

Press Release
18th Dec 2020

High Air Pollution Level Observed among Bus Stops in Kowloon West Schools and Elderly Homes Nearby Exposed to Serious Pollution

Clean Air Network (CAN) conducted a study for 2 weeks in October 2020, with the purpose to identify the levels of air pollution concentration (Nitrogen Dioxide, NO₂) at 8 bus stops located in Kowloon West District.

EXECUTIVE SUMMARY

1. Findings show that the most polluted bus stop, Man Kee Mansion Bus Stop located near two elderly homes in Ho Man Tin, recorded an average concentration of 120.02µg/m³, 3 times that of the World Health Organization's annual recommended safe level.¹ Commuters who queue at bus stops and residents in the elderly homes are at risks as they are exposed to dangerous level of roadside air pollution.
2. 23% of kindergartens and 31% of primary schools in Kowloon West District are located within 300 meters of the major roads. Student's health is threatened by serious roadside air pollution.
3. To reduce the exposure and health risk of vulnerable groups, CAN strongly urges the government to tighten the emission standard of the Franchised Bus Low Emission Zones (FBLEZs), transform all bus fleets to zero emission vehicles and set up more roadside air quality monitoring stations.

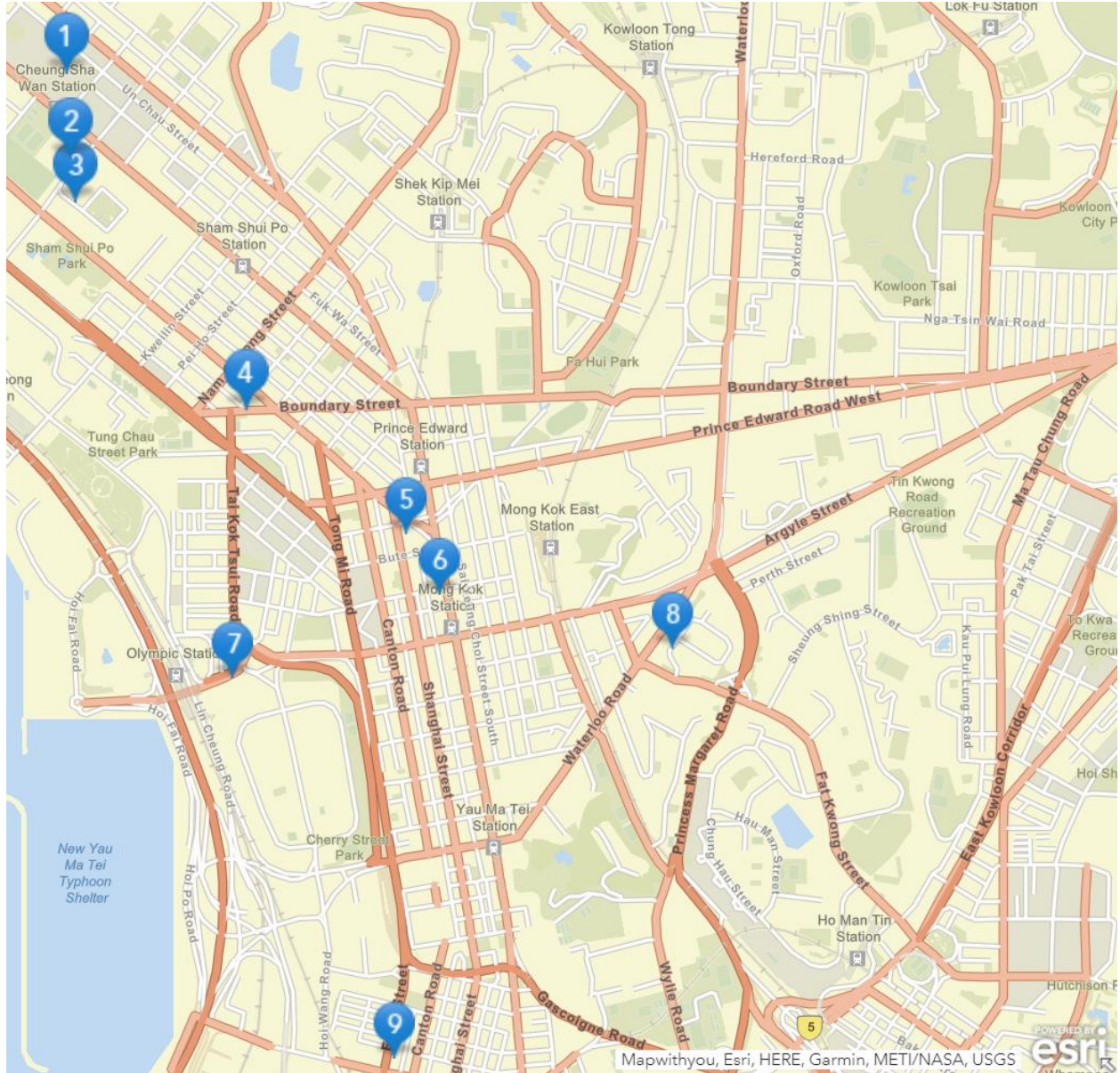
STUDY FINDINGS

1. Air pollution (NO₂) level recorded at all 8 bus stops exceeded the annual safe level recommended by the World Health Organization.
2. The average air pollution (NO₂) concentration for 8 bus stops is 84.33 microgram per cubic meter (µg/m³), two times higher than the recommended annual safe level.

¹ The most stringent target Air Quality Guidelines (AQG) of the World Health Organization (WHO) benchmarks the limiting NO₂ concentration at an annual average of 40 µg/m³.

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Figure 1: Map of 9 Monitoring Spots in Kowloon West District (including 8 bus stops)



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Figure 2: NO₂ concentration of 9 Monitoring Spots in Kowloon West District

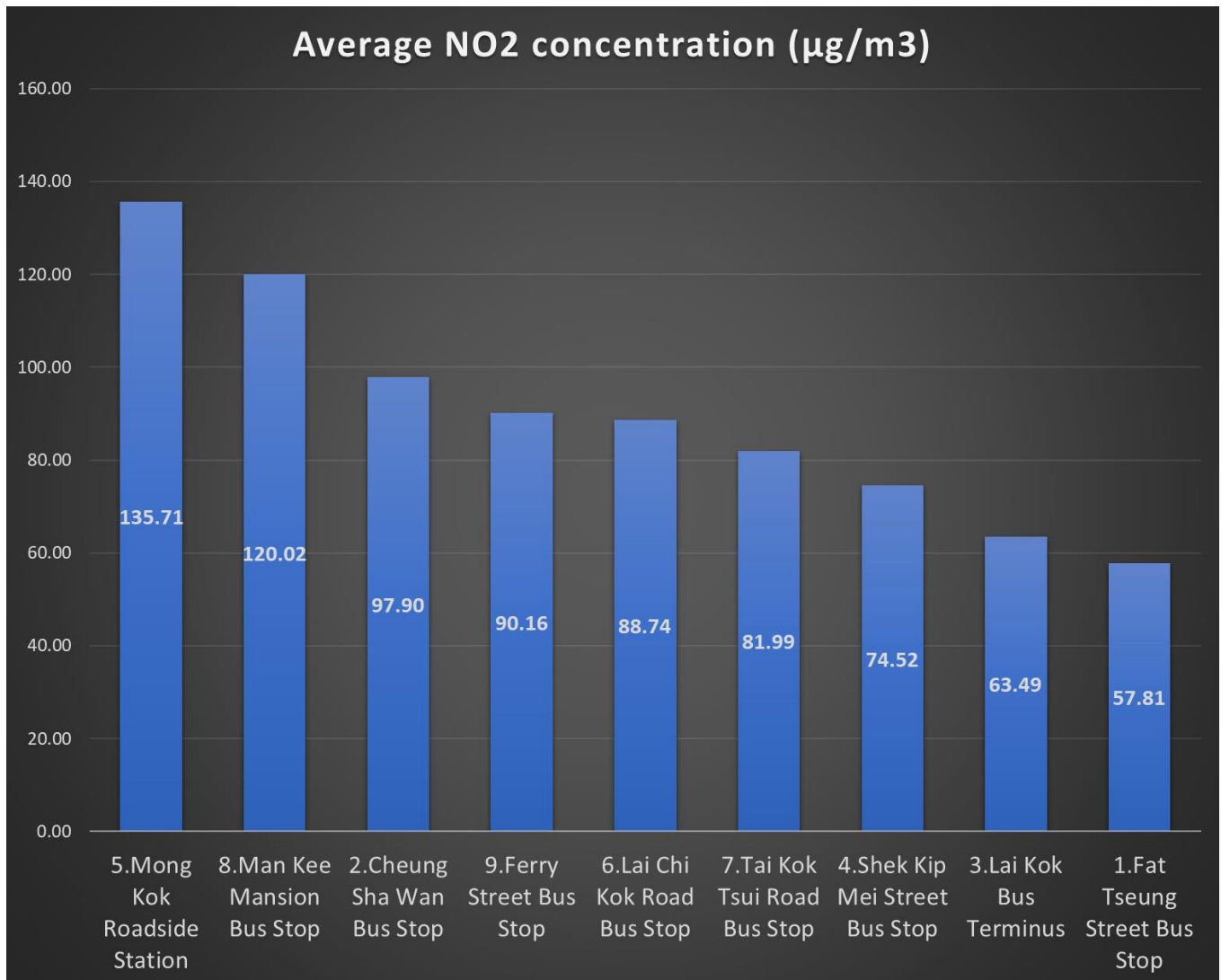
Monitoring Spot	Location	Vulnerable group nearby	Number of bus routes of the bus stop	Average NO ₂ concentration (microgram per cubic meter µg/m ³)	Compare to WHO annual air quality guidelines (40µg/m ³)
1	Fat Tseung Street Bus Stop	Elderly Home	5	57.81	+145%
2	Cheung Sha Wan Bus Stop	Elderly Home	7	97.90	+245%
3	Lai Kok Bus Terminus	Kindergarten	1	63.49	+159%
4	Shek Kip Mei Street Bus Stop	Elderly Home	3	74.52	+186%
5	Mong Kok Air Monitoring Station (Roadside Station)	Primary School	N/A	135.71	+339%
6	Lai Chi Kok Road Bus Stop	Primary School	12	88.74	+222%
7	Tai Kok Tsui Road Bus Stop	Elderly Home	26	81.99	+205%
8	Man Kee Mansion Bus Stop	Elderly Home	22	120.02	+300%
9	Ferry Street Bus Stop	Kindergarten	2	90.16	+225%

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Figure 3: Comparison of average NO₂ concentration among 9 Monitoring Spots



3. **Man Kee Mansion Bus Stop (spot 8)**, located on Waterloo Road in Ho Man Tin, was the most polluted among the 8 bus stops in the study. It recorded an average concentration of 120.02µg/m³, 3 times that of the recommended annual safe level. Man Kee Mansion Bus Stop has 22 bus routes in operation, also there are 4 other bus stops nearby. The traffic may be heavy. According to the Annual Traffic Census 2019, the annual average daily traffic (AADT) for Waterloo Road (from Pui Ching Road to Argyle Street where Man Kee Mansion Bus Stop is located at) is around 27,260. Also, the buildings next to the road are high rise with around 30 floors, resulting a canyon effect and pollutant is difficult to disperse. However, two elderly homes are located next to the

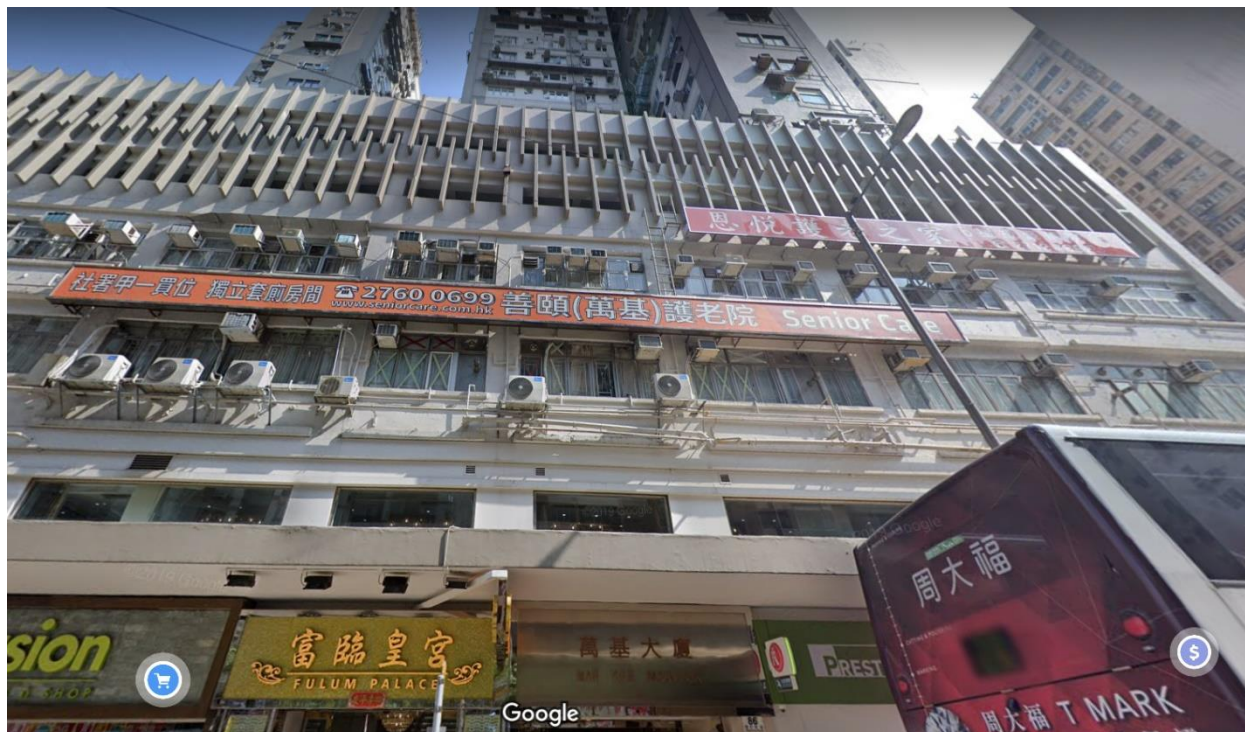
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bus stop on lower floors, with windows facing the road. The senior residents in the care centers are exposed extremely bad air quality daily, causing a burden to their health, especially to those who already have respiratory diseases. Besides, the symptoms of COVID 19 on infected elderly and people with chronic illnesses are far more serious than other infected groups.

Figure 4: Google Street View of Man Kee Mansion Bus Stop



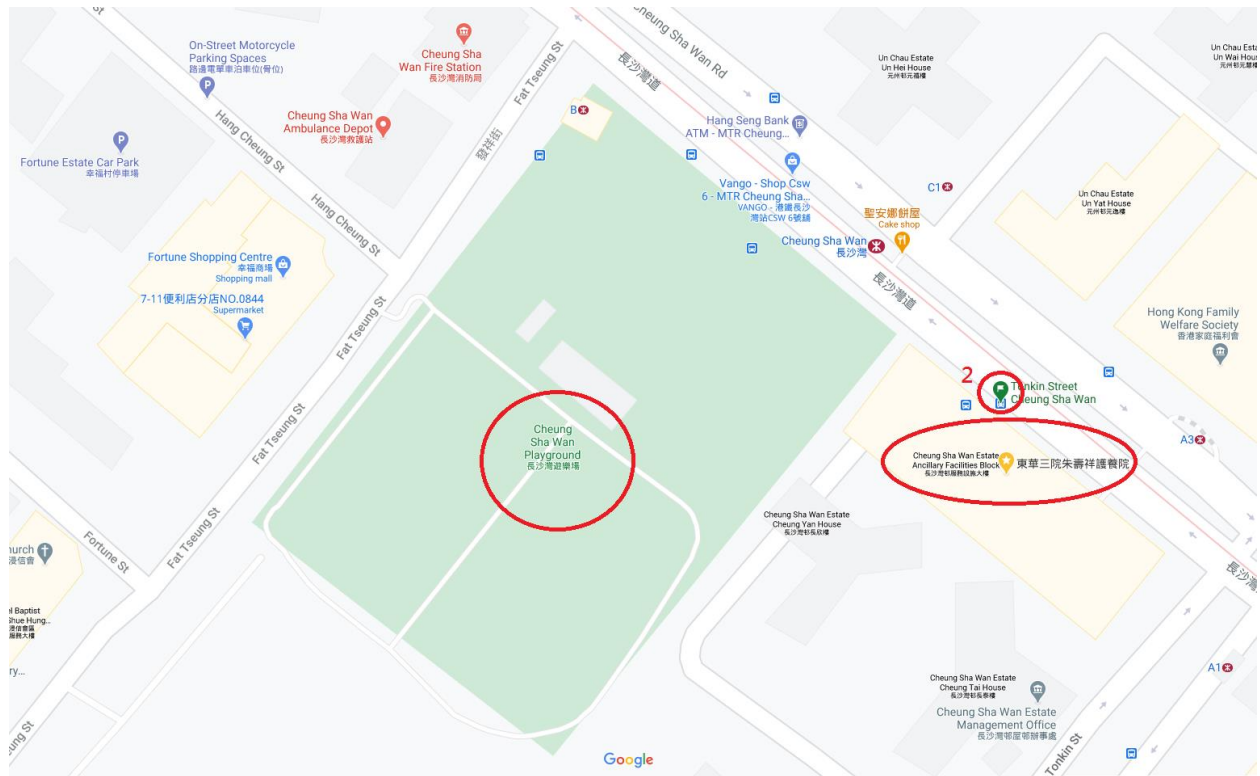
4. The second highest polluted spot is at **Cheung Sha Wan Bus Stop (spot 2)**, also next to an elderly home. It recorded an average concentration of $97.90\mu\text{g}/\text{m}^3$, 2 times that of the recommended annual safe level. Cheung Sha Wan Bus Stop has 7 bus routes in operation. According to the AADT 2019, the annual average traffic for Cheung Sha Wan Road (from Tonkin Street to Hing Wah Street where Cheung Sha Wan Bus Stop is located at) is around 23,670. The elderly home next to the bus stop is in an ancillary facilities block, where also accommodates other community services. Also, there is a playground near the bus stop with frequent use of children. With such a high level of air pollution, kids and the elderly are exposed to great health risks.

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Figure 5: Cheung Sha Wan Bus Stop and facilities nearby



5. **Ferry Street Bus Stop (spot 9)** is the third highest polluted spot in the study, recorded an average concentration of $90.16\mu\text{g}/\text{m}^3$, 2 times that of the recommended annual safe level. According to the AADT 2019, the annual average traffic for Ferry Street (from Jordan Road to Public Square Street where Ferry Street Bus Stop is located at) is 35,120. However, two kindergartens are located on the ground floor, next to the busy traffic. The daily commuting route for these children is highly polluted. The lungs and respiratory systems of children are still developing until they grow up to adults. Children have higher susceptibility to air pollution as they have higher risks of respiratory infections than adults.² Recently there also are upper respiratory tract infection outbreaks among kindergartens and schools in Hong Kong. As a result, kindergartens and some schools have class suspension.

² World Health Organization: The effects of air pollution on children's health and development: A review of the evidence E86575. 2005.

Figure 6: Google Street View of Man Kee Mansion Bus Stop (red circle is also a kindergarten on the same street)



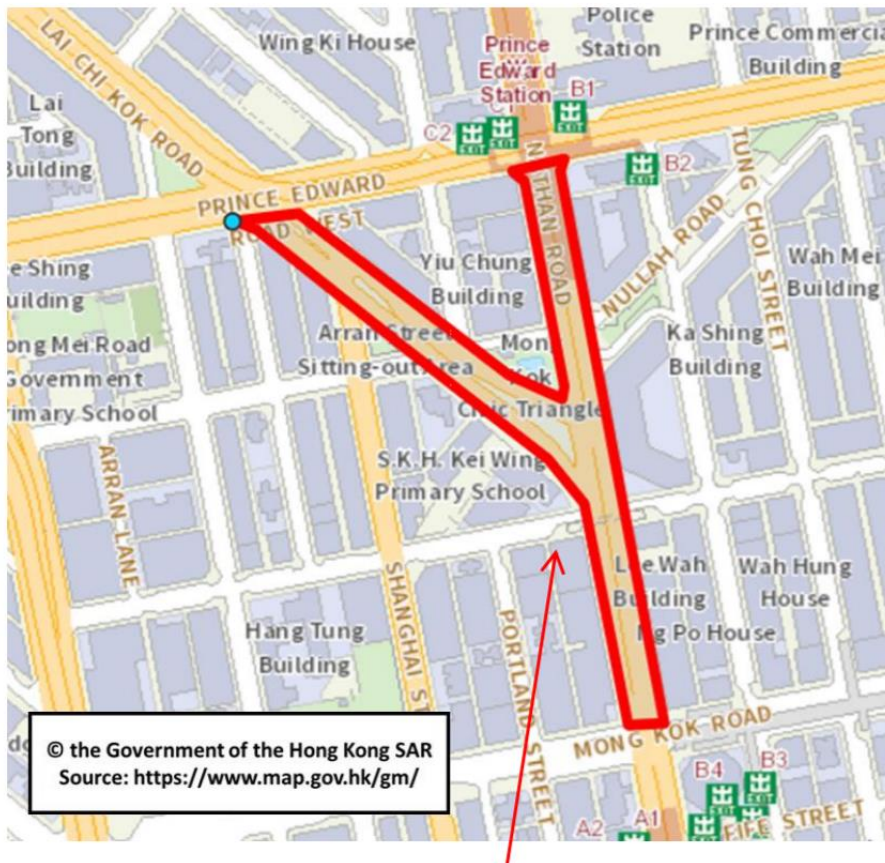
6. **Lai Chi Kok Road Bus Stop (spot 6)** which locates next to a primary school is the fourth polluted spot, with recorded an average concentration of $88.74\mu\text{g}/\text{m}^3$, 2 times that of the recommended annual safe level. According to the AADT 2019, the annual average traffic for Lai Chi Kok Road (from Prince Edward Road to Cedar Street where the bus stop is located at) is 11,820. Although the bus stop is located within the Franchised Bus Low Emission Zone (FBLEZ) in Mong Kok, its pollution level is still alarming. Although the government tightened the emission requirements of FBLEZs to Euro V or above emission standards last year, the requirements are still not effective in reducing NO_2 emissions.

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Figure 7: Franchised Bus Low Emission Zone in Mong Kok



7. **Fat Tseung Street Bus Stop (spot 1)** is the least polluted bus stop in the study, with recorded an average concentration of $57.81\mu\text{g}/\text{m}^3$. There are only 5 bus routes in operation. Also the buildings next to the road are low rise with around 6 floors. Pollutant can disperse more easily.

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PROBLEMS IDENTIFIED

a) Limited Effectiveness of Franchised Bus Low Emission Zones

Since 31st December 2015, the Government has set up FBLEZs at Yee Wo Street in Causeway Bay, the junction of Des Voeux Road Central and Pedder Street in Central, and the junction of Nathan Road and Lai Chi Kok Road in Mong Kok respectively. From 31st December 2019 the government tightened the emission requirements of FBLEZs to Euro V or above emission standards. However, in case of traffic congestion, vehicle breakdowns, traffic accidents and ad-hoc trips, bus operators are still allowed to deploy non-low emission buses to ply the FBLEZs. Therefore, the effectiveness of the FBLEZs is in doubt. Our previous study about air pollution in Central and this study have provided a proof to the question.

From the data obtained from the installed NO₂ diffusion tubes, it shows that Lai Chi Kok Road Bus Stop which located in the FBLEZ is the fourth polluted spot. The average concentration is 2 times higher than the WHO guidelines.

b) Vulnerable groups are exposed to serious air pollution due to insufficient planning guidelines

According to Hong Kong Planning Standards and Guidelines of the Planning Department, there are some recommended buffer distances for trunk roads, primary distributors and other road networks. For example, there should be at least 300 meters buffer between trunk road and residential uses. However, there is no recommended buffer distances between any road networks and school, kindergarten and elderly home while children and the elderly are the most sensitive and vulnerable groups among us. As a result, some schools, kindergartens and elderly homes are located right next to busy roads.

Clean Air Network analyzed the distance between schools and major roads in Kowloon West district. We found out that 23% of kindergartens and 31% of primary schools in Kowloon West District are located within 300 meters of the major roads, posing a threat to the health of children when they stay in the facilities and during their travel to the facilities.

Figure 8: Distribution of kindergartens and major roads in Kowloon West

Distance between kindergarten and the nearest major roads (meters)	Number of kindergartens	Percentage of all kindergartens
901-1000	13	5%
601-900	44	18%
301-600	36	15%
0-300	54	23%

Note: Total number of kindergartens in Kowloon West is 238.

Figure 9: Distribution of aided primary schools and major roads in Kowloon West

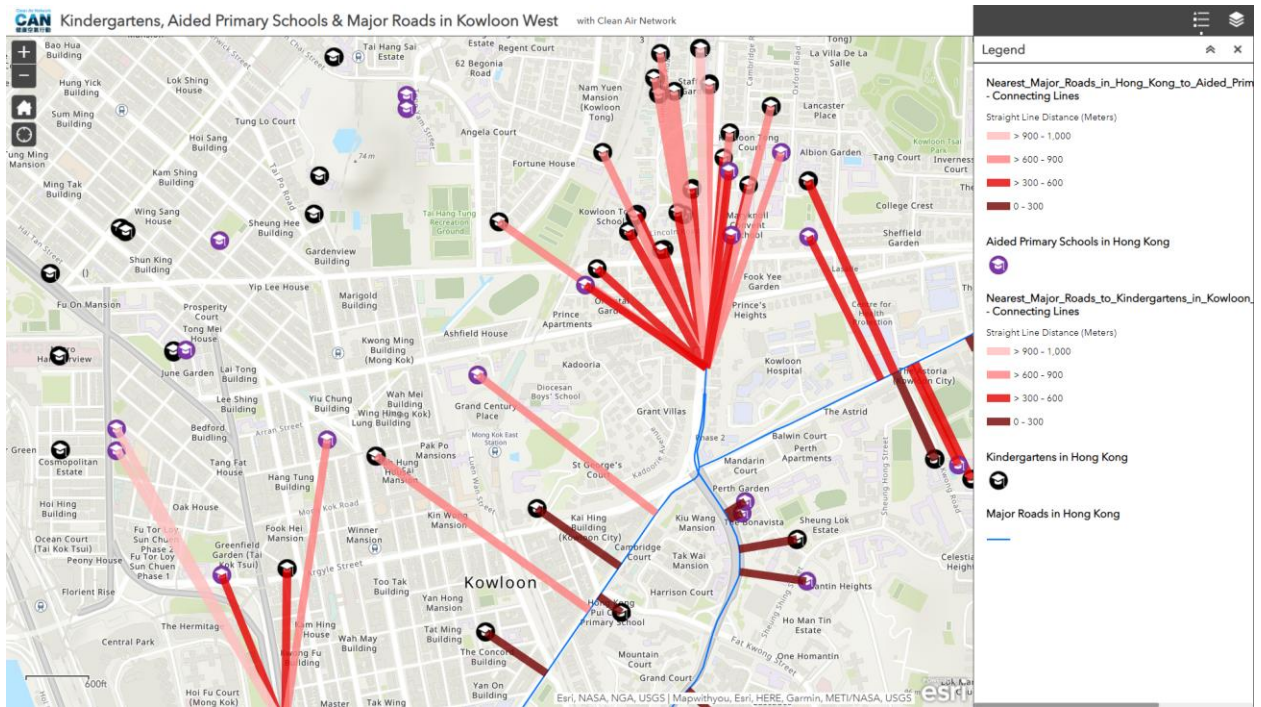
Distance between primary schools and the nearest major roads (meters)	Number of primary schools	Percentage of all primary schools
901-1000	2	3%
601-900	9	14%
301-600	13	20%
0-300	20	31%

Note: Total number of aided primary schools in Kowloon West is 65.

We created an interactive map (<https://bit.ly/3n1Yfl4>) showing all kindergartens and aided primary schools in Kowloon West and their distance to the nearest major roads. As shown below, the situation is obvious that schools are packed near major and busy roads, especially near Kowloon Tong and Tsim Sha Tsui. Studies have shown that traffic surrounding schools is associated with poorer respiratory health in students, including lower maximum mid-expiratory flow (MMEF) and a higher prevalence of rhinitis.³ It is not ideal for students to commute every day and have outdoor activities at schools, such as PE lessons. With constant exposure to roadside air pollution, children's health is under a great threat.

³ Traffic-related air pollution and Hong Kong school children: abridged secondary publication, Hong Kong Med J 2020;26(Suppl 6):S4-9

Figure 10: Screenshot of interactive map



c) Insufficient roadside air quality monitoring stations

There are only two air quality monitoring stations in Kowloon West District, including one roadside station in Mong Kok and one general station in Sham Shui Po. The station in Sham Shui Po is located 17 metres above ground and thus cannot reflect the roadside pollution that residents are exposed to every day. According to the data of Sham Shui Po monitoring station, the average concentration of NO₂ of the same period as our study was 40.32µg/m³. The spot of our study in Sham Shui Po, Shek Kip Mei Street Bus Stop (spot 4) recorded an obviously higher concentration of NO₂ of 74.52µg/m³. Roadside air quality monitoring station is more accurate to reflect the actual pollution that exposes to commuters and residents. Only one roadside station in Kowloon West is clearly insufficient. The general public is not able to understand the level of air pollution and thus health risk they are exposed to when queuing up or passing by bus stops.

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POLICY RECOMMENDATIONS

The below recommendations are made in response to the above problems.

Policy Level

a) Expand and Improve the Low Emission Zones

- The minimum emission requirement of Low Emission Zones should be tightened to Euro VI or above emission standards;
- The Government should conduct a study to investigate how the emission requirement should be extended to other types of vehicles other than franchised buses, including medium or heavy goods vehicles, minibuses and taxis;
- In addition, the LEZs should be expanded to more busy districts, for example Sham Shui Po, etc.

b) Covert bus fleets to zero-emission vehicles

- The Financial Secretary announced to formulate Hong Kong's first Electric Vehicle Roadmap to popularize the use of electric vehicles;
- CAN urges the government to include franchised buses in the Roadmap and set up a clear timeline to electrify all bus fleets;

c) Set up more roadside air quality monitoring stations

- Environmental Protection Department should set up more roadside air quality monitoring stations to assess the public's exposure to air pollution;
- EPD and Transport Department should coordinate to set up regular air pollution monitoring and reporting system in Public Transport Interchanges (PTIs) in all districts, to provide commuters information on the air quality;

Planning Level

a) Set up clear planning guidelines for facilities of vulnerable groups

- The Planning Department should review Hong Kong Planning Standards and Guidelines and set up clear guidelines for kindergartens, primary schools and elderly homes. For example, they should have a buffer of at least 300 meters away from busy roads;

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- Also, buildings next to major roads should adopt with wind corridor designs to ensure pollutant dispersion;

District Level

a) Set up mitigation measures to improve indoor air quality

- The government should examine how many facilities of vulnerable groups are located near busy roads like those in our study and work with district councils and facilities operators to set up air filters or screening to lower the health risks of the facility users
- The facilities should adopt indoor air quality management. For instance, constantly monitor the concentrations of air pollutants and issue guidelines for facilities users to wear masks or increase ventilation.

METHODOLOGY

In this project, 8 bus stops and the Roadside Air Monitoring Station in Mong Kok are selected. These spots are all located in Kowloon West District. The bus stops we selected are in close proximity to elderly homes, kindergartens or primary schools as the elderly and children are more vulnerable to air pollution and related respiratory diseases.

Diffusion tubes containing a chemical reagent Triethanolamine ,TEA to absorb the pollutant (Nitrogen Dioxide, NO₂) to be measured directly from the air are installed at 9 spots in Kowloon West District over 10 working days in 2 weeks. Since we would like to measure the NO₂ concentration in working days (from Monday to Friday), the cap of NO₂ diffusion tubes are opened on Mondays and closed on Fridays. To make sure that the sampling time covers the peak traffic hours, we installed the diffusion tubes at 07:30 and removed the tubes at 18:30.

Date of installation	5/10/2020 and 12/10/2020 (Mondays)
Time of installation	07:30-08:30
Date of removal	9/10/2020 and 16/10/2020 (Fridays)
Time of removal	18:30-19:30

Note:

- 1) There are 9 spots in total. 3 tubes were installed at every spot. We also installed 1 field blank tube at 4 spots.
- 2) For field blank tubes, the caps were closed throughout the whole measurement period to measure the background NO₂ concentration on the street, showing the reaction of sunlight and the chemicals.
- 3) We kept one travel blank tube in the refrigerator to measure the two-weeks background concentration.

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ABOUT CLEAN AIR NETWORK

Established in 2009, Clean Air Network is a non-profit organization with charitable status which envisions to clean up Hong Kong's air until it meets the World Health Organization's recommended safe level. Our mission is to amplify the voices of individuals, groups and organizations and together urge the Government to take appropriate measures to clean air.

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