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BAQ 2023
BETTER AIR QUALITY CONFERENCE
15-17 NOV • MANILA

2023 Air Quality in Asia Status and Trends

KEY FINDINGS

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The Air Quality in Asia: Status and Trends

- flagship publication of Clean Air Asia which aims to provide stakeholders with an overview of the status of air pollution in Asian cities and the **air quality management approach and needs of governments.**

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Air Quality in Asia: Status and Trends

The need for *solutions* based on government data

- Policy development and improvement require as much data, but governments are also keen on the use of official information especially in air quality assessments which can have legal implications
- Some *challenges* in the use of existing databases:
  - Non-uniform methods (instrumentation, approach, estimations) and reporting
  - Use of unofficial data which may be uncorrected (if sensor-based) or unverified at the government level
  - If based on satellite/remote-sensing data, data resolution may be too low for smaller cites/countries
  - No context provided on the monitoring locations – direct comparisons are made

Scope of the study

- Use of only official government data from accessible official websites, reports, statistics compilation
- The study covers
  - Data from 2011 to 2018 from previous Clean Air Asia databases, updated up to 2022 (collected as of October 2023)
  - $PM_{2.5}$,PM_{10}, SO_2, NO_2, CO and O_3 data officially reported by government agencies and documents per monitoring site, or per city/state/province depending on availability
  - 49 countries and more than 800 from 4 sub-regions in Asia (Central & West, East, South, Southeast)

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Air Quality in Asia: Status and Trends

Study limitations

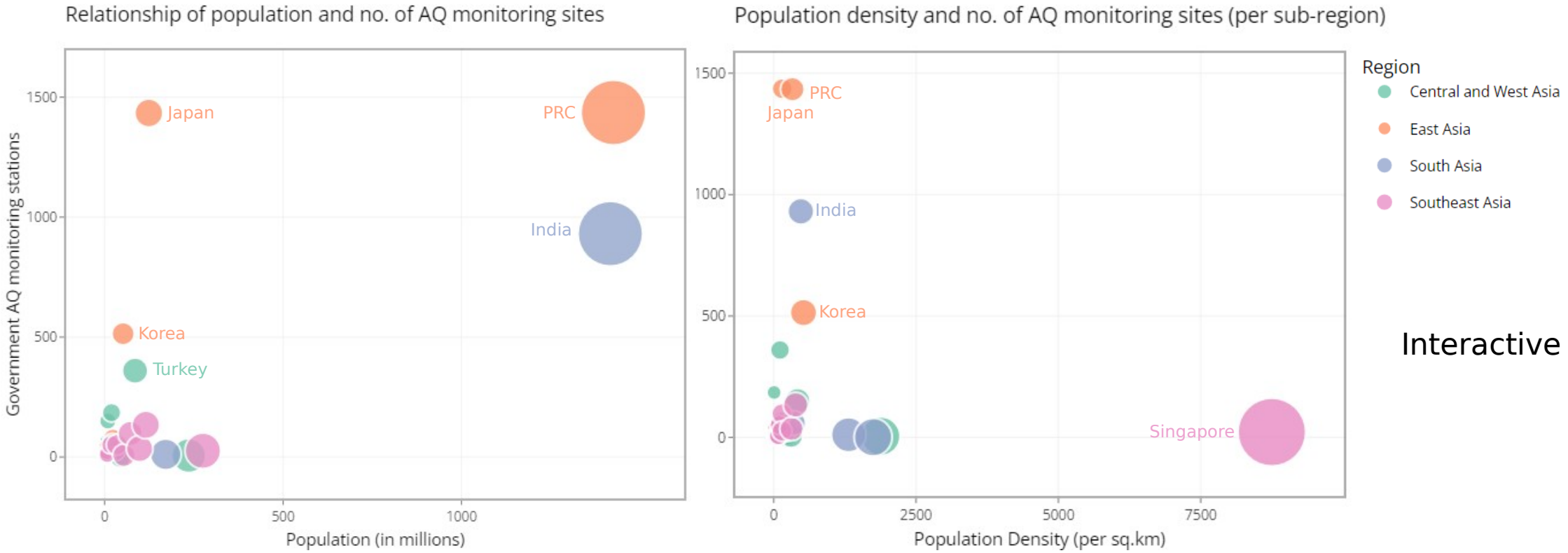
- The study only provides an analysis of accessible government data, limited by the following:
  - Variation in the type and extent of data shared publicly across different platforms
  - Challenges in translating data from local language
    (i.e., limited data obtained from ROK and Japan, and several West and Central Asian countries)
  - Variation in the definition of ‘cities’ and some pollutants (e.g., PM_{10} is ‘SPM’, $PM_{2.5}$ as ‘fine dust’)

- Some countries are excluded in analyses which involve annual PM mass concentrations
  - There are countries which only provide data on air quality index (AQI), air pollution index (API) or pollutant standards index (PSI)
  - Some websites only display real-time data, no historical data can be downloaded
  - Some air quality reports only show data in graph/plot form, with no numerical values

Invitation to contribute to the study

- To further increase coverage of the report, we encourage submission or sharing of official government data. Kindly email aqccmanila@cleanairasia.org.

What is the extent of air quality monitoring in Asian countries per sub-region?

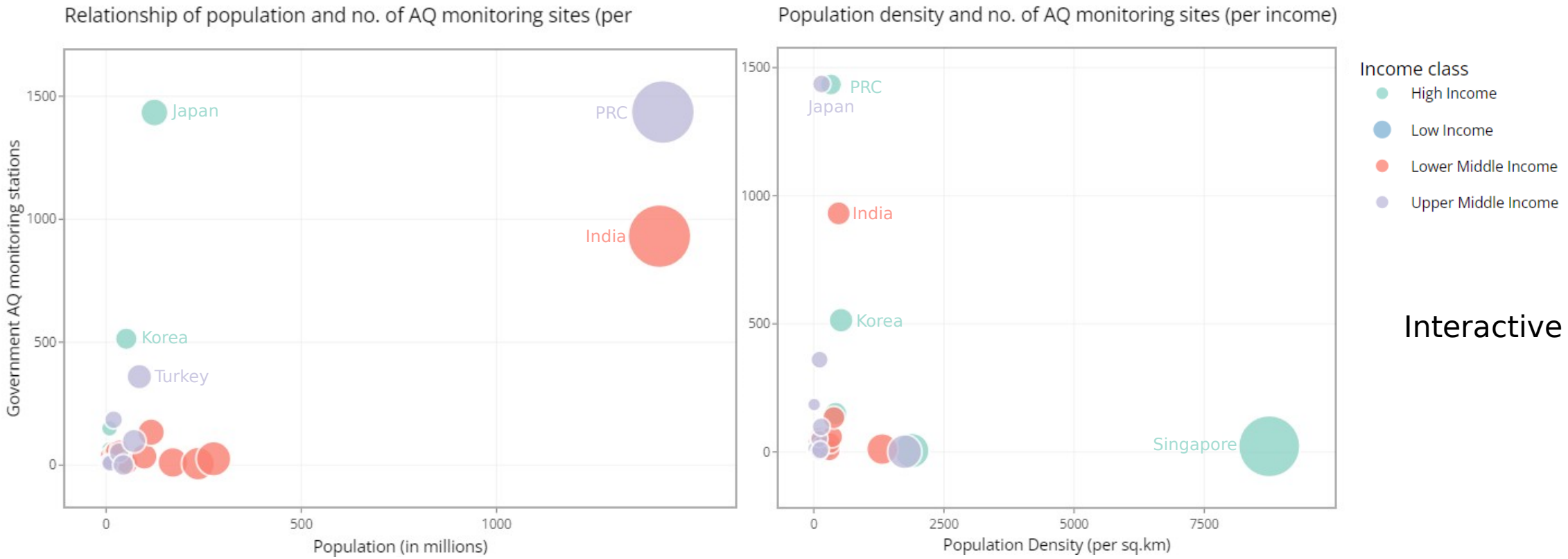


Interactive plots:

Government AQ monitoring sites in Southeast and South Asia (except India) are less in number relative to population and population density compared to East and Central and West Asia.

**with publicly accessible and usable official government data*

What is the extent of air quality monitoring in Asian countries per income class?



Interactive plots:

Lower middle-income countries with high populations have lower number of AQ monitoring sites, compared to other income classes.

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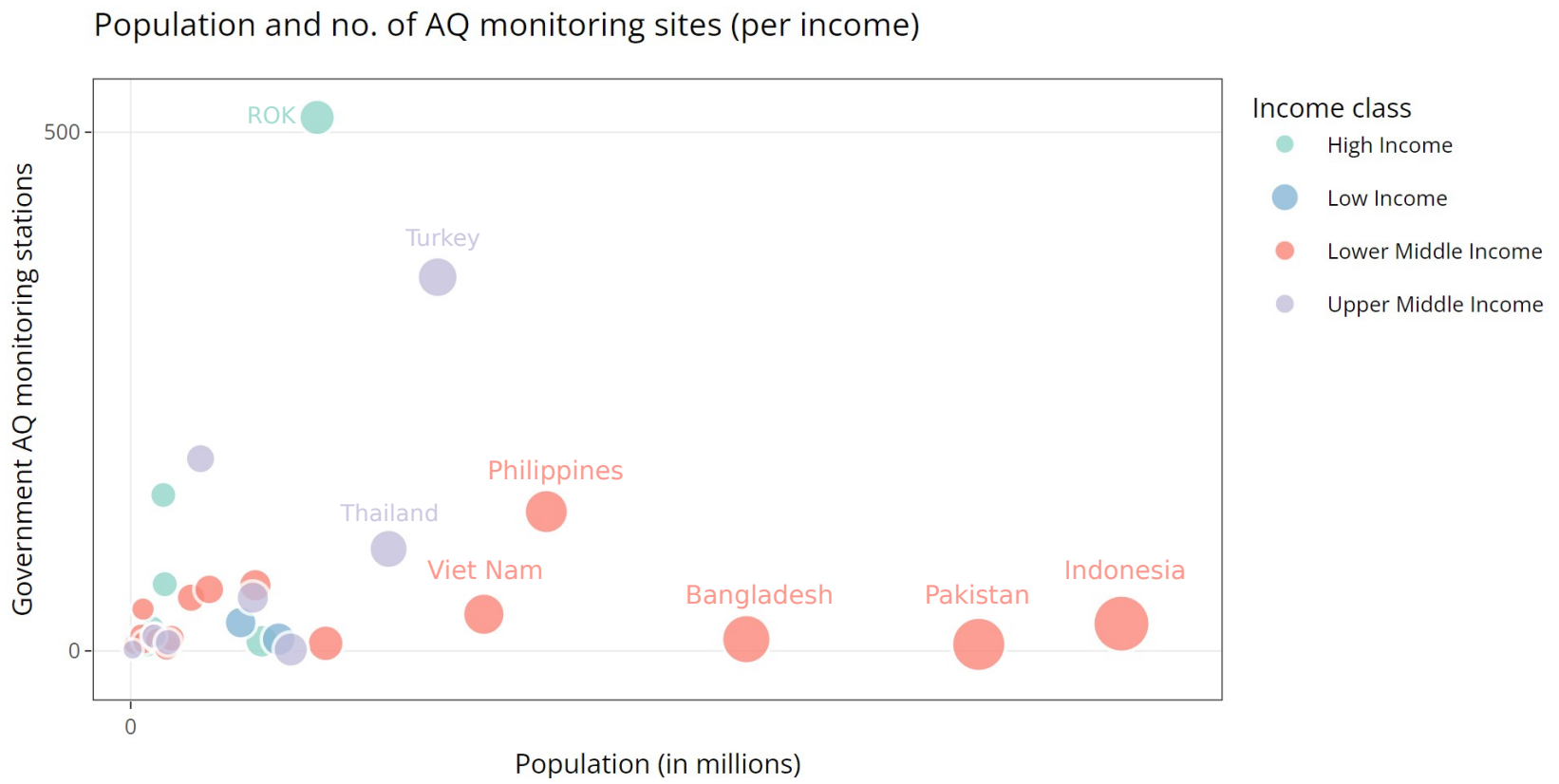
What is the extent of air quality monitoring in Asian countries per income class?

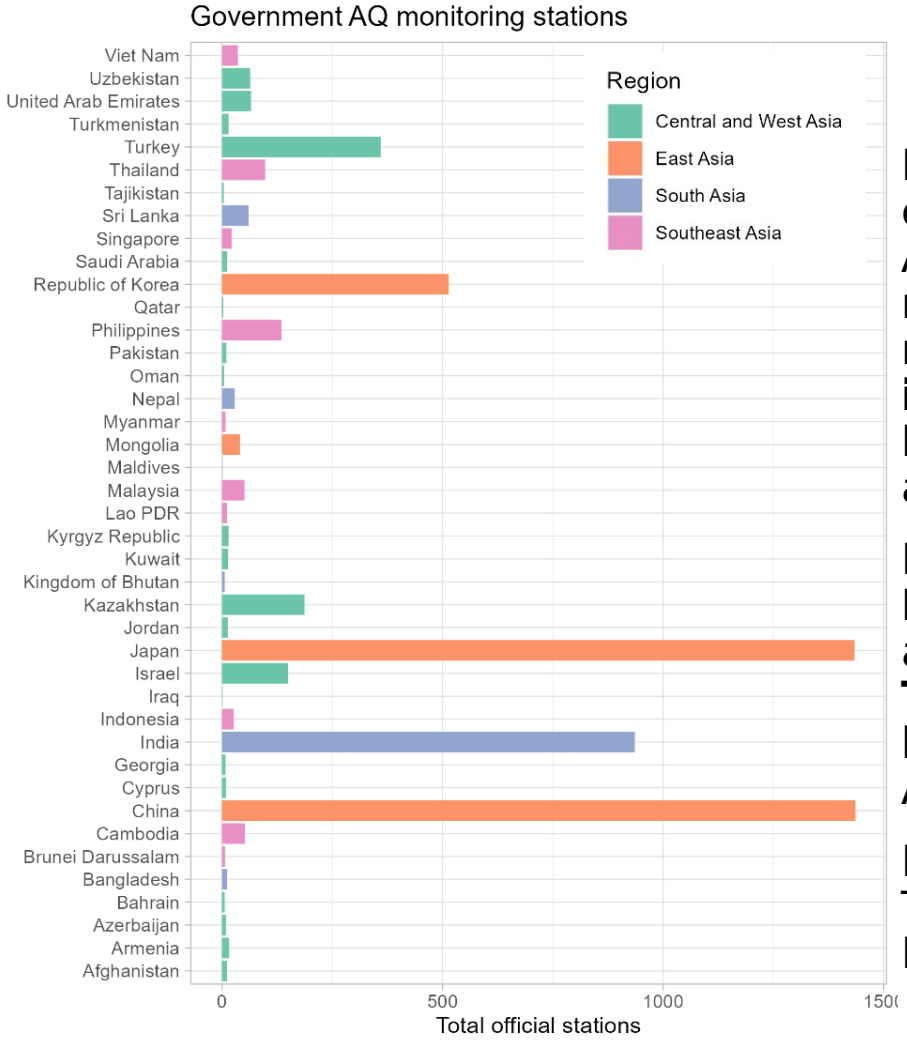
*without PRC, India, Japan



Lower middle-income countries with high populations have lower number of AQ monitoring sites, compared to other income classes.

*with publicly accessible and usable official government data

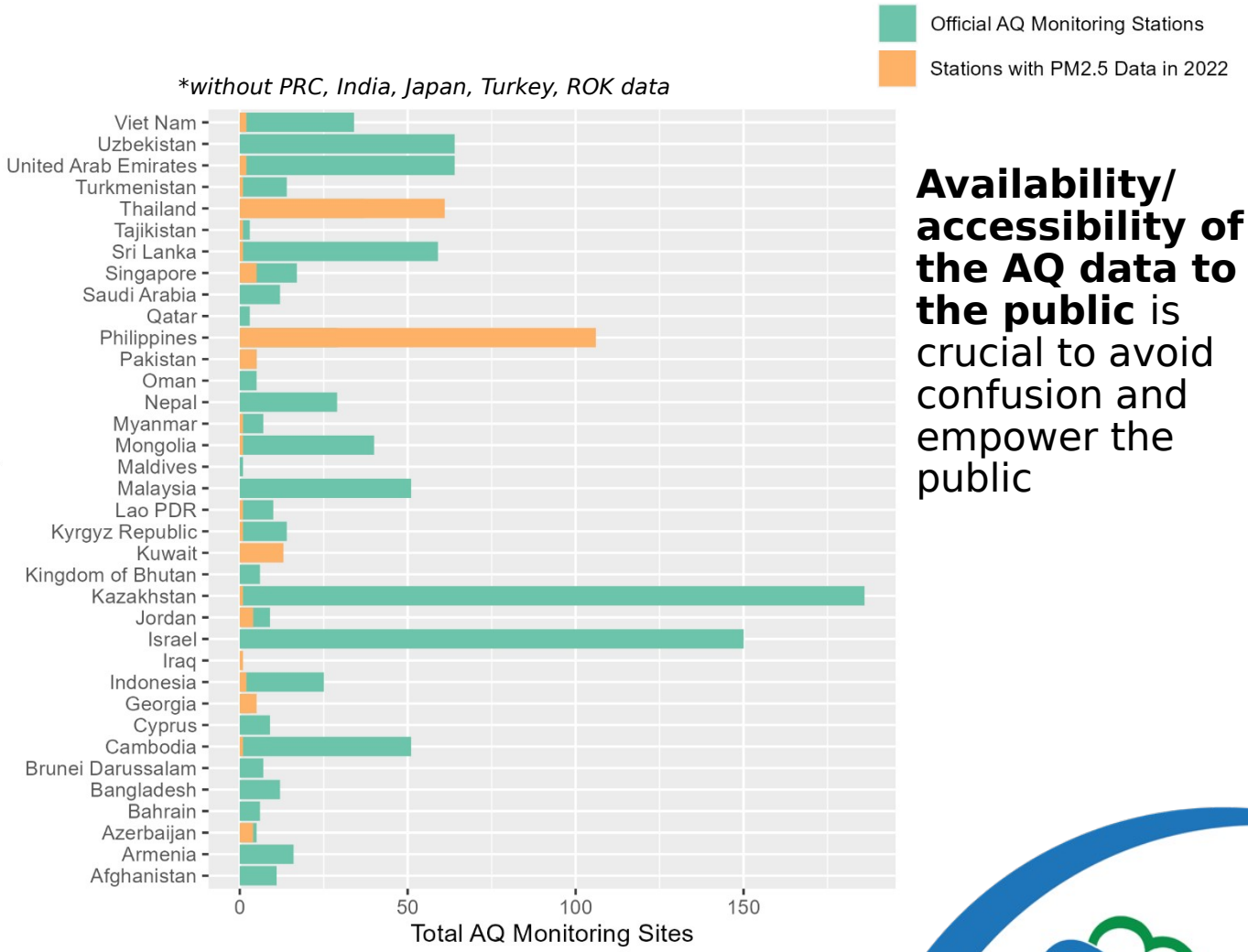
What is the total extent of AQ monitoring stations and accessibility of AQ data in Asia?



Most extensive AQ monitoring networks are **in Japan, PRC, India** and **ROK**

In SEA, **Philippines** and **Thailand** have most AQ stations.

In CW Asia, Turkey and Kazakhstan.



Availability/ accessibility of the AQ data to the public is crucial to avoid confusion and empower the public

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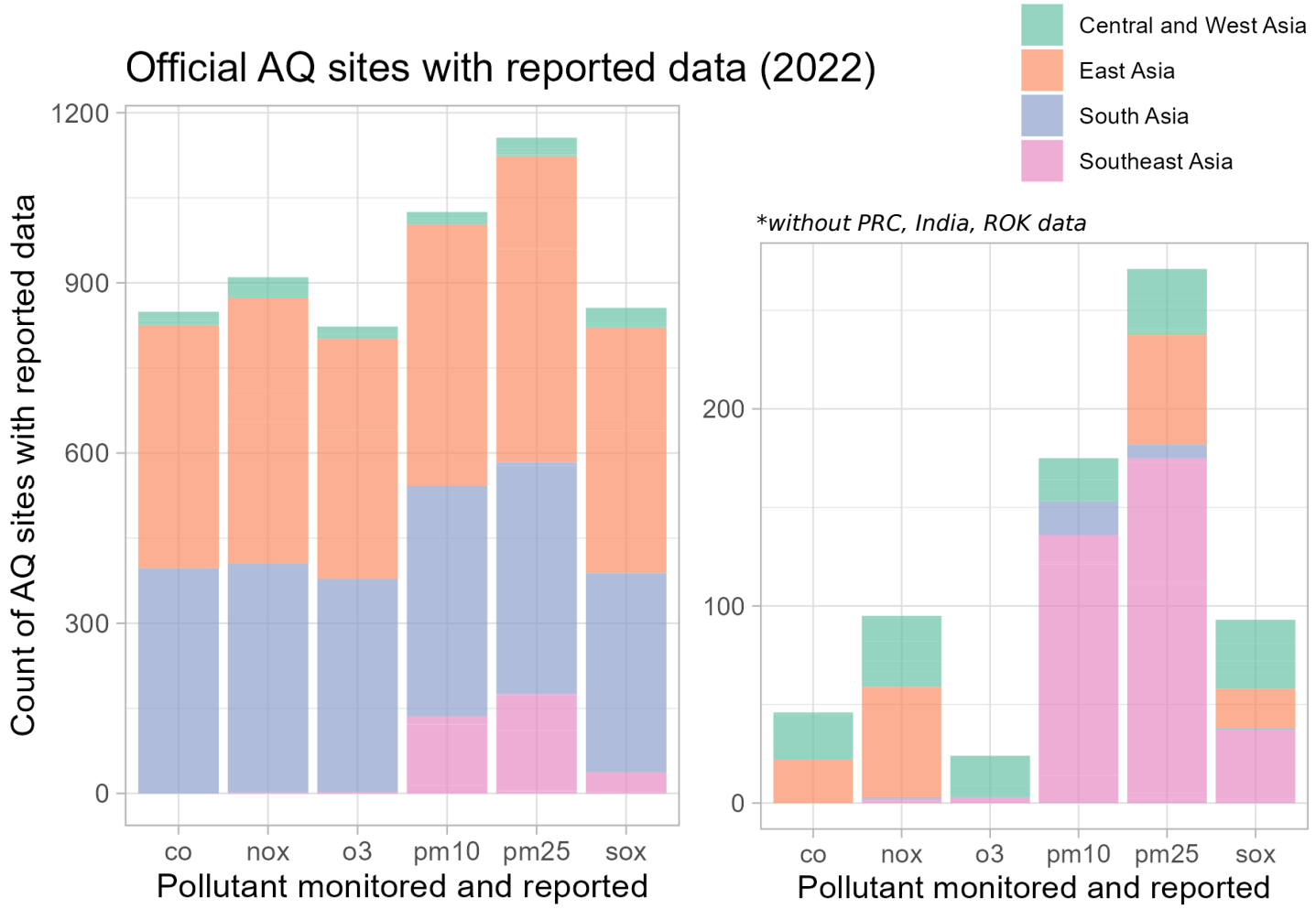
What air pollutants are monitored by Asian governments?



The impacts of air pollution vary in extent depending on the type of pollutant. **It is important to monitor and report as many criteria air pollutants, especially those with higher health impacts** (e.g., ultrafine particles, black carbon (BC)).

This is also aligned with the WHO 2021 AQGs guidance.

SEA countries must also increase monitoring and reporting of gases, especially **ozone (O_3)** which can directly impact health.

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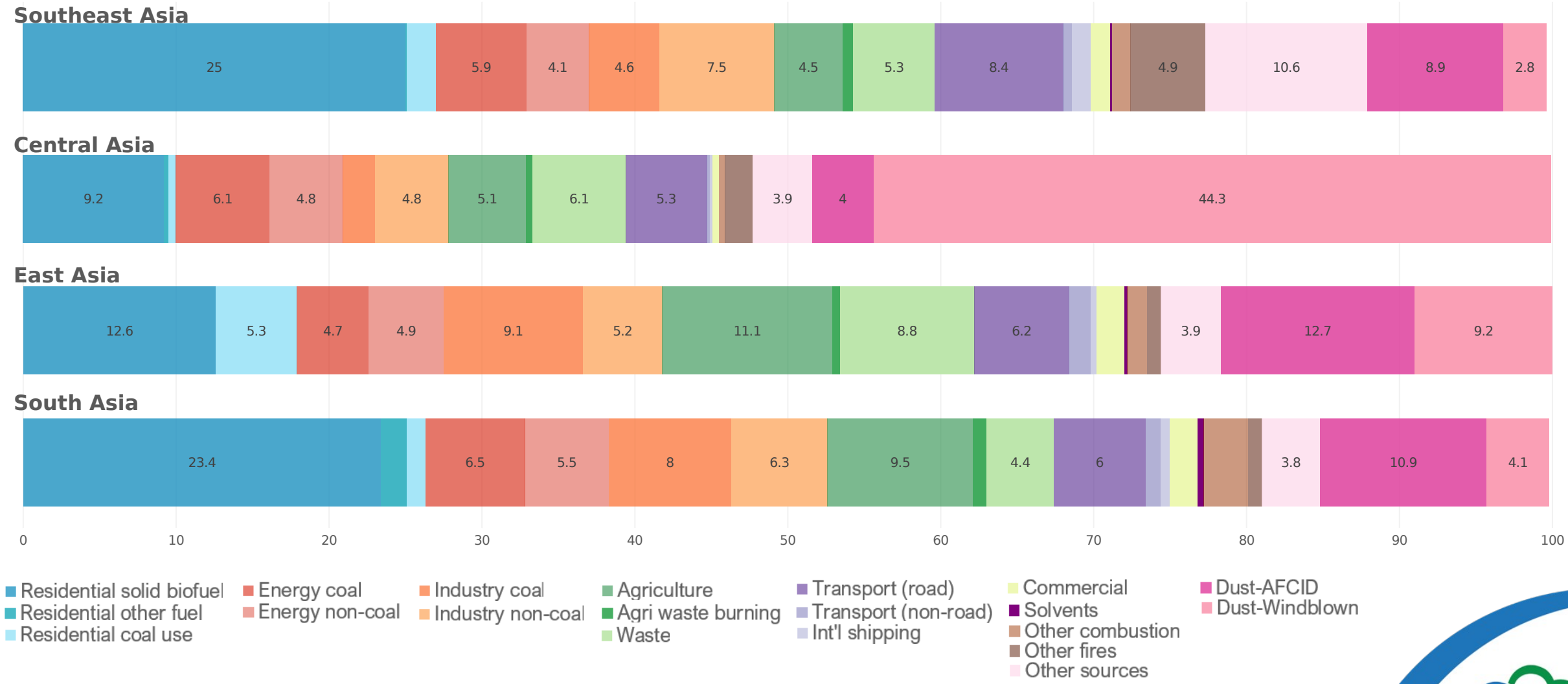
Source sector contribution to ambient $PM_{2.5}$ in Asia



*AFCID means anthropogenic fugitive, combustion, and industrial dust

McDuffie E. et al. (2021). Fine Particulate Matter and Global Health: Fuel and Sector Contributions to Ambient PM2.5 and its Disease Burden Across Multiple Scales. Nature Communications, 2021
http://dx.doi.org/10.1038/s41467-021-22853-x

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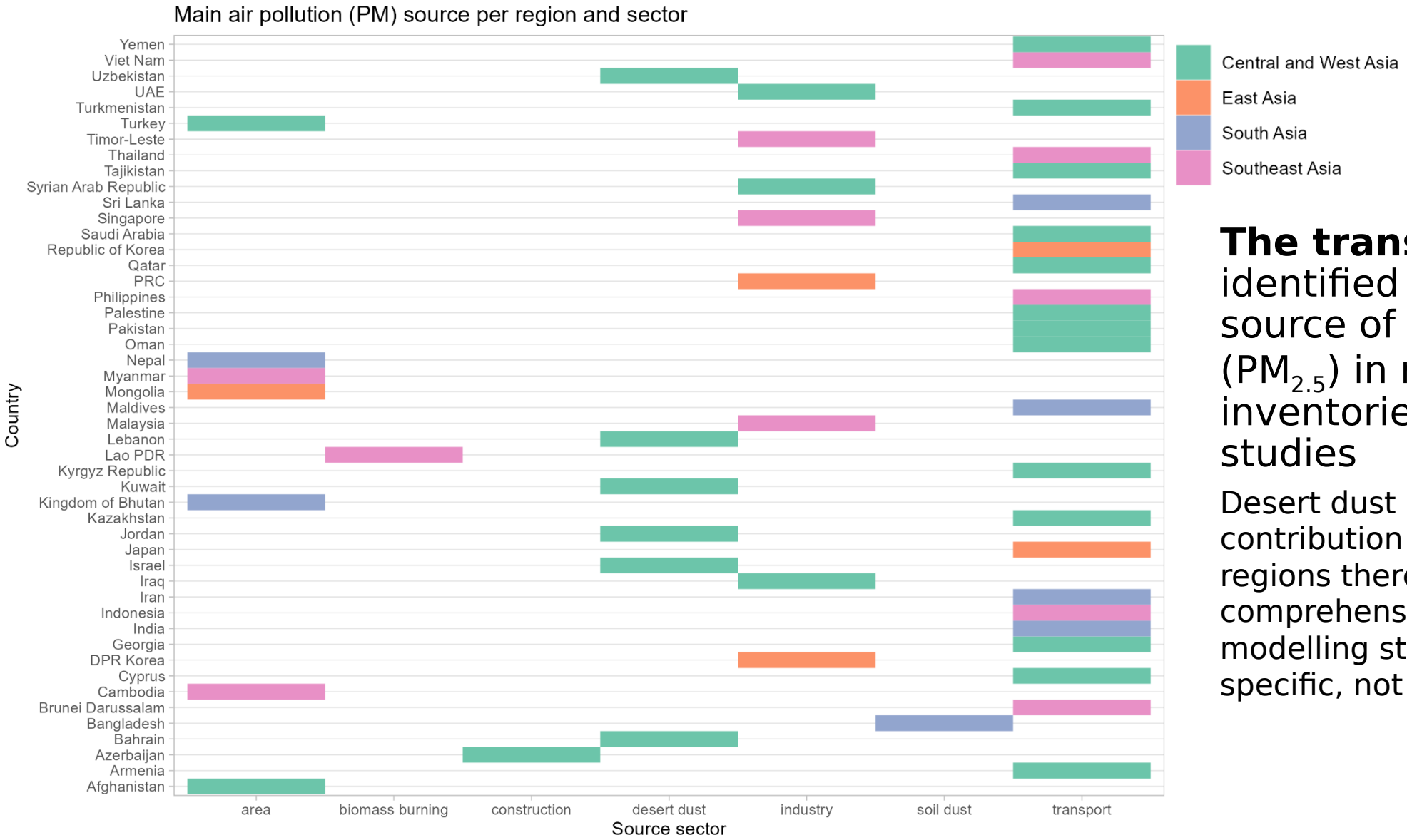
Main contributors in local emission inventories



The transport sector is identified as the top source of air pollution ($PM_{2.5}$) in most national inventories and local studies

Desert dust plays a key contribution in CW Asia; For all regions there is a need for more comprehensive EIs, SAs, modelling studies that are city-specific, not just national.

**Data based on official national air pollution inventories and published journals*

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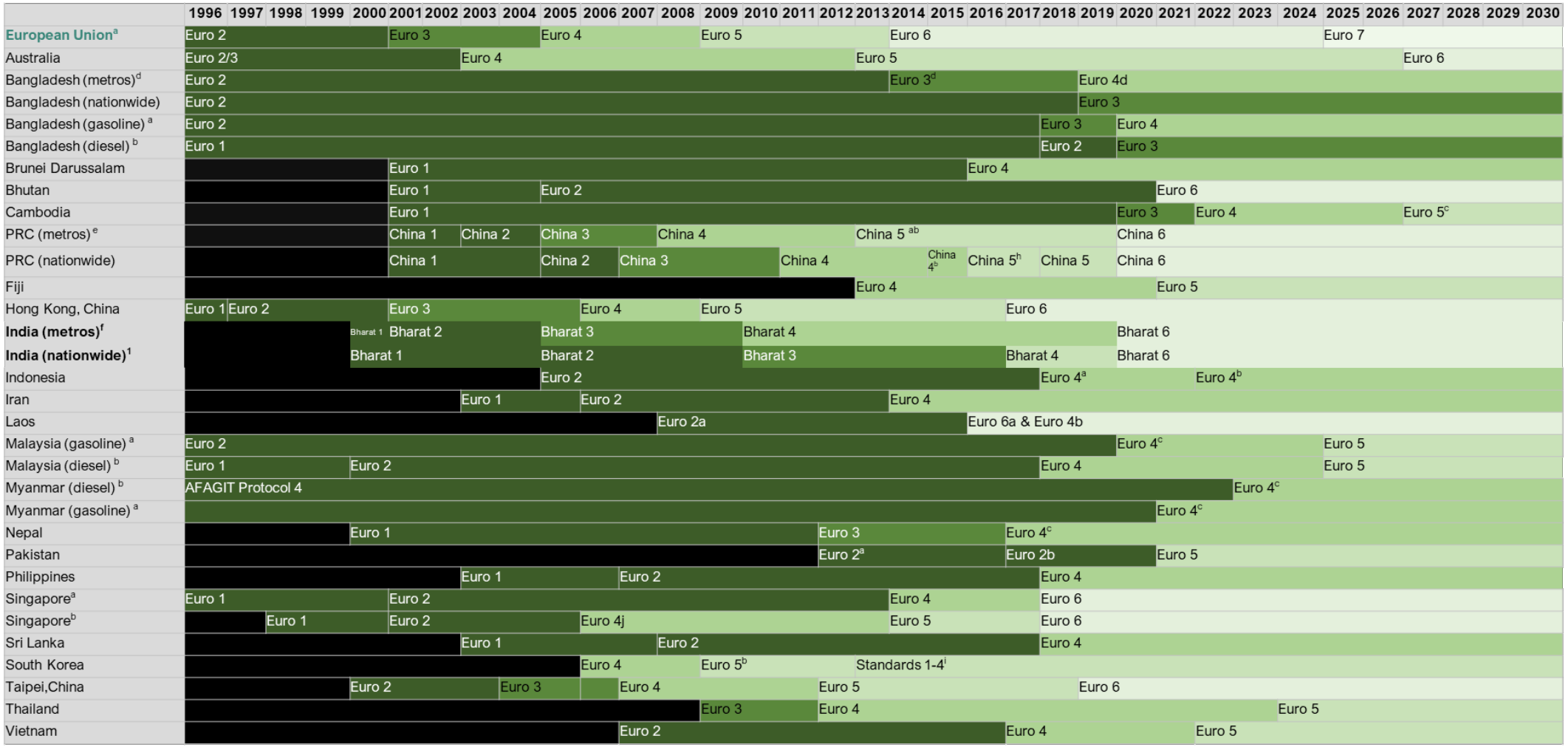
Status of vehicle emission standards in Asia



Bhutan, PRC, and **Singapore** have pioneered in adopting more stringent vehicle emissions standards, while **majority of SEA nations have adopted at least Euro 4** since 2018.

*Source: Clean Air Asia. March 2021. Emission Standards for New Light-Duty Vehicle **
The level of adoption vary by country but most are based on the Euro emission standard

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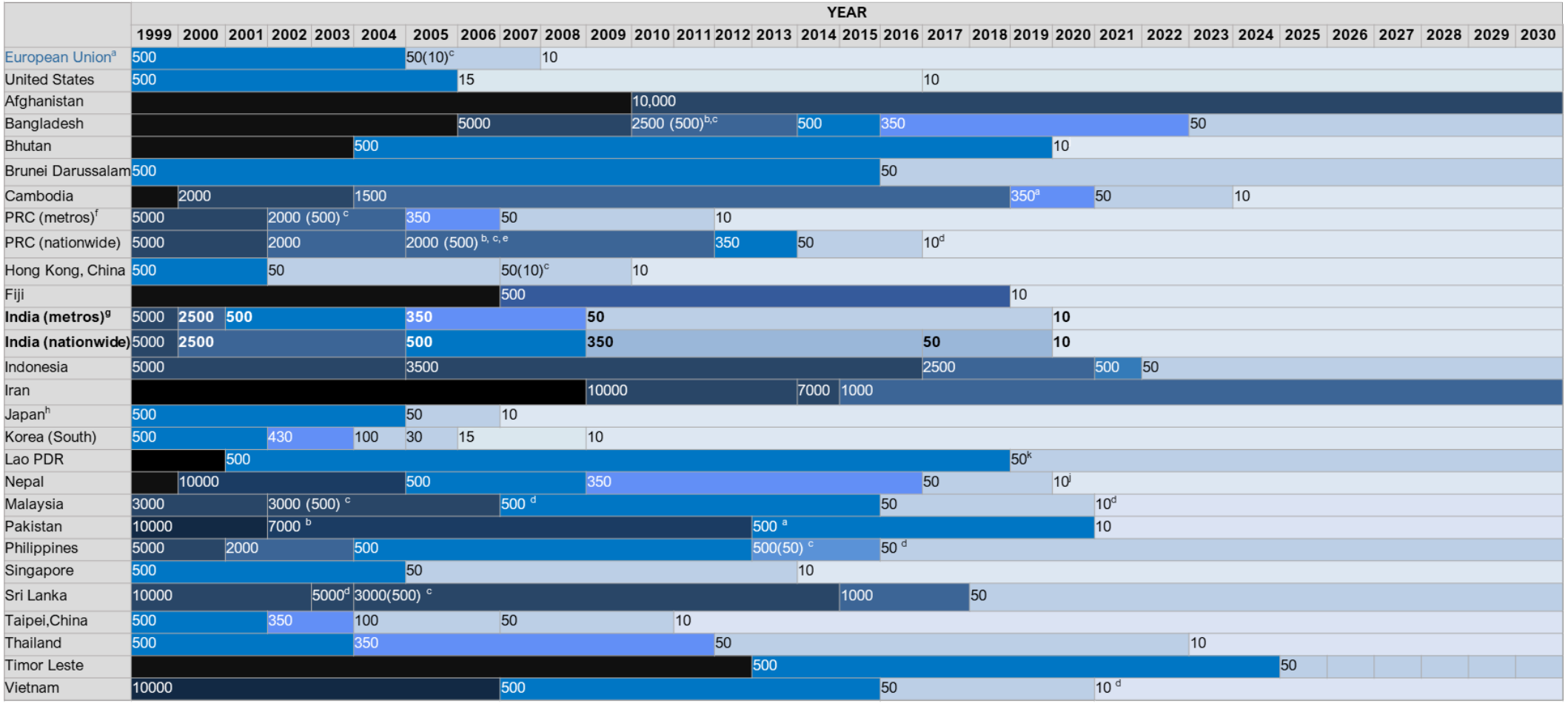
Status of fuel standards in Asia



Compliance with stringent emission standards require lower sulfur (S) content of fuels.

Most countries are implementing max of 10 ppm S content by 2020 onwards.

Source: Clean Air Asia. October 2021. Current and Proposed Sulfur levels in Diesel in Asia, EU and USA

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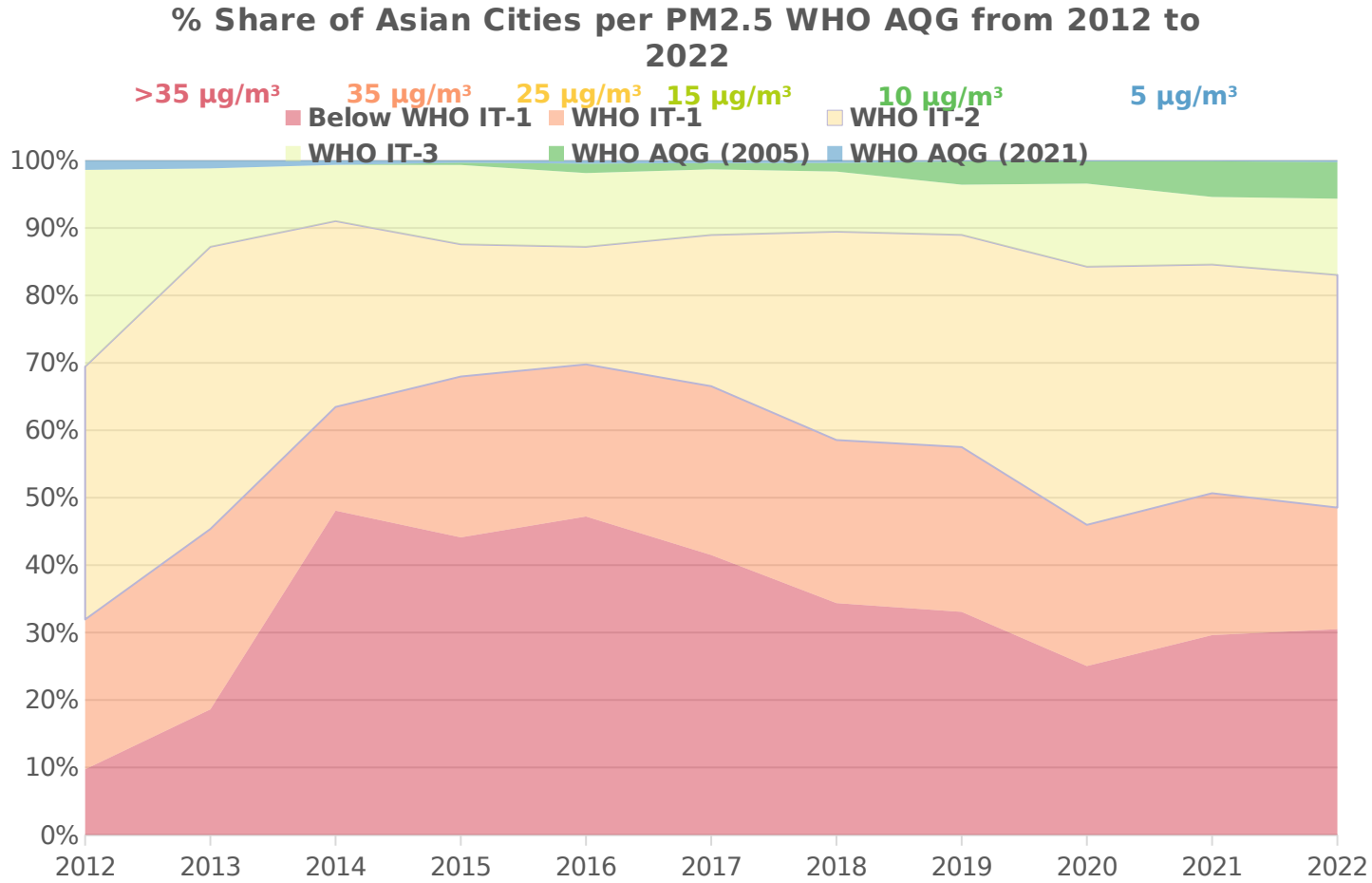
The share of cities with better $PM_{2.5}$ WHO AQG levels increased, but still requires action



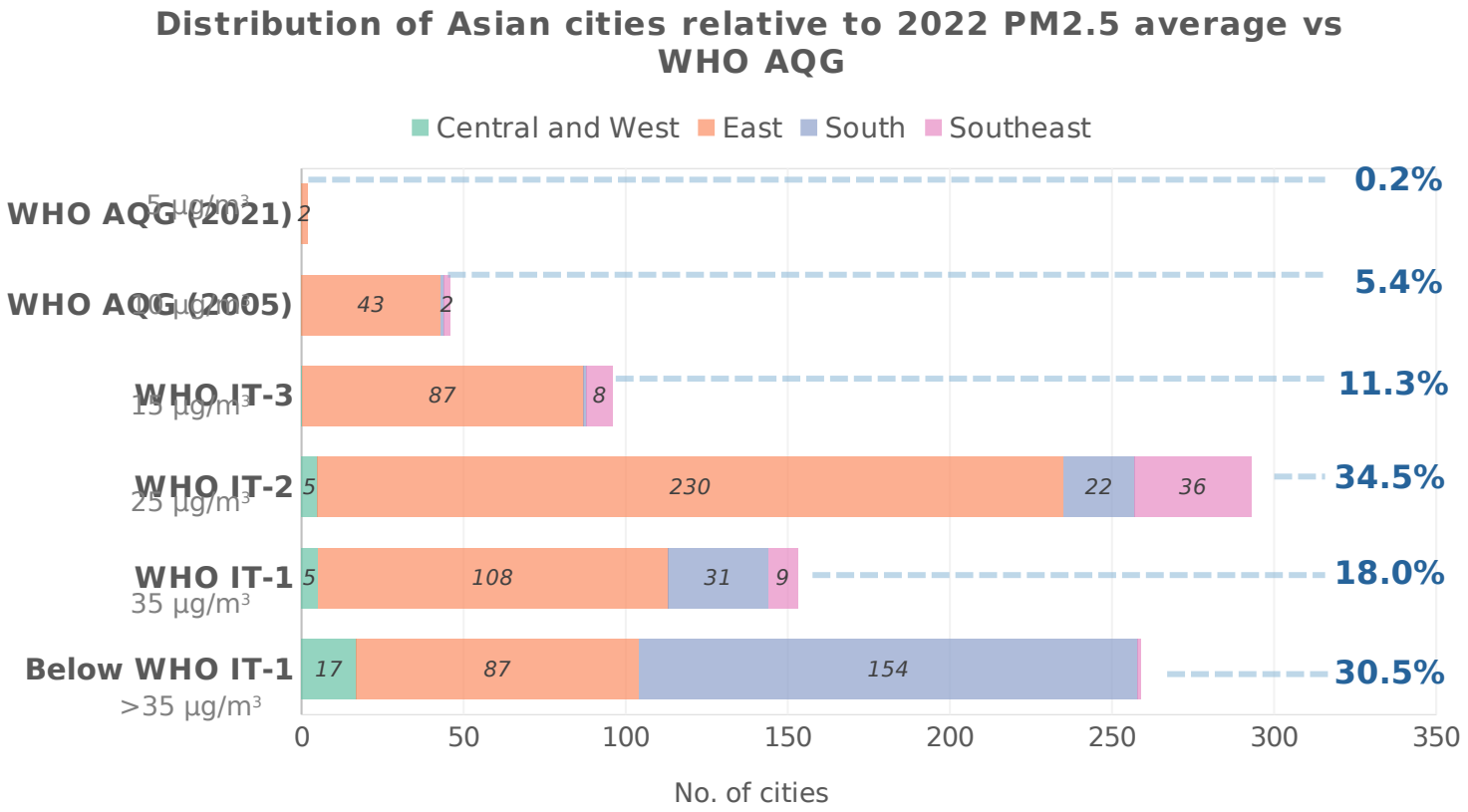
% Share of cities with annual $PM_{2.5}$ **higher than 35 µg/m³ has generally decreased,** while those **between >15 and 25 µg/m³ has increased**

- Break in trends is observed by 2021

% Share of cities within 2005 WHO AQG (≤10 µg/m³) **has increased since 2018**

- A closer look is needed on the distribution of cities to understand targeted action

99.8% of Asian cities are at risk from the health impacts of $PM_{2.5}$ exposure



Only 2 of the 849 cities met the $PM_{2.5}$ WHO AQG (2021)

- 2 of the 557 cities in East Asia
- **46 cities were able to meet the 2005 WHO AQG**, majority from East Asia.
- **Majority of Asian cities** (esp. East and SEA) **met WHO IT-2**.
- South Asian cities are mostly above the WHO IT-2, with majority of cities even above the WHO IT-1.

Asian cities must continue to strive for better air quality, especially those with cities that are far from the 2021 WHO AQG.

**with publicly accessible and official government data*

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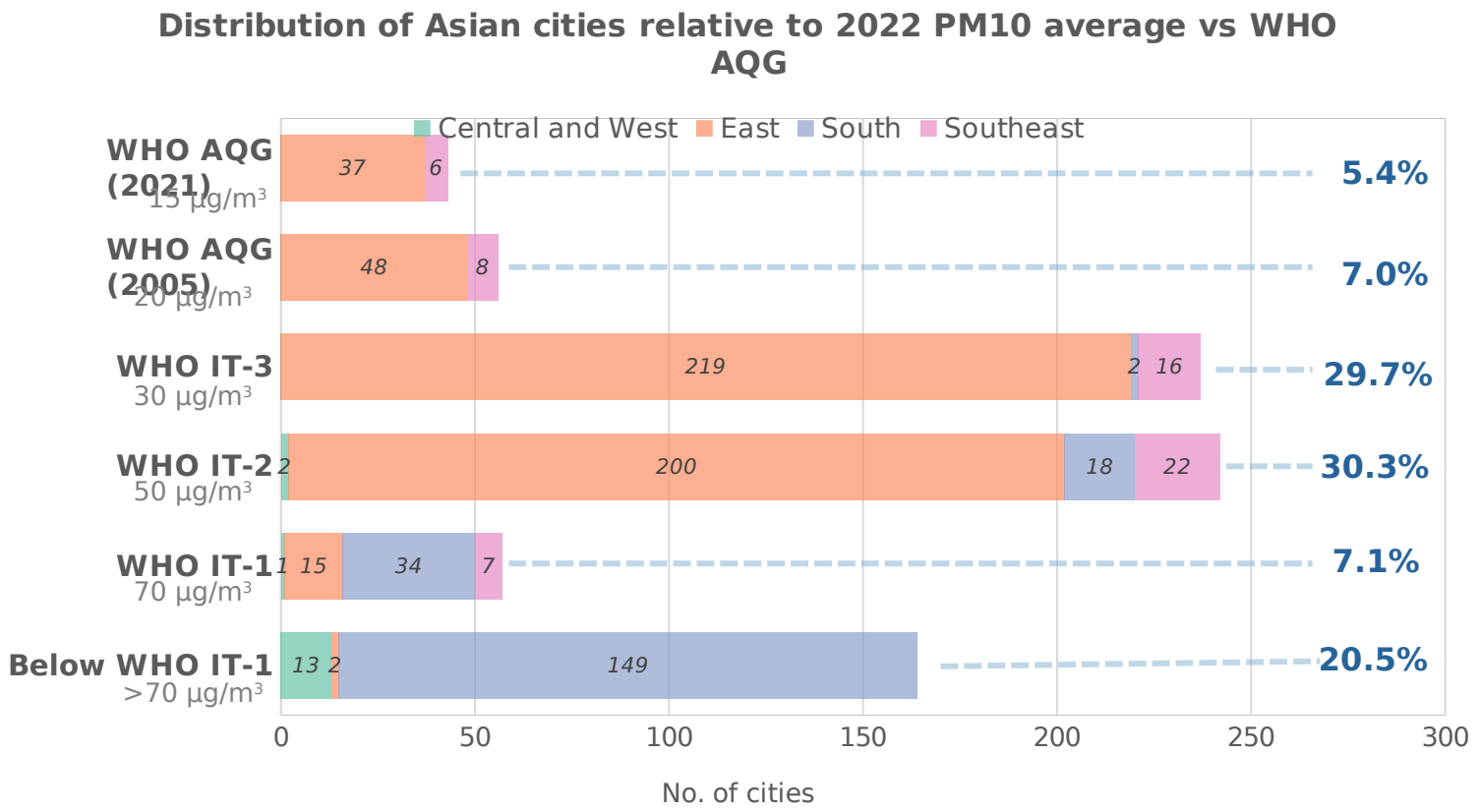
94.6% of Asian cities do not meet WHO AQGs for annual PM_{10}



Only 43 of the 799 cities met the PM_{10} WHO AQG (2021)

- 37 of the 521 cities in East Asia
- 6 of the 59 cities in Southeast Asia
- **56 cities were able to meet the 2005 WHO AQG**, majority from East Asia.
- **Majority of Asian cities** (esp. East and SEA) **are meeting WHO IT-2, IT-3**.
- South Asian cities are mostly below WHO IT-1

Asian cities are recommended to continue monitoring PM_{10} levels, especially cities with dust storms, resuspended dust and soil, and construction activities

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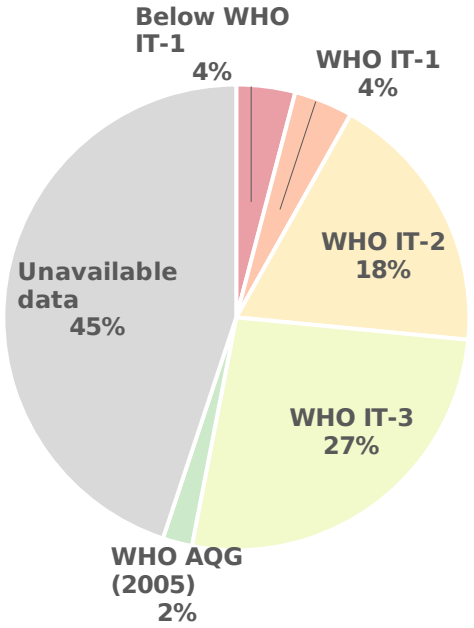
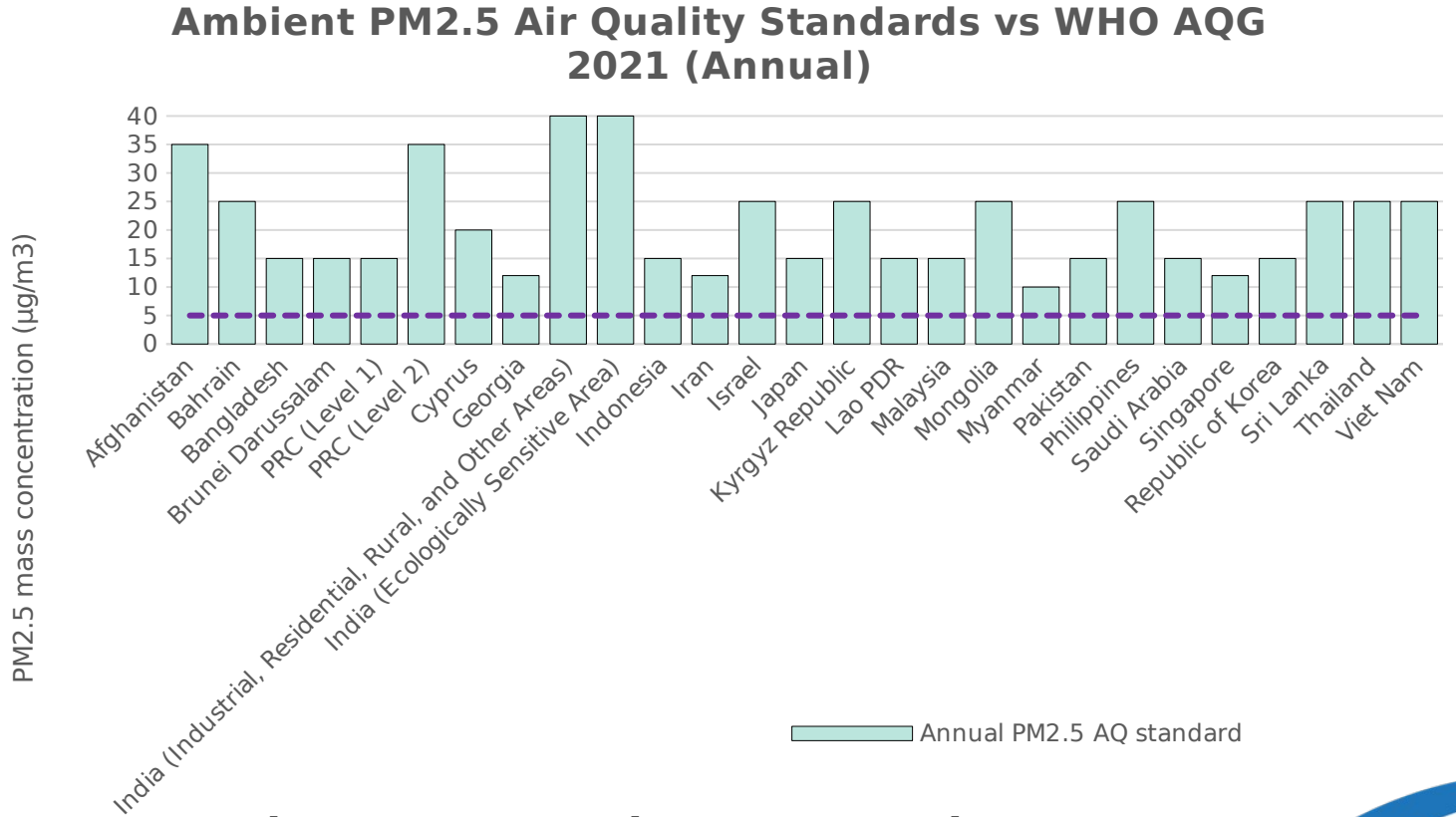
Annual $PM_{2.5}$ national standards versus WHO AQG

Distribution of PM2.5 AQ standards relative to the WHO AQG





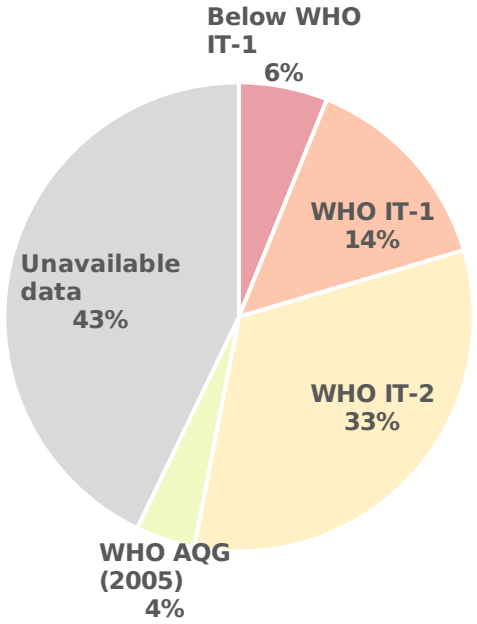
Countries have yet to meet the 2021 WHO AQG, but Myanmar aims to meet the 2005 WHO AQG

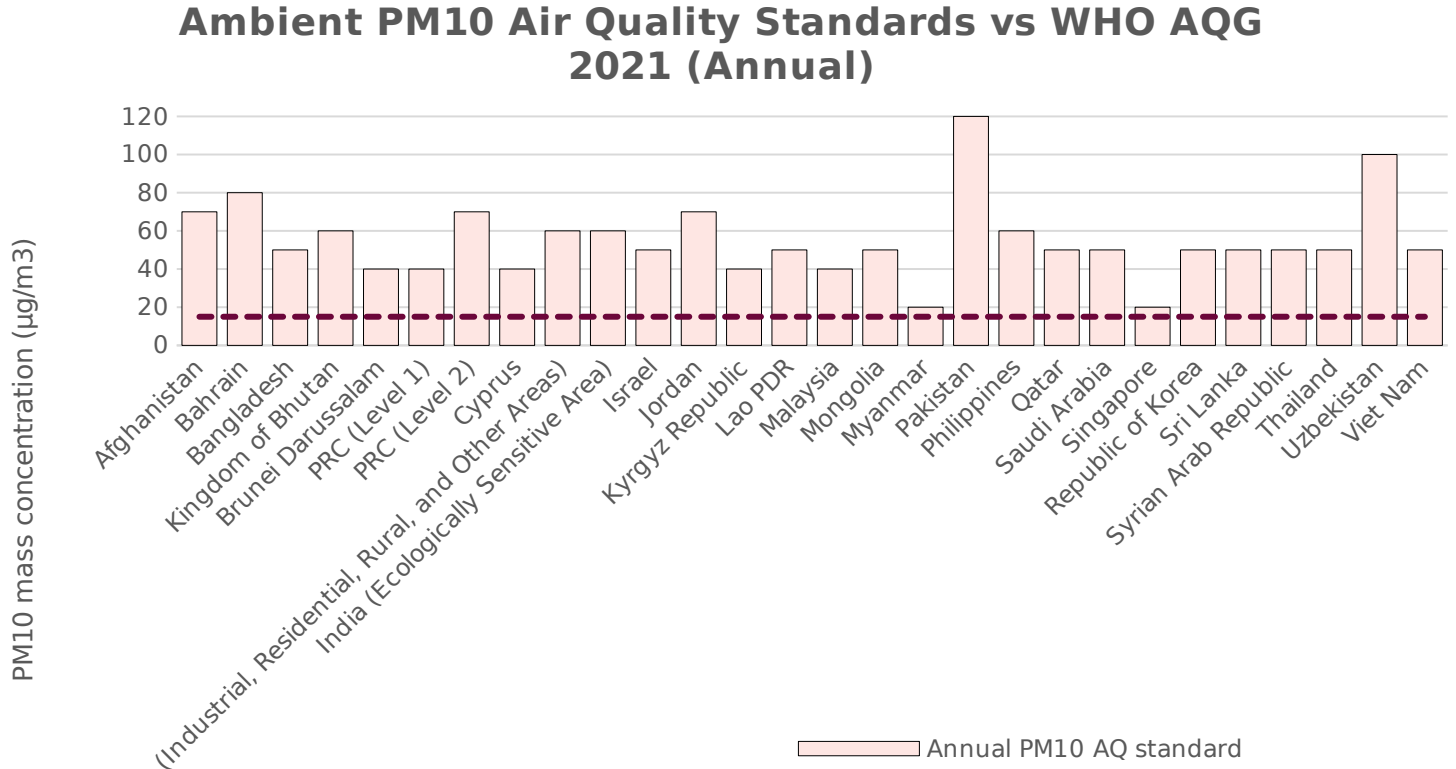
Majority of countries have AQ standards aiming to meet the WHO IT-3 (14 countries) and WHO IT-2 (10 countries)

**Based on data accessed as of November 2023*

Annual PM_{10} national standards versus WHO AQG

Distribution of PM10 AQ standards relative to the WHO AQG



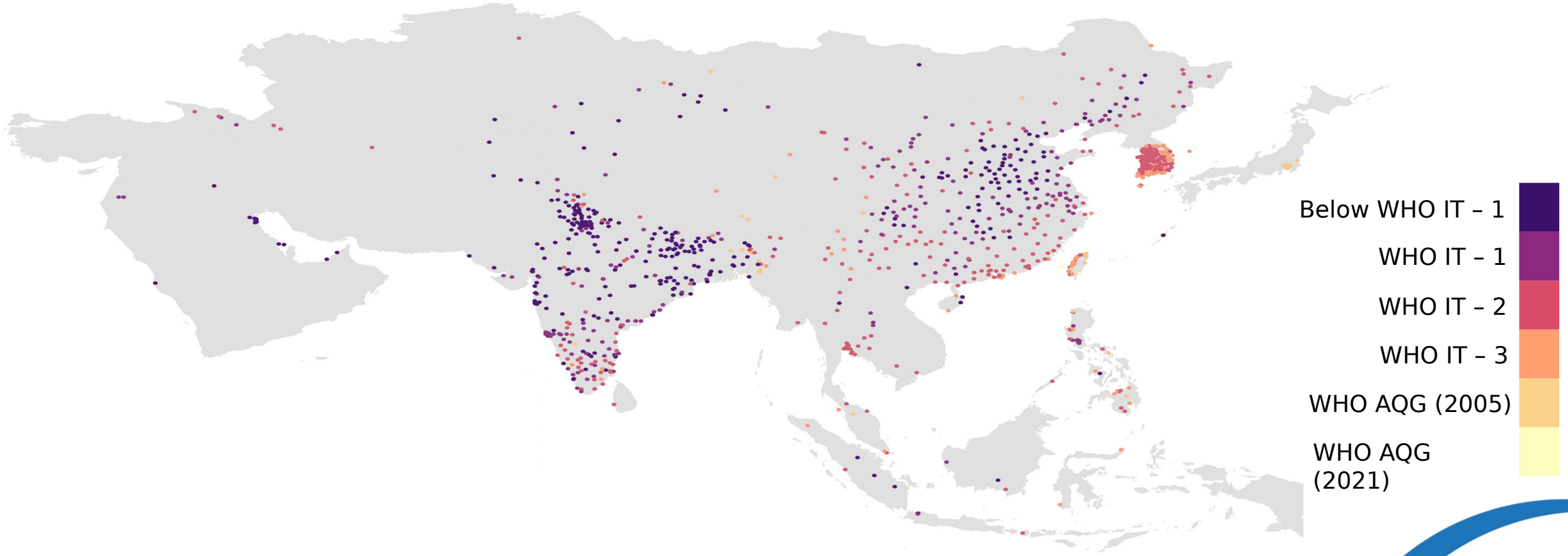


Countries have yet to meet the 2021 WHO AQG but Myanmar and Singapore aims to meet the 2005 WHO AQG

Majority of countries have AQ standards aiming to meet the WHO IT-2 (18 countries) and WHO IT-1 (7 countries)

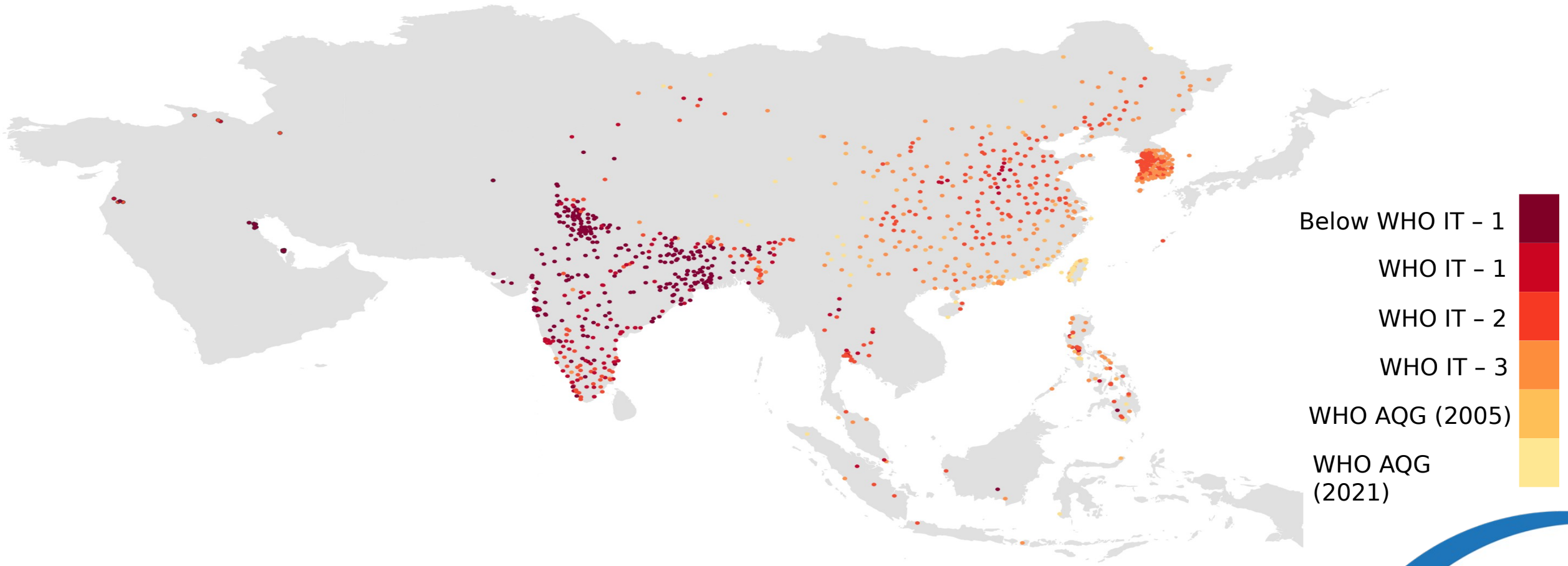
*Based on data accessed as of November 2023

Distribution map of annual $PM_{2.5}$ in Asia



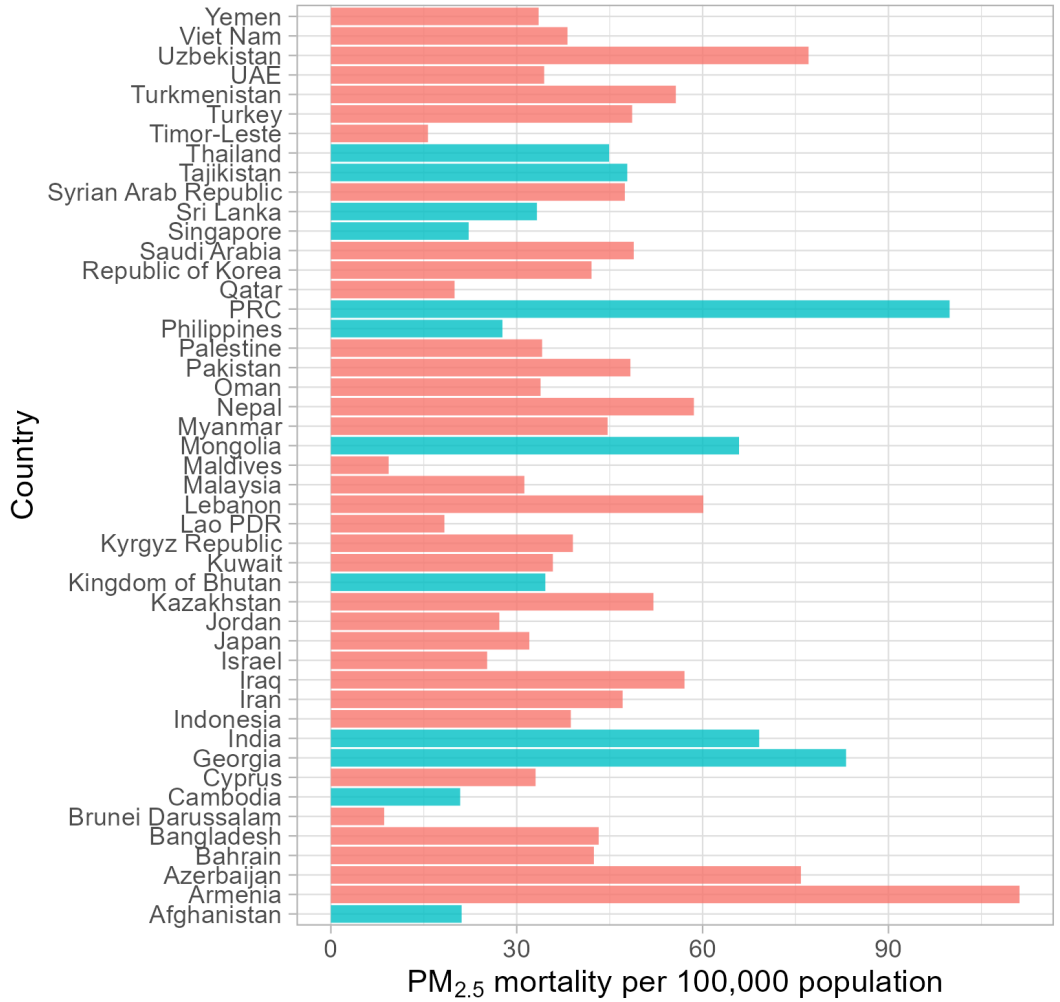
*with publicly accessible and usable official government data

Distribution map of annual PM_{10} in Asia



*with publicly accessible and usable official government data

$PM_{2.5}$-related mortality and policies/plans recognizing air pollution health impacts



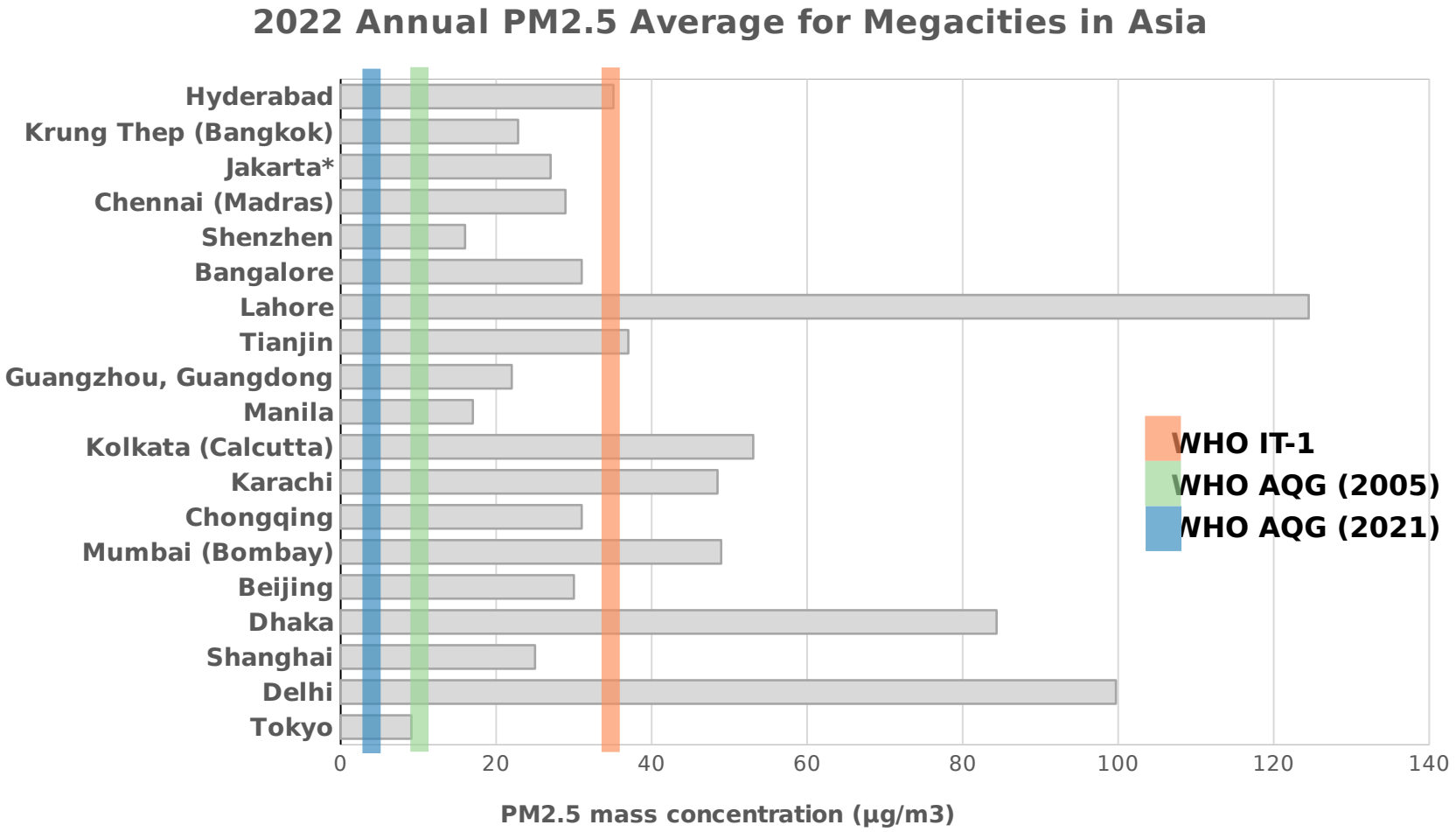
While all countries have some form of clean air act or air pollution policy/standards, most countries **do not have policies which directly aim to understand air pollution health impacts, nor national health action plans which recognize the health impacts of poor air quality**

- Only 12 out of 48 have any of the following: *Health and Pollution Action Plan; Environment and Health Action Plan; Environmental Health Strategy; Healthy City Action Plan; Air Quality Action Plans with specific health targets; or something similar*

Mortality data from Health Effects Institute. 2020. State of Global Air 2020. Data source: Global Burden of Disease Study 2019. IHME, 2020.

Policy data from accessible official government websites, documents, and reports.

Air pollution in Asia's megacities



All Asian megacities have annual $PM_{2.5}$ exceed the WHO AQG 2021 and 2005, except Tokyo

- 8 out of 19 megacities are also beyond the WHO IT-1

Megacities are defined as cities with more than 10 million inhabitants.

United Nations, Department of Economic and Social Affairs, Population Division (2018). The World's Cities in 2018—Data Booklet (ST/ESA/ SER.A/417)

*Used 2019 data for Jakarta;
Osaka and Istanbul were not included since $PM_{2.5}$ data were not accessed

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Summary of key messages

Air quality monitoring networks must be expanded while increasing ease of access to data, especially in areas where it is most needed

- Ease of access to (real-time) data provide guidance to the public on risks related to air pollution, and can be used to develop and further improve air quality policies and action

Analysis of data per sub-region, country income level, over time (trends), and spatial (maps) can provide targeted guidance for actions

- Different datasets tell different stories but can all direct next steps that can be done to help improve air quality

Identified sources of air pollution vary depending on the method and approach, but key sources are transport and residential energy use

- Geographical features of the study area can impact air quality (i.e., desert/soil dust); more detailed (city-level) analyses can provide more insight since sources can vary per location
- The **implementation of stricter vehicle emission and fuel standards**, together with other sustainable transport solutions, can play a big role in the overall improvement of air quality in Asian nations
- The combined contribution of energy production and use in the residential and industry sectors reiterates need for a **just energy transition** in Asia

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Summary of key messages

Air quality targets are linked with public health improvements and must thus be included in the national health plans

- Aside from air pollution plans, having specific health targets (reduction in air pollution-related mortality and morbidity) can reinforce actions to improve air quality

Cities and megacities exceeding the WHO AQG should take urgent actions

- National success can be driven and complemented by city-level efforts

Air quality improvement must be a continuous goal especially in countries far from the WHO AQGs

- Overall progress in complying with less strict WHO IT values has been observed, but majority of the countries are still far from the 2005 WHO AQG, especially the more stringent 2021 WHO AQG
- Countries must continue towards legally aiming to meet WHO AQGs by aligning national standards
- Best practice of countries with progress must be continuously shared, fostering a **co-learning approach** that can help all nations achieve better air quality.

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Thank you!

For more information and data submissions, please email aqccmanila@cleanairasia.org

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