Asian Transport Observatory

Karachi

Urban Transport - State of Play

Insights from the Asian Transport Observatory (ATO)

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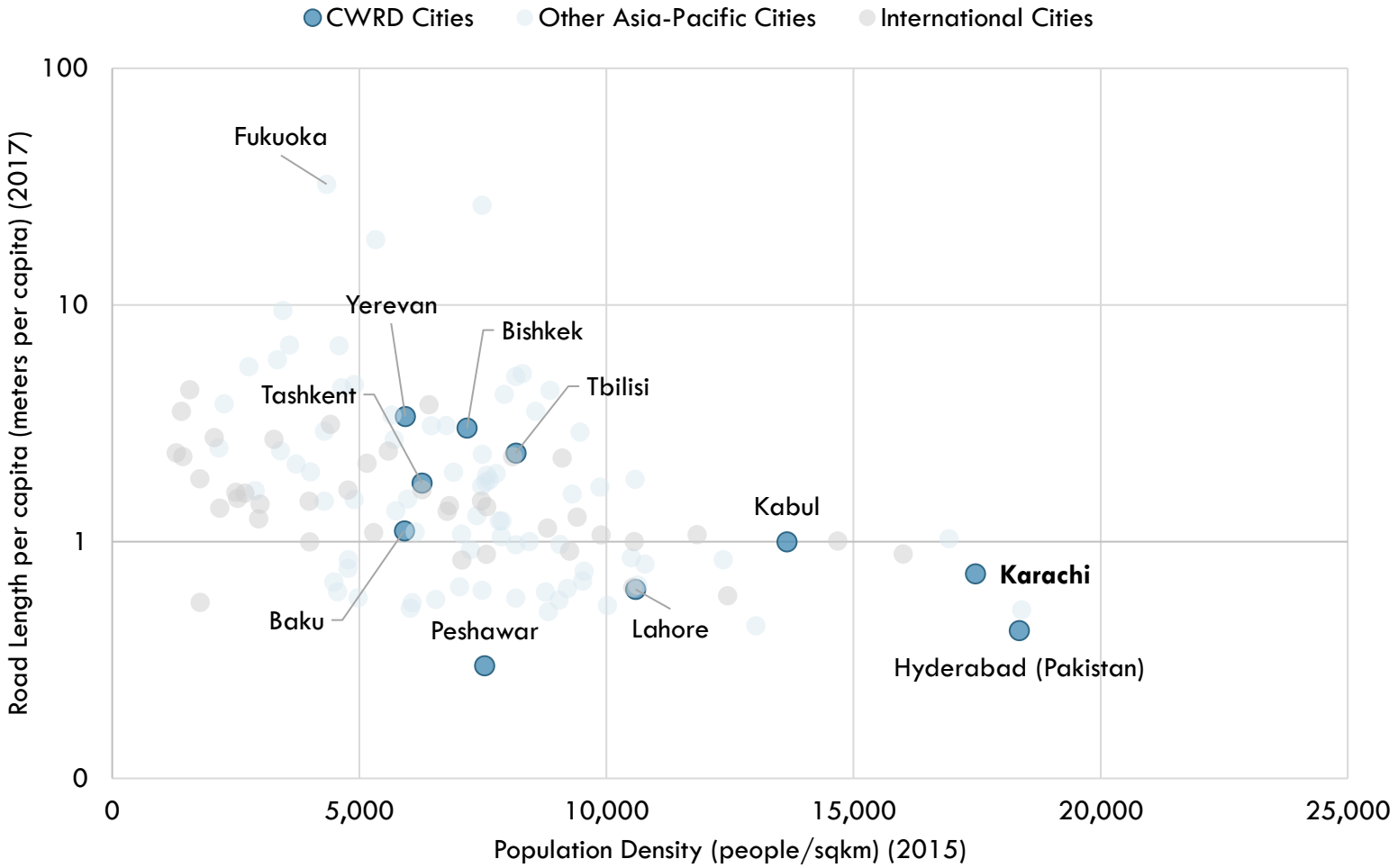
This knowledge product was developed in collaboration with: UN environment programme | copenhagen climate centre

Section 1:

Karachi – state of play

Karachi's Road Infrastructure Deficit

- Analysis reveals a significant disparity in road infrastructure availability across Asian cities. This is evident when we consider cities like Karachi, Pakistan, with a high population density of 17,400 people per square kilometer, but a meager 0.7 meters of road per capita. This falls far short of the national average in Pakistan (1.1 meters/capita) and the Central and West Asia regional average (3 meters/capita). Such limited road infrastructure puts immense strain on the existing network, contributing to the prevalence of traffic congestion in Karachi.
- This trend suggests a crucial link between population density and road infrastructure needs. While denser cities might require less total road length per capita due to proximity, sufficient investment in roads remains essential to manage traffic flow effectively.



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Sources: Oke et.al. (2019)(OSM), GHS (European Commission) | ATO Indicators: SEC-UDB-003, INF-UDB-004
Notes: Value for Peshawar is for 2009, Source for Karachi and Kathmandu is National statistics

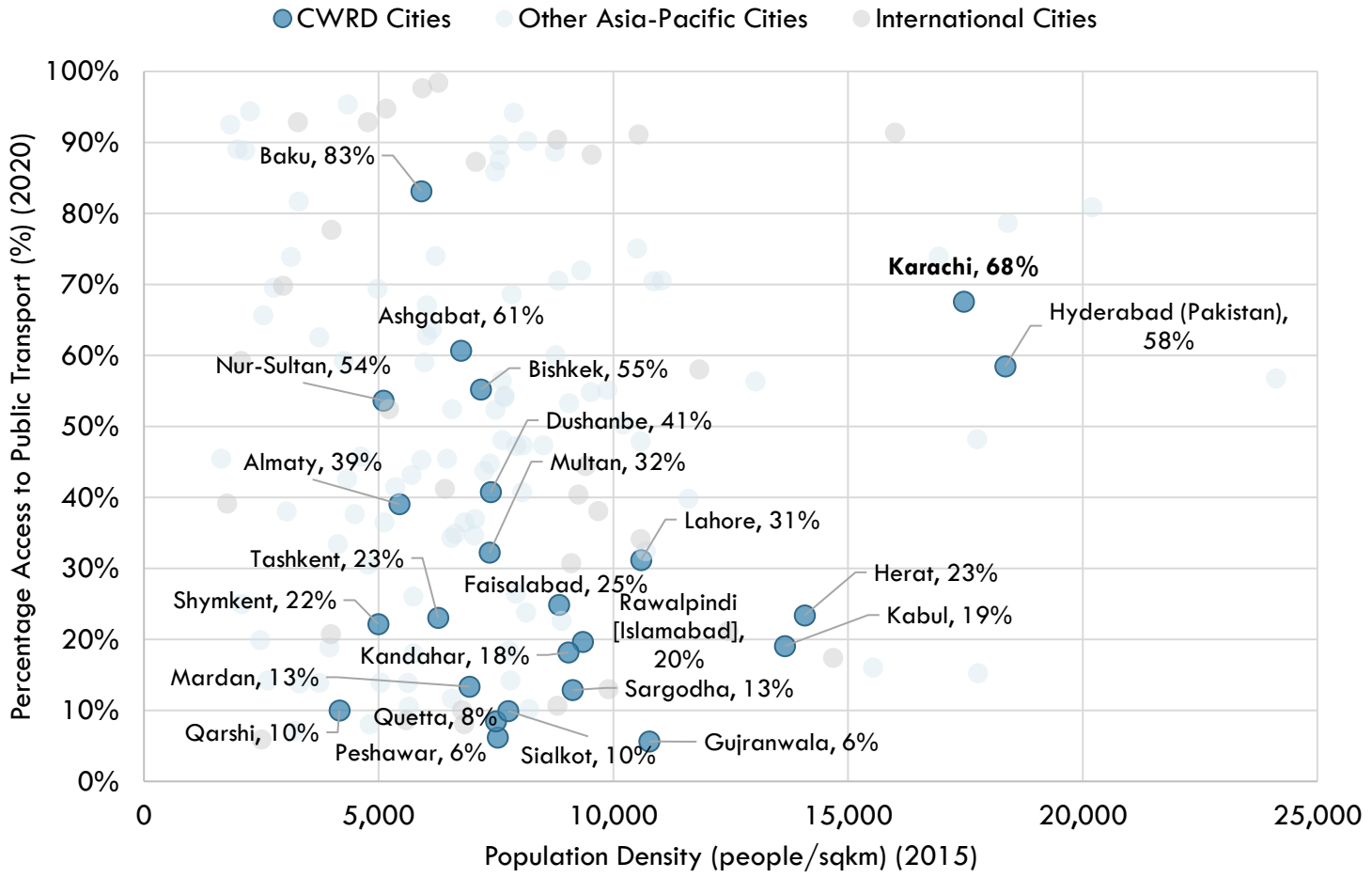
Lack of Public Transit Access

- Karachi's public transit system faces significant challenges, as evidenced by the fact that as of 2019, 58% of the city's 13.5 million daily motorized trips were made by private transport. This heavy reliance on private vehicles is further emphasized by the overcrowding on public buses, with an average of 45 people competing for one seat.

- Despite these issues, Karachi boasts a relatively high level of public transportation accessibility, with 68% of residents living within 500 meters of a public transit stop as of 2020. This figure surpasses that of all other major Pakistani cities.

- In an effort to improve the public transit system, Karachi is currently developing a Bus Rapid Transit (BRT) system called Karachi Breeze. Currently, two lines are operational and two lines are under construction as of September 2022.

- The city's long-term transportation improvement plan also includes ambitious projects such as reviving the Karachi Circular Railway (KCR) and adding two mass rapid transit lines, alongside the ongoing BRT development. These initiatives aim to address the existing challenges and enhance public transportation options for Karachi's residents in the years to come.

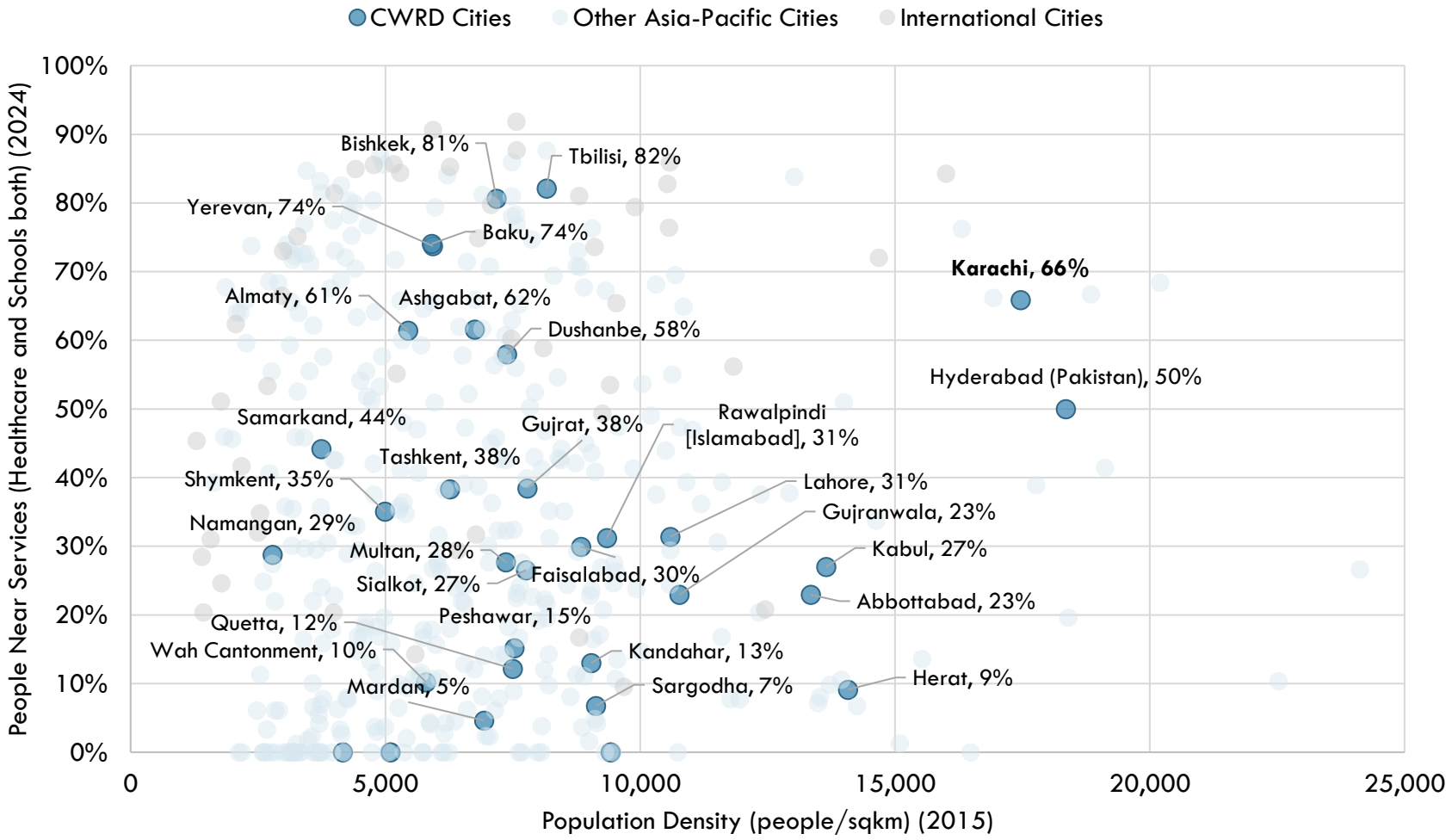


Sources: UN-Habitat, GHS (European Commission) | ATO Indicators: SEC-UDB-003, ACC-UDB-001

Notes: This indicator is computed as share of population living within a walking distance of 500m to a low capacity public transport system (eg bus, tram) and 1000m to a high capacity public transport system (eg trains, ferries, etc). Only public transport stops which are mapped are included in the analysis which may include both formal and informal stops.

Access to healthcare and educational services in Karachi is better than Pakistan average

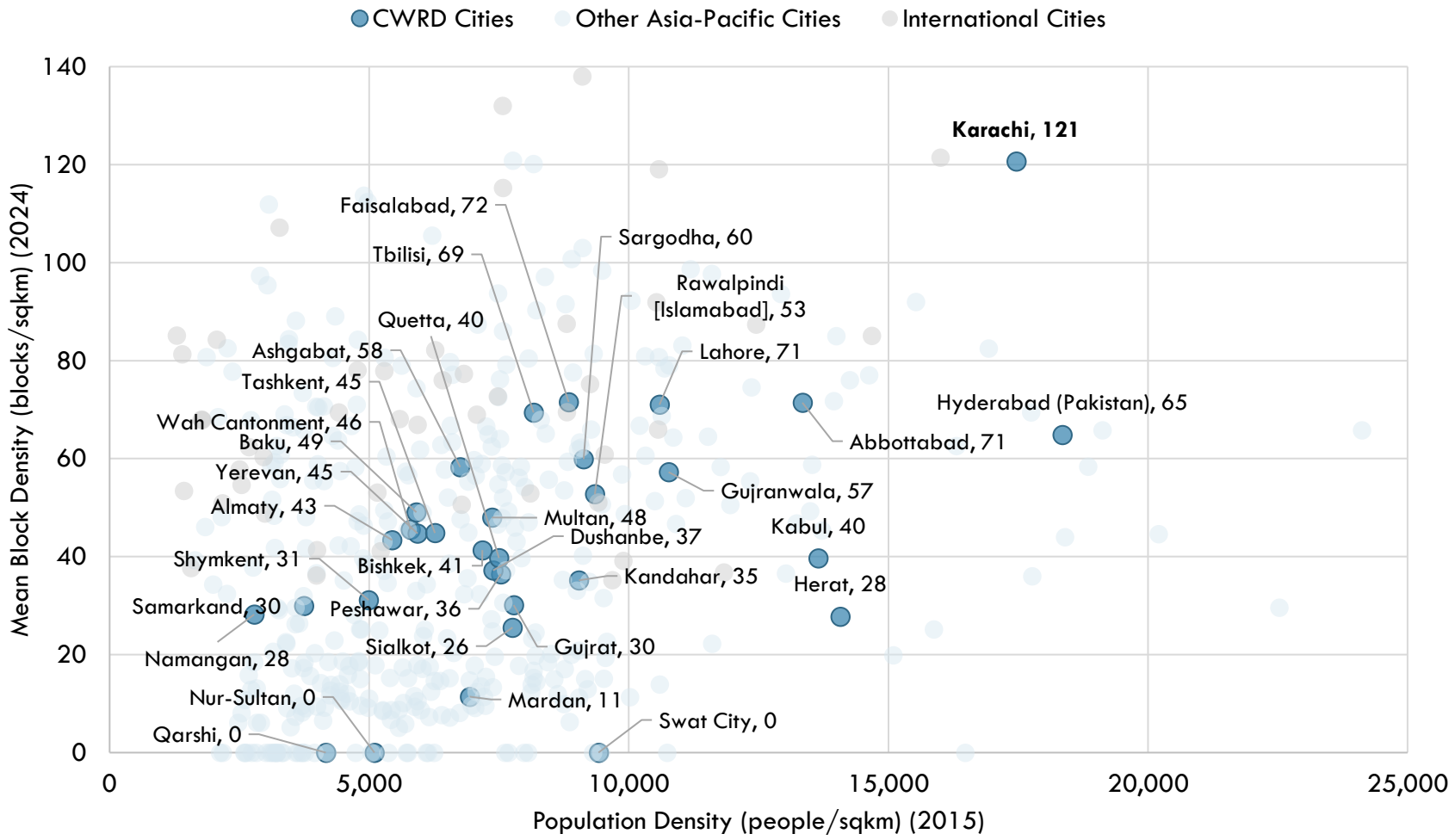
- People Near Services measures the percentage of an area's population living within walking distance (1km) of some form of both healthcare and education services. Proximity is the first requirement for walkability. In a city where people live within a 15-minute walk of their daily needs, they will be able to live without a car.
- Karachi has a decent access to services at 66%, while Pakistan stands at about 50%. Karachi's better performance is also attributed to its high population density.



Sources: ITDP, GHS (European Commission) | ATO Indicators: SEC-UDB-003, ACC-UDB-002

Karachi promises easier walkability with high Mean block density

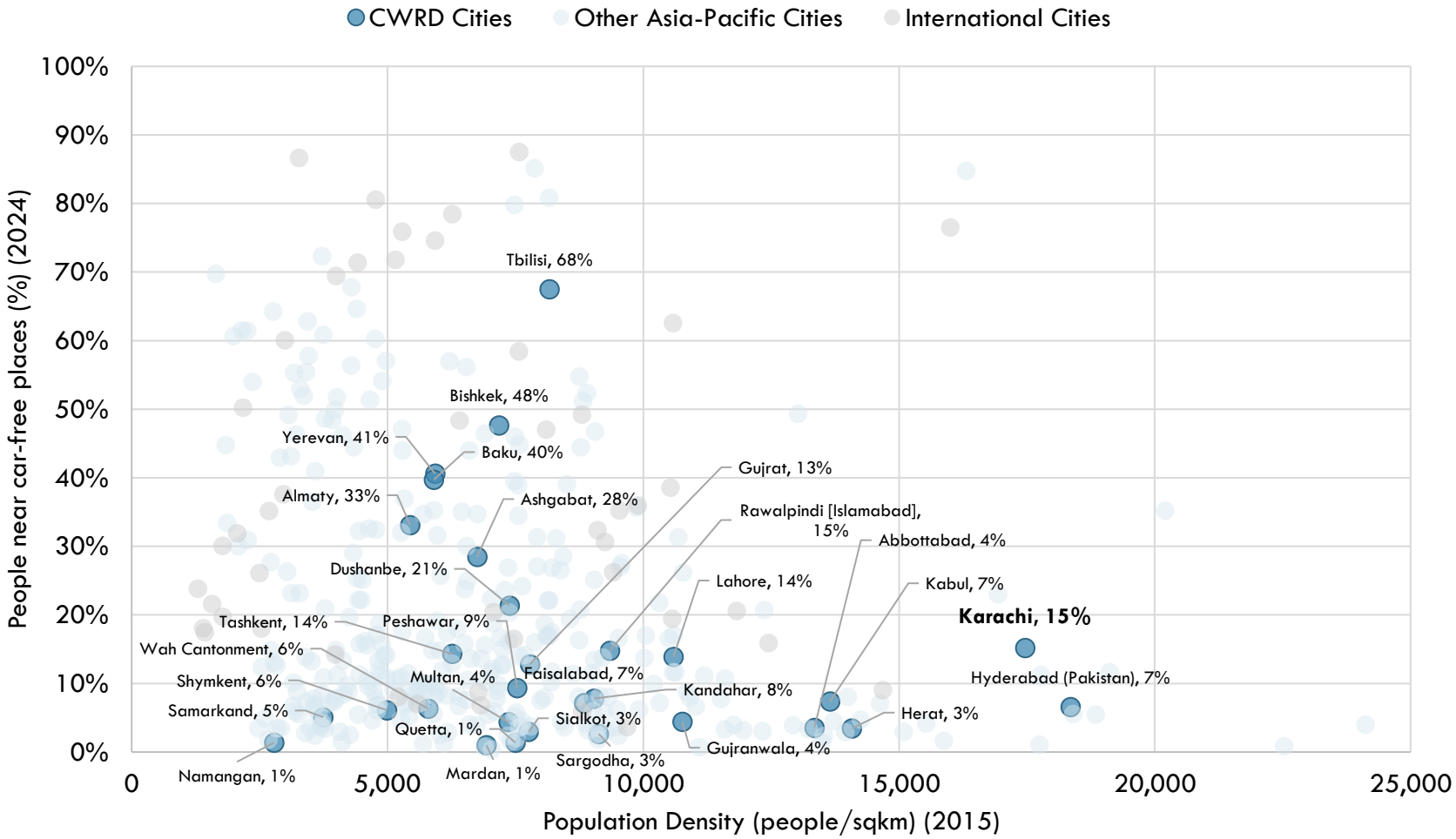
- Mean block density, which refers to the average number of blocks per square kilometer, is a key indicator of walkability. Denser block patterns typically translate to smaller block sizes, encouraging pedestrian movement with shorter distances and lower average traffic speeds.
- In this regard, Karachi holds a significant advantage within Central and West Asia, boasting a mean block density of 121 blocks per square kilometer, one of the highest in the region. This characteristic, combined with its high population density, positions Karachi with a strong potential to be a highly walkable city.



Sources: ITDP, GHS (European Commission) | ATO Indicators: SEC-UDB-003, UFS-UDB-005

Karachi performs decent among the Pakistani cities in terms of People near car free places, but significantly lags globally

- People Near Car-Free Places measures the percentage of an area's population living immediately near (within 100m of) a car-free place. This includes parks, squares, car-free streets, recreation grounds, sports fields, and forests.
- Car-free public spaces become integral components of pedestrian infrastructure. By eliminating vehicle traffic, they create safe and often more direct walking routes
- Karachi at 15% ranks 2nd out of the 26 cities in Pakistan.



Sources: ITDP, GHS (European Commission)

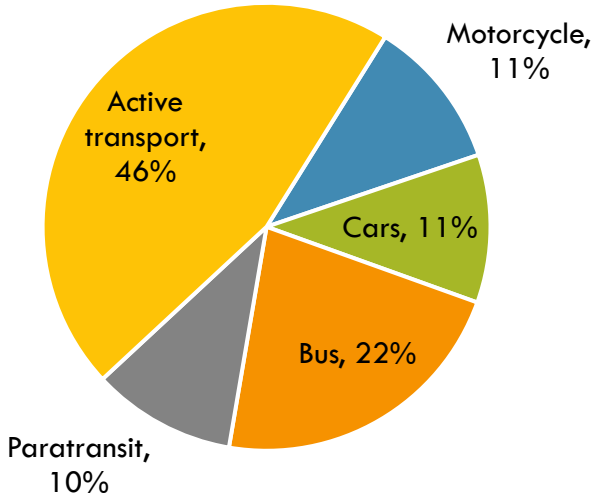
Active + Public Transport plays a significant role in Passenger Mode share in the city

- Karachi's transportation landscape has undergone significant changes over the years. In 2012, walking and cycling dominated with 46% of mode share, followed by buses at 22%. By 2020, private transport modes accounted for 84% of vehicles on the streets, yet only carried 54% of passengers, while buses, despite representing a mere 3% of vehicles, transported 34% of passengers.

- Data from the C40 Cities report (2019) further reveals a shift away from public transport between 2008 and 2018. While buses remained a crucial component, their share of vehicles on arterial routes decreased from 6% to 3%, and their share of passengers dropped from 53% to 34%. Conversely, paratransit (taxis and auto-rickshaws) saw an increase, representing 13% of vehicles and 12% of passengers in 2018, up from 10% and 6% in 2008.

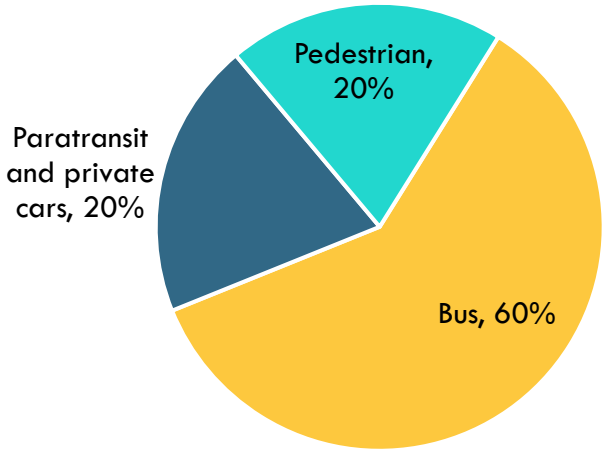
- These figures, while not directly comparable due to differing methodologies, underscore the evolving role of public transport and active mobility in Karachi's transportation system, highlighting the growing prominence of private vehicles and paratransit.

Transport mode share (2012)



Source: Karachi Bus Rapid Transit Red Line Project: Sector Assessment (Summary): Transport

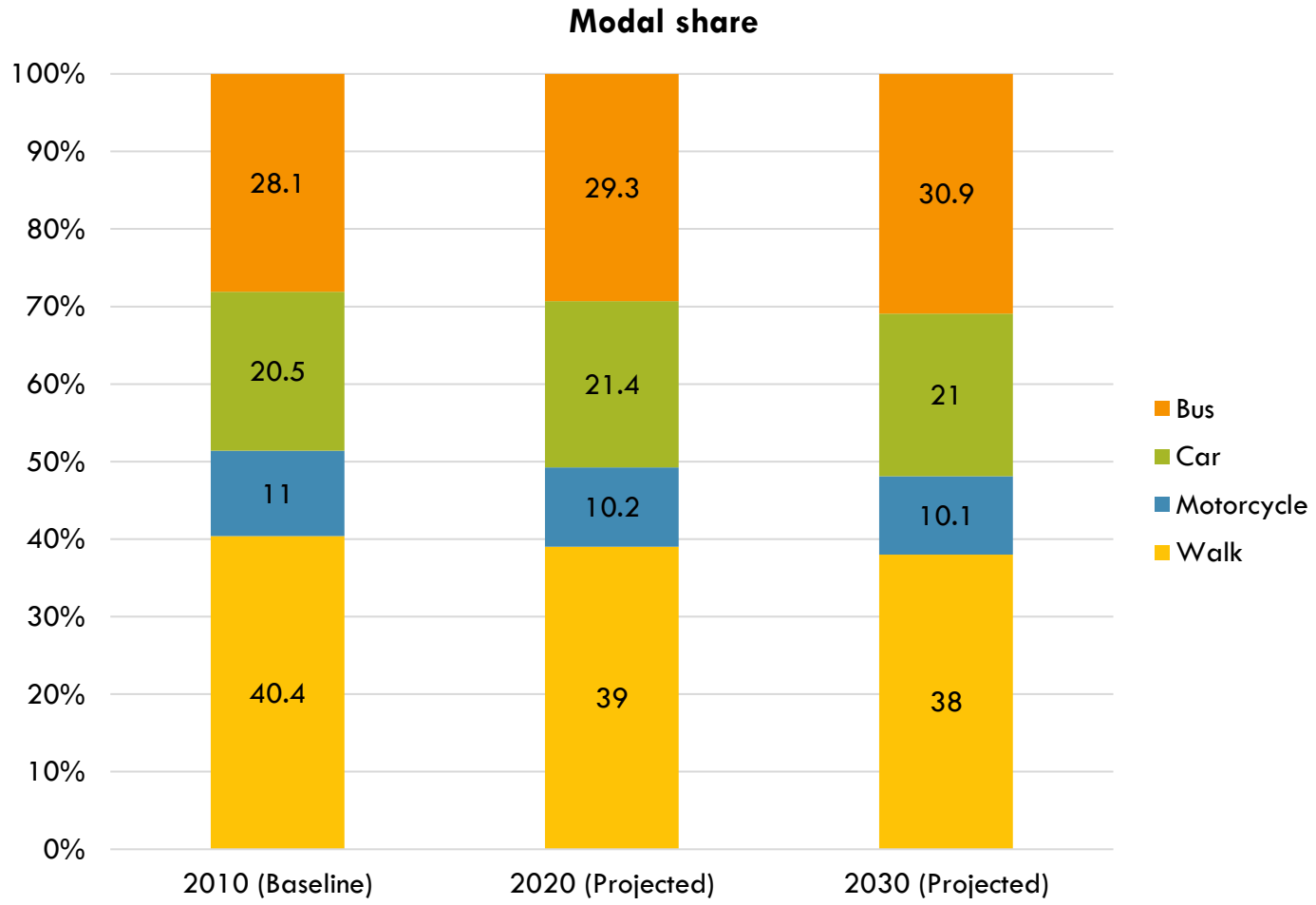
Transport mode share (2020)



Source: Karachi Strategic Development Plan – 2020

Modal share estimation indicates minor increase in Bus mode

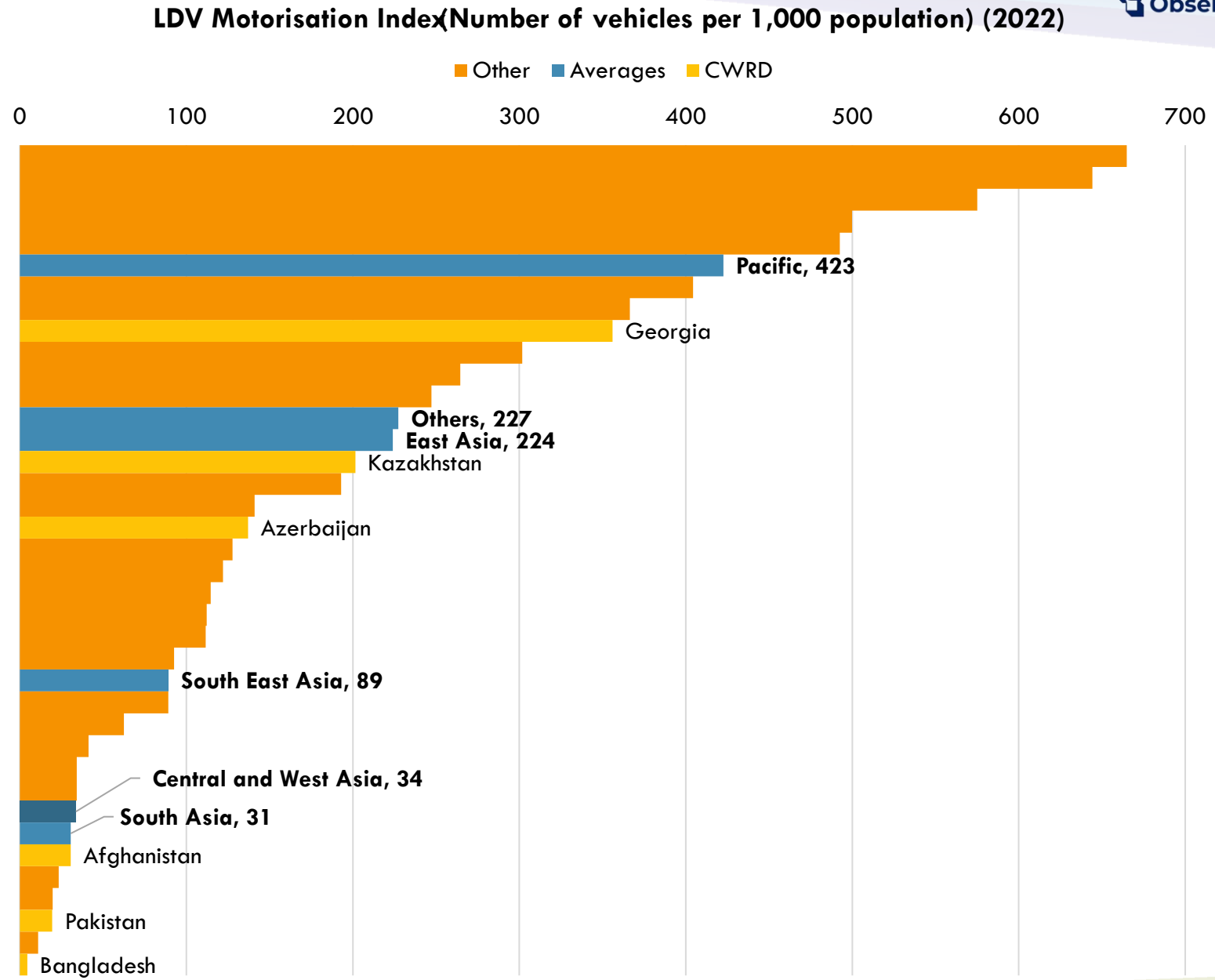
- Based on 2010 data, the Karachi Transportation Improvement Project predicts a modest increase in bus ridership by 2030, factoring in population growth (1.67 times) and urban expansion (1.64 times). Mode shares are calculated using travel time by mode, including public transport.
- Due to urban sprawl, average travel distances are expected to increase, leading to a slight decrease in walking and an increase in motorized trips. The total number of motorized trips (motorbike, car, bus) is projected to reach 20 million, a 1.7-fold increase from 2010, exceeding population growth.
- Scenario studies in the report further analyze future trends. Scenario 1 assumes highway development without mass transit, while Scenario 2 includes both. With mass transit, public mode trips increase by 1.7 million to 10.3 million, raising the public mode share from 41.6% to 49.8%. This shift mainly comes from taxi and Suzuki users, not car owners.



https://openjicareport.jica.go.jp/pdf/12086377_05.pdf

Karachi's LDV motorization significantly exceeds Pakistan's average

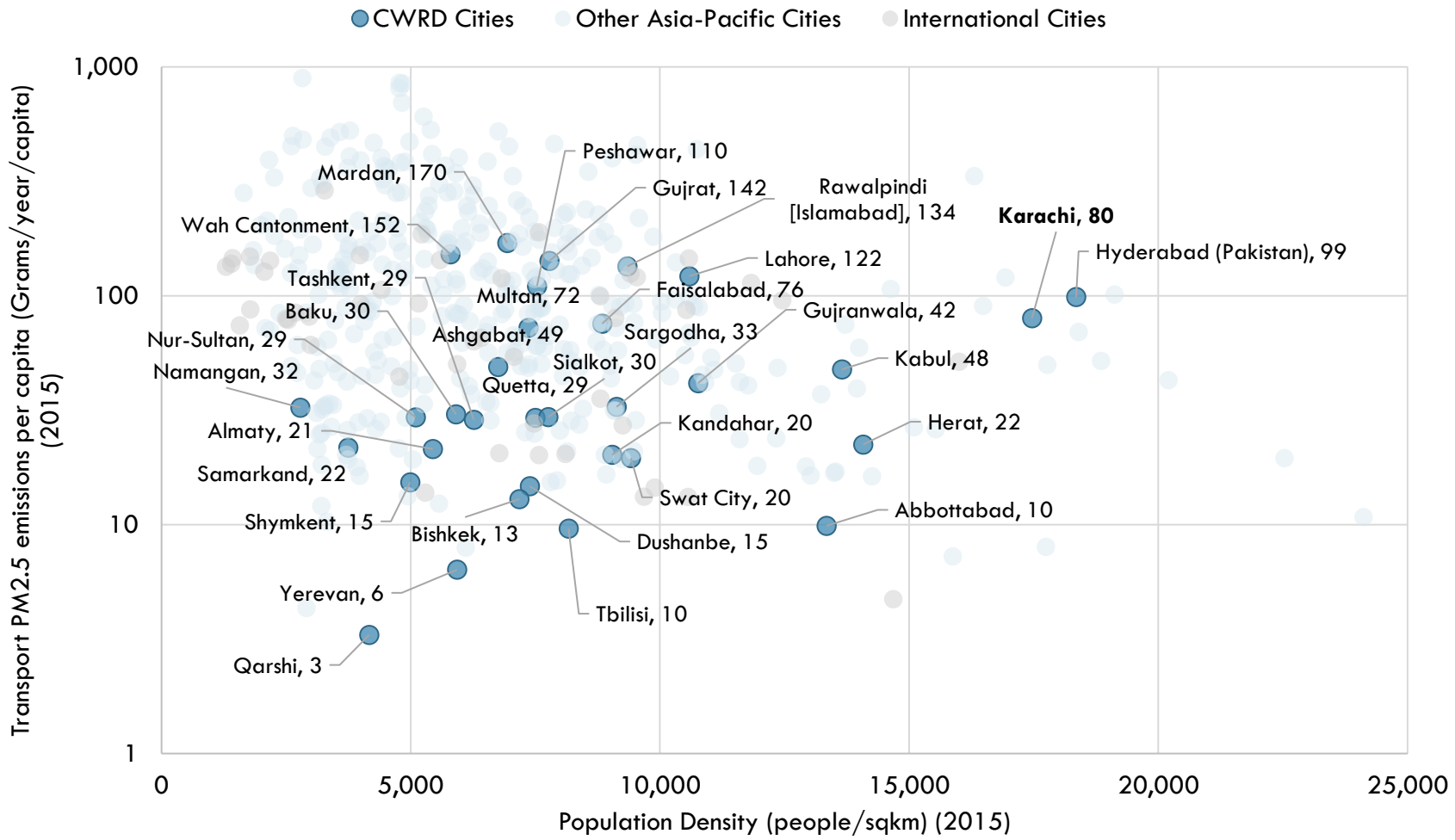
- In 2012, the LDV motorization in Karachi was recorded at 76 . This is significantly higher than Pakistan (19) and Central and West Asia region (34) average numbers, as of 2022.



LDV registration data source: https://urckarachi.org/wp-content/uploads/2020/07/Transport-isues-in-Karachi-Final-Report.pdf
Visualization based on ATO calculations

Karachi performs better than peer Pakistan UCs in Transport PM2.5 emissions

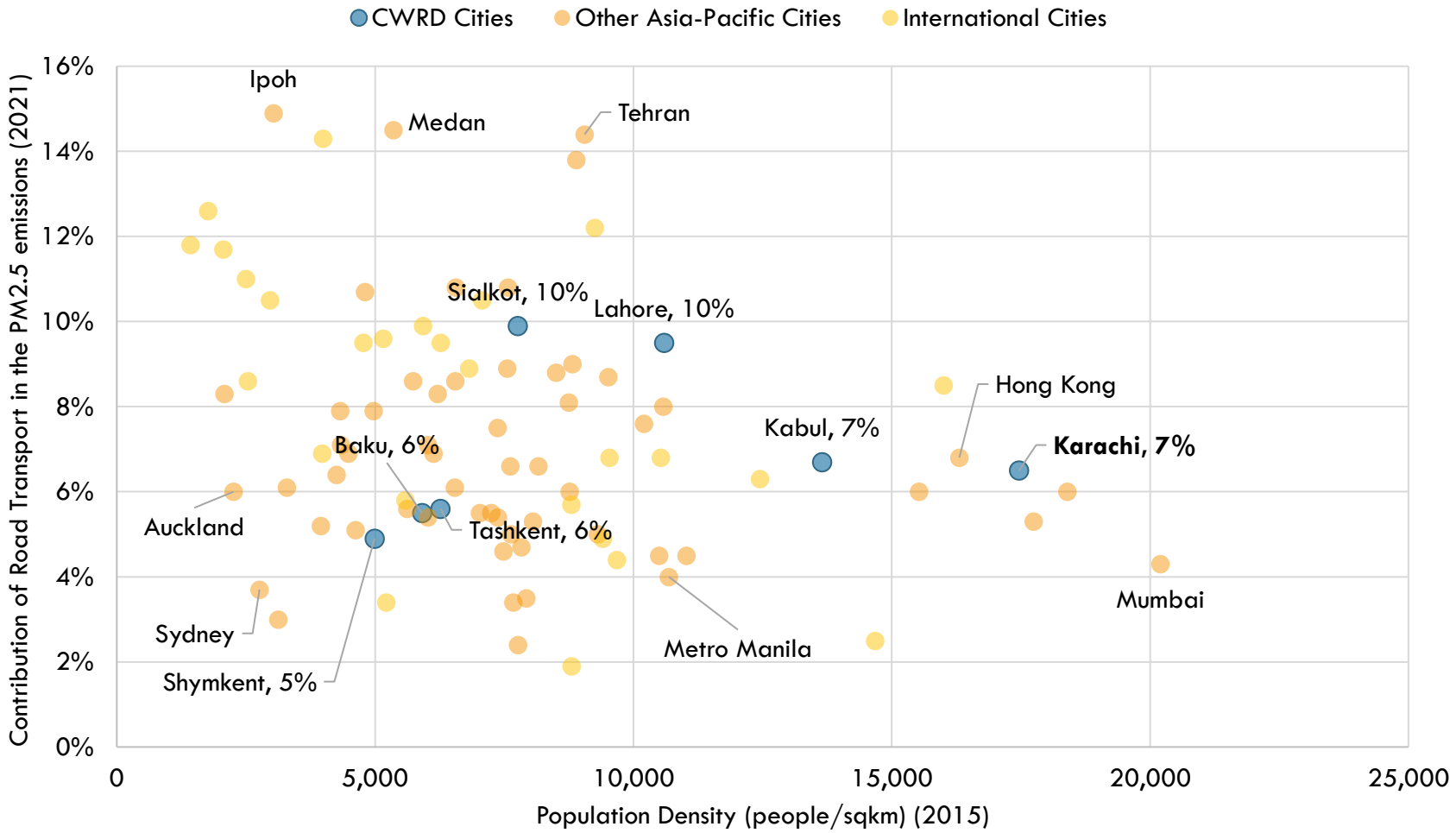
- Karachi ranks lower compared to many of its peer Pakistani cities in terms of transport PM2.5 emissions per capita.
- About 42% of the total private bus fleet is over 15 years old with poor mechanical condition and contributes significantly to air pollution. The diesel-run buses and two-stroke engine rickshaws contribute about 86% of total air pollution caused by transport vehicles. (Source: Karachi Strategic Development Plan – 2020)



Sources: GHS (European Commission) | ATO Indicators: SEC-UDB-003, APH-UDB-003

Road traffic contributes 7% of the estimated PM2.5 emission in Karachi

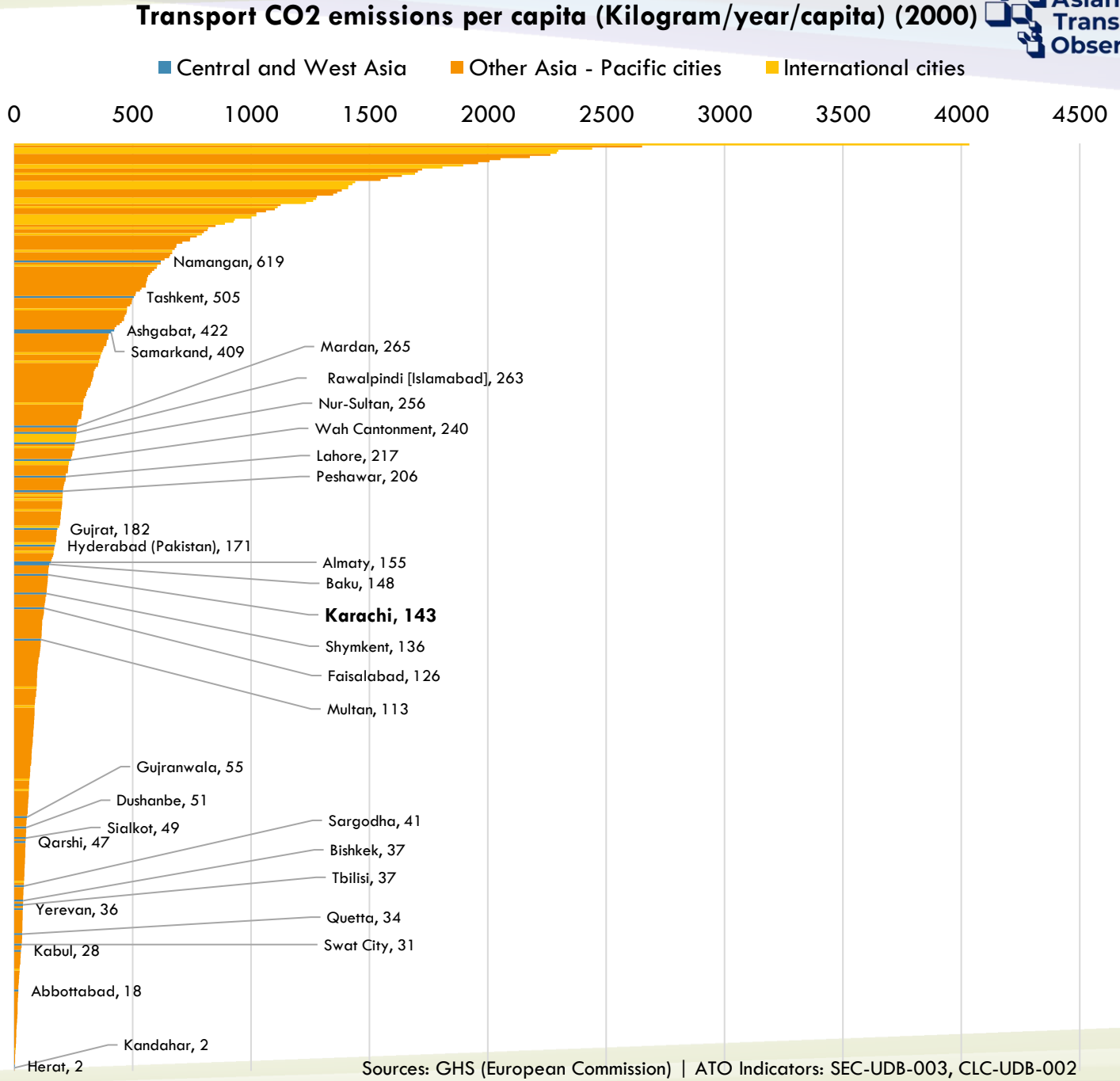
- Road traffic contributes 7% of the estimated PM2.5 emission loading in Karachi.
- In comparison, Lahore is at 10%.



Sources: GHS (European Commission), McDuffie et al. (2021) | ATO Indicators: SEC-UDB-003, APH-UDB-005

Karachi performs better than peer Pakistan UCs in terms of Transport CO2 per capita

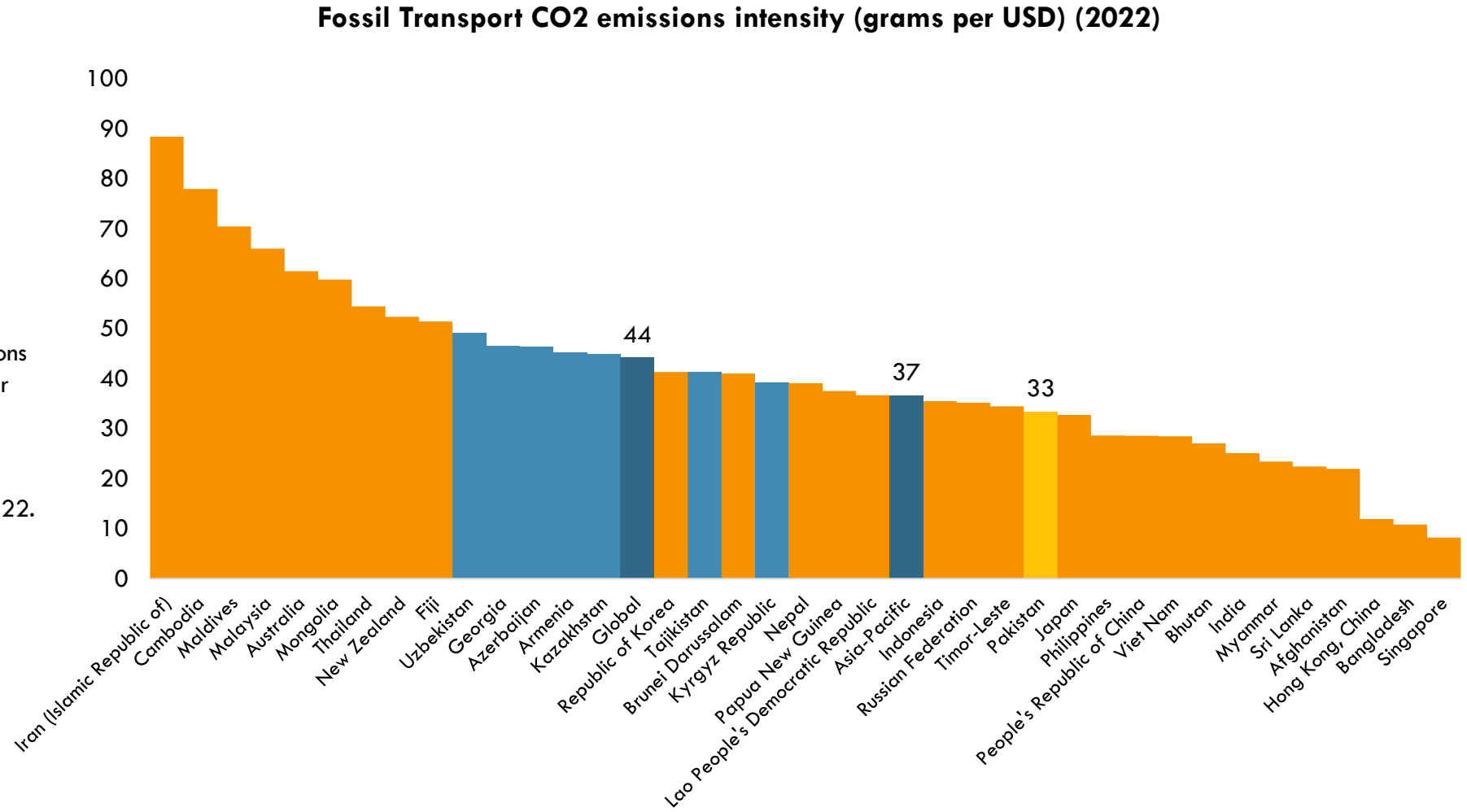
- There have been no recent/ updated data for the transport CO2 emissions per capita for Karachi.
- As of 2000, Karachi performs better compared to many of its peer Pakistani UCs in terms of transport CO2 emissions per capita. Karachi emits 143 kgs/ capita per year of transport CO2 compared to Pakistan average of 166 kgs/ capita per year.
- As of 2022, Pakistan averages of 212 kgs of transport CO2 emission per capita per year.



Sources: GHS (European Commission) | ATO Indicators: SEC-UDB-003, CLC-UDB-002

Karachi's transport CO2 emissions intensity (per GDP) is higher than Pakistan average

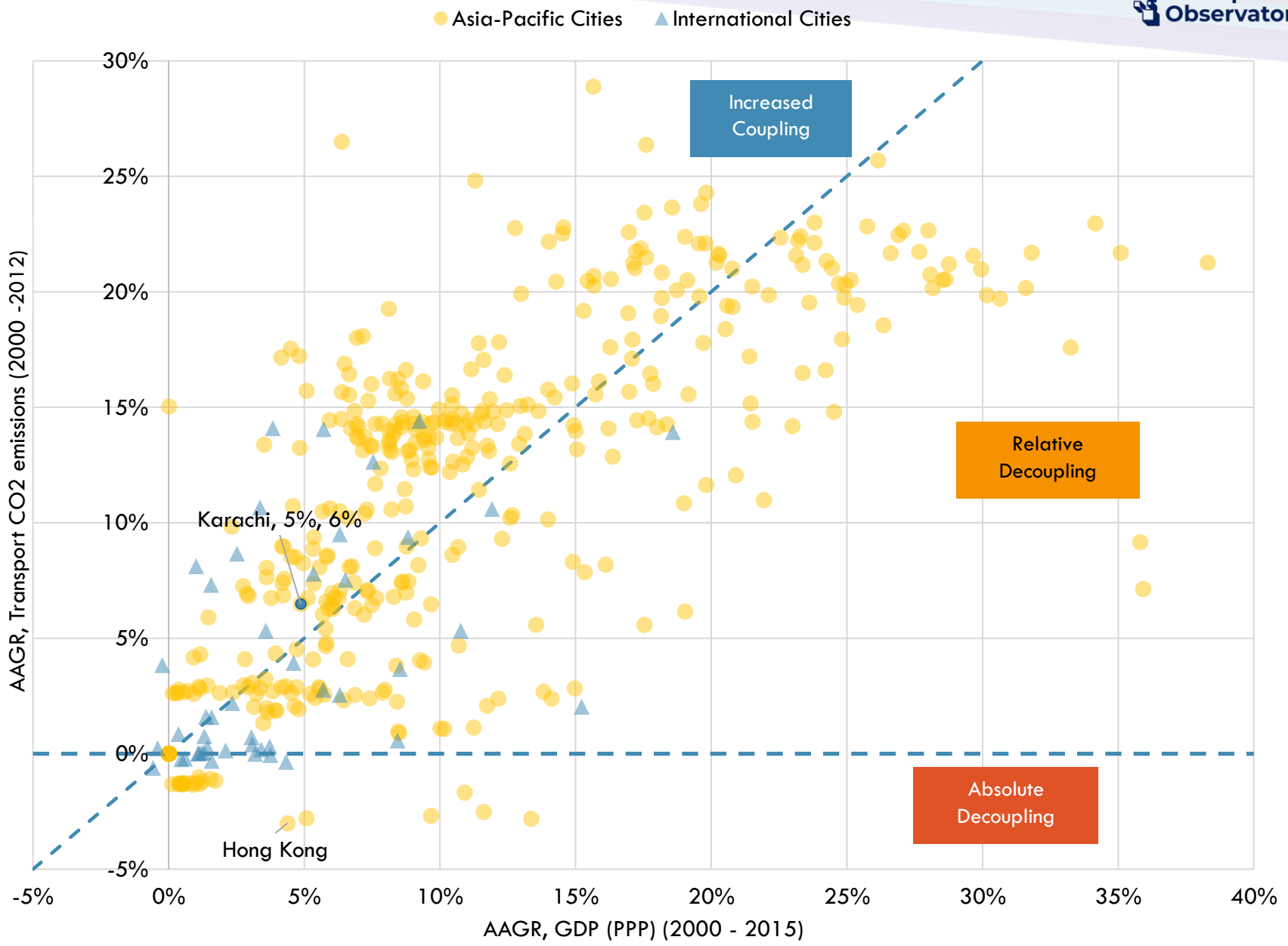
- As of 2012, the transport CO2 emissions intensity for Karachi was 44 grams per USD (Source: GHS – EC).
- Compared to that, Pakistan average number is 33 grams per USD as of 2022.



Source: ATO Analysis using the data sourced from EDGAR

Karachi exhibited strengthened coupling transport CO2 emissions and GDP

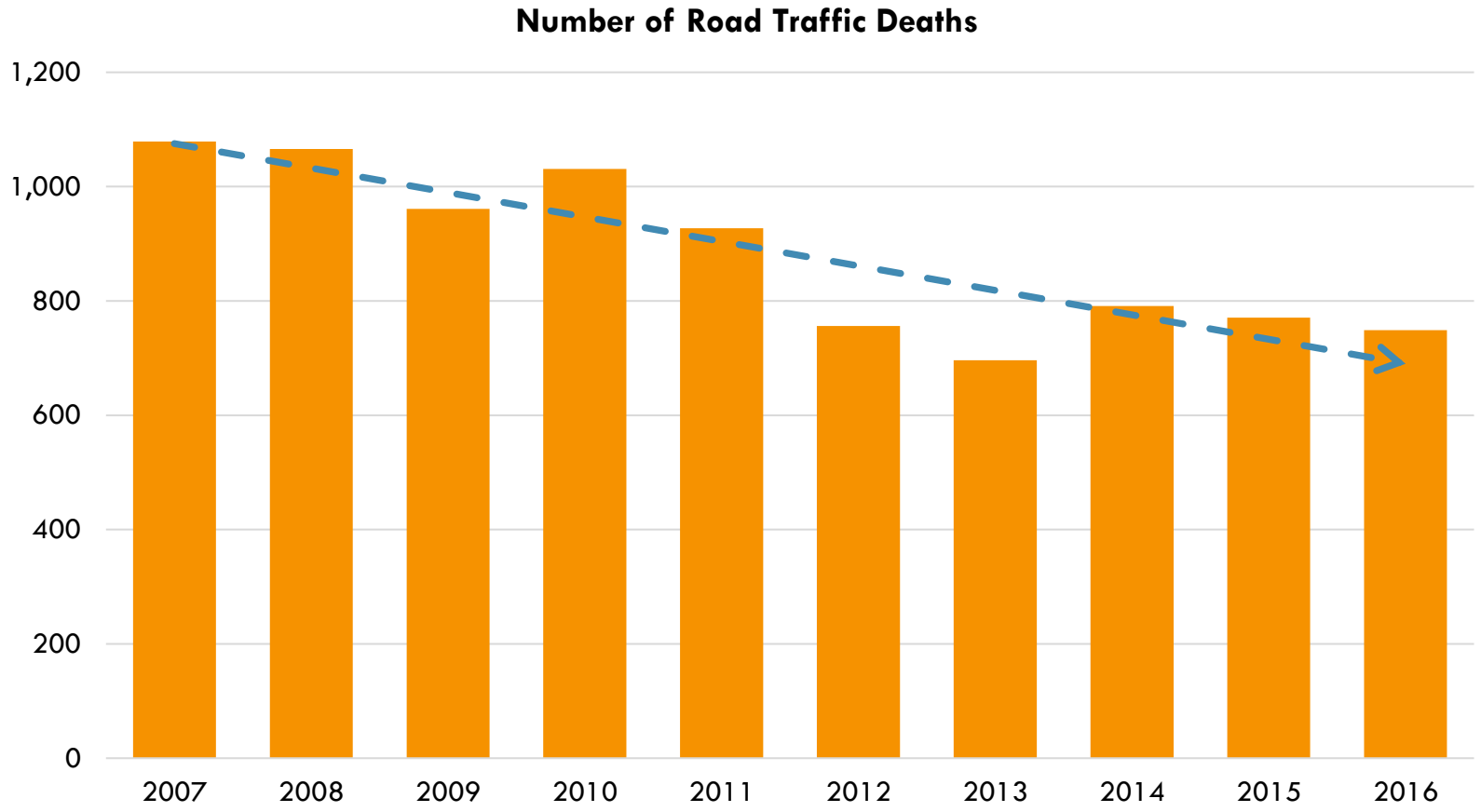
- For Karachi, the annual growth of transport CO2 emissions between (2000 and 2012) is 6% whereas the GDP increased by 5% during the period 2000 and 2015.
- On the other hand, Pakistan is in the relative decoupling zone with 6% increase in GDP and 2% increase in the transport (fossil) CO2 emissions in the period 2015 to 2022.
- Karachi exhibits strengthened coupling of transport CO2 emissions and GDP due to the city's high reliance on private motorized trips amidst limited road infrastructure. The high population density and inadequate road length per capita lead to significant traffic congestion, resulting in increased CO2 emissions from transport. As economic activities grow, the number of motorized trips also rises, further elevating CO2 emissions.



Source: ATO Analysis using the data sourced from GHS – EC

Road traffic deaths in Karachi decreased between 2007 and 2016

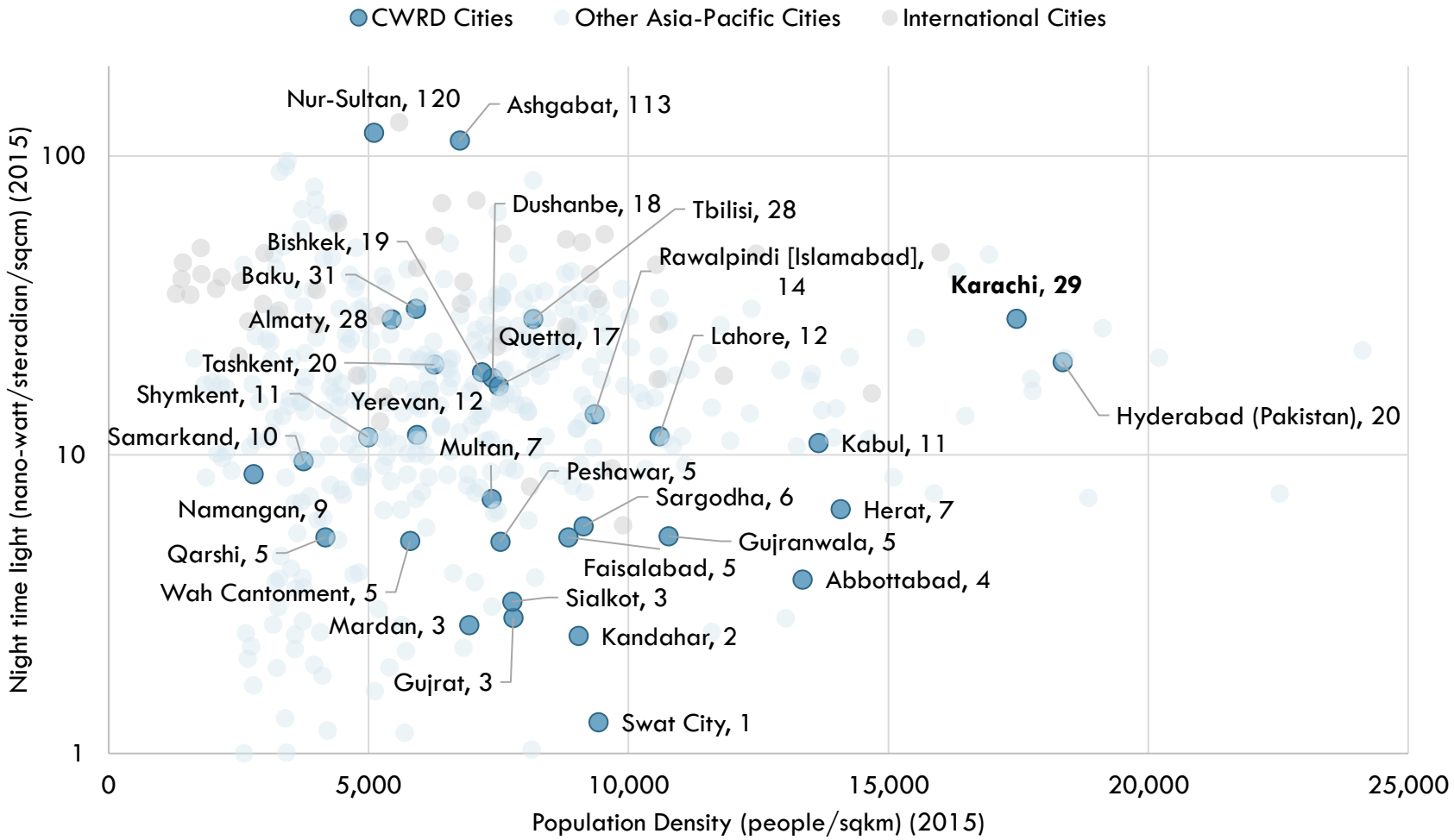
- The total number of road traffic crash deaths decreased in the period between 2007 and 2016 from 1079 to 749, i.e. 3% average annual reduction.
- Whereas, the more updated official report (Karachi strategic development plan 2020) indicates that with the rise of number of vehicles on the roads and resultant congestion the road safety situation has become alarming as the accident severity index has risen to 45%.



Source: ATO Analysis using the data sourced from https://urckarachi.org/wp-content/uploads/2020/07/Transport-isues-in-Karachi-Final-Report.pdf

Night time light analysis indicates Karachi's urbanization is comparatively densely packed

- Nighttime light analysis is a technique that involves studying satellite imagery of Earth at night to analyze the patterns and intensity of artificial lights.
- It reflects the urbanization trends, potentials of transport hubs, traffic and movement patterns etc.
- In comparison with the peer Pakistani UCs, Karachi shows a slightly higher level of urbanization concentration. It can be a reflection of high population densities compared to the peer cities.



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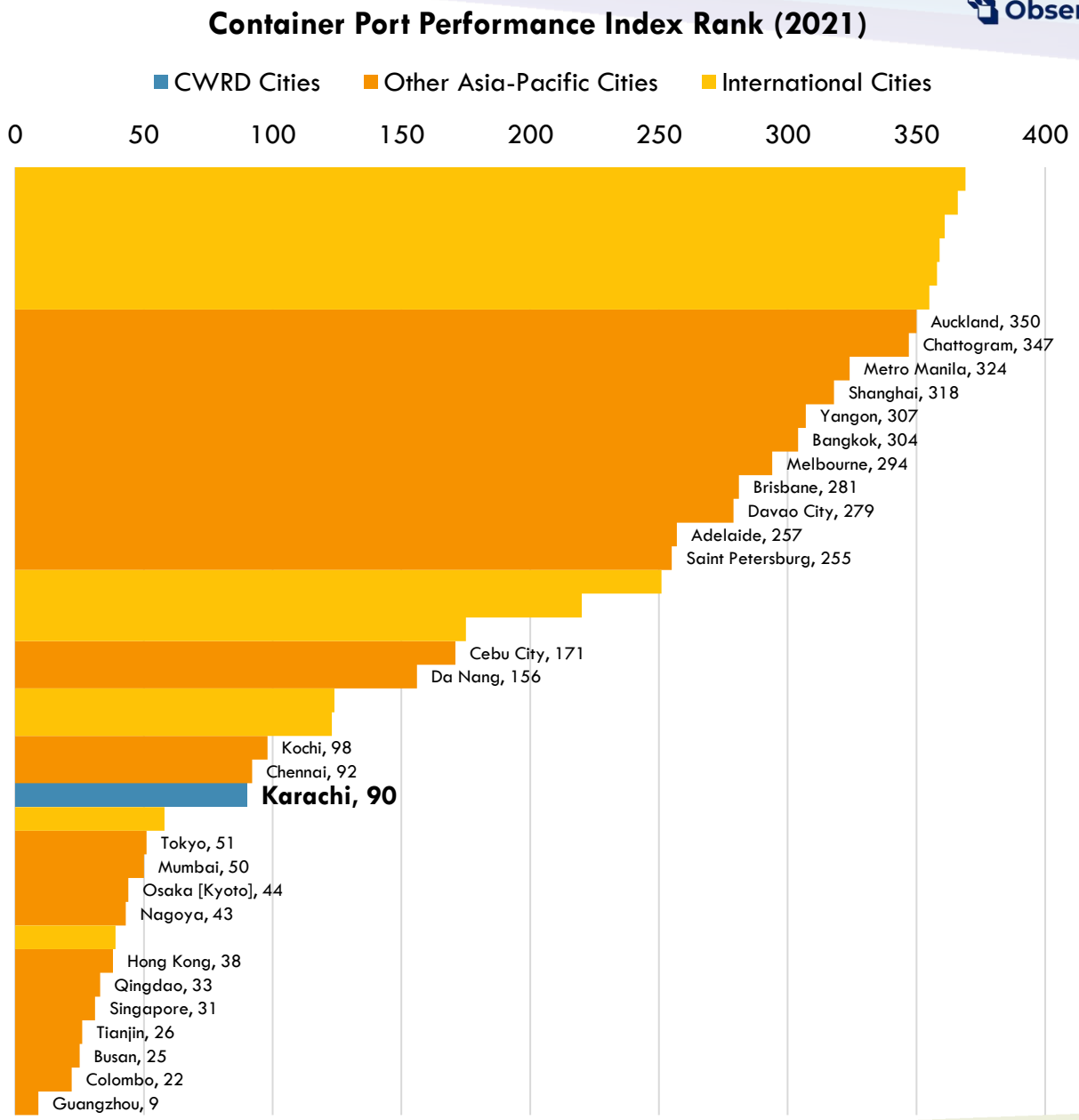
Sources: GHS (European Commission) | ATO Indicators: SEC-UDB-003, MIS-UDB-005

Container Port Performance Index (CPPI) 2021: Karachi Port Ranks 90th/ 370 Globally

- The Container Port Performance Index (CPPI), developed by the World Bank in collaboration with S&P Global Market Intelligence, addresses the need for a reliable, consistent, and comparable measure of port performance. The CPPI 2021, which includes data from 370 ports, uses two methodological approaches—administrative and statistical—to ensure robustness. The index identifies gaps and opportunities for improvement, benefiting stakeholders from shipping lines to governments. Lower rankings indicate better performance. The CPPI aims to guide improvements in port operations, ultimately enhancing global trade efficiency and economic growth.
- The Index is resultant of the sum of a weighted average of indices for each of the five vessel sizes: feeders (<1,500 TEUs), intra-regional (1,500–5,000 TEUs), intermediate (5,000–8,500 TEUs), neo-Panamax (8,500–13,500 TEUs), and ultra-large container carriers (>13,500 TEU).
- Karachi ranks at 90 within the within the whole set of 370 global ports.



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Summarizing the transport sector scenario of Karachi

Urban Density Advantage and Public Transport Accessibility: Karachi exhibits a high population density of 17,400 people per square kilometer, which theoretically reduces the need for extensive road infrastructure per capita due to shorter travel distances. This density also supports a robust public transportation network, with 68% of residents having convenient access to buses within a 500-meter radius, surpassing other major cities in Pakistan. Leveraging this advantage could enhance sustainable urban mobility and reduce reliance on private vehicles.

Potential for Enhanced Public Transport Infrastructure: The ongoing development of the Karachi Circular Railway (KCR) and Bus Rapid Transit (BRT) systems presents opportunities to enhance public transportation infrastructure. Once completed, the KCR, spanning 43.13 km, is projected to alleviate congestion and reduce CO2 emissions by offering efficient mass transit options to approximately 550,000 daily passengers. These initiatives underscore Karachi's potential to improve transportation sustainability and enhance the quality of urban life.

Inadequate Road Infrastructure and Congestion Issues: Despite its density, Karachi suffers from severe road infrastructure deficiencies, with only 0.7 meters of road per capita compared to the national average of 1.15 meters per capita. This limited infrastructure leads to chronic traffic congestion, compounded by a high reliance on private motorized trips, which significantly contribute to CO2 emissions and air pollution. These issues highlight the critical need for comprehensive road development strategies to alleviate congestion and improve urban mobility.

Rising Transport-Related CO2 Emissions and Safety Concerns: Karachi faces threats from its escalating transport-related CO2 emissions, amplified by a rapid increase in motorized trips amidst inadequate road infrastructure. The city's road safety situation has also worsened, with an alarming rise in the accident severity index to 45%, reflecting the risks posed by congested roads and insufficient safety measures. Addressing these challenges is crucial to mitigate environmental impacts and ensure safer transport conditions for residents.

Section 2:
Karachi – policy overview

Karachi Policy Landscape

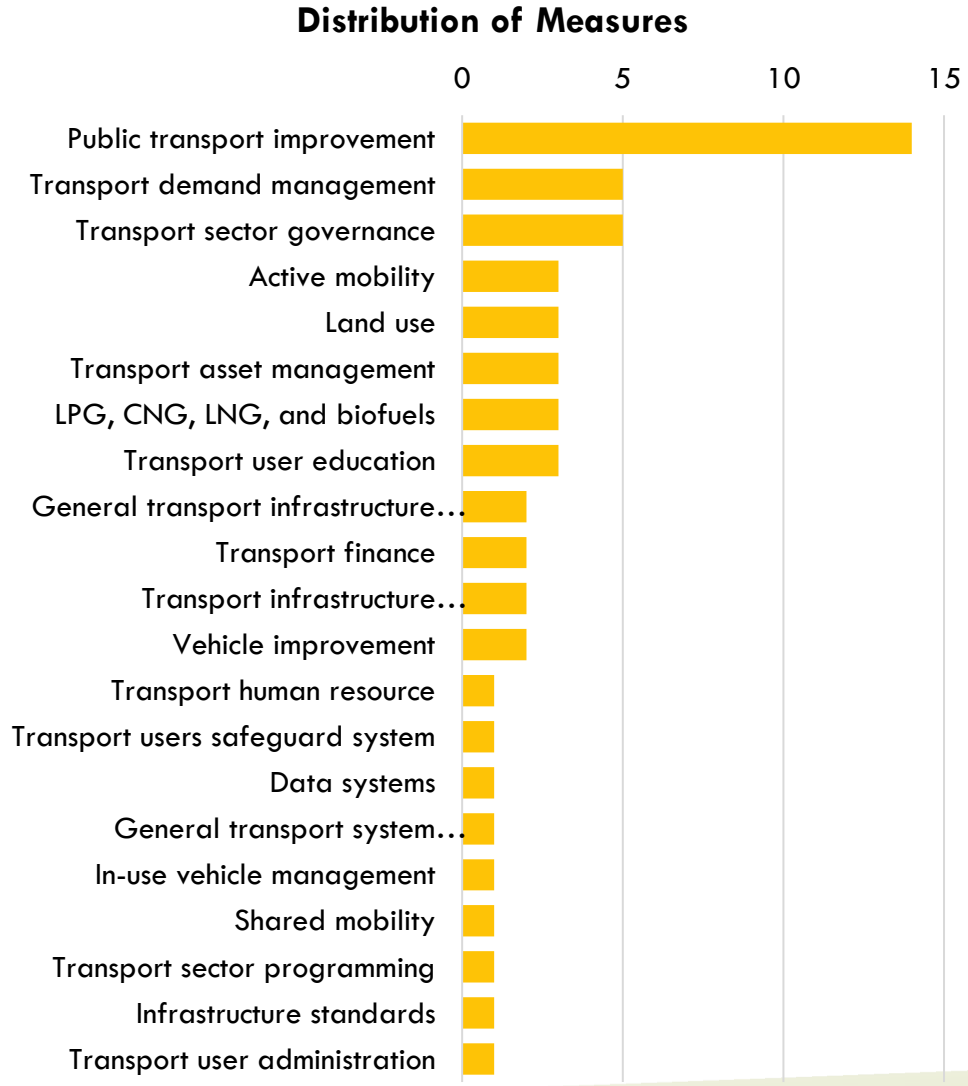
- The policy landscape in Karachi emphasizes comprehensive improvements in transport infrastructure, including the rehabilitation and reconstruction of roads, bridges, and non-motorized transport facilities, alongside the development of a transit-oriented strategy and bus rapid transit (BRT) systems. The policies include technical assistance in traffic management, road safety, and capacity building for urban transport management. The introduction of low-sulphur diesel, promotion of alternative fuels, and enhancement of pedestrian safety and facilities are also key components. Public-private partnerships (PPP) for BRT operations are also proposed. Moreover, the policy calls for regulatory measures, driver training, and public awareness programs to improve traffic management and air quality, while promoting the use of public transport over private vehicles.

Document Name	Year Published	Document Type
Karachi Building & Town Planning Regulations-2002	2002	Transport Laws/ Regulations
Karachi Strategic Development Plan – 2020	2007	Urban Development Policy
Karachi Transportation Improvement Project	2012	Urban Transport Policy
Karachi city climate change adaptation strategy - a road map	2012	Other Transport-related Urban Policy
Sindh Motor Vehicles (Amendment) Act 2019	2019	Transport Laws/ Regulations
Karachi Mobility Project	2019	Urban Transport Policy
Provincial Motor Vehicles (Amendment) Act 2021	2021	Transport Laws/ Regulations

Policy overview indicates prioritization of public transport improvement

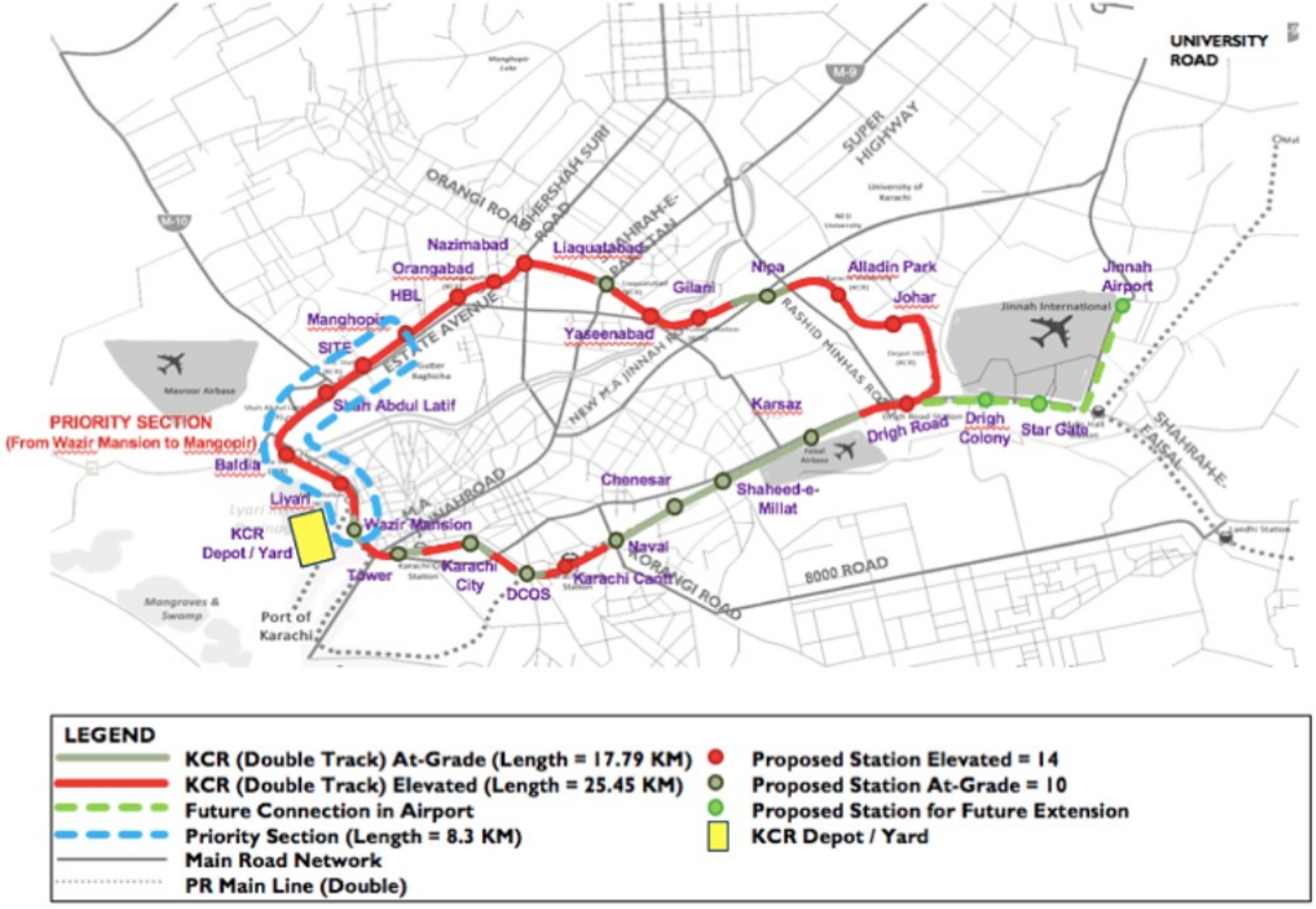
Key measures:

- Transport Infrastructure Development:
  - Rehabilitating roads, bridges, and non-motorized transport facilities.
  - Upgrading utilities like street lighting, sewer/water supply, and drainage.
  - Improving pedestrian safety with footpaths and crossings.
- Traffic Management and Road Safety:
  - Providing technical assistance in traffic management and safety measures.
  - Implementing environmental and social mitigation during construction.
- Transit-Oriented Development:
  - Designing strategies for the Yellow Corridor.
  - Building BRT facilities with segregated busways and stations.
- Public-Private Partnerships (PPP):
  - Undertaking PPP for vehicle procurement and BRT operations.
  - Advising on BRT operation subsidies and management.
- Urban Transport Management:
  - Capacity building for SMTA and automating bus route permits.
  - Engaging stakeholders and promoting the BRT system.
- Environmental and Social Initiatives:
  - Using weather-resistant materials in road construction.
  - Constructing stormwater drainage for extreme weather.
  - Phasing out old buses for efficient CNG vehicles.
  - Implementing social plans to enhance mobility and safety.
- Regulatory and Administrative Functions:
  - Reviewing Motor Vehicle Ordinance for inspections.
  - Promoting low-sulphur diesel and alternative fuels.
  - Regulating parking and improving air quality awareness.



Revival of the Karachi Circular Railway (KCR)

- Given the critical need to enhance public transportation in the city, the Government of Pakistan has initiated the revival of the Karachi Circular Railway (KCR) to alleviate congestion in the city center and facilitate efficient and convenient movement for residents.
- The KCR, which spans 43.13 km, is set to be developed as a mass rapid transit rail network. Of this, 14.95 km will be constructed at ground level, while the remaining 28.18 km will be developed as an elevated corridor. The project is projected to cost USD 1.971 billion, and once completed and operational, the KCR is expected to transport approximately 550,000 passengers daily.



Sources: https://www.c40.org/case-studies/the-revival-of-karachi-circular-railway-as-key-part-of-the-karachi-transportation-improvement-plan-2030/

Comprehensive Policy Priorities

General active mobility	General road safety	Transit Oriented Development	BRT	General transport infrastructure resilience	General transport asset management
Peak time traffic management	General reference to finance mechanisms in the urban area	Public Private Partnership (PPP)	General capacity building	General Institutional/ governance	Management Authority general
General Public transport administration	Stakeholder involvement	Gender responsive planning	General land use	Urban passenger rail infrastructure improvement	General public transport
Public transport funding/ investment	Road infrastructure expansion	Walking measures	General data repositories and data collection	General infrastructure improvements	General transport relevant zoning
Vehicle Inspection and maintenance	LPG/CNG/LNG	General alternative fuels	Bus fleet renewal	Express lanes / public transport priority	Public transport pricing
Public transit expansion	General IPT/ paratransit measures	General parking measures	Traffic flow improvement	General education and behavior change	General Training and workshops
Public awareness campaigns	Vehicle efficiency standards	General vehicle improvements	Audits/ star rating required for new road infrastructure for road safety	Development of other transport-related plan/ policy	Technical standards for road infrastructure

Disability access planning/ Barrier free design	General driving permits	General enforcement

Bus fleet renewal

Replace existing bus stock with environment friendly fleet

(Karachi Strategic Development Plan – 2020)

Gender responsive planning

Implementing and monitoring the Social Management Plan including its actions to mitigate gender based violence and actions to improve women's mobility and economic participation options

(Karachi Mobility Project)

Public transport pricing

Rationalize fare structure. Give tariff preference to CNG buses

(Karachi Strategic Development Plan – 2020)

Walking

Expand sidewalks where required in commercial districts, including the CBD area and other commercial/business areas.

(Karachi Strategic Development Plan – 2020)

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"ATO translates data into insights, policies, and investments"

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