

UNEQUAL BURDENS: HOW FOSSIL FUEL PRICE SHOCKS AFFECT MACROECONOMY, SECTORS, AND HOUSEHOLDS IN BANGLADESH

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1. Background and Rationale

Bangladesh is one of South Asia's fastest-growing economies. However, its growth relies heavily on imported fossil fuels. Natural gas makes up 44.09% of electricity generation. Coal accounts for 26.72%, and oil for 10.73%. Renewable energy contributes just 2.26% of the total power mix. The nation's dependence on imported primary energy jumped from 47.7% in FY2020–21 to 62.5% in FY2024–25. This rise leaves the economy more exposed to global energy market volatility. The 2022 global energy crisis highlighted this vulnerability. The Russia–Ukraine war caused LNG and oil prices to surge. Bangladesh had to pause spot LNG purchases and endured widespread, prolonged power outages. These outages disrupted industrial production, daily life, and economic activities across the country.

Global fossil fuel markets are inherently volatile. Geopolitical tensions, supply disruptions, OPEC decisions, and energy transition issues drive this volatility. Bangladesh has limited domestic energy reserves and a large low-income population. Its industrial base depends strongly on exports. For Bangladesh, price swings are not just an energy issue but a major macroeconomic and social challenge. Higher energy import costs inflate production costs, weaken the exchange rate, reduce household purchasing power, and strain public finances. The poorest and most vulnerable suffer the most. Despite growing energy import dependence, Bangladesh lacks rigorous, evidence-based analysis of how global fossil fuel shocks affect the domestic economy.

2. Objectives

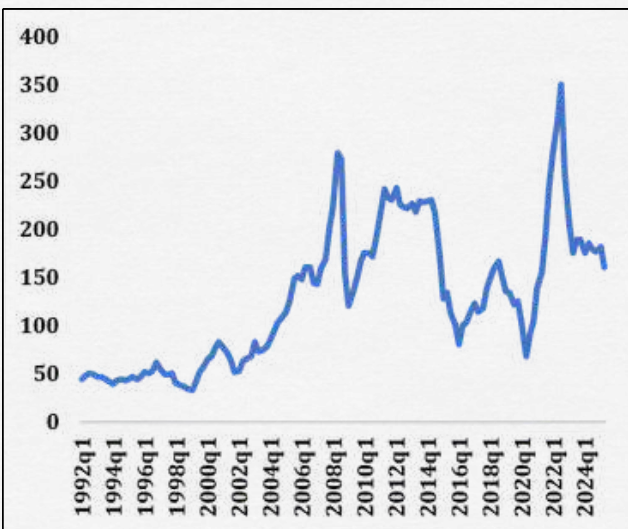
The study has three aims. First, to assess the macroeconomic effects of global fossil fuel price shocks on Bangladesh. These include impacts on GDP, inflation, exchange rate, exports, imports, and terms of trade. Second, to examine sectoral impacts across 86 production sectors. The goal is to find which industries suffer most and which ones may benefit. Third, to analyze welfare changes for households by income level, location (rural and urban), and farm or nonfarm status.

3. Global Energy Price Volatility and Bangladesh's Energy Import Dependence

Bangladesh's growing vulnerability to global fossil fuel price shocks is deeply rooted in its structural dependence on imported energy. Global fossil fuel markets have experienced sharp and frequent price fluctuations in recent years (Figure 1), driven by geopolitical tensions, supply disruptions, and shifting demand patterns. For an import-dependent economy like Bangladesh, this volatility poses serious risks to energy security and macroeconomic stability. Bangladesh's total energy imports rose dramatically over the past two decades, increasing from around 138,000 TJ in the early 2000s to over 1,025,000 TJ in 2022, more than doubling between 2017 and 2022 alone (Figure 2). While crude oil imports remained relatively stable during this period (Figure 3), the surge was largely driven by rapidly growing imports-

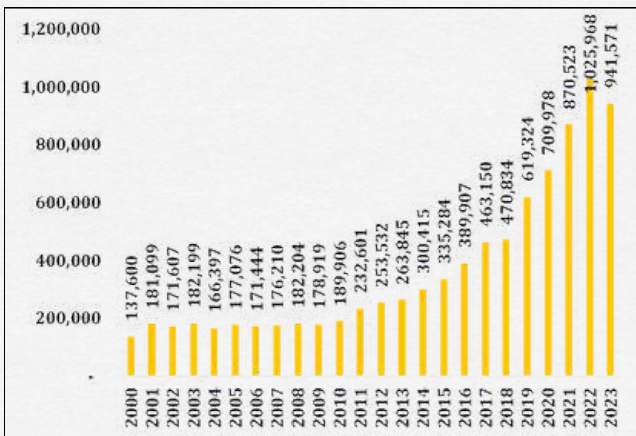
of liquefied natural gas (LNG) and coal, both increasingly used for power generation and industrial activity. LNG imports expanded sharply after 2019, reflecting Bangladesh's structural shift away from declining domestic gas reserves toward imported gas (Figure 4). Coal imports also rose steeply, reaching 148,627 TJ in 2023, as large coal-fired power plants came online (Figure 5). Together, these trends highlight that Bangladesh's exposure to global energy price volatility now extends well beyond oil markets, encompassing gas and coal as well. This makes the economy increasingly susceptible to sudden price spikes, such as those triggered by the 2022 Russia-Ukraine war, and highlights the urgent need for energy diversification, domestic resource development, and expanded renewable energy capacity.

Figure 1: Trends in Global Energy Price Index



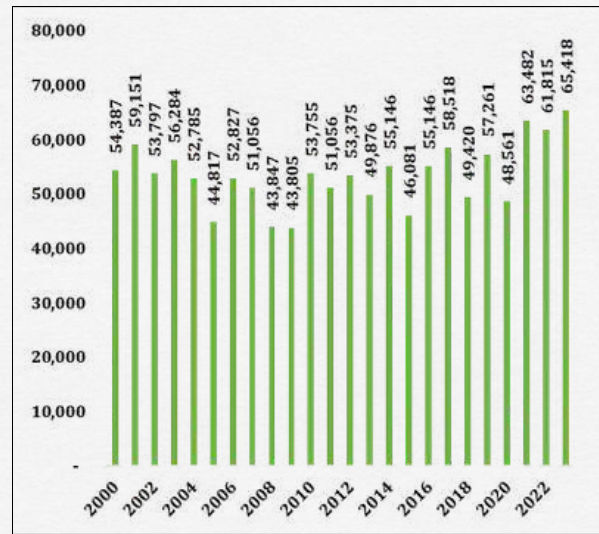
Source: International Monetary Fund

Figure 2: Total Energy Imports (in TJ) from 2000-2023



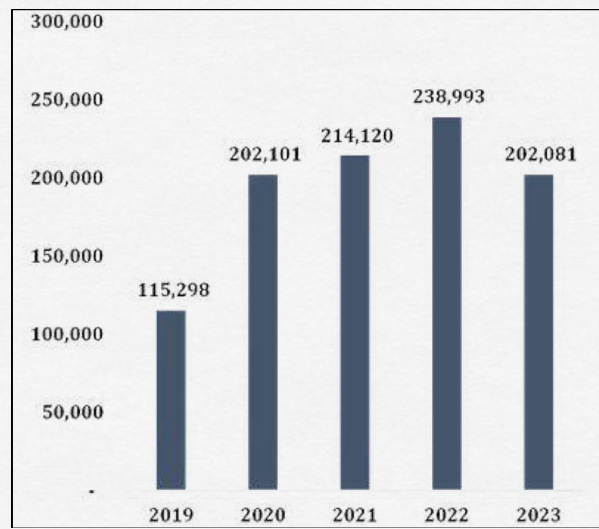
Source: International Energy Agency

Figure 3: Change in Real Exchange Rate from the Base Value (%)



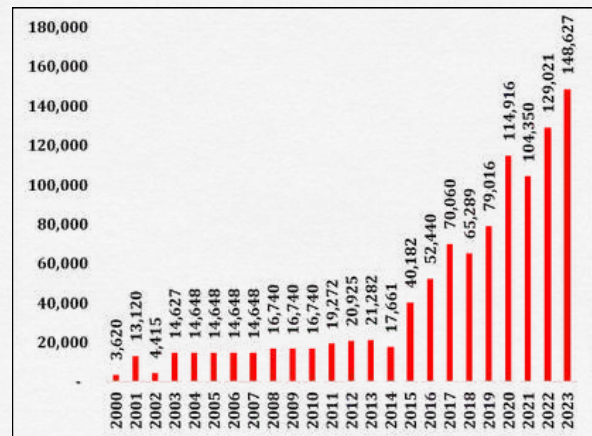
Source: International Energy Agency

Figure 4: LNG Imports (in TJ) from 2019 to 2023



Source: International Energy Agency

Figure 5: Coal Imports (In TJ) from 2000 to 2023



Source: International Energy Agency

4. Methodology and Simulation Design

This study uses a single-country, static Computable General Equilibrium (CGE) model. The model follows the IFPRI standard framework (Lofgren et al., 2002). It helps track how global fossil-fuel price shocks move through the economy. The CGE method captures interactions between production sectors, factor markets, households, government, and the rest of the world. This approach provides a broad view of both overall and distributional effects. It does more than partial equilibrium methods, which have a narrower focus.

The model uses the 2022 Bangladesh Social Accounting Matrix (SAM). This database covers 86 production sectors, 13 factor categories, and 15 household groups. Households are split by income, location (urban or rural), and whether they are farm or nonfarm families. This detailed setup lets the analysis follow the chain of economic effects. It traces changes from global energy prices through to domestic costs, incomes, and household welfare.

Three distinct scenarios are constructed to capture varying magnitudes and durations of global energy price shocks, based on observed market data (Table 1). Each scenario specifies the severity (mild, moderate, or severe), duration (short-term or sustained), and the types of fuels impacted, thereby illustrating possible pathways by which global energy price changes could affect Bangladesh's economy and households.

Table 1: Simulation Scenarios

Scenario	Crude Oil	Natural Gas	Coal
STEP	+39.15%	+102.32%	+143.28%
MTEP	+22.39%	+39.65%	+23.92%
LTEP	+3.83%	+4.29%	+6.64%

Note: Short-Term Energy Price (STEP) shocks reflect the 2022 Russia–Ukraine price surge. Medium-Term Energy Price (MTEP) shocks capture the persistence of elevated prices in 2024 vs. 2019. Long-Term Energy Price (LTEP) shocks represent average annual growth in global fossil fuel prices over 2015–2025.

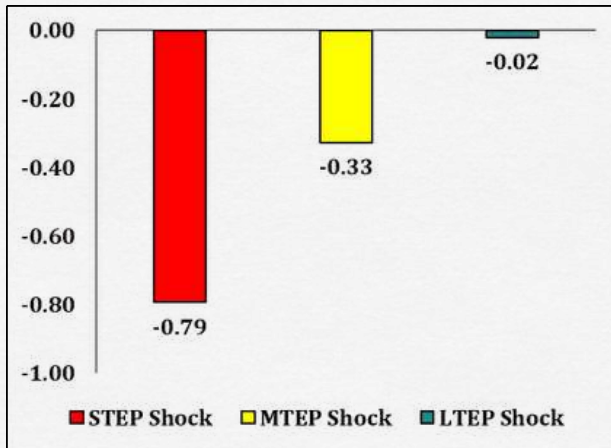
5. Simulation Results

5.1 Macroeconomic Impacts

Global fossil fuel price shocks generate significant and wide-ranging macroeconomic disruptions in Bangladesh. The severity of these impacts is closely tied to the magnitude and duration of the price increase. In the most acute scenario, the Short-Term Energy Price (STEP) shock, GDP contracts by 0.79% (Figure 6). This scenario reflects the 2022 Russia–Ukraine war price surge. Higher intermediate input costs compress output across production sectors, reduce real household incomes, and dampen consumption demand. The Consumer Price Index rises by 1.19%, showing the immediate pass-through of energy costs to consumer prices (Figure 7). The real exchange rate depreciates sharply by 5.28% (Figure 8). The terms of trade deteriorate by 6.99%, signaling a marked worsening of Bangladesh's external price position (Figure 9). Despite these pressures, exports increase modestly by 0.44% as real exchange rate depreciation generates a competitiveness effect. Imports contract by 3.97%, reflecting compressed domestic demand. Under the Medium-Term Energy Price (MTEP) shock, these disruptions moderate substantially. GDP declines by a more modest 0.45%. CPI rises by 0.68%.

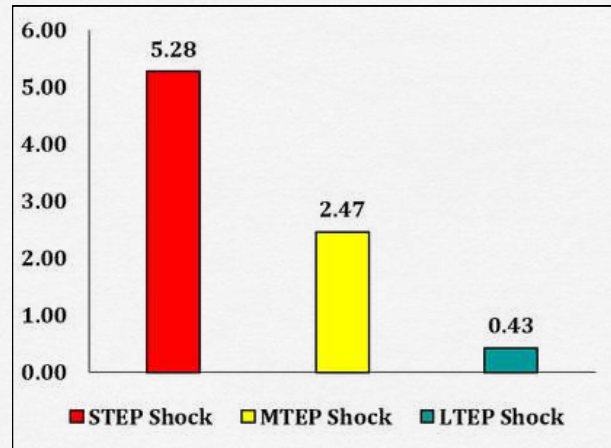
Trade and exchange rate pressures ease considerably. Under the Long-Term Energy Price (LTEP) shock, macroeconomic impacts are largely negligible. This confirms that Bangladesh's economy can absorb gradual and persistent energy price increases over the long run, while remaining acutely vulnerable to sudden, large price spikes like those witnessed in 2022.

Figure 6: Change in Real GDP from the Base Value (%)



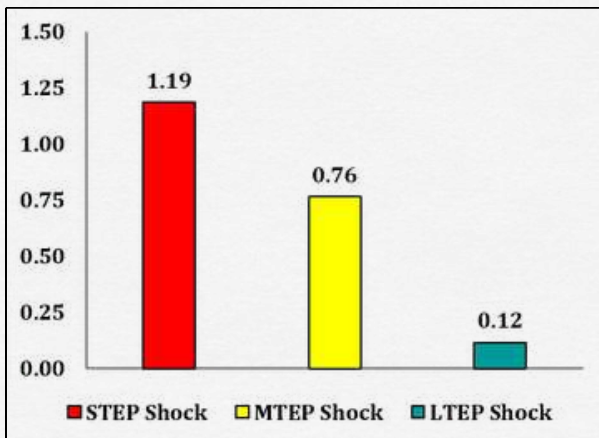
Source: Static CGE Model Simulation

Figure 8: Change in Real Exchange Rate from the Base Value (%)



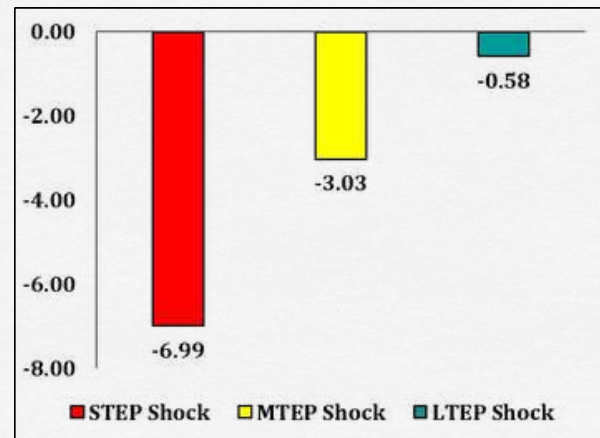
Source: Static CGE Model Simulation

Figure 7: Change in Consumer Price Index from the Base Value (%)



Source: Static CGE Model Simulation

Figure 9: Change in Terms-Of-Trade from the Base Value (%)



Source: Static CGE Model Simulation

5.2 Sectoral Impacts

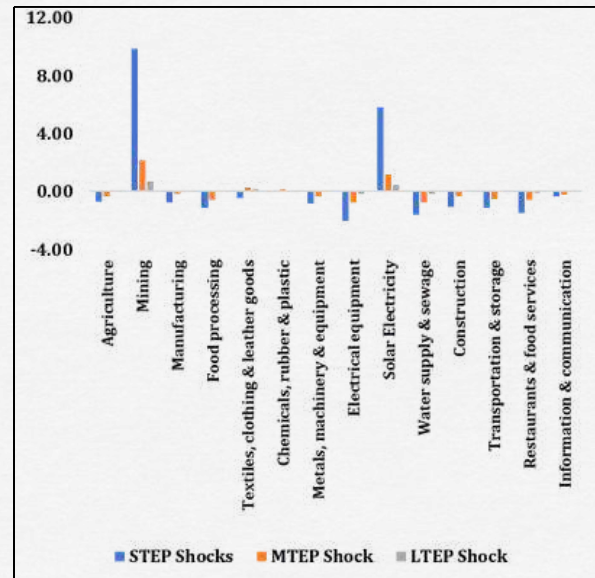
Global fossil fuel price shocks affect Bangladesh's productive sectors asymmetrically, creating a clear divide between energy-producing sectors, such as mining (coal, crude oil, natural gas extraction) and solar electricity, and energy-intensive sectors, such as electrical equipment, water supply and sewage, restaurants and food services, food processing, transportation and storage, and construction (Figure 10). While energy-producing sectors expand under the Short-Term Energy Price (STEP) shock—mining by 9.86% and solar electricity by 5.80%—energy-intensive sectors contract, with the largest declines seen in electrical equipment (-2.04%), water supply and sewage (-1.62%), restaurants and food services (-1.46%), food processing (-1.12%), transportation and storage (-1.09%), and construction (-1.04%). Higher global fossil fuel prices translate into higher domestic value for fossil fuel production and improve the competitiveness of

a renewables, signaling a shift in Bangladesh's energy transition agenda. Agriculture also contracts by 0.69% due to higher costs for irrigation, mechanization, and fertilizers. The textiles, clothing, and leather goods subsector—Bangladesh's dominant export—shrinks by 0.47% in the short term but returns to positive growth in the medium and long term as exchange rate depreciation restores export competitiveness. As the severity of energy price shocks diminishes over time, the sectoral impacts moderate under the Medium-Term Energy Price (MTEP) shock, and most sectors return to baseline under the Long-Term Energy Price (LTEP) shock. This highlights that sudden price surges, rather than gradual increases, pose the greatest threat to Bangladesh's productive structure.

4.3 Household Welfare Impacts

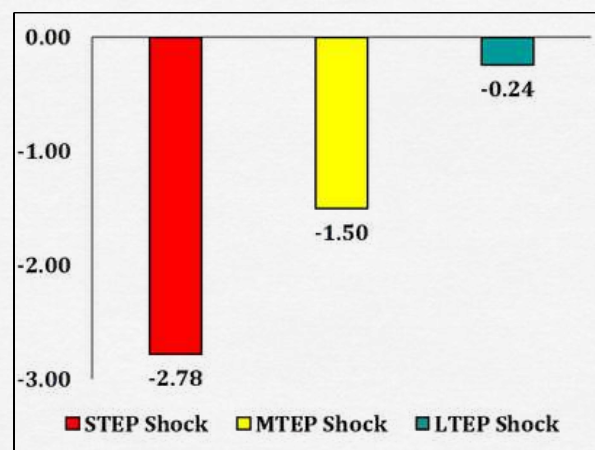
Global fossil-fuel price shocks generate significant, regressive welfare losses for Bangladeshi households. Poorer, rural, and farm households bear a disproportionately large burden compared to their wealthier, urban counterparts. Under the Short-Term Energy Price (STEP) shock, aggregate real household income declines by 2.78% (Figure 11). Real consumption falls by 1.91% (Figure 15). This reflects compressed factor incomes, rising consumer prices, and reduced economic activity across production sectors. The distributional pattern of income losses is strikingly regressive. The poorest households in Quintile 1 experience the largest real income decline, at 2.91% (Figure 12). By contrast, the richest households in Quintile 5 experience a 2.73% decline. This confirms that energy price shocks disproportionately erode the incomes of those least able to absorb them. The pattern for real consumption losses differs slightly. Higher-income households experience marginally larger consumption declines: 2.09% for Quintile 5 versus 1.64% for Quintile 1 (Figure 16). This reflects their greater expenditure on energy-intensive goods and services. Geographic and occupational disaggregation further reveals that rural households experience greater welfare losses than urban households.

Figure 10: Change in Sectoral GDP from the base value (%)



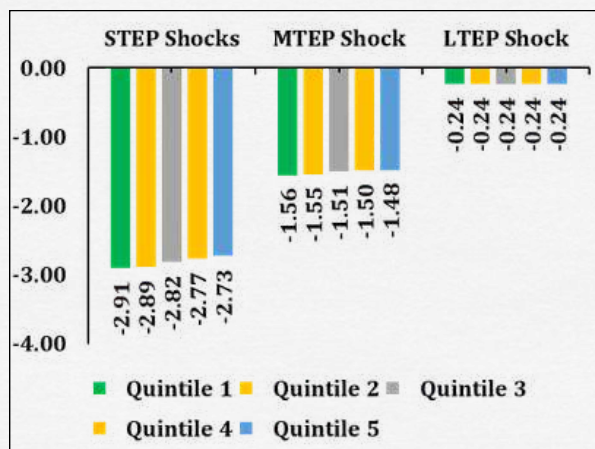
Source: Static CGE Model Simulation

Figure 11: Change in Households' Real Income from the Base Value (%)



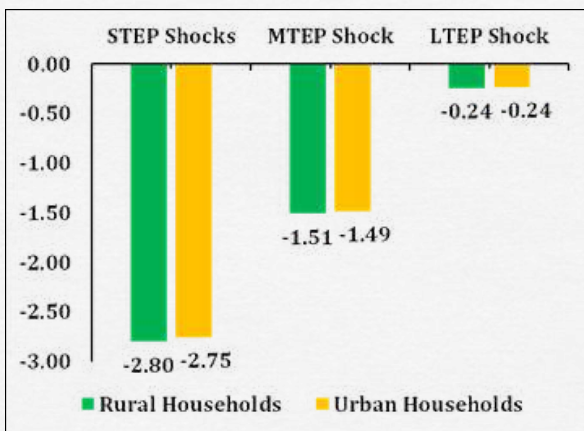
Source: Static CGE Model Simulation

Figure 12: Change in Households' Real Income by Quintile (%)



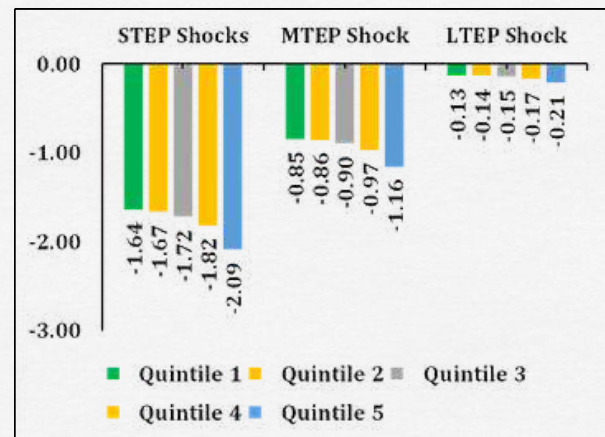
Source: Static CGE Model Simulation

Figure 13: Change in Households' Real Income by Region from the Base Value (%)



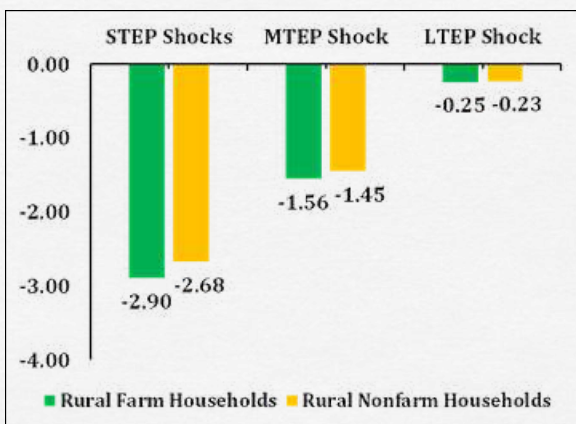
Source: Static CGE Model Simulation

Figure 16: Change in Households' Real Consumption by Quintile from the Base Value (%)



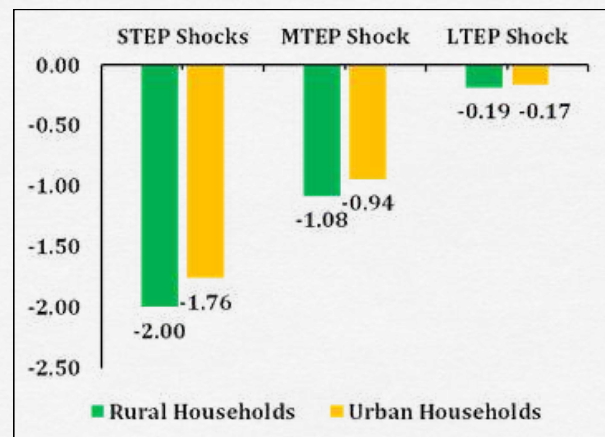
Source: Static CGE Model Simulation

Figure 14: Change in Rural Households' Real Income by Farm versus Nonfarm Status from the Base Value (%)



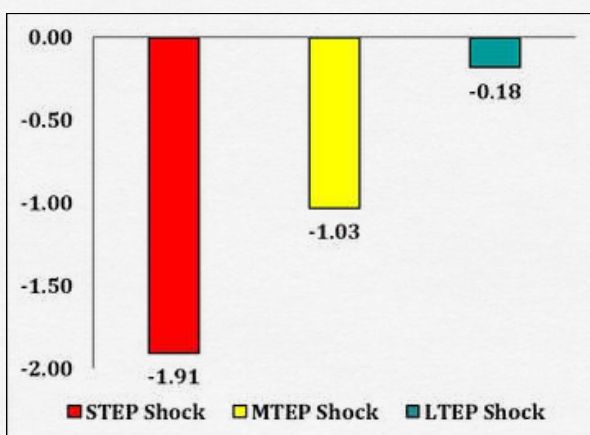
Source: Static CGE Model Simulation

Figure 17: Change in Households' Real Consumption by Region from the Base Value (%)



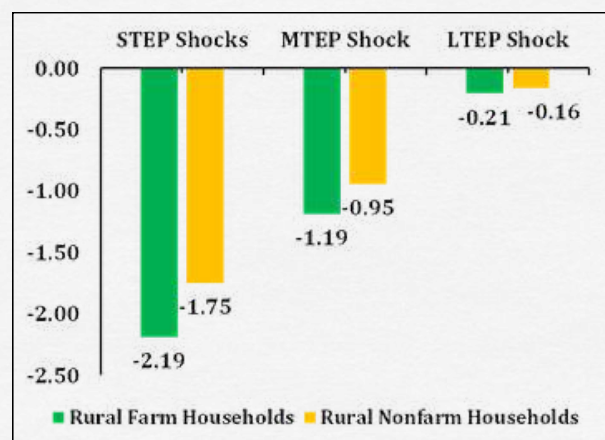
Source: Static CGE Model Simulation

Figure 15: Change in Households' Real Consumption from the Base Value (%)



Source: Static CGE Model Simulation

Figure 18: Change in Rural Households' Real Consumption by Farm versus Nonfarm from the Base



Source: Static CGE Model Simulation

The figures are -2.80 versus -2.75 for income (Figure 13) and -2.00 versus -1.76 for consumption (Figure 17). Moreover, rural farm households consistently experience larger welfare losses than rural nonfarm households. The figures are -2.90% versus -2.68% for income (Figure 14), and -2.19% versus -1.75% for consumption (Figure 18). These differences are driven by greater exposure to agricultural input costs, fuel prices, and energy-dependent production processes. Welfare disparities narrow considerably under the Medium-Term Energy Price (MTEP) shock. They largely converge across household groups in response to the Long-Term Energy Price (LTEP) shock. However, rural and farm households remain structurally more exposed across all time horizons. This underscores the need for targeted and differentiated welfare protection measures in Bangladesh's policy response to global energy price volatility.

5. Policy Recommendations

The findings call for proactive, coordinated, and time-sensitive policy interventions structured across three dimensions:

1. Macroeconomic Policies

- **Coordinated Inflation & Growth Stabilization:** Bangladesh Bank should adopt calibrated monetary tightening to contain second-round inflation from energy pass-through. At the same time, the Ministry of Finance deploys temporary counter-cyclical fiscal relief, designed as time-limited interventions that phase out as MTEP-level effects diminish.
- **Exchange Rate & External Balance Management:** Allow controlled exchange rate flexibility to support export competitiveness (simulation confirms +0.44% export gain under STEP from depreciation). Maintain adequate foreign exchange reserves and diversify energy import sources through long-term supply contracts and expanded strategic petroleum reserves.
- **Energy Transition Fund:** Establish a dedicated fund financed through redirected fossil fuel subsidies, green bonds, and climate finance to accelerate solar and renewable investment, justified by the solar sector's 5.80% expansion under STEP, confirming renewable energy as a natural hedge against fossil fuel price volatility.

2. Sectoral Policies

- **Sectoral Energy Shock Relief Facility:** Provide time-limited concessional credit, temporary energy tariff relief, and expedited imports of energy-efficient equipment for the most affected sectors (electrical equipment, food processing, water supply, transport, agriculture), conditional on energy efficiency commitments to avoid long-term subsidy dependence.
- **Energy Efficiency & Industrial Modernization Program:** Partner with BIDA and industry associations to offer tax incentives, investment grants, and subsidized technical assistance for energy-saving technologies and cleaner production. Shift agriculture toward solar-powered irrigation to reduce exposure to shocks in fossil fuel input costs.
- **Textile & RMG Sector Support:** Provide targeted export facilitation, temporary energy tariff reductions, and green certification incentives during the short-term adjustment window, accelerating the simulation-confirmed medium-term recovery of Bangladesh's dominant export sector.
- **Sovereign Energy Stabilization Fund:** Capture windfall revenues from the mining sector's expansion (+9.86% under STEP) through royalties and windfall profit taxes, channeled into a fiscal buffer fund for future shock mitigation.

- **Fuel Cost Stabilization Mechanism for Transport:** Introduce an automatic freight fuel subsidy or tax rebate triggered by defined oil price thresholds, and accelerate investment in rail, inland waterways, and mass transit to reduce petroleum-dependent logistics structurally.

3. Household Welfare Policies

- **Automatic Social Protection Stabilizer:** Institutionalize a pre-designed cash transfer mechanism - triggered automatically when global fossil fuel prices exceed a defined threshold, channeling enhanced transfers to Quintile 1 and Quintile 2 households through existing social safety net infrastructure before welfare impacts fully materialize.
- **Targeted Food Assistance for Rural Farm Households:** Expand the Open Market Sales (OMS) program and Vulnerable Group Feeding (VGF) scheme in rural agricultural districts during price shock episodes, explicitly prioritizing the bottom two income quintiles who face the compound burden of higher input costs and reduced incomes.

- **Energy Affordability Support:** Reform the lifeline electricity tariff to provide meaningful subsidies for bottom-quintile households, cross-subsidized by higher-income users. Introduce a targeted LPG voucher scheme for rural households reliant on fossil-fuel cooking.
- **Rural Skills Development & Income Diversification:** Scale up vocational training, rural enterprise finance, and digital financial services to facilitate farm household transition into nonfarm income — consistent with the simulation finding that rural nonfarm households experience smaller welfare losses than farm households.
- **Long-Term Energy Poverty Reduction Strategy:** Develop a national strategy combining subsidized solar home systems, clean cooking solutions, and community renewable energy infrastructure — simultaneously reducing energy poverty, lowering fossil fuel exposure, and supporting Bangladesh's climate commitments.

*This policy brief has been prepared based on the report titled "Economy-wide Effects of Fossil Fuel Price Shocks on Macro, Sectoral and Household Welfare." available at:
<https://sanemnet.org/economy-wide-effects-of-fossil-fuel-price-shocks-on-macro-sectoral-and-household-welfare/>*

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