Economic benefits from reducing air pollution and the impacts of transport policy interventions

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Agenda

1. Health & economic benefits from improving air quality
2. Impact of transport interventions on air quality in Egypt

This presentation draws inter alia upon analytical work carried out under the auspices of the ***Ministry of Environment / Egyptian Environmental Affairs Agency.*** *Together we also partnered with Ministry of Health and Population, and Ministry of Transport.*

جمهورية مصر العربية - وزارة البيئة
Arab Republic of Egypt-Ministery of Environment

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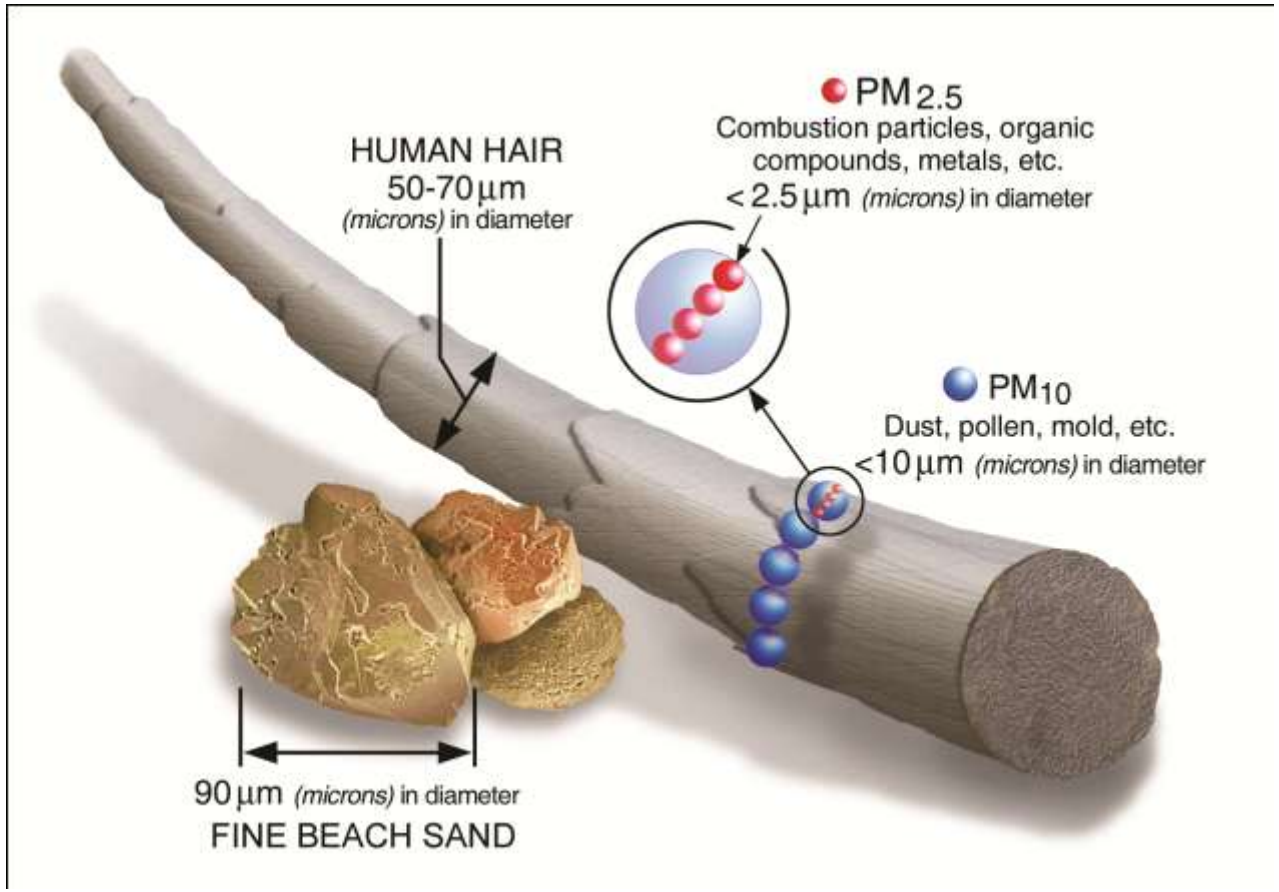
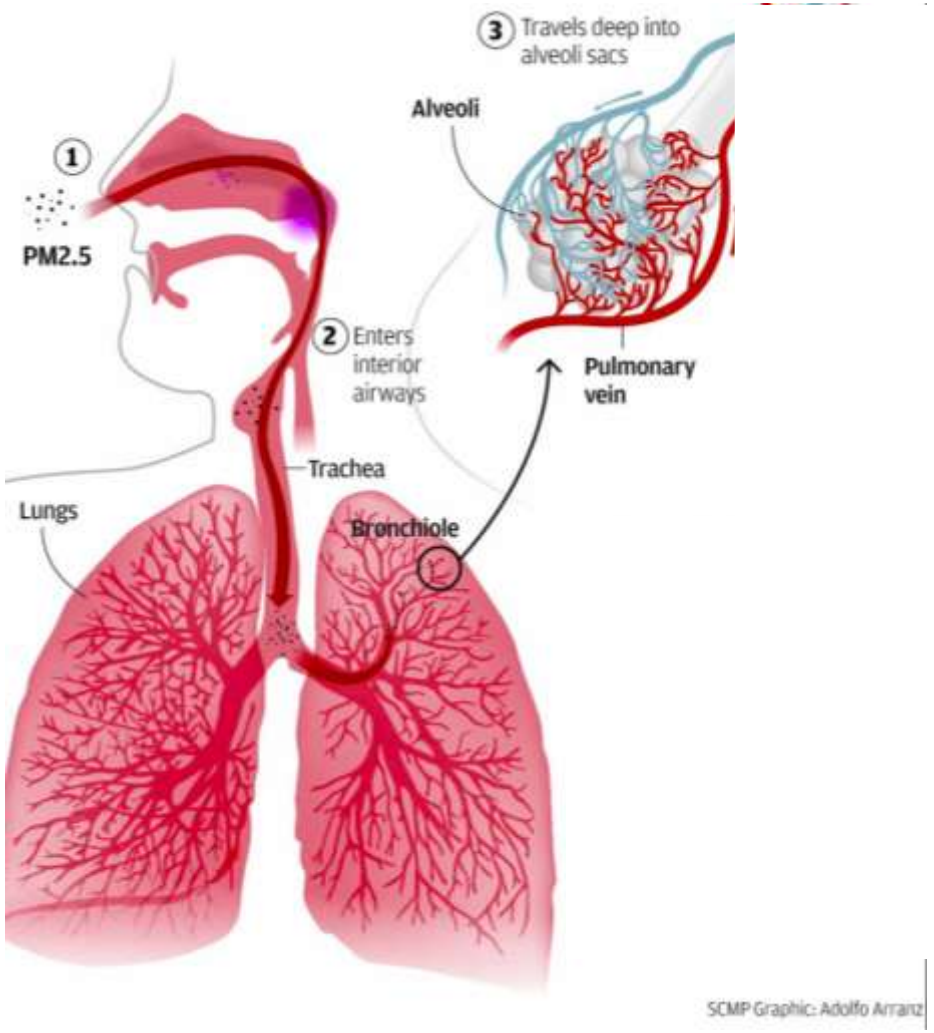
Air pollution has negative health effects: Focus on Particulate Matter (PM)

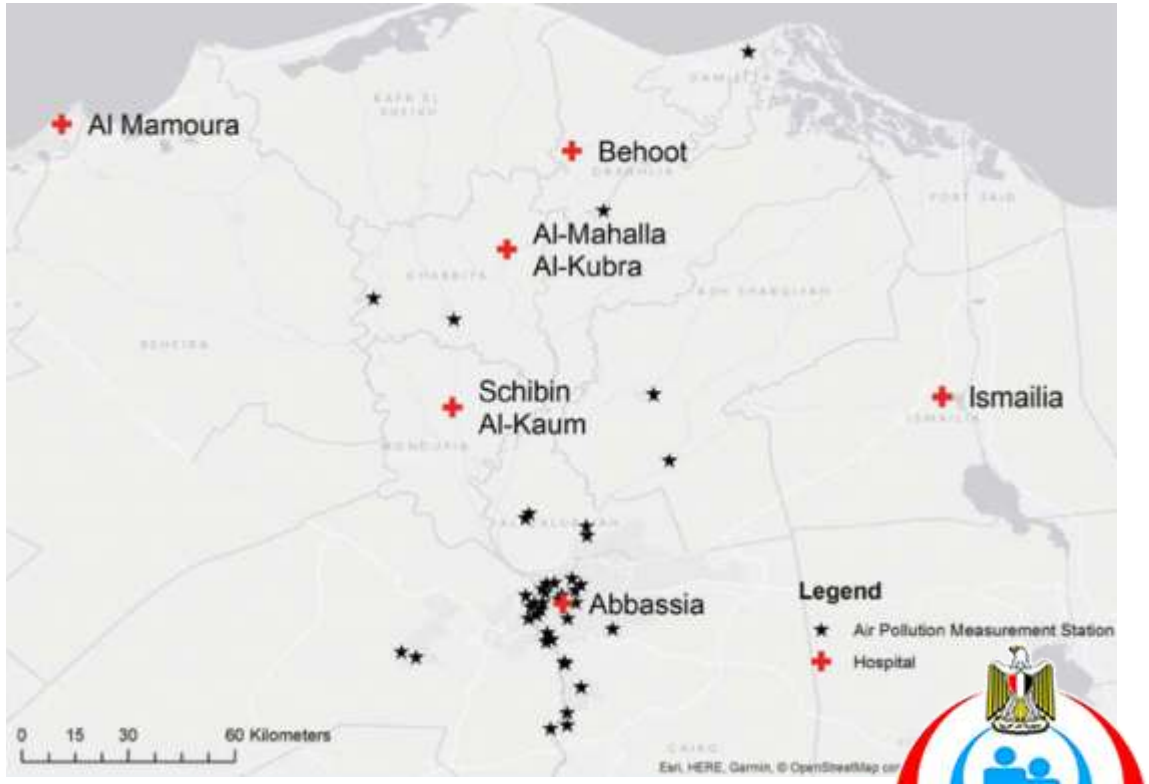




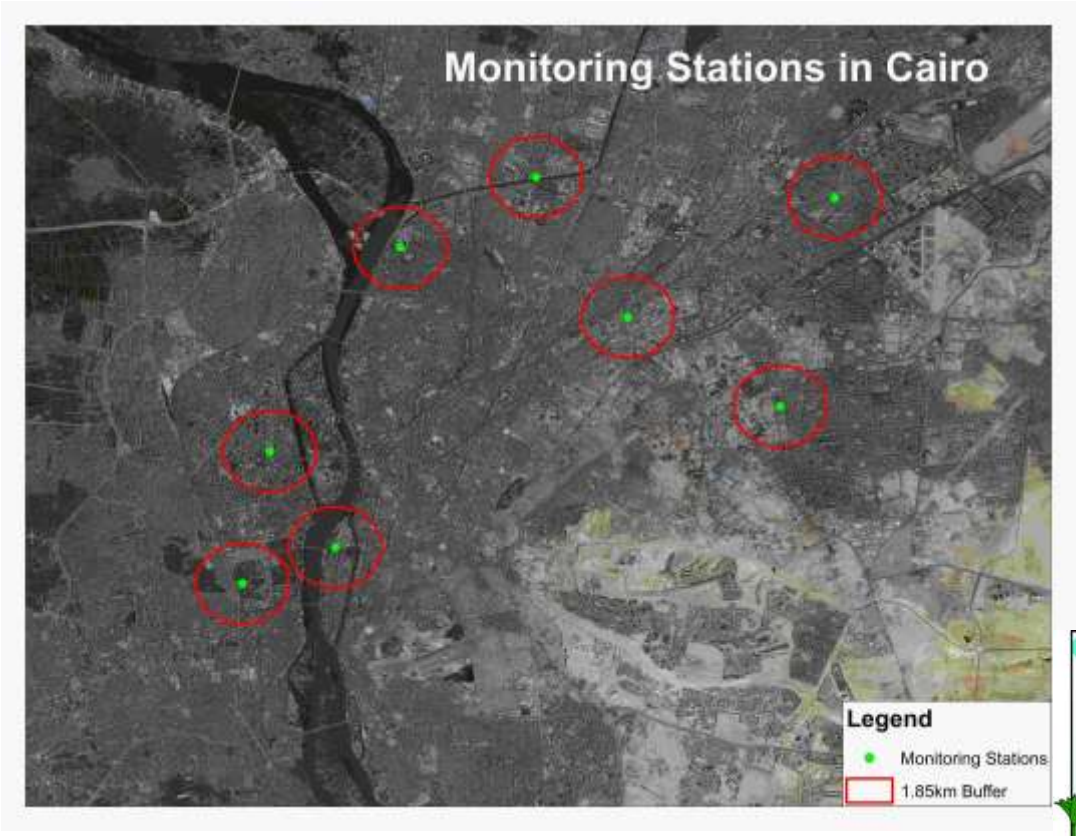
Source: US EPA

Epidemiological research: Linking hospital admissions & diagnostics data to air pollution in Egypt

Ongoing research with EEAA & MoH looking into the ambient air pollution effects on hospitalization

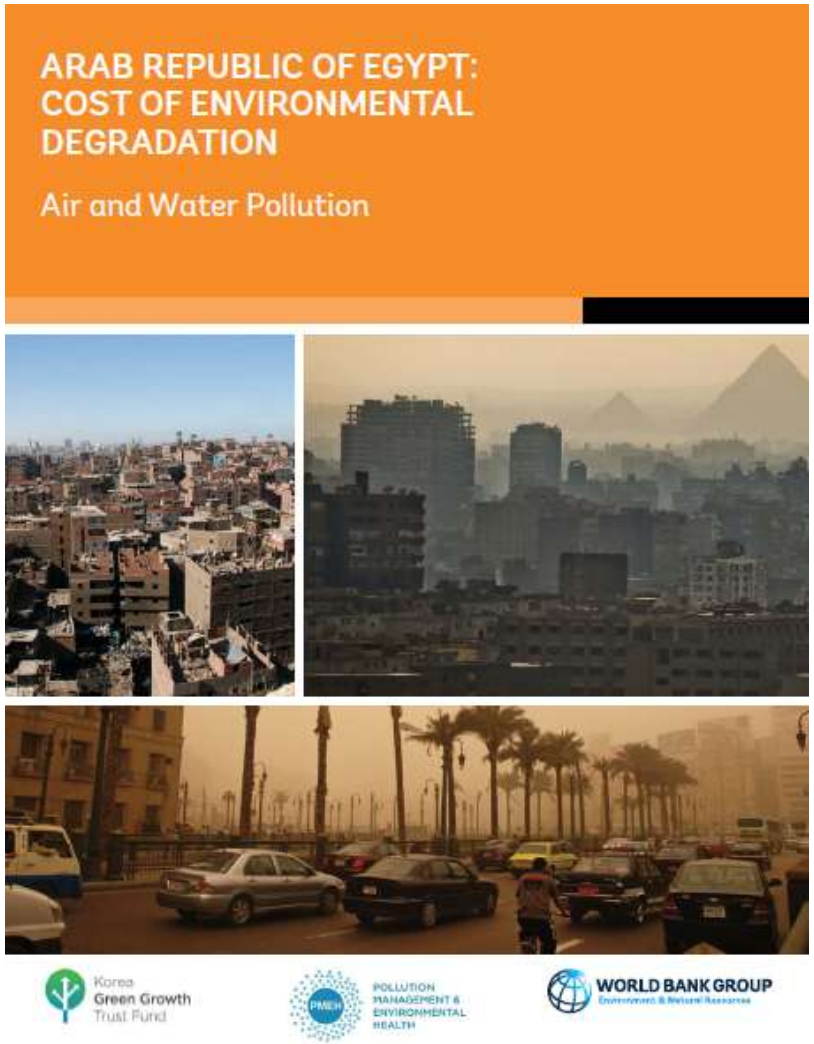


Source: Data from MoHP



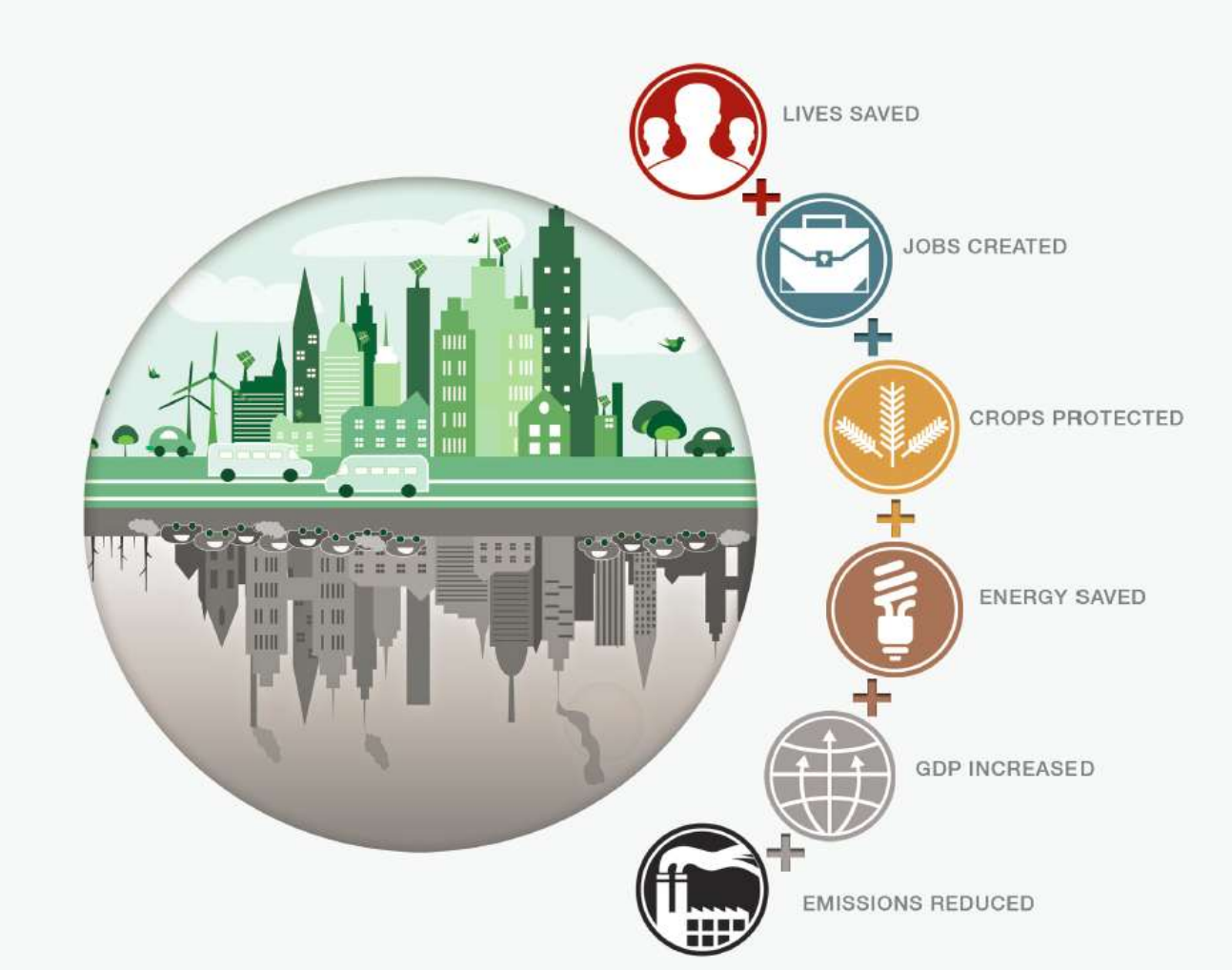
Source: Data from MoE/EEAA

The economic cost of health impacts



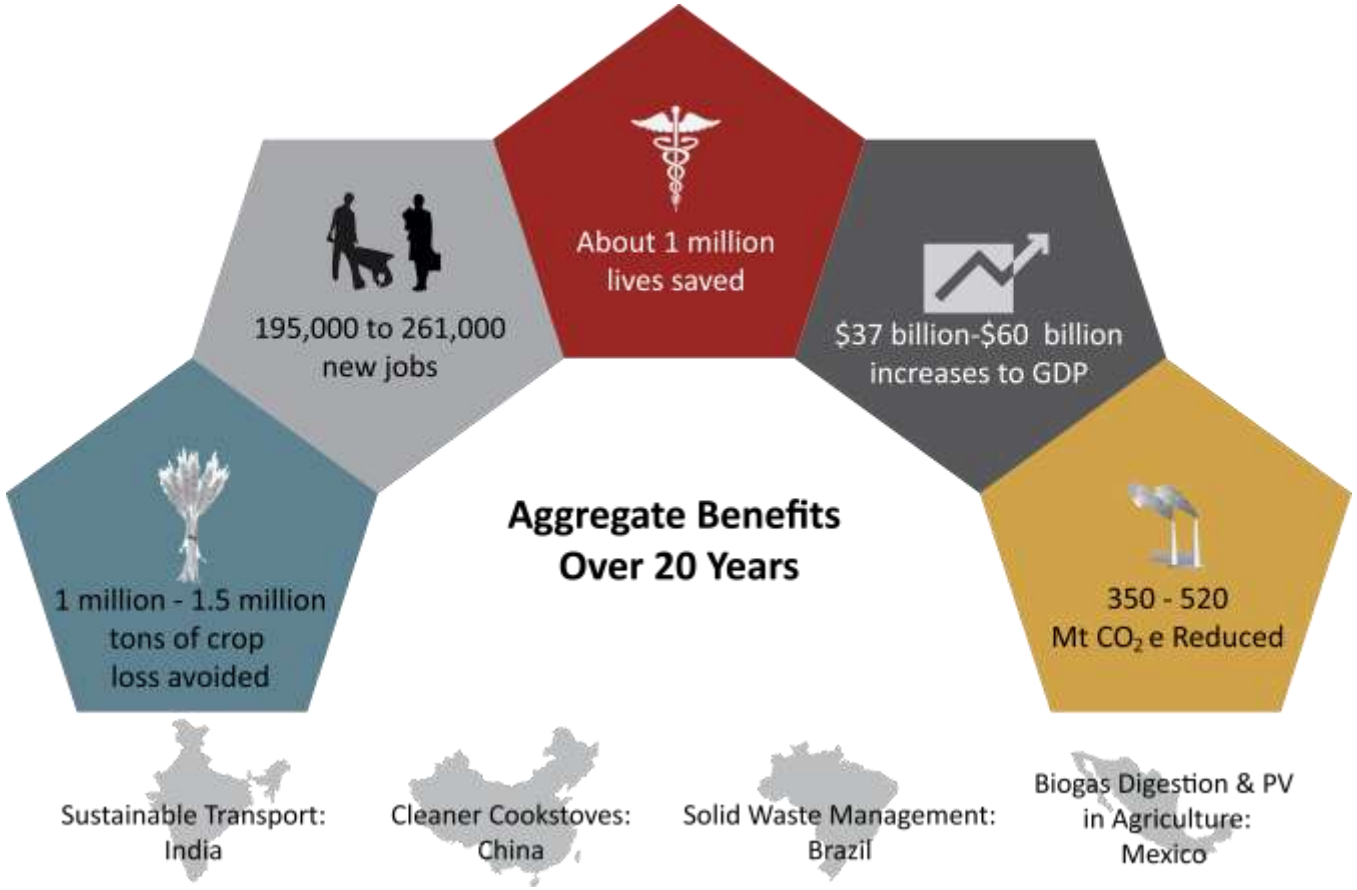
- Estimated the annual health cost for Greater Cairo to be LE 47 billion (45 – 48 bn).
  - equivalent to 1.35% of national GDP.
  - the **economic benefits** from improving air quality

Benefits from improving air quality: It’s not only health



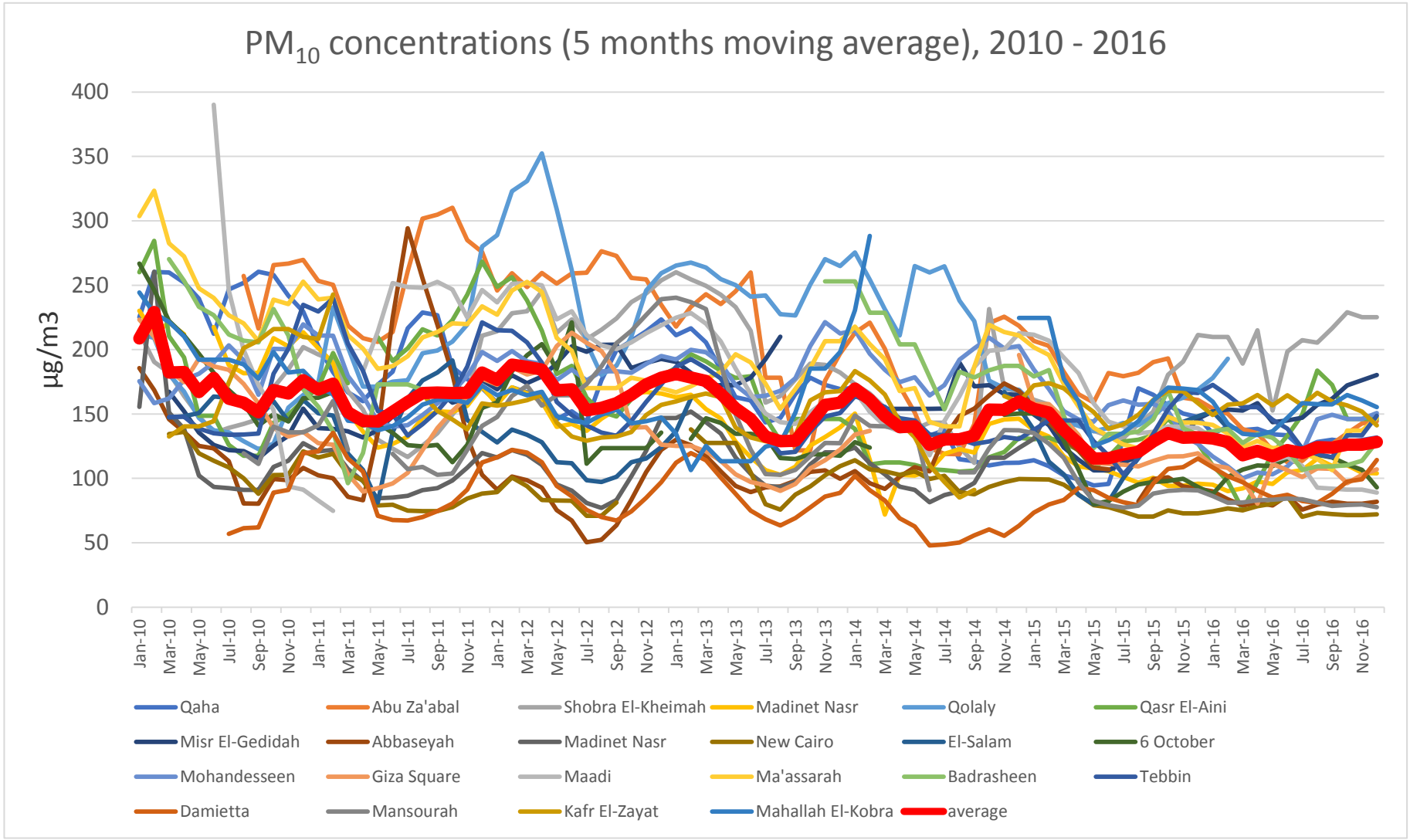
World Bank & Climate Works 2014

Benefits of 4 WB projects



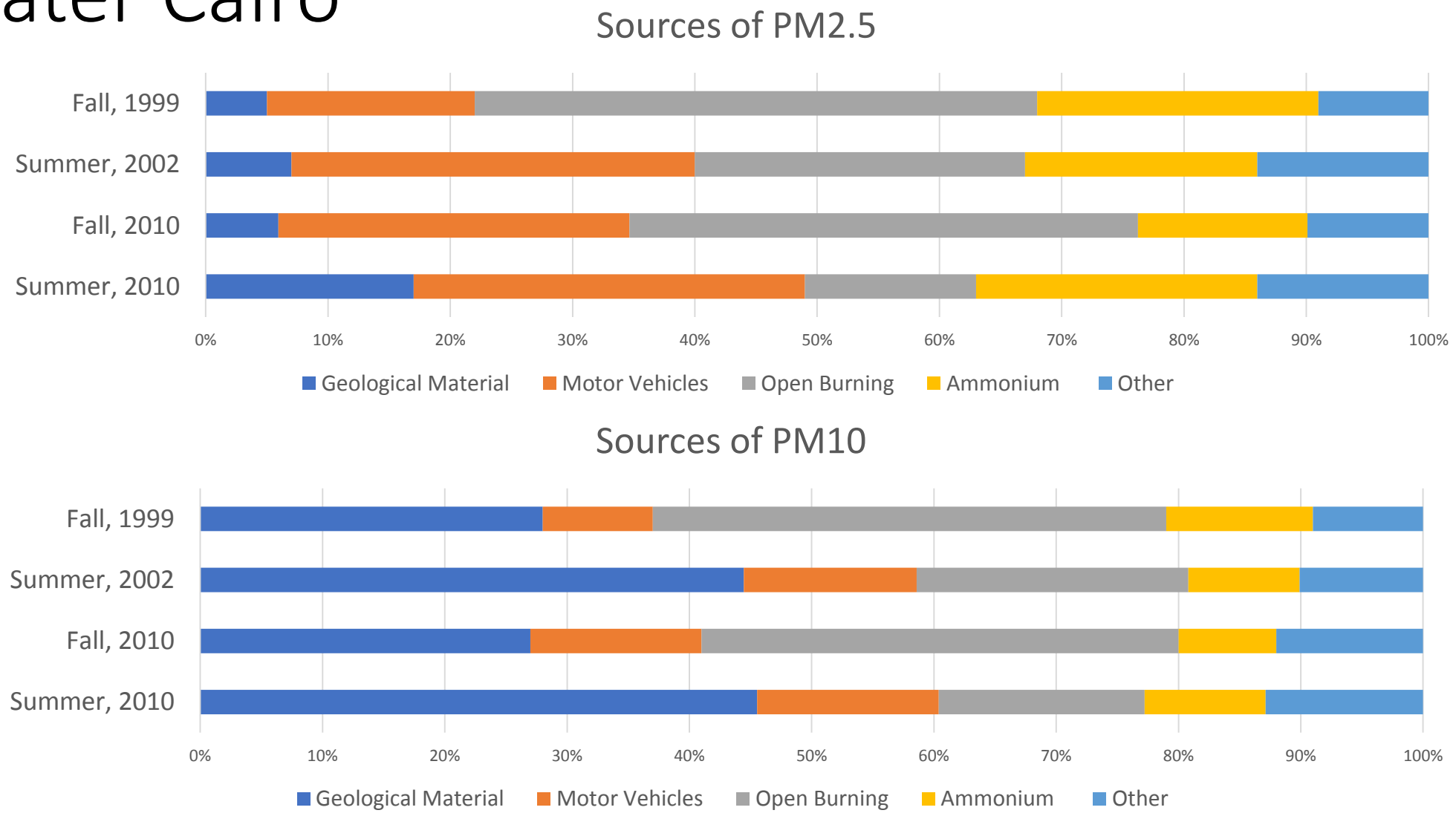
World Bank & Climate Works 2014

Air quality has improved in Greater Cairo… but is still above WHO & National recommended levels



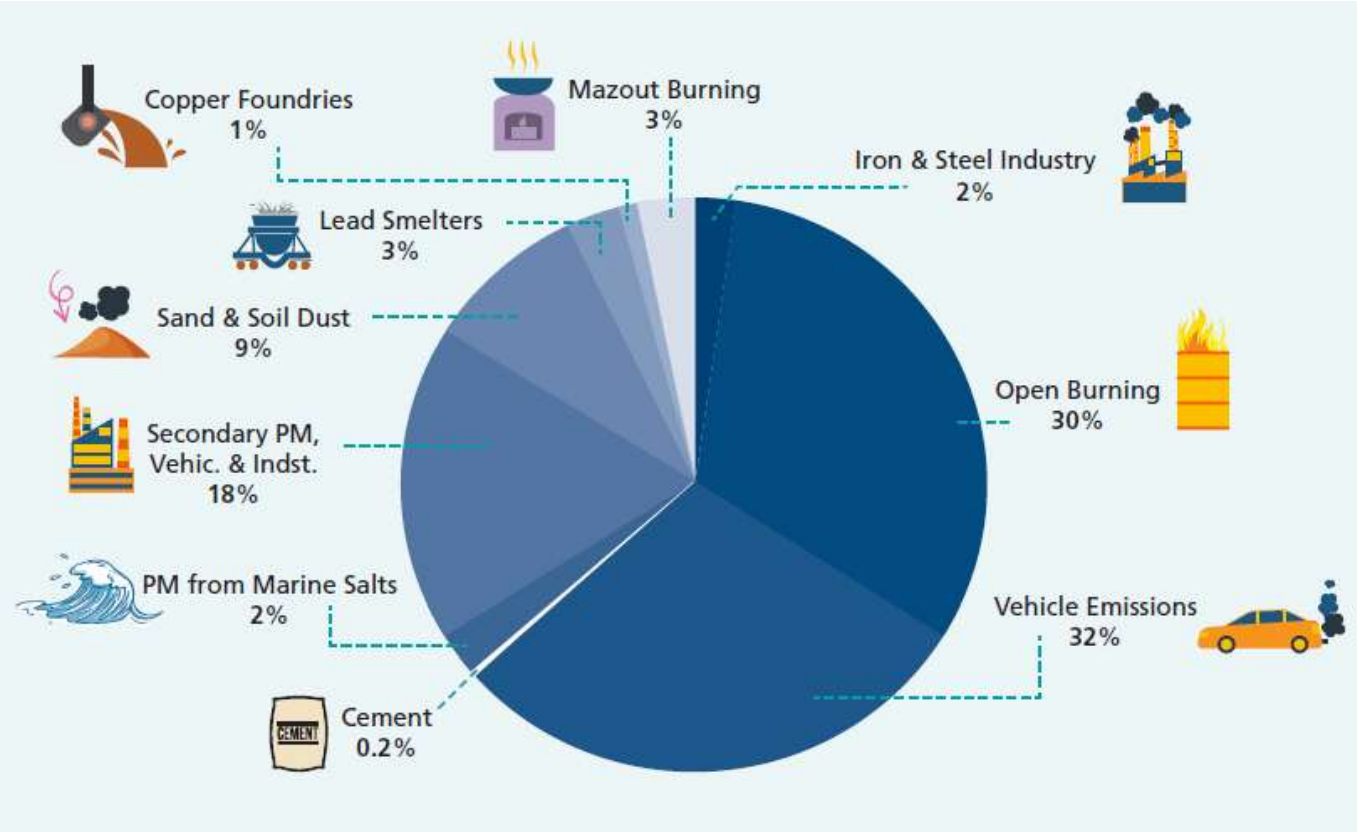
Source: EEAA

Motor vehicles are a large source (~ 1/4th) in Greater Cairo



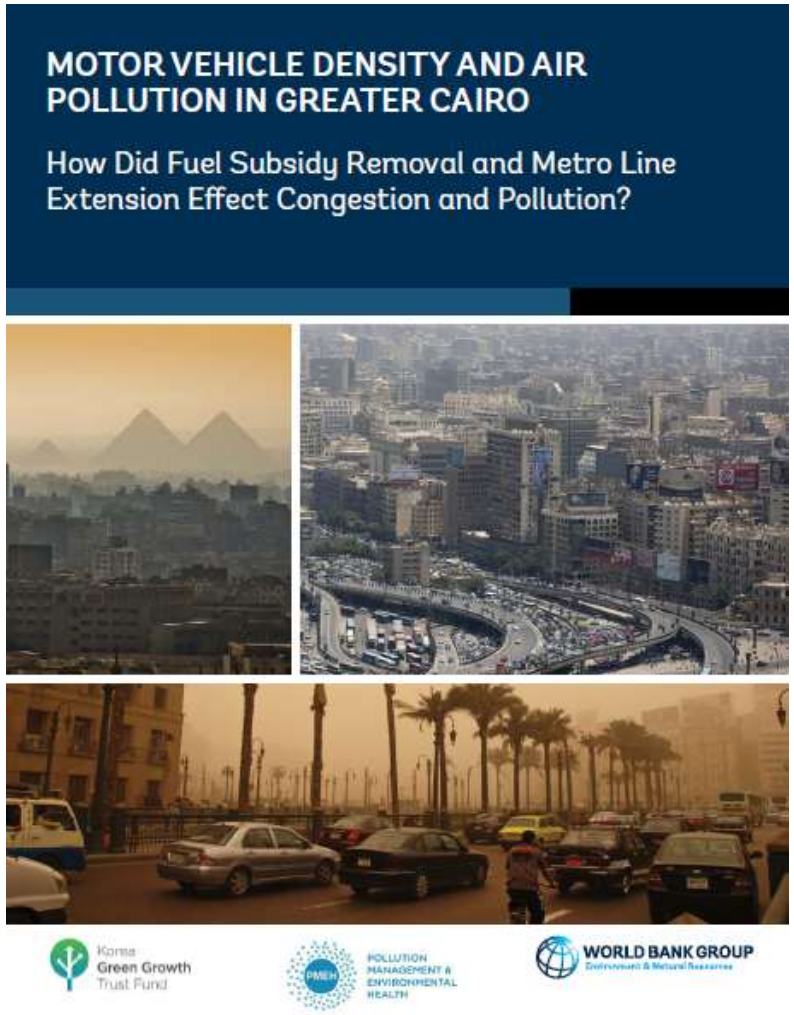
Source: Lowenthal, Gertler, and Labib (DRI & WB) 2013

Motor vehicles are about 1/3rd of anthropogenic PM10 sources in Greater Cairo



Source: EEAA, CEDARE, FES (2018) based on USAID, 2004

Studying the relationships between vehicles and air pollution & understanding the impact of the metro



Transport effects on air pollution: Starting with a deep look into the **metro**

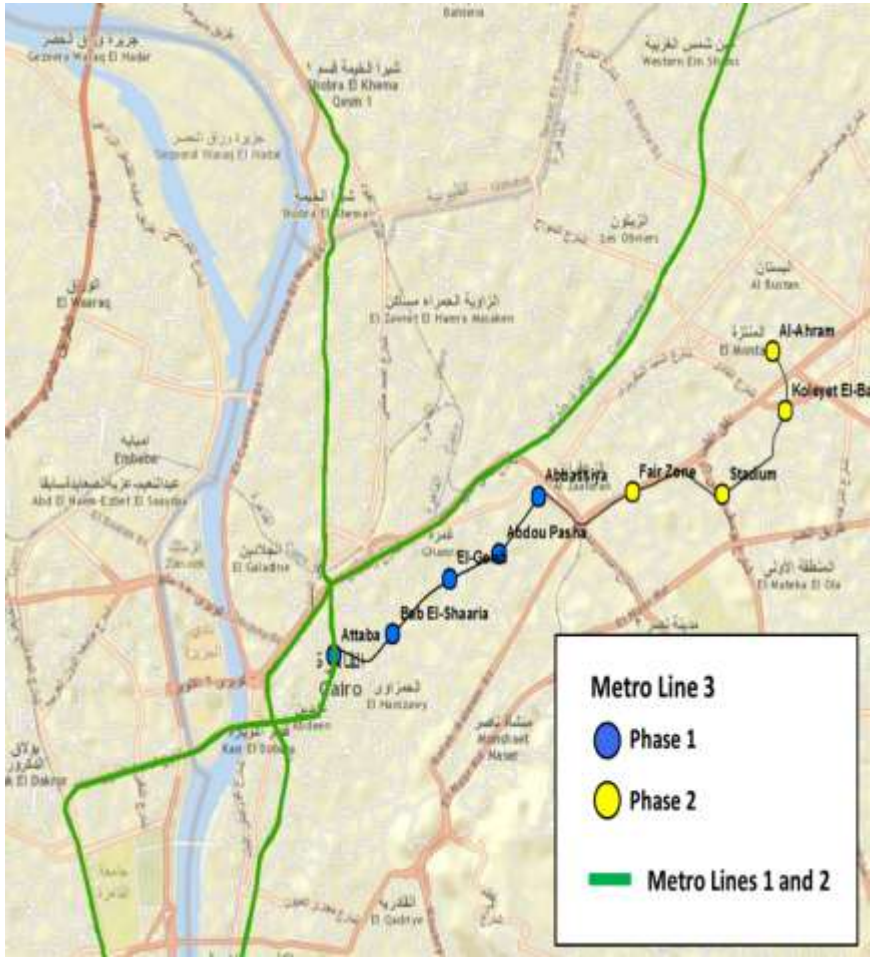
Metro effects on <u>traffic</u>:

- Subway expansion in ***Beijing*** reduced traffic delay by 15%; Yang et al (2018)
- Subway expansion by 10% in the ***US*** reduces road traffic on highways by 0.7% and on non-highway arterial roads by 1.7 percent; Pang (2017)

Metro effects on <u>air pollution</u>:

- ***Global*** subway analysis: metro extensions reduce ambient air pollution by 4% Gendron-Carrier et al (2018)
- ***Taiwan*** metro opening reduced Carbon Monoxide by 5-15%; Chen & Whalley (2012).
- National studies in several cities confirm the reduction of PM as a response to metro openings: ***Germany*** (Lalive et al., 2017), ***China*** (Zheng et al., 2017), ***India*** (Goel and Gupta, 2014), and ***Canada*** (Rivers et al, 2017; Rivers and Plumptre, 2016).

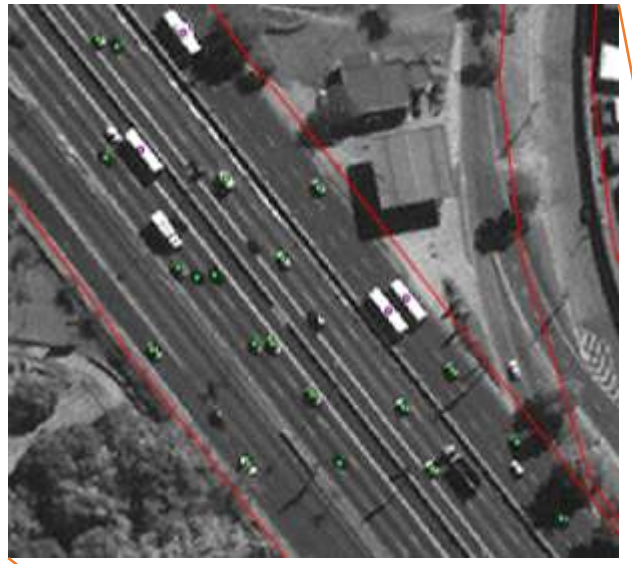
What are the effects of **metro 3** on congestion and air pollution in Greater Cairo?



Source: Cairo Metro Company

Detecting cars in Cairo

- **Trained machine-learning algorithms** on **high-resolution spatial images** from 5 different Sun-synchronous orbit (SSO) **satellites**
- Detected vehicles from 2010 - 2018

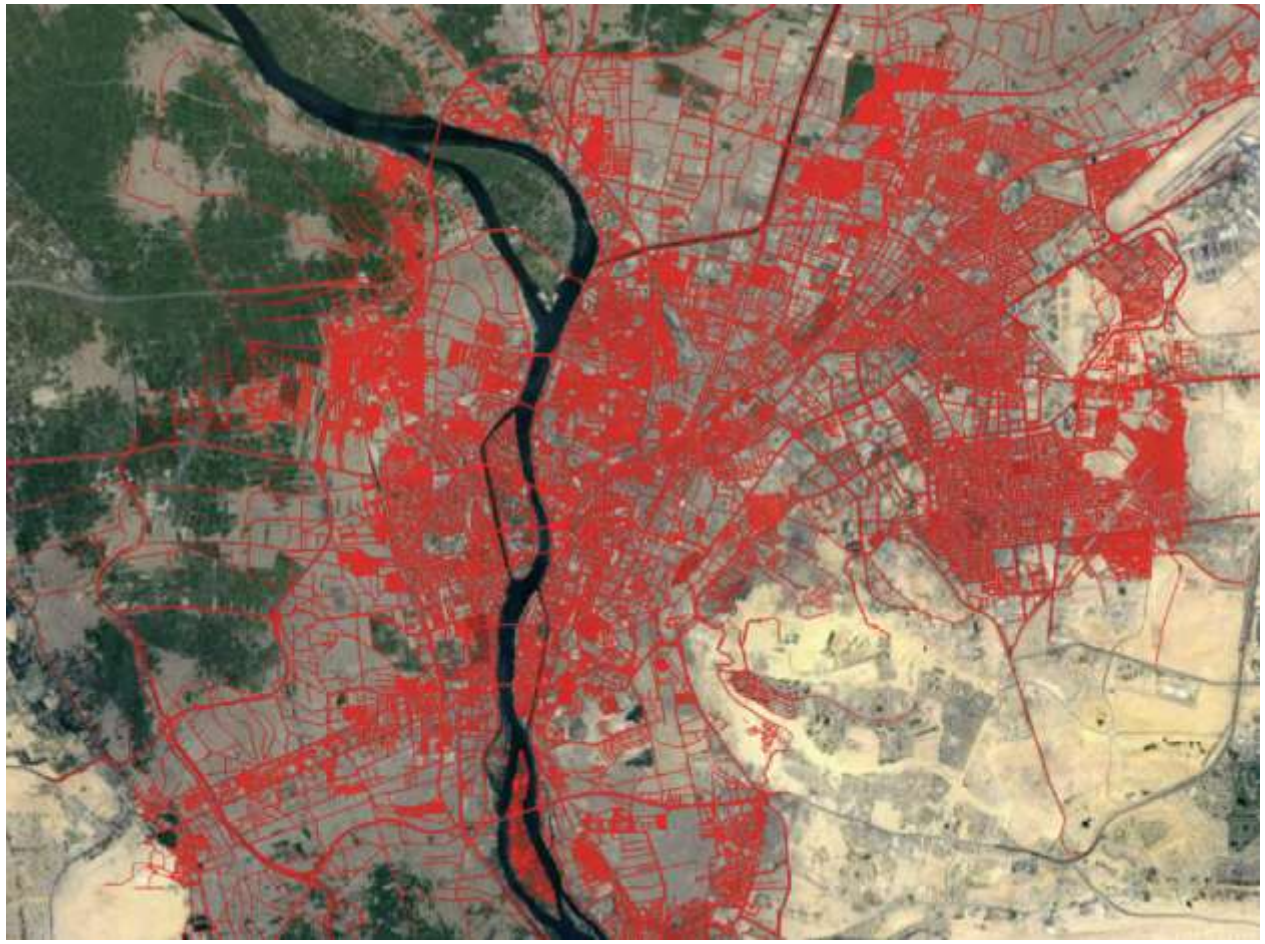


GeoEye-1

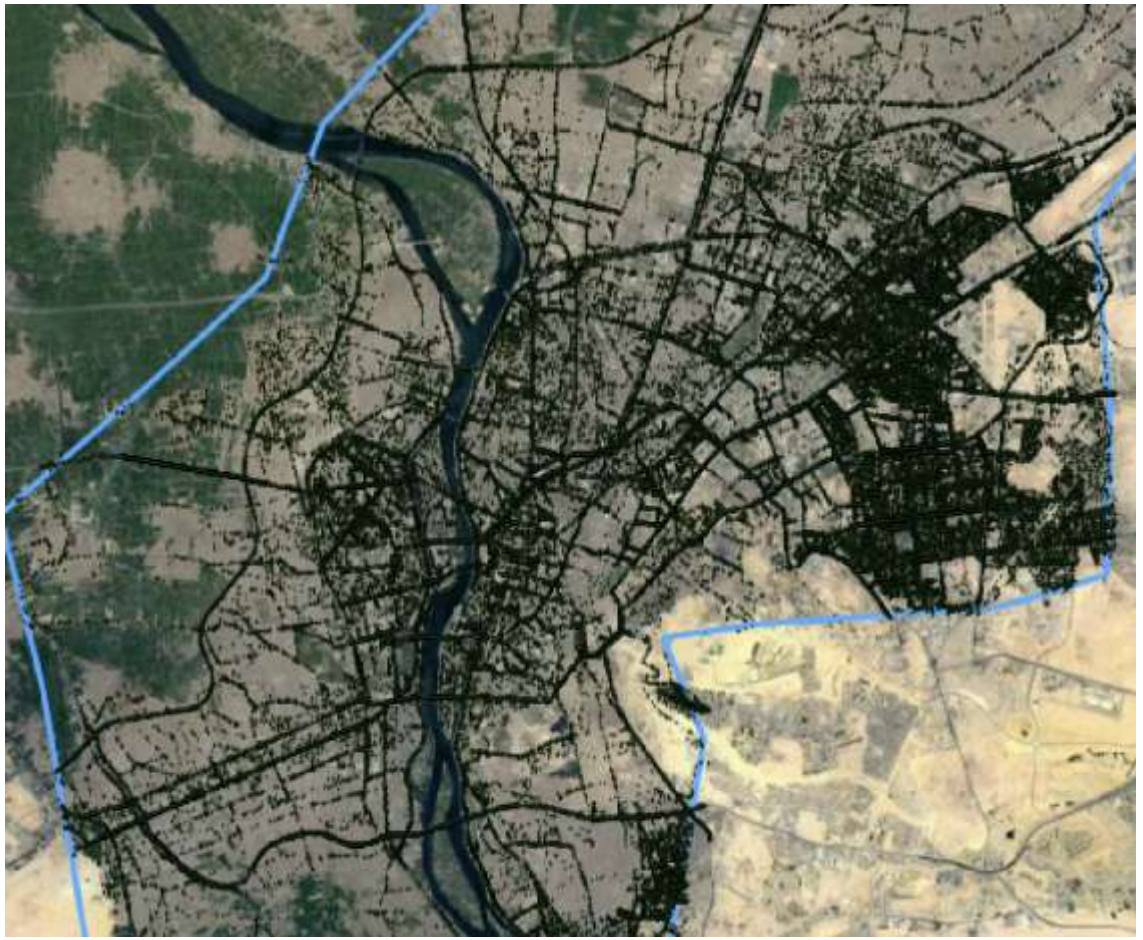
QuickBird-2

Detecting cars in Cairo

Streets of Cairo

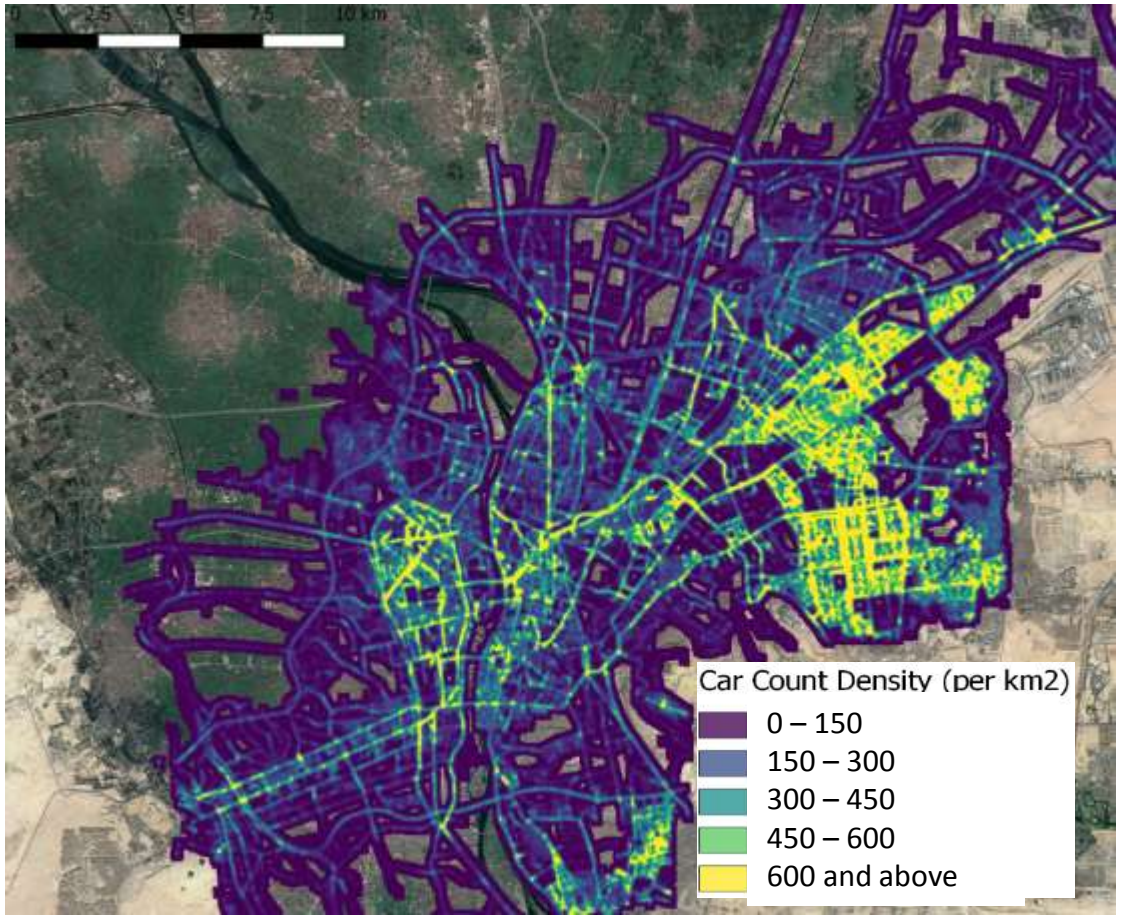


Cars in streets of Cairo

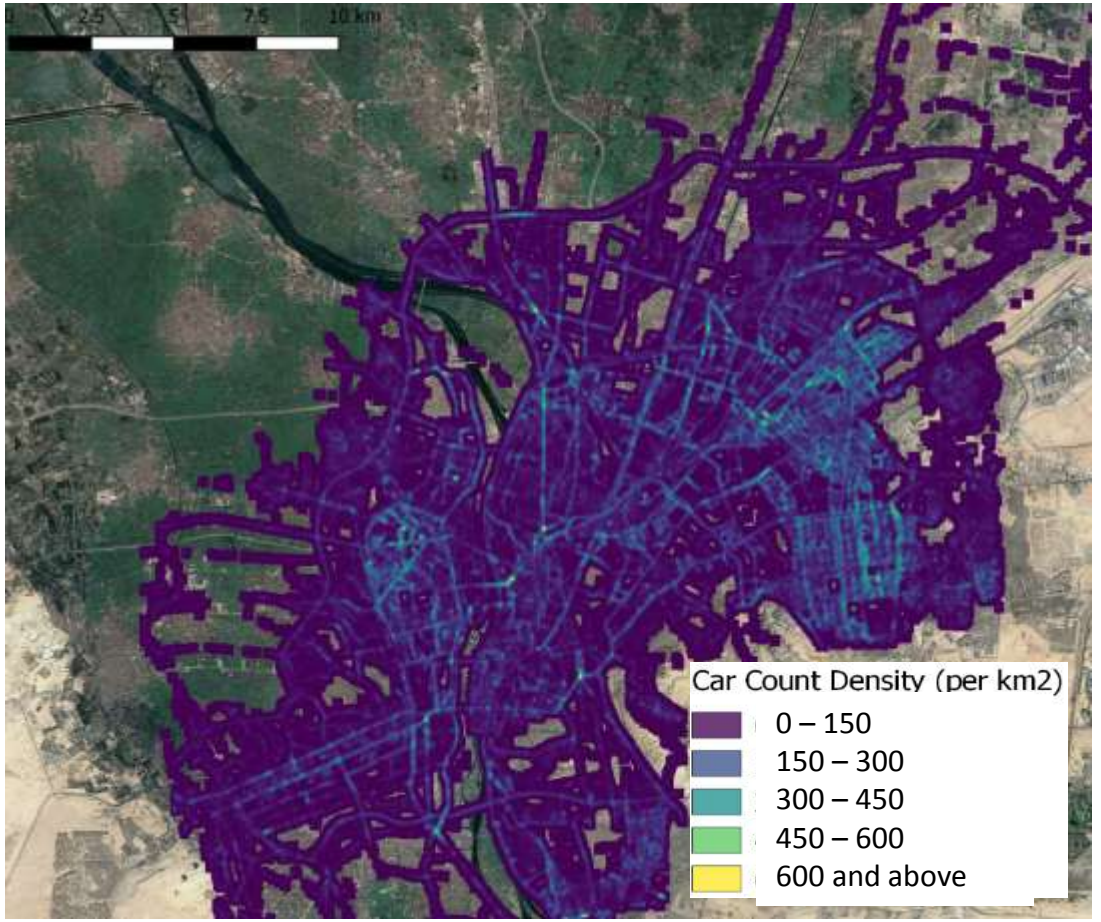


Car density

Average day

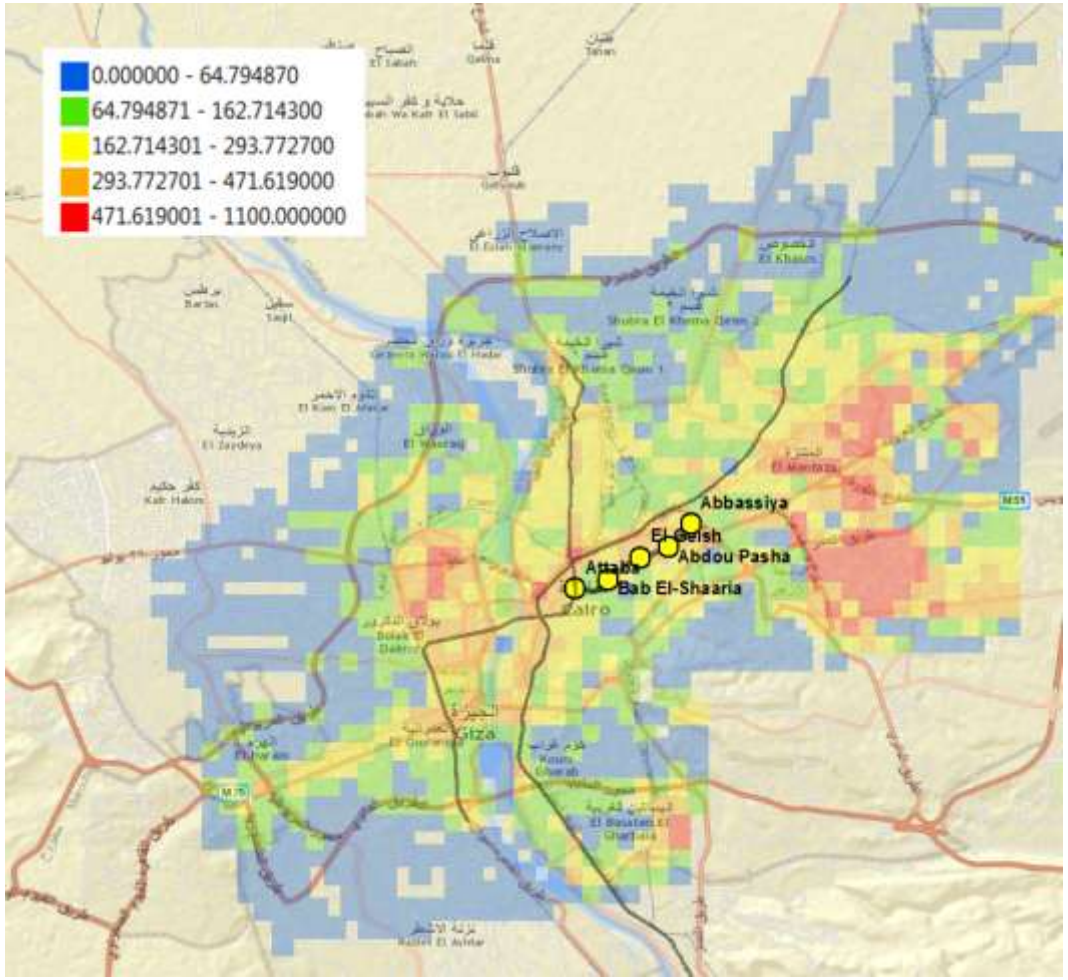


Lowest observed day

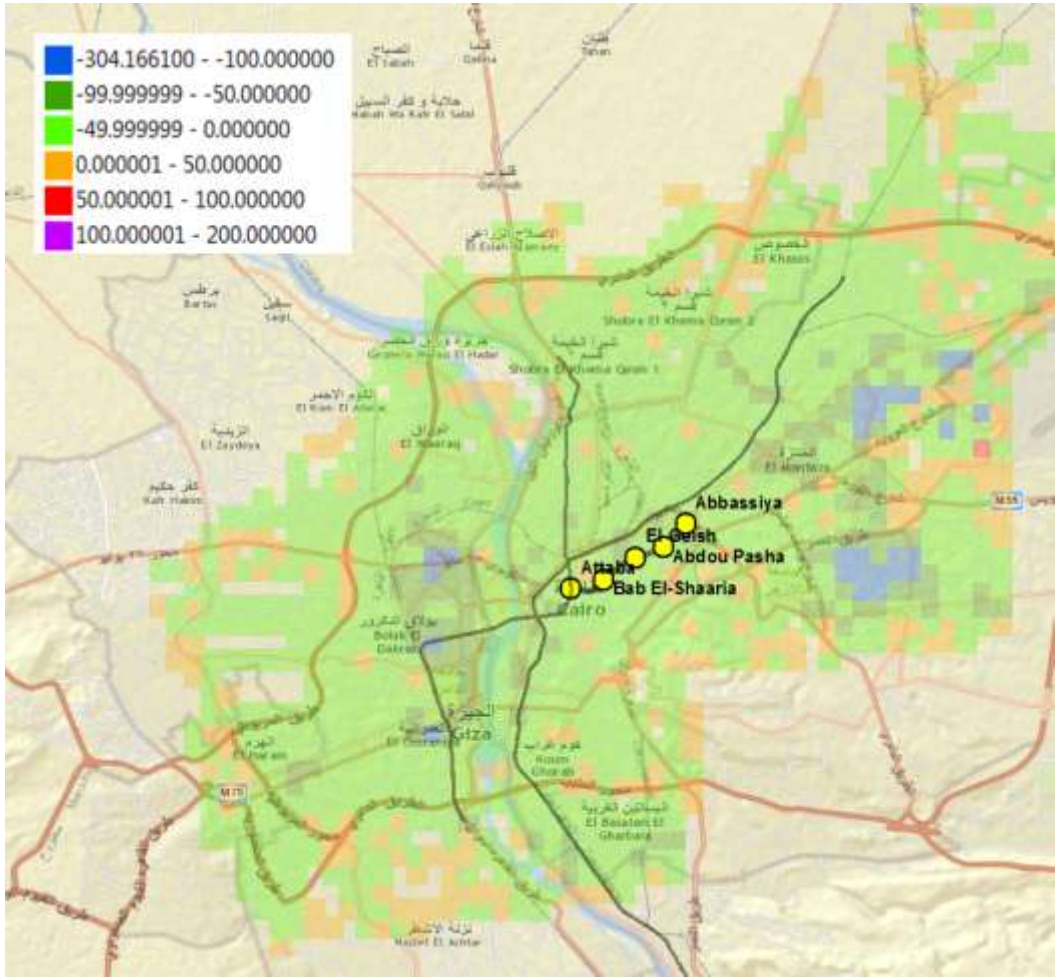


Results – effect of metro 3 phase 1

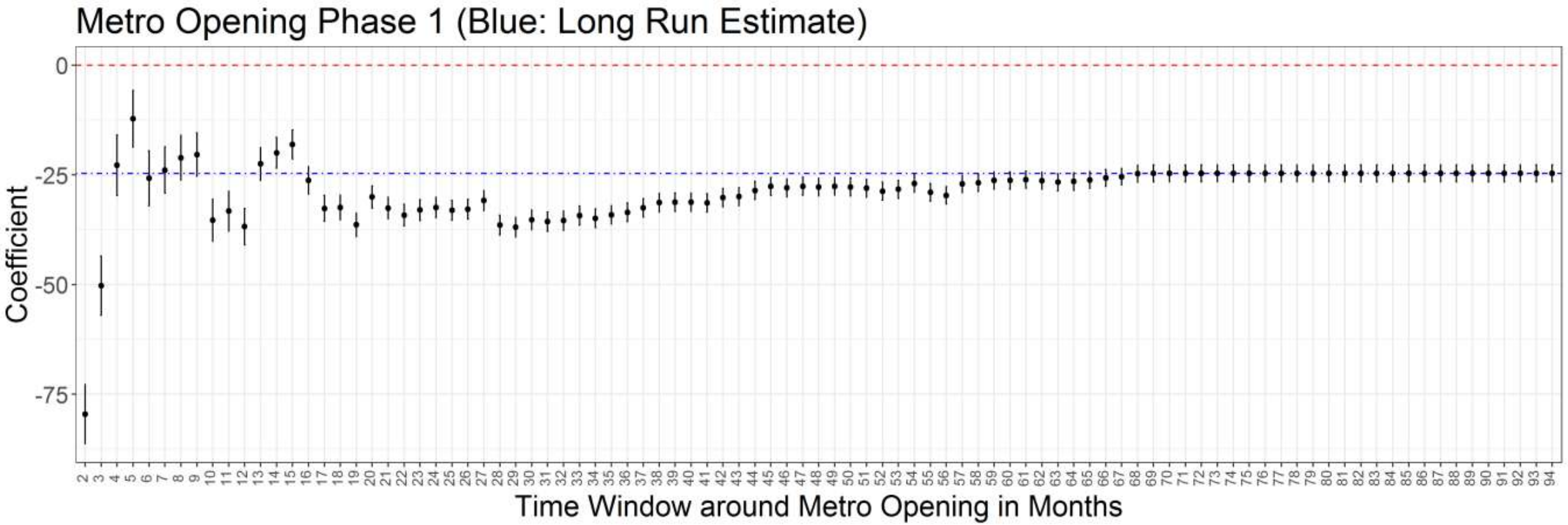
Traffic density



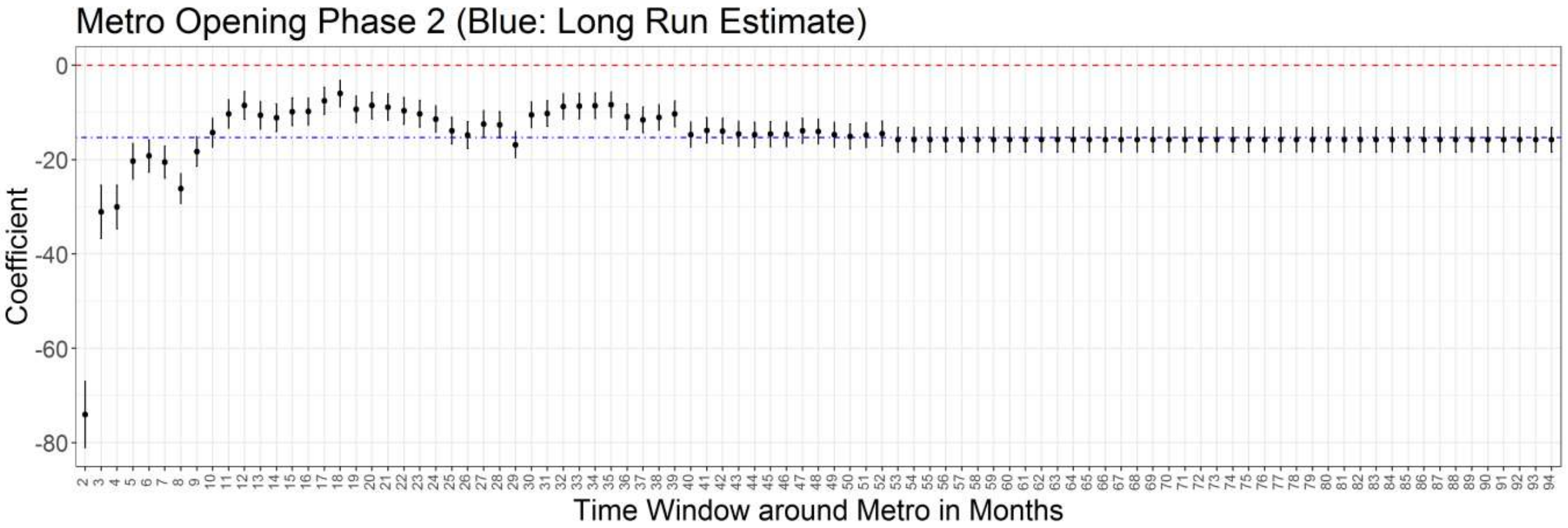
Changes in traffic density associated with metro



Results: Effect of metro over time

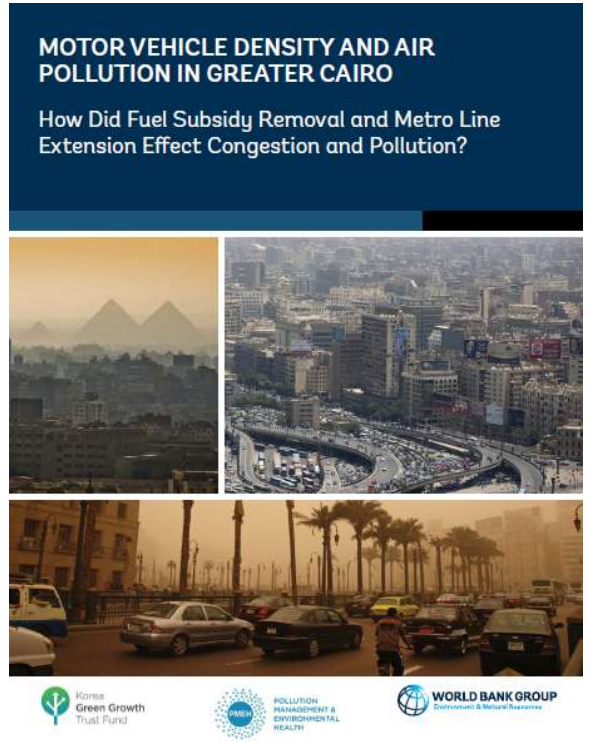


Results: Effect of metro over time



Summary of results for metro impact

1. Metro line 3 reduced congestion significantly, and PM10 air pollution by 3.4%
2. If no cars operated (or if they were all ZEVs), we would have 27% less PM10 in the atmosphere.
3. Relationship is quasi-linear: for each 1% of vehicles reduction/cleaning, PM10 reduced by 0.27%
4. We estimate that the averted health effects alone are worth about USD 209 million per year.



So what next?

Non-exhaustive list:

- Yes, **e-mobility**
- But also other components of **sustainable transport**:
  - Fuel quality & Vehicle Technology
  - Making walking and cycling more attractive
  - Road management & maintenance
  - Regulatory framework
- Interventions in **other sectors**, such as
  - integrated solid waste management (to reduce municipal waste burning),
  - industrial pollution abatement etc…
- Continuously improving the evidence-base (e.g. Pollution Management and Environmental Health Program) & making the case that there are **significant health & economic benefits from improving air quality**

Thank you!