World Bank Group

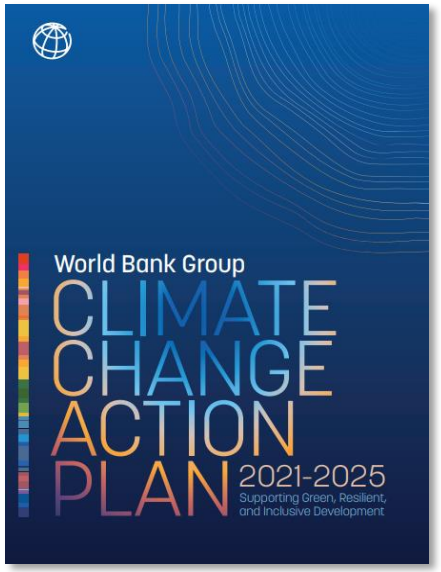
# COUNTRY CLIMATE AND DEVELOPMENT REPORT

## The Macroeconomic Implications of a Transition to Zero Net Emissions

Approaches of and lessons from Country Climate and Development Reports

## WHY CCDRs?

Integrating climate and development is a pillar of the WBG's new Climate Change Action Plan 2021–2025. To advance its implementation, the WBG has launched a new, core diagnostic tool: the Country Climate and Development Report (CCDR).




**ACTIONS**

**OPERATIONALIZING THE ACTION PLAN**

### 1 Integrating Climate and Development

- **Country climate and development diagnostics**, planning, and policies
- Alignment with the Paris Agreement
- Climate finance and impact

### 2 Prioritizing Key Systems Transitions

- Energy
- Agriculture, Food, Water and Land
- Cities
- Transport
- Manufacturing

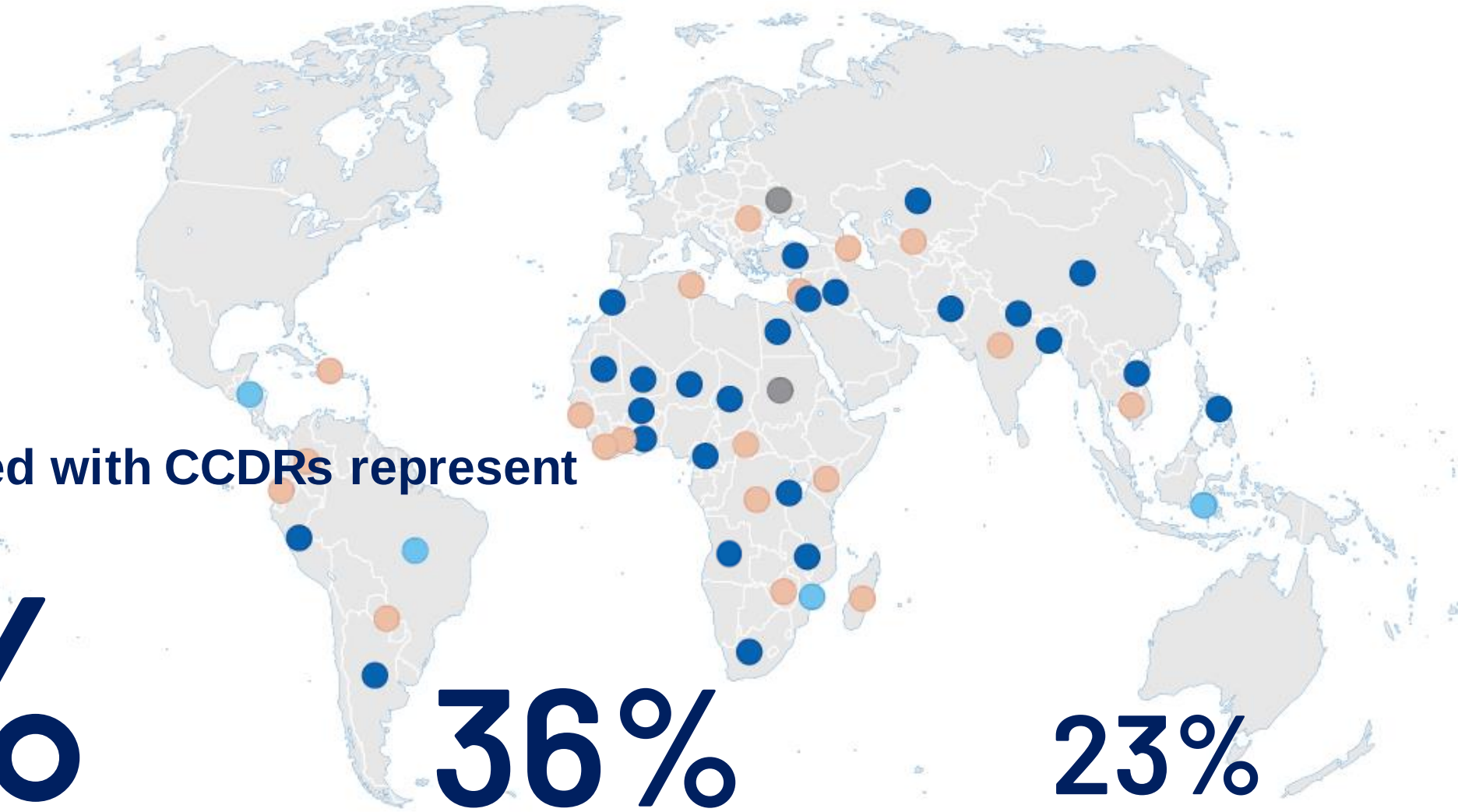
### 3 Financing to Support the Transitions

- Boosting client countries' public domestic resources
- Mobilizing and catalyzing private capital
- Concessional finance

## WHAT ARE CCDRs?

Diagnostic that focuses on the **interplay between development** (including poverty reduction, growth, inequality), **climate change and climate policies** in the context of the Paris Agreement.

- Published
- Forthcoming
- Initiated
- On hold



## 25 countries covered with CCDRs represent

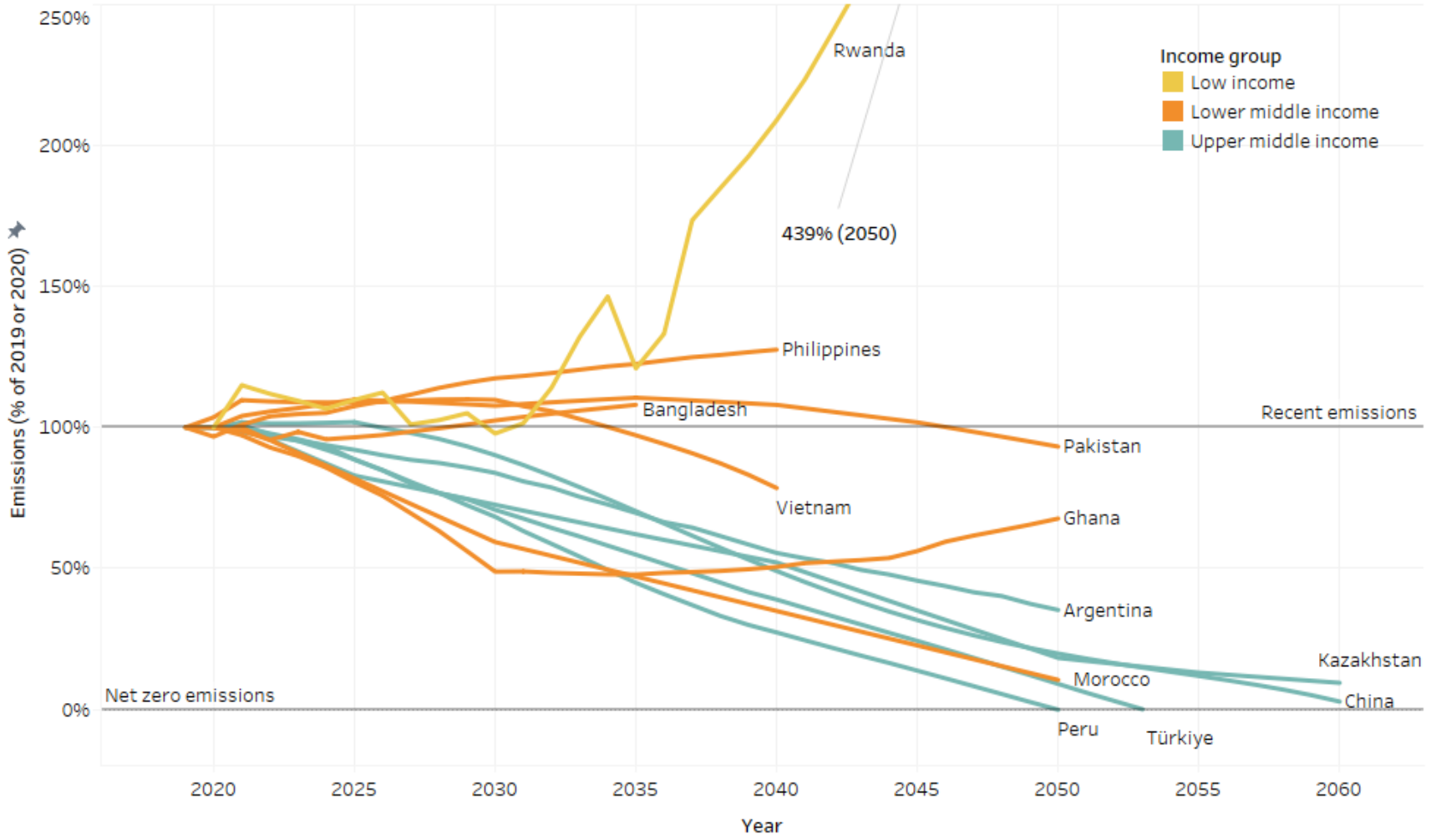
**34%**
of global population

**36%**
of global emissions

**23%**
of global GDP

# Low-carbon scenarios explored by the CCDRs: GHG emissions, relative to 2019 emission levels

-70%



# The Macroeconomic Implications of a Transition to Zero Net Emissions





Policy Research Working Paper 10367

## The Macroeconomic Implications of a Transition to Zero Net Emissions

### A Modeling Framework

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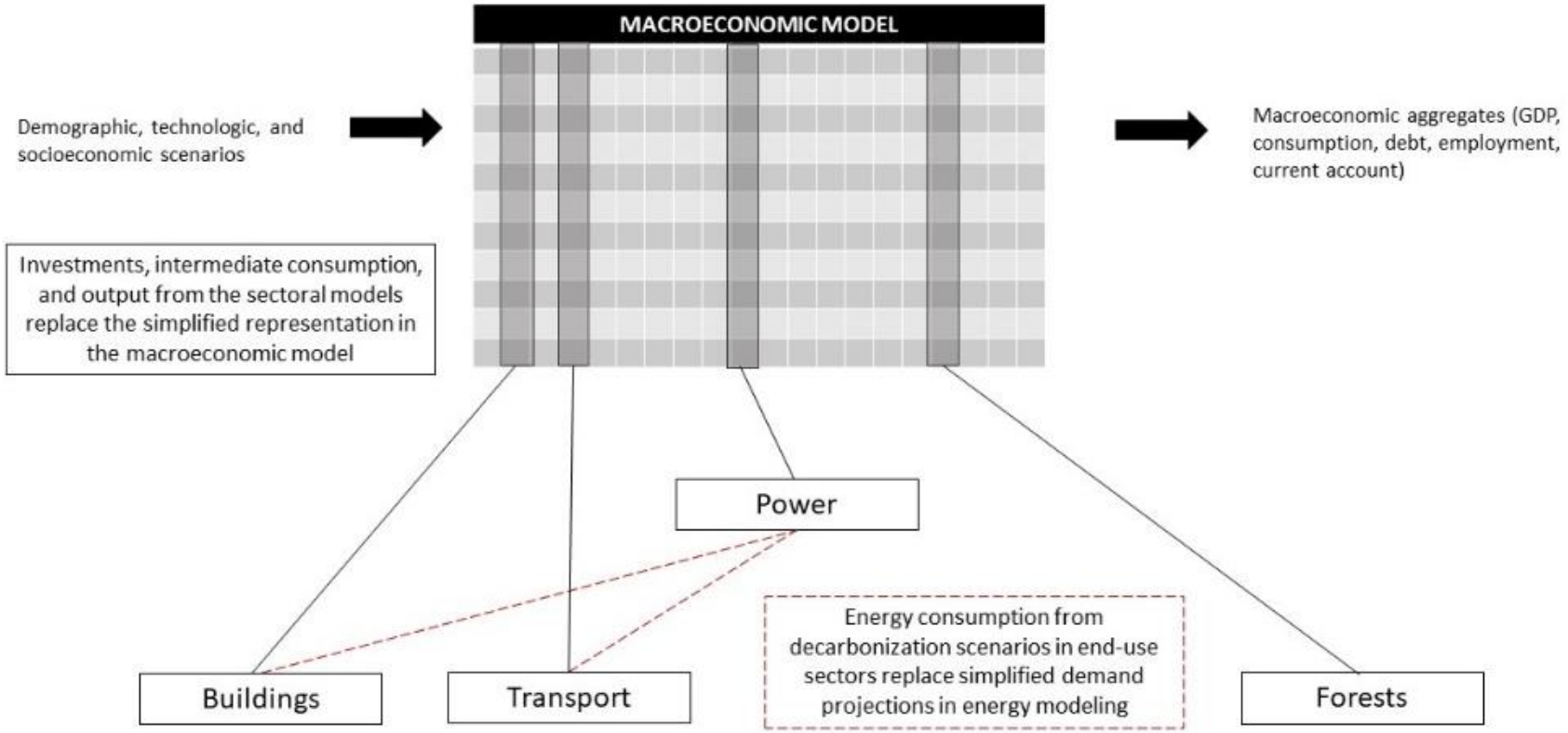
*Hans Beck*

# A hybrid modeling approach combining sectoral roadmap with macro modeling




1. **A sequence of models rather than a single integrated framework** (Bataille, Jaccard, Nyboer, & Rivers, 2006 ; Bosetti, Carraro, Galeotti, Massetti, & Tavoni, 2006 ; Böhringer & Rutherford, 2008 ; Hourcade, Jaccard, Bataille, & Ghersi, 2006 ; Kim, Edmonds, Lurz, Smith, & Wise, 2006 ; Köhler, Barker, Anderson, & Pan, 2006)
2. **Plausible rather than optimal decarbonation path** (Pindyck, 2013 ; IMF, 2022)
3. **Many market failures rather than one** (Lipsey & Lancaster, 1956 ; Batten 2018 ; Pisani-Ferry 2021)



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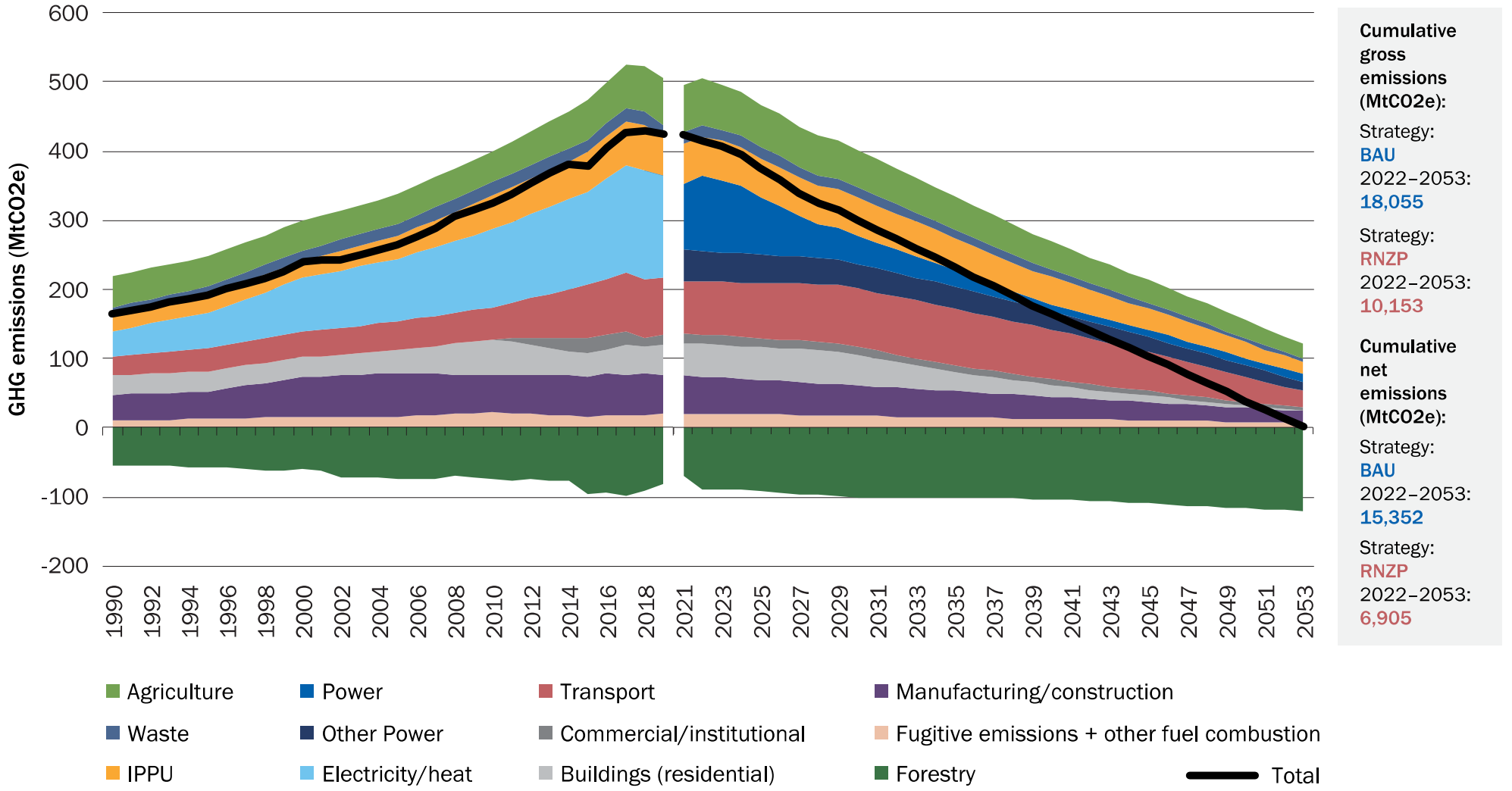
# Resilient Net zero Pathway (RNZP) for Türkiye




**Cumulative gross emissions (MtCO2e):**

Strategy: BAU
2022–2053: 18,055

Strategy: RNZP
2022–2053: 10,153

**Cumulative net emissions (MtCO2e):**

Strategy: BAU
2022–2053: 15,352

Strategy: RNZP
2022–2053: 6,905



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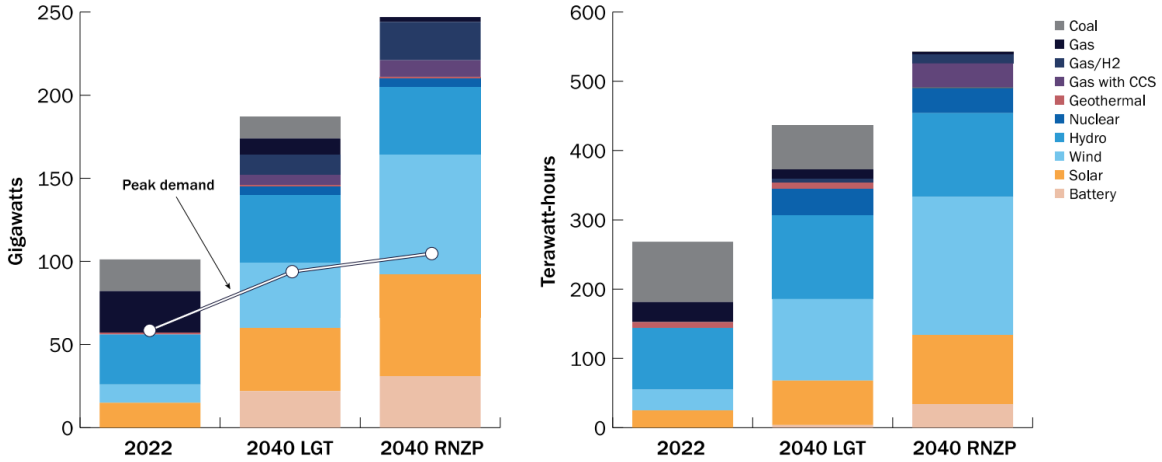
# Four techno-economic models: Examples of energy and transportation



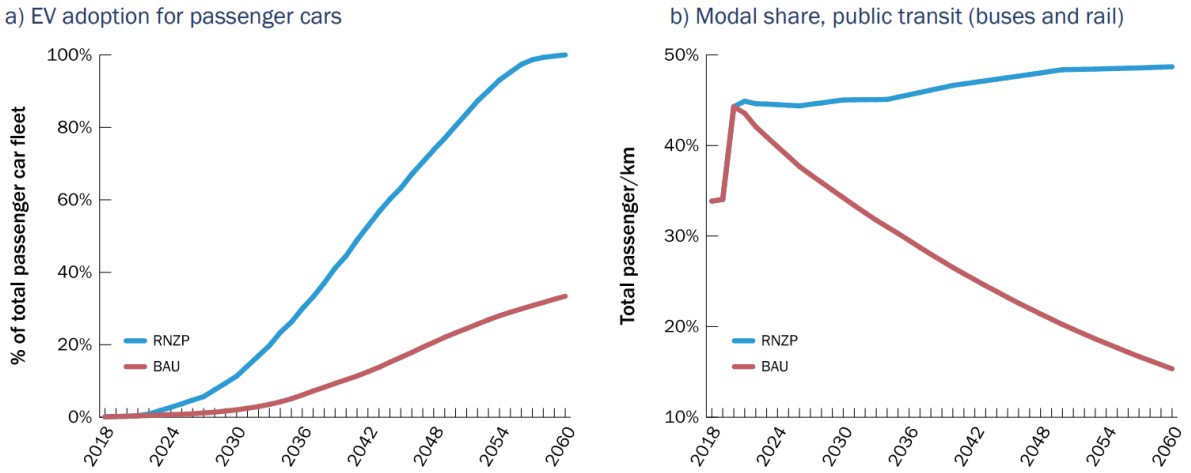

*Source: World Bank staff estimates*
*Notes: Gas/H2 = hydrogen gas; CCS = carbon capture and storage.* *Note: LGT = least-cost with current government targets (BAU)*

## Energy

- least-cost power sector planning model EPM (Chattopadhyay, de Sisternes, & Oguah, 2018) to meet 90% reduction by 2040
- calculates the consumption of different fuels, distinguishing between imported and domestically produced fuels, operating costs and simple estimates of air pollution costs

## Transportation

- A simple sectoral roadmap combining modal shift, energy efficiency, and electrification in transport.
- The shift affects total energy consumption, the energy mix used in transportation, as well as energy costs for households and firms as well as imports.
- calculates the consumption of various fuels, distinguishing imported and domestically produced fuels, the operational costs, and simple estimates for air pollution costs, as well as congestion and road fatalities




*Source: World Bank staff estimates*



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# Main inputs for macroeconomic models

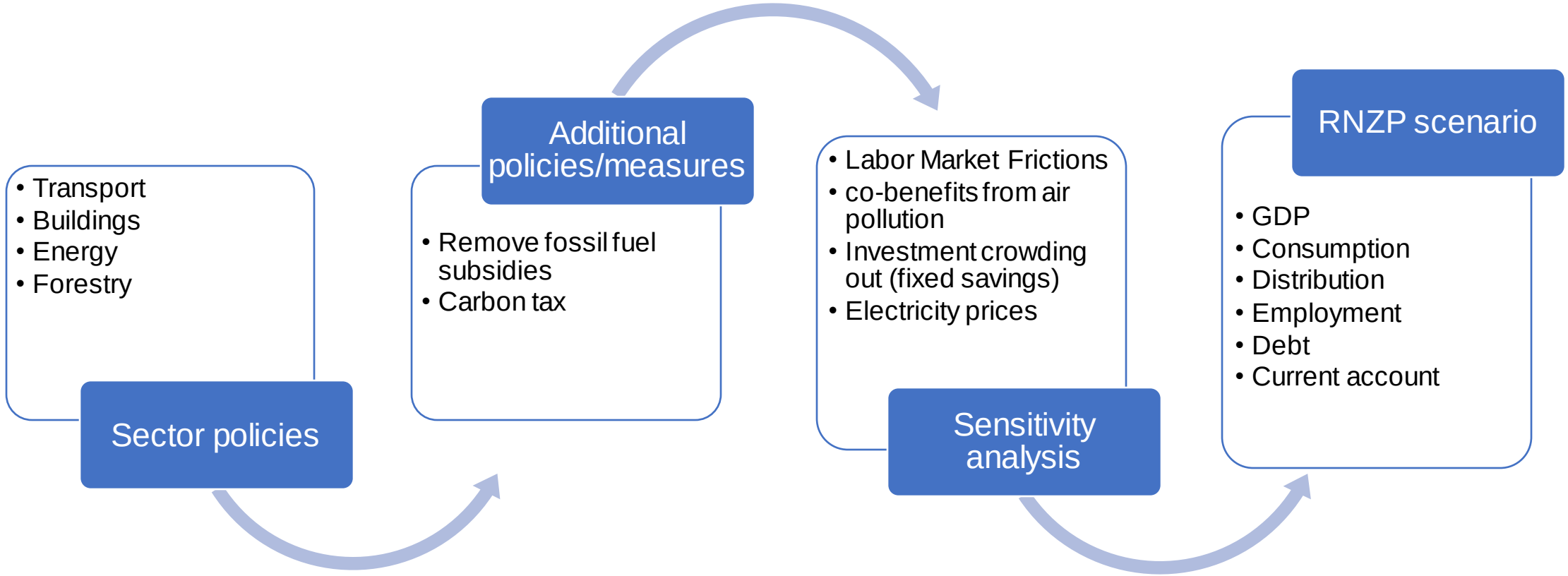
Table S.1: Investment needs and economic costs in the RNZP (additional compared with baseline)

| | 2022–30 ($, billions) | 2022–40 ($, billions) |
|---|---|---|
| **POWER** | | |
| Additional investment: new generation and storage capacity | +5 | +33 |
| Additional investment: transmission and distribution | +8 | +14 |
| Other economic costs: operational and fuel costs | -9 | -23 |
| Other economic costs: air pollution externality costs from coal | -9 | -38 |
| Other economic costs: decommissioning of coal plants and mines | < +1 | +1.4 |
| **RESIDENTIAL** | | |
| Additional investment: energy efficiency, electrification, and resilience | +45 | +100 |
| Other economic costs: gas imports | -11 | -46 |
| Other economic costs: lives lost and injuries | -1 | -3 |
| **TRANSPORT** | | |
| Additional investment: new resilient infrastructure | +8 | +15 |
| Other economic costs: fuel imports | -12 | -36 |
| Other economic costs: cost of disruptions | -3 | -11 |
| Other economic costs: air pollution, congestion, and road fatalities | -40 | -171 |
| **FOREST LANDSCAPES** | | |
| Additional investment: restoration, reforestation, and fire management | +2 | +3 |
| Other economic costs: loss of harvest revenues | +1 | +5 |
| **AGRICULTURE** | | |
| Other economic costs: on-farm emissions reductions | < +1 | - |
| **INDUSTRY AND MANUFACTURING** | | |
| Other economic costs: cement, iron, and steel | - | +11 |
| **TOTAL INVESTMENTS AND ECONOMIC COSTS** | | |
| Net economic costs | -15 | -146 |
| includes: additional investment | 68 | 165 |

*Notes: All amounts are discounted using a 6 percent discount rate. Decommissioning costs do not include the social expenditures to facilitate the transition of affected workers and communities. Numbers in red are net costs; numbers in green are net benefits.*

complemented by an economywide carbon tax that starts from USD 11 in 2022 and gradually reaches USD 211 dollars by 2040

# Flow of information in scenarios



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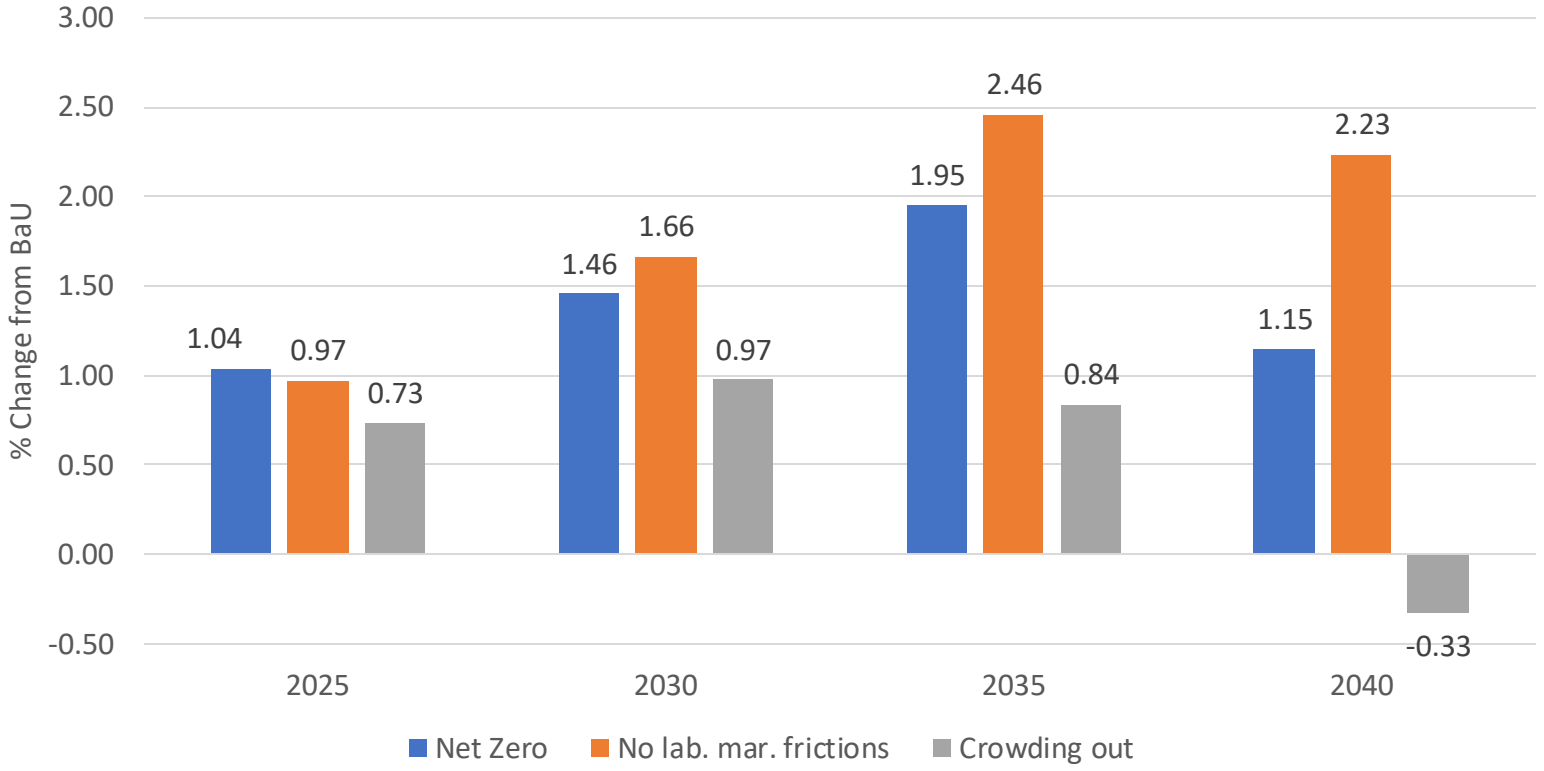
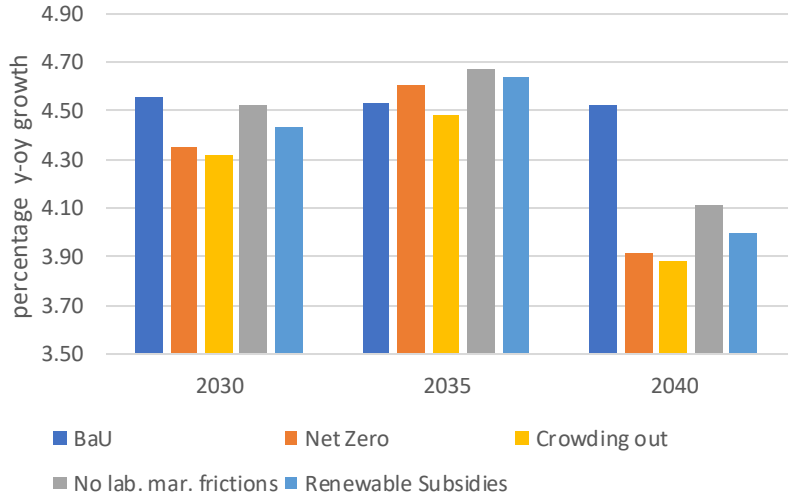
# Türkiye can achieve higher growth and decarbonization simultaneously




**Percentage point differences in GDP relative to the baseline**

## GDP growth rates



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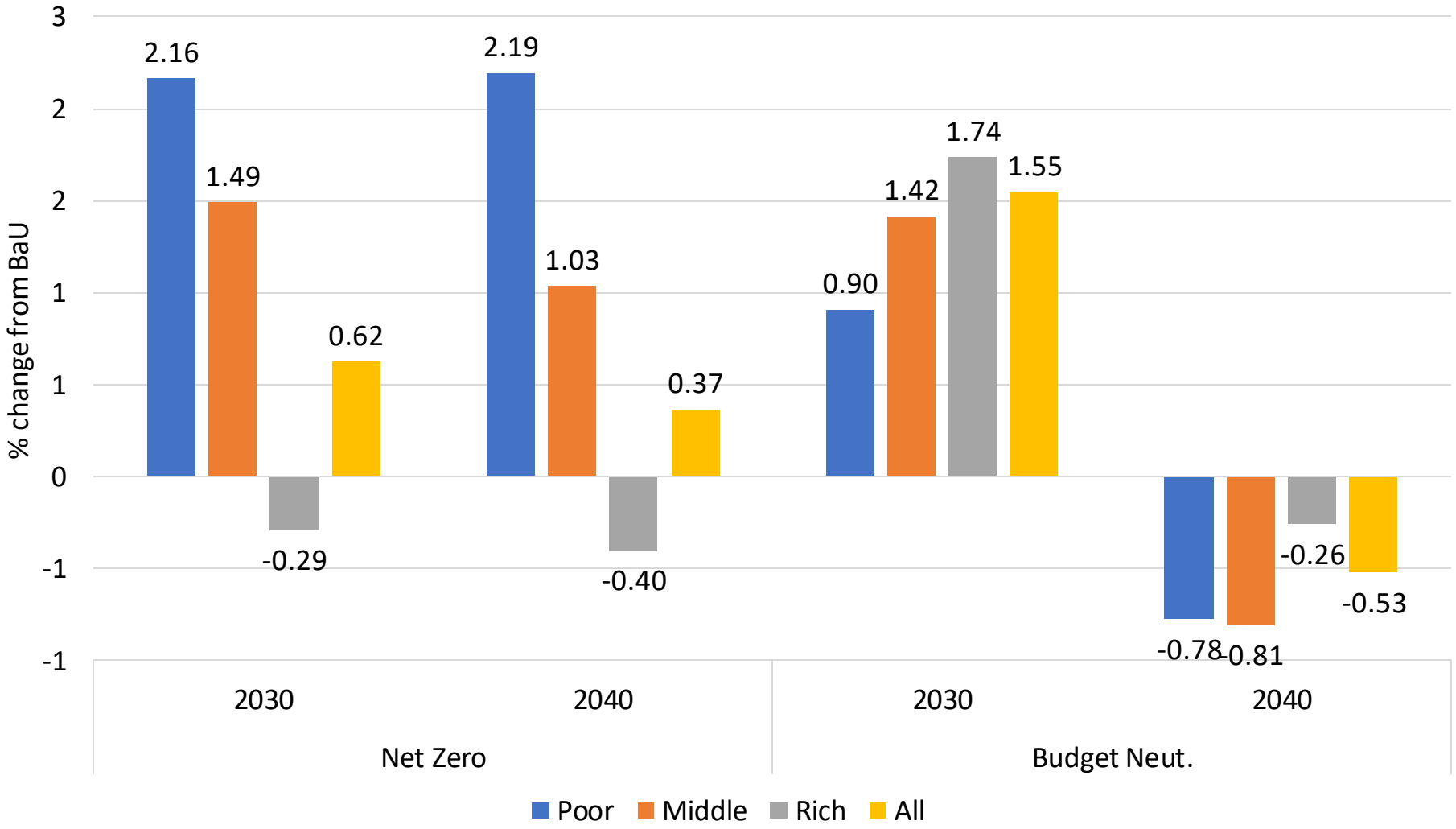
# Consumption is affected more than growth, but the RNZP is progressive



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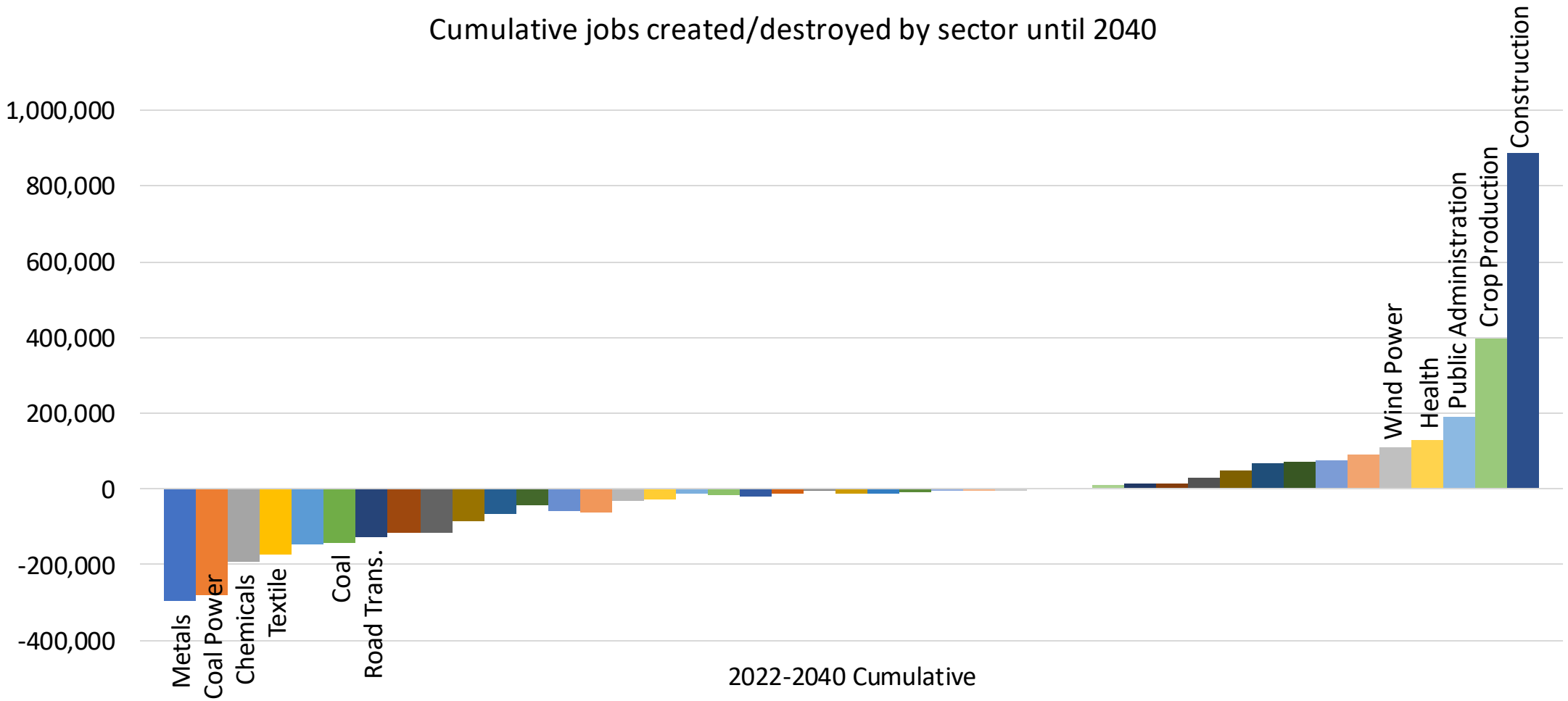
# Significant reallocation of jobs from emission intensive sectors to services, renewables, agriculture and construction by 2040 (RNZP )



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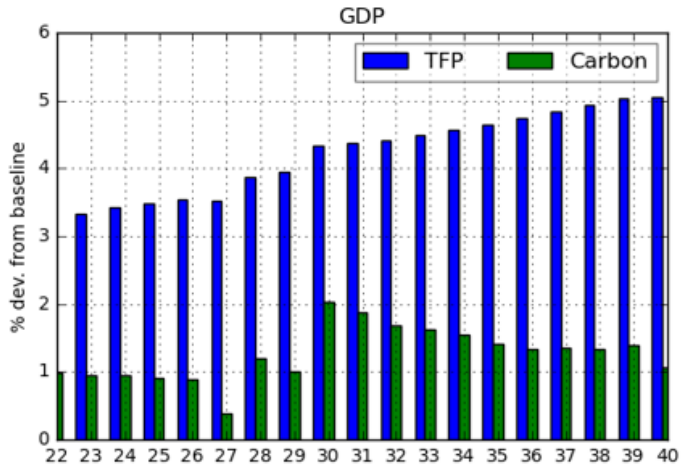
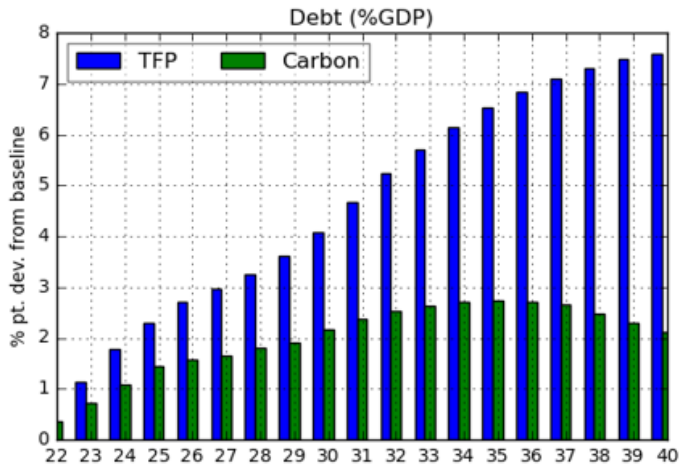
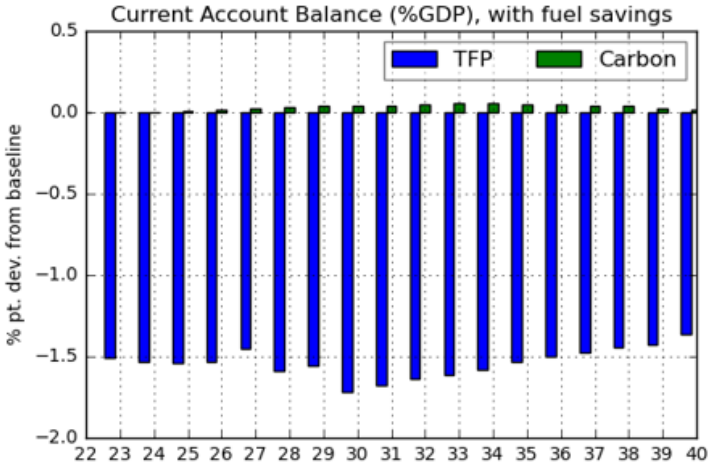
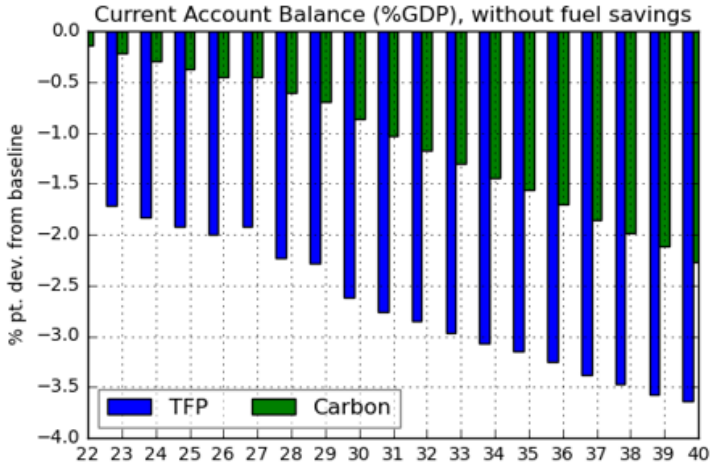
# A macrostructural model to explore implications for debt and current account…and the importance of the financing channel



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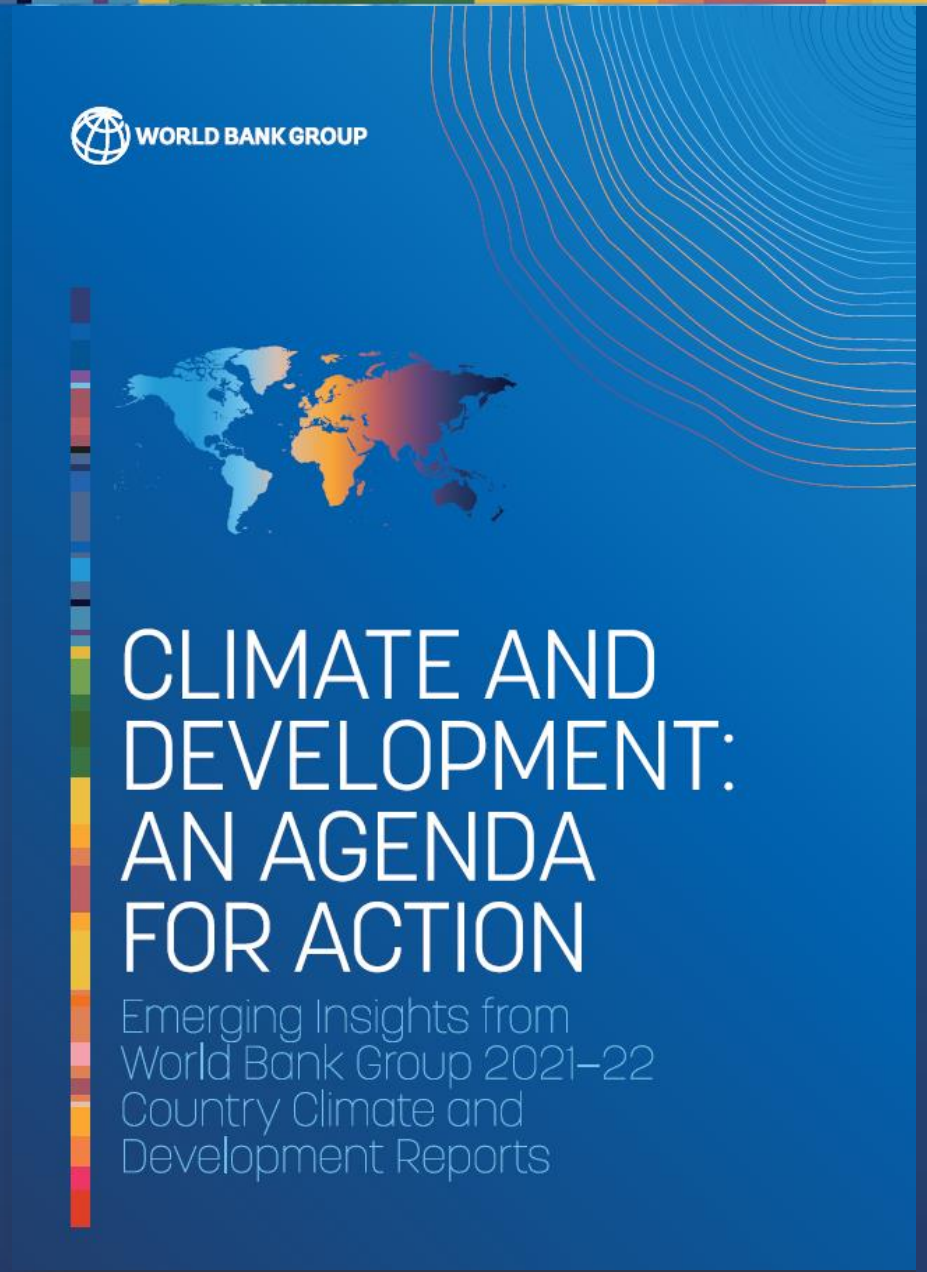
# Key findings from the first batch of CCDRs



# Macroeconomic impacts of climate policies would be low or positive

# -0.1% to 3.3%

## GDP impacts of climate action