Asian Transport Observatory

Lahore

Urban Transport - State of Play

Insights from the Asian Transport Observatory (ATO)

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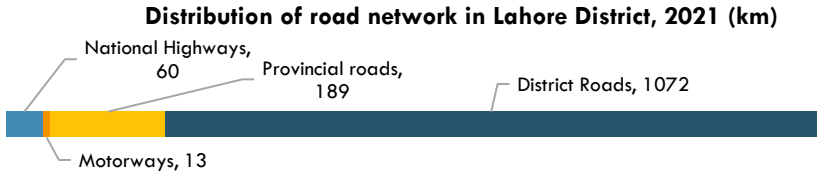
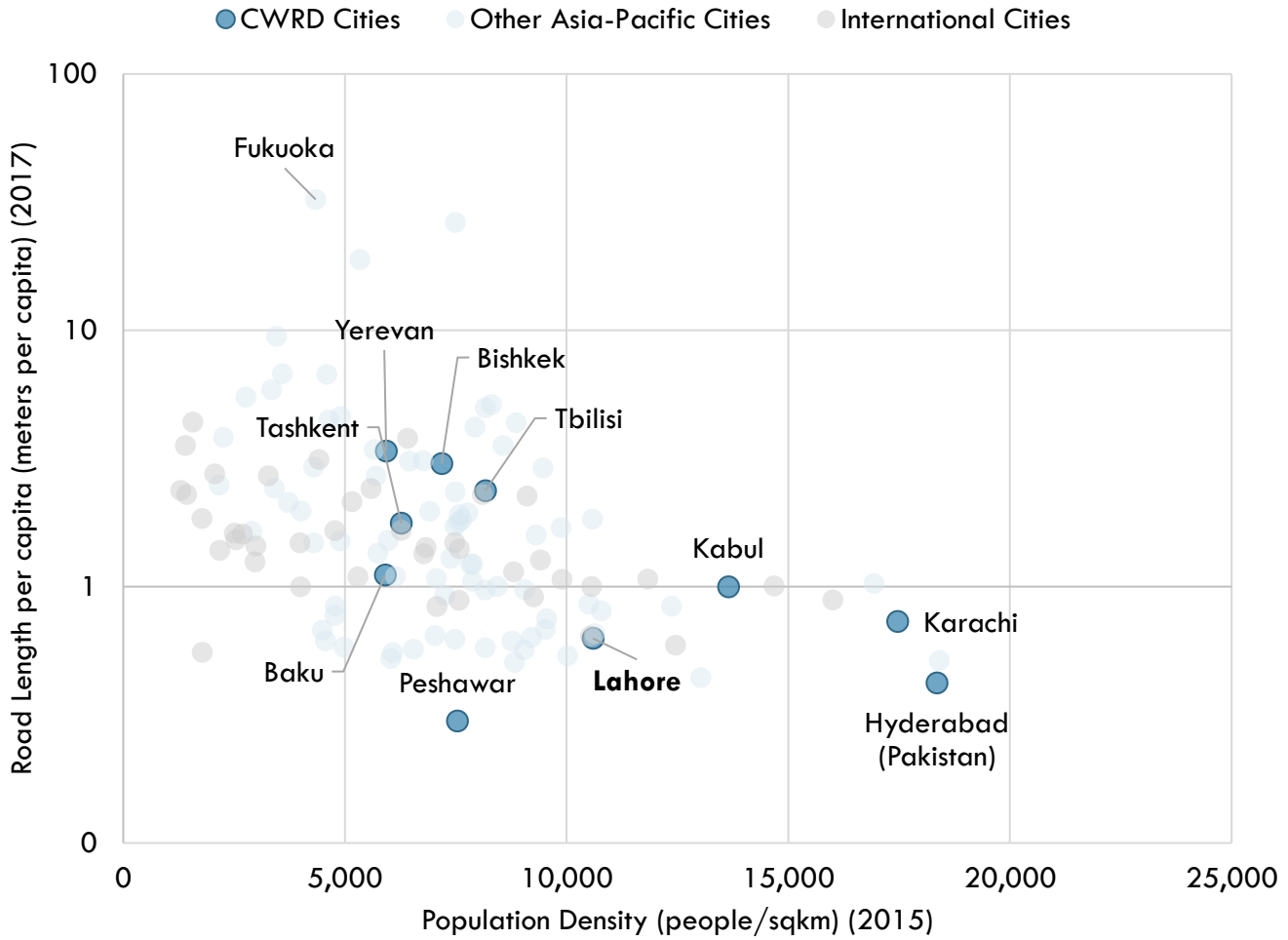
Section 1:

Lahore – state of play

Disparity in Road Infrastructure availability across Asian Cities highlights Lahore's challenges

- Analysis reveals a significant disparity in road infrastructure availability across Asian cities. This is evident when we consider cities like Lahore, Pakistan, with a high population density of 10,600 people per square kilometer, but a meager 0.6 meters of road per capita. This falls far short of the national average in Pakistan (1.15 meters/capita) and the Central and West Asia regional average (3.04 meters/capita). Such limited road infrastructure puts immense strain on the existing network, contributing to the prevalence of traffic congestion in Lahore.
- 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.
- The Lahore Urban Transport Master Plan, 2012, projects that by 2030, the overall volume-to-capacity (v/c) ratio of Lahore's road network will be 0.71, indicating that traffic volume will utilize 71% of the road network's capacity, compared to the projection of 0.49 by 2020, with network average speed of 28kph by 2020 and 13kph by 2030.
- Lahore district has a total road network of 1334km totaled for the following subdivisions.

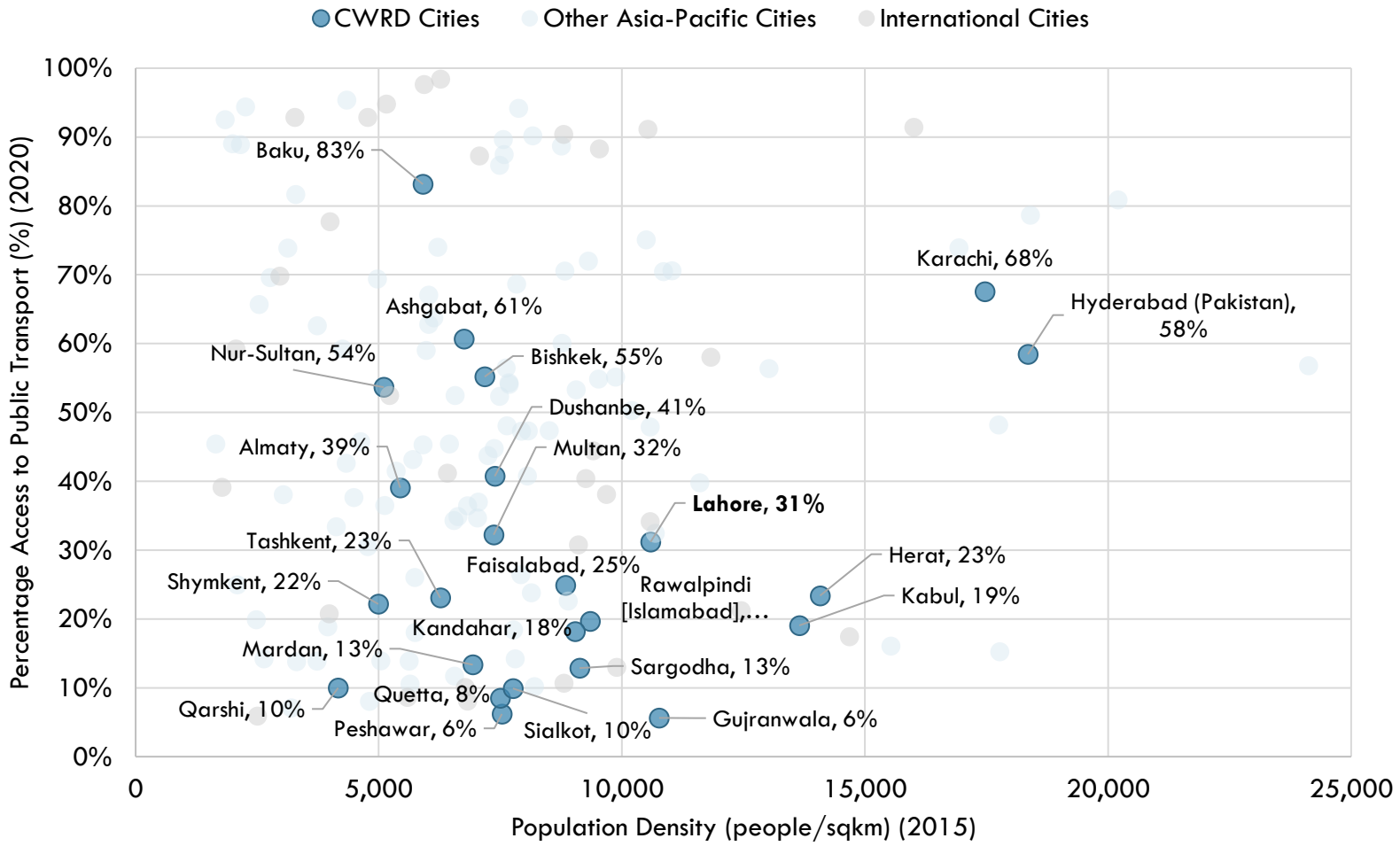




Sources: Oke et.al. (2019)(OSM), GHS (European Commission) | ATO Indicators: SEC-UDB-003, INF-UDB-004
Notes: Value for Peshawar is for 2009, Source for Karachi and Kathmandu is National statistics

Lahore severely lacks decent access to public transport

- The indicator, Percentage access to Public Transport (Y – axis) 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.
- Lahore severely lacks decent access to public transport with only 31% of the urban population having decent access, while Karachi is at 68%.
- According to Oke et al. (2019), in 2017, the passenger modal split included 24% of cars and 16% of public transport, and rest others.
- As of 2024, only 7% of the urban population had access to rapid transport (BRT/ LRT/ Metro rail) (ITDP). It indicates that the development of rapid transit infrastructure in the city is in the nascent stage.
- The Lahore Urban Transport Master Plan, 2012, projects a 45% increase in the public transport travel demand by 2030 (compared to 2010 baseline of 3.4 mln. Trips per day), i.e. an increase of about 1.6 million person trips from 2010 to 2030 would need to be accommodated to retain the PT mode share

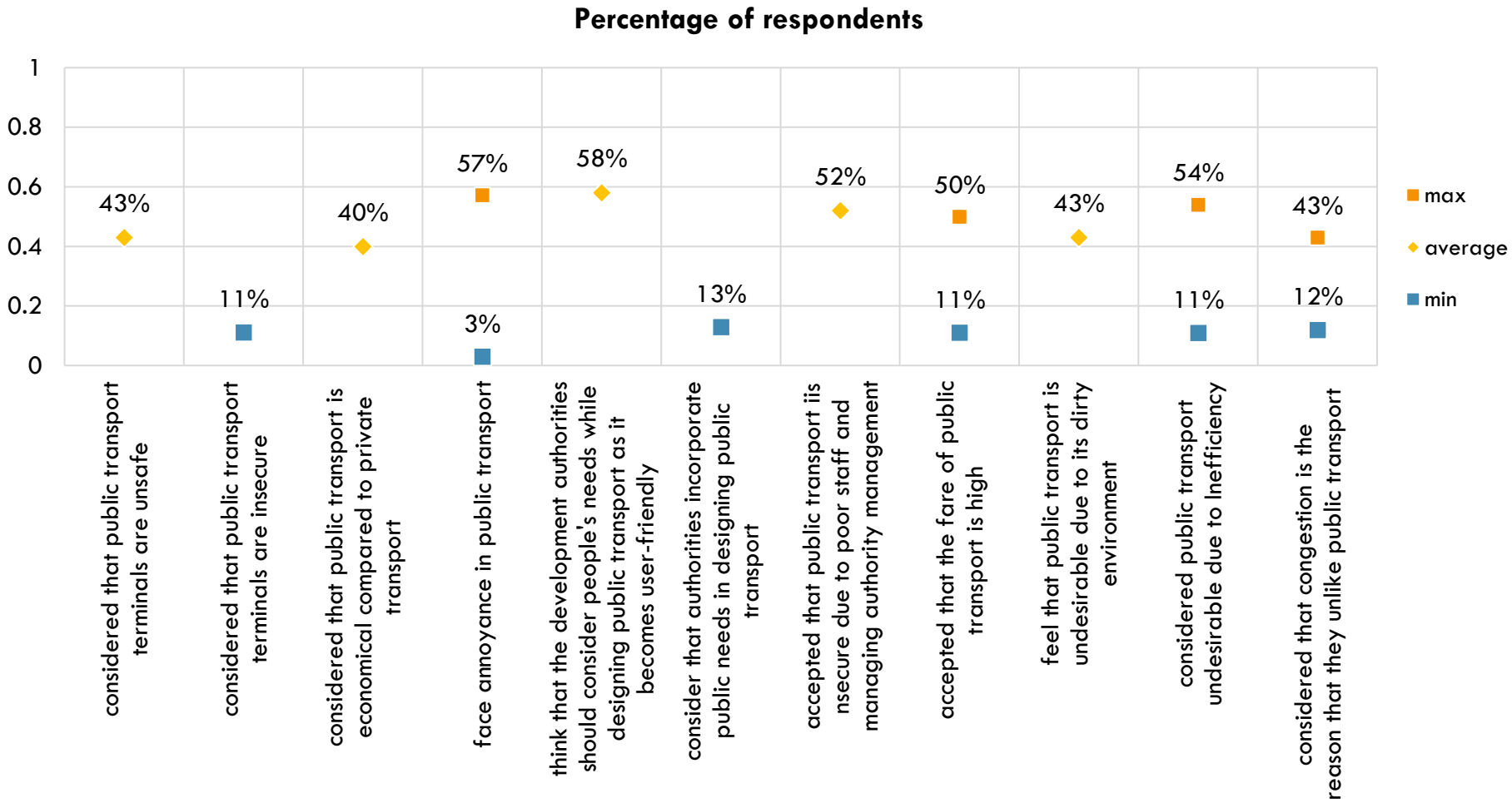


Sources: UN-Habitat, GHS (European Commission) | ATO Indicators: SEC-UDB-003, ACC-UDB-001

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.

Evaluating Public And Private Transport of Lahore, Survey response

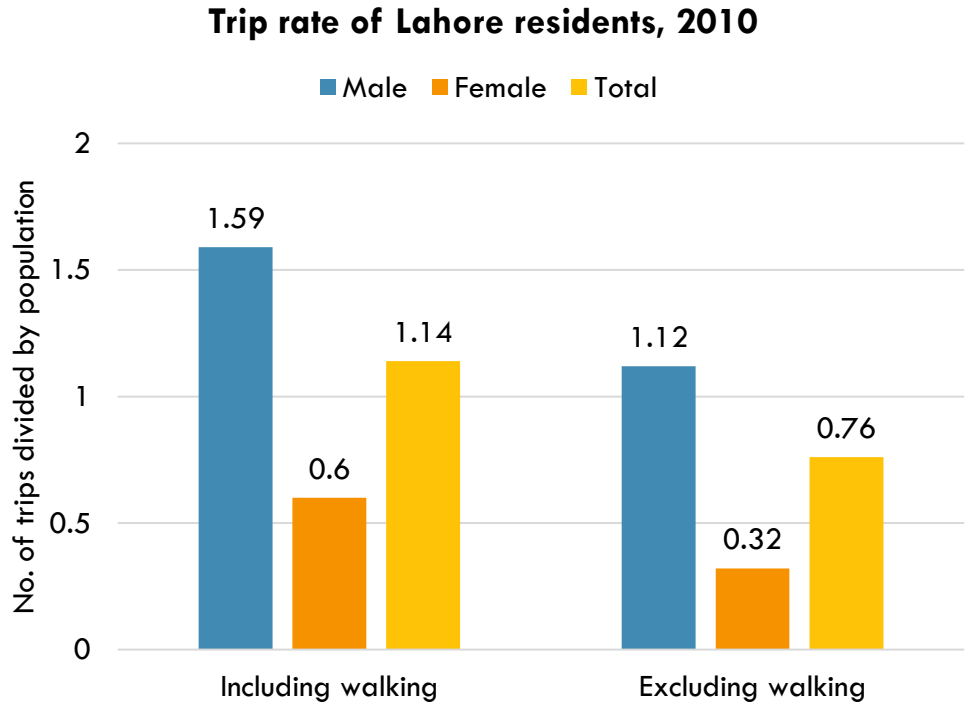
- A significant share of respondents consider public transport a weaker choice compared to private transport due to safety concerns, poor hygiene, and a lack of inclusivity in planning systems.



Sources: ATO visualization based on data from Iqbal et al. (2023) https://www.researchgate.net/publication/368928170_Evaluating_Public_And_Private_Transport_Of_Lahore

Low Passenger Trip Rates in Lahore: Unemployment and restricted female mobility key factors

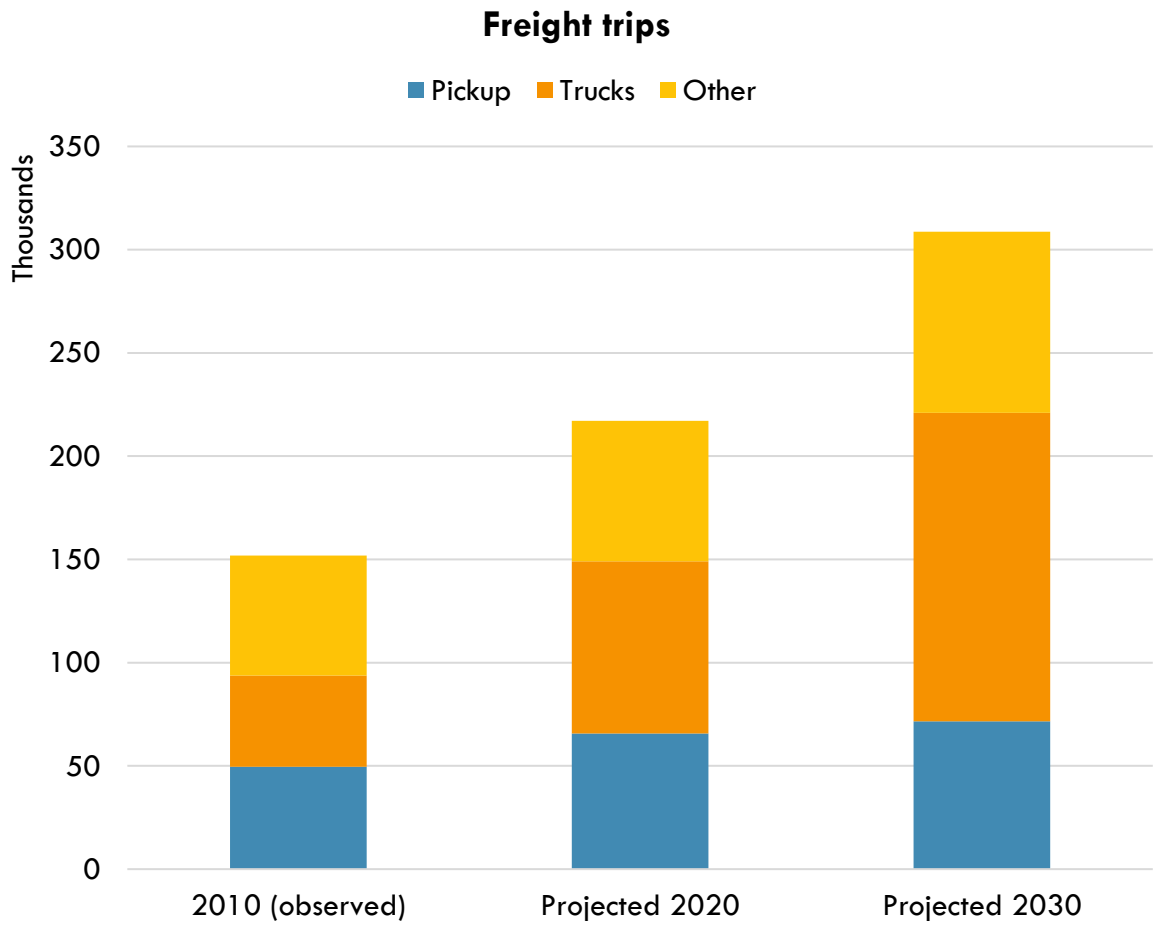
- On average, residents of Lahore make approximately 1.14 trips per day, including walking, or about 0.76 trips per day excluding walking. This rate is significantly lower—almost half—compared to other mega-cities in Asia such as Manila, Ho Chi Minh City, and Jakarta (Source: JICA Report)
- Several factors contribute to this lower trip rate:
  - Inactive Female Population: A significant portion of the female population in Lahore is not actively participating in the workforce or other activities that require regular travel. Cultural norms and safety concerns often restrict women's mobility, limiting their need to make trips. This contrasts with cities like Manila and Jakarta, where higher female labor force participation leads to more frequent travel.
  - High Unemployment Rate: High unemployment in Lahore reduces the necessity for daily commuting. Without the need to travel for work, the overall number of trips per day is lower. In comparison, cities with more robust job markets see higher trip rates as people commute for employment.
  - Transportation Mode Share: Females: Women in Lahore predominantly rely on walking for their daily commutes and use rickshaws relatively frequently. The reliance on walking indicates potential gaps in accessible and safe public transport options. Rickshaws, while popular, suggest a preference for more flexible and door-to-door transportation modes, which may be influenced by the lack of reliable public transport infrastructure. Males: Men prefer motorcycles, which provide a quick and affordable means of transportation. The higher use of motorcycles among males may be due to their greater financial independence and fewer safety concerns compared to females. Females often travel as passengers on motorcycles, highlighting gender-based differences in transportation mode choice.



Sources: ATO visualization based on data from JICA (Source: https://openjicareport.jica.go.jp/pdf/12068110_03.pdf)

Freight trips expected to double by 2030

- Modes considered
  i) Pick-up Trucks – these are open back 2-axle vehicles or closed back delivery trucks, used mostly for small goods delivery and distribution, ambulances, etc
  ii) 2 Axle Trucks – this is the most common type of trucks used in Pakistan.
  iii) All other Vehicles (these include large trucks, construction vehicles, Tractors, tractor trolleys, other agriculture vehicles, animal drawn carts etc)
- Demand elasticity was estimated and the modeshare forecast was made using the growth in GDP and the demand elasticity. (JICA Report)
- Overall, projections indicate that trucks will significantly expand their mode share by 2030 (48%) compared to the 2010 (29%) baseline numbers. Consequently, the overall number of freight trips is expected to double by 2030, reflecting a substantial surge in goods movement to meet the needs of a growing population and economy.

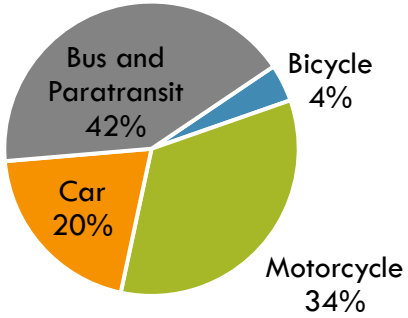


Sources: ATO visualization based on data from JICA

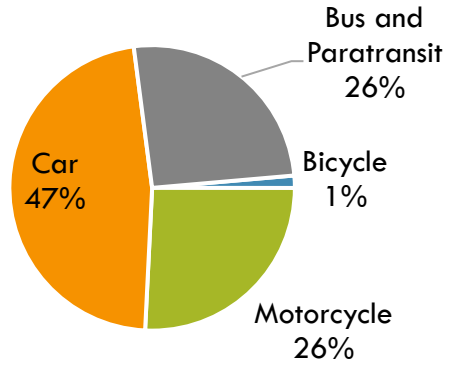
Modal Share projected to shift to Cars in a Do-Nothing scenario by 2030

- In a do-nothing scenario, the mode share of bicycles is projected to decline by a percentage point on average, dropping to just over 1% by 2030. This contrasts sharply with trends in other developed cities where cycling is actively encouraged. In these cities, the mode share of bicycles is increasing, driven by the expansion of dedicated cycle lanes and prioritization of cyclists at crossroads. These measures enhance safety and convenience for cyclists, leading to higher adoption rates.
- For motorized trips, the do-nothing scenario indicates a declining use of motorcycles and a significant reduction in the share of public transport, with a notable shift towards increased car usage. This shift can be attributed to various factors, including the lack of investment in public transport infrastructure, inadequate service levels, and rising income levels enabling more people to afford private cars.
- The implications of these trends are significant. The decline in bicycle use and the increasing preference for cars could lead to more traffic congestion, higher emissions, and greater reliance on fossil fuels. Meanwhile, the diminished share of public transport could result in reduced accessibility and mobility for those who rely on it the most, exacerbating social and economic inequalities.

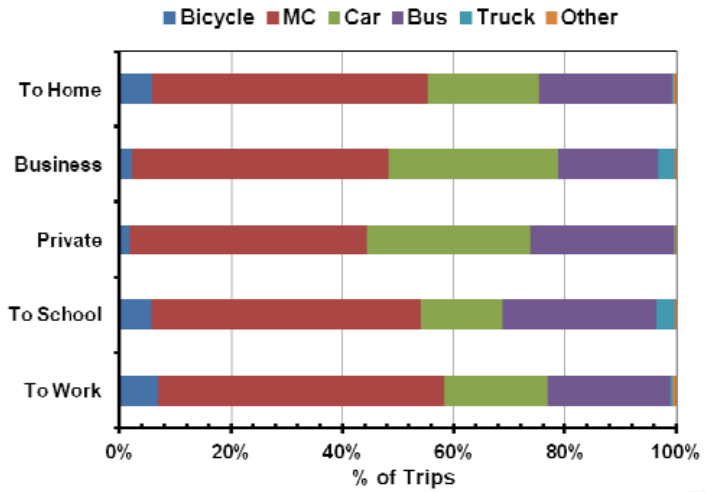
Modeshare, 2010



Projected Modeshare, 2030 based on Scenario III



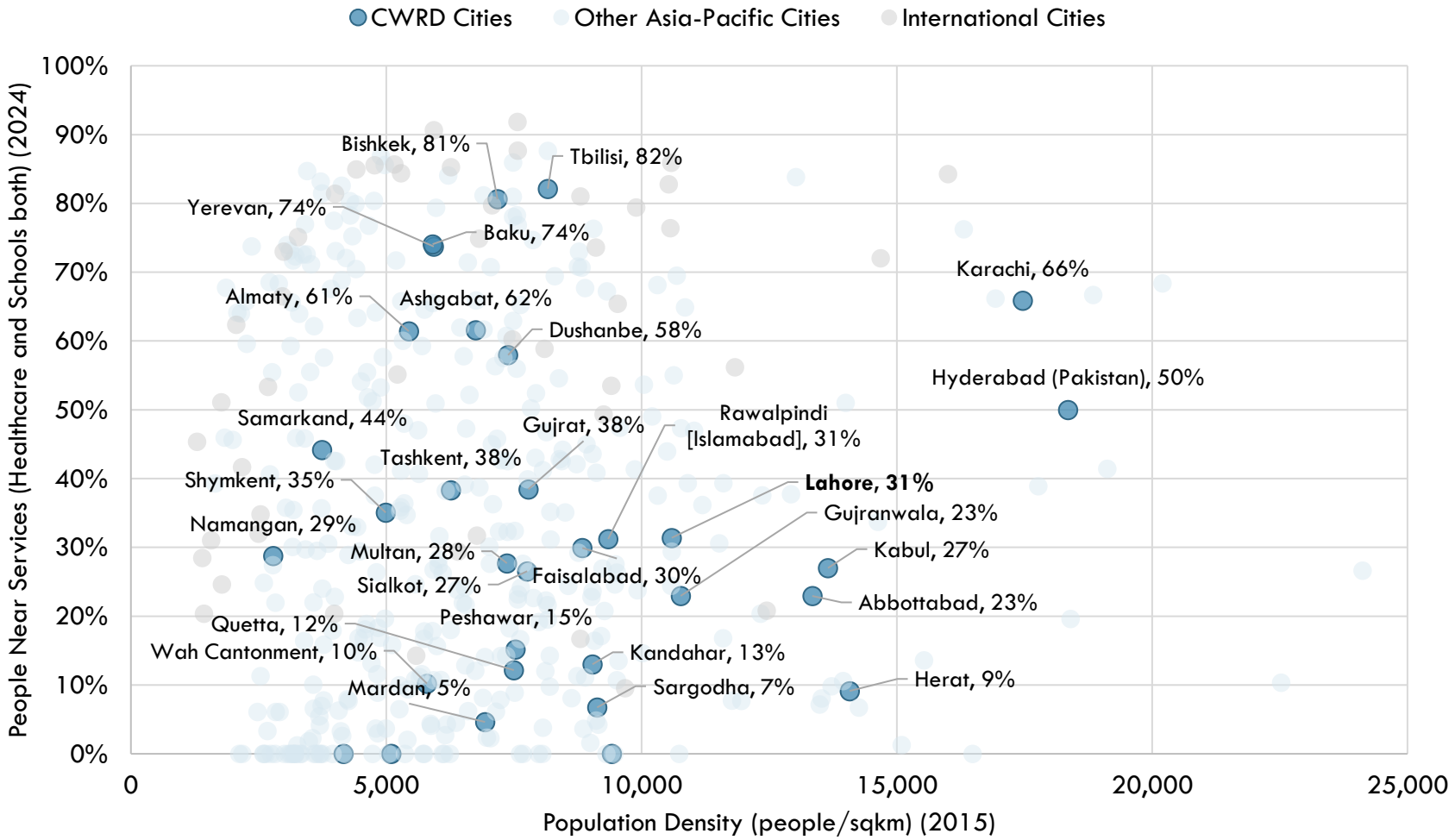
Modal Share by Trip Purpose (excluding walk), 2010



Sources: ATO visualization based on data from JICA (Lahore Urban Transport Plan)

Access to healthcare and educational services in Lahore is lower than Pakistan average

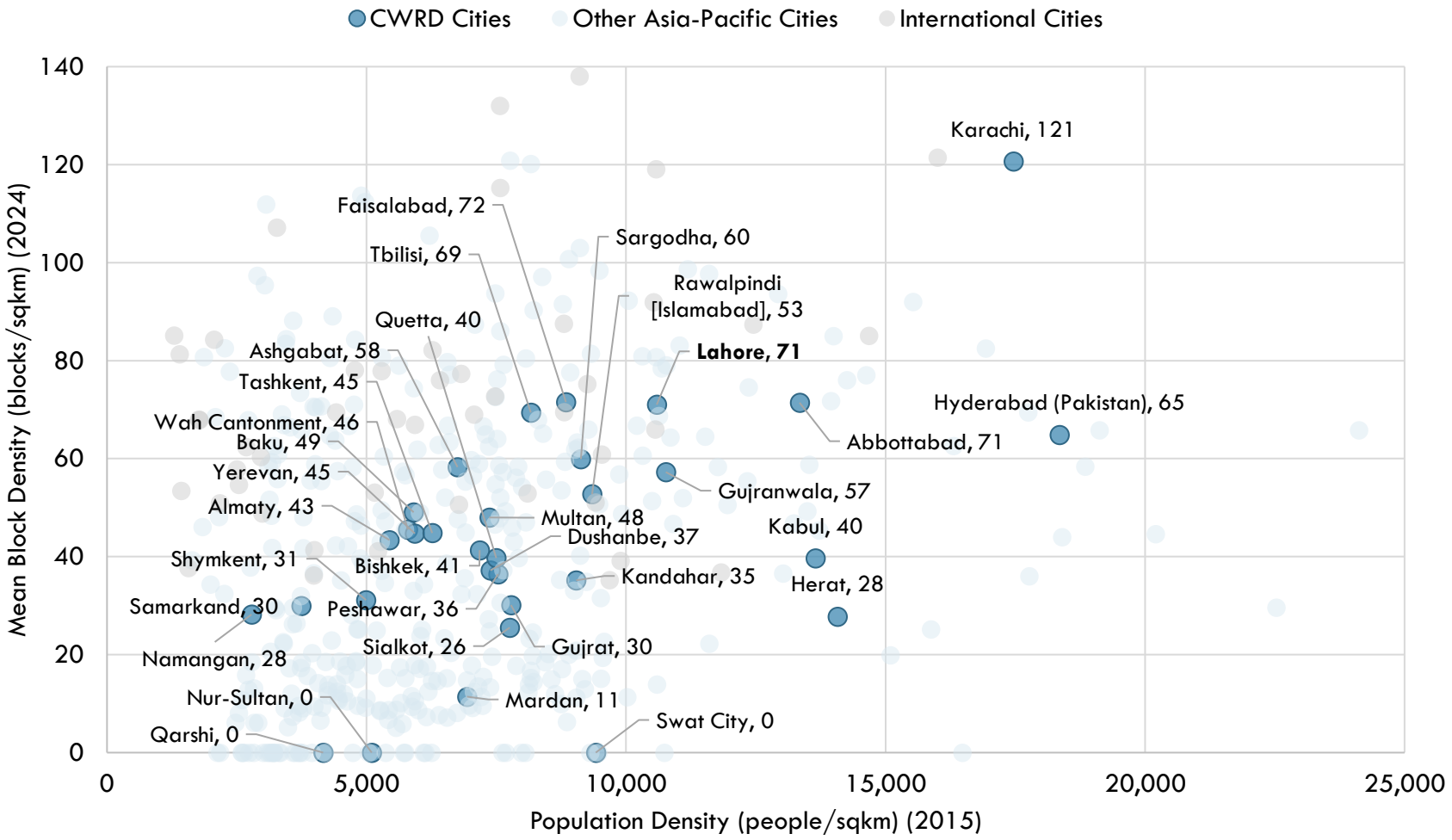
- People Near Services measures the percentage of an area's population living within walking distance (1km) of some form of both healthcare and education services. Proximity is the first requirement for walkability. In a city where people live within a 15-minute walk of their daily needs, they will be able to live without a car.
- Lahore has poor access to services at only 31%, while Pakistan stands at about 50%.



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

Lahore promises decent walkability with high Mean block density

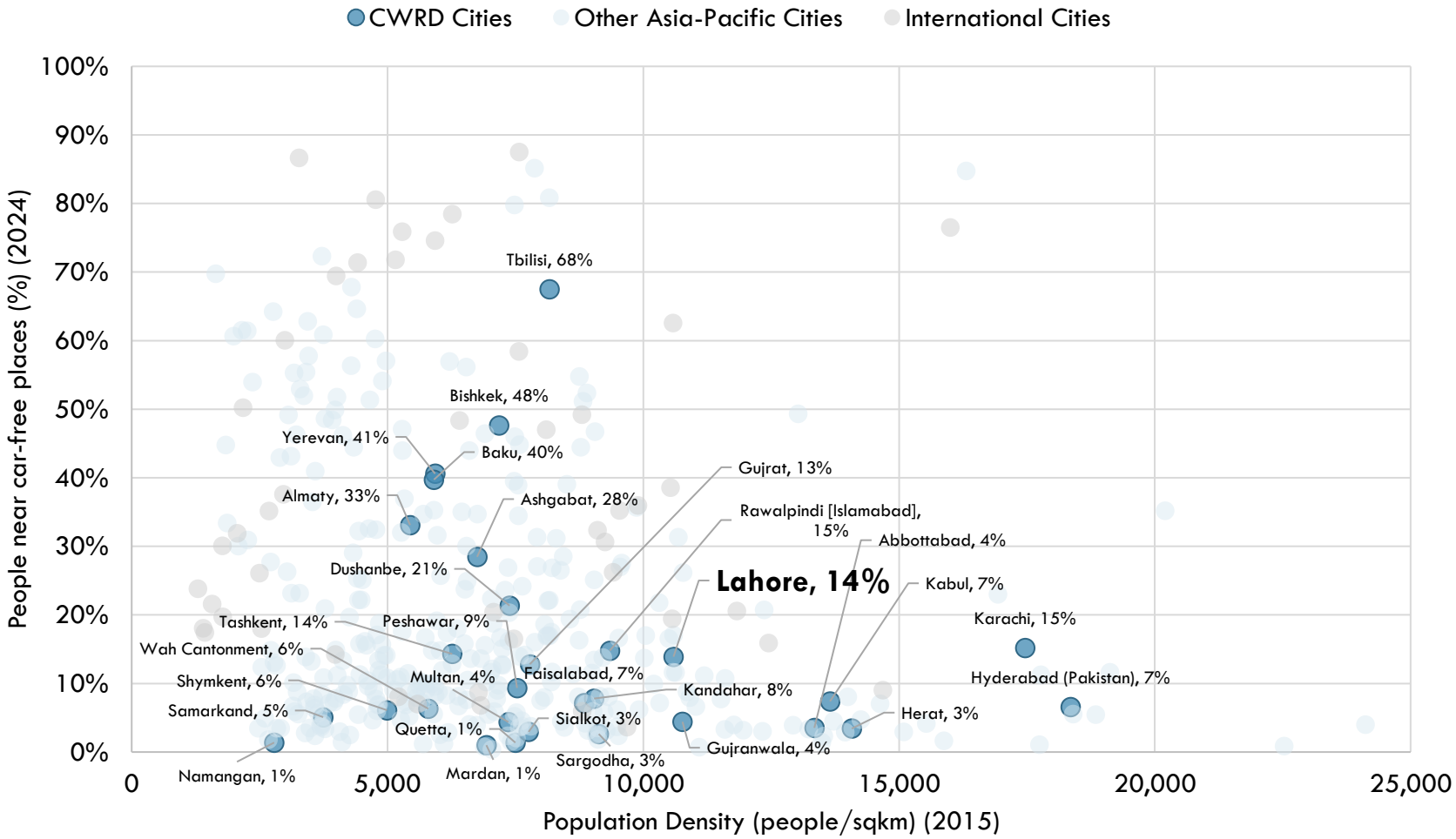
- Mean block density, which refers to the average number of blocks per square kilometer, is a key indicator of walkability. Denser block patterns typically translate to smaller block sizes, encouraging pedestrian movement with shorter distances and lower average traffic speeds.
- In this regard, Lahore holds a decent advantage within Central and West Asia, boasting a mean block density of 71 blocks per square kilometer, just below Faisalabad (72) and Karachi (121). This characteristic, combined with its high population density, positions Lahore with a strong potential to be a decently walkable city.



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

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

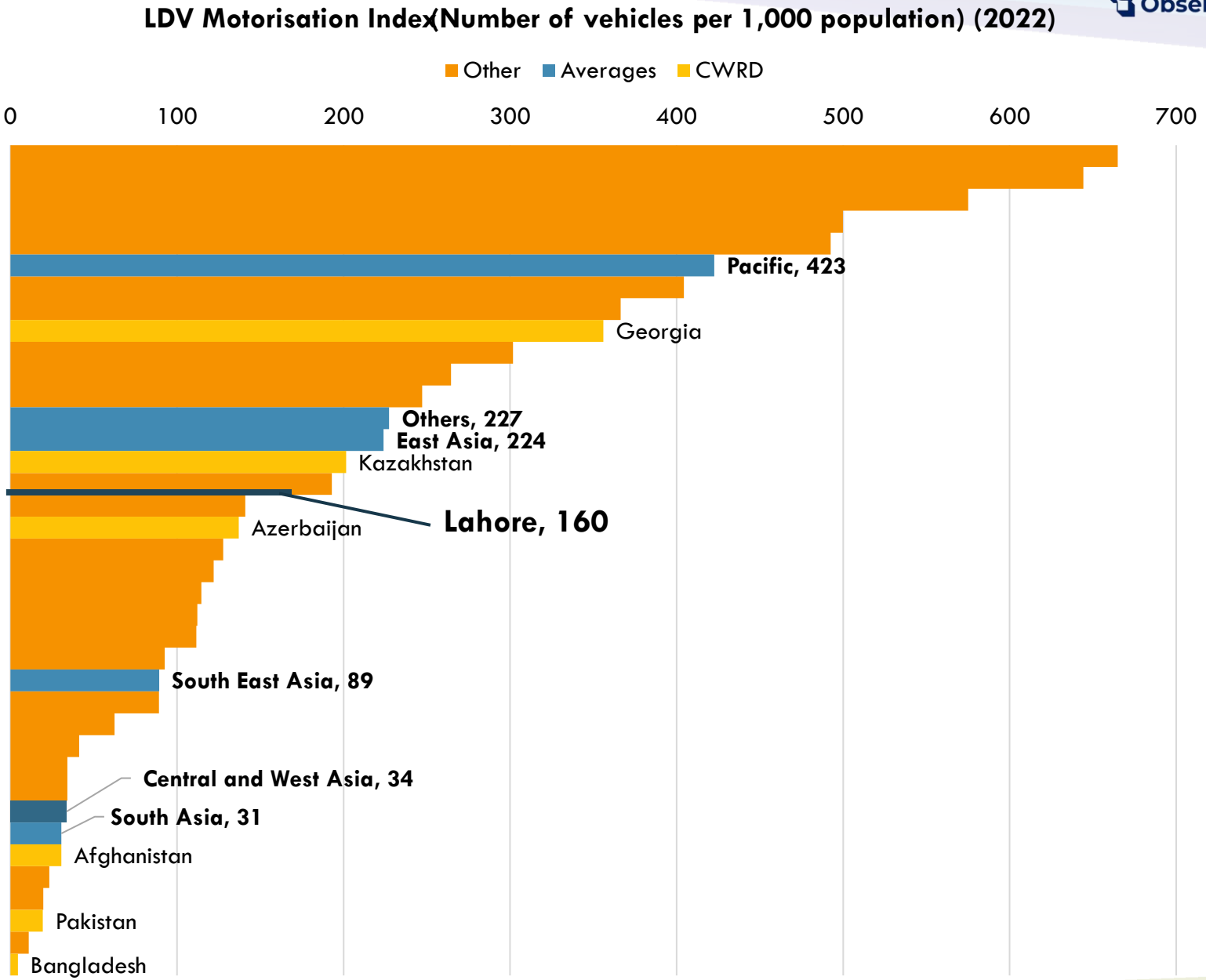
- People Near Car-Free Places measures the percentage of an area's population living immediately near (within 100m of) a car-free place. This includes parks, squares, car-free streets, recreation grounds, sports fields, and forests. Car-free public spaces become integral components of pedestrian infrastructure. By eliminating vehicle traffic, they create safe and often more direct walking routes
- Based on the ITDP Atlas data, Lahore (14%) ranks 4th out of the 26 cities in Pakistan.



Sources: ITDP, GHS (European Commission)

Lahore's LDV motorization significantly exceeds Pakistan's average

- In 2015, the LDV motorization in Lahore district was recorded at 106 (LDV registration data source: Additional Director General, Excise & Taxation, Punjab, Lahore, Pakistan) Based on the Lahore Urban Transport Master Plan, 2012, it is estimated that car ownership would grow to 45% of the households by 2030 (compared to 18% as of 2012).
- The current LDV motorization is significantly higher than Pakistan (19) and Central and West Asia region (34) average numbers, as of 2022.



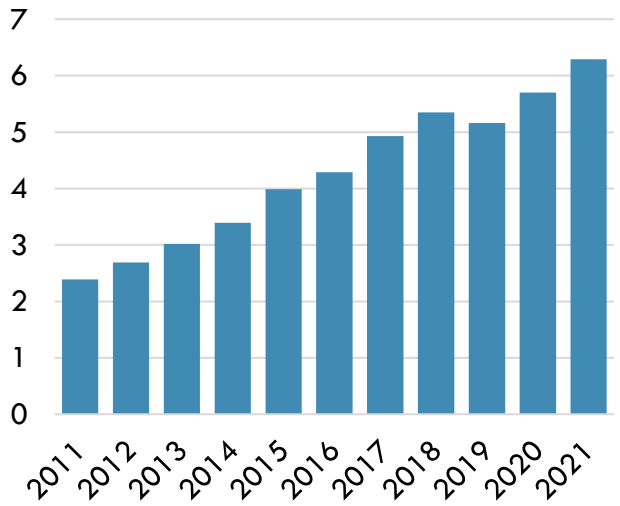
Visualization based on ATO calculations

Transport is a significant contributor to the air pollution emissions in the city

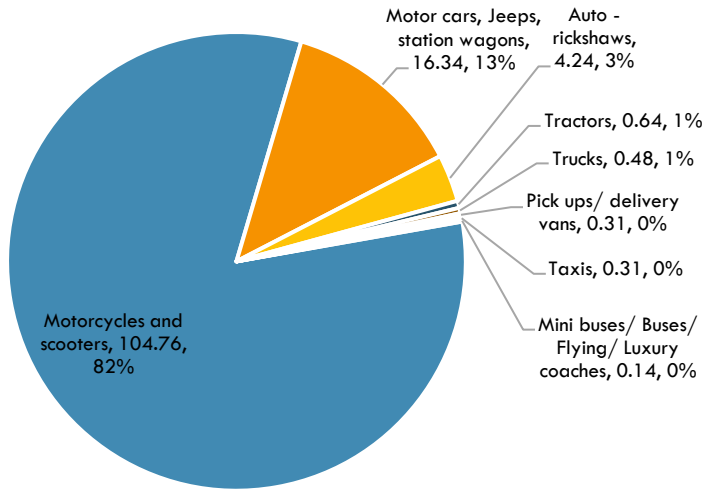
- Between 2011 and 2021, the number of registered vehicles in Lahore surged, driven by a preference for private transportation over mass transit. This shift benefited services like Uber and Careem but reduced the use of mass transit, leading to higher per capita transport-related emissions, estimated at 0.27 tons of CO2. This issue is exacerbated by Pakistan's subpar Euro-II fuel quality and the prevalence of inefficient two-stroke vehicles. These factors, combined with traffic congestion caused by inadequate infrastructure and poor transport policies, have made the transport sector the primary contributor to Lahore's poor air quality.

- The average vehicle in Pakistan emits 3.6 times more NOx, 8 times more lead, 20 times more hydrocarbons, and 25 times more carbon emissions per kilometer than an average vehicle in the USA. The transport sector is the key polluter, contributing to 102 kt of CO, and 3.4 kt of NOx sharing 92% and 54%, respectively, of the total emissions. Motorcycles and scooters are the largest polluters, followed by motorcars, jeeps, and wagons. Major pollutants from the transport sector include NMVOC (99%), CO (92%), and NOx (54%). These results underscore that the transport sector is the main cause of poor air quality in Lahore.

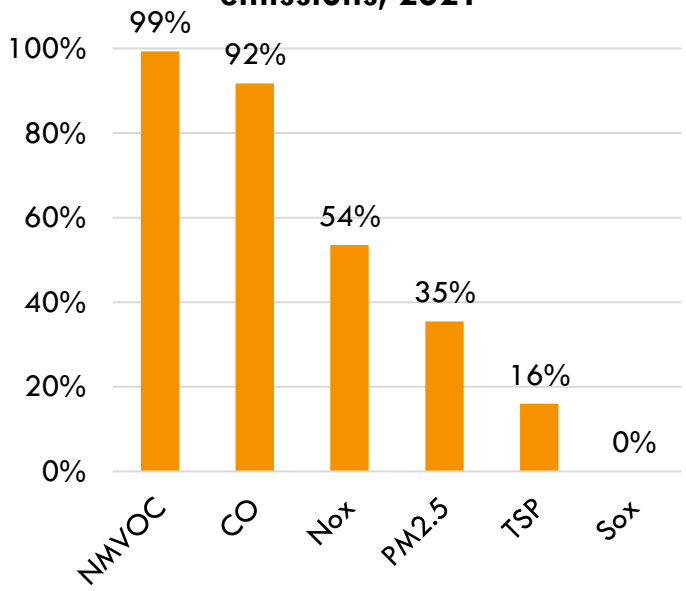
Number of registered vehicles in Lahore District (million units) (2011-2021)



Vehicular category wise Particulate matter emissions in Transport sector, 2021



Share of Transport sector in total emissions, 2021



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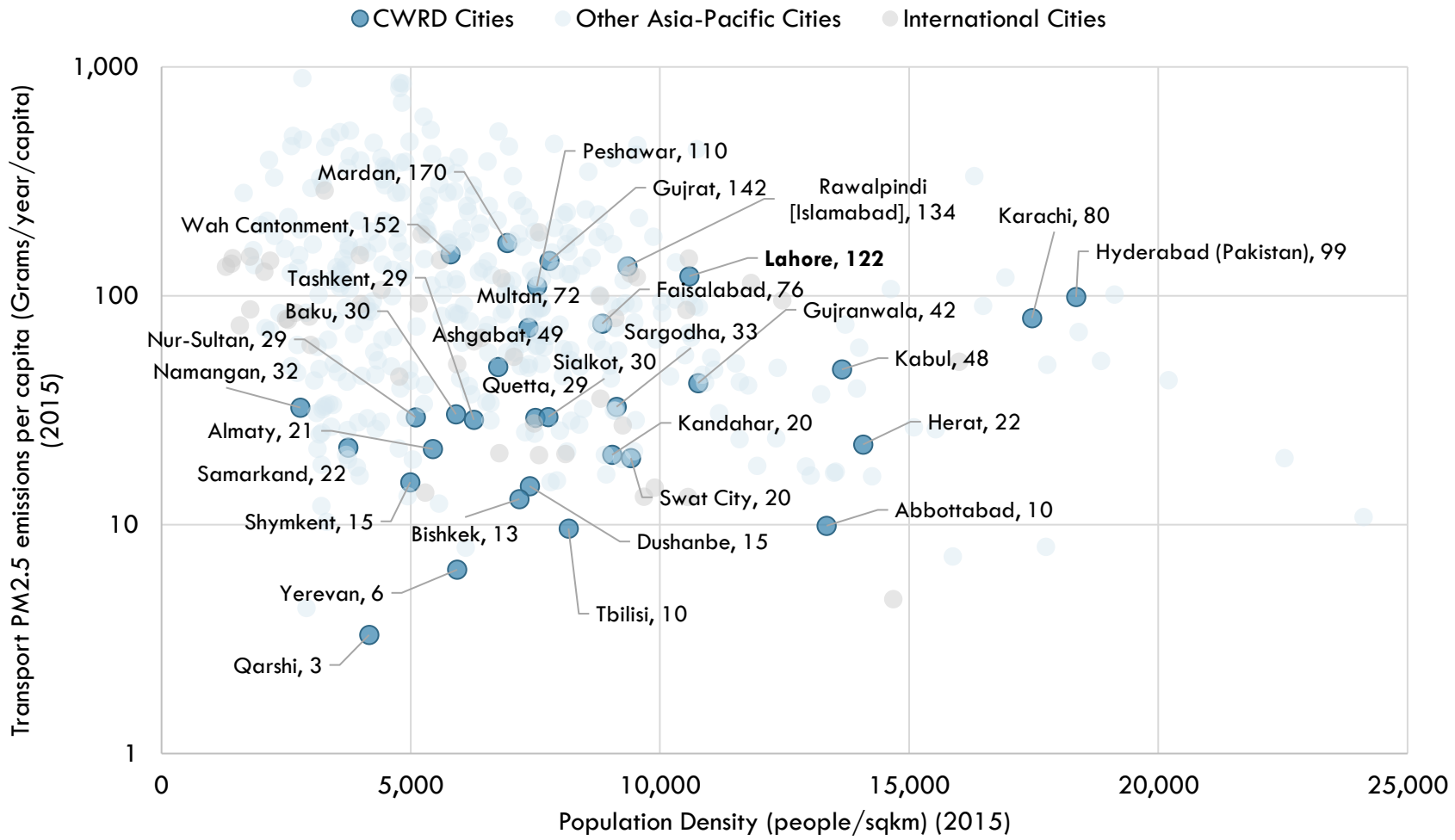
* Includes Nox, CO, NMVOC, Sox, TSP, PM10 and PM2.5. Sources: ATO visualization based on the data from Sectoral Emissions Inventory of Lahore (https://urbanunit.gov.pk/Download/publications/Files/8/2023/Emission%20Inventory%20of%20Lahore%202023.pdf)

Lahore ranks high in Transport PM2.5 emissions

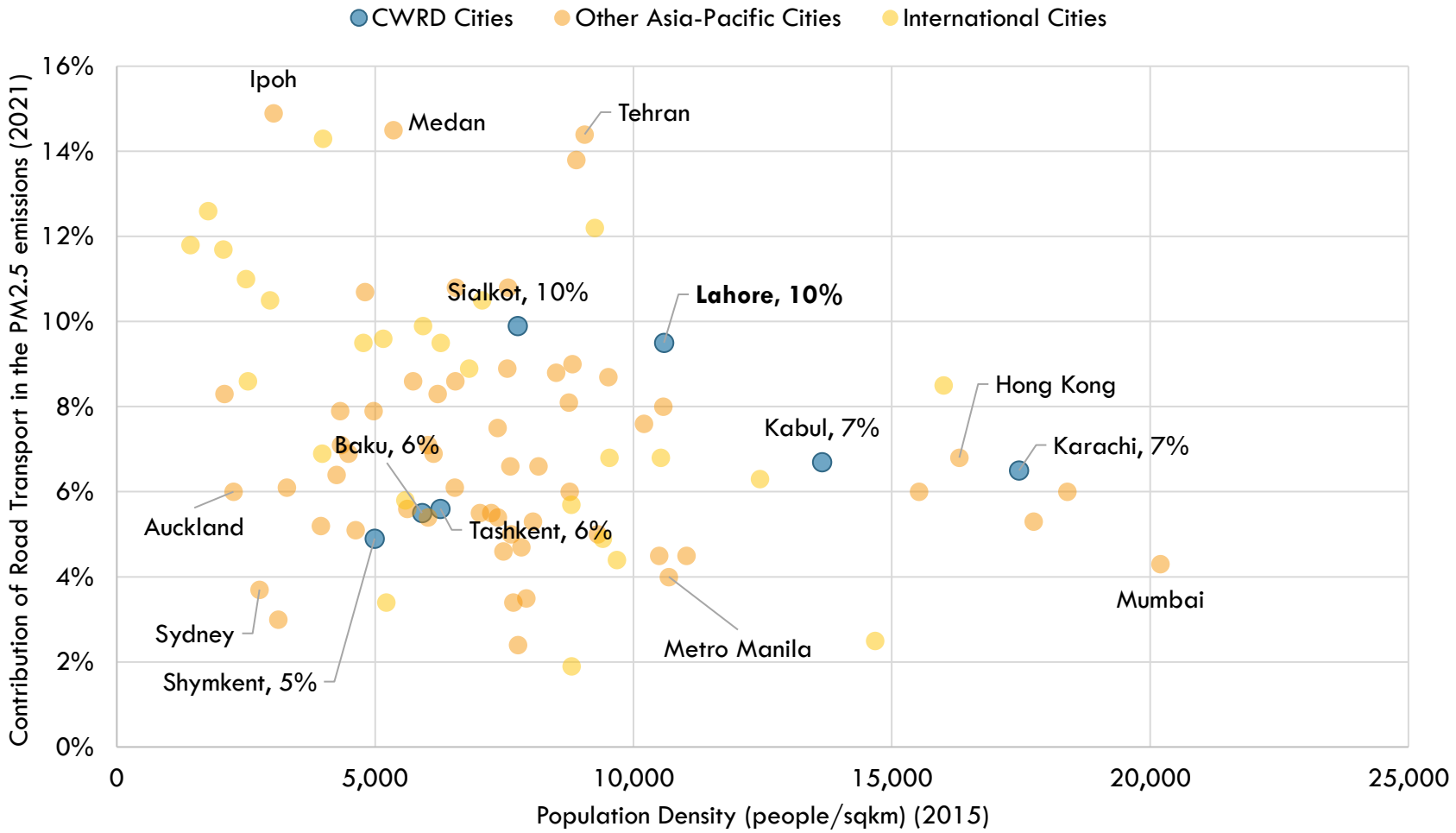
- Lahore ranks high in terms of transport PM2.5 emissions per capita. It is among the top 5 Pakistani cities in the sample with 122 grams / year/ capita level.



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

Road traffic contributes 10% of the estimated PM2.5 emission loading in Lahore

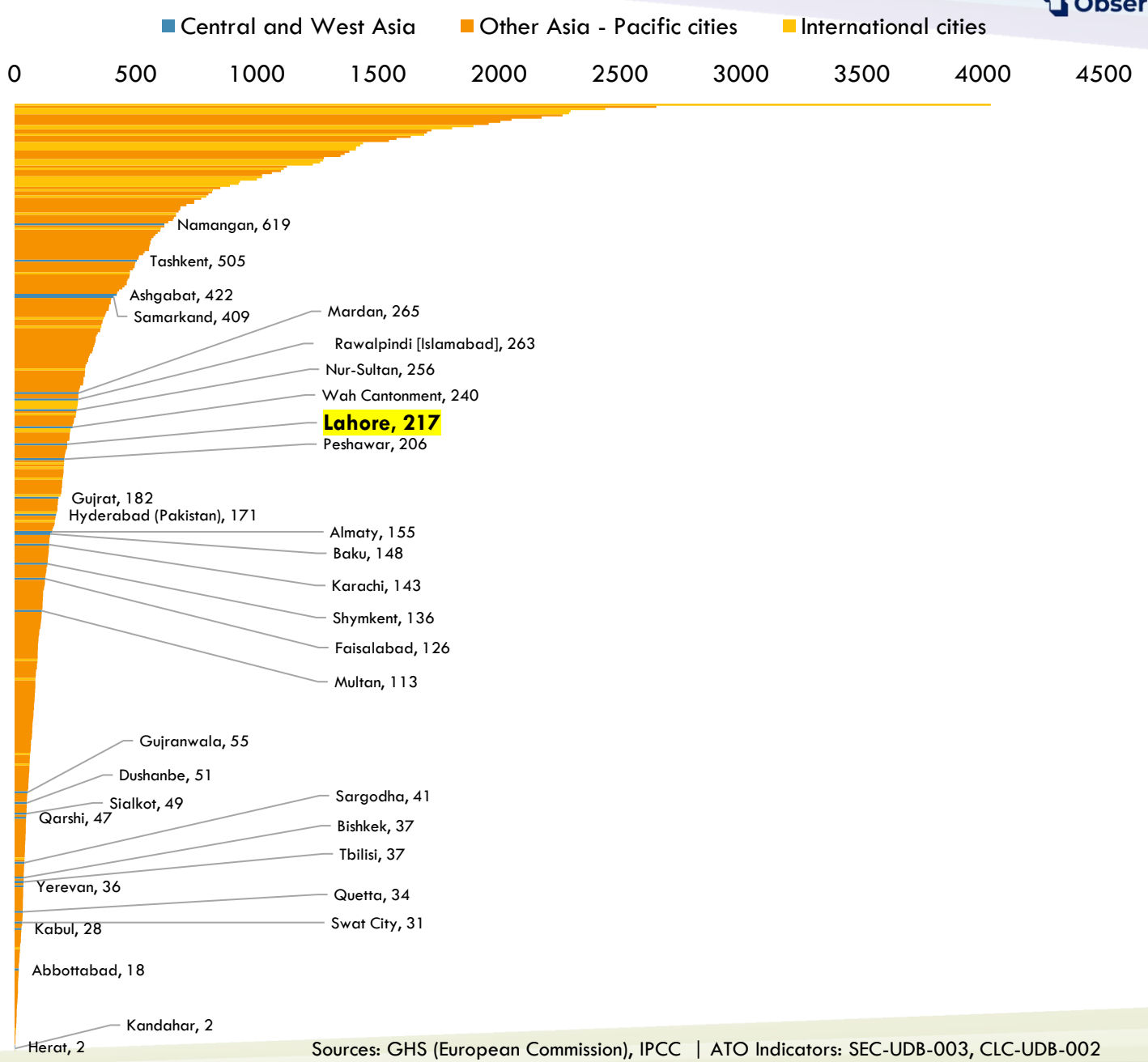
- Road traffic contributes 10% of the estimated PM2.5 emission loading in Lahore.
- In comparison, Karachi is at 7%.



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

Lahore ranks significantly high in Transport CO2 emissions

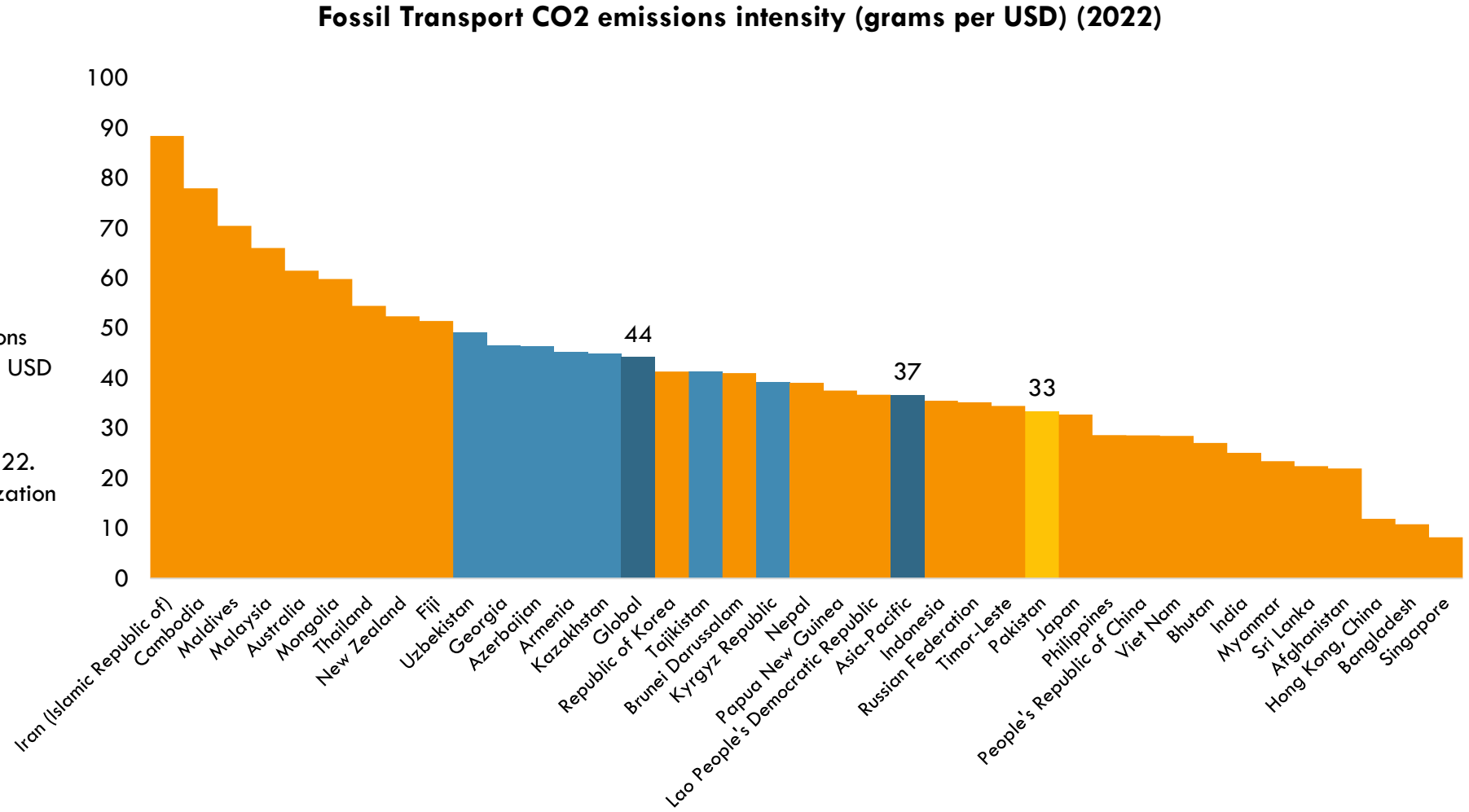
- There have been no recent/ updated data for the transport CO2 emissions per capita for Lahore.
- As of 2000, Lahore emit 217 kgs/ capita per year of transport CO2 compared to Pakistan average of 166 kgs/ capita per year.
- As of 2022, Pakistan averages of 212 kgs of transport CO2 emission per capita per year.



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

Lahore's transport CO2 emissions intensity is significantly higher than Pakistan average

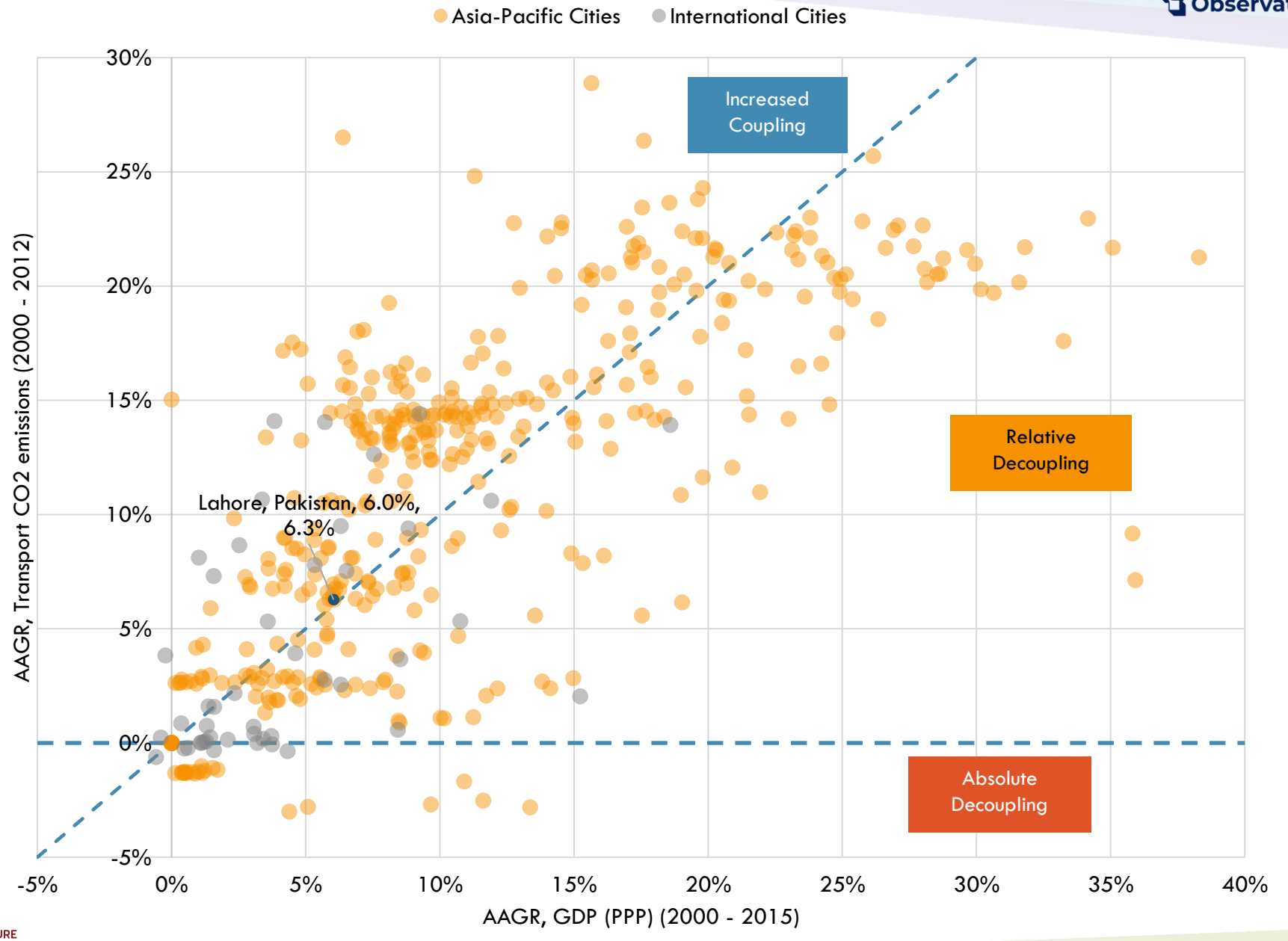
- As of 2012, the transport CO2 emissions intensity for Lahore was 88 grams per USD (Source: GHS – EC).
- Compared to that, Pakistan average number is 33 grams per USD as of 2022.
- This correlates with a high LDV motorization rate in Lahore.



Source: ATO Analysis using the data sourced from EDGAR

Lahore is increasingly coupling transport CO2 emissions with GDP

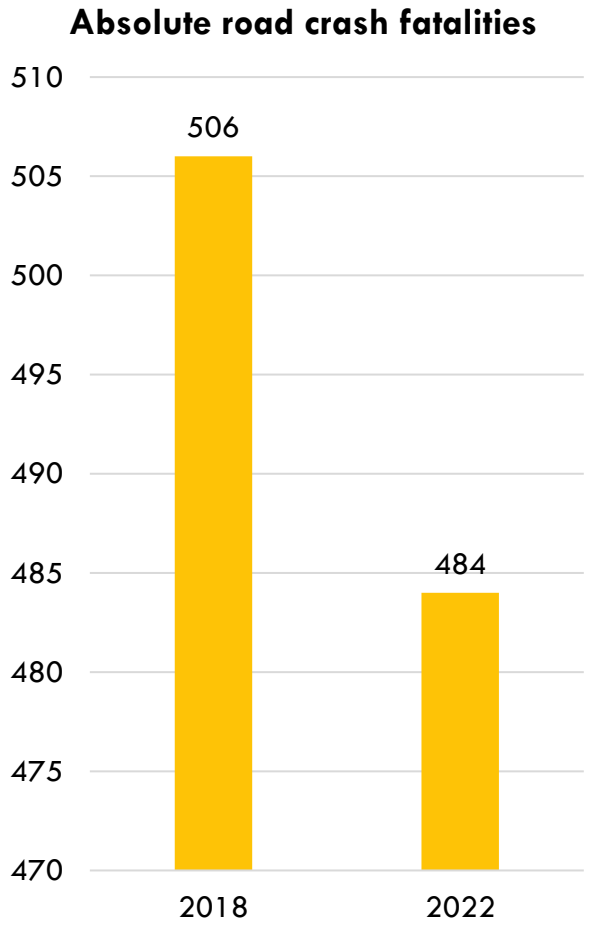
- For Lahore, the AAGR of transport CO2 emissions between 2000 and 2012 is 6.3% whereas the GDP increased by 6.0% during the period 2000 and 2015.
- On the other hand, Pakistan is in the relative decoupling zone with 6% increase in GDP and 2% increase in the transport (fossil) CO2 emissions in the period 2015 to 2022.

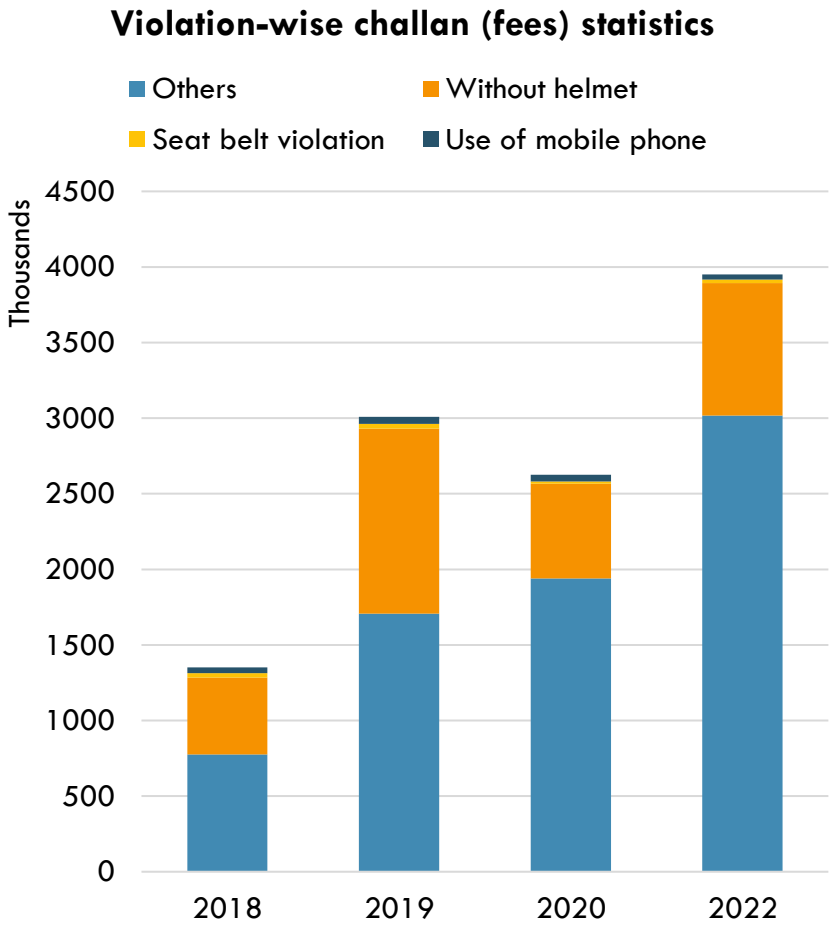


Source: ATO Analysis using the data sourced from GHS – EC

Road traffic deaths in Lahore decreased between 2018 and 2022

- As of 2013, the road traffic death rate accounted for 14.2 fatalities per 100,000 population in the city. (Oke et al. (2019)).
- The absolute road traffic crash fatality has reduced from 506 (2018) (https://ctplahore.gop.pk/system/files/2018.pdf) to 484 (2022) (https://www.dawn.com/news/1757571), about 1% average annual reduction.
- Between 2018 and 2022, helmet violation challans (fees) decreased by approximately 20%. While this may not fully reflect the actual traffic safety situation in the city, it provides a useful proxy. Notably, the total number of violation challans more than doubled during the same period. (https://ctplahore.gop.pk/performance-statistics)
- In 2021, Lahore district recorded 222 fatal accidents and 264 non-fatal accidents, resulting in 265 deaths and 410 injuries (Source: Deputy Inspector-General of Police, Traffic, Punjab, Lahore, Punjab Development Statistics 2022).

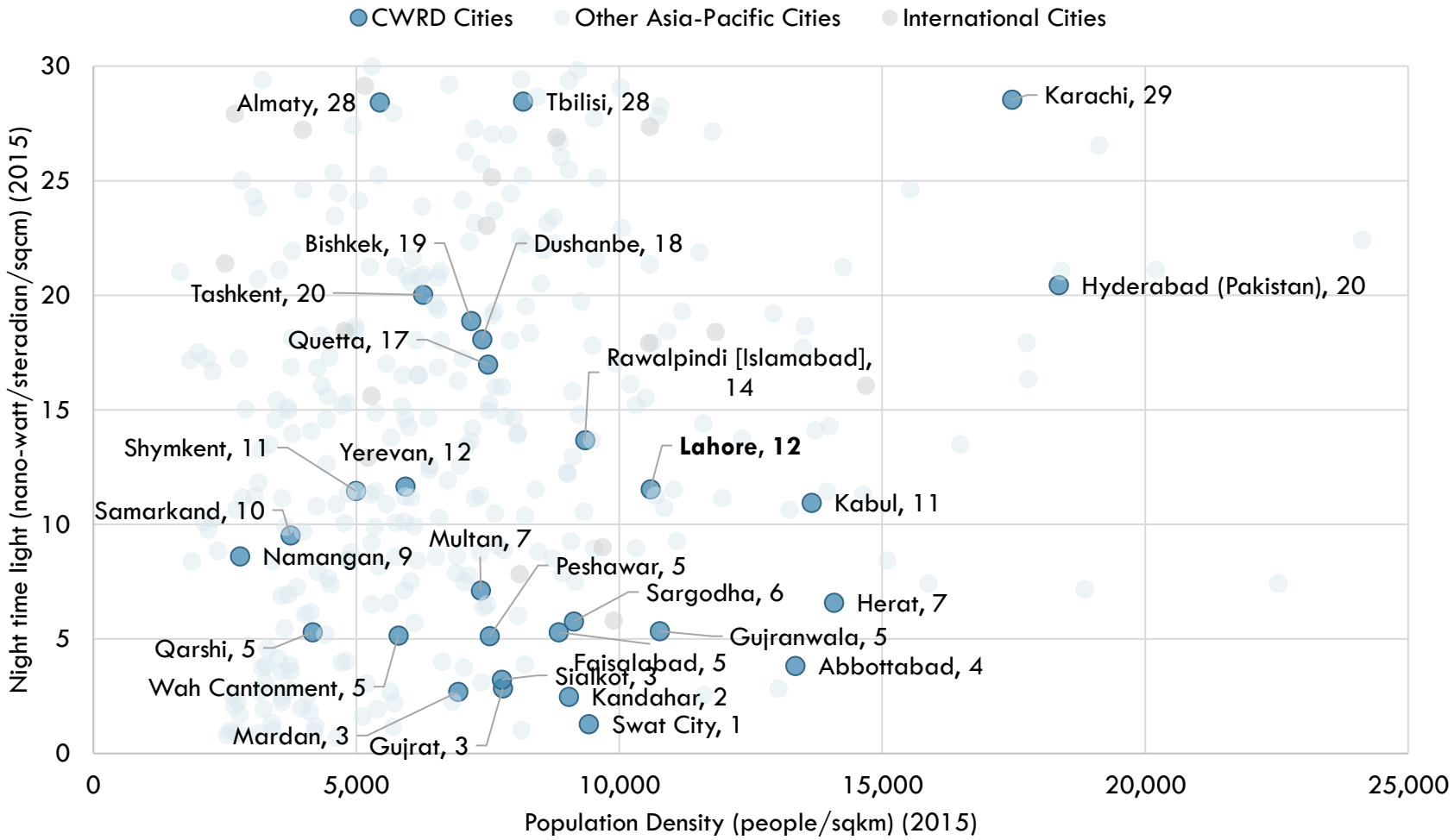




Source: ATO Analysis using the data sourced from https://ctplahore.gop.pk/performance-statistics

Night time light analysis indicates Lahore's urbanization is comparatively loosely 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, Lahore shows a slightly lower level of urbanization concentration (Still in the top 5 Pakistani UCS out of the sample). It can indicate a comparatively looser packing of the population density in the city.



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

Summarizing the transport sector scenario of Lahore

Challenges in Road Infrastructure and Congestion Management: Lahore, Pakistan, faces significant challenges in urban transport infrastructure, with a high population density of 10,600 people per square kilometer and only 0.6 meters of road per capita, below national and regional averages. This shortage increases traffic congestion, limiting mobility and increasing CO2 emissions from private vehicles. The Urban Transport Master Plan predicts a strained road network by 2030, operating at a volume-to-capacity ratio of 0.71, highlighting the urgent need for improved infrastructure.

Expanding Public Transport Accessibility: Lahore's public transport accessibility is limited, with only 31% of the urban population having convenient access. This reliance on private vehicles contributes to increased emissions and congestion. Efforts to expand public transport infrastructure, including BRT and LRT systems, are in early stages, benefiting only 7% of the population. The Urban Transport Master Plan forecasts a 45% rise in public transport demand by 2030, necessitating substantial investments to enhance accessibility and reduce dependency on cars.

Environmental Impacts and Climate Challenges: Lahore's transport sector significantly impacts the environment, with high PM2.5 emissions due to dense vehicle ownership. Current emissions are 122 grams per capita annually, placing Lahore among Pakistan's most polluted cities. Sustainable transport policies are crucial to mitigate climate change effects and improve urban air quality. Addressing these challenges requires transitioning to cleaner transport modes and sustainable urban planning.

Pathways to Sustainable Urban Mobility: Despite challenges, Lahore can improve urban mobility and reduce environmental impacts. The city's high block density supports walkability and transit-oriented development. Future strategies should prioritize enhancing public transport, promoting active transportation, and integrating sustainable mobility practices into urban planning. By seizing these opportunities, Lahore can develop a resilient transport system that enhances mobility, reduces emissions, and enhances quality of life.

Section 2:

Lahore – Policy overview

Lahore's transport policy focuses on infrastructure, public transport, traffic management, and environmental sustainability

- Lahore's transport policies focus on comprehensive transport infrastructure development. It includes development of pedestrian bridges, non-motorized traffic facilities, and a network of pedestrian and bicycle paths. Key initiatives include constructing new parking plazas, park-and-ride facilities, and implementing multiple Bus Rapid Transit (BRT) lines and the Rapid Mass Transit System (RMTS).
- The policy emphasizes traffic management and safety through intelligent transportation systems, improved junctions, traffic enforcement, and safety education. Public transport enhancements feature multimodal bus terminals and upgraded bus stands, while road network expansion includes remodeling major roads and building new flyovers and bridges. Institutional and financial measures involve establishing new organizations and an Urban Transport Fund (UTF) to support projects.
- Environmental initiatives focus on reducing emissions and improving vehicle standards, supported by regulatory measures for public transport and vehicle licensing. Future plans highlight metro train system expansions and strategic road projects to address the city's growing urban and traffic demands.

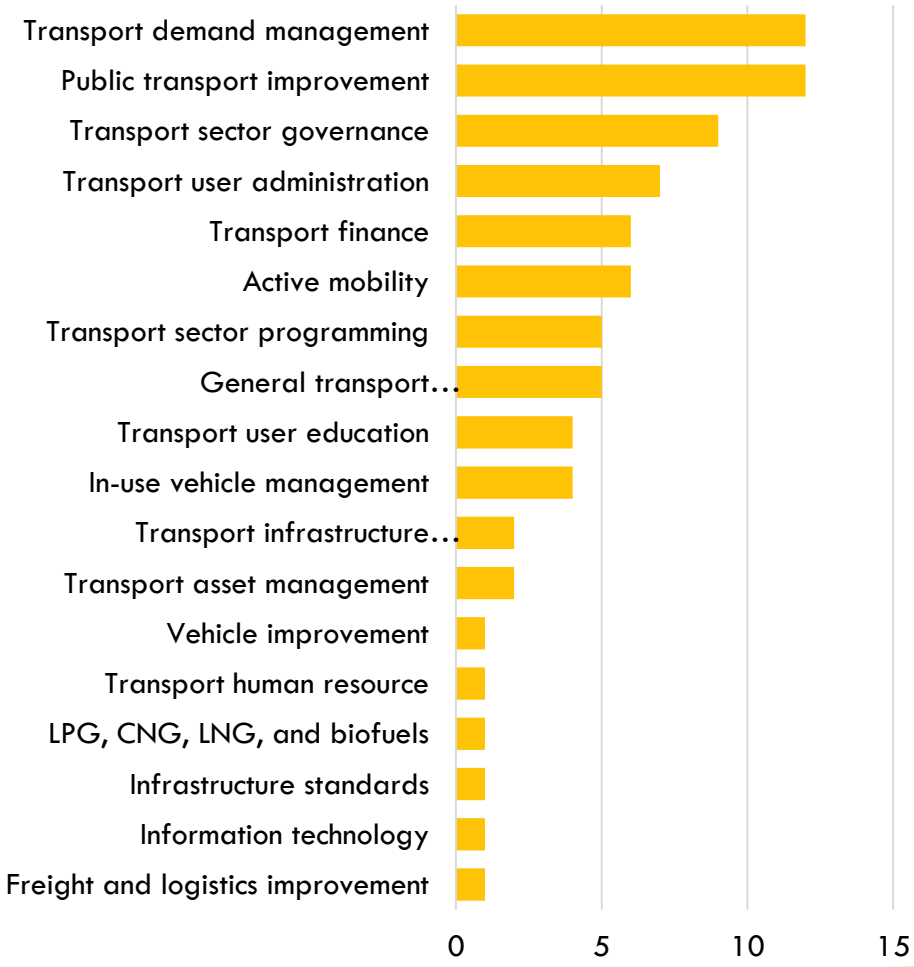
Document Name	Year Published	Document Type
Lahore Master Plan 2021	2004	Urban Development Policy
Lahore Urban Transport Master Plan	2012	Urban Transport Policy
Punjab Ring Road Authority Act 2011	2011	Transport Laws/ Regulations
Lahore Development Authority Act 1975	1975	Transport Laws/ Regulations
Transport Department Future Plans	n.d.	Other Transport-related Urban Policy
The Provincial Motor Vehicles Ordinance 1965	1965	Transport Laws/ Regulations
Punjab Motor Vehicle Rule 1969	1969	Transport Laws/ Regulations
The Punjab Mass transit Authority Act 2015	2015	Transport Laws/ Regulations
Pakistan : Preparing the Lahore Rapid Mass Transit System Project	2008	Others

Policy overview indicates prioritization of transport demand management related measures

Key measures:

- **Infrastructure Development:** Construction of multiple pedestrian bridges and non-motorized traffic facilities. Establishment of pedestrian and bicycle path networks across the city. Development of new parking plazas and park-and-ride facilities. Implementation of various Bus Rapid Transit (BRT) lines and Rapid Mass Transit System (RMTS) lines.
- **Traffic Management and Safety:** Traffic calming measures and intelligent transportation system development. Improvement of junctions, traffic circulation systems, and area traffic management. Strengthening traffic enforcement and traffic safety education. Introduction of a Vehicle Inspection and Certification System (VICS) and conversion of rickshaws to CNG.
- **Public Transport and Terminals**: Development of public and freight transport terminals. Establishment of multimodal inter-city bus terminals and bus terminals at Shahdara. Upgradation of bus stands and integration of bus operations.
- **Road Network Expansion and Improvement**: Remodeling and construction of various roads across Lahore to improve connectivity and circulation. Construction of flyovers, bridges, and extension of major roads like Lahore Ring Road and Southern Bypass.
- **Institutional and Financial Measures**: Creation of new organizations like Lahore Transport Development Company (LTDC) and Punjab Urban Transportation Planning and Engineering Institute (PUTPEI).Establishment of a Transport Management Board (TMB) and Lahore Urban Transport Advisory Council (LUTAC).Development of an Urban Transport Fund (UTF) to finance transport infrastructure projects.
- **Environmental and Technological Initiatives**: Implementation of measures to reduce emissions and improve vehicle standards. Introduction of environmentally efficient modes of transport and vehicle inspection regimes. Integration of environmental impact assessments into transport and road building activities.
- **Policy and Regulatory Framework**: Introduction of regulatory measures for public transport operations and vehicle licensing. Implementation of traffic regulations, fare controls, and development of a comprehensive traffic management safety program.
- **Future Plans and Projects**: Expansion of metro train systems, including the Lahore Orange Line Metro Train Project. Development of secondary road networks and strategic road projects.

Distribution of measures



Recorded policy measures

Active transport infrastructure expansion	General active mobility	Cycling/ Bike Lanes	Traffic calming	General urban freight consolidation centres	General infrastructure improvements	Passenger Transit hub
Intelligent transport systems	Technical standards for general transport infrastructure	Vehicle Inspection and maintenance	LPG/CNG/LNG	BRT	Public transit integration	Urban passenger rail infrastructure improvement
Enhanced bus networks	General transport asset management	General parking measures	General transport demand management	Energy efficient vehicle (non EV) fiscal incentives	Traffic flow improvement	Traffic signaling
General transport finance	Road infrastructure expansion	General enforcement	Management Authority general	General Parking administration	General transport planning	General education and behavior change
General Training and workshops	Peak time traffic management	General road safety	Road geometry improvement	Vehicle scrappage scheme/ centres	Budget/ identification of public transport projects	Express lanes / public transport priority
Public transport pricing	Fuel tax	Road charging and tolls	General reference to finance mechanisms in the urban area	Public Private Partnership (PPP)	General capacity building	Coordinate planning across government agencies
Integration of urban and transport planning	Ecodriving	Development of other transport-related plan/ policy	Passenger and freight load limits	General vehicle improvements	General driving permits	Speed restrictions/ limits
		Motorcycle helmet law	Seatbelt law	General Public transport administration		

<u>Active transport infrastructure expansion</u>

Construction of Pedestrian Bridges

(Lahore Urban Transport Master Plan)

<u>Energy efficient vehicle (non EV) fiscal incentives</u>

Providing incentives in the shape of tax structure for environmentally efficient mode, vehicle size and fuel type

(Lahore Urban Transport Master Plan)

<u>LPG/CNG/LNG</u>

Conversion of Two Stroke Rickshaw into CNG Fitted Four

Stroke Rickshaw

(Lahore Urban Transport Master Plan)

<u>Vehicle Inspection and maintenance</u>

Expansion of Vehicle Inspection and Certification System to private vehicles

(Transport Department Future Plans)

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