Green Transition in CAREC Region: Enabling Compliance with Environmental Standards

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Policy Workshop

ADVANCING THE GREEN TRANSITION IN CAREC: POLICY PATHWAYS FOR LOW-CARBON GROWTH

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Introduction

- Rapid industrialization and unsustainable resource use make climate change a critical challenge: Atmospheric CO_2 has increased by 51% since 1750, reaching 420 ppm in 2024.

- In 2023, CAREC countries emitted over 14 billion tonnes of CO_2, with per capita and per GDP emissions exceeding global averages, highlighting the need for targeted climate action.
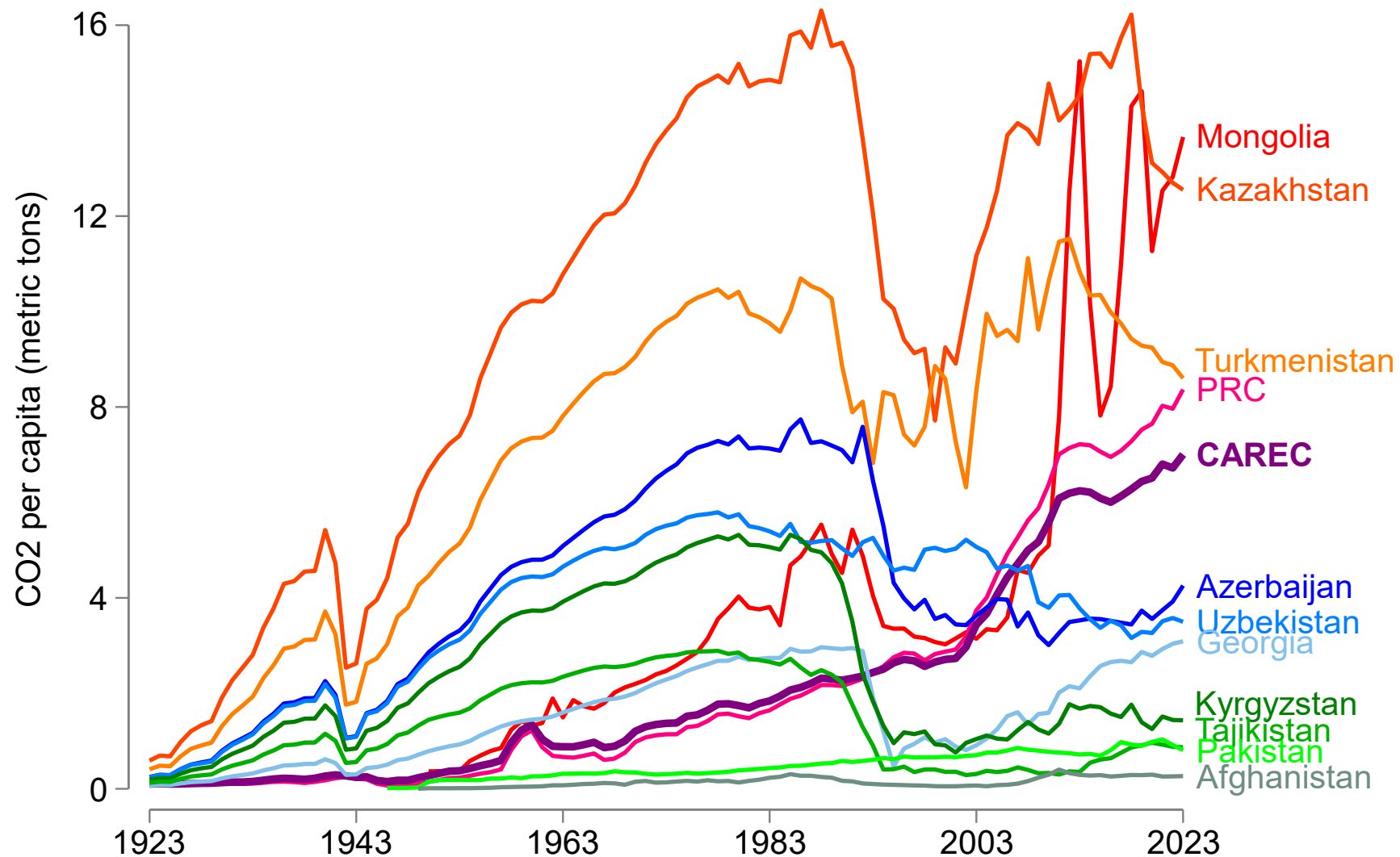
Objectives

- Analyze CO_2 emissions in CAREC countries to understand regional patterns and challenges

- Assess the impact of environmental standards on reducing emissions and provide evidence to support government investment in facilitating firm-level compliance.

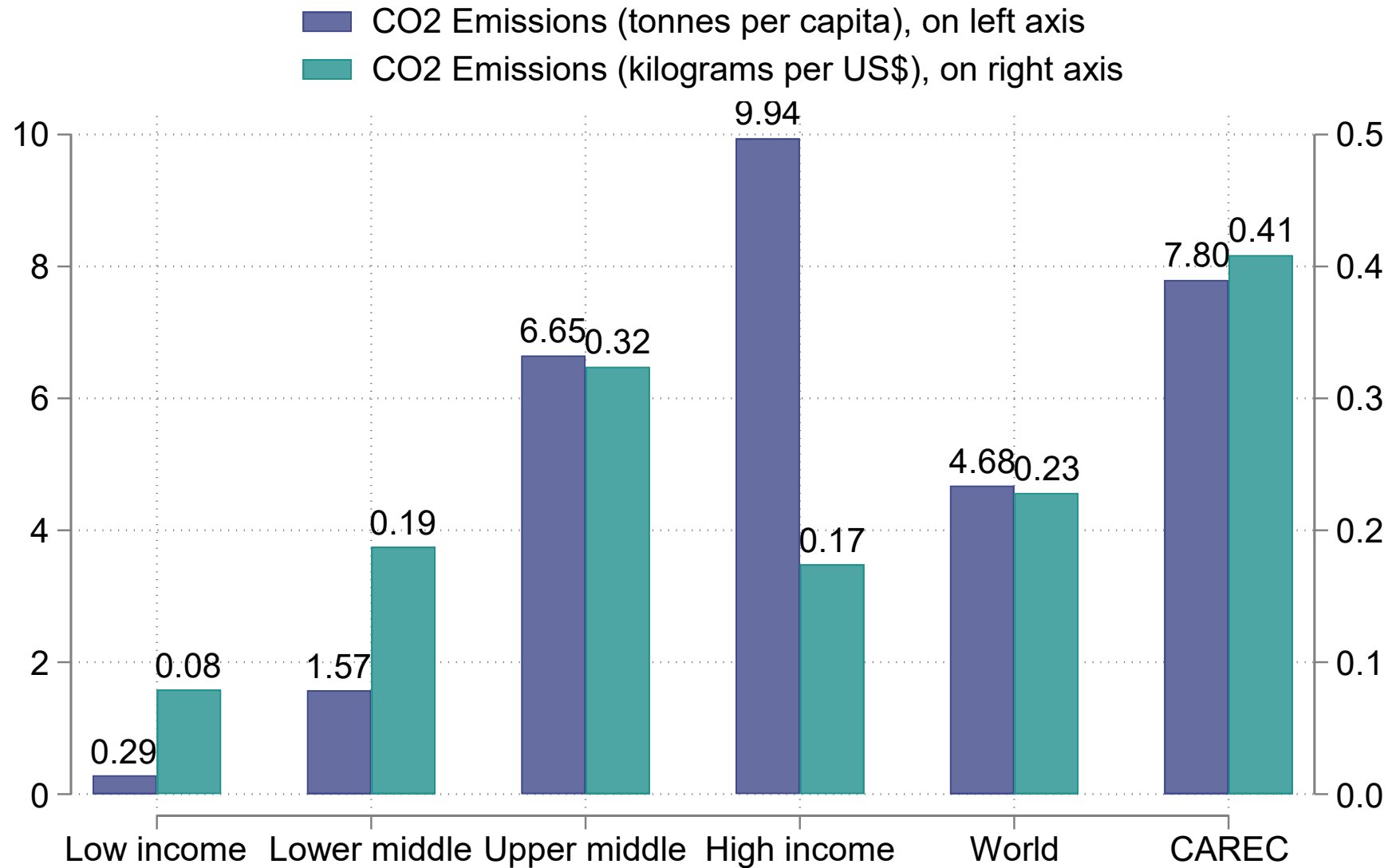# CO$_2$ emissions in CAREC countries to understand regional patterns

CO2 Emissions in CAREC Countries, 1923–2023

Notes: The values for CAREC are calculated based on the aggregated carbon emissions and population data of its member countries. Carbon emissions data are sourced from Our World in Data.
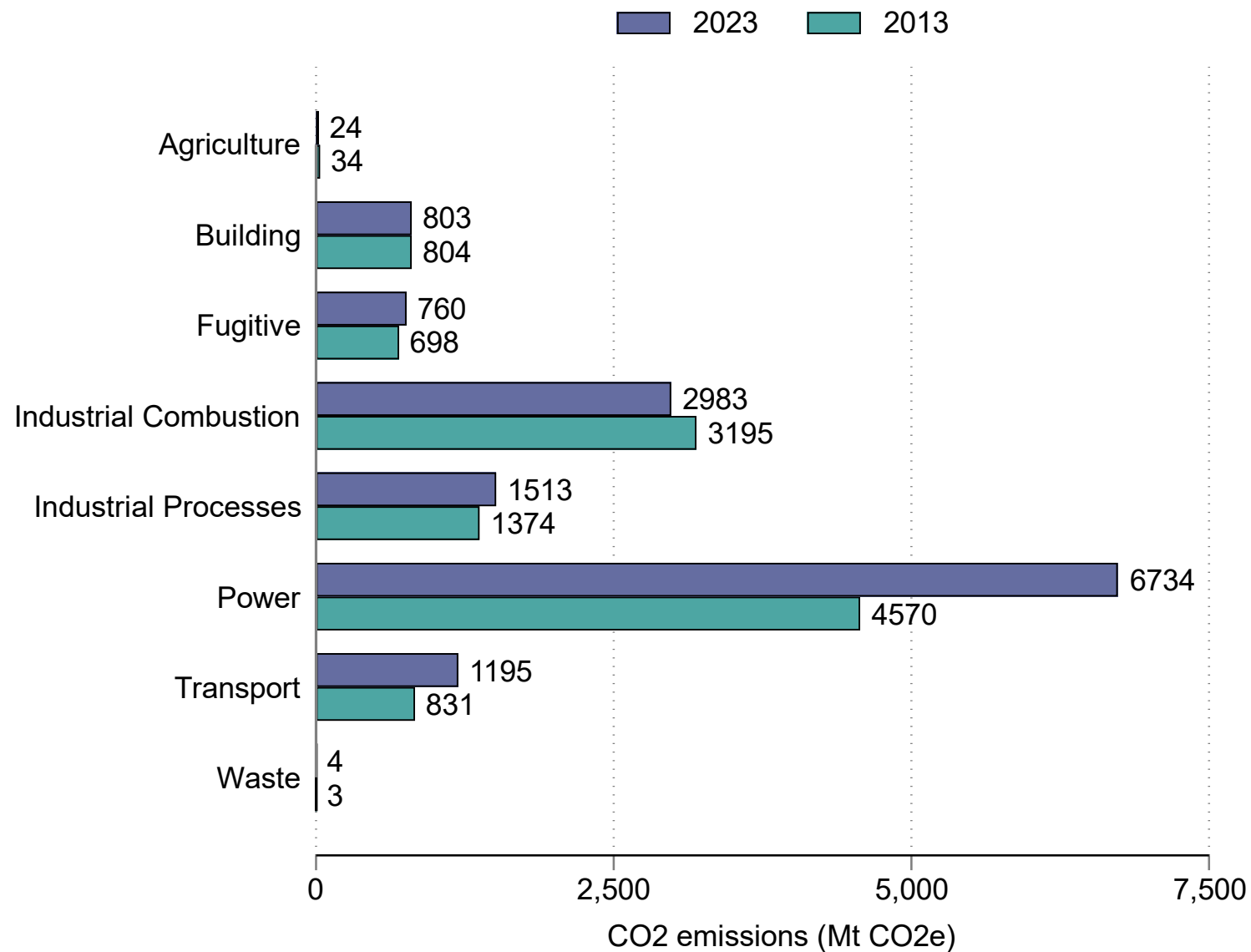
CO2 Emissions by CAREC Countries, 2023

Countries	CO_2 (million tonnes)	CO_2 (tonnes per person)	CO_2 (kilogram per US$)
Afghanistan	8.71	0.21	0.11
Azerbaijan	42.77	4.21	0.20
China	13259.64	9.40	0.42
Georgia	12.86	3.46	0.15
Kazakhstan	239.87	11.80	0.34
Kyrgyz Republic	10.46	1.47	0.23
Mongolia	28.12	8.08	0.50
Pakistan	200.51	0.81	0.15
Tajikistan	9.31	0.90	0.20
Turkmenistan	65.99	8.96	0.50
Uzbekistan	137.90	3.87	0.39
CAREC Region	14016.13	7.80	0.41

Notes: GDP is expressed in 2021 PPP US$. The values for CAREC region are calculated based on CO2 emissions, population, and GDP aggregated at the regional level. Data source: Emissions Database for Global Atmospheric Research.

Comparison of CO2 Emissions Across Country Groups, 2023

Notes: The values for CAREC region are calculated based on CO2 emissions, population, and GDP aggregated at the regional level. Data source: Emissions Database for Global Atmospheric Research.

Legend: 2023 (purple) | 2013 (teal)

Sector	2023	2013
Agriculture	24	34
Building	803	804
Fugitive	760	698
Industrial Combustion	2983	3195
Industrial Processes	1513	1374
Power	6734	4570
Transport	1195	831
Waste	4	3

X-axis: CO_2 emissions (Mt CO2e) — 0, 2,500, 5,000, 7,500

Sectoral CO2 Emissions in CAREC Region, 2023

Notes: The values for CAREC region are calculated based on CO2 emissions, population, and GDP aggregated at the regional level. Data source: Emissions Database for Global Atmospheric Research.

## Sectoral Shares of CO2 Emissions in CAREC Countries, 2023

Countries	Agri.	Building	Fugitive	IndComb	IndProc	Power	Transport
Afghanistan	0.2	7.2	2.2	38	1	24.5	26.9
Azerbaijan	0.3	26.4	8.2	5.8	3.9	35.9	19.5
Peoples Republic of China	0.1	4.9	5.3	21.7	11	48.8	8.1
Georgia	0.7	26.2	1.1	13.4	15.6	8.6	34.5
Kazakhstan	0.2	17	8.6	12.3	6	46.1	9.8
Kyrgyz Republic	1.2	40.8	0.7	5	10.6	25.2	16.4
Mongolia	0	12.5	8.3	8.6	1.9	58.4	10.3
Pakistan	2.8	9.5	2.9	26.8	12.6	23.8	21.6
Tajikistan	0.5	24.9	0.3	14.3	20.8	18.1	21.1
Turkmenistan	1.3	39.4	13	1	3	24	18.3
Uzbekistan	1.3	26.7	8.6	9.7	7.3	34.6	11.8

Notes: IndComb = Industrial Combustion; IndProc = Industrial Processes. The waste sector is excluded due to its negligible contribution. Data source: Emissions Database for Global Atmospheric Research (EDGAR). Legend: values 0–10 = white; 10–20 = yellow; 20–30 = orange; above 30 = red.
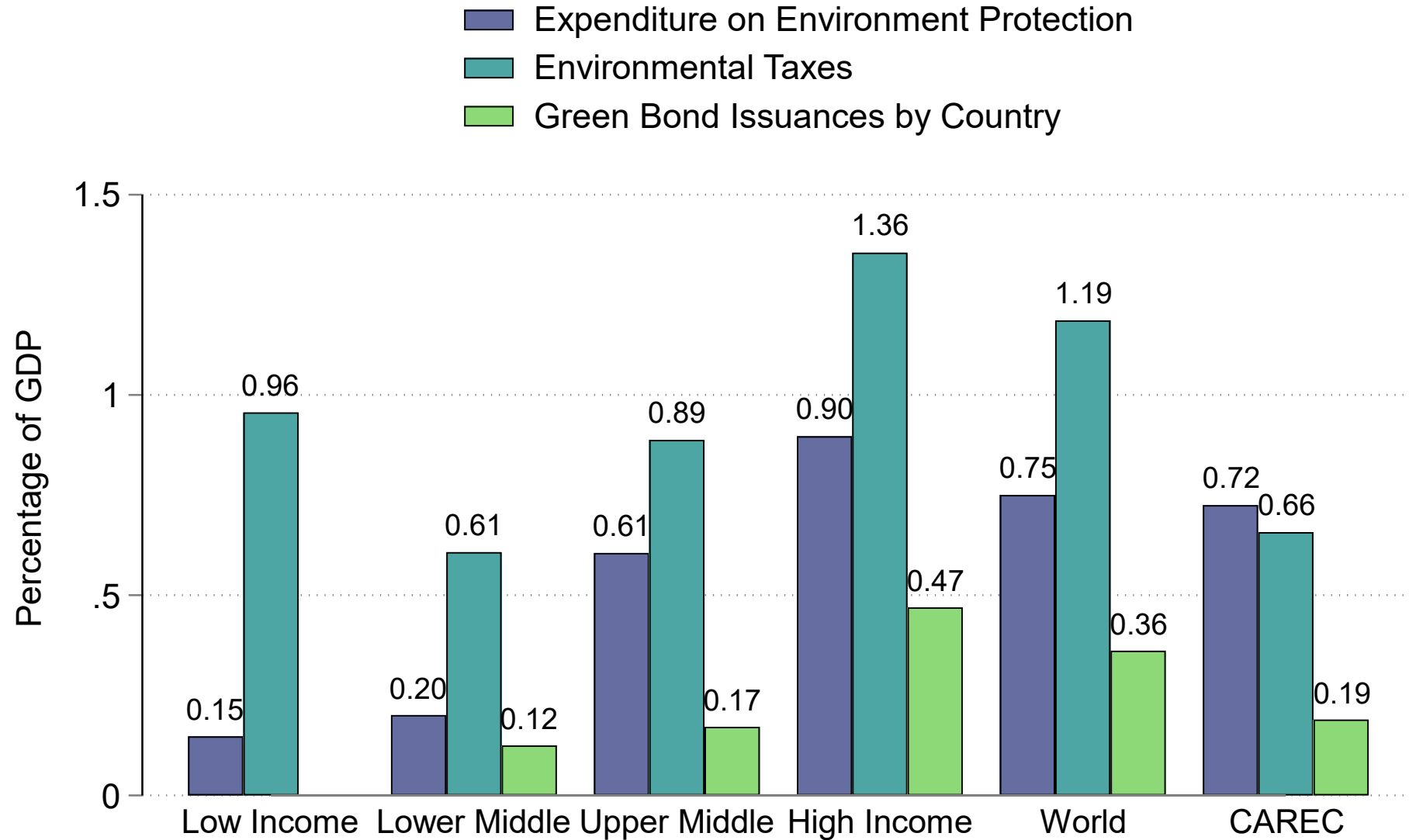
Comparison of Green Finance Across Country Groups

Notes: The values for CAREC are calculated based on the indicator values and GDPs of its member countries. Data is sourced from IMF Climate Dashboard.
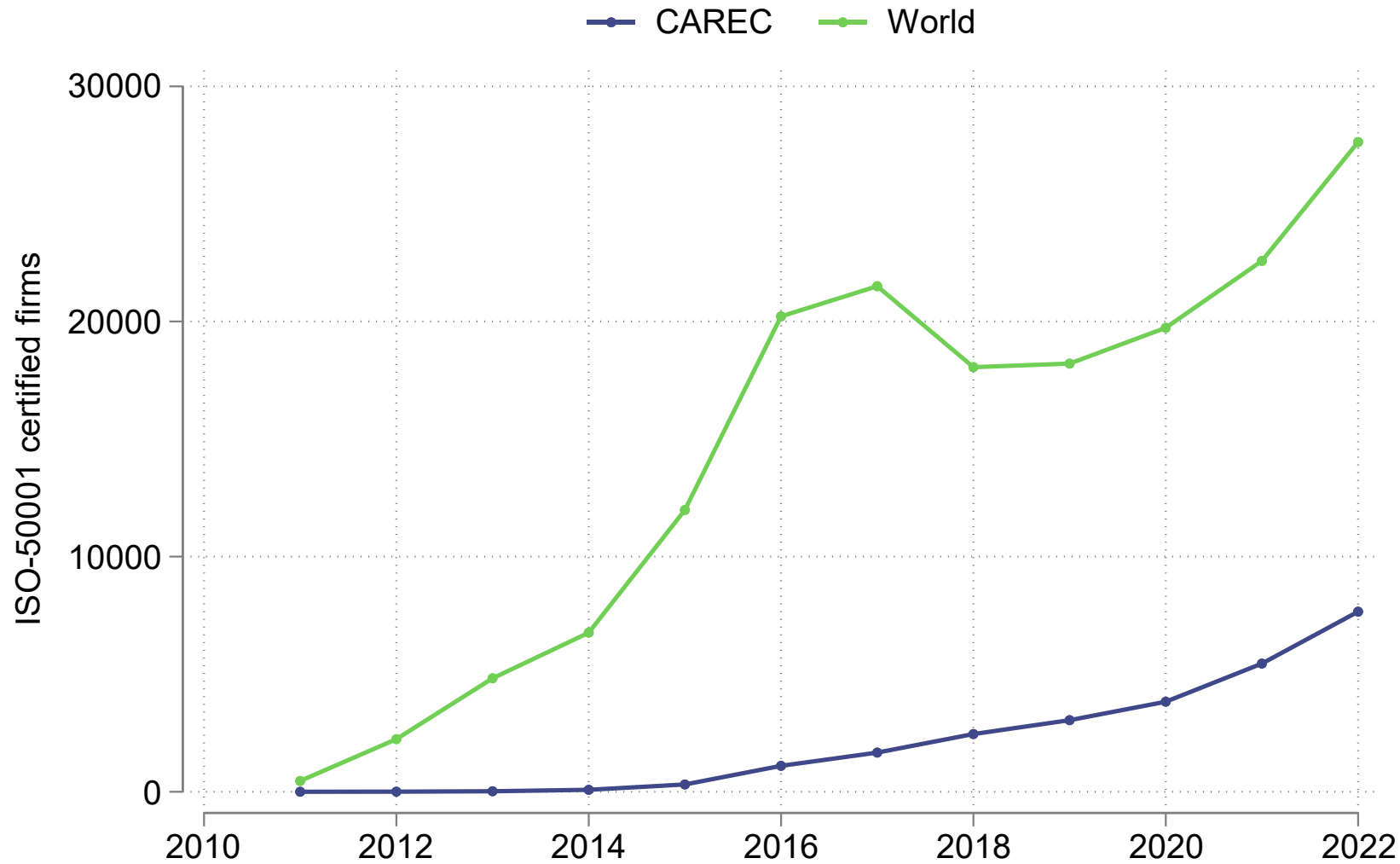
ISO-50001 Certified Firms, 2011–2022

Notes: The sharp shift around 2017 reflects a change in survey methodology, as the ISO clarified that from 2018 onwards, data was adjusted to correct cases of earlier overreporting based on the number of sites instead of the actual number of certificates. Data source: ISO Survey.

Empirical Estimation:
Effect of Energy Management (ISO-50001) Certification on CO2 Emission Reduction

IPAT Model

The IPAT equation, pioneered by Ehrlich and Holdren (1971), emerged alongside the modern environmental movement, mathematically expressing environmental impact (I) as the product of three key factors: population (P), affluence (A), and technology (T), mathematically, I = P×A×T.

$$\ln \left(\frac{I}{P} \right)_{it} = \alpha + \beta \ln A_{it} + \rho \, Policy_{it} + \delta \, Control_{it} + \varepsilon_{it}$$

The empirical model includes policy variable of the main interest (CERTpc), as well as control variables to capture other macroeconomic factors at country level.

$$\ln CO2pc_{it} = \alpha + \rho \ln CERTpc_{it} + \delta_1 \ln GBONDgdp_{it} + \delta_2 EPI_{it} + \delta_3 \ln CO2proxim_{it} + \delta_4 \ln ENERGYpc_{it} + \delta_5 \ln FOSSILshr_{it} + \delta_6 \ln GDPpc_{it} + \delta_7 \ln INDVA_{it} + \delta_8 \ln TRADEgdp_{it} + \phi_i + \Lambda_t + \varepsilon_{it}$$

- $CO2pc$ = carbon emissions, measured as metric tons per capita
- $CERTpc$ = ISO-50001 certifications normalized by population size
- $GBONDgdp$ = green bond issuance as a percentage of GDP
- EPI = electronic participation index
- $CO2proxim$ = spatially weighted carbon emissions from neighboring countries, based on inverse bilateral distance
- $ENERGYpc$ = primary energy consumption per capita
- $FOSSILshr$ = share of fossil fuels in total energy consumption
- $GDPpc$ = GDP per capita (constant 2015 US dollars)
- $INDVA$ = industry value added as a percentage of GDP
- $TRADEgdp$ = trade as a percentage of GDP

Data Sources

- ISO certification counts: ISO Survey
- Green bond issuance: IMF Climate Dashboard
- Electronic Participation Index (EPI): United Nations databases
- Bilateral distance: Centre for Prospective and International Information Studies (CEPII)
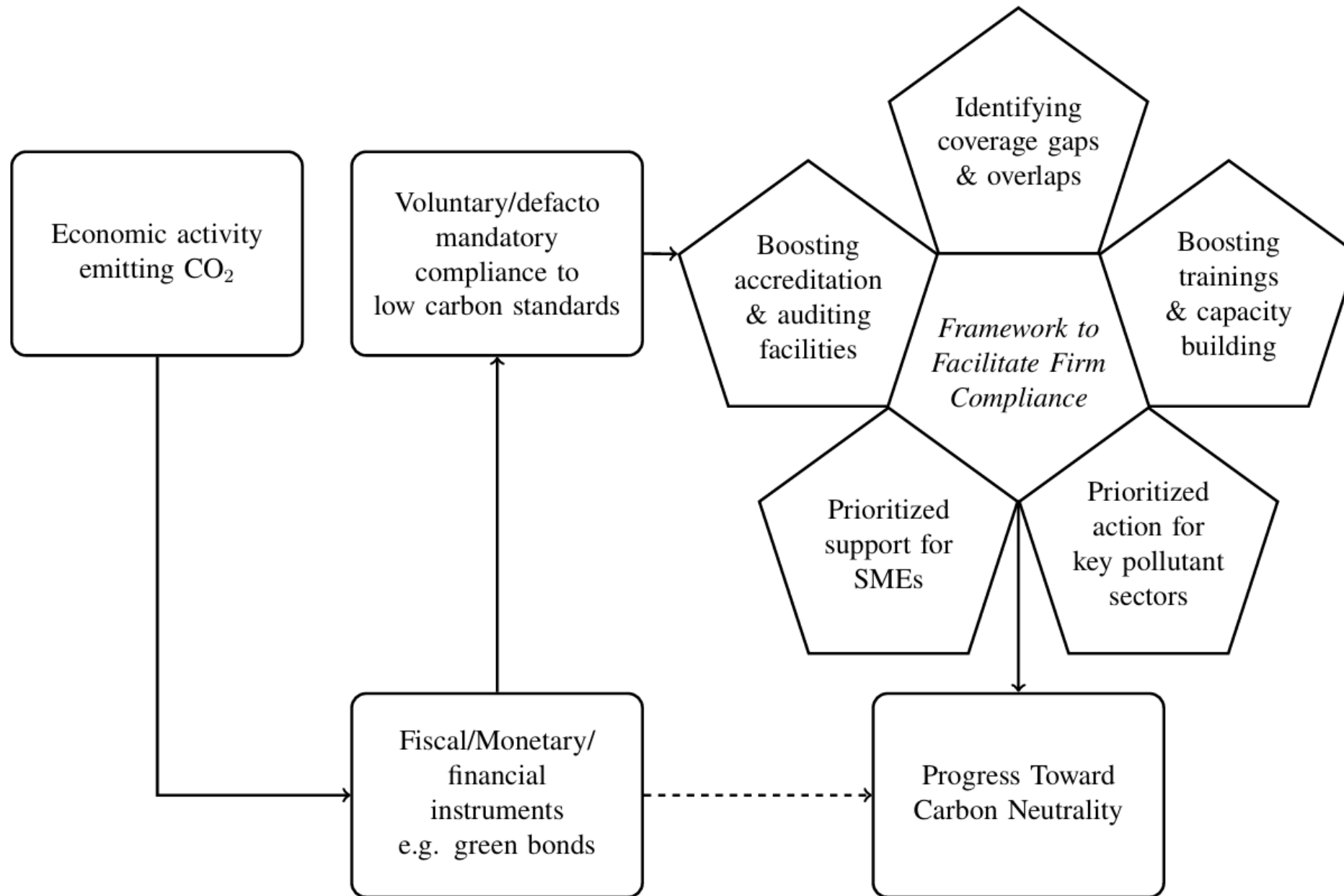- Other variables: World Bank's World Development Indicators

Main Finding

- Compliance with ISO-50001 certification contributes to reducing CO_2 emissions.

- Model estimations reveal a negative and statistically significant impact of ISO-50001 certification on CO_2 emissions at the country level. This effect holds true when both certification and emissions are normalized by GDP as well as when normalized by population size.

Policy Recommendations

- **Prioritizing Policy Action:** Implement sector-focused strategies targeting high-emission industries like power, heavy metals, and cement to encourage adoption of cleaner technologies and low-carbon solutions without harming competitiveness.

- **Streamlining Certification Guidelines:** Harmonize and simplify environmental standards through comprehensive mapping, removal of overlaps, and creation of a unified certification system to enhance regulatory clarity and reduce compliance costs.

- **Facilitating Firm Compliance:** Support SMEs with financial assistance, domestic accreditation, local auditing facilities, and training programs while promoting knowledge sharing and drawing on China's successful experience.

Any Questions?
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