

Supplementary Materials: Indoor Air Quality Assessment of Latin America's First Passivhaus Home

Alejandro Moreno-Rangel ^{1,2,*}, Filbert Musau ¹, Tim Sharpe ^{1,3} and Gráinne McGill ^{1,3}

Table S1. Summary of CO₂ levels in both homes. Source: Authors.

Month		Bedroom - Standard (ppm)	Living room - Standard (ppm)	Bedroom - Passivhaus (ppm)	Living room - Passivhaus (ppm)
January	Mean	1,056.60	615.19	625.59	515.78
	N	8,928	8,928	8,928	8,928
	SD	511.55	165.12	136.32	110.70
February	Mean	1,018.28	593.89	695.03	573.82
	N	8,064	8,064	8,064	8,064
	SD	500.12	145.85	364.75	300.71
March	Mean	967.29	567.32	1,003.05	969.29
	N	8,928	8,928	8,928	8,928
	SD	446.84	134.82	747.68	704.63
April	Mean	892.88	526.58	736.08	727.61
	N	8,628	8,628	8,628	8,628
	SD	398.33	97.12	457.20	421.00
May	Mean	1,024.33	555.14	682.89	653.69
	N	8,928	8,928	8,928	8,928
	SD	429.52	123.45	286.55	248.11
June	Mean	934.02	574.34	520.66	492.08
	N	8,640	8,640	8,640	8,640
	SD	417.78	149.13	168.25	124.03
July	Mean	1,042.05	634.89	465.37	506.12
	N	8,928	8,928	8,928	8,928
	SD	480.77	168.66	235.07	210.62
August	Mean	1,014.15	604.12	716.60	828.26
	N	8,928	8,928	8,928	8,928
	SD	468.02	153.73	602.60	639.49
September	Mean	810.11	558.82	598.77	646.43
	N	8,640	8,640	8,640	8,640
	SD	451.88	139.41	311.95	289.95
October	Mean	1,010.61	609.33	777.50	426.32
	N	8,940	8,940	8,940	8,940
	SD	504.51	149.95	474.35	390.33
November	Mean	1,074.62	654.24	777.91	366.57
	N	8,640	8,640	8,640	8,640
	SD	545.84	200.70	487.02	361.56
December	Mean	1,052.18	630.23	781.96	477.67
	N	8,928	8,928	8,928	8,928
	SD	552.99	181.96	484.96	375.50
Total	Mean	991.91	593.85	698.92	599.25
	N	105,120	105,120	105,120	105,120
	SD	483.75	157.34	453.88	425.09

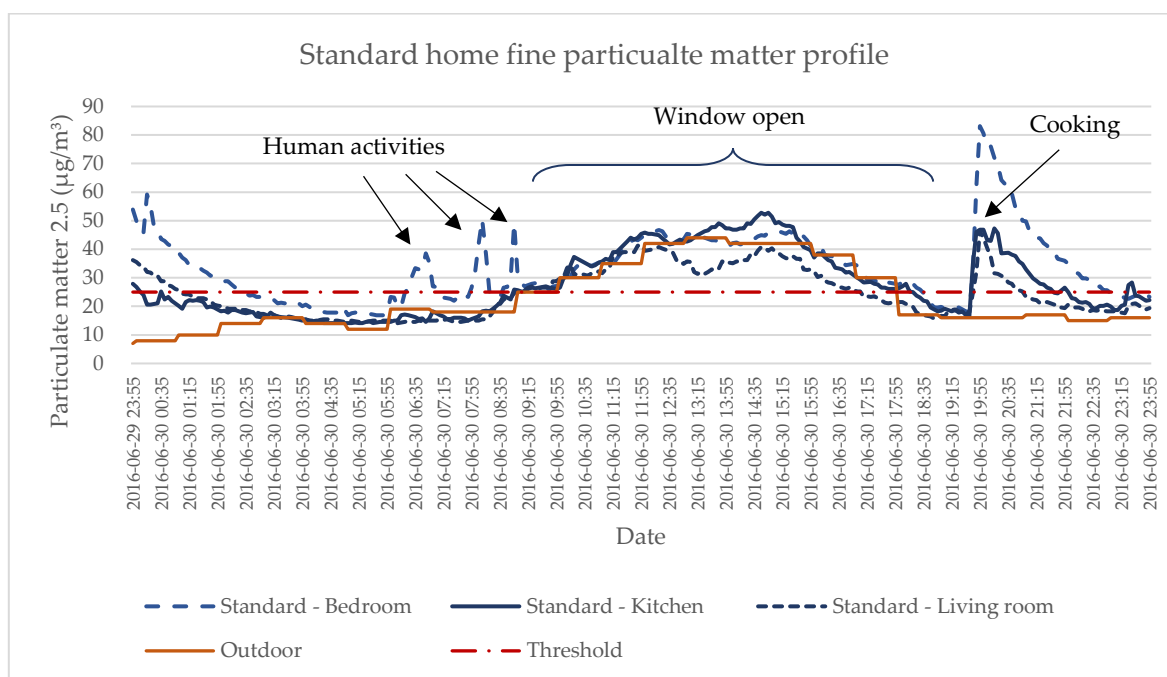


Figure S1. Standard home $\text{PM}_{2.5}$ profile 29–30 June 2016. Source: Authors.

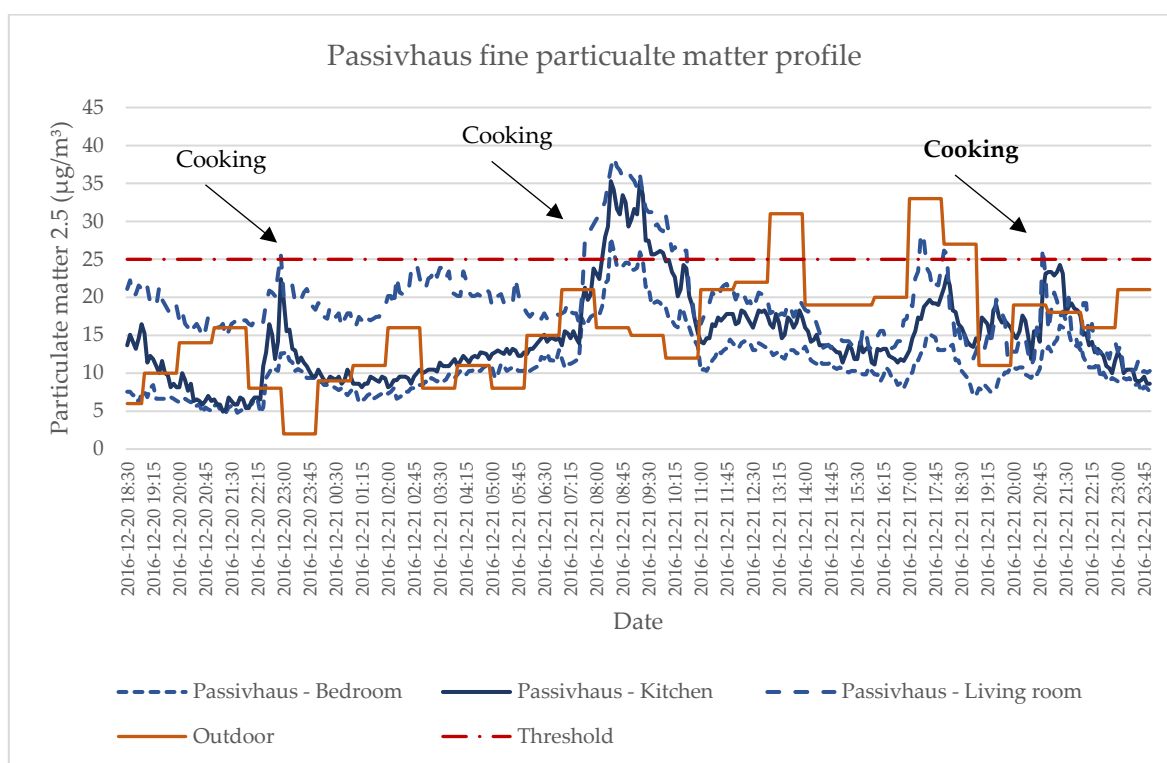


Figure S2. Passivhaus home $\text{PM}_{2.5}$ profile 20–21 December 2016. Source: Authors.

Table S2. Summary of PM_{2.5} levels in both homes. Source: Authors.

Month		Outdoor ($\mu\text{g}/\text{m}^3$)	Bedroom - Standard ($\mu\text{g}/\text{m}^3$)	Kitchen - Standard ($\mu\text{g}/\text{m}^3$)	Living room - Standard ($\mu\text{g}/\text{m}^3$)	Bedroom - Passivhaus ($\mu\text{g}/\text{m}^3$)	Kitchen - Passivhaus ($\mu\text{g}/\text{m}^3$)	Living room - Passivhaus ($\mu\text{g}/\text{m}^3$)
January	Mean	29.42	31.84	28.50	31.23	15.75	15.93	15.42
	N	8,928	8,928	8,928	8,928	8,928	8,928	8,928
	SD	14.19	24.26	17.43	24.18	7.43	7.54	7.19
February	Mean	23.13	28.57	24.33	24.71	13.50	16.33	16.15
	N	8,064	8,064	8,064	8,064	8,064	8,064	8,064
	SD	11.79	30.06	22.64	15.19	8.02	8.89	8.85
March	Mean	22.51	25.67	21.84	28.15	16.38	17.60	19.72
	N	8,928	8,928	8,928	8,928	8,928	8,928	8,928
	SD	10.82	11.30	11.28	10.03	14.19	15.20	12.56
April	Mean	26.98	27.36	27.65	24.34	18.16	19.66	18.15
	N	8,628	8,628	8,628	8,628	8,628	8,628	8,628
	SD	12.42	11.63	12.05	-	10.40	10.68	9.42
May	Mean	34.01	43.71	36.27	34.27	24.55	27.85	24.04
	N	8,928	8,928	8,928	8,928	8,928	8,928	8,928
	SD	13.34	11.90	17.22	16.54	11.40	12.03	11.31
June	Mean	22.21	26.82	24.23	24.86	14.70	15.71	16.72
	N	8,640	8,640	8,640	8,640	8,640	8,640	8,640
	SD	13.11	15.15	7.07	18.88	9.41	9.85	10.74
July	Mean	19.47	25.32	19.78	23.62	12.40	13.53	13.57
	N	8,928	8,928	8,928	8,928	8,928	8,928	8,928
	SD	11.18	13.51	13.50	11.03	9.07	9.06	2.35
August	Mean	17.33	30.25	21.29	27.08	13.30	14.32	13.29
	N	8,928	8,928	8,928	8,928	8,928	8,928	8,928
	SD	10.56	17.49	17.99	20.91	2.63	3.48	3.16
September	Mean	15.73	25.39	26.68	28.29	11.34	11.29	10.37
	N	8,640	8,640	8,640	8,640	8,640	8,640	8,640
	SD	9.58	16.83	17.72	16.44	7.87	7.48	8.01
October	Mean	14.02	25.92	25.33	27.69	15.55	13.99	16.09
	N	8,940	8,940	8,940	8,940	8,940	8,940	8,940
	SD	9.25	17.41	16.46	13.94	9.31	11.02	9.03
November	Mean	23.06	34.28	32.66	36.01	21.13	23.86	23.00
	N	8,640	8,640	8,640	8,640	8,640	8,640	8,640
	SD	15.31	22.43	19.85	21.37	17.56	20.24	19.46
December	Mean	20.88	27.96	24.08	23.29	13.19	15.96	16.40
	N	8,928	8,928	8,928	8,928	8,928	8,928	8,928
	SD	12.74	17.12	16.66	17.06	7.50	9.15	9.86
Total	Mean	22.39	29.44	26.05	27.82	15.84	17.17	16.91
	N	105,120	105,120	105,120	105,120	105,120	105,120	105,120
	SD	13.33	18.84	16.90	17.11	10.85	11.95	10.84

Table S3. Summary of tVOC levels in both homes. Source: Authors.

Month		Bedroom - Standard ($\mu\text{g}/\text{m}^3$)	Kitchen - Standard ($\mu\text{g}/\text{m}^3$)	Living room - Standard ($\mu\text{g}/\text{m}^3$)	Bedroom - Passivhaus ($\mu\text{g}/\text{m}^3$)	Kitchen - Passivhaus ($\mu\text{g}/\text{m}^3$)	Living room - Passivhaus ($\mu\text{g}/\text{m}^3$)
January	Mean	688.22	543.27	660.19	564.52	584.58	574.37
	N	8,928	8,928	8,928	8,928	8,928	8,928
	SD	380.31	309.70	474.98	191.84	176.73	187.09
February	Mean	1,026.08	745.67	682.76	763.33	719.77	737.56
	N	8,064	8,064	8,064	8,064	8,064	8,064
	SD	518.33	349.75	430.92	649.53	483.64	562.04
March	Mean	848.46	611.85	618.96	848.12	836.32	812.92
	N	8,928	8,928	8,928	8,928	8,928	8,928
	SD	434.68	296.58	288.58	552.11	468.31	536.78
April	Mean	868.44	596.74	513.22	340.97	320.74	333.51
	N	8,628	8,628	8,628	8,628	8,628	8,628
	SD	496.41	309.72	-	147.21	134.60	152.97
May	Mean	1,720.68	1,173.23	1,340.99	627.09	609.21	639.96
	N	8,928	8,928	8,928	8,928	8,928	8,928
	SD	1,021.79	1,174.63	1,497.48	454.91	381.32	507.22
June	Mean	672.97	923.49	515.31	542.09	545.63	532.73
	N	8,640.00	8,640.00	8,640.00	8,640.00	8,640.00	8,640.00
	SD	329.45	370.24	217.82	313.01	410.32	366.26
July	Mean	846.31	546.27	548.51	696.82	774.00	628.07
	N	8,928	8,928	8,928	8,928	8,928	8,928
	SD	471.50	268.79	275.79	349.64	451.43	287.49
August	Mean	632.33	458.28	452.86	593.18	581.59	578.46
	N	8,928	8,928	8,928	8,928	8,928	8,928
	SD	352.85	246.21	220.95	189.37	236.25	176.74
September	Mean	433.93	414.33	394.59	395.01	472.48	565.71
	N	8,640	8,640	8,640	8,640	8,640	8,640
	SD	215.98	199.84	157.09	283.53	290.68	468.17
October	Mean	648.45	361.20	505.25	454.02	424.24	462.71
	N	8,940	8,940	8,940	8,940	8,940	8,940
	SD	358.21	203.83	217.58	226.28	206.11	255.07
November	Mean	491.83	311.56	386.72	507.69	439.41	570.52
	N	8,640	8,640	8,640	8,640	8,640	8,640
	SD	277.79	139.24	191.54	400.20	257.43	366.00
December	Mean	556.24	388.35	410.58	498.96	519.30	510.16
	N	8,928	8,928	8,928	8,928	8,928	8,928
	SD	249.96	182.35	201.04	257.84	270.26	263.49
Total	Mean	786.02	588.52	586.49	569.08	569.07	578.46
	N	105,120	105,120	105,120	105,120	105,120	105,120
	SD	574.17	492.33	565.26	389.72	356.65	384.35

Hour		Bedroom																							Hour		
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		23	
January	Standard	867	899	866	879	824	780	763	796	805	732	671	537	430	366	357	389	443	544	657	710	790	780	802	830	Standard	January
	Passivhaus	579	582	593	603	616	620	640	657	653	646	599	529	503	491	472	458	463	486	502	553	594	580	560	575	Passivhaus	
February	Standard	1426	1423	1366	1319	1252	1209	1208	1242	1198	1111	928	707	591	522	530	593	648	713	882	1043	1089	1126	1209	1303	Standard	February
	Passivhaus	858	885	900	925	912	854	838	891	917	907	801	710	600	560	559	549	574	591	616	678	751	779	822	846	Passivhaus	
March	Standard	1058	1061	1083	1098	1057	1056	1040	1073	981	891	784	647	608	390	374	475	627	658	757	784	899	936	1013	1023	Standard	March
	Passivhaus	992	1041	1122	1124	1191	1258	1317	1336	1257	1093	816	683	522	459	433	481	510	540	561	617	666	721	796	897	Passivhaus	
April	Standard	1158	1146	1123	1090	1058	1078	1106	1094	1068	1035	871	742	596	499	424	423	506	587	698	774	832	877	1008	1072	Standard	April
	Passivhaus	346	362	387	401	415	428	440	451	453	448	405	341	296	267	258	251	261	250	244	255	274	299	321	334	Passivhaus	
May	Standard	2230	2246	2220	2178	2157	2207	2107	2180	1962	1778	1537	1275	1054	929	857	859	1020	1249	1431	1640	1872	2132	2076	2127	Standard	May
	Passivhaus	698	740	786	805	816	846	867	864	791	735	645	564	461	398	391	420	418	407	450	514	554	597	616	678	Passivhaus	
June	Standard	877	878	824	794	793	788	824	826	801	659	528	483	440	423	419	441	519	520	592	626	747	767	779	815	Standard	June
	Passivhaus	629	633	603	619	634	641	651	705	691	653	540	471	422	398	385	390	422	432	441	443	503	531	568	616	Passivhaus	
July	Standard	1042	1070	1076	1092	1064	1044	1048	1049	1019	864	729	592	542	525	451	527	584	643	680	757	900	960	966	1098	Standard	July
	Passivhaus	793	810	846	828	792	780	781	780	750	734	687	623	563	521	524	531	558	579	620	659	699	735	752	781	Passivhaus	
August	Standard	805	857	807	804	776	776	758	784	755	616	502	440	410	392	374	430	433	507	494	548	656	728	750	783	Standard	August
	Passivhaus	638	636	631	635	646	649	644	641	629	609	603	586	564	549	538	534	531	528	524	548	557	581	612	624	Passivhaus	
September	Standard	554	564	567	519	509	495	505	496	471	432	375	331	311	295	287	300	339	357	381	408	424	460	507	532	Standard	September
	Passivhaus	451	456	458	488	510	497	525	528	441	396	343	320	296	288	271	273	299	316	337	371	375	385	429	429	Passivhaus	
October	Standard	888	821	800	801	795	791	793	810	712	666	561	457	422	396	398	415	423	489	518	571	679	711	803	837	Standard	October
	Passivhaus	545	598	613	597	567	566	540	529	542	522	497	455	407	347	308	273	277	294	309	363	398	411	447	492	Passivhaus	
November	Standard	625	655	635	619	606	573	604	588	489	437	364	305	273	264	291	343	456	477	452	477	518	555	594	605	Standard	November
	Passivhaus	637	659	692	676	655	644	663	630	551	514	469	420	381	357	349	355	368	384	374	395	426	468	539	583	Passivhaus	
December	Standard	640	646	654	647	642	626	625	628	593	542	494	467	452	439	431	437	455	487	534	549	577	580	593	616	Standard	December
	Passivhaus	641	614	619	603	592	615	604	614	566	497	438	362	314	300	297	305	346	383	440	494	534	571	589	642	Passivhaus	
tVOC (ppb) scale		125	169	213	256	300	405	511	616	721	826	932	1037	1142	1247	1353	1458	1563	1668	1774	1879	1984	2089	2195	2300	tVOC (ppb) scale	

Figure S3. Hourly tVOC levels in the Passivhaus and Standard dwelling's bedrooms. Source: Authors.