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Low- and Middle-Income Countries at a Crossroad

Debt, Fossil Fuel Dependence, and the Transition Ahead

By Paula Rosa Haerle, 16th October 2025

Summary

This research investigates how sovereign external debt and fossil fuel dependence reinforce each other in low- and middle-income countries (LMICs), shaping their capacity to transition away from fossil fuels. The study develops the concept of "debt-driven carbon lock-in," demonstrating that debt functions as an active driver of fossil dependence rather than a mere background constraint. I identify five mechanisms through which extraction becomes entrenched: revenue volatility and procyclical borrowing, pre-source borrowing based on overly optimistic projections, fiscal dependence on fossil fuel revenue, debt-financed infrastructure and crowding-out of alternatives. The findings expose a critical gap in global climate governance: fiscal structures, not only political will or technology, determine transition feasibility. Unless debt is addressed, many producer states risk exclusion from the global energy transition, perpetuating both fossil dependence and fiscal distress.

The motivation

Fossil fuel-producing LMICs occupy a pivotal role in global decarbonization. They hold significant fossil fuel reserves which will have to remain underground to meet climate targets, yet their economies are structurally reliant on extraction revenues and possess limited fiscal capacity to diversify. These states are highly exposed to stranded assets, fiscal volatility, and economic dependence on fossil fuel production. However, their specific transition challenges remain underexplored in both academic and policy debates. Notably, the role of sovereign external debt has received little systematic attention, despite its strong influence on fiscal space, political decision-making, and energy strategies. Rising debt levels in the Global South risk intensifying pressures to maintain or expand fossil fuel extraction, creating structural constraints that can lock economies into carbon-intensive pathways.

Approach and methods

The project employs a mixed-methods approach, combining global quantitative mapping with seven expert interviews to investigate how sovereign external debt and fossil fuel dependency interact in LMICs between 2000 and 2021. Drawing on five mechanisms identified in the literature, I constructed two composite indices to measure fossil fuel dependency and sovereign external debt distress. These indices function as heuristic tools to reveal the structural exposure of 31 countries with overlapping vulnerabilities between 2018 and 2021.

Key findings

1. **Debt-Driven Carbon Lock-in:** The study identifies a self-reinforcing trap where sovereign external debt and fossil fuel dependency interact to entrench carbon-intensive development pathways in LMICs. Debt is not incidental to fossil lock-in but actively sustains and reproduces it.
2. **Scale of the Problem:** 31 LMICs are structurally at risk of entrapment, holding 21% of global fossil fuel reserves and over USD 1.3 trillion in external debt.
3. **Global Structures Reinforce Lock-in:** At-risk nations received four times more financing for fossil fuels than for renewables between 2013 and 2022. Legal and financial instruments like Investor-State Dispute Settlement and resource-backed loans bind governments to extraction, making transitions costly.
4. **Fiscal Squeeze:** Debt servicing absorbs around 16% of government revenue, crowding out investment in health, education, and decarbonization. The debt–fossil fuel nexus drives net financial outflows rather than enabling development.
5. **Escalating Risks:** Declining fossil fuel demand and rising climate impacts are set to deepen fiscal crises through stranded assets and disaster-related borrowing, furthering entrapment.

Insights and interpretation

The findings reframe the political economy of decarbonization by revealing sovereign external debt as an active driver of fossil fuel dependency, with clear theoretical and policy implications. First, they challenge transition models that assume fiscal neutrality: if sovereign external debt structures shape extraction, rapid transitions in LMICs cannot be understood without examining fiscal constraints. Debt dynamics must therefore be integrated into carbon lock-in theory and global transition scenarios, which currently underestimate how financial structures entrench fossil dependence.

Second, the global scale of debt-driven lock-in shows this is a structural, not marginal, feature of the international energy economy. The 31 exposed LMICs illustrate how fiscal vulnerability and carbon lock-in are geographically widespread and systematically linked. Standardized transition policies designed for high-income states risk reinforcing asymmetries if applied uncritically.

Third, the findings reveal a governance gap: climate regimes focus on technology and targets but neglect fiscal architectures that push states toward extraction. Without debt relief and fiscal justice as core elements of climate policy, efforts to "leave fossil fuels underground" will remain structurally constrained.

Recommendations

1.Integrate debt into transition planning: Climate and energy strategies must account for sovereign debt dynamics. Ignoring fiscal constraints risks excluding debt-stressed LMICs from decarbonization.

2.Scale up transition finance for fossil fuel-dependent LMICs: Provide credible, well-financed alternatives to extraction. Transition policies must support producers to achieve clean energy targets, rather than working against them.

3.Recognize and redress Global North responsibility: Global North states and financiers drove and profited from fiscal and fossil fuel dependencies; they must now bear their share of dismantling costs.

4.Reframe equity around phase-out costs: Equitable transitions should focus on fairly sharing the costs of phasing out production and stranded assets, especially for countries in fiscal distress, not just allocating remaining carbon budgets or benefits.

5. Place fiscal justice core climate policy: Addressing fiscal pressures through large-scale debt relief, restructuring, and concessional finance must be central to transition strategies. Legal and financial mechanisms related to debt-financed fossil fuel infrastructure need to be reformed to avoid entrenching extraction.

6.Strengthen interdisciplinary research: Link fiscal and energy transition analysis to refine carbon lock-in theory and develop effective, context-sensitive policy tools.

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