



AIR QUALITY IN LJUBLJANA



City of
Ljubljana



BASIC INFORMATIONS ABOUT LJUBLJANA

- Geographical position of the city - basin – occasional unfavorable climatic conditions and poor circulation of air masses – especially in winter
- Long-term temperature inversions in winter
- Near 130.000 people travel to Ljubljana every day for work – high traffic load
- Wind rose – winds are bringing pollution to the city from wider background
- Consequences:
 - Summer period – clean air
 - Winter period – occasional pollution and exceeding limit values – heating season and poor ventilation

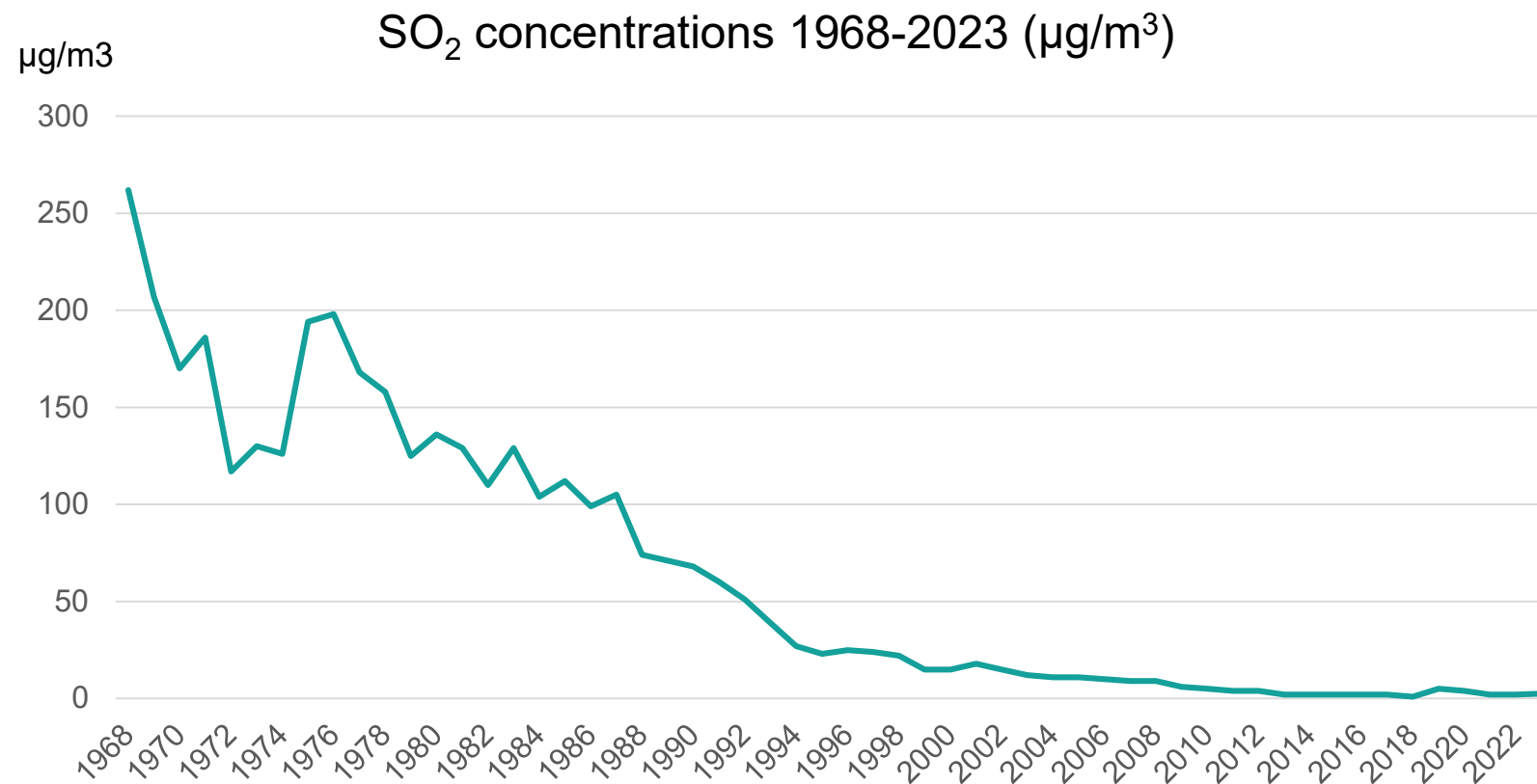


AIR QUALITY MONITORING

- air quality is one of the basic environmental indicators
- continuous SO₂ measurements since 1968
- since 1996 City has its own measuring station, since 2009 on the current location
- parameters: SO₂, NO₂, NO_x, BTX (benzene, toluene and xylene), PM₁₀ (since 2006) and PM_{2,5} (since 2018)
- city measuring station meets all standards of the state network
- we are monitoring the traffic impact on the pollution, noise and meteorological parameters (T, humidity, wind), occasionally black carbon
- new mobile measuring station (impact of traffic and background)
- 3 state measuring stations

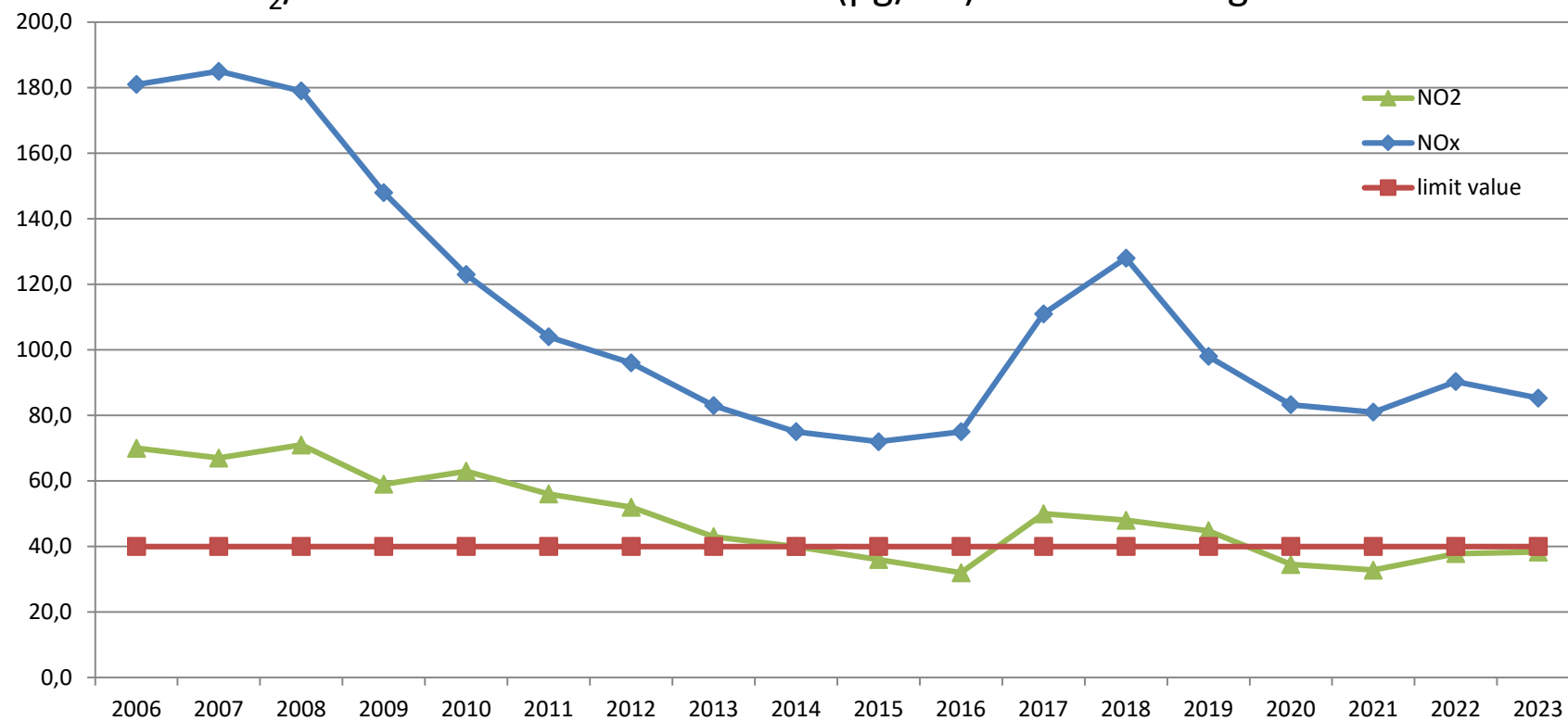


MONITORING RESULTS 1/6



MONITORING RESULTS 2/6

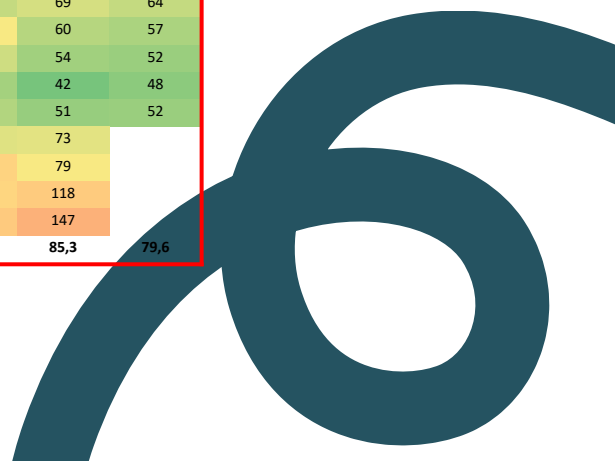
NO₂/NO_x concentrations 2006 - 2023 (µg/m³) – anual average



MONITORING RESULTS 3/6

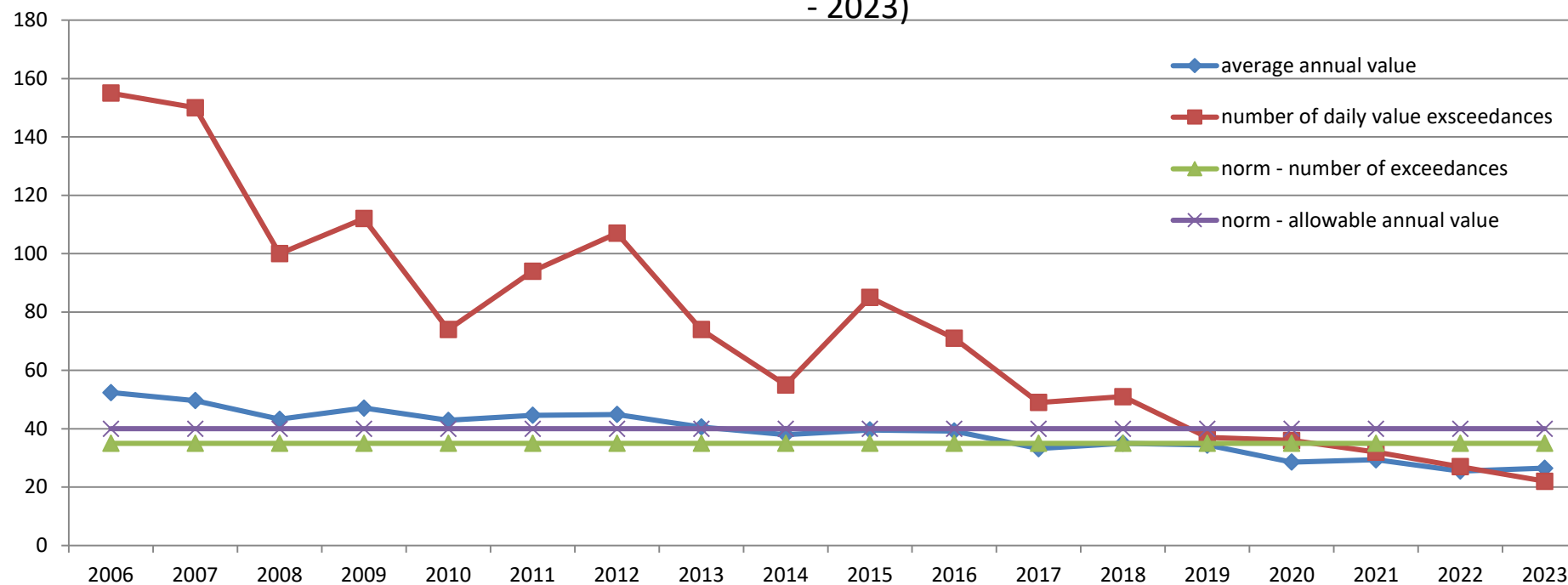
Ljubljana-Center	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	
NO2	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)
january	97	73	86	79	82	58	63	52	38	49	40	65	51	52	57	45	41	44	50	
february	93	82	82	84	103	63	65	61	48	47	34	58	62	56	45	34	29	49	46	
march	77	75	73	67	75	64	62	58	47	44	35	60	62	51	31	39	40	44	38	
april	71	69	73	62	69	56	50	44	40	36	30	45	52	46	24	27	36	39	37	
maj	60	57	61	48	53	54	50	37	34	34	34	45	31	34	24	23	49	36	34	
june	59	56	60	53	50	50	48	35	35	32	25	45	.	35	28	24	37	36	34	
july	54	55	56	43	49	44	44	36	33	30	25	43	.	38	29	32	35	29	31	
august	63	51	56	45	46	48	51	38	34	30	22	46	.	36	30	32	35	31	33	
september	67	58	63	54	47	57	49	39	40	31	27	41	.	46	31	39	36	38		
october	74	64	82	48	53	53	44	41	42	28	23	50	42	49	31	29	39	35		
november	75	79	86	selitev	53	58	44	35	40	37	28	46	36	.	40	26	38	38		
dicember	75	80	79	67	78	61	55	48	45	34	55	59	48	50	53	.	39	41		
yearly	72,1	66,6	71,4	59,1	63,2	55,5	52,1	43,7	39,7	36,0	31,5	50,3	48,0	44,8	35,3	31,8	37,8	38,3	37,9	

Ljubljana-Center	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	
NOx	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)
january	175	140	157	123	84	113	111	163	153	148	222	96	169	127	150	
february	226	131	115	117	99	98	73	170	150	168	114	87	94	115	133	
march	129	106	107	110	78	79	64	122	125	101	62	88	91	88	81	
april	110	88	74	68	65	58	48	73	100	92	39	54	64	69	64	
maj	81	79	74	57	49	51	55	70	84	64	41	49	79	60	57	
june	74	73	66	50	50	47	36	64	.	57	48	76	67	54	52	
july	66	60	62	49	51	42	36	59	.	57	49	50	55	42	48	
august	67	70	71	57	53	48	38	70	.	75	52	55	59	51	52	
september	86	94	87	69	73	54	58	87	.	72	69	75	72	73		
october	111	111	89	84	85	65	68	140	100	102	86	91	109	79		
november	.	.	.	selitev	123	136	99	78	99	104	85	136	109	.	98	94	105	118		
dicember	227	165	147	137	119	109	225	189	104	144	119	.	119	147		
yearly					123	104	96	83	75	72	75	112	116	98	83	74,1	90,3	85,3	79,6	



MONITORING RESULTS 4/6

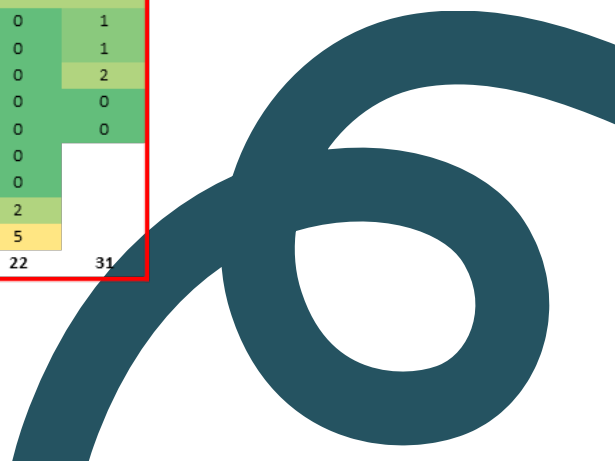
PM10 concentrations, average annual values + number of daily value exceedances (2006 - 2023)



MONITORING RESULTS 5/6

Ljubljana-Center	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
PM10	monthly mean (µg/m ³)	monthly mean (µg/m ³)	monthly mean (µg/m ³)	monthly mean (µg/m ³)	monthly mean (µg/m ³)	monthly mean (µg/m ³)	monthly mean (µg/m ³)	monthly mean (µg/m ³)	monthly mean (µg/m ³)	monthly mean (µg/m ³)	monthly mean (µg/m ³)	monthly mean (µg/m ³)	monthly mean (µg/m ³)	monthly mean (µg/m ³)	monthly mean (µg/m ³)	monthly mean (µg/m ³)	monthly mean (µg/m ³)	monthly mean (µg/m ³)	monthly mean (µg/m ³)
january	87	52	61	79	74	57	52	50	54	43	70	66	37	52	64	42	44	26	47
february	65	62	53	55	64	70	60	51	51	60	32	49	41	51	32	40	27	45	45
march	51	48	40	44	43	49	56	48	51	44	36	41	42	30	35	34	42	32	26
april	40	61	34	45	38	40	41	37	34	28	34	23	38	33	13	24	18	19	22
maj	43	40	41	50	35	38	32	32	26	23	27	21	29	20	20	17	21	20	19
june	50	48	41	35	30	32	37	30	28	28	26	23	25	29	18	33	22	22	21
july	45	42	35	36	33	31	40	36	30	33	29	23	25	29	19	21	19	18	22
august	33	41	38	42	28	41	46	33	27	35	27	28	28	33	23	17	18	22	23
september	55	49	40	45	34	29	38	31	31	28	34	23	25	25	23	25	14	24	
october	55	51	47	37	40	31	42	40	37	34	33	23	41	27*	23	38	34	24	
november	50	51	47	selitev	37	62	44	34	27	57	43	28	36	31*	39	30	24	28	
dicember	55	51	42	50	59	55	51	65	45	62	79	44	62	42	34	36	23	38	
yearly	52,4	49,7	43,3	47,1	42,9	44,6	44,9	40,6	36,8	39,6	39,2	32,7	35,8	34,4	28,6	29,8	25,5	26,5	28,1

Ljubljana-Center	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
PM10	days >50µg/m ³ per month	days >50µg/m ³ per month	days >50µg/m ³ per month	days >50µg/m ³ per month	days >50µg/m ³ per month	days >50µg/m ³ per month	days >50µg/m ³ per month	days >50µg/m ³ per month	days >50µg/m ³ per month	days >50µg/m ³ per month	days >50µg/m ³ per month	days >50µg/m ³ per month	days >50µg/m ³ per month	days >50µg/m ³ per month	days >50µg/m ³ per month	days >50µg/m ³ per month	days >50µg/m ³ per month	days >50µg/m ³ per month	days >50µg/m ³ per month
january	20	16	17	19	17	16	16	12	8	8	23	18	4	13	21	7	11	2	16
february	21	16	17	12	20	23	18	14	9	14	0	12	7	15	2	7	1	11	9
march	15	15	8	11	3	12	18	9	14	12	5	7	8	0	3	2	9	2	2
april	7	22	1	9	5	3	4	5	3	0	1	1	4	1	0	0	0	0	1
maj	5	5	7	15	0	4	0	1	0	0	0	0	0	0	0	0	0	0	1
june	11	13	7	2	0	0	4	1	0	0	0	0	0	0	0	4	0	0	2
july	12	7	1	5	0	2	7	0	0	1	0	0	0	0	0	0	0	0	0
august	0	5	3	10	0	7	9	3	0	4	0	1	0	2	0	0	0	0	0
september	16	8	9	9	1	0	5	1	0	1	2	0	0	0	0	0	0	0	
october	18	14	12	7	6	3	5	7	4	5	2	0	12	*	0	7	5	0	
november	11	15	10	selitev	5	14	11	4	9	19	10	1	1	0*	5	0	0	2	
dicember	19	14	8	13	17	10	10	17	8	21	28	9	15	6	5	5	1	5	
yearly	155	150	100	112	74	94	107	74	55	85	71	49	51	37	36	32	27	22	31

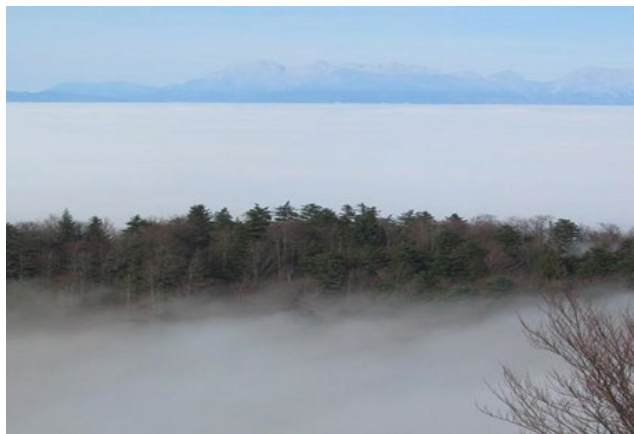


MONITORING RESULTS 6/6

Ljubljana-Center	2018	2019	2020	2021	2022	2023	2024
PM2,5	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)	monthly mean (µg/m3)
january	.	37	57	31	33	20	34
february	.	40	23	24	16	33	35
march	.	19	16	17	27	18	15
april	.	20	6	11	13	11	11
maj	.	9	11	6	14	12	10
june	11	15	10	12	13	12	11
july	12	14	11	10	12	10	13
august	15	19	14	8	11	14	10
september	13	11	14	12	11	14	
october	28	14	14	19	23	15	
november	20	14	27	21	18	21	
dicember	48	34	25	.	19	36	
yearly	21	21	19	16	18	18	17



MAIN SOURCES OF AIR POLLUTION



basin + inversion

individual fireplaces
(periphery of the city,
suburban settlements)



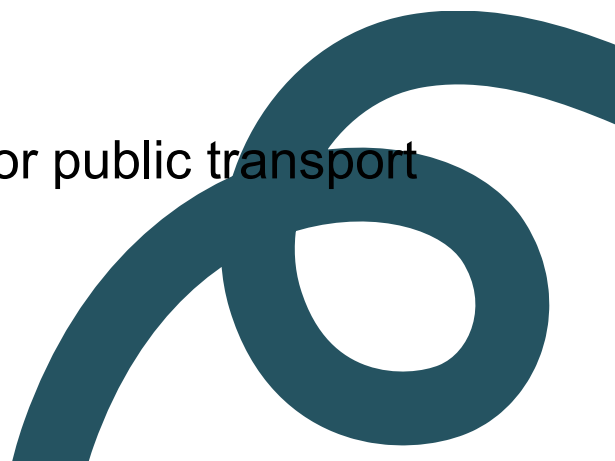
traffic



IMPLEMENTED MEASURES 1/2

TRAFFIC

- 50% vehicles on compressed natural gas (CNG - methane) – goal: by 2030 100% share of clean vehicles (electricity + hydrogen)
- electric vehicles
- installation of charging stations for electric cars (public-private partnership)
- 6 P+R parking areas (free parking + 1 return ticket for public transport)
- abolition of free parking in the city - redirection to the use of public transport
- implementation of 30 km/h speed limited zones
- 300 km of arranged bike lanes
- public-private partnership BicikeLj - bicycle rental with the Urbana card for public transport
 - 85 stations + more than 830 bicycles



IMPLEMENTED MEASURES 2/2

HEATING

- 80% of households are connected to the heating and gas pipeline systems - to the district heating system
- replacement of domestic coal in the Ljubljana thermal power plant with imported Indonesian coal and installation of anti-dust filters
- construction of a gas-steam unit - natural gas will replace 70% of a coal

Goals:

- instead of natural gas, gradually implement synthetic gases and hydrogen
- expanding the district heating system
- solar power plants on buildings owned by the city (51)
- individual fireplaces - cooperation with the state to take an inventory and establish a cadastral register for chimney sweeps



EU Mission: Climate-Neutral and Smart Cities

- In 2022, the European Commission selected 100 cities that will participate in the mission of creating 100 climate-neutral and smart cities by 2030
- 3 cities from Slovenia: Ljubljana, Kranj and Velenje
- obligation to further strengthen of all measures until decarbonization
- clean mobility, energy efficiency and green urban planning
- joint initiatives and strengthening cooperation
- selected cities have to prepare a general plan for climate neutrality in all sectors, from energy sector and buildings to waste management and traffic, as well as related investment plans
- The process includes: citizens, research organizations and the private sector





Contact:

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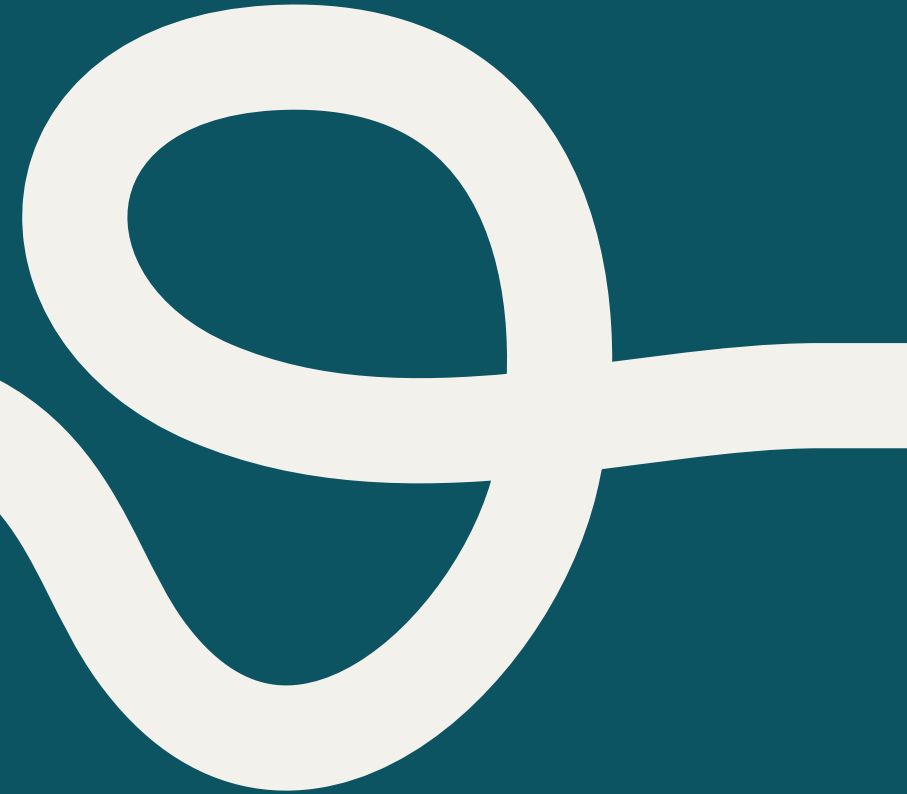
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Thank you.



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Ljubljana

