

Supplementary Material

Towards a living lab for enhanced thermal comfort and air quality: analyses of standard occupancy, weather extremes, and COVID-19 pandemic

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Appendix

Table A1. MyAir sensors and corresponding room characteristics.

MyAir # ^a	Floor ^b	Orientation ^c	Room type	Area [m ²]	Volume [m ³]	A/C ^d	Fans	Cross ventilation ^e	Window sides	Window type ^f	Shadings ^g	Operable windows ^h
1	6	W	Multilevel Study Area	94	329	N	2	H+V	2	PGF	PS	Y
2	6	N	Multilevel Study Area	48	168	N	4	H+V	1	PGF	PS	Y
3												
4	6	N	Multilevel Study Area	48	168	N	2	H+V	1	PGF	PS	Y
5	6	N	Staff Office	259	907	N	14	H	2	FGF, LG	US, PS	N, Y
6	5	S	Classroom	45	315	N	4	H+V	1	PGF	US	N
7	5	S	Multilevel Study Area	84	294	N	4	H+V	1	FGF	US	N
8	5	S	Multilevel Study Area	104	364	N	4	H+V	1	FGF	US	N
9	5	S	Multilevel Study Area	87	305	N	4	H+V	1	FGF	US	N
10	5	N	Staff Office	51	179	N	2	H	1	PGF	PS	Y
11	5	N	Meeting Room	36	126	N	2	H	1	PGF	S	Y
12	5	S	Individual Office	37	130	N	2	H	1	PGF	S	Y
13	4	N	Individual Office	9	32	N	1	H	1	PGF	PS	Y
14	4	W	Studio	59	207	N	4	H	2	PGF	S	Y
15	4	S	Classroom	52	182	N	4	H	1	PGF	S	Y
16	4	S	Meeting Room	48	168	Y	2	H	1	PGF	S	Y
17	4	S	Classroom	52	182	N	4	H	1	PGF	S	Y
18	4	S	Staff Office	160	560	N	12	H	2	PGF, LG	S	Y
19	4	N	Individual Office	9	32	N	1	H	1	PGF	PS	Y
20	3	W	Staff Office	59	207	N	4	H	2	PGF	PS	Y
21	3	S	Computer Lab	52	182	Y	4	H	1	PGF	US	Y
22	3	S	Computer Lab	48	168	Y	2	H	1	PGF	US	Y
23	3	S	Computer Lab	48	168	Y	2	H	1	PGF	US	Y

24	3	S	Classroom	52	182	N	4	H	1	PGF	S	Y
25	3	N	Individual Office	12	42	N	2	H	1	PGF	PS	Y
26	3	N	Individual Office	19	67	N	1	H	1	PGF	PS	Y
27	4	N	Individual Office	12	42	N	1	H	1	PGF	PS	Y
28	3	S	Staff Office	133	466	N	12	H	1	PGF	S	Y
29	3	C	Meeting Room	23	81	Y	0	N	0	None	None	None
30	2	W	Meeting Room	83	291	N	4	H	2	PGF	S	Y
31	2	N	Individual Office	9	32	N	1	H	1	PGF	PS	Y
32	2	S	Computer Lab	40	140	Y	3	H	1	PGF	US	Y
33	2	S	Computer Lab	48	168	Y	2	H	1	PGF	US	Y
34	2	S	Computer Lab	48	168	Y	2	H	1	PGF	US	Y
35	2	S	Classroom	52	182	N	4	H	1	PGF	S	Y
36	2	N	Individual Office	19	67	N	1	H	1	PGF	PS	Y
37	6	N	Multilevel Study Area	47	165	N	2	H+V	1	PGF	PS	Y
38	4	S	Staff Office	48	168	Y	2	H	1	PGF	S	Y
39	2	E	Meeting Room	28	98	N	2	H	1	PGF	US	Y
40	1	S	Studio	98	343	N	3	H	2	PGF	S	Y
41	1	N	Print Room	37	130	Y	0	N	1	LG	US	Y
42	1	S	Studio	85	298	N	4	H	1	PGF	S	N
43	1	S	Studio	48	168	N	2	H	1	FGF	S	N
44	1	S	Studio	48	168	N	2	H	1	FGF	S	N
45	1	S	Studio	87	305	N	4	H	1	FGF	S	N
46	1	C	Meeting Room	24	84	N	1	N	0	None	None	None
47	2	S	Staff Office	25	88	N	2	H	1	PGF	PS	Y
48	1	N	Staff Office	33	116	N	2	H	1	PGF	PS	Y
49	1	E	Staff Office	42	147	N	2	H	1	PGF	S	Y
50												
51	M	W	Staff Office	70	245	Y	0	H	1	PGF	PS	N

52	M	N	Classroom	88	308	N	4	H	3	PGF, LG	S	Y
53	B	N	Media Room	17	60	Y	0	N	0	None	None	None
54	B	C	Staff Office	156	546	Y	0	V	0	None	None	None
55	B	C	Meeting Room	17	60	Y	0	N	0	None	None	None
56	B	C	Meeting Room	19	67	Y	0	N	0	None	None	None
57	5	S	Staff Office	23	81	N	2	H+V	1	PGF	S	Y
58	B	C	Studio	14	49	Y	0	N	0	None	None	None
59	B	N	Studio	14	49	Y	0	N	0	None	None	None
60	B	C	Staff Office	14	49	Y	0	N	0	None	None	None
61	G	W	Classroom	125	438	Y	0	H	0	None	None	None
62	B	C	Staff Office	96	336	Y	0	V	0	None	None	None
63	B	S	Individual Office	11	39	N	1	N	0	None	None	None
64	M	S	Multilevel Study Area	130	455	Y	0	H+V	1	FGF	US	N
65	G	S	Multilevel Study Area	196	686	Y	0	H+V	2	FGF, LG	US, PS	N, Y

^a Blank lines denote faulty sensors (2), not included in the analysis.

^b Floor symbols: B, G, M, 1-6 = Basement, Ground, Mezzanine, Level 1 to Level 6

^c Orientation symbols: N, S, W, E, C = north, south, west, east, central (or basement)

^d A/C symbols: Y, N = Yes, No

^e Cross Ventilation symbols: H, V, H+V, N = Horizontal, Vertical, Horizontal and Vertical, None

^f Window type symbols: FGF, PGF, LG + combinations or None = Fully Glazed Façade, Partly Glazed Façade (extends from wall to wall but not from floor to ceiling), Limited Glazing (partial coverage both horizontally and vertically) + combinations or none. NB: all windows are single glazed

^g Shadings symbols: S, PS, US + combinations or None = Shaded (the user has the option to fully shade the window), Partly Shaded (shading provisions allow partial shadowing only), Unshaded + combinations or none. NB: overhangs, louvres, internal curtains, and air duct obstructions were considered as shadings

^h Operable windows symbols: Y, N or None = Yes, No or no windows

Table A2. Time periods under analysis and corresponding MyAir sensors

Period	Term 1	March & April 2019	Periods	Dates
Classroom	[15, 24, 52, 61]	[15, 24, 61]	Observation window	18 Feb 2019 - 31 May 2020
Computer Lab	[21, 22, 23, 32, 34]	[21, 22, 23]	Term 1	1-30 April 2019
Individual Office	[12, 25, 26, 27, 31, 36, 63]	[12, 25, 26, 27, 31, 63]	Term 2	1-31 July 2019
Media Room	[53]	[53]	Bushfire	1-30 November 2019
Meeting Room	[11, 29, 30, 39, 46, 55, 56]	[39, 46, 55, 56]	COVID-19	1-31 May 2020
Multilevel Study Area	[4, 65]		Summer	December, January, February
Staff Office	[18, 20, 28, 47, 48, 49, 5, 51, 54, 60, 62]	[18, 20, 28, 47, 48, 49, 5, 51, 54, 60, 62]	Autumn	March, April, May
Studio	[14, 43, 44, 58, 59]	[14, 58, 59]	Winter	June, July, August
Print Room			Spring	September, October, November
Totals	42	31		

Period	Term 1 & Term 2	Term 1 & Bushfire	Term 1 & COVID-19	Term 1 & Bushfire & COVID-19
Classroom	[52, 61, 15]	[52, 61]		
Computer Lab	[32, 23, 21]	[22, 32, 23, 21]	[22, 32, 23]	[22, 32, 23]
Individual Office	[25, 27, 36, 26, 31, 63]	[12, 25, 27, 36, 26, 63]	[12, 27, 36, 26]	[12, 27, 36, 26]
Media Room	[53]	[53]		
Meeting Room	[55, 39, 11, 46, 29, 30, 56]	[55, 11, 46, 29, 56]	[55, 39, 11, 46, 56]	[55, 11, 46, 56]
Multilevel Study Area	[65]	[65]	[65]	[65]
Staff Office	[62, 20, 48, 60, 54, 18, 47, 51, 49, 5, 28]	[62, 20, 48, 60, 54, 18, 51, 49, 5, 28]	[20, 48, 60, 54, 18, 47, 49, 5, 28]	[20, 48, 60, 54, 18, 49, 5, 28]
Studio	[14, 58, 44, 59, 43]	[14, 58, 59]	[14, 58, 59]	
Print Room				
Totals	37	32	25	23

Period	Summer	Autumn	Winter	Spring
Classroom	[15, 24, 52, 61]		[15, 52, 61]	[61]
Computer Lab	[21, 32]		[23, 32]	[21, 22, 23, 32, 33]
Individual Office	[12, 19, 25, 27, 36, 63]		[12, 27, 36]	[12, 19, 25, 26, 27, 36, 63]
Media Room	[53]			[53]
Meeting Room	[11, 29, 30, 46, 55, 56]	[11, 39, 46, 55, 56]	[11, 29, 39, 46, 55, 56]	[11, 16, 29, 39, 55, 56]

Multilevel Study Area	[65]	[65]	[64, 65]	[4, 65]
Staff Office	[18, 28, 38, 48, 49, 51, 54, 60, 62]	[18, 20, 28, 38, 47, 48, 49, 54, 60, 62]	[18, 28, 38, 47, 49, 5, 51, 54, 60, 62]	[20, 28, 38, 49, 5, 51, 57, 60, 62]
Studio	[40, 58, 59]	[14, 58, 59]	[14, 40, 43, 44, 59]	[14, 40, 58, 59]
Print Room			[41]	
Totals	32	24	38	33

Table A3. List of significant mutual correlations. Empty square brackets denote absence of any significant correlation

MyAir #	Significant_Parameters_T	Significant_Parameters_RH	Significant_Parameters_CO ₂	Significant_Parameters_T VOCs
11	['RH', 'T _{out} ']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'ws']	['RH']	[]
12	['RH', 'CO ₂ ', 'T _{out} ']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'NO ₂ ', 'O ₃ ']	['T', 'RH']	[]
14	['RH', 'T _{out} ', 'RH _{out} ', 'wd', 'O ₃ ']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'O ₃ ']	['RH']	[]
15	['RH', 'CO ₂ ', 'TVOCs', 'T _{out} ', 'RH _{out} ', 'wd', 'ws']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'O ₃ ']	['T', 'RH']	['T']
18	['RH', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'ws']	['T', 'CO ₂ ', 'TVOCs', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'O ₃ ']	['T', 'RH', 'TVOCs']	['RH', 'CO ₂ ']
20	['RH', 'T _{out} ', 'RH _{out} ', 'wd', 'O ₃ ']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'NO ₂ ', 'O ₃ ']	['RH', 'T _{out} ']	[]
21	['RH', 'CO ₂ ', 'T _{out} ']	['T', 'T _{out} ', 'RH _{out} ', 'wd', 'NO ₂ ']	['T', 'T _{out} ']	[]
22	['CO ₂ ']	['CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'O ₃ ']	['T', 'RH']	[]
23	['RH', 'CO ₂ ', 'T _{out} ', 'wd']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'ws']	['T', 'RH', 'T _{out} ']	[]
24	['RH', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'O ₃ ', 'PM ₁₀ ']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'NO ₂ ', 'O ₃ ']	['T', 'RH', 'T _{out} ', 'wd', 'PM ₁₀ ']	[]
25	['RH', 'CO ₂ ', 'TVOCs', 'T _{out} ', 'RH _{out} ', 'wd', 'O ₃ ']	['T', 'CO ₂ ', 'TVOCs', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'NO ₂ ', 'O ₃ ']	['T', 'RH', 'TVOCs']	['T', 'RH', 'CO ₂ ']
26	['RH', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'NO ₂ ', 'O ₃ ']	['T', 'RH', 'wd']	[]
27	['RH', 'CO ₂ ', 'T _{out} ', 'wd', 'ws']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'O ₃ ']	['T', 'RH']	[]
28	['RH', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'O ₃ ']	['T', 'RH', 'TVOCs']	['CO ₂ ']
29	['RH', 'CO ₂ ', 'TVOCs', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'O ₃ ']	['T', 'CO ₂ ', 'TVOCs', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'NO ₂ ', 'O ₃ ']	['T', 'RH']	['T', 'RH']
30	['RH', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'O ₃ ']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'O ₃ ']	['T', 'RH', 'T _{out} ', 'RH _{out} ', 'O ₃ ']	[]
31	['RH', 'CO ₂ ', 'T _{out} ', 'wd', 'ws']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'ws']	['T', 'RH', 'TVOCs']	['CO ₂ ']

32	['RH', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'NO ₂ ', 'O ₃ ', 'PM ₁₀ ']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'NO ₂ ', 'O ₃ ']	['T', 'RH', 'T _{out} ', 'O ₃ ']	[]
34	['RH', 'CO ₂ ', 'T _{out} ', 'RH _{out} ']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'NO ₂ ']	['T', 'RH', 'T _{out} ']	[]
36	['RH', 'CO ₂ ', 'T _{out} ']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd']	['T', 'RH', 'TVOCs', 'T _{out} ', 'RH _{out} ']	['CO ₂ ']
39	['RH', 'CO ₂ ', 'TVOCs', 'T _{out} ', 'RH _{out} ', 'wd', 'ws']	['T', 'CO ₂ ', 'TVOCs', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'O ₃ ']	['T', 'RH', 'TVOCs', 'T _{out} ', 'RH _{out} ', 'wd']	['T', 'RH', 'CO ₂ ', 'T _{out} ']
4	['RH', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'ws']	['T', 'RH']	[]
43	['RH', 'CO ₂ ', 'T _{out} ', 'wd', 'ws', 'O ₃ ']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'O ₃ ']	['T', 'RH']	[]
44	['RH', 'CO ₂ ', 'T _{out} ', 'wd', 'O ₃ ']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'NO ₂ ', 'O ₃ ']	['T', 'RH', 'TVOCs', 'O ₃ ']	['CO ₂ ']
46	['RH', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'NO ₂ ', 'O ₃ ']	['T', 'RH', 'T _{out} ', 'RH _{out} ', 'wd']	[]
47	['RH', 'CO ₂ ', 'TVOCs', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'O ₃ ']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'O ₃ ']	['T', 'RH', 'T _{out} ', 'RH _{out} ', 'O ₃ ']	['T']
48	['RH', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'ws']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'NO ₂ ', 'O ₃ ']	['T', 'RH', 'TVOCs']	['CO ₂ ']
49	['RH', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'O ₃ ']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'NO ₂ ', 'O ₃ ']	['T', 'RH', 'TVOCs', 'RH _{out} ', 'wd']	['CO ₂ ']
5	['RH', 'T _{out} ', 'wd']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'ws']	['RH']	[]
50	['RH', 'CO ₂ ', 'T _{out} ', 'wd', 'PM ₁₀ ']	['T', 'CO ₂ ', 'TVOCs', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'O ₃ ']	['T', 'RH']	['RH']
51	['RH', 'CO ₂ ', 'T _{out} ', 'RH _{out} ']	['T', 'CO ₂ ', 'TVOCs', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'O ₃ ']	['T', 'RH', 'TVOCs', 'RH _{out} ', 'O ₃ ']	['RH', 'CO ₂ ']
52	['RH', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'NO ₂ ', 'O ₃ ']	['T', 'RH', 'O ₃ ']	[]
53	['RH', 'CO ₂ ', 'TVOCs', 'T _{out} ', 'RH _{out} ', 'wd', 'NO ₂ ', 'O ₃ ']	['T', 'CO ₂ ', 'TVOCs', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'O ₃ ']	['T', 'RH']	['T', 'RH', 'RH _{out} ']
54	['RH', 'CO ₂ ', 'T _{out} ', 'wd']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd']	['T', 'RH']	[]
55	['RH', 'CO ₂ ', 'TVOCs', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'NO ₂ ', 'O ₃ ']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd']	['T', 'RH']	['T']
56	['RH', 'CO ₂ ', 'TVOCs', 'T _{out} ', 'RH _{out} ', 'wd']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd']	['T', 'RH', 'TVOCs']	['T', 'CO ₂ ']
58	['RH', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'NO ₂ ', 'O ₃ ']	['T', 'CO ₂ ', 'TVOCs', 'T _{out} ', 'RH _{out} ', 'wd', 'NO ₂ ', 'O ₃ ']	['T', 'RH']	['RH', 'RH _{out} ']
59	['RH', 'CO ₂ ', 'TVOCs', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'NO ₂ ', 'O ₃ ']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd']	['T', 'RH', 'TVOCs', 'T _{out} ']	['T', 'CO ₂ ']
60	['RH', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'NO ₂ ', 'O ₃ ']	['T', 'CO ₂ ', 'TVOCs', 'T _{out} ', 'RH _{out} ', 'wd', 'O ₃ ']	['T', 'RH', 'TVOCs', 'T _{out} ']	['RH', 'CO ₂ ']
61	['RH', 'CO ₂ ', 'T _{out} ', 'ws']	['T', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'ws', 'O ₃ ']	['T', 'RH', 'TVOCs']	['CO ₂ ']
62	['RH', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'NO ₂ ', 'O ₃ ']	['T', 'T _{out} ', 'RH _{out} ', 'wd']	['T']	[]
63	['RH', 'CO ₂ ', 'T _{out} ', 'RH _{out} ', 'wd', 'O ₃ ']	['T', 'T _{out} ', 'wd', 'ws', 'O ₃ ']	['T']	[]

