REVIEW OF PARAMETERS MEASURED TO CHARACTERIZE CLASSROOMS' INDOOR ENVIRONMENTAL QUALITY

Minh Tien Tran[1,2,*], Wenjuan Wei[1], Claire Dassonville[1], Christophe Martinsons[1], Pascal Ducruet[1], Corinne Mandin[1], Valérie Héquet[2], Pawel Wargocki[3]

1: Scientific and Technical Center for Building (CSTB), Health and Comfort Department, French Indoor Air Quality Observatory (OQAI), Marne-la-Vallée, France
2: IMT Atlantique, CNRS, GEPEA, UMR 6144, Nantes Cedex 3, France
3: International Centre for Indoor Environment and Energy, Department of Environmental and Resource Engineering (DTU SUSTAIN), Technical University of Denmark (DTU), Denmark

*Corresponding author: Minh Tien Tran, minh-tien.tran@cstb.fr

1 Tables

1.1 Table S1: Measurements of air temperature (°C) in schools in Europe and North America since 2010

References Location	Period (year)	Type of schools	Number of schools	Total number of samples	Type of ventilation	Occupancy	Measurement protocol	Air temperature (°C)		
								Min	Max	AM ± SD
Aguilar et al. 2022 [1]	Winter 2021	University	1	9	Window opening	Yes	Hygrometer sensor, 10 minutes before lecture start. 3 sensors per room, at 0.6 meter	15	28	21 ± 3.9
Campano-Laborda et al. 2020 Spain [2]	Winter 2020	Secondary	8	564	Window opening	Yes	Hygrometer sensor 30 minutes continuously Two times per day, 1 in early morning and 1 in midmorning break 12 sensors per room, at 0.6 and 1.7 meters	N/A	N/A	21 ± 1.4
Campano-Laborda et al. 2020 Spain [2]	Midseason 2020	Secondary	8	564	Window opening	Yes	Hygrometer sensor 30 minutes continuously Two times per day, 1 in early morning and 1 in midmorning break 12 sensors per room, at 0.6 and 1.7 meters	N/A	N/A	22 ± 2.1
Harcarova et al. 2020 Slovakia [3]	Winter 2020	Elementary	1	1	Window opening	Yes	Hygrometer sensor 1 hour, at 1.1 meters	22	23	22 ± 0.2
Harcarova et al. 2020 Slovakia [3]	Winter 2020	Elementary	1	1	Window opening	Yes	Hygrometer sensor 1 hour, at 1.1 meters	22	25	24 ± 0.8
Langer et al. 2020 Sweden [4]	October - March 2017	Elementary	10	10	Mechanical ventilation Windows opening	Yes	Hygrometer sensor 1 week continuous 2 minutes interval	22	24	N/A

References Location	Period (year)	Type of schools	Number of schools	Total number of samples	Type of ventilation	Occupancy	Measurement protocol	Air temperature (°C)		
								Min	Max	AM ± SD
Papadopoulos et al. 2020 Greece [5]	December 2019	University	1	10	Window opening	Yes	Hygrometer sensor 30 minutes continuously 3 days, with height ranged from 0.5 to 2.5 meters	18	26	23
Papadopoulos et al. 2020 Greece [5]	December 2019	University	1	10	Window opening	Yes	Hygrometer sensor 30 minutes continuously 3 days, with height ranged from 0.5 to 2.5 meters	18	24	21
Ahmed et al. 2019 Finland [6]	Heating and cooling season 2019	Daycare and elementary	1	7	HVAC*	Yes	Hygrometer sensor 1 month continuously 10 minutes interval	All buildings achieved the highest quality of thermal condition (22 °C ± 1 in heating season and 24 °C ± 1 in cooling season)		
Brdaric et al. 2019 Croatia [7]	February - May 2014	Elementary	20	20	Window opening	Yes	Hygrometer sensor 1 week 1 minute interval	20	23	21
Papazoglou et al. 2019 Greece [8]	January 2016	University	1	1	Window opening	Yes	Air temperature probe 90 minutes 10 second time interval, at 1.3 meters	17	20	20
Simanic, et al. 2019 Sweden [9]	Heating season 2018	Elementary	7	145	HVAC*	Yes	Hygrometer sensor 1 week continuously 7h30 to 16h00	22	24	NA
Simanic, et al. 2019 Sweden [9]	Cooling season 2018	Elementary	2	3	HVAC*	Yes	Hygrometer sensor 1 week continuously 7h30 to 16h00	N/A	N/A	23 ± 3
Buratti et al. 2018 Italy [10]	Spring and Autumn 2015	University	7	7	Mechanical ventilation	Yes	Microclimatic station in compliance with ISO 7726 1 week continuous, at 1.1 meters	N/A	N/A	24
Vornanen-Winqvist et al. 2020 Finland [11]	April to September 2016	Secondary	1	2	HVAC*	Yes	Hygrometer sensor 1 week continuously, at 0.6 meter	19	23	20

References Location	Period (year)	Type of schools	Number of schools	Total number of samples	Type of ventilation	Occupancy	Measurement protocol	Air temperature (°C)		
								Min	Max	AM ± SD
Vornanen-Winqvist et al. 2018 Finland [12]	May 2016 - March 2017	School	6	6	HVAC*	Yes	Hygrometer sensor 1 week continuously, at 0.6 meter	12	22	20
Zecevic et al. 2018 Bosnia and Herzegovina [13]	November to December 2016	University	1	2	Mechanical ventilation	Yes	Hygrometer sensor 1 week continuously 10 seconds time interval	21	22	21
Zecevic et al. 2018 Bosnia and Herzegovina [13]	May 2017	University	1	2	Mechanical ventilation	Yes	Hygrometer sensor 1 week continuously 10 second time interval	24	26	25
Irulegi et al. 2017 Spain [14]	April 2016	University	1	3	Window opening	Yes	Hygrometer sensor 1 week continuous 15 minutes time interval	17	24	22
Vilcekova et al. 2017 Slovakia [15]	Autumn 2016	Elementary	1	1	Windows opening	Yes	Testo 435-4 multifunctional (air temperature, air velocity, RH, CO_2) 1 week continuously 3 minutes time interval	23	25	24 ± 0.3
Vilcekova et al. 2017 Slovakia [15]	Autumn 2016	Elementary	1	1	Windows opening	Yes	Testo 435-4 multifunctional (air temperature, air velocity, RH, CO_2) 1 week continuously 3 minutes time interval	22	25	24± 0.5
Vilcekova et al. 2017 Slovakia [15]	Autumn 2016	Elementary	1	1	Windows opening	Yes	Testo 435-4 multifunctional (air temperature, air velocity, RH, CO_2) 1 week continuously	21	25	24 ± 0.6

References Location	Period (year)	Type of schools	Number of schools	Total number of samples	Type of ventilation	Occupancy	Measurement protocol	Air temperature (°C)		
								Min	Max	AM ± SD
							3 minutes time interval			
Vilcekova et al. 2017 Slovakia [15]	Autumn 2016	Elementary	1	1	Windows opening	Yes	Testo 435-4 multifunctional (air temperature, air velocity, RH, CO_2) 1 week continuously 3 minutes time interval	22	25	24 ± 0.8
Vilcekova et al. 2017 Slovakia [15]	Autumn 2016	Elementary	1	1	Windows opening	Yes	Testo 435-4 multifunctional (air temperature, air velocity, RH, CO_2) 1 week continuously 3 minutes time interval	21	24	23 ± 0.8
Branco et al. 2015 Portugal [16]	February to November 2013	Daycare	4	10	Window opening	Yes	Air temperature measurement probe 48 hours 1-minute time interval Positioned at the same height as the breathing zone of children.	14	25	24
De Giuli et al. 2015 Italy [17]	February 2011	Elementary	3	8	Windows opening	Yes	Hygrometer sensor Spot measurements at 0.6 meter	22	24	23 ± 0.7
De Giuli et al. 2015 Italy [17]	April 2011	Elementary	3	8	Windows opening	Yes	Hygrometer sensor Spot measurements at 0.6 meter	20	24	23 ± 1.7
De Giuli et al. 2015 Italy [17]	June 2011	Elementary	3	8	Windows opening	Yes	Hygrometer sensor Spot measurement at 0.6 meter	25	28	26 ± 1.1
Pereira et al. 2015 Portugal [18]	February and May 2010	Secondary	1	1	Window opening	Yes	Hygrometer sensor 1 time of 24 hours continuously and 1 time of 48 hours continuously	13	18	N/A

References Location	Period (year)	Type of schools	Number of schools	Total number of samples	Type of ventilation	Occupancy	Measurement protocol	Air temperature (°C)		
								Min	Max	AM ± SD
De Giuli et al. 2014 Italy [19]	March 2012	Elementary	1	12	Window opening	Yes	Hygrometer sensor Spot measurements recorded on one day at 0.6 meter	21	26	23 ± 1.3
De Giuli et al. 2014 Italy [19]	April 2012	Elementary	1	10	Windows opening	Yes	Hygrometer sensor Spot measurements recorded on day at 0.6 meter	25	27	26 ± 0.6
De Giuli et al. 2014 Italy [19]	May 2012	Elementary	1	12	Windows opening	Yes	Hygrometer senso Spot measurements recorded on one day at 0.6 meter	20	22	21 ± 0.7
De Giuli et al. 2014 Italy [19]	June 2012	Elementary	1	11	Windows opening	Yes	Hygrometer sensor Spot measurements recorded on one day at 0.6 meter	25	28	27 ± 0.9
Pereira et al. 2014 Portugal [20]	April to May 2013	Secondary	1	2	Window opening	No	Hygrometer sensor 2 weeks continuously, 1 minute time interval at 0.6 meter	16	26	21 ± 1.9
Alves et al. 2013 Portugal [21]	January 2012	Elementary	1	3	Window opening	Yes	Air temperature measurement probe Monday to Friday continuously at 1.2 meters	N/A	N/A	18 ± 1.4
Alves et al. 2013 Portugal [21]	January 2012	Kindergarten	1	1	Window opening	Yes	Air temperature measurement probe Monday to Friday continuously at 1.2 meters	N/A	N/A	19 ± 4.3
Alves et al. 2013 Portugal [21]	January 2012	Elementary	1	2	Window opening	Yes	Air temperature measurement probe Monday to Friday continuously at 1.2 meters	N/A	N/A	18 ± 1.5
Alves et al. 2013 Portugal	January 2012	Elementary	1	3	Window opening	Yes	Air temperature measurement probe	N/A	N/A	18 ± 1.5

References Location	Period (year)	Type of schools	Number of schools	Total number of samples	Type of ventilation	Occupancy	Measurement protocol	Air temperature (°C)		
								Min	Max	AM ± SD
[21]							Monday to Friday continuously at 1.2 meters			
De Giuli et al. 2012 Italy [22]	February to June 2010	Elementary	7	28	Window opening	Yes	Hygrometer sensor Spot measurements at 0.6 meter	20	25	22 ± 1.4
Haverinen et al. 2015 Finland [23]	January to April 2009	Elementary	70	70	12 Air handling unit 15 Fan coil 44 Unit ventilators	Yes	Hygrometer sensor (TSI QTrak Monitors) 1 week measurement 5 minutes interval	N/A	25 ± 1.5	23 ± 1.1
Haverinen et al. 2015 Finland [23]	October to December 2009	Elementary	27	27	3 Air handling unit 9 Fan coil 14 Unit ventilators	Yes	Hygrometer sensor (TSI QTrak Monitors) 3 days measurement 5 minutes interval	N/A	25 ± 1.1	23 ± 0.8
Haverinen et al. 2015 Finland [23]	January 2010 to May 2010	Elementary	27	27	3 Air handling unit 9 Fan coil 14 Unit ventilators	Yes	Hygrometer sensor 3 days measurement 5 minutes interval	N/A	26 ± 2.1	23 ± 1.8
Toftum et al. 2015 Denmark [24]	September to October 2009	Elementary	311	723	379 Window opening 130 Mechanical exhaust 223 Mechanical balanced	Yes	Thermometer provide by the schools Spot measurement at the end of the school day	14	30	22 ± 1.8

References Location	Period (year)	Type of schools	Number of schools	Total number of samples	Type of ventilation	Occupancy	Measurement protocol	Air temperature (°C)		
								Min	Max	AM ± SD
Toftum et al. 2015 Denmark [24]	October to December 2009	Elementary	88	88	44 Window opening 10 Mechanical exhaust 31 Mechanical balanced	Yes	Hygrometer sensor (HOBO, signal range: ± 2mV ± 2.5% of reading) 17 days measurement	N/A	27	21 ± 1.0
Erlandson et al. 2019 USA [25]	Yearlong 2019	University	1	1	HVAC	Yes	Hygrometer sensor (Q-trak TSI) 8 hours period with 1 minute interval	N/A	N/A	N/A
Canha et al. 2016 France [26]	January to April 2010	Nursery and Elementary	10	44	Window opening and Mechanical ventilation	Yes	Hygrometer sensor (Q Trak plus ±0.6°C) 4.5 days measurement with 10 minutes interval	20	26	22
Canha et al. 2016 France [26]	April to June 2010	Nursery and Elementary	7	44	Window opening and Mechanical ventilation	Yes	Hygrometer sensor (Q Trak plus ±0.6°C) 4.5 days measurement with 10 minutes interval	21	27	24
Jovanovic et al. 2014 Serbia [27]	April 2012	Elementary	1	5	Window opening	Yes	Hygrometer sensor (Testo 435-4, ±0.3°C) 8 days measurement	17	31	26 ± 2.1
Senitkova et al. 2017 Czech Republic [28]	2017	Nursery	3	6	Window opening	Yes	Hygrometer sensor (Testo 175 H2, ± 0.5 °C) 1 day measurement at 1.0 meter	22	24	23 ± 0.9
Barmparesos et al. 2018 Greece [29]	June to July 2017	Elementary	1	1	Window opening (Under green roof system)	Yes	Hygrometer sensor (TinyTag plus, ± 0.6 °C) 24h measurement at 15 minutes interval	29	34	32 ± 1.1

References Location	Period (year)	Type of schools	Number of schools	Total number of samples	Type of ventilation	Occupancy	Measurement protocol	Air temperature (°C)		
								Min	Max	AM ± SD
Barmparesos et al. 2018 Greece [29]	October to March 2017	Elementary	1	1	Window opening (Under green roof system)	Yes	Hygrometer sensor (TinyTag plus, ± 0.6 °C) 24h measurement at 15 minutes interval	11	28	20 ± 3.1
Barmparesos et al. 2018 Greece [29]	April to June 2017	Elementary	1	1	Window opening (Under green roof system)	Yes	Hygrometer sensor (TinyTag plus, ± 0.6 °C) 24h measurement at 15 minutes interval	21	30	25 ± 2.4
Barmparesos et al. 2018 Greece [29]	June to July 2017	Elementary	1	1	Window opening (Under cement roof)	Yes	Hygrometer sensor (TinyTag plus, ± 0.6 °C) 24h measurement at 15 minutes interval	31	38	35 ± 1.2
Barmparesos et al. 2018 Greece [29]	October to March 2017	Elementary	1	1	Window opening (Under cement roof)	Yes	Hygrometer sensor (TinyTag plus, ± 0.6 °C) 24h measurement at 15 minutes interval	6.0	26	16 ± 4.2
Barmparesos et al. 2018 Greece [29]	April to June 2017	Elementary	1	1	Window opening (Under cement roof)	Yes	Hygrometer sensor (TinyTag plus, ± 0.6 °C) 24h measurement at 15 minutes interval	19	37	26 ± 2.4
Verriele et al. 2016 France [30]	2009 to 2013	Elementary High school University	10	10	HVAC with CO_2 and occupancy sensors	Yes	Hygrometer sensor (Q Trak) 4.5 days measurement. Measured at 2m height	19	23	21 ± 1.0
Istrate et al. 2016 Romania [31]	July to August 2015	High school	1	2	HVAC	N/A	N/A	N/A	N/A	N/A
Zhong et al. 2016 USA [32]	October 2015 to March 2016	Elementary and K8 schools	37	144	HVAC	Both	Measured at 0.6 meter	N/A	N/A	22 ± 1.4

References Location	Period (year)	Type of schools	Number of schools	Total number of samples	Type of ventilation	Occupancy	Measurement protocol	Air temperature (°C)		
								Min	Max	AM ± SD
Stamp et al. 2020 UK [33]	2017	Secondary	1	1	Mechanical and by opening window	Yes	N/A	N/A	N/A	N/A
Madureira et al. 2015 Portugal [34]	November to March 2011 to 2013	Elementary	20	73	Opening window	Yes	Hygrometer (IAQ-CALC TSI 7545 monitor, ± 0.6 °C)	14	25	21
Csobod et al. 2014 Northern Europe [35]	Non heating season 2014	Nurseries and elementary	13	39	Window opening	Yes	Hygrometer sensor (Catec Klimabox) 5 days continuously (Monday to Friday)	18	25	22
Csobod et al. 2014 Northern Europe [35]	Non heating season 2014	Nurseries and elementary	26	78	Window opening	Yes	Hygrometer sensor (Catec Klimabox) 5 days continuously (Monday to Friday)	17	30	22
Csobod et al. 2014 Northern Europe [35]	Non heating season 2014	Nurseries and elementary	44	132	Window opening	Yes	Hygrometer sensor (Catec Klimabox) 5 days continuously (Monday to Friday)	12	29	21
Csobod et al. 2014 Northern Europe [35]	Non heating season 2014	Nurseries and elementary	31	93	Window opening	Yes	Hygrometer sensor (Catec Klimabox) 5 days continuously (Monday to Friday)	11	25	19
Oliveira et al. 2016 Portugal [36]	April to June 2013	Kindergarten	1	1	Window opening	Yes	Hygrometer sensor (TG 502 GrayWolf) 63 days consecutive	22	32	25
Oliveira et al. 2016 Portugal [36]	April to June 2013	Kindergarten	1	1	Window opening	Yes	Hygrometer sensor (TG 502 GrayWolf) 63 days consecutive	14	29	21
Oliveira et al. 2017 Portugal [37]	April to June 2013	Kindergarten	2	2	Window opening	Yes	Hygrometer sensor (Testo mini data-logger 174H) 7 weeks continuously	14	32	23 ± 2.2

References Location	Period (year)	Type of schools	Number of schools	Total number of samples	Type of ventilation	Occupancy	Measurement protocol	Air temperature (°C)		
								Min	Max	AM ± SD
Zivkovic et al. 2015 Serbia [38]	December 2011 to Jun 2012 Heating season	Mixed	4	5	Window opening	Yes	N/A	15	21	18 ± 3.2
Zivkovic et al. 2015 Serbia [38]	December 2011 to Jun 2012 Non-heating season	Mixed	4	5	Window opening	Yes	N/A	21	25	22 ± 2.1
Loreti et al. 2016 Italy [39]	N/A	Secondary	1	5	Window opening	Yes	Hygrometer sensor DH206-2 Delta-Ohm data-logger during morning classes 1 minute interval	20	21	N/A
de la Hoz – Torres et al. 2022 Portugal, Spain [40]	Fall 2021	University	2	12	Window opening	Yes	Hygrometer sensor, FHAD 46- C41A AHLBORN, 1.5 to 2.5 hours on continuous, 1 minute interval, at 0.6 meter	21	26	23 ± 1.9
Heracleous et al. 2019 Cyprus [41]	Winter 2018	Secondary	1	4	Window opening	Both period	Hygrometer sensor UX100-003 HOBO, 1 week on continuous, 1 minute interval	17	24	N/A
Korsavi et al. 2019 England [42]	Year long 2017 and 2018	Elementary	8	31	Window opening	Yes	Hygrometer SWEMA, 2 days on continuous, 5 minutes interval, at 1.1 meters	N/A	N/A	N/A
Oldham et al. 2020, United States [43]	Fall, spring 2018	Elementary	5	5	Window opening	Both period	Thermistor, 5 days on continuous	21	26	N/A

HVAC: Heat, ventilation and air conditioning; AM: arithmetic mean; SD: standard deviation; **: adjusted to the French stock of schools

1.2 Table S2: Measurement of relative humidity in schools across Europe and North America from 2010

References Location	Period (year)	Type of schools	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	Relative humidity (%)		
								Min	Max	AM ± SD
Campano-Laborda et al. 2020 Spain [2]	Winter 2020	Secondary	8	564	Window opening	Yes	Hygrometer sensor 30 minutes on continuous Two times per day, 1 in early morning and 1 in midmorning break	49	51	51 ± 6
Campano-Laborda et al. 2020 Spain [2]	Midseason 2020	Secondary	8	564	Window opening	Yes	Hygrometer sensor 30 minutes on continuous Two times per day, 1 in early morning and 1 in midmorning break	44	46	45 ± 10
Harcarova et al. 2020 Slovakia [3]	Winter 2020	Elementary	1	1	Window opening	Yes	Hygrometer sensor 1 hour	37	52	24 ± 0.8
Harcarova et al. 2020 Slovakia [3]	Winter 2020	Elementary	1	1	Window opening	Yes	Hygrometer sensor 1 hour	22	23	22 ± 0.2
Langer et al. 2020 Sweden [4]	October - March 2017	Elementary	10	10	Mechanical ventilation Windows opening	Yes	Hygrometer sensor 1 week continuous 2 minutes interval	N/A	N/A	N/A
Papadopoulos et al. 2020 Greece [5]	December 2019	University	1	10	Window opening	Yes	Hygrometer sensor 30 minutes on continuous 3 days	38	44	41
Papadopoulos et al. 2020 Greece [5]	December 2019	University	1	10	Window opening	Yes	Hygrometer sensor 30 minutes on continuous 3 days	35	46	40
Ahmed et al. 2019 Finland [6]	Heating and cooling season 2019	Daycare and elementary	1	7	HVAC*	Yes	Hygrometer sensor 1 month on continuous 10 minutes interval	N/A	N/A	N/A

References Location	Period (year)	Type of schools	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	Relative humidity (%)		
								Min	Max	AM ± SD
Brdaric et al. 2019 Croatia [7]	February - May 2014	Elementary	20	20	Window opening	Yes	Hygrometer sensor 1 week 1 minute interval	31	60	N/A
Papazoglou et al. 2019 Greece [8]	January 2016	University	1	1	Window opening	Yes	Relative humidity probe 90 minutes 10 second time interval	N/A	N/A	70
Simanic, et al. 2019 Sweden [9]	Heating season 2018	Elementary	7	145	HVAC*	Yes	Hygrometer sensor 1 week on continuous 7h30 to 16h00	N/A	N/A	N/A
Simanic, et al. 2019 Sweden [9]	Cooling season 2018	Elementary	2	3	HVAC*	Yes	Hygrometer sensor 1 week on continuous 7h30 to 16h00	N/A	N/A	N/A
Buratti et al. 2018 Italy [10]	Spring and Autumn 2015	University	7	7	Mechanical ventilation	Yes	Microclimatic station in compliance with ISO 7726 1 week continuous	33	71	47
Vornanen-Winqvist et al. 2020 Finland [11]	April to September 2016	Secondary	1	2	HVAC*	Yes	Hygrometer sensor 1 week on continuous	32	72	49
Vornanen-Winqvist et al. 2018 Finland [12]	May 2016 - March 2017	School	6	6	HVAC*	Yes	Hygrometer sensor 1 week on continuous	18	40	29
Zecevic et al. 2018 Bosnia and Herzegovina [13]	November to December 2016	University	1	2	Mechanical ventilation	Yes	Hygrometer sensor 1 week on continuous 10 seconds time interval	30	38	33
Zecevic et al. 2018 Bosnia and Herzegovina [13]	May 2017	University	1	2	Mechanical ventilation	Yes	Hygrometer sensor 1 week on continuous 10 second time interval	35	46	39

References Location	Period (year)	Type of schools	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	Relative humidity (%)		
								Min	Max	AM ± SD
Irulegi et al. 2017 Spain [14]	April 2016	University	1	3	Window opening	Yes	Hygrometer sensor 1 week continuous 15 minutes time interval	33	57	44
Vilcekova et al. 2017 Slovakia [15]	Autumn 2016	Elementary	1	1	Windows opening	Yes	Testo 435-4 multifunctional (air temperature, air velocity, RH, CO_2) 1 week on continuous 3 minutes time interval	46	54	50 ± 2
Vilcekova et al. 2017 Slovakia [15]	Autumn 2016	Elementary	1	1	Windows opening	Yes	Testo 435-4 multifunctional (air temperature, air velocity, RH, CO_2) 1 week on continuous 3 minutes time interval	47	53	50 ± 1.2
Vilcekova et al. 2017 Slovakia [15]	Autumn 2016	Elementary	1	1	Windows opening	Yes	Testo 435-4 multifunctional (air temperature, air velocity, RH, CO_2) 1 week on continuous 3 minutes time interval	45	52	48 ± 1.3
Vilcekova et al. 2017 Slovakia [15]	Autumn 2016	Elementary	1	1	Windows opening	Yes	Testo 435-4 multifunctional (air temperature, air velocity, RH, CO_2) 1 week on continuous 3 minutes time interval	44	54	50 ± 2.1
Vilcekova et al. 2017 Slovakia [15]	Autumn 2016	Elementary	1	1	Windows opening	Yes	Testo 435-4 multifunctional (air temperature, air velocity, RH, CO_2) 1 week on continuous 3 minutes time interval	48	54	51 ± 1.3

References Location	Period (year)	Type of schools	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	Relative humidity (%)		
								Min	Max	AM ± SD
Branco et al. 2015 Portugal. [16]	February to November 2013	Daycare	4	10	Window opening	Yes	Capacitive sensor 48 hours 1 minute time interval	37	83	Range: 51 ± 4.6 to 78 ± 2.7
De Giuli et al. 2015 Italy [17]	February 2011	Elementary	3	8	Windows opening	Yes	Hygrometer sensor Spot measurements recorded on one day	N/A	N/A	39 ± 2
De Giuli et al. 2015 Italy [17]	March-April 2011	Elementary	3	8	Windows opening	Yes	Hygrometer sensor, Spot measurements recorded on one day	N/A	N/A	41 ± 7
De Giuli et al. 2015 Italy [17]	June 2011	Elementary	3	8	Windows opening	Yes	Hygrometer sensor Spot measurement recorded on one day	N/A	N/A	53 ± 10
Pereira et al. 2015 Portugal. [18]	February and May 2010	Secondary	1	1	Window opening	Yes	Hygrometer sensor 1 time of 24 hours on continuous and 1 time of 48 hours on continuous	37	69	50 ± 1.6
De Giuli et al. 2014 Italy [19]	March 2012	Elementary	1	12	Window opening	Yes	Hygrometer sensor Spot measurements recorded on one day	32	38	34 ± 1.9
De Giuli et al. 2014 Italy [19]	April 2012	Elementary	1	10	Windows opening	Yes	Hygrometer sensor Spot measurements recorded on one day	48	53	50 ± 1.5
De Giuli et al. 2014 Italy [19]	May 2012	Elementary	1	12	Windows opening	Yes	Hygrometer sensor Spot measurements recorded on one day	50	51	50 ± 0.3
De Giuli et al. 2014 Italy [19]	June 2012	Elementary	1	11	Windows opening	Yes	Hygrometer sensor Spot measurements recorded on one day	50	54	52 ± 1.0
Pereira et al. 2014 Portugal [20]	April to May 2013	Secondary	1	2	Window opening	No	Hygrometer sensor 2 weeks on continuous, 1 minute time interval	26.9	65.9	47.2 ± 1.85

References Location	Period (year)	Type of schools	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	Relative humidity (%)		
								Min	Max	AM ± SD
Alves et al. 2013 Portugal [21]	January 2012	Elementary Urban-Traffic	1	3	Window opening	Yes	Relative humidity measurement probe Monday to Friday on continuous	N/A	N/A	Range: 47.8 ± 3.2 to 65.7 ± 3.3
Alves et al. 2013 Portugal [21]	January 2012	Kindergarten Urban	1	1	Window opening	Yes	Relative humidity measurement probe Monday to Friday on continuous	N/A	N/A	61.9 ± 8.1
Alves et al. 2013 Portugal [21]	January 2012	Elementary Urban	1	2	Window opening	Yes	Relative humidity measurement probe Monday to Friday on continuous	N/A	N/A	Range: 57.8 ± 4.6 to 71.6 ± 2.0
Alves et al. 2013 Portugal [21]	January 2012	Elementary Rural	1	3	Window opening	Yes	Relative humidity measurement probe Monday to Friday on continuous	N/A	N/A	Range: 51.9 ± 5.8 to 65.8 ± 4.6
De Giuli et al. 2012 Italy [22]	February to June 2010	Elementary	7	28	Window opening	Yes	Hygrometer sensor Spot measurements recorded on one day	N/A	N/A	46.1 ± 8.7
Ulla Haverinen et al. 2015 Finland [23]	January to April 2009	Elementary	70	70	12 Air handling unit 15 Fan coil 44 Unit ventilators	Yes	Hygrometer sensor (TSI QTrak Monitors) 1 week measurement 5 minutes interval	N/A	N/A	47 ± 7.8
Ulla Haverinen et al. 2015 Finland [23]	October to December 2009	Elementary	27	27	3 Air handling unit 9 Fan coil 14 Unit ventilators	Yes	Hygrometer sensor (TSI QTrak Monitors) 3 days measurement 5 minutes interval	N/A	N/A	46 ± 7.3

References Location	Period (year)	Type of schools	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	Relative humidity (%)		
								Min	Max	AM ± SD
Ulla Haverinen et al. 2015 Finland [23]	January 2010 to May 2010	Elementary	27	27	3 Air handling unit 9 Fan coil 14 Unit ventilators	Yes	Hygrometer sensor 3 days measurement 5 minutes interval	N/A	N/A	49 ± 10
Toftum et al. 2015 Danemark [24]	October to December 2009	Elementary	88	88	44 Window opening 10 Mechanical exhaust 31 Mechanical balanced	Yes	Hygrometer sensor (HOBO, signal range: ± 2mV ± 2.5% of reading) 17 days measurement	N/A	N/A	N/A
Erlandson et al. 2019 USA [25]	Yearlong 2019	University	1	1	HVAC	Yes	Hygrometer sensor (Q-trak TSI) 8 hours period with 1 minute interval	N/A	N/A	N/A
Canha et al. 2016 France [26]	January to April 2010	Nursery and Elementary	10	44	Window opening and Mechanical ventilation	Yes	Hygrometer sensor (Q Trak plus ±0.6°C) 4.5 days measurement with 10 minutes interval	18	39	31
Canha et al. 2016 France [26]	April to June 2010	Nursery and Elementary	7	44	Window opening and Mechanical ventilation	Yes	Hygrometer sensor (Q Trak plus ±0.6°C) 4.5 days measurement with 10 minutes interval	34	62	47
Jovanovic et al. 2014 Serbia [27]	April 2012	Elementary	1	5	Window opening	Yes	Hygrometer sensor (Testo 435-4, ±0.3°C) 8 days measurement	13	54	33 ± 8.4
Senitkova 2017 Czech Republic [28]	2017	Nursery	3	6	Window opening	Yes	Hygrometer sensor (Testo 175 H2, ± 0.5 °C) 1 day measurement	40	63	52 ± 10

References Location	Period (year)	Type of schools	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	Relative humidity (%)		
								Min	Max	AM ± SD
Barmparesos et al. 2018 Greece [29]	June to July 2017	Elementary	1	1	Window opening (Under green roof system)	Yes	Hygrometer sensor (TinyTag plus, ± 0.6 °C) 24h measurement at 15 minutes interval	29	46	41 ± 2.4
Barmparesos et al. 2018 Greece [29]	October to March 2017	Elementary	1	1	Window opening (Under green roof system)	Yes	Hygrometer sensor (TinyTag plus, ± 0.6 °C) 24h measurement at 15 minutes interval	27	74	47 ± 7.9
Barmparesos et al. 2018 Greece [29]	April to June 2017	Elementary	1	1	Window opening (Under green roof system)	Yes	Hygrometer sensor (TinyTag plus, ± 0.6 °C) 24h measurement at 15 minutes interval	28	61	47 ± 5.4
Barmparesos et al. 2018 Greece [29]	June to July 2017	Elementary	1	1	Window opening (Under cement roof)	Yes	Hygrometer sensor (TinyTag plus, ± 0.6 °C) 24h measurement at 15 minutes interval	28	41	35 ± 3.0
Barmparesos et al. 2018 Greece [29]	October to March 2017	Elementary	1	1	Window opening (Under cement roof)	Yes	Hygrometer sensor (TinyTag plus, ± 0.6 °C) 24h measurement at 15 minutes interval	35	78	59 ± 6.4
Barmparesos et al. 2018 Greece [29]	April to June 2017	Elementary	1	1	Window opening (Under cement roof)	Yes	Hygrometer sensor (TinyTag plus, ± 0.6 °C) 24h measurement at 15 minutes interval	30	57	45 ± 4.6
Verriele et al. 2016 France [30]	2009 to 2013	Elementary High school University	10	10	HVAC with CO2 and occupancy sensors	Yes	Hygrometer sensor (Q Trak) 4.5 days measurement. Measured at 2m height	28	58	44 ± 5.8
Istrate et al. 2016 Romania [31]	July to August 2015	High school	1	2	HVAC	N/A	N/A	N/A	N/A	N/A

References Location	Period (year)	Type of schools	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	Relative humidity (%)		
								Min	Max	AM ± SD
Zhong et al. 2016 USA [32]	October 2015 to March 2016	Elementary and K8 schools	37	144	HVAC	Both	N/A	N/A	N/A	30 ± 11
Stamp et al. 2020 United Kingdom [33]	2017	Secondary	1	1	Mechanical and by opening window	Yes	N/A	N/A	N/A	N/A
Madureira et al. 2015 Portugal [34]	November to March, 2011 to 2013	Elementary	20	73	Opening window	Yes	Hygrometer (IAQ-CALC TSI 7545 monitor, ± 0.6 °C)	34	74	54
Csobod et al. Northern Europe [35]	Non heasting season 2014	Nurseries and elementary	13	39	Window opening	Yes	Hygrometer sensor (Catec Klimabox) 5 days on continuous (Monday to Friday)	6.0	56	33
Csobod et al. Western Europe [35]	Non heasting season 2014	Nurseries and elementary	26	78	Window opening	Yes	Hygrometer sensor (Catec Klimabox) 5 days on continuous (Monday to Friday)	23	64	38
Csobod et al. Central-Eastern Europe [35]	Non heasting season 2014	Nurseries and elementary	44	132	Window opening	Yes	Hygrometer sensor (Catec Klimabox) 5 days on continuous (Monday to Friday)	20	64	38
Csobod et al. Southern Europe [35]	Non heasting season 2014	Nurseries and elementary	31	93	Window opening	Yes	Hygrometer sensor (Catec Klimabox) 5 days on continuous (Monday to Friday)	25	80	51
Oliveira et al. 2016 Portugal [36]	April to June 2013	Kindergarten	1	1	Window opening	Yes	Hygrometer sensor (TG 502 GrayWolf) 63 days consecutive	20	71	43
Oliveira et al. 2016 Portugal [36]	April to June 2013	Kindergarten	1	1	Window opening	Yes	Hygrometer sensor (TG 502 GrayWolf) 63 days consecutive	25	74	54

References Location	Period (year)	Type of schools	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	Relative humidity (%)		
								Min	Max	AM ± SD
Oliveira et al. 2017 Portugal [37]	April to June 2013	Kindergarten	2	2	Window opening	Yes	Hygrometer sensor (Testo mini data-logger 174H) 7 weeks on continuous	20	71	48 ± 22
Zivkovic et al. 2015 Serbia [38]	December 2011 to Jun 2012 Heating season	Mixed	4	5	Window opening	Yes	N/A	32	49	36 ± 8.2
Zivkovic et al. 2015 Serbia [38]	December 2011 to Jun 2012 Non-heating season	Mixed	4	5	Window opening	Yes	N/A	45	70	57 ± 8.8
Loreti et al. 2016 Italy [39]	2016	Secondary	1	5	Window opening	Yes	Hygrometer sensor DH206-2 Delta-Ohm data-logger during morning classes 1 minute interval	46	55	N/A
Aguilar et al. 2022 [1]	Winter 2021	University	1	9	Window opening	Yes	Hygrometer sensor, 10 minutes before lecture start. 3 sensors per room, at 0.6 meter	16	94	58 ± 21
de la Hoz – Torres et al. 2022 Portugal, Spain [40]	Fall 2021	University	2	12	Window opening	Yes	Hygrometer sensor, FHAD 46- C41A AHLBORN, 1.5 to 2.5 hours on continuous, 1 minute interval, at 0.6 meter	20	50	38 ± 7.3
Heracleous et al. 2019 Cyprus [41]	Winter 2018	Secondary	1	4	Window opening	Both period	Hygrometer sensor UX100-003 HOBO, 1 week on continuous, 1 minute interval	37	70	N/A

References Location	Period (year)	Type of schools	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	Relative humidity (%)		
								Min	Max	AM ± SD
Korsavi et al. 2019 England [42]	Year long 2017 and 2018	Elementary	8	31	Window opening	Yes	Hygrometer SWEMA, 2 days on continuous, 5 minutes interval, at 1.1 meters	N/A	N/A	N/A
Oldham et al. 2020, United States [43]	Fall, spring 2018	Elementary	5	5	Window opening	Both period	Thermistor, 5 days on continuous	23	72	N/A

1.3 Table S3: Thermal comfort assessment in schools in Europe and North America since 2010

References location	Period (year)	Type of schools	Number of schools Number of students	Type of ventilation	Method	Measured parameters	Results
Campano-Laborda et al. 2020 Spain [2]	Winter 2020	Secondary	8 977 students 12-17 years old	Opening window	-Physical and operational characterization of the indoor environment -Thermal sensation vote 7 scale ASHRAE Clothing insulation	Indoor: -air temperature (Pt 100, (±0.3°C) -surface temperatures (Thermocouple type K, ±0.3°C) -mean radiant temperature (MRT) measured with a globe thermometer (± 1.5°C) -operative temperature measured with a globe thermometer (± 1.5°C) -relative humidity (capacitive ± 2%) -air velocity (hot wire, ±0.03 m/s) Outdoor: -air temperature -air velocity	MRT: Closed windows: 21 ± 2.6°C* Closed windows/open doors: 22 ± 1.7 °C Open windows: 20 ± 1.7°C* PMV: +0.3 PPD: 81%

References location	Period (year)	Type of schools	Number of schools Number of students	Type of ventilation	Method	Measured parameters	Results
Campano-Laborda et al. 2020 Spain [2]	Midseason 2020	Secondary	8 977 students 12-17 years old	Opening window	-Physical and operational characterization of the indoor environment -Thermal sensation vote 7 scale ASHRAE Clothing insulation	Indoor: -air temperature (Pt 100, (±0.3°C) -surface temperatures (Thermocouple type K, ±0.3°C) -mean radiant temperature (MRT) measured with a globe thermometer (± 1.5°C) -operative temperature measured with a globe thermometer (± 1.5°C) -relative humidity (capacitive ± 2%) -air velocity (hot wire, ±0.03 m/s) Outdoor: -air temperature -air velocity	MRT: Closed windows: 23 ± 2.9 °C* Open windows: 23 ± 3.7 °C* PMV: +0.38 PPD: 85%
Papadopoulos et al. 2020 Greece [5]	Winter 2019	University	1 198 students More than 18 years old	Opening window 1 Lecture hall	Rational approach Thermal sensation vote 7 scale ASHRAE, Clothing insulation Height, weight to estimation of metabolic rate	Indoor: -air temperature (± 0.5°C) - mean radiant temperature (MRT) estimated with surface temperatures (± 0.5°C) and thermal imaging camera -relative humidity (± 5%) -air velocity (±1.5% RMS)	T_{op}: Period 1: 21.49 ± 1.17 Period 2: 21.64 ± 0.58 Period 3: 24.42 ± 2.51 PMV: Period 1: - 0.09 ± 0.19 Period 2: 0.04 ± 0.17 Period 3: 0.49 ± 0.09 PPD: Period 1: 5.89 ± 0.83 Period 2: 5.55 ± 0.75 Period 3: 10.20 ± 2.00

References location	Period (year)	Type of schools	Number of schools Number of students	Type of ventilation	Method	Measured parameters	Results
						-operative temperature (Top) (mean of MRT and air temperature and air velocity <0.2 m/s) Outdoor: -air temperature -relative humidity	
Papadopoulos et al. 2020 Greece [5]	Winter 2019	University	1 198 students More than 18 years old	Opening window 1 Classroom	Rational approach Thermal sensation vote 7 scale ASHRAE, Clothing insulation Height, weight to estimation of metabolic rate	Indoor: -air temperature (± 0.5°C) - mean radiant temperature (MRT) estimated with surface temperatures (± 0.5°C) and thermal imaging camera -relative humidity (± 5%) -air velocity (±1.5% RMS) -operative temperature (Top) (mean of MRT and air temperature and air velocity <0.2 m/s) Outdoor: -air temperature -relative humidity	T_{op}: Period 1: 21.19 ± 0.66 Period 2: 19.97 ± 0.69 Period 3: 19.2 ± 0.97 PMV: Period 1: 0.17 ± 0.24 Period 2: -0.26 ± 0.19 Period 3: -0.45 ± 0.27 PPD: Period 1: 6.77 ± 4.20 Period 2: 7.16± 2.34 Period 3: 10.80 ± 4.87
Papazoglou et al. 2019 Greece [8]	Winter 2016	University	1 lecture hall 19 students 16-18 years old	Opening window	Rational approach Thermal sensation vote 7 scale ASHRAE, Clothing insulation Height, weight to estimate metabolic rate	Indoor: Microclimatic station - Air temperature - Air velocity - Operative temperature (height 1.2 m, with the probe clamped at 30° from the vertical,	T_{op}: 17.37 °C to 20.29 °C MRT: 17.67 °C to 20.33 °C PMV: -1.77 to -0.73 PPD: 16.16 % to 65.32 % Actual mean vote (AMV) results and Percentage dissatisfied (PD) are -0.32 and 7.07% respectively

References location	Period (year)	Type of schools	Number of schools Number of students	Type of ventilation	Method	Measured parameters	Results
					Measurement in 1.5 hour total with a 5 minutes time interval	simulating a sitting person) -relative humidity	
Buratti et al. 2018 Italy [10]	Spring and Autumn 2015	University	7 331 students 16-18 years old	Opening window	Rational approach Thermal sensation vote 7 scale ASHRAE, Clothing insulation Height, weight to estimate metabolic rate	Indoor: -air temperature (±0.17 °C) - mean radiant temperature measured with a globe thermometer (±0.17 °C) -surface temperature (±0.17 °C) -relative humidity Outdoor: -air temperature (± 0.10 °C) -relative humidity (±2%)	MRT: 24.42 °C PMV Man: 0.11 PPD Man: 12.50 % PMV Woman: 0.20 PPD Woman: 13.20% The study also incorporated a 13 points scale into the questionnaire of PMV and PPD

References location	Period (year)	Type of schools	Number of schools Number of students	Type of ventilation	Method	Measured parameters	Results
Vilcekova et al. 2017 Slovakia [15]	Autumn 2016	Elementary	34 students 9-15 years old	Opening window	Rational approach Thermal sensation vote 7 scale ASHRAE, Estimation on clothing insulation and metabolic information	Indoor (multifunctional device): -air temperature (±0.3°C) - mean radiant temperature (MRT) analyzed during 24h before monitoring survey with a globe thermometer - Amplitude <1°C and safety considerations: MRT=T ± 1°C -air velocity (±0.03 m/s) -relative humidity (±2%) Outdoor: -air temperature -relative humidity	MRT: Class 1: 23.1 °C to 25.1 °C Class 2: 23.6 °C to 25.6 °C Class 3: 22.8 °C to 24.8 °C Class 4: 22.8 °C to 24.8 °C Class 5: 22.1 °C to 24.1 °C PMV: Class 1: 0.09 to 0.33 Class 2: 0.21 to 0.45 Class 3: 0 to 0.24 Class 4: 0.01 to 0.25 Class 5: -0.16 to - 0.04 PPD: Class 1: 5 to 6% Class 2: 6 to 9% Class 3: 5 to 6% Class 4: 5 to 6% Class 5: 5 to 6% N/A
De Giuli et al. 2015 Italy [17]	Spring and Autumn 2010	Elementary	3 62 students 9-11 years old	Opening window	Rational approach Adaptative model 4 points scale question on temperature sensation (remove all neutral choice)	Indoor: -air temperature - plane radiant temperature measured according to the ISO 7726 (1998) -air velocity -relative humidity - Operative temperature (Top) Outdoor: -air temperature -relative humidity	MRT: Day 1: N/A Day 2: 13.7 °C to 14.1 °C Day 3: 21.9 °C to 22.1 °C T_{op}: Day 1: 21.4 °C to 23.1 Day 2: 20 °C to 24.7 °C Day 3: 25 °C to 28.9 °C PMV: Day 1: -0.1 to 0.4 Day 2: -0.5 to 0.6 Day 3: 0.7 to 1.2 PPD: Day 1: 5% to 8% Day 2: 7% to 13%

References location	Period (year)	Type of schools	Number of schools Number of students	Type of ventilation	Method	Measured parameters	Results
							Day 3: 5% to 34% More than 60% children felt too warm in midseason, and they generally didn't feel cold in cold season
Pereira et al. 2014 Portugal. [20]	Winter 2010	Secondary	1 45 teenager students	N/A	Rational approach Thermal sensation vote 7 scale ASHRAE, Simulation on clothing insulation and metabolic information	Indoor: -air temperature (T) - mean radiant temperature (MRT) analyzed during 24h before monitoring survey - Amplitude <1°C MRT=T ± 1°C -relative humidity Outdoor: -air temperature -relative humidity	PMV and PPD were not calculated but simulated based on the thermal sensation vote of occupants
Fabbri et al. 2013 Italy [44]	Autumn	Kindergarten	2 classrooms 78 students 4-5 years old	Opening window	Rational approach Thermal sensation vote 6 scale ASHRAE ("Very cold, -3, had been removed), Estimation on clothing insulation and metabolic information	Indoor (microclimatic station): -air temperature - mean radiant temperature measured with a globe thermometer -air velocity -relative humidity	PMV -4 years old children: - at 9h30: +0.68 - at 11h50: +0.57 - at 15h00: +0.71 PMV- 5 years old children: - at 9h30: +0.59 - at 11h50: +0.35 - at 15h00: +0.67 PPD-4 years old children: - at 9h30: 14.77% - at 11h50: 11.69% - at 15h00: 15.73% PPD- 5 years old children: - at 9h30: 12.32% - at 11h50: 7.52% - at 15h00: 14.34%

References location	Period (year)	Type of schools	Number of schools Number of students	Type of ventilation	Method	Measured parameters	Results
							Beside an interactive way to illustrate the answer to 4-5 years old children, this study also made a comparison between PMV and PPD recorded by a datalogger and PMV and PPD results from children's answer. On average, there was an overestimation of +0.59 and +0.62 in PMV from the data-logger for 4 and 5 years old respectively.
Loreti et al. 2016 Italy [39]	2016	Secondary	105 students 13 year old pupils	Window opening	Thermal Microclimate HD32.1, measured during the morning classes.	- air velocity - relative humidity - MRT - T operative	T_{op}: 20.1 °C to 21.4 PMV mean: -0.5 to 0.06

1.4 Table S4: Measurements of background noise level (dB) in schools in Europe and North America since 2010

References Location	Period (years)	Type of schools	Number of schools	Number of classrooms	Classrooms' total volume (m^3)	Type of ventilation	Occupancy	Measurement protocol	Noise equivalent level (dBA)		
									Min	Max	AM ± SD
Harcarova et al. 2020 Slovakia [3]	Winter 2020	Elementary	1	1	N/A	Window opening	Yes	1st class sound level meter 1 hour continuously	72	85	79 ± 5.4
Harcarova et al. 2020 Slovakia [3]	Winter 2020	Elementary	1	1	N/A	Window opening	Yes	1st class sound level meter 1 hour continuously	59	86	74 ± 12
Smith et al. 2019 USA [45]	3 times in a school year	Elementary Secondary	104	208	N/A	HVAC*	Yes	2nd class sound level meter 2 days continuously 10 seconds time interval	N/A	N/A	66
Smith et al. 2019 USA [45]	3 times in a school year	Elementary Secondary	104	208	N/A	HVAC*	No	2nd class sound level meters 2 days continuously 10 seconds time interval	N/A	N/A	49
Smith et al. 2019 USA [45]	3 times in a school year	Elementary Secondary	41	82	N/A	Centralized ventilation	Yes	2nd class sound level meter 2 days continuously 10 seconds time interval	N/A	N/A	67
Smith et al. 2019 USA [45]	3 times in a school year	Elementary Secondary	41	82	N/A	Centralized ventilation	No	2nd class sound level meter 2 days continuously 10 seconds time interval	N/A	N/A	48

References Location	Period (years)	Type of schools	Number of schools	Number of classrooms	Classrooms' total volume (m^3)	Type of ventilation	Occupancy	Measurement protocol	Noise equivalent level (dBA)		
									Min	Max	AM ± SD
Smith et al. 2019 USA [45]	3 times in a school year	Elementary Secondary	59	118	N/A	Indoor unit ventilators	Yes	2nd class sound level meter 2 days continuously 10 seconds time interval	N/A	N/A	66
Smith et al. 2019 USA [45]	3 times in a school year	Elementary Secondary	59	118	N/A	Indoor unit ventilators	No	2nd class sound level meter 2 days continuously 10 seconds time interval	N/A	N/A	51
Buratti et al. 2018 Italy [10]	Spring-Autumn 2015	University	1	7	202 – 1331.6	Mechanical ventilation	Yes	12-sided speaker and microphones (Standard ISO 3382) 1 minute spot measurement	N/A	N/A	42
Vilcekova et al. 2017 Slovakia [15]	Autumn 2016	Elementary	5	5	112.84	Window opening	Yes	1st class sound level meter 1 week continuously 10 minutes time interval	48	98	75 ± 4.2
Chetoni et al. 2016 Italy [46]	2015	Secondary and High school	8	24	121 - 236	Window opening	No	2 microphones in each classroom, 1 at the center of the room, 1 near the window (at 1m distance) 30 minutes measurements	23	63	N/A

References Location	Period (years)	Type of schools	Number of schools	Number of classrooms	Classrooms' total volume (m^3)	Type of ventilation	Occupancy	Measurement protocol	Noise equivalent level (dBA)		
									Min	Max	AM ± SD
Klatte et al. 2010 Germany [51]	2010	Secondary	8	21	231	N/A	No	N/A	22	39	N/A
Shield et al. 2015 England [52]	2015	Secondary	13	86	161	N/A	No	Norsonics N140 sound analyzer	N/A	N/A	34 ± 5.8

HVAC: Heat, ventilation and air conditioning; AM: arithmetic mean; SD: standard deviation

1.5 Table S5: Measurement of clarity index in schools across Europe and North America from 2010

Parameters	References location	Type of school	Number of classrooms	Number of points	Ventilation	Occupancy	Measurement protocol	Results		
								Min	Max	AM ± SD
Clarity index (C50) (dB)	Buratti et al. 2018 Italy [10]	University	7	12	Mechanical ventilation	Yes	12-sided speaker and microphones (ISO 3382)	N/A	N/A	-0,73
Clarity index (C50) (dB) at 250 Hz	Loreti et al. 2016 Italy [39]	Secondary	1	18	Windows opening	Yes	3 sound sources + 18 microphones around the class (ISO 3382.2)	N/A	N/A	-5,48
Clarity index (C50) (dB) at 500 Hz	Loreti et al. 2016 Italy [39]	Secondary	1	18	Windows opening	Yes	3 sound sources + 18 microphones around the class (ISO 3382.2)	N/A	N/A	-5,87
Clarity index (C50) (dB) at 1000 Hz	Loreti et al. 2016 Italy [39]	Secondary	1	18	Windows opening	Yes	3 sound sources + 18 microphones around the class (ISO 3382.2)	N/A	N/A	5,55
Clarity index (C50) (dB) at 2000 Hz	Loreti et al. 2016 Italy [39]	Secondary	1	18	Windows opening	Yes	3 sound sources + 18 microphones around the class (ISO 3382.2)	N/A	N/A	-6,28
Clarity index (C50) (dB) at 4000 Hz	Loreti et al. 2016 Italy [39]	Secondary	1	18	Windows opening	Yes	3 sound sources + 18 microphones around the class (ISO 3382.2)	N/A	N/A	-5,74
Clarity index (C50) (dB) at 125 Hz	Russo et al. 2019 Italy [47]	Secondary	1	9	Windows opening	No	12-sided speaker and microphones (ISO 3382)	N/A	N/A	-0,48
Clarity index (C50) (dB) at 250 Hz	Russo et al. 2019 Italy [47]	Secondary	1	9	Windows opening	No	12-sided speaker and microphones (ISO 3382)	N/A	N/A	-2,21
Clarity index (C50) (dB) at 500 Hz	Russo et al. 2019 Italy [47]	Secondary	1	9	Windows opening	No	12-sided speaker and microphones (ISO 3382)	N/A	N/A	-1,48

Parameters	References location	Type of school	Number of classrooms	Number of points	Ventilation	Occupancy	Measurement protocol	Results		
								Min	Max	AM ± SD
Clarity index (C50) (dB) at 1000 Hz	Russo et al. 2019 Italy [47]	Secondary	1	9	Windows opening	No	12-sided speaker and microphones (ISO 3382)	N/A	N/A	-1,78
Clarity index (C50) (dB) at 2000 Hz	Russo et al. 2019 Italy [47]	Secondary	1	9	Windows opening	No	12-sided speaker and microphones (ISO 3382)	N/A	N/A	-1
Clarity index (C50) (dB) at 4000 Hz	Russo et al. 2019 Italy [47]	Secondary	1	9	Windows opening	No	12-sided speaker and microphones (ISO 3382)	N/A	N/A	0,28
Clarity index (C50) (dB) at 8000 Hz	Russo et al. 2019 Italy [47]	Secondary	1	9	Windows opening	No	12-sided speaker and microphones (ISO 3382)	N/A	N/A	3,06
SNR	Sarantopoulos et al. 2020, Greece [48]	Elementary	10	31	N/A	Yes				
STI	Mikulski et al. 2011 Poland [49]	Elementary	1	160	N/A	No	The impulse method was applied, using a pseudo-random MLS signal (EN ISO 3382-2:2008)	0.53	0.74	0.61 ± 0.02
STI	Shield et al. 2015 England [52]	Secondary	86	161	N/A	No	Calculated from impulse responses generated by balloon bursts and captured by a Norsonics N140 sound analyzer	N/A	N/A	0.71 ± 0.05
C50	Shield et al. 2015 England [52]	Secondary	86	161	N/A	No	Calculated from impulse responses generated by balloon bursts and captured by a	N/A	N/A	4.77 ± 2.04

Parameters	References location	Type of school	Number of classrooms	Number of points	Ventilation	Occupancy	Measurement protocol	Results		
								Min	Max	AM ± SD
							Norsonics N140 sound analyzer			

1.6 Table S6: Measurements of reverberation time in schools across Europe and North America from 2010

Time Frequency (Hz)	References location	Type of school	Number of schools	Number of classrooms	Classrooms' total volume (m^3)	Type of ventilation	Occupancy	Measurement protocol	Reverberation time (s)
T30 125 Hz	Russo et al. 2019 Italy [47]	Secondary	1	1	180	Window opening	No	Impulsive method (blank gun shots) 9 microphones placed at 1.2 m (students' seated positions) and 1m from the walls (According to the ISO 3382-2 standard) Decay of the sound pressure level as a function of time in a point of an environment after the cessation of the sound source, by reverse integration of the responses to the square impulse.	1.5
T30 250 Hz	Russo et al. 2019 Italy [47]	Secondary	1	1	180	Window opening	No		1.1
T30 500 Hz	Russo et al. 2019 Italy [47]	Secondary	1	1	180	Window opening	No		0.8
T30 1000 Hz	Russo et al. 2019 Italy [47]	Secondary	1	1	180	Window opening	No		0.7
T30 2000 Hz	Russo et al. 2019 Italy [47]	Secondary	1	1	180	Window opening	No		0.7
T30 4000 Hz	Russo et al. 2019 Italy [47]	Secondary	1	1	180	Window opening	No		0.6
T30 8000 Hz	Russo et al. 2019 Italy [47]	Secondary	1	1	180	Window opening	No		0.5
T30 250 Hz	Buratti et al. 2018 Italy [10]	University	1	7	201 to 1546	Mechanical ventilation	Yes	12-sided loudspeaker at teacher's desk Impulsive white noise (source) 4 to 6 microphones (±2 dB, frequency range 3.15–20 000 Hz) placed at 1.1 m (students' seated positions) (According to the ISO 3382-2 standard)	AM: 1.1 Range: 0.95 to 1.46
T60	Chetoni et al. 2016 Italy [46]	Secondary High school	8	24	121 to 236	Window opening	Yes	Impulsive method (Maximum length sequence – MLS)	AM: 1.9 Range: 0.88 to 2.88

Time Frequency (Hz)	References location	Type of school	Number of schools	Number of classrooms	Classrooms' total volume (m^3)	Type of ventilation	Occupancy	Measurement protocol	Reverberation time (s)
								2 microphones in each classroom, 1 at the center of the room, 1 near the window (at 1m distance) (According to the ISO 3382-2 standard)	
T60 250 Hz	Loreti et al. 2015 Italy [39]	Secondary	1	1	172	Window opening	Yes	Impulsive method (Maximum length sequence – MLS) 3 sound sources at 1.2m of height (teacher's desk, center, corner of the listening area) 18 microphones at 1.1m of height placed throughout the classroom. (According to the ISO 3382-2 standard)	1.1
T60 500 Hz	Loreti et al. 2015 Italy [39]	Secondary	1	1	172	Window opening	Yes		1.1
T60 1000 Hz	Loreti et al. 2015 Italy [39]	Secondary	1	1	172	Window opening	Yes		0.9
T60 2000 Hz	Loreti et al. 2015 Italy [39]	Secondary	1	1	172	Window opening	Yes		0.9
T60 4000 H	Loreti et al. 2015 Italy [39]	Secondary	1	1	172	Window opening	Yes		1.0
T20 250 Hz	Loreti et al. 2015 Italy [39]	Secondary	1	1	172	Window opening	Yes		1.2 ± 0.1
T20 500 Hz	Loreti et al. 2015 Italy [39]	Secondary	1	1	172	Window opening	Yes		1.2± 0.1
T20 1000 Hz	Loreti et al. 2015 Italy [39]	Secondary	1	1	172	Window opening	Yes		1.3 ± 0.1
T20 2000 Hz	Loreti et al. 2015 Italy [39]	Secondary	1	1	172	Window opening	Yes		1.5 ± 0.1
Tm,f mean	Mikulski et al. 2011 Poland [49]	Elementary	5	1	160	N/A	No	Impulsive method (Maximum length sequence – MLS) (According to the ISO 3382-2 standard)	1.14
Tw,f mean	Mikulski et al. 2011 Poland [49]	Elementary	5	1	160	N/A	No	Impulsive method (Maximum length sequence – MLS) (According to the ISO 3382-2 standard)	1.13

Time Frequency (Hz)	References location	Type of school	Number of schools	Number of classrooms	Classrooms' total volume (m^3)	Type of ventilation	Occupancy	Measurement protocol	Reverberation time (s)
T30	Kristiansen et al. 2011 Denmark [50]	Secondary	13	38	200 - 320	N/A	No	Impulse decay method (According to the ISO 3382-2 standard)	0.38 – 0.86
T20 250 – 2000 Hz	Klatte et al. 2010 Germany [51]	Secondary	8	21	231	N/A	No	N/A	0.51 – 1.11
T20	Shield et al. 2015 England [52]	Secondary	13	86	161	N/A	No	Impulse responses generated by balloon bursts, measured with a Norsonics N140 sound analyzer	0.65 ± 0.17

1.7 Table S7: Measurements of carbon dioxide (CO_2) in schools in Europe and North America since 2010

Reference Location	Period (years)	Type of schools	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	CO_2 concentration (ppm)		
								Min	Max	AM±SD
Becerra et al. 2020 Spain [53]	March 2020	Kindergarten, elementary, secondary and high school	4	8	Window opening	Yes	NDIR sensor Range: 0 – 5000 ppm, ± 50 ppm, 2 days measurement with a 2 minutes interval	N/A	N/A	1434 ± 197
Becerra et al. 2020 Spain [53]	March 2020	Secondary and high school	5	10	Window opening	Yes	NDIR sensor Range: 0 – 5000 ppm, ± 50 ppm, 2 days measurement with a 2 minutes interval	N/A	N/A	1611 ± 234
Campano-Laborda et al. 2020 Spain [2]	Winter 2020	Secondary	8	564	Window opening	Yes	Hygrometer 30 minutes continuously	N/A	N/A	1951 ± 552
Campano-Laborda et al. 2020 Spain [2]	Midseason 2020	Secondary	8	564	Window opening	Yes	Hygrometer 30 minutes continuously	N/A	N/A	1267 ± 499
Harcarova et al. 2020 Slovakia [3]	Winter 2020	Elementary	1	1	Window opening	Yes	Hygrometer 1 hour continuously	732	1709	1238 ± 294
Harcarova et al. 2020 Slovakia [3]	Winter 2020	Elementary	1	1	Window opening	Yes	Hygrometer 1 hour continuously	705	1615	1415 ± 224
Langer et al. 2020 Sweden [4]	October - March 2017	Elementary	10	10	Window opening Mechanical ventilation	Yes	Hygrometer 1 week continuous 2 minutes time interval	N/A	N/A	N/A
Papadopoulos et al. 2020 Greece [5]	December 2019	University	1	10	Window opening	Yes	Hygrometer 30 minutes continuously	502	2500	1920
Papadopoulos et al. 2020 Greece [5]	December 2019	University	1	10	Window opening	Yes	Hygrometer 30 minutes continuously	523	2253	1316

Reference Location	Period (years)	Type of schools	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	CO_2 concentration (ppm)		
								Min	Max	AM±SD
Stamp et al. 2020 UK [33]	2017	Secondary	1	1	Window opening Mechanical ventilation	Yes	Measurement continuously 5 minutes time interval	N/A	N/A	N/A
Ahmed et al. 2019 Finland [6]	Heating and cooling season 2019	Daycare and elementary	7	1	HVAC*	Yes	Hygrometer 1 month continuously	6 out of 7 building achieved category I concentration (<750 ppm)		
Brdaric et al. 2019 Croatia [7]	February - May 2014	Elementary	20	60	Window opening	Yes	Hygrometer 1 week continuously 1 minute time interval	500	5383	2093
Sivanantham et al. 2021 France [54]	2013 – 2017	Kindergarten Elementary	301	67299***	Window opening Mechanical ventilation	Yes	NDIR sensor Monday to Friday continuously 10 minutes time interval	N/A	2872 ± 44	1418 ± 26
Erlandson et al. 2019 USA [25]	Yearlong 2019	University	1	61	HVAC	Yes	Hygrometer sensor (Q-trak TSI) 8 hours period with 1 minute interval	271	986	493 ± 1.3
Simanic, et al. 2019 Sweden [9]	Heating and cooling season 2018	Elementary	7	145	HVAC*	Yes	Hygrometer 1 week continuously, from 7h30 to 16h00	60 of 61 classrooms fulfilled the Sweden guideline limit of 1000 ppm		
Barmparesos et al. 2018 Greece [29]	June 2016 to July 2017	Elementary	1	2	Window opening (Under green roof system)	Yes	Portable sensor (Tongdy) range 0 – 2000 ppm ± 40 ppm 24 hours continuously 15 minutes interval	396	1996	591 ± 226

Reference Location	Period (years)	Type of schools	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	CO_2 concentration (ppm)		
								Min	Max	AM±SD
Barmparesos et al. 2018 Greece [29]	June 2016 to July 2017	Elementary	1	4	Window opening (Under cement roof)	Yes	Portable sensor (Tongdy) range 0 – 2000 ppm ± 40 ppm 24 hours continuously 15 minutes interval	360	1999	640 ± 228
Vornanen-Winqvist et al. 2018 Finland [11]	April to September 2016	Secondary	1	2	HVAC*	Yes	Hygrometer 1 week continuously	399	597	424
Vornanen-Winqvist et al. 2020 Finland [12]	May 2016 to March 2017	School	6	6	HVAC*	Yes	Hygrometer 1 week continuously	402	829	458
Zecevic et al. 2018 Bosnia and Herzegovina [13]	November to December 2016	University	1	1	Window opening	Yes	Hygrometer 3 period of 1 week continuously 10 seconds time interval	N/A	2310	1235
Zecevic et al. 2018 Bosnia and Herzegovina [13]	May 2017	University	1	1	Window opening	Yes	Hygrometer 3 period of 1 week continuously 10 seconds time interval	N/A	1592	965
Oliveira et al. 2017 Portugal [55]	April to June 2013	Kindergarten	2	2	Window opening	Yes	Hygrometer (Testo mini data-logger 174H) 7 weeks continuously	381	2003	N/A
Senitkova et al. 2017 Czech Republic [28]	2017	Nursery	3	1	Window opening	Yes	NDIR sensor Range 0 – 10000 ppm, ± 100 ppm 1 day continuously	N/A	N/A	380
Senitkova et al. 2017 Czech Republic [28]	2017	Nursery	3	1	Window opening	Yes	NDIR sensor Range 0 – 10000 ppm, ± 100 ppm	N/A	N/A	1270

Reference Location	Period (years)	Type of schools	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	CO_2 concentration (ppm)		
								Min	Max	AM±SD
							1 day continuously			
Senitkova et al. 2017 Czech Republic [28]	2017	Nursery	3	1	Window opening	Yes	NDIR sensor Range 0 – 10000 ppm, ± 100 ppm 1 day continuously	N/A	N/A	2850
Senitkova et al. 2017 Czech Republic [28]	2017	Nursery	3	1	Window opening	Yes	NDIR sensor Range 0 – 10000 ppm, ± 100 ppm 1 day continuously	N/A	N/A	380
Senitkova et al. 2017 Czech Republic [28]	2017	Nursery	3	1	Window opening	Yes	NDIR sensor Range 0 – 10000 ppm, ± 100 ppm 1 day continuously	N/A	N/A	1520
Senitkova et al. 2017 Czech Republic [28]	2017	Nursery	3	1	Window opening	Yes	NDIR sensor Range 0 – 10000 ppm, ± 100 ppm 1 day continuously	N/A	N/A	3420
Vilcekova et al. 2017 Slovakia [15]	Autumn 2016	Elementary	1	1	Window opening	Yes	Testo 435-4 NDIR sensor 1 week continuously 3 minutes time interval	957	1597	1261 ± 134
Vilcekova et al. 2017 Slovakia [15]	Autumn 2016	Elementary	1	1	Window opening	Yes	Testo 435-4 NDIR sensor 1 week continuously 3 minutes time interval	797	1418	1212 ± 154
Vilcekova et al. 2017 Slovakia [15]	Autumn 2016	Elementary	1	1	Window opening	Yes	Testo 435-4 NDIR sensor 1 week continuously 3 minutes time interval	711	1502	1122 ± 186

Reference Location	Period (years)	Type of schools	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	CO_2 concentration (ppm)		
								Min	Max	AM±SD
Vilcekova et al. 2017 Slovakia [15]	Autumn 2016	Elementary	1	1	Window opening	Yes	Testo 435-4 NDIR sensor 1 week continuously 3 minutes time interval	652	1778	1242 ± 288
Vilcekova et al. 2017 Slovakia [15]	Autumn 2016	Elementary	1	1	Window opening	Yes	Testo 435-4 NDIR sensor 1 week continuously 3 minutes time interval	577	1787	984 ± 281
Zhong et al. 2017 USA [32]	October 2015 to March 2016	Elementary and K8 schools	37	144	HVAC	Both	1 to 2 days continuously	N/A	N/A	N/A
Canha et al. 2016 France [26]	January to April 2010	Nursery and Elementary	10	44	Window opening and Mechanical ventilation	Yes	NDIR sensor range:0 – 5000 ppm, accuracy ± 3% Monday to Friday continuously 10 minutes interval	N/A	N/A	1200 ± 400
Canha et al. 2016 France [26]	April to June 2010	Nursery and Elementary	7	44	Window opening and Mechanical ventilation	Yes	NDIR sensor range:0 – 5000 ppm, accuracy ± 3% Monday to Friday continuously 10 minutes interval	N/A	N/A	1400 ± 400
Loreti et al. 2016 Italy [39]	2016	Secondary	1	5	Window opening	Yes	Thermal Microclimate HD32.1 1 day continuously	N/A	N/A	1732 ± 222

Reference Location	Period (years)	Type of schools	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	CO_2 concentration (ppm)		
								Min	Max	AM±SD
Nunes et al. 2016 Portugal [56]	April to June 2014	Nursery and kindergarten (Rural)	3	5	Window opening	Yes	Haz- Scanner NDIR sensor 2 to 4 days continuously	691	3490	1301 ± 374
Nunes et al. 2016 Portugal [56]	April to June 2014	Nursery and kindergarten (Urban)	1	3	Window opening	Yes	Haz- Scanner NDIR sensor 2 to 4 days continuously	715	4571	2629 ± 822
Nunes et al. 2016 Portugal [56]	April to June 2014	Nursery and kindergarten (Rural)	3	5	Window opening	No	Haz- Scanner NDIR sensor 2 to 4 days continuously	622	1718	735 ± 31
Nunes et al. 2016 Portugal [56]	April to June 2014	Nursery and kindergarten (Urban)	1	3	Window opening	No	Haz- Scanner NDIR sensor 2 to 4 days continuously	708	3127	992 ± 89
Verriele et al. 2016 France [30]	2009 to 2013	Elementary High school University	10	10	HVAC with CO_2 and occupancy sensors	Yes	Hygrometer Monday to Friday At 2m height	N/A	2762	N/A
Branco et al. 2015 Portugal [16]	February to June 2014	Daycare	4	10	Window opening	Yes	NDIR sensor 24h continuously Occupancy period	271	3110	604 ± 351
De Giuli et al. 2015 Italy [17]	February 2011	Elementary	3	8	Windows opening	Yes	Hygrometer Spot measurement	510**	2095**	1494 ± 437**
De Giuli et al. 2015 Italy [17]	April 2011	Elementary	3	8	Windows opening	Yes	Hygrometer Spot measurement	318**	1897**	1167 ± 461**
De Giuli et al. 2015 Italy [17]	June 2011	Elementary	3	8	Windows opening	Yes	Hygrometer Spot measurement	80**	591**	246 ± 156**
Haverinen et al. 2015 Finland [23]	January to April 2009	Elementary	70	70	12 Air handling unit 15 Fan coil 44 Unit ventilators	Yes	Hygrometer 3 days continuously 5 minutes time interval	N/A	N/A	N/A

Reference Location	Period (years)	Type of schools	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	CO_2 concentration (ppm)		
								Min	Max	AM±SD
Haverinen et al. 2015 Finland [23]	October 2009 to December 2009	Elementary	27	27	3 Air handling unit 9 Fan coil 14 Unit ventilators	Yes	Hygrometer 3 days continuously 5 minutes time interval	N/A	N/A	N/A
Haverinen et al. 2015 Finland [23]	January 2010 to May 2010	Elementary	27	27	3 Air handling unit 9 Fan coil 14 Unit ventilators	Yes	Hygrometer 3 days continuously 5 minutes time interval	N/A	N/A	N/A
Madureira et al. 2015 Portugal [34]	November to March 2011 to 2013	Elementary	20	73	Opening window	Yes	NDIR sensor Monday to Friday 5 minutes time interval	829	3111	1469
Mainka et al. 2015 Poland [57]	December 2013 to March 2014	Nursery school	4	8	Window opening	Yes	NDIR sensor (Az instruments 77535, range 0 – 10000 ppm, accuracy ± 100 ppm) 5 days continuously, 1 minute interval	Results presented according to PN-EN 13779 classification (in relation to outdoor CO_2 concentration) IDA 1: ≤ 400 ppm IDA 2: 400 – 600 ppm IDA 3: 600 – 1000 ppm IDA 4: ≥ 1000 ppm		
Pereira et al. 2015 Portugal [18]	February and May 2010	Secondary	1	1	Window opening	Yes	Hygrometer 24h continuously	374	4640	1927
Ramalho et al. 2015 France [58]	September 2009 to July 2011	Nursery and Kindergarten	310	896	Window opening and mechanical ventilation	Yes	NDIR sensor 7 days continuously 10 minutes interval	296	1953	736 ± 236
Toftum et al. 2015 Denmark [24]	October to December 2009	Elementary	88	88	44 Window opening 10 Mechanical exhaust	Yes	IR sensor (Vaisala GMW22 (CO_2 range: 0-5000 ppm ± 100 ppm ± 2% of reading)	N/A	N/A	Median of maximum 20 min running average: Windows opening: 2875 Mechanical exhaust: 2372 Mechanical balanced: 1344

Reference Location	Period (years)	Type of schools	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	CO_2 concentration (ppm)		
								Min	Max	AM±SD
					31 Mechanical balanced		Continuously varied from 4 – 35 days			
Csobod et al. 2014 Europe [35]	Non heating season 2014	Kindergarten	25	25	Window opening and mechanical ventilation	Yes	Hygrometer 5 days continuously (Monday to Friday)	394	3530	1309 ± 892
Csobod et al. 2014 Europe [35]	Non heating season 2014	Elementary	300	300	Window opening and mechanical ventilation	Yes	Hygrometer 5 days continuously (Monday to Friday)	296	4960	1433 ± 856
De Giuli et al. 2014 Italy [19]	March to June 2012	Elementary	1	12	Window opening	Yes	Hygrometer 3 months continuously 5 minutes time interval	Concentration reached up to 4000 ppm above outdoor concentration. After May 29, concentration below 800 ppm above outdoor concentration		
Jovanovic et al. 2014 Serbia [27]	April 2012	Elementary	1	5	Window opening	Yes	NDIR sensor (Testo 435-4, range 0-5000 ppm, ±50ppm) 8 days measurement	562	592	575
Pereira et al. 2014 Portugal [20]	April to May 2013	Secondary	1	2	Window opening	No	Hygrometer 2 weeks continuously	< 10% compliance in 2 of 10 period of measurements		
Rovelli et al. 2014 Italy [59]	November 2011 to March 2012	Elementary and secondary school	4	12	Window opening	Yes	NDIR sensor, Monday to Friday continuously	567	1191	891 ± 174
Rovelli et al. 2014 Italy [59]	November 2012 to February 2013	Elementary and secondary school	5	15	Window opening	Yes	NDIR sensor, Monday to Friday continuously	698	1370	870 ± 181
Alves et al. 2013 Portugal	January 2012	Elementary	1	3	Window opening	Yes	NDIR sensor	N/A	N/A	2084 ± 577

Reference Location	Period (years)	Type of schools	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	CO_2 concentration (ppm)		
								Min	Max	AM±SD
[21]							Monday to Friday continuously			
Alves et al. 2013 Portugal [21]	January 2012	Elementary	1	1	Window opening	Yes	NDIR sensor Monday to Friday continuously	N/A	N/A	2144 ± 525
Alves et al. 2013 Portugal [21]	January 2012	Elementary	1	2	Window opening	Yes	NDIR sensor Monday to Friday continuously	N/A	N/A	3494 ± 835
Alves et al. 2013 Portugal [21]	January 2012	Daycare	1	3	Window opening	Yes	NDIR sensor Monday to Friday continuously	N/A	N/A	1766 ± 503
De Giuli et al. 2012 Italy [22]	February to June 2010	Elementary	7	28	Window opening	Yes	Hygrometer Spot measurement	45**	3635**	1149 ± 798**

HVAC: Heat, ventilation and air conditioning; NDIR: Nondispersive infrared detection; AM: arithmetic mean; SD: standard deviation; **: concentration above outdoor concentration; ***: adjusted to the French stock of schools

1.8 Table S8: Calculation of air change rate/ ventilation in schools across Europe and North America from 2010

References location	Period (years)	Type of schools	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	Air change rate/ ventilation rate		
								Min	Max	AM±SD
Sivanantham et al. 2021 France [54]	2013 – 2017	Kindergarten Elementary	301	67299***	Windows opening Mechanical ventilation	Yes	NDIR sensor Monday to Friday continuously 10 minutes time interval	N/A	N/A	0.8 h^{-1}
Barmparesos et al. 2018 Greece [29]	June 2016 to July 2017	Elementary	1	2	Window opening (Under green roof system)	Yes	Air exchange rate estimated with CO_2 concentration (Turanjanin et al. 2014)	N/A	N/A	0.11 to 0.29 h^{-1}
Barmparesos et al. 2018 Greece [29]	June 2016 to July 2017	Elementary	1	4	Window opening (Under cement roof)	Yes	Air exchange rate estimated with CO_2 concentration (Turanjanin et al. 2014)	N/A	N/A	0.04 to 0.14 h^{-1}
Zhong et al. 2017 USA [32]	October 2015 to March 2016	Elementary and K8 schools	37	144	HVAC	Both	Calculated using measured CO_2 concentrations, room dimensions, occupancy data, and a time-dependent numerical mass balance model that simulated 15 min CO_2 concentrations over the study period	N/A	N/A	1.4 ± 1.1 h^{-1}
Canha et al. 2016 France [26]	January to April 2010	Nursery and Elementary	17	44	Window opening and Mechanical ventilation	Yes	Air exchange rate estimated with CO_2 concentration	0.3 h^{-1}	3.1 h^{-1}	1.4 ± 0.6 h^{-1}

References location	Period (years)	Type of schools	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	Air change rate/ ventilation rate		
								Min	Max	AM±SD
Canha et al. 2016 France [26]	April to June 2010	Nursery and Elementary	17	44	Window opening and Mechanical ventilation	No	Air exchange rate estimated with CO_2 concentration	0.03 h^{-1}	0.54 h^{-1}	0.16 ± 0.13 h^{-1}
Canha et al. 2016 France [26]	April to June 2010	Nursery and Elementary	7	44	Window opening and Mechanical ventilation	Yes	Ventilation rate deduced from AER	0.6 l/p/s	8.2 l/p/s	2.9 ± 1.6 l/p/s
Ramalho et al. 2015 France [58]	September 2009 to July 2011	Nursery	80	896	Window opening and mechanical ventilation	Yes	Calculated based on CO_2 measurements, represented nighttime air exchange	0.04 h^{-1}	1.00 h^{-1}	0.26 ± 0.20 h^{-1}
Ramalho et al. 2015 France [58]	September 2009 to July 2011	Kindergarten	57	57	Window opening and mechanical ventilation	Yes	Calculated based on CO_2 measurements, represented nighttime air exchange	0.03 h^{-1}	0.40 h^{-1}	0.12 ± 0.07 h^{-1}
Ramalho et al. 2015 France [58]	September 2009 to July 2011	Elementary	334	334	Window opening and mechanical ventilation	Yes	Calculated based on CO_2 measurements, represented nighttime air exchange	0.03 h^{-1}	1.28 h^{-1}	0.15 ± 0.13 h^{-1}
Haverinen et al. Finland [23]	January to April 2009	Elementary	70	70	12 Air handling unit 15 Fan coil 44 Unit ventilators	Yes	Estimation with CO_2 concentration	N/A	N/A	3.6 ± 2.3 l/p/s
Haverinen et al. Finland [23]	October 2009 to December 2009	Elementary	27	27	3 Air handling unit 9 Fan coil 14 Unit ventilators	Yes	Estimation with CO_2 concentration	N/A	N/A	4.1 ± 3.0 l/p/s

References location	Period (years)	Type of schools	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	Air change rate/ ventilation rate		
								Min	Max	AM±SD
Haverinen et al. Finland [23]	January 2010 to May 2010	Elementary	27	27	3 Air handling unit 9 Fan coil 14 Unit ventilators	Yes	Estimation with CO_2 concentration	N/A	N/A	4.1 ± 2.6 l/p/s
Csobod et al. 2014 Northern Europe [35]	Non heating season 2014	Nurseries and elementary	13	39	Window opening	Yes	Calculated based on CO_2 measurements	0.35 l/p/s	11.2 l/p/s	3.39 l/p/s
Csobod et al. 2014 Northern Europe [35]	Non heating season 2014	Nurseries and elementary	26	78	Window opening	Yes	Calculated based on CO_2 measurements	0.17 l/p/s	2.87 l/p/s	0.87 l/p/s
Csobod et al. 2014 Northern Europe [35]	Non heating season 2014	Nurseries and elementary	44	132	Window opening	Yes	Calculated based on CO_2 measurements	0.14 l/p/s	13.33 l/p/s	1.82 l/p/s
Csobod et al. 2014 Northern Europe [35]	Non heating season 2014	Nurseries and elementary	31	93	Window opening	Yes	Calculated based on CO_2 measurements	0.12 l/p/s	13.30 l/p/s	1.8 l/p/s
Rovelli et al. 2014 Italy [59]	November 2011 to March 2012	Elementary and secondary school	4	12	Window opening	Yes	Calculated based on CO_2 measurements	0.10 h^{-1}	0.6 h^{-1}	0.35 ± 0.14 h^{-1}
Rovelli et al. 2014 Italy [59]	November 2012 to February 2013	Elementary and secondary school	5	15	Window opening	Yes	Calculated based on CO_2 measurements	0.24 h^{-1}	0.61 h^{-1}	0.39 ± 0.11 h^{-1}
Rovelli et al. 2014 Italy [59]	November 2011 to March 2012	Elementary and secondary school	4	12	Window opening	Yes	Calculated based on air exchange rate	0.7 l/p/s	7.7 l/p/s	3.0 ± 1.6 l/p/s
Rovelli et al. 2014 Italy [59]	November 2012 to February 2013	Elementary and secondary school	5	15	Window opening	Yes	Calculated based on air exchange rate	1.8 l/p/s	5.6 l/p/s	3.2 ± 1.0 l/p/s
Alves et al. 2013 Portugal [21]	January 2012	Elementary and daycare	4	9	Window opening	Yes	Estimation with CO_2 concentration (Griffiths and Eftekhari, 2008)	N/A	N/A	< 0.2 h^{-1}

1.9 Table S9: Measurements of formaldehyde in schools in Europe and North America since 2010

References Location	Period (years)	Type of school	Number of schools	Number of total samples	Ventilation type	Occupancy	Measurement protocol	Concentration (µg/m^3)		
								Min	Max	AM ± SD
Langer et al. 2020 Sweden [4]	Autumn – Winter 2020	Elementary	30	30	HVAC	Yes	Diffusive sampler 5 days	2	10	N/A
Langer et al. 2020 Sweden [4]	Autumn – Winter 2020	Elementary	30	30	Window opening	Yes	Diffusive sampler 5 days	8	12	N/A
Branco et al. 2015 Portugal [60]	February – November 2013	Nurseries	4	10	Window opening	Yes	Electrochemical detection from 2 to 9 measurements	0	146	2 ± 12
Erlandson et al. 2019 USA [25]	Year long 2019	University	1	39	HVAC	Yes	Passive sampler (UMEx 100) 48h	0.7	34	7.0 ± 2.3
Stamp et al. 2020 UK [33]	Year long 2020	Secondary	1	18	HVAC	Yes	Diffusive sampler 5 days	0.6	13	3.5
Becerra et al. 2020 Spain [53]	Spring 2020	Elementary Secondary	18	18	Window opening	Yes	Diffusive sampler 5 days	5.6	21	N/A
Villanueva et al. 2018 Spain [61]	Spring 2013	Kindergarten (Rural)	18	18	Window opening	Yes	Diffusive sampler 2 weeks continuously	25	53	36 ± 9.9
Villanueva et al. 2018 Spain [61]	Spring 2013	Kindergarten (Urban)	18	18	Window opening	Yes	Diffusive sampler 2 weeks continuously	13	18	15± 1.7
Villanueva et al. 2018 Spain [61]	Spring 2013	Kindergarten (Industrial)	18	18	Window opening	Yes	Diffusive sampler 2 weeks continuously	19	30	25 ± 4.0
Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Rural)	18	18	Window opening	Yes	Diffusive sampler 2 weeks continuously	18	42	30 ± 9.1
Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Urban)	18	18	Window opening	Yes	Diffusive sampler 2 weeks continuously	11	66	31 ± 23

References Location	Period (years)	Type of school	Number of schools	Number of total samples	Ventilation type	Occupancy	Measurement protocol	Concentration (µg/m^3)		
								Min	Max	AM ± SD
Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Industrial)	18	18	Window opening	Yes	Diffusive sampler 2 weeks continuously	13	48	25 ± 12
Canha et al. 2016 France [26]	January – June 2010	Nurseries, elementary	17	37	Window opening	Yes	Diffusive sampler 5 days continuously (Monday to Friday)	N/A	N/A	28 ± 16
Canha et al. 2016 France [26]	January – June 2010	Nurseries, elementary	17	14	HVAC*	Yes	Diffusive sampler 5 days continuously (Monday to Friday)	N/A	N/A	18 ± 7
Jovanovic et al. Serbia [27]	Spring 2012	Elementary	1	5	Window opening	Yes	Diffusive sampler of 8 days	43	88	64
Madureira et al. 2016 Portugal [34]	Heating season 2011-2013	Elementary	20	80	Window opening	Yes	Active sampling, air pump at 100L/min for a duration of 2.5 hours	8.2	126	20
Csobod et al. 2014 Northern Europe [35]	Non heating season 2014	Nurseries and elementary	13	39	Window opening	Yes	Diffusive sampler 5 days continuously (Monday to Friday)	0.3	2.2	1.4
Csobod et al. 2014 Western Europe [35]	Non heating season 2014	Nurseries and elementary	26	78	Window opening	Yes	Diffusive sampler 5 days continuously (Monday to Friday)	0.3	15	2.3
Csobod et al. 2014 Central-Eastern Europe [35]	Non heating season 2014	Nurseries and elementary	44	132	Window opening	Yes	Diffusive sampler 5 days continuously (Monday to Friday)	0.6	40	5.0
Csobod et al. 2014 Southern Europe [35]	Non heating season 2014	Nurseries and elementary	31	93	Window opening	Yes	Diffusive sampler 5 days continuously (Monday to Friday)	0	4.9	2.6
Istrate et al. 2016 Romania [31]	Summer 2016	High school	1	1	HVAC	Yes	Diffusive sampler 595 hours	N/A	N/A	87
Istrate et al. 2016 Romania	Summer 2016	High school	1	1	HVAC	Yes	Diffusive sampler 595 hours	N/A	N/A	5.3

References Location	Period (years)	Type of school	Number of schools	Number of total samples	Ventilation type	Occupancy	Measurement protocol	Concentration (µg/m³)		
								Min	Max	AM ± SD
[31]										
Zhong et al. 2017 USA [32]	Heating season 2016	Elementary	37	144	HVAC	Yes	Electrochemical analyzer with detection limit of 6 µg/m³, minimum of 30 minutes	6	32	8.6
Sivanantham et al. 2021 France [54]	2013 – 2017	Kindergarten Elementary	301	67299*	Windows opening Mechanical ventilation	Yes	Diffusive sampler 5 days continuously (Monday to Friday)	N/A	N/A	21 ± 0.7
Verriele et al. 2016 France [30]	2009 to 2013	Elementary High school University	10	10	HVAC with CO_2 and occupancy sensors	Yes	Diffusive sampler 5 days continuously (Monday to Friday)	N/A	N/A	16 ± 1.5
Ramalho et al. 2015 France [58]	September 2009 to July 2011	Nursery and Kindergarten	310	1353	Window opening and mechanical ventilation	Yes	Diffusive sampler 5 days continuously (Monday to Friday)	1.6	181	18 ± 13

HVAC: Heating, ventilation and air conditioning; AM: arithmetic mean; SD: standard deviation; *: adjusted to the stock of French schools

1.10 Table S10: Measurements of aldehydes in schools across Europe and North America from 2010

Substances	References location	Period	Type of school	N° of classroom	N° of point	Ventilation type	Occupancy	Measurement protocol	Results (µg/m³)		
									Min	Max	AM ± SD
Acetaldehyde	Becerra et al. 2020 Spain [53]	Spring 2020	Elementary Secondary	18	18	Window opening	Yes	Diffusive passive sampler, collect duration of 5 days	-	-	Ranges: 3.3 - 5.6
Acetaldehyde	Villanueva et al. 2018 Spain [61]	Spring 2013	Kindergarten (Rural)	18	18	Window opening	Yes	Diffusive passive sampler, 2 weeks on continuous	4.7	10.1	6.8 ± 2
Acetaldehyde	Villanueva et al. 2018 Spain [61]	Spring 2013	Kindergarten (Urban)	18	18	Window opening	Yes	Diffusive passive sampler, 2 weeks on continuous	3.2	5.7	4.5 ± 1
Acetaldehyde	Villanueva et al. 2018 Spain [61]	Spring 2013	Kindergarten (Industrial)	18	18	Window opening	Yes	Diffusive passive sampler, 2 weeks on continuous	3.8	7.4	6.0 ± 1.3
Acetaldehyde	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Rural)	18	18	Window opening	Yes	Diffusive passive sampler, 2 weeks on continuous	2.7	11	6.7 ± 2.7
Acetaldehyde	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Urban)	18	18	Window opening	Yes	Diffusive passive sampler, 2 weeks on continuous	3.2	8.3	5.4 ± 2.3
Acetaldehyde	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Industrial)	18	18	Window opening	Yes	Diffusive passive sampler, 2 weeks on continuous	4.2	13.3	6.7 ± 3.4
Acetaldehyde	Canha et al. 2016 France [26]	January – June 2010	Nurseries, elementary	17	37	Window opening	Yes	Diffusive passive sampler, 5 days	-	-	6.9 ± 2.1
Acetaldehyde	Canha et al. 2016 France [26]	January – June 2010	Nurseries, elementary	17	14	HVAC*	Yes	Diffusive passive sampler, 5 days	-	-	4.8 ± 1.6
Acetaldehyde	Madureira et al. 2016 Portugal [34]	Heating season 2011-2013	Elementary	20	80	Window opening	Yes	Active sampler, air pump at 100L/min for 2.5 hours	1.92	64.6	9.3
Acetaldehyde	Istrate et al. 2016 Romania [31]	Summer 2016	High school	1	1	HVAC	Yes	Diffusive passive sampler, 595 hours on continuous	-	-	45.16

Substances	References location	Period	Type of school	N° of classroom	N° of point	Ventilation type	Occupancy	Measurement protocol	Results (µg/m³)		
									Min	Max	AM ± SD
Acetaldehyde	Istrate et al. 2016 Romania [31]	Summer 2016	High school	1	1	HVAC	Yes	Diffusive passive sampler, 595 hours on continuous	-	-	1.65
Acrolein	Becerra et al. 2020 Spain [53]	Spring 2020	Elementary Secondary	18	18	Window opening	Yes	Diffusive passive sampler, collect duration of 5 days	< 0.1	-	-
Acrolein	Villanueva et al. 2018 Spain [61]	Spring 2013	Kindergarten (Rural)	18	18	Window opening	Yes	Diffusive passive sampler, 2 weeks son continuous	2.5	43.7	14.5 ± 16.9
Acrolein	Villanueva et al. 2018 Spain [61]	Spring 2013	Kindergarten (Urban)	18	18	Window opening	Yes	Diffusive passive sampler, 2 weeks on continuous	6.7	9.2	7.8 ± 0.9
Acrolein	Villanueva et al. 2018 Spain [61]	Spring 2013	Kindergarten (Industrial)	18	18	Window opening	Yes	Diffusive passive sampler, 2 weeks on continuous	4.9	11.3	7.9 ± 2.2
Acrolein	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Rural)	18	18	Window opening	Yes	Diffusive passive sampler, 2 weeks on continuous	-	36	10.3 ± 14.6
Acrolein	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Urban)	18	18	Window opening	Yes	Diffusive passive sampler, 2 weeks on continuous	5.9	16.5	10.8 ± 4.2
Acrolein	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Industrial)	18	18	Window opening	Yes	Diffusive passive sampler, 2 weeks on continuous	4.8	10.3	7.9 ± 2.1
Benzaldehyde	Villanueva et al. 2018 Spain [61]	Spring 2020	Elementary Secondary	18	18	Window opening	Yes	Diffusive passive sampler, 5 days	< 0.1	0.7	N/A
Benzaldehyde	Villanueva et al. 2018 Spain [61]	Spring 2013	Kindergarten (Rural)	18	18	Window opening	Yes	Diffusive passive sampler, 2 weeks on continuous	-	4.3	1.6 ± 1.6
Benzaldehyde	Villanueva et al. 2018 Spain [61]	Spring 2013	Kindergarten (Urban)	18	18	Window opening	Yes	Diffusive passive sampler, 2 weeks on continuous	0,1	1,2	0.5 ± 0.4

Substances	References location	Period	Type of school	N° of classroom	N° of point	Ventilation type	Occupancy	Measurement protocol	Results (µg/m³)		
									Min	Max	AM ± SD
Benzaldehyde	Villanueva et al. 2018 Spain [61]	Spring 2013	Kindergarten (Industrial)	18	18	Window opening	Yes	Diffusive passive sampler, 2 weeks on continuous	0,3	2,4	1.1 ± 1.0
Benzaldehyde	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Rural)	18	18	Window opening	Yes	Diffusive passive sampler, 2 weeks son continuous	-	1,4	0.85 ± 0.5
Benzaldehyde	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Urban)	18	18	Window opening	Yes	Diffusive passive sampler, 2 weeks on continuous	0,2	0,8	0.5 ± 0.3
Benzaldehyde	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Industrial)	18	18	Window opening	Yes	Diffusive passive sampler, 2 weeks on continuous	0,2	1,4	0.6 ± 0.4
Butanal	Becerra et al. 2020 Spain [53]	Spring 2020	Elementary Secondary	18	18	Window opening	Yes	Diffusive passive sampler, collect duration of 5 days	< 0.6	-	-
Butyaldehyde	Canha et al. 2016 France [26]	January – June 2010	Nurseries, elementary	17	37	Window opening	Yes	Diffusive passive sampler, collect duration of 5 days	-	-	13 ± 8
Butyaldehyde	Canha et al. 2016 France [26]	January – June 2010	Nurseries, elementary	17	14	HVAC*	Yes	Diffusive passive sampler, collect duration of 5 days	-	-	7.6 ± 4.5
Crotonaldehyde	Villanueva et al. 2018 Spain [61]	Spring 2013	Kindergarten (Rural)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	-	-	-
Crotonaldehyde	Villanueva et al. 2018 Spain [61]	Spring 2013	Kindergarten (Urban)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	-	-	-
Crotonaldehyde	Villanueva et al. 2018 Spain [61]	Spring 2013	Kindergarten (Industrial)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	-	-	-
Crotonaldehyde	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Rural)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	-	0,8	-

Substances	References location	Period	Type of school	N° of classroom	N° of point	Ventilation type	Occupancy	Measurement protocol	Results (µg/m³)		
									Min	Max	AM ± SD
Crotonaldehyde	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Urban)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	-	0,3	-
Crotonaldehyde	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Industrial)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	-	0,3	0.2 ± 0.04
Hexaldehyde	Canha et al. 2016 France [26]	January – June 2010	Nurseries, elementary	17	37	Window opening	Yes	Diffusive passive sampler, collect duration of 5 days	-	-	15 ± 11
Hexaldehyde	Canha et al. 2016 France [26]	January – June 2010	Nurseries, elementary	17	14	HVAC*	Yes	Diffusive passive sampler, collect duration of 5 days	-	-	12 ± 3
Hexanal	Becerra et al. 2020 Spain [53]	Spring 2020	Elementary Secondary	18	18	Window opening	Yes	Diffusive passive sampler, collect duration of 5 days	-	-	Ranges: 6.3 - 15.7
Hexanal	Villanueva et al. 2018 Spain [61]	Spring 2013	Kindergarten (Rural)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	9,9	34,6	19.9 ± 8.4
Hexanal	Villanueva et al. 2018 Spain [61]	Spring 2013	Kindergarten (Urban)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	7,6	20,8	14.9 ± 5.3
Hexanal	Villanueva et al. 2018 Spain [61]	Spring 2013	Kindergarten (Industrial)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	8,8	19,1	14.8 ± 3.8
Hexanal	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Rural)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	9	26,9	15.8 ± 6.3
Hexanal	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Urban)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	3,9	26,7	13.5 ± 8.4
Hexanal	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Industrial)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	5,8	18,5	10.8 ± 4.7

Substances	References location	Period	Type of school	N° of classroom	N° of point	Ventilation type	Occupancy	Measurement protocol	Results (µg/m³)		
									Min	Max	AM ± SD
Isopentanal	Becerra et al. 2020 Spain [53]	Spring 2020	Elementary Secondary	18	18	Window opening	Yes	Diffusive passive sampler, collect duration of 5 days	-	-	Ranges: 0.5 - 1.0
Pentanal	Becerra et al. 2020 Spain [53]	Spring 2020	Elementary Secondary	18	18	Window opening	Yes	Diffusive passive sampler, collect duration of 5 days	-	-	Ranges: 1.5 - 3.0
Pentanal	Villanueva et al. 2018 Spain [61]	Spring 2013	Kindergarten (Rural)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	1,6	4,3	3.0 ± 1.1
Pentanal	Villanueva et al. 2018 Spain [61]	Spring 2013	Kindergarten (Urban)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	0,2	1,5	0.6 ± 0.5
Pentanal	Villanueva et al. 2018 Spain [61]	Spring 2013	Kindergarten (Industrial)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	0,1	3,2	1.2 ± 1.1
Pentanal	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Rural)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	1	3,7	2.4 ± 1.2
Pentanal	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Urban)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	1,2	1,7	1.4 ± 0.3
Pentanal	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Industrial)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	-	2,1	1.0 ± 0.8
Propanal	Villanueva et al. 2018 Spain [61]	Spring 2020	Elementary Secondary	18	18	Window opening	Yes	Diffusive passive sampler, collect duration of 5 days	-	-	Ranges: 1.5 - 2.7
Propanal	Villanueva et al. 2018 Spain [61]	Spring 2013	Kindergarten (Rural)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	2	3	2.3 ± 0.4
Propanal	Villanueva et al. 2018 Spain [61]	Spring 2013	Kindergarten (Urban)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	0,6	1,4	1.1 ± 0.3

Substances	References location	Period	Type of school	N° of classroom	N° of point	Ventilation type	Occupancy	Measurement protocol	Results (µg/m³)		
									Min	Max	AM ± SD
Propanal	Villanueva et al. 2018 Spain [61]	Spring 2013	Kindergarten (Industrial)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	0,9	2,4	1.6 ± 0.6
Propanal	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Rural)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	0,2	3,2	2.3 ± 0.9
Propanal	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Urban)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	0,6	1,8	1.2 ± 0.6
Propanal	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Industrial)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	1	1,8	1.4 ± 0.3
p-Tolualdehyde	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Industrial)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	0,1	0,6	0.3 ± 0.1
p-Tolualdehyde	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Industrial)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	0,1	0,9	0.3 ± 0.3
p-Tolualdehyde	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Industrial)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	0,2	0,9	0.5 ± 0.3
p-Tolualdehyde	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Industrial)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	0,2	1,2	0.8 ± 0.3
p-Tolualdehyde	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Industrial)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	0,1	1,3	0.5 ± 0.5
p-Tolualdehyde	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Industrial)	18	18	Window opening	Yes	Diffusive passive sampler, 2 week on continuous	-	1,8	0.6 ± 0.7

1.11 Table S11: Measurements of BTEX in schools across Europe and North America from 2010

Compounds	References location	Period (Year)	Type of school	Number of schools	Number of total samples	Occupancy	Measurement protocol	Concentration (µg/m³)		
								Min	Max	AM ± SD
Benzene	Villanueva et al. 2018 Urban, Spain [61]	2018	Elementary	6	12	Yes	Passive samplers 2 weeks continuously	0.4	0.5	0.5 ± 0.1
Benzene	Villanueva et al. 2018 Rural, Spain [61]	2018	Elementary	6	12	Yes	Passive samplers 2 weeks continuously	0.2	0.4	0.3 ± 0.1
Benzene	Villanueva et al. 2018 Industrial, Spain [61]	2018	Elementary	6	12	Yes	Passive samplers 2 weeks continuously	0.6	0.9	0.7 ± 0.1
Benzene	Zhong et al. 2017 USA [32]	2017	Elementary	37	144	Yes	Tenax passive sampler 48h continuously	N/A	4.4	0.5
Benzene	Canha et al. 2016 France [26]	2016	Elementary Nursery	17	51	Yes	Diffusive samplers 5 days continuously (Monday to Friday)	<DL	8.5	2.1 ± 2.2
Benzene	Madureira et al. 2016 Portugal [34]	2016	Elementary	20	N/A	Yes	Diffusive samplers 5 days continuously (Monday to Friday)	1.5	2.7	2.2
Benzene	Ramalho et al. 2015 France [58]	2009 - 2011	Kindergarten	46	N/A	Yes	Diffusive samplers 5 days continuously (Monday to Friday)	0.7	6.5	2.5 ± 1.0
Benzene	Ramalho et al. 2015 France [58]	20	Elementary	53	N/A	Yes	Diffusive samplers 5 days continuously (Monday to Friday)	0.2	22	2.5 ± 1.4
Benzene	Csobod et al. 2014 Europe [35]	2014	Nurseries, elementary	114	N/A	Yes	Diffusive samplers 5 days continuously (Monday to Friday)	<DL	38	4
Benzene	Gennaro et al. 2013 Italy [62]	2013	Elementary Secondary	8	8	Yes	Diffusive samplers 5 days continuously (Monday to Friday)	0.1	0.5	0.3 ± 0.2
Benzene	Papadopoulos et al. 2020 Greece [5]	2020	University	1	1	Yes	Active air sampling 80ml/min 30 minutes	N/A	N/A	8

Compounds	References location	Period (Year)	Type of school	Number of schools	Number of total samples	Occupancy	Measurement protocol	Concentration (µg/m³)		
								Min	Max	AM ± SD
Benzene	Papadopoulos et al. 2020 Greece [5]	2020	University	1	1	Yes	Active air sampling 80ml/min 30 minutes	N/A	N/A	17
Benzene	Becerra et al. 2020 Spain [53]	2020	Elementary	4	8	Yes	Diffusive samplers 5 days continuously (Monday to Friday)	1.1	1.5	1.3 ± 0.1
Benzene	Becerra et al. 2020 Spain [53]	2020	Secondary High school	4	8	Yes	Diffusive samplers 5 days continuously (Monday to Friday)	1.1	1.8	1.4 ± 0.2
Benzene	Senitkova et al., Czech Republic [28]	2017	Nursery	3	6	Yes	Photoionization detector with UV lamp 30 minutes continuously	1.6	3.7	2.7 ± 0.7
Benzene	Sivanantham et al. 2021 France [54]	2013- 2017	Kindergarten Elementary	296	66044*	Yes	Passive sampler Monday to Friday	N/A	N/A	1.4 ± 0.1
Toluene	Villanueva et al. 2018 Urban, Spain [61]	2018	Elementary	6	12	Yes	Passive samplers 2 weeks continuously	1.4	4.3	2.2 ± 1.1
Toluene	Villanueva et al. 2018 Rural, Spain [61]	2018	Elementary	6	12	Yes	Passive samplers 2 weeks continuously	1.1	10	3.4 ± 3.5
Toluene	Villanueva et al. 2018 Industrial, Spain [61]	2018	Elementary	6	12	Yes	Passive samplers 2 weeks continuously	1.1	31	7.9 ± 12
Toluene	Zhong et al. 2017 USA [32]	2017	Elementary	37	144	Yes	Tenax passive sampler 48h continuously	N/A	2	0.2
Toluene	Canha et al. 2016 France [26]	2016	Elementary Nursery	17	51	Yes	Diffusive samplers 5 days continuously (Monday to Friday)	1.7	24	5.2 ± 5.1
Toluene	Madureira et al. 2016 Portugal [34]	2016	Elementary	20	N/A	Yes	Diffusive samplers 5 days continuously (Monday to Friday)	1.8	202	15
Toluene	Gennaro et al. 2013 Italy [62]	2013	Elementary Secondary	8	8	Yes	Diffusive samplers 5 days continuously (Monday to Friday)	0.7	6.8	2.2 ± 1.7

Compounds	References location	Period (Year)	Type of school	Number of schools	Number of total samples	Occupancy	Measurement protocol	Concentration (µg/m^3)		
								Min	Max	AM ± SD
Toluene	Papadopoulos et al. 2020 Greece [5]	2020	University	1	1	Yes	Active air sampling 80ml/min 30 minutes	N/A	N/A	11
Toluene	Papadopoulos et al. 2020 Greece [5]	2020	University	1	1	Yes	Active air sampling 80ml/min 30 minutes	N/A	N/A	17
Toluene	Becerra et al. 2020 Spain [53]	2020	Elementary	4	8	Yes	Diffusive samplers 5 days continuously (Monday to Friday)	3.4	20	8.6 ± 5.8
Toluene	Becerra et al. 2020 Spain [53]	2020	Secondary High school	4	8	Yes	Diffusive samplers 5 days continuously (Monday to Friday)	3.0	9.2	5.2 ± 2.2
Toluene	Senitkova et al. 2018 Czech Republic [28]	2017	Nursery	3	6	Yes	Photoionization detector with UV lamp 30 minutes continuously	1.1	4.6	2.8 ± 1.3
Toluene	Sivanantham et al. 2021 France [54]	2013- 2017	Kindergarten Elementary	296	66044*	Yes	Passive sampler Monday to Friday	N/A	N/A	7.0 ± 1.3
Ethylbenzene	Villanueva et al. 2018 Urban, Spain [61]	2018	Elementary	6	12	Yes	Passive samplers 2 weeks continuously	<DL	2.2	0.6 ± 0.8
Ethylbenzene	Villanueva et al. 2018 Rural, Spain [61]	2018	Elementary	6	12	Yes	Passive samplers 2 weeks continuously	0.2	2.1	1 ± 0.9
Ethylbenzene	Villanueva et al. 2018 Industrial, Spain [61]	2018	Elementary	6	12	Yes	Passive samplers 2 weeks continuously	0.3	2.2	0.8 ± 0.5
Ethylbenzene	Zhong et al. 2017 USA [32]	2017	Elementary	37	144	Yes	Tenax passive sampler 48h continuously	N/A	2	0.2
Ethylbenzene	Canha et al. 2016 France [26]	2016	Elementary Nursery	17	51	Yes	Diffusive samplers 5 days continuously (Monday to Friday)	1.2	6	2.2 ± 1.3
Ethylbenzene	Gennaro et al. 2013 Italy [62]	2013	Elementary Secondary	8	8	Yes	Diffusive samplers 5 days continuously (Monday to Friday)	0.1	2.3	0.6 ± 0.5
Ethylbenzene	Papadopoulos et al. 2020 Greece [5]	2020	University	1	1	Yes	Active air sampling 80ml/min	N/A	N/A	1

Compounds	References location	Period (Year)	Type of school	Number of schools	Number of total samples	Occupancy	Measurement protocol	Concentration (µg/m³)		
								Min	Max	AM ± SD
							30 minutes			
Ethylbenzene	Papadopoulos et al. 2020Greece [5]	2020	University	1	1	Yes	Active air sampling 80ml/min 30 minutes	N/A	N/A	6
Ethylbenzene	Becerra et al. 2020 Spain [53]	2020	Elementary	4	8	Yes	Diffusive samplers 5 days continuously (Monday to Friday)	0.3	0.9	0.5 ± 0.2
Ethylbenzene	Becerra et al. 2020 Spain [53]	2020	Secondary High school	4	8	Yes	Diffusive samplers 5 days continuously (Monday to Friday)	0.5	0.9	0,7 ± 0,2
Ethylbenzene	Senitkova et al. 2018 Czech Republic [28]	2017	Nursery	3	6	Yes	Photoionization detector with UV lamp 30 minutes continuously	0.5	9.0	5.0 ± 3.3
Ethylbenzene	Sivanantham et al. 2021 France [54]	2013- 2017	Kindergarten Elementary	296	66044*	Yes	Passive sampler Monday to Friday	N/A	N/A	1.3 ± 0.1
m,p-xylenes	Senitkova et al. 2018 Czech Republic [28]	2017	Nursery	3	6	Yes	Photoionization detector with UV lamp 30 minutes continuously	0.6	2.5	1.6 ± 0.7
m,p-xylenes	Villanueva et al. 2018 Urban, Spain [61]	2018	Elementary	6	12	Yes	Passive samplers 2 weeks continuously	0.6	2.1	1.3 ± 0.6
m,p-xylenes	Villanueva et al. 2018 Rural, Spain [61]	2018	Elementary	6	12	Yes	Passive samplers 2 weeks continuously	0.7	4.1	2.1 ± 1.4
m,p-xylenes	Villanueva et al. 2018 Industrial, Spain [61]	2018	Elementary	6	12	Yes	Passive samplers 2 weeks continuously	0.9	0.6	0.3 ± 0.1
m,p-xylenes	Zhong et al. 2017 USA [32]	2017	Elementary	37	144	Yes	Tenax passive sampler 48h continuously	N/A	7.4	0.9
m,p-xylenes	Canha et al. 2016 France [26]	2016	Elementary Nursery	17	51	Yes	Diffusive samplers 5 days continuously (Monday to Friday)	1.6	14.9	4.4 ± 3.5
m,p-xylenes	Madureira et al. 2016 Portugal [34]	2016	Elementary	20	N/A	Yes	Diffusive samplers 5 days continuously (Monday to Friday)	1.2	365	17.7

Compounds	References location	Period (Year)	Type of school	Number of schools	Number of total samples	Occupancy	Measurement protocol	Concentration (µg/m^3)		
								Min	Max	AM ± SD
m,p-xylenes	Gennaro et al. 2013 Italy [62]	2013	Elementary, Secondary	8	8	Yes	Diffusive samplers 5 days continuously (Monday to Friday)	0.2	21	2.7 ± 4.9
m,p-xylenes	Papadopoulos et al. 2020 Greece [5]	2020	University	1	1	Yes	Active air sampling 80ml/min 30 minutes	N/A	N/A	1
m,p-xylenes	Papadopoulos et al. 2020 Greece [5]	2020	University	1	1	Yes	Active air sampling 80ml/min 30 minutes	N/A	N/A	6
m,p-xylenes	Becerra et al. 2020 Spain [53]	2020	Secondary High school	4	8	Yes	Diffusive samplers 5 days continuously (Monday to Friday)	0.8	9.0	2.2 ± 2.4
m,p-xylenes	Becerra et al. 2020 Spain [53]	2020	Secondary High school	4	8	Yes	Diffusive samplers 5 days continuously (Monday to Friday)	1.5	3.8	2.2 ± 0.8
m,p-xylenes	Sivanantham et al. 2021 France [54]	2013- 2017	Kindergarten Elementary	296	66044*	Yes	Passive sampler Monday to Friday	N/A	N/A	3.5 ± 0.4
o xylene	Madureira et al. 2016 Portugal [34]	2016	Elementary Secondary	20	N/A	Yes	Diffusive samplers 5 days continuously (Monday to Friday)	1.1	52.4	3.9
o xylene	Zhong et al. 2017 USA [32]	2017	Elementary	37	144	Yes	Tenax passive sampler 48h continuously	N/A	2.2	0.3
o-xylene	Papadopoulos et al. 2020 Greece [5]	2020	University	1	1	Yes	Active air sampling 80ml/min 30 minutes	N/A	N/A	0.5
o-xylene	Papadopoulos et al. 2020 Greece [5]	2020	University	1	1	Yes	Active air sampling 80ml/min 30 minutes	N/A	N/A	2
o-xylene	Becerra et al. 2020 Spain [53]	2020	Elementary	4	8	Yes	Diffusive samplers 5 days continuously (Monday to Friday)	0.6	2.2	0.8 ± 0.5
o-xylene	Becerra et al. 2020 Spain [53]	2020	Secondary High school	4	8	Yes	Diffusive samplers 5 days continuously (Monday to Friday)	0.5	1.8	0.9 ± 0.5

Compounds	References location	Period (Year)	Type of school	Number of schools	Number of total samples	Occupancy	Measurement protocol	Concentration (µg/m³)		
								Min	Max	AM ± SD
o-xylene	Senitkova et al. 2018 Czech Republic [28]	2017	Nursery	3	6	Yes	Photoionization detector with UV lamp 30 minutes continuously	0.6	11.6	7.1 ± 4.7
o-xylene	Sivanantham et al. 2021 France [54]	2013- 2017	Kindergarten Elementary	296	66044*	Yes	Passive sampler Monday to Friday	N/A	N/A	1.6 ± 0.2

DL: detection limit; HVAC: Heat, ventilation and air conditioning; AM: arithmetic mean; SD: standard deviation

1.12 Table S12: Measurements of volatile organic compounds in schools across Europe and North America from 2010

Substances	References Location	Period	Type of schools	Number of buildings	Number of points	Type of ventilation	Measurement protocol	Concentration (µg/m³)		
								Min	Max	AM ± SD
1,2,3-trimethylbenzene	Papadopoulos et al. 2020 Greece [5]	December 2019	University	1	1	Window opening	30 minutes Active air sampling 80ml/min	N/A	N/A	<DL
1,2,3-trimethylbenzene	Papadopoulos et al. 2020 Greece [5]	December 2019	University	1	1	Window opening	30 minutes Active air sampling 80ml/min	N/A	N/A	1
1,2,4-trimethylbenzene	Papadopoulos et al. 2020 Greece [5]	December 2019	University	1	10	Window opening	30 minutes Active air sampling 80ml/min	N/A	N/A	<DL
1,2,4-trimethylbenzene	Papadopoulos et al. 2020 Greece [5]	December 2019	University	1	10	Window opening	30 minutes Active air sampling 80ml/min	N/A	N/A	0.5
1,4-dichlorobenzene	Becerra et al. 2020 Spain [53]	Spring 2020	Elementary Secondary	18	18	Window opening	5 days on continuous, Diffusive sampling	N/A	N/A	Ranges: <LD
1,4-dichlorobenzene	Becerra et al. 2020 Spain [53]	Spring 2020	Elementary Secondary	18	18	Window opening	5 days on continuous, Diffusive sampling	N/A	N/A	Ranges: <LD
1-butanol	Senitkova et al. 2017 Czech Republic [28]	2017	Nursery	3	6	Window opening	30 minutes on continuous Photoionization detector with UV lamp	N/A	Ranges: 0.47 - 9.93	N/A

Substances	References Location	Period	Type of schools	Number of buildings	Number of points	Type of ventilation	Measurement protocol	Concentration (µg/m³)		
								Min	Max	AM ± SD
1-butylacetate	Senitkova et al. 2017 Czech Republic [28]	2017	Nursery	3	6	Window opening	30 minutes on continuous Photoionization detector with UV lamp	N/A	Ranges: 0.69 - 11.26	N/A
1-butylacetate	Senitkova 2017 Czech Republic [28]	2017	Nursery	3	6	Window opening	30 minutes on continuous Photoionization detector with UV lamp	N/A	Ranges: 0.58 - 11.88	N/A
Decane	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Urban)	18	18	Window opening	2 weeks on continuous, Passive samplers	0.4	1.1	0.8 ± 0.3
Decane	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Rural)	18	18	Window opening	2 weeks on continuous, passive samplers	0.4	1.1	0.8 ± 0.3
Decane	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Industrial)	18	18	Window opening	2 weeks on continuous, passive samplers	0.3	8.6	1.8 ± 3.3
Decane	Madureira et al. 2015 Portugal [34]	November to March, 2011 to 2013	Elementary	20	73	Window opening	5 days on continuous (Monday to Friday) Diffusive passive sampler	1.1	52.4	3.9
Decane	Gennaro et al., 2013 Italy [62]	2013	Elementary Secondary	1	3	Window opening	5 days on continuous (Monday to Friday) Diffusive passive sampler	0.4	2.9	N/A
d-limonene	Papadopoulos et al. 2020 Greece [5]	December 2019	University	1	1	Window opening	30 minutes Active air sampling 80ml/min	NA	NA	1
d-limonene	Papadopoulos et al. 2020 Greece [5]	December 2019	University	1	1	Window opening	30 minutes Active air sampling 80ml/min	NA	NA	10
Ethylacetate	Senitkova et al. 2017 Czech Republic [28]	2017	Nursery	3	6	Window opening	30 minutes on continuous Photoionization detector with UV lamp	N/A	Ranges: 0.21 - 4.27	N/A
Ethylacetate	Senitkova et al. 2017 Czech Republic	2017	Nursery	3	6	Window opening	30 minutes on continuous Photoionization detector with UV lamp	N/A	Ranges: 0.33 - 5.43	N/A

Substances	References Location	Period	Type of schools	Number of buildings	Number of points	Type of ventilation	Measurement protocol	Concentration (µg/m³)		
								Min	Max	AM ± SD
	[28]									
Hexane	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Urban)	18	18	Window opening	2 weeks on continuous, Passive samplers	0.7	4.9	NA
Hexane	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Rural)	18	18	Window opening	2 weeks on continuous, Passive samplers	<DL	3.7	1.1 ± 1.5
Hexane	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Industrial)	18	18	Window opening	2 weeks on continuous, Passive samplers	<DL	<DL	NA
Hexane	Zhong et al. 2016 USA [32]	October 2015 to March 2016	Elementary and K8 schools	37	144	HVAC	48h on continuous Tenax passive sampler	NA	27.2	3.2
Hexane	Papadopoulos et al. 2020 Greece [5]	December 2019	University	1	1	Window opening	30 minutes Active air sampling 80ml/min	NA	NA	67
Hexane	Papadopoulos et al. 2020 Greece [5]	December 2019	University	1	1	Window opening	30 minutes Active air sampling 80ml/min	NA	NA	8
Limonene	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Urban)	18	18	Window opening	48h on continuous Tenax passive sampler	6.3	25.7	18.9 ± 8
Limonene	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Rural)	18	18	Window opening	48h on continuous Tenax passive sampler	6.2	37	14.3 ± 8
Limonene	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Industrial)	18	18	Window opening	48h on continuous Tenax passive sampler	1.1	33.7	33.2 ± 36.5
Limonene	Zhong et al. 2016 USA [32]	October 2015 to March 2016	Elementary and K8 schools	37	144	HVAC	48h on continuous Tenax passive sampler	N/A	158.5	11.3

Substances	References Location	Period	Type of schools	Number of buildings	Number of points	Type of ventilation	Measurement protocol	Concentration (µg/m³)		
								Min	Max	AM ± SD
Limonene	Madureira et al. 2015 Portugal [34]	November to March, 2011 to 2013	Elementary	20	73	Window opening	5 days on continuous (Monday to Friday) Diffusive passive sampler	2.8	215.3	38.1
Limonene	Csobod et al. Europe [35]	2011 - 2012	Elementary Nursery	114	<LD	Mixed	5 days on continuous (Monday to Friday) Diffusive passive sampler	N/A	671	N/A
Methylacetate	Senitkova et al. 2017 Czech Republic [28]	2017	Nursery	3	6	Window opening	30 minutes on continuous Photoionization detector with UV lamp	N/A	Ranges: 0.82 - 7.44	N/A
Methylacetate	Senitkova et al. 2017 Czech Republic [28]	2017	Nursery	3	6	Window opening	30 minutes on continuous Photoionization detector with UV lamp	N/A	Ranges: 0.73 - 7.16	N/A
MIBK	Zhong et al. 2016 USA [32]	October 2015 to March 2016	Elementary and K8 schools	37	144	HVAC	48h on continuous Tenax passive sampler	N/A	4.3	0.2
Naphtalene	Papadopoulos et al. 2020 Greece [5]	December 2019	University	1	1	Window opening	30 minutes Active air sampling 80ml/min	N/A	N/A	<DL
Naphtalene	Papadopoulos et al. 2020 Greece [5]	December 2019	University	1	1	Window opening	30 minutes Active air sampling 80ml/min	N/A	N/A	0.5
Naphtalene	Senitkova et al. 2017 Czech Republic [28]	2017	Nursery	3	6	Window opening	30 minutes on continuous Photoionization detector with UV lamp	N/A	Ranges: 1.15 - 2.07	N/A
Naphtalene	Senitkova et al. 2017 Czech Republic [28]	2017	Nursery	3	6	Window opening	30 minutes on continuous Photoionization detector with UV lamp	N/A	Ranges: 0.57 - 2.17	N/A

Substances	References Location	Period	Type of schools	Number of buildings	Number of points	Type of ventilation	Measurement protocol	Concentration (µg/m³)		
								Min	Max	AM ± SD
n-butylbenzene	Senitkova et al. 2017 Czech Republic [28]	2017	Nursery	3	6	Window opening	30 minutes on continuous Photoionization detector with UV lamp	N/A	N/A	Ranges: 0.60 - 2.73
n-butylbenzene	Senitkova et al. 2017 Czech Republic [28]	2017	Nursery	3	6	Window opening	30 minutes on continuous Photoionization detector with UV lamp	N/A	N/A	Ranges: 0.53 - 2.11
Octane	Papadopoulos et al. 2020 Greece [5]	December 2019	University	1	1	Window opening	30 minutes Active air sampling 80ml/min	NA	NA	1
Octane	Papadopoulos et al. 2020 Greece [5]	December 2019	University	1	1	Window opening	30 minutes Active air sampling 80ml/min	N/A	N/A	1
Perchloroethylene	Canha et al. France [26]	January – June 2010	Nurseries, elementary	17	37	Mixed	5 days on continuous (Monday to Friday) Diffusive passive sampler)	<DL	11.5	<DL
Perchloroethylene	Papadopoulos et al. 2020 Greece [5]	December 2019	University	1	1	Window opening	30 minutes Active air sampling 80ml/min	N/A	N/A	< LD
Perchloroethylene	Papadopoulos et al. 2020 Greece [5]	December 2019	University	1	1	Window opening	30 minutes Active air sampling 80ml/min	N/A	N/A	< LD
Perchloroethylene	Becerra et al, 2020 Spain [53]	2017	Elementary	4	2		5 days on continuous, Diffusive sampling	<DL	0.8	N/A
Perchloroethylene	Becerra et al, 2020 Spain [53]	2017	Secondary High school	4	2		5 days on continuous, Diffusive sampling	>DL	0.8	N/A
Styrene	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Urban)	18	18	Window opening	2 weeks on continuous Passive samplers	-	2	0.9 ± 0.8

Substances	References Location	Period	Type of schools	Number of buildings	Number of points	Type of ventilation	Measurement protocol	Concentration (µg/m³)		
								Min	Max	AM ± SD
Styrene	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Rural)	18	18	Window opening	2 weeks on continuous Passive samplers	N/A	1.5	0.4 ± 0.6
Styrene	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Industrial)	18	18	Window opening	2 weeks on continuous Passive samplers	N/A	8	2.1 ± 3.9
Styrene	Canha et al. France [26]	January – June 2010	Nurseries, elementary	17	37	Mixed	5 days on continuous (Monday to Friday) Diffusive passive sampler	0.9	4	1.1 ± 1.3
Styrene	Papadopoulos et al. 2020 Greece [5]	December 2019	University	1	1	Window opening	30 minutes Active air sampling 80ml/min	N/A	N/A	2
Styrene	Papadopoulos et al. 2020 Greece [5]	December 2019	University	1	1	Window opening	30 minutes Active air sampling 80ml/min	N/A	N/A	1
Styrene	Becerra et al. 2020 Spain [53]	Spring 2020	Elementary Secondary	18	18	Window opening	5 days on continuous, Diffusive sampling	N/A	N/A	Ranges: 0.6 - 1.45
Styrene	Becerra et al. 2020 Spain [53]	Spring 2020	Elementary Secondary	18	18	Window opening	5 days on continuous, Diffusive sampling	N/A	N/A	Ranges: 0.8 - 2.45
Styrene	Senitkova et al. 2017 Czech Republic [28]	2017	Nursery	3	6	Window opening	30 minutes on continuous Photoionization detector with UV lamp	N/A	N/A	Ranges: 0.97 - 5.14
Styrene	Senitkova et al. 2017 Czech Republic [28]	2017	Nursery	3	6	Window opening	30 minutes on continuous Photoionization detector with UV lamp	N/A	N/A	Ranges: 0.87 - 5.19
Trichloroethylene	Papadopoulos et al. 2020 Greece [5]	December 2019	University	1	1	Window opening	30 minutes Active air sampling 80ml/min	N/A	N/A	3

Substances	References Location	Period	Type of schools	Number of buildings	Number of points	Type of ventilation	Measurement protocol	Concentration (µg/m³)		
								Min	Max	AM ± SD
Trichloroethylene	Papadopoulos et al. 2020 Greece [5]	December 2019	University	1	1	Window opening	30 minutes Active air sampling 80ml/min	N/A	N/A	< LD
Trichloroethylene	Becerra et al. 2020 Spain [53]	Spring 2020	Elementary Secondary	18	18	Window opening	5 days on continuous, Diffusive sampling	N/A	N/A	<0.1
Trichloroethylene	Becerra et al. 2020 Spain [53]	Spring 2020	Elementary Secondary	18	18	Window opening	5 days on continuous, Diffusive sampling	N/A	N/A	<0.1
TVOCs	Harcarova et al. 2020 Slovakia [3]	Winter 2020	Elementary	1	1	Window opening	1 hour on continuous Photoionization UV detector	1416	3367	2256 ± 581.4
TVOCs	Harcarova et al. 2020 Slovakia [3]	Winter 2020	Elementary	1	1	Window opening	1 hour on continuous Photoionization UV detector	2490	3150	2847 ± 174.9
TVOCs	Barmparesos et al. 2018 Greece [29]	June to July 2017	Elementary	1	1	Window opening	24h on continuous at 15 min interval Portable sensors	< 1 ppm	15.00 ppm to 30.00 ppm	6.63 ppm to 13.33 ppm
TVOCs	Nunes et al., 2016 Portugal [56]	1	Nursery	4	9	Window opening	2 to 3 weekdays + 2 weekend days on continuous	79.23 - 142.01	Ranges: 174.17 - 488.33	Ranges: 155.22 - 159.40
α-pinene	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Urban)	18	18	Window opening	2 weeks on continuous, passive samplers	0,3	3,7	1,6 ± 1,4
α-pinene	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Rural)	18	18	Window opening	2 weeks on continuous, Passive samplers	1.5	6	3 ± 1.6
α-pinene	Villanueva et al. 2018 Spain [61]	Spring 2013	Elementary (Industrial)	18	18	Window opening	2 weeks on continuous, Passive samplers	0.6	3.6	1.8 ± 1.2
α-pinene	Zhong et al. 2016 USA [32]	October 2015 to March 2016	Elementary and K8 schools	37	144	HVAC	48h on continuous Tenax passive sampler	N/A	55.7	1.5

Substances	References Location	Period	Type of schools	Number of buildings	Number of points	Type of ventilation	Measurement protocol	Concentration (µg/m³)		
								Min	Max	AM ± SD
α-pinene	Gennaro et al., 2013 Italy [62]	2013	Elementary Secondary	1	3	Window opening	48h on continuous Tenax passive sampler	0.6	5.1	N/A
α-pinene	Madureira et al. 2016 Portugal [34]	Heating season 2011-2013	Elementary	20	80	Window opening	5 days on continuous (Monday to Friday) Diffusive passive sampler	1	32	3,4
α-pinene	Papadopoulos et al. 2020 Greece [5]	December 2019	University	1	1	Window opening	30 minutes Active air sampling 80ml/min	N/A	N/A	<DL
α-pinene	Papadopoulos et al. 2020 Greece [5]	December 2019	University	1	1	Window opening	30 minutes Active air sampling 80ml/min	N/A	N/A	1
α-pinene	Becerra et al. 2020 Spain [53]	Spring 2020	Elementary Secondary	18	18	Window opening	5 days on continuous, Diffusive sampling	N/A	N/A	Ranges: <LD - 0.8
α-pinene	Becerra et al. 2020 Spain [53]	Spring 2020	Elementary Secondary	18	18	Window opening	5 days on continuous, Diffusive sampling	N/A	N/A	Ranges: <LD - 0.2

1.13 Table S13: Measurements of particulate matter (PM) in schools in Europe and North America since 2010

PM size (µm)	References Location	Period (years)	Type of school	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	Results Gravimetric: µg/m³ Counts: particles/cm³		
									Min	Max	AM ± SD
0.5	Rovelli et al. 2014 Italy [59]	November/2011 to 03/2012 and November 2012 to February 2013	Elementary Secondary	7	14	Window opening	Yes	Nephelometer 3 L/min	N/A	N/A	11 ± 5.3
1	Rovelli et al. 2014 Italy [59]	November 2011 to 03/2011 and November 2012 to February 2013	Elementary Secondary	7	14	Window opening	Yes	Nephelometer 3 L/min	N/A	N/A	19 ± 7.2
2.5	Rovelli et al. 2014 Italy [59]	November 2011 to 03/2011 and November 2012 to February 2013	Elementary Secondary	7	14	Window opening	Yes	Nephelometer 3 L/min and equipped with a size-selective impactor for $PM_{2.5}$	N/A	N/A	33 ± 10.0
5	Rovelli et al. 2014 Italy [59]	November 2011 to 03/2011 and November 2012 to February 2013	Elementary Secondary	7	14	Window opening	Yes	Nephelometer 3 L/min	N/A	N/A	104 ± 50
10	Rovelli et al. 2014 Italy [59]	November 2011 to 03/2011 and November 2012 to February 2013	Elementary Secondary	7	14	Naturally ventilated,	Yes	Nephelometer 3 L/min	N/A	N/A	134 ± 68
2.5	Becerra et al. 2020 Spain [53]	March 2017	Elementary High school	9	9	Window opening	Yes	Optical particle counter at 1.2 L/min 2 days continuously 2 minutes time interval 0.3 to 10 µm 0 to 3,000 particles/cm³ Accuracy (5% ± 0.5 µm)	2.2	27	9.2 ± 7.4

PM size (µm)	References Location	Period (years)	Type of school	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	Results Gravimetric: µg/m^3 Counts: particles/cm^3		
									Min	Max	AM ± SD
10	Becerra et al. 2020 Spain [53]	March 2017	Elementary High school	9	9	Window opening	Yes	Optical particle counter at 1.2 L/min 2 days continuously 2 minutes time interval Size: 0.3 to 10 µmm 0 to 3,000 particles/cm^3 Accuracy (5% ± 0.5 µm)	1.3	12	4.4 ± 2.9
2.5	Rivas et al. 2014 Spain [63]	February 2012 to February 2013	Elementary school	39	39	Window opening	Yes	Gravimetric Quartz fiber filter 30 m^3/h 8 hours per day continuously for 4 days for 2 weeks Indoor and outdoor	13	84	37 ± 13
2.5	Vornanen Winqvist et al. 2020 Finland [11]	April 2016 to September 2016	Secondary	1	1	Mechanical ventilation	Yes	Measure continuously with PM meter MiePDR1500	N/A	5.8	1.7
0.1	Slezakova et al. 2019 Portugal [64]	January 2014 to April 2014	Elementary	10	20	Mechanical ventilation Window opening	Yes	Portable condensation particle counter 5 days (Monday to Friday) 8 hours per day 1 minute time interval 0.7 L/min Size: 20 to 1000 nm Up to 5 x10^5 particles/ cm^3	Count: 1123	Count: 99,923	Count: 7798 ± 2981
2.5	Harcarova et al. 2020 Slovakia [3]	Winter 2019	Elementary school Rural,	1	2	Window opening	Yes	Optical particle counter 50 minutes Size: 0.5 to 10 µm 2.83 L/min	9.1	20	14 ± 1.7

PM size (µm)	References Location	Period (years)	Type of school	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	Results Gravimetric: µg/m³ Counts: particles/cm³		
									Min	Max	AM ± SD
10	Harcarova et al. 2020 Slovakia [3]	Winter 2019	Elementary school Rural	1	2	Window opening	Yes	Optical particle counter 50 minutes Size: 0.5 to 10 µm 2.83 L/min	34	273	122 ± 33
2.5	Erlandson et al. 2017 USA [25]	Yearlong 2019 (Fall, Winter, Spring)	University Rural	1	70	Window opening	Yes	Gravimetric Aluminum Cyclone GK2.05 PVC filter 4 L/min 48 hours	0.5 [a]	11[a]	1.9 ± 2.2 [a]
4	Erlandson et al. 2017 USA [25]	Yearlong 2019 (Fall, Winter, Spring)	University Rural	1	70	Window opening	Yes	Gravimetric Aluminum Cyclone PVC filter 4 L/min 48 hours	1.2 [a]	45 [a]	5.3 ± 2.3 [a]
10	Erlandson et al. 2017 USA [25]	Yearlong 2019 (Fall, Winter, Spring)	University Rural	1	70	Window opening	Yes	Gravimetric SKC button sampler PVC filter 4 L/min 48 hours	1.1 [a]	52.7 [a]	7.5 ± 2.4 [a]
2.5	Alves et al. 2013 Portugal [21]	January 2012	Elementary Urban	3	3	Window opening	Yes	Optical particle counter (station) 5 days Monday to Friday Indoor and outdoor	N/A	N/A	44 - 117
10	Alves et al. 2013 Portugal [21]	January 2012	Elementary Urban	3	3	Window opening	Yes	Optical particle counter (station) 5 days Monday to Friday Indoor and outdoor	N/A	N/A	362 ± 84

PM size (µm)	References Location	Period (years)	Type of school	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	Results Gravimetric: µg/m³ Counts: particles/cm³		
									Min	Max	AM ± SD
2.5	Canha et al. 2016 France [26]	January to June 2010	Nursery Elementary	17	51	Mechanical ventilation and window opening	Yes	Gravimetric PTFE filter 1.8 L/min 5 days Monday to Friday	N/A	N/A	22 ± 8
2.5	Mainka et al. 2015 Poland [57]	December 2013 to January 2014	N/A	2	2	N/A	Yes	Gravimetric Polycarbonate filter 3 stages impactor 30L/min, 5 days Monday to Friday	47	106	N/A
2.5	Jovanovic et al. 2014 Serbia [27]	2012	Elementary	1	5	Window opening	Yes	Gravimetric Quartz filter 3.2 m^3/h 192h 24 hours interval	27	64	44 ± 13
2.5	Vilcekova et al. 2017 Slovakia [15]	2016	Elementary	1	5	Window opening	Yes	Optical particle counter Size: 0.3 to 10 µm 2.83 L/min 1 week 5 minutes time interval	5.1	51	10.± 1.2 to 25 ± 4.6
10	Vilcekova et al. 2017 Slovakia [15]	2016	Elementary	1	5	Window opening	Yes	Optical particle counter Size: 0.3 to 10 µm 2.83 L/min 1 week 5 minutes time interval	32	2061	96 ± 49 to 406 ± 292
2.5	Sivanantham et al. 2021 France [54]	2013 -2017	Kindergarten Elementary	294	65823**	Window opening Mechanical ventilation	Yes	Gravimetric Teflon PTFE filter Monday to Friday	N/A	N/A	20 ± 1.0
2.5	Stamp et al. 2020 UK[33]	2014	Secondary	1	3	Mechanical and by opening window	Yes	Optical particle counter 6 – 10 months continuously	N/A	N/A	N/A

PM size (µm)	References Location	Period (years)	Type of school	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	Results Gravimetric: µg/m³ Counts: particles/cm³		
									Min	Max	AM ± SD
10	Stamp et al. 2020 UK [33]	2014	Secondary	1	3	Mechanical and by opening window	Yes	Optical particle counter 6 – 10 months continuously	N/A	N/A	N/A
2.5	Madureira et al. 2015 Portugal [34]	November to March (2011 to 2013)	Elementary	20	73	Opening windows	Yes	Portable TSI DustTrak DRX photometers 1 day measurement	39	244	82
10	Madureira et al. 2015 Portugal [34]	November to March (2011 to 2013)	Elementary	20	73	Opening windows	Yes	Portable TSI DustTrak DRX photometers 1 day measurement	56	320	127
2.5	Csobod et al. 2014 Europe [35]	Non heating season 2014	Kindergarten	25	25	Window opening and mechanical ventilation	Yes	Gravimetric measurement, 8 hours per day, Monday to Friday	14	163	56 ± 34
2.5	Csobod et al. 2014 Europe [35]	Non heating season 2014	Elementary	300	300	Window opening and mechanical ventilation	Yes	Gravimetric measurement, 8 hours per day, Monday to Friday	4	250	44 ± 37
2.5	Oliveira et al. 2016 Portugal [36]	April – June 2013	Kindergarten	2	2	Window opening	Yes	Gravimetric measurement over a period of 24 hours	5.8	34.8	14.2 – 18.4
1	Oliveira et al. 2016 Portugal [36]	April – June 2013	Kindergarten	2	2	Window opening	Yes	Gravimetric measurement over a period of 24 hours	1.5	26.1	12.4 – 15.8
2.5	Oliveira et al. 2017 Portugal [37]	January – April 2014	Elementary	10	10	Opening window	Yes	Gravimetric measurement over 3 days continuously	4.5	85	9.2 to 66
2.5	Liaud et al. France [65]	April - May 2014	High school	1	36	Window opening	Yes	Three-stages cascade impactors HPLC/PAD/fluorescence 3-4 days 119 - 181.3 m^3	N/A	N/A	N/A

PM size (µm)	References Location	Period (years)	Type of school	Number of schools	Number of total samples	Type of ventilation	Occupancy	Measurement protocol	Results Gravimetric: µg/m^3 Counts: particles/cm^3		
									Min	Max	AM ± SD
2.5	Krugly et al. Lithuania [66]	2011-2012	Elementary	5	25	Window opening	Yes	25 mm quartz filter (pore size 1.6 µm) 8 hours 10 L/min flow rate 0,48m^3 – 14 m^3	N/A	N/A	N/A

[a] geometric mean and geometric standard deviation; DL: detection limit; HVAC: Heat, ventilation and air conditioning; AM: arithmetic mean; SD: standard deviation; ** adjusted to the French stock of schools

1.14 Table S14: Measurements of flame retardants (SVOCs) in schools across Europe and North America since 2010

SVOCs	References Location	Measurement period	Type of schools	N° of schools	N° of samples	Measurement protocol	Concentration (ng/m^3)			
							Phase	Min	Max	AM
Tributylphosphate	Cequier et al. 2014 Norway [67]	January - May 2012	Elementary	2	6	PUF Filter 12 L/min flow rate for 24 h.	Air	-	4.6	3.1
Tributylphosphate	Persson et al. 2018 Sweden [68]	2015-2016	Kindergarten	1	12	24h on continuous 0.2 L/min flow rate with XAD-2 absorbent	Gas	<DL	<DL	<DL
Tributylphosphate	Persson et al. 2018 Sweden [68]	2015-2016	Kindergarten	1	12	24h on continuous at 0.2 L/min flow rate with XAD-2 absorbent	Gas	<DL	21	<DL
Tributylphosphate	Persson et al. 2018 Sweden [68]	2015-2016	Kindergarten	1	12	24h on continuous at 0.2 L/min flow rate with XAD-2 absorbent	Gas	<DL	82	<DL
Tributylphosphate	Persson et al. 2018 Sweden [68]	2015-2016	Kindergarten	1	12	24h on continuous at 0.2 L/min flow rate with XAD-2 absorbent	Gas	<DL	150	36
Tributylphosphate	Raffy et al. 2017 France [69]	2010	Schools	30	62	Φ 76 mm PUF, with 4.5 days air pump at 2.1 L/min	Air	N/A	N/A	N/A
BDE47	Cequier et al. 2014 Norway [67]	January - May 2012	Elementary	2	6	PUF Filter 12 L/min flow rate for 24 h.	Air	N/A	0.5	0.2
BDE85	Cequier et al. 2014 Norway [67]	January - May 2012	Elementary	2	6	PUF Filter 12 L/min flow rate for 24 h.	Air	N/A	0.001	0.0007
BDE99	Cequier et al. 2014 Norway [67]	January - May 2012	Elementary	2	6	PUF Filter 12 L/min flow rate for 24 h.	Air	N/A	0.05	0.03

SVOCs	References Location	Measurement period	Type of schools	N° of schools	N° of samples	Measurement protocol	Concentration (ng/m^3)			
							Phase	Min	Max	AM
BDE99	Raffy et al. 2017 France [69]	2010	Schools	30	62	Φ 76 mm PUF, with 4.5 days air pump at 2.1 L/min	Air	N/A	-	-
BDE100	Cequier et al. 2014 Norway [67]	January - May 2012	Elementary	2	6	PUF Filter 12 L/min flow rate for 24 h.	Air	N/A	0.02	0.009
BDE153	Cequier et al. 2014 Norway [67]	January - May 2012	Elementary	2	6	PUF Filter 12 L/min flow rate for 24 h.	Air	N/A	0.002	0.0007

1.15 Table S15: Measurements of polycyclic aromatic hydrocarbons (SVOCs) in schools across Europe and North America since 2010

PAH ng/m^3	Reference Location	Measurement period	Type of schools	Number of buildings	Number of samples	Measurement protocol	Concentration (ng/m^3)			
							Phase	Min	Max	AM
Acenaphtene	Oliveira et al. Paranhos, 2017 [55] Portugal	May - June 2015	Kindergarten	1	88	75 mm pre-cleaned PUF plugs 24 hours 38.3 L/min flow rate at 55 m^3 total	Air	0,03	0,8	N/A
Acenaphtene	Oliveira et al. 2016 [36] Chaves, Portugal	May - June 2015	Kindergarten	1	64	75 mm pre-cleaned PUF plugs 24 hours 38.3 L/min at 55 m^3 total	Air	0,7	8,19	N/A
Acenaphtene	Oliveira et al. 2016 [36] Oporto, Portugal	January-April 2014	Primary school	10	60	47 mm PTFE filter 24 hours 38.3 L/min at 300m^3 total	$PM_{2.5}$	0,7	2,4	0,9 - 2,3
Acenaphtene	Živković et al. 2015 Serbia [38]	Heating	Multi schools	4	4	PUF Quartz filter (TSP) 1 week on continuous 38 L/min flow rate at 386 m^3 total	Air	7.15	72.02	7.15 - 72.02
Acenaphtene	Živković et al. 2015 Serbia [38]	Non- Heating	Multi schools	4	4	PUF Quartz filter (TSP) 1 week on continuous 38 L/min flow rate at 386 m^3 total	Air	0.7	8.92	0.70 - 8.92
Acenaphtene	Liaud et al. 2021 France [65]	April - May 2014	High school	1	36	Three-stages cascade impactors HPLC/PAD/fluorescence 3-4 days 119 - 181.3 m^3	PM_{1}	N/A	N/A	0.0003
							$PM_{2.5}$	N/A	N/A	0.0015
							PM_{10}	N/A	N/A	0.002
Anthracene	Oliveira et al. Paranhos, 2017 [55] Portugal	May - June 2015	Kindergarten	1	88	75 mm pre-cleaned PUF plugs 24 hours 38.3 L/min flow rate at 55 m^3 total	Air	0.005	0.7	N/A
Anthracene	Oliveira et al. 2016 [36] Chaves, Portugal	May - June 2015	Kindergarten	1	64	75 mm pre-cleaned PUF plugs 24 hours 38.3 L/min at 55 m^3 total	Air	0.3	0.6	N/A
Anthracene	Oliveira et al. 2016 [36] Oporto, Portugal	January-April 2014	Primary school	10	60	47 mm PTFE filter 24 hours 38.3 L/min at 300m^3 total	$PM_{2.5}$	N/A	N/A	0.003-0.08

PAH ng/m^3	Reference Location	Measurement period	Type of schools	Number of buildings	Number of samples	Measurement protocol	Concentration (ng/m^3)			
							Phase	Min	Max	AM
Anthracene	Živković et al. 2015 Serbia [38]	Heating	Multi schools	4	4	PUF Quartz filter (TSP) 1 week on continuous 38 L/min flow rate at 386 m^3 total	Air	N/A	N/A	1.00 - 15.83
Anthracene	Živković et al. 2015 Serbia [38]	Non- Heating	Multi schools	4	4	PUF Quartz filter (TSP) 1 week on continuous 38 L/min flow rate at 386 m^3 total	Air	N/A	N/A	0.45 - 2.93
Anthracene	Liaud et al. 2021 France [65]	April - May 2014	High school	1	36	Three-stages cascade impactors HPLC/PAD/fluorescence 3-4 days 119 - 181.3 m^3	PM $_1$	N/A	N/A	0.0024
							PM $_{2.5}$	N/A	N/A	0.0034
							PM $_{10}$	N/A	N/A	0.004
Benzo[a]pyrene	Liaud et al. 2021 France [65]	April - May 2014	High school	1	36	Three-stages cascade impactors HPLC/PAD/fluorescence 3-4 days 119 - 181.3 m^3	PM $_1$	N/A	N/A	0.0225
							PM $_{2.5}$	N/A	N/A	0.0248
							PM $_{10}$	N/A	N/A	0.0252
Benzo[g,h,i]perylene	Liaud et al. 2021 France [65]	April - May 2014	High school	1	36	Three-stages cascade impactors HPLC/PAD/fluorescence 3-4 days 119 - 181.3 m^3	PM $_1$	N/A	N/A	0.0612
							PM $_{2.5}$	N/A	N/A	0.0671
							PM $_{10}$	N/A	N/A	0.0751
Benzo[k]fluoranthene	Liaud et al. 2021 France [65]	April - May 2014	High school	1	36	Three-stages cascade impactors HPLC/PAD/fluorescence 3-4 days 119 - 181.3 m^3	PM $_1$	N/A	N/A	0.0121
							PM $_{2.5}$	N/A	N/A	0.0137
							PM $_{10}$	N/A	N/A	0.0139
Benzoaanthracene	Liaud et al. 2021 France [65]	April - May 2014	High school	1	36	Three-stages cascade impactors HPLC/PAD/fluorescence 3-4 days 119 - 181.3 m^3	PM $_1$	N/A	N/A	0.0075
							PM $_{2.5}$	N/A	N/A	0.0083
							PM $_{10}$	N/A	N/A	0.0088
Benzoapyrene	Oliveira et al. Paranhos, 2017 [55] Portugal	May - June 2015	Kindergarten	1	88	75 mm pre-cleaned PUF plugs 24 hours 38.3 L/min flow rate at 55 m^3 total	Air	0.05	0.08	

PAH ng/m^3	Reference Location	Measurement period	Type of schools	Number of buildings	Number of samples	Measurement protocol	Concentration (ng/m^3)			
							Phase	Min	Max	AM
Benzoapyrene	Oliveira et al. 2016 [36] Chaves, Portugal	May - June 2015	Kindergarten	1	64	75 mm pre-cleaned PUF plugs 24 hours 38.3 L/min at 55 m^3 total	Air	0.06	0.1	
Benzoapyrene	Oliveira et al. 2016 [36] Oporto, Portugal	January-April 2014	Primary school	10	60	47 mm PTFE filter 24 hours 38.3 L/min at 300m^3 total	PM $_{2.5}$	0.03	4.2	0.04 - 3.5
Benzoapyrene	Živković et al. 2016 Serbia [38]	Heating	Multi schools	4	4	PUF Quartz filter (TSP) 1 week on continuous 38 L/min flow rate at 386 m^3 total	Air	N/A	N/A	1.20 - 9.84
Benzoapyrene	Živković et al. 2016 Serbia [38]	Non- Heating	Multi schools	4	4	PUF Quartz filter (TSP) 1 week on continuous 38 L/min flow rate at 386 m^3 total	Air	N/A	N/A	0.11 - 0.78
Benzoapyrene	Romagnoli et al. 2014 Italy [70]	Winter 2011-20012	Multi schools	6	18	Quartz filter 24 hours 6-10 L/min flow rate	$PM_{2.5}$	0.71	1.6	1.2
Benzoapyrene	Krugly et al. 2014 Lituania [66]	2011-2012	Elementary	5	25	25 mm quartz filter (pore size 1.6 µm) 8 hours 10 L/min flow rate at 0,48m^3 – 14 m^3 total	$PM_{2.5}$	N/A	8.4	N/A
Benzobfluoranthene	Liaud et al. 2021 France [65]	April - May 2014	High school	1	36	Three-stages cascade impactors HPLC/PAD/fluorescence 3-4 days 119 - 181.3 m^3	PM $_1$	N/A	N/A	0.0339
							PM $_{2.5}$	N/A	N/A	0.0378
							PM $_{10}$	N/A	N/A	0.0385
Chrysene	Liaud et al. 2021 France [65]	April - May 2014	High school	1	36	Three-stages cascade impactors HPLC/PAD/fluorescence 3-4 days 119 - 181.3 m^3	PM $_1$	N/A	N/A	0.0097
							PM $_{2.5}$	N/A	N/A	0.0114
							PM $_{10}$	N/A	N/A	0.0126
Dibenzo[a,h]anthracene	Liaud et al. 2021 France [65]	April - May 2014	High school	1	36	Three-stages cascade impactors HPLC/PAD/fluorescence 3-4 days 119 - 181.3 m^3	PM $_1$	N/A	N/A	0.0142
							PM $_{2.5}$	N/A	N/A	0.0156
							PM $_{10}$	N/A	N/A	0.016

PAH ng/m^3	Reference Location	Measurement period	Type of schools	Number of buildings	Number of samples	Measurement protocol	Concentration (ng/m^3)			
							Phase	Min	Max	AM
Fluoranthene	Oliveira et al. Paranhos, 2017 [55] Portugal	May - June 2015	Kindergarten	1	88	75 mm pre-cleaned PUF plugs 24 hours 38.3 L/min flow rate at 55 m^3 total	Air	0.04	2.9	N/A
Fluoranthene	Oliveira et al. 2016 [36] Chaves, Portugal	May - June 2015	Kindergarten	1	64	75 mm pre-cleaned PUF plugs 24 hours 38.3 L/min at 55 m^3 total	Air	2.3	3.3	N/A
Fluoranthene	Oliveira et al. 2016 [36] Oporto, Portugal	January-April 2014	Primary school	10	60	47 mm PTFE filter 24 hours 38.3 L/min at 300m^3 total	PM $_{2.5}$	0.06	7.5	0.008 - 6.1
Fluoranthene	Živković et al. 2016 Serbia [38]	Heating	Multi schools	4	4	PUF Quartz filter (TSP) 1 week on continuous 38 L/min flow rate at 386 m^3 total	Air	N/A	N/A	4.47 - 23.39
Fluoranthene	Živković et al. 2016 Serbia [38]	Non- Heating	Multi schools	4	4	PUF Quartz filter (TSP) 1 week on continuous 38 L/min flow rate at 386 m^3 total	Air	N/A	N/A	1.77 - 44.91
Fluoranthene	Raffy et al. 2017 France [69]	2010	Multi schools	30	62	76 mm PUF Quartz filter (TPS) 4.5 days 2.L/min flow rate at 20 m^3 total	Air	N/A	N/A	N/A
Fluoranthene	Liaud et al. 2021 France [65]	April - May 2014	High school	1	36	Three-stages cascade impactors HPLC/PAD/fluorescence 3-4 days 119 - 181.3 m^3	PM $_{1}$	N/A	N/A	0.0234
							PM $_{2.5}$	N/A	N/A	0.0324
							PM $_{10}$	N/A	N/A	0.0371
Fluorene	Oliveira et al. Paranhos, 2017 [55] Portugal	May - June 2015	Kindergarten	1	88	75 mm pre-cleaned PUF plugs 24 hours 38.3 L/min flow rate at 55 m^3 total	Air	3.7	23	N/A
Fluorene	Oliveira et al. 2016 [36] Chaves, Portugal	May - June 2015	Kindergarten	1	64	75 mm pre-cleaned PUF plugs 24 hours 38.3 L/min at 55 m^3 total	Air	5.1	14.3	N/A
Fluorene	Oliveira et al. 2016 [36] Oporto, Portugal	January-April 2014	Primary school	10	60	47 mm PTFE filter 24 hours 38.3 L/min at 300m^3 total	PM $_{2.5}$	0.003	0.1	0.006 - 0.08
Fluorene	Živković et al. 2016 Serbia [38]	Heating	Multi schools	4	4	PUF Quartz filter (TSP) 1 week on continuous	Air	N/A	N/A	11.00 - 55.31

PAH ng/m^3	Reference Location	Measurement period	Type of schools	Number of buildings	Number of samples	Measurement protocol	Concentration (ng/m^3)			
							Phase	Min	Max	AM
						38 L/min flow rate at 386 m^3 total				
Fluorene	Živković et al. 2016 Serbia [38]	Non- Heating	Multi schools	4	4	PUF Quartz filter (TSP) 1 week on continuous 38 L/min flow rate at 386 m^3 total	Air	N/A	N/A	9.50 - 35.23
Fluorene	Raffy et al. 2017 France [69]	2010	Multi schools	30	62	76 mm PUF Quartz filter (TPS) 4.5 days 2.L/min flow rate at 20 m^3 total	Air	N/A	N/A	N/A
Fluorene	Liaud et al. 2021 France [65]	April - May 2014	High school	1	36	Three-stages cascade impactors HPLC/PAD/fluorescence 3-4 days 119 - 181.3 m^3	PM $_1$	N/A	N/A	0.0046
							PM $_{2.5}$	N/A	N/A	0.0124
							PM $_{10}$	N/A	N/A	0.0175
Indeno[1,2,3-c,d]pyrene	Liaud et al. 2021 France [65]	April - May 2014	High school	1	36	Three-stages cascade impactors HPLC/PAD/fluorescence 3-4 days 119 - 181.3 m^3	PM $_1$	N/A	N/A	0.0511
							PM $_{2.5}$	N/A	N/A	0.0552
							PM $_{10}$	N/A	N/A	0.0554
PAHs	Jovanovic et al. 2014 Serbia [27]	April 2012	Primary school	1	5	Quartz filter 192 hours Average on 24 h, at a flow rate of 1.0 - 2.3 m^3/h	PM_{10}	10190	198730	61660
Phenanthrene	Oliveira et al. Paranhos, 2017 [55] Portugal	May - June 2015	Kindergarten	1	88	75 mm pre-cleaned PUF plugs 24 hours 38.3 L/min flow rate at 55 m^3 total	Air	6.1	56.1	N/A
Phenanthrene	Oliveira et al. 2016 [36] Chaves, Portugal	May - June 2015	Kindergarten	1	64	75 mm pre-cleaned PUF plugs 24 hours 38.3 L/min at 55 m^3 total	Air	25.7	35.3	N/A
Phenanthrene	Oliveira et al. 2016 [36] Oporto, Portugal	January-April 2014	Primary school	10	60	47 mm PTFE filter 24 hours 38.3 L/min at 300m^3 total	$PM_{2.5}$	0.08	1	0.09 - 0.9
Phenanthrene	Živković et al. 2016 Serbia [38]	Heating	Multi schools	4	4	PUF Quartz filter (TSP) 1 week on continuous 38 L/min flow rate at 386 m^3 total	Air	N/A	N/A	18.71 - 95.52

PAH ng/m^3	Reference Location	Measurement period	Type of schools	Number of buildings	Number of samples	Measurement protocol	Concentration (ng/m^3)			
							Phase	Min	Max	AM
Phenanthrene	Živković et al. 2016 Serbia [38]	Non- Heating	Multi schools	4	4	PUF Quartz filter (TSP) 1 week on continuous 38 L/min flow rate at 386 m^3 total	Air	N/A	N/A	13.98 - 118.71
Phenanthrene	Raffy et al. 2017 France [69]	2010	Multi schools	30	62	76 mm PUF Quartz filter (TPS) 4.5 days 2.L/min flow rate at 20 m^3 total	Air	N/A	N/A	N/A
Phenanthrene	Krugly et al. 2014 Lituania [66]	2011-2012	Elementary	5	25	25 mm quartz filter (pore size 1.6 µm) 8 hours 10 L/min flow rate at 0,48m^3 – 14 m^3 total	$PM_{2.5}$	N/A	115	N/A
Phenanthrene	Liaud et al. 2021 France [65]	April - May 2014	High school	1	36	Three-stages cascade impactors HPLC/PAD/fluorescence 3-4 days 119 - 181.3 m^3	PM_{1}	N/A	N/A	0.0294
							$PM_{2.5}$	N/A	N/A	0.0638
							PM_{10}	N/A	N/A	0.0817
Pyrene	Oliveira et al. Paranhos, 2017 [55] Portugal	May - June 2015	Kindergarten	1	88	75 mm pre-cleaned PUF plugs 24 hours 38.3 L/min flow rate at 55 m^3 total	Air	0.05	3.7	N/A
Pyrene	Oliveira et al. 2016 [36] Chaves, Portugal	May - June 2015	Kindergarten	1	64	75 mm pre-cleaned PUF plugs 24 hours 38.3 L/min at 55 m^3 total	Air	0.09	2.1	N/A
Pyrene	Oliveira et al. 2016 [36] Oporto, Portugal	January-April 2014	Primary school	10	60	47 mm PTFE filter 24 hours 38.3 L/min at 300m^3 total	$PM_{2.5}$	0.05	1.7	0.05 - 1,4
Pyrene	Živković et al. 2016 Serbia [38]	Heating	Multi schools	4	4	PUF Quartz filter (TSP) 1 week on continuous 38 L/min flow rate at 386 m^3 total	Air	N/A	N/A	4.06 - 22.19
Pyrene	Živković et al. 2016 Serbia [38]	Non- Heating	Multi schools	4	4	PUF Quartz filter (TSP) 1 week on continuous 38 L/min flow rate at 386 m^3 total	Air	N/A	N/A	1.33 - 20.12
Pyrene	Raffy et al. 2017 France [69]	2010	Multi schools	30	62	76 mm PUF Quartz filter (TPS) 4.5 days	Air	N/A	N/A	N/A

PAH ng/m^3	Reference Location	Measurement period	Type of schools	Number of buildings	Number of samples	Measurement protocol	Concentration (ng/m^3)			
							Phase	Min	Max	AM
						2.L/min flow rate at 20 m^3 total				
Pyrene	Liaud et al. 2021 France [65]	April - May 2014	High school	1	36	Three-stages cascade impactors HPLC/PAD/fluorescence 3-4 days 119 - 181.3 m^3	PM $_1$	N/A	N/A	0.018
							PM $_{2.5}$	N/A	N/A	0.0243
							PM $_{10}$	N/A	N/A	0.0269

Table S16: Measurements of phthalates and musks (SVOCs) in schools across Europe and North America since 2010

Phthalates and musks	References Location	Measurement period	Type of schools	N° of schools	N° of samples	Measurements protocol	Phase	Results (ng/m^3)					
								Min	P25	P50	P75	Max	AM
BBP	Raffy et al. 2017 France [69]	2010	Mixed	30	62	Φ 76 mm polyurethane foam, with 4.5 days air pump at 2.1 L/min	Air	N/A	N/A	19	N/A	N/A	N/A
DBP	Raffy et al. 2017 France [69]	2010	Mixed	30	62	Φ 76 mm polyurethane foam, with 4.5 days air pump at 2.1 L/min	Air	N/A	N/A	228	N/A	N/A	N/A
DEHP	Raffy et al. 2017 France [69]	2010	Mixed	30	62	Φ 76 mm polyurethane foam, with 4.5 days air pump at 2.1 L/min	Air	N/A	N/A	108	N/A	N/A	N/A
DEP	Raffy et al. 2017 France [69]	2010	Mixed	30	62	Φ 76 mm polyurethane foam, with 4.5 days air pump at 2.1 L/min	Air	N/A	N/A	221	N/A	N/A	N/A
DIBP	Raffy et al. 2017 France [69]	2010	Mixed	30	62	Φ 76 mm polyurethane foam, with 4.5 days air pump at 2.1 L/min	Air	N/A	N/A	>800	N/A	N/A	N/A
DINP	Raffy et al. 2017 France [69]	2010	Mixed	30	62	Φ 76 mm polyurethane foam, with 4.5 days air pump at 2.1 L/min	Air	N/A	N/A	35	N/A	N/A	N/A
Galaxolide	Raffy et al. 2017 France [69]	2010	Mixed	30	62	Φ 76 mm polyurethane foam, with 4.5 days air pump at 2.1 L/min	Air	N/A	N/A	>50	N/A	N/A	N/A
Tonalide	Raffy et al. 2017 France [69]	2010	Mixed	30	62	Φ 76 mm polyurethane foam, with 4.5 days air pump at 2.1 L/min	Air	N/A	N/A	20	N/A	N/A	N/A
BBP	Larsson et al. 2017 Sweden [71]	February - April 2015 September – November 2015	Kindergarten	100	100	Cellulose filter fixed in styrene acrylonitrile container, mounted on a vacuum cleaner, Dust collected from surface 50- 250 cm above the floor	Settled dust	0,01	N/A	8,7	110	240	24
BBP	Raffy et al. 2017 France [69]	2010	Mixed	30	22	Φ 76 mm polyurethane foam, with 4.5 days air pump at 2.1 L/min	Settled dust	N/A	N/A	105	468	N/A	N/A

Phthalates and musks	References Location	Measurement period	Type of schools	N° of schools	N° of samples	Measurements protocol	Phase	Results (ng/m^3)					
								Min	P25	P50	P75	Max	AM
DBP	Larsson et al. 2017 Sweden [71]	February - April 2015 September – November 2015	Kindergarten	100	100	Cellulose filter fixed in styrene acrylonitrile container, mounted on a vacuum cleaner, Dust collected from surface 50- 250 cm above the floor	Settled dust	1,2	N/A	21	140	21 000	250
DBP	Raffy et al. 2017 France [69]	2010	Mixed	30	89	Φ 76 mm polyurethane foam, with 4.5 days air pump at 2.1 L/min	Settled dust	N/A	N/A	38,2	N/A	N/A	N/A
DEHP	Larsson et al. 2017 Sweden [71]	February - April 2015 September – November 2015	Kindergarten	100	99	Cellulose filter fixed in styrene acrylonitrile container, mounted on a vacuum cleaner, Dust collected from surface 50- 250 cm above the floor	Settled dust	<0,27	N/A	290	1900	4500	470
DEHP	Raffy et al. 2017 France [69]	2010	Mixed	30	28	Φ 76 mm polyurethane foam, with 4.5 days air pump at 2.1 L/min	Settled dust	N/A	N/A	1430	5830	N/A	N/A
DEP	Larsson et al. 2017 Sweden [71]	February - April 2015 September – November 2015	Kindergarten	100	100	Cellulose filter fixed in styrene acrylonitrile container, mounted on a vacuum cleaner, Dust collected from surface 50- 250 cm above the floor	Settled dust	N/A	<0,02	0,46	130	390	15
DEP	Raffy et al. 2017 France [69]	2010	Mixed	30	76	Φ 76 mm polyurethane foam, with 4.5 days air pump at 2.1 L/min	Settled dust	N/A	N/A	2,9	6,6	N/A	N/A
DIBP	Larsson et al. 2017 Sweden [71]	February - April 2015 September – November 2015	Kindergarten	100	100	Cellulose filter fixed in styrene acrylonitrile container, mounted on a vacuum cleaner, Dust collected from	Settled dust	1	N/A	6,4	46	130	12

Phthalates and musks	References Location	Measurement period	Type of schools	N° of schools	N° of samples	Measurements protocol	Phase	Results (ng/m^3)					
								Min	P25	P50	P75	Max	AM
						surface 50- 250 cm above the floor							
DINP	Larsson et al. 2017 Sweden [71]	February - April 2015 September – November 2015	Kindergarten	100	100	Cellulose filter fixed in styrene acrylonitrile container, mounted on a vacuum cleaner, Dust collected from surface 50- 250 cm above the floor	Settled dust	58	N/A	380	3400	66 000	1400
DINP	Raffy et al. 2017 France [69]	2010	Mixed	30	32	Φ 76 mm polyurethane foam, with 4.5 days air pump at 2.1 L/min	Settled dust	N/A	N/A	1030	4100	N/A	N/A
Galaxolide	Raffy et al. 2017 France [69]	2010	Mixed	30	89	Φ 76 mm polyurethane foam, with 4.5 days air pump at 2.1 L/min	Settled dust	N/A	N/A	0,965	2,2	N/A	N/A
Tonalide	Raffy et al. 2017 France [69]	2010	Mixed	30	89	Φ 76 mm polyurethane foam, with 4.5 days air pump at 2.1 L/min	Settled dust	N/A	N/A	0,337	0,9	N/A	N/A

Table S17: Measurements of NO_2 in schools across Europe and North America since 2010

References Location	Type of school	Period of measurement	N° of building	N° of measured point	Measurement protocol	Concentration (µg/m³)				
						Min	Max	Mean	Median	SD
Villanueva et al. 2018 Spain [61]	Kindergarten (Urban)	February - April 2013	3	6	Passive sampler, 1 week on continuous	8.1	24.9	4.9	4.32	2.5
Villanueva et al. 2018 Spain [61]	Elementary (Urban)	February - April 2013	3	6	Passive sampler, 1 week on continuous	1.4	29.3	8.9	5.16	10.5
Villanueva et al. 2018 Spain [61]	Kindergarten, Elementary (Rural)	February - April 2013	3	6	Passive sampler, 1 week on continuous	11.5	25.2	19.9	20.8	5.6
Villanueva et al. 2018 Spain [61]	Elementary (Rural)	February - April 2013	3	6	Passive sampler, 1 week on continuous	7.5	23.1	15.2	15.1	5.3
Villanueva et al. 2018 Spain [61]	Kindergarten (Industrial)	February - April 2013	3	6	Passive sampler, 1 week on continuous	5.4	20.6	12.4	12.7	5.1
Villanueva et al. 2018 Spain [61]	Elementary (Industrial)	February - April 2013	3	6	Passive sampler, 1 week on continuous	9.8	15.8	13.4	14.0	2.5
Jovanović et al. Serbia [27]	Elementary school	April -2012	1	3	Passive sampler, 8 days on continuous	7,53	22,45	15,02	N/A	7,5
Gaffin et al. 2018 USA [72]	Mixed	2008-2013	37	218	Passive sampler, 1 week on continuous	4.3 ppb	29.7 ppb	11.1 ppb	10.4 ppb	N/A
Rivas et al. 2014 Spain [63]	Mixed	2012 - 2013	39	39	Passive dosimeter, 4 days on continuous	5,1	69	30	30	12
Csobod et al. 2014 Europe [35]	Elementary school	2012	114	300	Passive sampler, 5 days on continuous	<DL	88	14	11	9

References Location	Type of school	Period of measurement	N° of building	N° of measured point	Measurement protocol	Concentration (µg/m^3)				
						Min	Max	Mean	Median	SD
Csobod et al. 2014 Europe [35]	Kindergarten	2012	114	114	Passive sampler, 5 days on continuous	1	60	14	12	8
Annesi-Maesano et al. France [73]	Elementary school	N/A	108	401	Passive sampler, 5 days on continuous	N/A	N/A	28	29	15.54
Stamp et al. 2020 UK [33]	Secondary school	Heating and non-heating season, 2017	18	18	Passive sampler, 14 days on continuous	11.3	42.9	22.1	20.4	N/A
Verriele et al. 2016 France [30]	Mixed	2009 to 2013	10	10	Passive sampler, 4.5 days on continuous	N/A	N/A	15.3	18	N/A
Papadopoulos et al. 2020 Greece [5]	University	December	1	6	Portable Air Quality Monitor, 30 mins on continuous	N/A	N/A	80	N/A	20
Nunes et al. 2016 Portugal [56]	Nurseries	April - June 2014	4 schools, 8 classrooms	12	Electrochemical detection, 24h on continuous	0.00-98.58	34.46 – 146.27	16.67 – 125.57	17.07 – 127.74	7.32 – 44.76
Sivanantham et al. 2021 France [54]	Kindergarten and elementary	2013 – 2017	300 schools	67068	Passive diffusive sampler (Triethylamine tube) 5 days on continuous	N/A	N/A	8.4	N/A	0.8

Table S18: Measurements of radon in schools across Europe and North America since 2010

References Location	Type of school	Measurement period	N° of schools	N° of points	Measurement protocol	Radon concentration Bq/m^3			
						Min	Max	AM	Median
A.Azara et al., 2018 Italy [74]	Mixed	March - July 2010	16	28	Radon detector monitor each 60 min, 24 time a day, 72h on continuous	N/A	1147	N/A	92
M.A.Istrate et al., 2016 Romania [31]	High school	July - August 2015	1	4	Radon semiconductor detector, high voltage collection, 595 hours on continuous	N/A	N/A	Classroom 1: 320 Classroom 2: 40	N/A
Csobod et al., 2014 Europe [35]	Elementary school	November - January 2012 and April -June 2012	114	300	Track count on exposed film	N/A	9190	205	101
Csobod et al., 2014 Europe [35]	Kindergarten	November - January 2012 and April -June 2012	114	25	Track count on exposed film	32	9850	579	68
K. Ivanova et al., 2021 Bulgaria [75]	Elementary school	September 2018 - April 2019	14	16	RSKS type nuclear track detectors	24	995	169	68 ± 2.3
K. Ivanova et al., 2021 Bulgaria [75]	Elementary school	September 2018 - April 2019	14	16	RSKS type nuclear track detectors	42	278	95	88 ± 1.5
K. Ivanova et al., 2021 Bulgaria [75]	Elementary school	September 2018 - April 2019	14	16	RSKS type nuclear track detectors	27	211	774	58 ± 1.7
K. Ivanova et al., 2021 Bulgaria [75]	Elementary school	September 2018 - April 2019	14	16	RSKS type nuclear track detectors	224	984	481	471 ± 1.6
K. Ivanova et al., 2021 Bulgaria [75]	Elementary school	September 2018 - April 2019	14	16	RSKS type nuclear track detectors	102	995	326	253 ± 1.8
Z.Curguz et al., 2020 Bosnia and Herzegovina [76]	Mixed	N/A	50	100	CR-39 detectors, 1 year on continuous	89	4244	341	210
Z.Curguz et al., 2020	Mixed	N/A	50	41	CR-39 detectors, 1 year on continuous	75	655	165	150

References Location	Type of school	Measurement period	N° of schools	N° of points	Measurement protocol	Radon concentration Bq/m^3			
						Min	Max	AM	Median
Bosnia and Herzegovina [76]									
K.Kojo et al., 2019 Finland [77]	Daycare centers	November - 2014	482	482	Radon detector, 60 days on continuous measuring	N/A	2426	86	40
K.Kojo et al., 2019 Finland [77]	Mixed	November - 2014	1176	1176	Radon detector, 60 days on continuous measuring	N/A	4205	82	41
P.Dhoqina et al. 2020 Albania [78]	Mixed	February - May 2014	30	37	Solid state nuclear track detectors, 3 months exposure	31	633	133	114 ± 113
M.Müllerova et al., 2017 Hungary [79]	Daycare centers	October 2015 - March 2016	5	23	RSKS type detectors	64	524	233	238 ± 144
M.Müllerova et al., 2017 Hungary [79]	Daycare centers	October 2015 - March 2016	8	23	TERA system detector semi-conductor, 13 days exposure	31	200	90	73 ± 49
M.Müllerova et al., 2017 Hungary [79]	Daycare centers	October 2015 - March 2016	7	21	Radon reference monitor, 8 days exposure	67	1167	317	195 ± 346
A.Onishchenko et al., 2017 Russia [80]	Kindergarten	2013 - 2016	180	560	LR-115 nuclear track detectors during 2-3 months	N/A	620	59,1	46 ± 2.1
Madureira et al., 2016 Portugal [34]	Elementary school	November - March, 2011 - 2012	13	45	CR-39 detectors, 2 weeks on continuous	56	889	197	154
Branco et al., 2016 Portugal [81]	Daycare centers Kindergarten Elementary school	October - April	7	2429	Radim 5B radon monitor, from 2 to 9 days continuous in daycare centers, or for at least 24h in elementary school	N/A	459	62	N/A
Branco et al., 2016 Portugal [81]	Daycare centers Kindergarten Elementary school	October - April	8	1342	Radim 5B radon monitor, from 2 to 9 days continuous in daycare centers, or for at least 24h in elementary school	N/A	888	193	N/A

References Location	Type of school	Measurement period	N° of schools	N° of points	Measurement protocol	Radon concentration Bq/m^3			
						Min	Max	AM	Median
D.Franci et al., 2014 Italy [82]	Mixed	January 2012 - January 2013	22	102	Polyallyl diglycol carbonate PADC passive detectors, 48h on continuous	17	918	154	111
K.Ivanova et al., 2014 Bulgaria [83]	Kindergarten	February - April 2013	296	922	CR-39 detectors, 3 months on continuous	9	1415	132	98
R.Trevisi et al., 2012 Italy [84]	Mixed	2010	438	N/A	CR-39 detectors, 2 time of 6 months on continuous	2090	1608	214	157
P.Poulin et al., 2012 Canada [85]	Elementary school	2010	65	585	CR-39 detectors, 3 months on continuous	15	663	56	N/A

Table S19: Measurements of illuminance (Lux) in schools in Europe and North America since 2010

Illuminance	References Location	Period (years)	Type of school	Number of schools	Number of total samples	Shading system	Measurement protocol	Illuminance (lux)		
								Min	Max	AM ± SD
Artificial	Buratti et al. 2018 Italy [10]	Spring, Autumn 2015	University	1	7	Open	Mavolux 5032 lux meter Range: 0.1 lux–199.900 lux f1 = 3% = V(Lambda) (DIN 13032-1) Class C 7 campaigns (4 in Spring, 3 in Autumn) 4 to 9 points per classroom	74	453	251 ± 115
Artificial	Loreti et al. 2016 Italy [39]	N/A	Secondary	1	5	N/A	Thermal microclimate HD32.1	231	627	435 ± 166
Artificial + natural	Vilcekova et al. 2017 Slovakia [15]	2016	Elementary	1	5	Open	Testo 435-4 multifunctional measuring device – Lux probe	53	413	N/A

Illuminance	References Location	Period (years)	Type of school	Number of schools	Number of total samples	Shading system	Measurement protocol	Illuminance (lux)		
								Min	Max	AM ± SD
							Range: 0 to 100,000 lx f1 = 6% = V(Lambda) (DIN 13032-1) Class C			
Artificial + natural	De Giuli et al. 2012 Italy [22]	May 2010	Elementary	1	2	Open	Minolta CL200 Lux meter Range: 0.01 to 299,000 lx f1 < 6% = V(Lambda) (DIN 13032-1) Class AA Measurements on desks Half-lights switch on Sunny conditions	366	2600	1255 ± 895
Artificial + natural	De Giuli et al. 2012 Italy [22]	May 2010	Elementary	5	12	Open	Minolta CL20 Lux meter Range: 0.01 to 299,000 lx f1 < 6% = V(Lambda) (DIN 13032-1) Class AA Measurements on desks Lights switch off Sunny conditions	47	4300	911 ± 459

Illuminance	References Location	Period (years)	Type of school	Number of schools	Number of total samples	Shading system	Measurement protocol	Illuminance (lux)		
								Min	Max	AM ± SD
Artificial + natural	De Giuli et al. 2012 Italy [22]	May 2010	Elementary	2	4	Open	Minolta CL20 Lux meter Range: 0.01 to 299,000 lx f1 < 6% = V(Lambda) (DIN 13032-1) Class AA Measurements on desks Lights switch on Sunny conditions	140	1700	454 ± 289
Artificial + natural	De Giuli et al. 2012 Italy [22]	May 2010	Elementary	3	5	Half-open	Minolta CL20 Lux meter Range: 0.01 to 299,000 lx f1 < 6% = V(Lambda) (DIN 13032-1) Class AA Measurements on desks Lights switch on Sunny conditions	210	2170	498 ± 243
Artificial + natural	De Giuli et al. 2012 Italy [22]	May 2010	Elementary	2	2	Half-open	Minolta CL20 Lux meter Range: 0.01 to 299,000 lx f1 < 6% = V(Lambda) (DIN 13032-1) Class AA Measurements on desks Lights switch off Sunny conditions	81	1500	351 ± 226

Illuminance	References Location	Period (years)	Type of school	Number of schools	Number of total samples	Shading system	Measurement protocol	Illuminance (lux)		
								Min	Max	AM ± SD
Artificial + natural	De Giuli et al. 2012 Italy [22]	May 2010	Elementary	1	1	Close	Minolta CL20 Lux meter Range: 0.01 to 299,000 lx f1 < 6% = V(Lambda) (DIN 13032-1) Class AA Measurements on desks Lights switch half-on Sunny conditions	440	820	637 ± 126
Artificial + natural	De Giuli et al. 2012 Italy [22]	May 2010	Elementary	1	1	Half - Open	Minolta CL20 Lux meter Range :0.01 to 299,000 lx f1 < 6% = V(Lambda) (DIN 13032-1) Class AA Measurements on desks Lights switch half-on Sunny conditions	150	390	473 ± 100
Artificial + natural	De Giuli et al. 2012 Italy [22]	May 2010	Elementary	1	1	Close	Minolta CL20 Lux meter Range: 0.01 to 299,000 lx f1 < 6% = V(Lambda) (DIN 13032-1) Class AA Measurements on desks Lights switch half-on Sunny conditions	140	460	303 ± 79

Illuminance	References Location	Period (years)	Type of school	Number of schools	Number of total samples	Shading system	Measurement protocol	Illuminance (lux)		
								Min	Max	AM ± SD
Artificial + natural	De Giuli et al. 2014 Italy [19]	March 2012	Elementary	1	4	2 Close 2 Half-Open	Measurements on desks	Minimum illuminance < 300 lux		
Artificial + natural	De Giuli et al. 2014 Italy [19]	April 2012	Elementary	1	4	1 Open 3 Half-Open	Measurements on desks	Mean illuminance > 300 lux.		
Artificial + natural	De Giuli et al. 2014 Italy [19]	May 2012	Elementary	1	4	4 Half - Open	Measurements on desks	Minimum illuminance < 300 lux		
Artificial + natural	De Giuli et al. 2014 Italy [19]	June 2012	Elementary	1	4	1 Open 3 Half-Open	Measurements on desks	Minimum illuminance < 300 lux recommendations.		
Artificial + natural	De Giuli et al. 2015 Italy [17]	February 2011	Elementary	3	8	4 Open 4 Half-Open	Minolta CL20 Lux meter Range: 0.01 to 299,000 lx f1 < 6% = V(Lambda) (DIN 13032-1) Class AA Measurements on desks	95	1940	546 ± 303
Artificial + natural	De Giuli et al. 2015 Italy [17]	April 2011	Elementary	3	8	3 Close 2 Half-Open 3 Open	Minolta CL20 Lux meter Range: 0.01 to 299,000 lx f1 < 6% = V(Lambda) (DIN 13032-1) Class AA Measurements on desks	48	2000	542 ± 318

Illuminance	References Location	Period (years)	Type of school	Number of schools	Number of total samples	Shading system	Measurement protocol	Illuminance (lux)		
								Min	Max	AM ± SD
Artificial + natural	De Giuli et al. 2015 Italy [17]	June 2011	Elementary	3	8	7 Open 1 Half-Open	Minolta CL20 Lux meter Range:0.01 to 299,000 lx f1 < 6% = V(Lambda) (DIN 13032-1) Class AA Measurements on desks	197	2011	631 ± 328
Total	Rucinska et al. 2020 Poland [86]	2018 - 2019	University	1	319	Open	Testo 545 illuminance meter Range: 0 to 100,000 lx f1 = 6% = V(Lambda) (DIN 13032-1) Class C Several days at different hours Sunny conditions	189	38757	8206 ± 9114
Total	Rucinska et al. 2020 Poland [86]	2018 - 2019	University	1	319	Open	Testo 545 illuminance meter Range:0 to 100,000 lx f1 = 6% = V(Lambda) (DIN 13032-1) Class C Cloudy conditions	27	616	169 ± 132
Artificial	Harcarova et al. 2020, Slovakia [3]	2020	Elementary	1	2	N/A	Testo 545 illuminance meter at 1.1 meters	N/A	N/A	364 1122
Total	Laborda et al. 2020, Spain [2]	2018	Secondary High school	8	282	N/A	PCE-134 lux-meter	N/A	N/A	Range: 461 – 560 with a SD of 222 Lighting uniformity: 0.48

Illuminance	References Location	Period (years)	Type of school	Number of schools	Number of total samples	Shading system	Measurement protocol	Illuminance (lux)		
								Min	Max	AM ± SD
Total	Leccese et al. 2020, Italy [87]	2020	University	1	1	Yes/no	Illuminance meter RadioLux 1111 PRC Krochmann	N/A	N/A	847
Daylight	Baloch et al. 2021, Europe [88]	2011-2012	Elementary	115	319	Yes/no	N/A	N/A	N/A	N/A

2 Figures

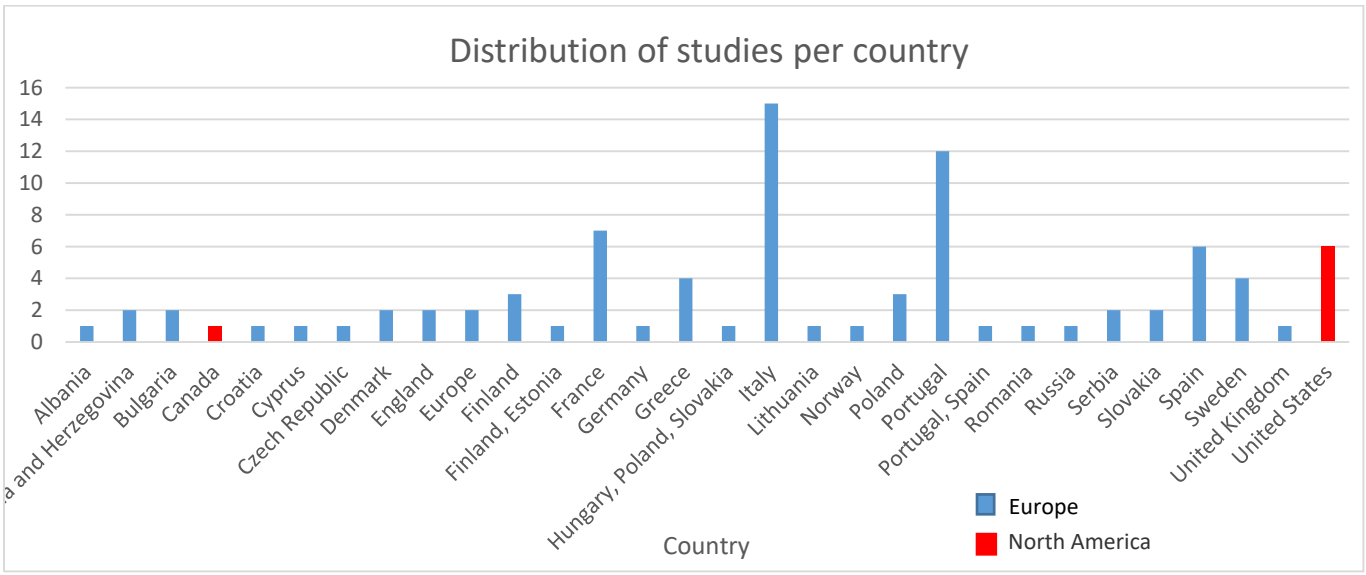

Figure S1: Distribution of studies per country (n=88)

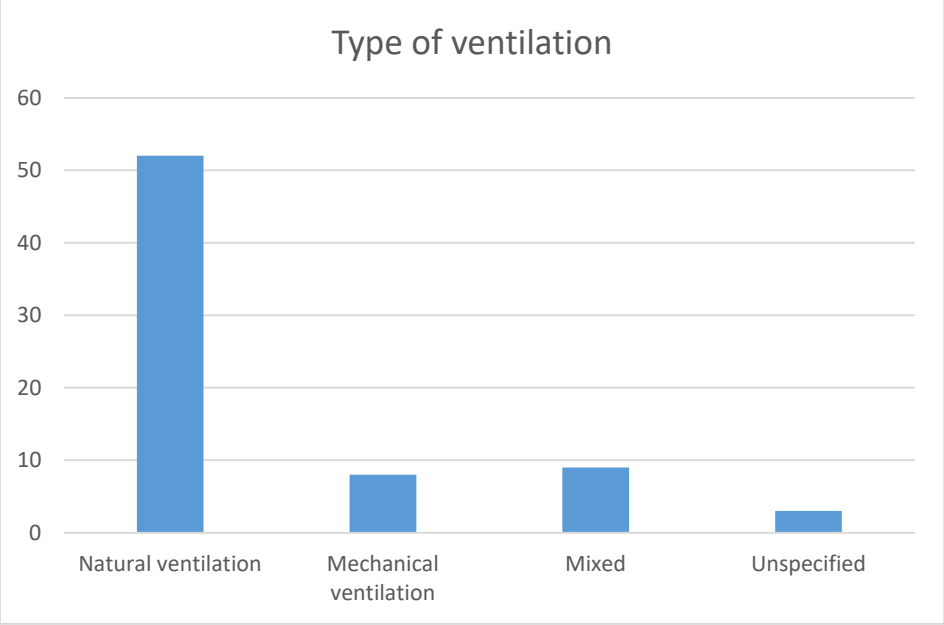

Figure S2: Types of ventilation in reviewed studies

3 References

1. Aguilar, A.J.; de la Hoz-Torres, M.L.; Martínez-Aires, M.D.; Ruiz, D.P. Thermal Perception in Naturally Ventilated University Buildings in Spain during the Cold Season. *Buildings* **2022**, *12*, doi:10.3390/buildings12070890.
2. Campano-Laborda, M.Á.; Domínguez-Amarillo, S.; Fernández-Agüera, J.; Acosta, I.

Indoor Comfort and Symptomatology in Non-University Educational Buildings: Occupants' Perception. *Atmosphere (Basel).* **2020**, *11*, doi:10.3390/atmos11040357.
3. Harčárová, K. Indoor Air Quality in Classrooms of a Newly Built School. *IOP Conf. Ser. Mater. Sci. Eng.* **2020**, *867*, doi:10.1088/1757-899X/867/1/012008.
4. Langer, S.; Ekberg, L.; Teli, D.; Cabovska, B.; Bekö, G.; Wargocki, P. Study of the Measured and Perceived Indoor Air Quality in Swedish School Classrooms. *IOP Conf. Ser. Earth Environ. Sci.* **2020**, *588*, doi:10.1088/1755-1315/588/3/032070.
5. Papadopoulos, G.; Panaras, G.; Tolis, E. Thermal Comfort and Indoor Air Quality Assessment in University Classrooms. *IOP Conf. Ser. Earth Environ. Sci.* **2020**, *410*, doi:10.1088/1755-1315/410/1/012095.
6. Ahmed, K.; Kuusk, K.; Heininen, H.; Arumägi, E.; Kalamees, T.; Hasu, T.; Lolli, N.; Kurnitski, J. Indoor Climate and Energy Performance in Nearly Zero Energy Day Care Centers and School Buildings. *E3S Web Conf.* **2019**, *111*, doi:10.1051/e3sconf/201911102003.
7. Brdarić, D.; Capak, K.; Gvozdić, V.; Barišin, A.; Jelinić, J.D.; Egorov, A.; Šapina, M.; Kalambura, S.; Kramarić, K. Indoor Carbon Dioxide Concentrations in Croatian Elementary School Classrooms during the Heating Season. *Arh. Hig. Rada Toksikol.* **2019**, *70*, 296–302, doi:10.2478/aiht-2019-70-3343.
8. Papazoglou, E.; Moustris, K.P.; Nikas, K.S.P.; Nastos, P.T.; Statharas, J.C. Assessment of Human Thermal Comfort Perception in a Non-Air-Conditioned School Building in Athens, Greece. *Energy Procedia* **2019**, *157*, 1343–1352, doi:10.1016/j.egypro.2018.11.299.
9. Simanic, B.; Nordquist, B.; Bagge, H.; Johansson, D. Indoor Air Temperatures, CO2 Concentrations and Ventilation Rates: Long-Term Measurements in Newly Built Low-Energy Schools in Sweden. *J. Build. Eng.* **2019**, *25*, 100827, doi:10.1016/j.jobe.2019.100827.
10. Buratti, C.; Belloni, E.; Merli, F.; Ricciardi, P. A New Index Combining Thermal, Acoustic, and Visual Comfort of Moderate Environments in Temperate Climates. *Build. Environ.* **2018**, *139*, 27–37, doi:10.1016/j.buildenv.2018.04.038.
11. Vornanen-Winqvist, C.; Järvi, K.; Andersson, M.A.; Duchaine, C.; Létourneau, V.; Kedves, O.; Kredics, L.; Mikkola, R.; Kurnitski, J.; Salonen, H. Exposure to Indoor Air Contaminants in School Buildings with and without Reported Indoor Air Quality Problems. *Environ. Int.* **2020**, *141*, doi:10.1016/j.envint.2020.105781.
12. Vornanen-Winqvist, C.; Salonen, H.; Järvi, K.; Andersson, M.A.; Mikkola, R.; Marik, T.; Kredics, L.; Kurnitski, J. Effects of Ventilation Improvement on Measured and Perceived Indoor Air Quality in a School Building with a Hybrid Ventilation System. *Int. J. Environ. Res. Public Health* **2018**, *15*, doi:10.3390/ijerph15071414.
13. Zečević, N.; Husika, A.; Džaferović, E. Impact of Energy Efficiency Measures on Indoor Air Quality in Building of Mechanical Engineering Faculty Sarajevo. *Ann. DAAAM Proc. Int. DAAAM Symp.* **2018**, *29*, 0197–0201, doi:10.2507/29th.daaam.proceedings.028.
14. Irulegi, O.; Serra, A.; Hernández, R. Data on Records of Indoor Temperature and Relative Humidity in a University Building. *Data Br.* **2017**, *13*, 248–252, doi:10.1016/j.dib.2017.05.029.
15. Vilcekova, S.; Meciarova, L.; Burdova, E.K.; Katunska, J.; Kosicanova, D.; Doroudiani, S. Indoor Environmental Quality of Classrooms and Occupants' Comfort in a Special Education School in Slovak Republic. *Build. Environ.* **2017**, *120*, 29–40, doi:10.1016/j.buildenv.2017.05.001.
16. Branco, P.T.B.S.; Alvim-Ferraz, M.C.M.; Martins, F.G.; Sousa, S.I.V. Children's Exposure to Indoor Air in Urban Nurseries-Part I: CO2 and Comfort Assessment.

Environ. Res. **2015**, *140*, 1–9, doi:10.1016/j.envres.2015.03.007.
17. De Giuli, V.; Zecchin, R.; Corain, L.; Salmaso, L. Measurements of Indoor Environmental Conditions in Italian Classrooms and Their Impact on Childrens Comfort. *Indoor Built Environ.* **2015**, *24*, 689–712, doi:10.1177/1420326X14530586.
18. Pereira, L.D.; Cardoso, E.; Da Silva, M.G. Indoor Air Quality Audit and Evaluation on Thermal Comfort in a School in Portugal. *Indoor Built Environ.* **2015**, *24*, 256–268, doi:10.1177/1420326X13508966.
19. De Giuli, V.; Zecchin, R.; Corain, L.; Salmaso, L. Measured and Perceived Environmental Comfort: Field Monitoring in an Italian School. *Appl. Ergon.* **2014**, *45*, 1035–1047, doi:10.1016/j.apergo.2014.01.004.
20. Dias Pereira, L.; Raimondo, D.; Corgnati, S.P.; Gameiro da Silva, M. Assessment of Indoor Air Quality and Thermal Comfort in Portuguese Secondary Classrooms: Methodology and Results. *Build. Environ.* **2014**, *81*, 69–80, doi:10.1016/j.buildenv.2014.06.008.
21. Alves, C.; Nunes, T.; Silva, J.; Duarte, M. Comfort Parameters and Particulate Matter (PM10 and PM2.5) in School Classrooms and Outdoor Air. *Aerosol Air Qual. Res.* **2013**, *13*, 1521–1535, doi:10.4209/aaqr.2012.11.0321.
22. De Giuli, V.; Da Pos, O.; De Carli, M. Indoor Environmental Quality and Pupil Perception in Italian Primary Schools. *Build. Environ.* **2012**, *56*, 335–345, doi:10.1016/j.buildenv.2012.03.024.
23. Haverinen-Shaughnessy, U.; Shaughnessy, R.J.; Cole, E.C.; Toyinbo, O.; Moschandreas, D.J. An Assessment of Indoor Environmental Quality in Schools and Its Association with Health and Performance. *Build. Environ.* **2015**, *93*, 35–40, doi:10.1016/j.buildenv.2015.03.006.
24. Toftum, J.; Kjeldsen, B.U.; Wargocki, P.; Menå, H.R.; Hansen, E.M.N.; Clausen, G. Association between Classroom Ventilation Mode and Learning Outcome in Danish Schools. *Build. Environ.* **2015**, *92*, 494–503, doi:10.1016/j.buildenv.2015.05.017.
25. Erlandson, G.; Magzamen, S.; Carter, E.; Sharp, J.L.; Reynolds, S.J.; Schaeffer, J.W. Characterization of Indoor Air Quality on a College Campus: A Pilot Study. *Int. J. Environ. Res. Public Health* **2019**, *16*, 17–26, doi:10.3390/ijerph16152721.
26. Canha, N.; Mandin, C.; Ramalho, O.; Wyart, G.; Ribéron, J.; Dassonville, C.; Hänninen, O.; Almeida, S.M.; Derbez, M. Assessment of Ventilation and Indoor Air Pollutants in Nursery and Elementary Schools in France. *Indoor Air* **2016**, *26*, 350–365, doi:10.1111/ina.12222.
27. Jovanović, M.; Vučićević, B.; Turanjanin, V.; Živković, M.; Spasojević, V. Investigation of Indoor and Outdoor Air Quality of the Classrooms at a School in Serbia. *Energy* **2014**, *77*, 42–48, doi:10.1016/j.energy.2014.03.080.
28. Senitkova, I.J. Occurrence of Indoor VOCs in Nursery School - Case Study. In Proceedings of the IOP Conference Series: Materials Science and Engineering; Institute of Physics Publishing, November 4 2017; Vol. 245.
29. Barmparesos, N.; Assimakopoulos, M.N.; Assimakopoulos, V.D.; Loumos, N.; Sotiriou, M.A.; Koukoumtzis, A. Indoor Air Quality and Thermal Conditions in a Primary School with a Green Roof System. *Atmosphere (Basel).* **2018**, *9*, doi:10.3390/atmos9020075.
30. Verriele, M.; Schoemaecker, C.; Hanoune, B.; Leclerc, N.; Germain, S.; Gaudion, V.; Locoge, N. The MERMAID Study: Indoor and Outdoor Average Pollutant Concentrations in 10 Low-Energy School Buildings in France. *Indoor Air* **2016**, *26*, 702–713, doi:10.1111/ina.12258.
31. Istrate, M.A.; Catalina, T.; Cucos, A.; Dicu, T. Experimental Measurements of VOC and Radon in Two Romanian Classrooms. *Energy Procedia* **2016**, *85*, 288–294,

doi:10.1016/j.egypro.2015.12.254.
32. Zhong, L.; Su, F.C.; Batterman, S. Volatile Organic Compounds (VOCs) in Conventional and High Performance School Buildings in the U.S. *Int. J. Environ. Res. Public Health* **2017**, *14*, doi:10.3390/ijerph14010100.
33. Stamp, S.; Burman, E.; Shrubsole, C.; Chatzidiakou, L.; Mumovic, D.; Davies, M. Long-Term, Continuous Air Quality Monitoring in a Cross-Sectional Study of Three UK Non-Domestic Buildings. *Build. Environ.* **2020**, *180*, 107071, doi:10.1016/j.buildenv.2020.107071.
34. Madureira, J.; Paciência, I.; Rufo, J.; Ramos, E.; Barros, H.; Teixeira, J.P.; de Oliveira Fernandes, E. Indoor Air Quality in Schools and Its Relationship with Children's Respiratory Symptoms. *Atmos. Environ.* **2015**, *118*, 145–156, doi:10.1016/j.atmosenv.2015.07.028.
35. Csobod, É.; Annesi-Maesano, I.; Carrer, P.; Kephalopoulos, S.; Madureira, J.; Rudnai, P.; de Oliveira Fernandes, E. Schools Indoor Pollution & Health Observatory Network in Europe SINPHONIE. **2014**, doi:10.2788/99220.
36. Oliveira, M.; Slezakova, K.; Delerue-Matos, C.; Pereira, M.D.C.; Morais, S. Assessment of Polycyclic Aromatic Hydrocarbons in Indoor and Outdoor Air of Preschool Environments (3-5 Years Old Children). *Environ. Pollut.* **2016**, *208*, 382–394, doi:10.1016/j.envpol.2015.10.004.
37. Oliveira, M.; Slezakova, K.; Madureira, J.; de Oliveira Fernandes, E.; Delerue-Matos, C.; Morais, S.; do Carmo Pereira, M. Polycyclic Aromatic Hydrocarbons in Primary School Environments: Levels and Potential Risks. *Sci. Total Environ.* **2017**, *575*, 1156–1167, doi:10.1016/j.scitotenv.2016.09.195.
38. Živković, M.; Jovašević-Stojanović, M.; Cvetković, A.; Lazović, I.; Tasić, V.; Stevanović, Ž.; Gržetić, I. Pahs Levels in Gas and Particle-Bound Phase in Schools at Different Locations in Serbia. *Chem. Ind. Chem. Eng. Q.* **2015**, *21*, 159–167, doi:10.2298/CICEQ140206016Z.
39. Loreti, L.; Barbaresi, L.; De Cesaris, S.; Garai, M. Overall Indoor Quality of a Non-Renewed Secondary-School Building. *Build. Acoust.* **2016**, *23*, 47–58, doi:10.1177/1351010X16637533.
40. de la Hoz-Torres, M.L.; Aguilar, A.J.; Costa, N.; Arezes, P.; Ruiz, D.P.; Martínez-Aires, M.D. Reopening Higher Education Buildings in Post-Epidemic COVID-19 Scenario: Monitoring and Assessment of Indoor Environmental Quality after Implementing Ventilation Protocols in Spain and Portugal. *Indoor Air* **2022**, *32*, 1–19, doi:10.1111/ina.13040.
41. Heracleous, C.; Michael, A. Experimental Assessment of the Impact of Natural Ventilation on Indoor Air Quality and Thermal Comfort Conditions of Educational Buildings in the Eastern Mediterranean Region during the Heating Period. *J. Build. Eng.* **2019**, *26*, 100917, doi:10.1016/j.jobe.2019.100917.
42. Korsavi, S.S.; Montazami, A. Developing a Valid Method to Study Adaptive Behaviours with Regard to IEQ in Primary Schools. *Build. Environ.* **2019**, *153*, 1–16, doi:10.1016/j.buildenv.2019.02.018.
43. Oldham, E.; Kim, H. IEQ Field Investigation in High-Performance, Urban Elementary Schools. *Atmosphere (Basel).* **2020**, *11*, 1–25, doi:10.3390/ATMOS11010081.
44. Fabbri, K. Thermal Comfort Evaluation in Kindergarten: PMV and PPD Measurement through Datalogger and Questionnaire. *Build. Environ.* **2013**, *68*, 202–214, doi:10.1016/j.buildenv.2013.07.002.
45. Smith, K. Explorations of Acoustic Trends in Data Logged in K-12 Classrooms. **2019**.
46. Chetoni, M.; Ascari, E.; Bianco, F.; Fredianelli, L.; Licitra, G.; Cori, L. Global Noise Score Indicator for Classroom Evaluation of Acoustic Performances in LIFE

GIOCONDA Project. *Noise Mapp.* **2016**, *3*, 157–171, doi:10.1515/noise-2016-0012.
47. Russo, D.; Ruggiero, A. Choice of the Optimal Acoustic Design of a School Classroom and Experimental Verification. *Appl. Acoust.* **2019**, *146*, 280–287, doi:10.1016/j.apacoust.2018.11.019.
48. Sarantopoulos, G.; Lykoudis, S.; Kassomenos, P. Noise Levels in Primary Schools of Medium Sized City in Greece. *Sci. Total Environ.* **2014**, *482–483*, 493–500, doi:10.1016/j.scitotenv.2013.09.010.
49. Mikulski, W.; Radosz, J. Acoustics of Classrooms in Primary Schools - Results of the Reverberation Time and the Speech Transmission Index Assessments in Selected Buildings. *Arch. Acoust.* **2011**, *36*, 777–793, doi:10.2478/V10168-011-0052-6.
50. Kristiansen, J.; Lund, S.P.; Nielsen, P.M.; Persson, R.; Shibuya, H. Determinants of Noise Annoyance in Teachers from Schools with Different Classroom Reverberation Times. *J. Environ. Psychol.* **2011**, *31*, 383–392, doi:10.1016/j.jenvp.2011.08.005.
51. Klatte, M.; Hellbroock, J. *Effects of Classroom Acoustics on Performance and Wellbeing in Elementary School Children: A Field Study*; 2010; Vol. 42; ISBN 9781617823961.
52. Shield, B.; Conetta, R.; Dockrell, J.; Connolly, D.; Cox, T.; Mydlarz, C. A Survey of Acoustic Conditions and Noise Levels in Secondary School Classrooms in England. *J. Acoust. Soc. Am.* **2015**, *137*, 177–188, doi:10.1121/1.4904528.
53. Becerra, J.A.; Lizana, J.; Gil, M.; Barrios-Padura, A.; Blondeau, P.; Chacartegui, R. Identification of Potential Indoor Air Pollutants in Schools. *J. Clean. Prod.* **2020**, *242*, doi:10.1016/j.jclepro.2019.118420.
54. Sivanantham, S.; Dassonville, C.; Grégoire, A.; Malingre, L.; Ramalho, O.; Mandin, C. Coexposure to Indoor Pollutants in French Schools and Associations with Building Characteristics. *Energy Build.* **2021**, *252*, doi:10.1016/j.enbuild.2021.111424.
55. Oliveira, M.; Slezakova, K.; Delerue-Matos, C.; do Carmo Pereira, M.; Morais, S. Assessment of Exposure to Polycyclic Aromatic Hydrocarbons in Preschool Children: Levels and Impact of Preschool Indoor Air on Excretion of Main Urinary Monohydroxyl Metabolites. *J. Hazard. Mater.* **2017**, *322*, 357–369, doi:10.1016/j.jhazmat.2016.10.004.
56. Nunes, R.A.O.; Branco, P.T.B.S.; Alvim-Ferraz, M.C.M.; Martins, F.G.; Sousa, S.I.V. Gaseous Pollutants on Rural and Urban Nursery Schools in Northern Portugal. *Environ. Pollut.* **2016**, *208*, 2–15, doi:10.1016/j.envpol.2015.07.018.
57. Mainka, A.; Zajusz-Zubek, E. Indoor Air Quality in Urban and Rural Preschools in Upper Silesia, Poland: Particulate Matter and Carbon Dioxide. *Int. J. Environ. Res. Public Health* **2015**, *12*, 7697–7711, doi:10.3390/ijerph120707697.
58. Ramalho, O.; Wyart, G.; Mandin, C.; Blondeau, P.; Cabanes, P.A.; Leclerc, N.; Mullot, J.U.; Boulanger, G.; Redaelli, M. Association of Carbon Dioxide with Indoor Air Pollutants and Exceedance of Health Guideline Values. *Build. Environ.* **2015**, *93*, 115–124, doi:10.1016/j.buildenv.2015.03.018.
59. Rovelli, S.; Cattaneo, A.; Nuzzi, C.P.; Spinazzè, A.; Piazza, S.; Carrer, P.; Cavallo, D.M. Airborne Particulate Matter in School Classrooms of Northern Italy. *Int. J. Environ. Res. Public Health* **2014**, *11*, 1398–1421, doi:10.3390/ijerph110201398.
60. Branco, P.T.B.S.; Nunes, R.A.O.; Alvim-Ferraz, M.C.M.; Martins, F.G.; Sousa, S.I.V. Children's Exposure to Indoor Air in Urban Nurseries - Part II: Gaseous Pollutants' Assessment. *Environ. Res.* **2015**, *142*, 662–670, doi:10.1016/j.envres.2015.08.026.
61. Villanueva, F.; Tapia, A.; Lara, S.; Amo-Salas, M. Indoor and Outdoor Air Concentrations of Volatile Organic Compounds and NO2 in Schools of Urban, Industrial and Rural Areas in Central-Southern Spain. *Sci. Total Environ.* **2018**, *622–623*, 222–235, doi:10.1016/j.scitotenv.2017.11.274.

62. de Gennaro, G.; Farella, G.; Marzocca, A.; Mazzone, A.; Tutino, M. Indoor and Outdoor Monitoring of Volatile Organic Compounds in School Buildings: Indicators Based on Health Risk Assessment to Single out Critical Issues. *Int. J. Environ. Res. Public Health* **2013**, *10*, 6273–6291, doi:10.3390/ijerph10126273.
63. Rivas, I.; Viana, M.; Moreno, T.; Pandolfi, M.; Amato, F.; Reche, C.; Bouso, L.; Àlvarez-Pedrerol, M.; Alastuey, A.; Sunyer, J.; et al. Child Exposure to Indoor and Outdoor Air Pollutants in Schools in Barcelona, Spain. *Environ. Int.* **2014**, *69*, 200–212, doi:10.1016/j.envint.2014.04.009.
64. Slezakova, K.; de Oliveira Fernandes, E.; Pereira, M. do C. Assessment of Ultrafine Particles in Primary Schools: Emphasis on Different Indoor Microenvironments. *Environ. Pollut.* **2019**, *246*, 885–895, doi:10.1016/j.envpol.2018.12.073.
65. Liaud, C.; Chouvenc, S.; Le Calvé, S. Simultaneous Monitoring of Particle-Bound PAHs inside a Low-Energy School Building and Outdoors over Two Weeks in France. *Atmosphere (Basel).* **2021**, *12*, doi:10.3390/atmos12010108.
66. Krugly, E.; Martuzevicius, D.; Sidaraviciute, R.; Ciuzas, D.; Prasauskas, T.; Kauneliene, V.; Stasiulaitiene, I.; Kliucininkas, L. Characterization of Particulate and Vapor Phase Polycyclic Aromatic Hydrocarbons in Indoor and Outdoor Air of Primary Schools. *Atmos. Environ.* **2014**, *82*, 298–306, doi:10.1016/j.atmosenv.2013.10.042.
67. Cequier, E.; Ionas, A.C.; Covaci, A.; Marcé, R.M.; Becher, G.; Thomsen, C. Occurrence of a Broad Range of Legacy and Emerging Flame Retardants in Indoor Environments in Norway. *Environ. Sci. Technol.* **2014**, *48*, 6827–6835, doi:10.1021/es500516u.
68. Persson, J.; Wang, T.; Hagberg, J. Organophosphate Flame Retardants and Plasticizers in Indoor Dust, Air and Window Wipes in Newly Built Low-Energy Preschools. *Sci. Total Environ.* **2018**, *628–629*, 159–168, doi:10.1016/j.scitotenv.2018.02.053.
69. Raffy, G.; Mercier, F.; Blanchard, O.; Derbez, M.; Dassonville, C.; Bonvallot, N.; Glorennec, P.; Le Bot, B. Semi-Volatile Organic Compounds in the Air and Dust of 30 French Schools: A Pilot Study. *Indoor Air* **2017**, *27*, 114–127, doi:10.1111/ina.12288.
70. Romagnoli, P.; Balducci, C.; Perilli, M.; Gherardi, M.; Gordiani, A.; Gariazzo, C.; Gatto, M.P.; Cecinato, A. Indoor PAHs at Schools, Homes and Offices in Rome, Italy. *Atmos. Environ.* **2014**, *92*, 51–59, doi:10.1016/j.atmosenv.2014.03.063.
71. Larsson, K.; Lindh, C.H.; Jönsson, B.A.; Giovanoulis, G.; Bibi, M.; Bottai, M.; Bergström, A.; Berglund, M. Phthalates, Non-Phthalate Plasticizers and Bisphenols in Swedish Preschool Dust in Relation to Children's Exposure. *Environ. Int.* **2017**, *102*, 114–124, doi:10.1016/j.envint.2017.02.006.
72. Gaffin, J.M.; Hauptman, M.; Petty, C.R.; Sheehan, W.J.; Lai, P.S.; Wolfson, J.M.; Gold, D.R.; Coull, B.A.; Koutrakis, P.; Phipatanakul, W. Nitrogen Dioxide Exposure in School Classrooms of Inner-City Children with Asthma. *J. Allergy Clin. Immunol.* **2018**, *141*, 2249-2255.e2, doi:10.1016/j.jaci.2017.08.028.
73. Annesi-Maesano, I.; Hulin, M.; Lavaud, F.; Raherison, C.; Kopferschmitt, C.; De Blay, F.; Charpin, D.A.; Denis, C. Poor Air Quality in Classrooms Related to Asthma and Rhinitis in Primary Schoolchildren of the French 6 Cities Study. *Thorax* **2012**, *67*, 682–688, doi:10.1136/thoraxjnl-2011-200391.
74. Azara, A.; Dettori, M.; Castiglia, P.; Piana, A.; Durando, P.; Parodi, V.; Salis, G.; Saderi, L.; Sotgiu, G. Indoor Radon Exposure in Italian Schools. *Int. J. Environ. Res. Public Health* **2018**, *15*, doi:10.3390/ijerph15040749.
75. Ivanova, K.; Stojanovska, Z.; Djunakova, D.; Djounova, J. Analysis of the Spatial Distribution of the Indoor Radon Concentration in School's Buildings in Plovdiv Province, Bulgaria. *Build. Environ.* **2021**, *204*, doi:10.1016/j.buildenv.2021.108122.
76. Curguz, Z.; Venoso, G.; Zunic, Z.S.; Mirjanic, D.; Ampollini, M.; Carpentieri, C.; Di

Carlo, C.; Caprio, M.; Alavantic, D.; Kolarz, P.; et al. Spatial Variability of Indoor Radon Concentration in Schools: Implications on Radon Measurement Protocols. *Radiat. Prot. Dosimetry* **2020**, *191*, 133–137, doi:10.1093/rpd/ncaa137.
77. Kojo, K.; Kurttio, P. Indoor Radon Measurements in Finnish Daycare Centers and Schools-Enforcement of the Radiation Act. *Int. J. Environ. Res. Public Health* **2020**, *17*, doi:10.3390/ijerph17082877.
78. Dhoqina, P.; Tushe, K.; Xhixha, G.; Daci, B.; Bylyku, E. Measurements of Indoor Radon Concentrations in Schools in Some Cities of North Albania. In Proceedings of the AIP Conference Proceedings; American Institute of Physics Inc., February 26 2019; Vol. 2075.
79. Müllerová, M.; Mazur, J.; Csordás, A.; Grzadziel, D.; Holý, K.; Kovács, T.; Kozak, K.; Kureková, P.; Nagy, E.; Neznal, M.; et al. Preliminary Results of Radon Survey in the Kindergartens of V4 Countries. *Radiat. Prot. Dosimetry* **2017**, *177*, 95–98, doi:10.1093/rpd/ncx155.
80. Onishchenko, A.; Malinovsky, G.; Vasilyev, A.; Zhukovsky, M. Radon Measurements in Kindergartens in Ural Region (Russia). *Radiat. Prot. Dosimetry* 2017, *177*, 112–115.
81. Branco, P.T.B.S.; Nunes, R.A.O.; Alvim-Ferraz, M.C.M.; Martins, F.G.; Sousa, S.I.V. Children's Exposure to Radon in Nursery and Primary Schools. *Int. J. Environ. Res. Public Health* **2016**, *13*, doi:10.3390/ijerph13040386.
82. Franci, D.; Aureli, T. Long- and Short-Term Indoor Radon Survey in the Ardea Municipality, South Rome. *Radiat. Prot. Dosimetry* **2014**, *162*, 625–629, doi:10.1093/rpd/ncu025.
83. Ivanova, K.; Stojanovska, Z.; Tsenova, M.; Badulin, V.; Kunovska, B. Measurement of Indoor Radon Concentration in Kindergartens in Sofia, Bulgaria. *Radiat. Prot. Dosimetry* **2014**, *162*, 163–166, doi:10.1093/rpd/ncu251.
84. Trevisi, R.; Leonardi, F.; Simeoni, C.; Tonnarini, S.; Veschetti, M. Indoor Radon Levels in Schools of South-East Italy. *J. Environ. Radioact.* **2012**, *112*, 160–164, doi:10.1016/j.jenvrad.2012.05.030.
85. Poulin, P.; Leclerc, J.M.; Dessau, J.C.; Deck, W.; Gagnon, F. Radon Measurement in Schools Located in Three Priority Investigation Areas in the Province of Quebec, Canada. *Radiat. Prot. Dosimetry* **2012**, *151*, 278–289, doi:10.1093/rpd/ncr483.
86. Rucińska, J.; Trzaski, A. Measurements and Simulation Study of Daylight Availability and Its Impact on the Heating, Cooling and Lighting Energy Demand in an Educational Building. *Energies* **2020**, *13*, doi:10.3390/en13102555.
87. Leccese, F.; Salvadori, G.; Rocca, M.; Buratti, C.; Belloni, E. A Method to Assess Lighting Quality in Educational Rooms Using Analytic Hierarchy Process. *Build. Environ.* **2020**, *168*, doi:10.1016/j.buildenv.2019.106501.
88. Baloch, R.M.; Maesano, C.N.; Christoffersen, J.; Mandin, C.; Csobod, E.; De, E.; Fernandes, O.; Annesi-Maesano, I. Daylight and School Performance in European Schoolchildren. *Public Health* **2021**, *18*, doi:10.3390/ijerph.