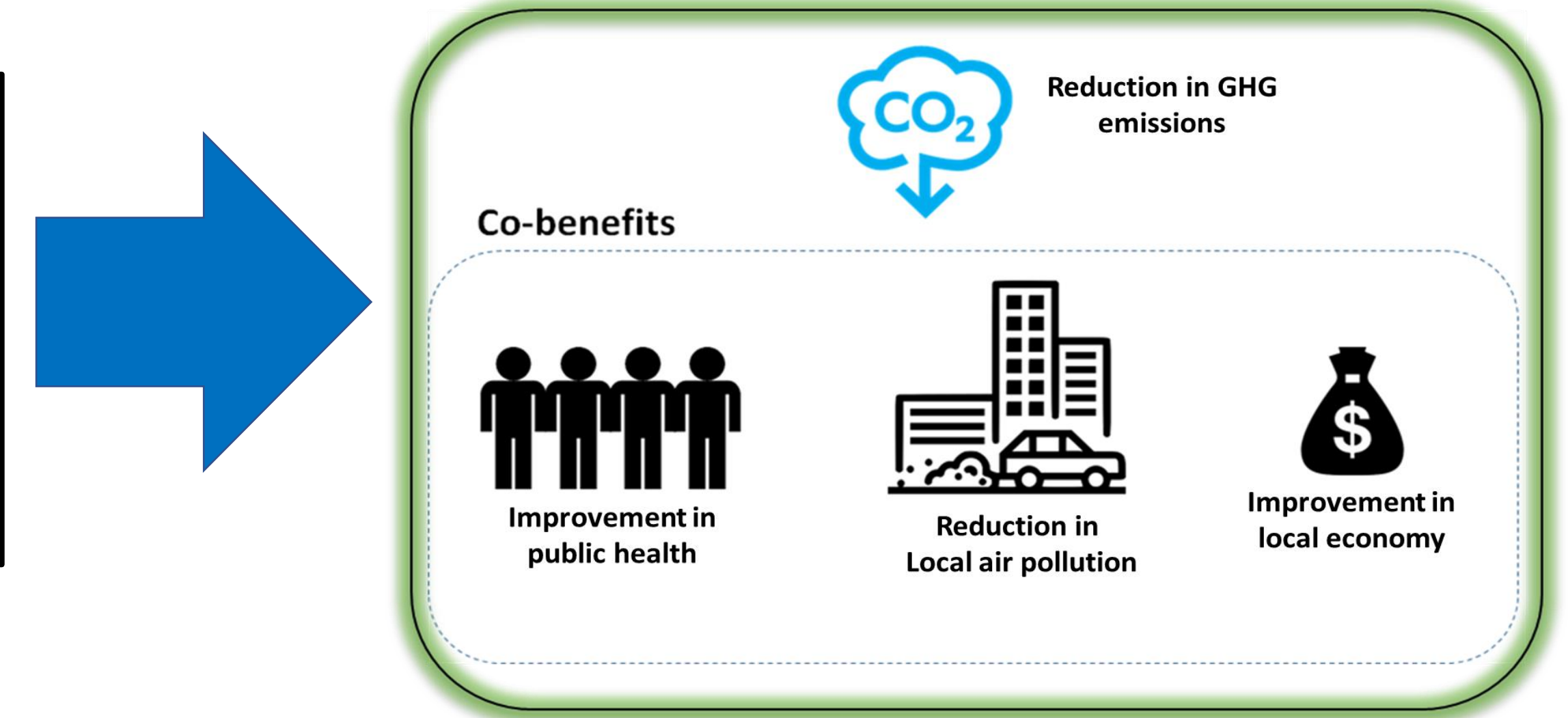


Environmental, health, and economic co-benefits assessment of the electrification of the Delhi public transport bus fleet, estimating near roadway PM2.5 avoided emission

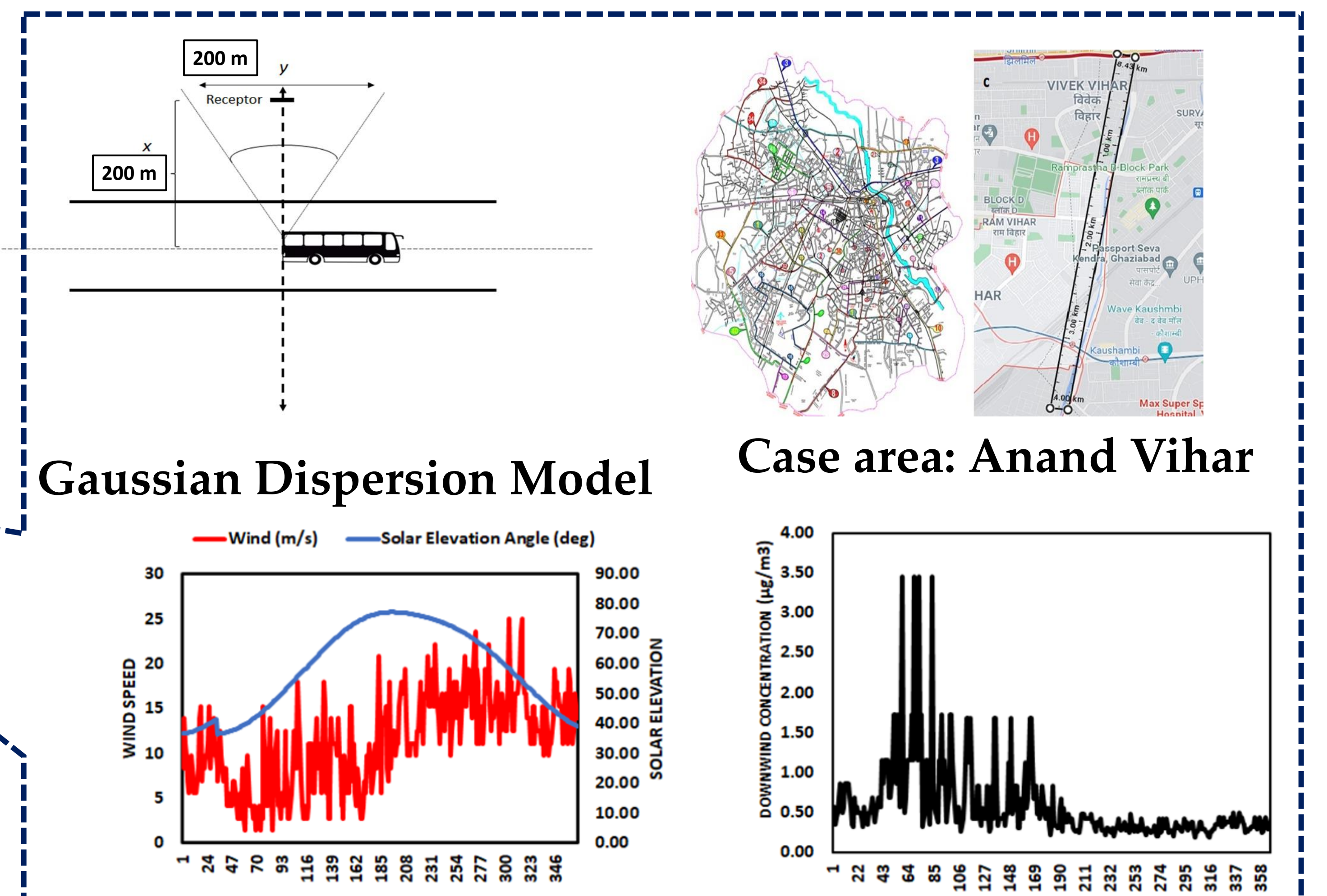
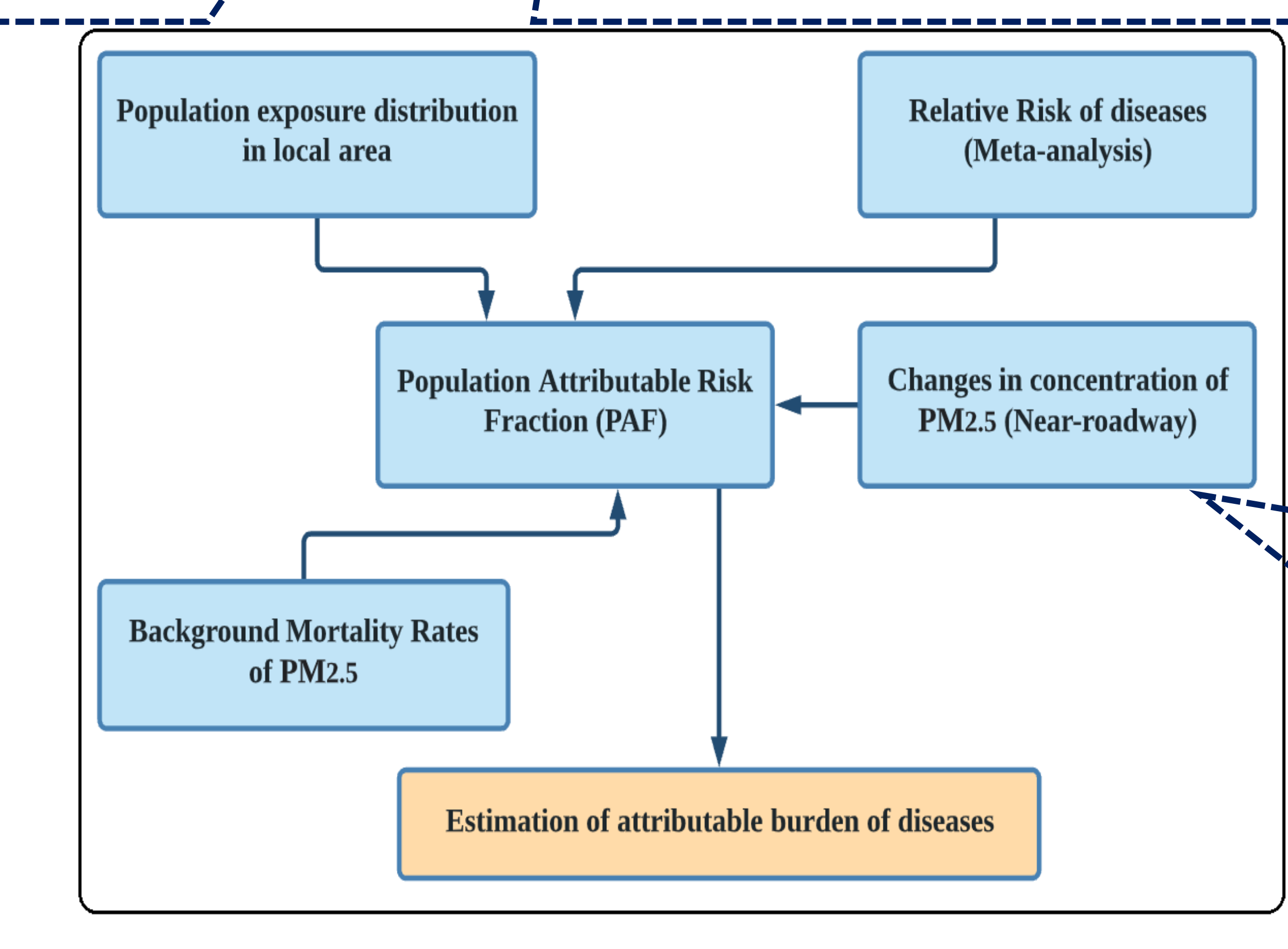
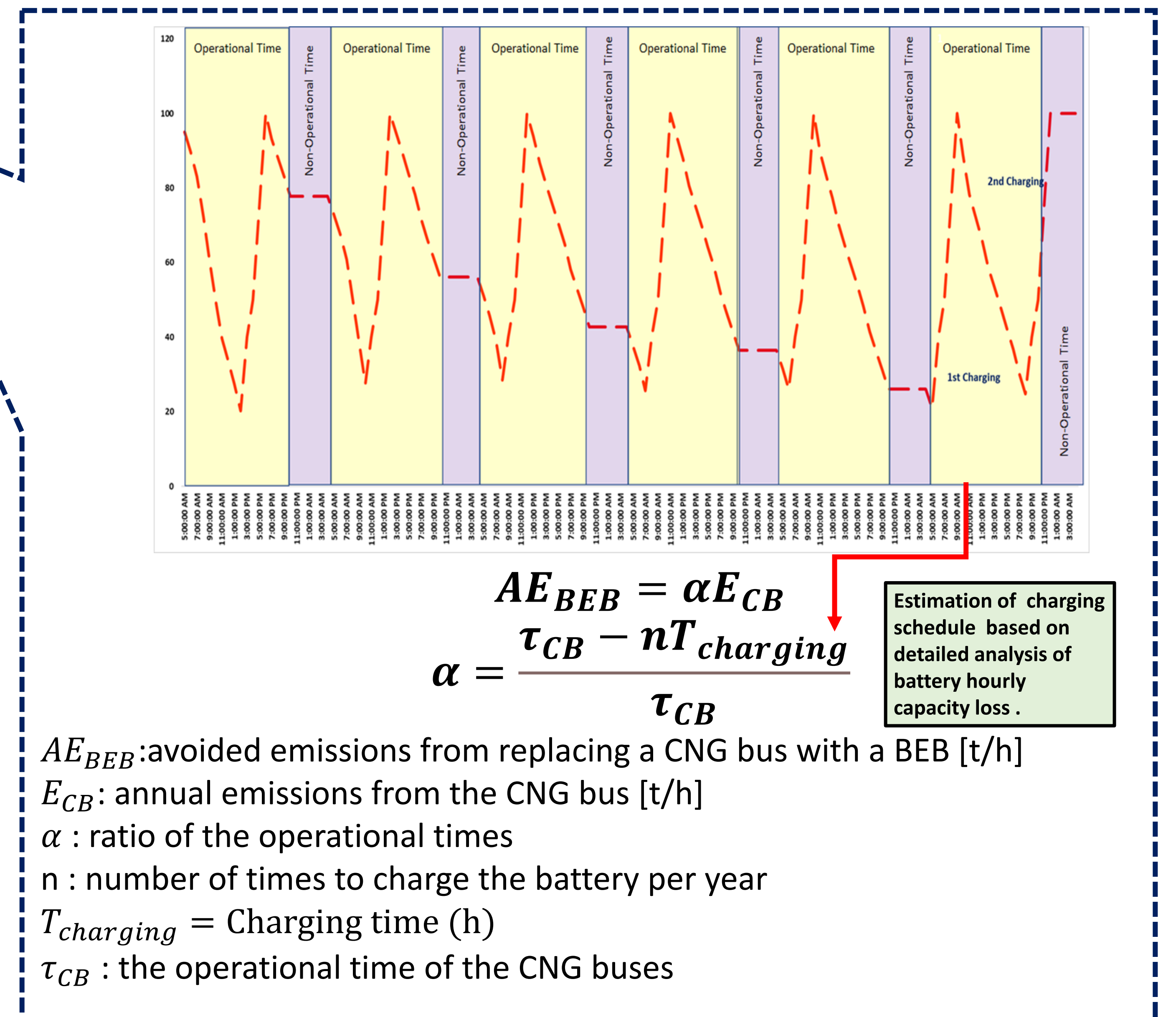
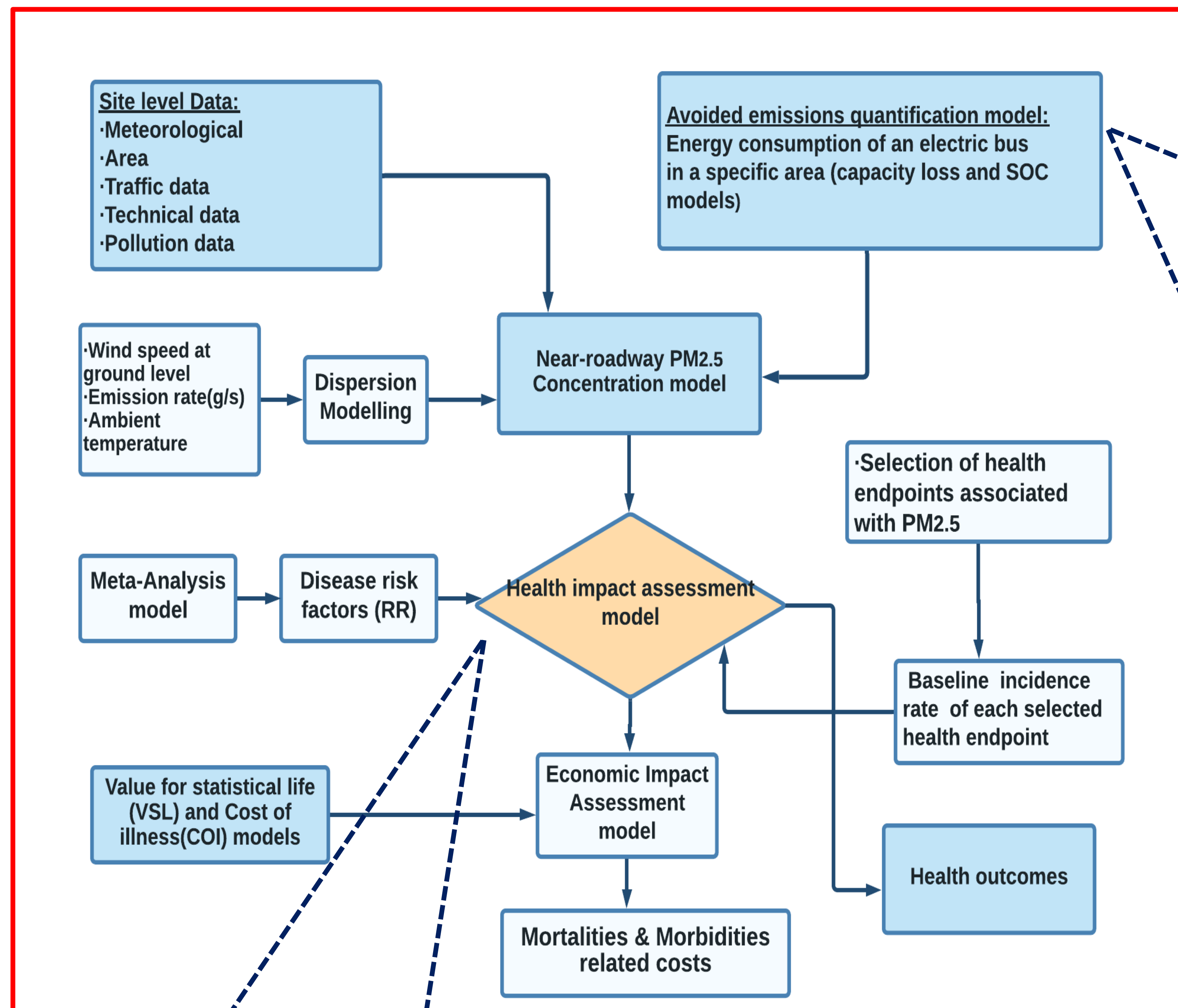
Tavoos Hassan Bhat and Hooman Farzaneh *

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University, Fukuoka 816-8580, Japan; tavoos.hassan.bhat.478@s.kyushu-u.ac.jp (T.H.B.); *Correspondence: farzaneh.hooman.961@m.kyushu-u.ac.jp

- India's energy consumption, travel demand, and transportation-related emissions have all increased substantially as the country's urbanization rate has risen.
- The transportation sector's energy consumption is expected to increase in the future as people's living standards rise, as will the environmental and health implications in Delhi.
- **Battery Electric Buses (BEBs) can enhance public health and the environment while simultaneously decreasing healthcare and transportation costs for individuals**



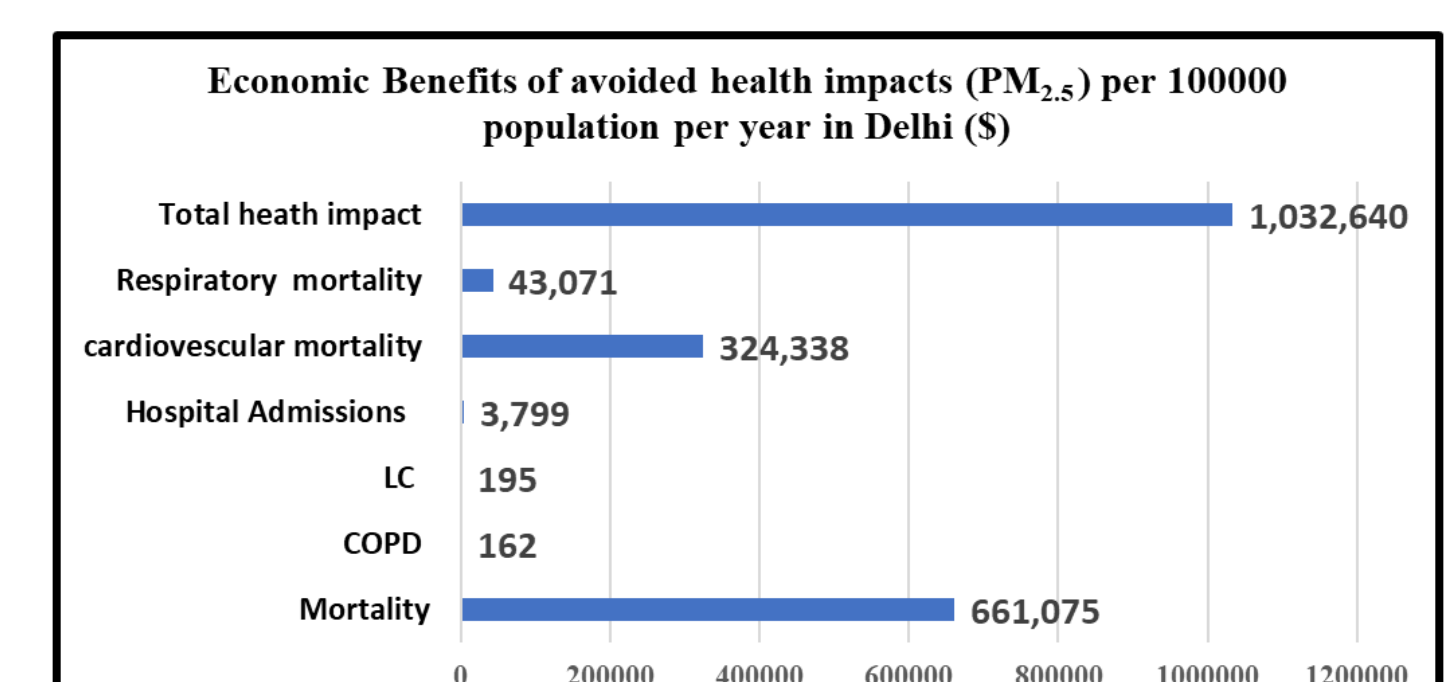
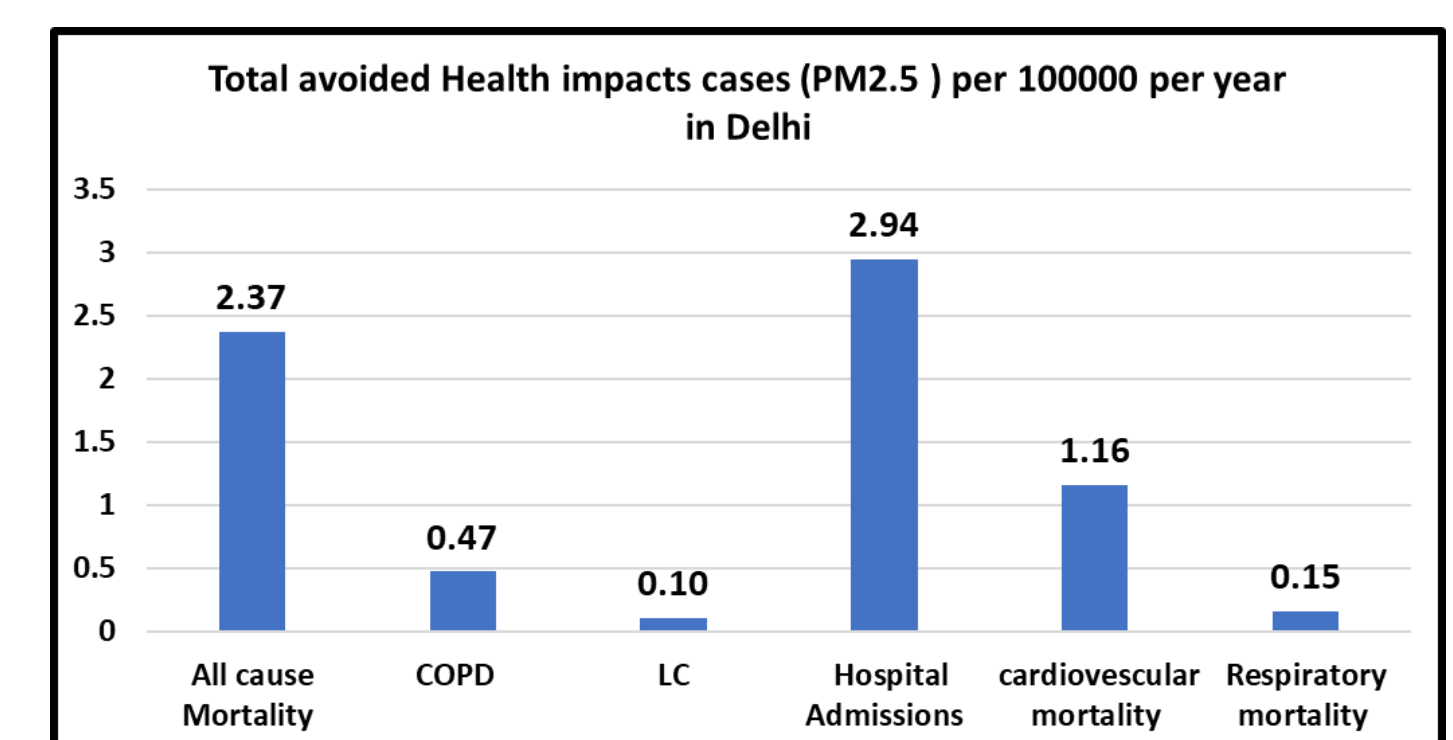
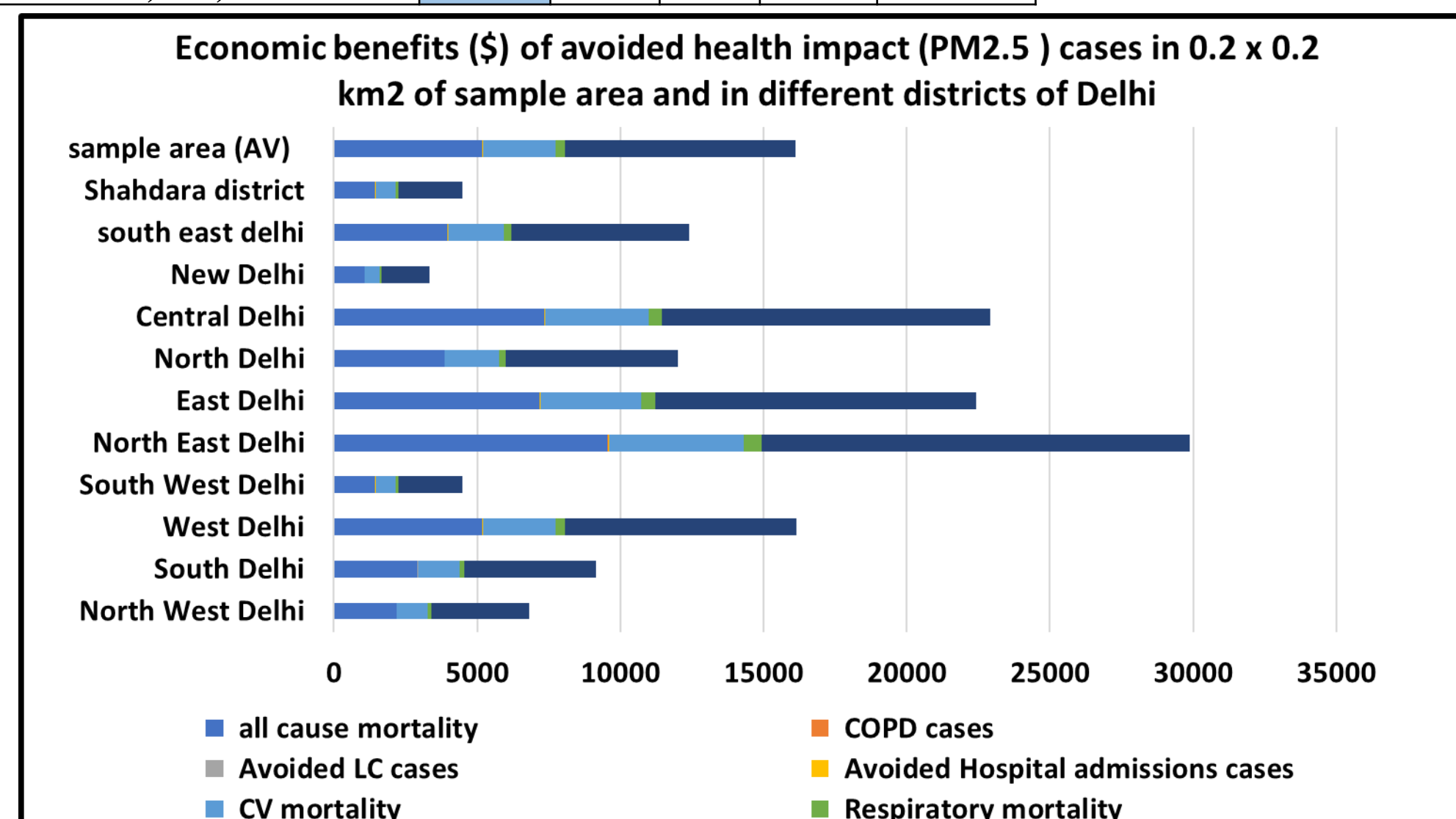
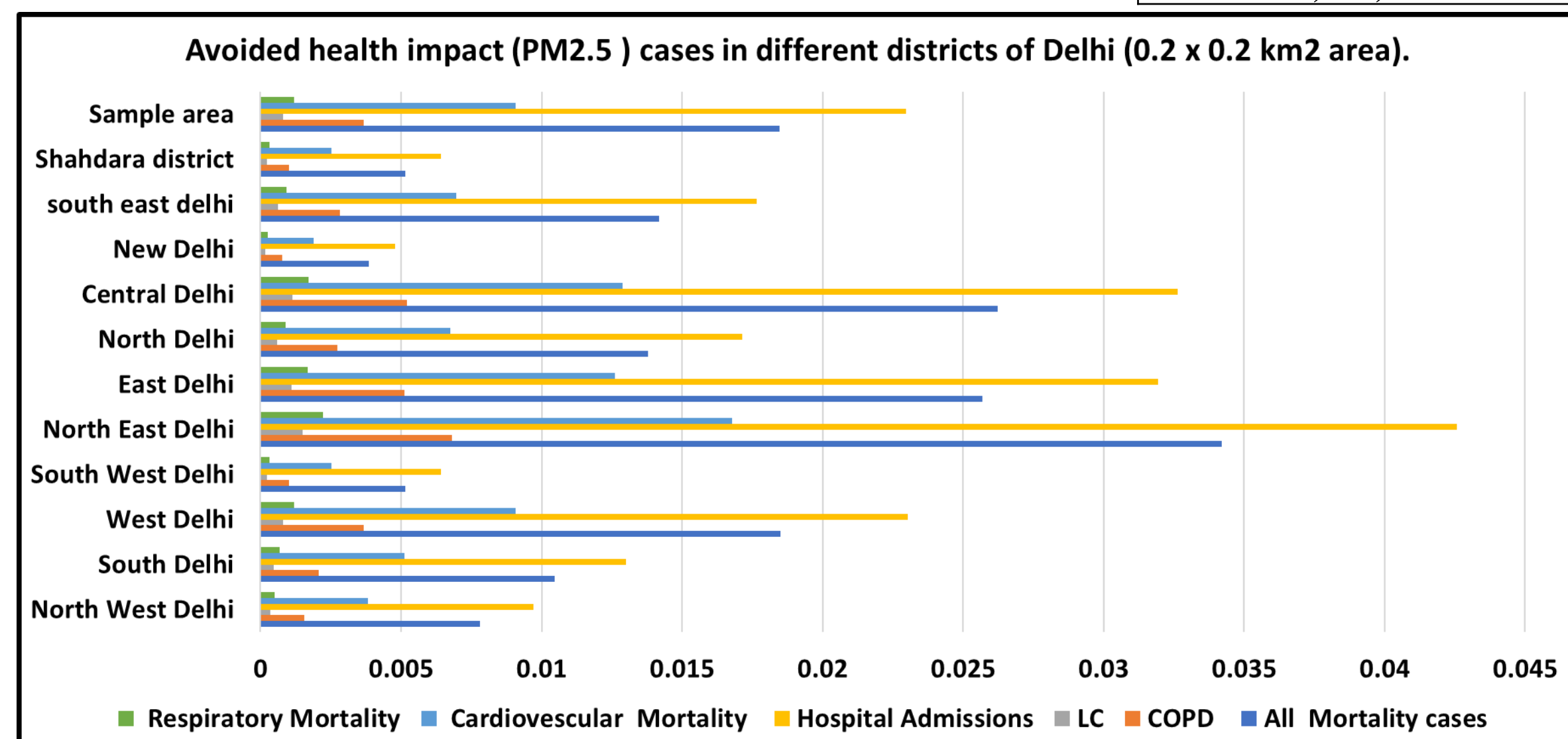
Data & Methodology



Results

Avoided emissions from implementing BEBs in case area (Anand Vihar)

| Total annual bus kilometres | Annual BEB kilometres | PM _{2.5} (kg/y) | Nox (t/y) | CO (t/y) | VOC (t/y) | CO ₂ (t/y) |
|-----------------------------|-----------------------|--------------------------|-----------|----------|-----------|-----------------------|
| 2,518,500 | 1,881,017 | 346 | 48.3 | 22.0 | 6.3 | 2460.4 |



Conclusion

- Equal number of BEB fleet will be only able to cover 74.67 % of the total current operation hours of the CNG bus fleet .
- The ground level area concentration of PM_{2.5} in a receptor grid covering an area of 0.2 X 0.2 km² downwind and crosswind distances is calculated to be 2.35 µg/m³, which is regarded the lower level of PM_{2.5} concentration near the road.
- The model was extended to 100000 people living roadside in Delhi which resulted in 2.4 avoided mortality cases and other morbidities and associated monetary benefits of \$ 1032640 per 100000 people.
- BEB fleet in Delhi can cover all initial capital costs within its lifespan in terms of monetary benefits from near road avoided health impacts in addition have lower operational costs per kilometer .