Asia's Transition to Net Zero and Sustainable Bond Markets

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Background

- The Paris Agreement achieved a global consensus to keep global warming well below 2°C relative to preindustrial temperatures.
  - Nearly all countries of the world submitted nationally determined contributions (NDCs) with emissions reduction targets.
  - However, those targets collectively fall well short of the goals of the Agreement.
- During 2020-2022 many countries put forward much more ambitious net zero pledges, and the importance of net zero received much more global recognition.
- Technologies and policies have also evolved over recent years, with rapid declines in the cost of renewables.
- Merits exploration of what a net zero world would mean for developing Asia, the main source of recent emissions increases.

Outline of the Thematic Report

1. Asia's Special Stake in the Global Climate Crisis

2. Asia's Transformation during the Global Transition to Net Zero

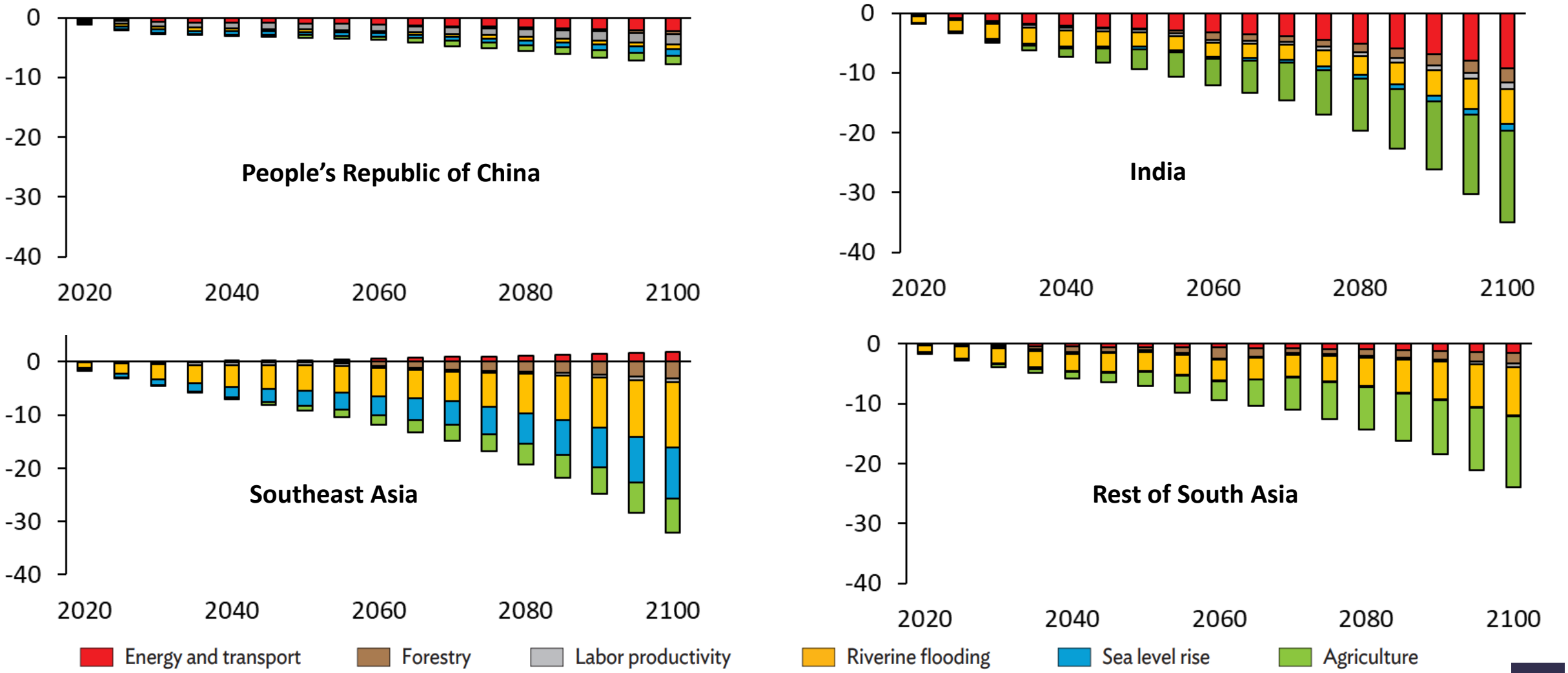
3. Socioeconomic Consequences of the Global Transition Net Zero

4. Policies for an Efficient and Equitable Global Transition to Net Zero

Asia’s Special Stake in the Global Climate Crisis

Developing Asia will face large losses, if climate change is not addressed

Economic Losses from Climate Change in Developing Asia under a High Emissions Scenario by 2100
(% Change in GDP)

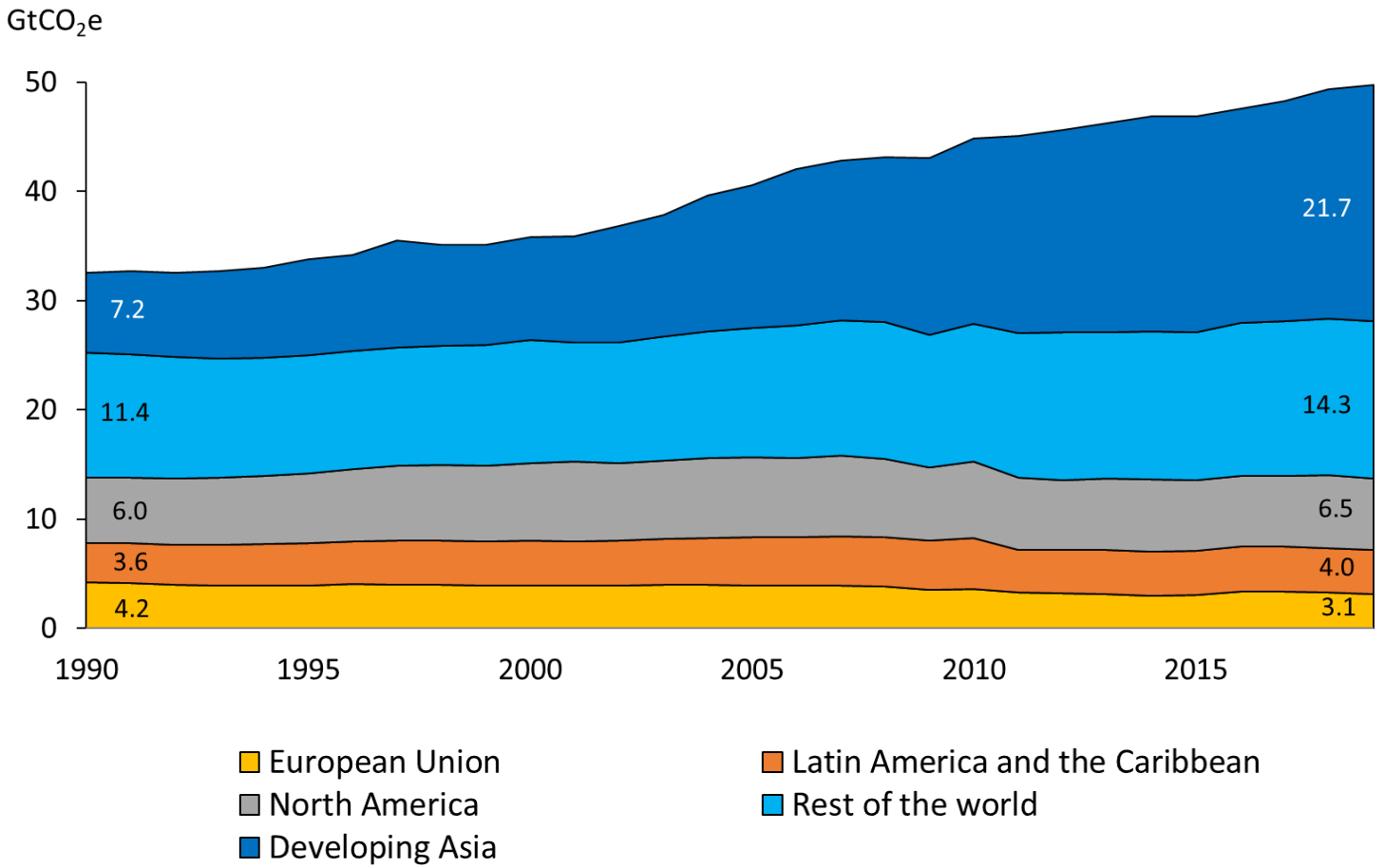


GDP = gross domestic product.
Source: Author's calculations from K. van der Wijst et al. 2023. New Damage Curves and Multi-Model Analysis Suggest Lower Optimal Temperature. *Nature Climate Change*.

Climate change cannot be addressed without Asia

- The region is increasingly a contributor to the global climate crisis.
- However, signs of change:
  - All developing Asian parties to the Paris Agreement have submitted nationally determined contributions (NDCs).
  - The region's largest emitters have made net-zero pledges, representing close to 80% of the region's emissions in 2019.

Global Annual Greenhouse Gas Emissions, 1990–2019

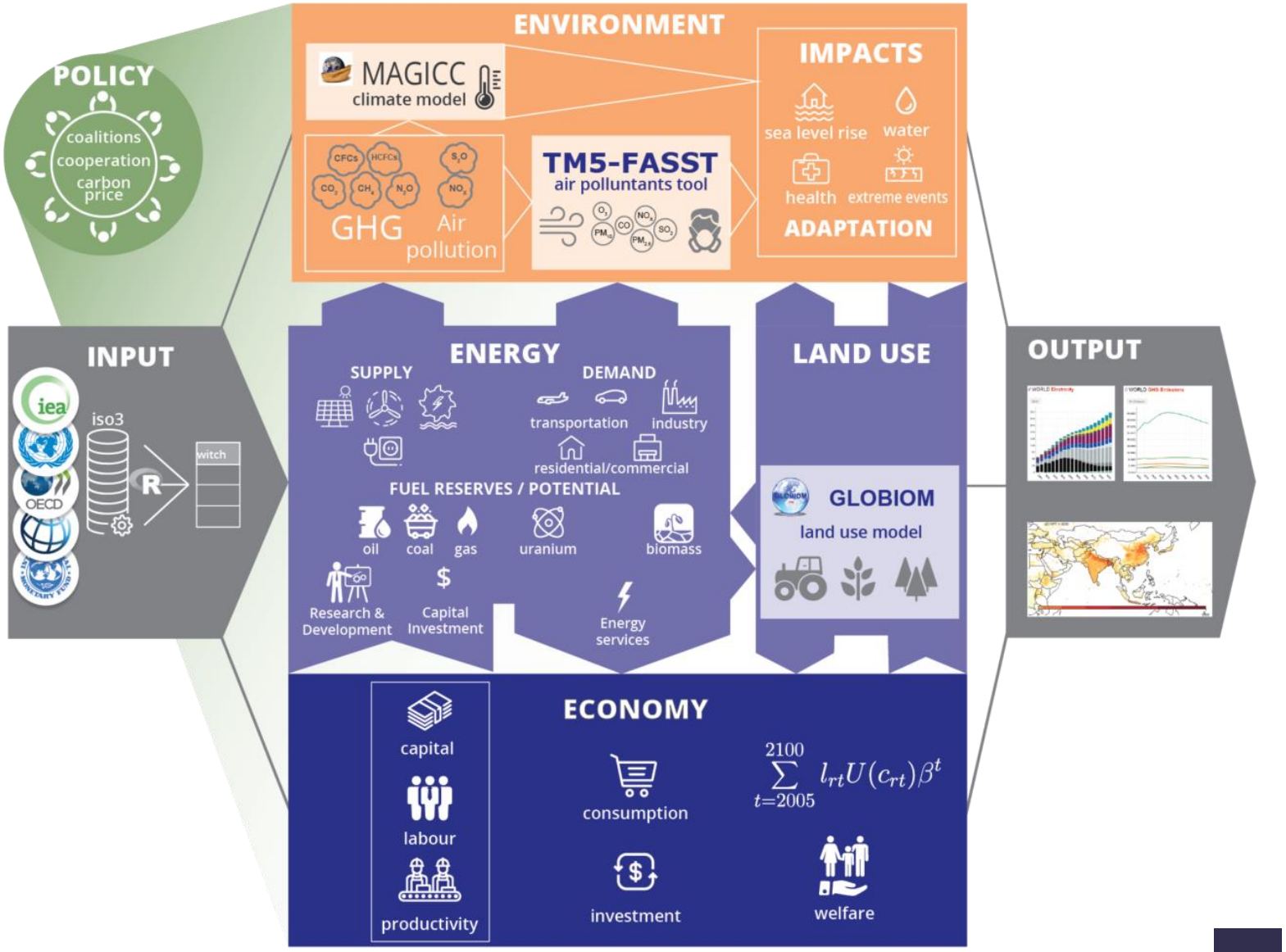


$GtCO_2e$ = billion tons of carbon dioxide equivalent.
Source: World Resources Institute. Climate Watch.

Asia's Transformation during the Global Transition to Net Zero

World Induced Technical Change Hybrid (WITCH) model

- Third most used integrated assessment model for Intergovernmental Panel on Climate Change 6th Assessment Report
- Macro-economic model linked to energy model including specific technologies.
- Incorporates technical change via learning by doing and research.
- Soft linked to land use model (GLOBIOM)
- Results fed to climate, air quality, microsimulation, and labor models



Scenario framework

Climate Scenario Matrix

Scenario	NDCs Until 2030	2030 to Net Zero Year	International Carbon trade	Carbon Emissions 2020-2100
Current policies	No	Current policies	No	3,270 $GtCO_2$ (endogenous)
NDC effort	Unconditional	NDCs Extrapolation	No	2,650 $GtCO_2$ (endogenous)
Uncoordinated net zero	Unconditional	Pledged transition	No	1,420 $GtCO_2$ (endogenous)
Global net zero	Unconditional	Fast transition	Yes	1,150 $GtCO_2$
Accelerated global net zero	Beyond NDCs	Fast transition	Yes	1,150 $GtCO_2$

Scenarios under current bottom-up approach of the Paris Agreement

Scenarios that meet Paris Agreement goals through greater coordination (>66% probability of less than 2°C of peak warming)

$GtCO_2$ = billion tons of carbon dioxide, NDC = nationally determined contribution.
Source: Authors.

Disaggregation within developing Asia: Caucasus and Central Asia, People's Republic of China, India, Rest of South Asia, Indonesia, Rest of Southeast Asia

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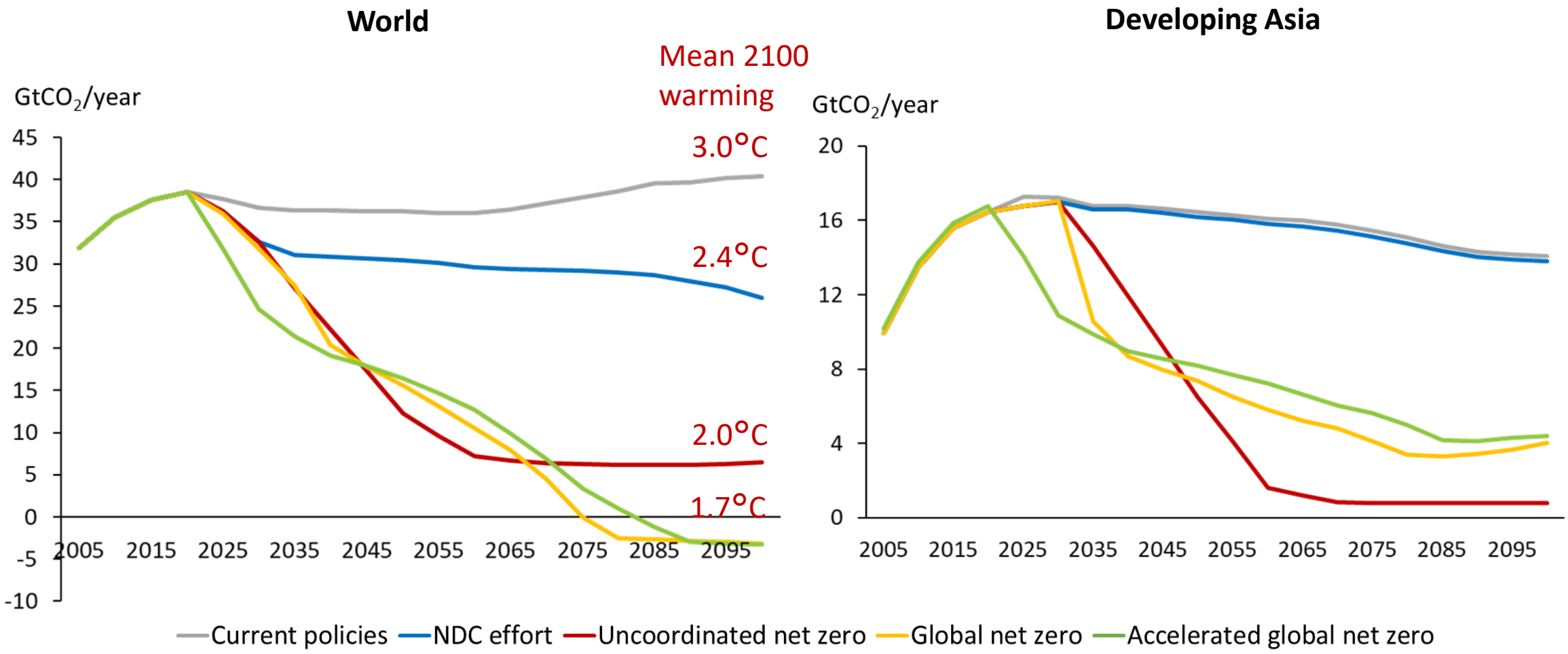
Scenarios contrast current policies, NDCs, and national net zero pledges with more optimal net zero pathways.

Carbon Dioxide Emissions Pathways under the Modeled Scenarios, 2005–2100



$GtCO_2$/year = billion tons of carbon dioxide per year, NDC = nationally determined contribution
Notes: International shipping and aviation emissions are not included in the global CO_2 emission pathways.
Source: Authors.

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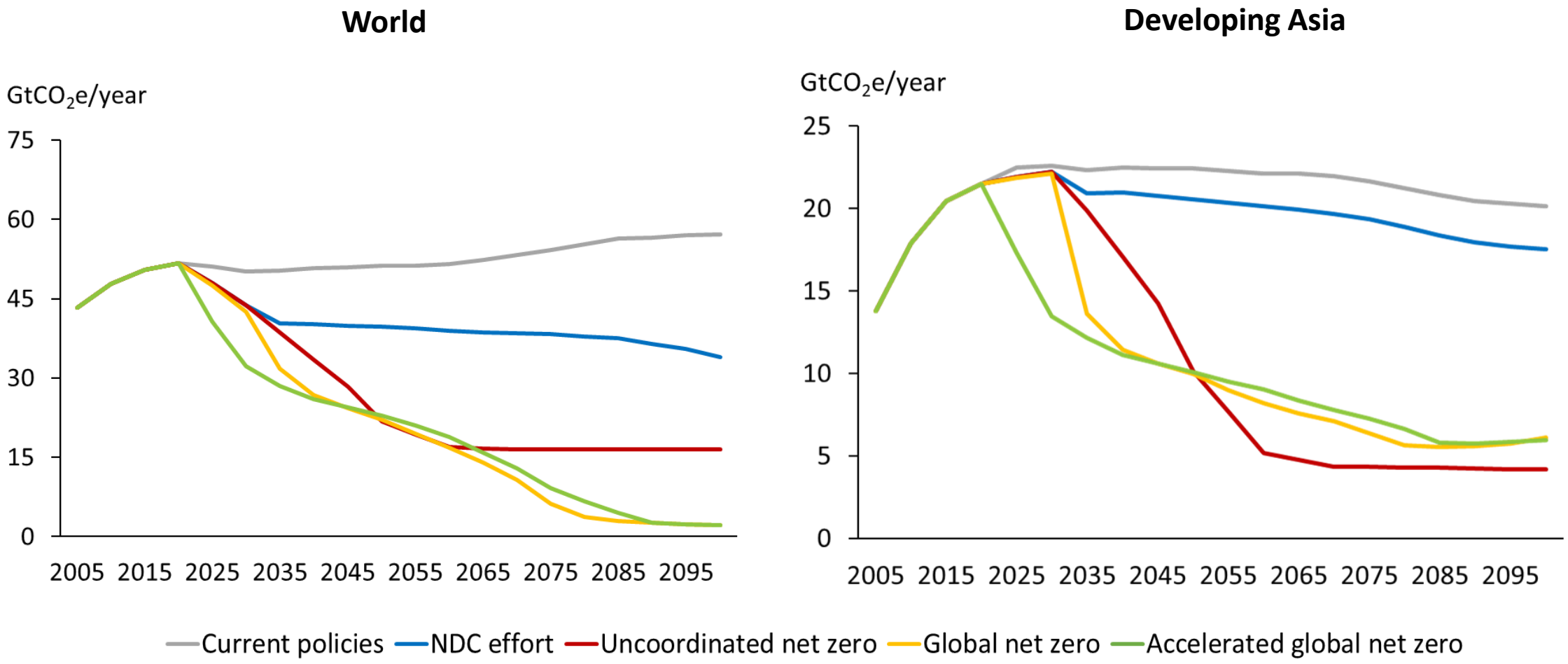
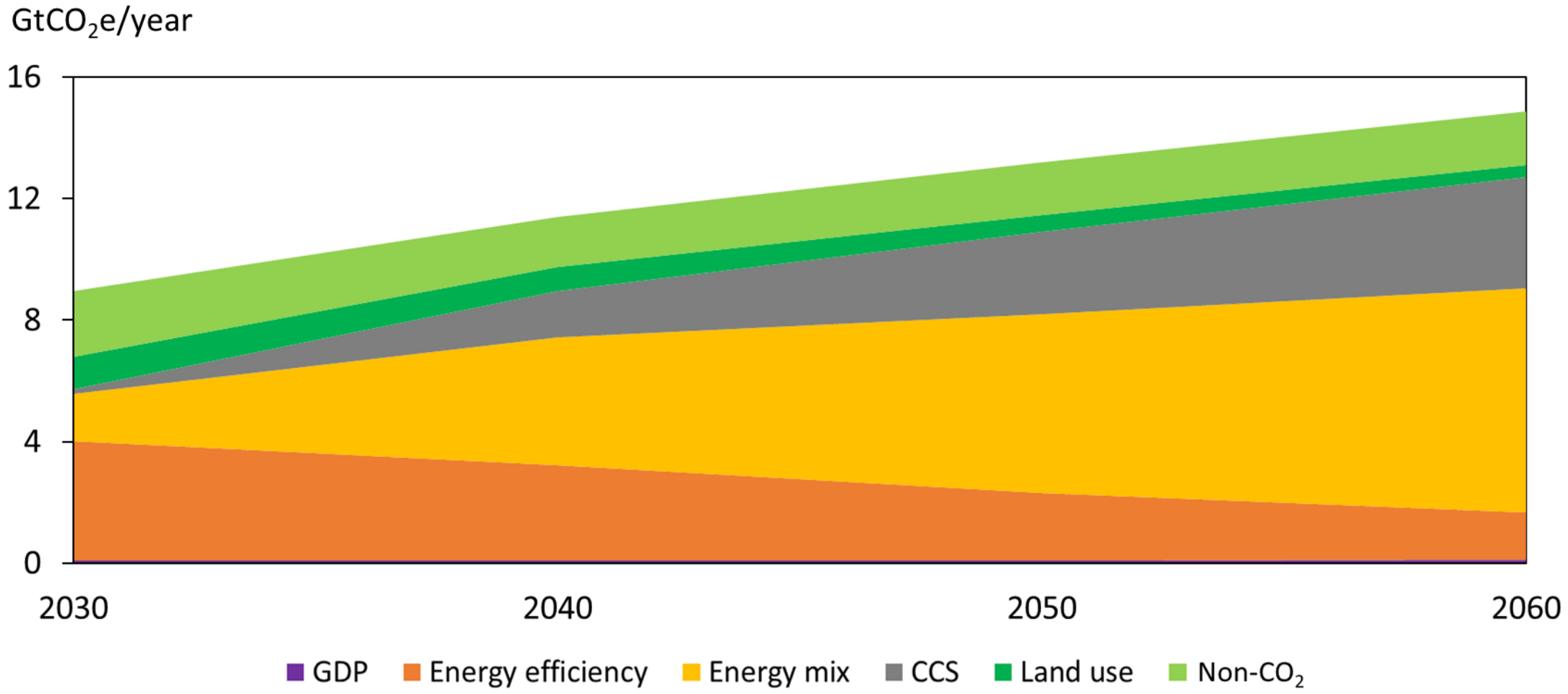
Greenhouse Gas Emissions Pathways under the Modeled Scenarios, 2005–2100



$GtCO_2e$/year = billion tons of carbon dioxide equivalent per year, NDC = nationally determined contribution
Source: Authors.

mitigation in the near term, while decarbonization of energy is critical in the long run

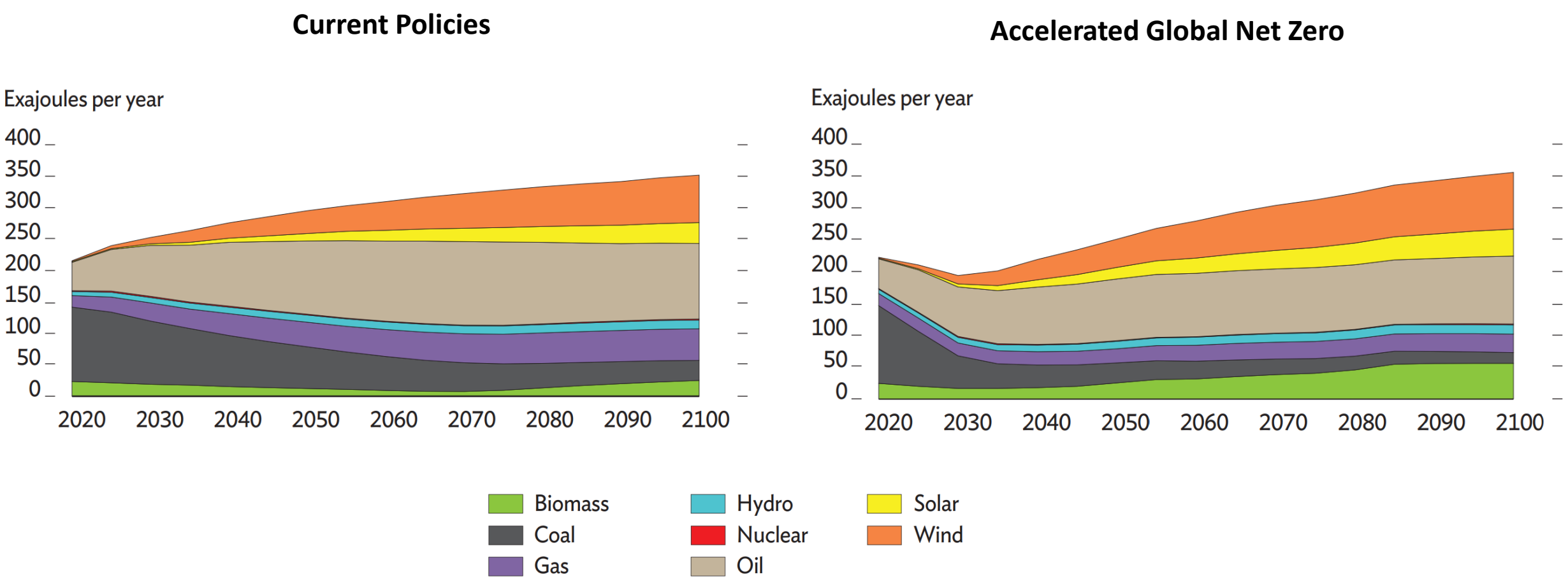
Decomposition of Mitigation Sources in Developing Asia under the Accelerated Global Net Zero Scenario, 2030–2060



CCS = carbon capture and storage, CO_2 = carbon dioxide, GDP = gross domestic product, $GtCO_2e$/year = billion tons of carbon dioxide equivalent per year.
Source: Authors.

As the largest source of emissions, the energy sector will undergo a rapid transformation

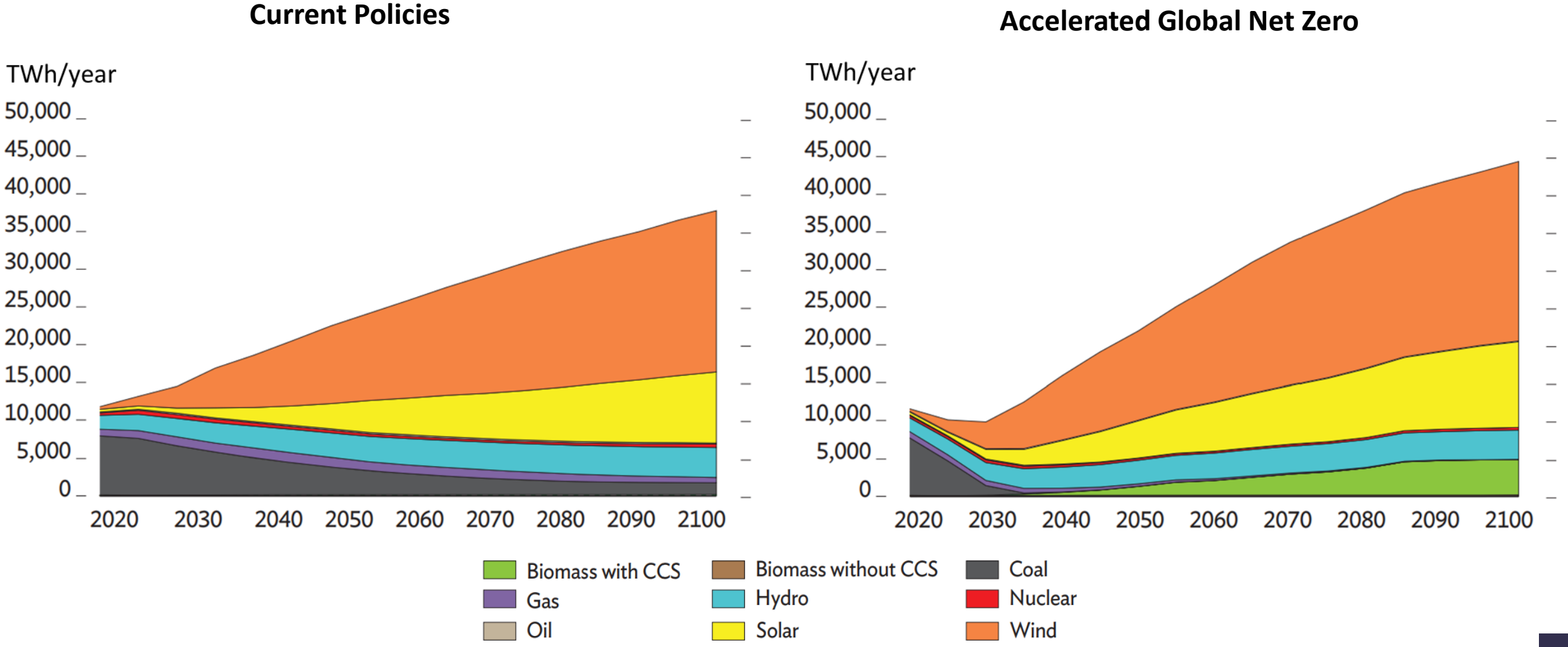
Primary Energy Mix in Developing Asia under Modeled Scenarios, 2020–2100



Source: Authors.

Electricity sector will undergo faster decarbonization under the net zero scenarios, with coal virtually absent.

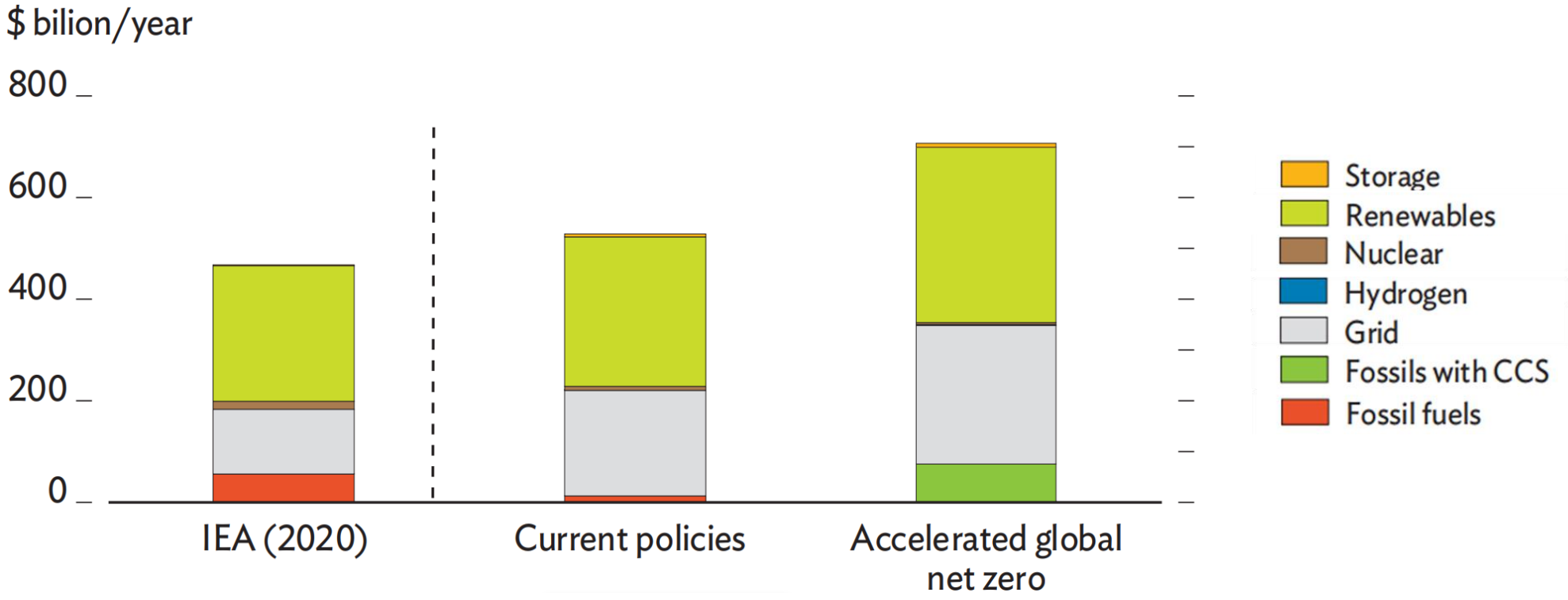
Electricity Mix in Developing Asia under Modeled Scenarios, 2020–2100



CCS = carbon capture and storage, TWh = terawatt-hour.
Source: Authors

The energy transition requires an increase in total investments in power supply.

Average Annual Investment in Power Supply in Developing Asia under Modeled Scenarios, 2020–2050

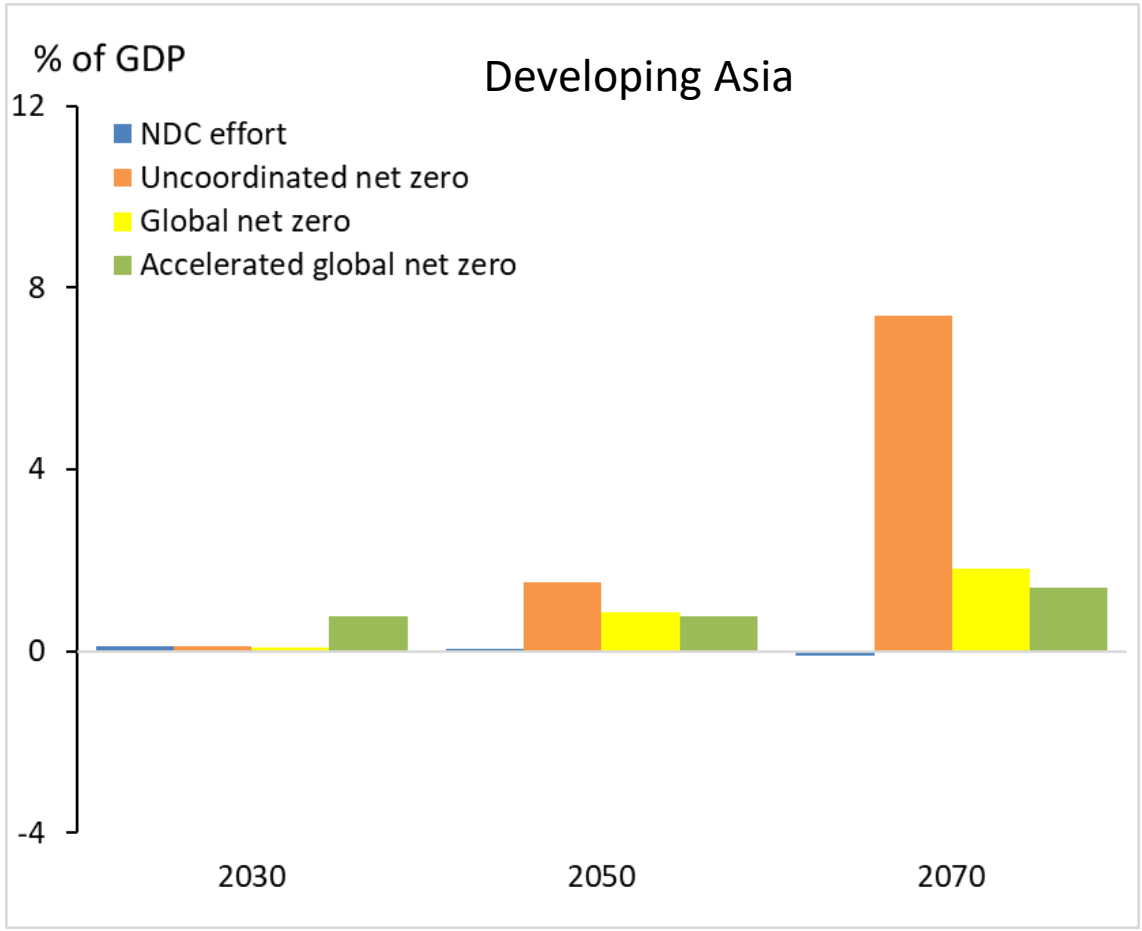


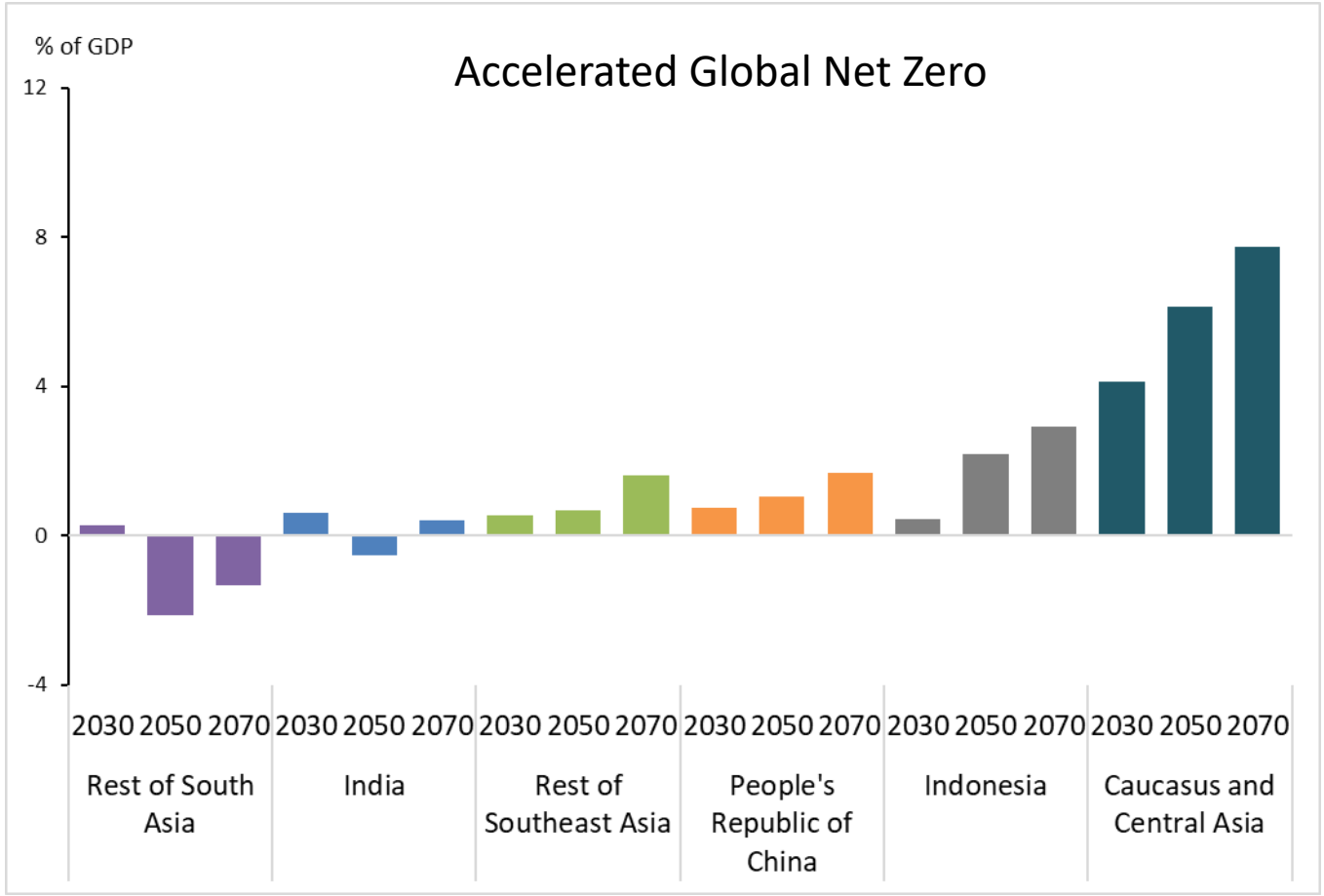
Notes: Renewables include solar, wind, hydro, and biomass. International Energy Agency (IEA) data has been downscaled using weights and aggregated to the reported region definitions.
Sources: Authors; International Energy Agency. 2020. *World Energy Outlook 2020: Access to Electricity Database*

Socioeconomic Consequences of the Global Transition Net Zero

Policy costs (excluding benefits) stay low for most of developing Asia, in all but the divergent net zero scenario.

Policy costs for developing Asia under the modelled scenarios over time, excluding benefits, relative to current policies.

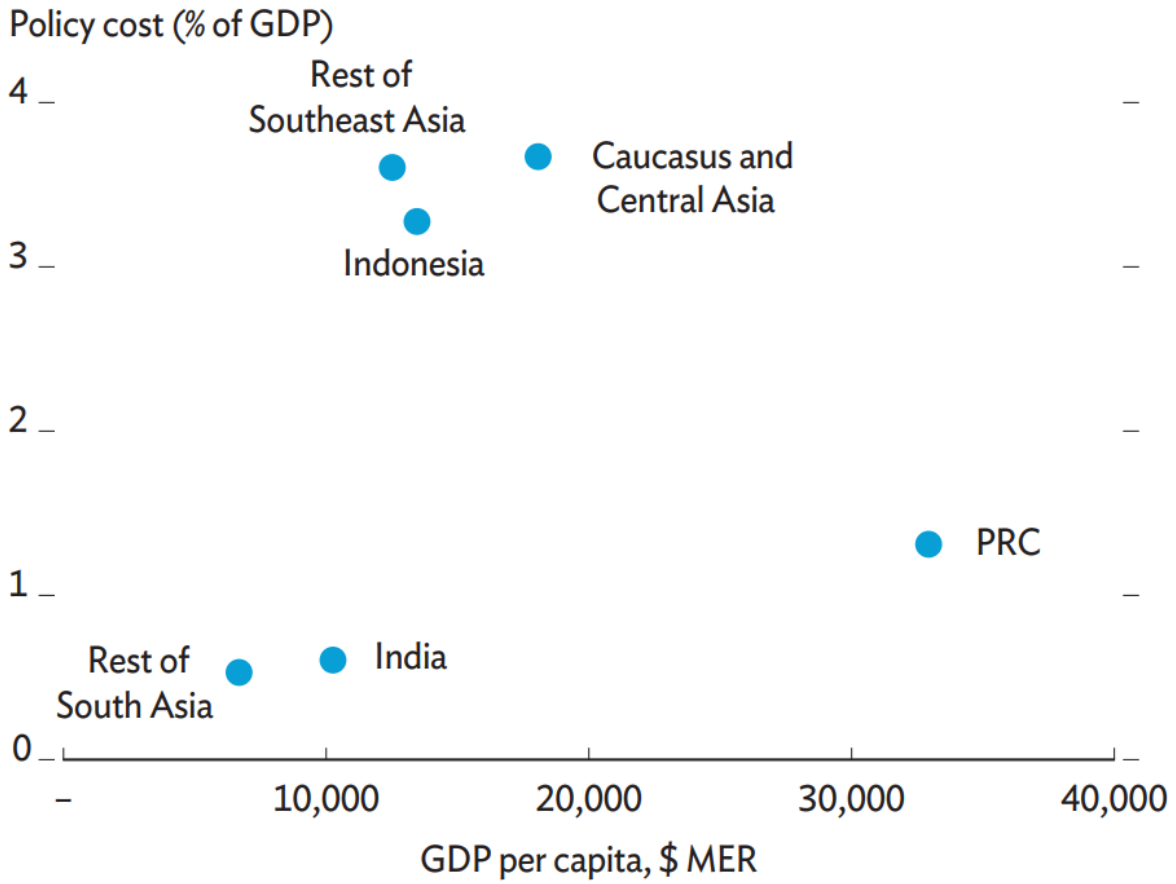


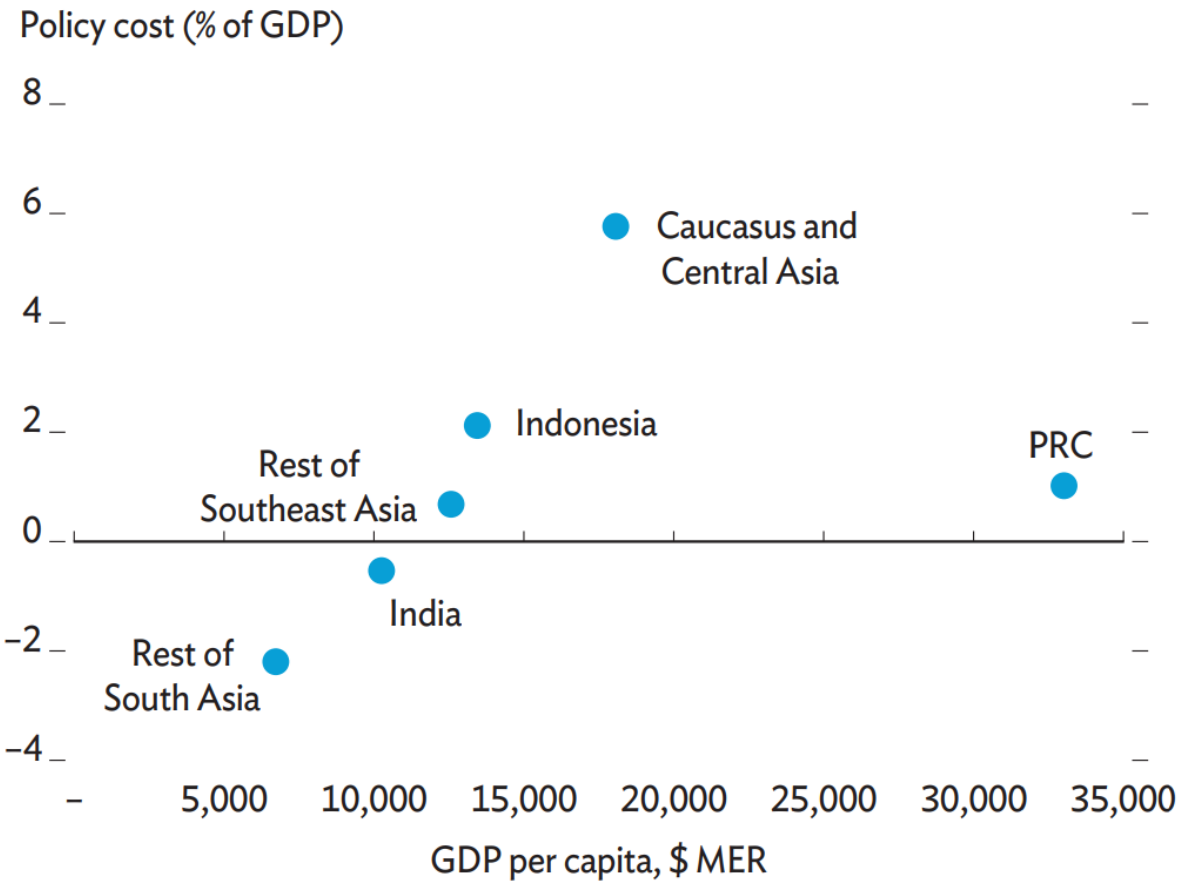


GDP=gross domestic product, NDC=nationally determined contribution.
Source: Authors.

A globally coordinated approach improves fairness for developing Asia

Distribution of Policy Costs against per Capita Gross Domestic Product under the Modeled Scenarios, 2050



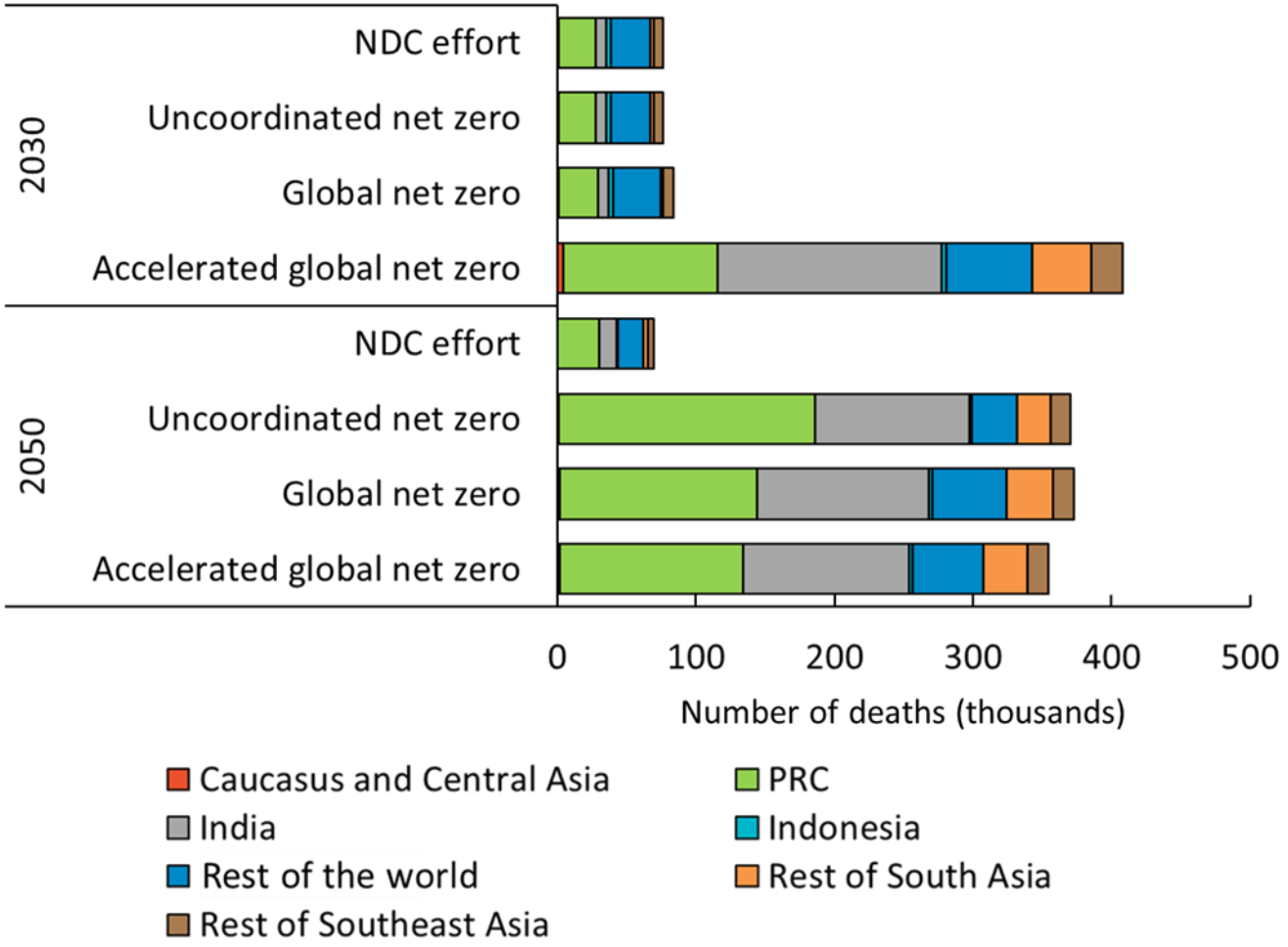


GDP = gross domestic product, MER = market exchange rate, PRC = People's Republic of China.
Source: Authors.

The accelerated global net zero scenario helps to reduce air pollution mortality quickly.

- Air quality is a major issue for developing Asia.
  - 6 of the 10 cities with highest population weighted PM2.5 exposure globally are in the region.
- Under *accelerated net zero scenario*, 346,000 premature deaths could be avoided annually by 2030 in the region from air pollution.

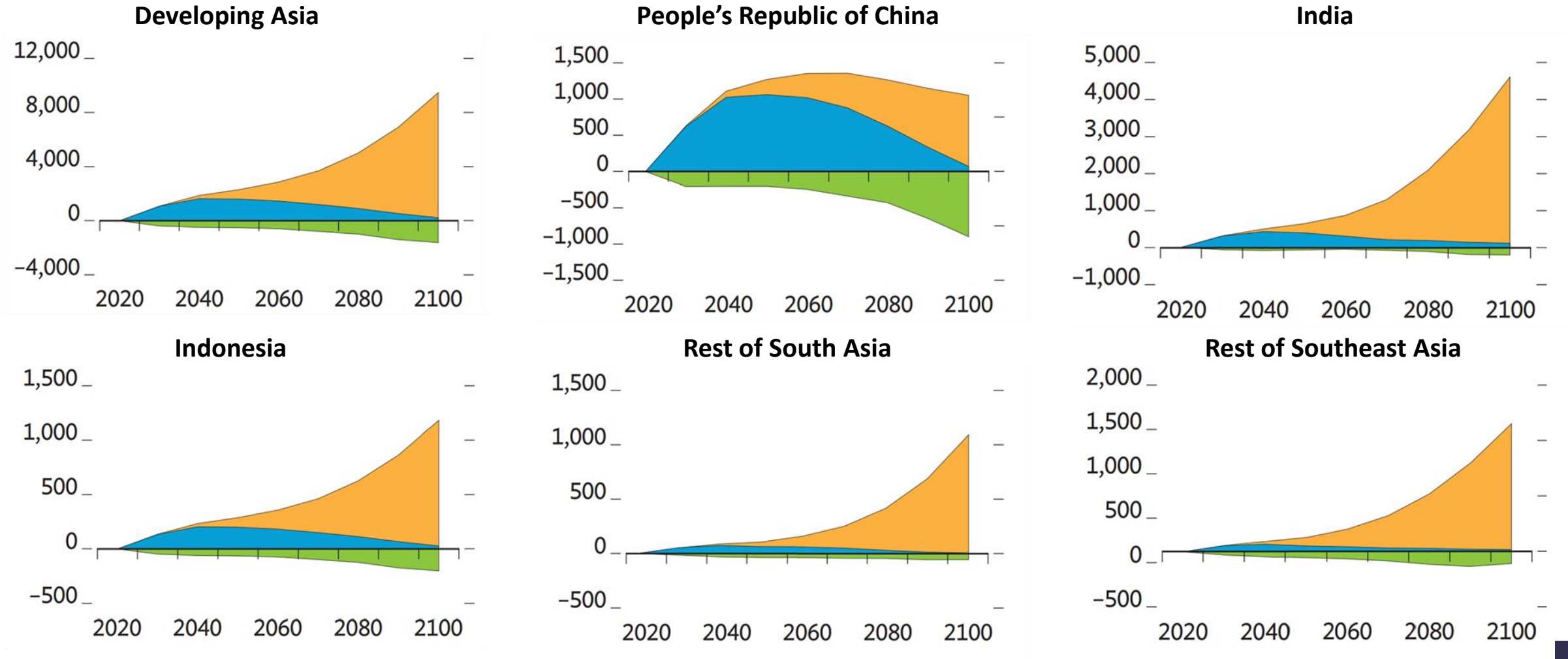
Avoided Annual Premature Deaths Due to Outdoor Particulate Matter 2.5 and Ozone under the Modeled Scenarios Relative to the Current Policies Scenario, 2030 and 2050



NDC = nationally determined contribution, PRC = People's Republic of China.
Source: Authors.

The benefits of ambitious climate action are 5 times policy costs for developing Asia.

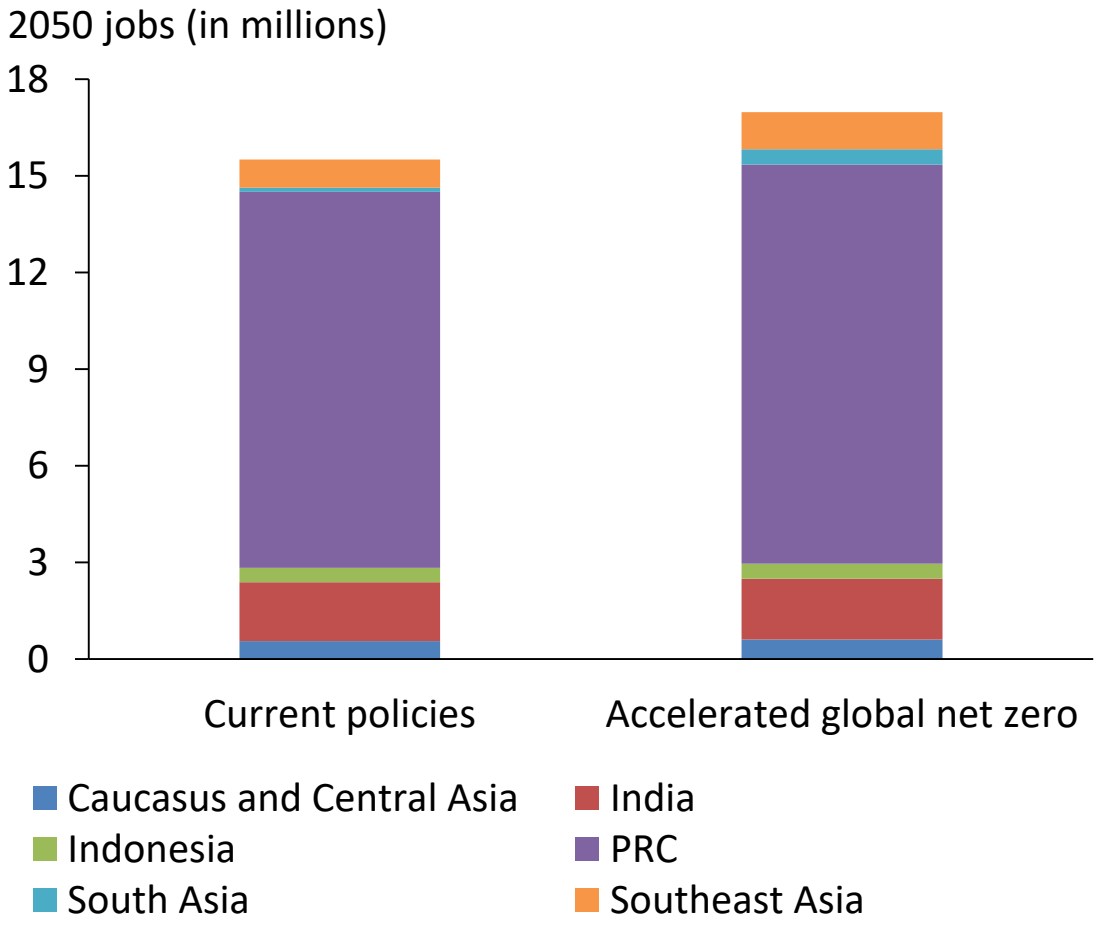
Annual Net Policy Costs, Climate Benefits, and Air Quality Co-Benefits in Developing Asia of the Accelerated Global Net Zero Scenario Relative to the Current Policies Scenario, 2020–2100
(Total economic impact, $ billion 2020)



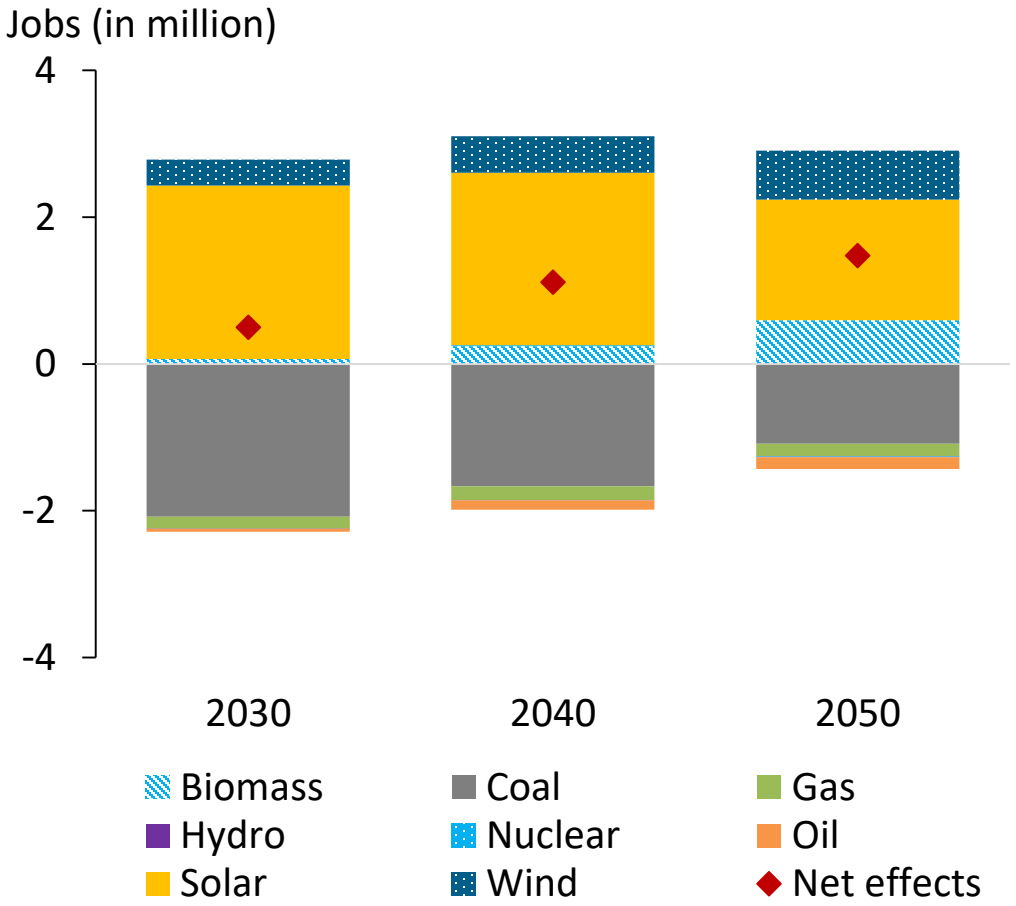
PRC = People's Republic of China.
Source: Authors.

sector jobs in all of developing Asia

Total direct energy sector full time equivalent employment by region



Changes in full time direct energy sector employment by type of energy between current policies and the accelerated global net zero scenario



PRC=People's Republic of China.
Source: Authors

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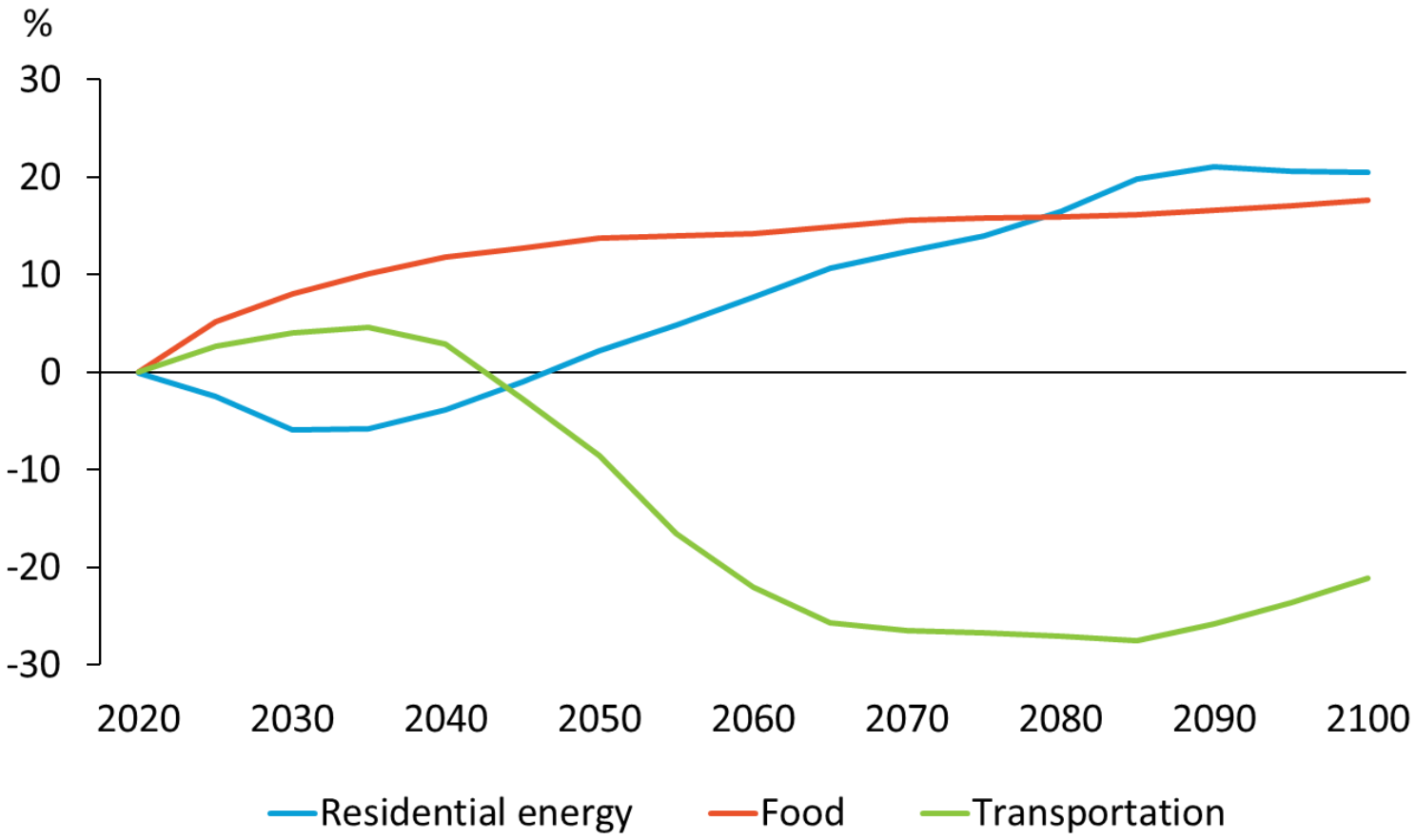
Climate action principally affects households via energy and food price changes

- Ambitious decarbonization is found to:
  - Increase food prices
  - Increase long term residential energy expenditures
  - Increase, followed by eventual decrease in transportation expenditures

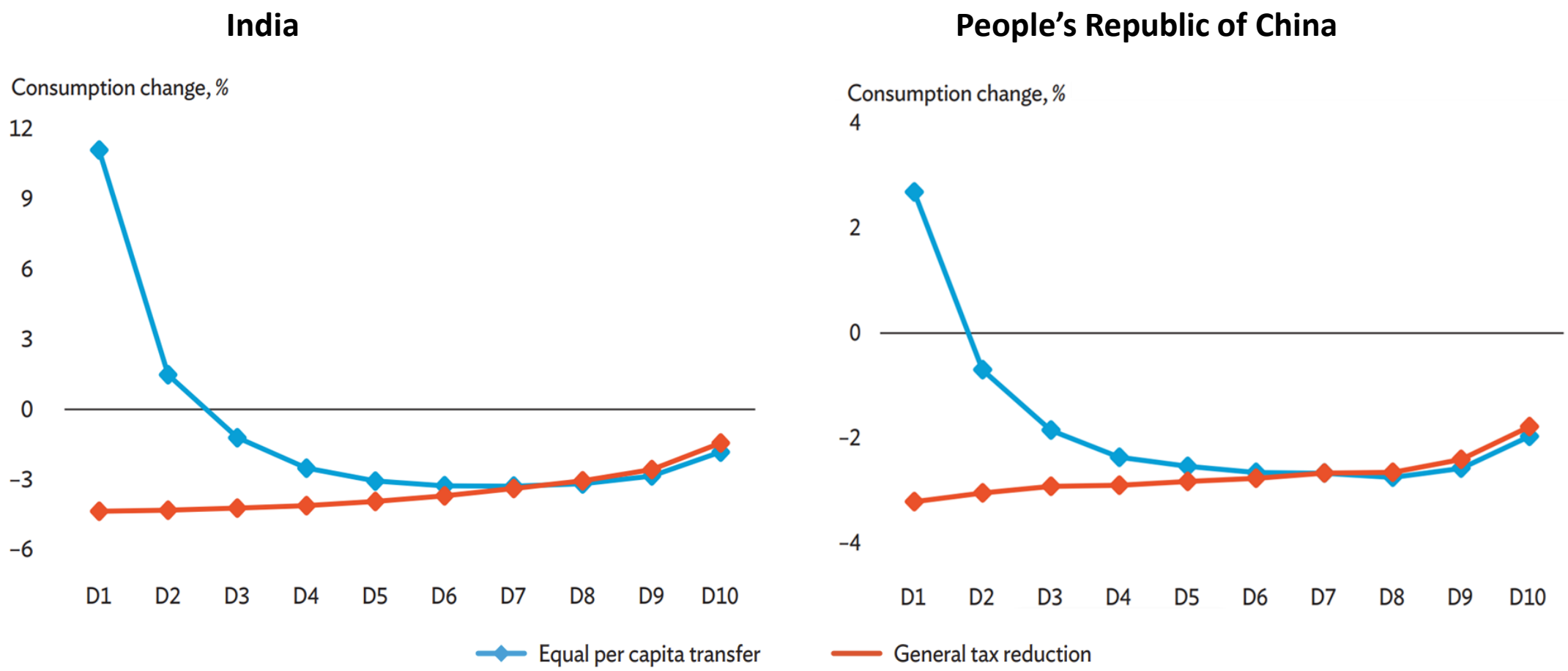
Change in Household Food and Energy Expenditure from the Current Policies to Accelerated Global Net Zero Scenarios



Source: Authors.

climate policy has regressive or progressive effects.

Household Consumption Impact of the Accelerated Global Net Zero Scenario Compared to the Current Policies Scenario under Alternative Redistribution of Carbon Pricing Revenues in India and the People's Republic of China



D = income decile.
Source: Authors.

Policies for an Efficient and Equitable Global Transition to Net Zero

Developing Asia can decarbonize via three policy pillars.

Three Policy Pillars to Achieve Developing Asia's Low-Carbon Transition

Reforming Prices	Facilitating Low-Carbon Responses	Ensuring Fairness
• Putting a price on carbon emissions. • Removing subsidies that promote emissions.	• Implementing regulations and incentives for decarbonization. • Leveraging finance towards low carbon activities.	• Working towards fair international mitigation burden sharing. • Compensating and protecting vulnerable groups. • Helping the affected to adjust.

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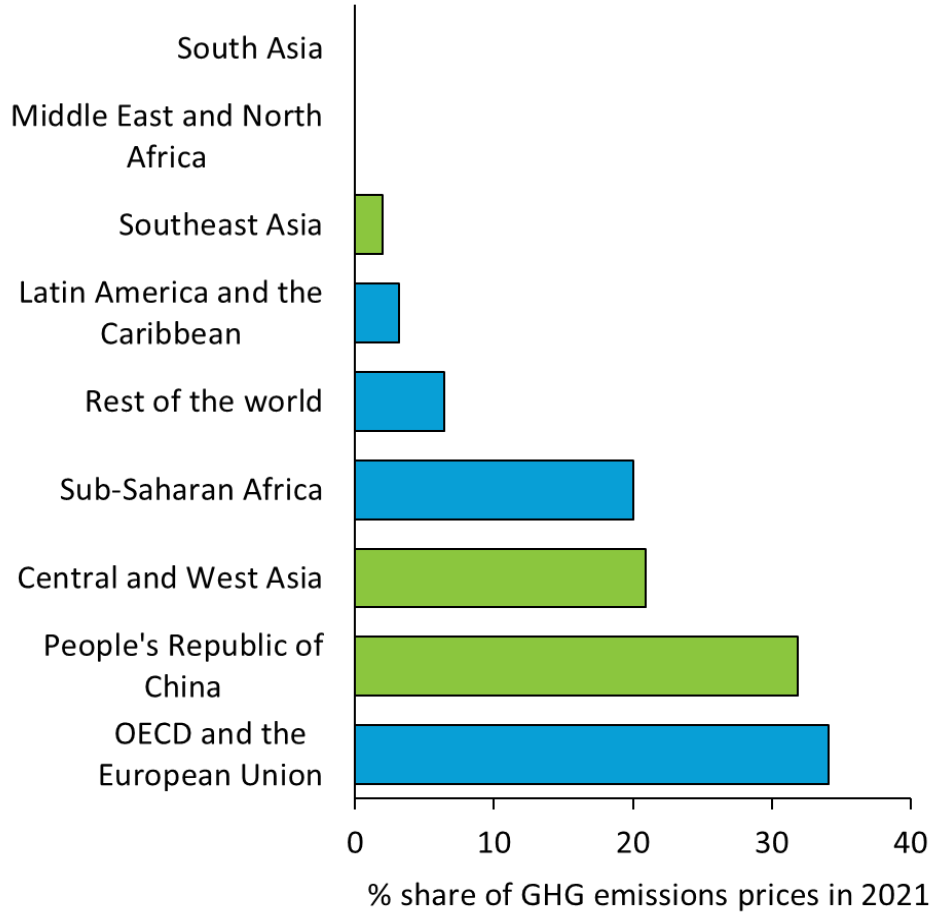
ensure that mitigation effort is allocated efficiently

- Progress:
  - Higher income countries, such as PRC, Kazakhstan, Korea, and Singapore, use carbon pricing, and Indonesia is starting this year.
- About 21% of developing Asia's emissions have pricing, compared with 34% in the OECD & EU.
- Price levels remain lower than other regions.
- Barriers limit pricing exposure even in targeted sectors.

Coverage of Global Greenhouse Gas Emissions by Carbon Pricing, 2021

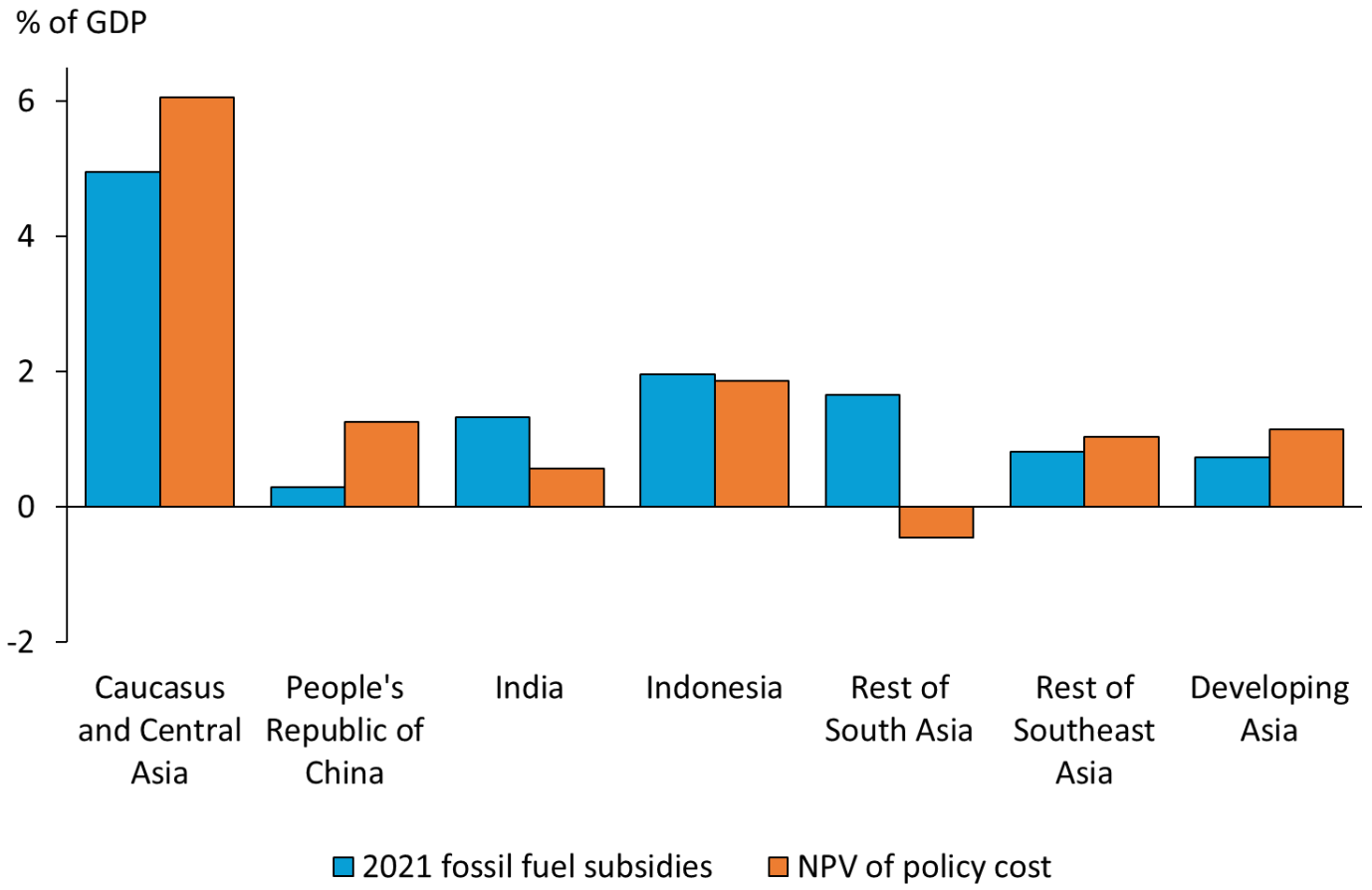


EU = European Union, GHG = greenhouse gas, OECD = Organisation for Economic Co-operation and Development.
Source: World Bank. Carbon Pricing Dashboard.

consume resources that could enable decarbonization

- Fossil fuel subsidies cost governments in developing Asia nearly as much as the most ambitious decarbonization scenario.
- Subsidies also encourage land use emissions. Globally, agriculture received $777 billion in distorting subsidies in 2021 (OECD 2023).
  - The PRC accounts for 37% of subsidies globally.
- Concession systems may subsidize deforestation on public lands.

Fossil Fuel Subsidies in Developing Asia in 2021 Compared with the Policy Costs Found for the Accelerated Net Zero Scenario



GDP = gross domestic product, NPV = net present value.
Sources: Authors; International Energy Agency. Fossil Fuels Subsidy Database.

Facilitating low carbon responses: Regulations, incentives, and mobilization of investment

- Command and control regulations are widely used in the region.
  - Standards for end uses: buildings, minimum energy efficiency performance, vehicle fuel economy
  - Mandates for vehicle biofuel blending, renewable energy shares
  - Labeling for energy efficiency
- Subsidies and fiscal incentives also target clean energy adoption.
  - Feed-in-tariffs for renewables, tax exemptions and subsidies for electric vehicles
- Yet, coverage gaps remain, and green subsidies are outweighed by subsidies to fossil fuels.
- The private sector accounts for 49% of global climate finance in 2019-2020, and this needs to rise (IEA 2021, UNFCCC 2021).
- Governments can de-risk green projects to improve their risk return profiles and can help develop green and transition finance markets to attract additional investment.

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Ensuring fairness: A low carbon transition must be just to succeed.

Ensuring international fairness

- An international emissions allocation framework could enable fairer climate policy outcomes, by coordinating NDC mitigation commitments as a basis for carbon trade.

Ensuring domestic fairness

- Carbon revenue recycling can help offset impacts on low-income households through higher prices of essentials, employment effects, and access to land.
- Training and reskilling can help integrate those adversely affected, while social protection help smooth the transition.
- Investing in agriculture and strengthening land rights are critical to safeguard the welfare of the vulnerable.

Sustainable bond market Developments in Emerging East Asia

The AsianBondsOnline is an ASEAN+3 Initiative supported by the ADB and funded by the Ministry of Finance Japan, through the Investment Climate Facilitation Fund.

ABO
AsianBondsOnline
An ASEAN+3 Initiative

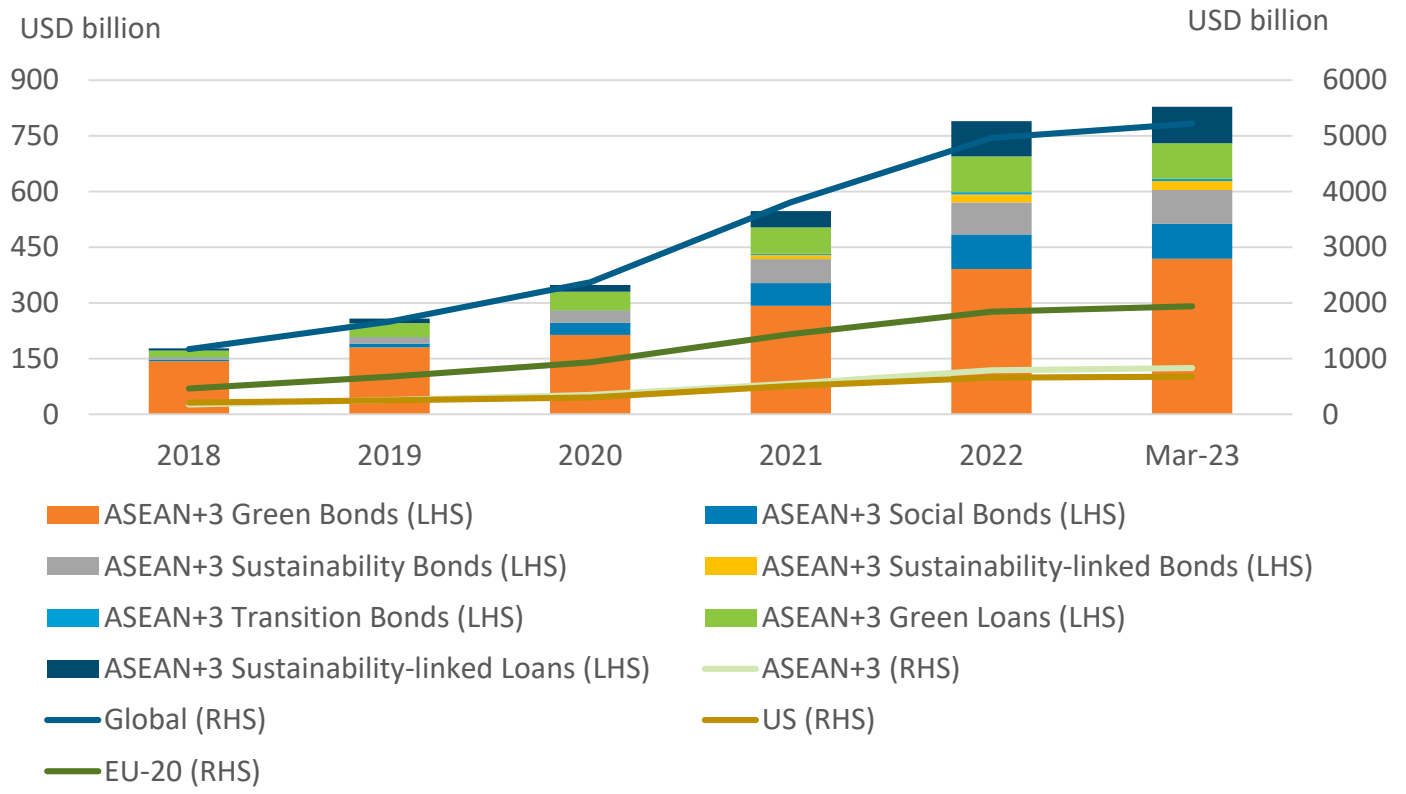
Green bonds are major sustainable finance debt instruments in ASEAN+3

In ASEAN+3, outstanding sustainable debt financing grew from USD142 billion in Q1 2018 to USD828 billion by Q1 2023 (nearly 500% in 5 years) .

By Q1 2023, global sustainable bonds, green and sustainability-linked loans reached USD5.2 trillion. EU-20 accounts for 37% global total, and ASEAN+3 is the second largest user of sustainable debt finance with a 16% share.

In ASEAN+3, green bonds outstanding reached USD419 billion as of Q1 2023, accounting for 50.6% of regional total sustainable debt financing.

Outstanding Sustainable Financing in ASEAN+3 Markets

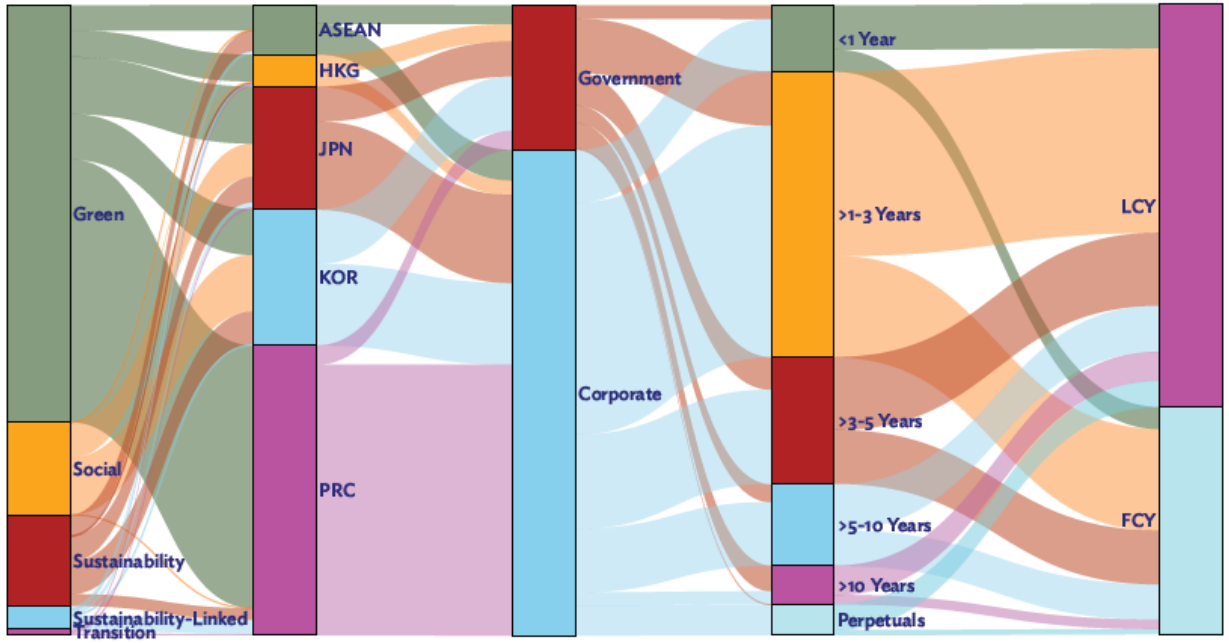


EU = European Union, US = United States, USD = United States dollar.
Note: ASEAN+3 markets include the People's Republic of China; Hong Kong, China; Indonesia; Japan; the Republic of Korea; Malaysia; the Philippines; Singapore, Thailand, and Viet Nam. Sustainable financing includes green bonds; green loans; social bonds; sustainability bonds; sustainability loans; sustainability-linked bonds, and transition bonds.
Source: *AsianBondsOnline* calculations based on Bloomberg LP data.

ASEAN+3 sustainable bond market has become more diversified in terms of market and product profiles

Despite rapid growth, ASEAN+3 sustainable bond markets accounted for only 1.8% of the regional bond financing. By the end of March, green bonds (66.1%), LCY financing (64.0%), and private sector financing (77.1%) comprised most of ASEAN+3's sustainable bond market.

Market Profile of Outstanding ASEAN+3 Sustainable Bonds at the end of March 2023



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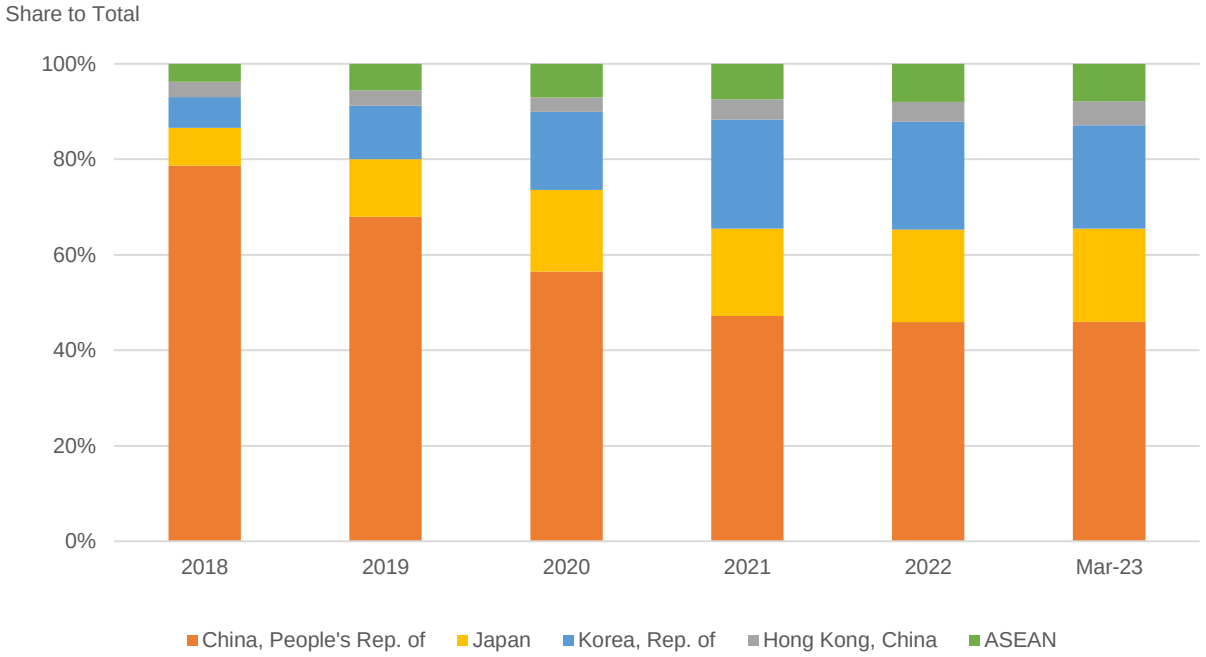
Source: ADB. *Asia Bond Monitor June 2023*. Manila.

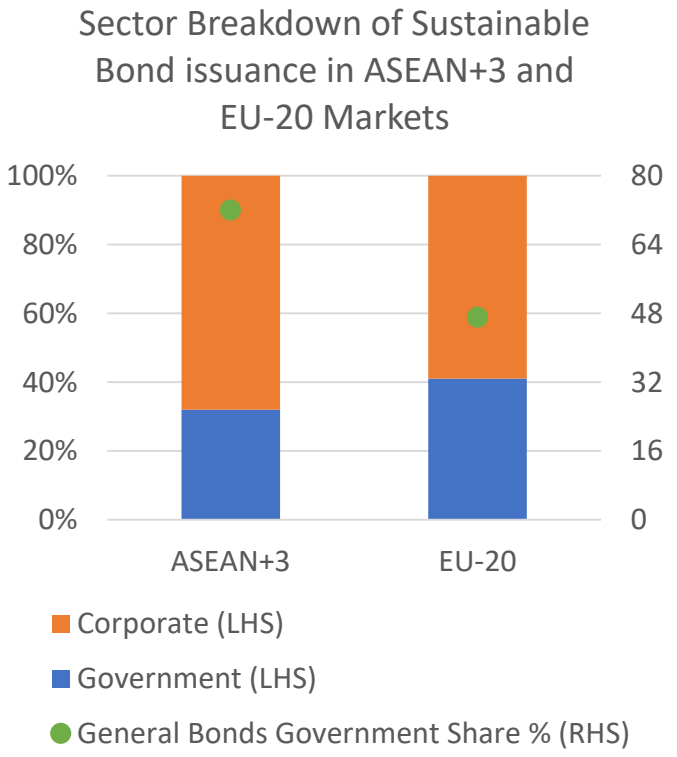
HHI of different markets decreased by half from March 2018 to March 2023. ASEAN, Japan, and the Republic of Korea increased their shares in ASEAN+3 sustainable bond markets from 3.7%, 8.0%, and 6.4% in 2018 to 7.8%, 19.5%, and 21.6% as of March 2023, respectively.

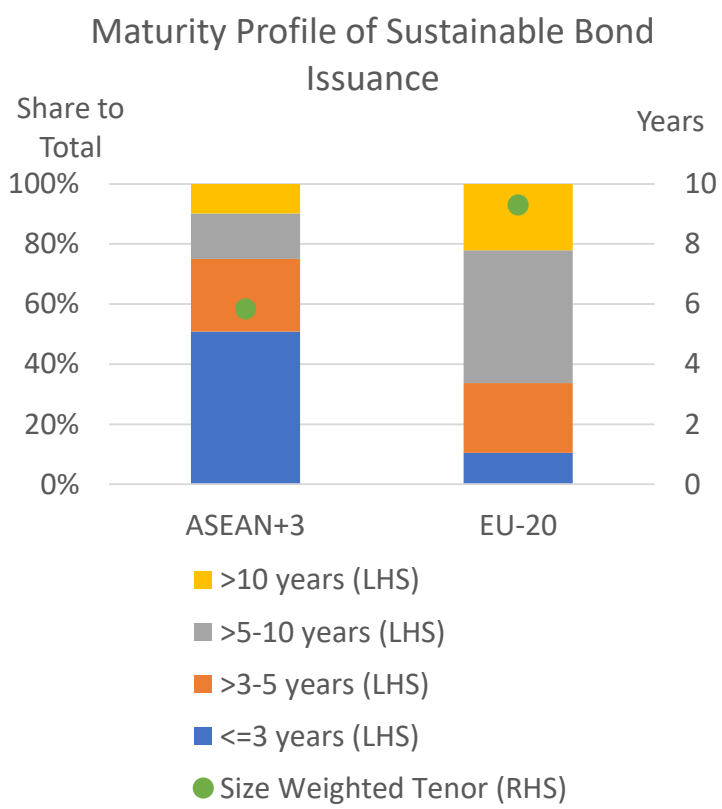
Market profile of Sustainable Bond Outstanding in ASEAN+3

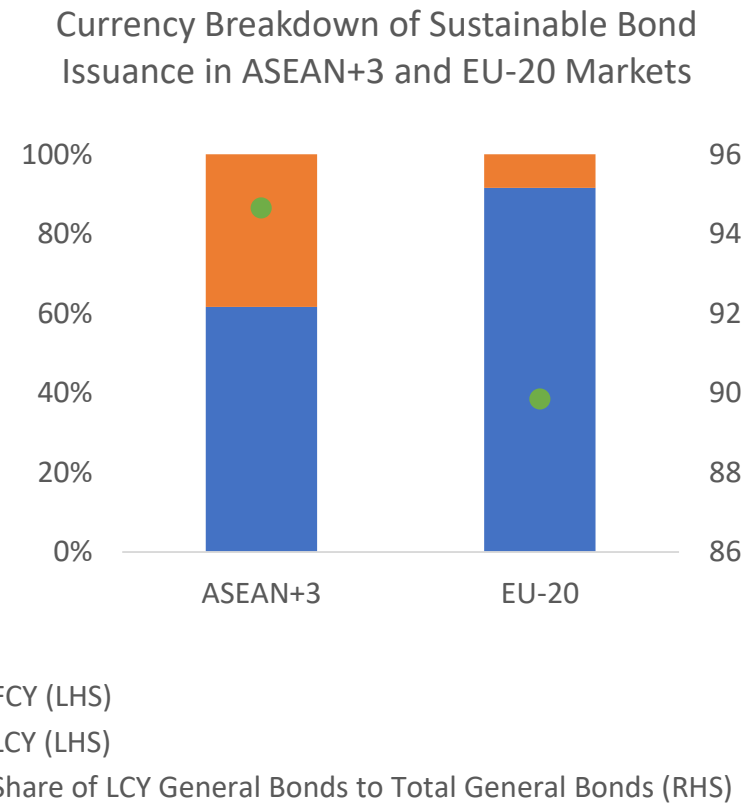


ASEAN+3's sustainable bond market has potential for further development to provide more LCY, public sector, and longer-term financing

Comparison between Sustainable Bond Issuance in ASEAN+3 and EU-20 Markets in the First Quarter of 2023







ASIA IN THE GLOBAL TRANSITION TO NET ZERO

Thematic Report of the
Asian Development Outlook 2023

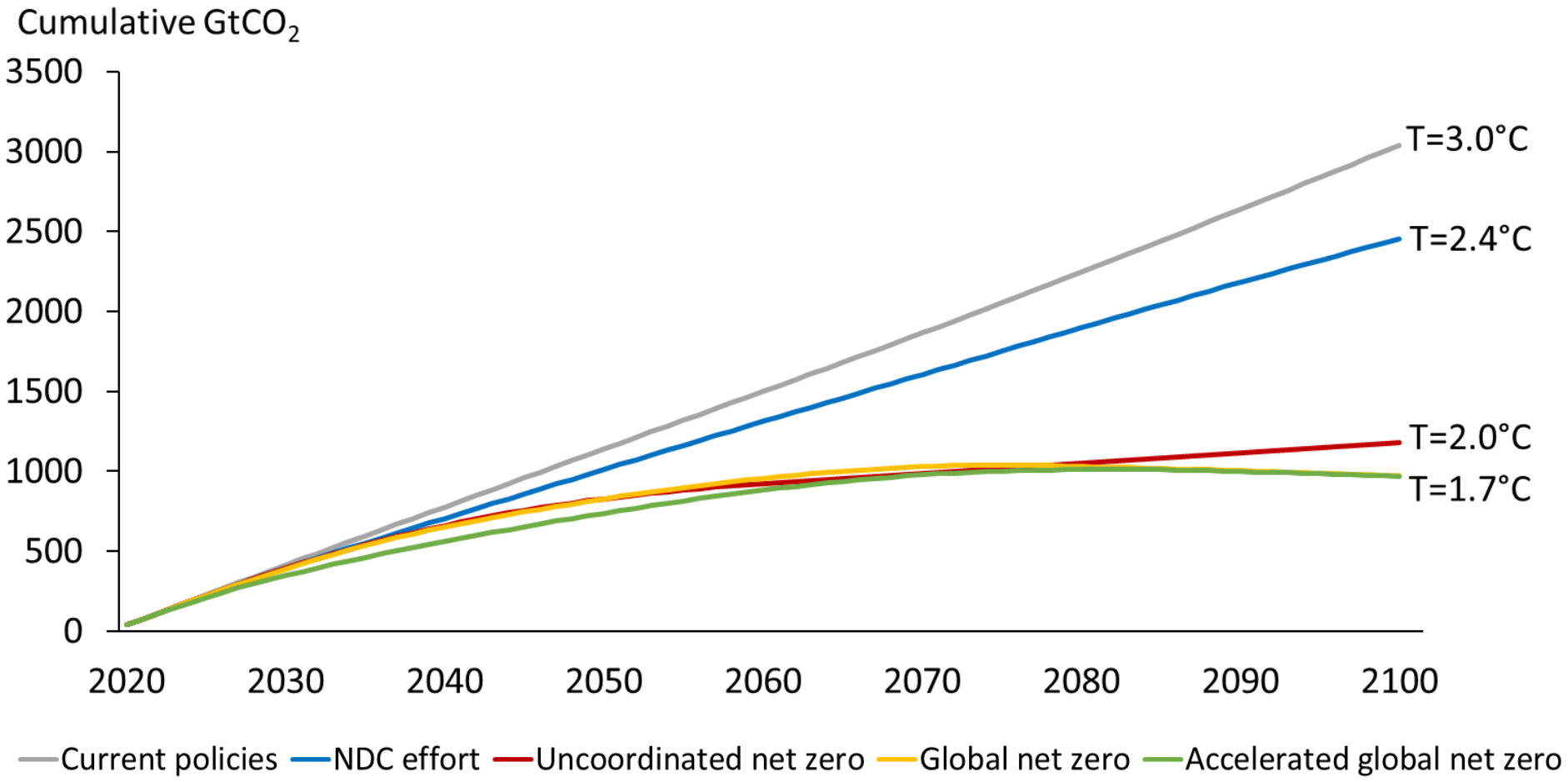
Download here: https://www.adb.org/ado-2023-thematic-report

Thank you!

Extra slides

Climate policies remain fragmented and unlikely to meet Paris Agreement goals.

Global Cumulative Carbon dioxide Emissions and Average Temperature Increase in 2100



$GtCO_2$ = billion tons of carbon dioxide, NDC = nationally determined contribution, T = temperature in 2100.
Notes: International shipping and aviation emissions are not included in the global CO2 emission pathways. All temperature calculated with MAGIC v6 model.
Source: Authors.

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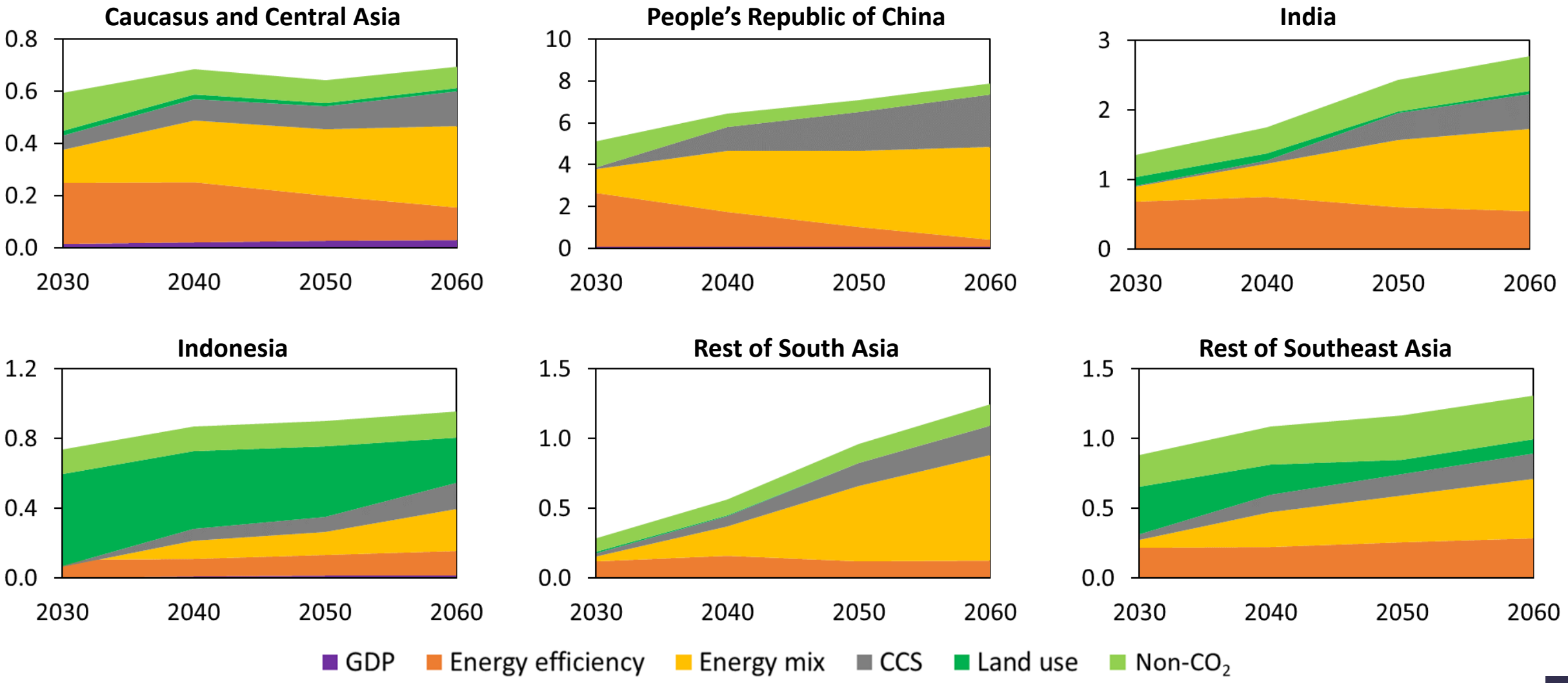
There are however regional differences....

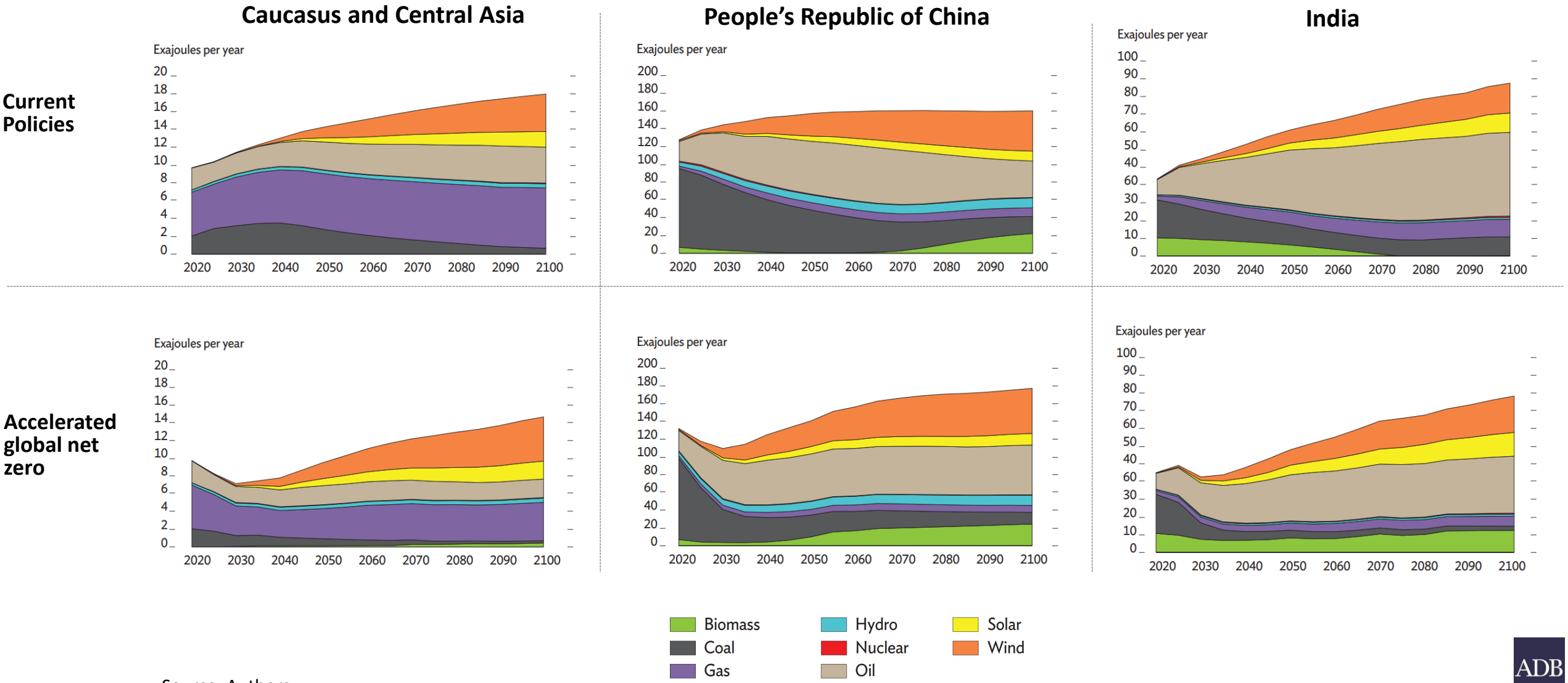
Decomposition of Mitigation Sources under the Accelerated Global Net Zero Scenario, By Region, 2030–2060
($GtCO_2e$/year)



CCS = carbon capture and storage, GDP = gross domestic product, $GtCO_2e$/year = billion tons of carbon dioxide equivalent per year.
Source: Authors.

The share of coal in primary energy in the region will decline even under modest climate action

Primary Energy Mix in Developing Asia under Modeled Scenarios, 2020–2100



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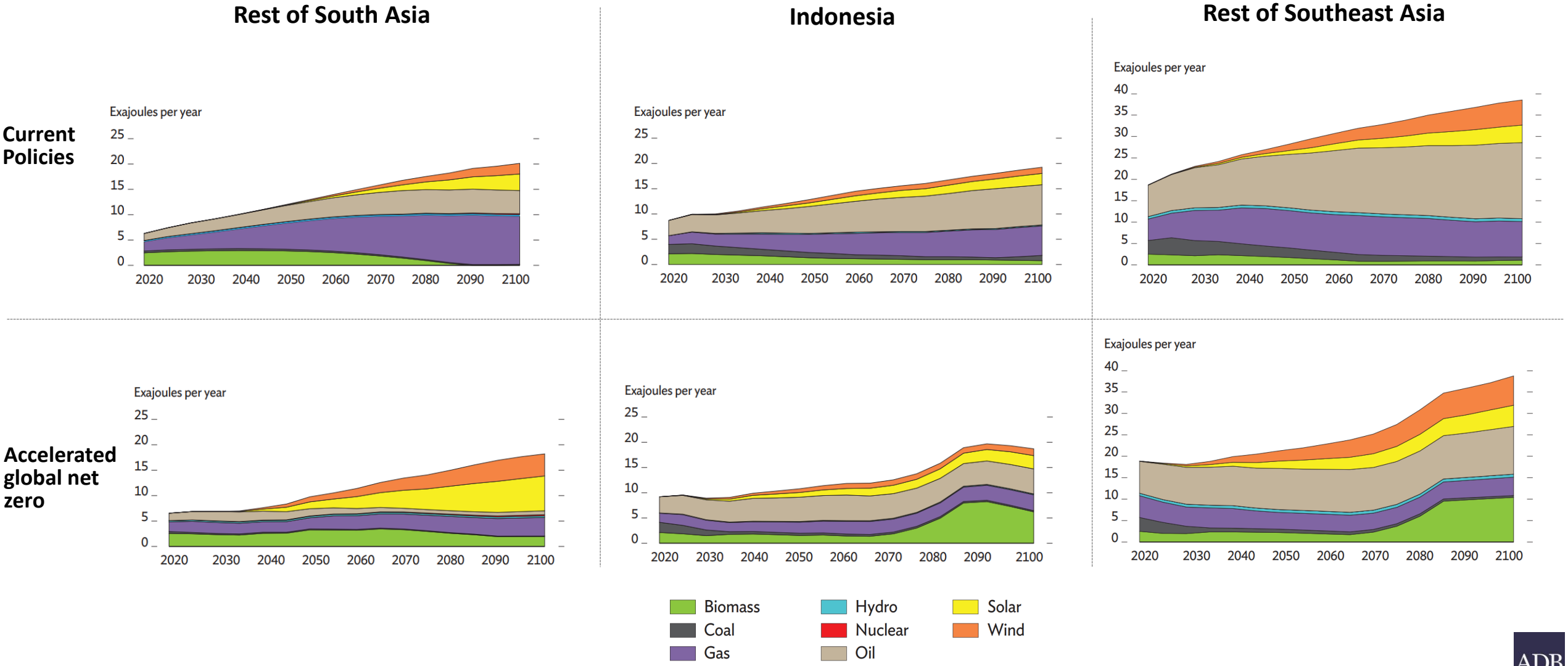
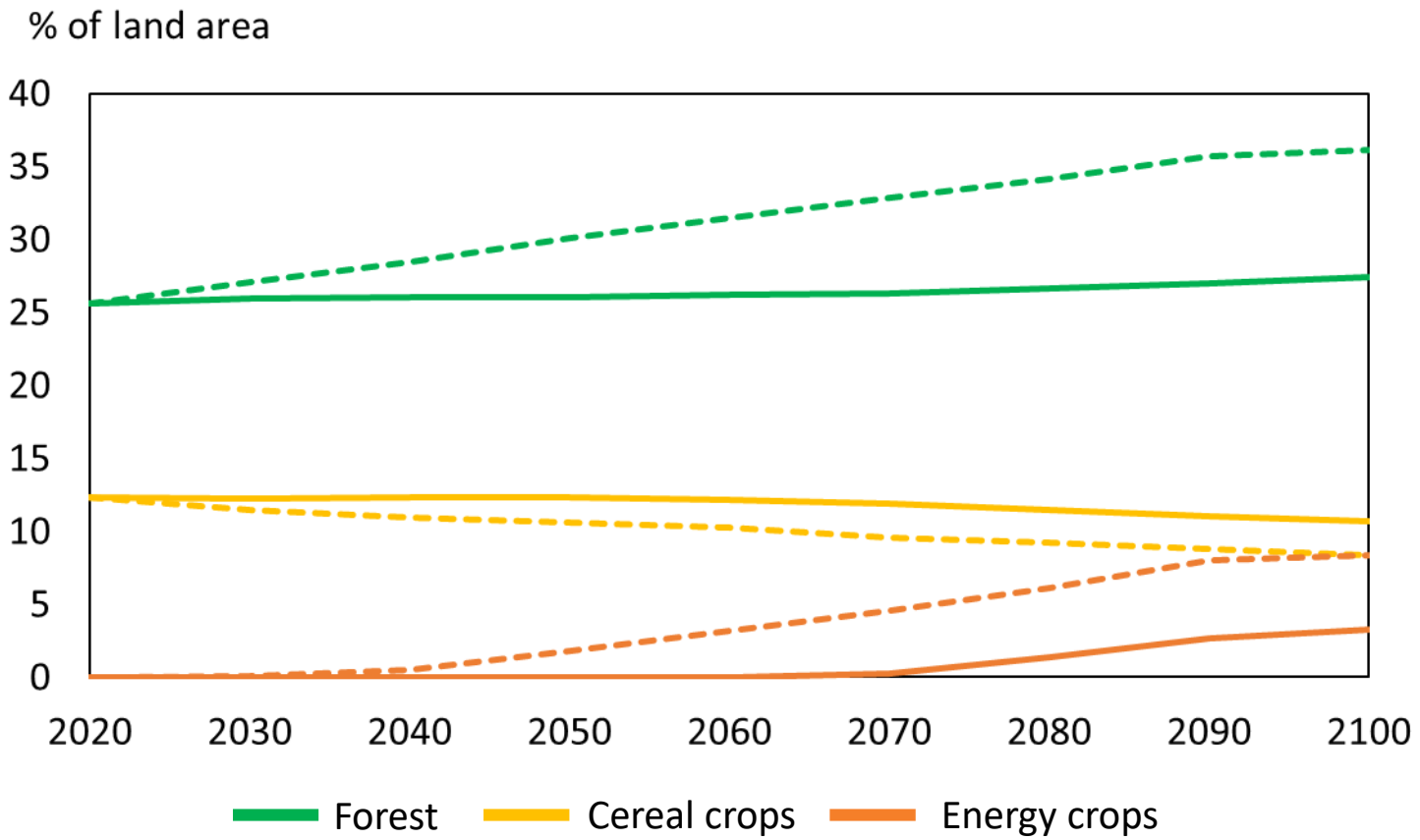


Source: Authors.

The net zero transition implies bold changes in patterns of land use

- Under accelerated global net zero scenario, forest cover in developing Asia increases from 26% to reach 30% of landcover by 2050.
- Land area devoted to grow food crops decreases by 36 million hectares, while 39 million hectares of land will be used to grow energy crops by 2050.

Share of Forest, Cereal Crops, and Energy Crops in Land Cover in Developing Asia under Modeled Scenarios, 2020–2100

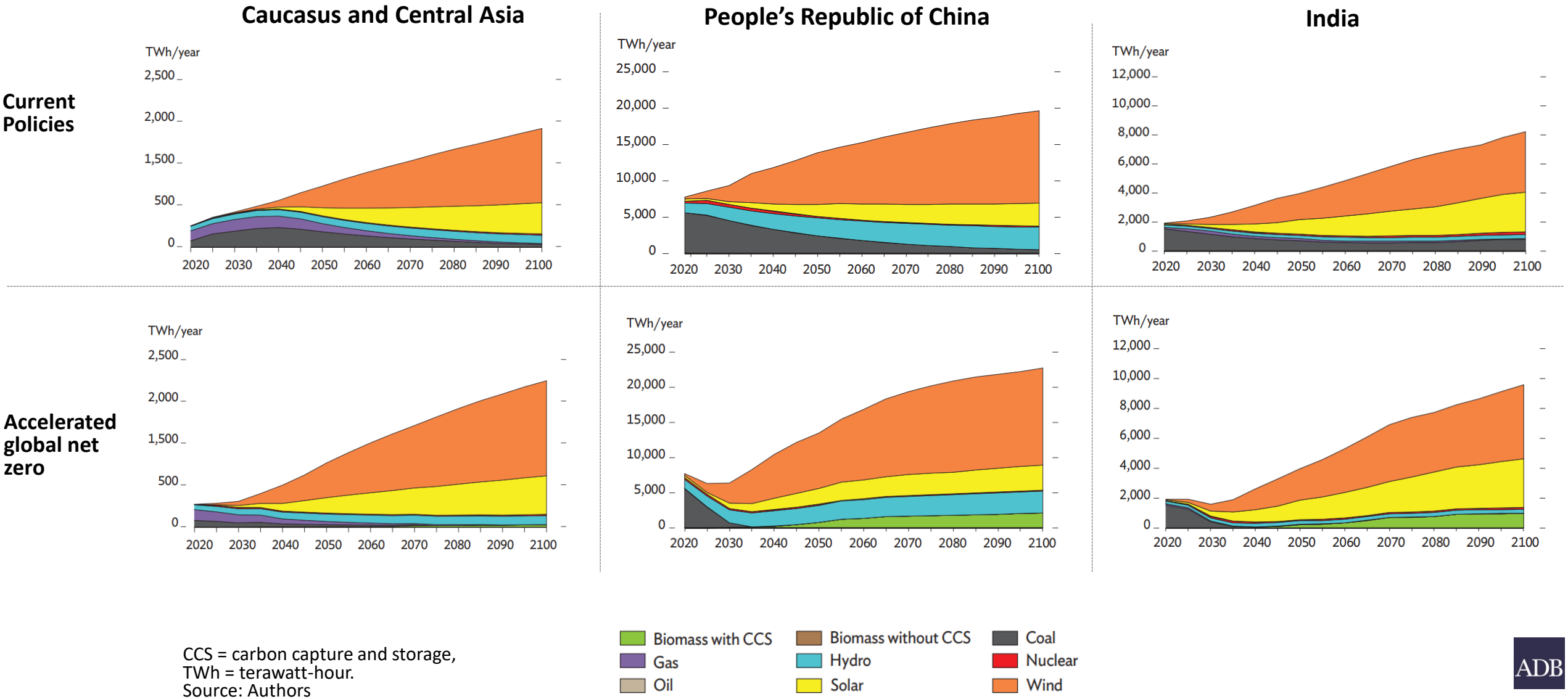


Note: Solid lines refer to the current policies scenario; while dashed lines refer to the accelerated global net zero scenario.

Source: Authors.

Electricity sector will undergo faster decarbonization under the net zero scenarios, with coal virtually absent.

Electricity Mix in Developing Asia under Modeled Scenarios, 2020–2100



CCS = carbon capture and storage,
TWh = terawatt-hour.
Source: Authors

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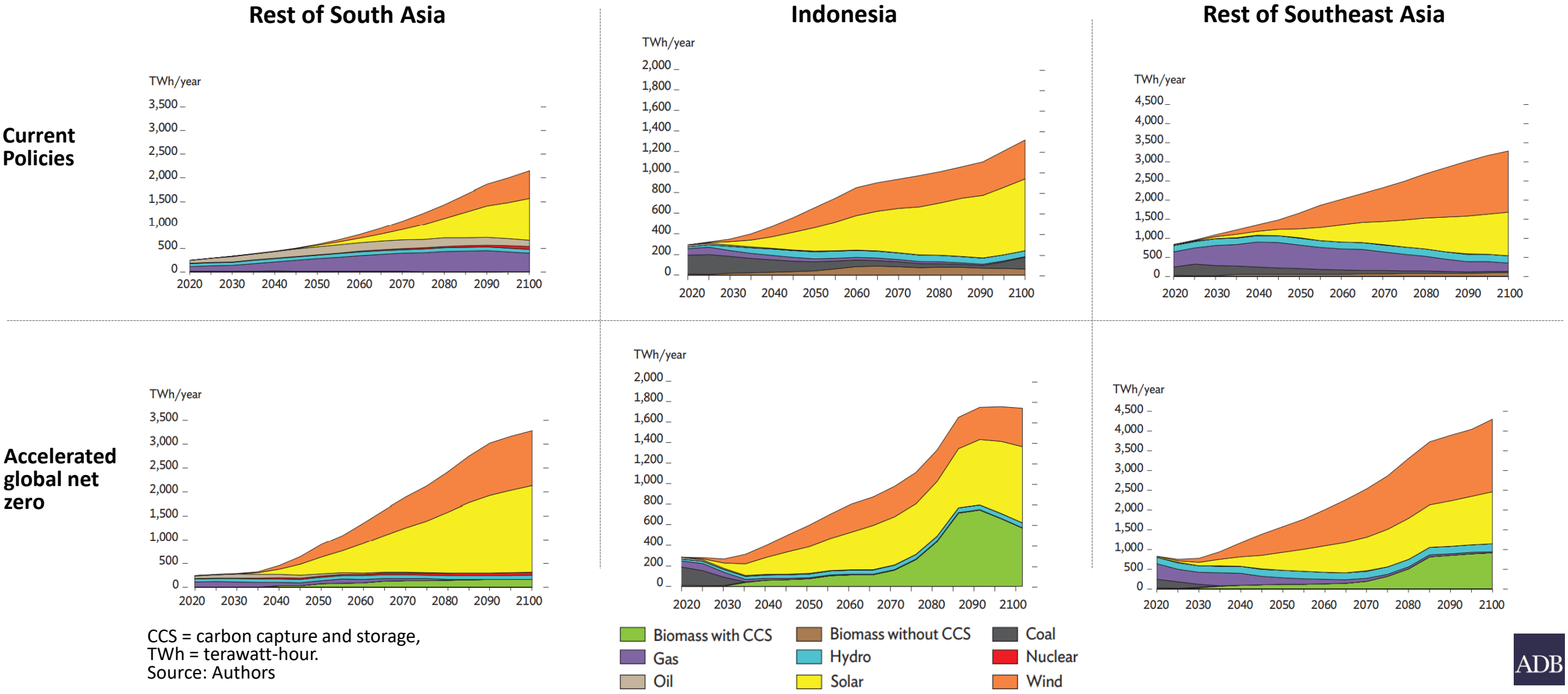

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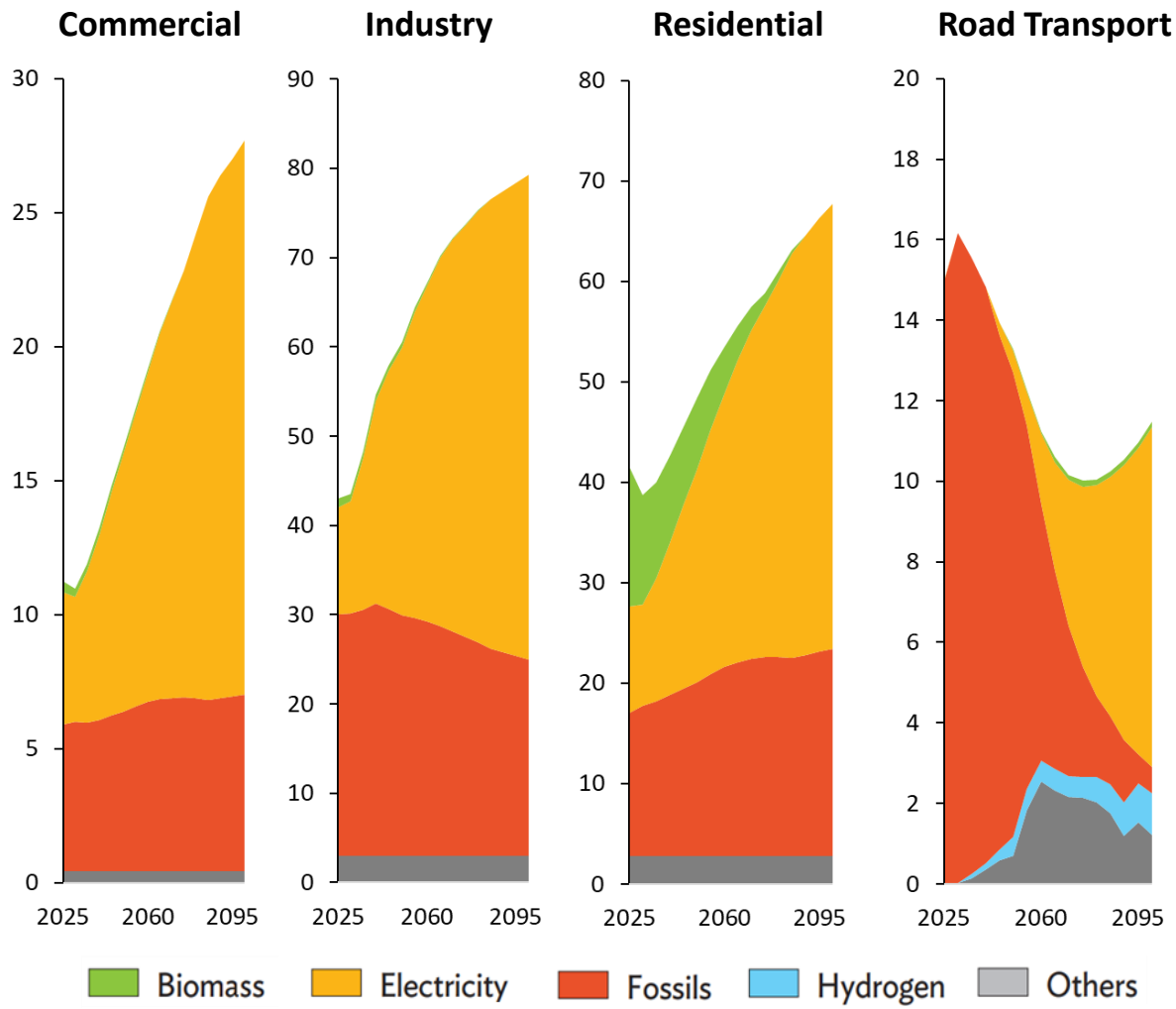
Source: Authors

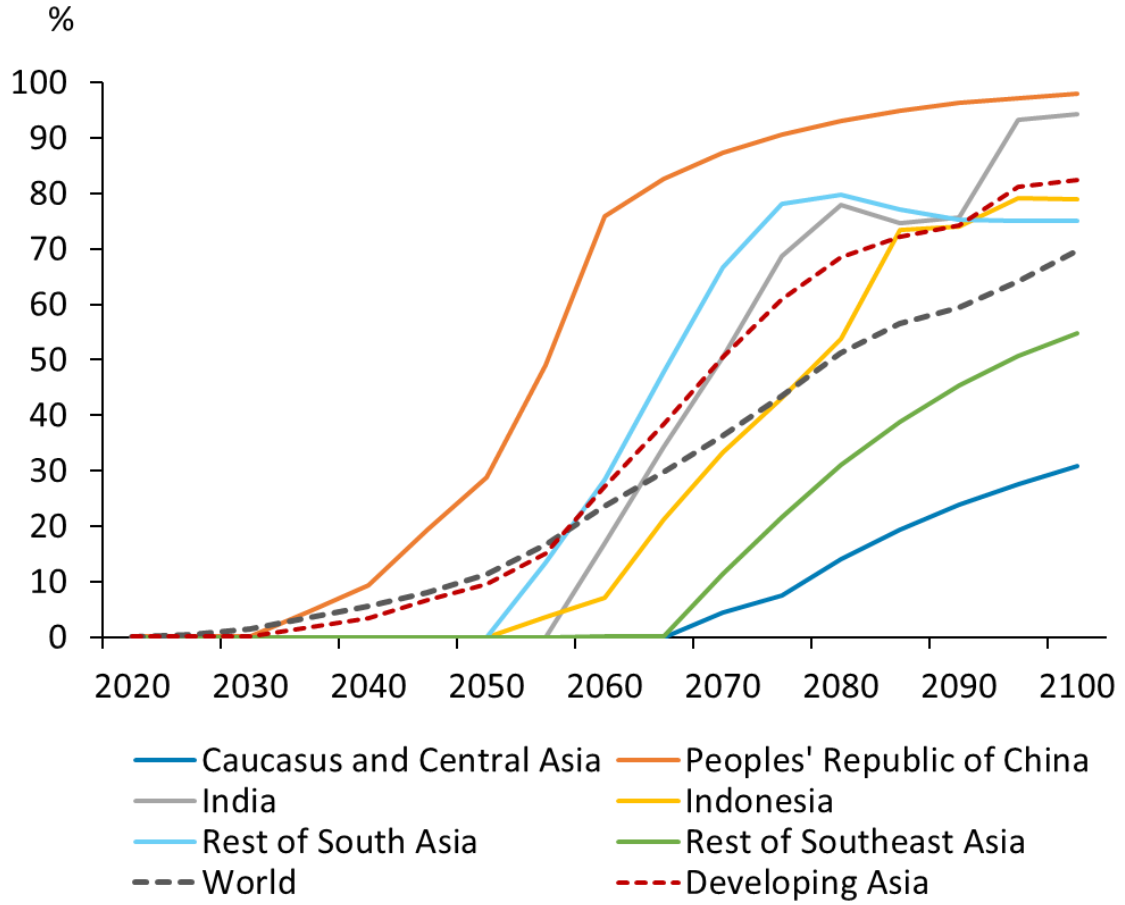
Achieving a net zero transition depends on widespread electrification of end uses

Electrification of Services under the Accelerated Global Net Zero Scenario, 2025–2100 (Exajoules)



Source: Authors

Share of Electricity in Road Transport in Developing Asia under the Accelerated Global Net Zero Scenario

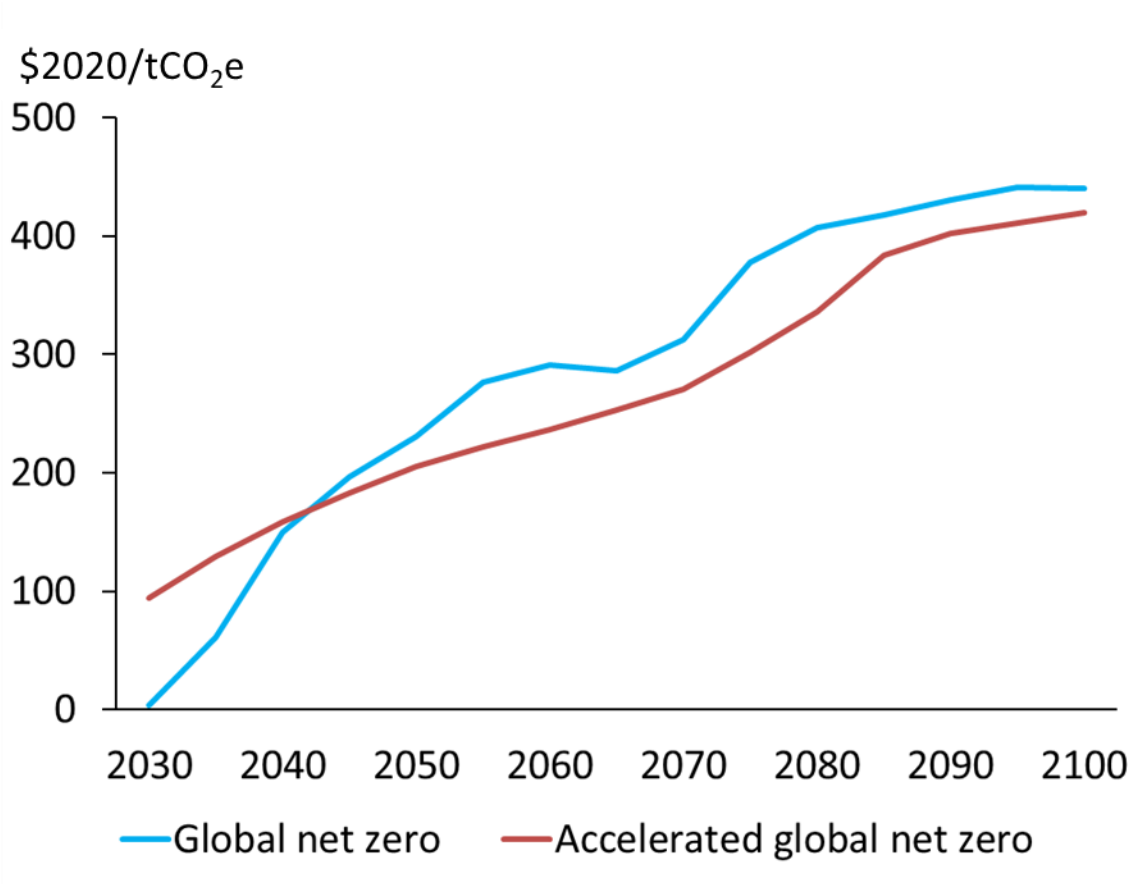


Notes: Road transport includes freight and passenger transport. Two- and three-wheelers not included in the model.
Source: Authors.

Carbon prices stay within feasible levels in the net zero scenarios.

- In the model, the policy that triggers decarbonization is imposition of carbon prices.
- Under the accelerated global net zero scenarios, carbon price in 2030 is $94 per ton of CO2e, which increases to $206 in 2050.

Global Carbon Prices under the Modeled Global Net Zero Scenarios

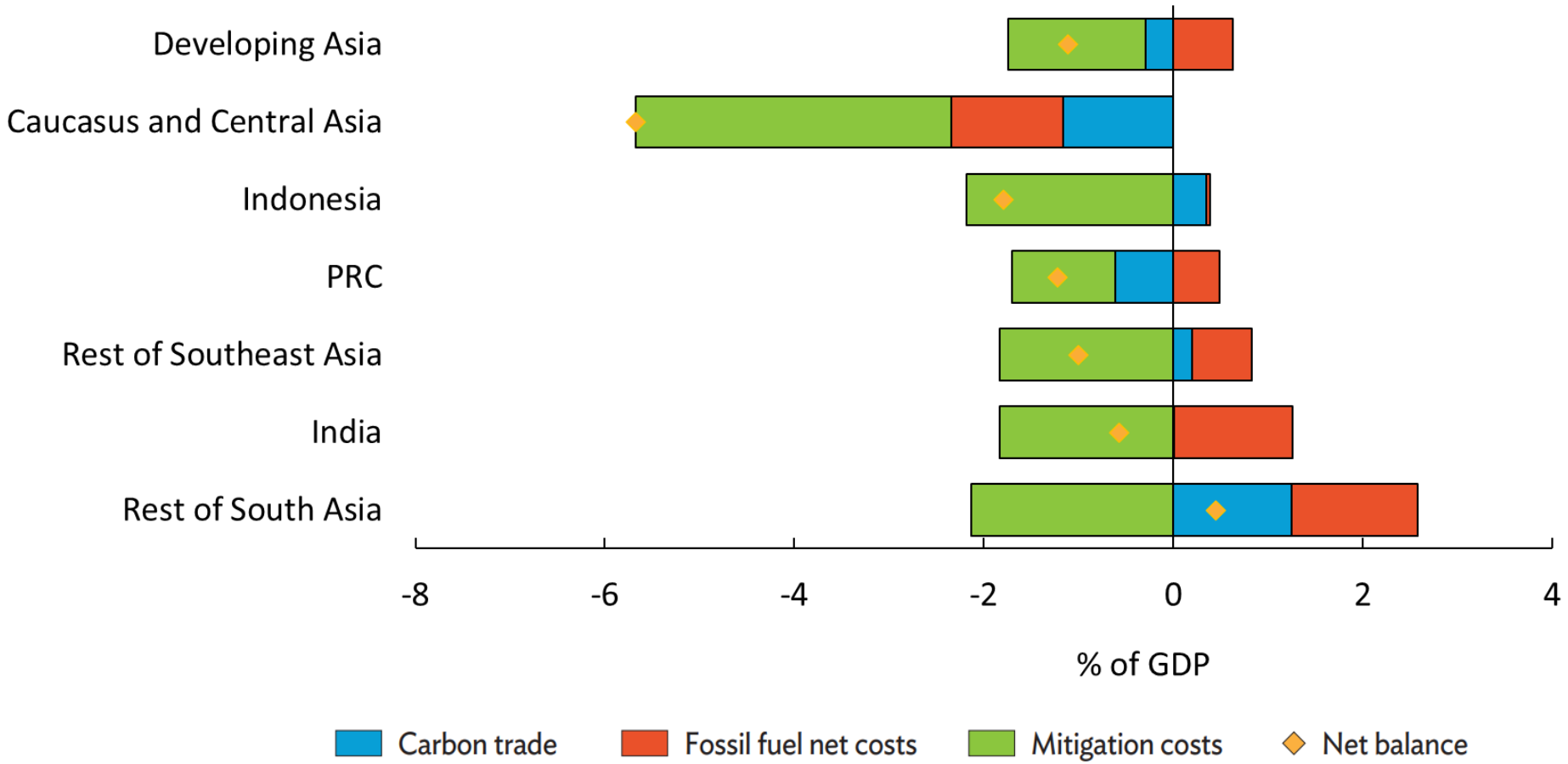


tCO_2e = ton of carbon dioxide equivalent.
Source: Authors.

ADB

Carbon trade can help to cushion the costs of decarbonization in much of Asia

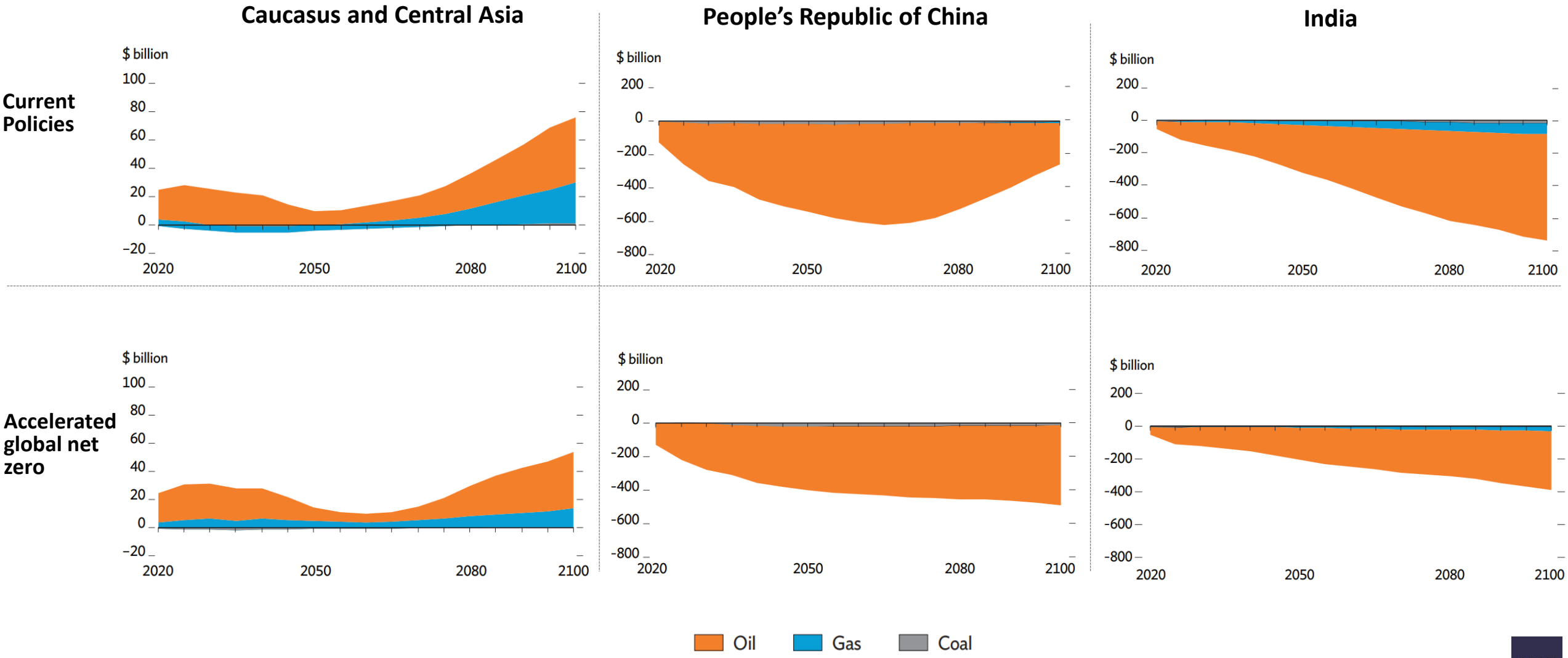
Policy-Cost Decomposition in Developing Asia of the Accelerated Global Net Zero Scenario



GDP = gross domestic product, PRC = People's Republic of China.
Note: Discounted at 3%. Values expressed as a share of the net present value of GDP.
Source: Authors' estimates.

Ambitious mitigation is found to change the balance of fossil fuel trade dramatically

Fossil Fuel Trade in Developing Asia under the Modeled Scenarios, 2020–2100



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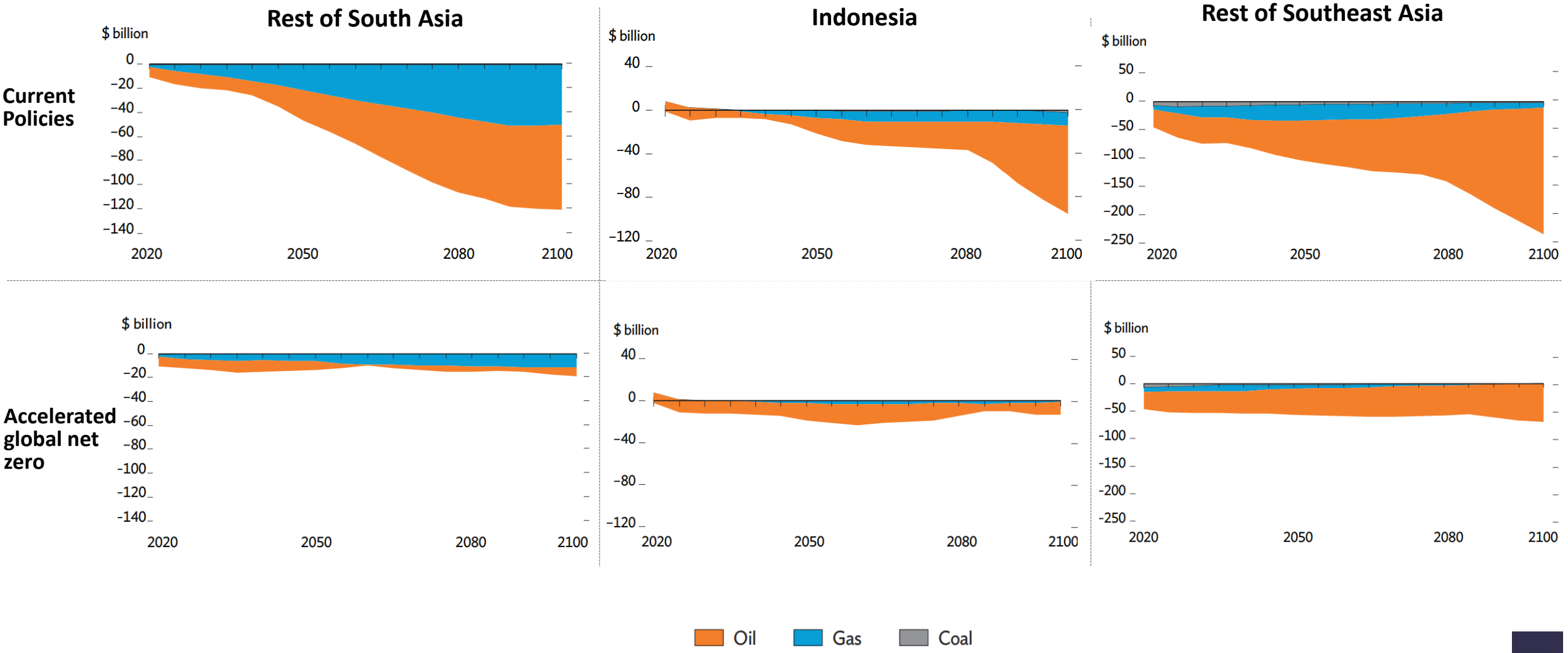
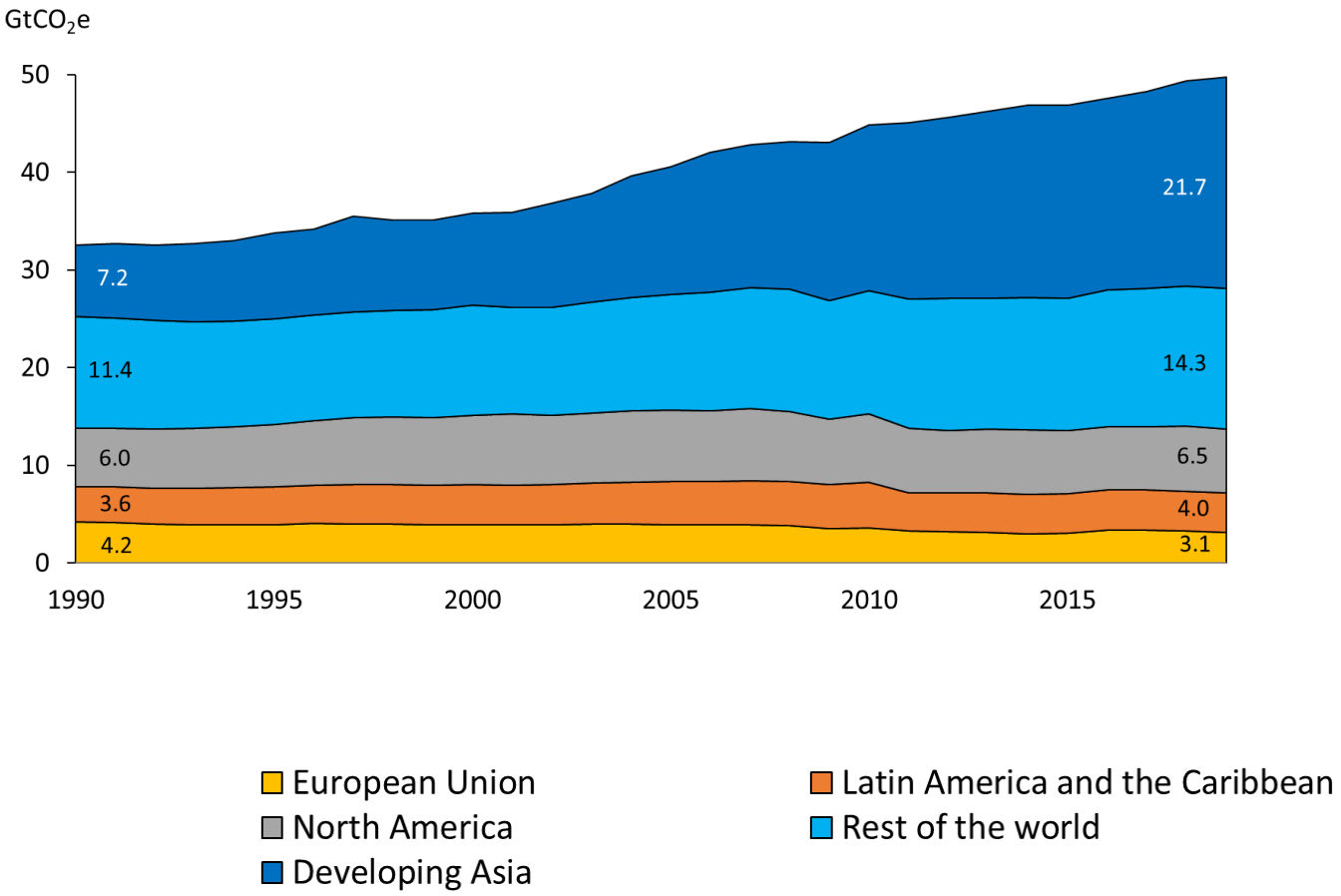


Source: Authors' estimates.

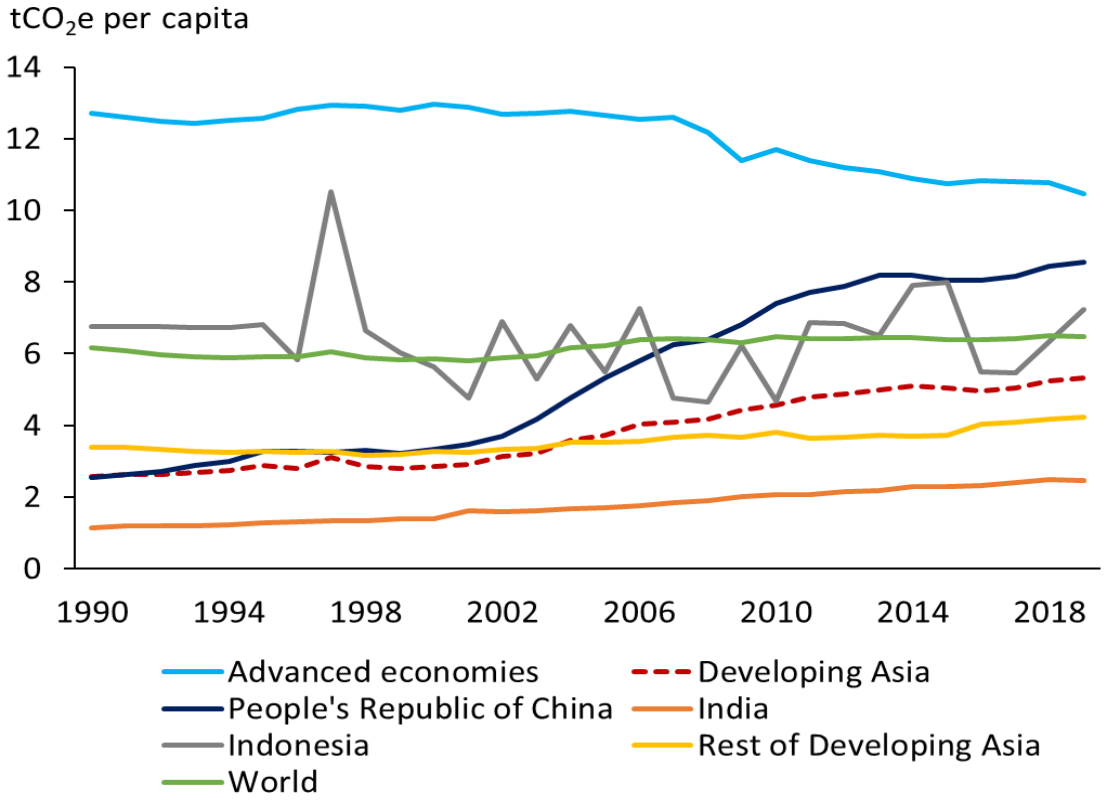
Climate change cannot be addressed without Asia

Global Annual Greenhouse Gas Emissions, 1990–2019



$GtCO_2e$ = billion tons of carbon dioxide equivalent.
Notes: Emissions from land use change and forestry, which can be positive or negative, are included. Developing Asia excludes Hong Kong, China and Taipei, China for lack of data.
Source: World Resources Institute. Climate Watch.

Annual Greenhouse Gas per Capita Emissions by Region, 1990–2019



tCO2e = tons of carbon dioxide equivalent.
Notes: Greenhouse gas emissions including land use, land use change, and forestry. Developing Asia excludes Cook Islands; Hong Kong, China; Taipei,China; and Niue for lack of data. Rest of developing Asia excludes People's Republic of China, India, and Indonesia.
Source: World Resources Institute. Climate Watch.