The disaster is assumed to hit in Year 1.

### Box 7. Summary of the Disaster Module

The Natural Disaster Shock Module for the Fiscal Stress Test (the Disaster Module) allows country authorities to assess the impact of different scales and magnitudes of natural disasters on macroeconomic and fiscal outcomes. The Disaster Module simulates the impact of a supply side disaster shock—pandemic, as well as flood, drought, earthquake, and severe storms—on economic activities.

The Disaster Module can be used at the onset of a disaster, or for medium to long term scenario analysis, to analyze:

- the impacts of a disaster on individual sectors of the economy,
- how these impacts will feed into tax, expenditure, and deficit/financing/debt changes; and
- what this means for the macroeconomy and public finances overall.

The Disaster Module has an option to record discretionary fiscal policy in response to the disaster being analyzed, or materialization of contingency liabilities because of the disaster. A simple production function underpins the Module. However, the analysis is partial equilibrium in nature, in the sense that the external and monetary sectors are assumed exogenous.

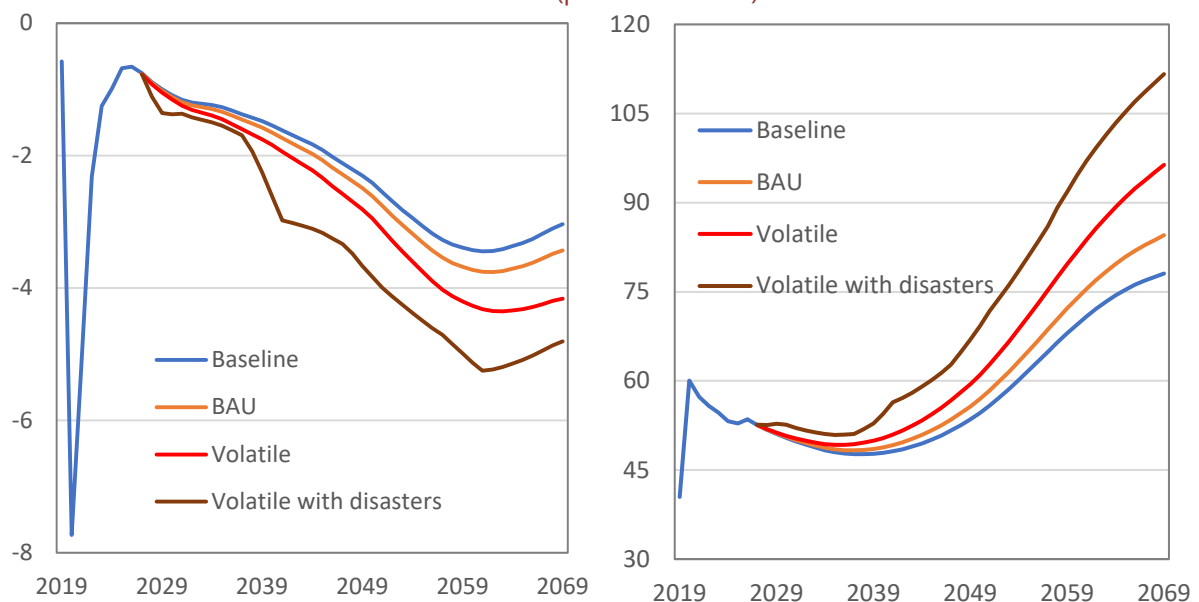
The Module automatically generates a range of macroeconomic and fiscal scenarios in response to changes in a pair of variables describing the type of disaster being simulated. The model allows four natural disaster modes, and to adjust for type of disaster: the severity of the disaster—a measure of how damaging the disaster is; and preparedness of the country—the degree to which a country's policy settings, institutions, and public agencies are ready to respond to, and ameliorate, the impact of the disaster.

The Module is designed to be adapted to country circumstances. It requires the use of national macroeconomic and fiscal data, to which some global impacts are applied as the starting point of analysis. Authorities are strongly encouraged to amend the scale and nature of these impacts to reflect their particular national circumstances.

**67. Severe floods are assumed in 2028 and 2048, and severe drought in 2038 and 2058.** Floods and drought are the climate related natural disasters that Georgia is at most risk of. Consultations indicated that flooding has been becoming more frequent and severe over the past couple of decades. Georgia experienced severe flooding in 2015, and a major drought in 2000. The stylized fiscal effects presented above are then layered on to the fiscal projections under the volatile scenario. To simulate the effect of rising temperatures increasing the intensity of natural disasters, the impacts are scaled by the degree of temperature rise, so that the impact rises with time.

**68. The fiscal effects of more frequent and intense natural disasters would worsen the fiscal situation significantly (Figure 4.9).** The primary deficit peaks during the 2058 drought at 5 percent of GDP, and public debt exceeds 110 percent of GDP. Debt levels of this magnitude would likely result in challenges in meeting gross financing needs and could result in interest payment to revenue ratios (the fiscal burden) that prove challenging. These simulations provide an early guide as to quantify the vulnerability of the public finances to increasingly frequent and intense natural disasters, however they should be continued to be refined and tailored to country specific circumstances. Work underway at the Ministry of Economy will provide a sounder base for these estimates, and cooperation should be developed with the Ministry of Environment, who is in the process of modelling the impact of climate variations on natural disaster risks to refine the shocks.

**Figure 4.9. Primary Balance (LHS) and Debt (RHS) Under Climate Scenarios with Natural Disasters (percent of GDP)**



Source: IMF staff estimates.

**69. The above projections can be used to quantify the potential impact of climate change fiscal risks on fiscal rules and fiscal sustainability.** For example, to calculate the debt-stabilizing primary balance required to stabilize the debt-GDP ratio in 2069. Table 4.2 shows that

whereas a fiscal consolidation of 0.6 of a percentage point of GDP would achieve this objective in the baseline scenario, a larger fiscal consolidation would be required under all the other scenarios.

**Table 4.2. Georgia: Debt-Stabilizing Primary Balance Under Different Scenarios, 2068**

Scenario	PB	PB*	Task
Baseline	-3.1	-2.5	0.6
BAU	-3.5	-2.7	0.8
Volatile	-4.2	-2.9	1.3
Volatile with disasters	-4.9	-3.4	1.5

Source: authors' calculations. PB refers to primary balance. PB\* refers to the debt-stabilizing primary balance, and is derived as  $(r-g)/(1+g)*D_{t-1}$  where  $r$  is the real interest rate,  $g$  is the real GDP growth, and  $D_{t-1}$  is the initial debt stock. Task refers to the fiscal consolidation required to stabilize debt. All figures are per cent of GDP.

## E. Next Steps: Refinements and Extensions

**70. The results and analysis presented above provides a preliminary, broad brushed analysis of the fiscal risks from climate change for Georgia, which should continue to be refined.** The mission has provided the models and analysis to the Ministry of Finance, who should continue to improve the analysis over the course of 2022 before presenting the results in the FRS 2022. Some suggestions for improvement to the modelling, analysis of discrete risks and integration of climate risks into the broader balance sheet work are provided below. Some can be completed by FRS 2022, others will take more time to complete.

**71. Several refinements to the modelling techniques could be pursued:**

- **The input data used for the analysis should be updated.** The analysis presented above uses the October 2021 WEO data. Both the Long-Term and Disaster Modules should be run with Georgia's historical data and the medium-term fiscal framework. In addition, the UN will release updated population projections in March 2022, which should be incorporated into the Long-Term Module. Data updates should be carried out in the first quarter of 2022.
- **The economic and fiscal effects of the historical occurrence of natural disasters should be analyzed and integrated into the baseline and volatile scenarios.** The current baseline does not include the impact of natural disasters that can be expected based on historical occurrences (thus, not driven by climate change); it can therefore be argued that the current baseline overestimates economic and fiscal indicators. Additionally, as is also done by the UK OBR, the government could layer in the expected impact of other fiscal risks (to which Georgia has proven to be vulnerable). This extra layer could be developed towards, and published in, the FRS 2022.
- **The Disaster Module could be calibrated to match Georgia's expectations for the future, and the simulated results could be integrated with simulations from the Long-**

**Term Module.** Work together with MESD, MEPA, EPA, and other expert agencies to develop home grown scenarios for climate change and natural disasters. This will improve the robustness of the scenario analysis along the lines of what is presented here. Assuming that the input data are updated in both modules in the first half of the 2022, this task could be performed in the third quarter of 2022. This will allow for the results to be published in the FRS 2022.

- **Using historical national accounts data and parameter values from the economic growth literature, the labor productivity series used in the Long-Term module could be disaggregated into capital-labor ratio and total factor productivity.**<sup>25</sup> This would allow authorities to examine, initially in a stylized way, but eventually with more robustness, the effect of climate change on the capital stock. For example, climate change might result in faster depreciation of the capital stock under the BAU and volatile scenarios. Assuming that the input data are updated in both modules in the first half of the year, this task could start in the third quarter of 2022. This will allow for a qualitative discussion in the FRS 2022, with further quantification to follow in the subsequent years.
- **The analysis could incorporate external and monetary shocks emanating from climate change.** For example, to the extent that the effect of climate change on Georgia's labor productivity is different from its neighbors or other comparable economies, this may lead to changes in the country's capital accounts and exchange rate. Another possibility is that supply chain disruptions caused by natural disasters lead to inflation, which causes a depreciation of the exchange rate. Because the majority of Georgia's public debt is denominated in foreign currency, both situations would present a significant fiscal risk. A qualitative discussion of these issues should be included in the FRS 2022. Various quantification approaches, including possibly using the MoF's macroeconomic model, could be explored in late 2022.
- **The effect of climate change on labor supply and government expenditure could also be analyzed.** For example, if climate change were to affect neighboring countries more adversely, Georgia might see an influx of labor, which will have macro-fiscal implications. Another possibility is to explore specific expenditures, such as on health or infrastructure against the backdrop of climate change. These issues might be qualitatively discussed in the FRS 2022, with detailed quantification left for subsequent years.

**72. In addition to the analysis presented above, the FRS 2022 could also provide analysis of discrete risks associated with climate change.** These are risks that could foreseeably result in specific events, such as guarantees being called, long-term contracts failing to be met or loss of key strategic infrastructure. Suggestions for MOF include in the FRS 2022 or the versions thereafter, include:

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<sup>25</sup> The authorities' models described above, in conjunction with the National Bank of Georgia's estimate of potential growth, can inform this analysis.

- **Identify and analyze climate-change risks to public infrastructure.** For this, the government could analyze the exposure and vulnerability of public infrastructure to climate change. Additionally, supplementing a future infrastructure register with a climate risk rating, as is already done with roads under existing weather conditions, could result in the identification of public assets at risk within the PSBS and inform future adaptation investments for the purpose of protecting or supplementing critical infrastructure. Also, in this context, the government could consider requesting a Climate-Public Investment Management Assessment (C-PIMA) from the IMF in 2023. The C-PIMA assesses a country's capacity to manage climate-related infrastructure from the perspectives of adaptation and mitigation. See Annex I.

**73. Examining PPA contracts, other major long-term contracts, and contingent liabilities for vulnerabilities to climate change.** Authorities indicated that the contracted power suppliers bear the bulk of the risk associated with an inability to produce power. However, natural disasters such as major flooding, glacial retreat, or drought events may lead to possible force majeure events resulting in project risks falling on the government. The same sort of risk might also relate to other long-term contracts, as well as to contingent liabilities; for example, those related to the financial sector and SOEs.

- **Working with the National Bank of Georgia to integrate climate-related risks into the financial supervisory expectations relating to the management and disclosure of such risks.** In line with the growing importance of climate change for the economy and the increasing evidence of its financial impact on banks and insurers, central banks across the globe are including climate-related risk management and disclosure in their regulatory frameworks, guidelines and monitoring activities, including climate scenario analysis and stress tests.<sup>26</sup>
- **Analyze the transition risks of Georgia related to climate change mitigation objectives and related policies and investments.** Climate change transition risk can result from changes in climate policy, technology, and consumer and market sentiment during the adjustment to a lower-carbon economy. Transition risks may materialize on the asset side of e.g., the government, SOEs and financial institutions as their businesses are increasingly modeled around the economics of low carbon emissions. MoF could carry out this assessment together with other expert agencies and publish the first results in FRS 2022.

**74. The work could be extended to include examining the effects and costs of climate adaptation measures.** By analyzing the effects and costs of climate adaptation measures, such as, e.g., increasing resilience against landslides, the government enables itself to (i) add climate adaptation scenarios to the risk analyzed, and (ii) analyze (and rank measures in order of) cost-

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<sup>26</sup> Example activities of central banks can be found at the website of the European Central Bank (<https://www.ecb.europa.eu/ecb/climate/html/index.en.html>) and the Bank of England (<https://www.bankofengland.co.uk/climate-change>).



effectiveness to support the design of cost-effective climate adaptation pathways. The former can be accommodated within the modelling framework, as implicit in the Khan et al (2021) paper is an adaptation parameter that assumes countries will adapt to higher temperatures over the course of 30 years. This parameter can be reduced, reducing the macroeconomic impact, so once a link between increased adaptive investment is established this can be modelled.

## **Recommendations**

- 4.1** Use the long-term fiscal projection tool to refine the estimates of baseline and climate scenarios, further refining and tailoring the assumptions and climate shocks to Georgia, so that quantified climate change fiscal risk analysis can be published in FRS 2022 (MoF, 2022).
- 4.2** Work with the MESD and MEPA to better tailor the natural disaster shock to Georgian experiences; and match projected environmental scenarios, so that quantified climate change fiscal risk analysis can be published in FRS 2022. (MoF, 2022)
- 4.3** Include likely non-climate change related natural disasters, and other evident fiscal risks, in the baseline. (MoF, 2022)
- 4.4** Examine discrete climate change-related fiscal risks, including vulnerabilities of the government budget to climate change risks, such as those relating to PPA contracts, other major long-term contracts, and contingent liabilities. (MoF, 2022)
- 4.5** Examine fiscal risks related to climate change transition risks. (MoF, 2022)
- 4.6** Extend the model to include the analyzes of climate change adaptation measures on climate change fiscal risks. (MoF, 2023)
- 4.7** Undertake a C-PIMA, which includes also assesses if public infrastructure assets registers include climate change-relevant aspect such the exposure of infrastructure to climate change risks. (MoF, 2022).

## Annex I. Integrating Climate Change in PIM Framework

**Green and resilient public investment matters.** Green and resilient public investment is an important enabler for a sustainable recovery—it creates jobs, spurs economic growth, addresses climate change, and improves the quality of life. It can also stimulate much needed private sector investment. While green and resilient infrastructure is key to achieving SDGs and the Paris agreements, the economic and social outcomes of public investment depend crucially on the efficiency of public investment management (PIM). IMF research shows that countries can lose up to one-third of their public investment spending due to inefficiencies. And strong public investment management institutions—that is public sector institutions that effectively plan, allocate, and implement public investment—can help countries close up to two-thirds of their efficiency gap. This is key, in the context of large financing needs, lack of fiscal space and high debt. The IMF's [PIMA](#) helps countries assess the strength and weaknesses of PIM institutions and recommend prioritized actions to address weaknesses.

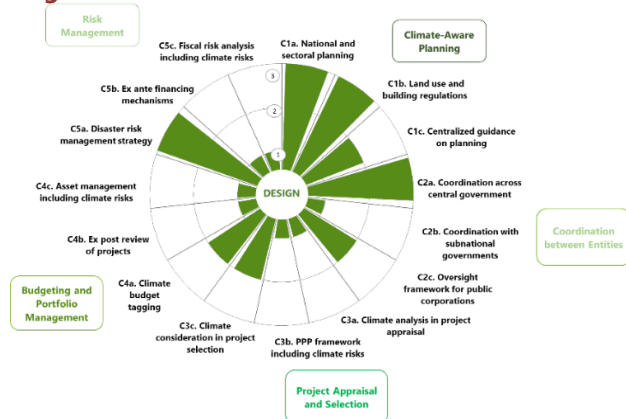
**The IMF is developing the Climate PIMA Module (C-PIMA) to focus on the climate aspects of PIM.** A Board Paper, to be issued in late 2021, will present the C-PIMA and plans, reflecting lessons from testing the module through about 11 pilot missions and desk studies.

### Key Features of the C-PIMA

The C-PIMA assesses five key PIM practices from the climate change perspective that are most critical to addressing climate challenges:

- C1. Climate-aware planning**—whether public investment is planned considering climate change policies.
- C2. Coordination between entities**—how decision making on climate-related investment is coordinated across the public sector.
- C3. Project appraisal and selection**—how climate-related analysis and criteria are reflected in project appraisal and selection.
- C4. Budgeting and portfolio management**—how the government's portfolio of climate-related public investment projects is managed, from budgeting to asset management.
- C5. Risk management**—how the government identifies and manages its fiscal risk exposure associated with public investment that could be impacted by climate change and natural disasters.

**Figure 1. A hypothetical example of C-PIMA diagnostic**



### The Benefits of a C-PIMA

**Diagnostic.** Assess institutional readiness and gaps in PIM against the backdrop of climate change challenges.

**Institutions.** Support the development of framework for addressing climate-related risks in infrastructure planning and investment.

**Roadmap.** Identify reform actions and explore capacity development support from the IMF and other organizations.

**Peer exchange.** Learn from—and share experiences with—other countries that face similar issues and challenges.

**The findings and recommendations of a C-PIMA are summarized in a report prepared by IMF staff.** The report presents detailed C-PIMA assessment across the five institutions and fifteen dimensions of the framework (Figure 1). It also includes a set of recommendations in the form of a roadmap of reform priorities, based on the C-PIMA assessment.