



United Nations  
Climate Change

# 2025 case studies Comprehensive overview

Seven studies · Five UN regions · Four methodologies

UNFCCC Secretariat



# Seven Case Studies at a Glance

#	Region	Country / Entity	Policy Focus	Method	Core Question
1	Africa	Botswana, DRC, Eswatini, Ghana	NDC energy deployment; local content requirements	JEDI Input-Output	What jobs & GDP does the energy transition deliver if local content is maximised?
2	Latin America & Caribbean	Brazil	Agricultural credit policy (Plano Safra)	Econometric Data analysis	Does rural credit drive deforestation or can its design enable just transition?
3	Asia-Pacific	India	Destination-based carbon pricing by trading partners	CGE — GLOBE model	How do external carbon measures affect exports, GDP and wages?
4	Africa	Ghana	Economy-wide NDC pathways; BCA, Article 6, EU deforestation reg.	CGE — Global & country model	Distributional impacts of Ghana's NDC goals while managing trade exposure and just transition?
5	Africa	Nigeria	Economic diversification integrated with climate policy	Dynamic CGE + policy analysis	How can diversification and climate policy reinforce each other?
6	Asia-Pacific	Lao PDR	Energy sector low-emission scenario (NDC)	Mixed methods (quant + qualitative)	What are the costs, benefits and distributional impacts of NDC energy measures?
7	Europe	European Union	Employment impacts of clean transition policies	Ex-post empirical synthesis	Which clean transition policies create or displace jobs, and for whom?

# Sectoral Coverage: Policy Domains Covered

## Energy Transition & Low-Emission Development

Africa (regional), Ghana, Lao PDR

## Cross-Border Measures (BCA, Article 6, Carbon Pricing)

Ghana, India

## Employment & Just Transition

EU, Africa (regional), Nigeria, Ghana

## Economic Diversification & Structural Transformation

Nigeria, Lao PDR

## Agriculture, Land Use & Rural Finance

Brazil

## Trade Competitiveness & Industrial Policy

India, Ghana

# Methodological Approaches — Comparative View

## CGE Modelling

Economy-wide

India · Ghana · Nigeria

### Strength:

Captures systemic links across sectors, trade, GDP, wages and household welfare simultaneously

## Econometric analysis

Evidence-based

Brazil · EU

### Strength:

Causal identification from real administrative data; reveals actual outcomes vs. projections

## JEDI Input-Output

Jobs & GDP

Africa (4 countries)

### Strength:

Direct, indirect and induced multiplier effects of energy investments; job quality and wage metrics by technology

## Mixed Methods & Synthesis

Accessible

Lao PDR

### Strength:

Combines GHG accounting, cost-benefit and qualitative stakeholder engagement; captures distributional effects

# EU: Employment Impacts of Clean Transition Policies

Ex-post empirical synthesis of quasi-experimental and econometric studies | European Commission DG CLIMA | UN Region: Europe

## Context

The EU has an advanced clean transition architecture: Green Deal, EU ETS, Fit for 55, Just Transition Fund, Social Climate Fund. The study synthesises ex-post empirical evidence on how the full portfolio of clean transition policies — carbon pricing, renewables support, efficiency standards, environmental regulation, subsidy reform — actually affects employment across sectors, regions and worker groups.

## Method

Systematic synthesis of quasi-experimental and econometric studies assessing employment effects of EU clean transition policies. Methods include difference-in-differences, regression discontinuity, propensity score matching and CGE/IO models. Policies covered: EU ETS, carbon/environmental taxes, renewable deployment (FiTs, subsidies), eco-innovation, energy price changes, phasing out of subsidies, biodiversity restoration, policy-mix interactions.

## Findings

- 1 EU ETS reduced emissions substantially while leaving aggregate employment largely unaffected — decarbonisation achieved at low employment cost
- 2 Renewable energy deployment is a net job creator: EU transition to renewables generated ~530,000 net jobs, but distribution is highly uneven across member states
- 3 Adjustment pressures are concentrated in specific sectors (coal, utilities), regions (industrial communities) and worker groups (low-skilled, male workers) — aggregate figures mask distributional reality; negative impacts on employment fade away within 7 years
- 4 Revenue recycling from carbon pricing is decisive: channelling revenues into labour tax reductions and reskilling programmes transforms distributional outcomes

**Key lesson:** Clean transition achieves environmental goals with limited aggregate employment cost — but policy design determines who bears adjustment costs. Revenue recycling, reskilling and Just Transition support are not optional add-ons; they are essential.

# Brazil: Agricultural Credit & Just Transition

Econometric Data Analysis | UFRJ / UFF | UN Region: Latin America & Caribbean

## Context

Credit program (Plano Safra) provides approximately USD 80 billion/year in agricultural credit — Brazil's main policy instrument for agriculture (~27% of GDP). Agriculture and land-use sectors account for ~75% of Brazil's GHG emissions. The study asks: does rural credit drive deforestation and emissions, or can credit design enable just transition?

## Method

Municipal-level panel data (2013–2024) combining rural credit allocation data with GHG emissions, land-use and agricultural productivity indicators. Fixed-effects model for causal identification. Distinguishes livestock vs. crop credit. Assesses distributional impacts on smallholder vs. large-landholder access.

## Findings

- 1 A 10% increase in rural credit is associated with a 0.022% decrease in forest cover — credit design directly shapes deforestation
- 2 A 50% credit reduction would avoid ~0.8 million ha of deforestation annually and reduce GHG emissions by ~18 MtCO<sub>2</sub>e/year
- 3 Livestock credit has disproportionately large emissions and deforestation impact — 75% of Brazil's agricultural emissions from livestock activities
- 4 Smallholder and family farmers are most vulnerable to credit reductions — equitable distribution design is critical for just transition

**Key lesson:** Credit instrument design matters enormously: shifting from livestock to sustainable crop credit can simultaneously deliver climate and livelihood goals without cutting overall credit volumes.

# India: Destination-Based Carbon Pricing — Impacts & Incentives

CGE — GLOBE Model | 21 regions · 35 sectors | UN Region: Asia-Pacific

## Context

India has significant trade exposure in carbon-intensive sectors. G6 trading partners (US, EU, UK, Canada, Australia, Japan) are introducing destination-based carbon pricing. Key sectors at risk: iron and steel, non-ferrous metals, petroleum products, chemicals and paper. The study assesses both the incentives and negative impacts created for early domestic action.

## Method

GLOBE recursive-dynamic global CGE model calibrated to GTAP-Power v11 (21 regions, 35 sectors). Four scenarios analysed to 2040: Status quo (India does not act), Late comer, First mover (India decarbonises proactively), Global action. Models carbon price convergence, renewable energy investment and steel sector transformation.

## Findings

- 1 Status quo (India does not decarbonise): worst outcome — adverse impacts on both exports AND GDP from carbon border measures
- 2 First mover scenario (India decarbonises proactively): negative BCA effects substantially offset by competitiveness gains and domestic growth
- 3 Early action on iron and steel + renewable investment transforms carbon border measures from a threat into a competitive advantage
- 4 Dynamic analysis is essential: static models significantly can underestimate India's adaptive response and transition opportunity

**Key lesson:** External carbon measures create both losses AND incentives for early domestic action. Proactive decarbonisation is India's optimal strategic response to G6 carbon border measures.

# Ghana: Economy-Wide NDC Pathways & International Response Measures

CGE (domestic + global model) | Elevate Economics / Universität Hohenheim | UN Region: Africa

## Context

Domestic NDC implementation — (64 MtCO<sub>2</sub>e reductions by 2030, growing electricity demand, gas and hydro-dominated mix) AND external response measures from trading partners — Border Carbon Adjustments, Article 6 carbon markets, and Deforestation Regulation affecting cocoa exports.

## Method

Two-model approach: (1) Domestic NDC: single-country CGE (GLOBE-SINGLE/CPIA-Ghana) for economy-wide NDC policy assessment. (2) International measures: global CGE (CPIA-GEM Africa) for BCA scenarios (5 variations), Article 6 carbon market mechanisms and potential EU Deforestation Regulation impacts on cocoa and smallholder farmers.

## Findings

- 1 Expanding renewable electricity without complementary demand-shift policies produces limited sustained emission reductions due to market rebound effects — cheaper electricity raises demand
- 2 DR- cocoa export volumes fall ~5% but export values rise as higher prices more than offset volume decline; rural households benefit from higher returns to labour and land; poverty rate falls slightly; labour income share in GDP increases
- 3 Article 6 Africa emerges as a net exporter of carbon credits generating 0.1–0.3% of government income; traded quantities represent a large share of fossil emissions in many African countries, indicating a non-negligible impact on their remaining mitigation space for future NDCs
- 4 BCA overall macro impact on Ghana is very small; final demand shows a slight positive trend from higher household income; some sectors (machinery, food) expand exports; recognition of domestic carbon policies in BCA rates significantly reduces negative impacts

**Key lesson** External measures bring both challenges and opportunities, they create adjustment pressures but also generate positive distributional outcomes for rural and lower-income households; Article 6 can generate fiscal revenues. Capturing the gains while managing the costs requires proactive domestic policy design and institutional capacity

# Nigeria: Economic Diversification & Climate Policy Integration

Dynamic CGE + Policy Analysis | GIZ 2 | UN Region: Africa

## Context

Nigeria is Africa's largest economy with a nominal GDP of ~USD 252 billion (2024). The economy remains highly concentrated around hydrocarbons: crude oil accounts for ~90% of exports and ~65% of government revenue. Development gaps persist — 40% of Nigerians lack electricity access. The study examines how integrating economic diversification with climate objectives can place Nigeria on a more resilient, job-rich growth path.

## Method

Dynamic CGE model calibrated to Nigeria's rebased macroeconomic statistics, aligned with SSP2 trajectories. Baseline incorporates stakeholder views on crude oil production, electricity mix and subsidy evolution. Three cumulative diversification scenarios (Cautious, Bold, Structural Reform) layered from 2026 onward. Impacts reported as deviations from baseline.

## Findings

- 1 Cautious reform (tax reform + subsidy removal + investment): GDP ~5% above baseline by 2050; employment and welfare improve vs. reform-only
- 2 Bold reform (Cautious + 80% revenue recycled to investment + 30% renewables by 2050): GDP ~7.1% above baseline; stronger wages and exports
- 3 Structural reform (100% revenue to investment + 50% renewables + deeper productivity): GDP +8.5%, exports +27.5%, emissions -10% vs. baseline
- 4 Economic diversification and climate integration are complementary, not in conflict — non-hydrocarbon investment absorbs workers and grows the economy

**Key lesson:** The most credible pathway couples fiscal reform with targeted non-hydrocarbon investment, productivity upgrades, and gradual renewables deployment. The cost of inaction is visible in the baseline.

# Lao PDR: Mixed Methods for NDC & Low-Emission Scenario Assessment

Mixed methods (GACMO + indicator-based + qualitative) | Center for Climate Strategies | UN Region: Asia-Pacific

## Context

Lao PDR is a small, landlocked developing country with limited data availability, institutional capacity and resources for impact assessment. Power sector dominated by hydropower (80% of generation exported to neighbours); coal plant Sepon for domestic supply. NDC targets net zero GHG by 2050. Study assesses 15 energy sector response measures across supply, buildings, transport, industry and waste.

## Method

Three-component mixed approach: (1) Quantitative GHG accounting and investment cost estimation using GACMO (Excel-based, IPCC-consistent, free tool); (2) Indicator-based assessment of macroeconomic growth and employment impacts across 6 indicators; (3) Proposed qualitative methodology for distributional impact assessment across population groups. Designed for replicability in data-limited contexts.

## Findings

- 1 Full implementation of the low-emission scenario reduces GHG emissions by 85% by 2050 (from 64 to 14 MMt CO<sub>2</sub>e) with net annual savings of USD 4.5 billion by 2050
- 2 Upfront investment of USD 24 billion required vs. BAU — but costs are spread over implementation period, facilitating government planning
- 3 Rural and poor households face higher upfront energy transition costs — explicit social protection and distributional design is essential
- 4 Mixed methodology enables robust assessment despite data constraints — directly replicable in other developing countries with limited modelling capacity

**Key lesson:** Mixed methods are not a compromise — they are superior for developing countries. Robust impact assessment with distributional analysis is achievable without large-scale modelling infrastructure.

# Africa: Energy Transition — Economy & Jobs

JEDI Input-Output Model | NREL/UNECA/ACF | UN Region: Africa

## Context

Africa's electricity demand is projected to grow 75% by 2030 (from 680 to 1,180 TWh). Four countries were selected to represent the continent's diversity: Botswana (mineral-dependent, coal-dominated), DRC (hydro-rich, 19% electricity access), Eswatini (90% electricity imported), and Ghana (diversified mix, gas and hydro). All have NDC energy targets.

## Method

JEDI Model (NREL) — input-output framework measuring direct, indirect and induced economic multiplier effects of energy investments. Two scenarios: 30% local content requirement (LCR — current level) and 60% LCR (ambitious). Outputs: FTE jobs, earnings (wage quality proxy), GDP and local value added across construction and O&M phases.

## Findings

- 1 Doubling local content (30% → 60%) increases jobs and GDP by ~30–35% — local content policy design is as decisive as technology choice
- 2 Renewables deliver significantly higher wage quality than coal: \$506/MW for solar PV vs \$74/MW for coal — transition improves job quality
- 3 DRC: vast hydropower potential carries the largest GDP multiplier in Africa — if domestic value chains are built
- 4 Eswatini: 90% electricity import dependence makes domestic renewable deployment transformative for energy security and employment

**Key lesson:** Africa's climate ambition can align with its development imperative — but only if local value creation is deliberately designed into NDC implementation from the start.

# Cross-Cutting Insights Across Studies

Convergent findings emerging from very different countries, sectors and methodologies

## 1 Policy Design > Policy Choice

HOW a measure is designed, sequenced and financed determines outcomes as much as WHAT is chosen.

*Ghana rebound effect · Brazil livestock vs. crop credit · Nigeria reform sequencing*

## 2 Economy-Wide Assessment is Essential

Response measures create effects far beyond the target sector — GDP, jobs, welfare and trade all shift.

*India BCA → wages and welfare · Nigeria diversification → multiplier effects across sectors*

## 3 Just Transition is Central, Not Peripheral

Aggregate impacts mask concentrated adjustment pressures on specific sectors, regions and worker groups.

*EU coal regions · Lao PDR poor households · Africa: job quality vs. job quantity*

## 4 Cross-Border Impacts Are Real

External measures — BCA, Article 6, EUDR, destination-based carbon pricing — reshape developing country competitiveness.

*Ghana dual exposure · India: early action turns BCA from threat to incentive*

## 5 Methodological Diversity is a Strength

No single tool answers all policy questions. CGE, econometrics, JEDI and mixed methods each reveal different truths.

*KCI portfolio = replicable toolkit for Parties at all capacity levels*

## 6 Local Content & Capacity Are Decisive

Who captures transition benefits depends on local value chains, industrial policy and institutional capacity.

*Africa: doubling LCR nearly doubles jobs · Brazil: governance gaps limit sustainability outcomes*



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Thank you for your  
attention

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