

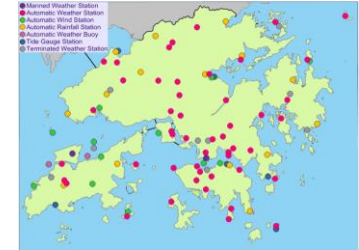
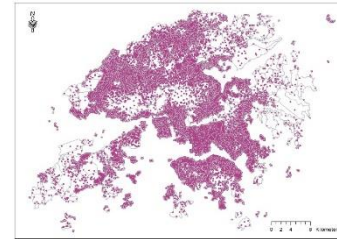
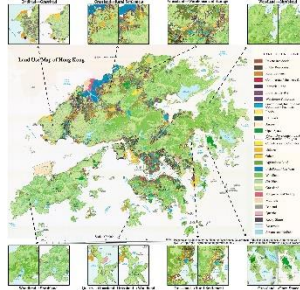
Monitoring Data

Emission Data

Land-Use/Topography

Population

Meteorology



Land Use Regression

Spatiotemporal Distribution of Air
Pollutant Concentrations

Land use regression modelling of ambient air pollutants in Hong Kong

Zhiyuan Li (zhiyuanli@cuhk.edu.hk),
Steve Hung Lam Yim*, Kin-Fai Ho
The Chinese University of Hong Kong,
Shatin, N.T., Hong Kong, China

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香港中文大學
The Chinese University of Hong Kong

Data

Category	Variables	Buffer size (radius in meters)	Prior direction	Data source
Air quality data	PM _{2.5} , NO ₂ , O ₃ , etc.	NA	NA	Hong Kong Environmental Protection Department
Land use data	Residential area, farmland, green space, water body, etc.	50 m, 100 m, 200 m, 500 m, and 1000 m	+/-	Hong Kong Planning Department
Meteorological data	Temperature, relative humidity, wind speed, wind direction, etc.	NA	+/-	Hong Kong Observatory
Traffic emission	Road length, private light bus, bus, car, taxi, van, light duty vehicle, medium duty vehicle, heavy duty vehicle, truck	50 m, 100 m, 200 m, 500 m, and 1000 m	+/-	Hong Kong Transport Department
Population data	Population count	50 m, 100 m, 200 m, 500 m, and 1000 m	+	Hong Kong Census and Statistics Department
Topography data	Elevation	NA	+/-	Chinese Academy of Sciences
Urban/building morphology	Average building height, maximum building height, total building area	50 m, 100 m, 200 m, 500 m, and 1000 m	+	-
Geo-location	Longitude, latitude	NA	+/-	-



Air Quality Monitoring Network of Hong Kong



2018 annual $\text{PM}_{2.5}$, NO_2 , and O_3 concentrations measured at 16 air quality monitoring stations (AQMSs): 13 general AQMSs and 3 roadside AQMSs
(<https://cd.epic.epd.gov.hk/EPICDI/air/station/>)



Development of LUR models

Supervised Forward Regression

(Eeftens et al., 2016, Environ. Health 15:53; Huang et al., 2017, Environ. Res. 158, 542-552; Ji et al., 2019, Environ. Pollut. 248, 574-583; Li et al., 2018, Environ. Pollut. 243, 501-509; Liu et al., 2016, Sci. Total Environ. 565, 607-615; Meng et al., 2015, Environ. Res. 137, 308-315; Xu et al., Atmos. Environ. 200, 254-263)

- the gain of the adjusted R^2 was no less than 1%;
- the effect of the predictor was as pre-defined;
- Variables added into the model when the probability of $F < 0.05$ and removed when the probability of $F > 0.1$;
- predictors already included in the model kept the same effect direction;
- the Variance Inflation Factor (VIF) of the predictor retained below 3 indicating no collinearity existing.



LUR result (2018 annual)

Air pollutants	Variables	Coefficient	Standard error	p	VIF	R ²	LOOCV R ²
PM _{2.5}	Constant	17.2	1	0		0.56	0.46
	F_LGVVL500	3.90E-04	9.10E-05	0.001	1		
NO ₂	Constant	13.1	2.7			0.96	0.89
	F_TVL500	3.10E-04	2.00E-05	0	1.4		
	F_MHVVL1000	3.00E-04	8.30E-05	0.003	1.1		
	POP_100	4.00E-04	1.10E-04	0.004	1.4		
O ₃	(Constant)	-4.92E+03	8.81E+02	0		0.96	0.90
	F_BUS500	-1.02E-03	6.55E-05	0	1.2		
	Longitude	4.36E+01	7.72E+00	0	1.1		
	LENGTH100	-2.67E+00	5.85E-01	0.001	1.2		
	H_M_100	5.23E-02	1.70E-02	0.011	1.1		

F_LGVVL500: the number of light-duty vehicles in buffer size of 500 m

F_TVL500: the number of total vehicles in buffer size of 500 m

F_MGVVL1000: the number of medium & heavy-duty vehicles in buffer size of 1000 m

POP_100: number of people in buffer size of 100 m

F_BUS500: the number of bus in buffer size of 500 m

LENGTH100: the length of roads in buffer size of 100

H_M_100: the maximum building height in buffer size of 100

VIF: the Variance Inflation Factor

