



## Clean energy transition, fiscal policy, and climate risks: An Environmental DSGE for Uganda

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Climate change is a growing fiscal risk for Uganda, threatening infrastructure, public finances, and long-term development. This study uses an Environmental DSGE model to empirically assess climate change's impact pathways on fiscal policy and identify optimal fiscal policy options for Uganda.

- Clean capital subsidies are effective for emissions reduction but may worsen fiscal deficits and reduce welfare.
- Recycling emission tax revenues into climate adaptation yields the best macro-fiscal outcomes with moderate emissions cuts.
- Lump-sum household transfers offer limited benefits compared to adaptation or clean energy investments.
- Policymakers should integrate climate risks into macroeconomic planning, balancing emission goals with fiscal sustainability.

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## Background

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Climate change poses a significant and escalating challenge to Uganda's economic resilience and sustainable development aspirations. The country is increasingly exposed to the damaging effects of extreme weather events, including floods, droughts, heatwaves, and mudslides, which disrupt livelihoods, erode economic output, and destroy public infrastructure. Roads, bridges, health facilities, schools, and water systems have suffered extensive damage in recent years, leading to unplanned government expenditures on emergency repairs and reconstruction, and these have made climate change a key source of fiscal risks in Uganda.

This growing fiscal burden threatens to reverse Uganda's hard-won macroeconomic gains over the past two decades. Between FY 2017/18 and FY 2021/22, rising climate-related infrastructure damages contributed to widening fiscal deficits and increased public debt levels, with the fiscal deficit reaching 7.4% of GDP in FY 2021/22, far exceeding the East African Community (EAC) target of 3%. Combined with global shocks such as the COVID-19 pandemic and the Russia-Ukraine conflict, these pressures have weakened Uganda's capacity to finance social services, maintain infrastructure, and support economic recovery.

Under the legally binding Paris Agreement of 2015, Uganda committed to reducing the country's greenhouse gas emissions by 24.7% by 2030. This obligation necessitates implementing clean energy transition policies, such as emission taxes and clean capital subsidies, to reduce carbon emissions. However, such policies come with macro-fiscal trade-offs. This policy brief discusses the findings and policy recommendations of the analysis that used an Environmental Dynamic Stochastic General Equilibrium (DSGE) model to examine the macro-fiscal impacts of transitioning to clean energy in the face of climate change.

## Objectives

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This study seeks to empirically assess climate change's impact pathways on fiscal policy and identify optimal fiscal policy options for Uganda using an Environmental DSGE model. The key objectives are:

1. To identify the channels through which climate damages distort fiscal policy effectiveness in Uganda.
2. To evaluate whether climate damage externalities affect inclusive growth.

3. To compare fiscal policy options - including subsidising clean capital, investing in climate adaptation infrastructure, and providing household relief – in mitigating climate damages.
4. To assess whether transitioning to clean energy can help restore fiscal policy effectiveness and resilience.

## Key findings

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Using an Environmental DSGE model calibrated to Uganda's economy:

1. Subsidising clean capital is the most effective policy for cutting emissions and accelerating the clean energy transition, helping meet the 24.7% Nationally Determined Contributions (NDC) target. However, this comes at the cost of reduced economic output, consumption, employment, household welfare, and a worsening fiscal deficit, confirming transition risks.
2. Recycling emission tax revenues to finance climate adaptation (infrastructure resilience and/or flood protection) generates the most favourable macro-fiscal outcomes. It improves output, tax revenue, and fiscal balance, reduces debt accumulation, and raises real wages and household welfare, although it achieves smaller emissions reductions.
3. Lump-sum rebate transfers to households modestly cushion welfare losses but offer limited fiscal or climate mitigation benefits compared to the other two options.

These findings highlight a clear trade-off between macro-fiscal management and clean energy transition objectives. Relying solely on clean energy subsidies without addressing climate-induced damages risks undermining fiscal and economic stability.

## Policy recommendations

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1. Integrate climate policy into macro-fiscal frameworks to balance emission reduction goals with fiscal sustainability.
2. Prioritise using emission tax revenues to finance climate adaptation investments, particularly resilient infrastructure, which offers immediate protection to economic activity while gradually facilitating a clean energy transition.
3. Complement adaptation investments with targeted clean capital subsidies, structured to minimise fiscal risks while preserving the momentum towards NDC targets.
4. Extend Uganda's macroeconomic modelling frameworks to incorporate climate risk analysis for informed fiscal and monetary policy planning.

## Conclusion

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Climate change presents complex fiscal challenges that demand carefully balanced, evidence-based policy responses. Uganda's clean energy transition must proceed alongside strategic adaptation investments to preserve macro-fiscal stability and inclusive growth. Integrating climate considerations into fiscal policy design is essential for safeguarding Uganda's long-term development trajectory.