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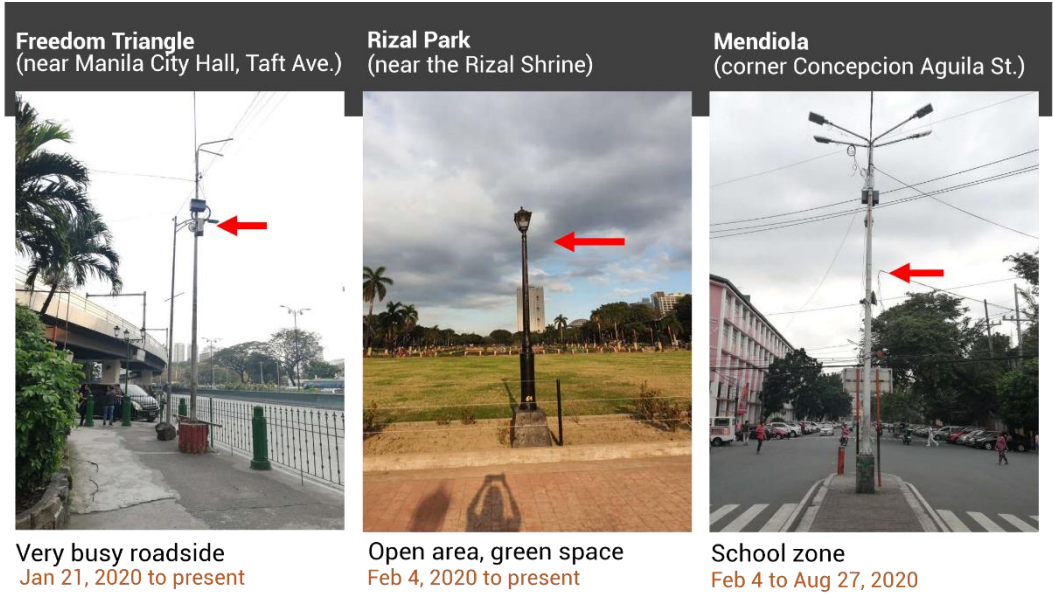
Ensuring data to action at the city level

Case study on the Manila Clean Air Action Plan Development and the Quezon City Air Quality Management Project

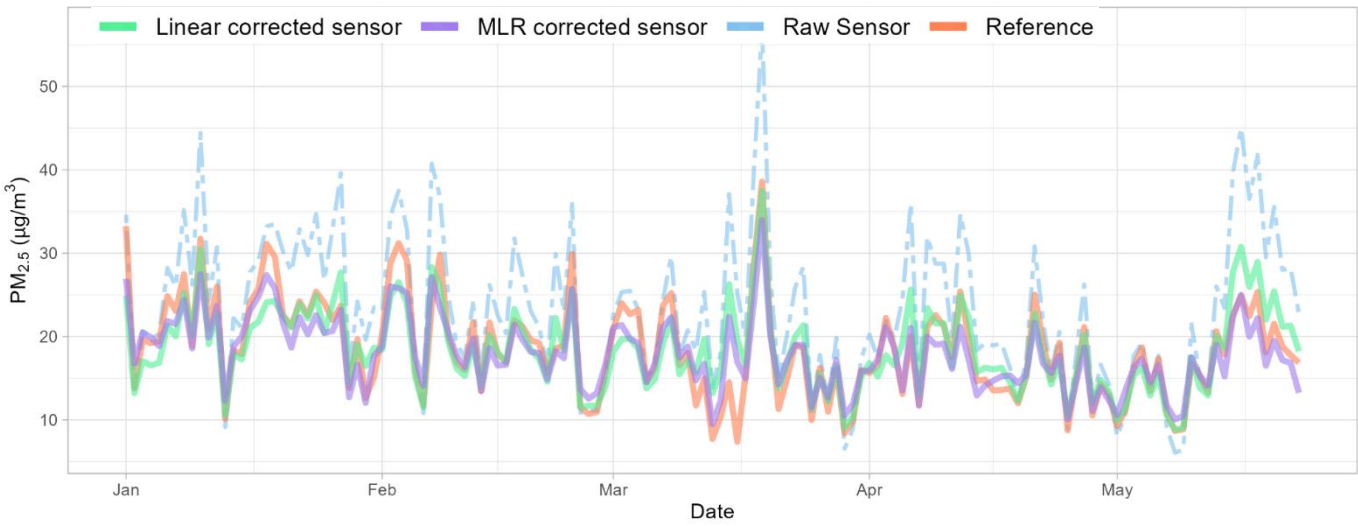
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Asia Blue Skies Program in Manila, Philippines

Baseline Air Quality Monitoring towards AQM



Raw and corrected sensor PM_{2.5} data in Mehan Garden, Manila (Graph shows 2022 data)



Year	Reference	Corrected sensor	Relative Accuracy (%)
2020 (Aug-Dec)	16.6	18	91.6
2021 (Jan-Dec)	18.2	18.1	99.5
2022 (Jan-May)	18.6	18	97.1

The deployment of sensors in the City of Manila to complement the 1 reference station cascaded action

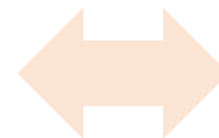
- Longest field collocation in the country (Aug 2020-May 2022) with good performance
- Demonstrated how data from sensors can help in filling gaps and in Clean Air Action Planning



Clean Air Asia approach to Clean Air Action Planning (from Data to Action)



KNOWLEDGE BASE



SOLUTIONS



AIR QUALITY MONITORING

- Level of pollution

- **Baseline air quality levels in monitoring sites**
- **Air quality targets**
- **Highlights contribution of roadside emissions to ambient air quality**

Informs targeting of pollution control measures



EMISSIONS INVENTORY

- Sources of Pollution

- Applicable emission sources
- Priority sources based on emissions contribution
- Baseline emissions

Monitoring and evaluation framework for pollution control measures



HEALTH MAPPING

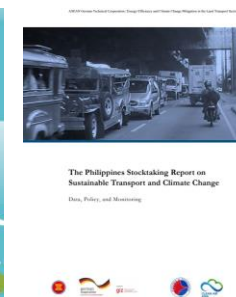
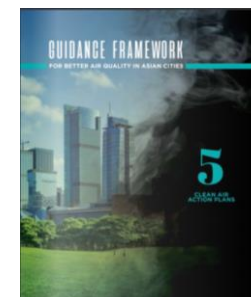
- Impacts

- Priority districts for exposure reduction
- Baseline PhilHealth incidences



CITY PROFILE, ACTIVITIES, TRENDS

- Local conditions and air pollution drivers



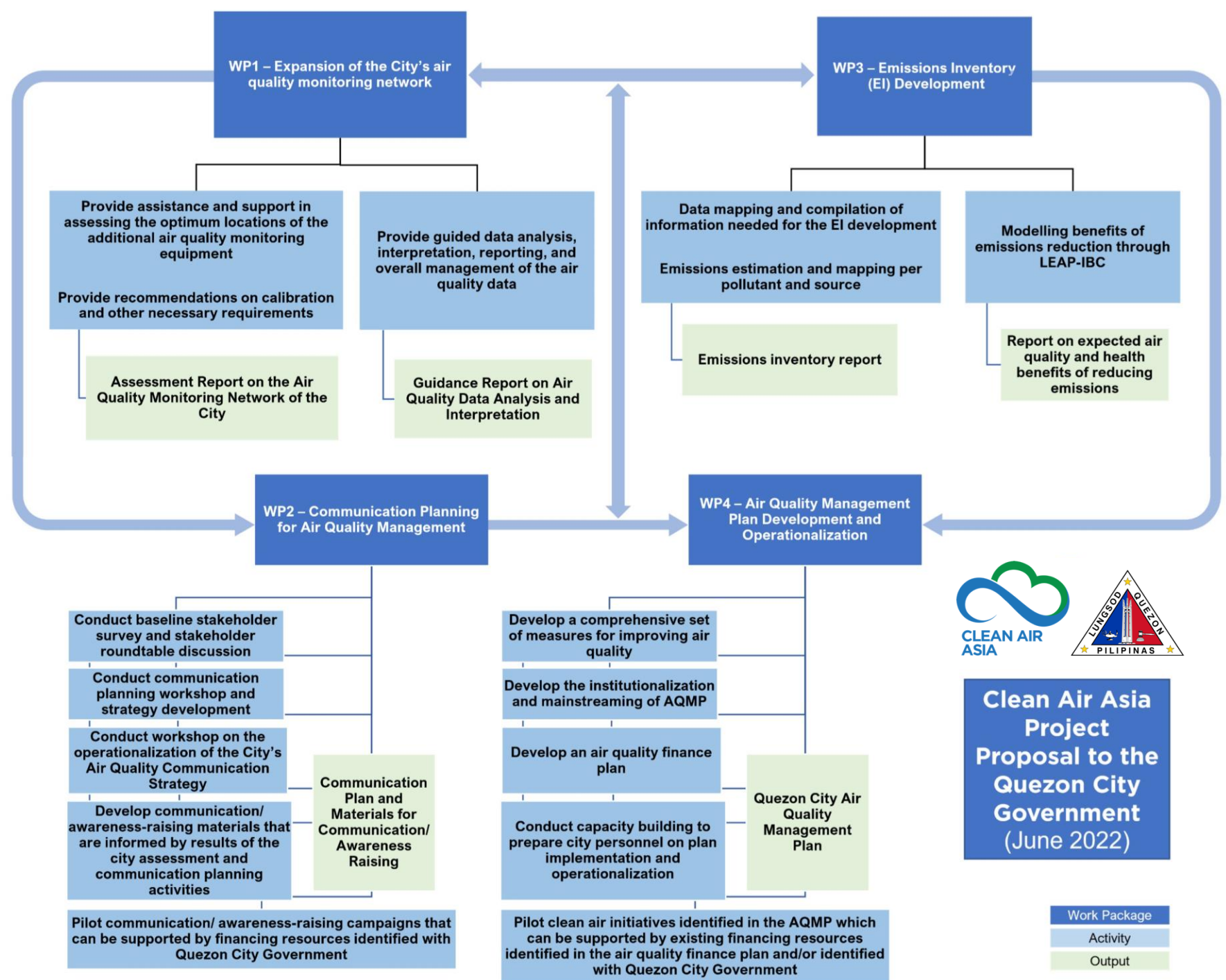
Key lesson learned: City partners must be part of the data collection and interpretation process. Tangible data helps them visualize action.



Quezon City Air Quality Management Project

Government-led project aimed at developing the City's Air Quality Management Plan

- Aligned with their commitment to meet WHO AQGs
- Links air quality monitoring, emissions inventory, & air quality communication towards AQMP finalization
- Focused on **strengthening the capacity** of the local government



The Quezon City Air Quality Monitoring Network

Largest city-level monitoring network in the PH

- 20 units of Clarity Node-S (PM_{2.5} and NO₂ monitor; one with O₃)
- 6 units of Davis Vantage Vue Automated Weather Station
- 1 reference station (QCU) with ENVEA PM₁₀, PM_{2.5}, SO₂, NO₂ monitoring equipment with weather monitor
- As of 2023, 30 units sensors are deployed



The Quezon City Air Quality Monitoring Network

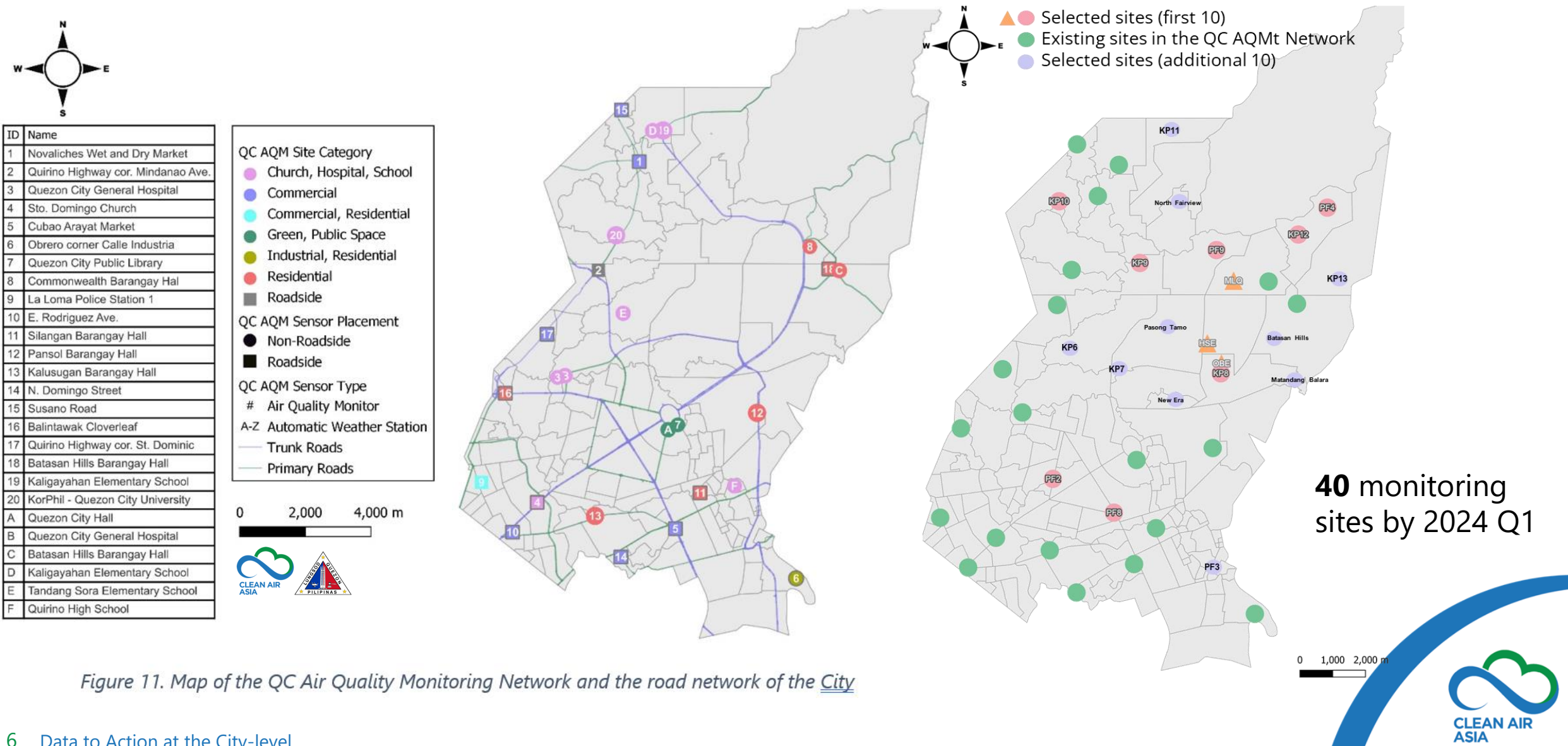
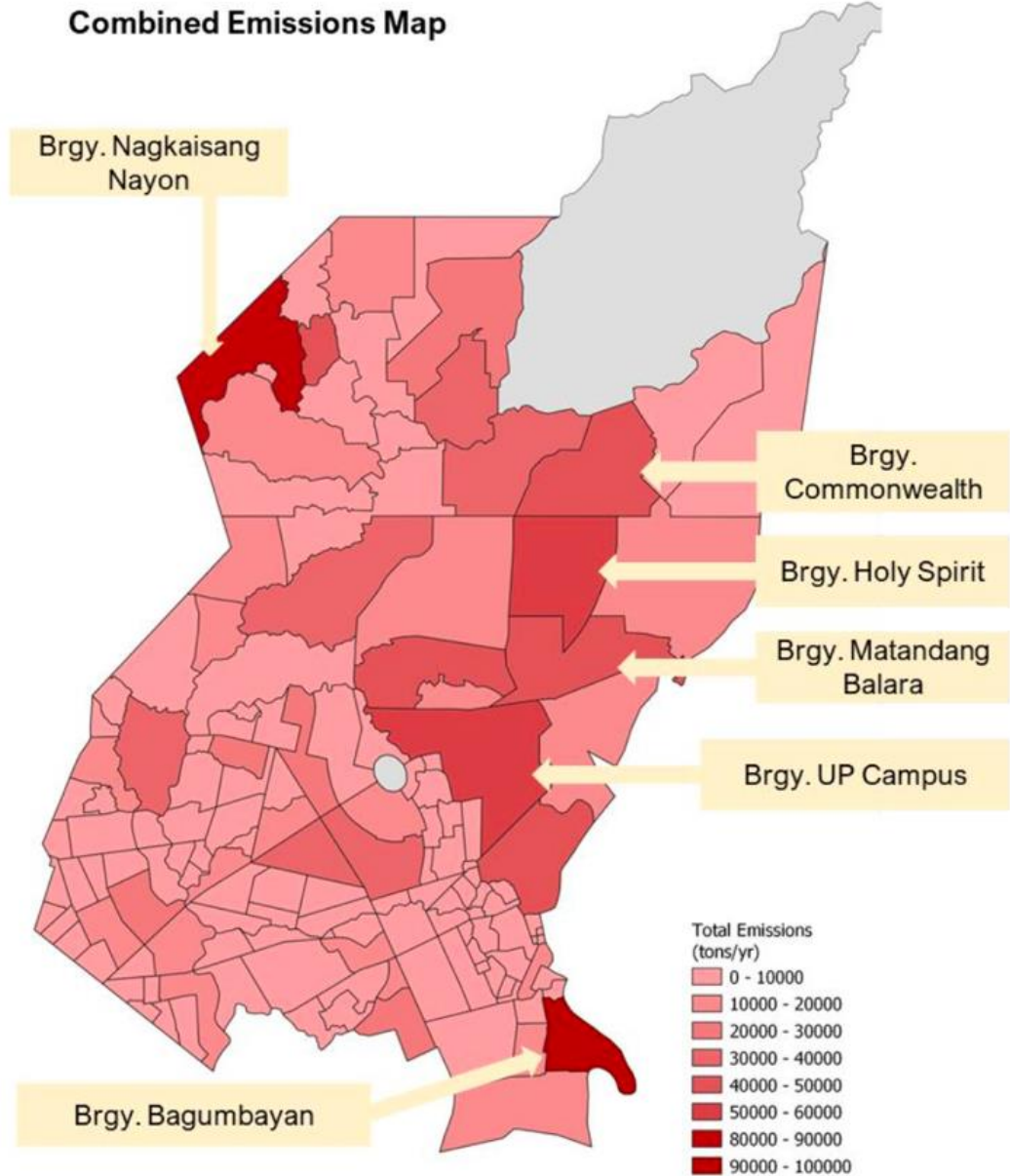
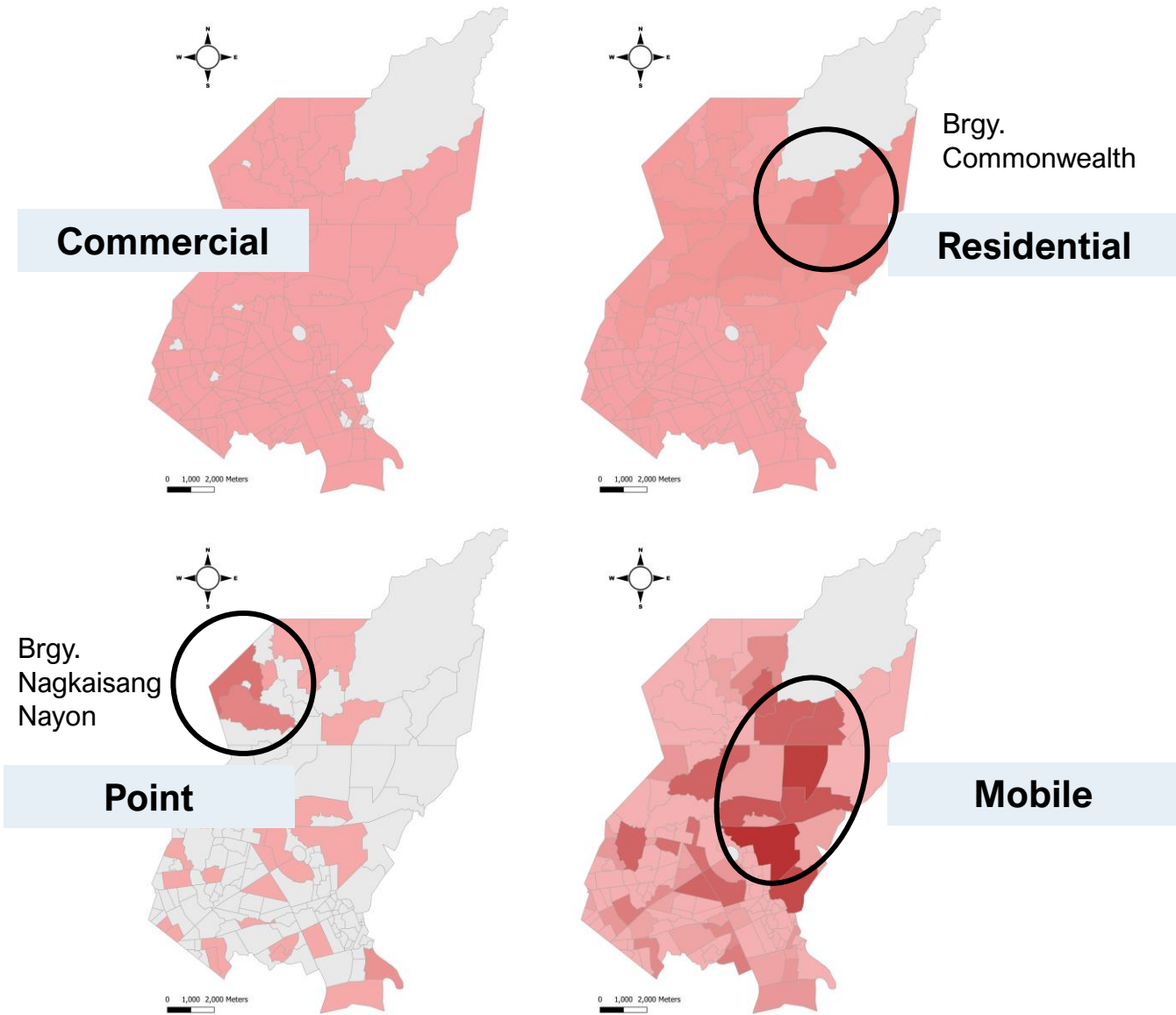


Figure 11. Map of the QC Air Quality Monitoring Network and the road network of the City

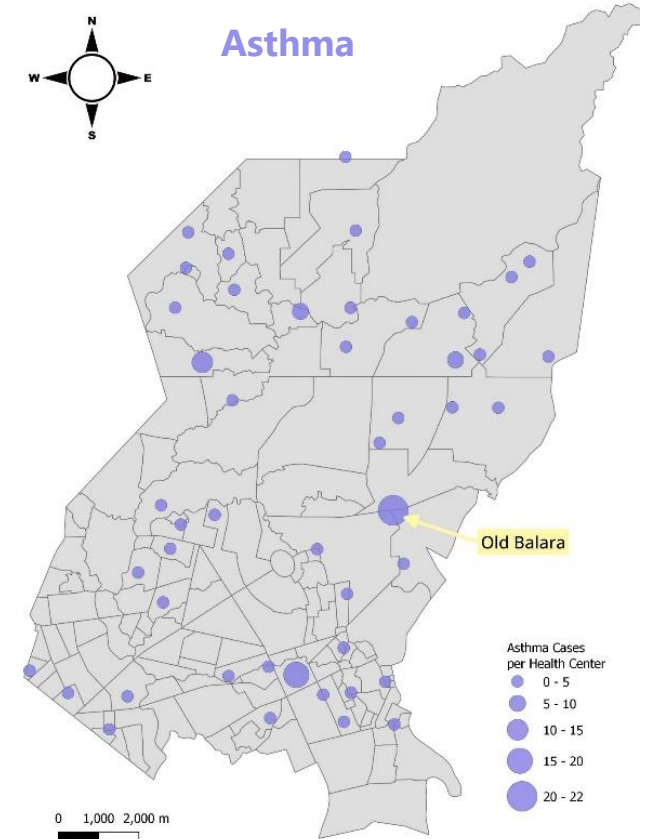
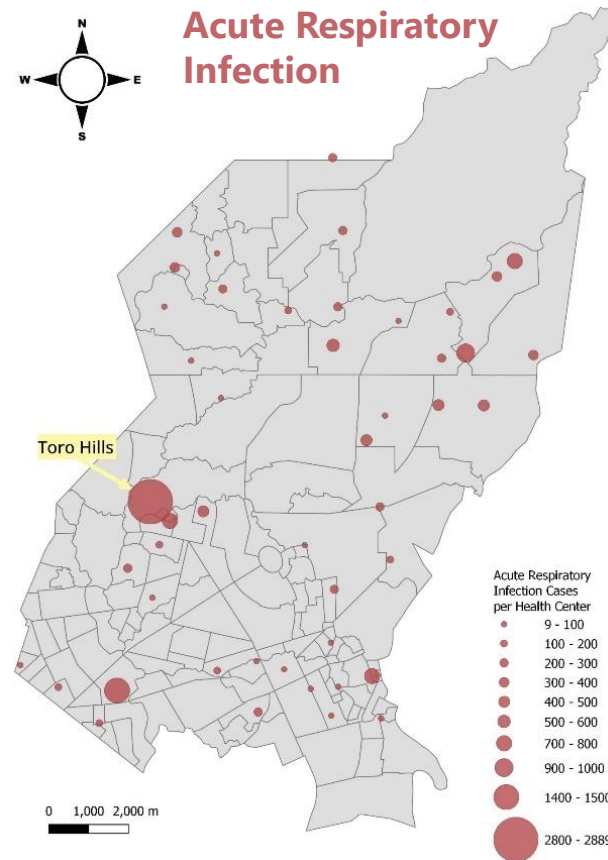
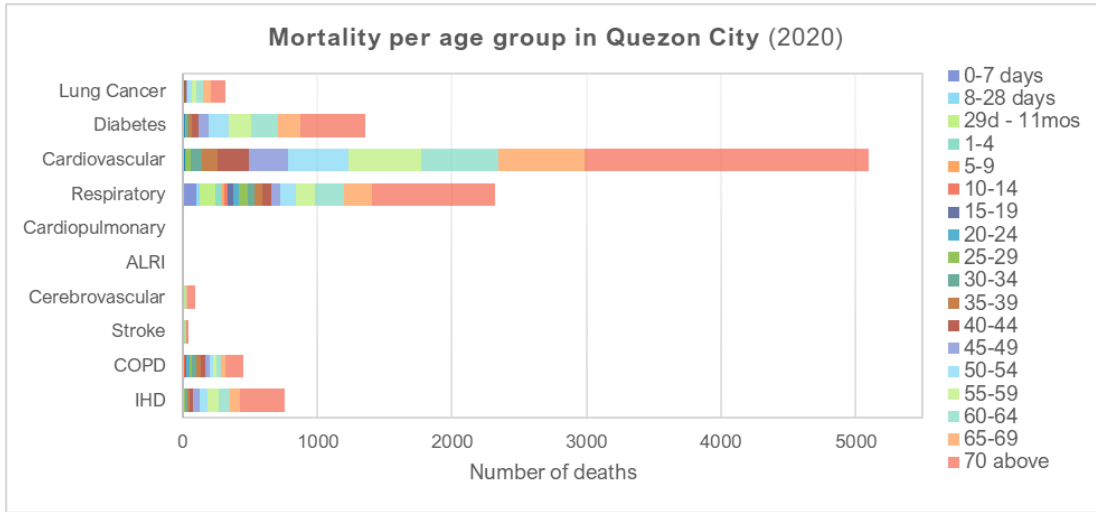
Spatial distribution of all emissions



High-resolution inventories lead to specific priorities

Source	Source Type	Priority site for action
Mobile	<ol style="list-style-type: none"> Passenger Cars (CO₂, SO₂, NH₃) Motorcycles (CO, NMVOC, CH₄, OC, PM, NO_x) Jeepneys (BC) 	<ol style="list-style-type: none"> Commonwealth Avenue (302,316 vehicles passing through per day on average) EDSA (372,271 vehicles passing through per day on average) <p><i>*Commonwealth has a longer total length inside Quezon City than EDSA (more emissions accounted for)</i></p>
Area	<ol style="list-style-type: none"> Household Cooking (PM_{2.5}, BC, CO, SO₂, NO_x, CO₂, N₂O) Waste Generation - residential and commercial (CH₄) Solvent use - residential and commercial (NMVOCs) Construction (PM₁₀) 	<ol style="list-style-type: none"> Brgy. Commonwealth Brgy. Batasan Hills Brgy. Payatas <p><i>*Residential emissions were computed per capita, thus barangays with higher populations would consequently have higher emissions</i></p>
Point	<ol style="list-style-type: none"> Food and Beverage Industry (CO₂) Paper and Board Manufacturing (CO₂) Textile Industry (CO₂) <p>Per equipment type:</p> <ol style="list-style-type: none"> Coal fueled boilers - 10 units (CO₂, SO_x, CO, PM) Rice hull fueled boilers - 2 units (CO₂) LSFO fueled furnaces - 8 units (CO₂) 	<ol style="list-style-type: none"> Brgy. Nagkaisang Nayon Brgy. Bagumbayan

Health mapping visualize link of air pollution and health



- **Cardiovascular and respiratory** disease-caused mortality have the highest rates, especially among residents **55 years old and above**.
- High incidence rates of **Hypertension and heart disease morbidity** were found for the **elderly group**, and **Acute Respiratory Infection for children under 5 years old**.

Benefits of emission reduction measures were quantified (LEAP-IBC)

Scenario	Measure	Target	Timeline
ESP: Energy Saving Plan	Energy efficiency at the residential level	Energy saving by 1.2%, 1.3%, and 1.3% annually for residential, commercial, and industrial sectors, respectively	Until 2040
WM: Waste Management	City-wide solid waste management systems	fraction of waste reduced by: 5% every 3 years	2021 onwards
BWM: Biodegradable Waste Management	Bio-digested facility program in key strategic areas such as public markets	fraction of waste reduced by: 10% 50% 60%	2025 2030 2050
CONST: Dust Control Strategies	Improvement of dust control strategies	50% reduction in PM10 and PM2.5 fugitive dust from building construction	from 2020 onwards
SOLVENT: Low VOC Products	Promotion of low VOC products and approaches	10% reduction in NMVOC from solvent application	from 2020 onwards

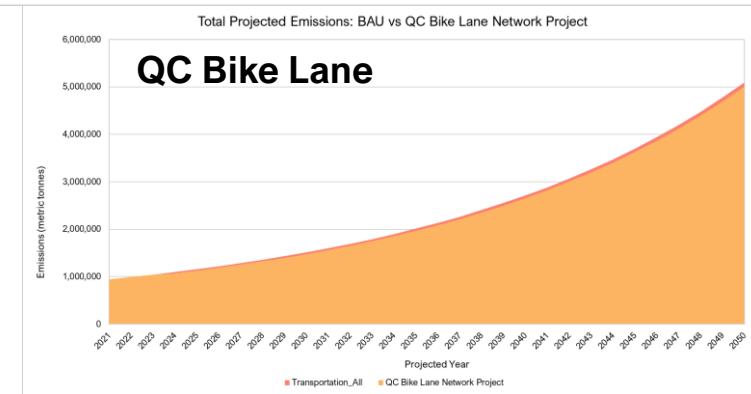
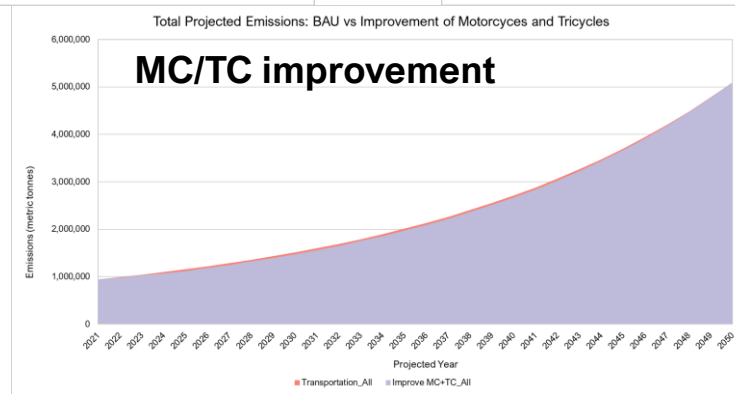
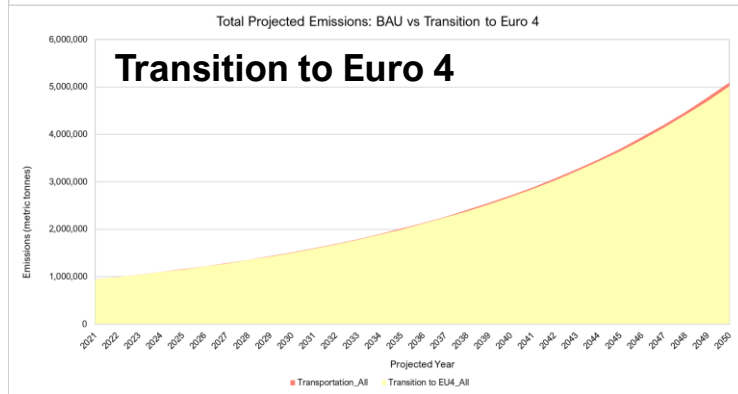
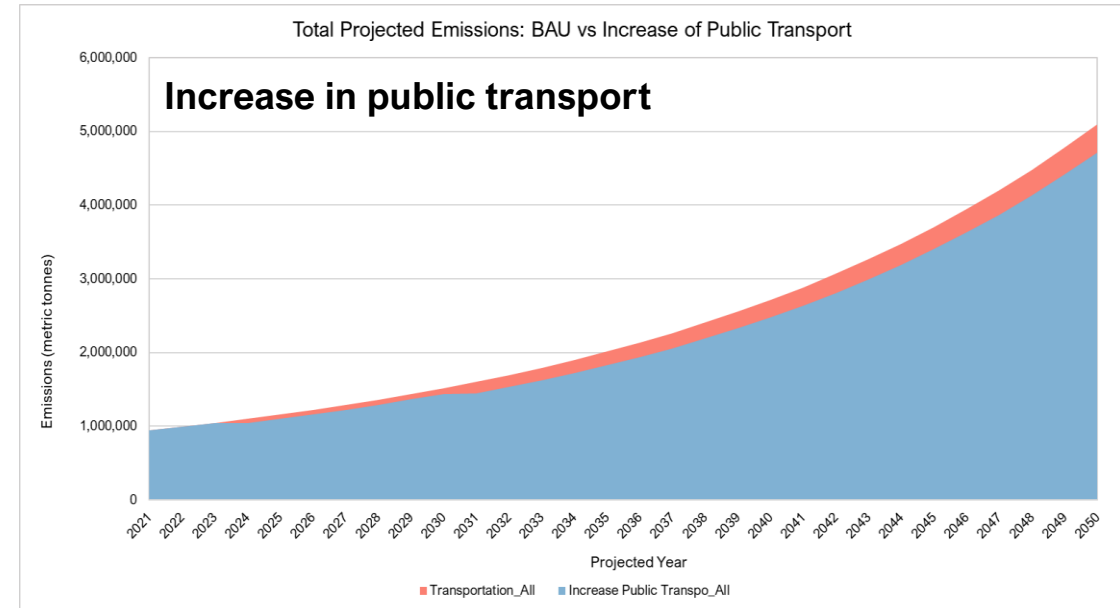
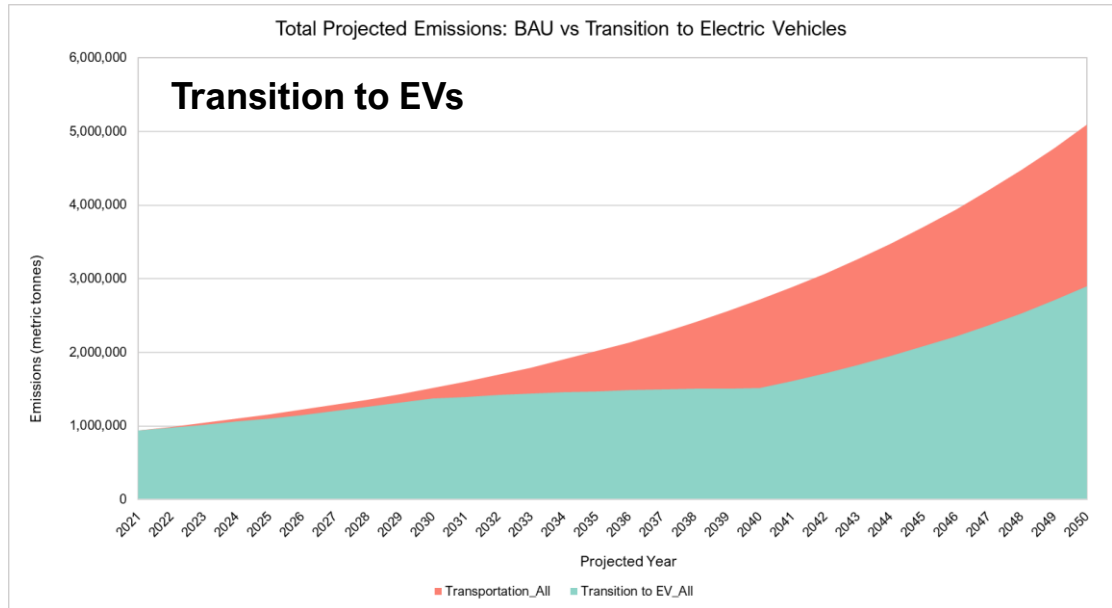
Scenario	Measure	Target	Timeline
TRANS_EV: Transition to EV_ALL	Encouragement/ motivation of all sectors to use/ transition to EVs	Transition all vehicles to EV by (veh-km): 5% 10% 50%	2025 2030 2040
GOV_EV: Transition to EV_Govt	Procurement of zero emission government-owned buses and vehicles	Transition all government vehicles to EV by (veh-km): 5% 10% 50%	2025 2030 2040
TRANS_EU4: Transition to Euro 4_ALL	Transition to Euro 4 (all vehicle fleet)	100% of vehicles comply with Euro4 standards	2040
GOVT_EU4: Transition to Euro 4_Govt	Transition to Euro 4 (all government fleet)	100% of vehicles comply with Euro4 standards	2030
NEW_TRIC: Improve Tricycles to 4Stroke	Improvement of tricycle fleet	Transition all motorcycles/tricycles to 4-stroke	2025
MASSTRAN: Increase BRT/MRT/LRT	Increase in sustainable public transport: Local bus rapid transit system or increase in MRT/LRT capacity	Reduction in share of passenger cars and UV by (veh-km): 10% 20%	2025 2030
QCBIKE: QC Bike Lane Network Project	Quezon City Bike Lane Network project	Reduction in share of passenger cars by (veh-km): 5% of passenger cars x 68 km	2024 onwards

All measures were carefully discussed with the local government and stakeholders to avoid unrealistic expectations



Total emission reduction from Transport Measure Scenarios

Other transport measure scenarios had lower benefits than EV transition but would still be helpful
 (small decrease in the projected emissions (compared to BAU) by 2050).



Ano ang "Air Pollution"?



• Ang air pollution ay ang pagkakaroon ng mababang kalidad ng hangin na dulot ng mga "air pollutants" bunga ng iba't ibang gawain ng tao at industriya.

• Taun-taon, pitong milyong tao ang namamatay sanhi ng air pollution at nakakapagpaiksi ng buhay na umaabot hanggang 20 buwan.

• Ang mga sakit na maaaring makuha o mas mapalala dahil sa mababang kalidad ng hangin ay:

- Sakit sa baga: (lung cancer, Chronic Obstructive Pulmonary Disease, hika)
- Sakit sa puso: (Ischemic Heart Disease)
- Type II diabetes

Developmental delays ng mga bata
Mababang timbang ng sanggol, preterm birth



• Matatanda at bata ang pinakaapektado ng polusyon sa hangin na sanhi ng 20% pagkamatay ng mga sanggol sa buong mundo.



• Ang air pollution ay maaaring "outdoor" o "indoor" depende sa source o exposure ng mga tao.

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Pinagmumulan ng Air Pollution

- 1. Natural sources** (mula sa pagsabog ng bulkan at forest fires)
- 2. Man-made** (mula sa mga gawaing-tao)

Man-made sources mula sa:

Area sources (Residential at Commercial)

- Maliit ng pamamahala at pagsusunod ng mga casa
- Paglalantay ng saknang, pinara at appliances
- Paglalantay ng paggamit ng uling, kalye, LPG, at iba pang gas
- Akiba ng mga konstruksiyon
- Komunang gamit mula sa mga solid at wastewater disposal facilities, at dum ng bayon
- Lugaw na emisyon galing sa gas stations at chemical facilities

Mobile o Transport sources

- Mga sasakyan (land, water, air) na fuel based
- Mga heavy machinery at equipment (e.g., gamit sa pagpapalit)

Point o Industry sources

- Mga industriya, pabrik, power plants

Ang air pollution sources ay kaparehas din ng mga pinagmumulan ng climate pollutants (GHGs at SCLPs) na sanhi ng climate change. Kaya ang pagkilos para mapabuti ang kalidad ng hangin ay makabubuti rin para matugunan ang climate change.



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Ano ang ginagawa ng Quezon City upang matugunan ang air pollution?



Establishment of Quezon City-owned air quality monitoring network

• Pagkakaroon ng pinakamalawak na Air Quality Monitor Network na may kalukung dami na 40 non-reference air quality sensors, 3 automated weather stations at 1 reference monitoring station.



Air quality communication

• Communication strategy planning kasama ng mga QC stakeholders
• Pag-develop ng mga information dissemination materials



Emissions inventory and health mapping

• Pag-inventary ng lahat ng emission sources sa QC
• Pag-model ng benefits ng emission reduction measures
• Mapping ng respiratory health incidences sa siyudad



Air Quality Management Plan

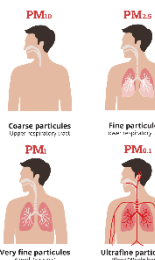
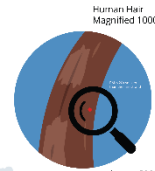
• Pagtala ng mga tiyak na hakbang at aksyon para magabuti ang kalidad ng hangin na magbibigay gabay sa paggawa ng mga polisiya para sa siyudad.

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Ano ang "Air Pollutants"?

• Ang air pollutants ay mga kemikal sa hangin na maaaring magdulot ng masamang epekto sa kalusugan ng tao at sa kalikasan. Ito ay karaniwang mula sa pagsunod ng fossil fuels (transportasyon, industriya).

• Maaaring mag-iba ang lebel ng polusyon bawat lugar at oras, depende sa lapit sa sources at lagay ng panahon.



May iba't-ibang klase ng air pollutants na nagdulot ng masamang epekto sa kapaligiran at kalusugan kabilang ang mga sumusunod:

- Particulate Matter (PM)
- Nitrogen Dioxide (NO₂)
- Tropospheric Ozone (O₃)
- Sulfur Dioxide (SO₂)
- Methane (CH₄)
- Carbon Monoxide (CO)
- Volatile Organic Compounds (VOCs)
- Black Carbon (BC)
- Hazardous air pollutants (e.g., PAHs, heavy metals)

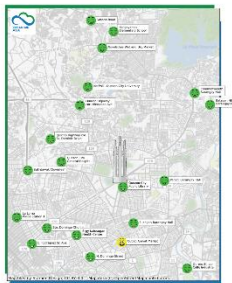
Hangang lumilit ang suklat ng Particulate Matter (PM), mas nakapapasok ito sa baga at nagdulot ng matinding epekto sa kalusugan.

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Paano nasusukat ang level ng polusyon sa hangin?



Ginagamit ang air quality monitor upang masukat ang level ng pollutant sa hangin.



Ang mga sumusunod ay maaaring makapagpakita sa air pollution level:

- Emission sources** o pinagmumulan ng pollutants (mga sasakyan, industriya, pagsusunod, etc.) – mas tumataas ang pollution level kapag mas malaki, marami o malapit sa emission sources
- Weather conditions** (hangin, ulan, temperatura, humidity, etc.) – maaaring makataas o babag ng pollution level depende sa situasyon
- Physical conditions** (bundok, buildings, etc.) – maaaring harangan o ikalat ang pollutants, depende rin sa lagay ng panahon
- Chemical reactions** na maaaring mag-form ng iba pang pollutants (ex., ang photochemical smog ay mula sa air pollutants na nag-react kapag may araw)



Ano ang Air Quality Index (AQI)?

Ang AQI ay ginagamit upang malaman ang air quality at mga paalala upang maiwasan ang masamang epekto dulot nito sa kalusugan ng tao.

	Good	- Walang babala
	Fair	- Walang babala
	Unhealthy for Sensitive Groups	- Iwasang lumabas kung mayroong respiratory disease tulad ng hika.
	Very Unhealthy	- Iwasang lumabas ng bahay at limitahang gumamit ng sasakyan - Iwasan ang lugar na may matinding traffic - Manatili at magpahinga sa bahay kung may heart/respiratory disease
	Acutely Unhealthy	- Iwasang lumabas ng bahay. Manatili at magpahinga kung may heart/respiratory disease - Maaaring limitahan ang paggamit ng sasakyan at bawasan ang mga gawaing pang industriya.
	Emergency	- Ang lahat ay dapat manatili sa loob ng bahay - Ipinagbabawal ang pagbyahe ng sasakyan maliban kung medical o emergency ang dahilan - Kailangang bawasan ang mga gawaing pang-industriya maliban kung makakaapekto sa kalusugan at kailigtasan

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AIR QUALITY ADVISORY

ANO ANG KALIDAD NG HANGIN SA QUEZON CITY?

SEPTEMBER 21-22, 2023

Sinusukat ng Quezon City ang polusyon sa hangin upang makatulong sa pagbuo ng mga aksyon, programa at batas sa pagpapabuti ng air quality sa lungsod.

Makikita sa mapa ang Air Quality Index (AQI) mula sa 20 lokasyon sa QC. Ang Particulate Matter 2.5 ay mga particle na mas maliit pa sa 2.5 micrometers ang sukat (20x na mas maliit sa hibla ng buhok).

Mula kahapon, makikita na may tig-isang lokasyon na may 'Very Unhealthy' at 'Acutely Unhealthy' na AQI, at 12 na lokasyon ay may 'Unhealthy for Sensitive Groups' na AQI.

Ngayong araw, 3 lokasyon ang may 'Acutely Unhealthy', 4 ay 'Very Unhealthy' at 11 ang may 'Unhealthy for Sensitive Groups' na AQI. Inaabisuhan ang mga residente na magsuot ng N95 Mask at iwasan lumabas lalo na kung mayroong respiratory o heart disease hanggang bumuti ang kalidad ng hangin.

Binuo ng QC LGU ang Quezon City Air Quality Management Plan upang matugunan ang air pollution sa lungsod.

Para sa mga karagdagang tanong, maaaring tawagan ang Climate Change & Environmental Sustainability Department (CCESD) sa 8988-4242 locals 8348 / 8349 / 8359 / 8360 at ang City Health Department sa (02)8929-8038 para sa mga health concerns tulad ng hirap na paghinga, hika, at iba pa.

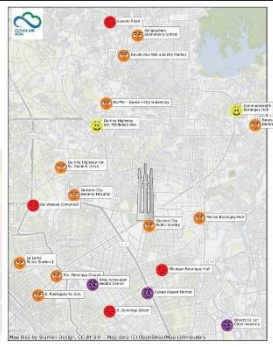
Air Quality in Quezon City

24-Hour PM_{2.5} AQI
21 September 2023

Air Quality Index (AQI)

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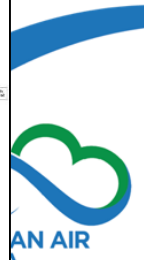
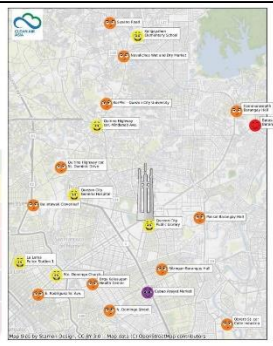
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2022 - 2023
Quezon City Air Quality Management Project

Roadmap for QC's AQMP development

Establish the planning process for Quezon City

- Establish an Air Quality TWG
- Convene AQM stakeholders and start the AQMP development process
- Identify available resources and mobilize them
- Build capacity of CCESD and AQM stakeholders



Establish baselines

- Air quality levels
- Emissions
- Health impacts of air pollution



Identify pollution control measures and plan for operationalization

- Set air quality and emission reduction targets
- Identify pollution control measures from existing plans and other measures for inclusion
- Formulate a monitoring and evaluation system
- Develop a communication plan to support measures



Integrate the AQMP with other city plans

- Local Climate Change Action Plan (LCCAP); Enhanced LCCAP
- Comprehensive Land Use Plan
- Comprehensive Development Plan
- Local Energy Efficiency and Conservation Plan



QC AQMP Development Highlights



Multi-stakeholder approach for development and validation of AQMP measures through workshops and consultations

- AQ-TWG, Academia, CSOs and NGOs



Resource sharing and collaboration

- **Data sharing** between city departments
- **Collaboration** during planning meetings
- **Collaboration and partnerships** during conduct of baseline activities (air quality monitoring, EI development, and health mapping)



Systematic and evidence-based approached for

- **Air quality and emission reduction targets developed** were based on baseline assessment results (air quality and emission reduction)
- **Prioritization of measures** based on outcomes of LEAP-IBC assessment
- **Evidence-based** monitoring and evaluation framework for the measures



Capacity building for air quality management and planning through workshops and targeted sessions

- AQ-TWG, Academia, CSOs and NGOs

The key success factor in city-level action is empowering the local government

Data is important AND it must be understood by the leaders and local government personnel themselves

- Some of the data may be intimidating, but it is important that they are not only provided the final results, but are also part of the data collection and analysis

The city is best known by its residents and leaders – experts provide guidance, but local stakeholders must be given an opportunity to co-lead the process

- Government leaders and personnel provide unique perspectives that lead to more accurate and realistic solutions
- Recognizing their strengths increase responsibility and ownership of the steps and outcomes

Real sustainable solutions stem from sustained leadership and institutional efforts

- Empowering the local government from its leaders to the staff, institutionalizing the process, and inspiring them of their impact can lead to continuous efforts and success



Thank you!

For more information, please email
aqccmanila@cleanairasia.org