The differences of air quality between the outdoor and indoor interchange

Group 1

Our groupmates

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Background

- The offical doucment : in 64 public transport change→ the air pollutants in air of HK>50%→affect public ‘ s health

- Hypothesis: ? air pollutants in outdoor bus stop > semi-closed bus stop

- Aim : to alleviate the air pollution and raise the awareness of public about his environmental problem

Hypothesis

To explain the air quality in a outdoor is better than that in semi-covered bus stop

- make use of portable outdoor air quality monitors
- take the pollutants concentration, e.g. carbon monoxide (CO), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), ozone (O_3), $PM_{2.5}$ and PM_{10}

➔ to confirm more air pollutants in semi-covered bus stop than outdoor

Sampling details

Venue: Metro City indoor bus stop V.S Outdoor

Indoor (the middle of semi-covered bus stop)

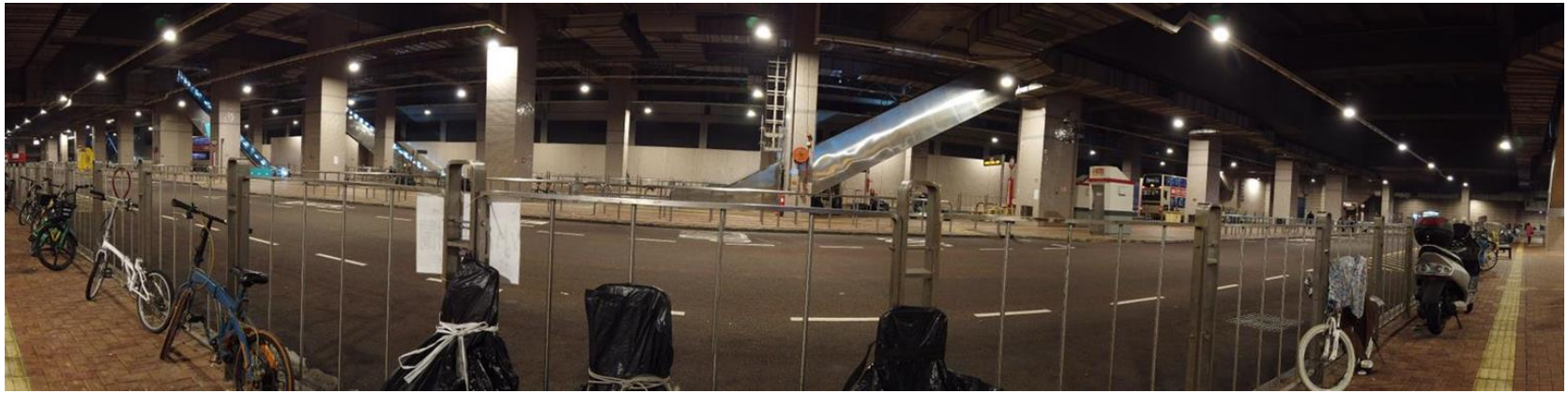
Outdoor (near the Cinema)

Date:8/10,22/10, 26/11, 10/12 (lunch period 12:45)

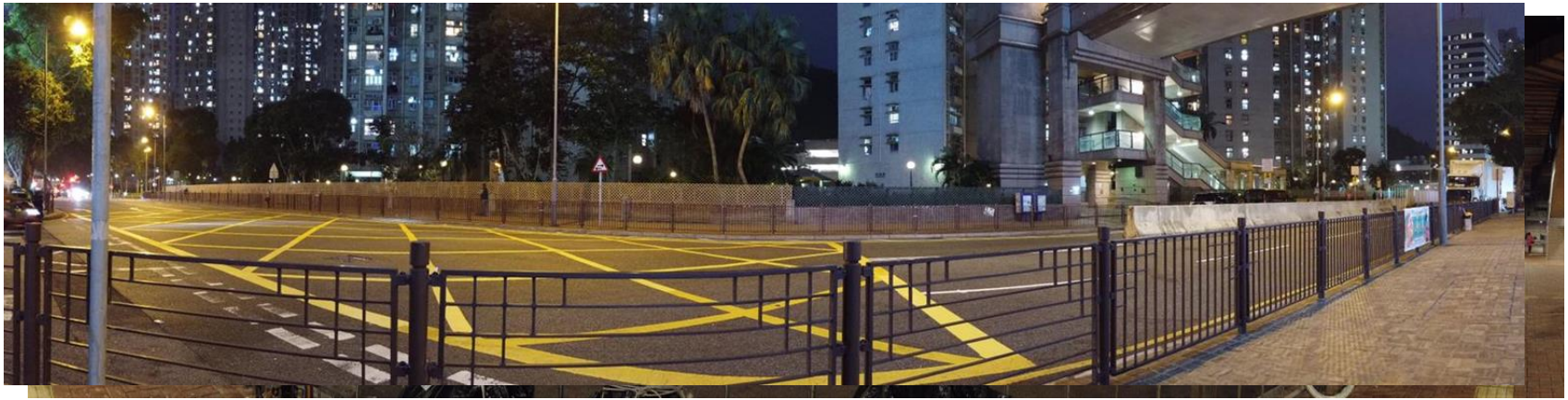
5mins per data (CO,NO_2,SO_2,O_3,$PM_{2.5}$,PM_{10})

Our sampling location

Semi-covered bus stop



Outdoor



Machine

Portable Outdoor Air Quality Monitors

Subtances

Nitrogen dioxide (NO_2)

- a group of highly reactive gases
- irritate airways in the human respiratory system
- form acid rain

Ozone (O3)

- both a natural and a man-made product
- reducing human exposure to harmful UV radiation
- reacts chemically with many biological molecules in the respiratory tract

Sulfur dioxide (SO_2)

- invisible and has a nasty, sharp smel
- from human sources
- irritates

Subtances

Carbon monoxide

- odorless, colorless gas
- in fumes produced
- ‘flu-like’ symtoms

PM2.5 & PM10

- atmospheric particulate matter
- leads to health problem

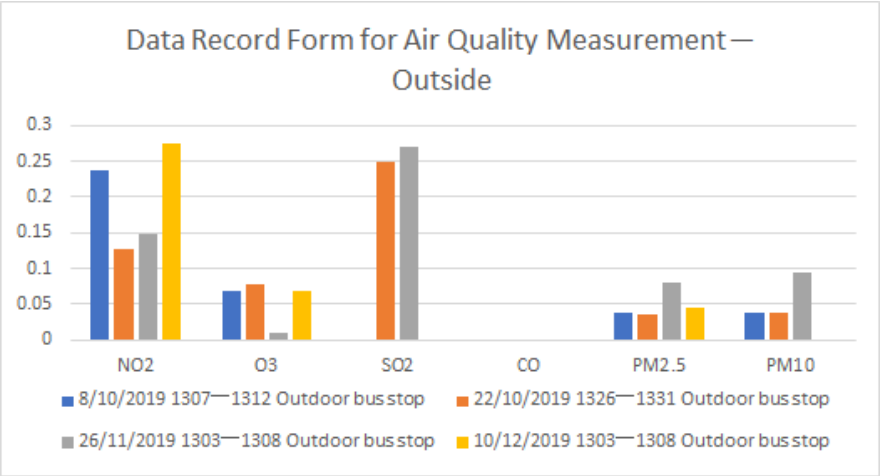
Data Record (1st)

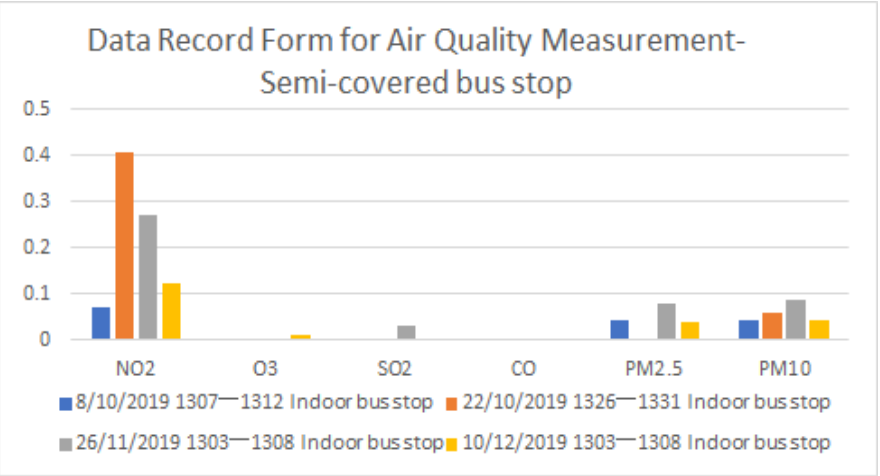
Date	Time	Venue	NO_2	O_3	SO_2	CO	$PM_{2.5}$	PM_{10}
08/10/2019	1307-1312	Outdoor bus stop	0.237	0.069	0	0	0.038	0.037
08/10/2019	1307-1312	Indoor bus stop	0.07	0.002	0	0	0.045	0.043
22/10/2019	1326-1331	Outdoor bus stop	0.128	0.078	0.25	0	0.035	0.038
22/10/2019	1326-1331	Indoor bus stop	0.406	0.005	0	0	0.005	0.06

Data record (2nd)

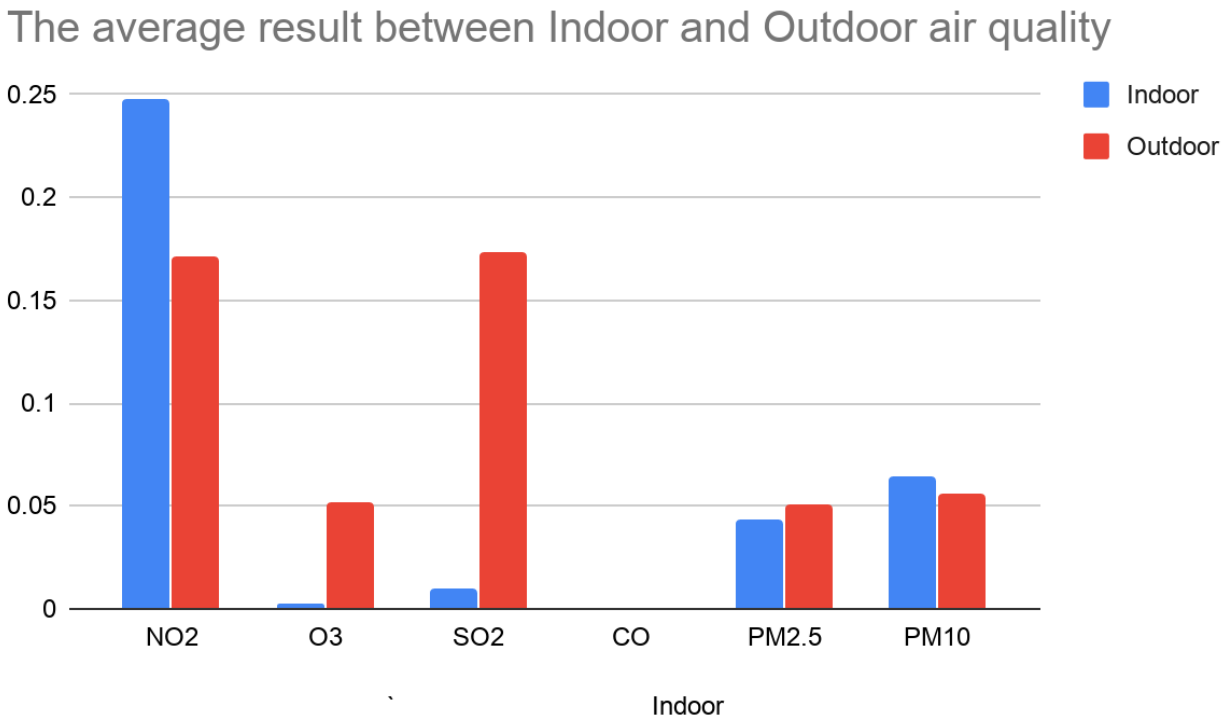
Date	Time	Venue	NO_2	O_3	SO_2	CO	$PM_{2.5}$	PM_{10}
26/11/2019	1303-1308	Outdoor bus stop	0.149	0.010	0.27	0	0.079	0.094
26/11/2019	1303-1308	Indoor bus stop	0.269	0.001	0.03	0	0.080	0.089
10/12/2019	1303-1308	Outdoor bus stop	0.274	0.068	/	0	0.045	0
10/12/2019	1303-1308	Indoor bus stop	0.123	0.012	0	0	0.041	0.042

The comparison of the air pollutants between 4 sampling days





Average result



Data analysis

- NO_2 : outside > semi-covered bus stop
- O_3 : outside < semi-covered bus stop
- SO_2 : outside < semi-covered bus stop
- CO : remain 0
- $PM_{2.5}$: outside < semi-covered bus stop
- PM_{10} : outside > semi-covered bus stop

- Overall : outside > semi-covered bus stop
- Our hypothesis ❌

Our Discussion

Q1.Why the results turn out like this

How come some substances are absent?

- Vehicles pass through Yan King Road rapidly
- Increase air pollutants (e.g. SO2) outside

Our Discussion

Q2.Does petrol affect our results?

- Yes
- it affected CO (if it burn completely, it will not affected CO) , NO_2, and $PM_{2.5}$
- Especially SO_2, are emitted by the burning of fossil fuels — coal, oil, and diesel — or other materials that contain sulfur
- It is produced in the incomplete combustion of carbon-containing fuels.

Our discussion

Q3. How to reduce the error next time ?

- take more sampling data > more acurate average data > avoid extreme data

- pay attention on surrounding > look for causes of extreme value (take photo to observe the surrounding environment)

Problems

1. The indoor air quality is much worser than outdoor

1. Extreme data (10/12 value of PM_{10} is 0)

Suggestions

Based on different perspectives

1. Government
2. Distric counciler
3. Citizens

Suggestion (1)

- Encourage the car owners to convert diesel vehicles into electric vehicles
- Reduce pollutants
- Increase support or fundings
- Install solar panel on the roof of our building to generate electricity (reduce the need from electric company)

Suggestions (2)

- Plants more plants in the different distric (reduce the carbon emittion)
- especially near the road
- Promote the wider use of renewable energy

Suggestions (3)

- Choose to use public transport
- Cycling or walking is also better than driving your own vehicles
- Stop buying vehicles

Conclusion

- The air quality inside the transport interchange > the air quality outside the transport interchange.

- The amount of O_3 and SO_2 are the most obvious proof

- The hypothesis is disagreed.

References

1. https://www.legco.gov.hk/yr18-19/english/panels/ea/papers/ea20181219cb1-319-4-e.pdf
2. https://www.epd.gov.hk/epd/english/environmentinhk/air/prob_solutions/cleaning_air_atroad.htm
3. https://www.epa.gov/no2-pollution/basic-information-about-no2l
4. https://www.epa.gov/ozone-pollution-and-your-patients-health/what-ozone
5. https://www.environment.gov.au/protection/publications/factsheet-sulfur-dioxide-so2
6. https://www.cdc.gov/co/faqs.htm
7. https://blissair.com/what-is-pm-2-5.htm