

Implications of the Net Zero Transition Scenarios on SDG Indicators: Linking Global Energy System, CGE and Atmospheric Source-receptor Models

Topic: CGE and Econometric Input-output Modelling (1)

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This study contributes to a better understanding of synergies and trade-offs between climate mitigation and sustainable development goals, covering 17 indicators across various SDGs. Our assessment employs a multi-model framework, which includes a global computable general equilibrium model (ENVISAGE), an energy system model (KINESYS) and an atmospheric source-receptor model (TM5-FASST). This combination of modeling tools allows us to provide a detailed representation of the energy-related SDG indicators while accounting for their interactions with climate mitigation and socio-economic dimensions. We find that out of 17 analyzed SDG indicators, seven experience co-benefits from implementing mitigation efforts (including improved environmental footprints, energy efficiency and clean energy), six SDG indicators are subject to trade-offs (energy and food affordability, economic growth and labor participation), while the remaining four SDG indicators show mixed trends (distributional aspects and energy diversity). The identified trade-offs could be substantially reduced through specific policy solutions. We find that if the revenue collected from carbon pricing is recycled via reductions in factor taxes in selected low-carbon activities, as opposed to lump-sum payments to households, 11 out of 13 SDG dimensions analyzed in this regard would improve—reducing energy prices, increasing the share of renewable energy, improving distributional outcomes and decreasing welfare losses. In addition, we showcase the need for properly capturing interactions across various SDG dimensions by monetizing the co-benefits from improved air quality. We find that such co-benefits outweigh mitigation costs by more than a factor of two, thus changing trade-offs earlier identified for the case of economic growth into synergies. A higher ratio of air quality co-benefits relative to mitigation costs observed for developing countries could also lead to reductions in between-country inequality.