

Rail beyond mobility: climate and resilience pathways

Adwait Limaye

Data and Policy Analyst
Asian Transport Observatory

UIC Asia-Pacific Web Series 2026
18 May 2026



Asian Transport Observatory (ATO): A Catalyst for Sustainable Transport in Asia

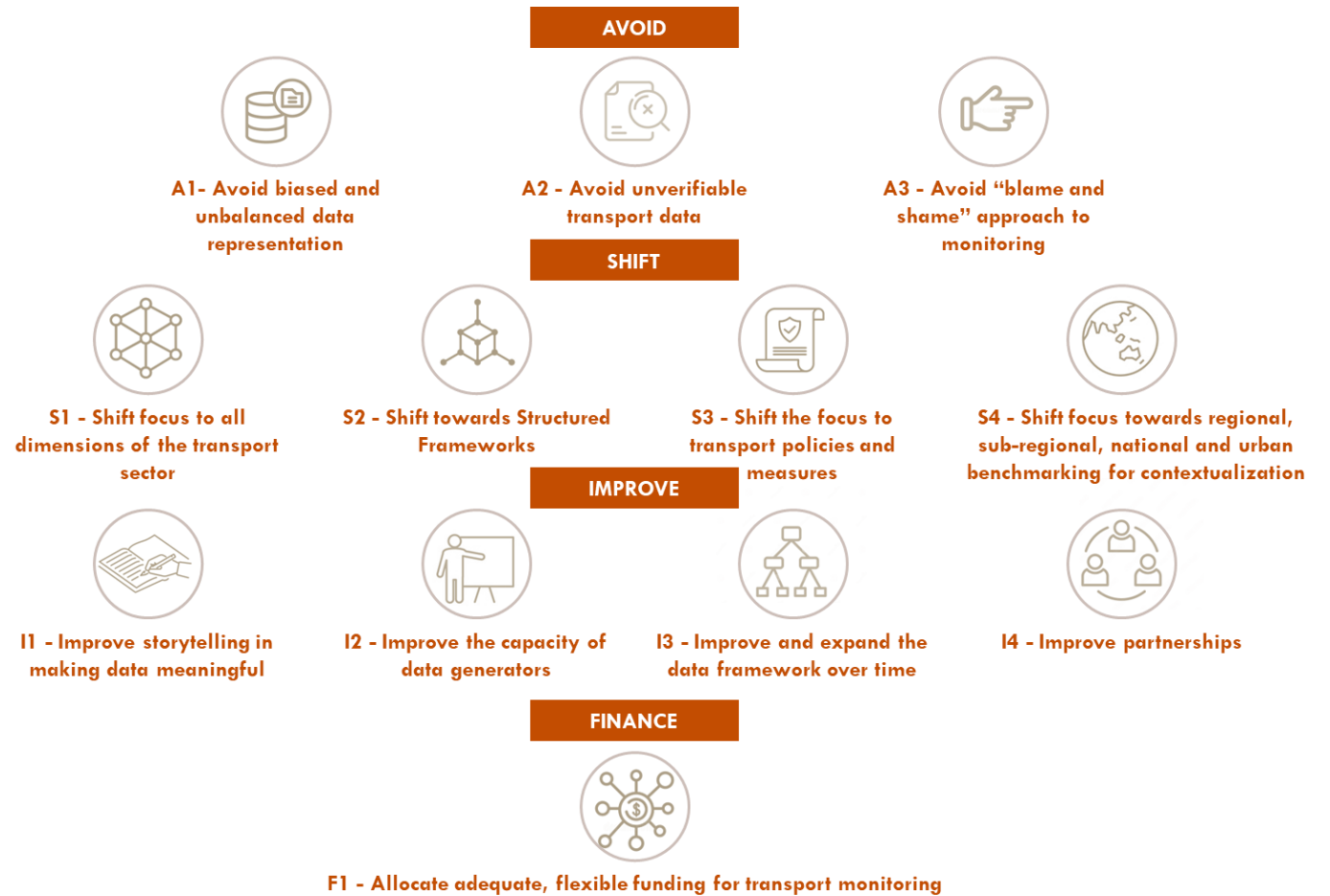
asiantransportobservatory.org



52 Economies (ADB Members + Iran and Russia)

460 Urban Centers (412 Asia-Pacific, 48 Others)

50 Urban Centers with a detailed review



Climate and Transport Profile

Rail Profile

MALAYSIA

TRANSPORT AND CLIMATE PROFILE

Supported by:

Background

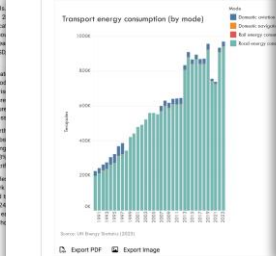
Malaysia, an upper middle-income country with a population of 33.6 million, faces significant challenges in reducing carbon emissions. In 2023, the transport sector emitted 61.2 million tonnes of greenhouse gases, making up about 18% of the total emissions across the economy. An important point is the absolute decoupling of sectoral growth from emissions: Transport CO2 emissions grew by 4.5% annually before the Paris Agreement, but this rate has now slightly reversed to a -0.2% annual decline. Despite progress, the road sector still dominates with 97% of transport emissions, while rail and domestic aviation contribute almost nothing (0%), and domestic aviation accounts for 0.7%.

The sector's energy profile is still heavily reliant on fossil fuels. 94% of transport energy use, down slightly from 97% in 2 electricity accounted for just 5% and -1%, respectively, indicate alternative fuels compared to regional counterparts. While emissions per unit of GDP (44.6 gCO2e per USD) has decrease remains above the Asia-Pacific average of 29.0 gCO2e per USD structural change efficiency.

Malaysia's transport networks are highly vulnerable to climate the nation has experienced 26 natural disasters, with flood incidents. Under a scenario with a 4.5-degree temperature rise and rail infrastructure could face more frequent and severe estimated average annual damage to transport infrastructure about 0.012% of GDP, with roads accounting for 58% of the loss.

The economic cost of the current transport regime is high, with high external costs to society, primarily through congestion (25%). Furthermore, road fuel subsidies consume roughly 6% creating a fiscal challenge as the country moves toward electric.

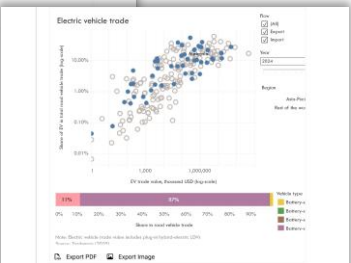
Malaysia has a notably high motorization rate of 600 vehicles (three times the Asia-Pacific average of 217). The road network (47%) and light-duty vehicles (47%). Although road is 4.2 km per million urban residents in 2015 to 11.9 km in 2024. 41% of Malaysian cities, 8 out of 10 residents do not have in and only 14% of urban areas meet the 50% accessibility threshold.



Multihazad average annual losses to transport infrastructure (sub-region)

Country	Losses (%)
Brazil (South America)	34%
Canada	31%
India	29%
USA (North America)	28%
Malaysia	25%
Japan	22%
Malaysia	21%
Spain	16%
Turkey	7%
Taiwan	4%
Yemen	0%

Other Externalities



Bangladesh

Population (2023): 170 Million
GDP (domestic product) (GDP, PPP (2022)): 3.27 trillion USD

Number of roads length (2021): 3,838.38 km

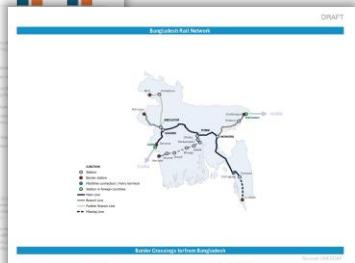
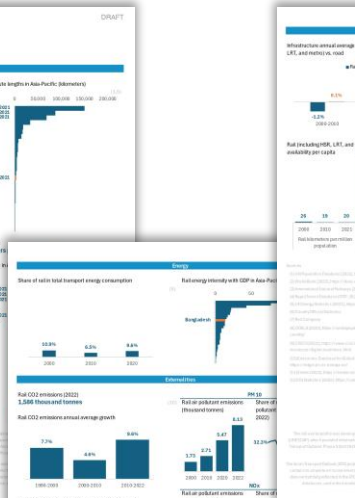
Single track routes (2018): 25.0%

Double track routes (2018): 62.0%

Electricity access: 94.4%

Availability per capita: 17.9 kilometers per million population

Availability per capita in Asia-Pacific: 12.0 kilometers per million population



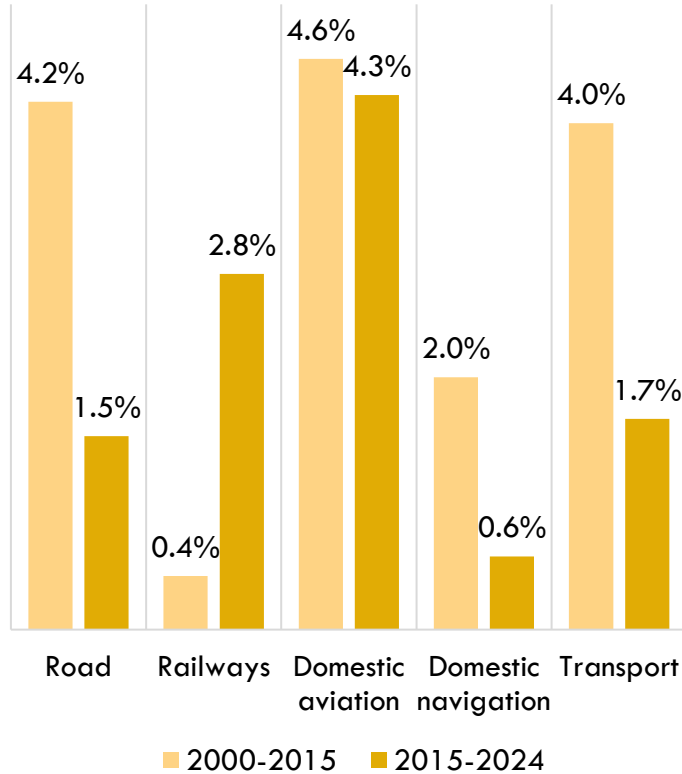
<https://asiantransportobservatory.org/analytical-outputs/transportclimateprofiles/>



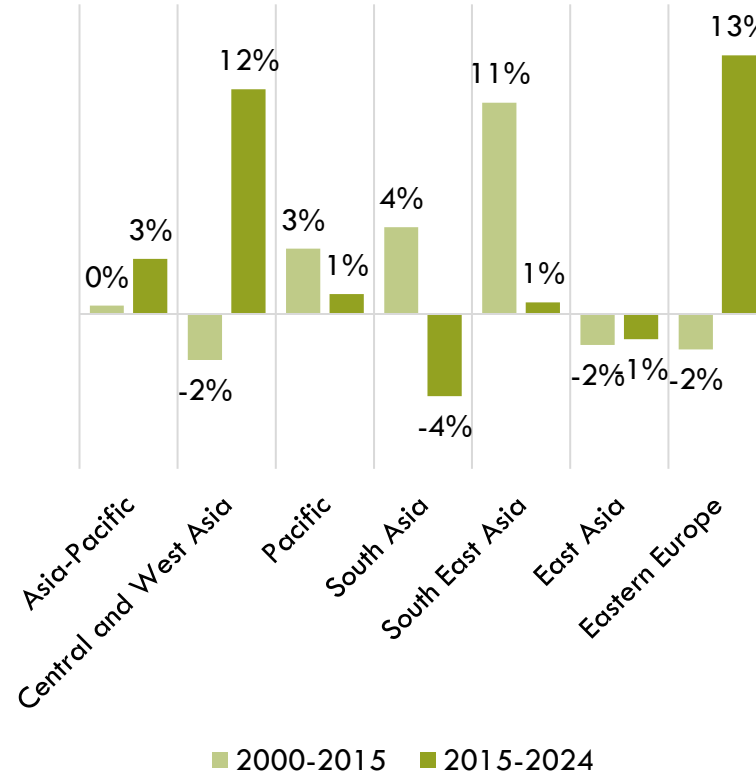
<https://asiantransportobservatory.org/analytical-outputs/railsectorprofiles/>

Rail emissions are rising, while sectoral share continues to decline

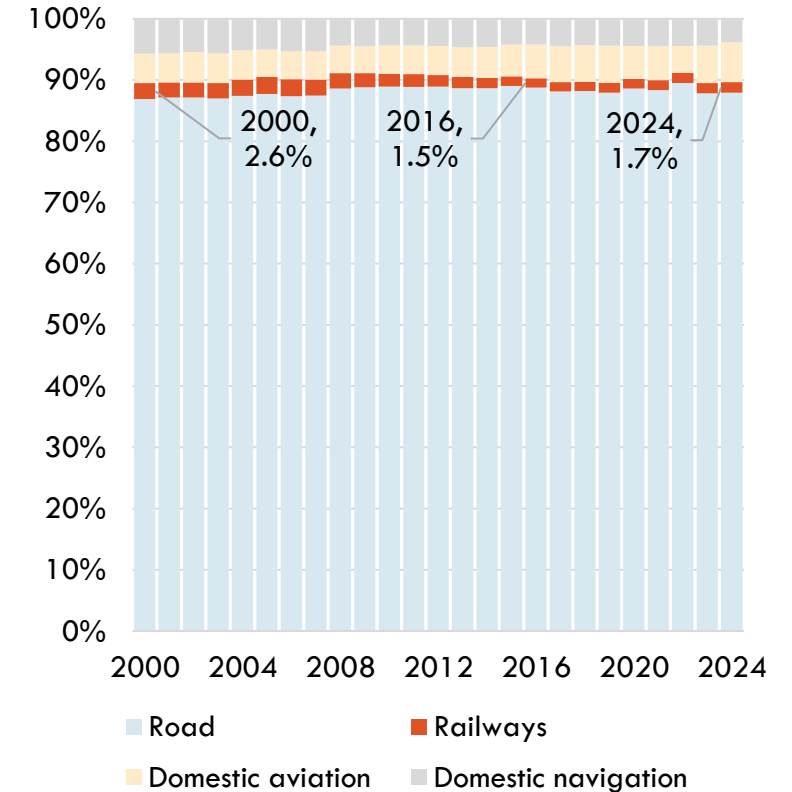
GHG Average Annual Growth Rates



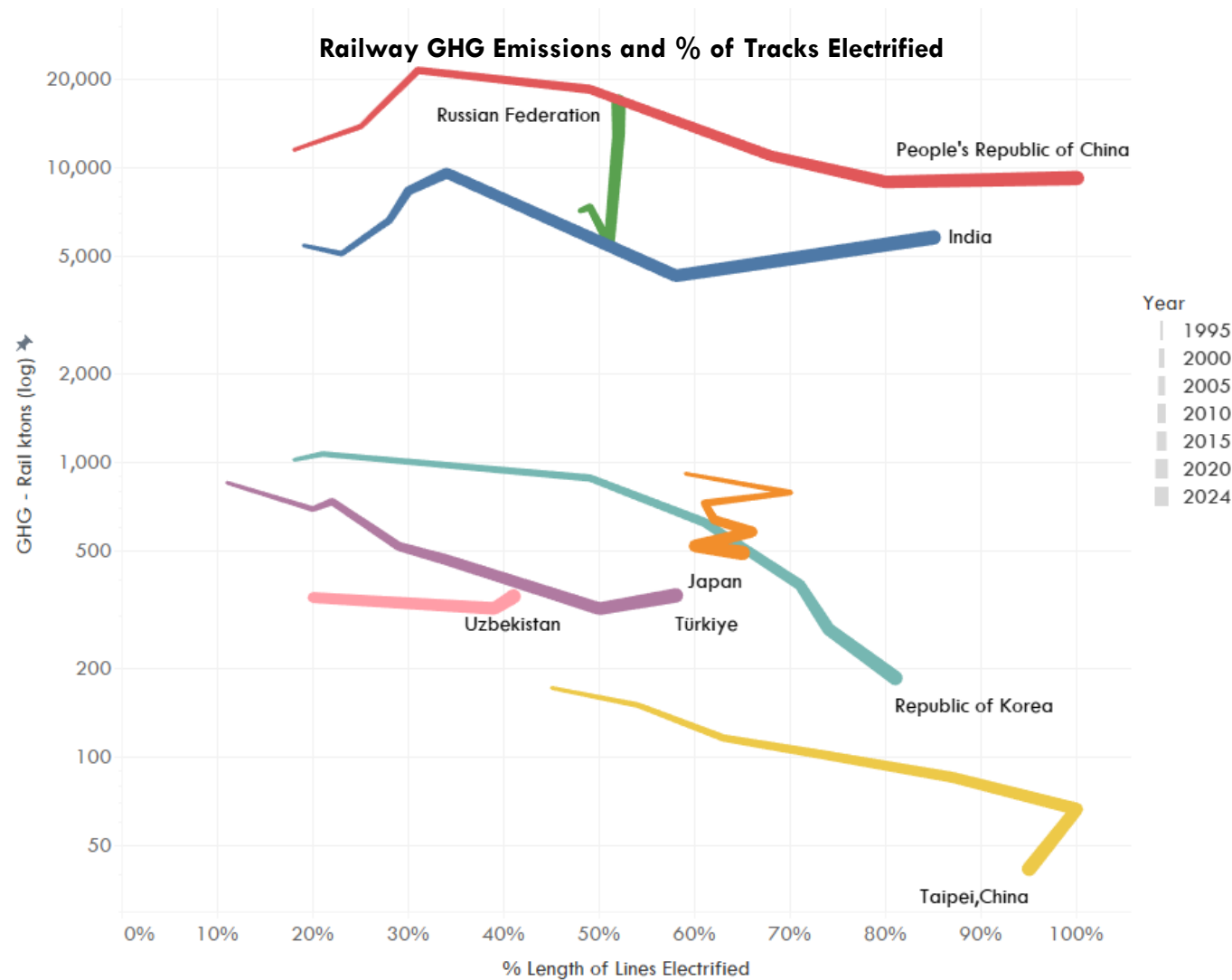
Railway GHG Emissions by Sub-region



Share of Rail GHG Emissions in Transport

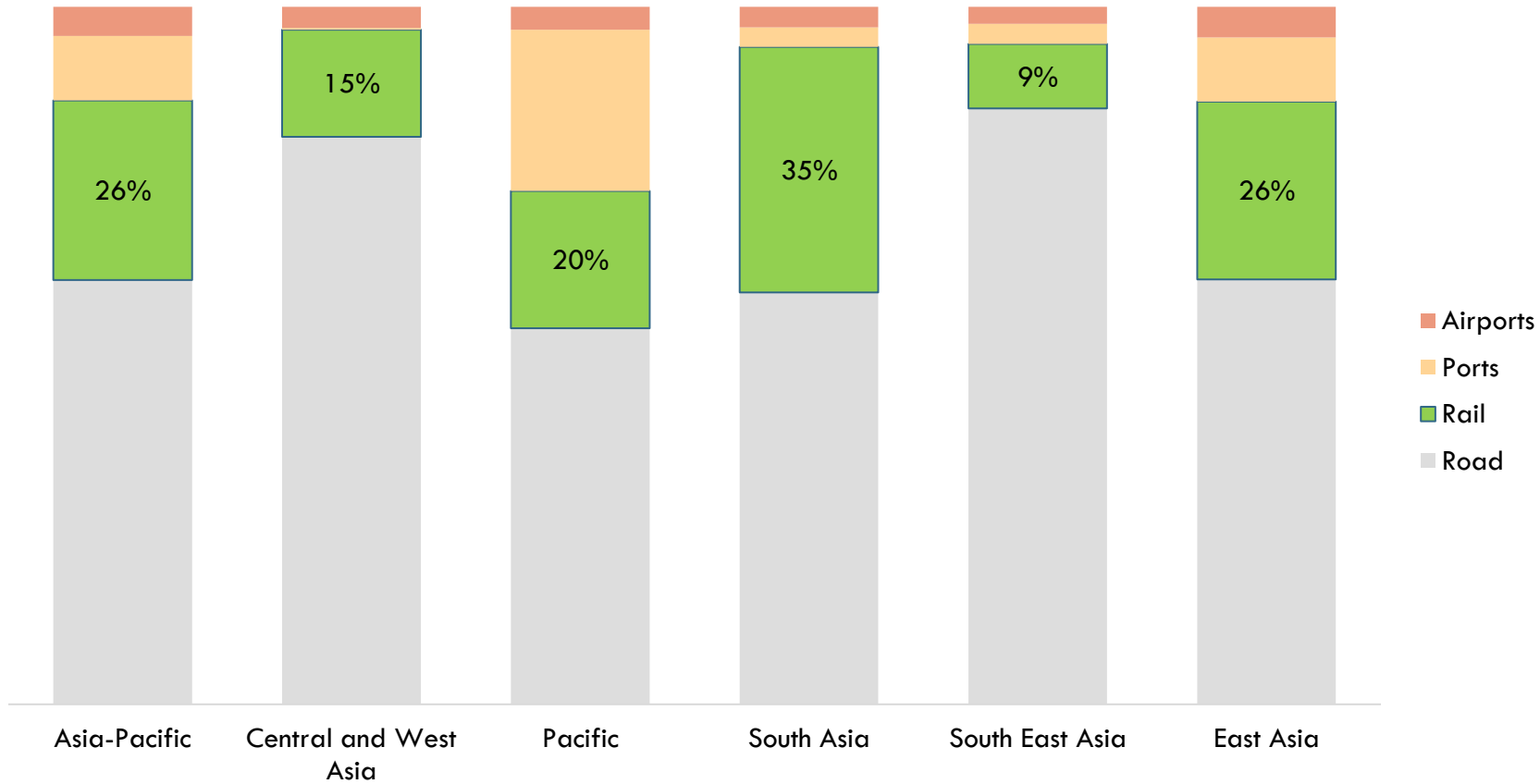


Electrification is reshaping rail emissions trajectories



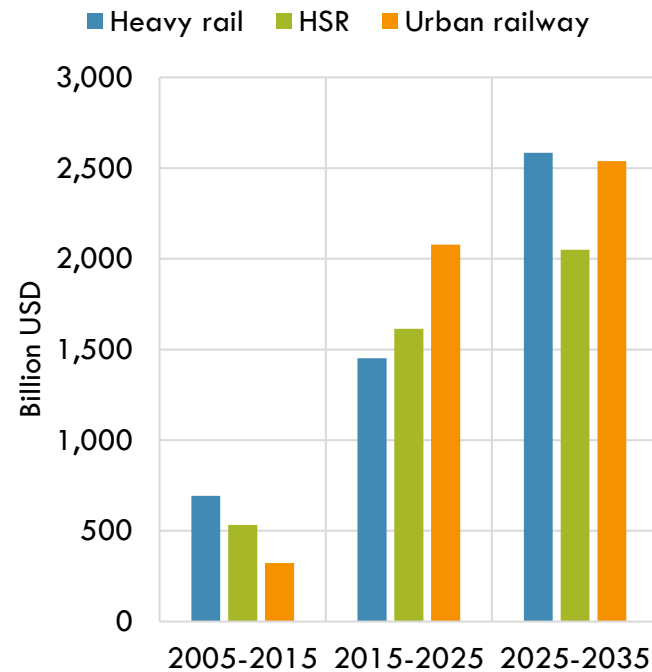
Rail carries a disproportionate climate-risk burden

Average annual losses in transport infrastructure, share by mode

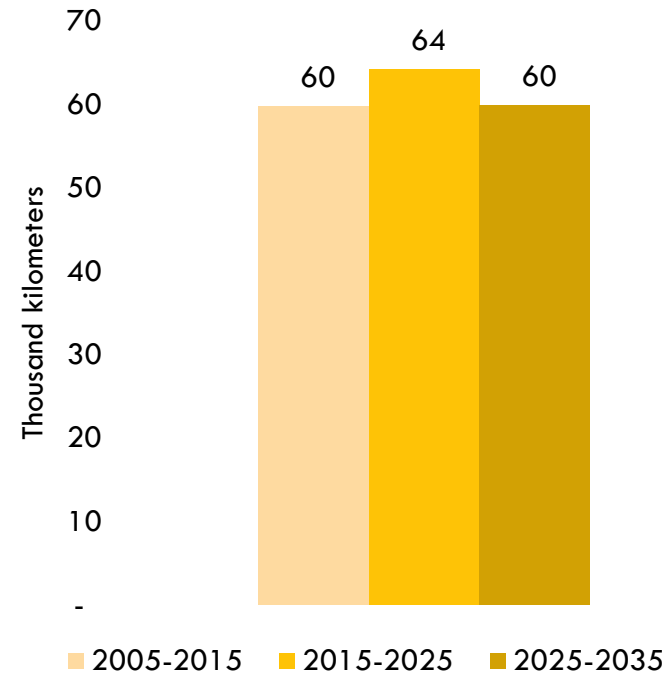


Strong investment momentum masks persistent infrastructure gaps

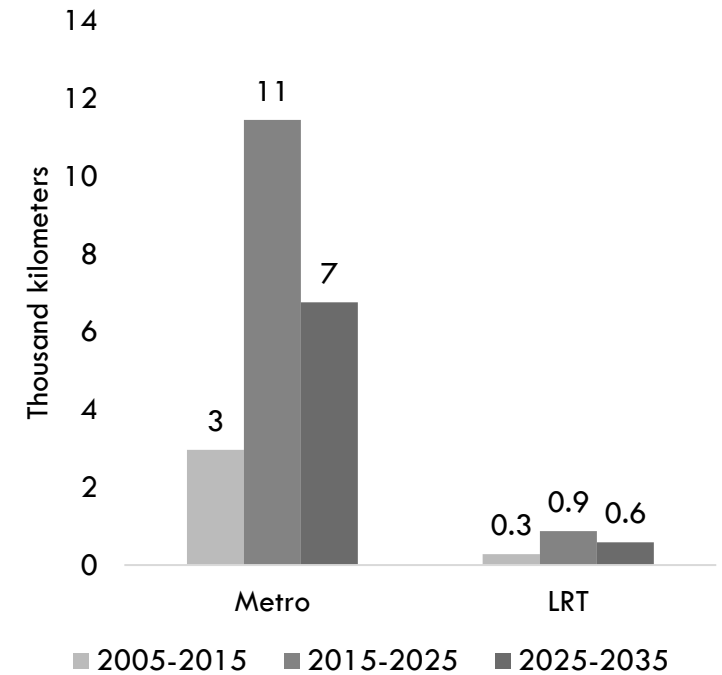
Heavy rail vs. metro infrastructure investment in LMIC (billion USD)



Heavy Rail Infrastructure Kilometers Added in LMICs (thousand km)

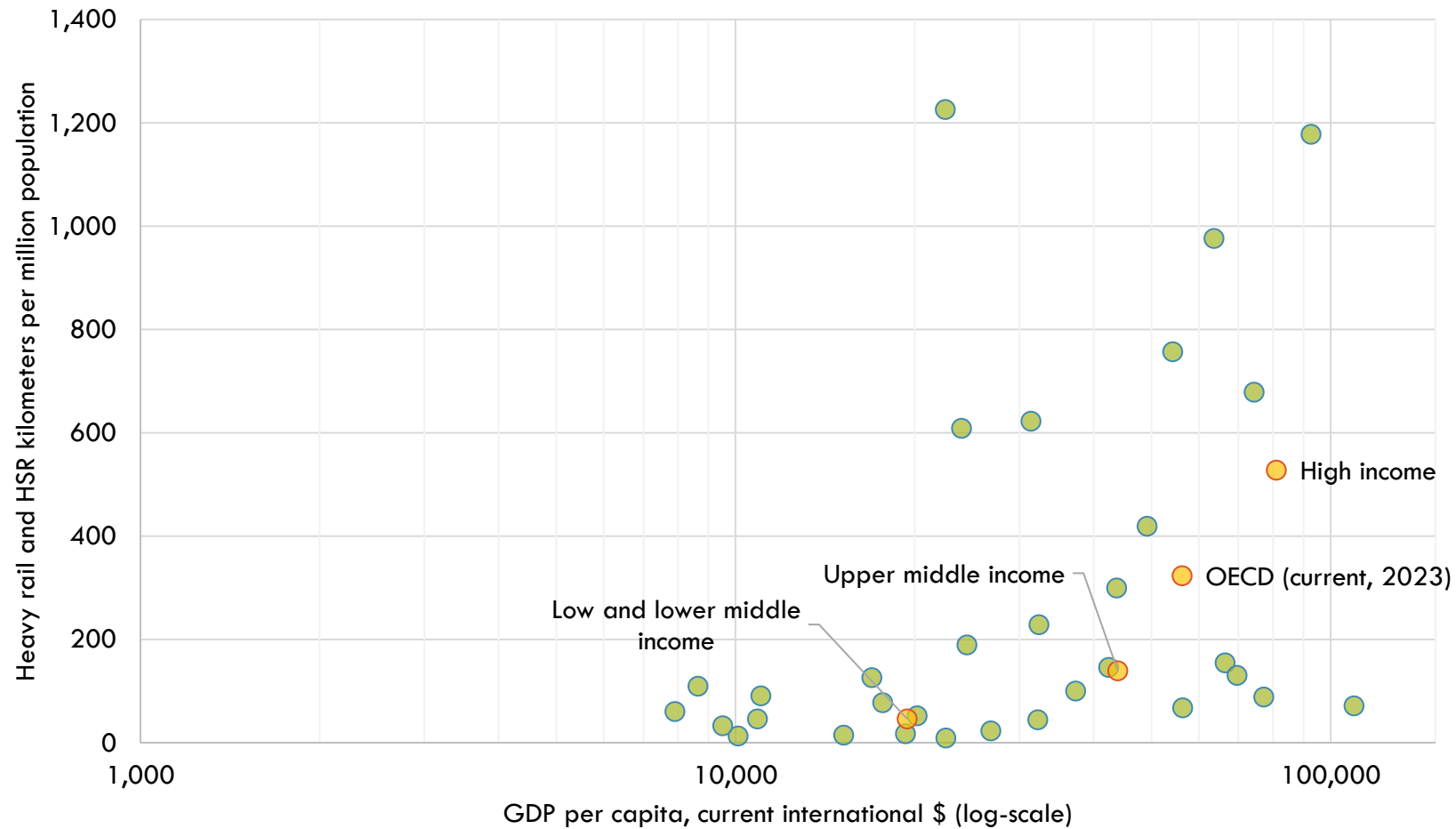


Urban Rapid Transit Kilometers Added (thousand km)



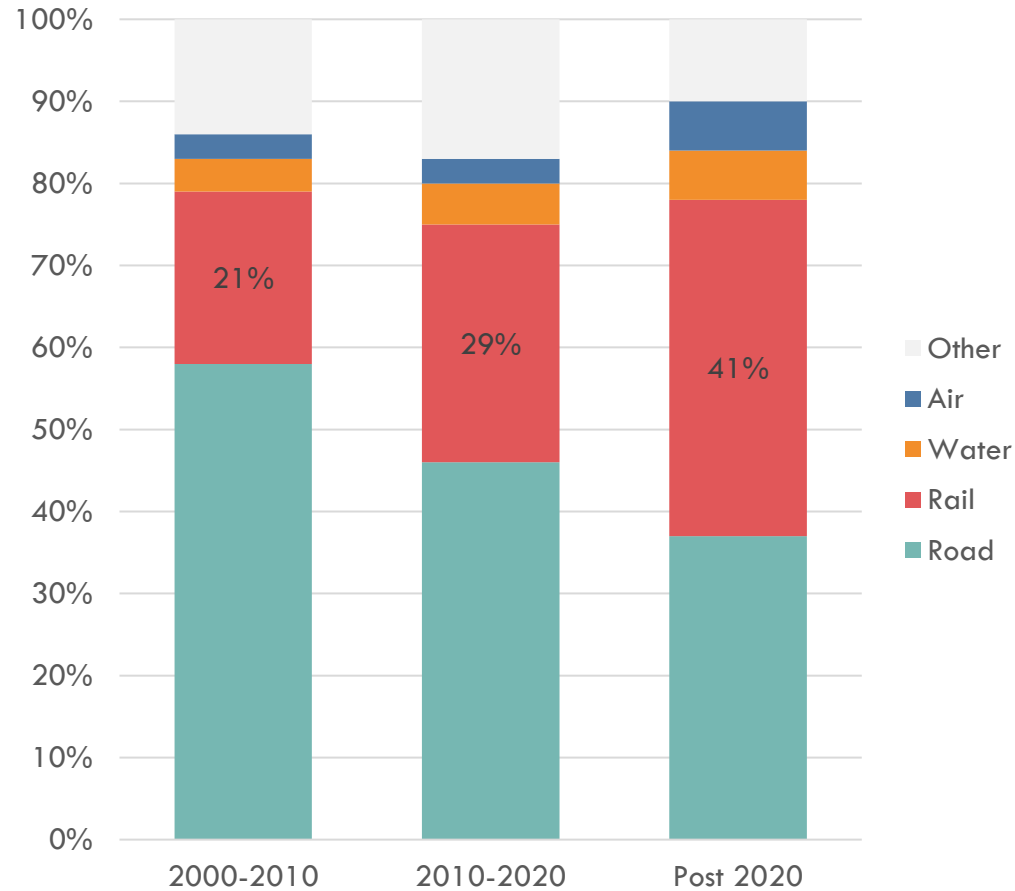
Infrastructure per capita shows a constrained picture

Heavy Rail Infrastructure Availability (km per million population), by 2035

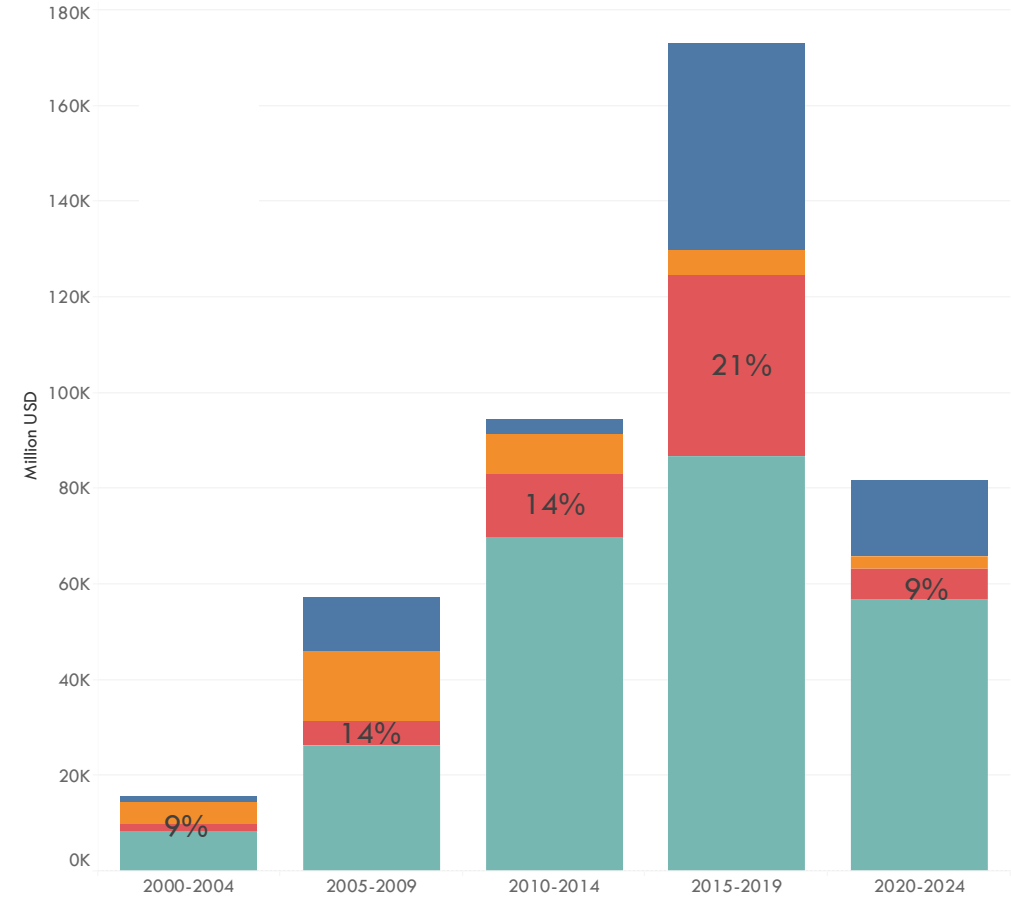


Development Aid is shifting toward rail, while private finance remains mixed

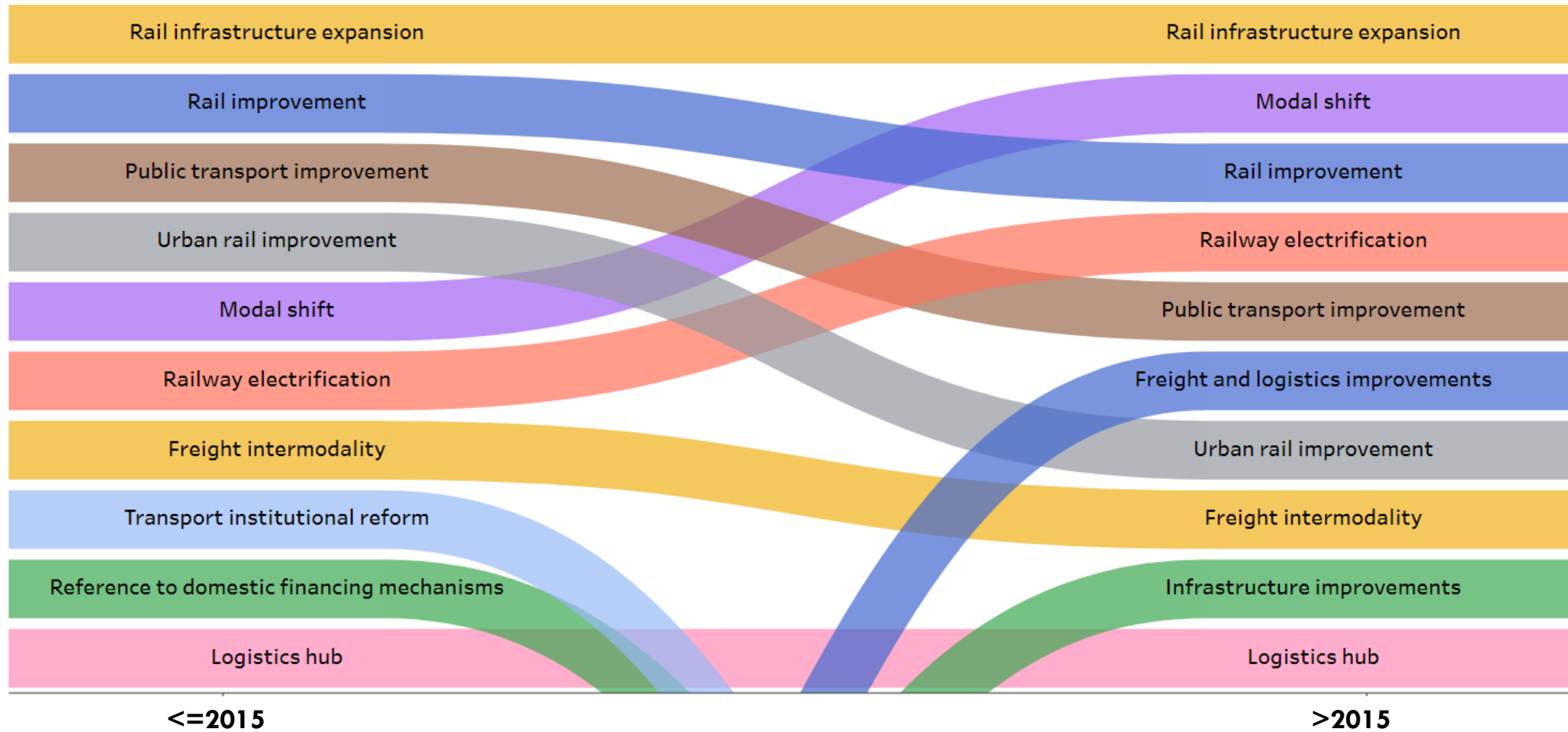
Share in commitments per transport subsector



Public-private partnership investments in the transport sector of Asia LMICs

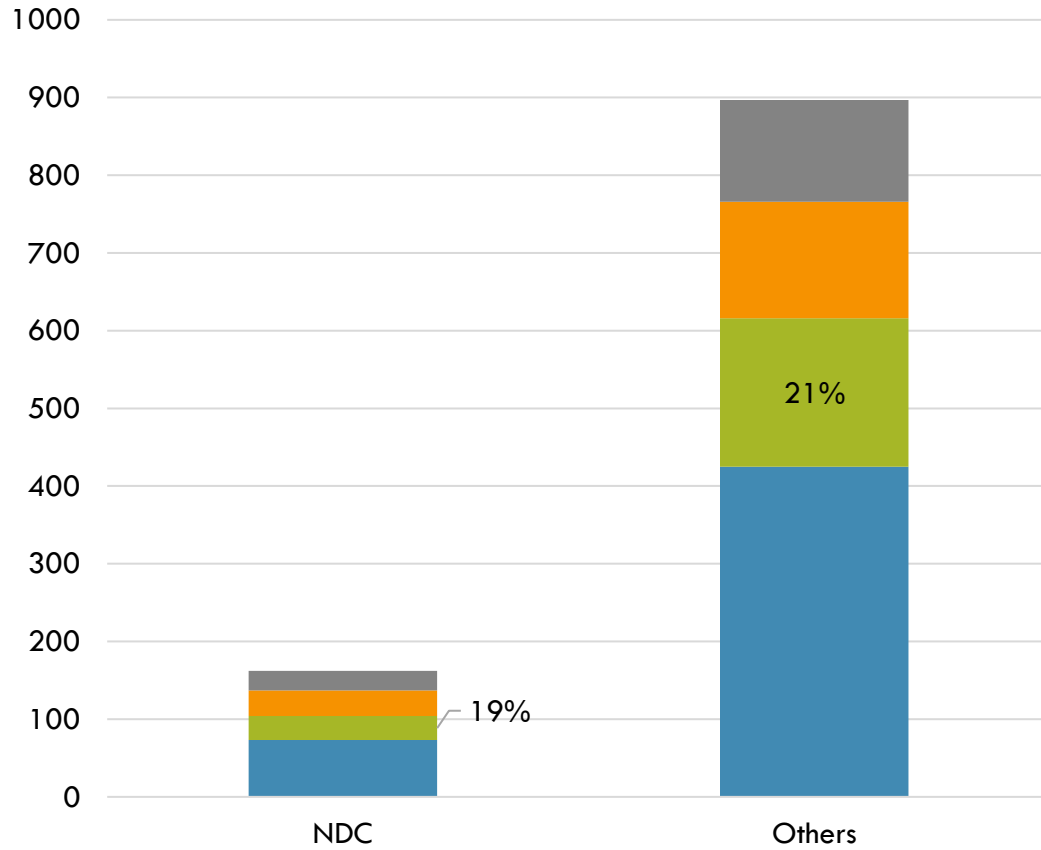


Rail climate policies are moving toward system transformation

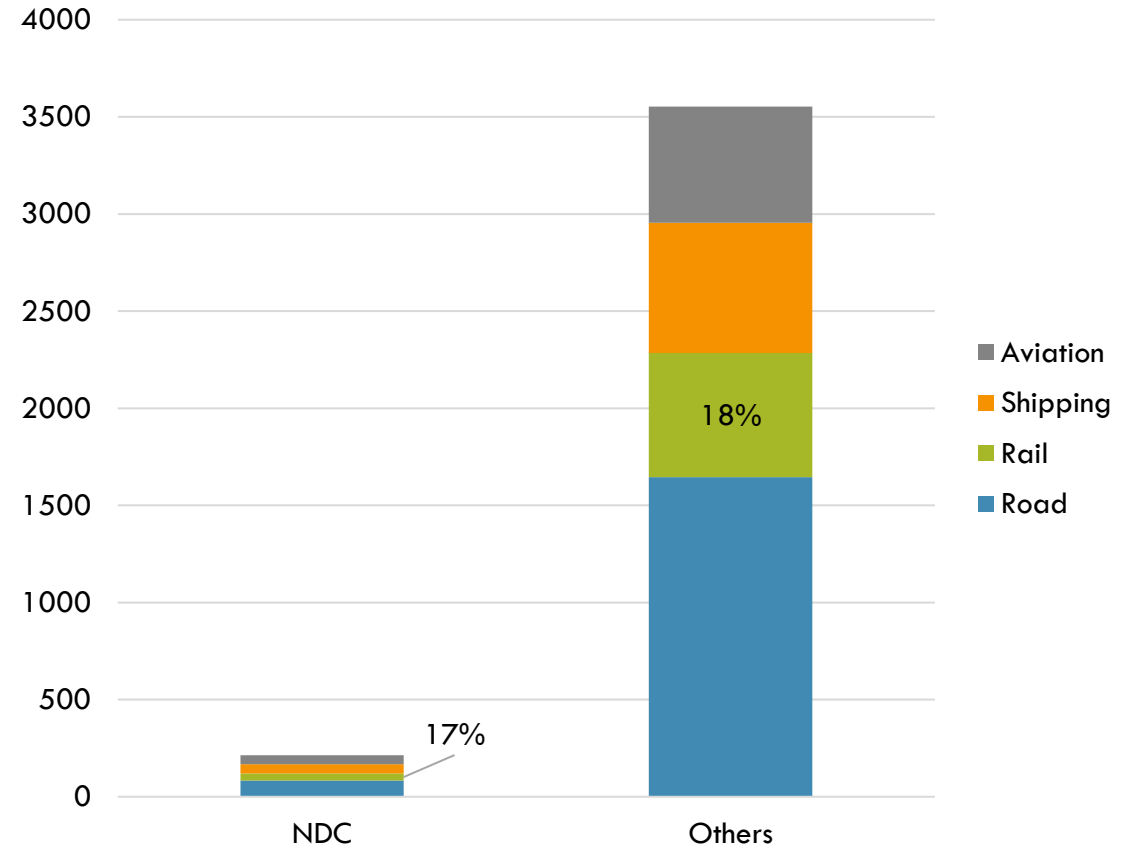


Rail remains underrepresented in climate commitments

Modal Distribution of Climate Change Mitigation Targets



Modal Distribution of Climate Change Adaptation Measures



Positioning: Rail as climate infrastructure



Emissions up,
share falling



Electrification
is working



Climate risk
unevenly spread



Investment &
policy on track



NDCs still
lagging behind

asiantransportobservatory.org

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

ATO Team	info@asiantransportobservatory.org
Jamie Leather	jleather@adb.org
Andres Pizarro	andres.pizarro@aiib.org
Manuel Benard	manuel.benard@aiib.org
Alvin Mejia	alvinmejia@asiantransportobservatory.org
Sudhir Gota	sudhirgota@asiantransportobservatory.org
Mel Francis Eden	meleden@asiantransportobservatory.org
Adwait Limaye	adwait@asiantransportobservatory.org
Benjamin Soco	benjaminsoco@asiantransportobservatory.org