London South Bank University

EST 1892

School of The Built Environment and Architecture

Environmental Engineering

Regional air quality assessment for a road scheme

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LONDON SOUTH BANK UNIVERSITY

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Fig 1- Assessment options

Student's surname	Year of implementation of the scheme	Annual average speed (km/h)	Option 1	Option 1 (realigned road) Speed (km/h)	Option 1 Upgraded existing road with New speed (km/h)
A-E	2024	60	Do-nothing	80	70
F-L	2025	70	Do-nothing	90	80
M-Q	2026	80	Do-nothing	100	90
R-Z	2027	90	Do-nothing	110	100

Fig 2- Traffic flow characteristics on each current link (according to your first name)

Student's first name	Link	Road type	AADT (veh/day)	% HGV	Number of Residential properties within 200m (existing roads)	Number of Residential properties within 200m (realigned roads)
A-L	1a /b	A	23,000	15%	65	53
	2a/b	A	20,000	12%	21	9
	3a/b	A	16,000	10%	32	20
	4a/b	A	21,000	17%	53	42
M-Z	1a /b	A	26,000	10%	73	62
	2a/b	A	21,000	13%	29	16
	3a/b	A	18,000	15%	42	30
	4a/b	A	23,000	12%	59	49

Map Location

Version A: Students whose first name is A-L (Guildford)

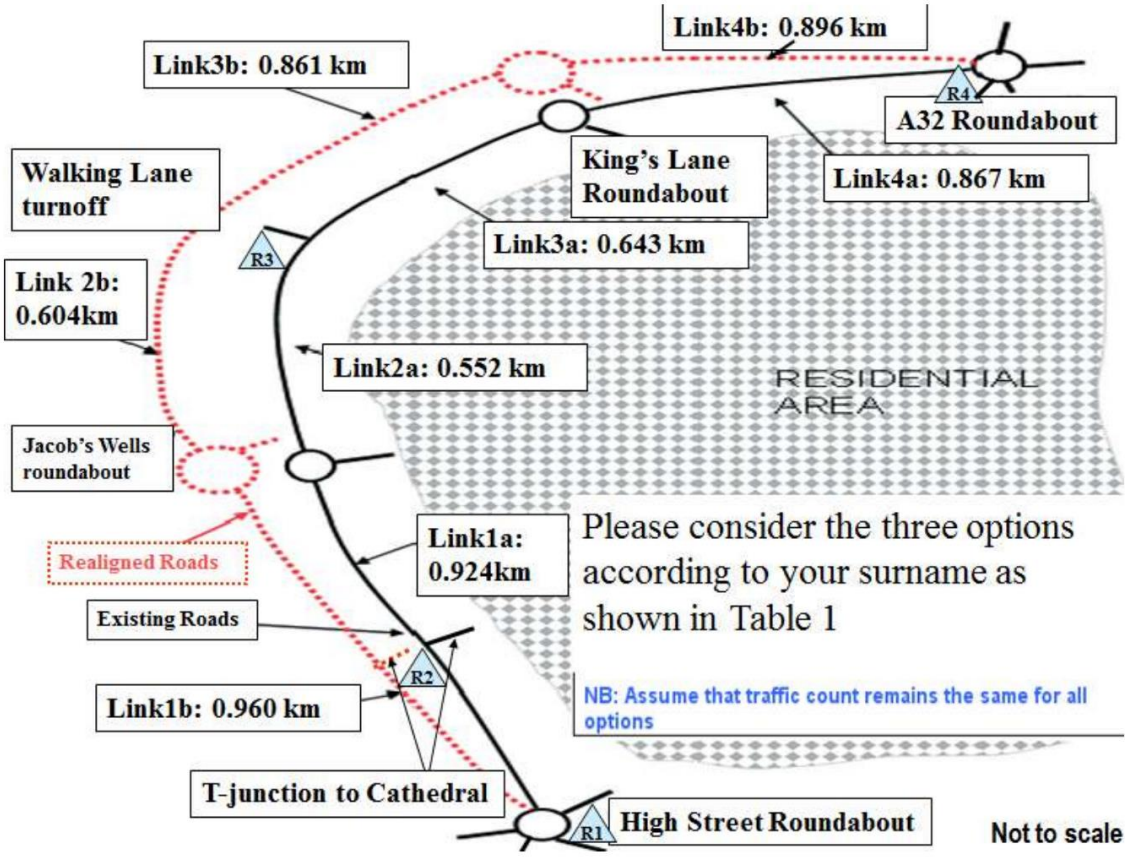

Fig 3 – Map location

1.2 - 1.8

		Emission rate (kg/yr)		Link length (km)	Emission rate (kg/km/yr)		Number of houses within 200 m radius	Score of Pollutant	
		NOx	PM10		NOx	PM10		NOx	PM10
Option 1	1a	1,287.82445	338.52991	0.924	1393.74941	366.3743656	65	90593.71164	23814.33376
	2a	670.73839	165.22695	0.552	1215.105781	299.3241877	21	25517.2214	6285.807941
	3a	626.13058	147.36671	0.643	973.7645034	229.1861676	32	31160.46411	7333.957365
	4a	1,101.39256	301.71537	0.867	1270.348968	347.9992771	53	67328.49532	18443.96169
							Total Result	214599.8925	55878.06076
Option 2	1b	1,685.20978	352.51160	0.96	1755.426851	367.1995818	53	93037.62311	19461.57783
	2b	931.61148	181.24577	0.604	1542.40311	300.0757838	9	13881.62799	2700.682054
	3b	1,069.72920	197.86261	0.861	1242.426476	229.8055868	20	24848.52952	4596.111736
	4b	1,426.09112	312.46112	0.896	1591.619553	348.7289236	42	66848.02124	14646.61479
							Total Result	198615.8018	41404.98641
							Differences between pollutant in Option 1 and 2	-15984.09063	-14473.07434
Option 3	1a	1,413.52155	338.72849	0.924	1529.785222	366.5892781	65	99436.03944	23828.30307
	2a	739.27072	165.33853	0.552	1339.258547	299.5263235	21	28124.42948	6290.052794
	3a	692.00461	147.47592	0.643	1076.212452	229.3560126	32	34438.79846	7339.392402
	4a	1,205.52280	301.87624	0.867	1390.453051	348.1848228	53	73694.0117	18453.79561
							Total Result	235693.2791	55911.54388
							Differences between pollutant in Option 1 and 3	21093.38661	33.48311967

Fig 4 - Calculations

SourceID	Road Type	Traffic Flow	%HDV	Speed(kph)	No of Hours	Link Length (km)
Option 1- 1a	Urban (not London)	23000	15	90	24	0.924
2a	Urban (not London)	20000	12	90	24	0.552
3a	Urban (not London)	16000	10	90	24	0.643
4a	Urban (not London)	21000	17	90	24	0.867
Option 2 1b	Urban (not London)	23000	15	110	24	0.96
2b	Urban (not London)	20000	12	110	24	0.604
3b	Urban (not London)	16000	10	110	24	0.861
4b	Urban (not London)	21000	17	110	24	0.896
Option 3 1a	Urban (not London)	23000	15	100	24	0.924
2a	Urban (not London)	20000	12	100	24	0.552
3a	Urban (not London)	16000	10	100	24	0.643
4a	Urban (not London)	21000	17	100	24	0.867

Fig 5 – Input data for EFT

1.9

Option	NO_x Exposure Index	Outcome	PM_{10} Exposure Index	Outcome
Do something (Option 2)	-15984.09	Better	-14473.07	Better
Do something (Option 3)	21093	Worse	33	Slightly worse

Fig 6 – Summary of exposure results

1.10

Discussions

The realigned roads are longer than the existing roads by 335 m which may increase the time to pass the route however, the increase of speed may mean that the route will be quicker to pass. The realigned route is further away from the residential area which could be better as it is desirable. The realigned road will be better because there will less noise and air pollution entering the residential area.

Upgrading existing road with new speed can be dangerous as well as more pollutant. The upgraded speed may not be suitable for the road as the road has not been designed for this speed. Previous users of the existing road might use the road in the same manner while overtaking slower vehicles which could lead to injuries.

Recommendations

Making no changes to the road the same would be better than upgrading the road with a higher speed however, realigning the road and changing the speed is recommended because this method reduces the emissions dramatically.

Conclusion

The results indicate that option 3 is worse that than option 1. Option 2 is the better option and reduces the pollutants (NO_x and PM_{10}) drastically.

Faster speed on existing road doesn't reduce the pollutants

The number of houses within 200m radius also has an impact. The more houses in the 200m radius the more the score of pollutant.