



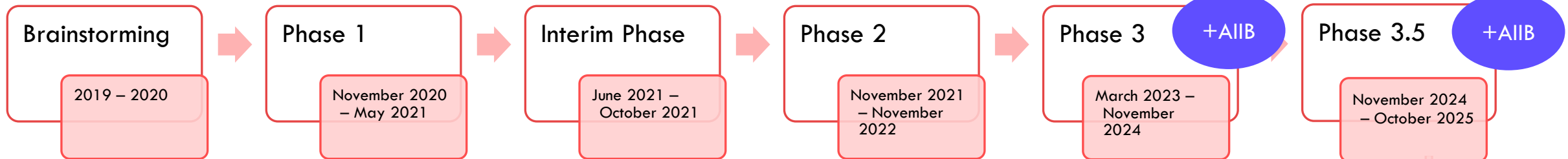
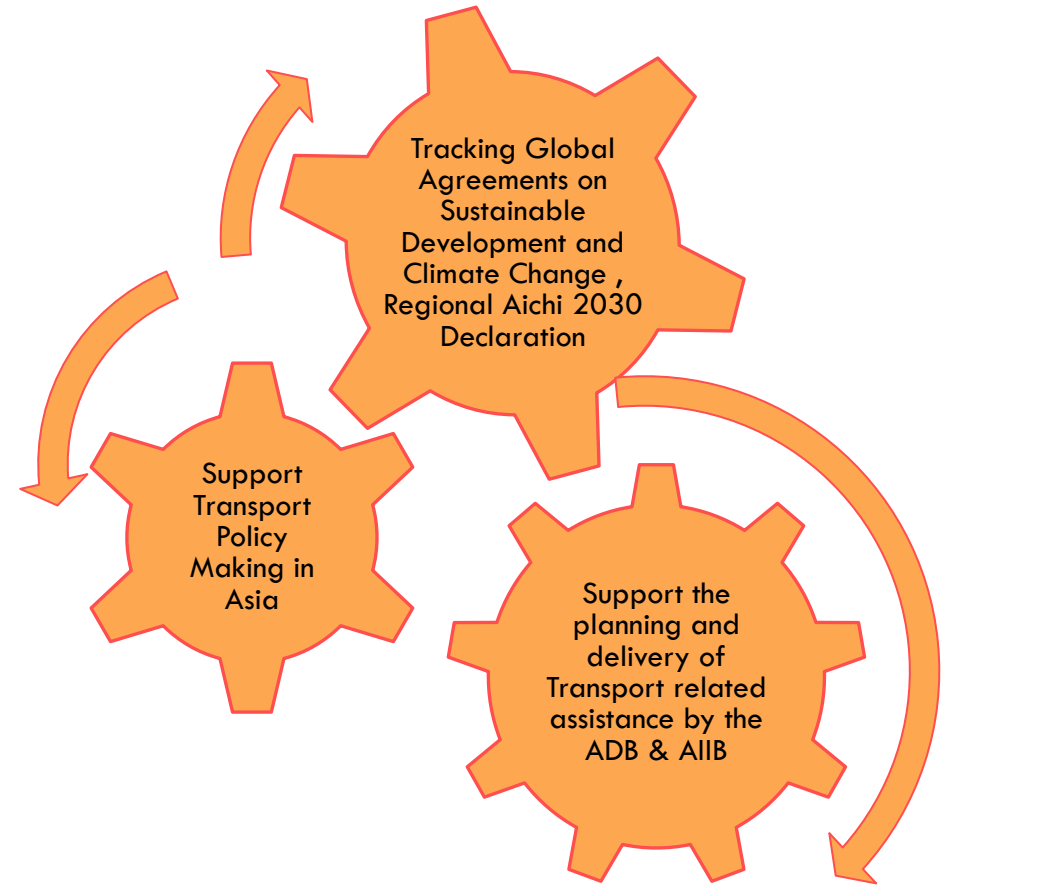
Asian Transport Outlook: Translating Data into Insights, Policies, and Investments

Sudhir Gota,
Co-Team Lead
Asian Transport Outlook

Asian Transport Outlook (ATO)



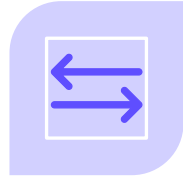
- 51** Economies (ADB Members + Russia and Iran)
- 460** Urban Centers (412 Asia-Pacific, 48 International)
- 46** Urban Centers with a detailed review * To be increased to 50



Why Innovative?



Multiple Sources
for single
indicator



Multiple
Dimensions &
Modes



Data and
Policy



Historical &
Outlook



Tracking
Instrument for
SDG/PA/Aichi
Declaration



Incremental
Approach



Partnerships



On-demand
Research



2024-10-18

Update

Asian Development Bank (ADB) has Won the 2024 IRF Award for Environmental Stewardship for Asian Transport Outlook!

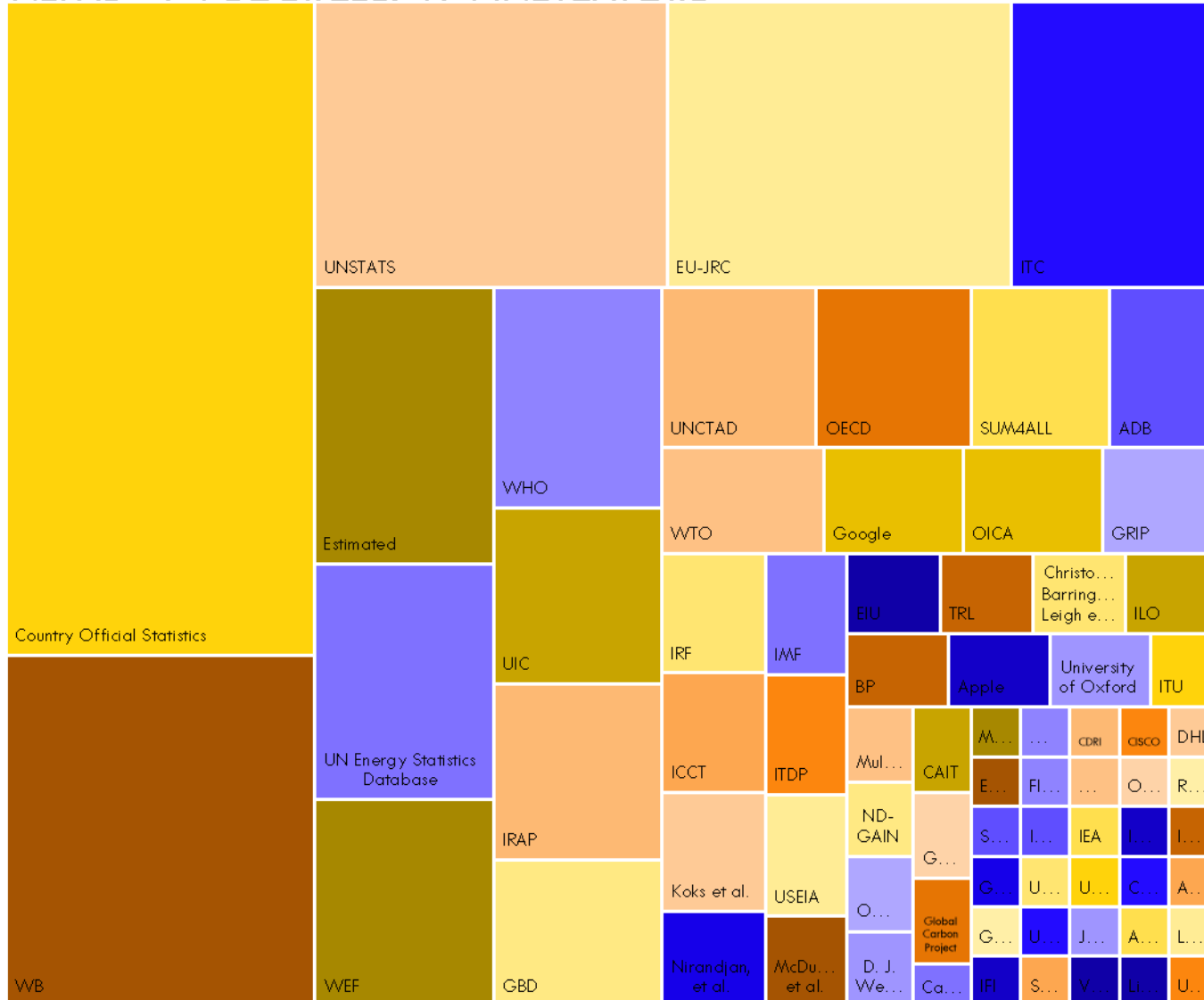
The Asian Development Bank (ADB) has won the prestigious IRF Awards 2024 - Environmental Stewardship category for the ADB-initiated Asian Transport Outlook (ATO)! The IRF Awards recognizes outstanding projects and initiatives that foster innovation, safety, and sustainability in the road transport sector.

[Read More](#)

Istanbul, Türkiye

Why Innovative?

NEPAL – 74 SOURCES. 494 INDICATORS



- Data Sharing/Validation**
- IRF
 - ITEM
 - TDCI
 - ADB Statistics

- Policy**
- UNCRD

- Railways**
- UNESCAP
 - UIC

- Roads**
- ADB's Green Roads Toolkit
 - IRF

- Climate Change**
- SLOCAT
 - UNESCAP
 - UK FCDO

- Electric Vehicles**
- ADB-GEF EV Platform
 - UEMI

- Road Safety**
- APRSO

- Freight**
- UNCTAD
 - Smart Freight Center

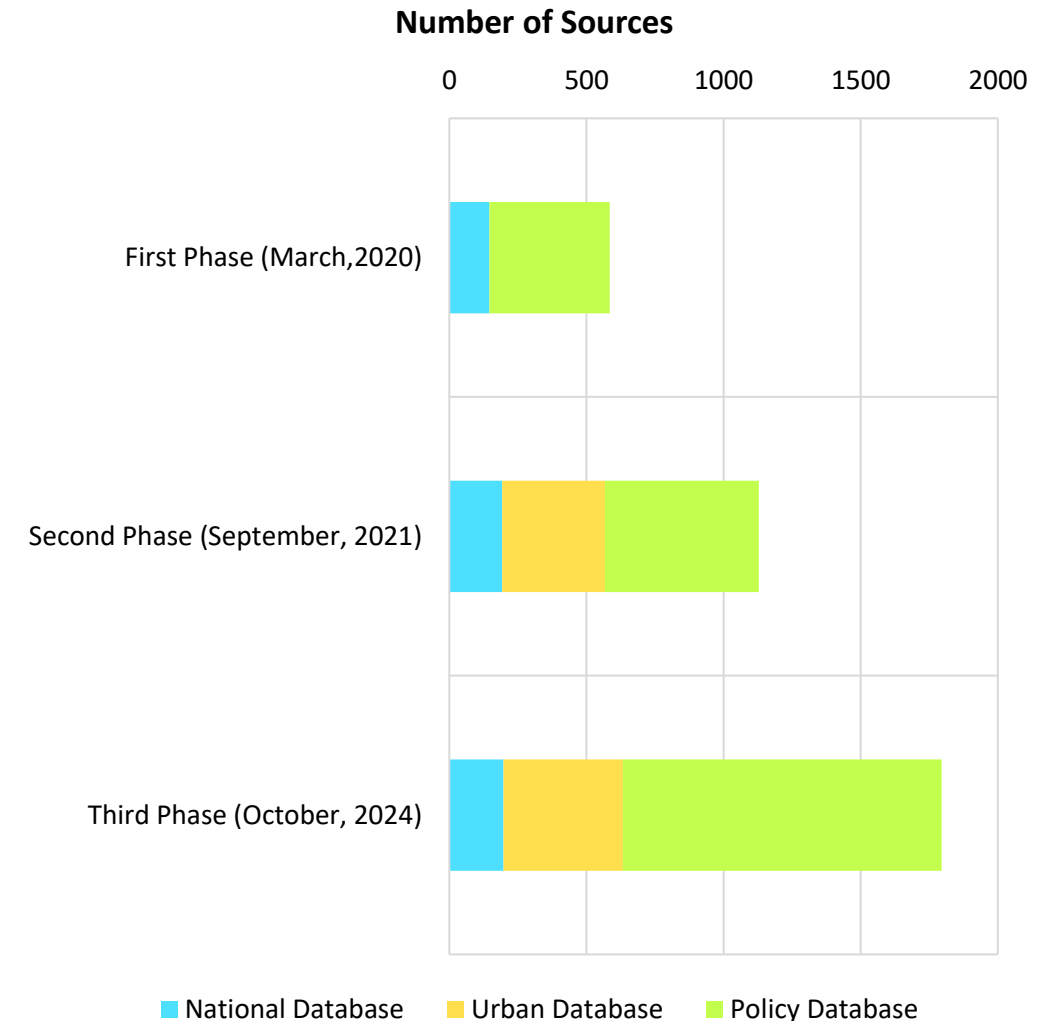
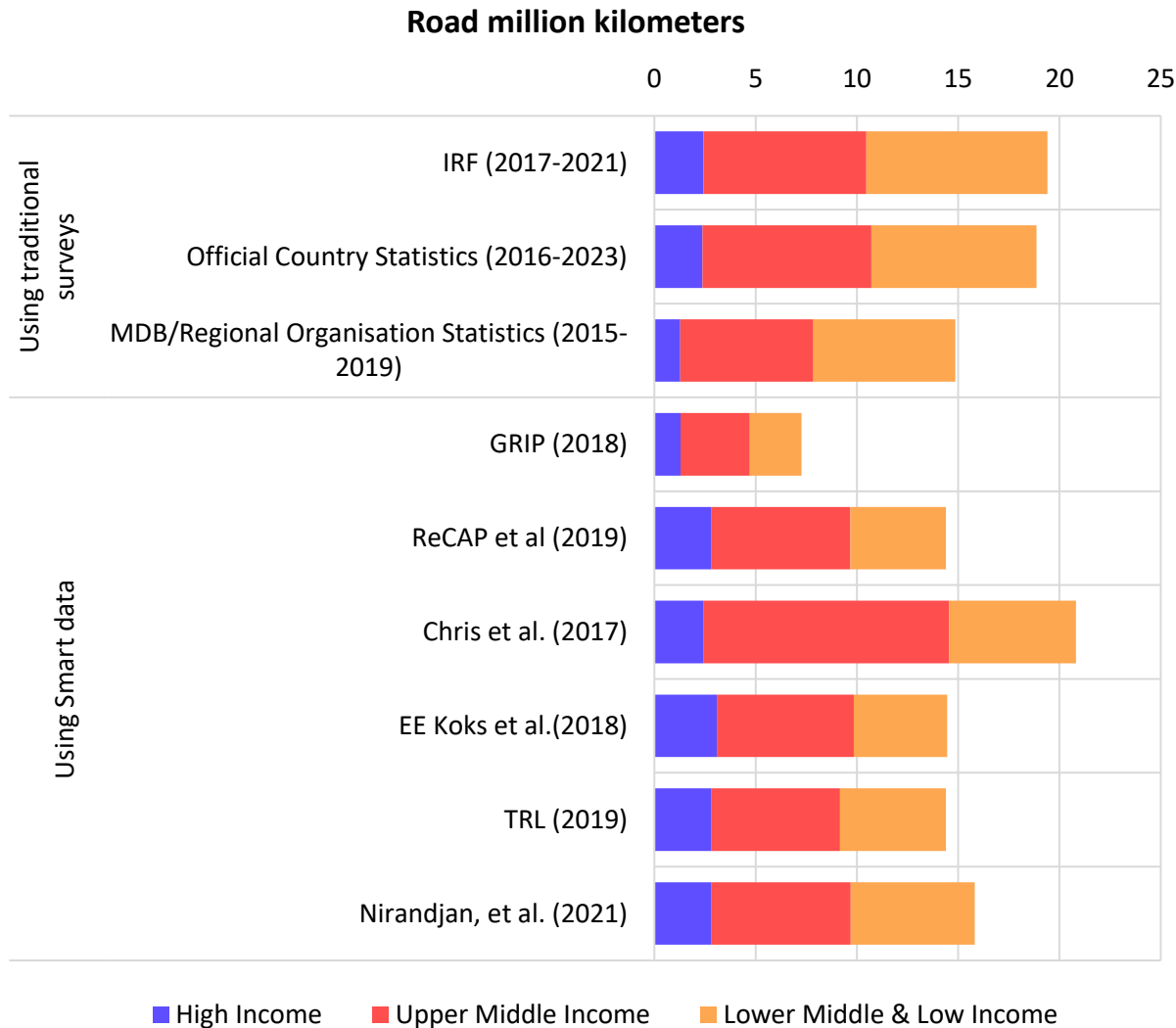
- Climate Resilience**
- Life Links Council

- Air Pollution**
- Clean Air Asia

- Urban Data**
- Mobilize Your City

- Country Partners**
- SOTEN
 - Indonesia Transport Society (MTI)

Connect Multiple Sources (traditional + new technologies)

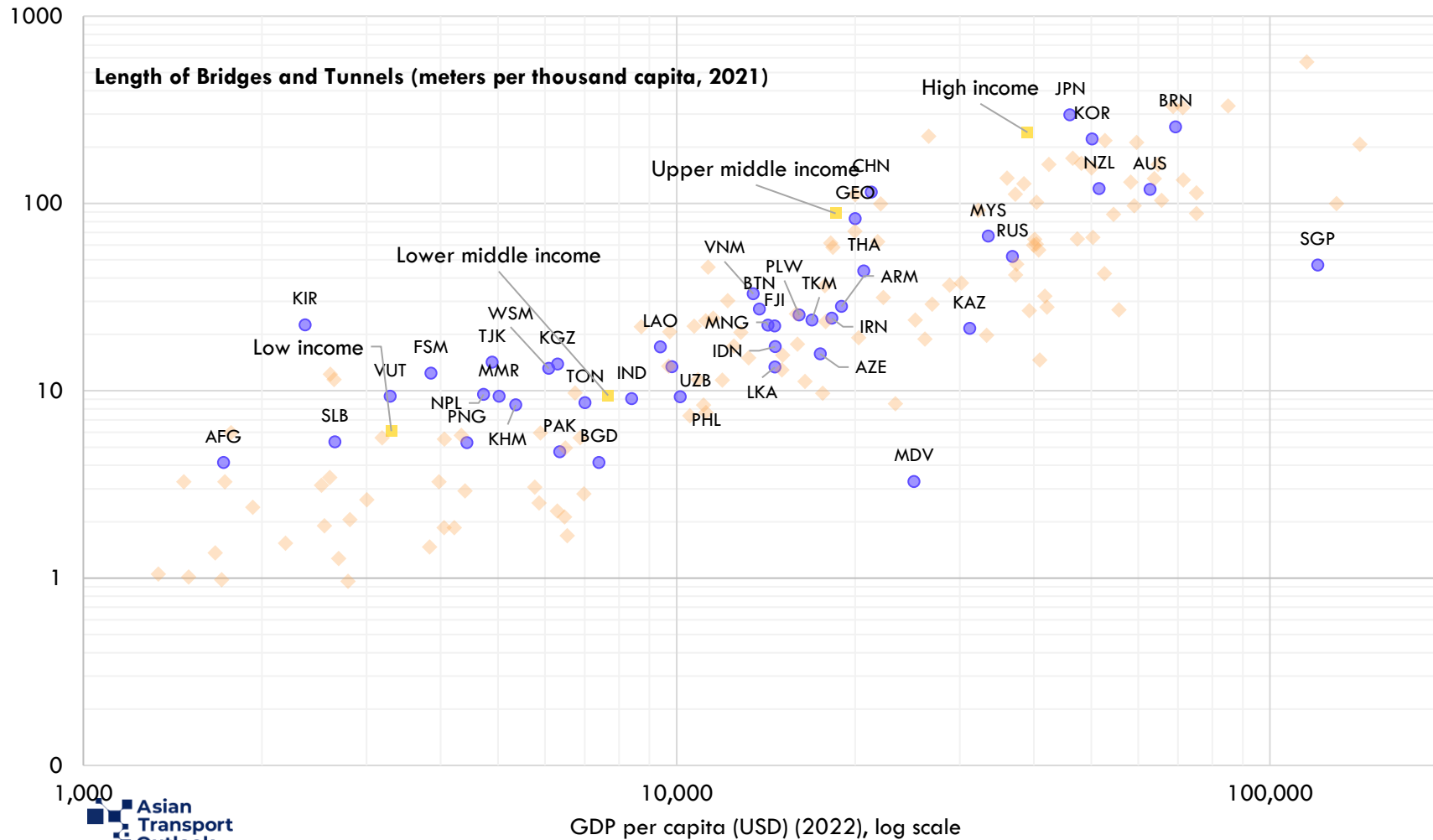


Primary + Secondary + High Quality Academic Papers

Bridges and Tunnels

● Asia - Pacific Economies ■ Asia - Pacific Averages ◆ Non - Asia-Pacific Economies

Length of Bridges and Tunnels (meters per thousand capita, 2021)



Journal of Cleaner Production 434 (2024) 139742

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Mapping and modelling global mobility infrastructure stocks, material flows and their embodied greenhouse gas emissions

Dominik Wiedenhofer^{a,*}, André Baumgart^{a,1}, Sarah Matej^{a,1}, Doris Virág^a, Gerald Kalt^a, Maud Lanau^{b,c}, Danielle Densley Tingley^c, Zhiwei Liu^d, Jing Guo^e, Hiroki Tanikawa^d, Helmut Haberl^a

^a University of Natural Resources and Life Sciences, Vienna, Austria
^b Department of Architecture and Civil Engineering, Chalmers University of Technology, Gothenburg, Sweden
^c Department of Civil and Structural Engineering, University of Sheffield, UK
^d Graduate School of Environmental Studies, Nagoya University, Nagoya 464-8601, Japan
^e Institute of Urban Environment, Chinese Academy of Sciences, Xiamen 361021, China

ARTICLE INFO

Handling Editor: Zhifu Mi

Keywords: Material and energy flow analysis (MEFA), Socio-economic metabolism, Transport, Road, Rail

ABSTRACT

Roads and rail-based mobility infrastructures are the basis for mobility services and underpin several Sustainable Development Goals, but also induce material use and greenhouse gas emissions. To date, no stock-flow consistent study has assessed globally accumulated stocks of mobility infrastructures, associated material flows and emissions, and their spatial patterns.

We present global findings on material stocks for all roads, rail-based infrastructures, incl. tunnels and bridges, and model associated material flows and their embodied emissions for the year 2021. The stock-flow consistent model combines crowd-sourced Open Street Maps data with architectural infrastructure designs, material compositions, assumptions on lifetimes and network growth rates, incl. uncertainty ranges. We derive spatially explicit, national-level stock estimates for 180 countries, map them at a resolution of 5 arcminutes, and derive material flows and their embodied emissions at the country-level.

We find that 314 [218–403] Gt of materials (41 [28–53] tons/cap) have accumulated in global mobility infrastructure, the majority in roads as aggregates and asphalt. Stocks are unequally distributed between countries, from averages of 23 [16–30] tons/cap in low income countries, to 130 [89–164] tons/cap in high income countries. Spatial inequality of per capita stocks per area differs by orders of magnitude, from 10¹–10³ between rural, suburban, and dense urban areas. We find that 8 [4–16] Gt/year of material flows are due to expansion and maintenance, amounting to 6 [3–10] % of global resource extraction. These translate into 0.36 [0.19–0.69] Gt CO₂e/year, or 1 [0.5–1.9] % of global GHG emissions in 2021.

Approximately two-thirds of these flows result from maintenance and replacement of stocks, indicating an important lock-in of resource use due to already existing infrastructure stocks. These findings support the crucial role of improving spatial planning, limiting stock expansion and (sub-)urbanization, to achieve more sustainable resource use and mitigate climate change.

Transport Data + Policies

The Asian Transport Outlook

has developed policy trackers for

29 economies recording

~560 documents and

7000+ measures

Example - Nepal

Transport related 20 policy documents for Nepal	Year	Document Type
Motor Vehicles and Transport Management Act, 2049 (1993)	1993	Transport Laws/ Regulations
National Transport Policy	2001	National Transport Policy
Convention on the Rights of Persons with Disabilities 2006	2006	Secondary Source
National Energy Strategy of Nepal	2013	Other Transport-related Policy
National Sustainable Transport Strategy (NSTS) for Nepal (2015-2040)	2015	National Transport Policy
Nepal Civil Aviation Act, 2073	2017	Transport Subsector Policy
National Review of Sustainable Development Goals	2017	National Report to International/ Regional Processes
Global Status Report on Road Safety 2018	2018	Secondary Source
National Action Plan for Electric Mobility	2018	Transport Subsector Policy
Nepal Urban Road Standard- 2076	2019	Transport Laws/ Regulations
The Fifteenth Plan (Fiscal Year 2019/20 – 2023/24)	2020	National Development Policy
Second Nationally Determined Contribution	2020	Nationally Determined Contributions
Road Safety Opportunities and Challenges: Low- and Middle-Income Country Profiles	2020	Secondary Source
National Adaptation Plan (NAP) 2021 - 2050	2021	Other Transport-related Policy
Assessment of Electric Mobility Targets for Nepal's 2020 Nationally Determined Contributions (NDC)	2021	Transport Subsector Policy
59 UN Transport Agreements/ and Conventions Serviced by ECE	2021	Secondary Source
Nepal LTS	2021	Long-term Strategies
Nepal Road Safety Action Plan (2021-2030)	2022	Transport Subsector Policy
National Implementation Plan for Climate Change Mitigation and Adaptation (2080-2087)	2023	Other Transport-related Policy
Strategy and Initiatives for Electrification of Public Transportation in Nepal	n.d.	Transport Subsector Policy

Aichi 2030 Declaration – Monitoring

Issued without formal editing/20 Oct 2021 Final Version

Aichi 2030 Declaration on Environmentally Sustainable Transport - Making Transport in Asia Sustainable (2021-2030)

Sustainable Transport Goals for Achieving Universally Accessible, Safe, Affordable, Efficient, Resilient, Clean and Low-carbon Passenger and Freight Transport in Asia

1. We, the participants, who are representatives of Asian countries (Afghanistan, Bangladesh, Bhutan, Brunei Darussalam, Cambodia, Indonesia, India, Islamic Republic of Iran, Japan, Lao PDR, Malaysia, Maldives, Mongolia, Myanmar, Nepal, the Philippines, Russian Federation, Singapore, Sri Lanka, Thailand, and Viet Nam)¹, international organizations, bilateral and multilateral agencies, non-governmental organizations (NGOs), research organizations, and expert sustainable transport professionals, having met at the Fourteenth Regional Environmentally Sustainable Transport (EST) Forum in Asia, held in Tokoname City, Aichi Prefecture, Japan, 18th – 20th October 2021, inspired by the Sustainable Development Goals, the Paris Agreement on Climate Change, the New Urban Agenda and other global agreements, adopt the non-legal, non-binding Aichi 2030 Declaration on Making Transport in Asia Sustainable (the Aichi 2030 Declaration). We affirm our interest in, and commitment to, realizing a decade (2021-2030) of progress in sustainable actions and measures for achieving universally accessible, safe, affordable, efficient, clean, low-carbon, resilient, multi-modal passenger and freight transport in Asia.²

I. Preamble

i. **Recognizing** the urgent need for immediate greater action on sustainability of transport systems in Asia. This considering that by 2030, it is projected that Asia will have about half of the global population, with an increasing number living in cities, close to 40% of global Gross Domestic Product (GDP) (in Purchasing Power Parity), one third of global transport CO2 emissions, and almost 60% of worldwide road crash fatalities;³

ii. **Acknowledging** the global agreements, since 2010, that have a direct relevance for the transport sector in Asia: the 2030 Agenda for Sustainable Development, the Paris Agreement on climate change, the New Urban Agenda, the Addis Ababa Action Agenda on Financing for Development, the second UN Decade of Action for Road Safety 2021-2030, the Sendai Framework for Disaster Risk Reduction 2015-2030, and the UNCTAD Nairobi Mandate;

iii. **Agreeing** that the successful implementation of these global agreements will require policies and actions that combine “developing” the transport sector through the provision of additional sustainable, low carbon transport infrastructure and services⁴ to

¹ The Aichi 2030 Declaration is open to all Asia-Pacific countries to voluntarily join.
² The scope of the Declaration is mainly on land transport. It excludes international aviation and international shipping. Domestic aviation and shipping, including inland water transport are, however, considered to be part of the Declaration.
³ Sources: World Bank, SLOCAT Partnership and World Health Organization.
⁴ See in this context the G20 Principles for Quality Infrastructure.

14th Regional EST Forum in Asia, Aichi, Japan, 18-20 October 2021

Access the Declaration document here:
https://sdgs.un.org/sites/default/files/2021-10/UNCRD_14th%20EST_Aichi%202030%20Declaration-20%20Oct%202021-ADOPTED_0.pdf

Malaysia

Aichi 2030 Declaration on Environmentally Sustainable Transport (EST): Country Profile

Goal 1a – Low-Carbon (climate change mitigation):
 By 2030, cut in half transport CO2 emissions and climate indicators in transport-related CO2 emissions with the intention to move towards decarbonization of the transport sector by 2050, as clearly characterised (based on SDG 7.2, 9.2, 13.2), Paris Agreement

Transport CO2 emissions (fossil)
 Growth of transport fossil CO2 emissions, total fossil CO2 emissions, population and GDP (PPP) (1990 – 2022)

Goal 2 – Road safety:
 By 2030, halve the number of deaths and injuries from road traffic accidents in Asia compared to 2020, with specific action road users. (Based on SDG 3.6 and second UN Decade of Action on Road Safety 2021 – 2030, Sendai Declaration on Road Safety)

Road traffic crash fatalities
 Road traffic crash fatality rate

Transport fossil CO2 emissions per capita (2022)

Transport CO2 emissions per unit of GDP (2022)

Malaysia

Aichi 2030 Declaration on Environmentally Sustainable Transport (EST): Country Profile

Goal 3 – Economic sustainability:
 By 2030, realize a decade's economic and employment growth by managing urban, industrial and resources and green investments in order to manage and realize the economic, infrastructure and services and energy for fully integrated sustainable and smart growth through the progress of the economic, infrastructure and services. (Based on SDG 8.4, 8.5, 9.1 and 9.2)

Transport sector and GDP
 Transport as a share of GDP

Transport employment
 Growth of transport sector employment

Female share in the transport employment

Share of road crash fatalities by age

Share of road crash fatalities by vulnerable groups

Malaysia

Aichi 2030 Declaration on Environmentally Sustainable Transport (EST): Country Profile

Transport relevant policy documents
 Red – Near average coverage, Moderate coverage, Green – Extensive coverage

Doc. No.	Document Name	Year	Goal 1a	Goal 1b	Goal 1c	Goal 2	Goal 3	Goal 4	Goal 5	Goal 6
1	Logistics and Trade Facilitation Master Plan 2015-2020	2015	Green	Green	Green	Green	Green	Green	Green	Green
2	Investment Nationality Determined Contribution of the Government of Malaysia	2015	Green	Green	Green	Green	Green	Green	Green	Green
3	Green Technology Master Plan 2017-2030	2017	Green	Green	Green	Green	Green	Green	Green	Green
4	Malaysia, Biennial Update Report (BUR), BUR 2, National Climate Indicators (NCI) V.1.0	2018	Green	Green	Green	Green	Green	Green	Green	Green
5	National Transport Policy 2019-2030	2019	Green	Green	Green	Green	Green	Green	Green	Green
6	National Automotive Policy 2020	2020	Green	Green	Green	Green	Green	Green	Green	Green
7	National Physical Plan, Chapter 7 (Implementation)	2020	Green	Green	Green	Green	Green	Green	Green	Green
8	National Low Carbon Climate Masterplan	2021	Green	Green	Green	Green	Green	Green	Green	Green
9	Low Carbon Mobility Blueprint 2021-2030	2021	Green	Green	Green	Green	Green	Green	Green	Green
10	Twelfth Malaysia Plan 2021-2025	2021	Green	Green	Green	Green	Green	Green	Green	Green
11	Updated Nationally Determined Contribution - MYS	2021	Green	Green	Green	Green	Green	Green	Green	Green
12	Malaysia Road Safety Plan 2022-2030	2022	Green	Green	Green	Green	Green	Green	Green	Green
13	National Energy Policy 2022-2040	2022	Green	Green	Green	Green	Green	Green	Green	Green

Asian Transport Outlook: A Catalyst for Sustainable Transport in Asia

Helpdesk on Transport Sector (Free*)

536

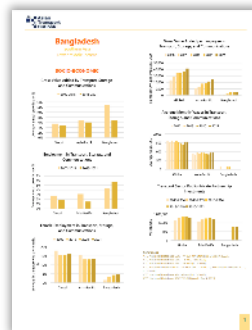
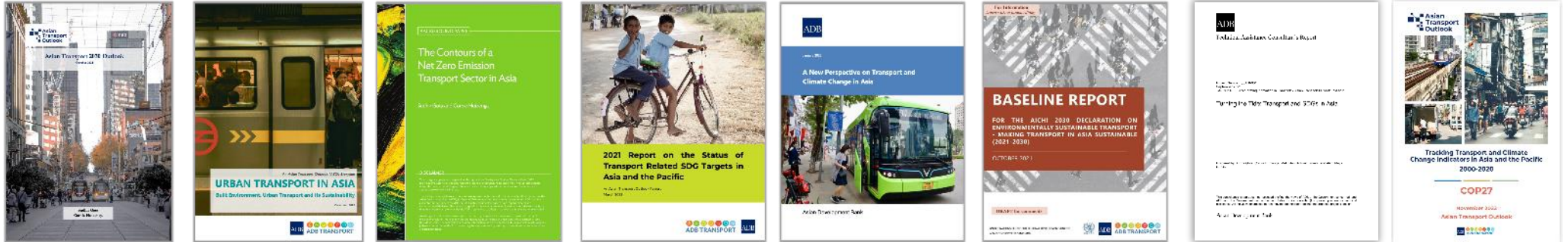
National indicators of which 45% are Road related

180

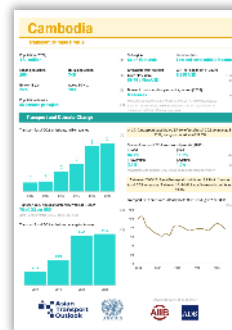
Urban indicators of which 30% are Road related

550

National Policy documents identified of which 80% are Road related



SDG Profiles
(39 countries)



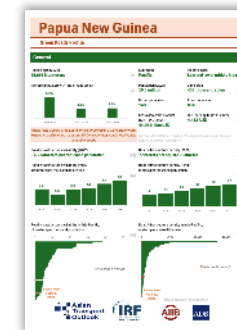
Transport Climate Profiles
(23 countries)



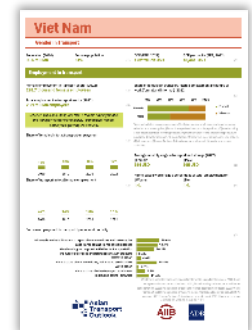
Road Safety Profiles
(24 countries)



E-mobility Profiles
(10 countries)



Green Roads Profiles
(23 countries)

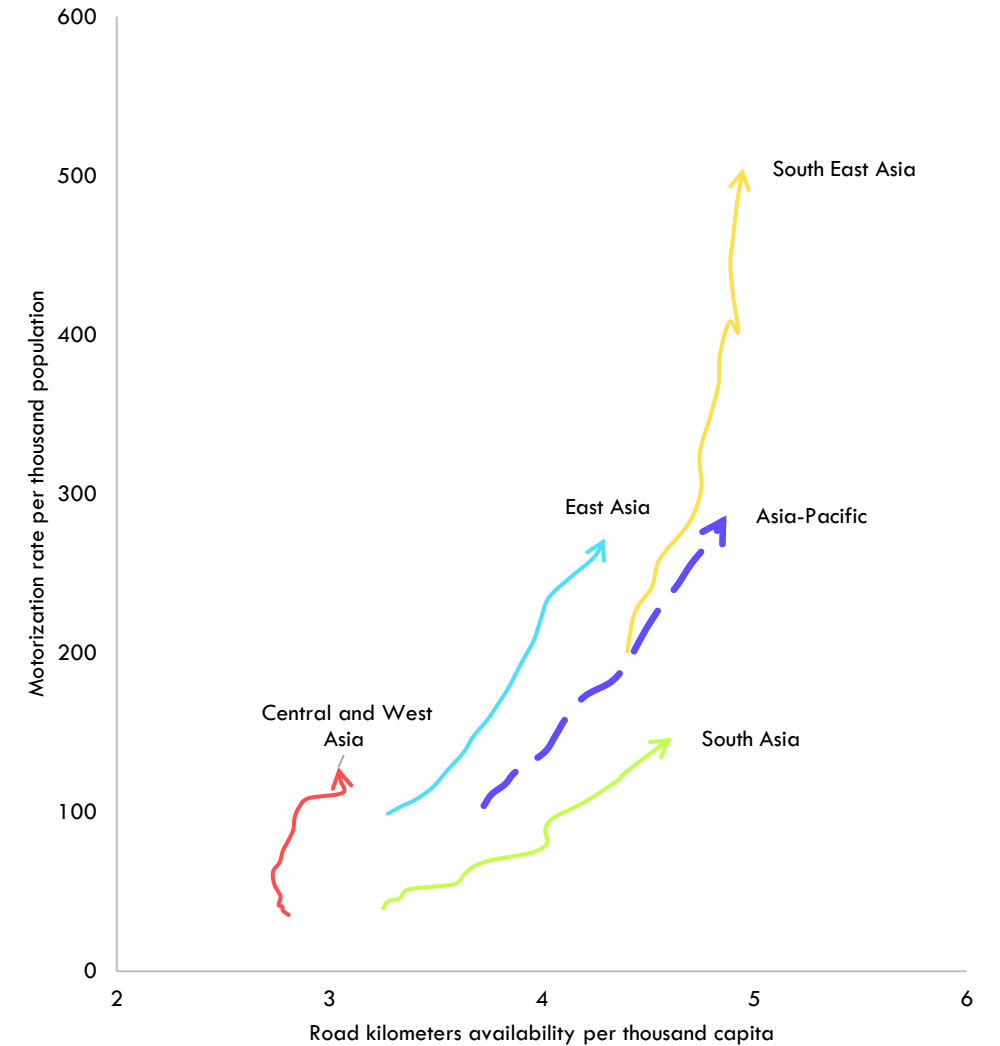
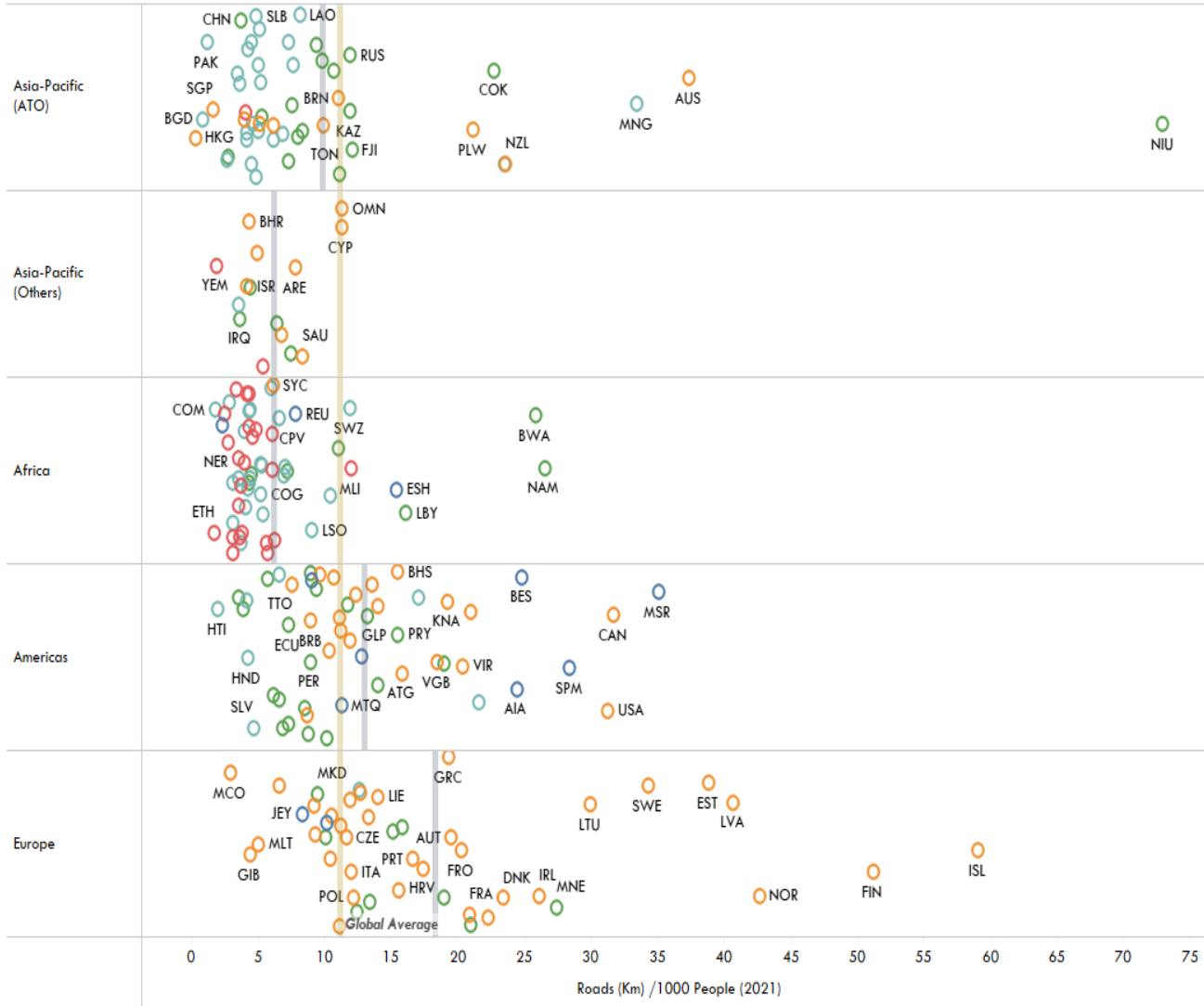


Gender Profiles
(20 countries)



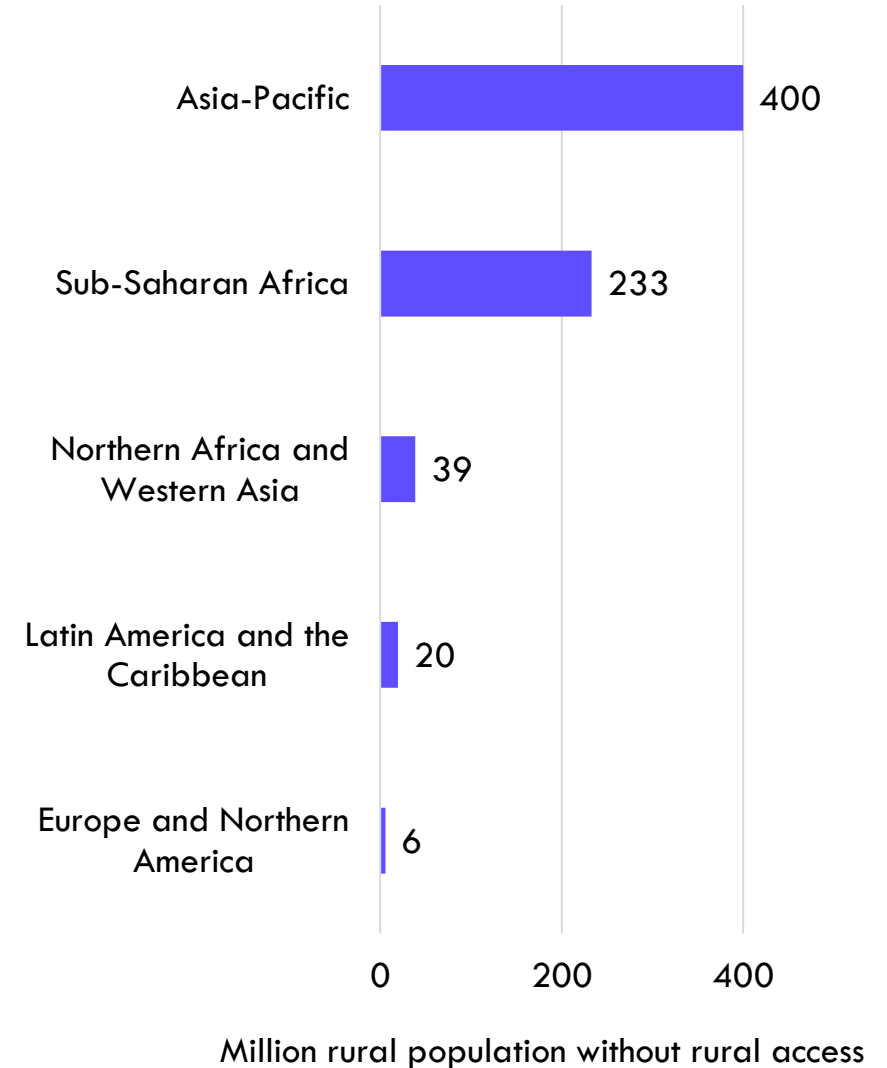
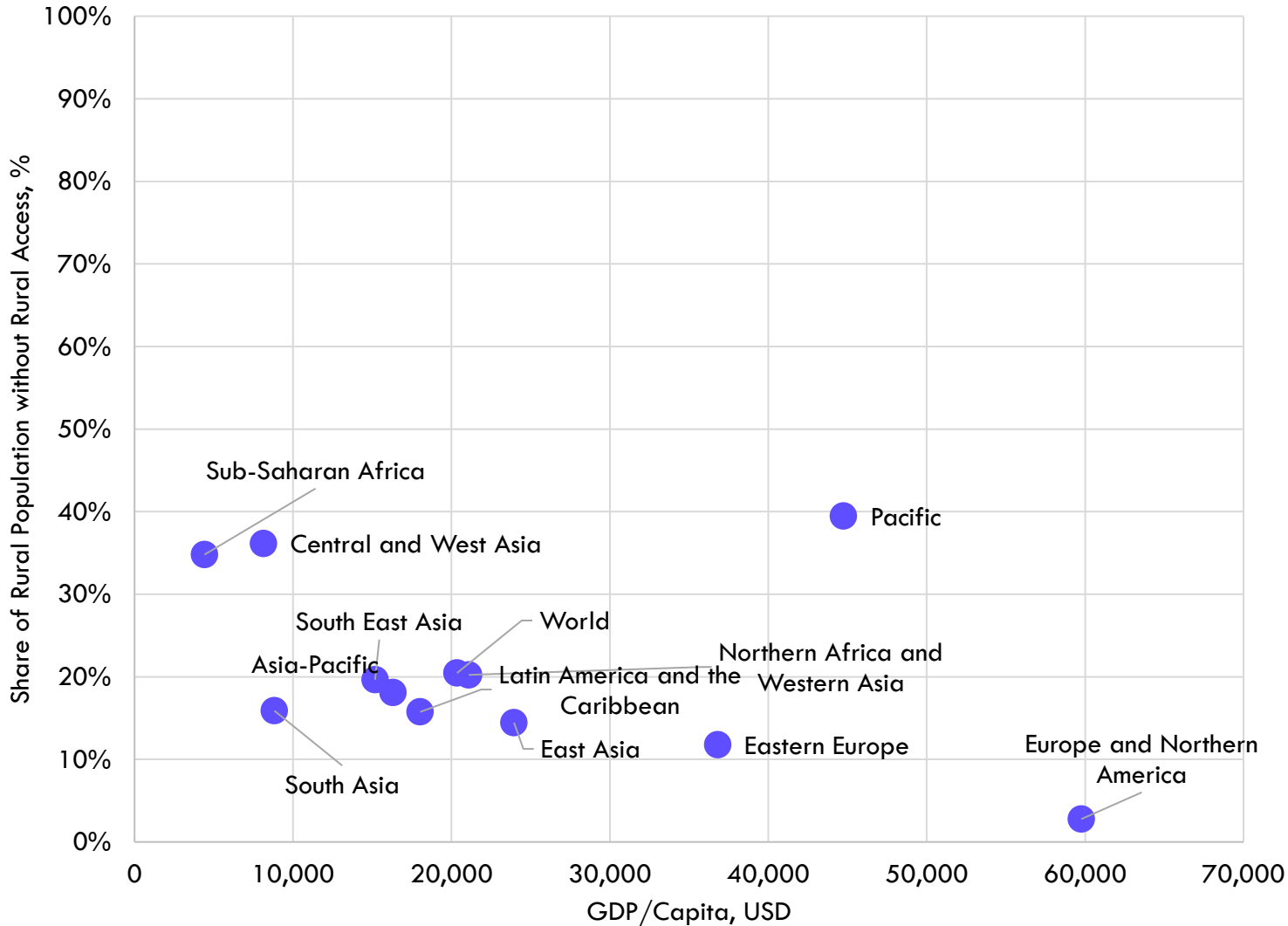
Translating Data into Insights, Policies, and Investments

Infrastructure Gap & Fast-Growing Motorization



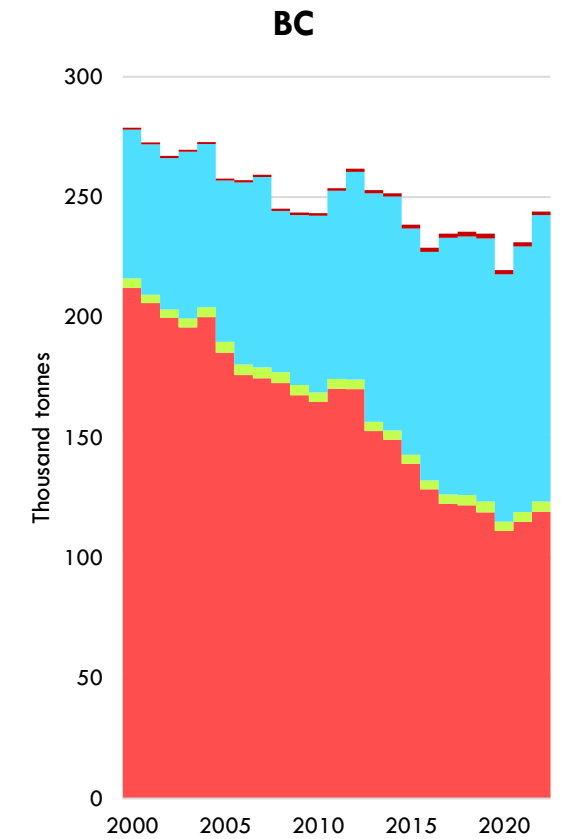
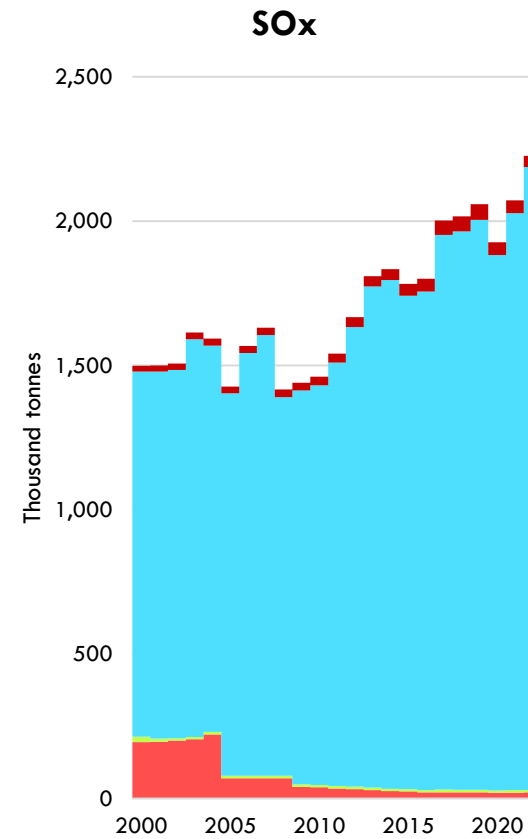
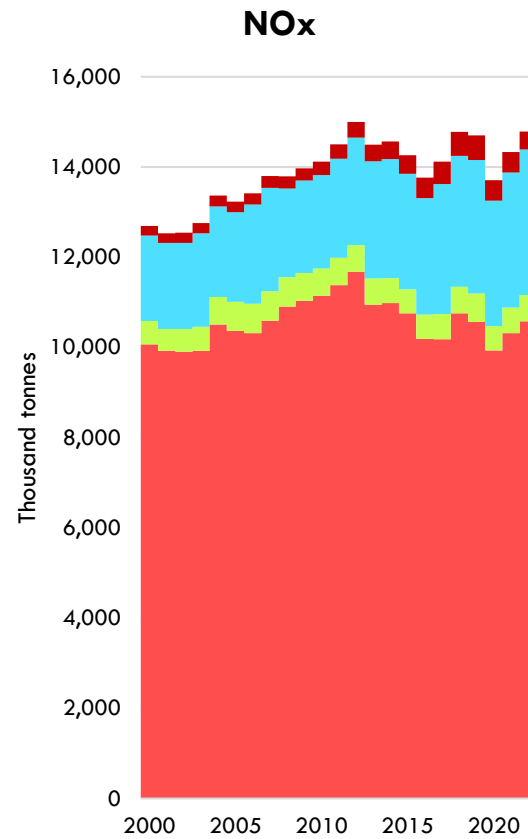
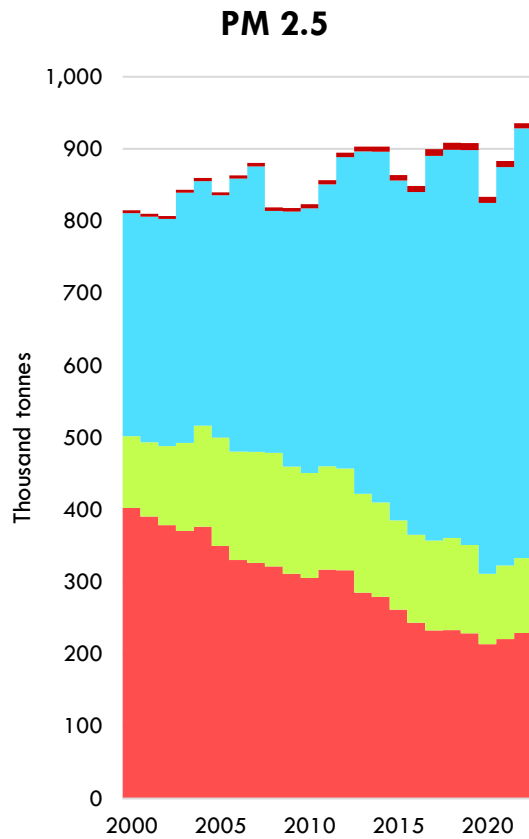
Connecting the Unconnected

Share of Rural Population Without Rural Access & GDP/Capita



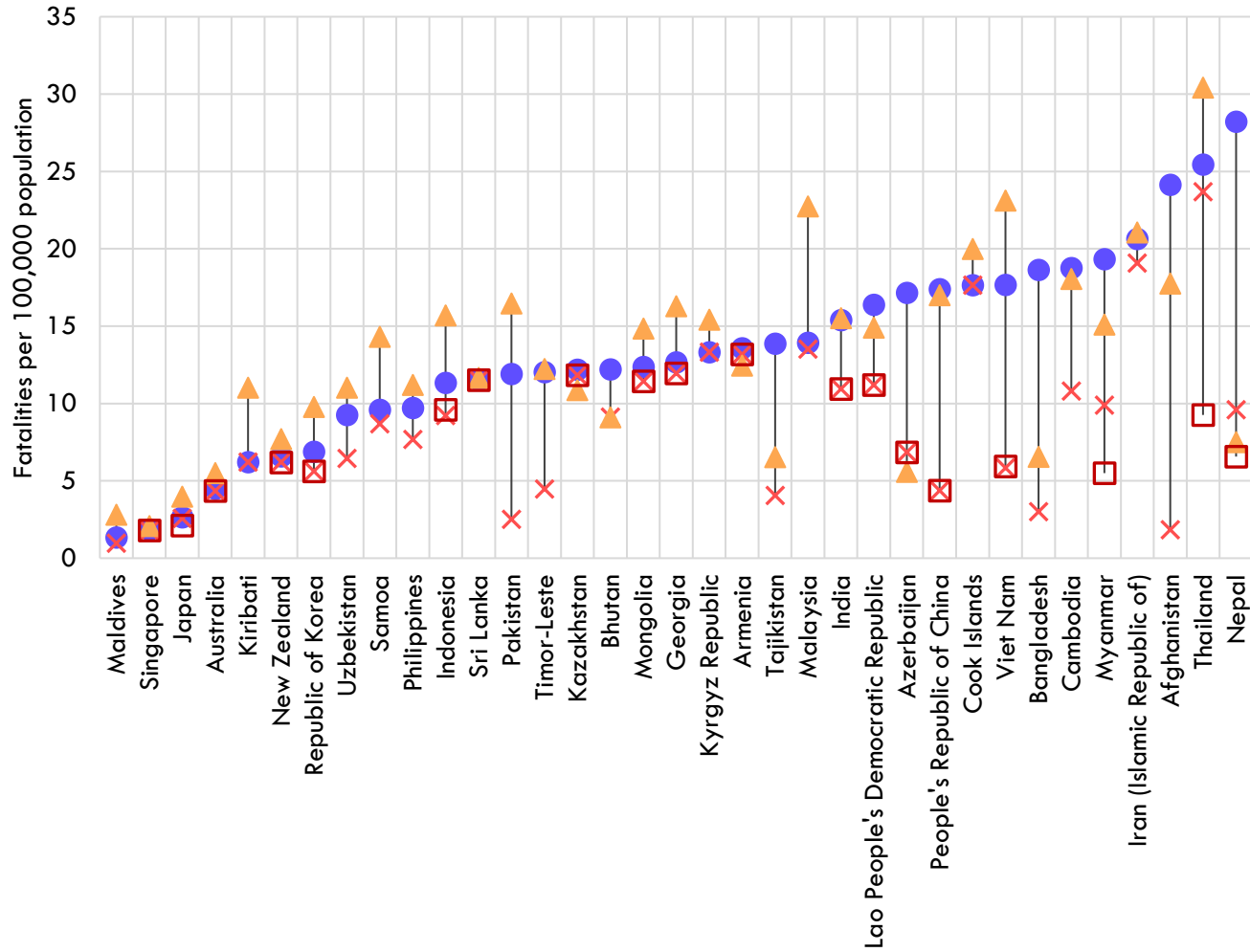
Transport is a Significant Source of Air Pollution

■ Road
 ■ Rail
 ■ Domestic navigation
 ■ Domestic Aviation



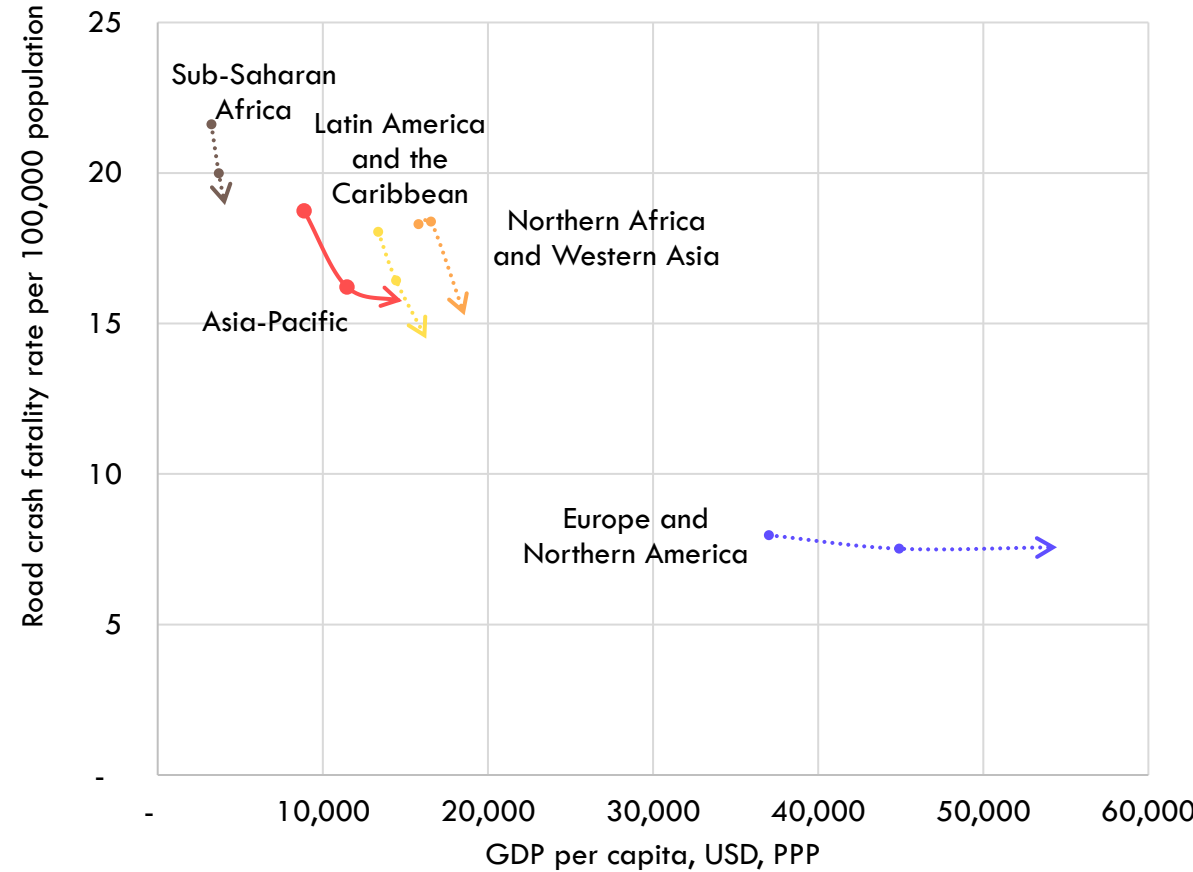
Can We Meet SDG Targets on Road Safety?

Road crash fatality rate in Asia by source, 2021



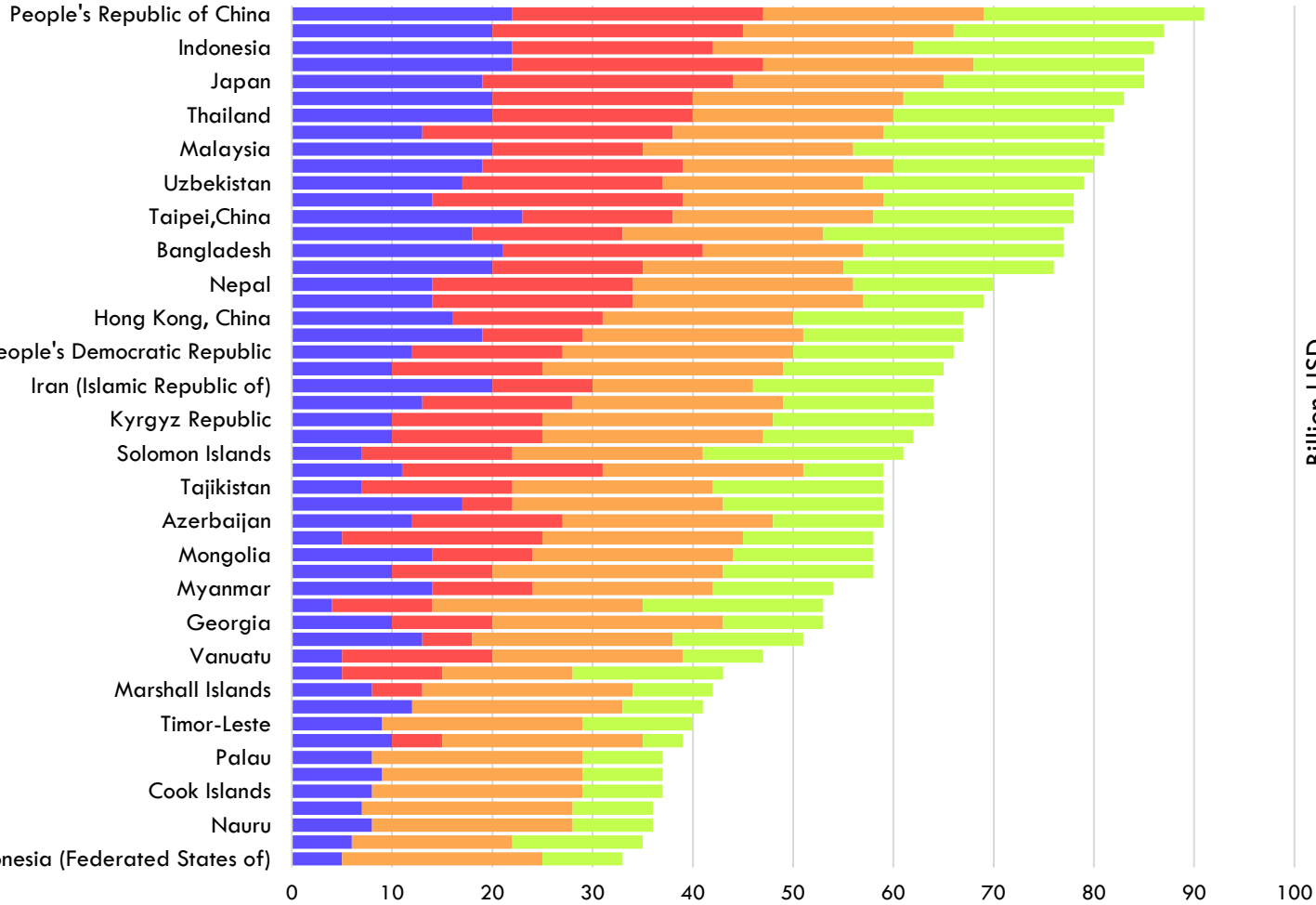
● WHO modelled estimates × Country report to WHO
▲ Global Burden of Disease 2021 ◻ Country Official Statistics

GDP per capita vs. road crash fatality rate (2010, 2016, 2021)

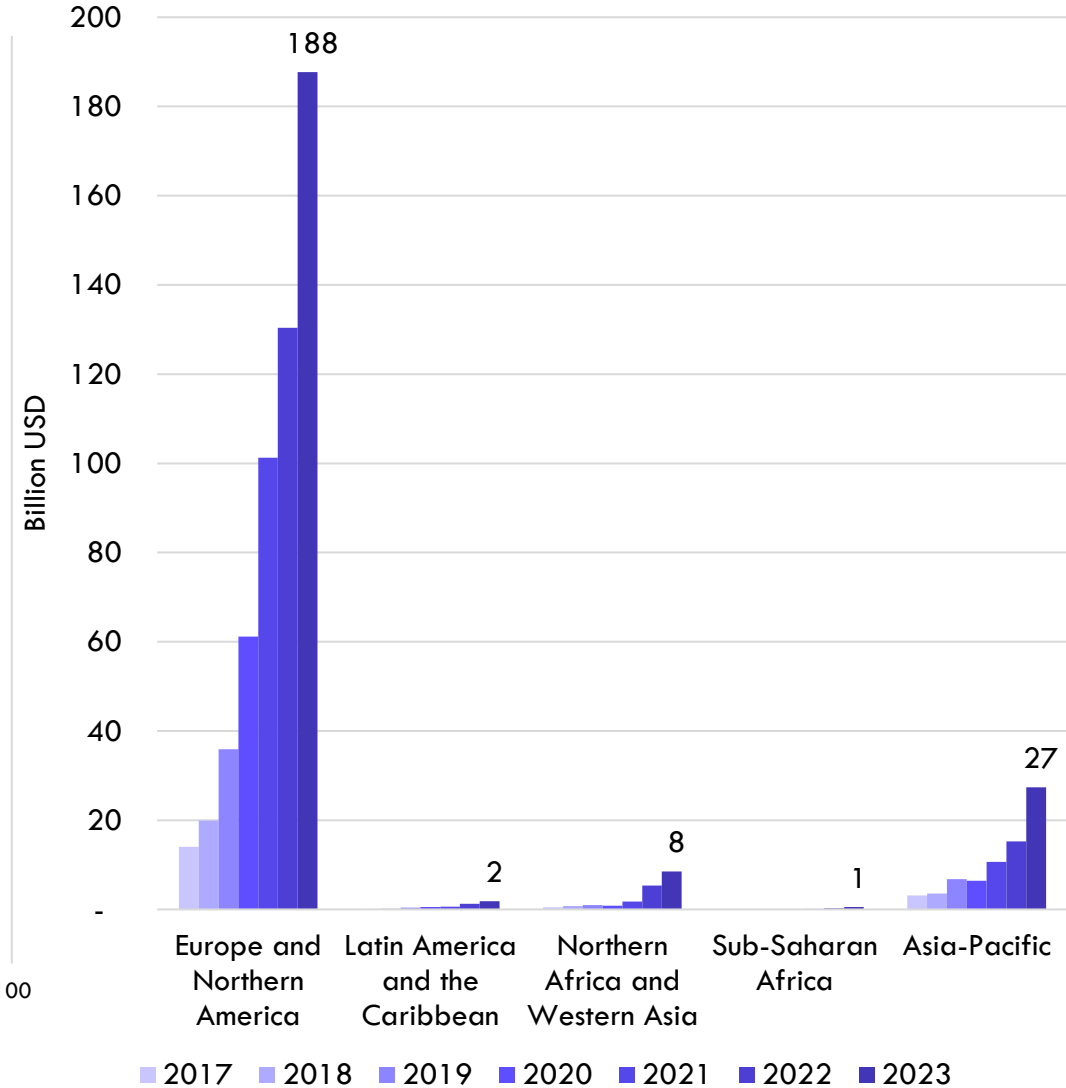


Asia's EV Surge: Near the Tipping Point

UNEP-E-Mobility Index (ATO 2024 Update)

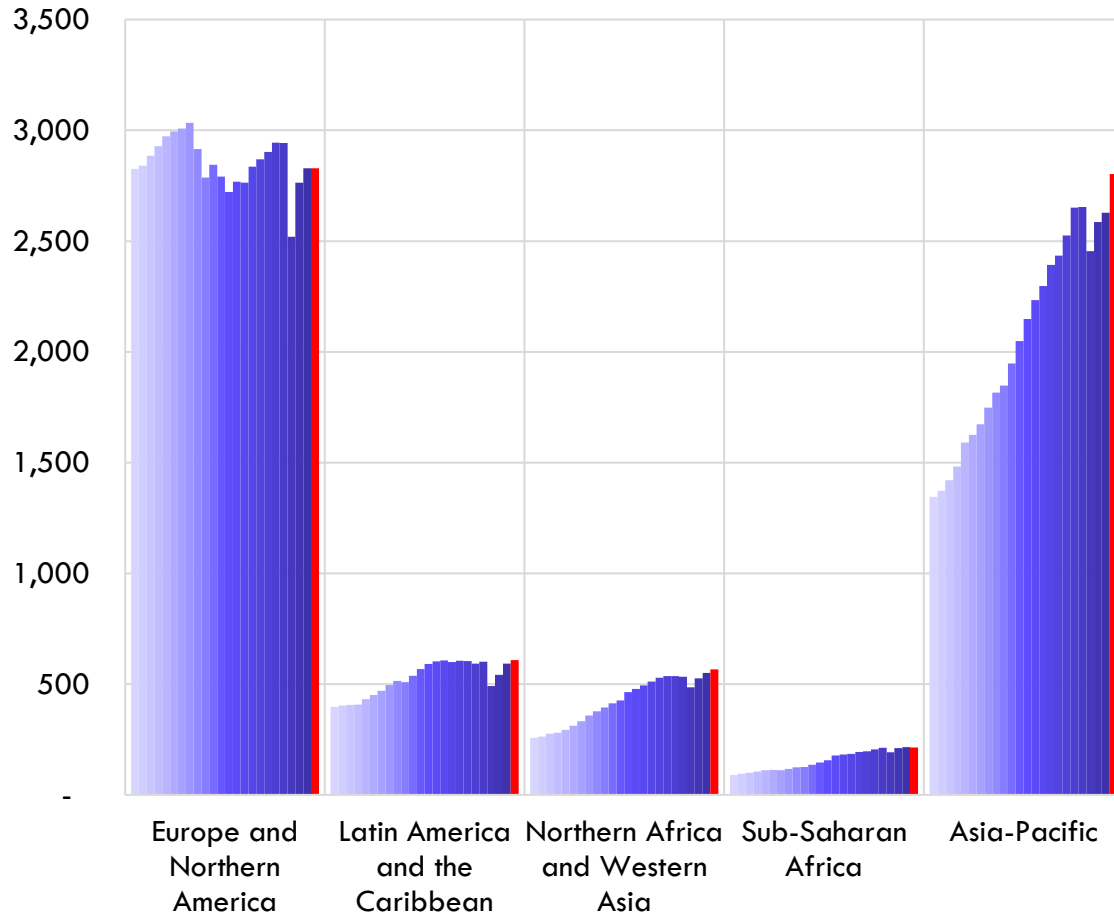


Total electric vehicle imports

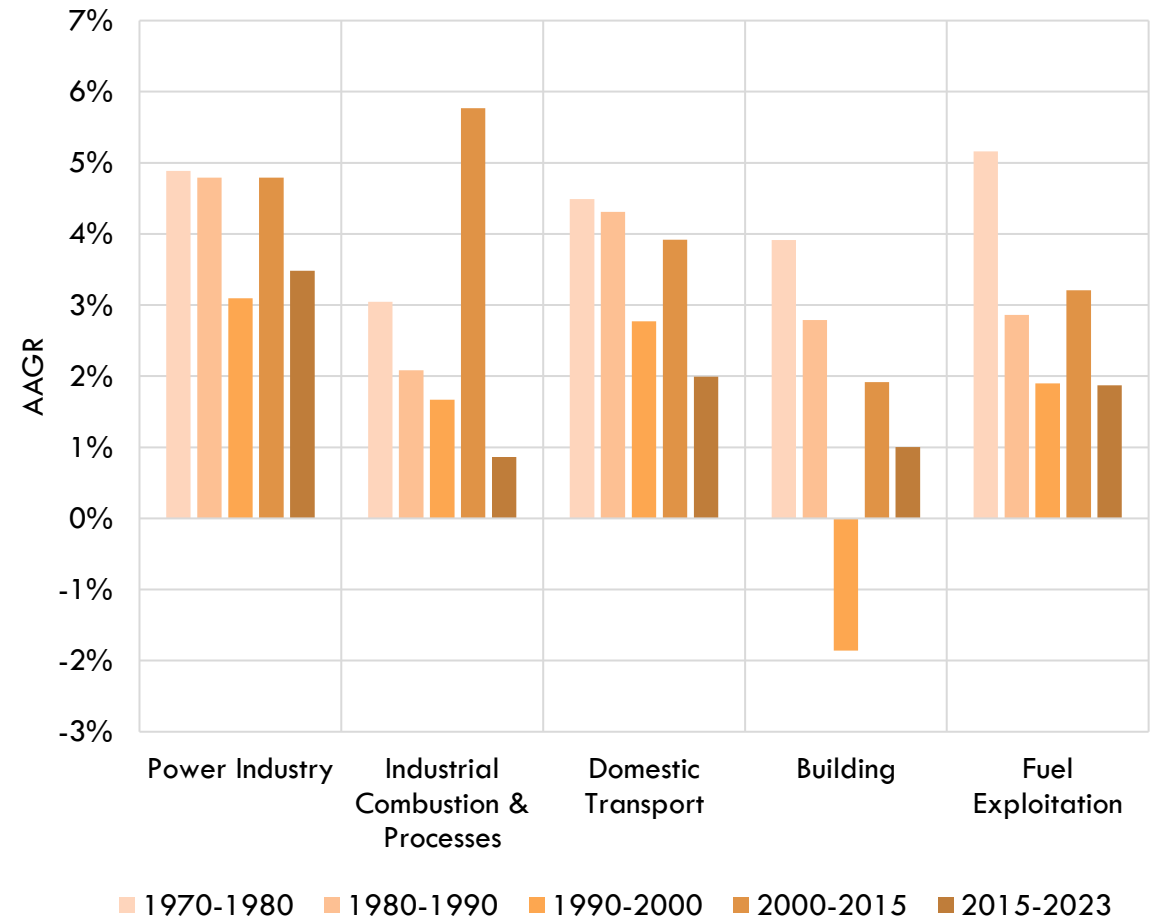


Alarming Rise in Asia-Pacific Transport Carbon Emissions

Domestic Transport CO2 Emissions, 2000-2023, Million Tonnes of CO2 Emissions

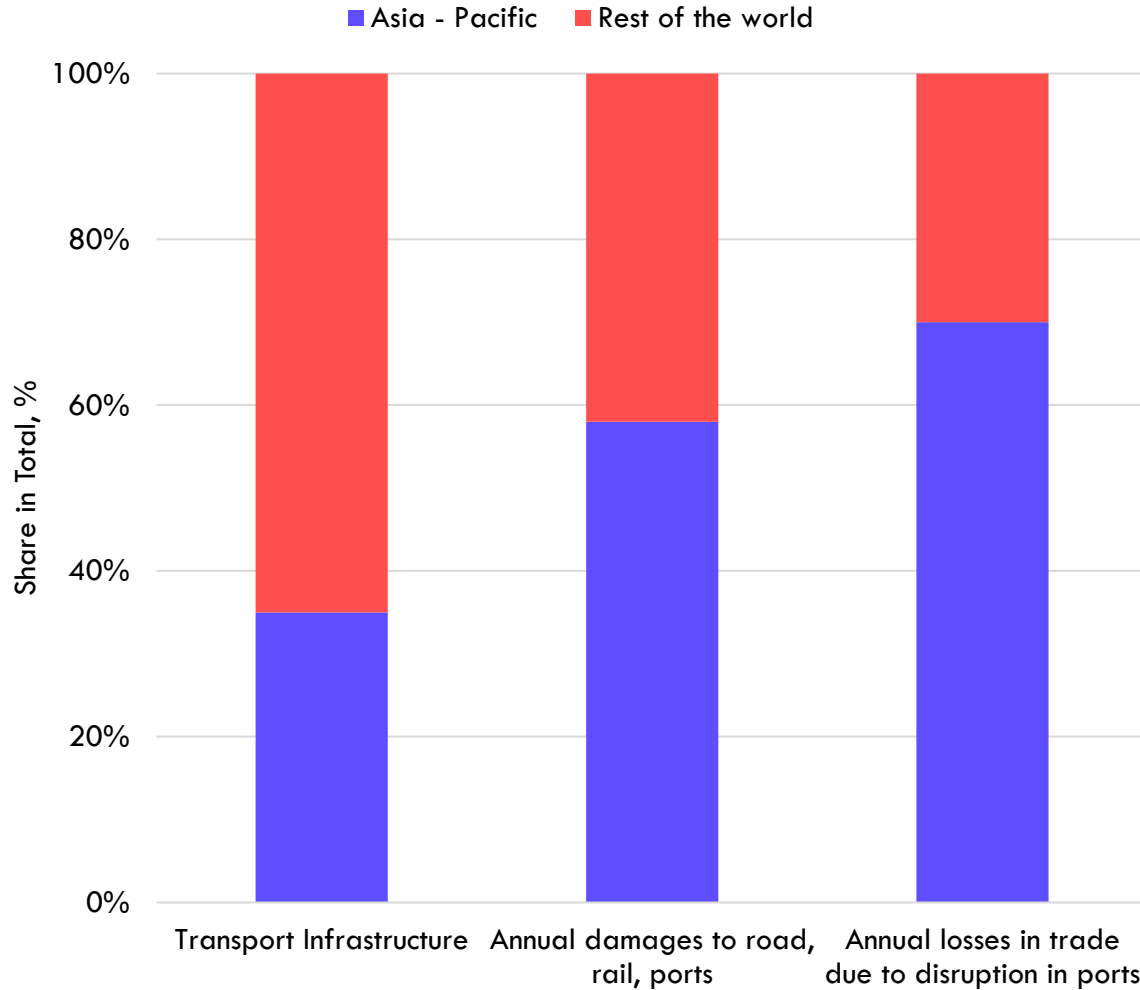


Transport Emissions (CO2) in Asia – Annual Growth Rate



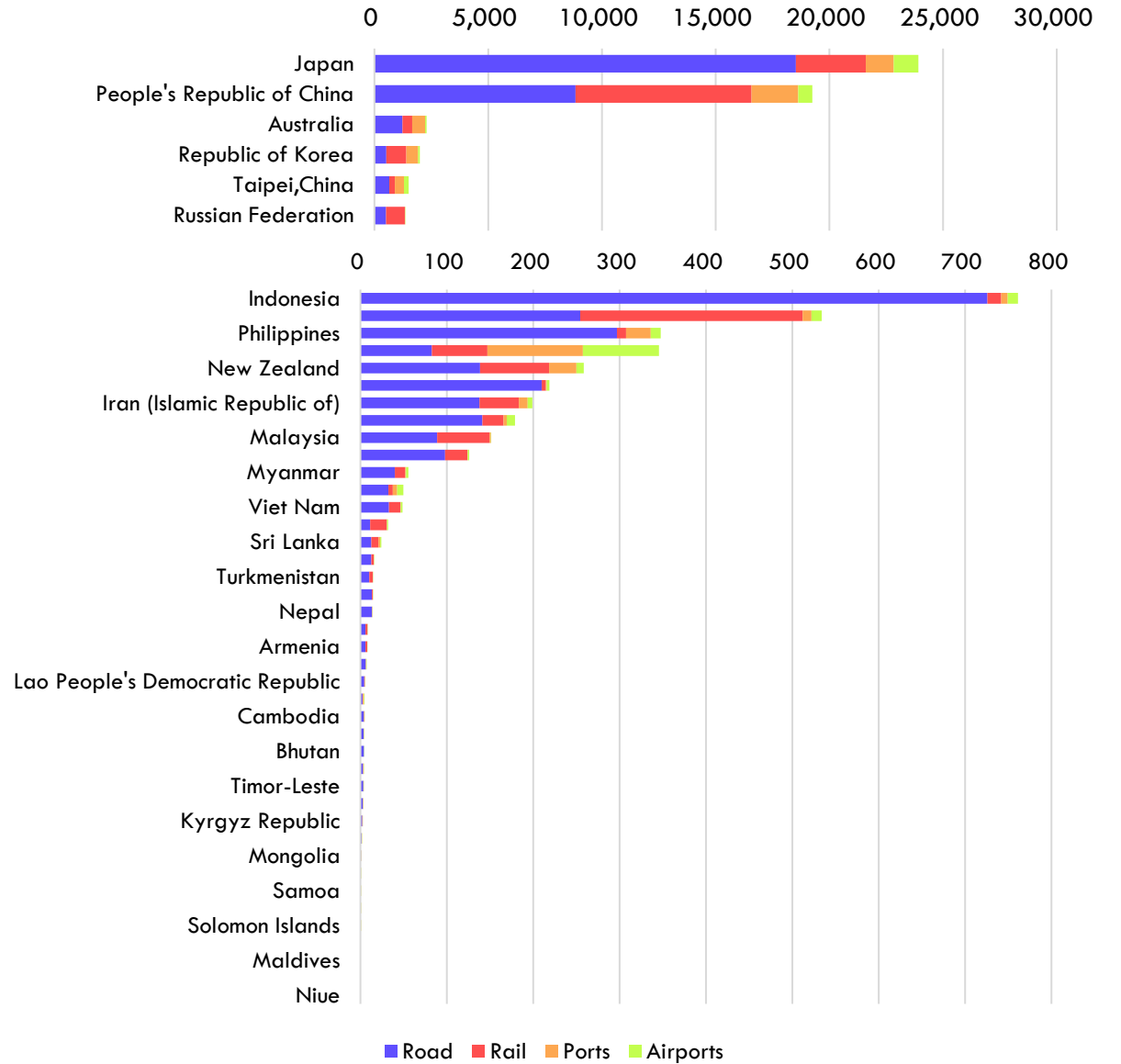
Adapting to a Changing World - From Choice to Necessity

Share of Asia-Pacific in transport infrastructure and potential damages to surface infrastructure due to hazards



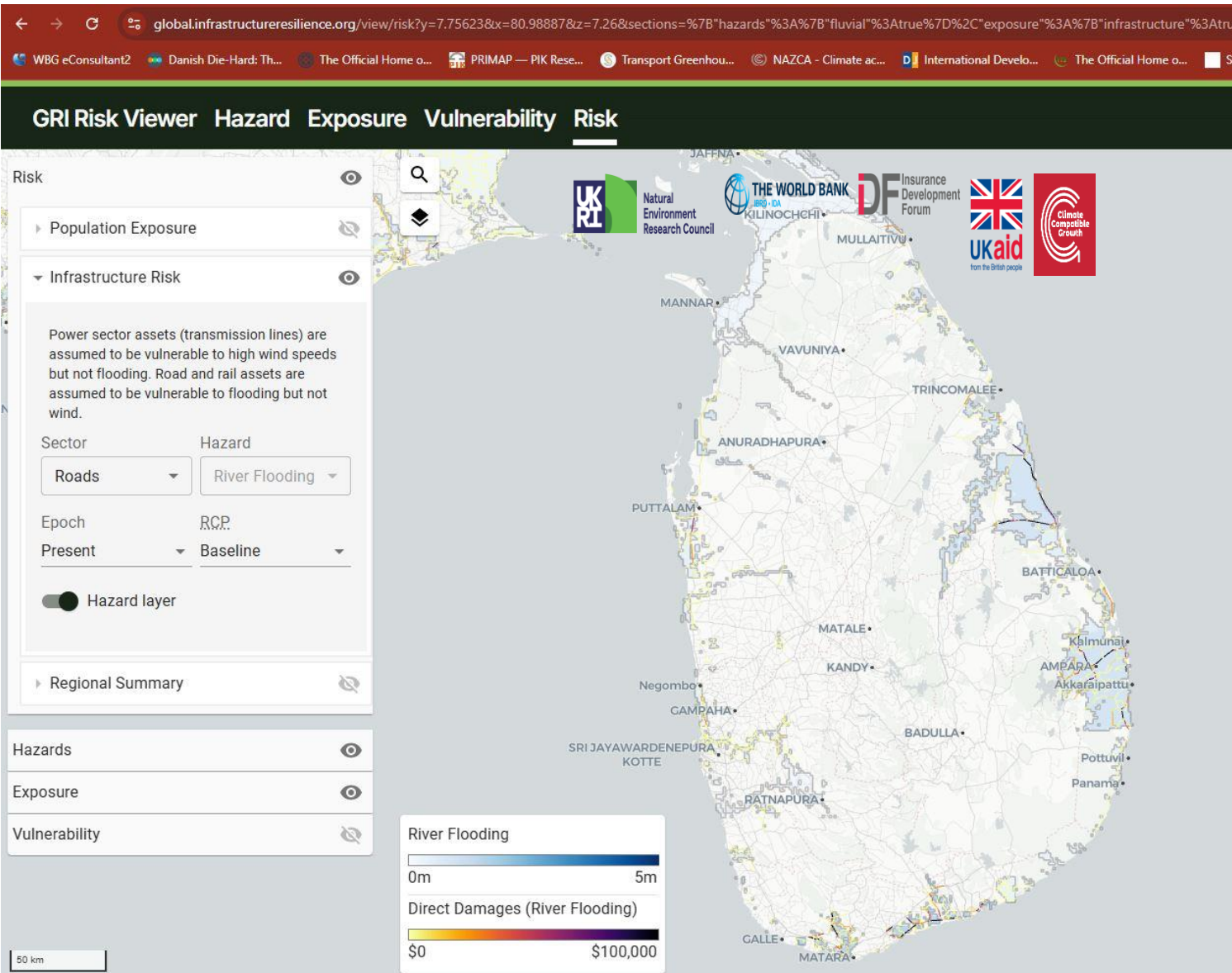
Source: Kokos Et al.

Average annual losses due to all potential hazards (2023)
(Million USD)



Source: CDRI

Adapting to a Changing World - From Choice to Necessity



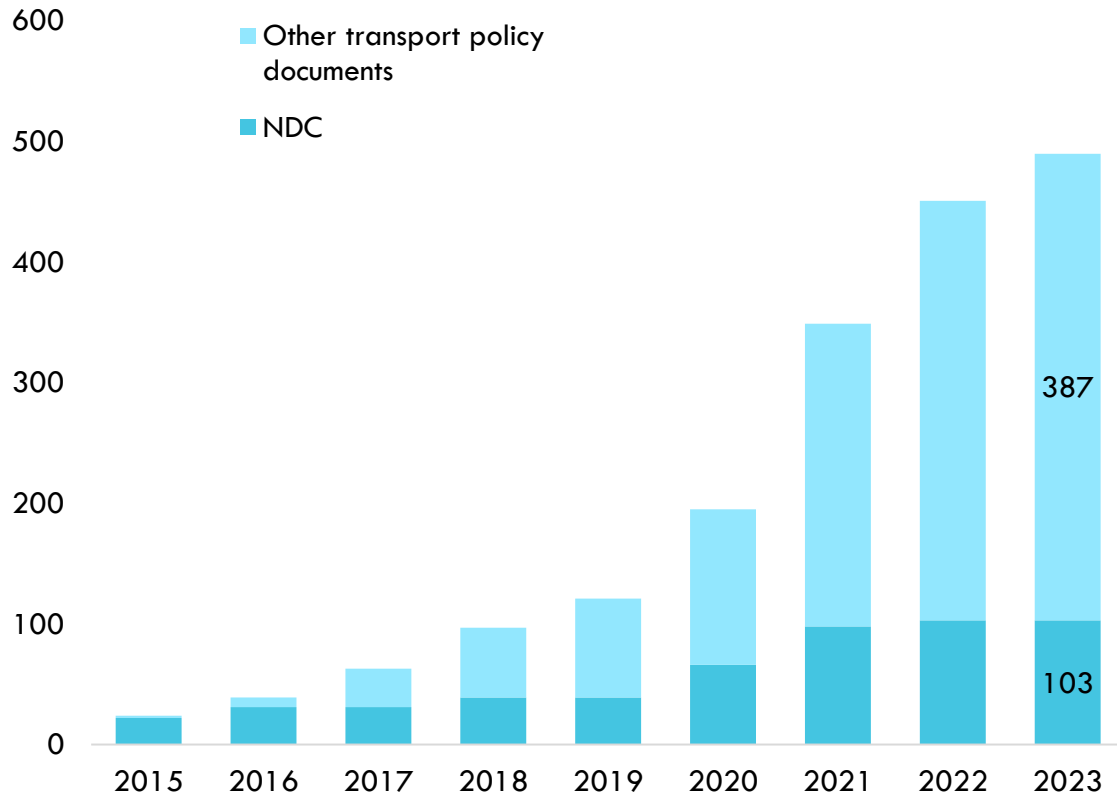
```
thomas-fred Consolidate damage curves and rehab costs
```

Preview Code Blame 16 lines (16 loc) · 679 Bytes

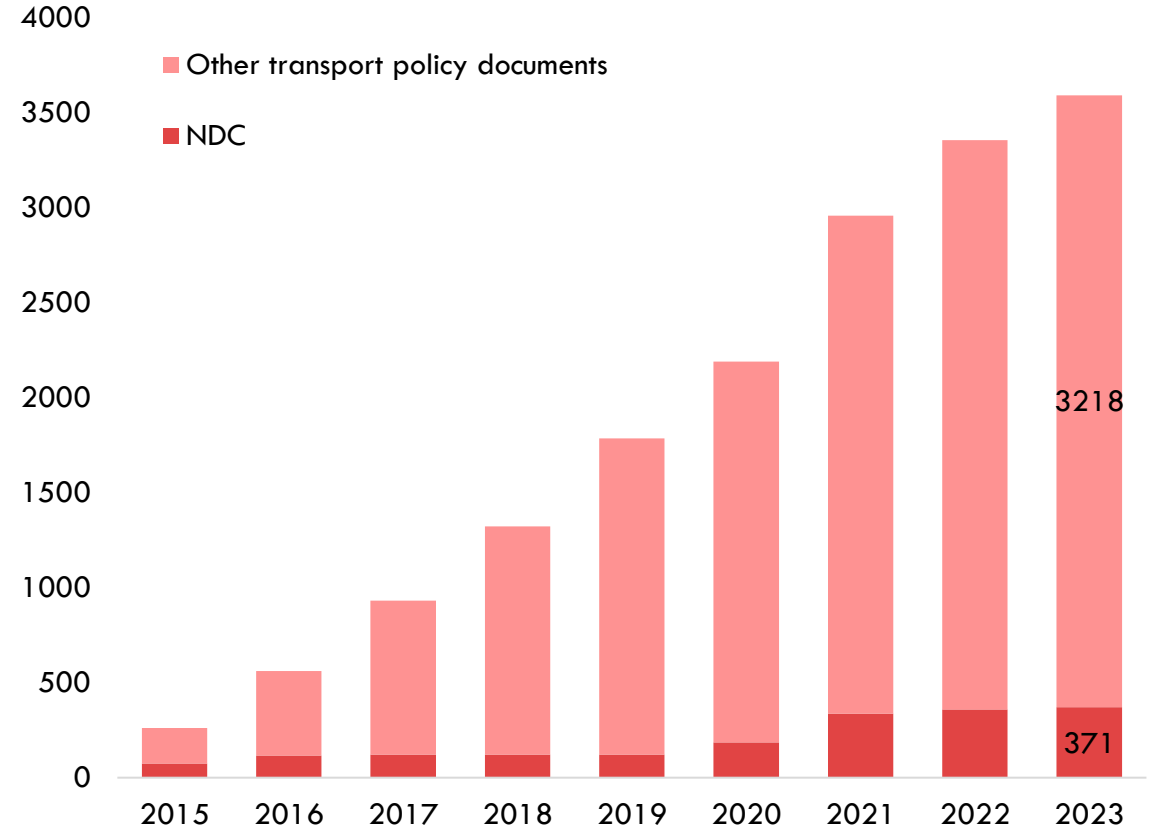
```
1 # Sources:
2 # World Bank. Road Costs Knowledge System (ROCKS) v2.3
3 # US Federal Highways Agency, Bridge Replacement Unit Costs 2020, https://www.fhwa.dot.gov/bridge/nbi/sd2020.cfm#
4 # York et al 2019. A global multi-hazard risk analysis of road and railway infrastructure assets
5 # Asian Development Bank, Asian Transport Outlook, https://asiantransportoutlook.com/costdata/
6 "asset_type","rehab_cost_USD_per_km_per_lane"
7 "road_bridge",40805816.00
8 "road_motorway",2289717.82
9 "road_trunk",348280.34
10 "road_primary",348280.34
11 "road_secondary",164059.77
12 "road_tertiary",164059.77
13 "road_residential",164059.77
14 "road_unclassified",164059.77
15 "road_paved",164059.77
16 "road_unpaved",23545.10
```

NDC's: The Need for Paradigm Shift

Cumulative Distribution of Targets (2015 - 2023)



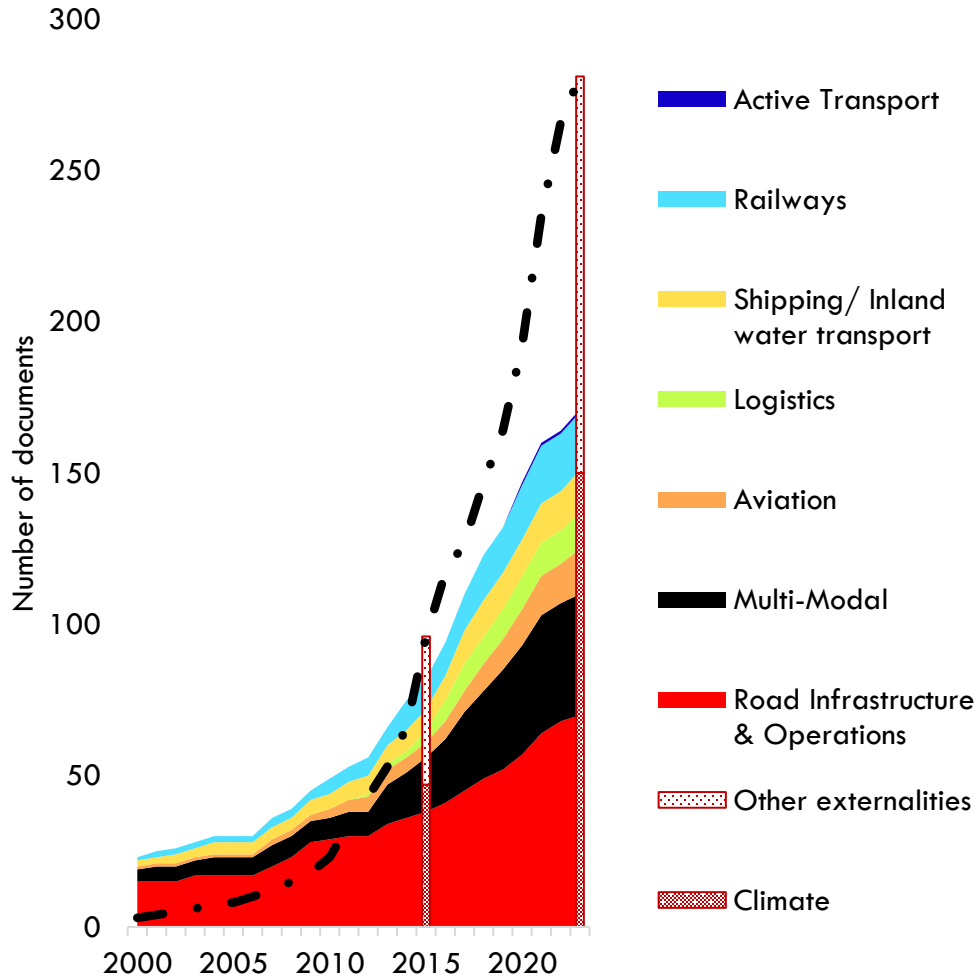
Cumulative Distribution of Measures (2015 - 2023)



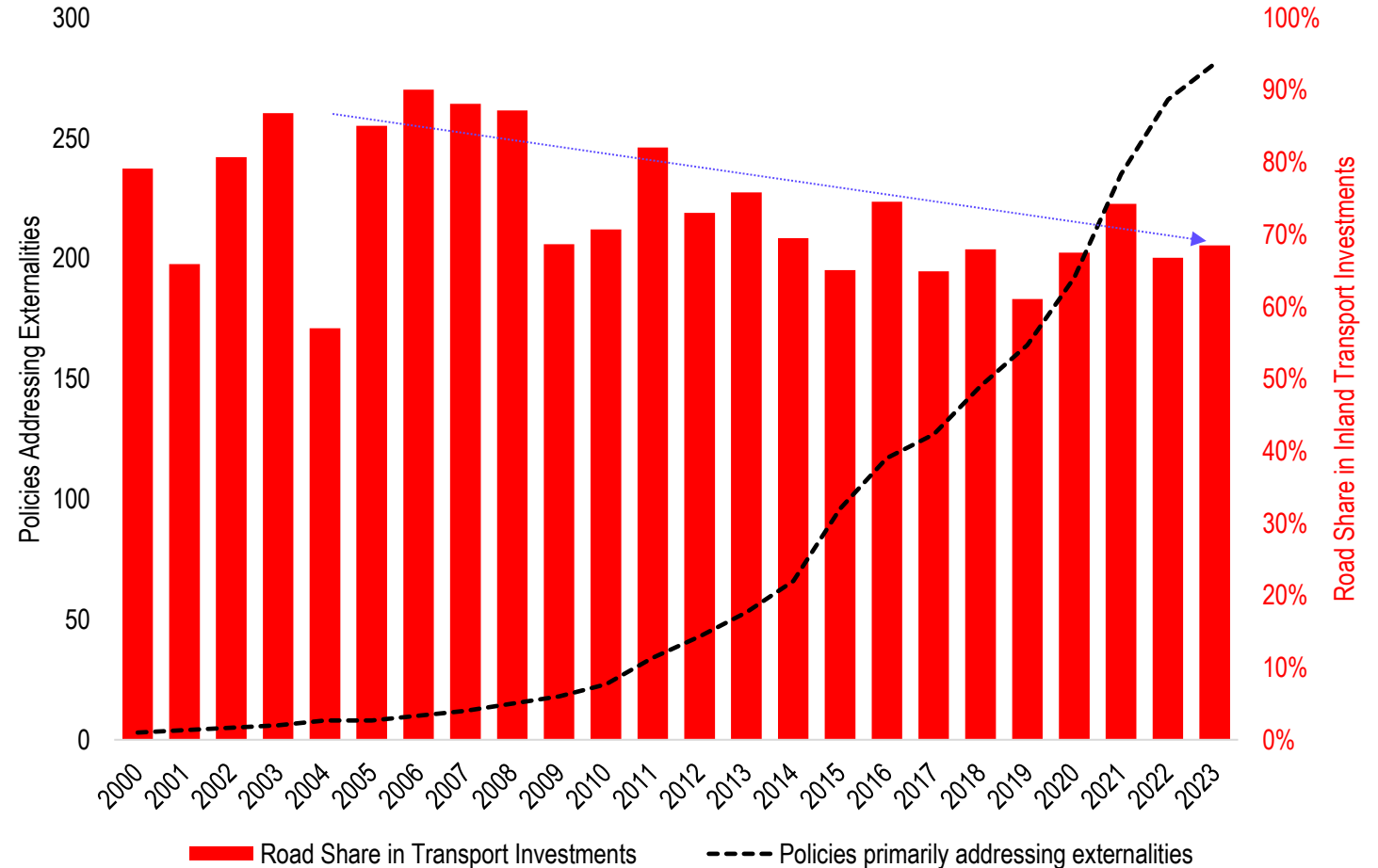
“Emerging economies need more detailed and ambitious transport-related commitments in their NDCs”

The Evolving Landscape of Transport Policies

Transport policy documents by theme

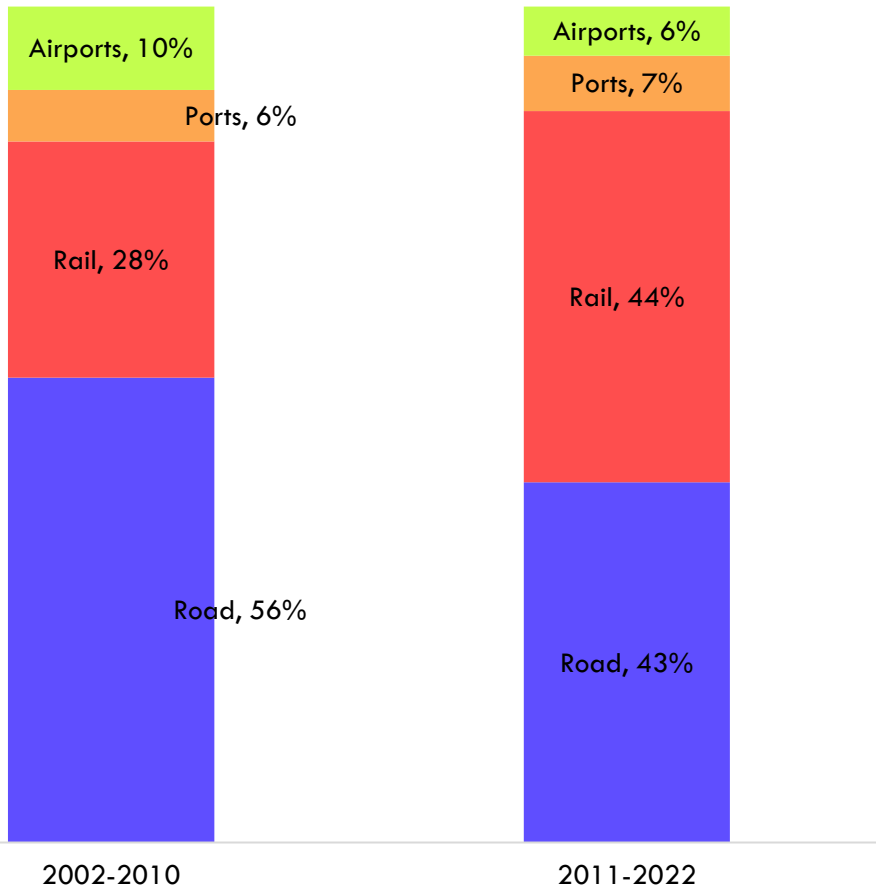


The Evolving Landscape of Transport Policies

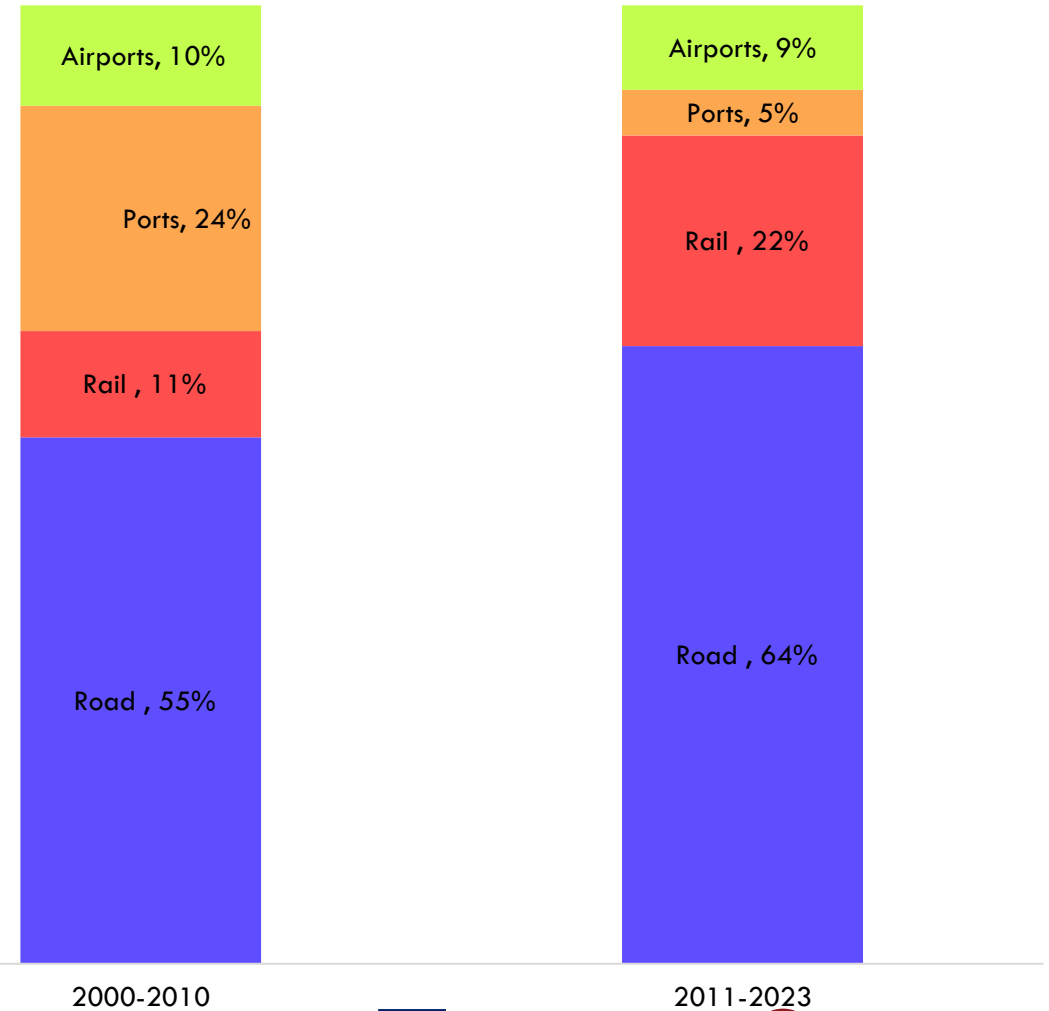


The Need for Investments

Official development assistance in the transport sector

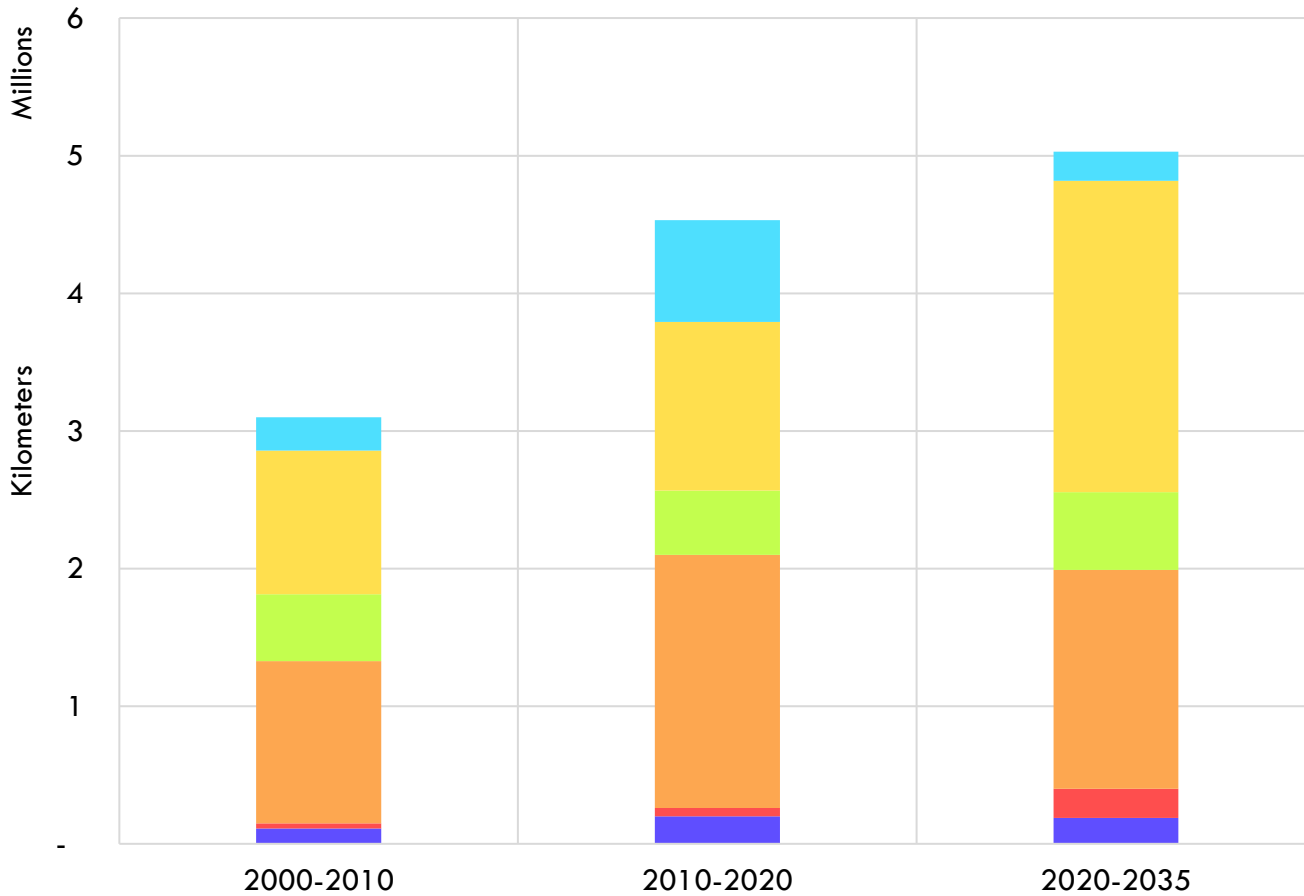


Public-private partnership investments in the transport sector



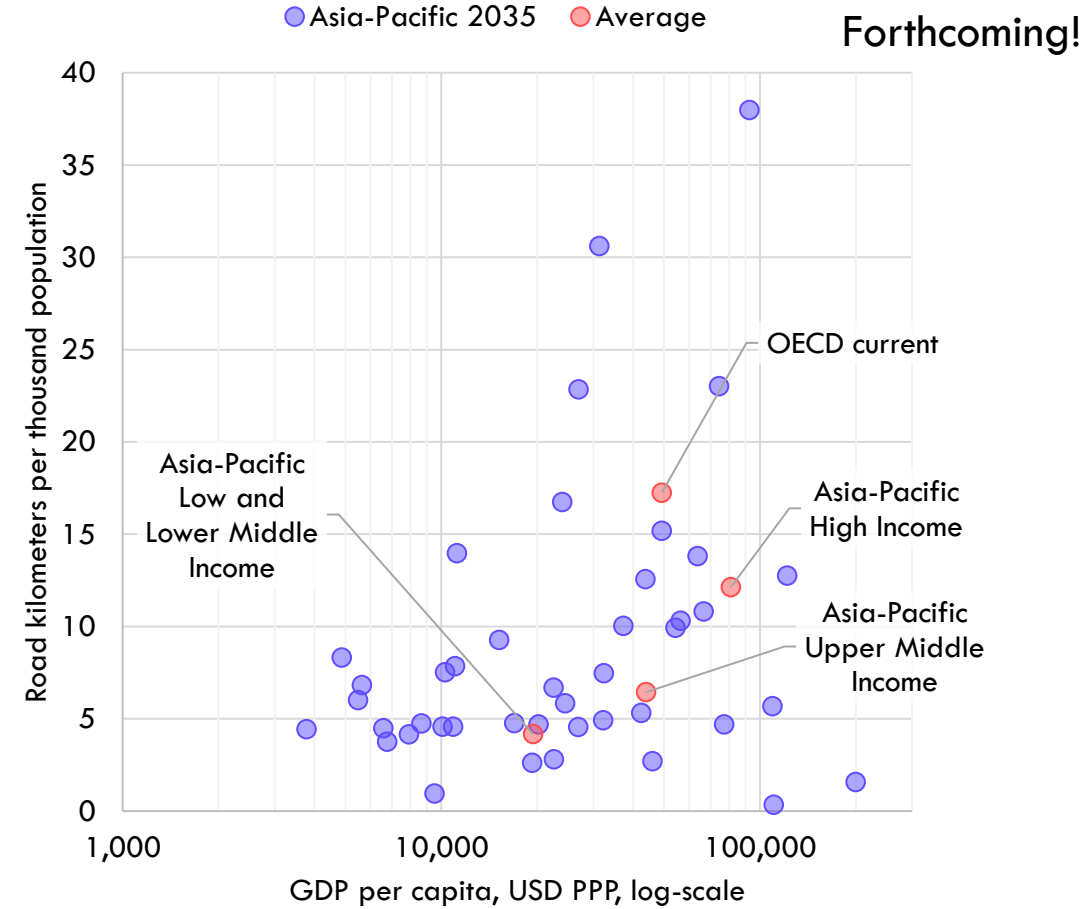
Outlook - Road Infrastructure in 2035

Road kilometers added



■ Central and West Asia ■ Pacific ■ South Asia ■ South East Asia ■ East Asia ■ Eastern Europe

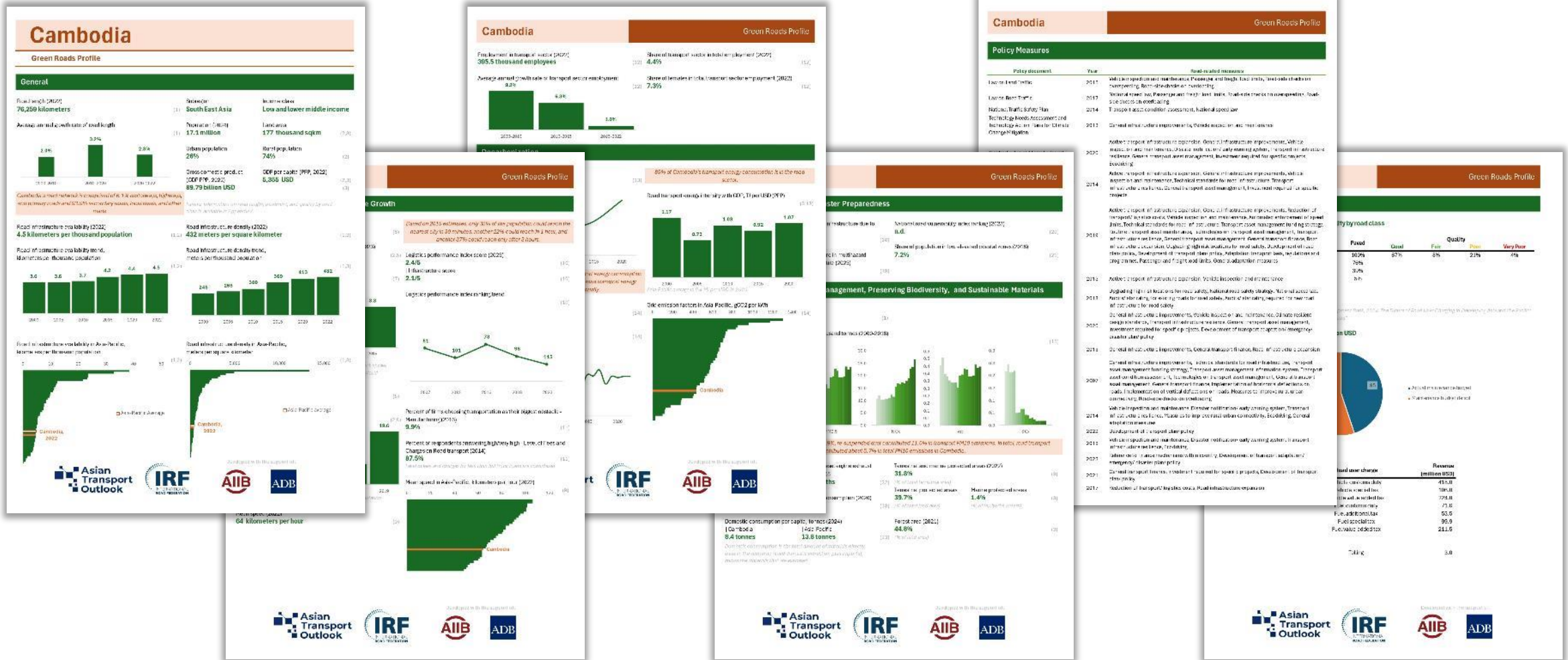
Road availability



The Evolving Landscape of Transport Policies

The screenshot shows the website's interface. At the top, there is a browser address bar with the URL 'asiantransportoutlook.com'. Below it is a breadcrumb trail: 'Data in General > Transport Tools an... > Statistics > PERSONAL AND FA... > 2024 Learn > GIS > Financial Business... > Old projects > SG and A'. The main header features the 'Asian Transport Outlook' logo on the left, a home icon, and navigation menus for 'Databases', 'Analytical Outputs', and 'About'. The 'Analytical Outputs' menu is expanded, listing: 'ATO Reports', 'ATO Regional Profiles', 'ATO Country Profiles', 'ATO Transport Sector Profiles', 'ATO Transport State of Play Presentations', 'ATO Road Safety Profiles', 'ATO E-mobility Profiles', 'ATO Green Roads Profiles' (highlighted in red), and 'ATO City Profiles'. The background of the page is a photograph of a blue electric locomotive (numbered 60026) pulling a train on a track, with overhead power lines and greenery visible.

Green Roads Profile – Connecting Data and Policies




Transport Climate Profile - Indonesia

Define roles and accountabilities across agencies	Design standards for sidewalks and bicycle paths	Development of other transport-related plan/policy	Emissions trading and carbon pricing	Energy efficient vehicle purchase incentives	Fuel quality	General aviation improvements	General capacity building	General education and behavior change	General e-mobility	General freight and logistics improvements
General infrastructure improvements	General land use	General parking measures	General public transport	General rail improvement	General shipping improvement	General transport asset management	General transport institutional reform	Intelligent transport systems (ITS)	Involvement of subnational government for transport activities	Local production, services, contracting etc.
Logistics hub	LPG/ CNG/ LNG	Rail infrastructure expansion	Reference to finance mechanisms within country	Reporting, transparency, feedback mechanism	Road infrastructure expansion	Stakeholder involvement	Economy-wide emissions target	Technical standards for general transport infrastructure	Technology and knowledge transfer	Traffic management
Transport law	Urban passenger rail infrastructure improvement	Vehicle efficiency standards	Vehicle import inspections	Vehicle inspection and maintenance	Vehicle labelling	Vehicle restrictions (import, age, access, sale, taxation)	Vehicle scrappage scheme	Vehicle taxes	Accreditation of vehicle inspection centers	Biofuels
BRT	Data modelling improvements	Development of climate change/ low carbon plan/policy	Development of national development plan/policy	Ecodriving	EV charging infrastructure	EV manufacturing	Fiscal incentives for EVs and components	Fossil fuel subsidy elimination	Freight rail infrastructure improvement	Fuel tax
General alternative fuels	General economic instruments	General innovations and digitalization	General transport demand management	General transport finance	High-speed rail (HSR)	Hydrogen	Intermodality measures	Investment required for specific projects	Port electrification	Port infrastructure improvements
Programs to reduce emissions in logistics	Public transit integration	Reduction of transport/ logistics costs	Renewable energy	Road charging and tolls	Road-side vehicle technical checks	Ship efficiency improvements	Technical standards for rail infrastructure	Technologies on transport asset management	Transit-oriented development (TOD)	Transport asset condition assessment
Travel time improvement	Vehicle air pollution emission standards	Vehicle manufacturing	Ban of ICE sales	Accreditation of driver training agencies	Air traffic management	Aircraft fleet renovation	Jet fuel policies	Local authorities have the power to modify national speed limits	Low-emission vehicle zones	Express lanes/ public transport priority

Translating Data into Insights, Policies, and Investments

ATO Insights

Search Insights 10




Urban Access to Public Transport - Visualization

2024-10-24

Access to public transport plays a critical role in creating inclusive, sustainable cities. SDG Indicator 11.2.1—Urban Access to Public Transport—focuses on how well urban residents can connect to public transport services, influencing social equity, environmental sustainability, and economic opportunity.

Interactive Visualization

Tags: urban access, cities, public transport, urban centers



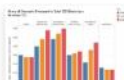
Alarming Rise in Asia-Pacific Transport Emissions

2024-10-15

The 2023 data on domestic transport CO2 emissions in Asia and the Pacific region presents a stark reality for COP29 discussions.

Visualization

Tags:



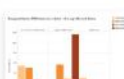
Varying Emissions Landscape

2024-10-15

Globally, the domestic transport sector represents 19% of total fossil CO2 emissions, notably lower in Asia at 12%. However, the transport sector's share of total fossil emissions within Asia varies significantly depending on income levels.

Visualization

Tags:



Emissions Growth: A Tale of Two Asias

2024-10-15

The emissions growth rate differs significantly between high-income and low- and middle-income Asian economies.

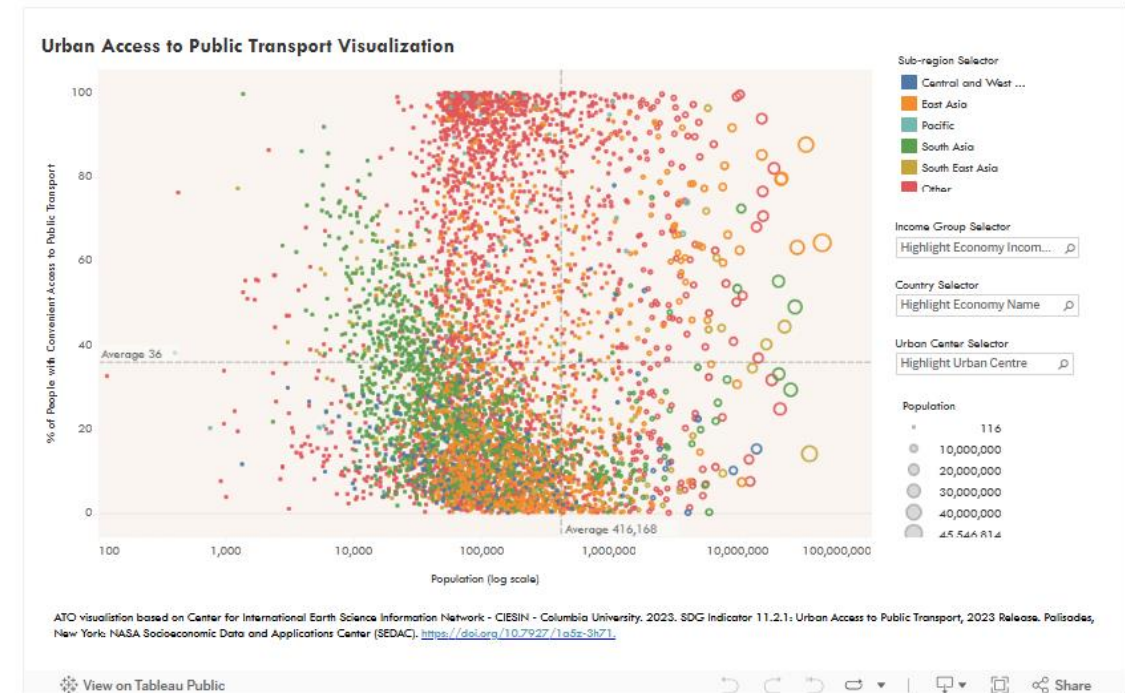
Visualization

Urban Access to Public Transport - Visualization

ATO - 2024-10-24

Home / Insights / Urban Access to Public Transport - Visualization

Access to public transport plays a critical role in creating inclusive, sustainable cities. SDG Indicator 11.2.1—Urban Access to Public Transport—focuses on how well urban residents can connect to public transport services, influencing social equity, environmental sustainability, and economic opportunity. This post explores the data from the Center for International Earth Science Information Network (CIESIN) at Columbia University through a visualization created by the Asian Transport Outlook. The dashboard provides an insightful way to explore urban access patterns and identify gaps in public transport networks.



The visual in the dashboard shows the estimated percentage of the population having convenient access to public transport in the y-axis and the urban population in the x-axis (which is also emphasized through the size of the circles). You can select on a sub-region, or directly select a country or a city.

***“ATO translates data into insights,
policies, and investments”***

asiantransportoutlook.com

ATO Team asiantransportoutlook@gmail.com

Jamie Leather jleather@adb.org

Andres Pizarro andres.pizarro@aiib.org

Manuel Benard manuel.benard@aiib.org

Alvin Mejia alvin.mejia.a@gmail.com

Sudhir Gota sudhirgota@gmail.com

Twitter [@transportATO](https://twitter.com/transportATO)

LinkedIn bit.ly/ATOlinkedin