

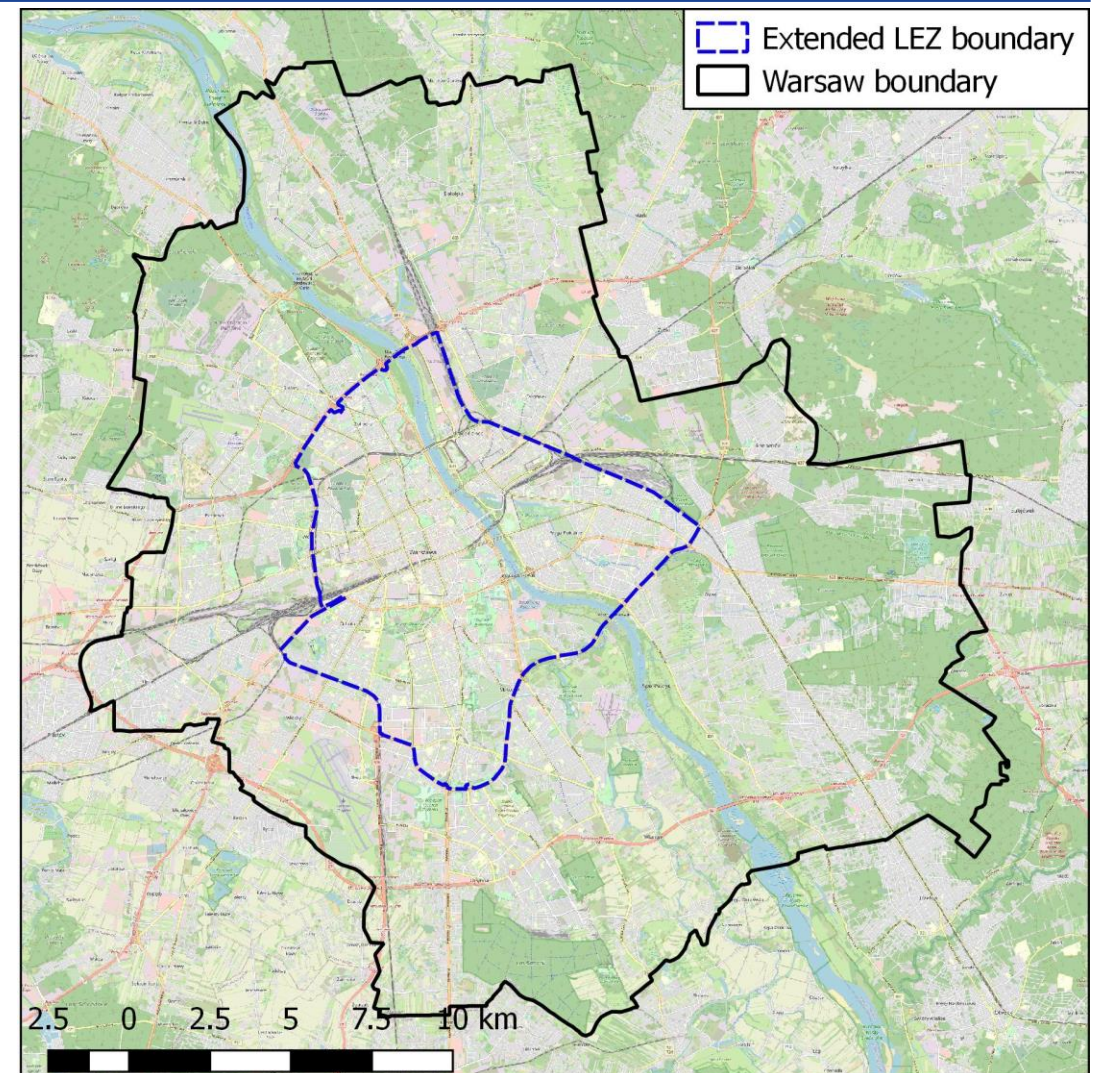
Appendix 1: Extension to Impact Assessment

Extension to Impact Assessment: Introduction

Following our original impact assessment study to understand the air quality and economic impacts of proposed LEZ options for Warsaw, we have provided an assessment of two further options for the scheme. These options are as follows:

- 1. Phase 2A:** Phase 2 (Euro 3 Petrol, Euro 5 Diesel) with travel behaviour response. This scenario is based on the 'Phase 2 with travel behaviour response' in the original report and applies an extended zone boundary and includes the potential impacts of scheme exemption for residents living in the zone on the predicted vehicle upgrades
- 2. Phase 3A:** Phase 3 (Euro 4 Petrol, Euro 6 Diesel) with travel behaviour response. This scenario is based on the 'Phase 3 with travel behaviour response' in the original report and applies an extended zone boundary

Both scenarios were assessed for the 2026 future year and applied the same model inputs as for the original study unless stated.



Behavioural response & scheme exemption assumptions

Behavioural response

The same behavioural response assumptions were applied to assess the impact of the extended LEZ scheme as for the original assessment except for the upgrade response for vehicles outside of the LEZ. Here we have assumed that **34.7% of non-compliant vehicles will see an upgrade response**. This is because the transport model shows that an average of 34.7% of trips that start outside of the extended LEZ end in the extended LEZ.

Scheme exemptions

Our assessment of Phase 2A includes the potential impacts of scheme exemption for residents living in the zone on the predicted vehicle upgrades. The transport model shows that **38.2% of passenger cars start or end their journey at 'home' inside the extended LEZ**. The percentage of these vehicles that do not meet the LEZ restrictions (non-compliant vehicles) were assumed as being exempt from the scheme.

Extended LEZ:
Air quality modelling results –
annual mean concentration maps

Annual mean concentration maps

Introduction

- The following maps show the modelled NO₂, PM_{2.5} and PM₁₀ annual mean concentrations across the full model domain for the 2026 LEZ Phase 2A and 2026 LEZ Phase 3A scenarios. Concentration maps from the original 2026 LEZ Phase 2 and 2026 LEZ Phase 3 scenarios are also provided to aid comparison of the impact of the original and extended LEZ boundaries
- All LEZ scenarios include the impacts associated with both travel behaviour and upgrade response on the road links within the LEZ and upgrade response on roads outside of the LEZ
- Areas in red have concentrations in exceedance of the European annual limit value (40 µg/m³ for NO₂ and PM₁₀, 20 µg/m³ for PM_{2.5}) and areas in orange are within 10% of the limit value (36 – 40 µg/m³ for NO₂ and PM₁₀, 18 – 20 µg/m³ for PM_{2.5})

Phase 3A vs Phase 3

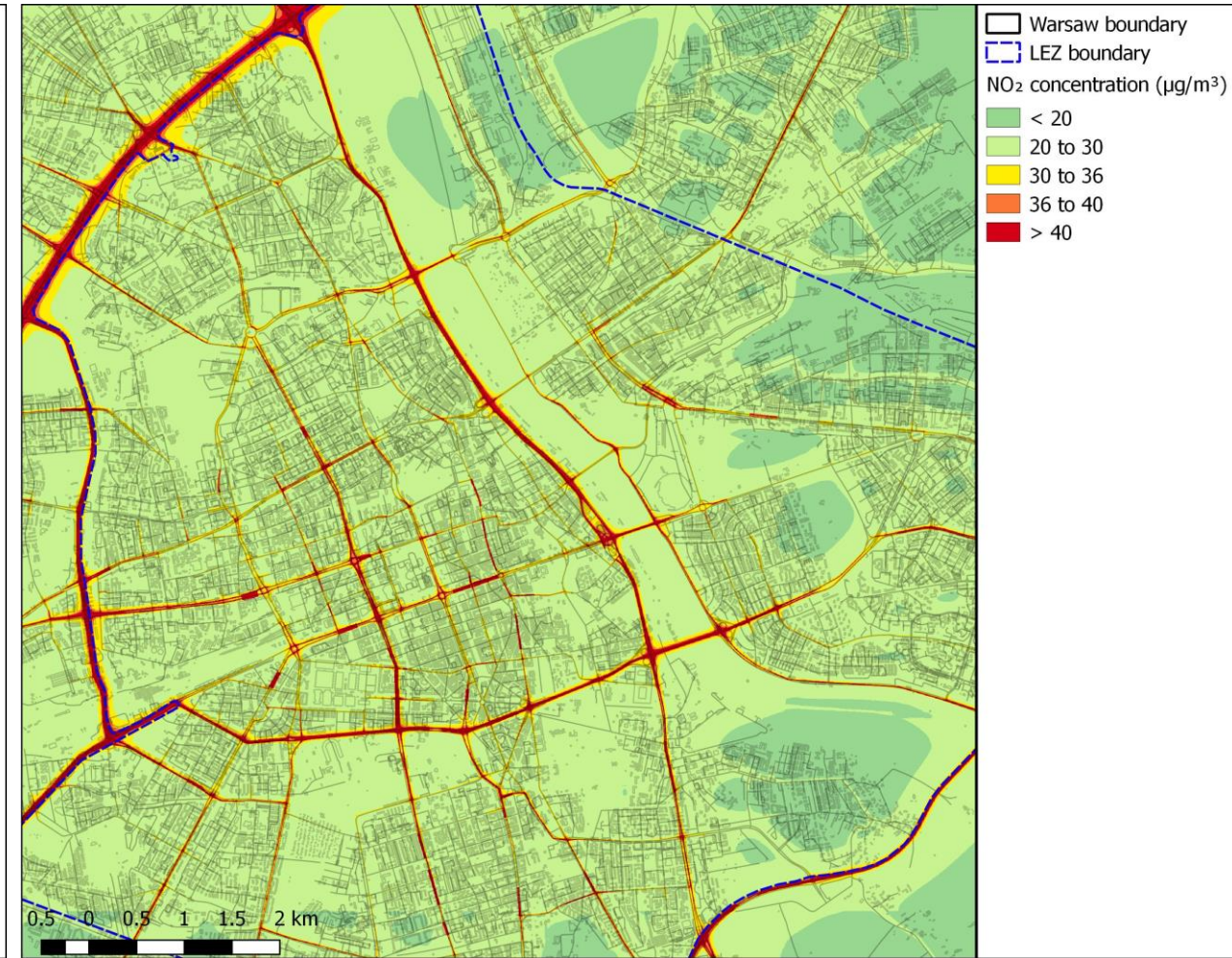
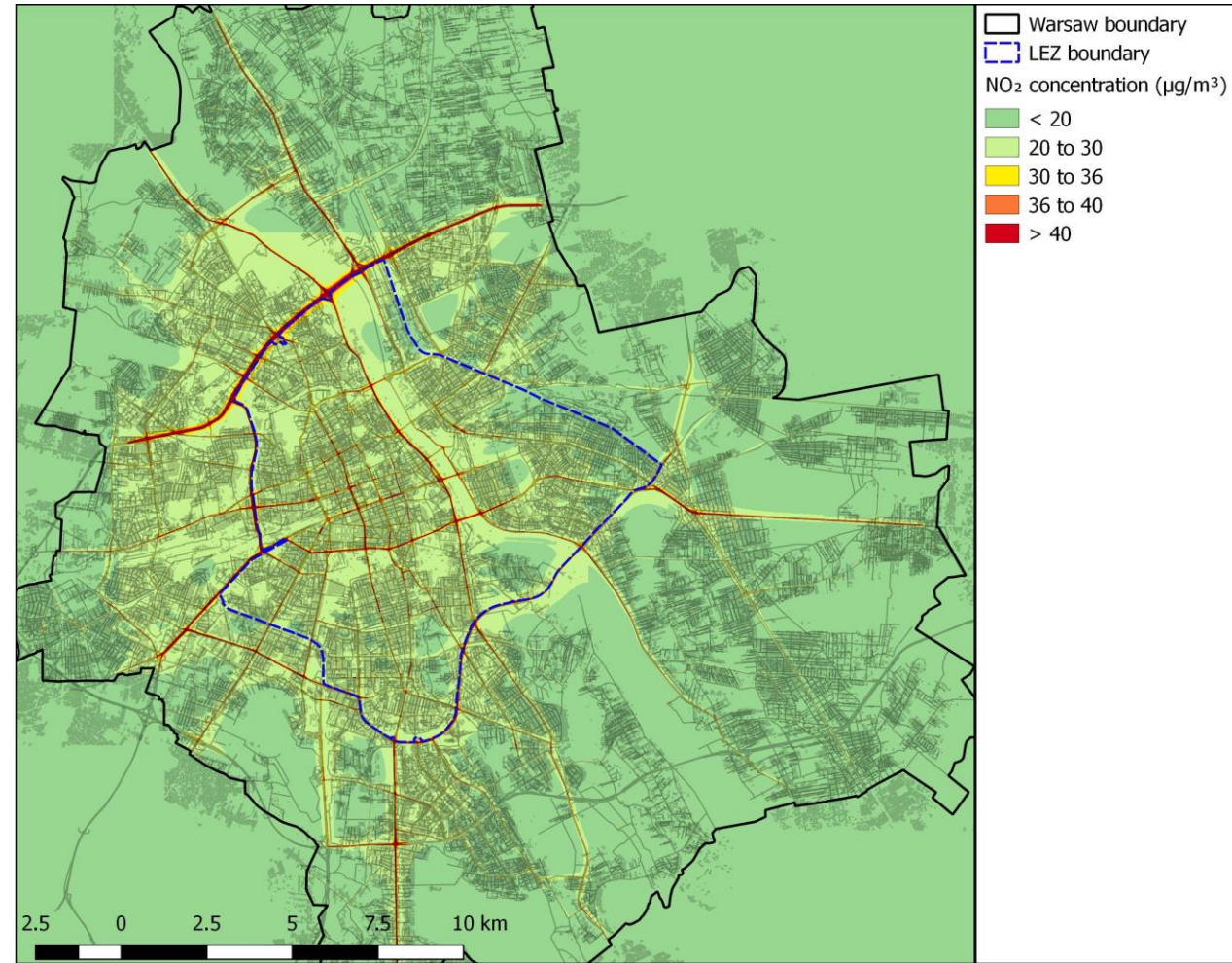
- An initial comparison of the Phase 3A and Phase 3 scenarios shows the impact of the extended LEZ scheme in further reducing pollutant concentrations across the city
- The largest decreases in concentrations as a result of extending the boundary are observed in areas within the extended LEZ boundary that were outside of the original LEZ
- A decrease in concentrations is also observed for areas outside of both the extended and original boundary

Phase 2A vs Phase 2

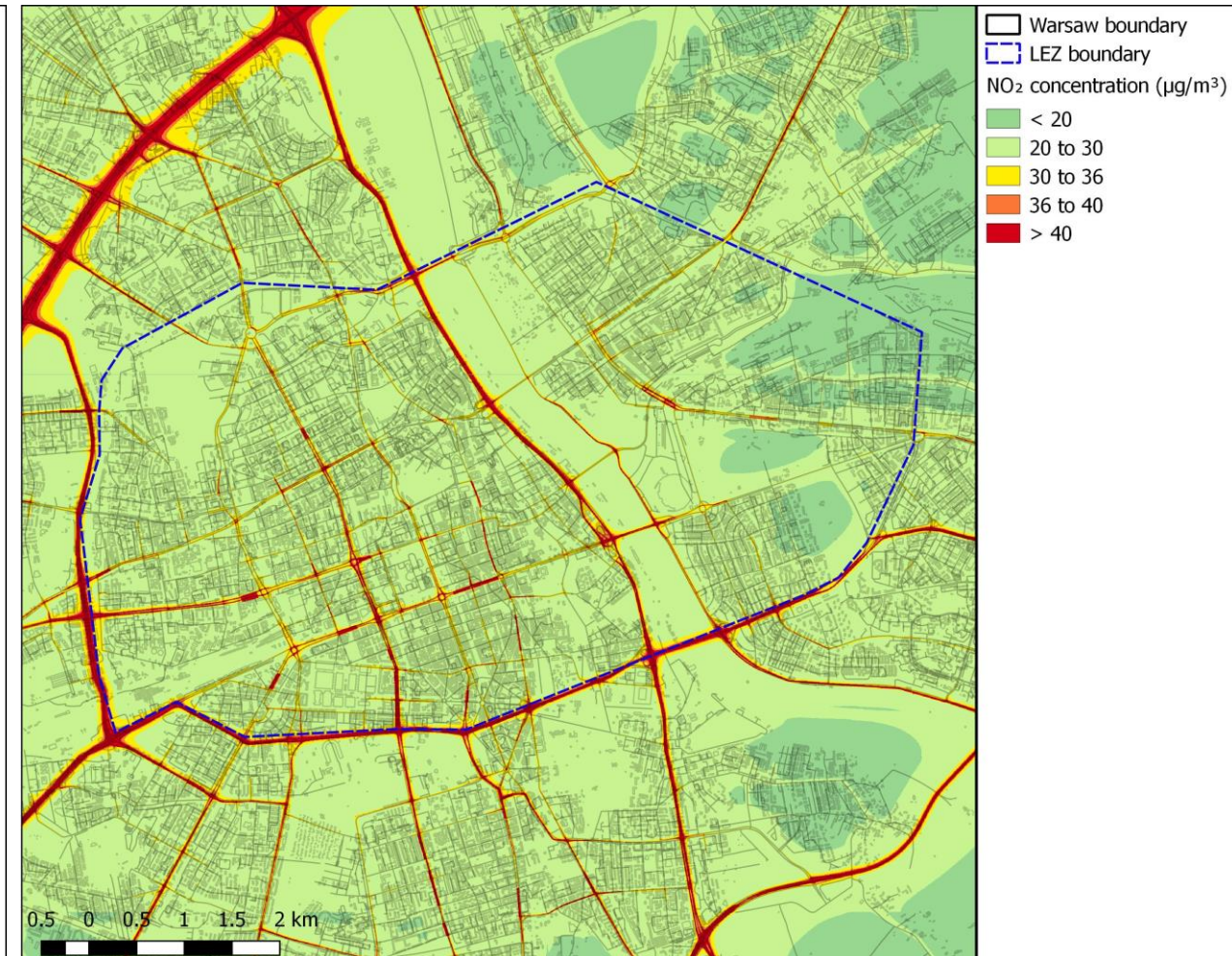
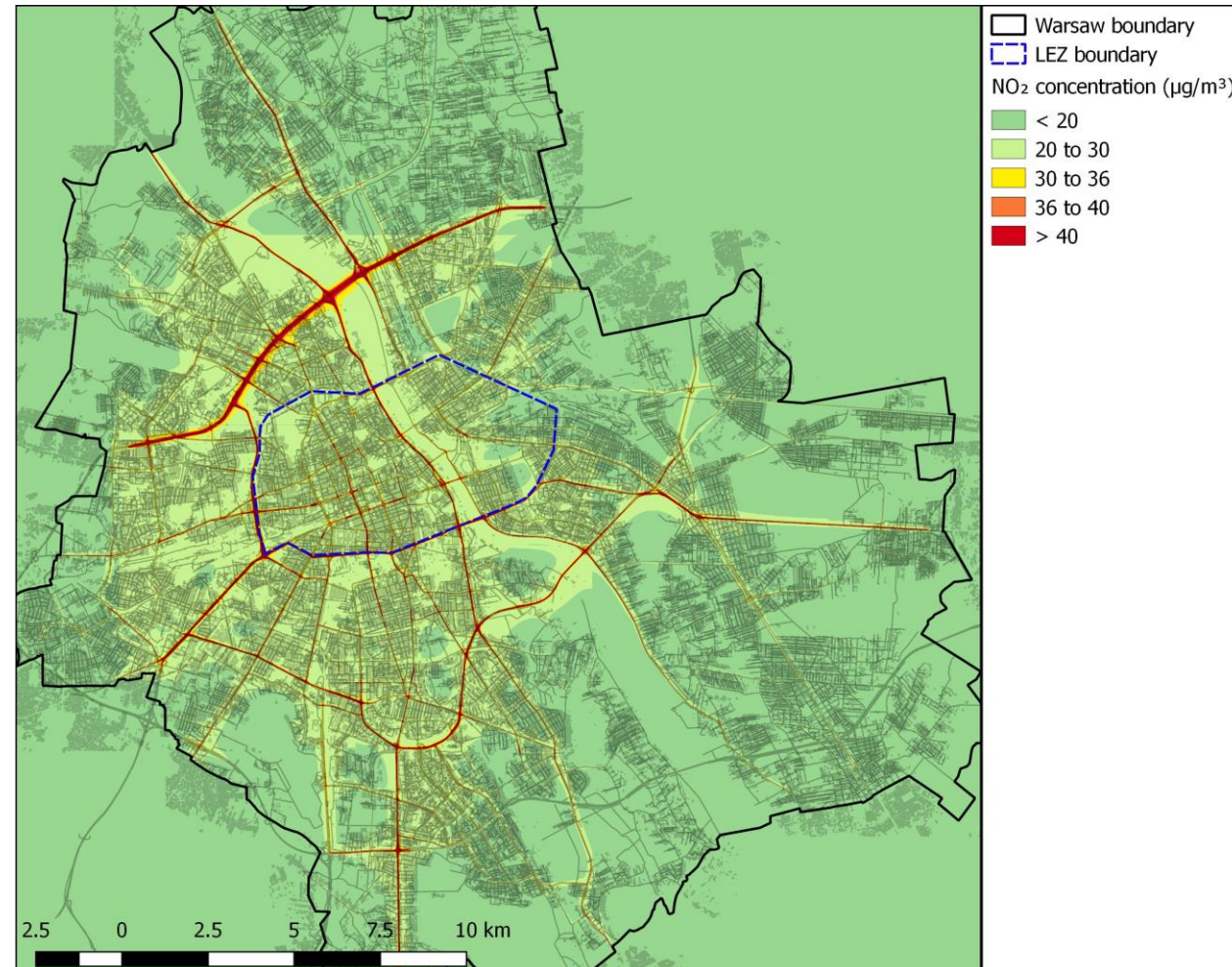
- Concentrations in areas that are within both the extended and original LEZ boundary are slightly higher for Phase 2A than Phase 2 because of the impacts of scheme exemption for residents living in the zone
- As for Phase 3A, the largest decrease in concentrations is observed in areas within the extended LEZ boundary that were outside of the original LEZ. A decrease in concentrations is also observed for areas outside of both the extended and original boundary

NO₂ results

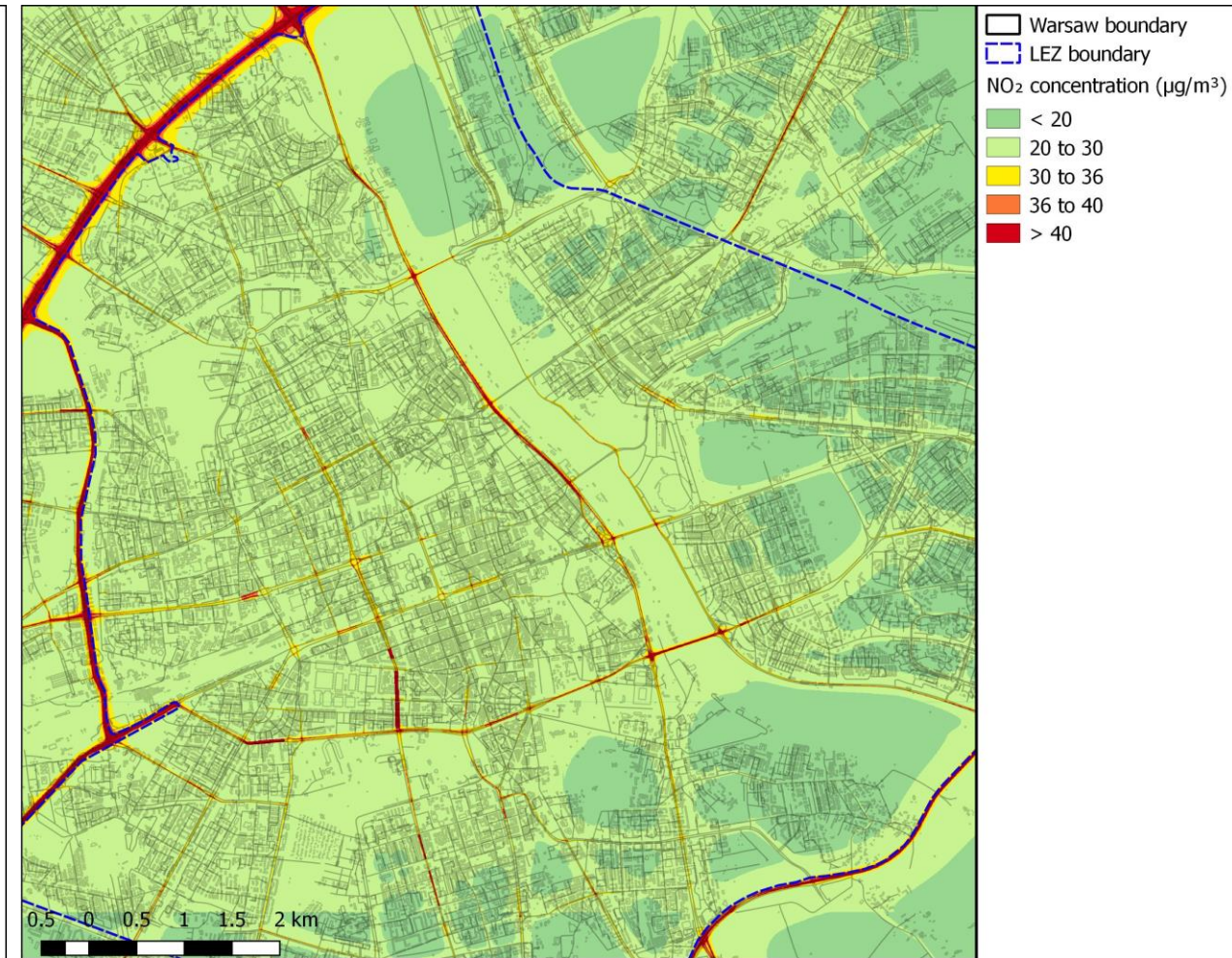
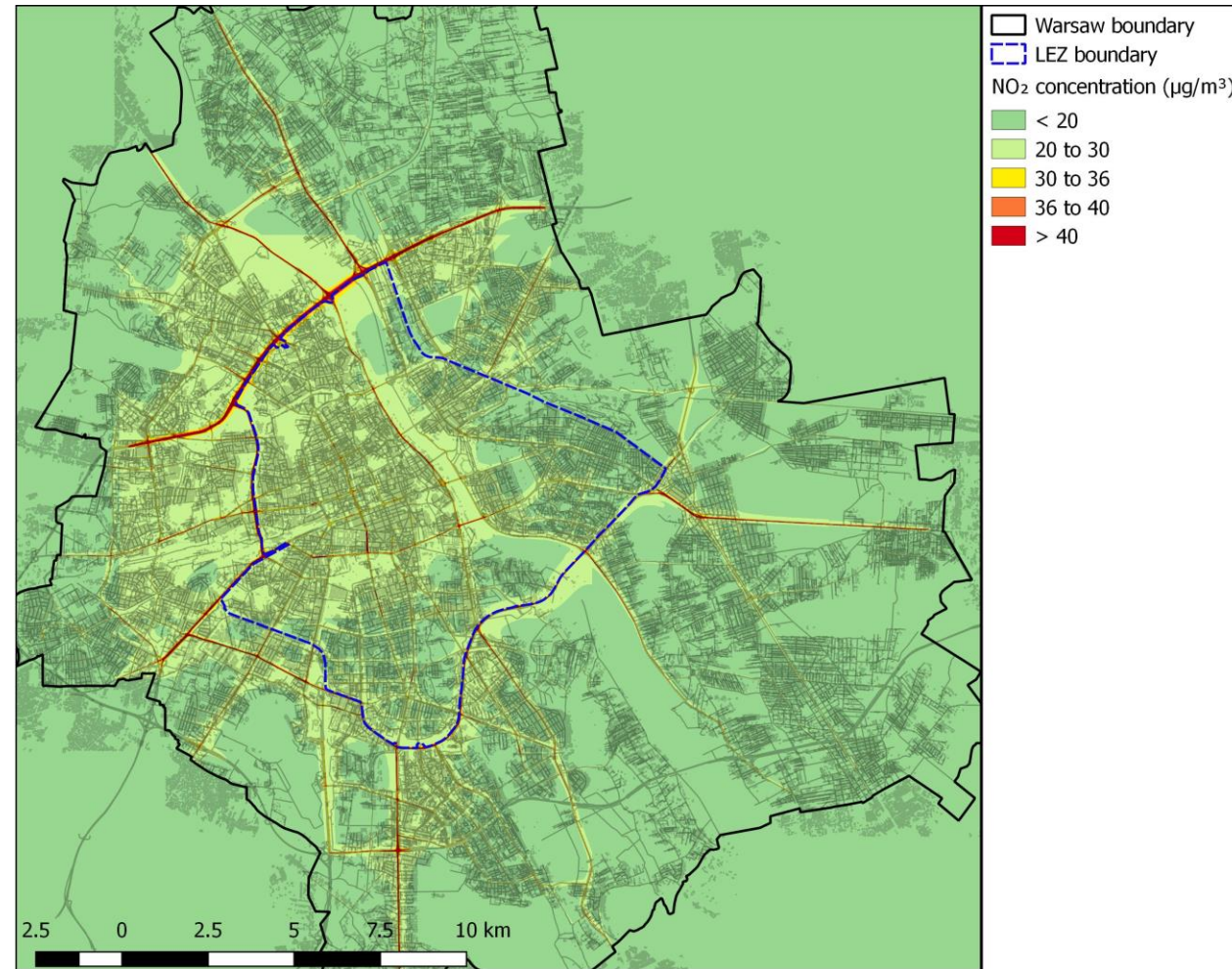
2026 LEZ Phase 2A NO₂ concentration



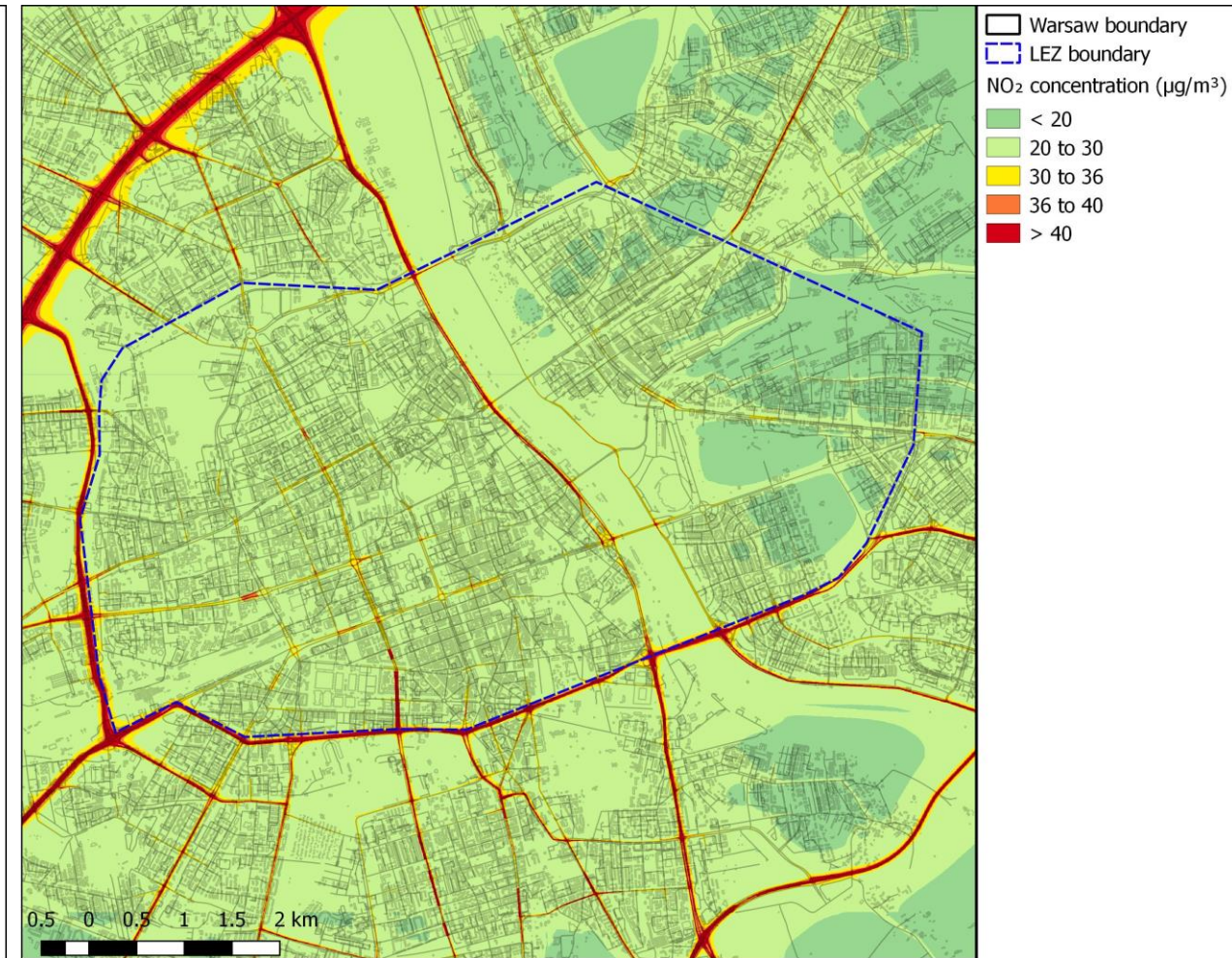
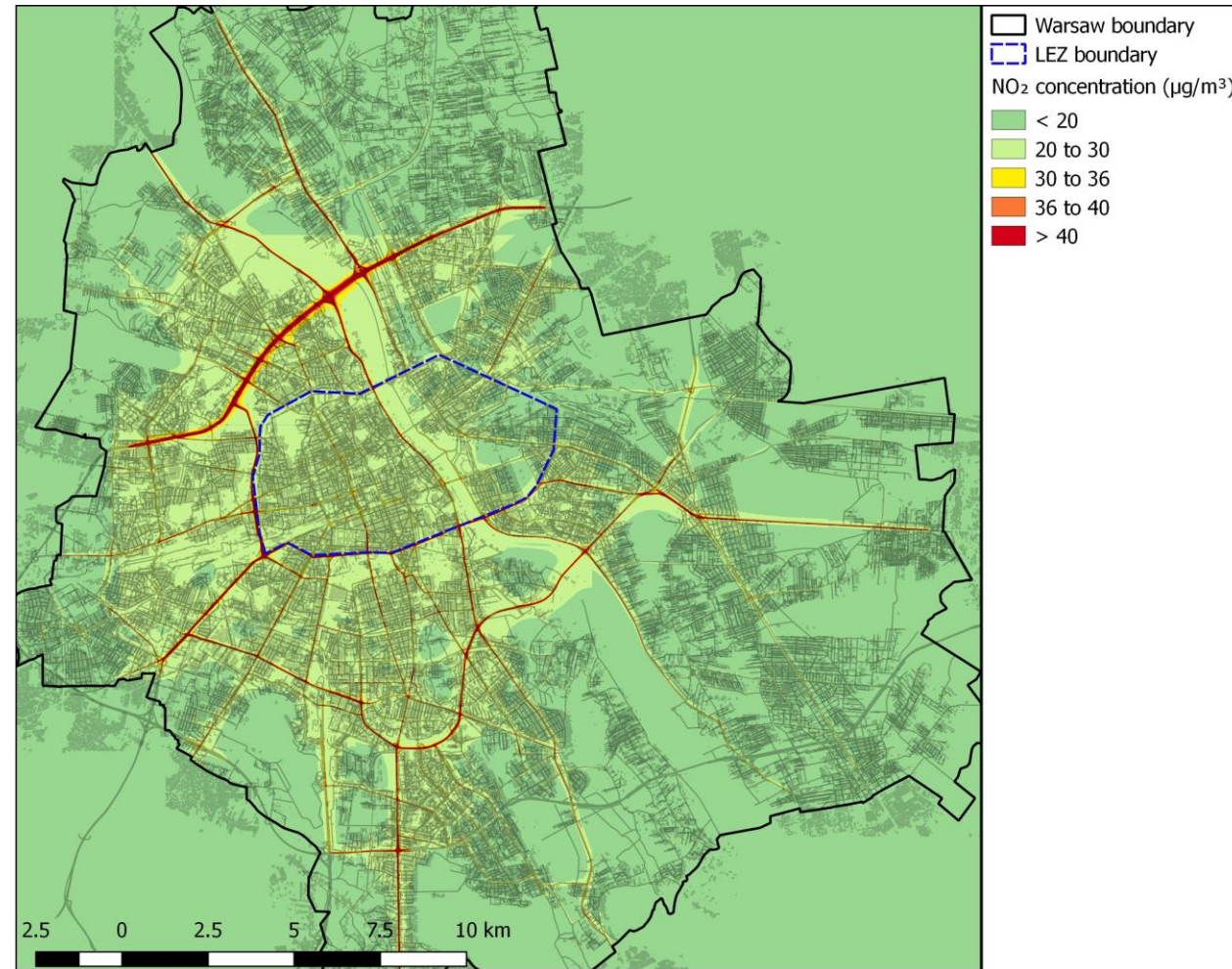
2026 LEZ Phase 2 (with TB) NO₂ concentration



2026 LEZ Phase 3A NO₂ concentration

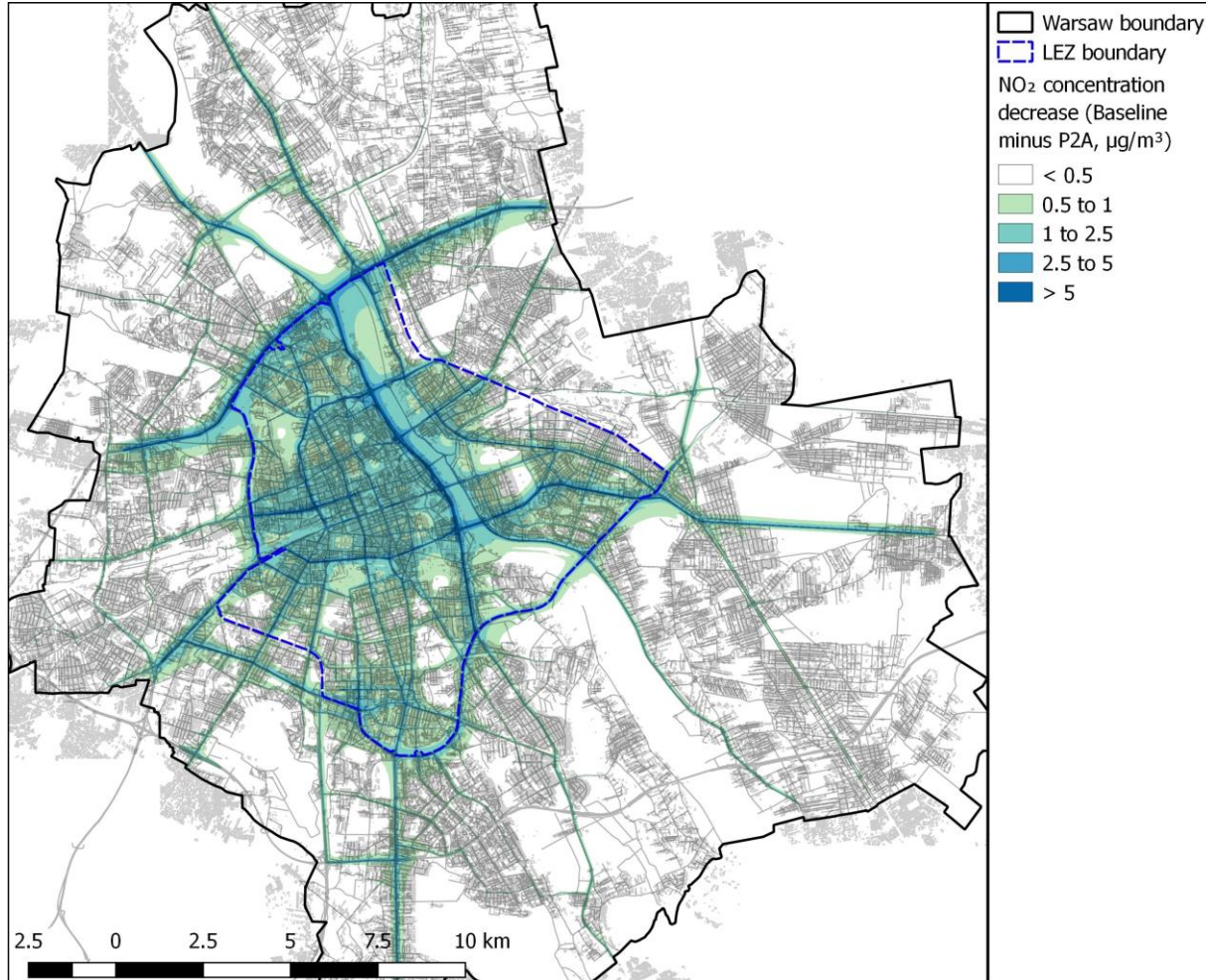


2026 LEZ Phase 3 (with TB) NO₂ concentration

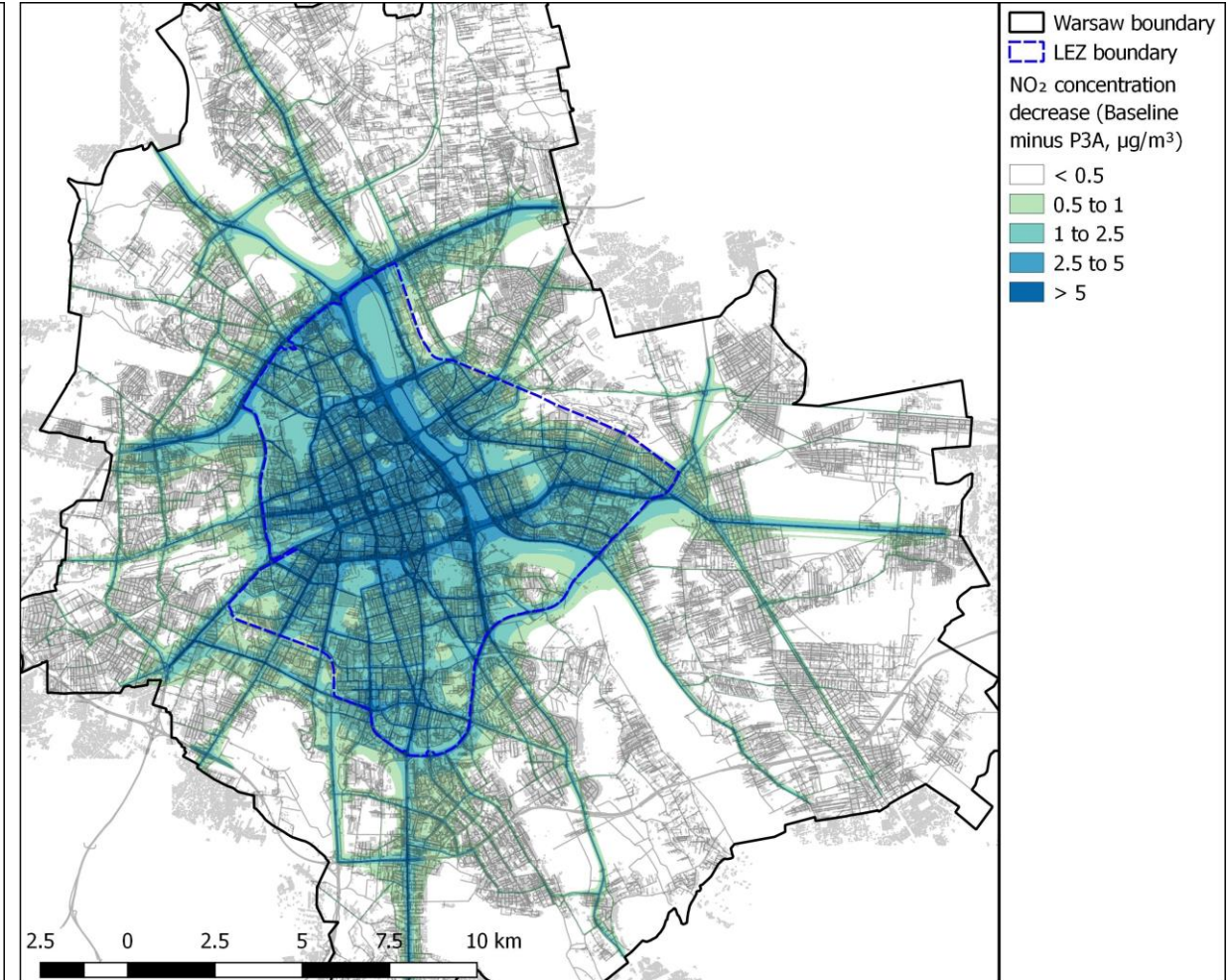


NO₂ concentration decrease as a result of LEZ implementation

Phase 2A

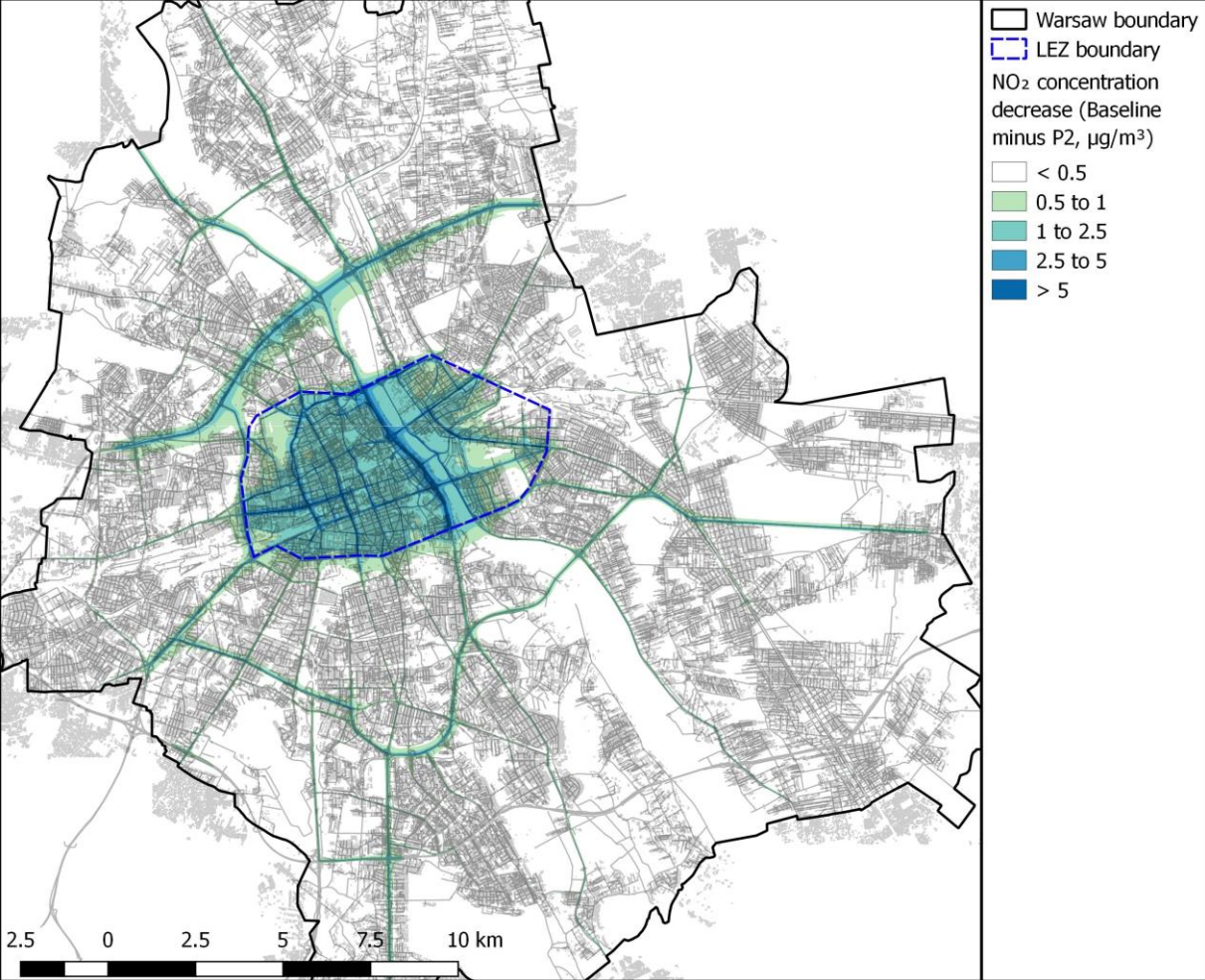


Phase 3A



NO₂ concentration decrease as a result of LEZ implementation

Phase 2

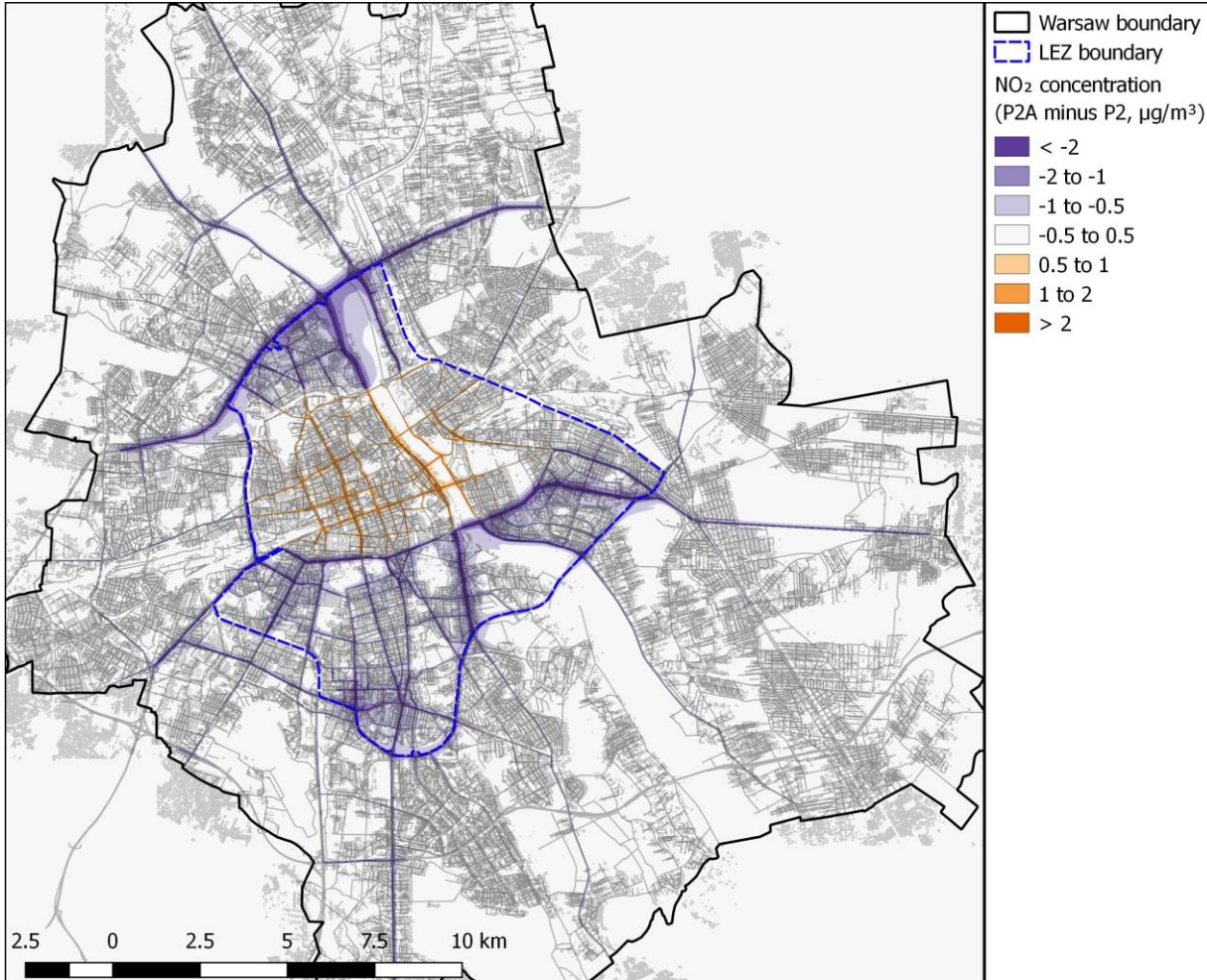


Phase 3

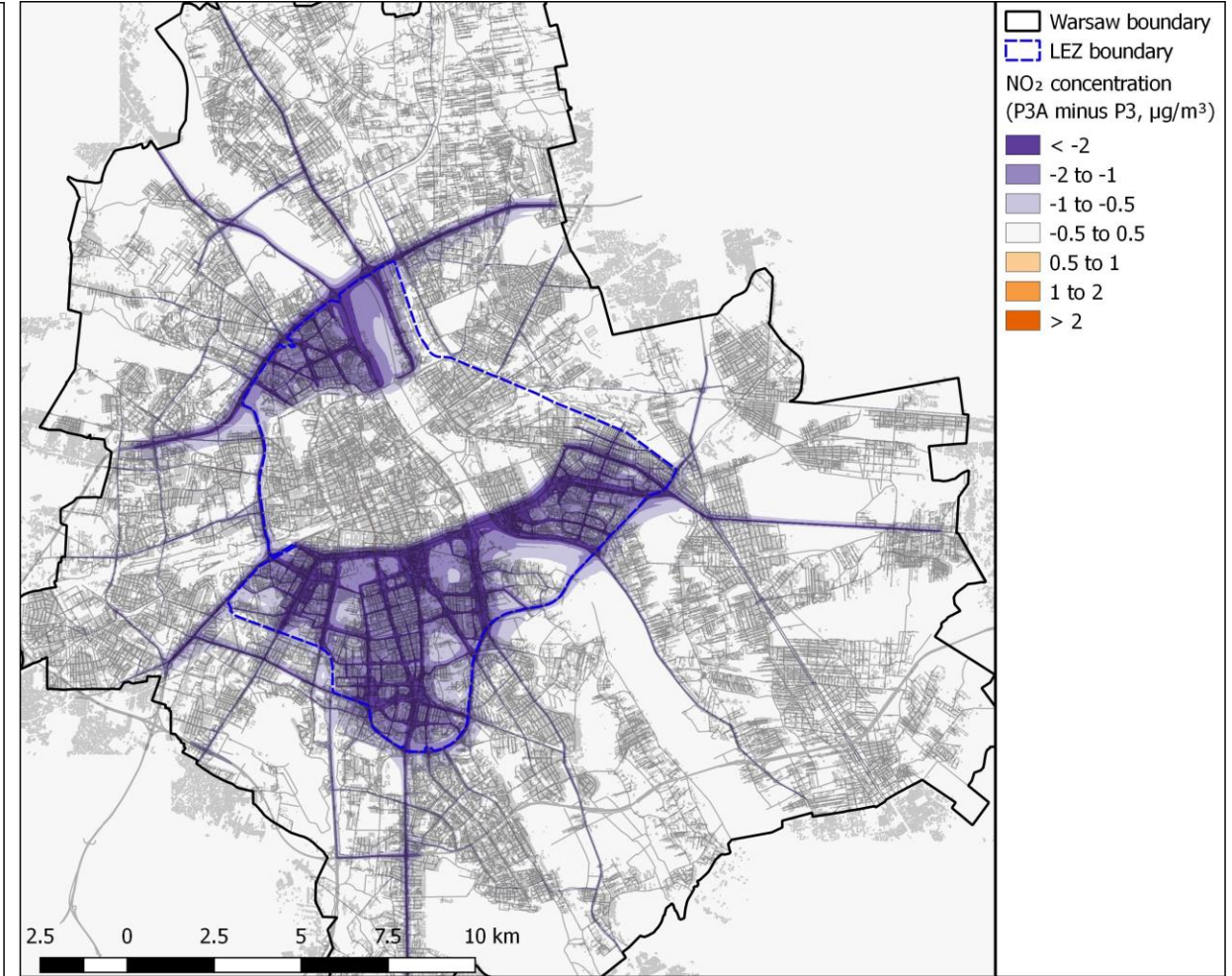


NO₂ concentration: Comparison of original and extended LEZ

Phase 2A – Phase 2

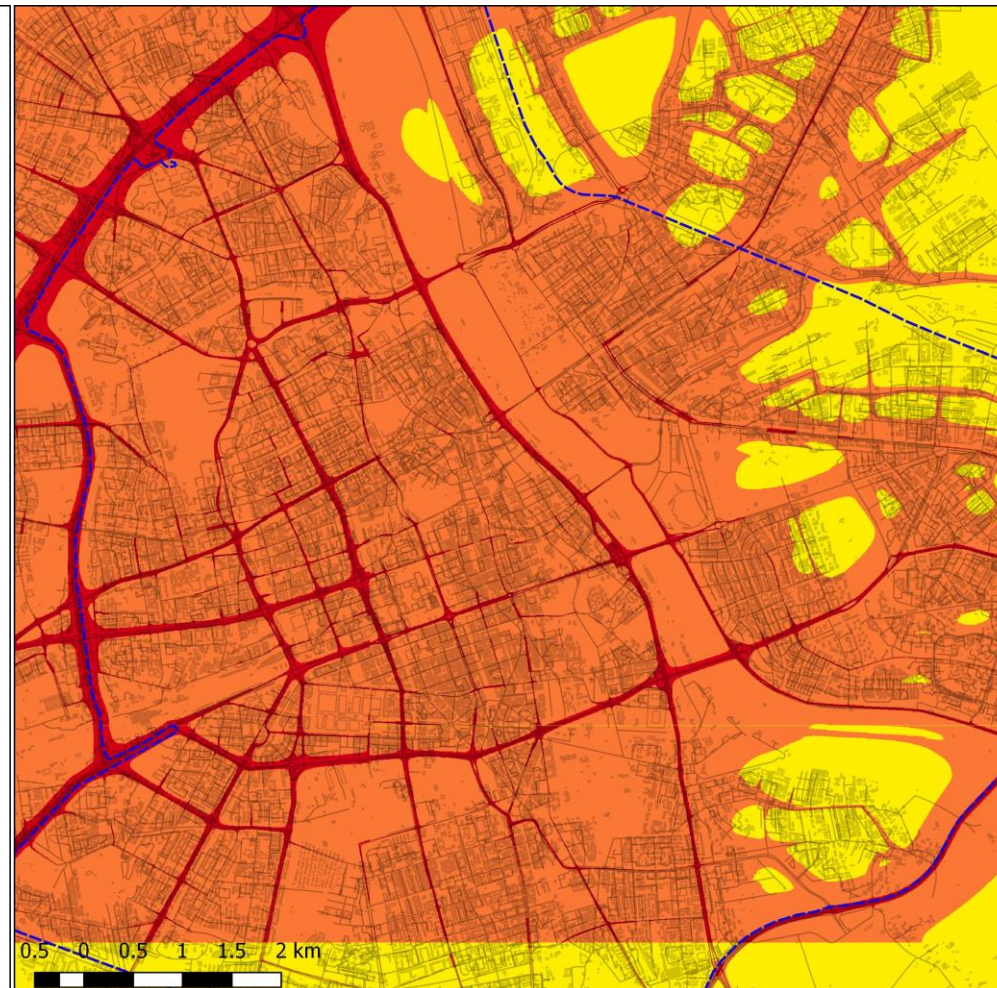
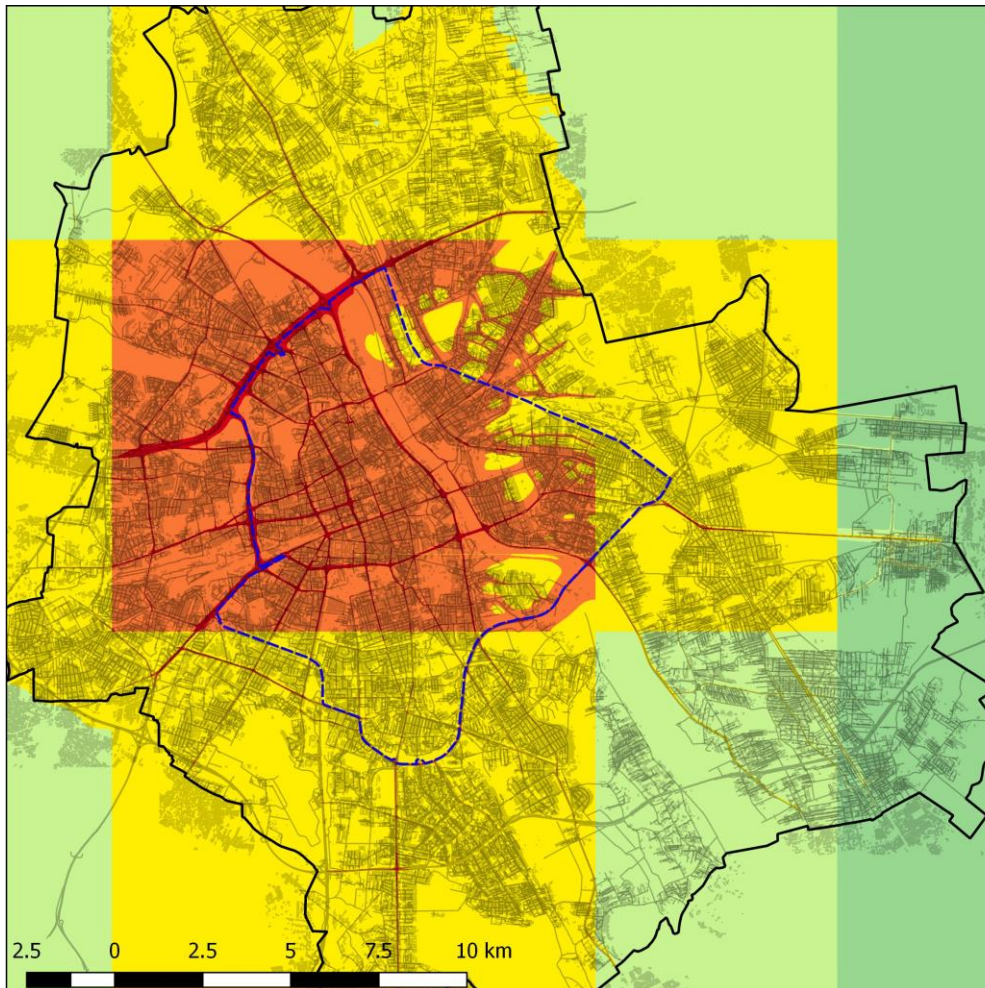


Phase 3A – Phase 3

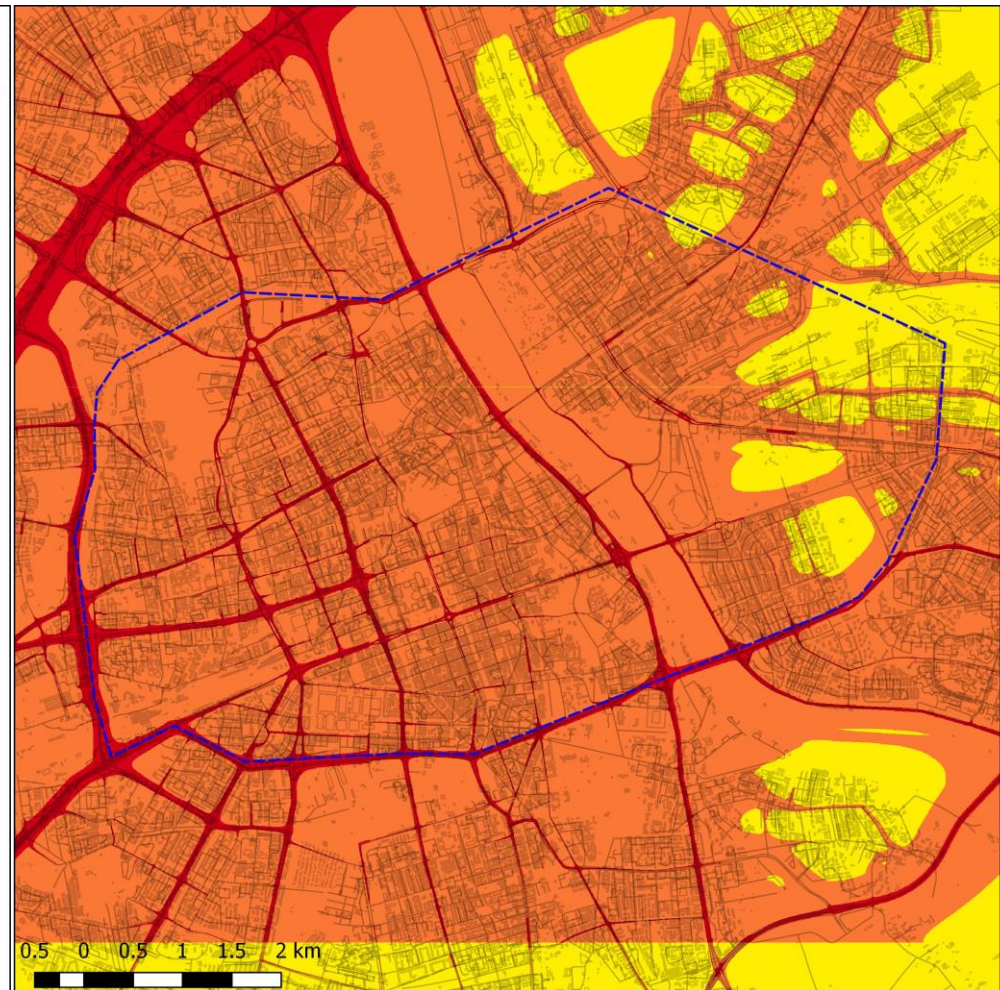
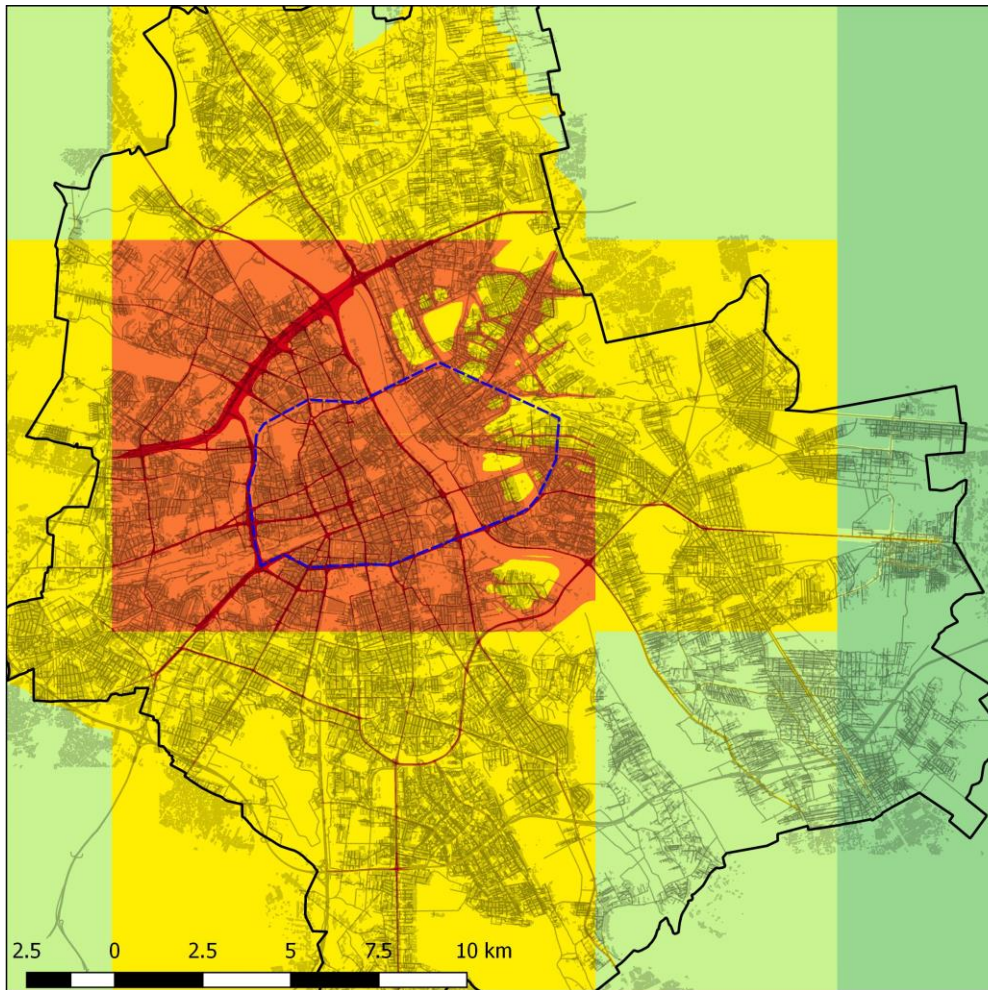


PM_{2.5} results

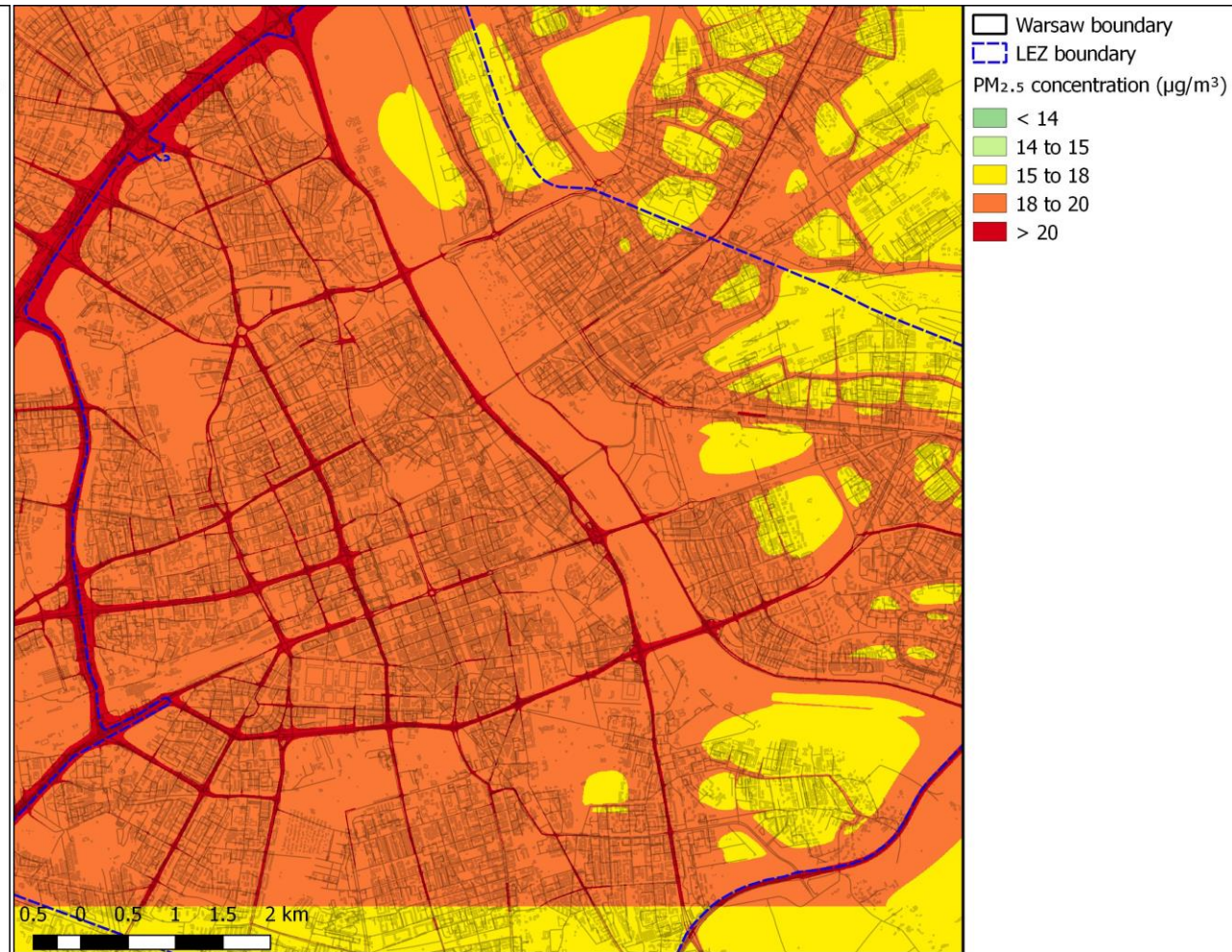
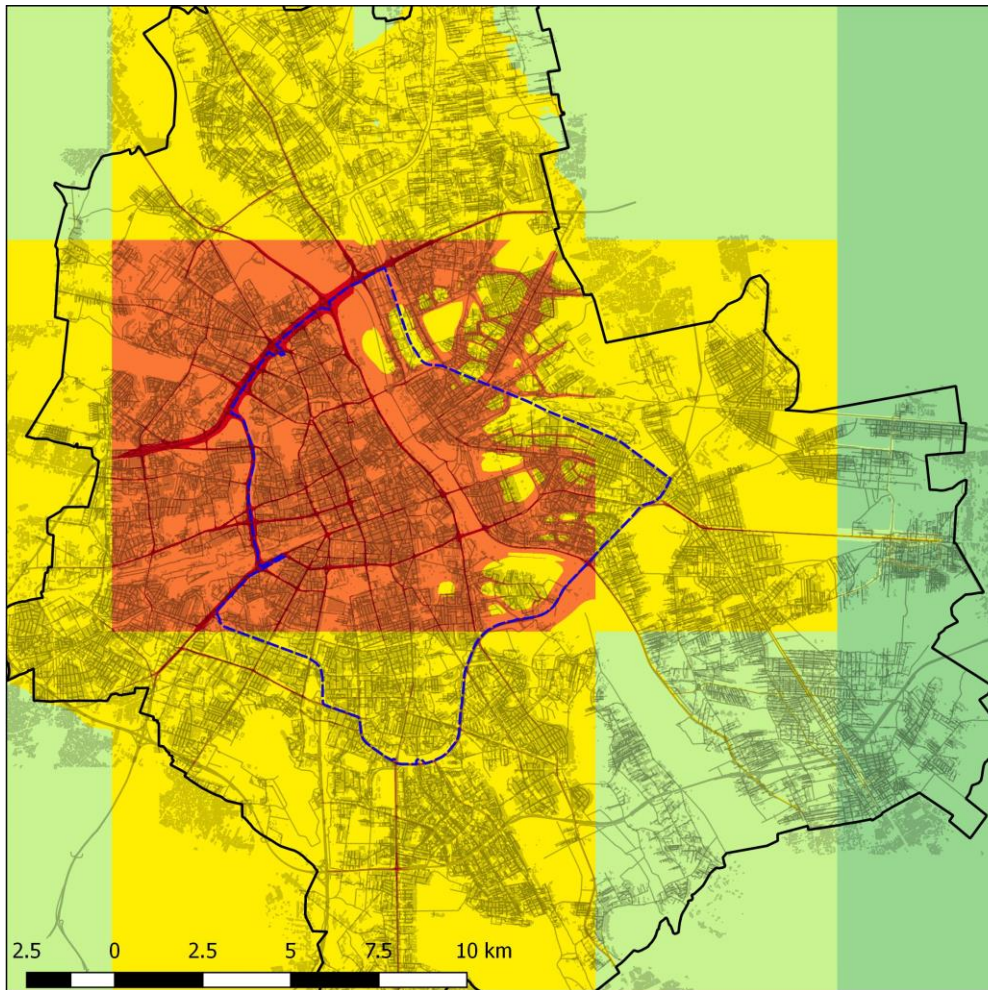
2026 LEZ Phase 2A PM_{2.5} concentration



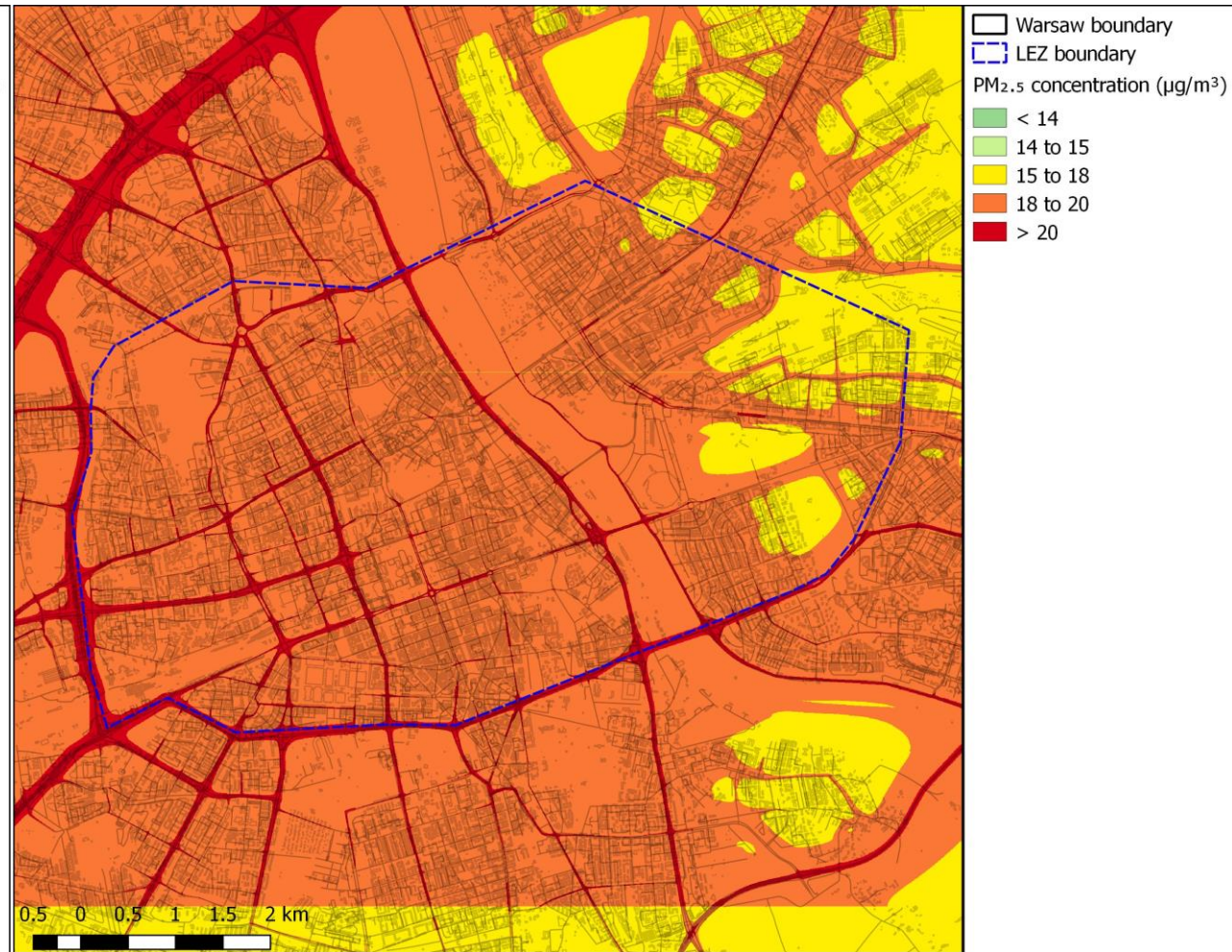
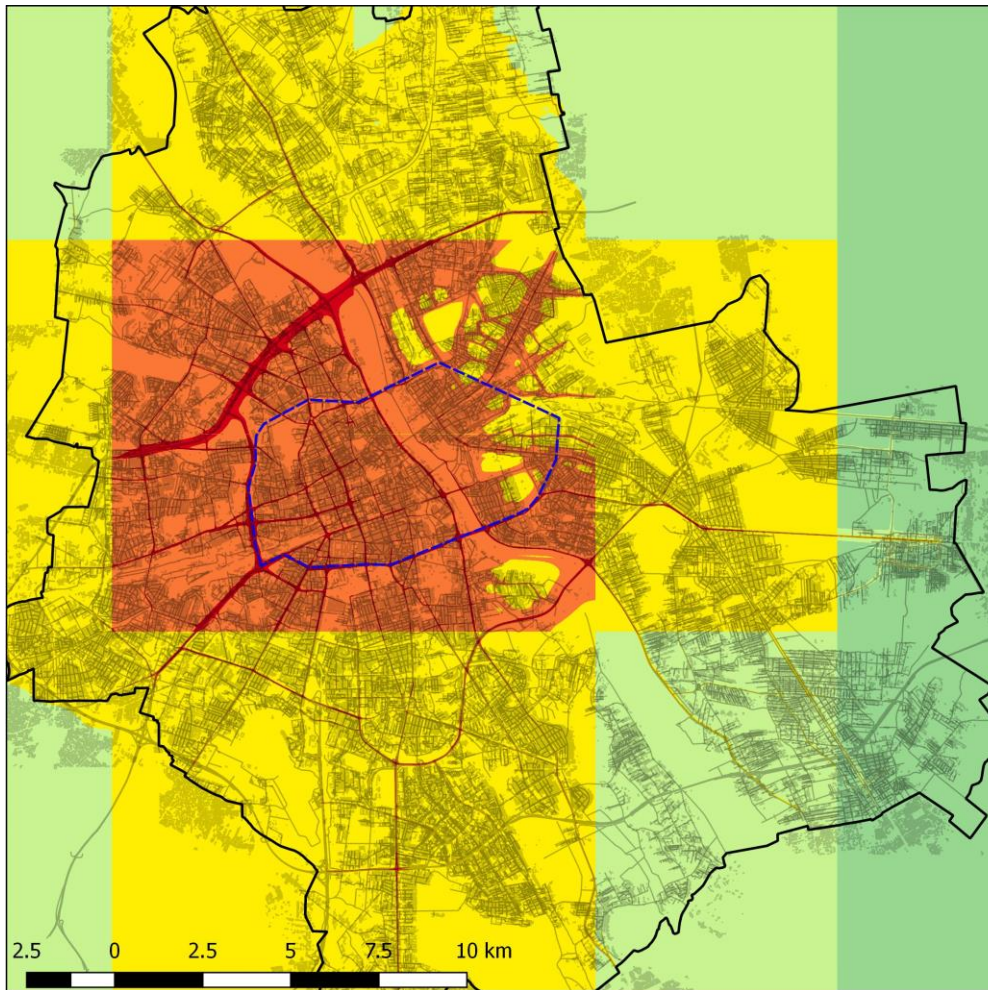
2026 LEZ Phase 2 (with TB) PM_{2.5} concentration



2026 LEZ Phase 3A PM_{2.5} concentration

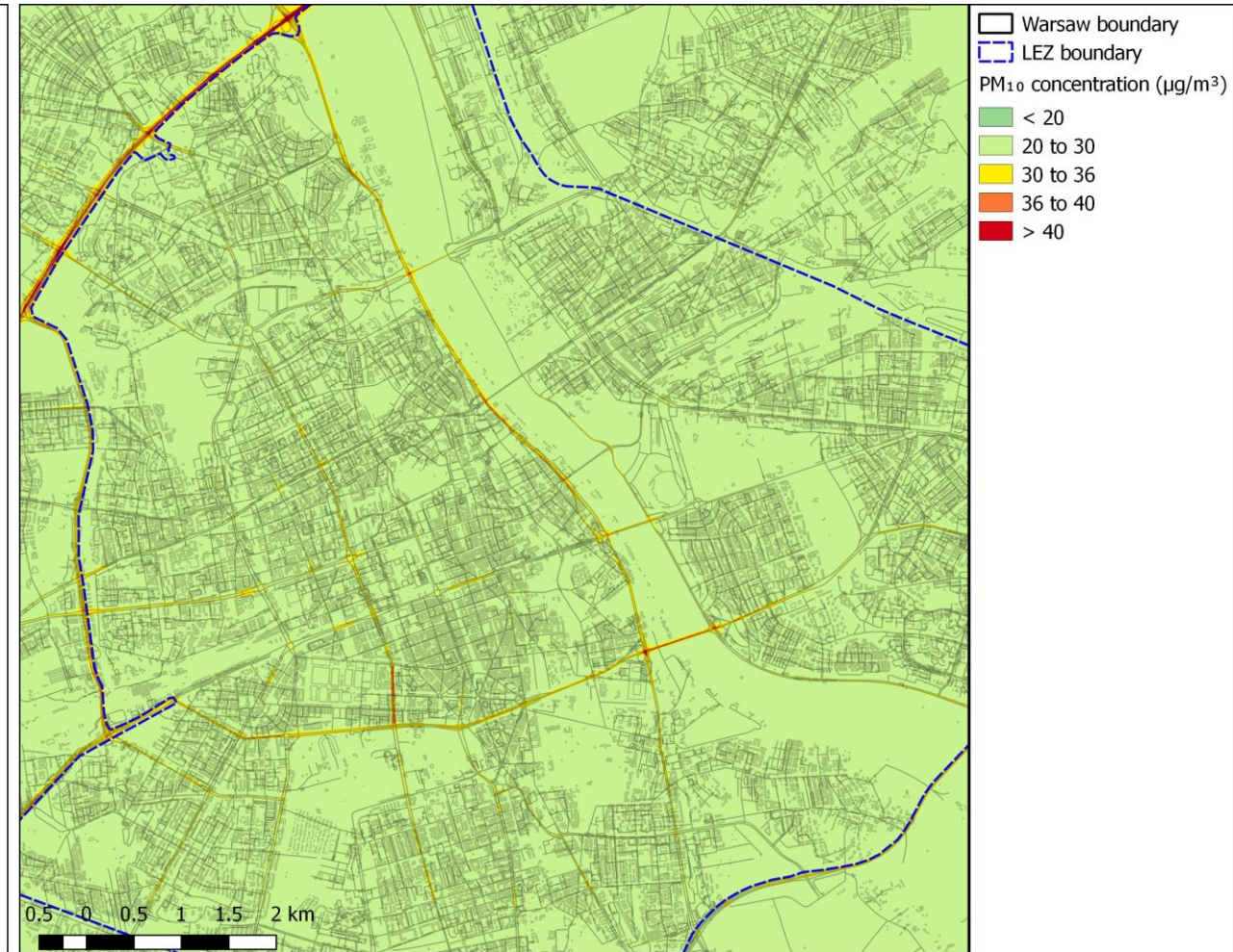
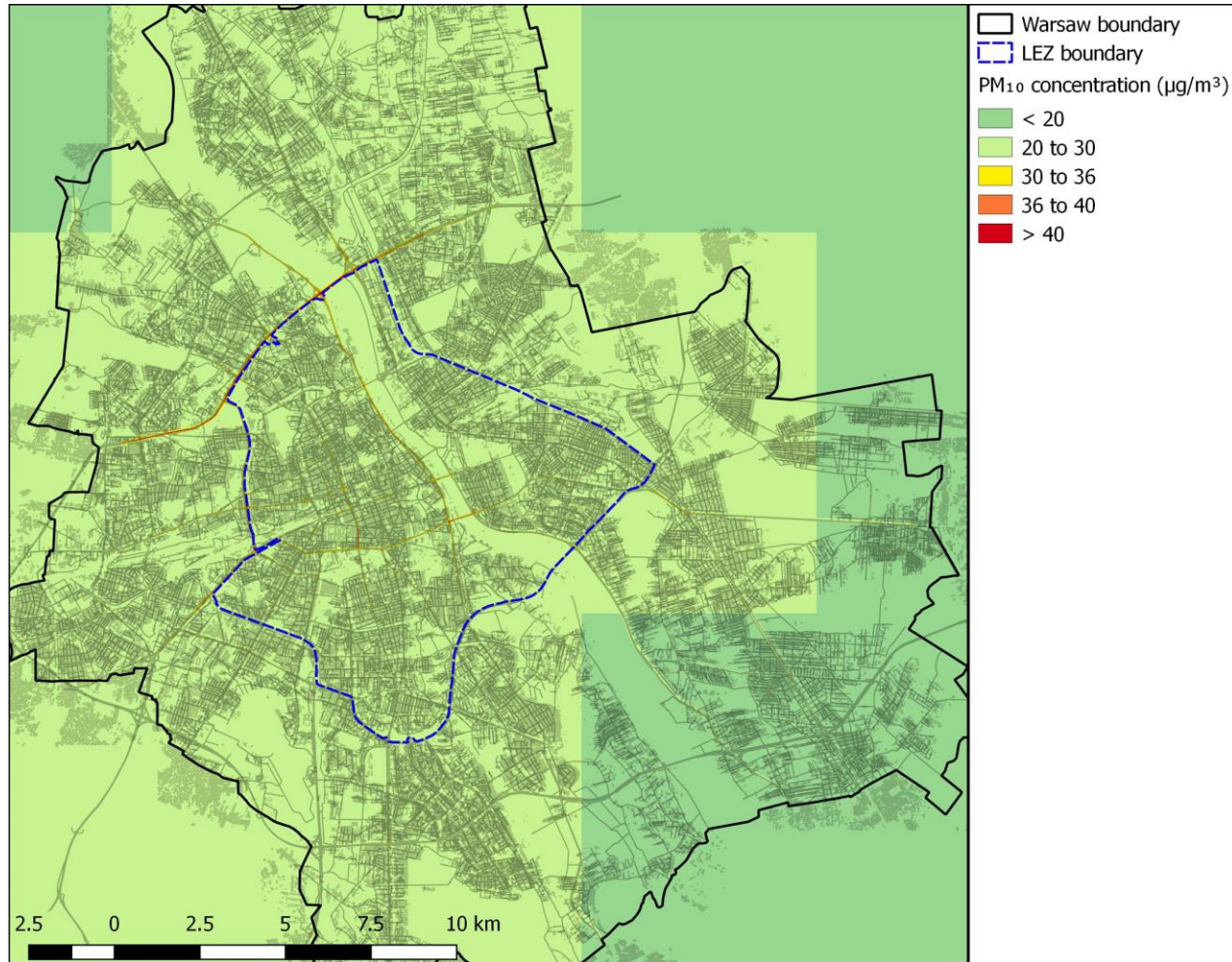


2026 LEZ Phase 3 (with TB) PM_{2.5} concentration

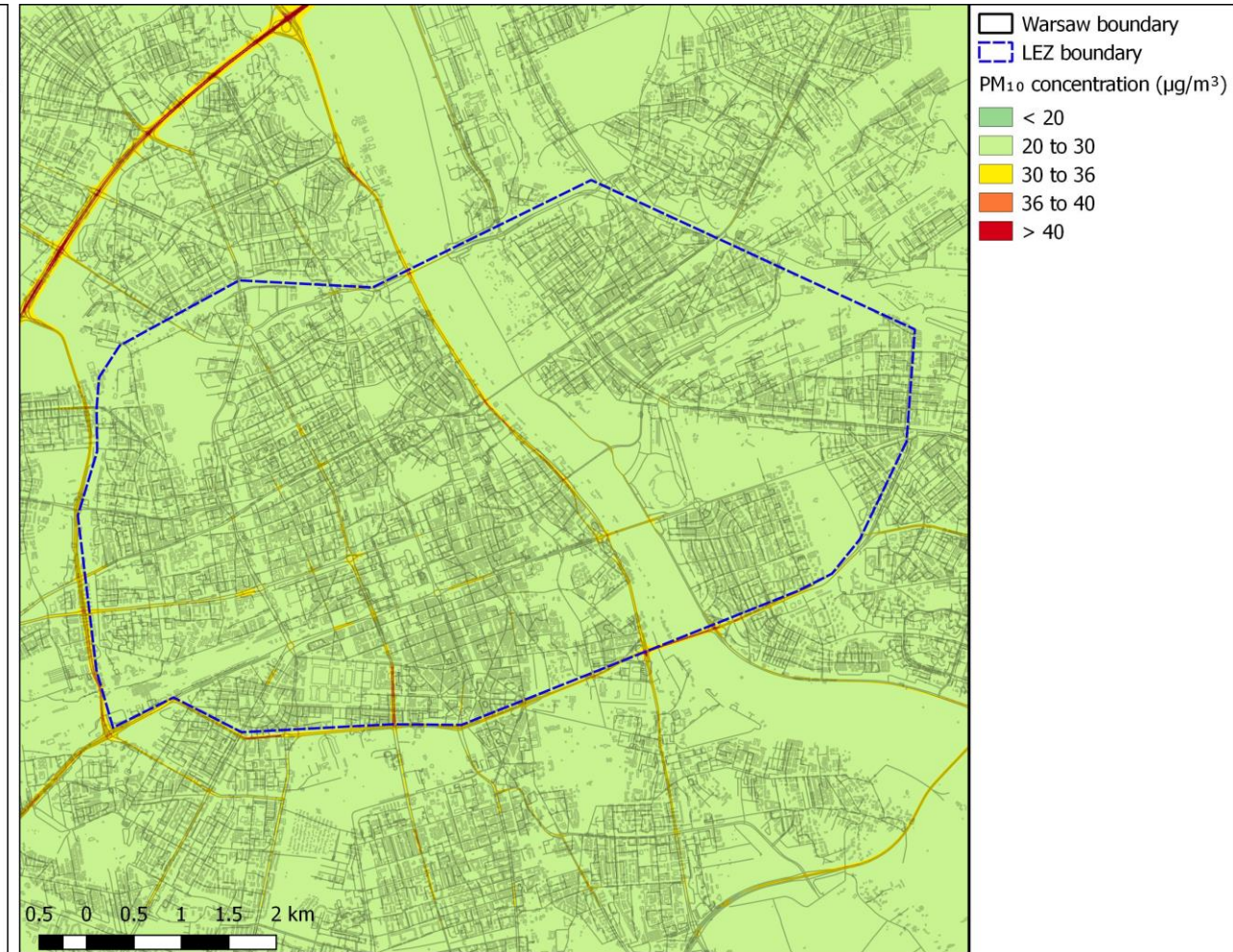
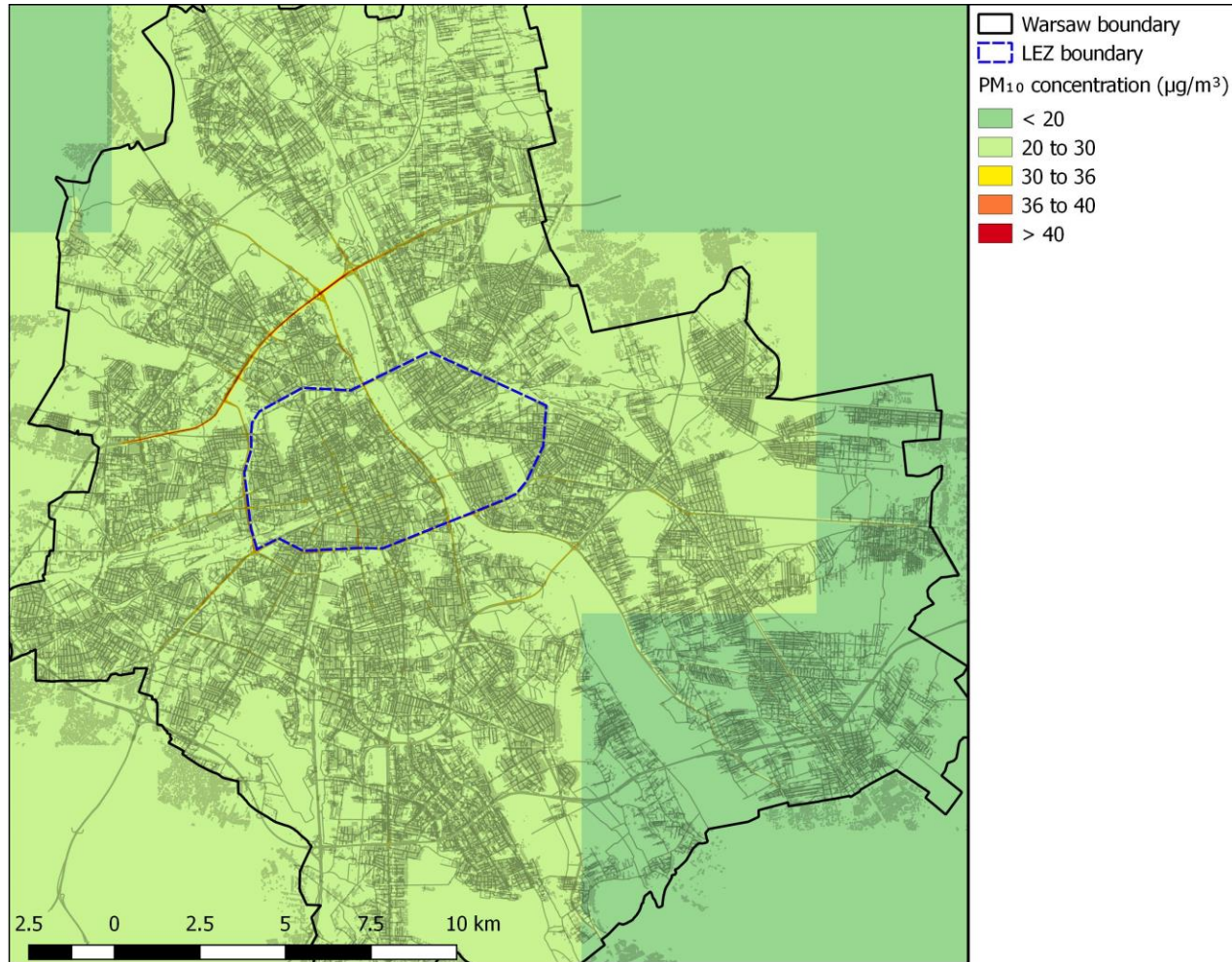


PM₁₀ results

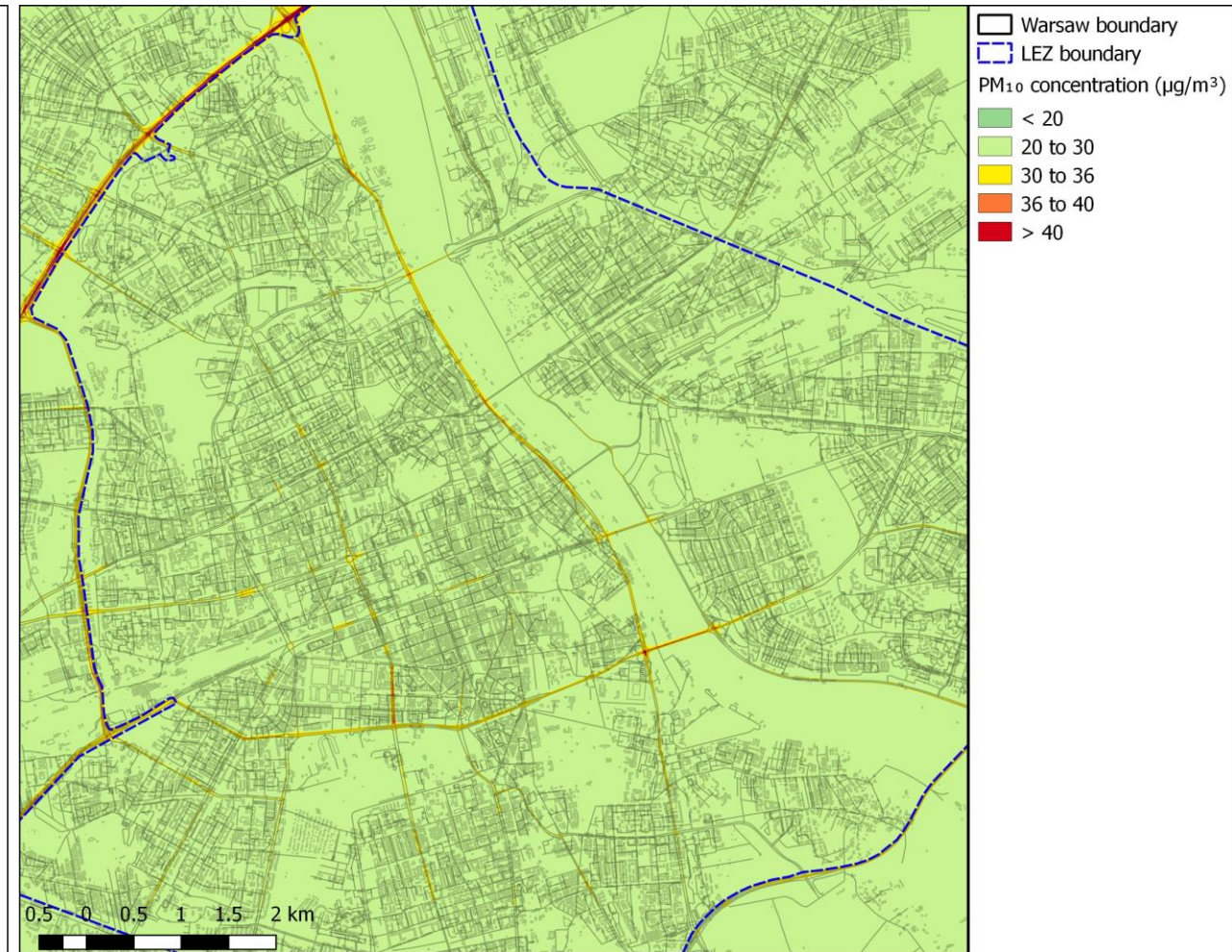
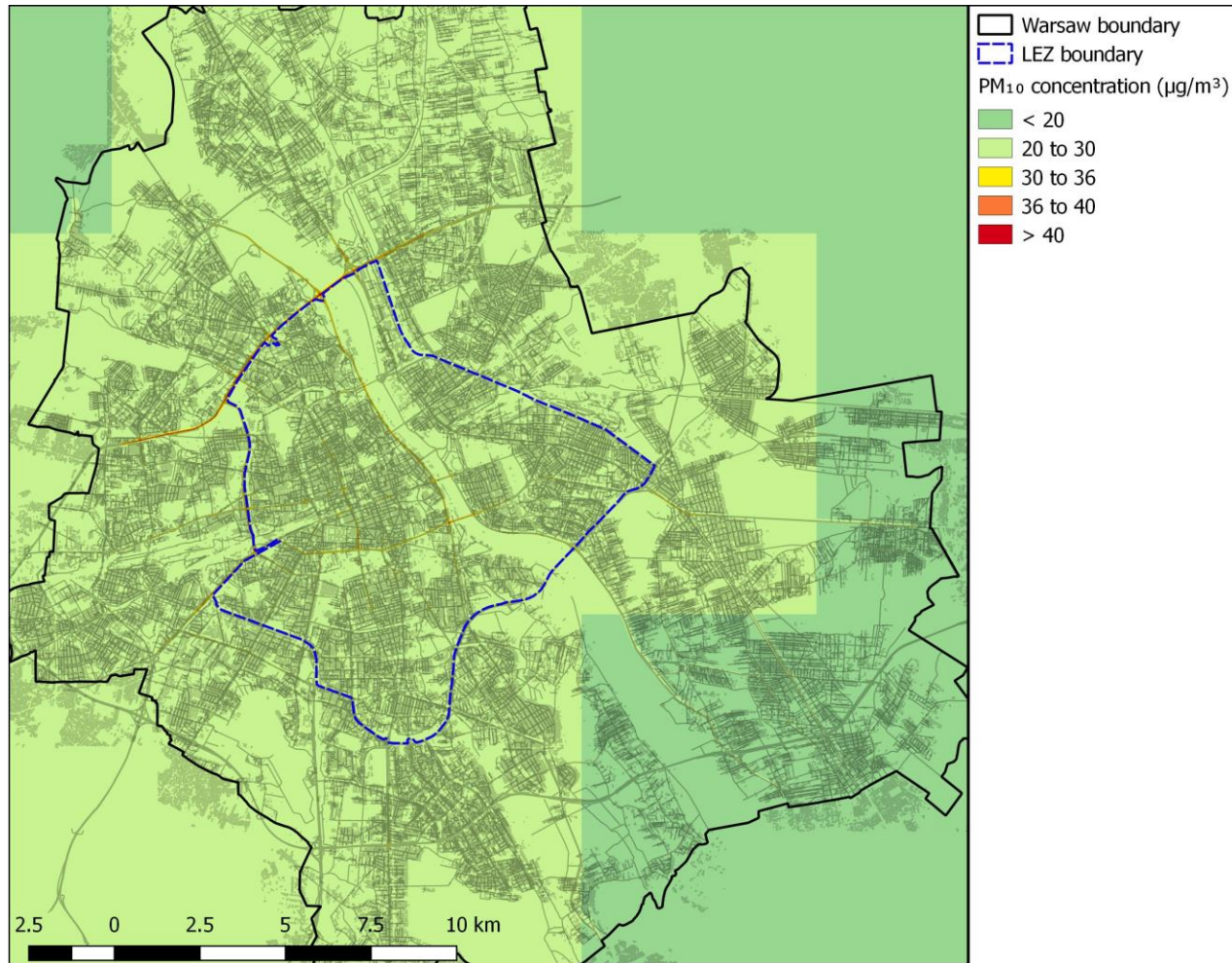
2026 LEZ Phase 2A PM₁₀ concentration



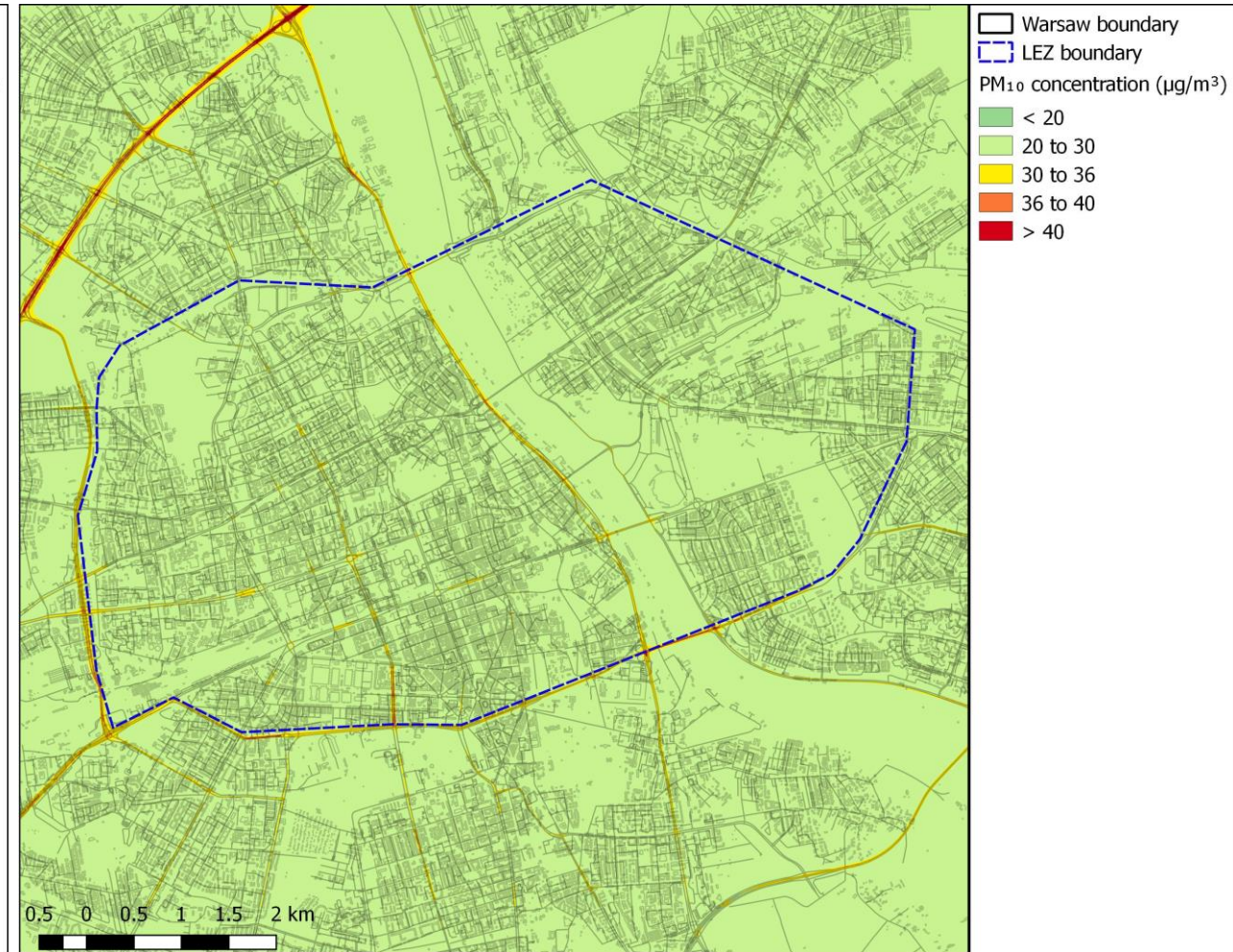
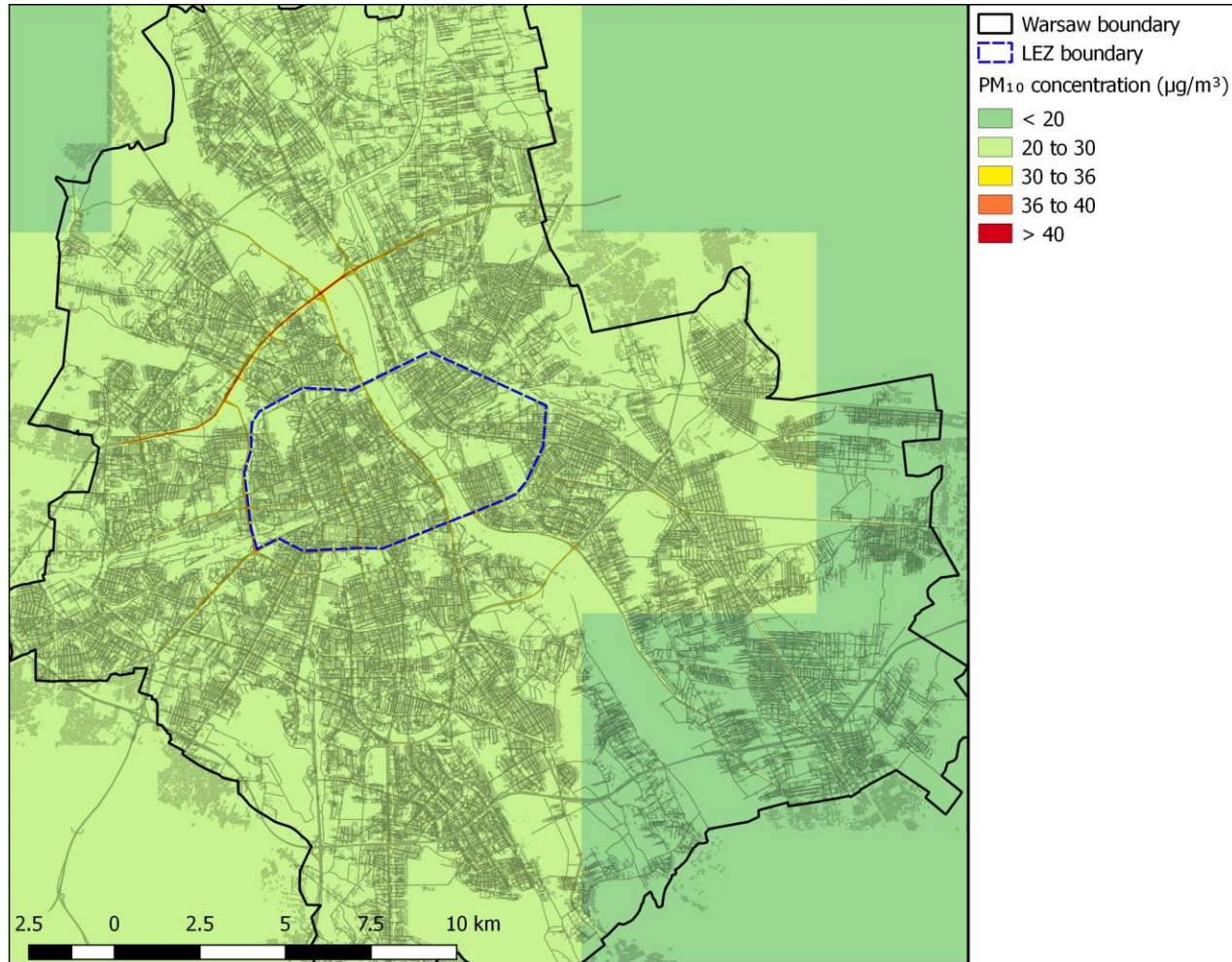
2026 LEZ Phase 2 (with TB) PM₁₀ concentration



2026 LEZ Phase 3A PM₁₀ concentration



2026 LEZ Phase 3 (with TB) PM₁₀ concentration



Extended LEZ: Air quality modelling results – at monitoring locations

Results at monitoring locations

Introduction

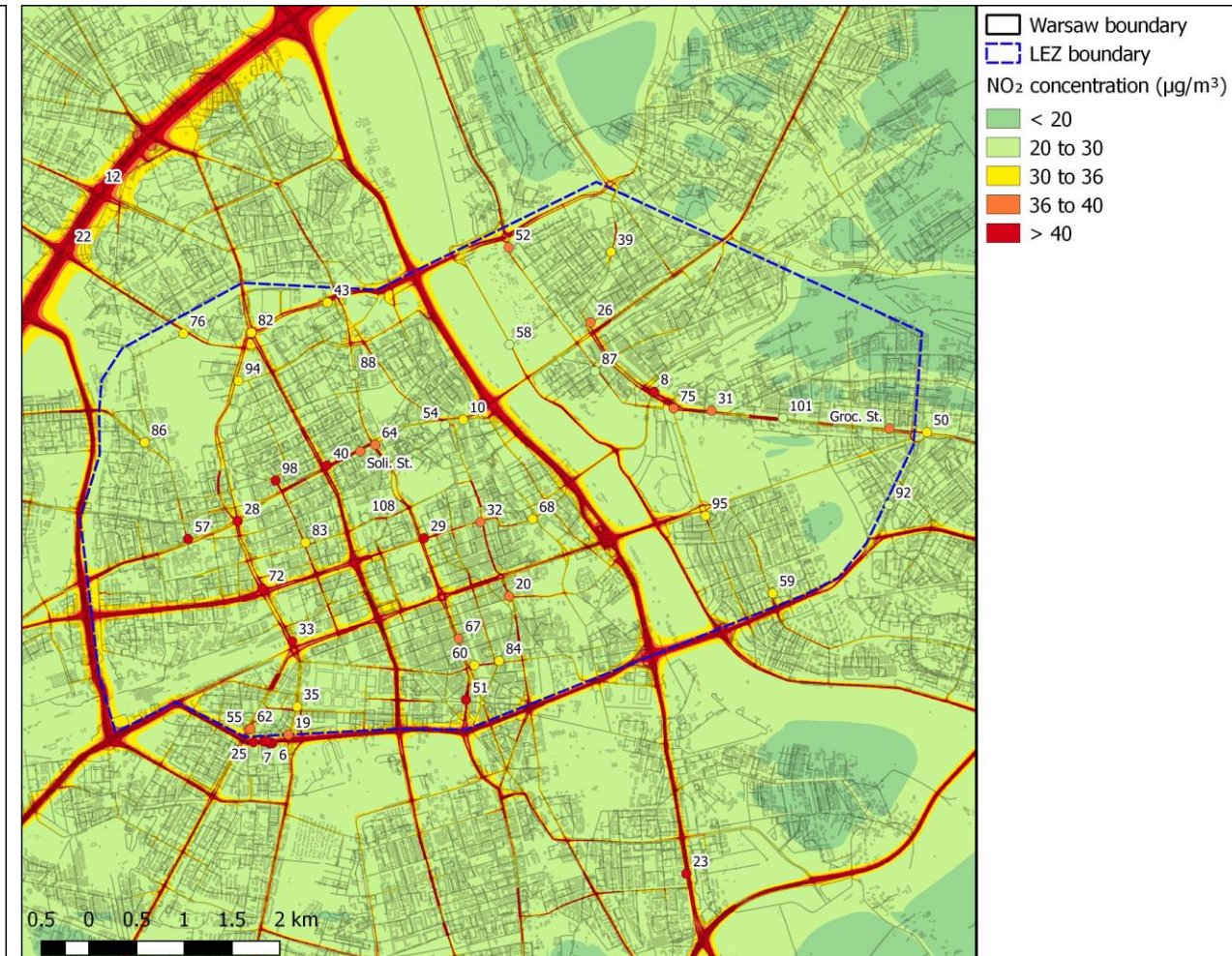
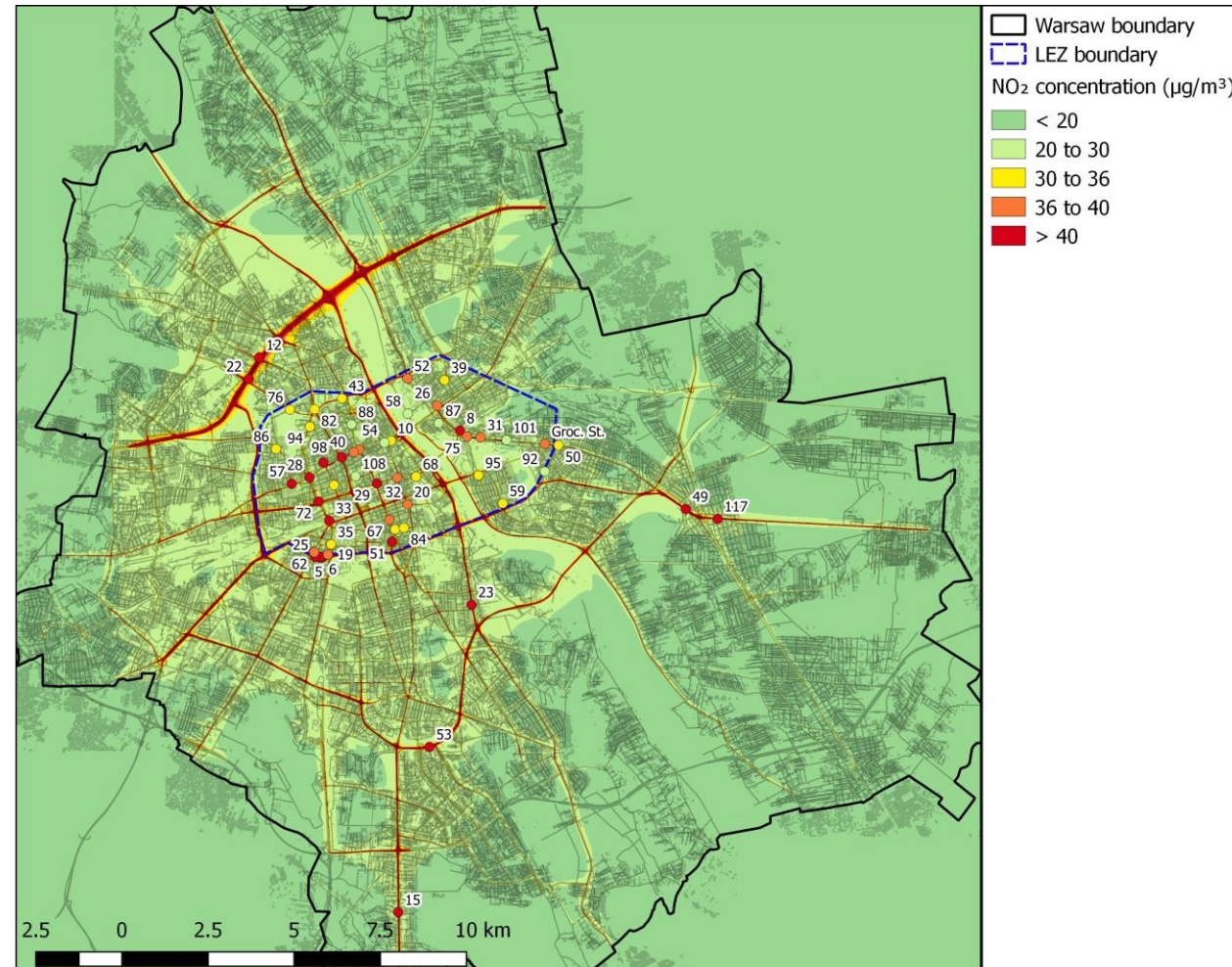
- An alternative way to view the modelling results is to consider the results at monitoring site locations
- Automatic monitoring stations and diffusion tubes are likely to have been sited to capture the worst-case exceedance locations on road links within the City of Warsaw
- Pollutant concentrations at these locations therefore provide a good indication of local air quality and potential exceedances in relation to the local air quality management regime
- The following data tables show the modelled pollutant concentrations at specified monitoring site locations in 2019 and 2026 for the Baseline, LEZ Phase 2A, LEZ Phase 2 (with TB), LEZ Phase 3A and LEZ Phase 3 scenarios
- Points are labelled as 'LEZ' or 'Outside' depending on their location in relation to both the original and extended LEZ boundary

Results summary

- Implementation of the LEZ shows a decrease in NO₂, PM_{2.5} and PM₁₀ concentrations at all monitoring locations compared to the Baseline. The largest decreases are observed at receptors located within the LEZ boundary

NO₂ results

Monitoring site locations: modelled NO₂ concentrations



Site ID	Original location	Extended location	Modelled NO ₂ concentration (µg/m ³)					
			2019	2026 Baseline	2026 Phase 2A	2026 Phase 2 (with TB)	2026 Phase 3A	2026 Phase 3 (with TB)
DT_28	LEZ	LEZ	64.45	52.37	45.02	43.46	36.55	36.55
DT_29	LEZ	LEZ	56.80	46.69	41.68	40.14	33.73	33.73
DT_98	LEZ	LEZ	54.42	45.68	42.18	40.66	34.66	34.66
DT_33	LEZ	LEZ	53.70	44.57	39.74	38.45	33.01	33.09
DT_8	LEZ	LEZ	53.17	44.08	39.12	37.73	31.39	31.39
DT_51	LEZ	LEZ	52.87	44.98	41.26	40.24	31.32	31.79
DT_40	LEZ	LEZ	52.66	44.27	40.75	39.32	33.47	33.47
DT_72	LEZ	LEZ	51.83	42.54	36.06	35.10	29.99	29.99
DT_57	LEZ	LEZ	50.29	42.13	38.42	37.15	32.27	32.34
DT_26	LEZ	LEZ	46.88	39.54	35.10	34.15	28.11	28.12
DT_32	LEZ	LEZ	46.77	39.49	35.68	34.71	28.53	28.53
DT_64	LEZ	LEZ	45.96	38.57	34.73	33.62	28.44	28.44
DT_55	LEZ	LEZ	45.76	38.91	35.75	35.92	29.94	32.33
DT_62	LEZ	LEZ	45.67	38.86	35.72	35.81	29.92	32.16
DT_75	LEZ	LEZ	45.63	38.59	35.24	34.09	28.56	28.56
DT_20	LEZ	LEZ	45.39	39.34	36.58	35.65	28.07	28.10
DT_31	LEZ	LEZ	44.92	37.29	32.88	31.83	27.37	27.37
DT_52	LEZ	LEZ	44.79	37.09	32.50	31.77	27.01	27.43
244A Grochowska Street	LEZ	LEZ	44.31	36.27	30.66	29.89	25.90	26.05
DT_67	LEZ	LEZ	42.42	36.12	33.39	32.44	27.23	27.31
DT_43	LEZ	LEZ	42.20	35.49	31.28	30.77	27.09	27.51
DT_39	LEZ	LEZ	41.17	35.05	32.68	31.59	27.27	27.31
DT_95	LEZ	LEZ	40.89	35.10	32.21	31.29	26.47	26.50
83/89 Solidarności Street	LEZ	LEZ	40.78	38.23	35.50	34.42	29.69	29.69
DT_86	LEZ	LEZ	40.76	34.83	32.63	31.80	28.65	28.81
DT_60	LEZ	LEZ	40.74	34.75	32.22	31.36	26.81	26.99
DT_76	LEZ	LEZ	40.65	34.80	32.37	31.66	27.97	28.35
DT_94	LEZ	LEZ	40.55	34.17	30.25	29.55	26.51	26.56
DT_10	LEZ	LEZ	40.19	34.32	30.90	30.10	26.19	26.19
DT_68	LEZ	LEZ	39.67	33.67	30.30	29.52	25.38	25.38
DT_35	LEZ	LEZ	39.44	34.10	31.98	31.35	27.50	28.00
DT_83	LEZ	LEZ	37.32	32.42	30.25	29.54	26.33	26.33
DT_84	LEZ	LEZ	36.67	31.54	29.34	28.63	24.95	25.14
DT_82	LEZ	LEZ	35.54	30.73	28.00	27.49	25.02	25.21
DT_59	LEZ	LEZ	34.77	30.01	27.81	28.23	23.62	25.64
DT_101	LEZ	LEZ	33.67	28.96	26.54	25.89	23.21	23.21
DT_88	LEZ	LEZ	33.65	29.49	27.40	26.87	24.57	24.62
DT_54	LEZ	LEZ	33.58	29.31	26.93	26.40	22.88	22.88
DT_87	LEZ	LEZ	31.81	27.74	25.80	25.23	22.62	22.62
DT_58	LEZ	LEZ	31.78	27.46	25.37	24.81	22.57	22.64
DT_108	LEZ	LEZ	29.42	26.63	25.38	24.98	23.16	23.16

*DT = diffusion tube. City automatic monitoring sites are shown in bold

Site ID	Original location	Extended location	Modelled NO ₂ concentration (µg/m ³)					
			2019	2026 Baseline	2026 Phase 2A	2026 Phase 2 (with TB)	2026 Phase 3A	2026 Phase 3 (with TB)
DT_5	Outside	LEZ	88.16	70.80	59.96	68.12	46.24	66.22
DT_9	Outside	LEZ	84.20	67.77	57.67	65.22	44.72	63.36
DT_25	Outside	LEZ	83.21	67.06	57.17	64.52	44.39	62.63
DT_13	Outside	LEZ	81.79	66.01	56.23	63.54	43.69	61.73
DT_18	Outside	LEZ	81.79	66.01	56.23	63.54	43.69	61.73
DT_7	Outside	LEZ	77.80	63.07	53.69	60.73	41.81	59.04
DT_49	Outside	Outside	76.75	59.72	55.27	57.32	52.53	55.87
DT_22	Outside	Outside	64.57	51.21	47.22	49.15	44.86	48.13
DT_12	Outside	Outside	64.56	50.80	46.46	48.51	44.48	47.55
DT_53	Outside	Outside	64.27	49.30	44.59	46.79	42.40	45.74
DT_23	Outside	LEZ	55.38	44.68	37.54	43.12	30.19	42.24
DT_117	Outside	Outside	52.60	41.38	38.06	39.58	36.43	38.71
DT_15	Outside	Outside	52.43	41.44	38.29	39.73	36.71	38.88
DT_6	Outside	LEZ	50.30	42.03	36.94	40.54	30.48	39.36
DT_19	Outside	LEZ	46.21	39.06	35.58	36.97	29.78	34.62
DT_50	Outside	LEZ	40.26	34.24	30.54	32.83	25.27	31.75
DT_92	Outside	LEZ	24.88	22.60	21.32	22.10	19.66	21.69

Comparison of NO₂ exceedances at monitoring sites by scenario

- The tables below show the number of the 58 monitoring locations in exceedance of the European annual limit value for NO₂ (40 µg/m³) and with concentrations within 10% of the limit value (36 – 40 µg/m³) for each of the modelled scenarios
- The 2026 Baseline scenario shows 23 locations with exceedances across the city as a whole
- Implementation of Phase 2A and Phase 3A of the scheme results in eight and 13 fewer locations in exceedance of the NO₂ annual limit value respectively. There are also four fewer locations within 10% of the limit value for Phase 2A and 10 for Phase 3A
- The extended LEZ results in one fewer exceedance for both Phase 2A and 3A when compared with Phase 2 and 3 respectively

Scenario	City > 40 µg/m ³	City 36 – 40 µg/m ³
2019	46	4
2026 Baseline	23	13
2026 Phase 2A	15	9
2026 Phase 2 (with TB)	16	7
2026 Phase 3A	10	3
2026 Phase 3 (with TB)	11	4

Difference from 2026 Baseline	City > 40 µg/m ³	City 36 – 40 µg/m ³
2026 Phase 2A	-8	-4
2026 Phase 2 (with TB)	-7	-6
2026 Phase 3A	-13	-10
2026 Phase 3 (with TB)	-12	-9

Site ID	Original location	Extended location	Modelled NO ₂ concentration (µg/m ³)						
			2026 Baseline	2026 Phase 2A	Phase 2A – Baseline	Phase 2A – Baseline (% of Baseline)	2026 Phase 3A	Phase 3A – Baseline	Phase 3A – Baseline (% of Baseline)
DT_28	LEZ	LEZ	52.37	45.02	-7.35	-14.03%	36.55	-15.82	-30.21%
DT_29	LEZ	LEZ	46.69	41.68	-5.01	-10.73%	33.73	-12.96	-27.76%
DT_98	LEZ	LEZ	45.68	42.18	-3.50	-7.66%	34.66	-11.02	-24.12%
DT_33	LEZ	LEZ	44.57	39.74	-4.83	-10.84%	33.01	-11.56	-25.94%
DT_8	LEZ	LEZ	44.08	39.12	-4.96	-11.25%	31.39	-12.69	-28.79%
DT_51	LEZ	LEZ	44.98	41.26	-3.72	-8.27%	31.32	-13.66	-30.37%
DT_40	LEZ	LEZ	44.27	40.75	-3.52	-7.95%	33.47	-10.80	-24.40%
DT_72	LEZ	LEZ	42.54	36.06	-6.48	-15.23%	29.99	-12.55	-29.50%
DT_57	LEZ	LEZ	42.13	38.42	-3.71	-8.81%	32.27	-9.86	-23.40%
DT_26	LEZ	LEZ	39.54	35.10	-4.44	-11.23%	28.11	-11.43	-28.91%
DT_32	LEZ	LEZ	39.49	35.68	-3.81	-9.65%	28.53	-10.96	-27.75%
DT_64	LEZ	LEZ	38.57	34.73	-3.84	-9.96%	28.44	-10.13	-26.26%
DT_55	LEZ	LEZ	38.91	35.75	-3.16	-8.12%	29.94	-8.97	-23.05%
DT_62	LEZ	LEZ	38.86	35.72	-3.14	-8.08%	29.92	-8.94	-23.01%
DT_75	LEZ	LEZ	38.59	35.24	-3.35	-8.68%	28.56	-10.03	-25.99%
DT_20	LEZ	LEZ	39.34	36.58	-2.76	-7.02%	28.07	-11.27	-28.65%
DT_31	LEZ	LEZ	37.29	32.88	-4.41	-11.83%	27.37	-9.92	-26.60%
DT_52	LEZ	LEZ	37.09	32.50	-4.59	-12.38%	27.01	-10.08	-27.18%
244A Grochowska Street	LEZ	LEZ	36.27	30.66	-5.61	-15.47%	25.90	-10.37	-28.59%
DT_67	LEZ	LEZ	36.12	33.39	-2.73	-7.56%	27.23	-8.89	-24.61%
DT_43	LEZ	LEZ	35.49	31.28	-4.21	-11.86%	27.09	-8.40	-23.67%
DT_39	LEZ	LEZ	35.05	32.68	-2.37	-6.76%	27.27	-7.78	-22.20%
DT_95	LEZ	LEZ	35.10	32.21	-2.89	-8.23%	26.47	-8.63	-24.59%
83/89 Solidarności Street	LEZ	LEZ	38.23	35.50	-2.73	-7.14%	29.69	-8.54	-22.34%
DT_86	LEZ	LEZ	34.83	32.63	-2.20	-6.32%	28.65	-6.18	-17.74%
DT_60	LEZ	LEZ	34.75	32.22	-2.53	-7.28%	26.81	-7.94	-22.85%
DT_76	LEZ	LEZ	34.80	32.37	-2.43	-6.98%	27.97	-6.83	-19.63%
DT_94	LEZ	LEZ	34.17	30.25	-3.92	-11.47%	26.51	-7.66	-22.42%
DT_10	LEZ	LEZ	34.32	30.90	-3.42	-9.97%	26.19	-8.13	-23.69%
DT_68	LEZ	LEZ	33.67	30.30	-3.37	-10.01%	25.38	-8.29	-24.62%
DT_35	LEZ	LEZ	34.10	31.98	-2.12	-6.22%	27.50	-6.60	-19.35%
DT_83	LEZ	LEZ	32.42	30.25	-2.17	-6.69%	26.33	-6.09	-18.78%
DT_84	LEZ	LEZ	31.54	29.34	-2.20	-6.98%	24.95	-6.59	-20.89%
DT_82	LEZ	LEZ	30.73	28.00	-2.73	-8.88%	25.02	-5.71	-18.58%
DT_59	LEZ	LEZ	30.01	27.81	-2.20	-7.33%	23.62	-6.39	-21.29%
DT_101	LEZ	LEZ	28.96	26.54	-2.42	-8.36%	23.21	-5.75	-19.85%
DT_88	LEZ	LEZ	29.49	27.40	-2.09	-7.09%	24.57	-4.92	-16.68%
DT_54	LEZ	LEZ	29.31	26.93	-2.38	-8.12%	22.88	-6.43	-21.94%
DT_87	LEZ	LEZ	27.74	25.80	-1.94	-6.99%	22.62	-5.12	-18.46%
DT_58	LEZ	LEZ	27.46	25.37	-2.09	-7.61%	22.57	-4.89	-17.81%
DT_108	LEZ	LEZ	26.63	25.38	-1.25	-4.69%	23.16	-3.47	-13.03%

Site ID	Original location	Extended location	Modelled NO ₂ concentration (µg/m ³)						
			2026 Baseline	2026 Phase 2A	Phase 2A – Baseline	Phase 2A – Baseline (% of Baseline)	2026 Phase 3A	Phase 3A – Baseline	Phase 3A – Baseline (% of Baseline)
DT_5	Outside	LEZ	70.80	59.96	-10.84	-15.31%	46.24	-24.56	-34.69%
DT_9	Outside	LEZ	67.77	57.67	-10.10	-14.90%	44.72	-23.05	-34.01%
DT_25	Outside	LEZ	67.06	57.17	-9.89	-14.75%	44.39	-22.67	-33.81%
DT_13	Outside	LEZ	66.01	56.23	-9.78	-14.82%	43.69	-22.32	-33.81%
DT_18	Outside	LEZ	66.01	56.23	-9.78	-14.82%	43.69	-22.32	-33.81%
DT_7	Outside	LEZ	63.07	53.69	-9.38	-14.87%	41.81	-21.26	-33.71%
DT_49	Outside	Outside	59.72	55.27	-4.45	-7.45%	52.53	-7.19	-12.04%
DT_22	Outside	Outside	51.21	47.22	-3.99	-7.79%	44.86	-6.35	-12.40%
DT_12	Outside	Outside	50.80	46.46	-4.34	-8.54%	44.48	-6.32	-12.44%
DT_53	Outside	Outside	49.30	44.59	-4.71	-9.55%	42.40	-6.90	-14.00%
DT_23	Outside	LEZ	44.68	37.54	-7.14	-15.98%	30.19	-14.49	-32.43%
DT_117	Outside	Outside	41.38	38.06	-3.32	-8.02%	36.43	-4.95	-11.96%
DT_15	Outside	Outside	41.44	38.29	-3.15	-7.60%	36.71	-4.73	-11.41%
DT_6	Outside	LEZ	42.03	36.94	-5.09	-12.11%	30.48	-11.55	-27.48%
DT_19	Outside	LEZ	39.06	35.58	-3.48	-8.91%	29.78	-9.28	-23.76%
DT_50	Outside	LEZ	34.24	30.54	-3.70	-10.81%	25.27	-8.97	-26.20%
DT_92	Outside	LEZ	22.60	21.32	-1.28	-5.66%	19.66	-2.94	-13.01%

PM_{2.5} results

Site ID	Original location	Extended location	Modelled PM _{2.5} concentration (µg/m ³)					
			2019	2026 Baseline	2026 Phase 2A	2026 Phase 2 (with TB)	2026 Phase 3A	2026 Phase 3 (with TB)
DT_28	LEZ	LEZ	24.11	23.15	22.36	22.16	22.01	22.01
DT_98	LEZ	LEZ	22.51	22.11	21.71	21.53	21.41	21.41
DT_40	LEZ	LEZ	22.43	22.03	21.64	21.47	21.35	21.35
DT_33	LEZ	LEZ	22.34	21.77	21.28	21.13	21.02	21.02
DT_29	LEZ	LEZ	22.19	21.60	21.06	20.88	20.75	20.75
DT_72	LEZ	LEZ	22.16	21.44	20.87	20.76	20.65	20.65
DT_57	LEZ	LEZ	21.94	21.52	21.15	21.01	20.91	20.91
DT_51	LEZ	LEZ	21.69	21.26	20.87	20.74	20.53	20.56
83/89 Solidarności Street	LEZ	LEZ	21.39	21.10	20.83	20.70	20.61	20.61
DT_55	LEZ	LEZ	21.36	21.01	20.70	20.70	20.50	20.63
DT_8	LEZ	LEZ	21.35	20.79	20.29	20.14	20.03	20.03
DT_62	LEZ	LEZ	21.31	20.97	20.67	20.66	20.47	20.59
DT_43	LEZ	LEZ	21.10	20.66	20.28	20.22	20.13	20.15
DT_76	LEZ	LEZ	20.90	20.64	20.41	20.33	20.24	20.26
DT_86	LEZ	LEZ	20.82	20.57	20.36	20.27	20.20	20.21
DT_94	LEZ	LEZ	20.79	20.39	20.06	19.99	19.93	19.93
DT_20	LEZ	LEZ	20.79	20.51	20.22	20.11	19.95	19.96
DT_32	LEZ	LEZ	20.77	20.38	20.02	19.91	19.79	19.79
DT_64	LEZ	LEZ	20.74	20.33	19.97	19.85	19.75	19.75
DT_35	LEZ	LEZ	20.72	20.50	20.29	20.22	20.12	20.15
DT_26	LEZ	LEZ	20.66	20.16	19.74	19.64	19.53	19.53
DT_75	LEZ	LEZ	20.61	20.24	19.90	19.78	19.68	19.68
DT_31	LEZ	LEZ	20.58	20.12	19.72	19.61	19.53	19.53
244A Grochowska Street	LEZ	LEZ	20.56	19.99	19.53	19.45	19.36	19.37
DT_52	LEZ	LEZ	20.54	20.06	19.66	19.58	19.48	19.50
DT_67	LEZ	LEZ	20.42	20.14	19.87	19.76	19.65	19.66
DT_83	LEZ	LEZ	20.39	20.19	19.99	19.91	19.86	19.86
DT_82	LEZ	LEZ	20.24	19.96	19.72	19.66	19.61	19.62
DT_60	LEZ	LEZ	20.23	19.97	19.71	19.62	19.52	19.53
DT_39	LEZ	LEZ	20.19	19.94	19.70	19.59	19.50	19.51
DT_95	LEZ	LEZ	20.13	19.86	19.59	19.49	19.39	19.40
DT_10	LEZ	LEZ	20.02	19.64	19.30	19.22	19.15	19.15
DT_88	LEZ	LEZ	20.01	19.82	19.64	19.59	19.54	19.55
DT_68	LEZ	LEZ	19.92	19.65	19.39	19.30	19.23	19.23
DT_84	LEZ	LEZ	19.67	19.45	19.24	19.17	19.09	19.10
DT_59	LEZ	LEZ	19.62	19.41	19.22	19.24	19.07	19.19
DT_108	LEZ	LEZ	19.56	19.44	19.34	19.30	19.27	19.27
DT_101	LEZ	LEZ	19.36	19.14	18.94	18.87	18.82	18.82
DT_54	LEZ	LEZ	19.27	19.05	18.86	18.80	18.74	18.74
DT_58	LEZ	LEZ	19.21	19.02	18.85	18.79	18.74	18.74
DT_87	LEZ	LEZ	19.14	18.96	18.79	18.74	18.69	18.69

ID	Site ID	Original location	Extended location	Modelled PM _{2.5} concentration (µg/m ³)					
				2019	2026 Baseline	2026 Phase 2A	2026 Phase 2 (with TB)	2026 Phase 3A	2026 Phase 3 (with TB)
5	DT_5	Outside	LEZ	27.44	25.86	24.54	25.53	23.95	25.48
9	DT_9	Outside	LEZ	26.91	25.47	24.27	25.18	23.72	25.13
25	DT_25	Outside	LEZ	26.76	25.35	24.18	25.06	23.64	25.01
13	DT_13	Outside	LEZ	26.50	25.12	23.98	24.84	23.45	24.79
18	DT_18	Outside	LEZ	26.50	25.12	23.98	24.84	23.45	24.79
7	DT_7	Outside	LEZ	25.71	24.41	23.33	24.14	22.86	24.09
22	DT_22	Outside	Outside	24.44	23.36	22.98	23.18	22.92	23.15
49	DT_49	Outside	Outside	24.00	22.62	22.14	22.38	22.10	22.34
12	DT_12	Outside	Outside	23.86	22.77	22.41	22.59	22.37	22.57
23	DT_23	Outside	LEZ	22.31	21.54	20.89	21.40	20.61	21.38
6	DT_6	Outside	LEZ	21.81	21.25	20.78	21.11	20.56	21.08
19	DT_19	Outside	LEZ	21.53	21.16	20.82	20.94	20.61	20.89
53	DT_53	Outside	Outside	20.68	19.57	19.21	19.39	19.17	19.36
50	DT_50	Outside	LEZ	20.18	19.81	19.48	19.68	19.31	19.66
15	DT_15	Outside	Outside	19.58	18.74	18.47	18.60	18.45	18.58
117	DT_117	Outside	Outside	19.58	18.62	18.32	18.46	18.29	18.44
92	DT_92	Outside	LEZ	18.50	18.39	18.30	18.36	18.25	18.35

Comparison of PM_{2.5} exceedances by scenario

- The tables below show the number of 58 specified receptor locations in exceedance of the European annual limit value for PM_{2.5} (20 µg/m³) and with concentrations within 10% of the limit value (18 – 20 µg/m³) for each of the modelled scenarios
- The 2026 Baseline scenario shows 38 locations with exceedances across the city as a whole
- Implementation of Phase 2A and Phase 3A of the scheme results in seven and 10 fewer locations in exceedance of the PM_{2.5} annual limit value respectively
- The extended LEZ results in one more exceedance for Phase 2A than Phase 2 because of the impacts of scheme exemption for residents living in the zone

Scenario	City > 20 µg/m ³	City 18 – 20 µg/m ³
2019	48	11
2026 Baseline	38	20
2026 Phase 2A	31	27
2026 Phase 2 (with TB)	29	29
2026 Phase 3A	28	30
2026 Phase 3 (with TB)	28	30
Difference from 2026 Baseline	City > 20 µg/m ³	City 18 – 20 µg/m ³
2026 Phase 2A	-7	7
2026 Phase 2 (with TB)	-9	9
2026 Phase 3A	-10	10
2026 Phase 3 (with TB)	-10	10

Site ID	Original location	Extended location	Modelled PM _{2.5} concentration (µg/m ³)						
			2026 Baseline	2026 Phase 2A	Phase 2A – Baseline	Phase 2A – Baseline (% of Baseline)	2026 Phase 3A	Phase 3A – Baseline	Phase 3A – Baseline (% of Baseline)
DT_28	LEZ	LEZ	23.15	22.36	-0.79	-3.42%	22.01	-1.15	-4.95%
DT_98	LEZ	LEZ	22.11	21.71	-0.40	-1.80%	21.41	-0.70	-3.17%
DT_40	LEZ	LEZ	22.03	21.64	-0.39	-1.76%	21.35	-0.68	-3.10%
DT_33	LEZ	LEZ	21.77	21.28	-0.50	-2.29%	21.02	-0.76	-3.47%
DT_29	LEZ	LEZ	21.60	21.06	-0.54	-2.50%	20.75	-0.85	-3.96%
DT_72	LEZ	LEZ	21.44	20.87	-0.58	-2.69%	20.65	-0.79	-3.69%
DT_57	LEZ	LEZ	21.52	21.15	-0.37	-1.71%	20.91	-0.61	-2.85%
DT_51	LEZ	LEZ	21.26	20.87	-0.40	-1.86%	20.53	-0.73	-3.43%
83/89 Solidarności Street	LEZ	LEZ	21.10	20.83	-0.28	-1.31%	20.61	-0.50	-2.35%
DT_55	LEZ	LEZ	21.01	20.70	-0.31	-1.47%	20.50	-0.51	-2.44%
DT_8	LEZ	LEZ	20.79	20.29	-0.50	-2.39%	20.03	-0.77	-3.68%
DT_62	LEZ	LEZ	20.97	20.67	-0.31	-1.46%	20.47	-0.51	-2.43%
DT_43	LEZ	LEZ	20.66	20.28	-0.38	-1.82%	20.13	-0.53	-2.55%
DT_76	LEZ	LEZ	20.64	20.41	-0.23	-1.13%	20.24	-0.40	-1.95%
DT_86	LEZ	LEZ	20.57	20.36	-0.21	-1.03%	20.20	-0.37	-1.79%
DT_94	LEZ	LEZ	20.39	20.06	-0.33	-1.61%	19.93	-0.46	-2.27%
DT_20	LEZ	LEZ	20.51	20.22	-0.29	-1.39%	19.95	-0.55	-2.69%
DT_32	LEZ	LEZ	20.38	20.02	-0.36	-1.78%	19.79	-0.59	-2.88%
DT_64	LEZ	LEZ	20.33	19.97	-0.37	-1.81%	19.75	-0.59	-2.90%
DT_35	LEZ	LEZ	20.50	20.29	-0.21	-1.02%	20.12	-0.37	-1.83%
DT_26	LEZ	LEZ	20.16	19.74	-0.42	-2.08%	19.53	-0.63	-3.14%
DT_75	LEZ	LEZ	20.24	19.90	-0.34	-1.66%	19.68	-0.56	-2.78%
DT_31	LEZ	LEZ	20.12	19.72	-0.39	-1.96%	19.53	-0.59	-2.94%
DT_244	LEZ	LEZ	19.99	19.53	-0.46	-2.31%	19.36	-0.63	-3.15%
DT_52	LEZ	LEZ	20.06	19.66	-0.40	-1.98%	19.48	-0.59	-2.92%
DT_67	LEZ	LEZ	20.14	19.87	-0.27	-1.34%	19.65	-0.48	-2.39%
DT_83	LEZ	LEZ	20.19	19.99	-0.20	-0.99%	19.86	-0.33	-1.65%
244A Grochowska Street	LEZ	LEZ	19.96	19.72	-0.24	-1.20%	19.61	-0.34	-1.73%
DT_60	LEZ	LEZ	19.97	19.71	-0.25	-1.26%	19.52	-0.44	-2.22%
DT_39	LEZ	LEZ	19.94	19.70	-0.24	-1.19%	19.50	-0.44	-2.20%
DT_95	LEZ	LEZ	19.86	19.59	-0.28	-1.39%	19.39	-0.47	-2.35%
DT_10	LEZ	LEZ	19.64	19.30	-0.33	-1.69%	19.15	-0.49	-2.48%
DT_88	LEZ	LEZ	19.82	19.64	-0.17	-0.88%	19.54	-0.27	-1.37%
DT_68	LEZ	LEZ	19.65	19.39	-0.26	-1.34%	19.23	-0.42	-2.16%
DT_84	LEZ	LEZ	19.45	19.24	-0.21	-1.08%	19.09	-0.36	-1.83%
DT_59	LEZ	LEZ	19.41	19.22	-0.19	-0.99%	19.07	-0.34	-1.75%
DT_108	LEZ	LEZ	19.44	19.34	-0.11	-0.55%	19.27	-0.18	-0.91%
DT_101	LEZ	LEZ	19.14	18.94	-0.20	-1.06%	18.82	-0.32	-1.67%
DT_54	LEZ	LEZ	19.05	18.86	-0.19	-1.02%	18.74	-0.31	-1.63%
DT_58	LEZ	LEZ	19.02	18.85	-0.17	-0.91%	18.74	-0.28	-1.47%
DT_87	LEZ	LEZ	18.96	18.79	-0.17	-0.87%	18.69	-0.27	-1.42%

Site ID	Original location	Extended location	Modelled PM _{2.5} concentration (µg/m ³)						
			2026 Baseline	2026 Phase 2A	Phase 2A – Baseline	Phase 2A – Baseline (% of Baseline)	2026 Phase 3A	Phase 3A – Baseline	Phase 3A – Baseline (% of Baseline)
DT_5	Outside	LEZ	25.86	24.54	-1.32	-5.10%	23.95	-1.90	-7.35%
DT_9	Outside	LEZ	25.47	24.27	-1.20	-4.71%	23.72	-1.75	-6.88%
DT_25	Outside	LEZ	25.35	24.18	-1.17	-4.63%	23.64	-1.72	-6.77%
DT_13	Outside	LEZ	25.12	23.98	-1.15	-4.57%	23.45	-1.67	-6.66%
DT_18	Outside	LEZ	25.12	23.98	-1.15	-4.57%	23.45	-1.67	-6.66%
DT_7	Outside	LEZ	24.41	23.33	-1.08	-4.42%	22.86	-1.54	-6.32%
DT_22	Outside	Outside	23.36	22.98	-0.38	-1.61%	22.92	-0.44	-1.86%
DT_49	Outside	Outside	22.62	22.14	-0.47	-2.10%	22.10	-0.52	-2.31%
DT_12	Outside	Outside	22.77	22.41	-0.36	-1.58%	22.37	-0.40	-1.76%
DT_23	Outside	LEZ	21.54	20.89	-0.64	-2.99%	20.61	-0.93	-4.32%
DT_6	Outside	LEZ	21.25	20.78	-0.47	-2.22%	20.56	-0.69	-3.23%
DT_19	Outside	LEZ	21.16	20.82	-0.33	-1.58%	20.61	-0.55	-2.61%
DT_53	Outside	Outside	19.57	19.21	-0.36	-1.84%	19.17	-0.40	-2.06%
DT_50	Outside	LEZ	19.81	19.48	-0.32	-1.62%	19.31	-0.50	-2.50%
DT_15	Outside	Outside	18.74	18.47	-0.27	-1.44%	18.45	-0.29	-1.56%
DT_117	Outside	Outside	18.62	18.32	-0.30	-1.62%	18.29	-0.33	-1.75%
DT_92	Outside	LEZ	18.39	18.30	-0.09	-0.50%	18.25	-0.15	-0.80%

PM₁₀ results

ID	Site ID	Original location	Extended location	Modelled PM ₁₀ concentration (µg/m ³)					
				2019	2026 Baseline	2026 Phase 2A	2026 Phase 2 (with TB)	2026 Phase 3A	2026 Phase 3 (with TB)
28	DT_28	LEZ	LEZ	33.17	32.45	31.60	31.41	31.22	31.22
98	DT_98	LEZ	LEZ	31.04	30.86	30.42	30.24	30.09	30.09
40	DT_40	LEZ	LEZ	30.93	30.74	30.32	30.14	29.99	29.99
29	DT_29	LEZ	LEZ	30.61	30.24	29.65	29.47	29.31	29.31
33	DT_33	LEZ	LEZ	30.53	30.13	29.60	29.45	29.32	29.32
72	DT_72	LEZ	LEZ	30.04	29.45	28.84	28.73	28.61	28.61
57	DT_57	LEZ	LEZ	30.02	29.79	29.39	29.25	29.13	29.13
51	DT_51	LEZ	LEZ	29.94	29.69	29.25	29.13	28.90	28.93
8389	83/89 Solidarności Street	LEZ	LEZ	29.25	29.12	28.81	28.69	28.57	28.57
8	DT_8	LEZ	LEZ	29.11	28.72	28.19	28.04	27.90	27.90
55	DT_55	LEZ	LEZ	29.10	28.89	28.55	28.56	28.33	28.48
62	DT_62	LEZ	LEZ	29.03	28.82	28.49	28.48	28.27	28.40
43	DT_43	LEZ	LEZ	28.54	28.19	27.79	27.73	27.62	27.65
20	DT_20	LEZ	LEZ	28.54	28.39	28.08	27.97	27.79	27.80
76	DT_76	LEZ	LEZ	28.43	28.30	28.04	27.96	27.86	27.88
32	DT_32	LEZ	LEZ	28.37	28.11	27.71	27.60	27.46	27.46
64	DT_64	LEZ	LEZ	28.29	28.04	27.64	27.52	27.40	27.40
86	DT_86	LEZ	LEZ	28.28	28.16	27.93	27.84	27.76	27.77
35	DT_35	LEZ	LEZ	28.15	28.06	27.82	27.75	27.64	27.67
75	DT_75	LEZ	LEZ	28.09	27.87	27.50	27.38	27.26	27.26
94	DT_94	LEZ	LEZ	28.05	27.74	27.39	27.32	27.24	27.25
26	DT_26	LEZ	LEZ	28.01	27.62	27.18	27.08	26.95	26.95
31	DT_31	LEZ	LEZ	27.94	27.61	27.19	27.08	26.98	26.98
67	DT_67	LEZ	LEZ	27.91	27.76	27.47	27.36	27.24	27.24
52	DT_52	LEZ	LEZ	27.85	27.50	27.08	27.00	26.87	26.90
244	244A Grochowska Street	LEZ	LEZ	27.78	27.33	26.84	26.76	26.66	26.67
60	DT_60	LEZ	LEZ	27.60	27.48	27.20	27.10	26.99	27.00
83	DT_83	LEZ	LEZ	27.59	27.48	27.26	27.18	27.11	27.11
39	DT_39	LEZ	LEZ	27.54	27.44	27.18	27.06	26.96	26.96
95	DT_95	LEZ	LEZ	27.37	27.24	26.94	26.84	26.73	26.73
82	DT_82	LEZ	LEZ	27.22	27.01	26.75	26.70	26.64	26.65
10	DT_10	LEZ	LEZ	27.06	26.78	26.42	26.34	26.25	26.25
68	DT_68	LEZ	LEZ	27.02	26.86	26.58	26.49	26.40	26.40
88	DT_88	LEZ	LEZ	26.93	26.81	26.62	26.57	26.52	26.52
84	DT_84	LEZ	LEZ	26.66	26.54	26.31	26.24	26.15	26.16
59	DT_59	LEZ	LEZ	26.60	26.49	26.27	26.30	26.12	26.24
108	DT_108	LEZ	LEZ	26.24	26.18	26.06	26.02	25.98	25.98
101	DT_101	LEZ	LEZ	26.12	25.99	25.77	25.71	25.65	25.65
54	DT_54	LEZ	LEZ	25.96	25.80	25.59	25.54	25.47	25.47
58	DT_58	LEZ	LEZ	25.91	25.80	25.61	25.55	25.49	25.50
87	DT_87	LEZ	LEZ	25.79	25.67	25.49	25.44	25.38	25.38

Site ID	Original location	Extended location	Modelled PM ₁₀ concentration (µg/m ³)					
			2019	2026 Baseline	2026 Phase 2A	2026 Phase 2 (with TB)	2026 Phase 3A	2026 Phase 3 (with TB)
DT_5	Outside	LEZ	38.13	36.90	35.49	36.53	34.86	36.50
DT_9	Outside	LEZ	37.42	36.32	35.04	35.99	34.44	35.95
DT_25	Outside	LEZ	37.19	36.12	34.87	35.79	34.28	35.75
DT_13	Outside	LEZ	36.78	35.72	34.49	35.39	33.92	35.36
DT_18	Outside	LEZ	36.78	35.72	34.49	35.39	33.92	35.36
DT_7	Outside	LEZ	35.45	34.43	33.28	34.13	32.78	34.10
DT_49	Outside	Outside	34.04	33.06	32.56	32.77	32.55	32.75
DT_22	Outside	Outside	33.56	32.71	32.31	32.50	32.27	32.48
DT_12	Outside	Outside	32.49	31.58	31.21	31.38	31.19	31.36
DT_23	Outside	LEZ	30.64	30.05	29.36	29.90	29.05	29.89
DT_6	Outside	LEZ	29.60	29.16	28.66	29.01	28.43	28.99
DT_19	Outside	LEZ	29.39	29.16	28.80	28.92	28.56	28.87
DT_53	Outside	Outside	28.38	27.48	27.11	27.27	27.08	27.26
DT_50	Outside	LEZ	27.37	27.11	26.76	26.97	26.58	26.95
DT_15	Outside	Outside	26.83	26.16	25.89	26.00	25.88	25.99
DT_117	Outside	Outside	26.75	25.94	25.63	25.76	25.62	25.75
DT_92	Outside	LEZ	24.76	24.69	24.59	24.65	24.53	24.64

Site ID	Original location	Extended location	Modelled PM ₁₀ concentration (µg/m ³)						
			2026 Baseline	2026 Phase 2A	Phase 2A – Baseline	Phase 2A – Baseline (% of Baseline)	2026 Phase 3A	Phase 3A – Baseline	Phase 3A – Baseline (% of Baseline)
DT_28	LEZ	LEZ	33.17	31.60	-1.57	-4.72%	31.22	-1.95	-5.88%
DT_98	LEZ	LEZ	31.04	30.42	-0.62	-2.01%	30.09	-0.95	-3.08%
DT_40	LEZ	LEZ	30.93	30.32	-0.61	-1.98%	29.99	-0.94	-3.02%
DT_29	LEZ	LEZ	30.61	29.65	-0.96	-3.12%	29.31	-1.30	-4.25%
DT_33	LEZ	LEZ	30.53	29.60	-0.93	-3.04%	29.32	-1.21	-3.96%
DT_72	LEZ	LEZ	30.04	28.84	-1.20	-4.01%	28.61	-1.43	-4.77%
DT_57	LEZ	LEZ	30.02	29.39	-0.63	-2.11%	29.13	-0.90	-2.98%
DT_51	LEZ	LEZ	29.94	29.25	-0.68	-2.28%	28.90	-1.04	-3.47%
83/89 Solidarności Street	LEZ	LEZ	29.25	28.81	-0.44	-1.51%	28.57	-0.68	-2.32%
DT_8	LEZ	LEZ	29.11	28.19	-0.92	-3.15%	27.90	-1.20	-4.14%
DT_55	LEZ	LEZ	29.10	28.55	-0.55	-1.88%	28.33	-0.77	-2.64%
DT_62	LEZ	LEZ	29.03	28.49	-0.54	-1.86%	28.27	-0.76	-2.61%
DT_43	LEZ	LEZ	28.54	27.79	-0.75	-2.63%	27.62	-0.91	-3.20%
DT_20	LEZ	LEZ	28.54	28.08	-0.46	-1.60%	27.79	-0.74	-2.60%
DT_76	LEZ	LEZ	28.43	28.04	-0.38	-1.35%	27.86	-0.57	-2.00%
DT_32	LEZ	LEZ	28.37	27.71	-0.66	-2.32%	27.46	-0.90	-3.19%
DT_64	LEZ	LEZ	28.29	27.64	-0.66	-2.32%	27.40	-0.90	-3.17%
DT_86	LEZ	LEZ	28.28	27.93	-0.35	-1.24%	27.76	-0.52	-1.82%
DT_35	LEZ	LEZ	28.15	27.82	-0.33	-1.17%	27.64	-0.51	-1.81%
DT_75	LEZ	LEZ	28.09	27.50	-0.59	-2.09%	27.26	-0.83	-2.96%
DT_94	LEZ	LEZ	28.05	27.39	-0.66	-2.35%	27.24	-0.81	-2.87%
DT_26	LEZ	LEZ	28.01	27.18	-0.83	-2.97%	26.95	-1.06	-3.78%
DT_31	LEZ	LEZ	27.94	27.19	-0.75	-2.68%	26.98	-0.96	-3.44%
DT_67	LEZ	LEZ	27.91	27.47	-0.44	-1.59%	27.24	-0.67	-2.41%
DT_52	LEZ	LEZ	27.85	27.08	-0.77	-2.78%	26.87	-0.98	-3.51%
244A Grochowska Street	LEZ	LEZ	27.78	26.84	-0.94	-3.39%	26.66	-1.12	-4.04%
DT_60	LEZ	LEZ	27.60	27.20	-0.41	-1.47%	26.99	-0.61	-2.22%
DT_83	LEZ	LEZ	27.59	27.26	-0.33	-1.20%	27.11	-0.48	-1.73%
DT_39	LEZ	LEZ	27.54	27.18	-0.36	-1.31%	26.96	-0.58	-2.09%
DT_95	LEZ	LEZ	27.37	26.94	-0.44	-1.59%	26.73	-0.64	-2.34%
DT_82	LEZ	LEZ	27.22	26.75	-0.46	-1.71%	26.64	-0.58	-2.12%
DT_10	LEZ	LEZ	27.06	26.42	-0.64	-2.36%	26.25	-0.81	-2.98%
DT_68	LEZ	LEZ	27.02	26.58	-0.44	-1.63%	26.40	-0.62	-2.28%
DT_88	LEZ	LEZ	26.93	26.62	-0.31	-1.16%	26.52	-0.42	-1.55%
DT_84	LEZ	LEZ	26.66	26.31	-0.35	-1.32%	26.15	-0.51	-1.92%
DT_59	LEZ	LEZ	26.60	26.27	-0.32	-1.22%	26.12	-0.48	-1.81%
DT_108	LEZ	LEZ	26.24	26.06	-0.18	-0.69%	25.98	-0.26	-0.99%
DT_101	LEZ	LEZ	26.12	25.77	-0.35	-1.34%	25.65	-0.48	-1.82%
DT_54	LEZ	LEZ	25.96	25.59	-0.37	-1.43%	25.47	-0.50	-1.91%
DT_58	LEZ	LEZ	25.91	25.61	-0.30	-1.15%	25.49	-0.41	-1.59%
DT_87	LEZ	LEZ	25.79	25.49	-0.30	-1.16%	25.38	-0.41	-1.59%

Site ID	Original location	Extended location	Modelled PM ₁₀ concentration (µg/m ³)						
			2026 Baseline	2026 Phase 2A	Phase 2A – Baseline	Phase 2A – Baseline (% of Baseline)	2026 Phase 3A	Phase 3A – Baseline	Phase 3A – Baseline (% of Baseline)
DT_5	Outside	LEZ	38.13	35.49	-2.64	-6.93%	34.86	-3.27	-8.58%
DT_9	Outside	LEZ	37.42	35.04	-2.38	-6.35%	34.44	-2.97	-7.95%
DT_25	Outside	LEZ	37.19	34.87	-2.32	-6.25%	34.28	-2.91	-7.82%
DT_13	Outside	LEZ	36.78	34.49	-2.28	-6.21%	33.92	-2.85	-7.75%
DT_18	Outside	LEZ	36.78	34.49	-2.28	-6.21%	33.92	-2.85	-7.75%
DT_7	Outside	LEZ	35.45	33.28	-2.17	-6.13%	32.78	-2.68	-7.55%
DT_49	Outside	Outside	34.04	32.56	-1.48	-4.34%	32.55	-1.49	-4.37%
DT_22	Outside	Outside	33.56	32.31	-1.25	-3.73%	32.27	-1.29	-3.86%
DT_12	Outside	Outside	32.49	31.21	-1.28	-3.94%	31.19	-1.30	-4.01%
DT_23	Outside	LEZ	30.64	29.36	-1.28	-4.17%	29.05	-1.59	-5.18%
DT_6	Outside	LEZ	29.60	28.66	-0.94	-3.17%	28.43	-1.17	-3.95%
DT_19	Outside	LEZ	29.39	28.80	-0.59	-2.00%	28.56	-0.82	-2.80%
DT_53	Outside	Outside	28.38	27.11	-1.28	-4.50%	27.08	-1.30	-4.59%
DT_50	Outside	LEZ	27.37	26.76	-0.61	-2.23%	26.58	-0.80	-2.91%
DT_15	Outside	Outside	26.83	25.89	-0.95	-3.54%	25.88	-0.96	-3.57%
DT_117	Outside	Outside	26.75	25.63	-1.12	-4.18%	25.62	-1.13	-4.22%
DT_92	Outside	LEZ	24.76	24.59	-0.17	-0.70%	24.53	-0.23	-0.93%

Extended LEZ: Summary of air quality results

Reduction in pollutant concentrations by scenario

- The table below shows the average reduction in concentrations of NO₂, PM_{2.5} and PM₁₀ as a result of implementation of Phase 2A and Phase 3A of the LEZ scheme at the specified receptors across the city. Results for the original 2026 LEZ Phase 2 and 2026 LEZ Phase 3 scenarios are again provided to aid comparison of the impact of the original and extended LEZ boundaries
- The extended LEZ provides a larger average reduction in concentrations at receptors across the city than the original LEZ for all pollutants. The relative decrease in concentrations is larger between Phase 3A and Phase 3 than between Phase 2A and Phase 2 because of the impacts of scheme exemption for residents living in the zone
- The decrease in NO₂ concentrations is more significant than for PM as road transport emissions make up a larger proportion of total NOx emissions than total PM
- The relative decrease in concentrations between Phase 2A and Phase 3A is also larger for NO₂ than PM as the difference between emissions from the Euro standards permitted by both phases is larger for NOx than PM
- These result trends are also reflected in the reduction in emissions of pollutants by scenario, as shown on the next slide

	Average reduction in concentration at receptors (% of 2026 Baseline)		
Pollutant	NO₂	PM_{2.5}	PM₁₀
Scenario	City	City	City
2026 Phase 2A	-9.68%	-1.92%	-2.71%
2026 Phase 2 (with TB)	-9.09%	-1.69%	-1.31%
2026 Phase 3A	-23.56%	-2.90%	-3.46%
2026 Phase 3 (with TB)	-18.09%	-2.02%	-1.59%

Reduction in emissions of pollutants by scenario

Total emissions on all modelled road links

Pollutant	Emissions (t/year)					
	NOx		PM _{2.5}		PM ₁₀	
	City	Difference from baseline (% of 2026 Baseline)		Difference from baseline (% of 2026 Baseline)	City	Difference from baseline (% of 2026 Baseline)
2026 Baseline	5179.0		305.5		523.7	
2026 Phase 2A	4384.5	-15.3%	277.9	-9.1%	494.0	-5.7%
2026 Phase 2 (with TB)	4672.6	-9.8%	288.1	-5.7%	504.1	-3.7%
2026 Phase 3A	3629.6	-29.9%	268.4	-12.2%	485.0	-7.4%
2026 Phase 3 (with TB)	4299.9	-17.0%	284.8	-6.8%	501.2	-4.3%

Air quality results summary

- The implementation of both Phase 2A and Phase 3A of the extended LEZ provide large reductions in NO₂, PM₁₀ and PM_{2.5} pollutant concentrations across the City of Warsaw
- Comparing the extended and original LEZ scenarios:
 - The largest improvements in concentrations as a result of the extending the LEZ are observed in areas within the extended LEZ boundary that were outside of the original LEZ
 - An improvement in concentrations is also observed for areas that are outside of both the extended and original boundary
 - Concentrations in areas that are within both the extended and original LEZ boundary are slightly higher for Phase 2A than Phase 2 because of the impacts of scheme exemption for residents living in the zone
- The decrease in NO₂ concentrations is more significant than for PM₁₀ and PM_{2.5}:
 - Compared to the 2026 Baseline, NO₂ decreases by 10% for Phase 2A and 24% for Phase 3A across the city
 - Whereas PM_{2.5} only decreases by 2% for Phase 2A and 3% for Phase 3A
 - This is due to road transport being a larger contributor to NO₂ concentrations than for PM
 - The relative decrease in concentrations between Phase 2A and Phase 3A is also larger for NO₂ than PM, this is because the difference between emissions from the Euro standards permitted by both phases is larger for NO_x than PM
- At the monitoring stations used in this study, implementation of Phase 2A and Phase 3A of the scheme results in eight and 13 fewer locations in exceedance of the NO₂ annual limit value respectively
- The extended LEZ results in one fewer exceedance for both Phase 2A and 3A when compared with Phase 2 and 3 respectively

Extended LEZ: Economic and health impact assessment

Economic assessment methodology – analysis of the extended zone

The economic analysis consisted of three types of assessment:

1. Health impact assessment

- Approach identical to that applied to the analysis of the smaller zone
- Updated change in concentrations from air quality modelling of extended zone incorporated into HIA model

2. Cost-Benefit analysis

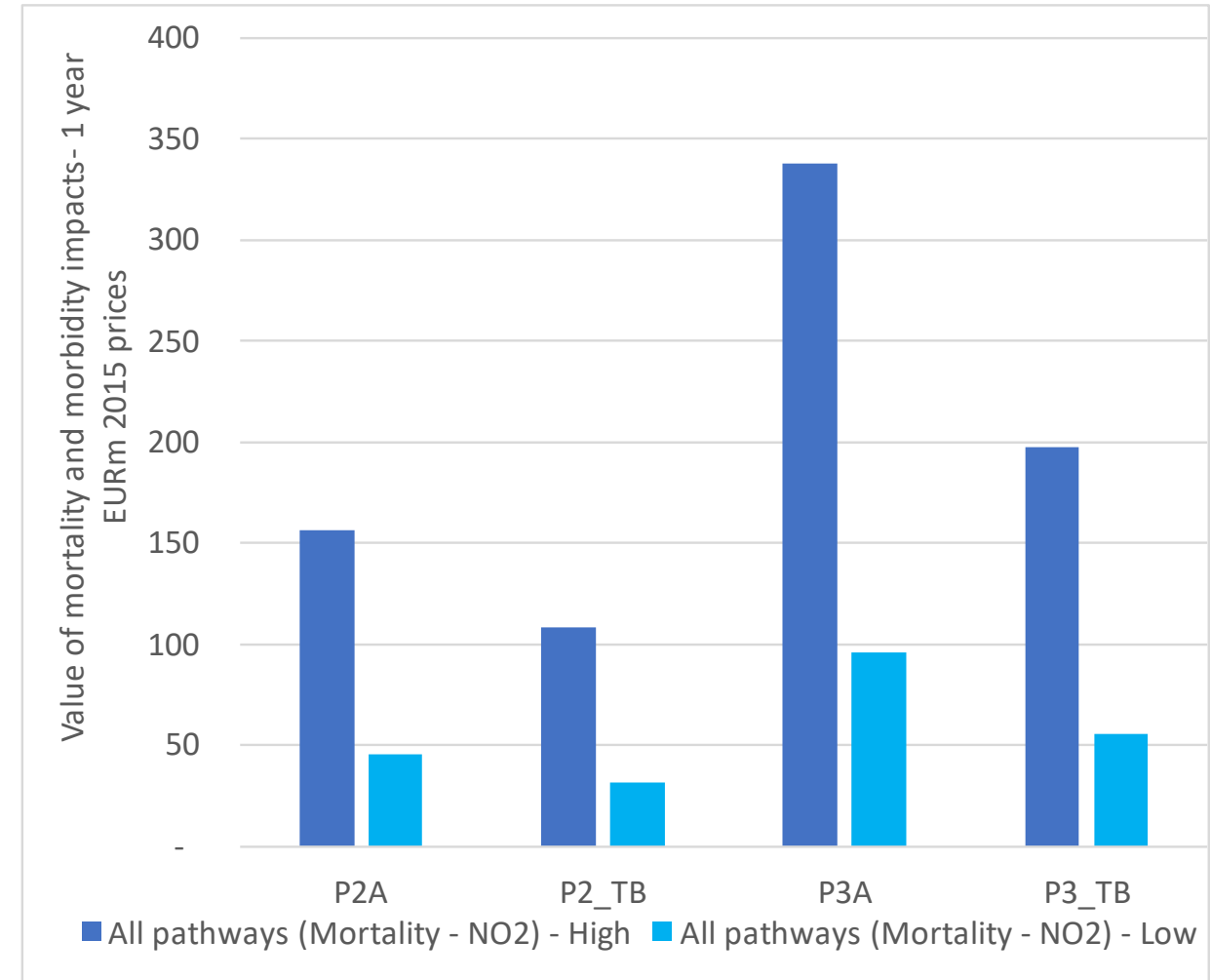
- Same approach and scope of impacts followed as applied to analysis of the smaller zone, albeit with some changes in the input assumptions
- Estimated larger vehicle fleet impacted by the zone from the extended boundary using data from transport model on change in proportion of trips which enter the zone (83% larger fleet) for calculation of vehicle upgrade costs and change in fuel and non-fuel vehicle operating costs
- Exemption applied to proportion of private car fleet registered within the zone (38.3% of cars) and also applied to affected trips and vkms
- Updated non-compliant trip and vehicle-km data from transport model used to update other cost impacts (includes impacts of exemption)
- Assumed uplifted cost of sticker system (in line with increase in vehicles)

3. Distributional analysis of business impacts

- Additional analysis conducted on change in businesses affected by larger zone

Health impact assessment (HIA) – overall monetised impacts

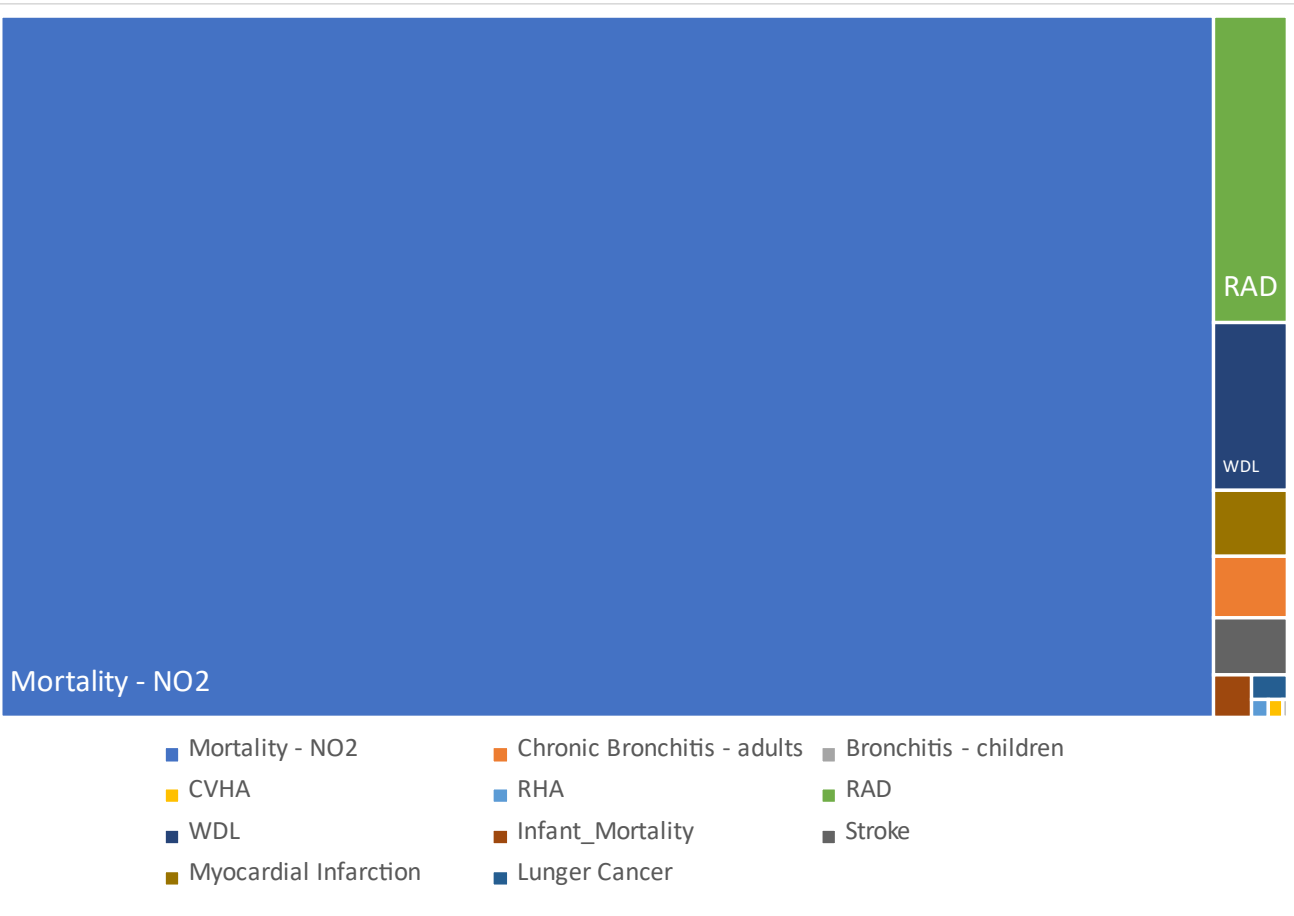
- HIA captures a range of different health impact pathways, including both mortality and morbidity effects
- To assess the impacts, we have closely followed the methodology and assumptions used in assessments in the EU – as applied by the [EC](#) and [EEA](#)
 - Results include monetisation of mortality effects associated with chronic exposure to NO₂ only (to avoid double counting of mortality effects which can also be calculated from a change in PM_{2.5})
- The chart shows the total, monetised economic benefit of one year of air pollution impacts delivered by the proposed LEZ
 - Shows relative (or difference) impact compared to the baseline
 - Shows Phase 2 and 3, for the smaller (P2/P3) and extended (P2A/P3A) zones
 - All scenarios capture the travel behaviour response
- The low/high sensitivities (dark/light blue bars) reflects uncertainty in the approach to monetising mortality effects (again following the example of the EU-approach)
- ***The air pollution benefit on human health could range from EUR 45m – 156m per annum for Phase 2A, and from EUR 95m – 338m pa for Phase 3A under an extended Low Emission Zone***
 - *This compares to EUR 31m – 108m and EUR 57m – 197m under Phase 2 and 3 respectively, under a smaller Low Emission Zone*
- This benefit captures savings in healthcare costs, avoidance of lost productivity (e.g. people being unable to attend work due to ill health), and avoidance of lost 'utility' (i.e. the value that people place on their own good health and wellbeing)



Health impact assessment (HIA) – impacts per year split by pathways

- The chart below shows contribution of different health impact pathways to overall monetised effect (shows Phase 3A, over the extended Low Emission Zone low sensitivity estimate)
- Most important pathway bar is reduction of mortality associated with chronic exposure
- Other key pathways include reduction in restricted activity days (RADs) and work days lost (WDL)

- HIA also produces ‘non-monetised’ health impacts of change in air pollution associated with the LEZ, as set out below (these are the impacts which add up to the total monetised effect)
- Note: these should not be viewed as actual effects that would be observed in the real-world. In practice, the reduction in air pollution would manifest in different ways – e.g. reduction in incidence and prevalence of disease, but also a change in severity of cases. The underlying HIA methodologies do not allow prediction of effects with high certainty
- Instead, it produces ‘attributable’ (or equivalent) effects which can be considered broadly representative of the overall effect of a change in air pollution, for use in economic appraisal



PHASE 2A	PHASE 3A
42 fewer deaths per annum	92 fewer deaths per annum
436 life-years saved	950 life-years saved
5 fewer new cases of chronic bronchitis in adults	8 fewer new cases of chronic bronchitis in adults
16 fewer bronchitis episodes in children	23 fewer bronchitis episodes in children
8 less hospital admissions each year for respiratory or cardio-vascular complaints	11 less hospital admissions each year for respiratory or cardio-vascular complaints
12,600 fewer restricted activity days	18,200 fewer restricted activity days
5,800 fewer work days lost	8,500 fewer work days lost
3 less new stroke cases	5 less new stroke cases
Reduction in 11 myocardial infarctions	Reduction in 15 myocardial infarctions
2 fewer new cases of lung cancer	3 fewer new cases of lung cancer

Cost benefit analysis – updated results

Comparison of updated results

- **Larger zone Phase 2A/3A have larger positive NPV compared with smaller zone options – i.e. they would deliver a larger overall benefit to society than smaller zone options**
 - Larger zone affects many more vehicles so the impacts (costs and benefits) are larger
 - additional costs (relative to the smaller zone) are outweighed by additional benefits achieved by the larger zone
 - Large increase in benefits in reduced fuel use costs and health impacts accompanied by larger costs associated with vehicle upgrades.
- **BCR of the larger zone are broadly similar to those for the smaller zone, and do not decrease**
 - i.e. the return / extra benefit achieved for each additional zloty invested in a large zone, is similar to the payback on each zloty invested in a smaller zone
 - Car exemption for 2A does not seem to have a large effect on overall BCR
- Phase 2A and 3A are estimated to deliver a net benefit to society valued at 2.6bn and 5.2bn zloty respectively (11% and 20% of the City's annual budget)
- GHG emission reductions of 391kt for P2A and 692kt for P3A

Results (Million zloty)	Smaller zone*		Extended zone	
	Phase 2	Phase 3	Phase 2A	Phase 3A
Health impacts	793	1,430	1,140	2,460
Vehicle upgrade costs	-753	-1,087	-1,330	-1,990
Residual value of scrapped vehicles	-14.9	-48.2	-23.6	-88.3
Change in fuel use	1,260	2,121	2,180	3,880
Change in non-fuel vehicle operating costs	240	297	439	543
Welfare impacts of cancelled trips	-28.9	-59.4	-33.1	-81.5
Change in travel time	-50	-102	-59.6	-136
GHG Emissions	201	335	346	612
Implementation costs	-10.8	-10.8	-19.7	-19.7
Benefit:Cost ratio	2.91	3.20	2.80	3.24
Net present value:	1,630	2,880	2,640	5,180

Note: green text signifies a benefit, red text signifies a cost; *Results for smaller zone re-present the outputs of the previous analysis undertaken – no changes have been made to the assessment of the smaller zone

Cost benefit analysis – sensitivity analysis

- Sensitivity analysis was updated for new larger zone results
- Key conclusion: ***under all sensitivity tests, the key results and conclusions from the analysis remain stable***. Namely that both phases are seen to deliver a positive NPV, and the BCR of Phase 3 is higher than that of Phase 2.
 - Hence these conclusion are robust to these key uncertainties in the underlying data and methods
- Increasing the assumption on years that vehicle upgrades are brought forward leads to a small increase in BCR for both phases and a very significant increase in NPV
- The results are not very sensitive to a 20% change in fleet size with a small effect on BCR and NPV
- Using low and high estimates of the value of health impacts from air pollution benefits leads to a significant impact on results, however utilising low estimates still results in very positive BCR for both phases (2.37 and 2.64 respectively)

		Phase 2A	Phase 3A	
Central results	Benefit:Cost ratio	2.8	3.24	
	Net present value (m zloty)	2,641	5,179	
Sensitivity test	5 years of life remaining	Benefit:Cost ratio	2.85	3.33
		Net present value (m zloty)	6,389	12,554
	20% reduced fleet size	Benefit:Cost ratio	2.81	3.26
		Net present value (m zloty)	2,568	4,923
	20% increased fleet size	Benefit:Cost ratio	2.79	3.22
		Net present value (m zloty)	2,713	5,435
	Health impacts low	Benefit:Cost ratio	2.37	2.64
		Net present value (m zloty)	2,010	3,805
	Health impacts high	Benefit:Cost ratio	3.23	3.83
		Net present value (m zloty)	3,271	6,553

Cost benefit analysis – caveats and limitations

The robustness of the analysis is inherently driven by the data available and methods adopted. When drawing conclusions from the results, it is important to keep in mind:

- There was a lack of Warsaw-specific, or even Poland-specific, data for certain metrics (e.g. fuel efficiency of vehicles). In such cases international data sets were applied and considered for their relevance
- The analysis is based on several key assumptions:
 - The baseline fleet projection and euro standard split in 2026
 - Assumed behavioural responses to LEZ, i.e. what proportion choose to upgrade their vehicle, cancel trip, etc.
 - The estimated number of ‘unique’ vehicles which access the LEZ over the course of a year
 - Vehicle ownership patterns (i.e. how much upgrades are brought forward by)
- The health benefits of reduced air pollution are likely undervalued – the approaches adopted do not capture all detrimental health effects that have been associated with exposure to air pollution, and it adopts a conservative approach to considering overlaps between effects of different pollutants and the valuation of impacts
- The analysis tested separately the shift from ‘no LEZ to Phase 2’, and from ‘no LEZ to Phase 3’. This is different to how the scheme is intended to work, and the impacts of shifting from ‘Phase 2 to Phase 3’ could be different in practice

Distributional analysis – Focus on impacts on businesses

Introduction

- Cost-benefit analysis (as presented in the slides above) is valuable to compare and contrast the aggregate impacts of the proposed LEZ. However, this may overlook important dynamics and risks which may affect specific groups in Warsaw. For example, cost-benefit analysis quantifies the overall compliance costs, but does not consider where these fall and whether these are affordable for those affected
- We have also conducted a 'distributional analysis' to consider in further detail who will be impacted by the proposed LEZ, how significantly and how they will respond
- This analysis has focused specifically on the impacts on businesses. Note: it was not in scope to consider effects on households. Given that cars will be captured in the LEZ restrictions, there may also be important risks and demographic to consider for these groups (e.g., if older vehicles are predominantly owned by lower-income households, they may face a greater share of the costs of complying with the LEZ)

Summary of previous analysis

- An online survey of 100 respondents and a workshop of 10 companies was undertaken to gather information on potential impacts on business
- Businesses are most likely to upgrade their vehicle fleet or look to change travel mode in response to the LEZ
- There are concerns around impacts on customers and reduced traffic to the LEZ

Approach to assessment of extended zone

- Additional research was conducted into the implications of an extended zone on number and type of businesses affected
- The extended area captures additional districts (Mokotow and Zoliborz) than captured in smaller zone.
- City data on number of businesses within each district was extracted and those within the zone estimated

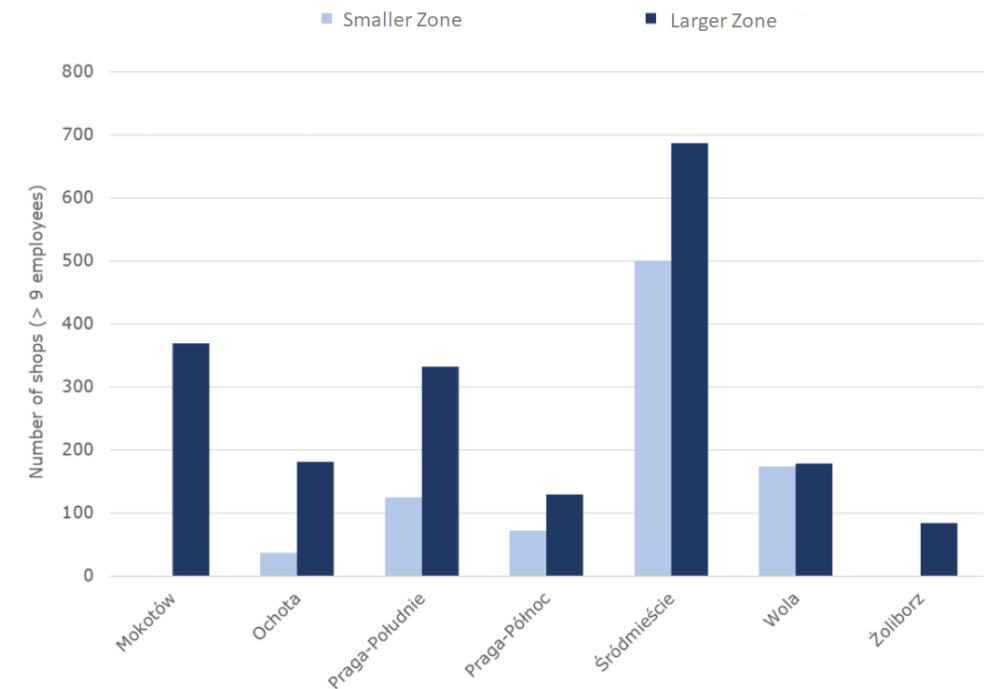
Business impacts – impact of extended (compared to a smaller) zone

- In most sectors, there is 2.5x the number of businesses captured by the extended zone (LEZ 2)
- First 4 sectors in particular likely to be most affected i.e. owning or operating a vehicle fleet, or relying on vehicle movements
- Impacts on shops will be on customers, not businesses directly, with potential for reduced business from people cancelling trips. The number of shops is shown in the chart. Greater numbers of shops will potentially be affected.

Number of businesses in each sector in smaller and extended LEZ area

	LEZ 1	LEZ 2
industry	8 469	21 795
construction industry	10 192	26 228
trade; repair of vehicles	25 114	64 626
transport and warehouse management	6 580	16 933
information and communication	21 266	54 724
real estate market service	10 244	26 361
professional, scientific and technical activities	34 510	88 805
health care and social assistance	7 583	19 515
others	34 370	88 446
TOTAL	158 329	407 432

Number of shops in smaller and larger LEZ area



Business impacts – impact of extended (compared to a smaller) zone

Extending the size of the zone will also increase the number of cultural and social assets captured..... but many more lie outside of the extended zone and would be less affected (for larger maps see next slide)

Analysis on number of significant buildings

Type of building	Smaller zone	Extended Zone	% Change
Tourist	29	33	14%
Theatre	11	16	45%
Community centre	4	9	125%
Offices	25	66	164%
Educational	230	441	92%
Medical	27	44	63%

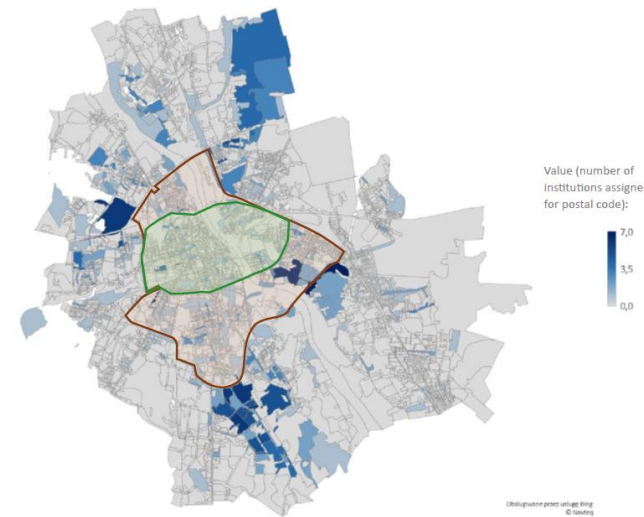


Figure 8. The locations of schools, kindergartens and other educational institutions, by marking the area according to postal code

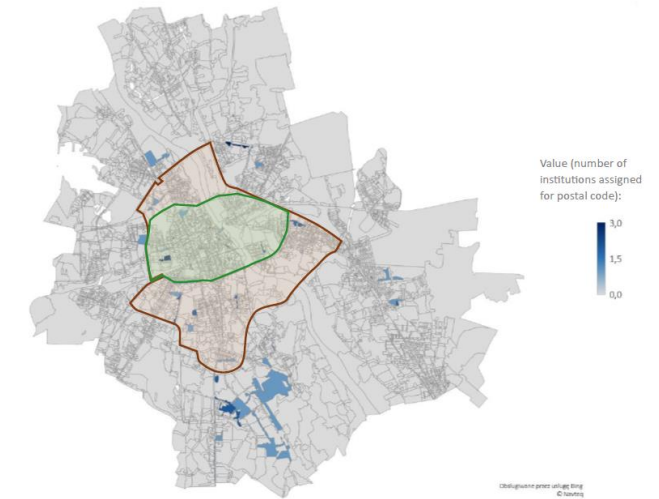


Figure 9. Locations of medical facilities, hospitals and clinics, by marking the area according to the postal code

Summary

- Increasing the LEZ area will increase the number of residents and companies located within the zone (and hence which could be affected):
 - The ratio of companies registered in LEZ 2 to LEZ 1 is approx. 2.57; In the case of shops, the LEZ 2/ LEZ 1 ratio is about 2.0; For important facilities, including offices, cultural and tourism facilities, LEZ 2/LEZ 1 ranges from 1.14 to 2.64
 - While the number of significant buildings increases with the extended zone, the majority of e.g. medical and education facilities reside outside the extended zone
 - But simply because a business is located in the zone, does not mean it will be affected. The impacts of the zone will depend on a range of variables
 - Also there are likely to be positive impacts for some businesses (alongside costs for others) – indeed many stakeholders highlighted the potential benefits of a Warsaw LEZ through engagement activities.

Business impacts – impact of extended (compared to a smaller) zone

Extending the size of the zone will also increase the number of cultural and social assets captured..... but many more lie outside of the extended zone (larger maps)

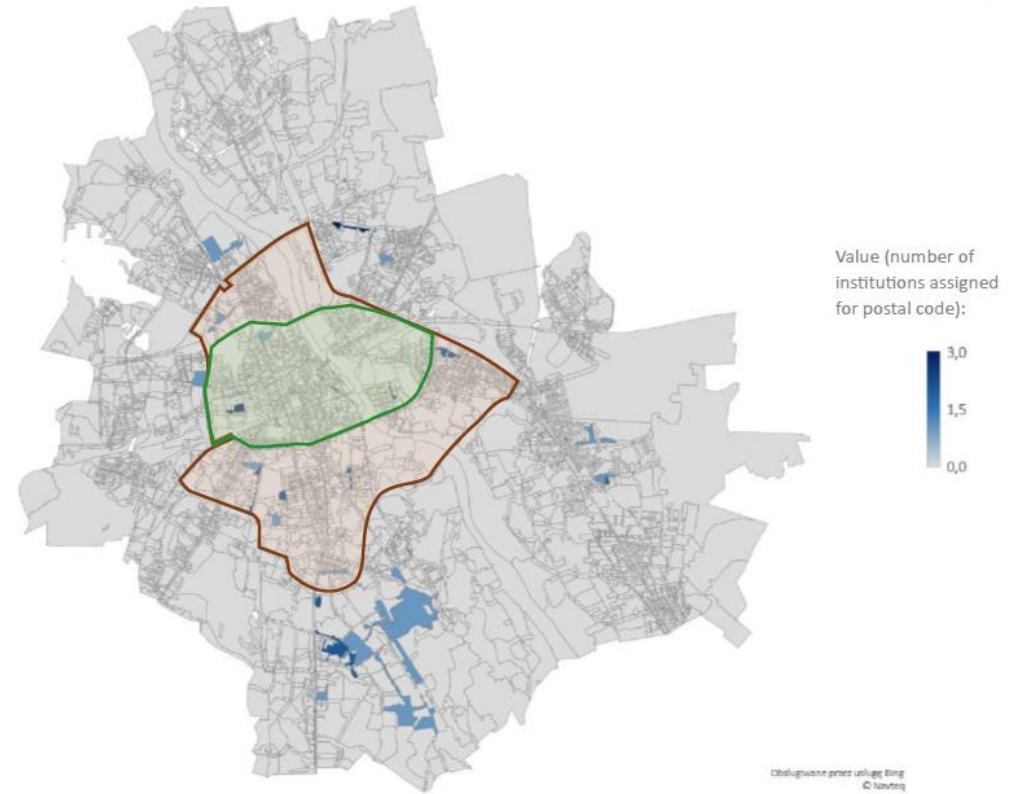
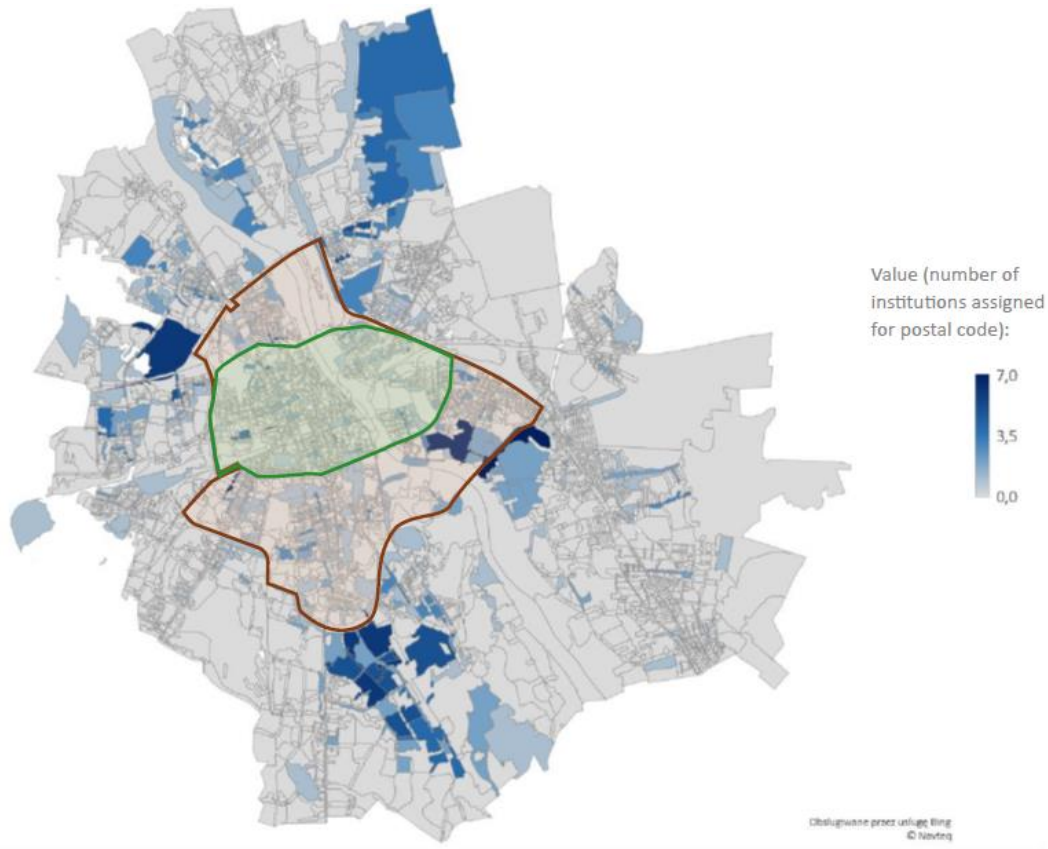


Figure 8. The locations of schools, kindergartens and other educational institutions, by marking the area according to postal code

Figure 9. Locations of medical facilities, hospitals and clinics, by marking the area according to the postal code

Distributional analysis – Focus on impacts on businesses

- Businesses could be affected either: directly, indirectly or both. Businesses both inside and outside the proposed LEZ could be affected and across a wide range of sectors, including: taxi drivers and operators, bus and coach operators, logistics, refuse and waste collection and operations, etc.
- But not all businesses and trips would be affected (e.g. 0-24% under Phase 2 smaller zone, and 0-38% under Phase 3 smaller zone, depending on vehicle type)

Costs and affordability risks

- **Some businesses will face a cost to comply with the LEZ** (i.e. those operating non-compliant vehicles). **Size of impact and risk to business will also depend on a number of other variables**, relating to their vehicle ownership and use, response to the zone, and wider operation
- **Smaller firms are more likely to face greater affordability risks** due to a number of factors
- Hence should a LEZ be taken forward, **mitigation measures could also be considered** for those negatively affected and most at risk. Several potential measures were highlighted in the stakeholder survey and workshop in the first project phase, including:
 - financial subsidy for the purchase of new vehicles/retrofit/alternative means of transport, improvements of the public transport and cycling network, derogations for certain vehicles, and amending taxi licencing conditions.

Positive effects for businesses

- **For some businesses there will be positive effects**: e.g. those operating cleaner fleets or modes of travel may see an increase in demand for their services. Also businesses (in particular retail and cultural operators) may benefit from the cleaner, safer environment in the city centre.
- Through the engagement activities, **many stakeholders highlighted the potential benefits of a LEZ in Warsaw**. E.g. in the Workshop:
 - All participants agreed on the need to improve air quality in Warsaw and that a low emissions zone could be helpful, in particular where combined with additional measures around public and active travel which could increase promotion of a healthy and environmentally friendly lifestyles
 - Most businesses noted they could/would upgrade vehicles in response, and noted city centre parking was more of an issue
- Furthermore, **40 local businesses have signed a letter supporting a LEZ in Warsaw**. They suggest:
 - *[translated Polish to English] Examples from European cities show that Clean Transport Zones and activities limiting car traffic translate into greater activity of residents in urban space, which has a positive impact on local business.*
 - *Clean air, less traffic jams, less noise and more space for people are a necessary direction in the development of the capital if we want it to be a city friendly to its inhabitants and attractive to tourists.*