FINAL REPORT

The Evaluation of the Air Pollution Level in Lithuania by Using of Diffusive Samplers

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1. Aims and Objectives of the Project

The aim of the project is an overall assessment of air quality in Lithuania and a comparison with the situation in 2010-2011. The project focuses on the evaluation and modernization of the range and location of measuring stations of the national ambient air monitoring network according to the current European legislation. The territory of Lithuania is divided according to EU legislation into zones and agglomerations for the purpose of air quality management, where the only zone is represented by the whole territory of Lithuania and 2 agglomerations - Vilnius and Kaunas. The project evaluation also includes a proposal of potential adjustment of the zone and agglomeration settings depending on the current state of air quality in the country.
Compared to the previous project from 2010, monitoring of particulates and persistent organic pollutants was added to the project.
The project includes the following sub-objectives:

- Evaluation of ambient air pollution levels of nitrogen dioxide (NO_2), sulfur dioxide (SO_2) and volatile organic compounds (VOC): benzene (C_6H_6), toluene, ethylbenzene and ortho-, meta-, para-xylene at the whole territory of Lithuania, including areas which are not continuously monitored. Evaluation of changes in the level of air pollution in comparison with the results of the research project realized in the period 2010-2011. These results are available here: http://oras.gamta.lt/cms/index?rubricId=480cd641-f93b-4070-8a51-41f768c5b898

Determination of background level of ambient air pollution.

- Estimation of average daily and annual concentrations of dust aerosol in areas where continuous monitoring of dust aerosol particle concentrations in ambient air is not available.
- Estimation of average annual concentrations of persistent organic pollutants (POPs) and comparison of these results with data measured during previous years.
- Based on the results of the evaluation and submission of a proposal for the modernization of the national air pollution monitoring network:
  - number of agglomerations and zones and their boundaries (with regard to air quality)
  - number and location of automated ambient air quality monitoring stations in accordance with the requirements of EU Directives and local legislation

2. Monitoring Locations

The selection of all the measuring locations were consulted with the representatives of the contracting authority – Lithuanian Environmanetal Protection Agency (EPA). Most of the passive sampling systems Radiello were installed on the masts of street lamps, electricity masts, etc. Five particulate monitors were installed to the locations of early warning network. Part passive samplers and dust monitors were also installed on the AQM stations. The samplers for POPs monitoring were installed to the background ambient air quality monitoring stations as was specified in the technical specification.

2.1 Monitoring Locations for Gas Sampling

The passive samplers were installed to the following locations:

Operator 1:

			www.maps.lt System LKS94		GPS Coordinates	
Nr.	**Name of the Location**	**Address**	**X**	**Y**	**N**	**E**
1	Kaunas 02	Vandžiogalos g. Vytenų g., Sargėnai, Šilainių sen.	500051	6086253	54.946868	23.884732
2	Kaunas 21	Panerių g. Linkuvos g. link parko, Vilijampolės sen.	492937	6086262	54.912365	23.889844
3	Kaunas 14	Netoli Kulautuvos g. prie Nemuno, Vilijampolės sen.	489996	6085770	54.90789	23.843995
4	Garliava 01	Vytauto g. K. Aglinskio g.	491907	6075767	54.818051	23.874075
5	Kaunas 29	Europos pr. Barkūnų g. Saulėgrąžų g., Aleksoto sen.	493827	6082050	54.874527	23.903815
6	Kaunas 30	Skuodo g. Juozapavičiaus g. Siūlų g., Šančių sen.	496006	6081911	54.873298	23.937776
7	Kaunas 31	Vaidilos g. Gailutės g., Panemunės sen.	497951	6082027	54.874357	23.968075
8	Kaunas 35	Dubravų g. Vaišvydo g., Panemunės sen.	501574	6079208	54.849023	24.024505
9	Kaunas 27	R. Kalantos M. Gimbutienes g., Petrašiūnų sen.	500089	6084011	54.892187	24.00139
10	OKTS 41	Kaunas, Petrašiūnai OKTS	499116	6084335	54.895095	23.986221
11	Kaunas 26	K. Baršausko g. Popieriaus g., Gričiupio sen.	497805	6085005	54.901111	23.965773
12	Kaunas 18	Vokes g. prie mokyklos stadiono, Gričiupio sen.	498051	6085969	54.909771	23.96961
13	Kaunas 19	Draugystes g. Elektrenų g. tarp įmonių terit., Petrašiūnų sen.	500068	6086226	54.912084	24.001054
14	Kaunas 25	Vytauto pr. Čiurlionio g. prie geležinkelio st., Centro sen.	495467	6083510	54.887665	23.929346
15	Kaunas 24	S. Daukanto g. link pesčiųjų tilto į Nemuno salą, Centro sen.	494479	6084259	54.894382	23.913943

16	Kaunas 16	Jonavos g. prie Neries, Žaliakalnio sen.	493964	6085815	54.908357	23.90587
17	Kaunas 17	Savanorių pr. Tvirtoves al. Taikos pr., Žaliakalnio sen.	495997	6086351	54.913195	23.93757
18	Kaunas 09	Ukmergės g., Eigulių sen.	495965	6087907	54.927165	23.937039
19	Kaunas 10	Šiaures pr. Savanorių pr., Eigulių sen.	498130	6088176	54.9296	23.970824
20	Kaunas 04	Liepų g. (netoli Jonavos pl.) Ramučiai, Karmėlavos sen.	502034	6089967	54.945696	24.031752
21	Elektrėnai 02	Literatūros meno muziejus, stadionas	542208	6071913	54.781712	24.656144
22	Elektrėnai 03	Draugystės g. ties arena	543165	6072363	54.785678	24.671081
23	Elektrėnai 01	Šviesos g. netoli A1 kelias prie stadiono	543513	6072650	54.788219	24.676536
24	Trakai 02	Birutės g.	560481	6056413	54.640592	24.936944

Operator 2:

Nr.	Name of the Location	Address	www.maps.lt System LKS94		GPS Coordinates	
			X	Y	N	E
1	Vilnius 15	Karklėnų g. 15, N. Vilnios sen.	591991	6062292	54.688645	25.426797
2	Vilnius 14	Žibuoklių g. 26, Markučiai, Rasų sen	584931	6060496	54.673749	25.316808
3	Vilnius 10	Stoties transporto žiedas, Naujamiesčio sen.	582796	6060109	54.67063	25.283611
4	Vilnius 09	Vokiečių g. 1, Senamiesčio sen.	582959	6060975	54.678382	25.286376
5	Vilnius 20	Pamėnkalnio g. Kudirkos g., Naujamiesčio sen.	581758	6061964	54.687463	25.268043
6	Vilnius 21	Savanorių pr. 41 G. Vilko g. 19, Vilkpėdės sen.	580262	6060396	54.673615	25.244415
7	Vilnius 32	Savanorių pr. Vilkpėdės g., Vilkpėdės sen.	580302	6059215	54.663	25.244711
8	Vilnius 12	Darbininkų g. 11, Naujininkų sen.	582010	6059221	54.662779	25.27118
9	Vilnius 13	Žirnių g. 35, Naujininkų sen.	582415	6058371	54.65508	25.277212
10	Vilnius 35	Durpių g. Kalno g., Pagirių sen.	577762	6049785	54.578689	25.202848

11	Vilnius 33	Paneriškių g. Jočionių g. Gariūnai, Panerių sen.	574980	6059219	54.663855	25.162233
12	Vilnius 23	Oslo g. Erfurto g., Lazdynų sen.	577161	6059998	54.670524	25.196239
13	Vilnius 24	Architektų g. 49, Lazdynų sen.	577530	6060653	54.676349	25.202132
14	Vilnius 31	Laisvės pr. Architektų g., Lazdynų sen.	578744	6060752	54.677053	25.220974
15	Vilnius 25	R. Jankausko g. 1, Karoliniškių sen.	577897	6062249	54.690632	25.208247
16	Vilnius 26	Pajautos g. 11, Pilaitės sen.	575851	6064365	54.709951	25.177074
17	Vilnius 27	Laisvės pr. Justiniškių g., Viršuliškių sen.	578871	6063710	54.703602	25.22375
18	Vilnius 28	Justiniškių g. 101, Justiniškių sen.	578896	6065424	54.719	25.224593
19	Vilnius 19	Kęstučio g. Selių g. Žvėryno sen.	580579	6063083	54.697706	25.250071
20	Vilnius 18	Ukmergės g. G. Vilko g., Šnipiškių-Žvėryno sen.	581427	6063505	54.70136	25.263336
21	Vilnius 17	Lvovo g. 21A, Šnipiškių sen.	582548	6062873	54.695499	25.280549
22	Vilnius 01	Žirmūnų g. 10, Žirmūnų sen.	583758	6063331	54.699414	25.299442
23	Vilnius 02	Klinikų g. 7, Antakalnio sen.	584763	6064354	54.708435	25.315322
24	Vilnius 30	Gelvonų g. 18, Šeškinės sen.	580925	6064834	54.713378	25.255915
25	Vilnius 07	Stanevičiaus g. 56, Fabijoniškių sen.	580681	6066187	54.725571	25.252508
26	Vilnius 08	Ukmergės g. P. Žadeikos g., Pašilaičių sen.	579739	6066685	54.730195	25.238028
27	Vilnius 34	Žaliųjų ež. g. Balsiai, Verkių sen.	585735	6071814	54.77528	25.332599
28	OKTS 03	Vilnius, Žirmūnai OKTS	583078	6065086	54.715291	25.289395
29	Grigiškės 03	Tarp Vokės upės ir Neries upės, Grigiškių sen.	569461	6060847	54.679269	25.077093
30	Lentvaris 02	Trumpoji g. Gėlių g. stadionas	567357	6056391	54.639525	25.04345

Operator 3:

			www.maps.lt System LKS94		GPS Coordinates	
Nr.	**Name of the Location**	**Address**	**X**	**Y**	**N**	**E**
1	OKTS53	Žemaitijos IMS, Plokščių k., Platelių sen., Plungės r.	368224	6210265	56.008343	21.886899
2	Telšiai02	Vyšnių g.	391253	6207678	55.990884	22.257015
3	Telšiai01	Turgaus al. Respublikos g.	390822	6206865	55.983487	22.25044
4	Telšiai03	Parko g. link Masčio ež.	390399	6205322	55.969538	22.244293
5	Plungė03	Stoties g. priešais dvaro parką	365228	6200559	55.920384	21.843747
6	Plungė01	Senamiesčio a. Dariaus ir Girėno g. Vytauto g.	365373	6199726	55.912944	21.84648
7	Plungė02	Lankos g. Saulėtekio g.	365775	6198557	55.902558	21.853485
8	Šilutė02	Sodų g. prie stadiono	340054	6137714	55.348652	21.477909
9	Šilutė03	Šyša upė Netoli geležinkelio tiltas	340797	6136362	55.336756	21.49038
10	Šilutė01	Lietuvninkų g. Gudobelių g.	339294	6137016	55.342138	21.466338
11	Gargždai02	Skinijos takas	336199	6176738	55.697612	21.39413
12	Gargždai01	Klaipėdos g. Kvietinių g.	336544	6178116	55.71009	21.398791
13	Gargždai03	Prie Minijos upes, netoli stadionas Kvietinių g.	337262	6178840	55.716829	21.409774
14	OKTS33	Klaipėda, Šilutės pl. OKTS	322661	6176421	55.690005	21.179245
15	Klaipėda07	Smiltelės g I. Simonaitytės g.	323146	6174130	55.669634	21.188424
16	Klaipėda11	Minijos g. Naikupės g.	320937	6175175	55.678192	21.152674
17	Klaipėda10	Taikos pr. 52	320946	6176889	55.693579	21.151698
18	Klaipėda13	Joniškės g. Jaunystės g.	322237	6179998	55.72195	21.17019
19	Klaipėda09	H. Manto g. S. Daukanto g.	319612	6179416	55.715761	21.128844
20	Klaipėda05	Sportininkų g. Stadiono g.	318437	6180451	55.724606	21.109482
21	Palanga02	Sodų g. 63	317902	6202273	55.920187	21.086371

Operator 4:

			www.maps.lt System LKS94		GPS Coordinates	
Nr.	**Name of the Location**	**Address**	**X**	**Y**	**N**	**E**
1	Utena03	Algirdo g. prie vaikų darželio	601211	6152092	55.493376	25.601666
2	Utena01	Aušros g. J. Basanavičiaus g.	601284	6152751	55.499277	25.603061
3	Utena02	Aušros g. 79	601222	6153609	55.506997	25.602393
4	Visaginas03	Visagino ež., stadionas, savivaldybė	652491	6165070	55.596565	26.419656
5	Visaginas01	Taikos pr. Veteranų g.	653675	6165598	55.600934	26.438714
6	Visaginas02	Jaunystės g.	654191	6164004	55.586459	26.446014
7	OKTS51	Aukštaitijos IMS, Rūgšteliškio k., Tauragnų sen., Utenos r.	626742	6149404	55.463291	26.004221
8	Ignalina01	Geležinkelio g. Aukštaičių g.	637268	6135970	55.339849	26.163945
9	Pabradė01	Vilniaus g. Arnionių g.	613192	6095512	54.982661	25.768481

Operator 5:

			www.maps.lt System LKS94		GPS Coordinates	
Nr.	**Name of the Location**	**Address**	**X**	**Y**	**N**	**E**
1	Šiauliai05	Vaidoto g. Merkinės g.	458435	6202358	55.953618	23.334471
2	Šiauliai02	Aušros al. Tilžės g.	457379	6200069	55.932964	23.317925
3	Šiauliai07	Lyros g. Dainų g.	453918	6198085	55.914824	23.262882
4	Šiauliai09	K. Donelaičio g. Šilėnų.g	456720	6198676	55.920393	23.307603
5	Šiauliai10	Pramonės g. Metalistų g.	457398	6197424	55.909205	23.318646
6	Šiauliai11	Šaukėnų g. Alksnių g.	458564	6197330	55.908462	23.337308
7	OKTS22	Šiauliai OKTS	456782	6200615	55.937813	23.308289
8	Radviliškis02	J. Marcinkevičiaus g. Purienų g.	470380	6187426	55.820366	23.527354
9	Radviliškis01	Šiaulių g. Gedimino g. autobusų st.	471591	6186580	55.812844	23.546766
10	Radviliškis03	Gedimino g. prie geležinkelio stoties	470973	6185949	55.807131	23.536974
11	Kelmė01	Vytauto g. Laisvės g. Gynėjų g.	432882	6166778	55.631154	22.934157

12	Mažeikiai01	Laisvės g. 22	397648	6243360	56.312686	22.345752
13	Mažeikiai03	Algirdo g. Gamyklos g.	395905	6243888	56.31705	22.317387
14	OKTS23	Mažeikiai OKTS	396752	6243040	56.309619	22.331403
15	Kuršėnai01	Vytauto g. V. Kudirkos g.	433829	6208758	56.008341	22.938981
16	Kuršėnai03	Ventos g. prie tilto	433353	6207866	56.000264	22.931567
17	Kuršėnai02	Daugėlių g. Klevų g.	434399	6206864	55.991406	22.948585

Operator 6:

Nr.	Name of the Location	Address	www.maps.lt System LKS94		GPS Coordinates	
			X	Y	N	E
1	Panevėžys08	Kalnelio g. Molainių mikrorajonas	520096	6175418	55.712987	24.319788
2	OKTS12	Panevėžys, Centras OKTS	522965	6176770	55.725006	24.36555
3	Panevėžys07	Vytauto g. Aukštaičių g.	523598	6176706	55.7244	24.375625
4	Panevėžys03	Elektros g. 4	522818	6177223	55.729082	24.363257
5	Panevėžys04	J. Janonio g. prie duonos kepyklos	520468	6178607	55.74162	24.32595
6	Panevėžys12	Pušaloto g. Raginėnų g.	521653	6178724	55.742617	24.344825
7	Panevėžys06	Pušyno g. Bijūnų g. Rožių mikrorajonas	522728	6179880	55.752955	24.362036
8	Likėnai01	Likėnų g. ir Pušų g., Pabiržės sen.	539016	6229173	56.194695	24.628624
9	Biržai01	Vabalninko g. Kęstučio g.	545760	6230044	56.20192	24.737426
10	Biržai02	Netoli upės, Žemaitės g.	547187	6229695	56.198648	24.760354
11	Rokiškis02	Parko g. 11	598633	6203755	55.95784	25.579512
12	Rokiškis03	Nepriklausomybės a. 11	599219	6204530	55.964683	25.589178
13	Rokiškis01	Respublikos g. Pramonės g.	599289	6202848	55.949565	25.589679
14	Anykščiai02	Netoli Liudiškių g. Statybininkų g.	570383	6154900	55.524001	25.114658
15	Ukmergė01	Kęstučio al. Vilniaus g.	548622	6124108	55.250042	24.764712
16	Ukmergė02	L. Giros g. A. Smetonos g.	547745	6124320	55.252034	24.750955
17	Ukmergė03	Nuotekų g. Laukų g. Jaunimo g.	549809	6123631	55.245641	24.783294

Operator 7:

			www.maps.lt System LKS94		GPS Coordinates	
Nr.	**Name of the Location**	**Address**	**X**	**Y**	**N**	**E**
1	Jonava02	Pramonės g. netoli Skarulių bažnyčios	520066	6104559	55.076398	24.314212
2	OKTS42	Jonava OKTS	518192	6104083	55.072193	24.284845
3	Jonava03	Prie I-ojo Jonavos tvenkinio	517111	6104606	55.076932	24.267947
4	Kėdainiai01	Kauno g. Ryto g.	498731	6127025	55.278643	23.980023
5	Kėdainiai03	J. Basanavičiaus g. 53	498358	6128078	55.288103	23.974147
6	OKTS43	Kėdainiai OKTS	497321	6127178	55.28001	23.957834
7	Raseiniai02	Pirmūnų g	445048	6137865	55.37296	23.133049
8	Raseiniai03	Žemaičių g. Vilkupės upė, parkas	444664	6139630	55.388771	23.126651
9	Raseiniai01	Vilniaus g. Vytauto Didžiojo g.	443808	6138665	55.380003	23.113328
10	Tauragė03	M.K. Čiurlionio g. Ganyklų g.	391377	6126892	55.265484	22.290883
11	Tauragė01	Dariaus ir Girėno g. Gedimino g.	391422	6125855	55.256187	22.291986
12	Tauragė02	Laisvės g. Malūno g., stadionas	391009	6124468	55.243633	22.286025
13	Jurbarkas02	A. Giedraičio-Giedriaus g. Bartkūnų g.	420104	6104683	55.071489	22.748997
14	Jurbarkas03	Mintuva, Parke prie cerkvės	420464	6105578	55.079586	22.754383
15	Jurbarkas01	Dariaus ir Girėno g. Ugniagesių g.	421550	6105388	55.078057	22.771438

Operator 8:

			www.maps.lt System LKS94		GPS Coordinates	
Nr.	**Name of the Location**	**Address**	**X**	**Y**	**N**	**E**
1	Birštonas01	Prie Vaižganto g. ir Tulpių g.	502155	6052152	54.605929	24.033356
2	Marijampolė01	V. Kudirkos g. Gedimino g.	458278	6046875	54.556797	23.354989
3	Marijampolė02	Pavasario g. Liepų g.	459492	6047161	54.559468	23.373717
4	Marijampolė04	Statybininkų g.	460094	6049221	54.578024	23.382744
5	Vilkaviškis03	Šeimenos upė J. Basanavičiaus g.	438370	6056650	54.642583	23.045211

6	Vilkaviškis01	Vytauto g. Gedimino g.	437829	6057306	54.648411	23.036685
7	Vilkviškis02	Vienybės g. tarp stadionų	437860	6058369	54.657965	23.036943
8	Lazdijai02	Tarp Turistų g. ir Vytauto g.	4691078	6010510	54.230829	23.52619
9	Druskininkai02	M.K. Čiurlionio g. Veisiejų g.	499500	5985931	54.010896	23.992365
10	Druskininkai01	M.K. Čiurlionio g. Antakalnio g.	498072	5986666	54.017496	23.970581
11	Druskininkai03	Kultūros poilsio parkas (iš mob)	498743	5985845	54.010113	23.980823
12	OKTS52	Dzūkijos IMS, Dubininko k., Marcinkonių sen., Varėnos r.	518818	5995189	54.093744	24.287666
13	Alytus02	Likiškėlių g. 14	500959	6028806	54.396158	24.014768
14	Alytus03	Rūtų g. Naujoji g.	502507	6028699	54.395194	24.038605
15	Alytus01	Pramonės g.	501105	6031759	54.422692	24.017027

2.2 Dust Particle Monitoring Locations

The dust monitors were installed to the following locations:

		www.maps.lt System LKS94		GPS Coordinates	
Nr.	**Name of the Location**	**X**	**Y**	**N**	**E**
1	Vilnius - OKTS03 Air quality measurement station (Breitfuss)	583080	6065083	54.715259	25.289414
2	Kaunas - OKTS41 Air quality measurement station (Breitfuss)	499110	6084335	54.895096	23.986122
3	Klaipėda - OKTS33 Air quality measurement station (Breitfuss)	322812	6176019	55.686457	21.181902
4	Panevėžys - OKTS12 Air quality measurement station (Breitfuss)	522967	6176770	55.725003	24.365575
5	Alytus Early warning station (RADIS)	502447	6029513	54.402505	24.037682
6	Biržai - meteorological site; Early warning station (RADIS)	548064	6229102	56.193229,	24.774372
7	Druskininkai Near municipality	498209	5986964	54.020169	23.972663

8	Elektrėnai Early warning station (RADIS)	542824	6072439	54.786389	24.665789
9	Marijampolė Baznycios g. 28B	457848	6046807	54.556152	23.348347
10	Raseiniai Near municipality	444120	6138891	55.382071	23.118203
11	Rokiškis Early warning station (RADIS)	598883	6202162	55.943486	25.582929
12	Šilutė Near municipality	338916	6137009	55.341953	21.460398
13	Tauragė On municipality building	391031	6125427	55.252248	22.285998
14	Telšiai On municipality building	390818	6206904	55.98384	22.25037
15	Utena On the roof of the Agency building Early warning station (RADIS)	602490	6152101	55.493188,	25.621909

2.3 POPs Monitoring Locations

The POPs samplers were installed to the following locations:

Nr.	Name of the Location	www.maps.lt System LKS94		GPS Coordinates	
		X	Y	N	E
1	Plateliai	364147	6214852	56.048376	21.819253
2	Rugsteliskis	626740	6149402	55.463276	26.004192

4. Project schedule

Air sampling and continuous monitoring of dust particles were carried out at the sites described in Part 3 from 1.1.2019 to 31.12.2019 as follows:

Measured compounds	Measuring periods
Particulates - PM_x (PM_{10}, $PM_{2.5}$, PM_1)	Continuously 1.1.2019 - 31.12.2019
NO_2, SO_2, VOCs - benzene	4 campaigns: - 9.2.2019 – 9.3.2019 - 11.5.2019 – 8.6.2019 - 24.8.2019 – 21.9.2019 - 9.11.2019 – 7.12.2019
Persistent organic pollutants - POPs	4 campaigns: - 22.1.2019 – 16.4.2019 - 16.4.2019 – 9.7.2019 - 9.7.2019 – 1.10.2019 - 1.10.2019 – 24.12.2019

The individual activities were set up in such a way that the logistic steps were smoothly connected and optimized. Samples were transported to laboratories in the Czech Republic as soon as possible after their collection. Individual sampling campaigns were synchronized so that we could transport as many samples as possible at the same time. There were no unexpected shifts in the planned activities for sampling, transporting and laboratory analysis during the project implementation.

Detailed schedule of activities

	2019												2020				
Activity	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**	**January**	**February**	**March**	**April**	**May**
Particulate monitoring																	
Sampling of NO_2 and SO_2																	
Sampling of VOCs (benzene)																	
Sampling of POPs																	
Transport of samples																	
Laboratory analysis																	
Partial expert evaluation																	
Pollution modeling, maps																	
Preparation of final report																	

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5. Technology

5.1. Passive diffusion samplers

Passive samplers ***radiello® Passive Air Sampler*** were used in the project.

The sampler consists of the following components:

- RAD196 – Outdoor sampling shelter

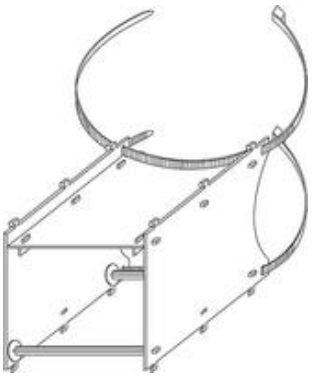

Fig. 1: Outdoor sampling shelter Radiello.

- RAD121 - Triangular supporting plate

Fig. 2: Triangular supporting plate Radiello.

- RAD120 – White diffusive body for BTEX and VOCs
- RAD1201 – Blue diffusive body for HF, NO_2 and SO_2

Fig. 3: Diffusive bodies Radiello.

- RAD130 - Cartridge BTEX/VOCS, W/ACT charcoal
- RAD166 – Cartridge HF, NO_2 and SO_2

Fig. 4: Example of catridge Radiello.

The sampling principle is based on the diffusion of analytes through the diffusion layer onto the adsorbent. After sampling, the analytes are chemically or thermally desorbed and then analyzed. It is not necessary to use a pump for sampling, samples may be taken in any environment (even explosive). Unlike conventional dosimeters (axial samplers), radiello has a significantly larger surface over which analytes can diffuse and then be retained on the corresponding sorbet from all sides, which brings many **benefits:**

- Significant increase in sorption rate - at least 3 times compared to conventional dosimeters
- high sorption capacity
- minimizing back diffusion
- higher reproducibility
- shortening of sampling time - 15 minutes to 30 days (1 ppb - 1000 ppm)

Diffusive sampler for SO_2 and NO_2

Diffusive body: blue – is made of microporous polyethylene, 1.7 mm thick, with average porosity 25 ± 5 µm. Diffusive path length is 18 mm, opaque to light: it is suitable for the sampling of light-sensitive compounds.
Adsorbing cartridge: matrix microporous PE impregnated with wet TEA. Nitrogen dioxide (NO_2) and sulfur dioxide (SO_2) are chemically adsorbed to TEA in the form of nitrite and sulphite or sulphate ions.

Desorption: extraction
Analytical method: Ion chromatography

Sampling Rates

NO_2
The sampling rate value Q at 298 K (25°C) and 1013 hPa is 0.141 ± 0.007 ng·ppb^{-1}·min^{-1}.

SO_2
The sampling rate value Q at 298 K (25°C) and 1013 hPa is 0.466 ± 0.022 ng·ppb^{-1}·min^{-1}.

Effect of Temperature, Humidity, and Wind Speed

Sampling rate of NO_2 varies from the value at 298 K on the effect of temperature (in Kelvin) following the equation:

$$Q_K = Q_{298} \cdot \left(\frac{K}{298}\right)^{7.0}$$

where $\mathbf{Q_K}$ is the sampling rate at the temperature K ranging from 263 to 313 K (from -10 to 40 °C) and $\mathbf{Q_{298}}$ is the reference value at 298 K. Sampling rate for SO_2 does not vary with temperature between 263 and 313 K (from -10 to 40 °C). Sampling rate is invariant with humidity in the range 15 - 90% and with wind speed between 0.1 and 10 m·s^{-1} for both gases.

Calculations

NO_2
The concentration C_{NO2} is calculated according to the equation:

$$C_{NO2} = \frac{m_{NO_2}}{Q_K \cdot t}$$

where $\mathbf{m_{NO2}}$ is nitrite mass in ng found on the cartridge, **t** is exposure time in minutes and $\mathbf{Q_K}$ is the sampling rate value at the temperature K in Kelvin.

SO_2
Convert the sulfite found onto the cartridge into sulfate by multiplying its mass by 1.2, then sum the obtained value to the sulfate found in the cartridge. The concentration in ppb is calculated according to the equation:

$$C_{SO2} = \frac{m_{SO_4}}{0.466 \cdot t}$$

where $\mathbf{m_{SO4}}$ is the overall sulfate mass in ng found in the cartridge (sulfate itself and sulfite converted into sulfate) and **t** is exposure time in minutes.

Diffusive sampler VOC – extraction to CS_2
Diffusive body: white - is made of microporous polyethylene, 1.7 mm thick, with average porosity 25 ± 5 µm. Diffusive path length is 18 mm.
Adsorbing cartridge: matrix SS net (100 mesh, 5.8 mm diam.), activated using activated charcoal (30-50 mesh).
Desorption: thermal

Analytical method: Extraction / Gas chromatography with flame ionization detector
Sampling rate coefficients determined for 32 volatile organic compounds.

5.2. Particulate matter monitor – enviDUST

The enviDUST unit developed by ENVItech Bohemia s.r.o. is based on the Alphasense OPC-N2 Particle Monitor optical dust sensor, which is integrated into the outdoor box and to the system of collection, processing and transmission of measured data on basis of Raspberry micro-computer.
The particulate monitor is designed for continuous monitoring of particulate matter in ambient air. The system provides real-time simultaneous measurement of PM_{10}, $PM_{2.5}$ and PM_1 fractions, including the measurement of particle number concentration.

Measuring principle:	Optical light scattering
Number of size channels:	16
Particle size range:	0,38 – 17 µm
Data output (average):	5 min., 1 hour
Sample flow rate:	220 ml/min
Power supply:	230 V; 50/60 Hz; or alternatively 12 / 24 V
Dimension:	280 x 210 x 130 mm (H x W x D)
Enclosure:	IP64
Control unit:	micro-computer Raspberry
Communication:	built-in GPRS modem

Fig. 5: Particulate monitor enviDUST and particulate sensor Alphasense OPC-N2.

Before their implementation, all enviDUST sensor units were calibrated using the Palas Fidas 200 optical dust analyzer owned by ENVItech Bohemia s.r.o. The Fidas 200 device has been certified by TÜV according to the most up-to-date standard for continuous monitoring of dust particles in the ambient air - EN 16450. After the comparison measurement, a correction factor was set by which the measured data were automatically recalculated.
The same calibration procedure was then performed continuously during the measurements in the respective localities, four times during the year 2019, when the measurements took place.

Fig. 6: Example of installation of particulate monitor enviDUST in the measuring location.

6. Air Sampling and Handling with Samples

Radiello passive samplers were used for the determination of NO_2, SO_2 a VOC concentrations in all cases of air sampling. The samplers were exposed throughout the whole periods of measurement campaigns, always in accordance with the manufacturer's instructions.
In the period between campaigns only outdoor sampling shelters were left in the locations.

6.1. Handling with Samples during Installation

The adsorbing cartridges and diffusive bodies were placed in a PE bag with a zip during transport. Before installing it, we always checked whether the bag or cartridge container was intact.
The installation proceeded as follows:
Prior to the first campaign, outdoor sampling shelters were assembled and attached to columns, into which the sampling elements were installed before each campaign. Adsorbing cartridges

with sorption filling were inserted into diffusive bodies, according to the type of the measured substance. Diffusive bodies were then screwed onto triangular supporting plates and suspended in outdoor sampling shelters. The designation of the individual sampling elements is then shown in Fig. 1-4.

Samples prepared in this way then passively collected air samples for the whole exposition period (14 days). After the exposition, the cartridges were inserted into the original containers and they were marked with individual code label and also the place and date of collection. Each campaign includes 28-day and it takes consecutive 2 sub-campaigns (14 exposition days each). 2 samples were exposed for each sub-campaign and 4 samples on the whole from each site per campaign.
Fig. 7 shows the installed Radiello samplers in the selected locations within the project implementation.

Fig. 7: Radiello samplers installed in the selected locations within the project implementation.

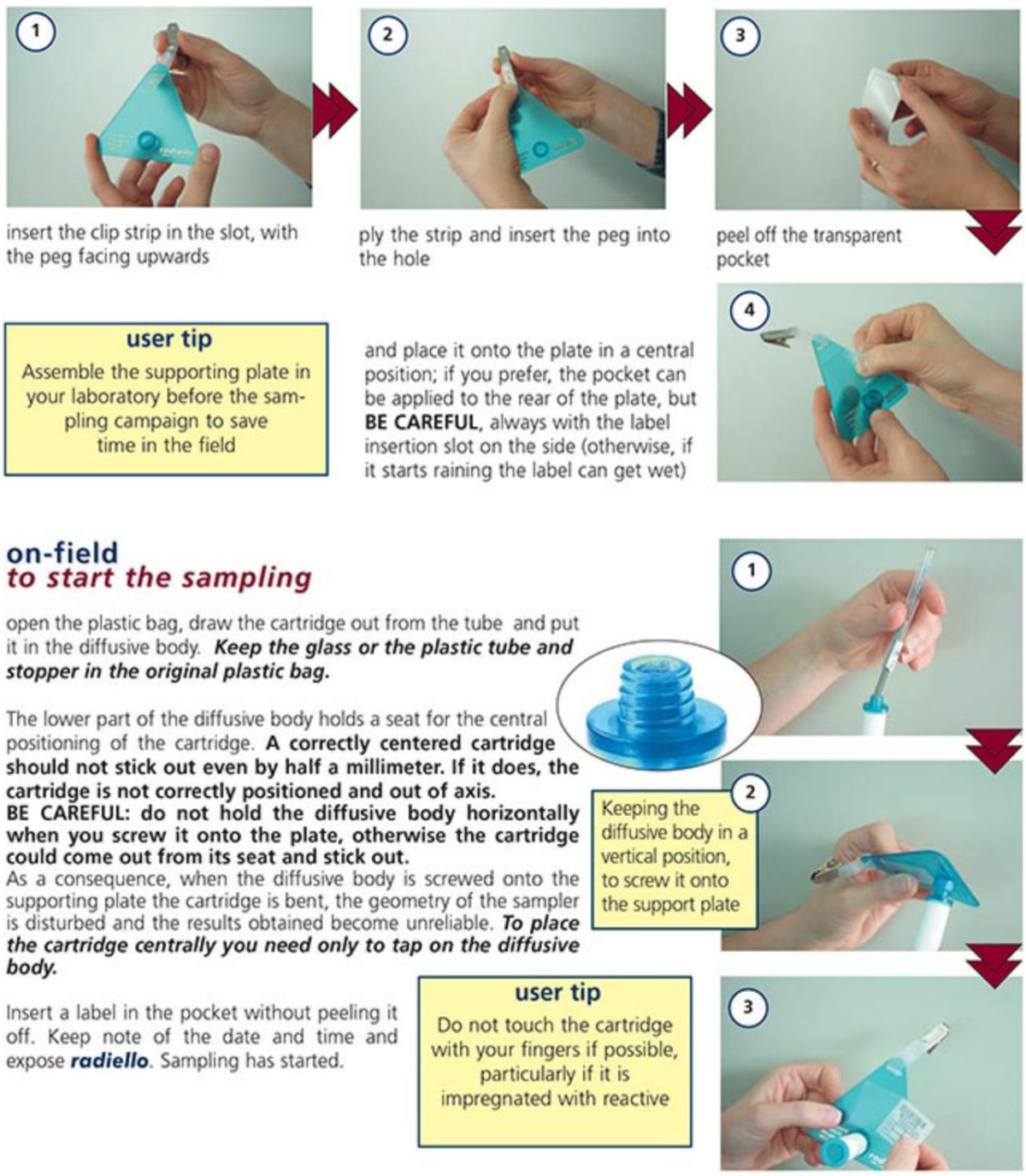

Fig. 8: Manipulation with dosimeter.

6.2. Handling with Samples during Storage and Transport

After removing the sampled Radiello sorption tubes from the diffusive bodies, they were inserted into the original cases with lids. The cartridges were placed there during the whole period of transport and storage. Cases with sampled tubes were placed in refrigerated polystyrene boxes in which they were transported.
All samples were collected after each campaign (and sub-campaign) at the headquarters of the company UAB "Adranas", where they were kept in a refrigerator at approximately 4° C until their transport to the laboratory. Subsequently, the samples were transported personally by car to VSB Technical University of Ostrava (Czech Republic) after each campaign.

Fig. 9: Safety vest and the sampling transport box.

6.3. Handling with Samples in the laboratory

The following section describes the path of the sample (sorption tube Radiello) from its taking over and entering the analytical laboratory, its registration, through the process of the analysis itself, to the reporting.

The analytical testing laboratory of VSB Technical University of Ostrava has been accredited according to ČSN EN ISO / IEC 17025: 2005 by the Czech Institute for Accreditation, under the certificate number 1166 dated May 9, 2019, with the validity of the certificate until 18.11.2020.

All sample handling has been recorded in the relevant laboratory documentation - instrument logs, work logs, and in the Laboratory Information System. Data has been personalized and it is possible to trace all processes from the modification, analysis to evaluation of samples. The system also stores primary measurement records.

Samples were delivered to the analytical testing laboratory in person by UAB “Adranas” or ENVItech Bohemia s.r.o. Upon receipt, samples from each campaign were checked and registered in the LabSystem laboratory information system. After registration, each sample was assigned a unique registration number and the sample is permanently registered by the laboratory under that number.

According to the Quality Manual, the particular analyst who has performed the analysis according to the relevant approved analytical method was responsible for the analytical technique used, while observing all conditions and procedures specified therein.

After labeling, samples were stored in a separate refrigerator, wrapped in an inert material (foil) to maintain a temperature of max. 4 ° C and darkness. All samples were processed within 2 months of sampling at the latest, which is in accordance with the manufacturer's requirement (max. 4 months).

The results of the individual determinations were entered into the laboratory information system after their evaluation. After being reviewed by the lead analyst, the results were approved and an analysis report was generated. The original protocols were handed over to Envitech Bohemia s.r.o. for further processing of measured data in electronic and paper form.

NÁRODNÍ AKREDITAČNÍ ORGÁN

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Český institut pro akreditaci, o.p.s.
Olšanská 54/3, 130 00 Praha 3

issues

according to section 16 of Act No. 22/1997 Coll., on technical requirements for products, as amended

CERTIFICATE OF ACCREDITATION

No. **505 / 2016**

Vysoká škola báňská - Technická univerzita Ostrava
with registered office 17. listopadu 2172/15, 708 33 Ostrava, Poruba, Company Registration No. 61989100

to the Testing Laboratory No. **1166**
Nanotechnology Centre

Scope of accreditation:

Chemical analysis of drinking, surface, ground and waste water, aqueous extracts, soils, waste, including emissions, immissions, workplace air, sediments, sludge, fuels, oils, building and silicate materials, spirits, industrial alcohol and antifreeze mixtures to the extent as specified in the appendix to this Certificate.

This Certificate of Accreditation is a proof of Accreditation issued on the basis of assessment of fulfillment of the accreditation criteria in accordance with

ČSN EN ISO/IEC 17025:2005

In its activities performed within the scope and for the period of validity of this Certificate, the Body is entitled to refer to this Certificate, provided that the accreditation is not suspended and the Body meets the specified accreditation requirements in accordance with the relevant regulations applicable to the activity of an accredited Conformity Assessment Body.

This Certificate of Accreditation replaces, to the full extent, Certificate No.: 789/2015 of 18 November 2015, or any administrative acts building upon it.

The Certificate of Accreditation is valid until: **18 November 2020**

Prague: 29 August 2016

Český institut pro akreditaci, o.p.s.
NÁRODNÍ AKREDITAČNÍ ORGÁN
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Jiří Růžička
Director
Czech Accreditation Institute
Public Service Company

Fig. 10: Accreditation certificate.

7. Sample Analysis Methods

The contents of NO_2 and SO_2 are determined by ion chromatography method. Gas chromatography was used to determine the VOC (benzene, ethylbenzene, toluene, m, p-xylene and o-oxylene).

7.1. Ion chromatography – determination of anions

Samples were analyzed by Metrohm Eco IC ion chromatograph with conductivity detector.

Fig. 11: Metrohm Eco IC with autosampler.

Sample preparation procedure for analysis:

5 ml of ultrapure water was added directly to the sampling tube, shaken vigorously for 1 minute, and extracted by rolling for a further 60 minutes. The tube was then removed and the vial solution was used for analysis on an ion chromatograph.

Calibration:

Calibration of the ion chromatograph was performed by analyzing standards prepared from Astasol Mix Certified Reference Materials (CRM) by dilution.

Quality control:

A control sample (QC sample), prepared from solutions of pure substances and having a concentration in the lower half of the working range, was included in each series of samples.

Determination:

The prepared sample is directly injected into the Metrohm Eco IC ion chromatograph with a conductivity detector.

Column: Metrosep A supp 5 (250/4.0)
Mobile phase: $NaHCO_3$: 1 mmol/L; Na_2CO_3: 3.2 mmol / l, acetone 2%; isopropanol 0.5%.

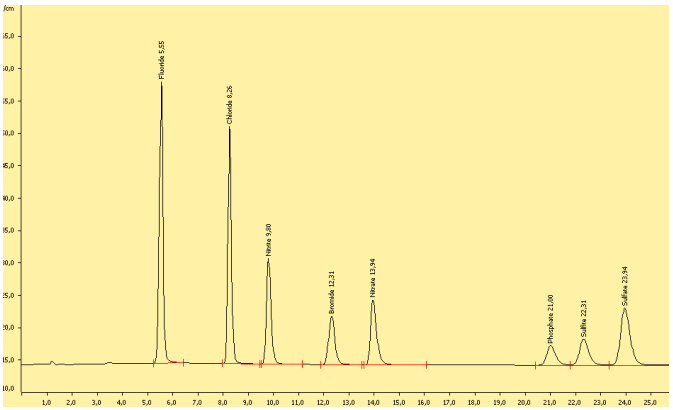


Fig.12: IC chromatogram, mixture of ions.

Results:

Results (expressed in mg/l) were evaluated using MagIC Net 3.2 software using the external standard method (ESTD). The NO_2 and SO_2 content of the sample (in µg/m^3) was calculated from the determined NO_2^-, SO_3^{2-} and SO_4^{2-} content according to the exposure time of the samples as well as the average temperature over the entire exposure period (calculation is also given in the Radiello samples manufacturer's manual).

7.2. Gas chromatography with flame ionization detection (FID) – determination of VOC

Preparation:
2 ml CS_2 were added to the collection tube and the whole mixture was extracted with occasional shaking for 30 min. Then the tube was removed and the CS_2 extract was analyzed on a gas chromatograph with a flame ionization detector (FID).

Calibration:

Calibration was performed on standard solutions of analytes in CS_2, prepared from certified reference materials (CRM) - pure substances - Sigma-Aldrich.

Determination:

The prepared sample was directly injected into an Agilent 7890A gas chromatograph with a FID detector.

Column: HP-5MS 5% Phenyl Methyl Siloxane, 325°C: 30 m x 250 µm x 0.25 µm
Conditions: He 1.2 mL/min., Split 20:1, Injection: 1 ul, Oven: 50°C for 2 min, then 30°C/min to 135°C for 0.5 min, then 100°C/min to 250°C for 0.5 min

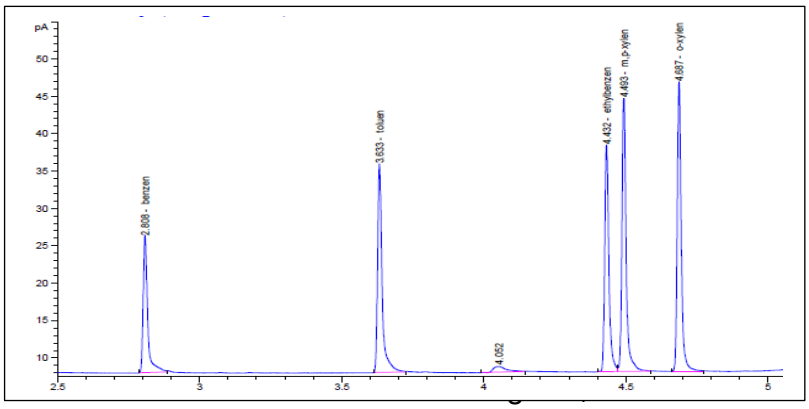


Fig.13: chromatographic record of GC.

Chromatogram was evaluated in SW of the device, calculation was performed by external standard method (ESTD). Final results (in µg/m^3) were calculated by including the time and average exposure temperature of the sampling tubes according to the manufacturer's manual (Radiello).

8. Measurement Results

Within the project, the concentration of dust particles of PM_{10}, $PM_{2.5}$ a PM_1 fractions, concentration of volatile organic compounds (benzene, toluene, ethylbenzene, styrene, m-, p-, o-xylenes) and SO_2 and NO_2 concentrations were measured in Lithuania. As additional parameters, the results were supplemented with meteorological data - wind speed and direction, air temperature.

8.1. Measurement of Particulates

PMx suspended particulate concentrations were monitored using low cost enviDUST sensors at 15 locations across the country. These data were supplemented with measured results from stations of automated air pollution monitoring (AQM) from other 16 localities. For comparison and calibration, 4 sensors were installed on AQM stations. These were the locations of Vilnius Žirmūnai, Kaunas Petrašiūnai, Klaipėda Šilutės pl. and Panevėžys Centras. Other sensory units were then located in sites (in cities) where data from automated air pollution monitoring are not available, as the aim was to cover as large a territory as possible. The enviDUST sensors provide data on the concentrations of individual PM_{10}, $PM_{2.5}$ and PM_1 size fractions, while AQM stations continuously measure only the PM_{10} and $PM_{2.5}$ size fractions (6 stations provide PM_{10} a $PM_{2.5}$ data, 9 stations only PM_{10} data and 1 station only $PM_{2.5}$ data).

Fig. 13: Examples of location of sensory units at individual sites.

Data transfer from individual sensor stations is shown in the Fig. 14. The daily average data transfer ranged from 91.2% to 100%, thus fulfilling the conditions stipulated in the contract. The overall daily average data transfer from all sensory stations reached 98.5%.

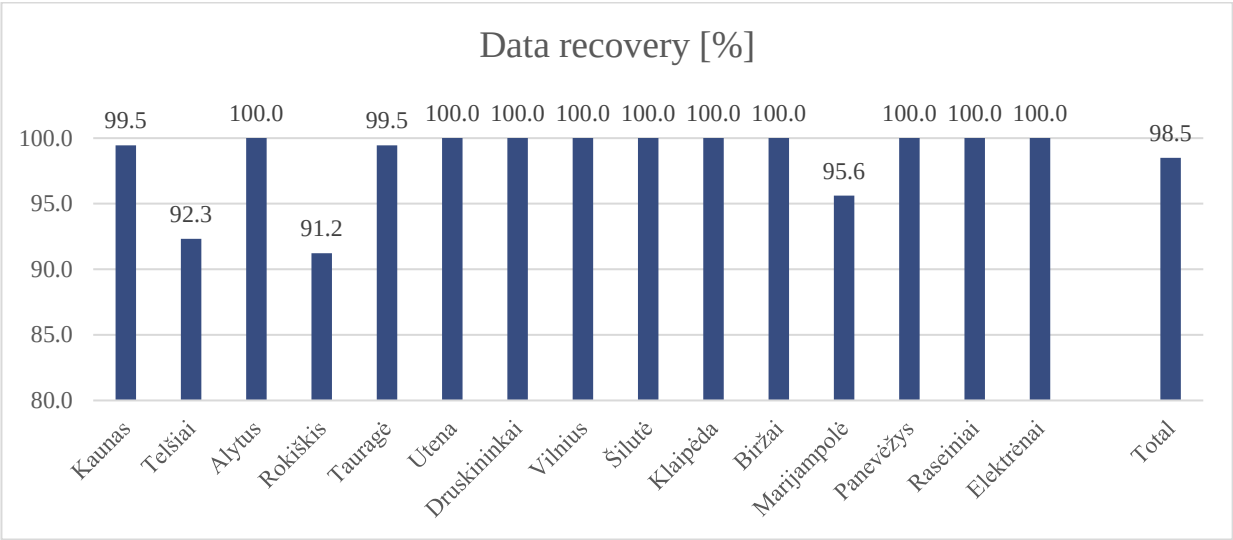


Fig. 14: Data transfer from individual sensory stations – daily average.

8.1.1. Evaluation of PM_{10} Results

Annual averages of concentrations PM_{10} (all locations)

Locations – Sensory units	***PM_{10} [µg/m³]***	***Locations - AQM***	***PM_{10} [µg/m³]***
Kaunas	27,5	Vilnius Senamiestis	25,7
Telšiai	31,0	Vilnius Lazdynai	16,5
Alytus	22,9	Vilnius Žirmūnai	29,8
Rokiškis	21,6	Vilnius Sąvanorių pr.	19,2
Tauragė	23,8	Kaunas Petrašiūnai	34,0
Utena	24,9	Kaunas Nauja	25,1
Druskininkai	24,6	Kėdainiai	18,0
Vilnius	28,7	Jonava	14,5
Šilutė	25,7	Šiauliai	23,9
Klaipėda	23,3	Naujoji Akmenė	23,7
Biržai	28,8	Mažeikiai	26,6
Marijampolė	26,3	Klaipėda Šilutės pl.	25,7
Panevėžys	24,8	Klaipėda Centras	20,1
Raseiniai	25,2	Panevėžys Centras	26,1
Elektrėnai	19,2	Žemaitija	12,1
Average sensors	**25,2**	**Average AIM**	**22,7**

Table 1.: Overview of annual average concentrations PM_{10} (all stations)

Daily averages of concentrations PM_{10} (all locations)

The average annual concentrations do not exceed the limit value of 40 µg/m³. The average calculated from data from the network of sensor units and automatic monitoring (AQM) differs minimally. The range of average PM_{10} concentrations is 12.1 - 34.0 µg/m³, which is about 60% of the limit value.

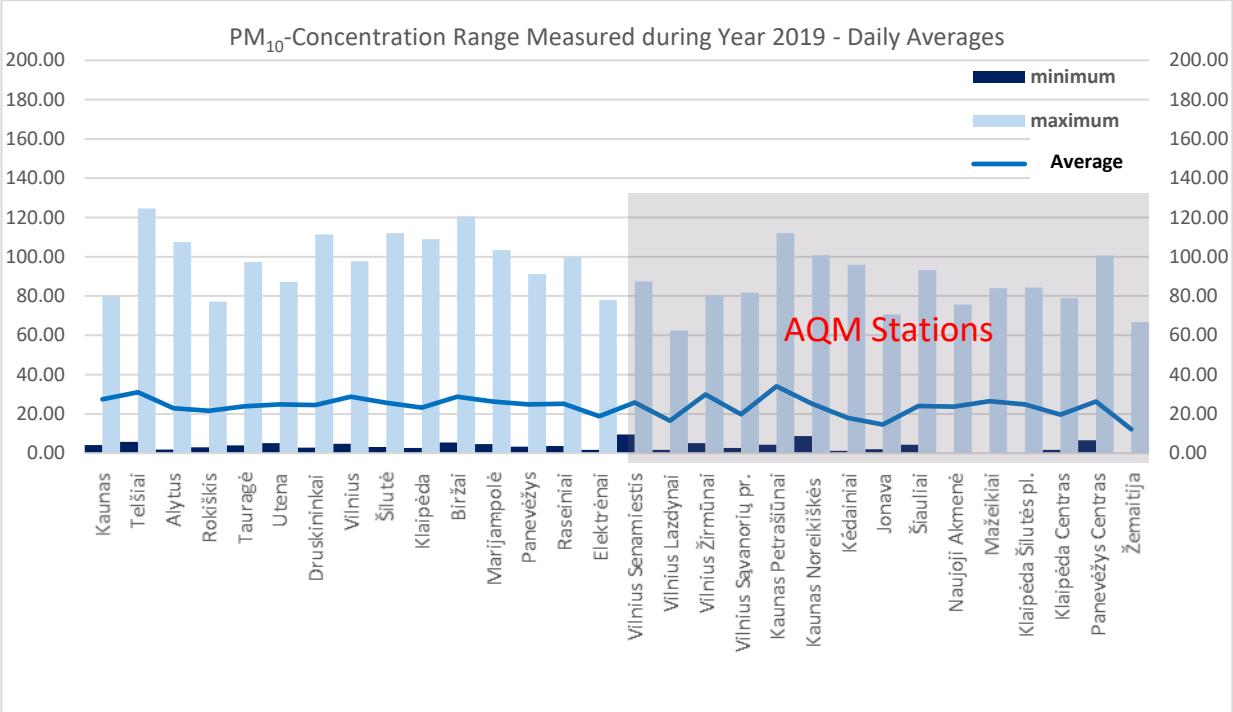


Fig. 15: Annual characteristics of PM_{10} concentrations in monitored localities.

The highest measured maximum daily concentrations were in the localities of Telšiai - 124.6 µg/m³ and Biržai - 120.5 µg/m³. Both concentrations were measured during short (one-day) episodes during April 2019. Generally, the highest PM_{10} concentrations were measured from 22/01/2019 to 20/02/2019. During this period the daily limit value was exceeded in all monitored localities.

The following table shows the number of exceedances of the daily limit value for PM_{10}, which is 50 µg/m³, as well as the date of the 36th exceedance of the limit value. The legislation stipulates 35 permitted exceedances of the daily limit value for PM_{10}.

Out of the 15 sensory stations, the permitted number of exceedances of the daily limit value for PM_{10} was exceeded at 8 of them, while the permitted number of exceedances was reached only in autumn or winter 2019. The exception is the Telšiai station, where the limit value was exceeded on 04/04/2019.

Of the 15 AQM stations, the permitted number of exceedances of the daily limit value of PM_{10} was exceeded only at the Kaunas Petrašiūnai station. This is probably due to greater fluctuation of the measured values in the case of sensory units. Testing in neighboring European countries has shown that, especially when measuring the lowest and highest concentrations, the variation

in the values of the optical sensor units is much higher than in the case of reference devices. In the case of long-term averages, the data quality is significantly higher.

	Measuring location	Number of exceedances of PM_{10} daily limit value	Date of 36th exceedance of PM_{10} daily limit value
Sensory units	Kaunas	45	28.9.2019
	Telšiai	63	4.4.2019
	Alytus	31	-
	Rokiškis	16	-
	Tauragė	35	17.12.2019
	Utena	27	-
	Druskininkai	39	5.12.2019
	Vilnius	41	26.11.2019
	Šilutė	39	20.12.2019
	Klaipėda	30	-
	Biržai	51	26.11.2019
	Marijampolė	38	21.12.2019
	Panevėžys	28	-
	Raseiniai	37	22.12.2019
	Elektrėnai	16	-
AQM stations	Vilnius Senamiestis	10	-
	Vilnius Lazdynai	3	-
	Vilnius Žirmūnai	15	-
	Vilnius Sąvanorių pr.	10	-
	Kaunas Petrašiūnai	40	16.10.2019
	Kaunas Nauja	12	-
	Kėdainiai	7	-
	Jonava	4	-
	Šiauliai	14	-
	Naujoji Akmenė	8	-
	Mažeikiai	7	-
	Klaipėda Šilutės pl.	23	-
	Klaipėda Centras	11	-
	Panevėžys Centras	11	-
	Žemaitija	2	-

Table 2.: Numbers of exceedances of daily PM_{10} concentrations at individual stations

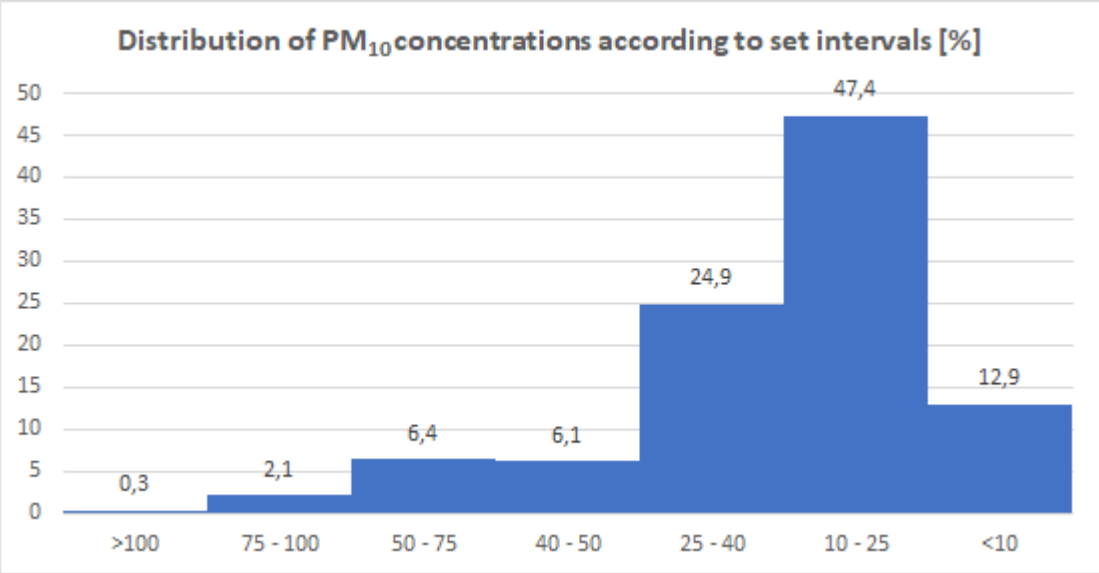


Fig. 16: Distribution of PM_{10} concentrations in all daily averages

Of all measured daily averages of PM_{10} concentrations, only 0.3% values are higher than 100 µg/m^3 and in total 8.8% exceed the level of the daily limit value for PM_{10}. Over 70% of all measured concentration values range from 10 to 40 µg/m^3. 12.9% of the concentration values were lower than 10 µg/m^3.

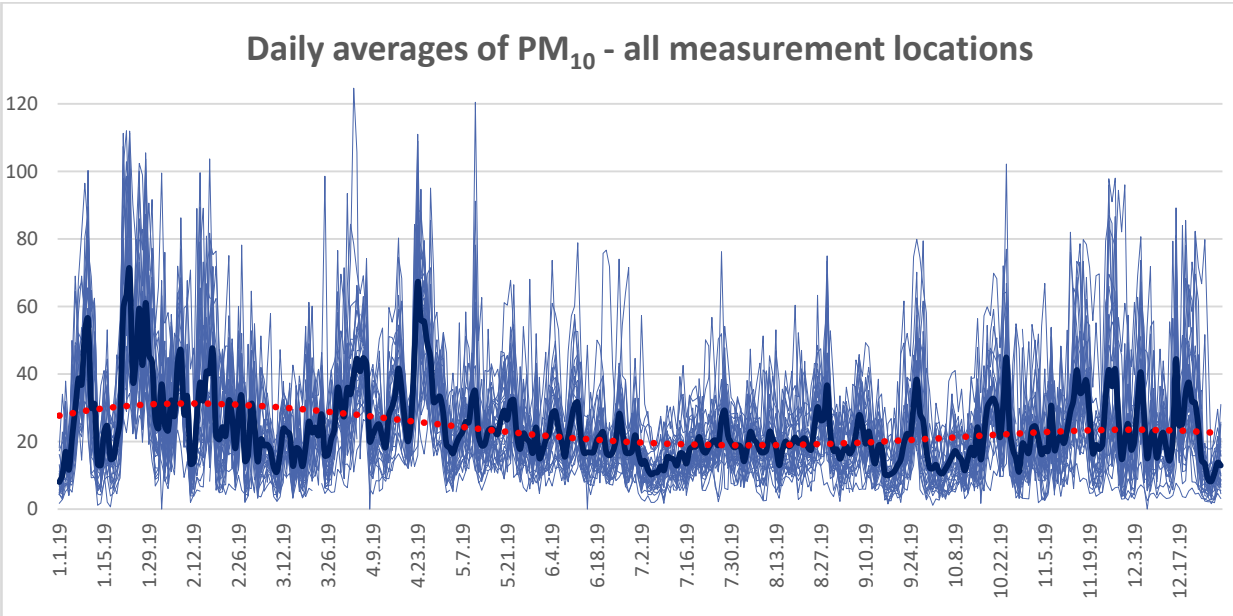


Fig. 17: Course of daily PM_{10} concentrations in µg/m^3 - all localities

Fig. 17 shows the course of daily PM_{10} concentrations from all measured localities, with the dark color highlighting the average of all stations. It is clear from the graph that all stations show a similar trend - they follow the average, ie. the course of concentrations does not show significant differences and the network does not contain stations with significantly different or totally incorrect measurements. The dashed red line is a trend curve that shows small but significant differences between the heating and non-heating season. The lowest concentrations are in July and August 2019 and the highest in February 2019. From May to September there is

a very good consistency between the trend curve and the average. The air in this period is calm in terms of air quality, PM_{10} concentrations do not show significant dynamics of development.

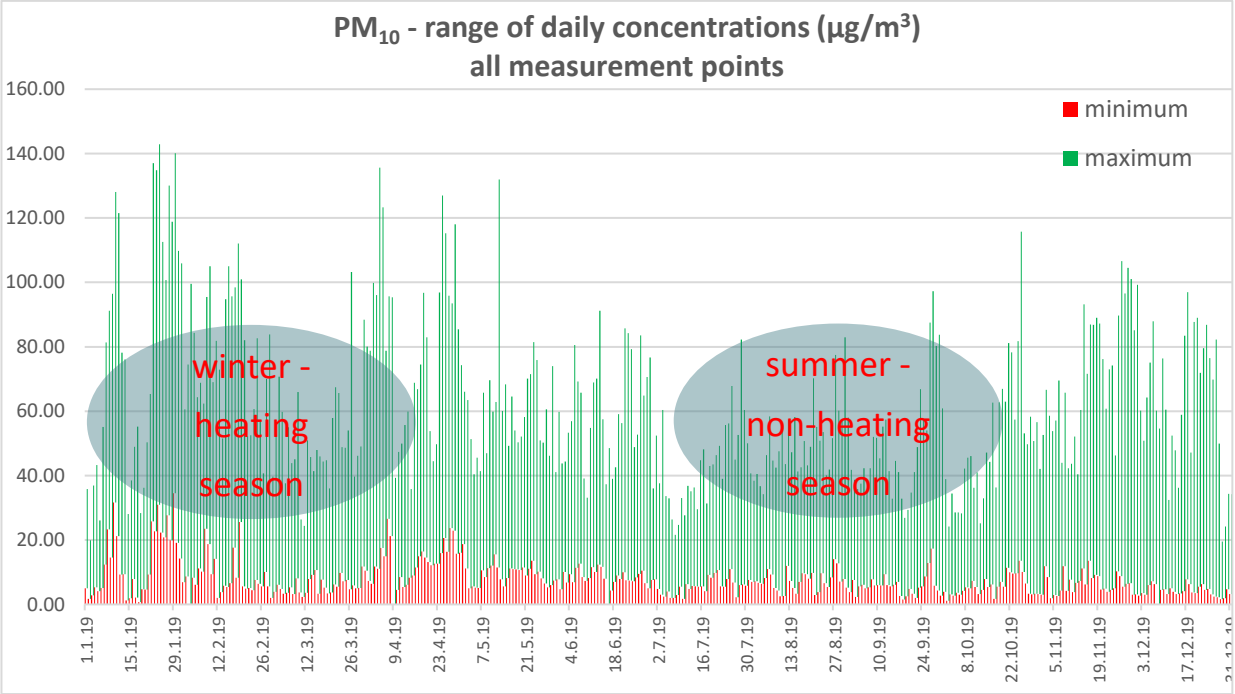


Fig. 18: Differences in minimum and maximum daily concentrations PM_{10} – all stations

Fig. 18 shows the differences between the minimum and maximum PM_{10} concentrations in individual days within the whole measuring system. It is clear from the graph that common differences are about 25 µg/m^3, while in the heating season, when higher concentrations occur, the differences are larger. On the contrary, in the summer period (July-August) the differences are clearly smaller.

The average PM_{10} concentrations in the sampling campaigns (1-8) are shown in Fig. 19. The order of the campaigns from worst to best (lowest concentration of PM_{10}) is 1 - 8 - 3 - 7 - 2 - 4 - 5 - 6.

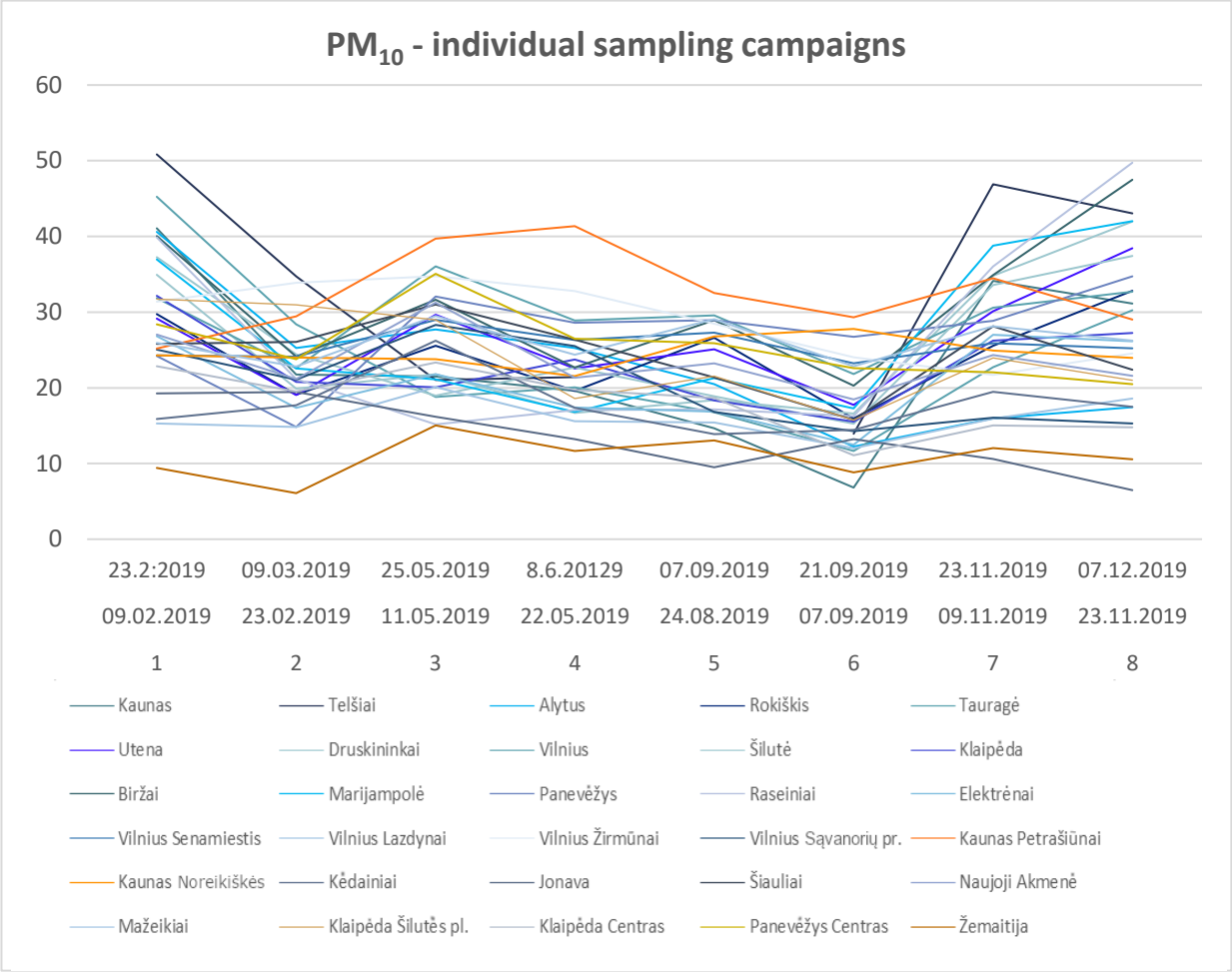


Fig. 19: Concentrations of PM_{10} in individual sampling campaigns for gas pollutants - all localities

8.1.2. Evaluation of $PM_{2.5}$ Results

The limit value for annual average of $PM_{2.5}$ concentration is 25 µg/m^3 and was not exceeded in 2019 at any of the measuring locations (sensory or AQM). At most stations the annual average concentrations reach about 65% of the limit value. Similar to PM_{10}, the measured concentrations from the sensor units are slightly higher than those from the reference AQM stations. The maximum daily average value was measured in the location Telšiai on April 4, 2019, namely 109.8 µg/m^3.

The limit value for annual average of $PM_{2.5}$ concentration falls to 20 µg/m^3 by 2020 year therefore 5 cities – Raseiniai, Marijampolė, Biržai, Šilutė and Telšiai according 2019 year monitoring data exceed this value and two places – Kaunas and Panevėžys are very close to the limit. It is recommended to pay attention and take all necessary actions to reduce the particulate pollution in these areas.

Annual averages, minimum and maximum* PM$_{2.5}$ *concentrations (all localities)

	Measuring location	*PM$_{2.5}$ annual average [µg/m^3]*	*PM$_{2.5}$ maximum daily average [µg/m^3]*	*PM$_{2.5}$ minimum daily average [µg/m^3]*
Sensory units	Kaunas	19,6	53,8	1,5
	Telšiai	23,7	109,8	2,5
	Alytus	17,8	101,0	1,7
	Rokiškis	12,5	58,7	2,1
	Tauragė	16,5	91,5	2,1
	Utena	17,5	81,9	3,1
	Druskininkai	17,2	107,6	2,3
	Vilnius	16,4	84,7	1,8
	Šilutė	20,0	104,2	2,5
	Klaipėda	15,7	71,3	1,1
	Biržai	22,4	108,2	3,0
	Marijampolė	20,9	96,5	3,4
	Panevėžys	19,2	87,0	2,6
	Raseiniai	20,1	96,1	2,3
	Elektrėnai	14,6	75,7	1,5
AQM stations	Naujoji Akmenė	7,9	44,6	0,0
	Aukštaitija	7,2	35,7	0,0
	Žemaitija	6,1	27,0	0,1
	Vilnius Žirmūnai	15,9	57,5	5,7
	Kaunas Petrašiūnai	11,4	97,5	0,1
	Klaipėda Šilutės pl.	15,6	51,8	4,0
	Kaunas Noreikiškės	11,2	71,9	6,8

Table 3.: Annual averages, minimum and maximum PM$_{2.5}$ concentrations (all locations)

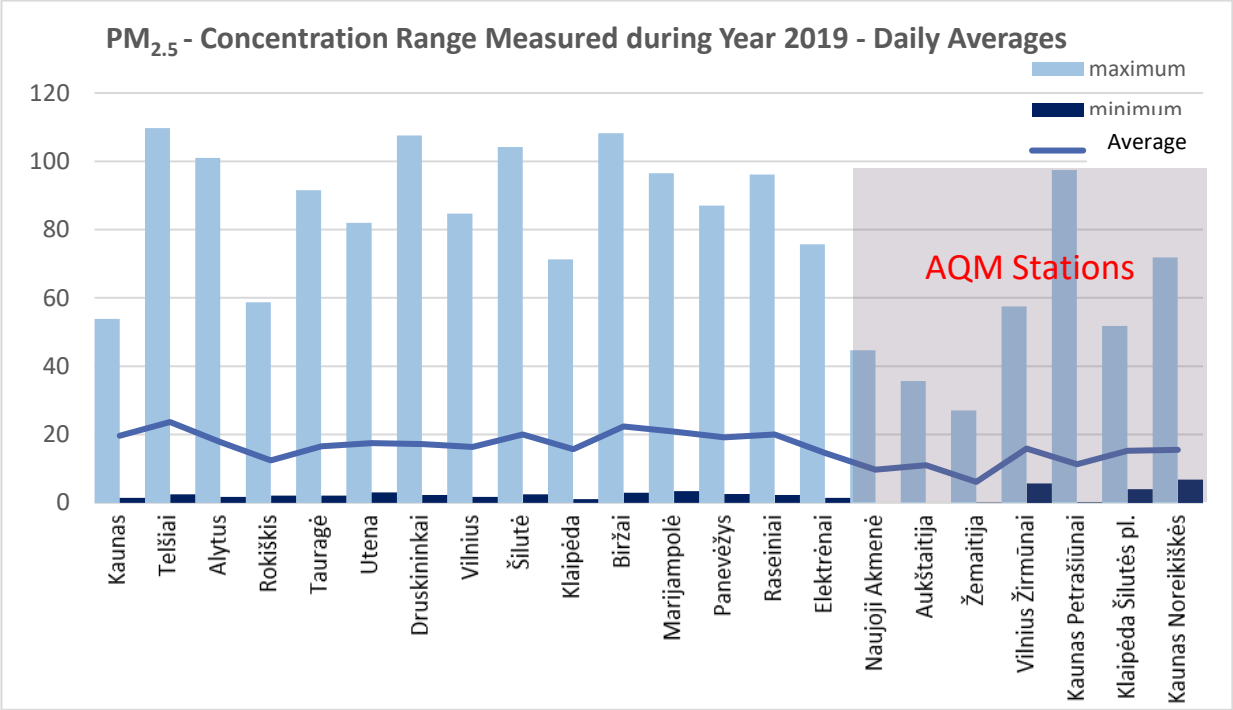


Fig. 20: Annual characteristics of $PM_{2.5}$ concentrations in the monitored localities.

It is clear from the Fig. 20 that, as in the case of PM_{10}, the variation in the measured data is considerably higher in the sensor units.

8.1.3. Evaluation of PM_1 Results

PM_1 concentrations were measured only at sensory stations and thus the measured data cannot be compared with AQM stations. Average annual concentrations, daily maximum and minimum values are similar to $PM_{2.5}$ and PM_{10}.

***Annual averages, minimum and maximum concentrations of* PM$_1$**

	Measuring location	*PM$_1$ annual average [µg/m^3]*	*PM$_1$ maximum daily average [µg/m^3]*	*PM$_1$ minimum daily average [µg/m^3]*
Sensory units	Kaunas	9,8	33,4	1,2
	Telšiai	20,2	104,3	2,1
	Alytus	14,9	93,5	1,5
	Rokiškis	9,7	47,5	1,6
	Tauragė	13,5	79,3	1,9
	Utena	13,8	71,6	2,1
	Druskininkai	13,9	89,1	1,9
	Vilnius	12,7	68,4	1,2
	Šilutė	16,1	95,6	2,3
	Klaipėda	12,2	64,6	0,9
	Biržai	18,2	95,7	2,0
	Marijampolė	17,4	83,3	2,6
	Panevėžys	14,6	75,1	0,0
	Raseiniai	16,3	79,6	1,8
	Elektrėnai	11,9	62,2	1,2

Table 4.: Annual averages, minimum and maximum concentrations of PM$_1$ at the sensory network stations

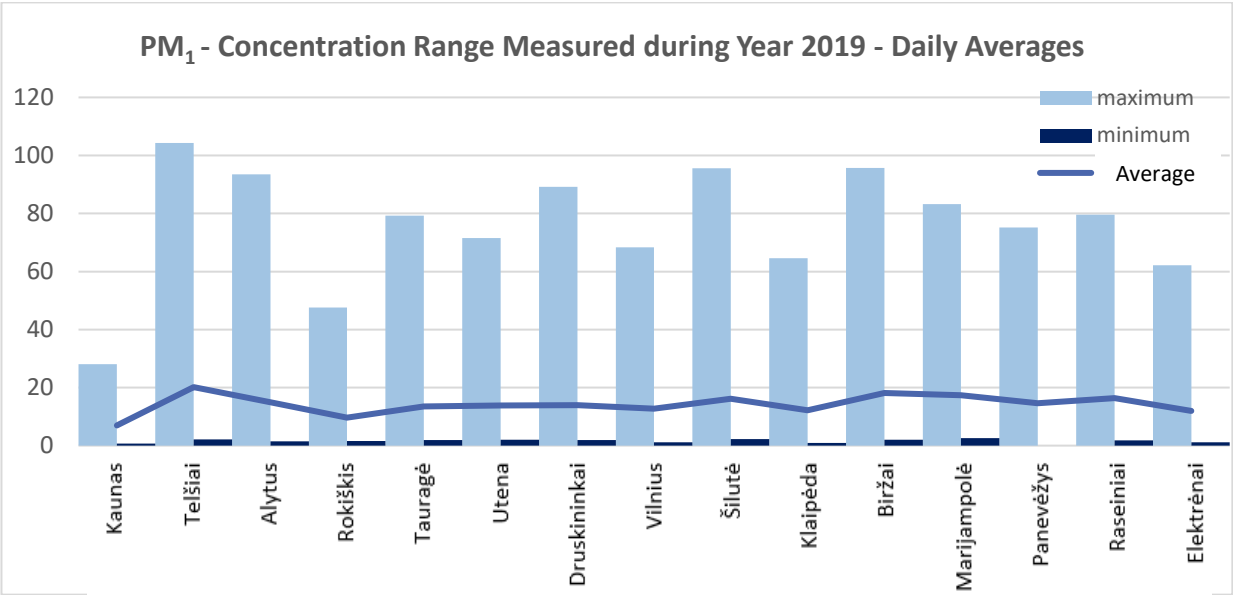


Fig. 21: Annual characteristics of PM$_1$ concentrations at the sensory network stations.

The concentration range is similar to the previous fractions, the maximum daily average of 104.3 µg/m^3 was also measured in Telšiai on April 4, 2019.

8.1.4. Comparison of PM_{10}, $PM_{2.5}$ and PM_1 Results

	Measuring location	*PM_{10} annual average [µg/m³]*	*$PM_{2.5}$ annual average [µg/m³];(in % the proportion in PM_{10})*	*PM_1 annual average [µg/m³]; (in % the proportion in PM_{10})*
Sensory units	Kaunas	27,5	19,6 (71%)	9,8 (36%)
	Telšiai	31,0	23,7 (76%)	20,2 (65%)
	Alytus	22,9	17,8 (78%)	14,9 (65%)
	Rokiškis	21,6	12,5 (58%)	9,7 (45%)
	Tauragė	23,8	16,5 (69%)	13,5 (57%)
	Utena	24,9	17,5 (70%)	13,8 (55%)
	Druskininkai	24,6	17,2 (72%)	13,9 (57%)
	Vilnius	28,7	16,4 (57%)	12,7 (44%)
	Šilutė	25,7	20,0 (78%)	16,1 (63%)
	Klaipėda	23,3	15,7 (67%)	12,2 (52%)
	Biržai	28,8	22,4 (78%)	18,2 (63%)
	Marijampolė	26,3	20,9 (79%)	17,4 (66%)
	Panevėžys	24,8	19,2 (77%)	14,6 (59%)
	Raseiniai	25,2	20,1 (80%)	16,3 (65%)
	Elektrėnai	18,8	14,6 (78%)	11,9 (63%)
AQM stations	Vilnius Senamiestis	25,7	-	-
	Vilnius Lazdynai	16,5	-	-
	Vilnius Žirmūnai	29,8	15,9 (53%)	-
	Vilnius Sąvanorių pr.	19,2	-	-
	Kaunas Petrašiūnai	34,0	11,4 (34%)	-
	Kaunas Noreikiškės	25,1	11,2 (45%)	-
	Kėdainiai	18,0	-	-
	Jonava	14,5	-	-
	Šiauliai	23,9	-	-
	Naujoji Akmenė	23,7	7,9 (33%)	-
	Mažeikiai	26,6	-	-
	Klaipėda Šilutės pl.	25,7	15,3 (61%)	-
	Klaipėda Centras	20,1	-	-
	Panevėžys Centras	26,1	-	-
	Žemaitija	12,1	6,1 (50%)	-
	Aukštaitija	-	7,2	-

Table 5.: Proportions of individual PM_x fractions

The measured values of PM_{10} concentrations are similar at both sensory units and AQM stations. The proportion of the fraction of $PM_{2.5}$ in the fraction of PM_{10} varies from 65% to 80% in most locations measured by sensory units, while at AQM stations this fraction is significantly lower (approximately between 40% and 60%). This could have been caused either by the fact that locations with lower proportion of smaller particles were selected for sensory unit measurements or by a different method and potentially lower quality of sensory units. The PM_1

fraction was monitored only by sensory units and the proportion of this fraction in the PM_{10} concentration ranged most often from 45% to 65%. These ranges are fully comparable with the general knowledge based on the measurement of suspended particles. The proportion of individual fractions for sensory measurements is graphically shown in the Fig. 22.

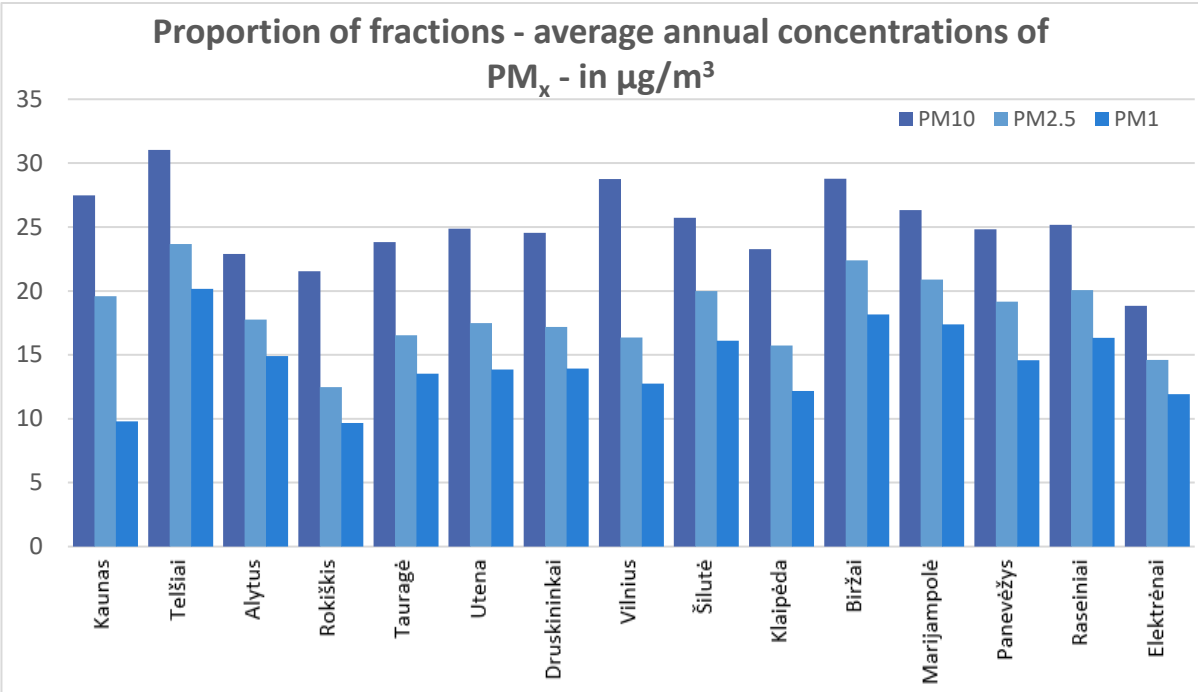


Fig. 22: Proportions of individual fractions of PM_x at sensory stations network.

The percentage of the annual PM_{10} a $PM_{2.5}$ concentrations relative to the annual limit value from all stations of the sensory network is shown in the Fig. 23. The order of individual stations according to this indicator is then indicated in Table 6. The highest values were found in Telšiai, while the lowest values were found in Rokiškis.

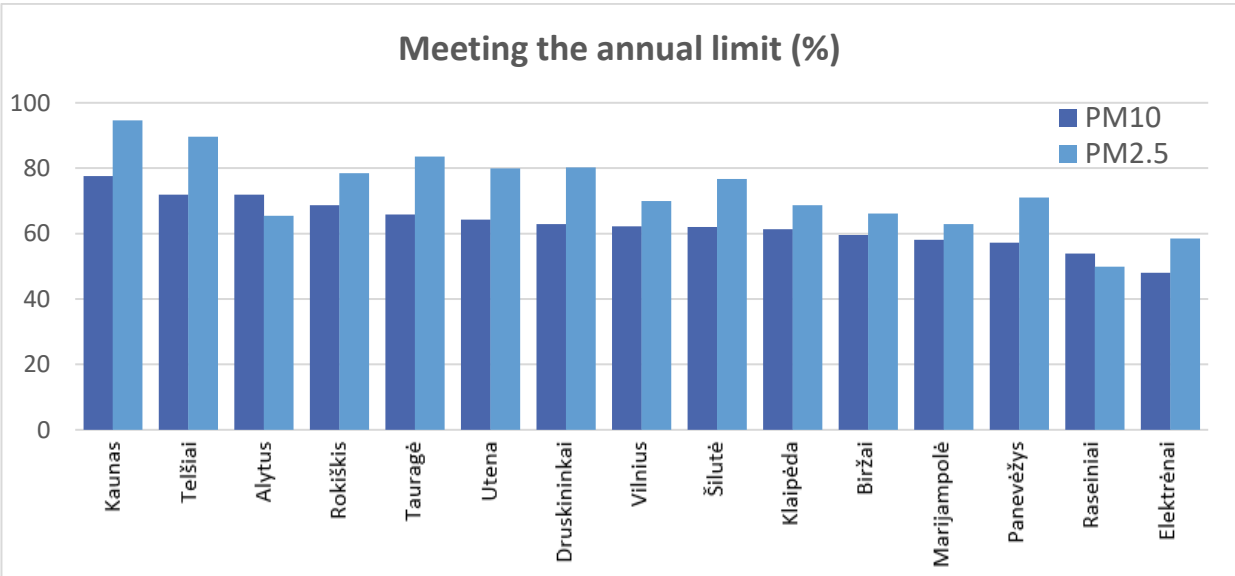


Fig. 23: Percentage of the ratio of the annual PM_{10} and $PM_{2.5}$ concentrations to the annual limit value from all stations in the sensory network.

Measuring location	Ranking
Telšiai	1
Biržai	2
Marijampolė	3
Kaunas	4
Šilutė	5
Raseiniai	6
Panevėžys	7
Vilnius	8
Utena	9
Druskininkai	10
Alytus	11
Tauragė	12
Klaipėda	13
Elektrėnai	14
Rokiškis	15

highest

lowest

Table 6: Ranking of localities according to the percentage of PM_{10} and $PM_{2.5}$ to annual limit values

8.1.5. Comparison of Sensory and Reference Measurements

In the localities of Vilnius Žirmūnai, Kaunas Petrašiūnai, Klaipėda Šilutės pl. and Panevėžys Centras, the sensory units were installed directly on the AQM stations, allowing the measured data to be compared and the sensory units to be “calibrated” according to the reference values.

Fig. 23: Sensor unit installed on the AQM station.

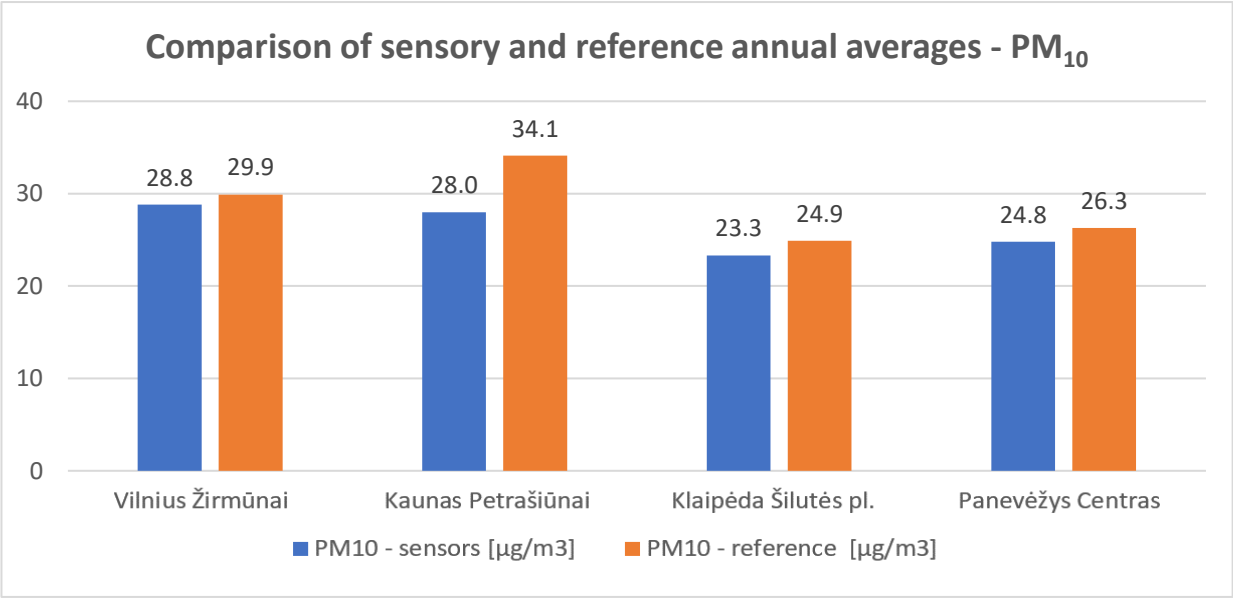


Fig. 24: Comparison of annual averages of PM_{10} concentrations measured by sensory and reference units.

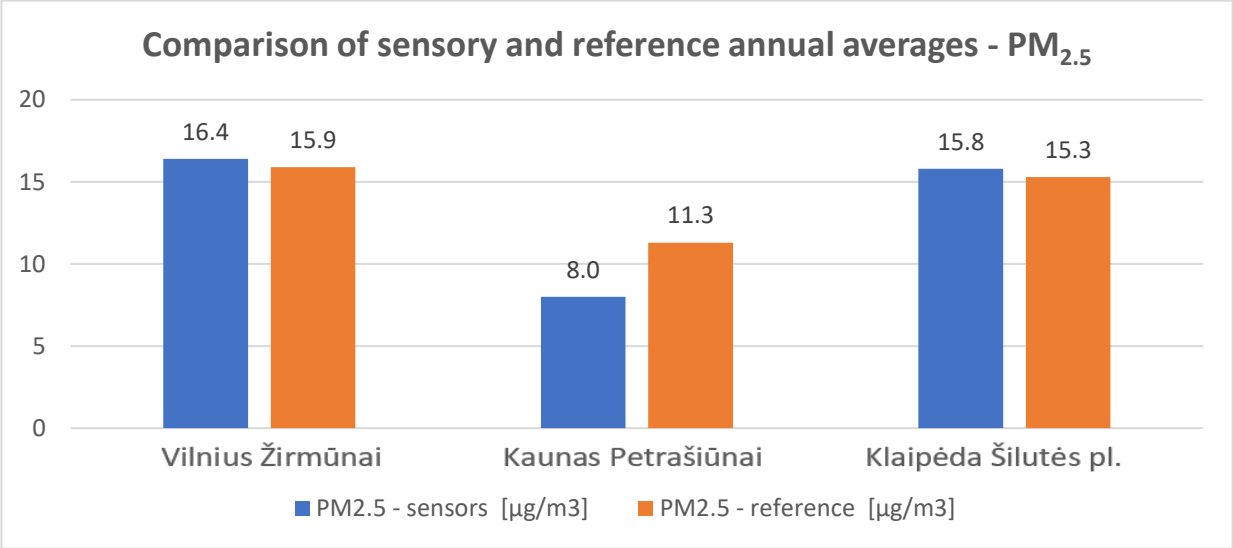


Fig. 25: Comparison of annual averages of $PM_{2.5}$ concentrations measured by sensory and reference units.

The graphs in the Fig. 24 and 25 show a comparison of annual averages from reference and sensory units. The annual averages calculated from the data measured using sensory and reference units are very similar in all locations. Only at Kaunas Petrašiūnai, data from the reference devices was significantly higher for both PM_{10} and $PM_{2.5}$.

The following graphs in Fig. show the trends of daily average concentrations of particulates from PM_{10} and $PM_{2.5}$ fractions and the correlations between them. Trends at all stations are very similar, while the correlations are not so high. In general, the correlations for smaller $PM_{2.5}$ particulates are much higher, which is generally valid for measurements using sensors. The coefficients of determination R^2 range from 0.0072 to 0.6475. The most significant correlation is measured in Klaipėda, the least significant is correlation in the locality Kaunas.

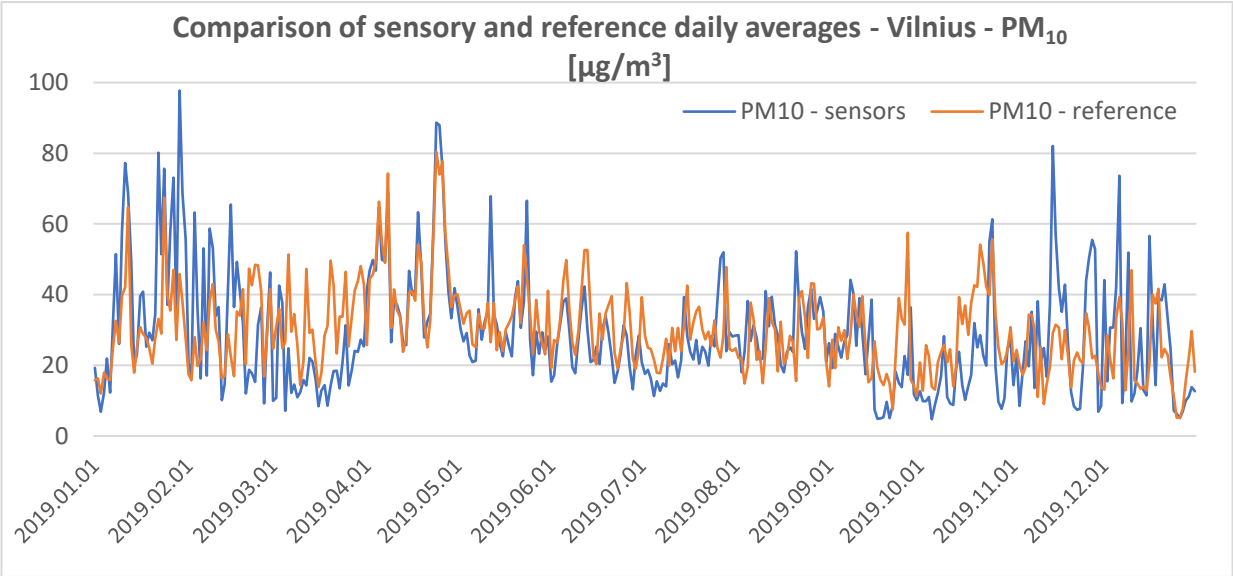


Fig. 26: Comparison of daily averages of PM_{10} concentrations measured by sensory and reference units - Vilnius Žirmunai locality.

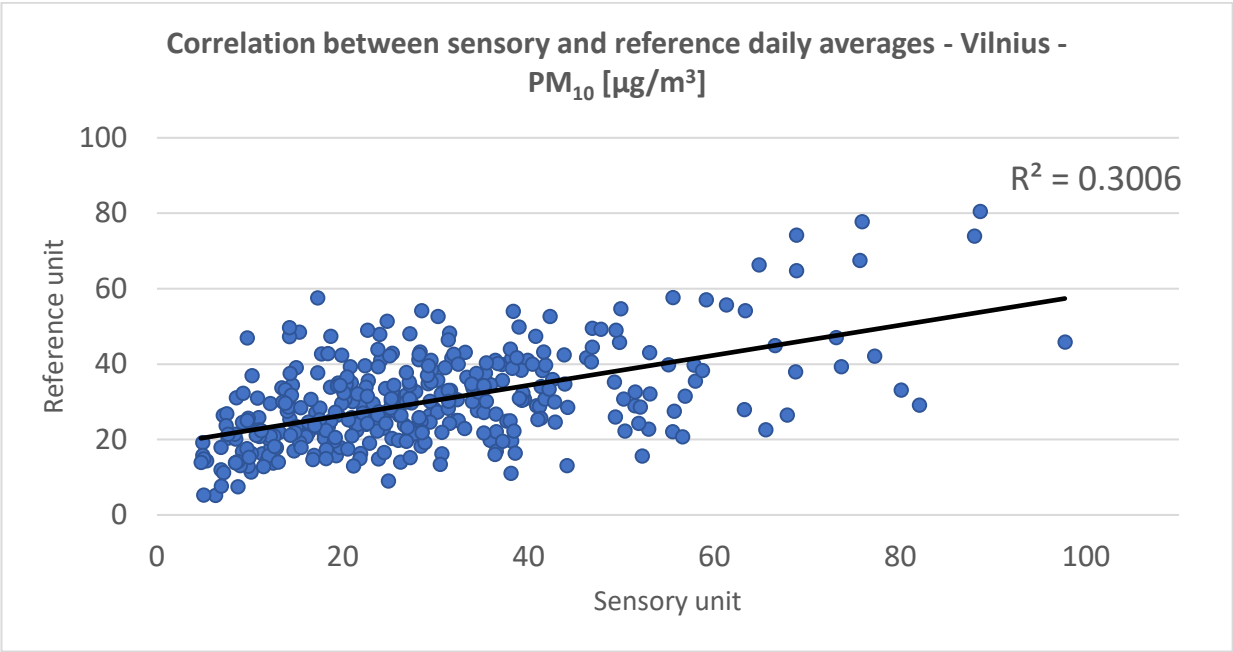


Fig. 27: Correlation of daily averages of PM_{10} concentrations measured by sensory and reference units - Vilnius Žirmunai locality.

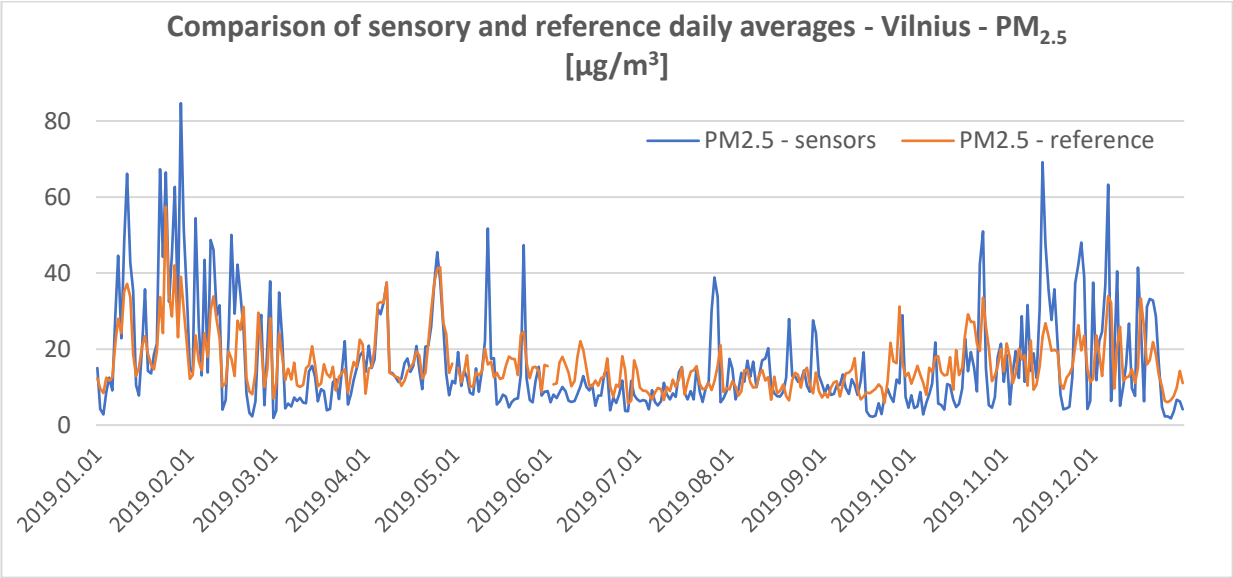


Fig. 28: Comparison of daily averages of $PM_{2.5}$ concentrations measured by sensory and reference units - Vilnius Žirmunai locality.

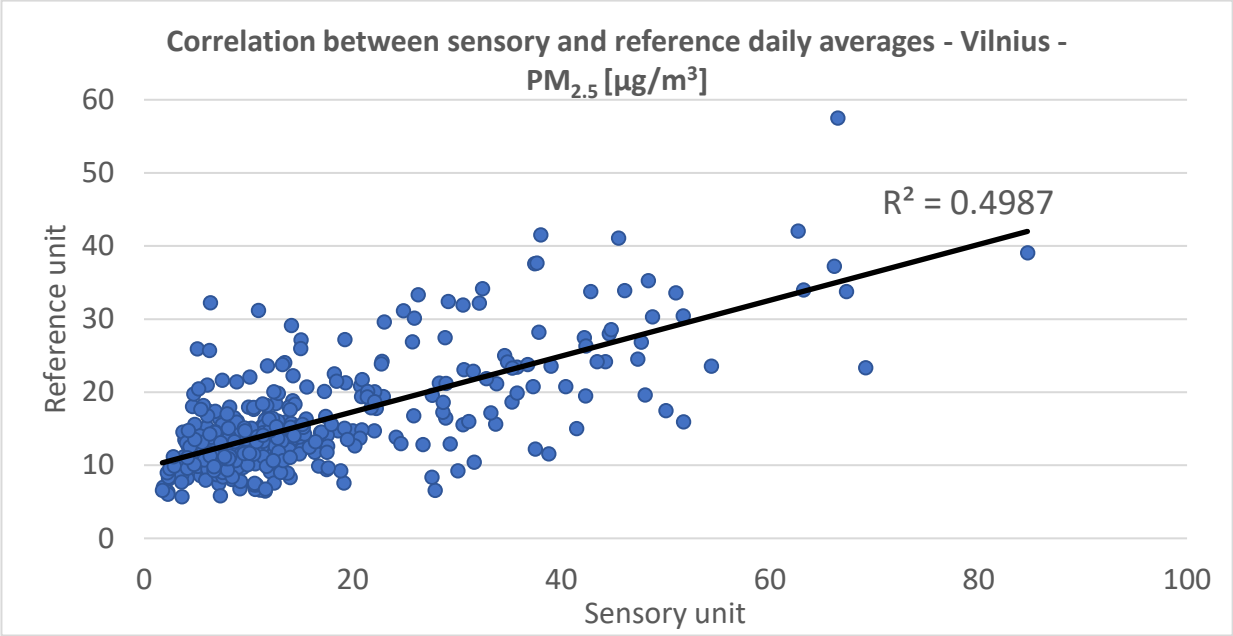


Fig. 29: Correlation of daily averages of $PM_{2.5}$ concentrations measured by sensory and reference units - Vilnius Žirmunai locality.

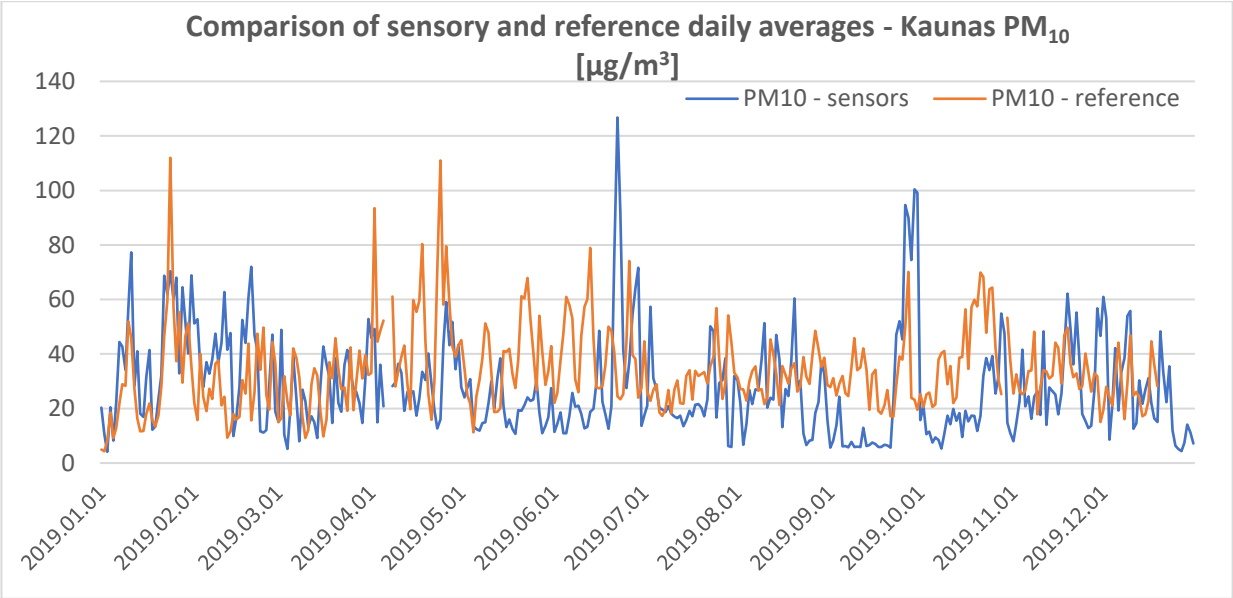


Fig. 30: Comparison of daily averages of PM_{10} concentrations measured by sensory and reference units - Kaunas Petrašiūnai locality.

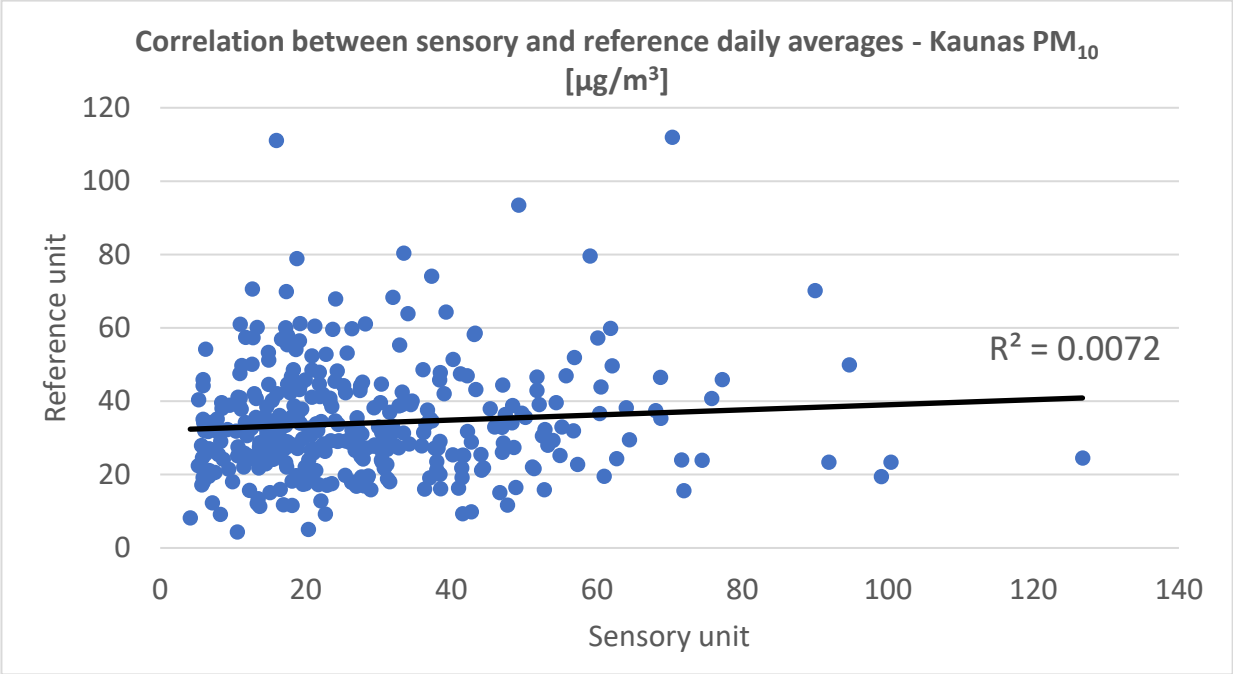


Fig. 31: Correlation of daily averages of PM_{10} concentrations measured by sensory and reference units - Kaunas Petrašiūnai locality.

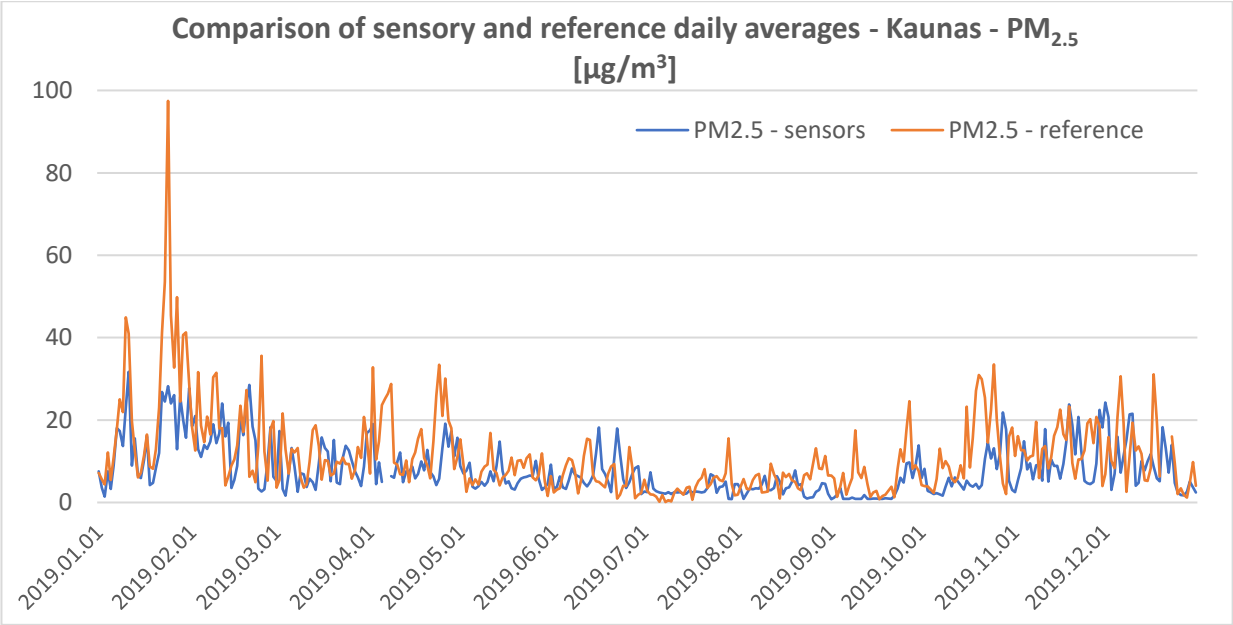


Fig. 32: Comparison of daily averages of $PM_{2.5}$ concentrations measured by sensory and reference units - Kaunas Petrašiūnai locality.

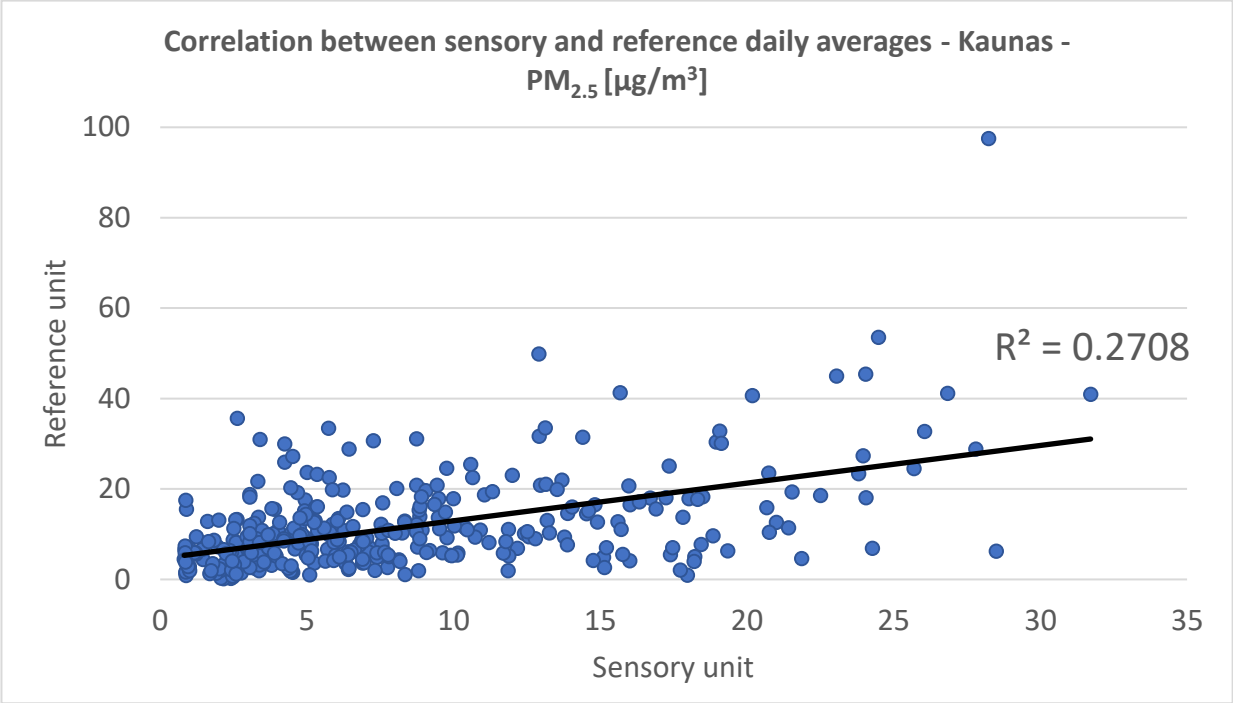


Fig. 33: Correlation of daily averages of $PM_{2.5}$ concentrations measured by sensory and reference units - Kaunas Petrašiūnai locality.

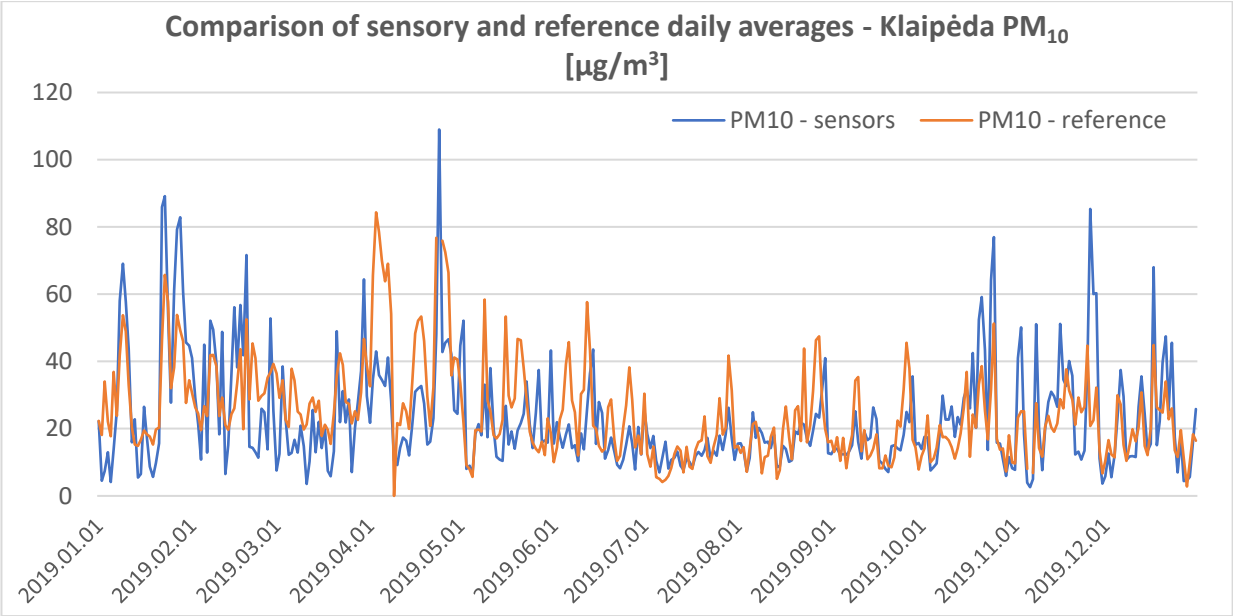


Fig. 34: Comparison of daily averages of PM_{10} concentrations measured by sensory and reference units - Klaipėda Šilutės pl.

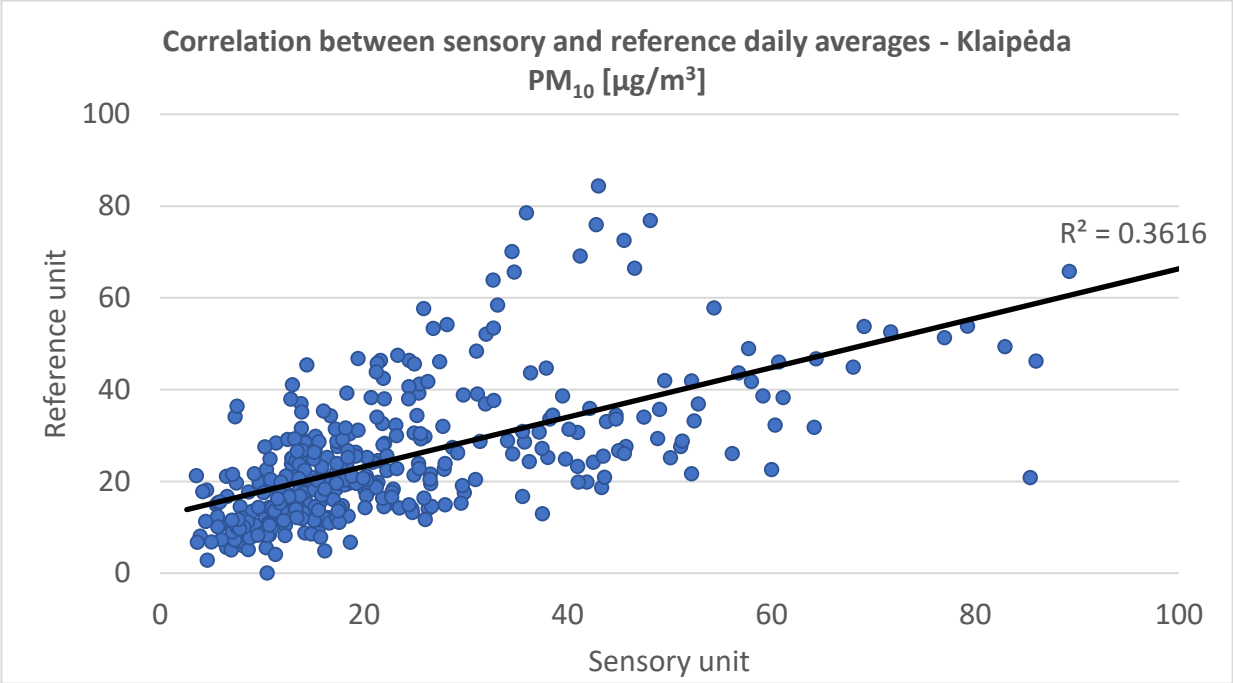


Fig. 35: Correlation of daily averages of PM_{10} concentrations measured by sensory and reference units - Klaipėda Šilutės pl.

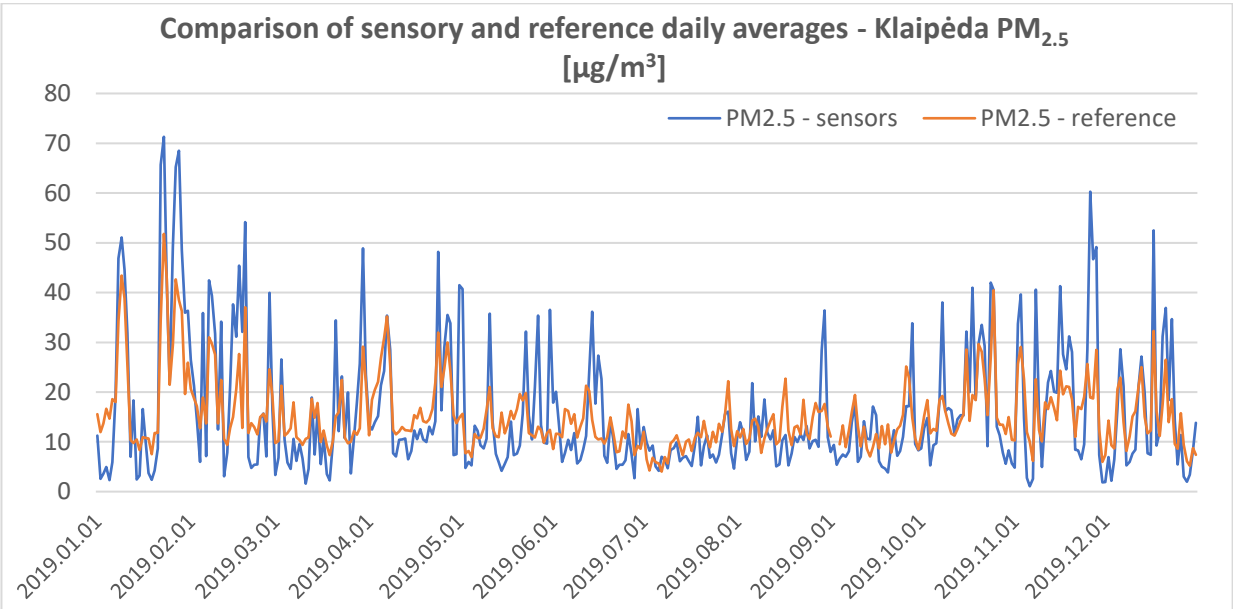


Fig. 36: Comparison of daily averages of $PM_{2.5}$ concentrations measured by sensory and reference units - Klaipėda Šilutės pl.

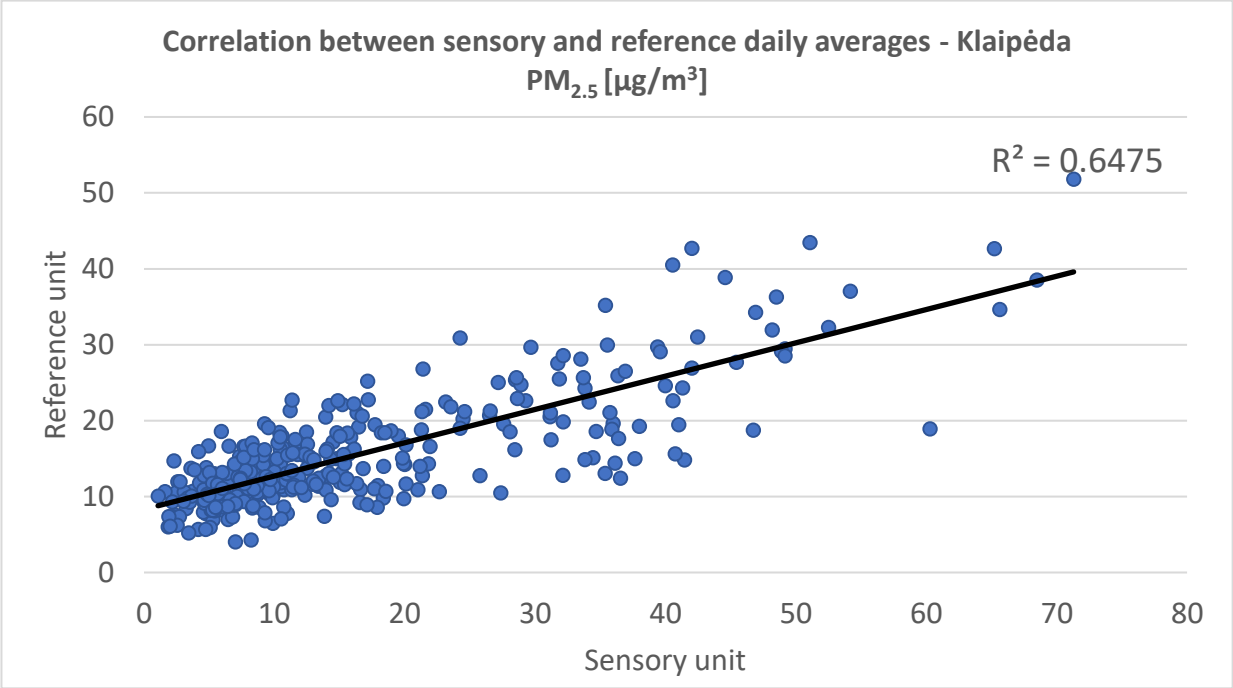


Fig. 37: Correlation of daily averages of $PM_{2.5}$ concentrations measured by sensory and reference units – Klaipėda Šilutės pl.

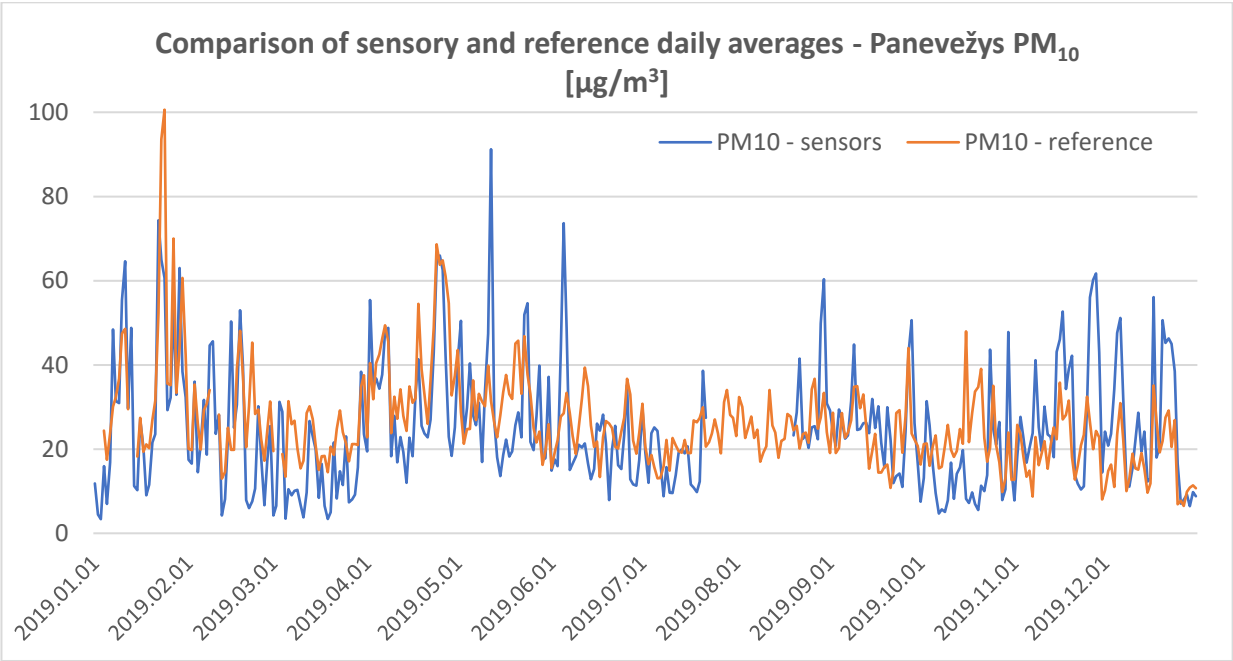


Fig. 38: Comparison of daily averages of PM_{10} concentrations measured by sensory and reference units - Panevėžys Centras.

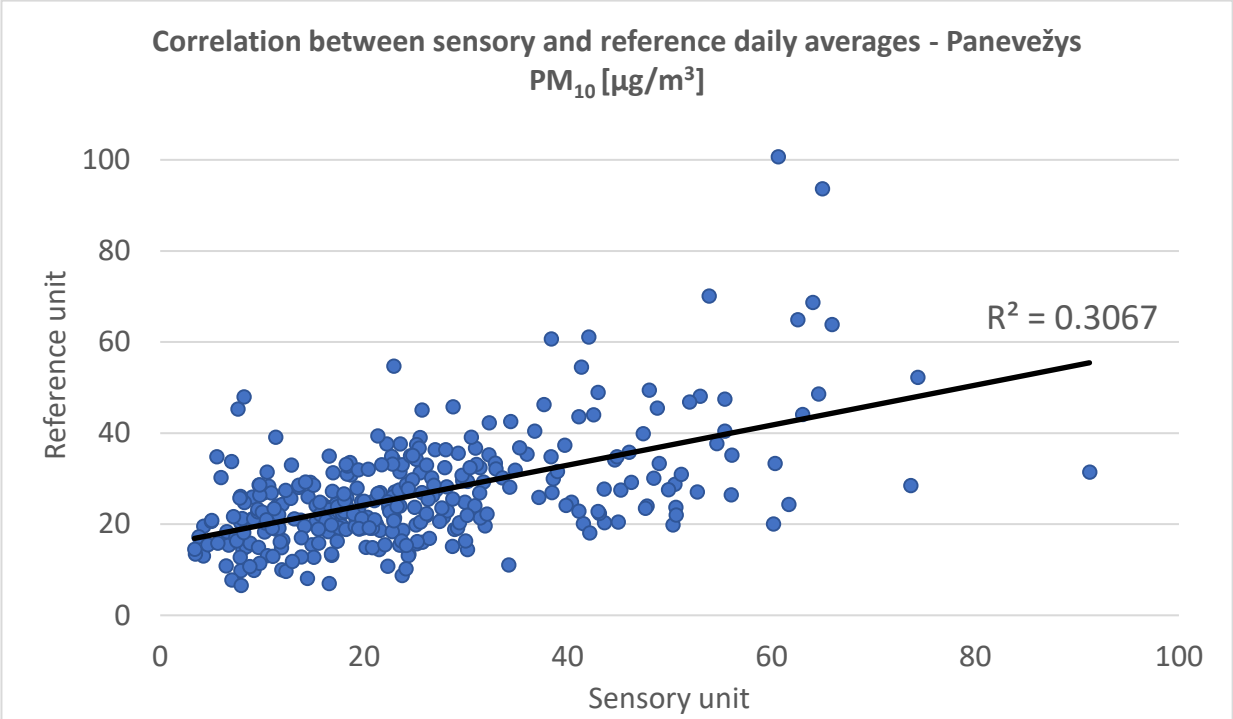


Fig. 39: Correlation of daily averages of PM_{10} concentrations measured by sensory and reference units - Panevėžys Centras.

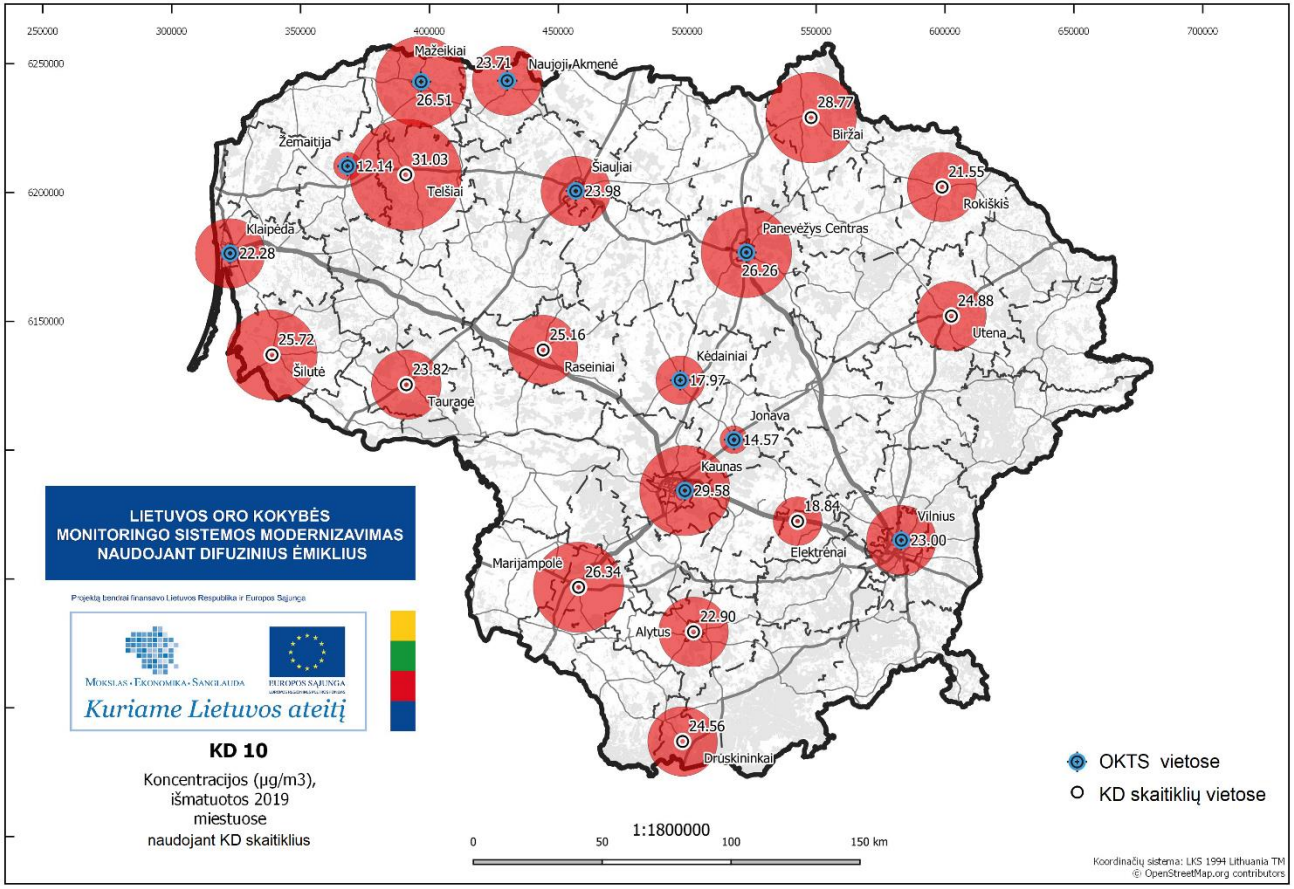


Fig. 40: Map of PM_{10} concentrations – Lithuania.

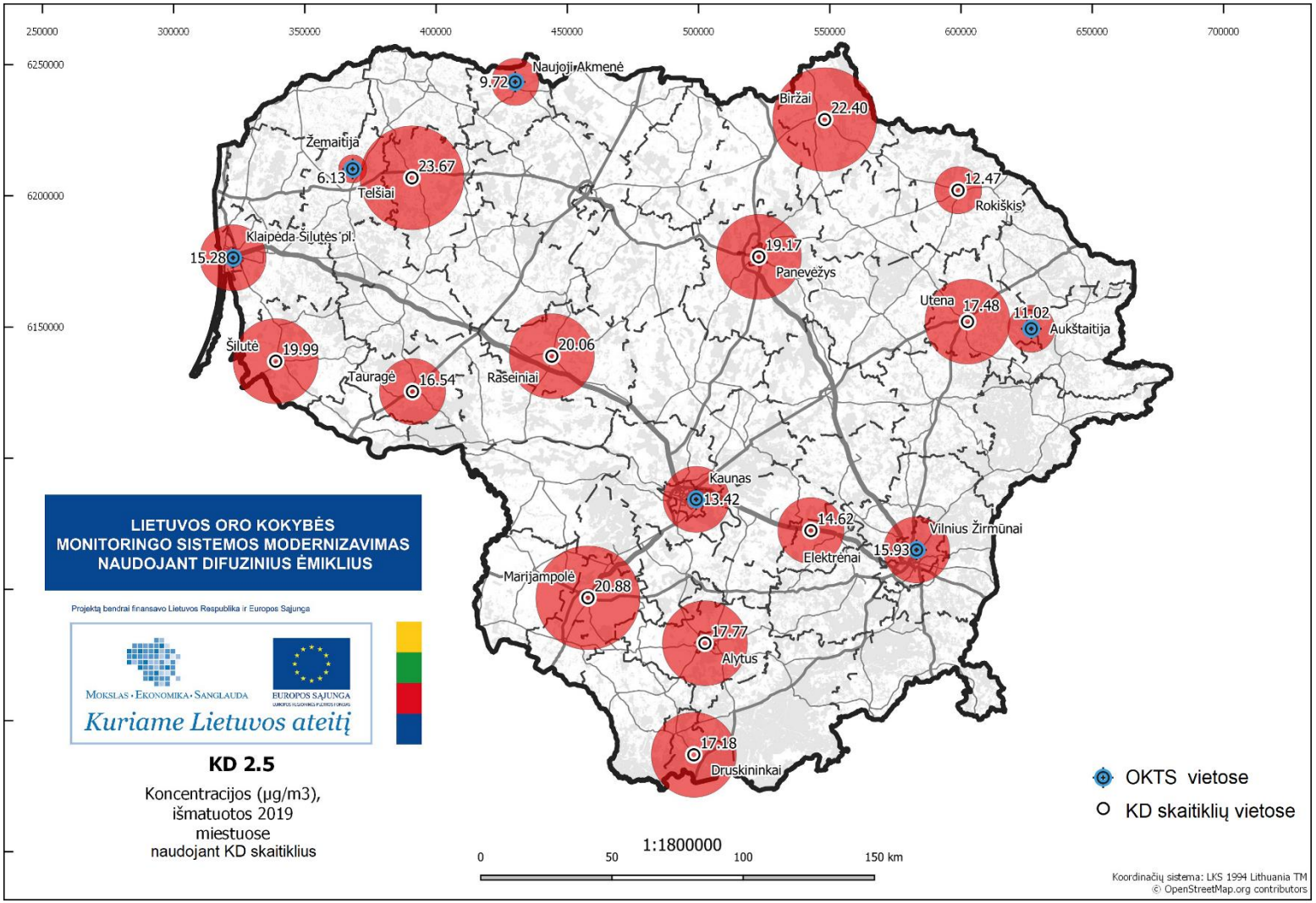


Fig. 41: Map of $PM_{2.5}$ concentrations – Lithuania.

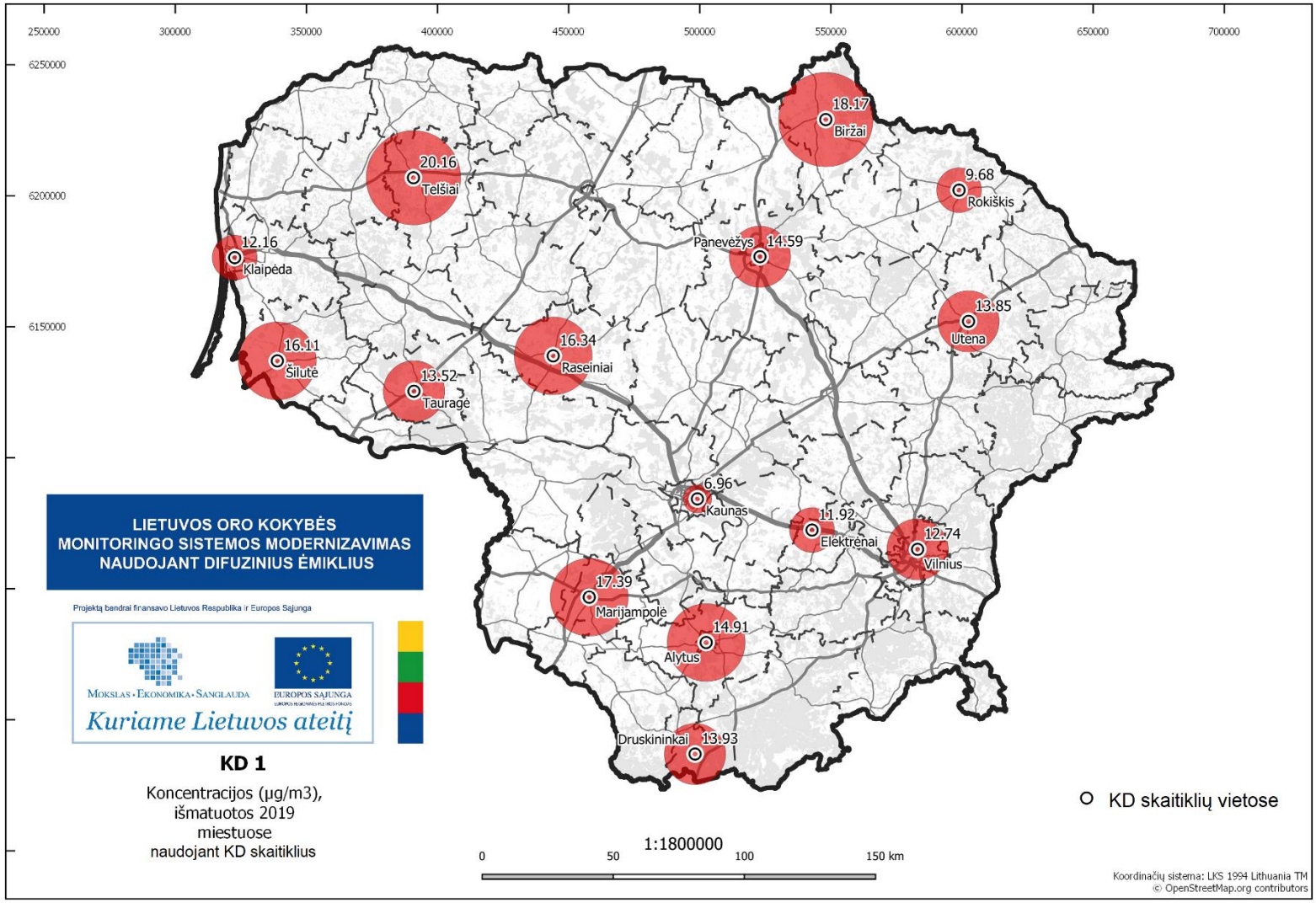


Fig. 42: Map of PM_1 concentrations – Lithuania.

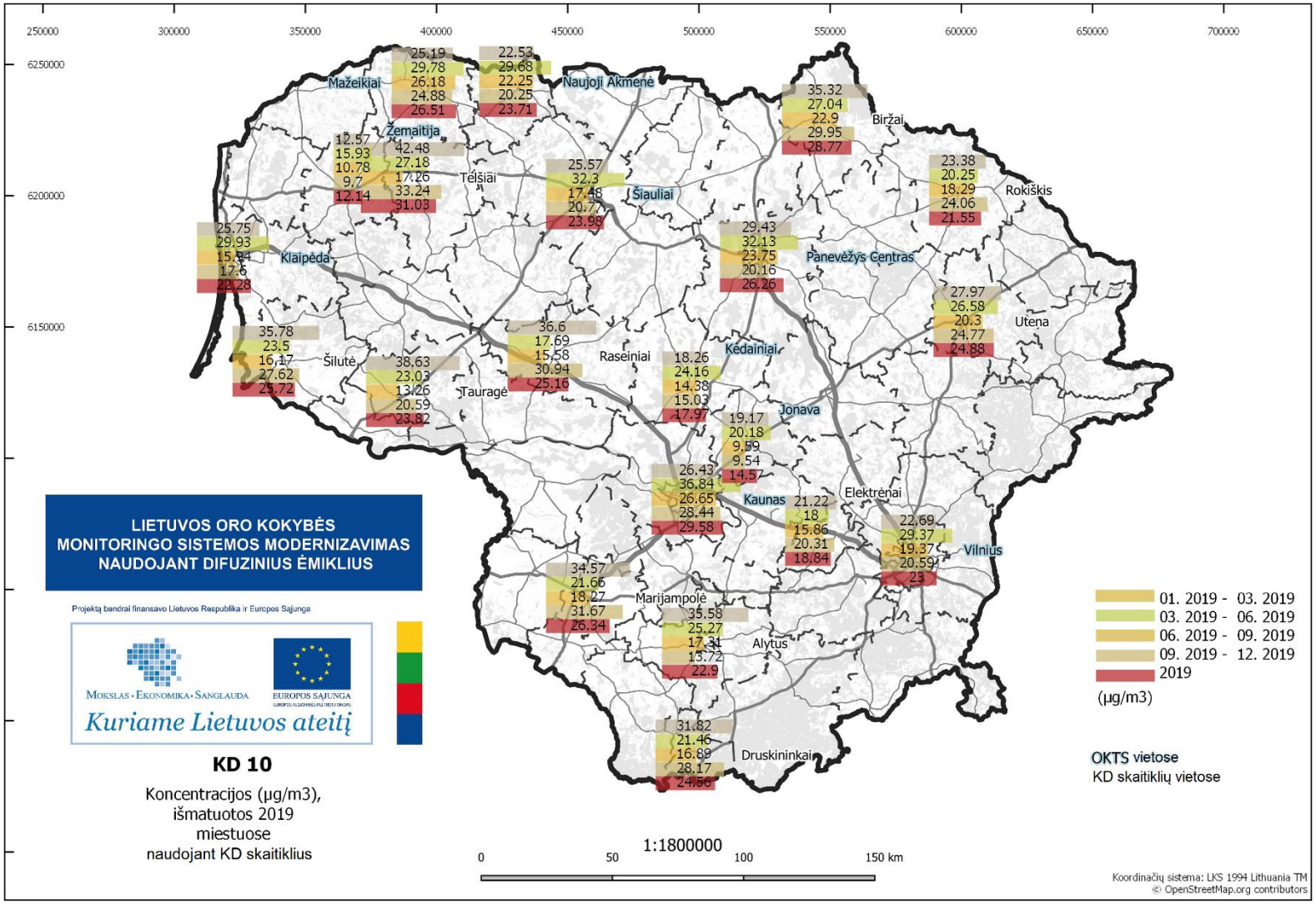


Fig. 43: Map of PM_{10} concentrations – Lithuania, all campaigns.

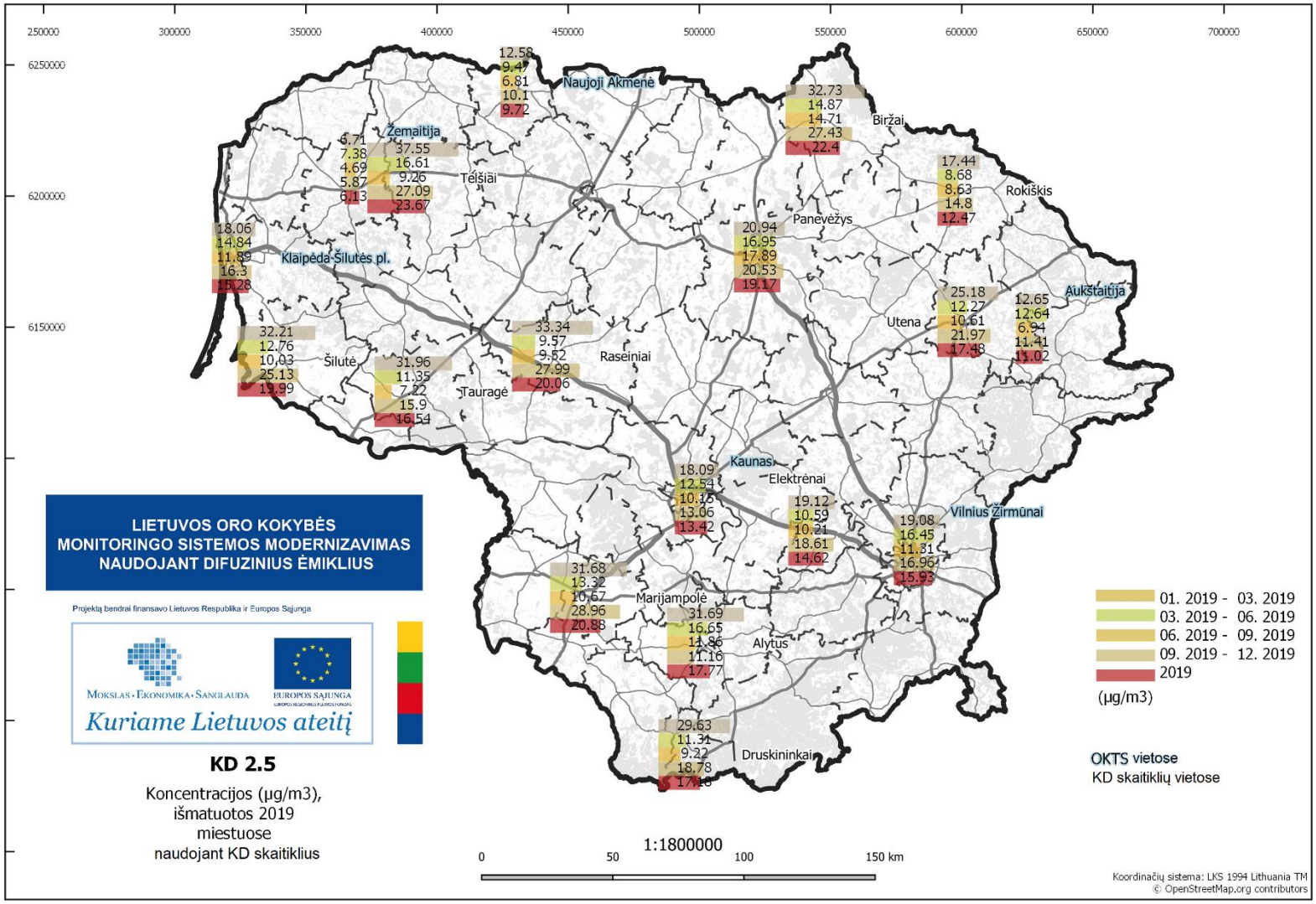


Fig. 44: Map of $PM_{2.5}$ concentrations – Lithuania, all campaigns.

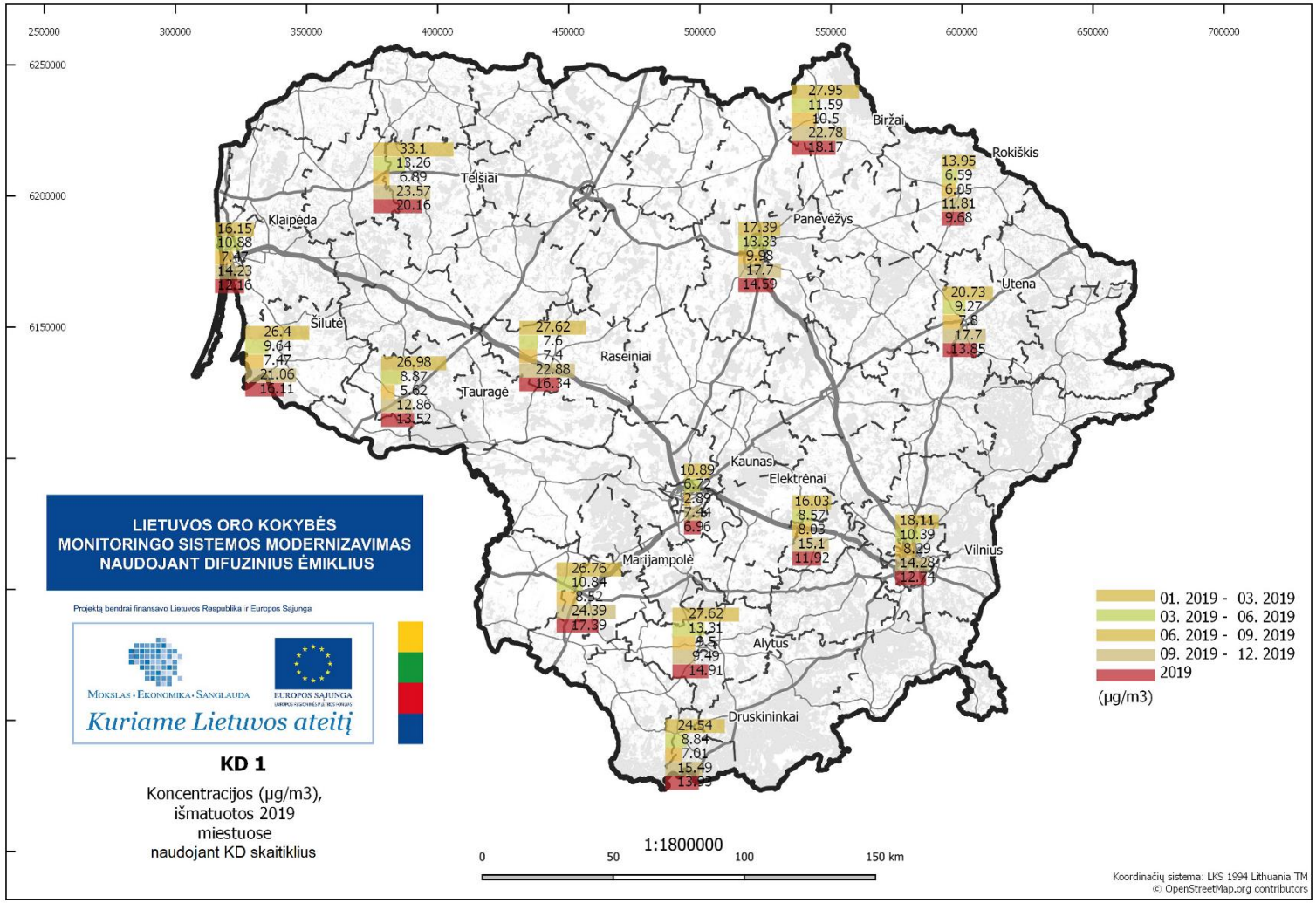


Fig. 45: Map of PM_1 concentrations – Lithuania, all campaigns.

8.2. Measurement of Gaseous Compounds

8.2.1. Average Concentrations of Gaseous Compounds

Using Radiello passive samplers (described in chapter 5.1.), air samples were taken in 4 campaigns (described in chapter 4.) for the subsequent analysis of NO_2, SO_2 and benzene (VOCs). The average values from all campaigns and the values per campaign for NO_2, SO_2 and benzene are shown in the graphs in Fig. 46 – 60.
When the measured value was below the detection level of the analytical technique, half of the detection system value was used to calculate the average value for the campaign or for the whole year. When a measurement outage occurred in any of the two 14-day sub-campaigns (for example, due to the theft of the passive sampler), only the value from the second 14-day sub-campaign was used. However, a 50% value was used for data recovery.
Due to the large number of sampling points, the graphs are always divided into 2 parts for the sake of clarity.

In one location (Vilnius 18), NO_2 concentrations almost reach the limit value for the calendar year, otherwise, the values from the vast majority of the location are far below the LAT (lower assessment threshold) or they are even very low. The highest average NO_2 concentrations from all 4 campaigns were measured in the locations in the agglomerations of Vilnius and Kaunas, while the highest average value was measured in the Vilnius 18 location, namely 37.88 µg/m^3. On the other hand, the lowest average NO_2 concentrations from all 4 campaigns were measured at locations at the background automated air pollution monitoring stations OKTS51 (Aukštaitijos IMS, Rūgšteliškio k., Tauragnų sen., Utenos r.), OKTS52 (Dzūkijos IMS, Dubininko k., Marcinkonių k., Marcinkonių k. Varėnos r.) and in the location Telšiai 03, the lowest average value was measured in the location OKTS51, 2.04 µg/m^3. The lowest NO_2 concentrations were measured in most locations during the 1st campaign, while the highest concentrations were most frequently measured during the 3rd campaign.

SO_2 concentrations are very low in all locations and they are far from any limit values, including limit values for vegetation protection. The highest average SO_2 concentrations of all 4 campaigns were measured in the locations in the agglomerations of Vilnius and Kaunas and in the Kėdainiai 01 and Garliava 01 locations, with the highest average value measured in the Kaunas 31 location, namely 2.69 µg/m^3. On the contrary, the lowest average SO_2 concentrations of all 4 campaigns were measured in the Ignalina 01, Klaipėda 13 and Palanga 02 locations, while the lowest average value was measured in the Ignalina 01 location, namely 0.32 µg/m^3. The lowest SO_2 concentrations were measured in most locations during the 4th campaign (heating season), while the highest concentrations were most frequently observed during the 2nd campaign (non-heating season). This shows greater seasonal variability than in case of NO_2.

Even in the case of benzene, the measured concentrations are very low and in all locations the values are lower than the LAT (lower assessment threshold). The highest average benzene concentrations of all 4 campaigns were measured at Tauragė 03, Utena 03 and Panevėžys 06, while the highest average value was measured at Tauragė 03, namely 1.63 µg/m^3. On the contrary, the lowest average benzene concentrations of all 4 campaigns were measured at locations at the background automated air pollution monitoring stations OKTS53 (Žemaitijos IMS, Plokščių k., Platelių sen., Plungės r.), Telšiai 03 and Visaginas 02, while the lowest average value was measured in the OKTS53 location, namely 0.28 µg/m^3. The lowest benzene concentrations were measured in the majority of locations during the 1st and 4th campaigns (heating season), while the highest concentrations were observed during the 2nd and 3rd campaigns (non-heating season). This shows a similar seasonal variation to that of SO_2.

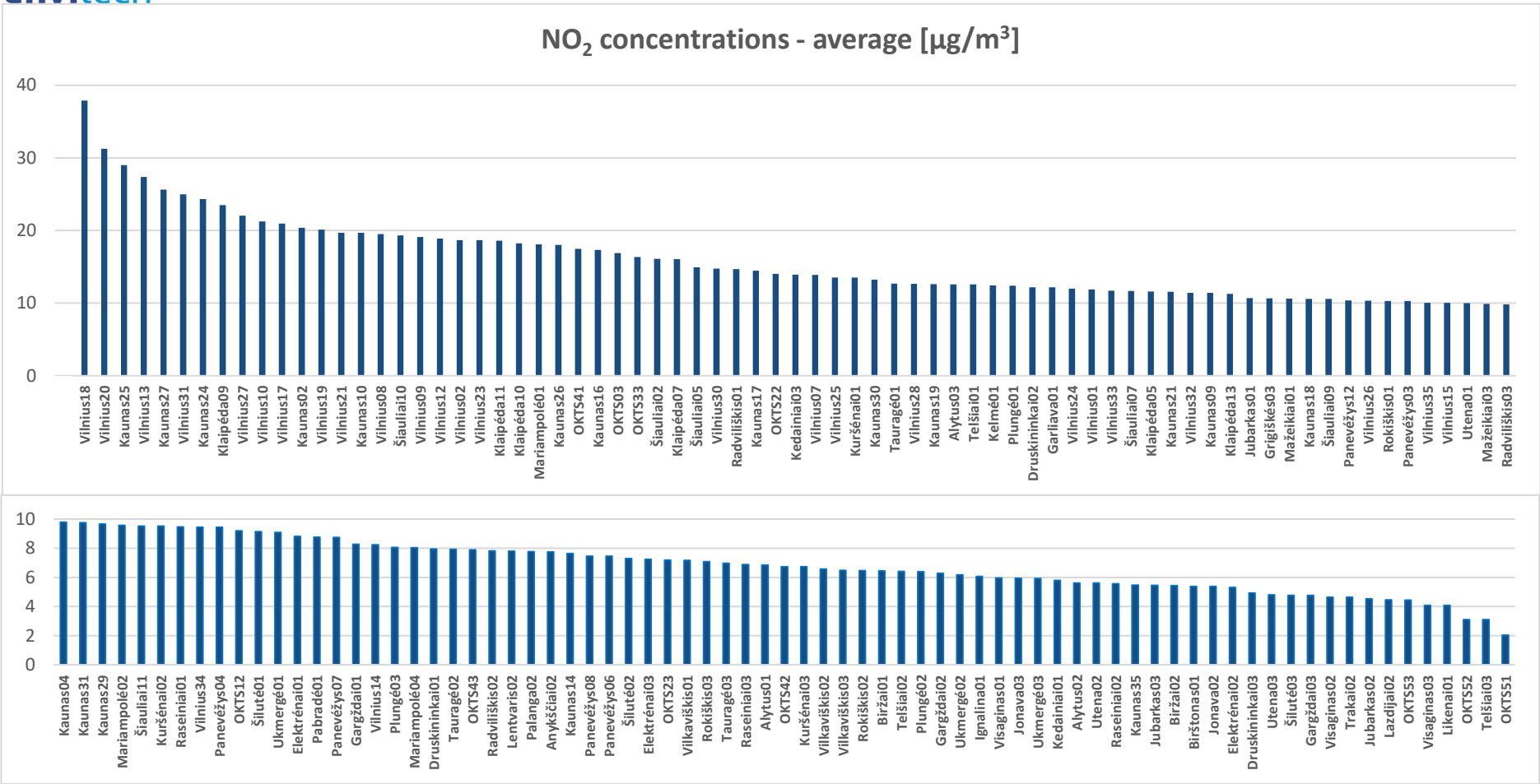


Fig. 46: Average NO_2 concentrations at all stations.

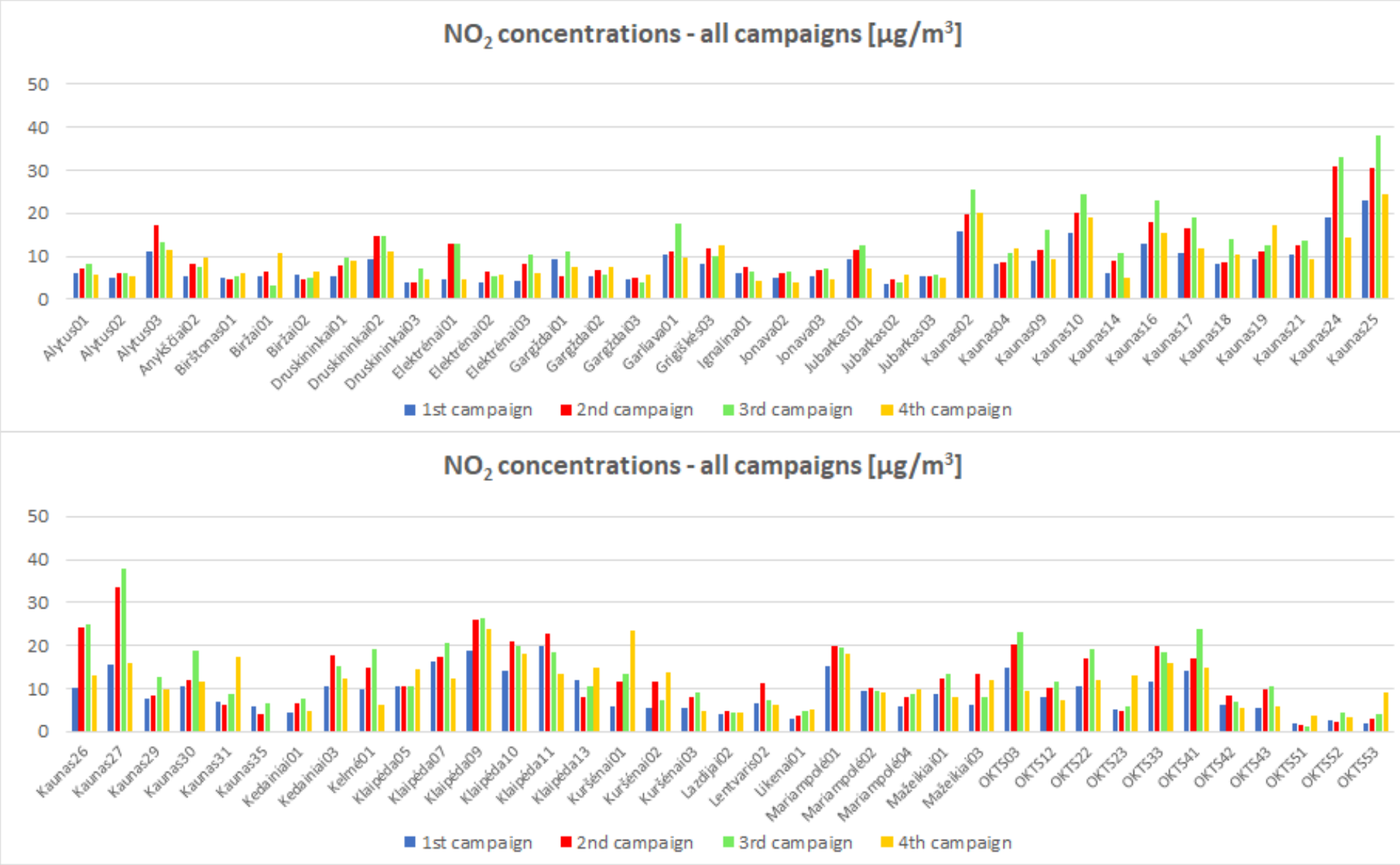


Fig. 47: Average NO_2 concentrations at all stations - all campaigns – 1st part

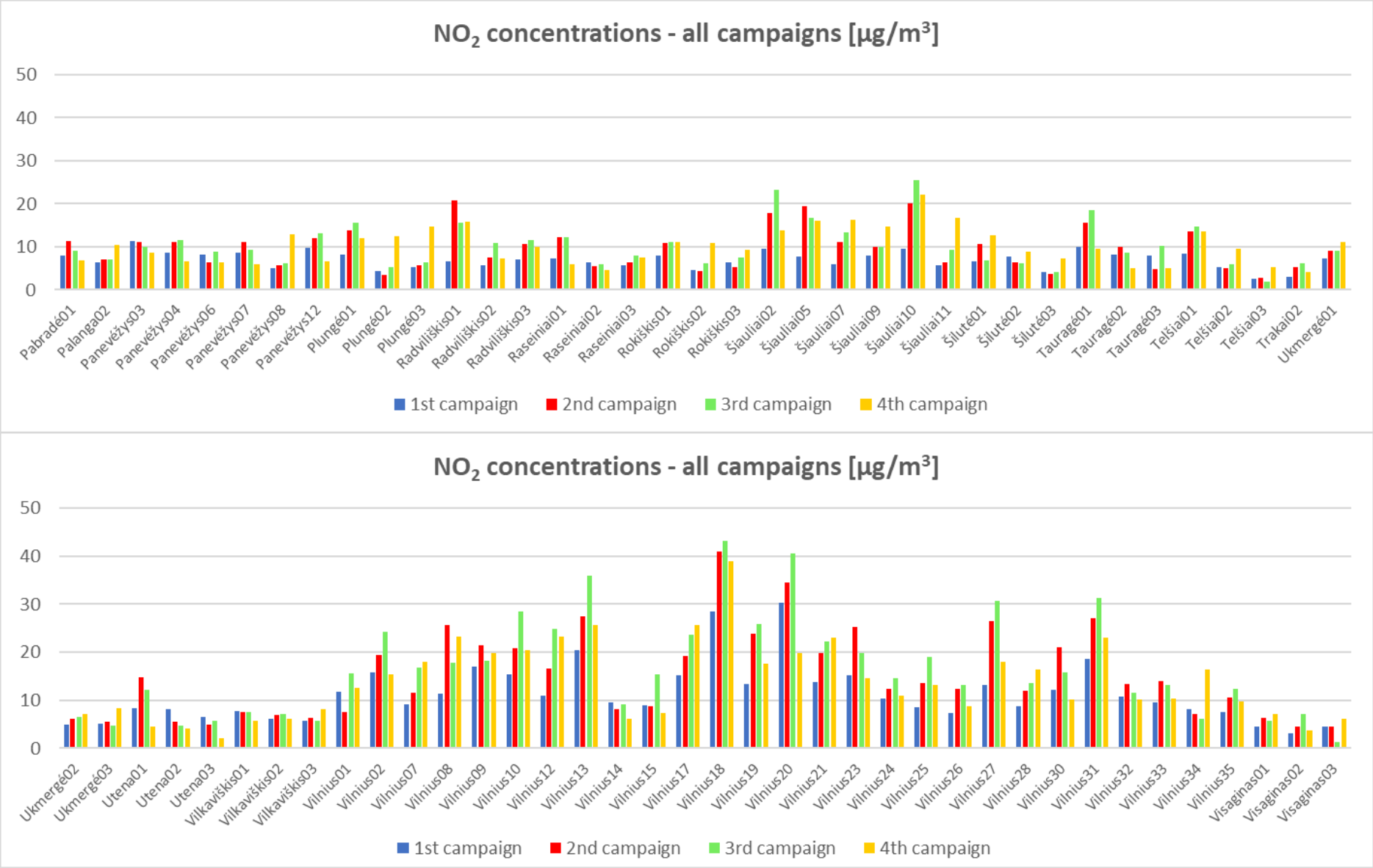


Fig. 48: Average NO_2 concentrations at all stations - all campaigns – 2nd part

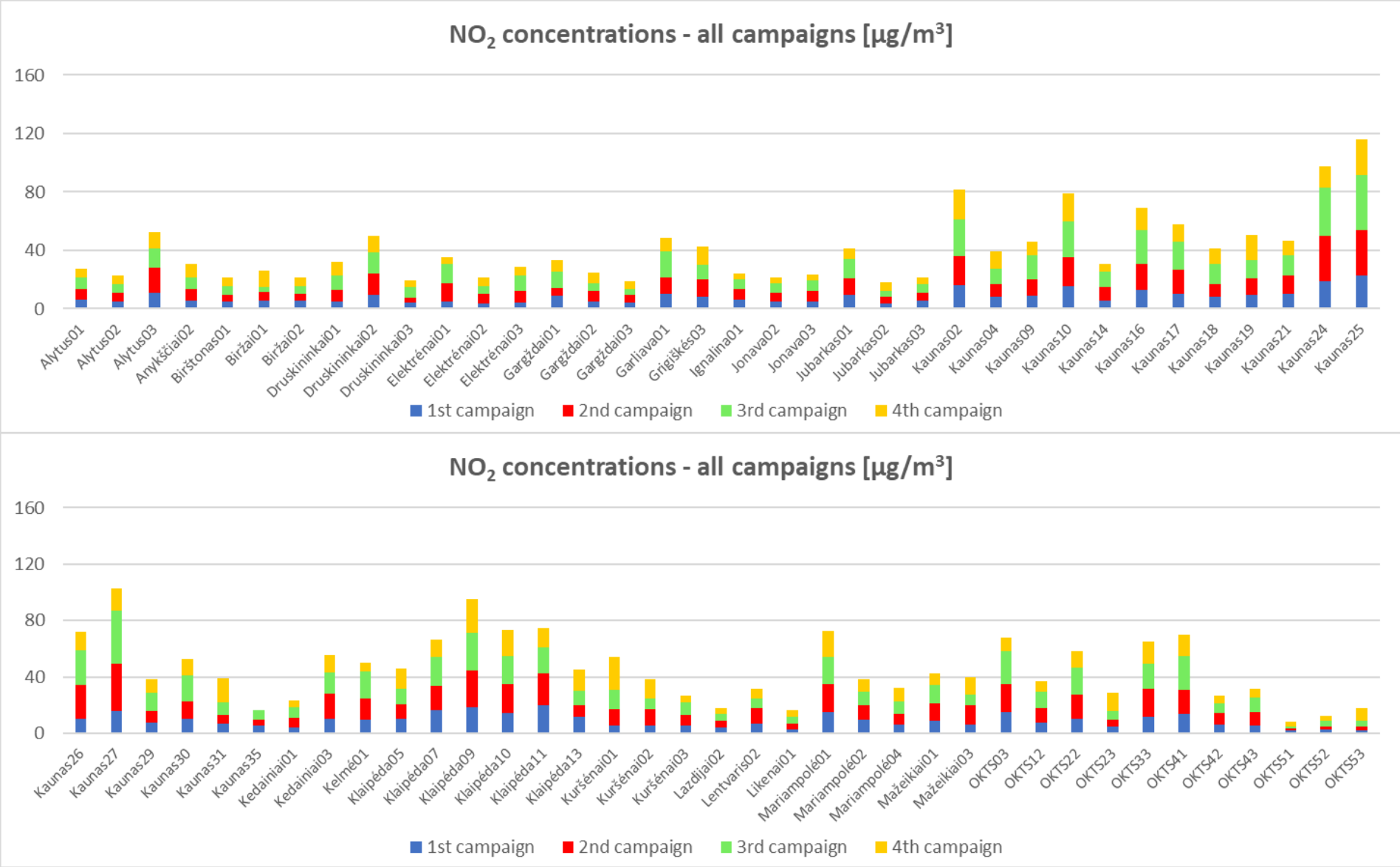
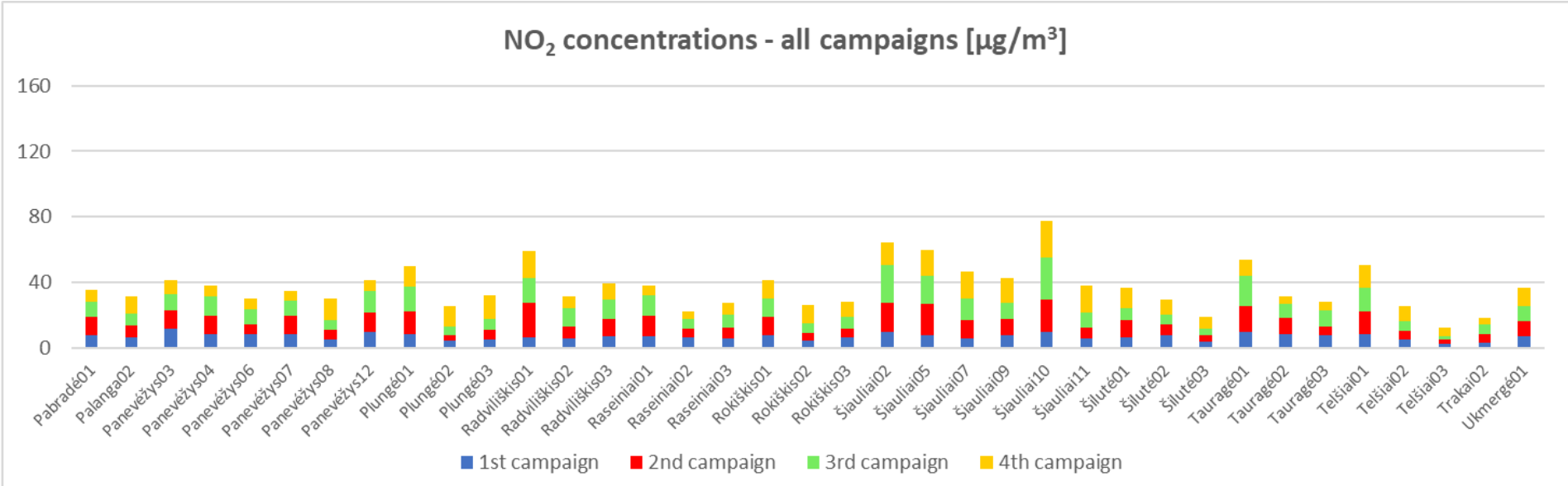


Fig. 49: Average NO_2 concentrations at all stations - all campaigns – 1st part



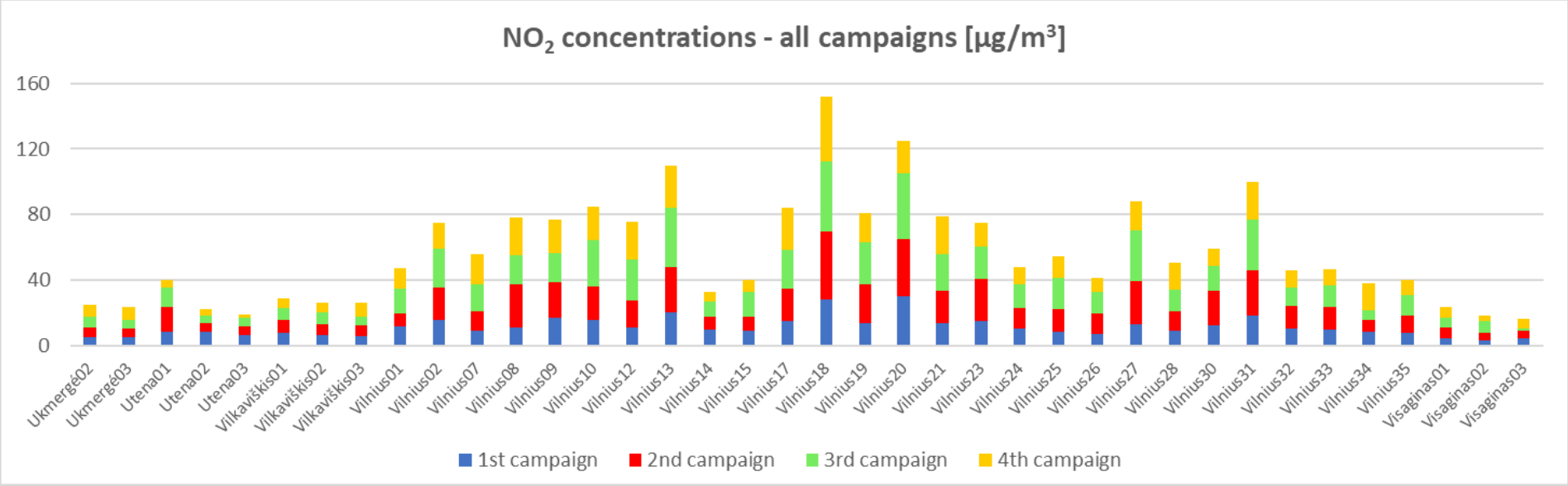


Fig. 50: Average NO_2 concentrations at all stations - all campaigns – 2nd part

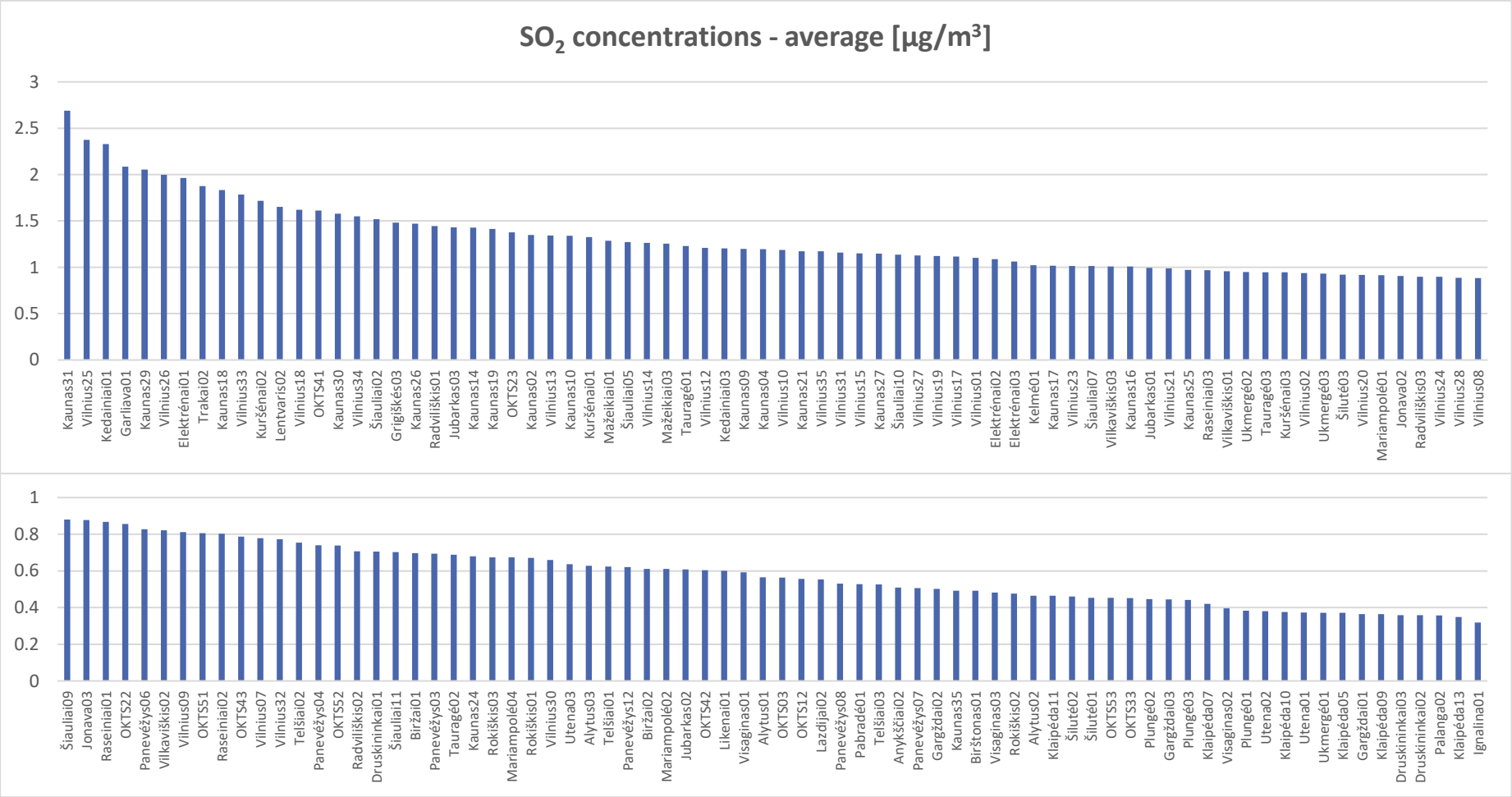


Fig. 51: Average SO_2 concentrations at all stations.

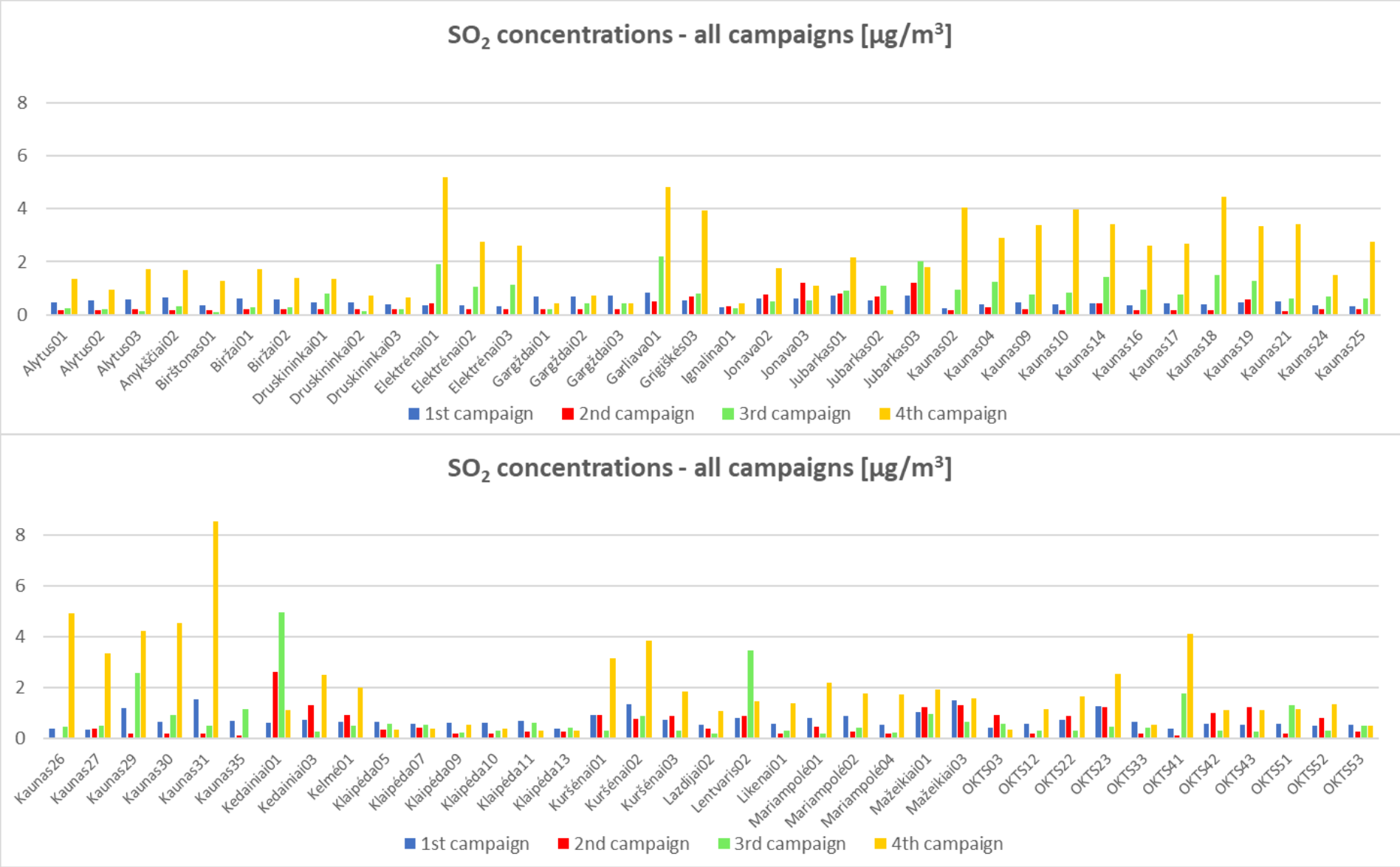


Fig. 52: Average SO_2 concentrations at all stations - all campaigns – 1st part

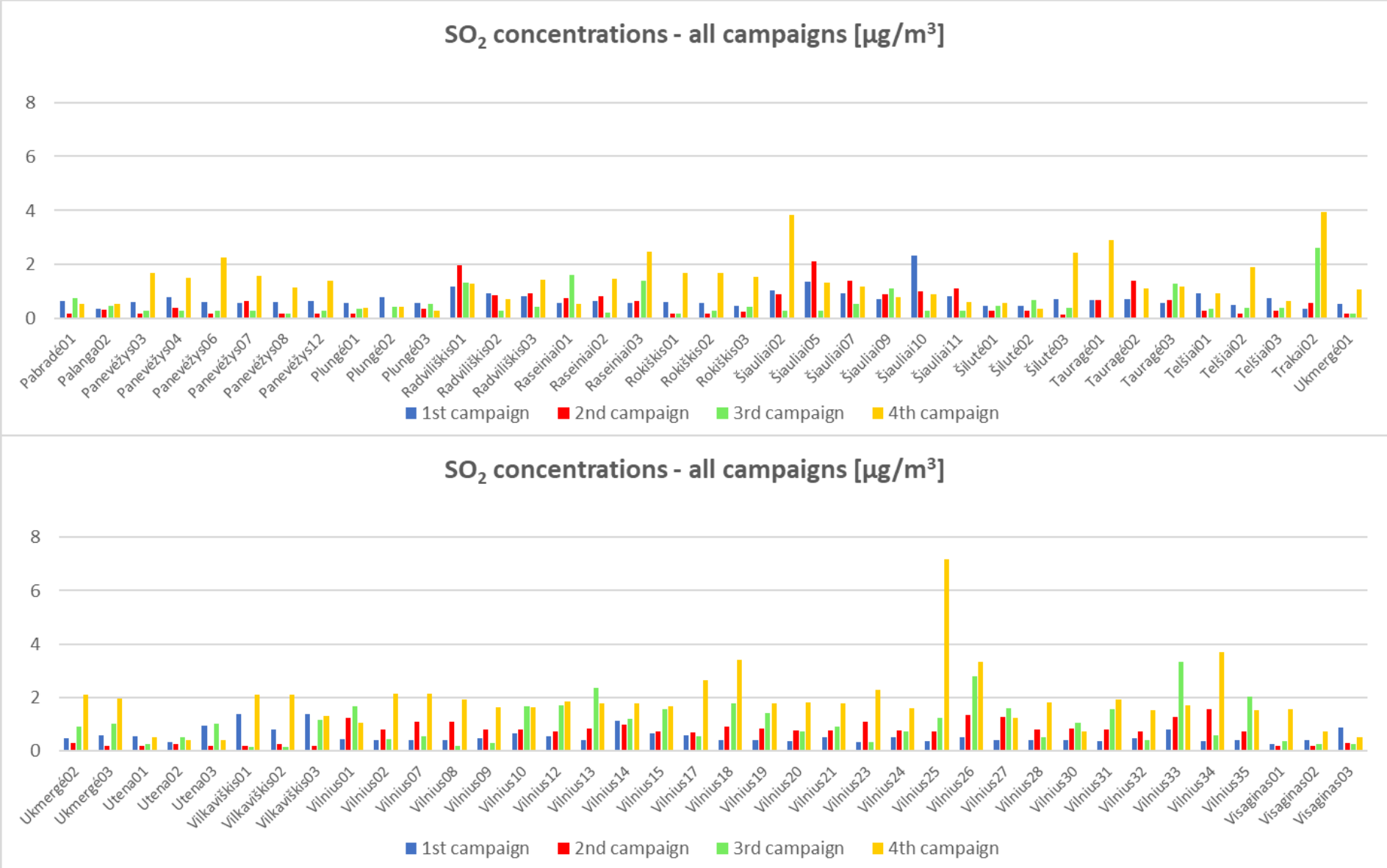


Fig. 53: Average SO_2 concentrations at all stations - all campaigns – 2nd part

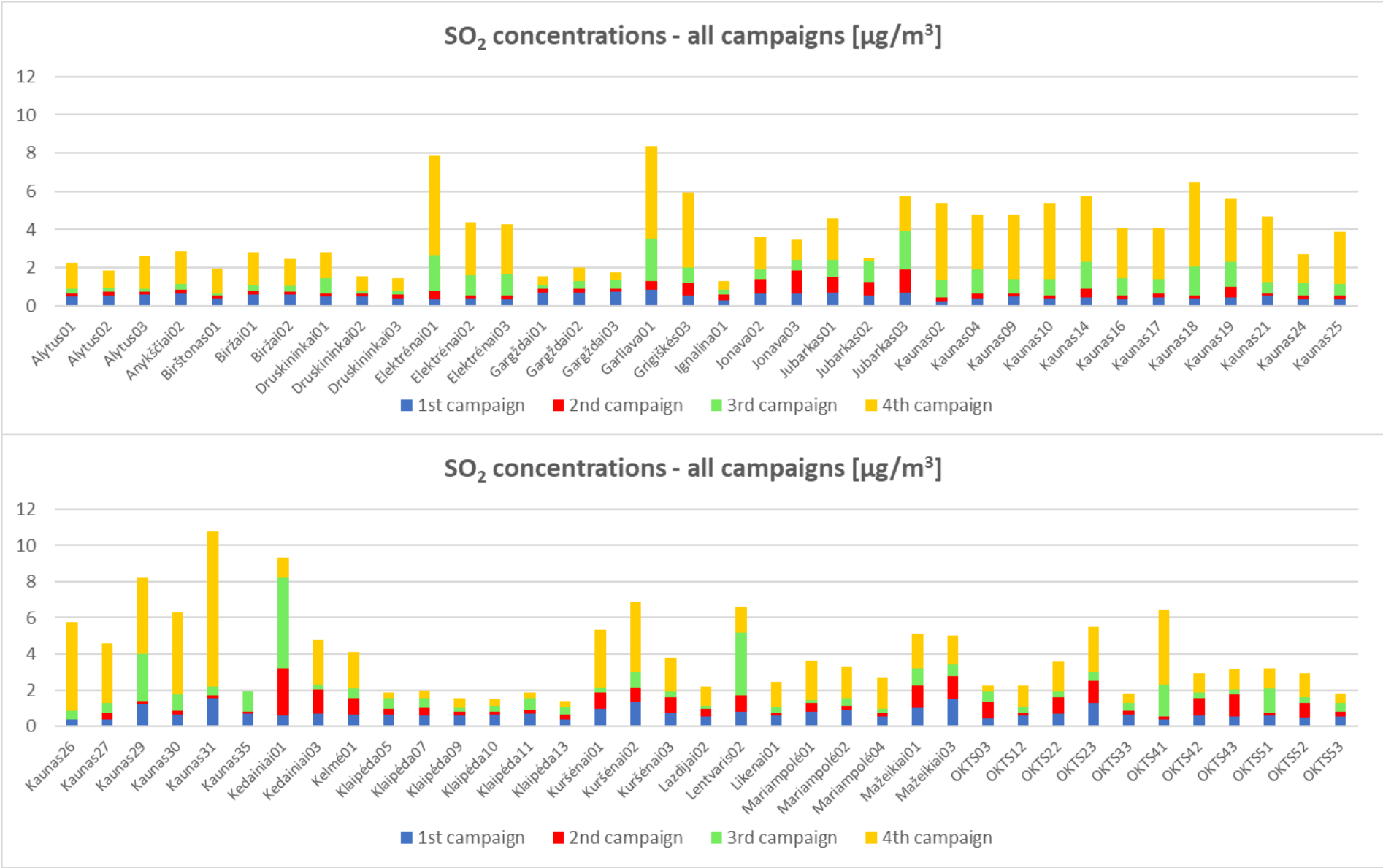


Fig. 54: Average SO_2 concentrations at all stations - all campaigns – 1st part

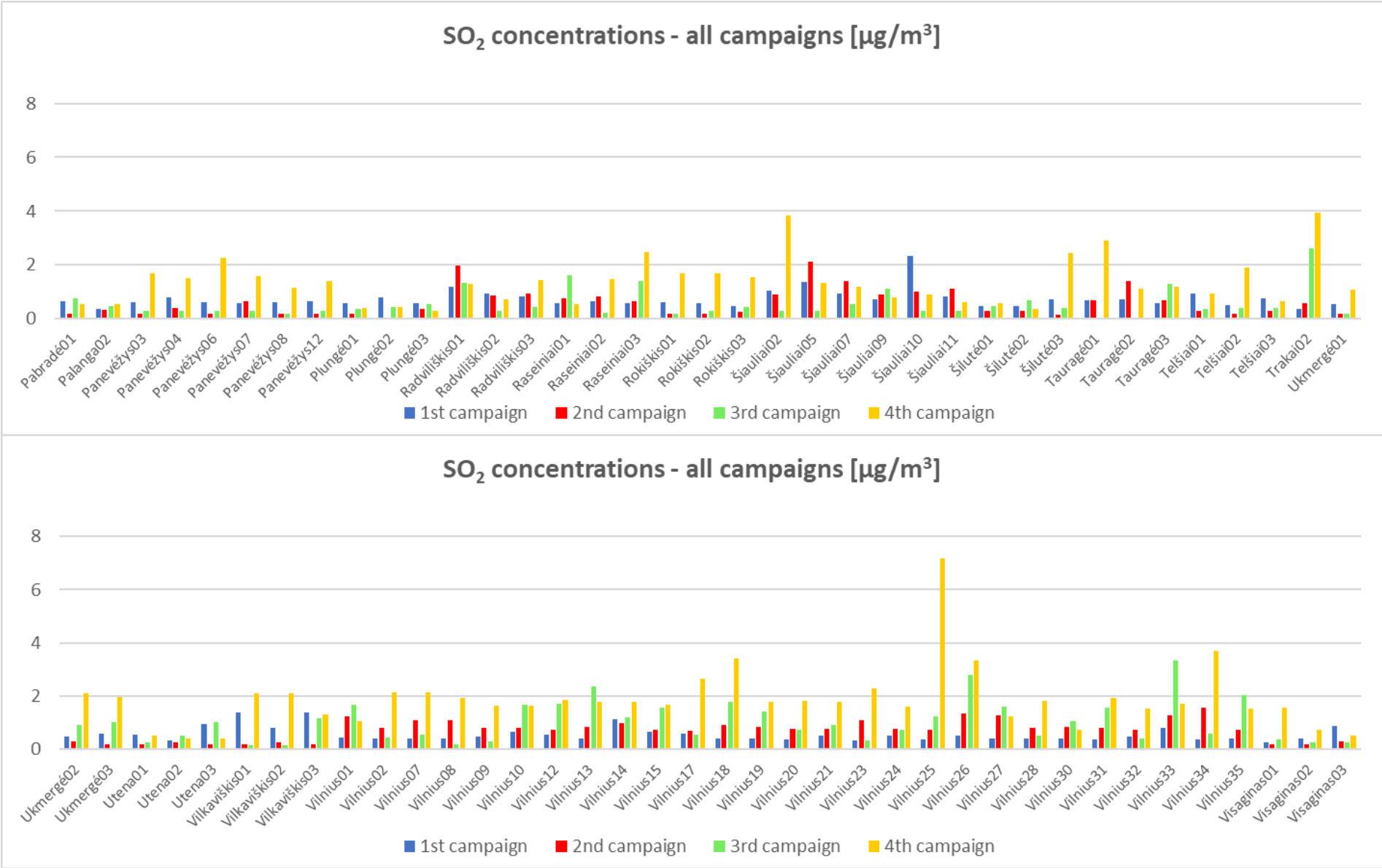


Fig. 55: Average SO_2 concentrations at all stations - all campaigns – 2nd part

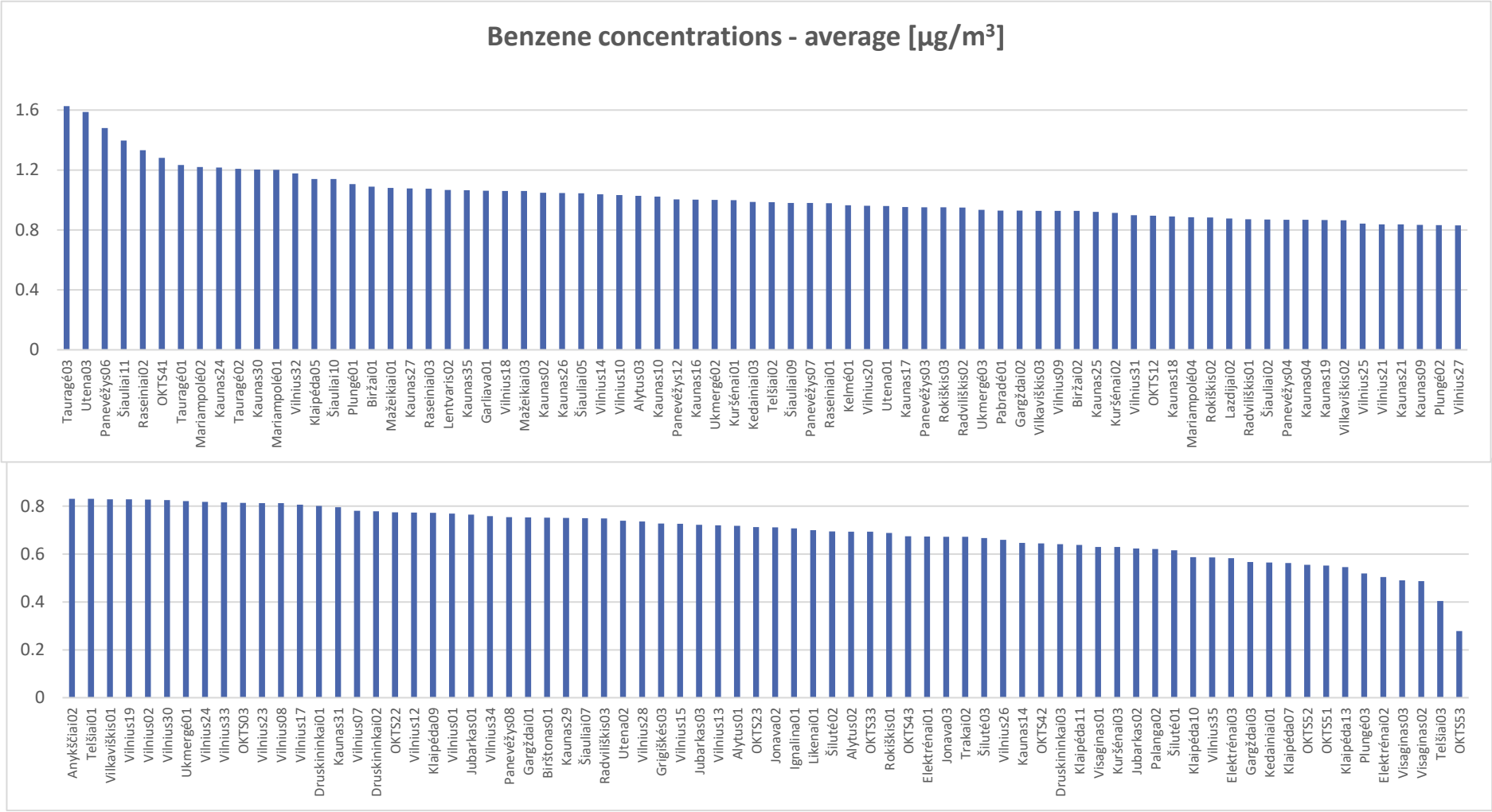


Fig. 56: Average benzene concentrations at all stations.

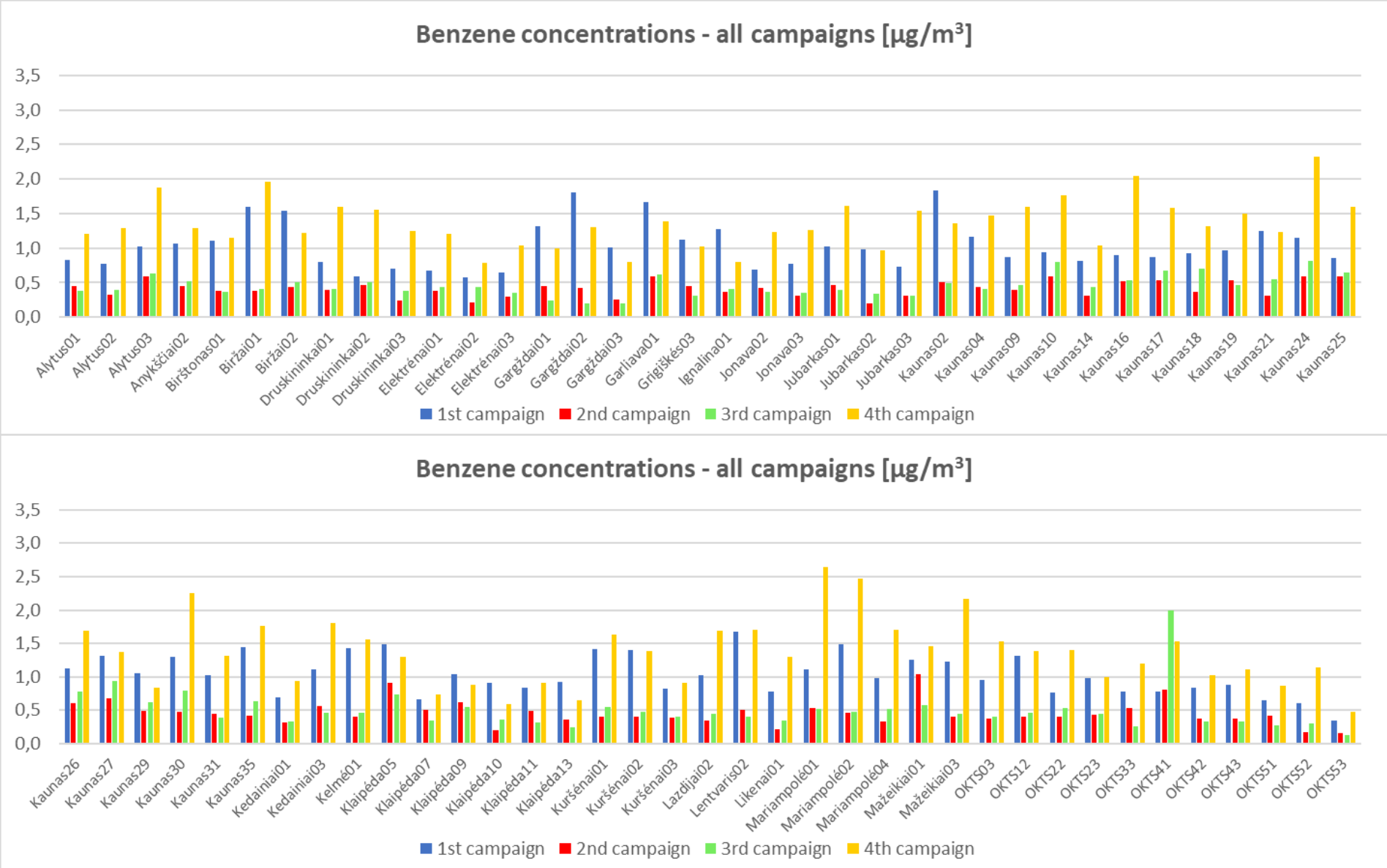


Fig. 57: Average benzene concentrations at all stations - all campaigns – 1st part

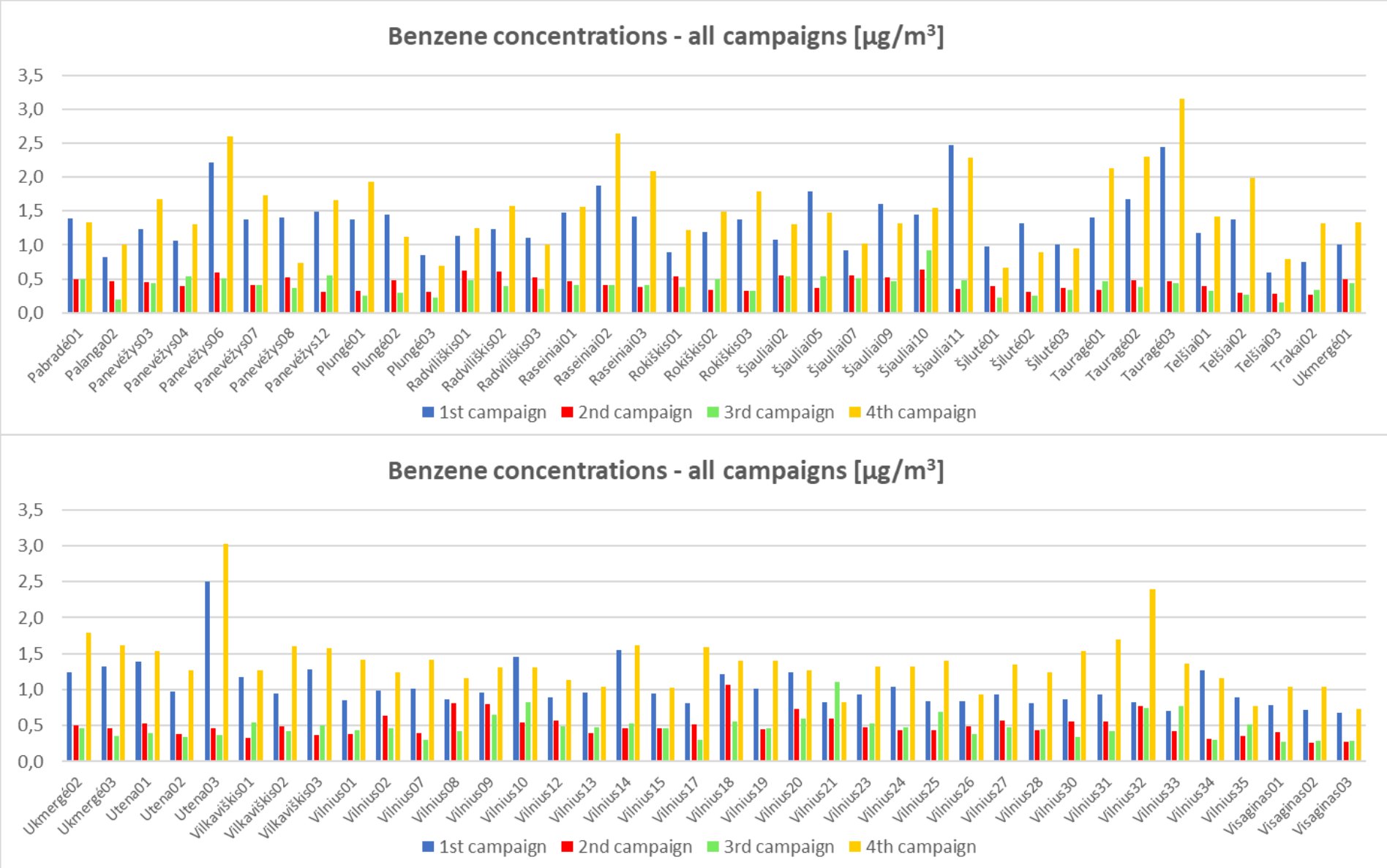


Fig. 58: Average benzene concentrations at all stations - all campaigns – 2nd part

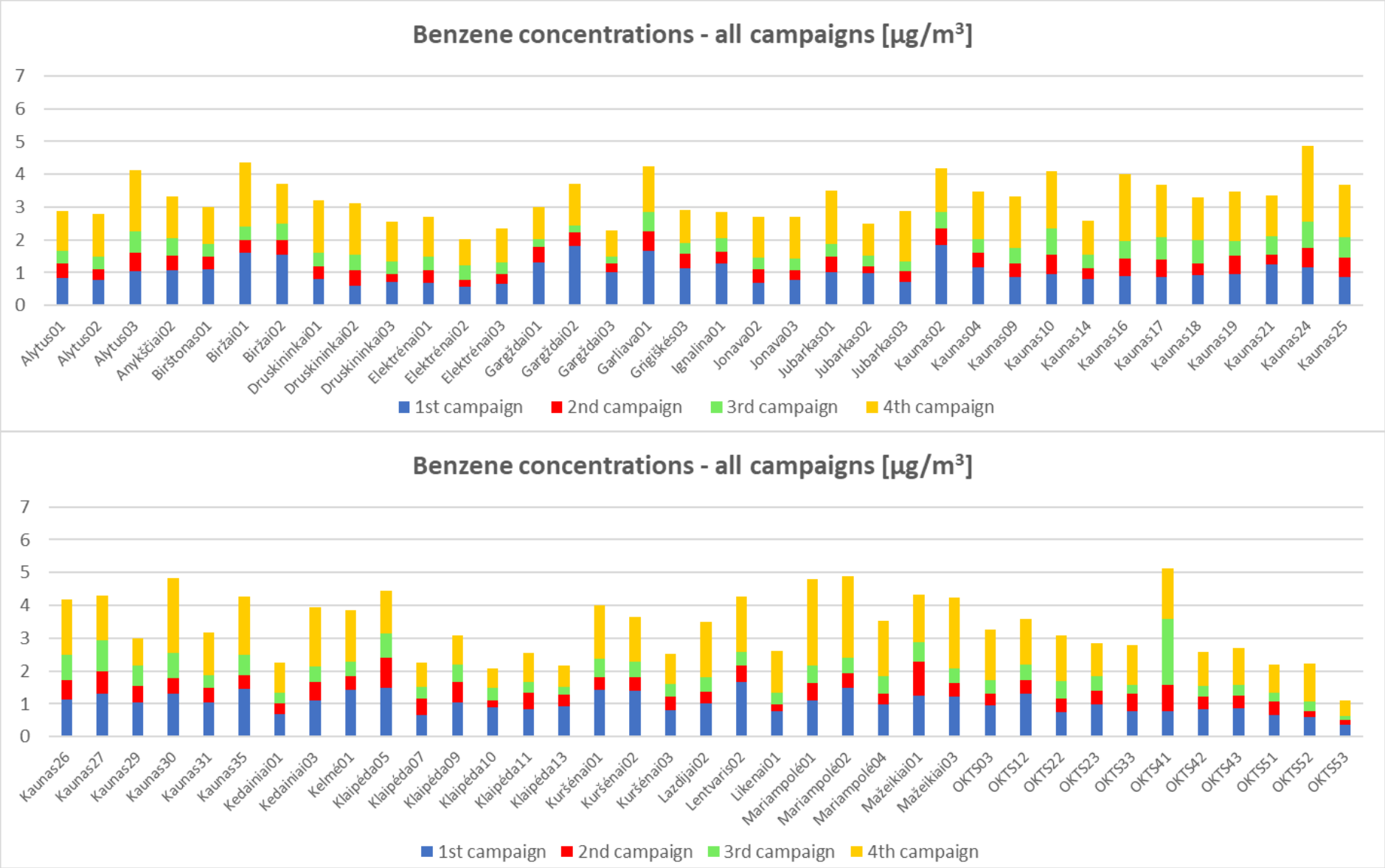
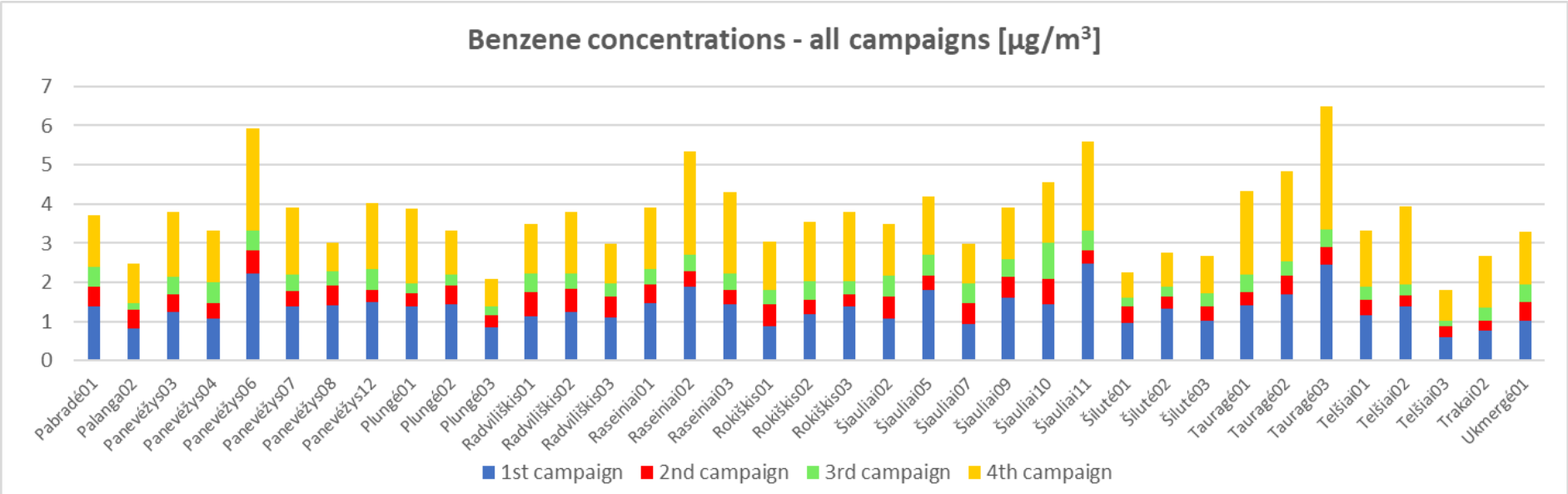


Fig. 59: Average benzene concentrations at all stations - all campaigns – 1st part



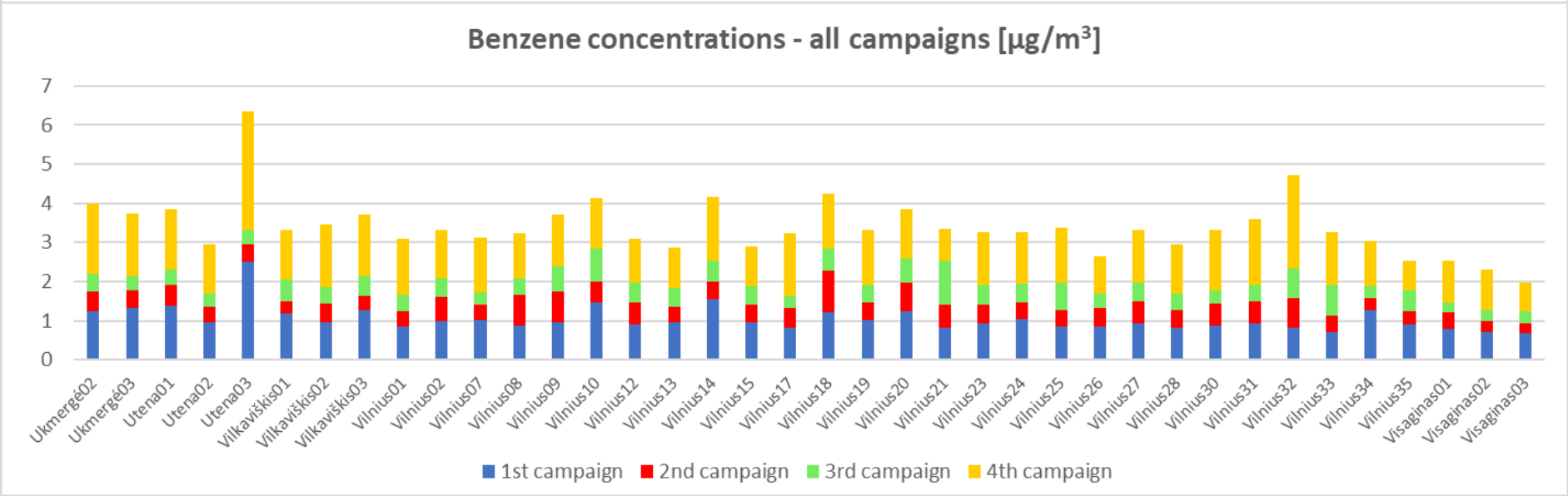
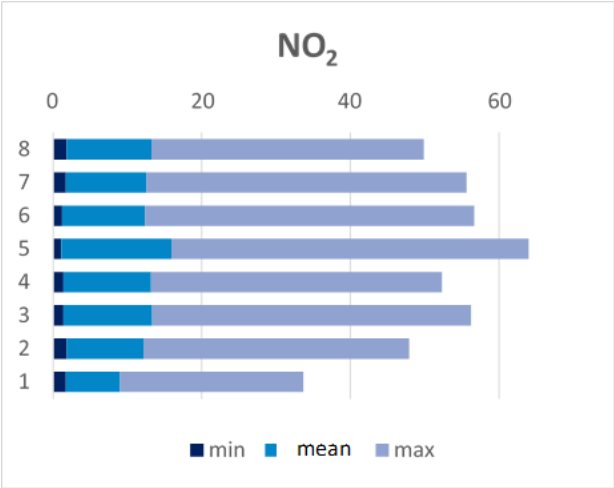


Fig. 60: Average benzene concentrations at all stations - all campaigns – 2nd part

8.2.2. Basic Statistical Data Analysis – Gaseous Compounds

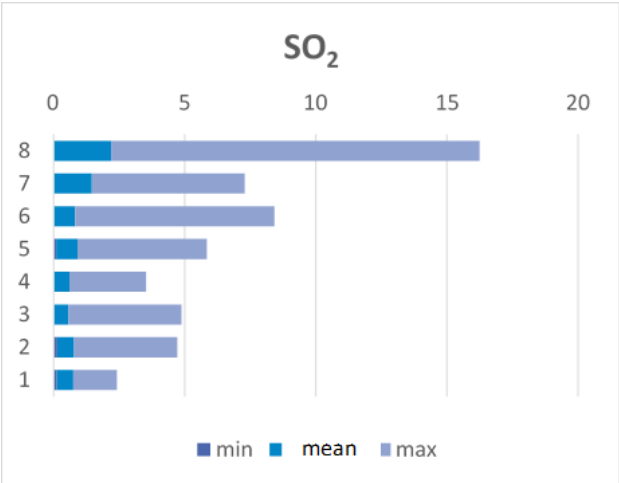
8.2.2.1. Evaluation of individual campaigns

In the graphs in Fig. 61- 63 data from individual campaigns are evaluated. Campaigns are further divided into 14-day sub-campaigns (the campaign 1 consists of two sub-campaigns 1 and 2, the campaign 2 consists of 2 sub-campaigns 3 and 4, etc.)



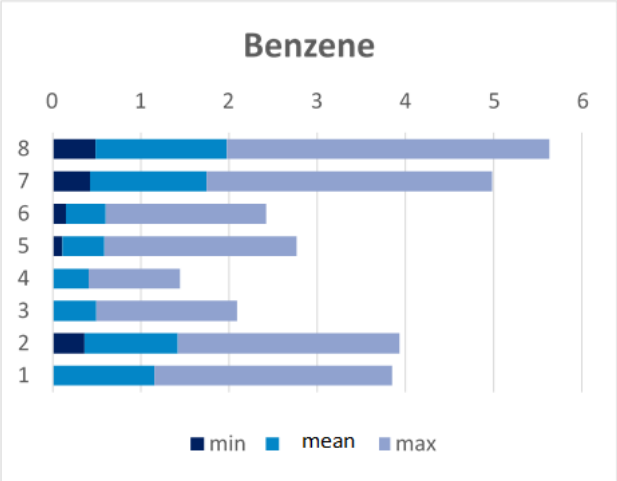
The average concentrations of NO_2 are surprisingly higher in the non-heating season (3,4,5,6), with the highest concentrations measured at the turn of August and September. This is probably due to higher traffic in the non-heating season.
Significantly higher concentrations were measured in the Kaunas and Vilnius agglomerations, which may be related to more intensive traffic, which is most often the cause of increased NO_2 concentrations.

Fig. 61: Average, minimum and maximum concentration values of NO_2 in the sub-campaigns.



Clearly the highest concentrations were measured during the last campaign in early December. On the contrary, the lowest concentrations were measured in the first campaign during February 2019. It is necessary to perceive this variance as irrelevant with regard to very low SO_2 concentrations. Average concentrations are more than 100 times lower than the valid daily air pollution limit value.

Fig.62: Average, minimum and maximum concentration values of SO_2 in sub-campaigns.



The annual limit value for benzene is 5 µg/m^3 and this value was far from exceeded in any of the realized campaigns. Nevertheless, the concentrations are very interesting, especially the occurrence of benzene in winter. The occurrence of higher concentration values has an area character, i.e. these values were measured at most of the monitored locations.

Fig. 63: Average, minimum and maximum concentration values of benzene in sub-campaigns.

8.2.2.2. Overview of Average and Maximal values – all Locations

NO_2 Location	Yearly Average [µg/m^3]	Maximum of 14-days Campaigns [µg/m^3]	Non-heating Season Average [µg/m^3]	Heating Season Average [µg/m^3]
Alytus 01	6,8	11	7,8	5,9
Alytus 02	5,6	7	6	5,2
Alytus 03	12,6	17,1	14,5	11,1
Anykščiai 02	7,7	12,2	8	7,5
Birštonas 01	5,4	6,2	5,1	5,6
Biržai 01	6,4	14,3	4,9	8
Biržai 02	5,4	8,8	4,8	6
Druskininkai 01	8	10,9	8,8	7,1
Druskininkai 02	12,2	20,7	14,7	10,3
Druskininkai 03	4,9	7,7	5,5	4,3
Elektrėnai 01	8,8	18	12,9	4,7
Elektrėnai 02	5,3	6,7	5,8	4,9
Elektrėnai 03	7,2	14,8	9,3	5,1
Gargždai 01	8,3	12	8,1	8,4
Gargždai 02	6,3	11,9	6,2	6,3
Gargždai 03	4,8	8	4,5	5,1
Garliava 01	12,2	19,8	14,5	9,9
Grigiškės 03	10,7	16,3	11	10,4
Ignalina 01	6,1	7,9	7	5,2
Jonava 02	5,4	6,9	6,3	4,5
Jonava 03	5,9	8,8	7	4,9
Jubarkas 01	10,7	12,8	12,2	8,7
Jubarkas 02	4,5	9,9	4,3	4,7
Jubarkas 03	5,4	8,3	5,6	5,3

NO_2 Location	Yearly Average [µg/m³]	Maximum of 14-days Campaigns [µg/m³]	Non-heating Season Average [µg/m³]	Heating Season Average [µg/m³]
Kaunas 02	20,4	33,7	22,7	18
Kaunas 04	9,8	15,1	9,7	9,9
Kaunas 09	11,4	21,6	13,8	9
Kaunas 10	19,7	28,2	22,3	17,1
Kaunas 14	7,6	14,9	9,8	5,5
Kaunas 16	17,3	28,9	20,4	14,3
Kaunas 17	14,5	23,2	17,7	11,2
Kaunas 18	10,6	19,3	12,2	9,4
Kaunas 19	12,6	24,4	11,9	13,3
Kaunas 21	11,6	14,9	13,2	9,9
Kaunas 24	24,3	41,6	32	16,6
Kaunas 25	29	48,1	34,4	23,6
Kaunas 26	18	34,2	24,4	11,6
Kaunas 27	25,6	47,7	35,6	15,6
Kaunas 29	9,7	16,8	10,5	8,8
Kaunas 30	13,2	20,7	15,4	11,1
Kaunas 31	9,8	20,2	7,5	12
Kaunas 35	5,5	9,8	5,3	5,8
Kėdainiai 01	5,8	8,7	7,1	4,5
Kėdainiai 03	13,9	18,6	16,5	11,4
Kelmė 01	12,4	21,7	16,9	7,9
Klaipėda 05	11,6	17,4	10,5	12,4
Klaipėda 07	16,1	20,6	18,4	14,3
Klaipėda 09	23,5	29,2	26,3	21,3
Klaipėda 10	18,3	26,4	20,5	16,1
Klaipėda 11	18,6	25,6	20,6	16,5
Klaipėda 13	11,3	25,2	9,2	13,4
Kuršėnai 01	13,5	26,1	12,5	14,6
Kuršėnai 02	9,5	19,4	9,5	9,6
Kuršėnai 03	6,7	14	8,4	5,1
Lazdijai 02	4,5	5,7	4,7	4,3
Lentvaris 02	7,8	14,6	9,2	6,4
Likėnai 01	4,1	6,8	4,2	3,9
Marijampolė 01	18,1	24	19,6	16,6
Marijampolė 02	9,6	12,2	9,9	9,3
Marijampolė 04	8	12,2	8,3	7,8
Mažeikiai 01	10,6	14,1	12,9	8,3
Mažeikiai 03	9,9	21,2	10,8	8,9
OKTS 03	16,9	24,1	21,7	12,1
OKTS 12	9,2	13	10,9	7,5
OKTS 22	14	19	17,7	11,3
OKTS 23	7,2	14,4	5,3	9

NO_2 Location	Yearly Average [µg/m³]	Maximum of 14-days Campaigns [µg/m³]	Non-heating Season Average [µg/m³]	Heating Season Average [µg/m³]
OKTS 33	16,4	24,5	19	13,7
OKTS 41	17,5	27	20,4	14,5
OKTS 42	6,7	9	7,6	5,9
OKTS 43	7,9	11,6	10,1	5,7
OKTS 51	2	3,7	1,4	2,7
OKTS 52	3,1	4,3	3,3	2,9
OKTS 53	4,4	16,3	3,4	5,4
Pabradė 01	8,8	11,6	10,2	7,3
Palanga 02	7,8	11,2	7,1	8,4
Panevėžys 03	10,3	13	10,5	10,1
Panevėžys 04	9,4	13	11,3	7,6
Panevėžys 06	7,5	11	7,7	7,2
Panevėžys 07	8,7	11,8	10,2	7,3
Panevėžys 08	7,5	20,7	6	8,9
Panevėžys 12	10,4	14,7	12,6	8,2
Plungė 01	12,4	18,3	14,6	10,2
Plungė 02	6,4	13,6	4,3	8,4
Plungė 03	8,1	17,7	6,1	10
Radviliškis 01	14,7	22,3	18,1	11,3
Radviliškis 02	7,8	11,8	9,2	6,5
Radviliškis 03	9,8	14,5	11,1	8,6
Raseiniai 01	9,5	14,5	12,3	6,6
Raseiniai 02	5,6	7,2	5,7	5,4
Raseiniai 03	6,9	10,3	7,1	6,6
Rokiškis 01	10,3	16,1	11	9,6
Rokiškis 02	6,5	14,3	5,2	7,7
Rokiškis 03	7,1	10,5	6,3	7,8
Šiauliai 02	16,1	27,3	20,5	11,7
Šiauliai 05	14,9	23,2	18,1	11,8
Šiauliai 07	11,7	19,7	12,2	11,1
Šiauliai 09	10,6	23	9,9	11,2
Šiauliai 10	19,3	27	22,8	15,9
Šiauliai 11	9,5	21,1	7,8	11,2
Šilutė 01	9,1	17,4	8,7	9,6
Šilutė 02	7,3	13,3	6,3	8,3
Šilutė 03	4,8	10,4	3,9	5,6
Tauragė 01	12,7	19,6	16,6	9,8
Tauragė 02	7,9	12,7	9,3	6,6
Tauragė 03	7	13,5	7,5	6,4
Telšiai 01	12,6	17,4	14,2	11
Telšiai 02	6,4	9,7	5,5	7,4
Telšiai 03	3,1	7,4	2,3	3,9

NO_2 Location	Yearly Average [µg/m³]	Maximum of 14-days Campaigns [µg/m³]	Non-heating Season Average [µg/m³]	Heating Season Average [µg/m³]
Trakai 02	4,6	9,3	5,7	3,6
Ukmergė 01	9,1	12,3	9,1	9,1
Ukmergė 02	6,2	10,3	6,3	6
Ukmergė 03	5,9	11	5,1	6,7
Utena 01	10	16,4	13,5	6,5
Utena 02	5,6	10,8	5,1	6,1
Utena 03	4,8	7,1	5,3	4,3
Vilkaviškis 01	7,2	9,3	7,6	6,7
Vilkaviškis 02	6,6	9	7	6,2
Vilkaviškis 03	6,5	8,7	6	7
Vilnius 01	11,9	18,7	11,6	12,2
Vilnius 02	18,7	26,4	21,8	15,5
Vilnius 07	13,9	27,2	14,2	13,6
Vilnius 08	19,5	27,3	21,8	17,2
Vilnius 09	19,1	22,3	19,8	18,4
Vilnius 10	21,2	31,5	24,6	17,9
Vilnius 12	18,9	29,3	20,8	17
Vilnius 13	27,4	45,3	31,8	23
Vilnius 14	8,2	11,5	8,6	7,8
Vilnius 15	10	17,6	12	8,1
Vilnius 17	21	30	21,5	20,5
Vilnius 18	37,9	44,3	42,1	33,7
Vilnius 19	20,1	31,9	24,8	15,4
Vilnius 20	31,3	42,8	37,5	25
Vilnius 21	19,7	25,2	21	18,4
Vilnius 23	18,7	27,9	22,5	14,9
Vilnius 24	12	16,3	13,4	10,6
Vilnius 25	13,5	20,7	16,2	10,9
Vilnius 26	10,3	14,7	12,7	8
Vilnius 27	22,1	35,3	28,6	15,6
Vilnius 28	12,6	23,7	12,7	12,6
Vilnius 30	14,8	22,9	18,3	11,2
Vilnius 31	25	31,3	29,2	20,8
Vilnius 32	11,4	14,9	12,5	10,4
Vilnius 33	11,7	14,5	13,5	9,9
Vilnius 34	9,5	25,7	6,6	12,3
Vilnius 35	10,1	16,1	11,5	8,6
Visaginas 01	6	8,3	6,1	5,9
Visaginas 02	4,6	8	5,9	3,4
Visaginas 03	4,1	7,4	2,8	5,3

Tab. 7: Basic statistical parameters - NO_2

SO_2 Location	Yearly Average [µg/m³]	Maximum of 14-days Campaigns [µg/m³]	Non-heating Season Average [µg/m³]	Heating Season Average [µg/m³]
Alytus 01	0,6	1,4	0,2	0,9
Alytus 02	0,5	1,1	0,2	0,7
Alytus 03	0,7	2,3	0,2	1,1
Anykščiai 02	0,6	1,7	0,3	0,8
Birštonas 01	0,5	1,5	0,2	0,8
Biržai 01	0,7	3,3	0,2	1,2
Biržai 02	0,6	1,7	0,2	1
Druskininkai 01	0,7	1,4	0,5	0,9
Druskininkai 02	0,4	1,1	0,2	0,6
Druskininkai 03	0,4	1,1	0,2	0,5
Elektrėnai 01	2	8,2	1,2	2,8
Elektrėnai 02	1,1	5,1	0,6	1,6
Elektrėnai 03	1,1	5	0,7	1,5
Gargždai 01	0,4	0,7	0,2	0,6
Gargždai 02	0,5	0,8	0,3	0,7
Gargždai 03	0,4	0,7	0,3	0,6
Garliava 01	2,1	8	1,3	2,8
Grigiškės 03	1,5	5,3	0,7	2,2
Ignalina 01	0,3	0,9	0,3	0,4
Jonava 02	0,9	2,4	0,6	1,2
Jonava 03	1	1,7	1,2	0,9
Jubarkas 01	1	2,2	0,8	1,2
Jubarkas 02	0,6	2,1	0,9	0,3
Jubarkas 03	1,4	3,2	1,6	1,3
Kaunas 02	1,4	7,4	0,6	2,1
Kaunas 04	1,2	3,4	0,8	1,6
Kaunas 09	1,2	4,1	0,5	1,9
Kaunas 10	1,3	4,2	0,5	2,2
Kaunas 14	1,4	5,5	0,9	1,9
Kaunas 16	1,1	3,2	0,7	1,5
Kaunas 17	1	2,9	0,5	1,6
Kaunas 18	1,8	5,9	1	2,4
Kaunas 19	1,4	4,8	0,9	1,9
Kaunas 21	1,3	6,3	0,5	2
Kaunas 24	0,7	2,4	0,4	0,9
Kaunas 25	1	4,7	0,4	1,5
Kaunas 26	1,9	8,6	0,5	2,7
Kaunas 27	1,1	5,9	0,5	1,8
Kaunas 29	2,1	8,5	1,4	2,7
Kaunas 30	1,6	6,5	0,6	2,6
Kaunas 31	2,7	13,2	0,3	5

SO_2 Location	Yearly Average [µg/m³]	Maximum of 14-days Campaigns [µg/m³]	Non-heating Season Average [µg/m³]	Heating Season Average [µg/m³]
Kaunas 35	0,8	1,3	0,8	0,7
Kėdainiai 01	2,3	7,6	3,8	0,9
Kėdainiai 03	1,2	3,7	0,8	1,6
Kelmė 01	1	2,3	0,7	1,3
Klaipėda 05	0,5	0,7	0,5	0,5
Klaipėda 07	0,5	0,6	0,5	0,5
Klaipėda 09	0,4	0,8	0,2	0,6
Klaipėda 10	0,4	0,7	0,3	0,5
Klaipėda 11	0,5	0,7	0,4	0,5
Klaipėda 13	0,4	0,5	0,3	0,4
Kuršėnai 01	1,3	4,2	0,6	2,1
Kuršėnai 02	1,7	5,8	0,8	2,6
Kuršėnai 03	0,9	1,9	0,6	1,3
Lazdijai 02	0,6	1,2	0,3	0,8
Lentvaris 02	1,7	4,9	2,2	1,1
Likėnai 01	0,7	1,7	0,3	1
Marijampolė 01	0,9	4,1	0,3	1,5
Marijampolė 02	0,6	1,8	0,3	0,9
Marijampolė 04	0,8	2,1	0,2	1,1
Mažeikiai 01	1,3	2,2	1,1	1,5
Mažeikiai 03	1,3	2,2	1	1,5
OKTS 03	0,6	1,1	0,8	0,4
OKTS 12	0,6	1,8	0,2	0,9
OKTS 22	1	2,7	0,7	1,2
OKTS 23	1,4	3,4	0,8	1,9
OKTS 33	0,5	0,8	0,3	0,6
OKTS 41	1,8	6,3	1,3	2,3
OKTS 42	0,6	1,1	0,6	0,6
OKTS 43	0,8	1,7	0,7	0,8
OKTS 51	0,8	1,5	0,8	0,9
OKTS 52	0,7	1,4	0,6	0,9
OKTS 53	0,5	0,8	0,4	0,5
Pabradė 01	0,5	1,2	0,5	0,6
Palanga 02	0,4	0,7	0,4	0,3
Panevėžys 03	0,7	1,7	0,2	1,1
Panevėžys 04	0,7	1,6	0,3	1,1
Panevėžys 06	0,9	2,7	0,3	1,4
Panevėžys 07	0,6	1,6	0,4	0,7
Panevėžys 08	0,6	1,8	0,2	0,9
Panevėžys 12	0,7	1,5	0,3	1
Plungė 01	0,4	0,6	0,3	0,5
Plungė 02	0,6	1,3	0,5	0,6

SO_2 Location	Yearly Average [µg/m³]	Maximum of 14-days Campaigns [µg/m³]	Non-heating Season Average [µg/m³]	Heating Season Average [µg/m³]
Plungė 03	0,4	0,7	0,4	0,4
Radviliškis 01	1,4	2,4	1,7	1,2
Radviliškis 02	0,7	1,1	0,6	0,8
Radviliškis 03	0,9	2,3	0,7	1,1
Raseiniai 01	0,9	2,6	1,2	0,6
Raseiniai 02	0,9	1,8	0,7	1,1
Raseiniai 03	1,1	2,7	1,3	0,9
Rokiškis 01	0,8	2,3	0,2	1,1
Rokiškis 02	0,5	1,7	0,3	0,7
Rokiškis 03	0,7	1,8	0,3	1
Šiauliai 02	1,5	5,4	0,6	2,4
Šiauliai 05	1,3	2,9	1,2	1,3
Šiauliai 07	1	1,7	1	1,1
Šiauliai 09	0,9	2	1	0,7
Šiauliai 10	1,3	3,9	0,8	1,6
Šiauliai 11	0,7	1,3	0,7	0,7
Šilutė 01	0,5	1,1	0,4	0,5
Šilutė 02	0,5	0,8	0,5	0,4
Šilutė 03	1	4,2	0,3	1,6
Tauragė 01	1,4	4,4	0,7	1,8
Tauragė 02	0,9	2,1	1,4	0,6
Tauragė 03	0,9	1,4	1	0,9
Telšiai 01	0,6	1,7	0,3	0,9
Telšiai 02	0,8	3,2	0,3	1,2
Telšiai 03	0,5	0,9	0,4	0,7
Trakai 02	1,9	5,3	1,6	2,2
Ukmergė 01	0,4	1,1	0,2	0,6
Ukmergė 02	1	3	0,6	1,3
Ukmergė 03	0,9	2,8	0,6	1,3
Utena 01	0,4	0,6	0,2	0,5
Utena 02	0,4	0,6	0,4	0,4
Utena 03	0,6	1,7	0,6	0,7
Vilkaviškis 01	1	2,7	0,2	1,8
Vilkaviškis 02	0,9	2,4	0,2	1,5
Vilkaviškis 03	1	2,2	0,7	1,3
Vilnius 01	1,1	3,1	1,5	0,7
Vilnius 02	0,9	2,4	0,6	1,3
Vilnius 07	0,8	2,1	0,8	0,7
Vilnius 08	1	2,2	0,8	1,2
Vilnius 09	0,9	2,9	0,7	1,1
Vilnius 10	1,2	3,1	1,2	1,1
Vilnius 12	1,2	3,1	1,2	1,2

SO_2 **Location**	**Yearly Average [µg/m³]**	**Maximum of 14-days Campaigns [µg/m³]**	**Non-heating Season Average [µg/m³]**	**Heating Season Average [µg/m³]**
Vilnius 13	1,3	4,4	1,6	1,1
Vilnius 14	1,3	3,4	1,1	1,4
Vilnius 15	1,2	3,2	1,1	1,2
Vilnius 17	1,1	4,4	0,6	1,6
Vilnius 18	1,6	5,3	1,3	1,9
Vilnius 19	1,1	2,9	1,1	1,1
Vilnius 20	0,9	3,4	0,7	1,1
Vilnius 21	1	3,1	0,8	1,2
Vilnius 23	1,1	3,2	0,9	1,3
Vilnius 24	0,9	2,9	0,8	1
Vilnius 25	2,4	14,1	1	3,8
Vilnius 26	2	4,8	2,1	1,9
Vilnius 27	1,1	1,6	1,4	0,8
Vilnius 28	0,9	2,2	0,7	1,1
Vilnius 30	0,7	1,3	0,9	0,4
Vilnius 31	1,2	3,1	1,2	1,1
Vilnius 32	0,8	2,7	0,6	1
Vilnius 33	1,8	4,5	2,3	1,3
Vilnius 34	1,5	4,6	1,1	2
Vilnius 35	1,2	2,2	1,4	1
Visaginas 01	0,6	2,6	0,3	0,9
Visaginas 02	0,4	1,1	0,2	0,6
Visaginas 03	0,5	1	0,3	0,7

Tab. 8: Basic statistical parameters - SO_2

Benzene **Location**	**Yearly Average [µg/m³]**	**Maximum of 14-days Campaigns [µg/m³]**	**Non-heating Season Average [µg/m³]**	**Heating Season Average [µg/m³]**
Alytus 01	0,7	1,5	0,4	1
Alytus 02	0,7	1,4	0,4	1
Alytus 03	1	2,4	0,6	1,4
Anykščiai 02	0,8	1,7	0,5	1,2
Birštonas 01	0,8	1,4	0,4	1,1
Biržai 01	1,1	2,1	0,4	1,8
Biržai 02	0,9	1,6	0,5	1,4
Druskininkai 01	0,8	2,2	0,4	1,2
Druskininkai 02	0,8	1,7	0,5	1,1
Druskininkai 03	0,6	1,2	0,3	1
Elektrėnai 01	0,7	1,3	0,4	0,9

Benzene **Location**	**Yearly Average [µg/m³]**	**Maximum of 14-days Campaigns [µg/m³]**	**Non-heating Season Average [µg/m³]**	**Heating Season Average [µg/m³]**
Elektrėnai 02	0,5	0,9	0,3	0,7
Elektrėnai 03	0,6	1,2	0,3	0,8
Gargždai 01	0,8	1,4	0,4	1,2
Gargždai 02	0,9	2	0,3	1,6
Gargždai 03	0,6	1,1	0,2	0,9
Garliava 01	1,1	1,9	0,6	1,5
Grigiškės 03	0,7	1,3	0,4	1,1
Ignalina 01	0,7	1,3	0,4	1
Jonava 02	0,7	1,2	0,4	1
Jonava 03	0,7	1,7	0,3	1
Jubarkas 01	0,8	1,6	0,4	1,2
Jubarkas 02	0,6	1,1	0,3	1
Jubarkas 03	0,7	2,1	0,3	1,1
Kaunas 02	1	2,2	0,5	1,6
Kaunas 04	0,9	1,8	0,4	1,3
Kaunas 09	0,8	1,6	0,4	1,2
Kaunas 10	1	1,8	0,7	1,4
Kaunas 14	0,6	1,1	0,4	0,9
Kaunas 16	1	2,1	0,5	1,5
Kaunas 17	1	1,8	0,6	1,2
Kaunas 18	0,9	1,3	0,6	1,1
Kaunas 19	0,9	2	0,5	1,2
Kaunas 21	0,8	1,7	0,4	1,2
Kaunas 24	1,2	2,5	0,7	1,7
Kaunas 25	0,9	1,7	0,6	1,2
Kaunas 26	1	2	0,7	1,4
Kaunas 27	1,1	1,5	0,8	1,3
Kaunas 29	0,8	1,2	0,6	0,9
Kaunas 30	1,2	2,6	0,6	1,8
Kaunas 31	0,8	2	0,4	1,2
Kaunas 35	1,1	2,2	0,5	1,6
Kėdainiai 01	0,6	1,1	0,3	0,8
Kėdainiai 03	1	2,1	0,5	1,5
Kelmė 01	1	1,9	0,4	1,5
Klaipėda 05	1,1	2,2	0,8	1,4
Klaipėda 07	0,6	1	0,4	0,7
Klaipėda 09	0,8	1,3	0,6	1
Klaipėda 10	0,6	1	0,4	0,8
Klaipėda 11	0,6	1	0,4	0,9
Klaipėda 13	0,5	1	0,3	0,8
Kuršėnai 01	1	2	0,5	1,5
Kuršėnai 02	0,9	1,7	0,4	1,4

Benzene Location	Yearly Average [µg/m³]	Maximum of 14-days Campaigns [µg/m³]	Non-heating Season Average [µg/m³]	Heating Season Average [µg/m³]
Kuršėnai 03	0,6	1,1	0,4	0,9
Lazdijai 02	0,9	2	0,4	1,4
Lentvaris 02	1,1	2,1	0,5	1,7
Likėnai 01	0,7	1,5	0,3	1
Marijampolė 01	1,2	2,7	0,5	1,9
Marijampolė 02	1,2	3,1	0,5	2
Marijampolė 04	0,9	1,8	0,4	1,3
Mažeikiai 01	1,1	1,7	0,8	1,4
Mažeikiai 03	1,1	2,7	0,4	1,7
OKTS 03	0,8	1,7	0,4	1,2
OKTS 12	0,9	1,6	0,4	1,4
OKTS 22	0,8	1,6	0,5	1,1
OKTS 23	0,7	1,1	0,4	1
OKTS 33	0,7	1,3	0,4	1
OKTS 42	0,6	1,1	0,4	0,9
OKTS 43	0,7	1,7	0,4	1
OKTS 51	0,6	1,1	0,4	0,8
OKTS 52	0,6	1,2	0,2	0,9
OKTS 53	0,3	0,5	0,1	0,4
Pabradė 01	0,9	1,7	0,5	1,4
Palanga 02	0,6	1,2	0,3	0,9
Panevėžys 03	1	2,1	0,4	1,5
Panevėžys 04	0,9	1,7	0,4	1,2
Panevėžys 07	1	2,4	0,4	1,6
Panevėžys 08	0,8	1,5	0,4	1,1
Panevėžys 12	1	2,1	0,4	1,6
Plungė 01	1,1	2	0,4	1,7
Plungė 02	0,8	1,7	0,4	1,3
Plungė 03	0,5	0,9	0,3	0,8
Radviliškis 01	0,9	1,5	0,6	1,2
Radviliškis 02	1	1,8	0,5	1,4
Radviliškis 03	0,7	1,2	0,4	1,1
Raseiniai 01	1	2,2	0,4	1,5
Raseiniai 03	1,1	2,1	0,4	1,8
Rokiškis 01	0,7	1,4	0,3	1,1
Rokiškis 02	0,9	1,6	0,4	1,3
Rokiškis 03	1	2,2	0,3	1,6
Šiauliai 02	0,9	1,7	0,5	1,2
Šiauliai 05	1	1,9	0,5	1,6
Šiauliai 07	0,7	1,2	0,5	1
Šiauliai 09	1	1,9	0,5	1,5
Šiauliai 10	1,1	1,6	0,8	1,5

Benzene **Location**	**Yearly Average [µg/m³]**	**Maximum of 14-days Campaigns [µg/m³]**	**Non-heating Season Average [µg/m³]**	**Heating Season Average [µg/m³]**
Šilutė 01	0,6	1	0,3	0,8
Šilutė 02	0,7	1,5	0,3	1,1
Šilutė 03	0,7	1,3	0,4	1
Tauragė 01	1,2	2,4	0,5	1,8
Tauragė 02	1,2	2,3	0,4	2
Telšiai 01	0,8	2	0,4	1,3
Telšiai 02	1	2,9	0,3	1,7
Telšiai 03	0,4	0,8	0,2	0,7
Trakai 02	0,7	1,4	0,3	1
Ukmergė 01	0,8	1,5	0,5	1,2
Ukmergė 02	1	2,1	0,5	1,5
Ukmergė 03	0,9	2,1	0,4	1,5
Utena 01	1	1,9	0,5	1,5
Utena 02	0,7	1,4	0,4	1,1
Vilkaviškis 01	0,8	1,3	0,4	1,2
Vilkaviškis 02	0,9	2	0,5	1,3
Vilkaviškis 03	0,9	2,5	0,4	1,4
Vilnius 01	0,8	1,6	0,4	1,1
Vilnius 02	0,8	1,5	0,5	1,1
Vilnius 07	0,8	1,5	0,3	1,2
Vilnius 08	0,8	1,2	0,6	1
Vilnius 09	0,9	1,4	0,7	1,1
Vilnius 10	1	1,7	0,7	1,4
Vilnius 12	0,8	1,4	0,5	1
Vilnius 13	0,7	1,1	0,4	1
Vilnius 14	1	1,8	0,5	1,6
Vilnius 15	0,7	1,2	0,5	1
Vilnius 17	0,8	1,6	0,4	1,2
Vilnius 18	1,1	1,7	0,8	1,3
Vilnius 19	0,8	1,9	0,5	1,2
Vilnius 20	1	1,4	0,7	1,3
Vilnius 21	0,8	1,6	0,9	0,8
Vilnius 23	0,8	1,7	0,5	1,1
Vilnius 24	0,8	1,3	0,5	1,2
Vilnius 25	0,8	1,7	0,6	1,1
Vilnius 26	0,7	1	0,4	0,9
Vilnius 27	0,8	1,4	0,5	1,1
Vilnius 28	0,7	1,3	0,4	1
Vilnius 30	0,8	1,9	0,5	1,2
Vilnius 31	0,9	1,8	0,5	1,3
Vilnius 32	1,2	2,8	0,8	1,6
Vilnius 33	0,8	1,5	0,6	1

Benzene **Location**	**Yearly Average [µg/m³]**	**Maximum of 14-days Campaigns [µg/m³]**	**Non-heating Season Average [µg/m³]**	**Heating Season Average [µg/m³]**
Vilnius 34	0,8	1,3	0,3	1,2
Vilnius 35	0,6	0,9	0,3	0,8
Visaginas 01	0,6	1,3	0,3	0,9
Visaginas 02	0,5	1,4	0,3	0,7
Visaginas 03	0,5	0,9	0,3	0,7

Tab. 9: Basic statistical parameters - benzene

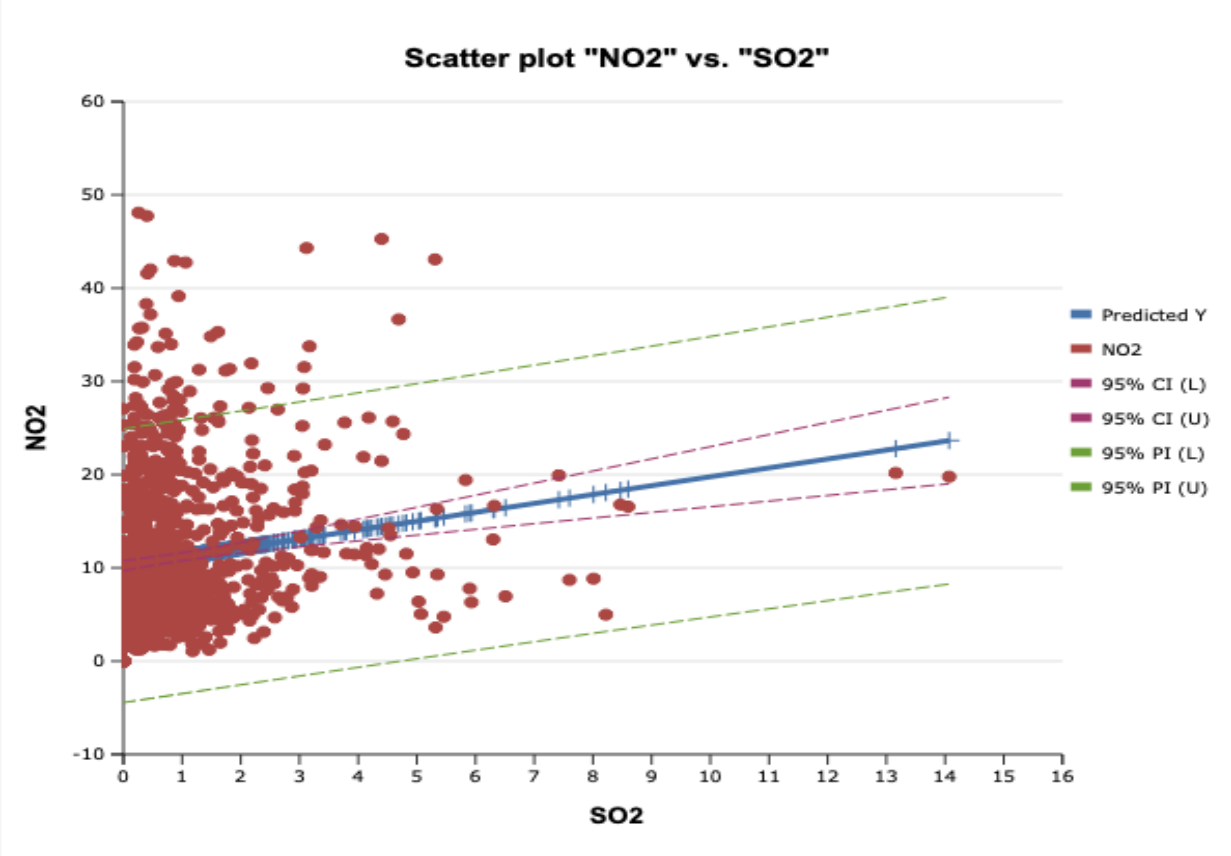
8.2.2.3. Most Polluted Locations

NO_2	SO_2	Benzene
Vilnius 18	Kaunas 31	Tauragė 03
Vilnius 20	Vilnius 25	Utena 03
Kaunas 25	Kėdainiai 01	Panevėžys 06
Vilnius 13	Garliava 01	Šiauliai 11
Kaunas 27	Kaunas 29	Raseiniai 02
Vilnius 31	Vilnius 26	OKTS 41
Kaunas 24	Elektrėnai 01	Tauragė 01
Klaipėda 09	Kaunas 26	Marijampolė 02
Vilnius 27	Trakai 02	Kaunas 24
Vilnius 10	Kaunas 18	Kaunas 26

Tab. 10.: 10 locations with the highest maximum concentrations of gaseous compounds for each measured substance.

8.2.2.4. Regression and Exploratory Data Analysis (EDA)

The correlation coefficient of the regression dependence of NO_2 and SO_2 is 0.152 and for the dependence of NO_2 and benzene even 0.033. Data are not related to each other and their value varies in time and space. The occurrence of higher concentrations and maxima is not caused by areal pollution or long-distance transport, but by local conditions at the measurement location. It is likely that the main reason are very low concentrations of measured gaseous compounds, in which potential dependencies tend to be lower. If higher concentrations were measured, both higher and potential dependencies could be expected.



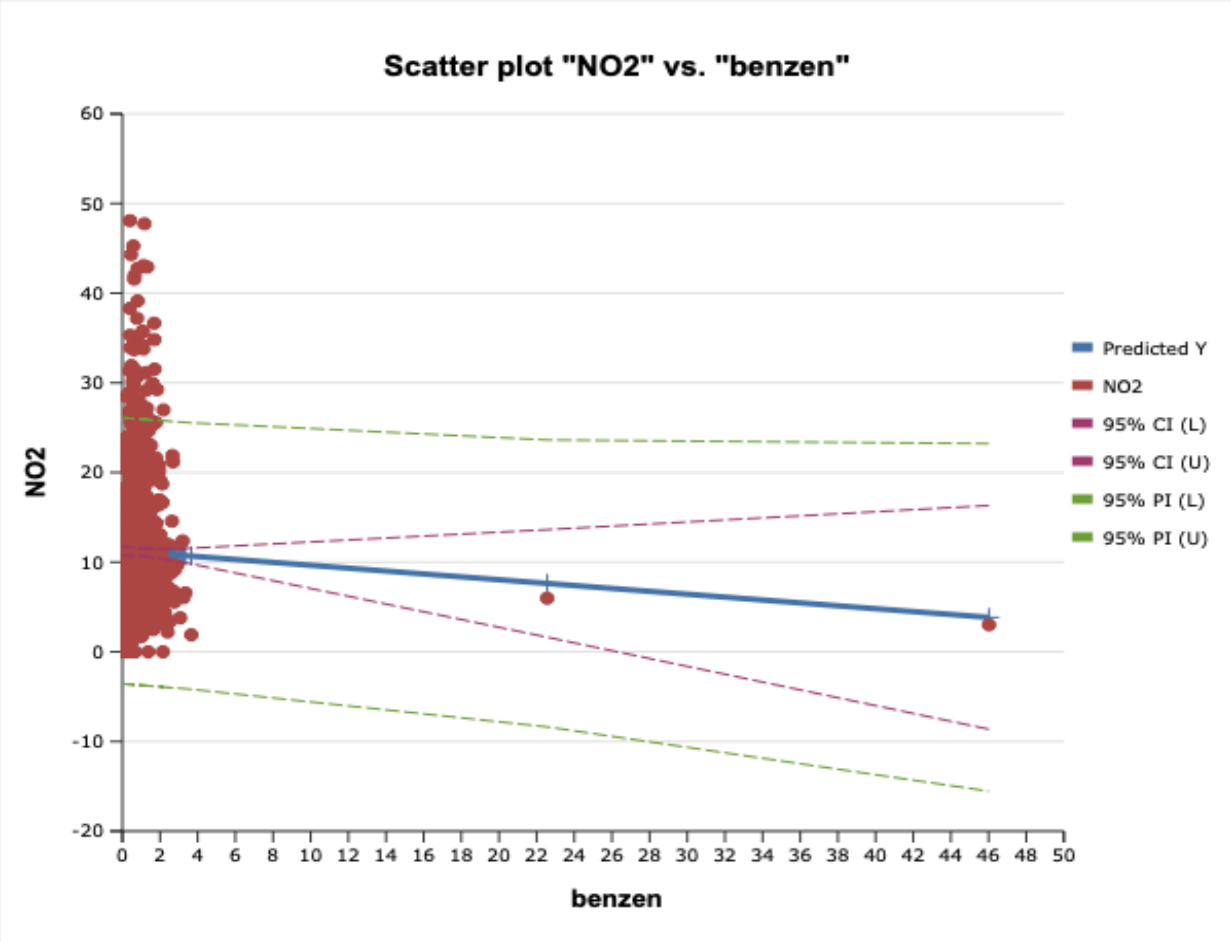


Fig. 64: Regression curves of NO_2, SO_2 and benzene.

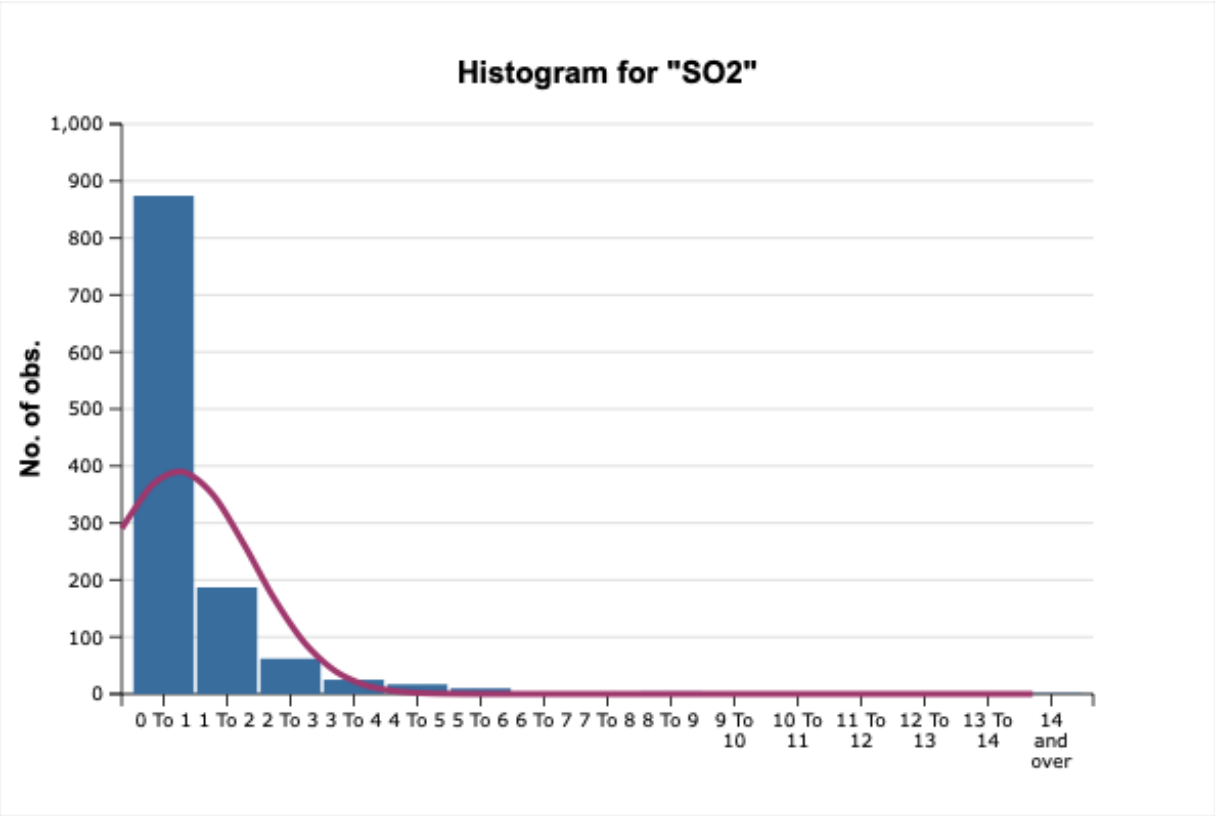


Fig. 65: Test of normality of data for SO_2.

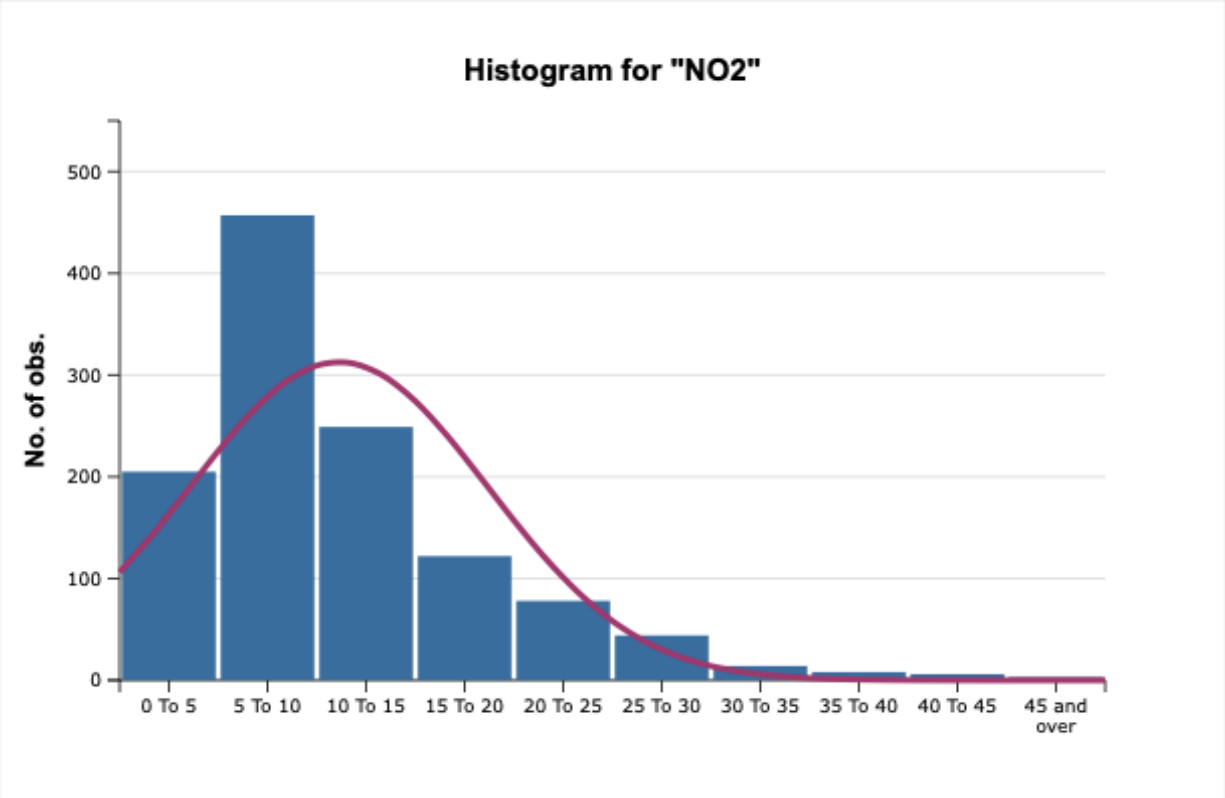


Fig. 66: Test of normality of data for NO_2.

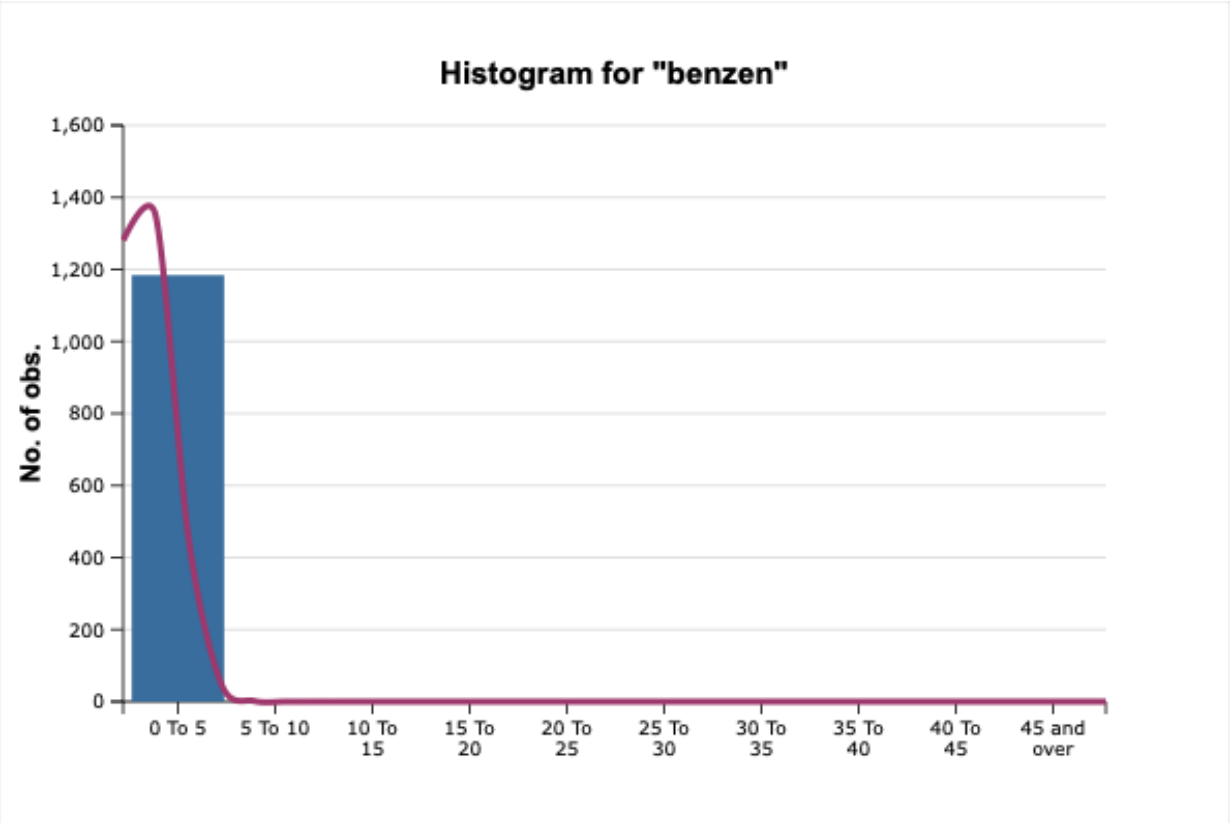


Fig. 67: Test of normality of data for benzene.

8.2.3. Comparison with the Data from Air Quality Monitoring Stations (AQMS)

Passive samplers were also installed on selected AQM stations operated by EPA (Environmental Protection Agency) and data from both programs (manual and automatic) could then be compared. At the same time, NO_2 was measured at 10 locations, SO_2 at 6 locations and benzene only at 3 locations, at one of which measurements are done by an automatic analyzer and at the other 2, samples are regularly taken at four-day intervals.
The graph in Fig. 68 shows that the average NO_2 values from all campaigns are relatively similar in most locations, while the values measured by automatic analyzers at AQM stations are, with the exception of 2 stations, slightly higher than the values measured by passive samplers.

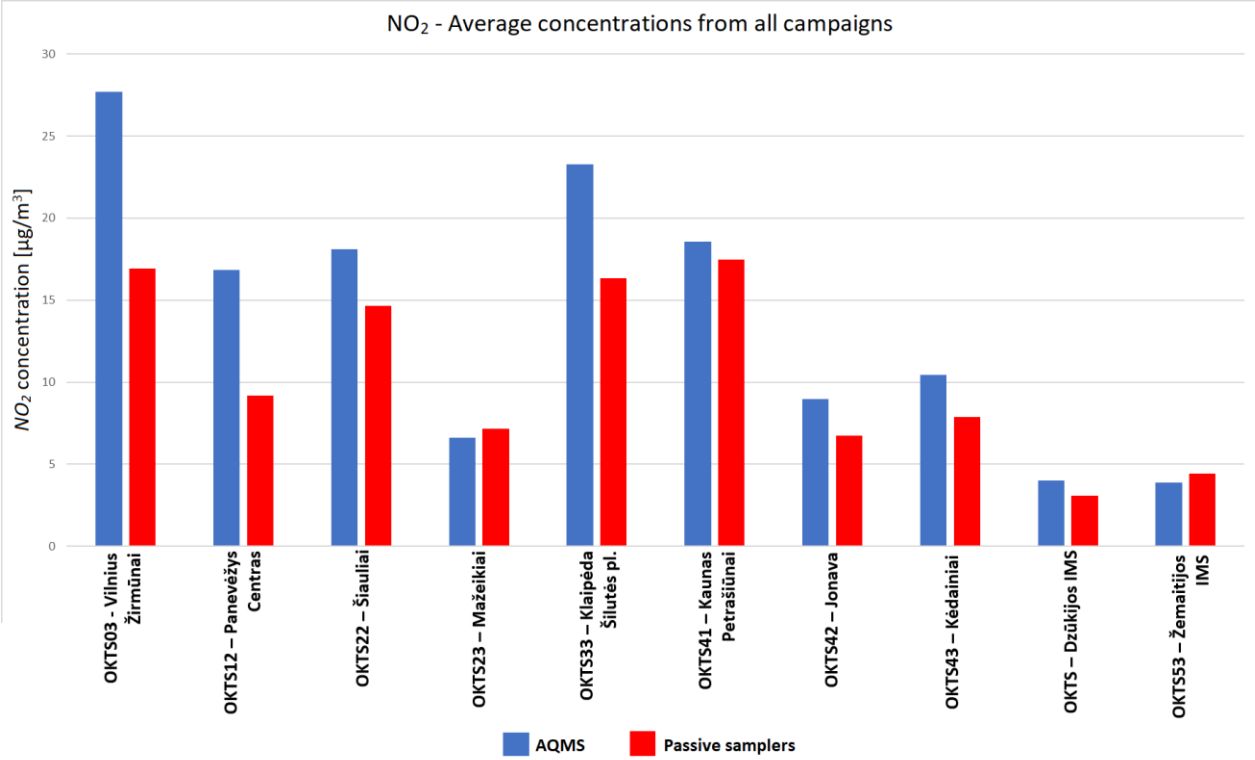


Fig. 68: NO_2 - comparison of average values from all campaigns measured by passive samplers and at AQM stations.

The graph in Fig. 69 shows that the average values of SO_2 from all campaigns are completely different from NO_2 in all locations, while the values measured by automatic analyzers at AQM stations significantly exceed the values measured by passive samplers. The sensitivity of the manual method using passive samplers to measure SO_2 is likely to be significantly lower than the UV-fluorescence used by reference analyzers.

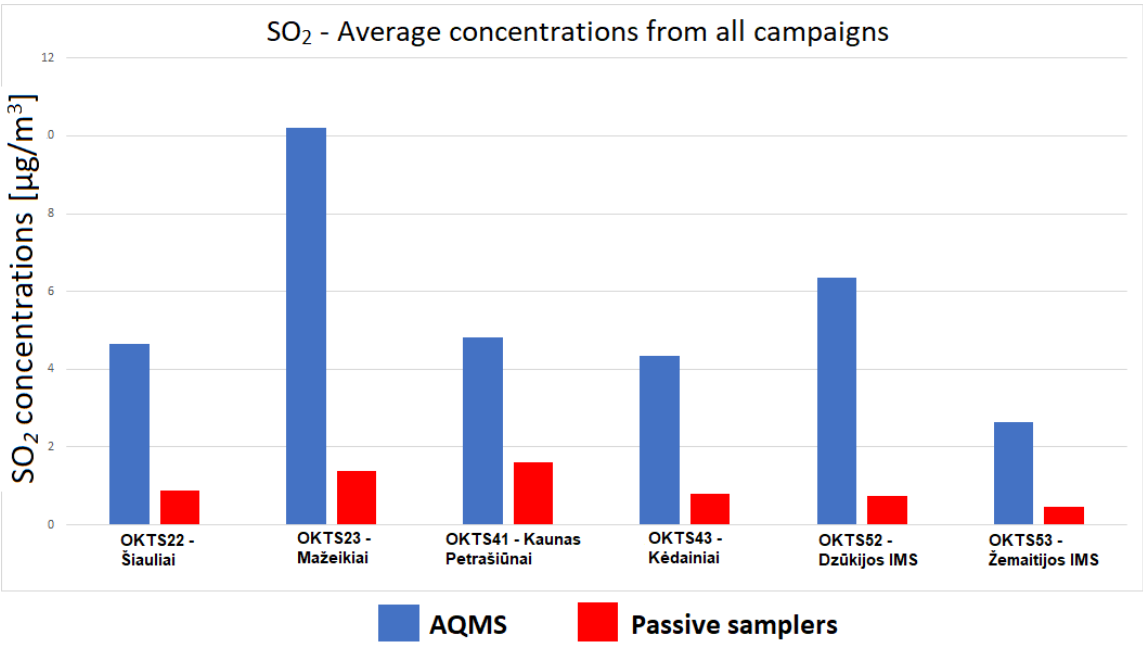


Fig. 69: SO_2 - Comparison of average values from all campaigns measured by passive samplers and at AQM stations.

The graph in Fig. 70 shows that the comparison of average values of benzene from all campaigns between passive samplers and AQM stations is diametrically different at the OKTS03 station - Vilnius Žirmūnai, where the AQM station is monitored by an automatic analyzer and at the remaining 2 stations, where samples are taken at four-day intervals. The values measured by the automatic analyzer at the AQM station OKTS03 - Vilnius Žirmūnai are significantly lower (during all 4 campaigns) than the values measured by the passive samplers. The data from the analyzers show a relatively strange course and often zero value was measured. At the other 2 stations, the measured data show much greater agreement.

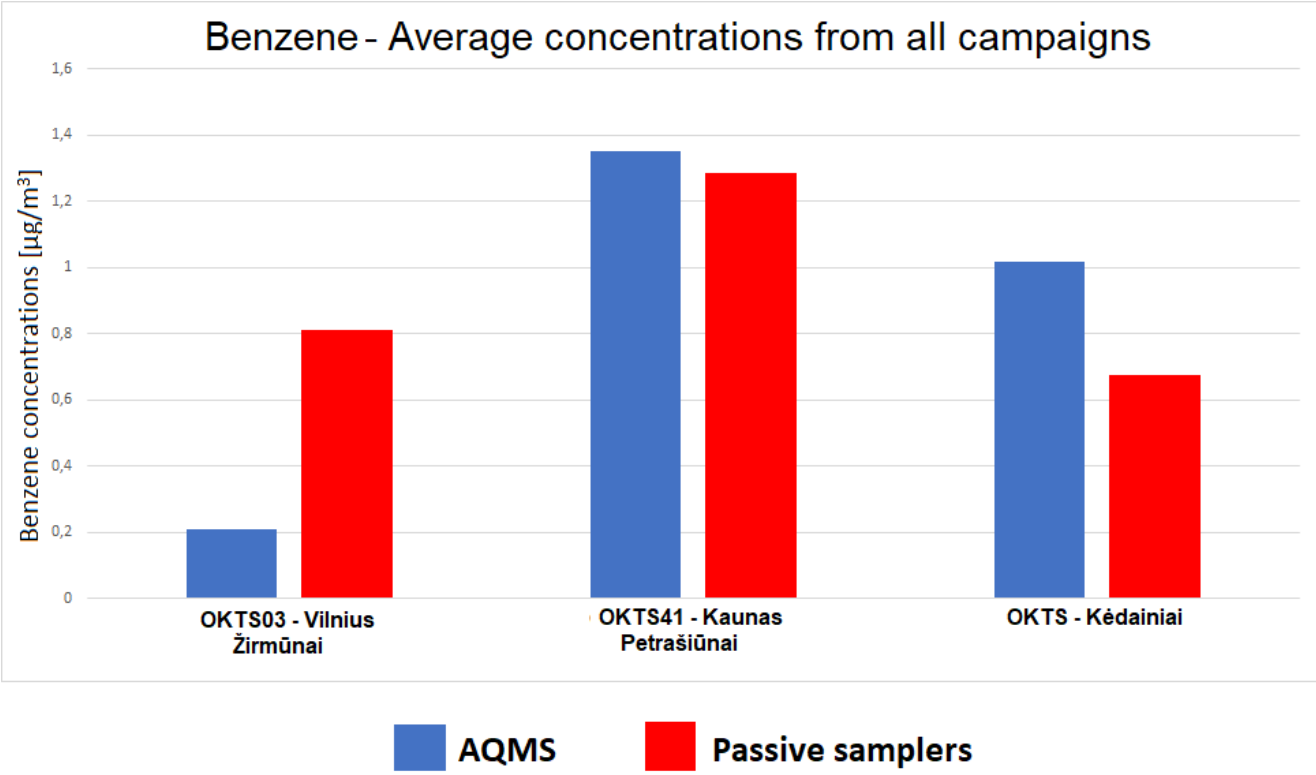
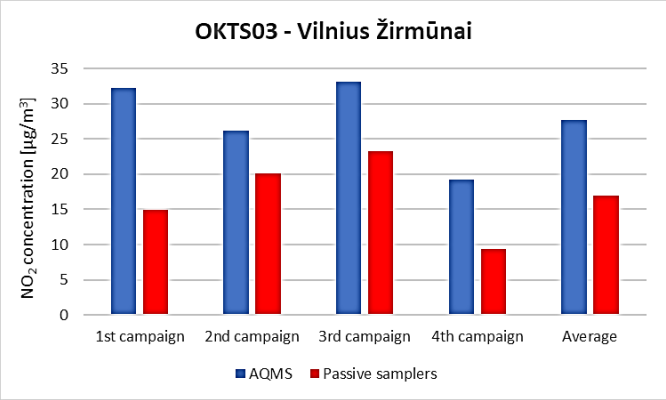
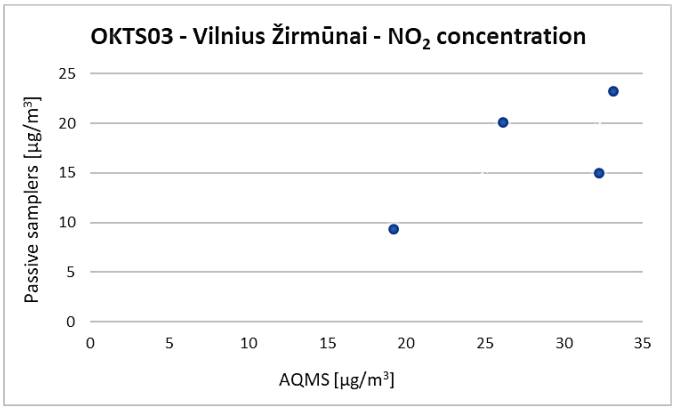


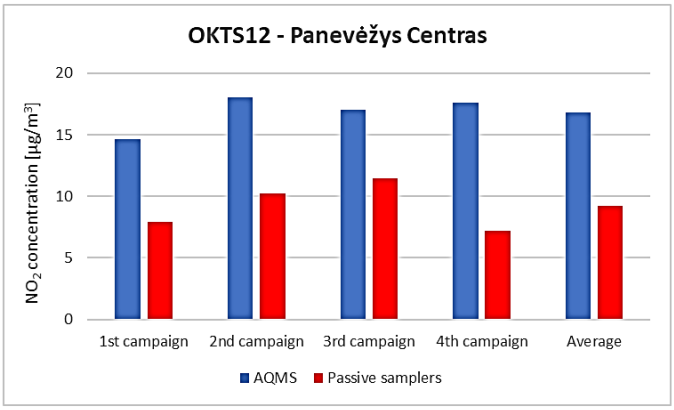
Fig. 70: Benzene - comparison of average values from all campaigns measured by passive samplers and at AQM stations.

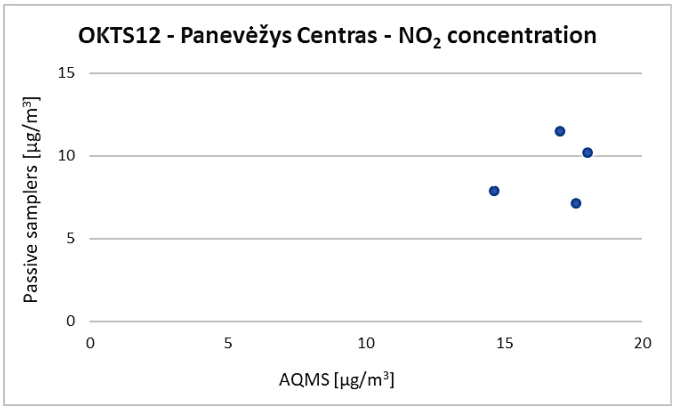
The following graphs in Fig. 71 - 73 show the comparison of measured values by individual campaigns at all comparative stations. Even from these graphs, the findings described earlier in this chapter are generally evident.

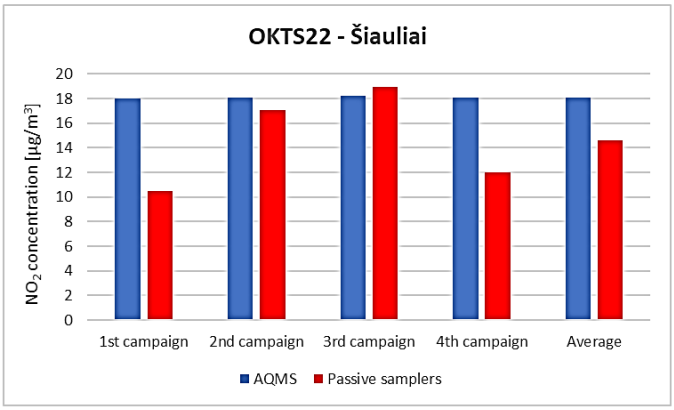
NO_2

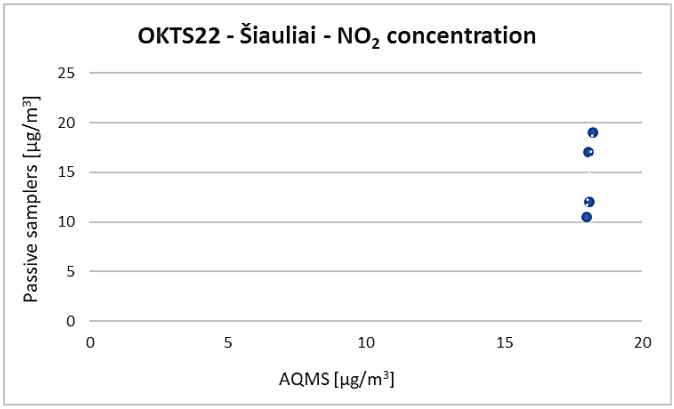

OKTS03 - Vilnius Žirmūnai
NO2 concentration [µg/m3]
35
30
25
20
15
10
5
0
1st campaign
2nd campaign
3rd campaign
4th campaign
Average
AQMS
Passive samplers

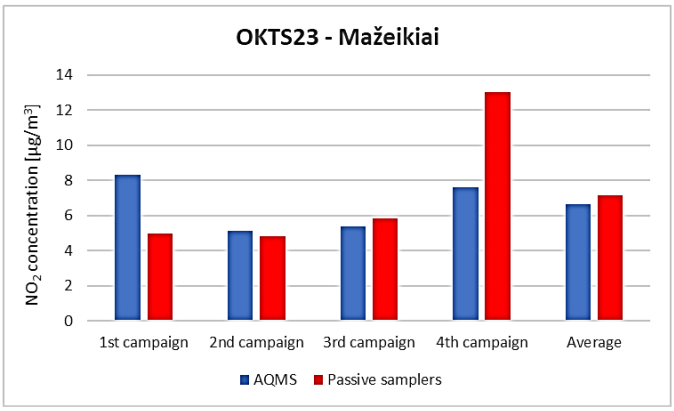

OKTS03 - Vilnius Žirmūnai - NO2 concentration
Passive samplers [µg/m3]
25
20
15
10
5
0
0
5
10
15
20
25
30
35
AQMS [µg/m3]

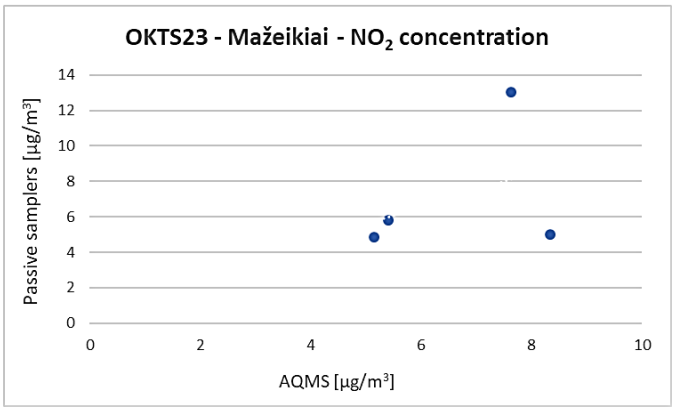

OKTS12 - Panevėžys Centras
NO2 concentration [µg/m3]
20
15
10
5
0
1st campaign
2nd campaign
3rd campaign
4th campaign
Average
AQMS
Passive samplers

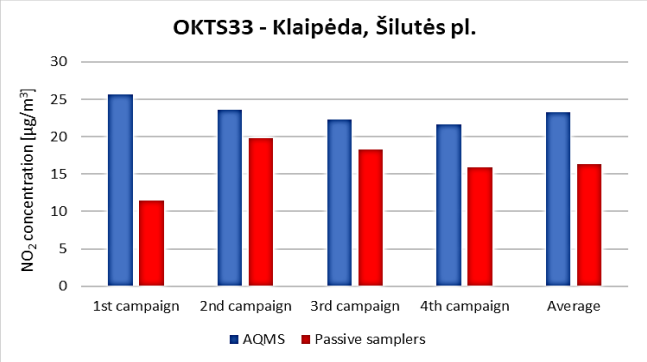

OKTS12 - Panevėžys Centras - NO2 concentration
Passive samplers [µg/m3]
15
10
5
0
0
5
10
15
20
AQMS [µg/m3]

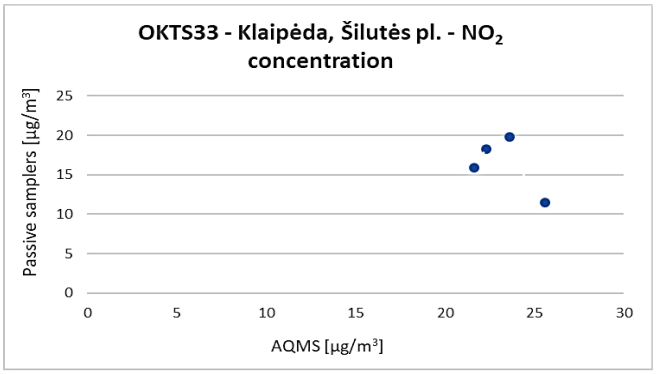

OKTS22 - Šiauliai
NO2 concentration [µg/m3]
20
18
16
14
12
10
8
6
4
2
0
1st campaign
2nd campaign
3rd campaign
4th campaign
Average
AQMS
Passive samplers

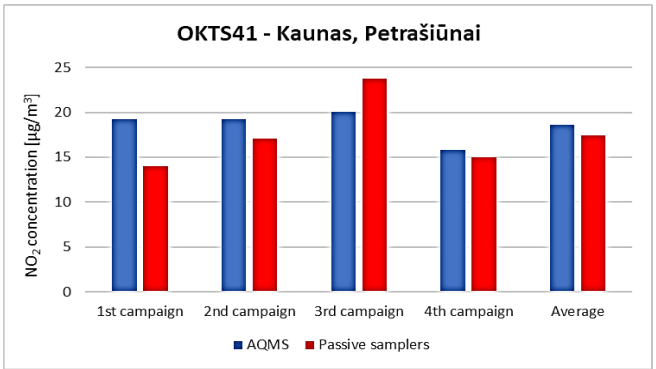

OKTS22 - Šiauliai - NO2 concentration
Passive samplers [µg/m3]
25
20
15
10
5
0
0
5
10
15
20
AQMS [µg/m3]

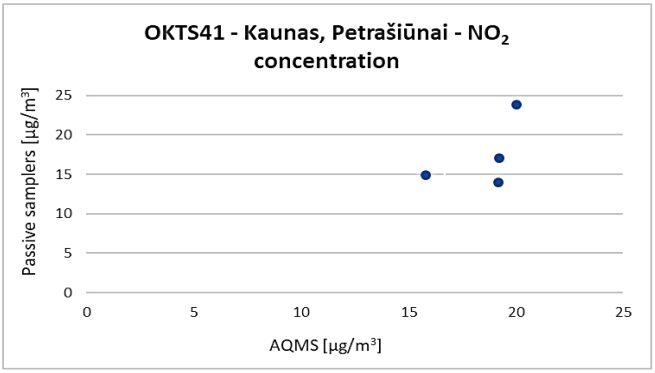

OKTS23 - Mažeikiai
NO2 concentration [µg/m3]
14
12
10
8
6
4
2
0
1st campaign
2nd campaign
3rd campaign
4th campaign
Average
AQMS
Passive samplers

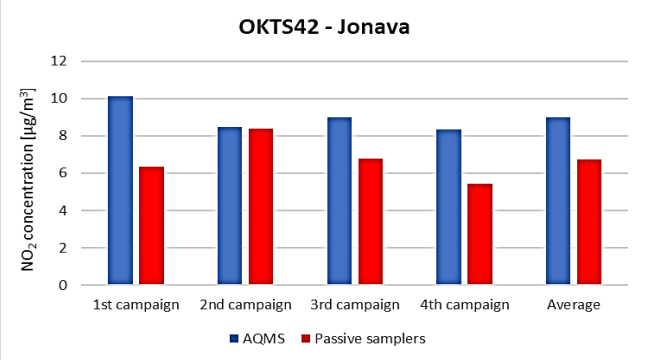

OKTS23 - Mažeikiai - NO2 concentration
Passive samplers [µg/m3]
14
12
10
8
6
4
2
0
0
2
4
6
8
10
AQMS [µg/m3]

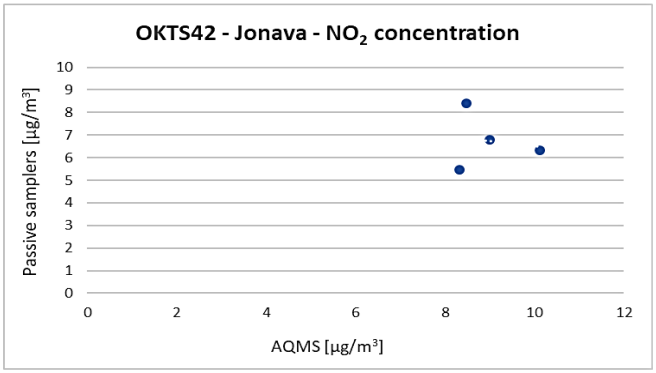

OKTS33 - Klaipėda, Šilutės pl.
NO2 concentration [µg/m3]
1st campaign
2nd campaign
3rd campaign
4th campaign
Average
AQMS
Passive samplers

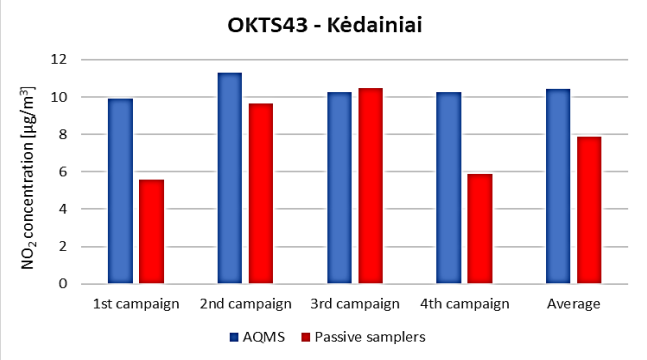

OKTS33 - Klaipėda, Šilutės pl. - NO2 concentration
Passive samplers [µg/m3]
AQMS [µg/m3]

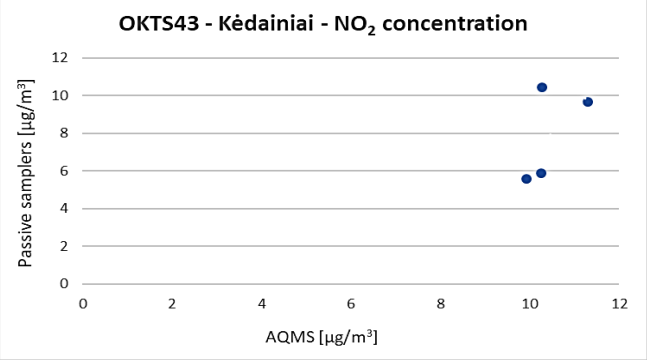

OKTS41 - Kaunas, Petrašiūnai
NO2 concentration [µg/m3]
1st campaign
2nd campaign
3rd campaign
4th campaign
Average
AQMS
Passive samplers

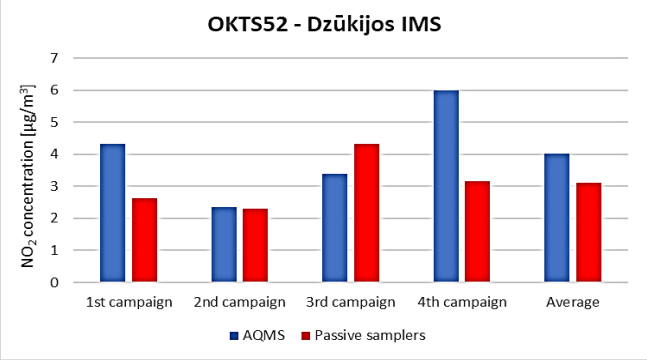

OKTS41 - Kaunas, Petrašiūnai - NO2 concentration
Passive samplers [µg/m3]
AQMS [µg/m3]

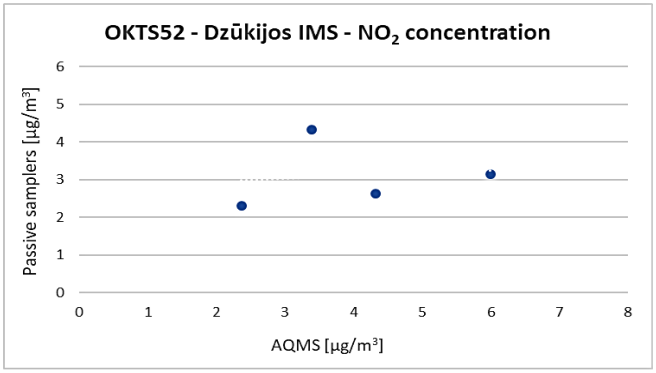

OKTS42 - Jonava
NO2 concentration [µg/m3]
1st campaign
2nd campaign
3rd campaign
4th campaign
Average
AQMS
Passive samplers

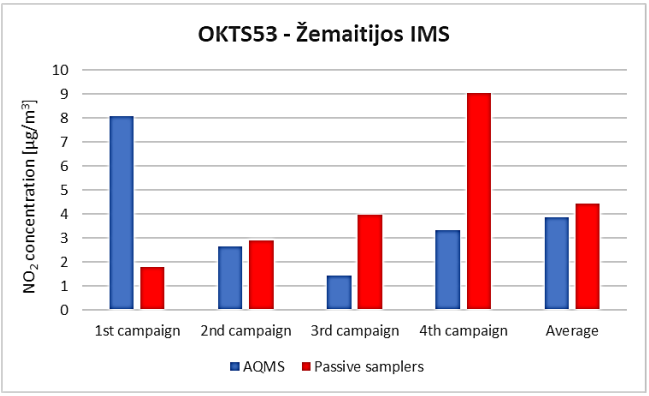

OKTS42 - Jonava - NO2 concentration
Passive samplers [µg/m3]
AQMS [µg/m3]


OKTS43 - Kėdainiai
NO2 concentration [µg/m3]
1st campaign
2nd campaign
3rd campaign
4th campaign
Average
AQMS
Passive samplers


OKTS43 - Kėdainiai - NO2 concentration
Passive samplers [µg/m3]
AQMS [µg/m3]


OKTS52 - Dzūkijos IMS
NO2 concentration [µg/m3]
1st campaign
2nd campaign
3rd campaign
4th campaign
Average
AQMS
Passive samplers


OKTS52 - Dzūkijos IMS - NO2 concentration
Passive samplers [µg/m3]
AQMS [µg/m3]



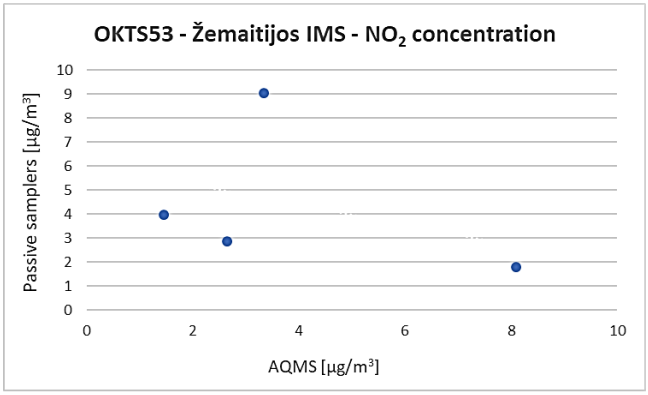
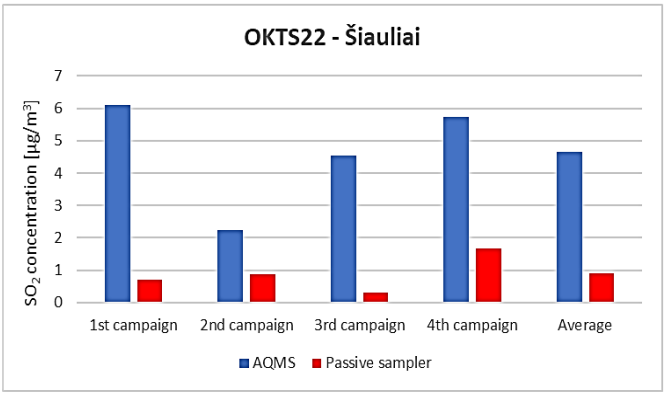
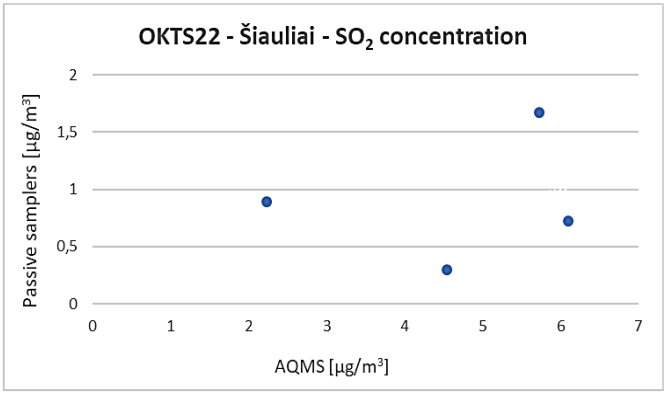
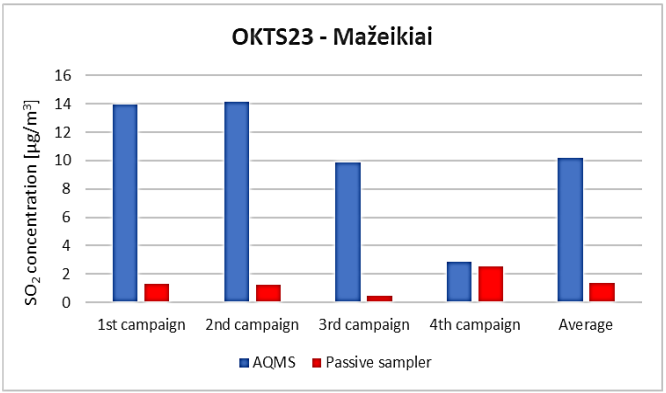


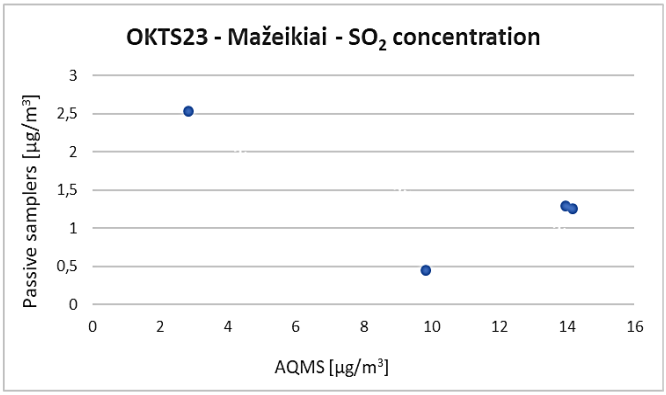
Fig. 71: NO_2 - Comparison of average values measured by passive samplers and at AQM stations.

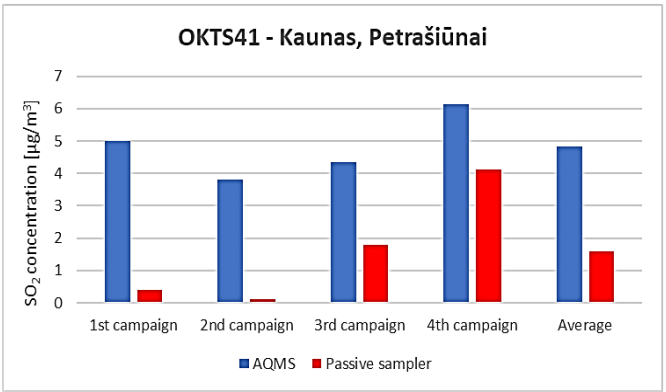
SO_2

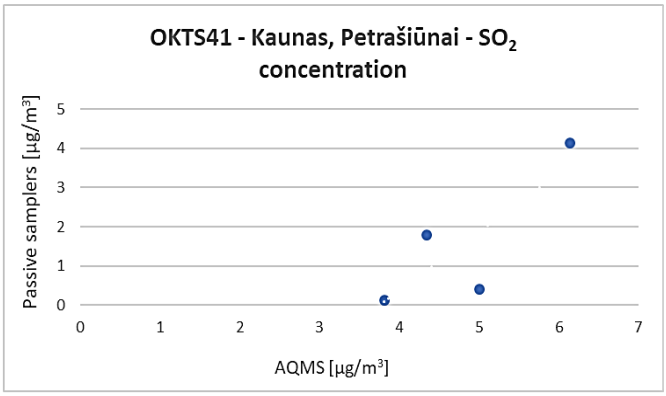












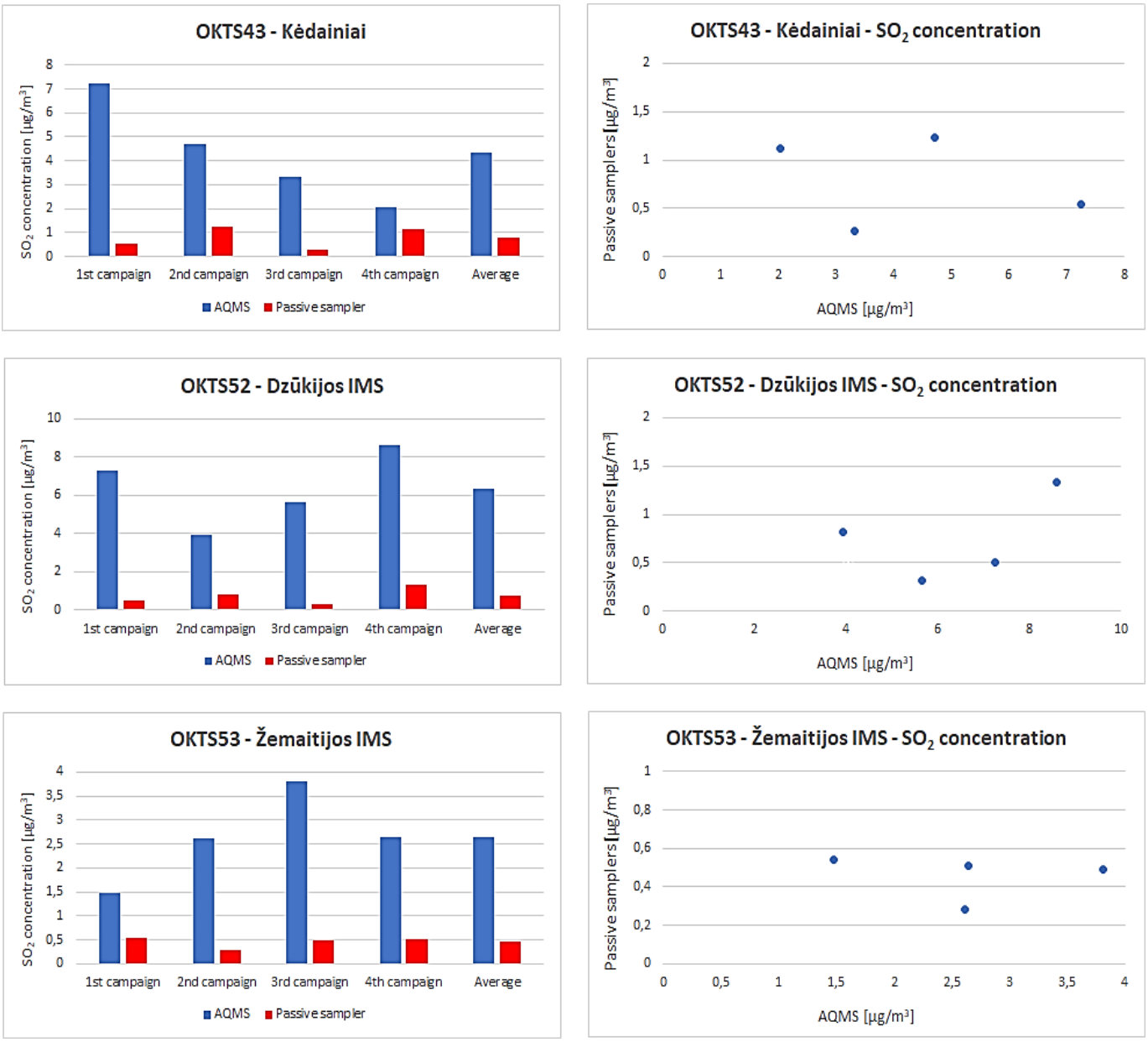
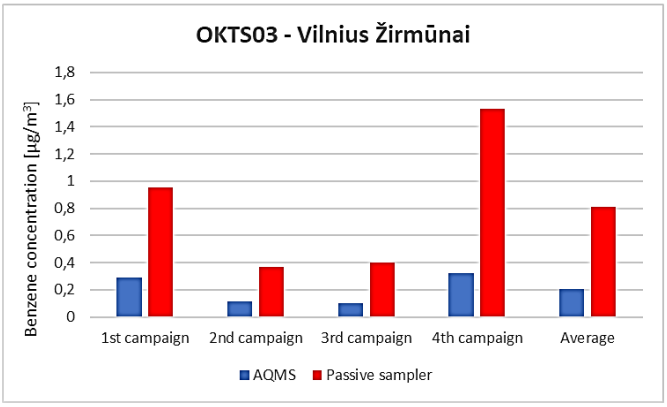
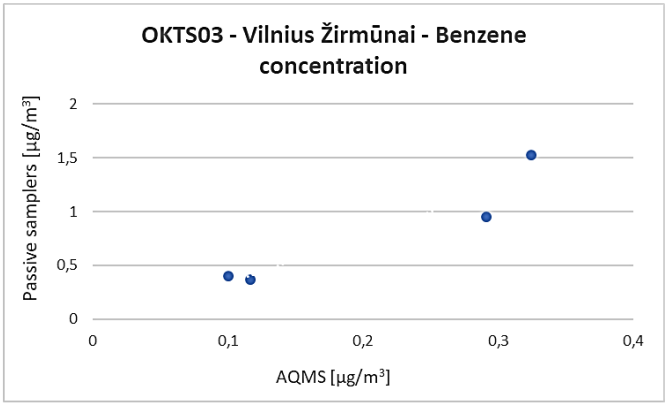
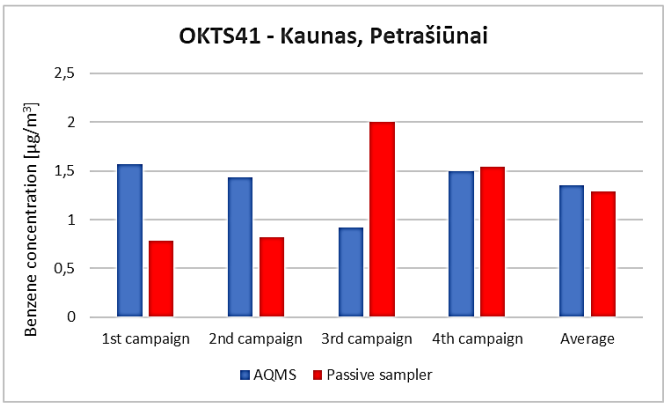


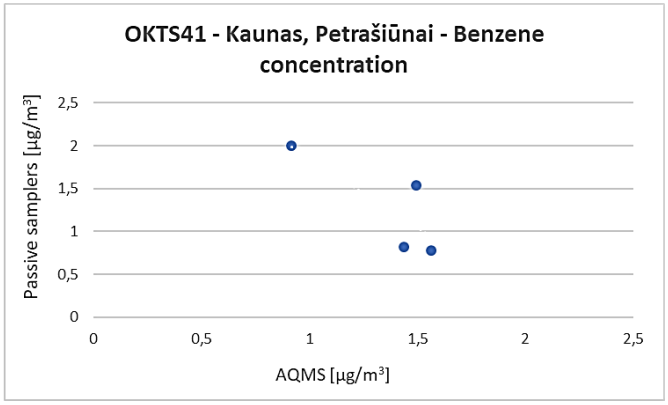
Fig. 72: SO_2 - Comparison of average values measured by passive samplers and at AQM stations.

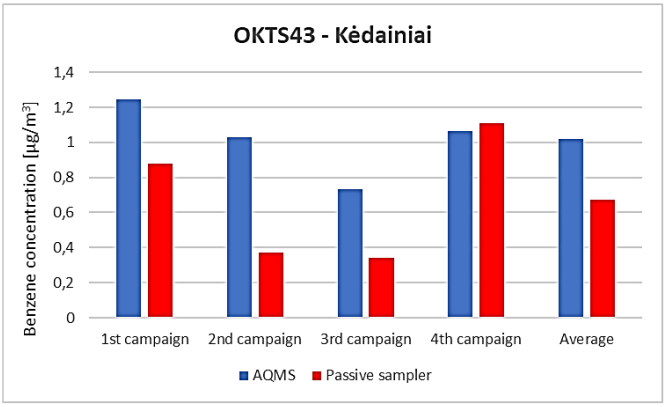
Benzene











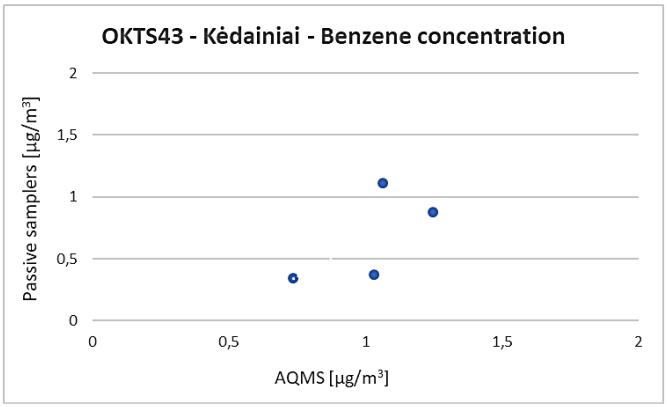


Fig. 73: Benzene - Comparison of average values measured by passive samplers and at AQM stations.

8.3. Evaluation by Zone and Agglomeration

The territory of Lithuania is divided into one zone (all Lithuania) and two agglomerations (Kaunas and Vilnius) for the purposes of air quality assessment. In this chapter, the individual gaseous pollutants will be evaluated according to this division.

8.3.1 Gaseous Compounds Concentration Maps – Zone Lithuania

In Fig. 74 - 88 interpolated concentrations of NO_2, SO_2 and benzene are shown on maps of the whole Lithuania, both by individual campaigns and their average values. In most cases, the spatial variability of concentrations is relatively small and, with the exception of slightly elevated values for the Vilnius and Kaunas agglomerations, greater diversity is evident only in the 4th campaign for SO_2 concentrations, but this variability is on the level of very low concentrations. All maps were modeled using data Kriging and inverse distance interpolation reflecting (showing) methods. The white markers show locations measured by Radiello passive samplers, while the blue markers show locations with an automatic measuring program using reference analyzers. In the figures the maps in A4 format are shown. The A2 maps are attached as attachments to this report in both electronic and printed form.

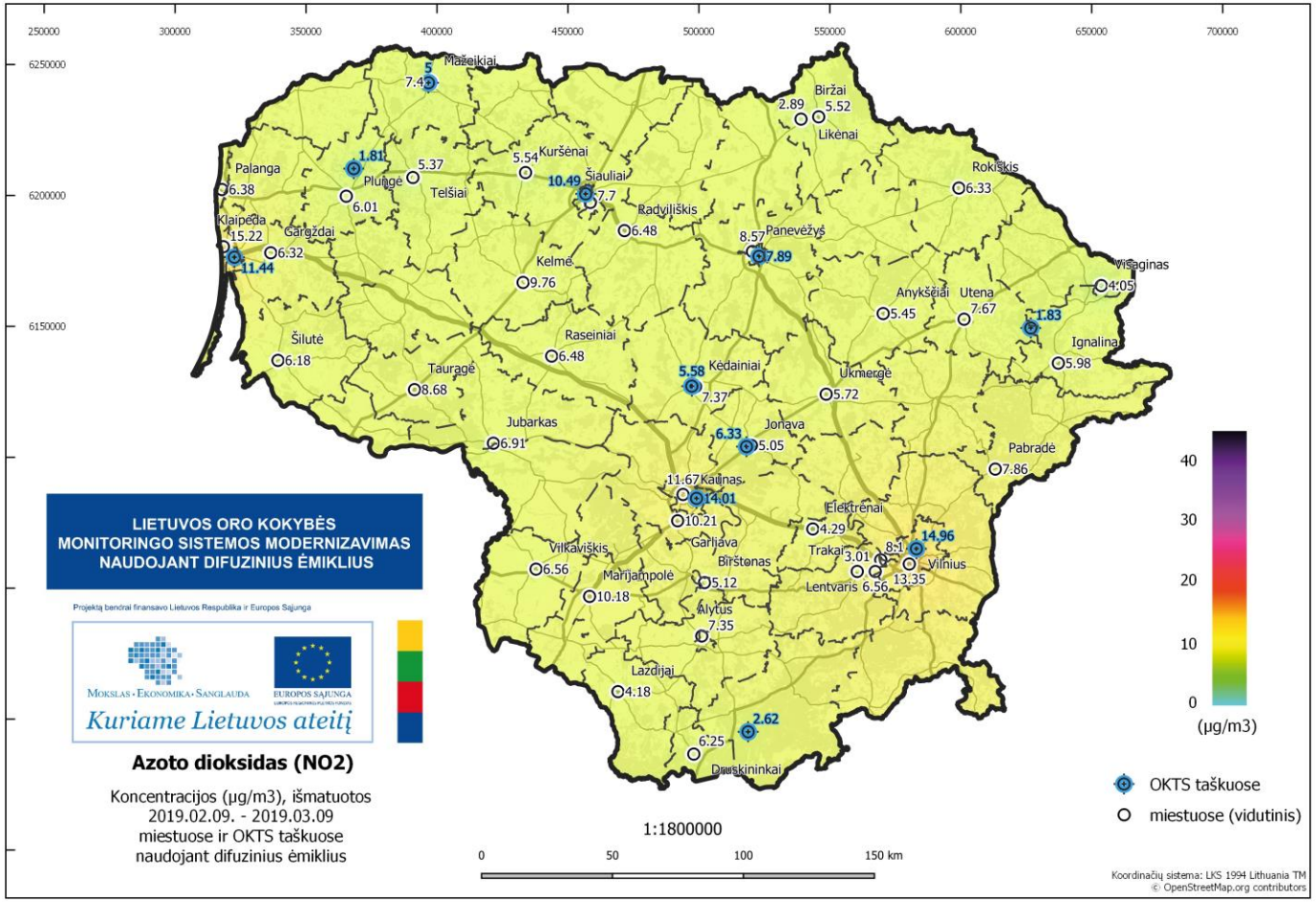


Fig. 74: Map of distribution of NO_2 concentration – 1st campaign.

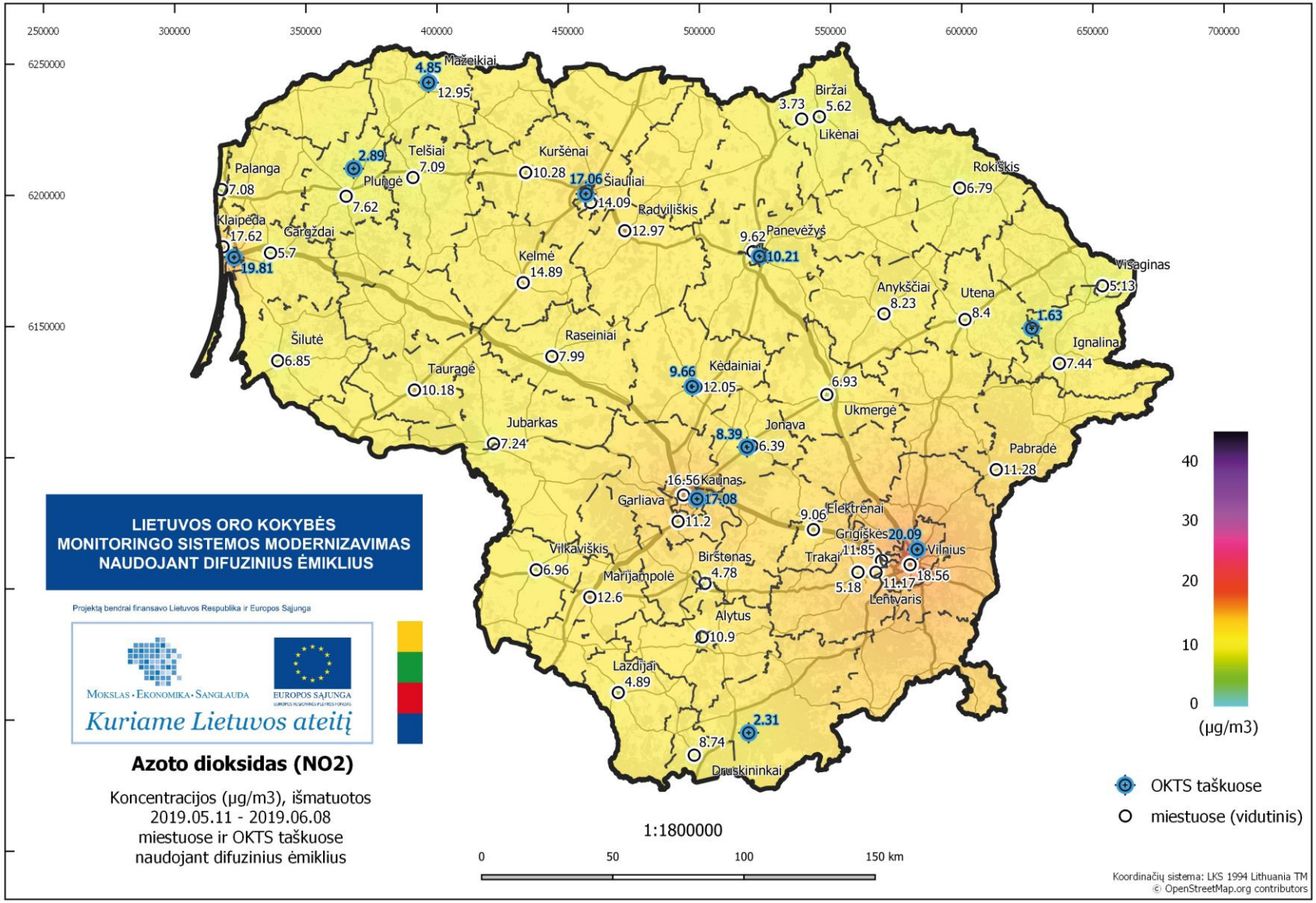


Fig. 75: Map of distribution of NO_2 concentration – 2nd campaign.

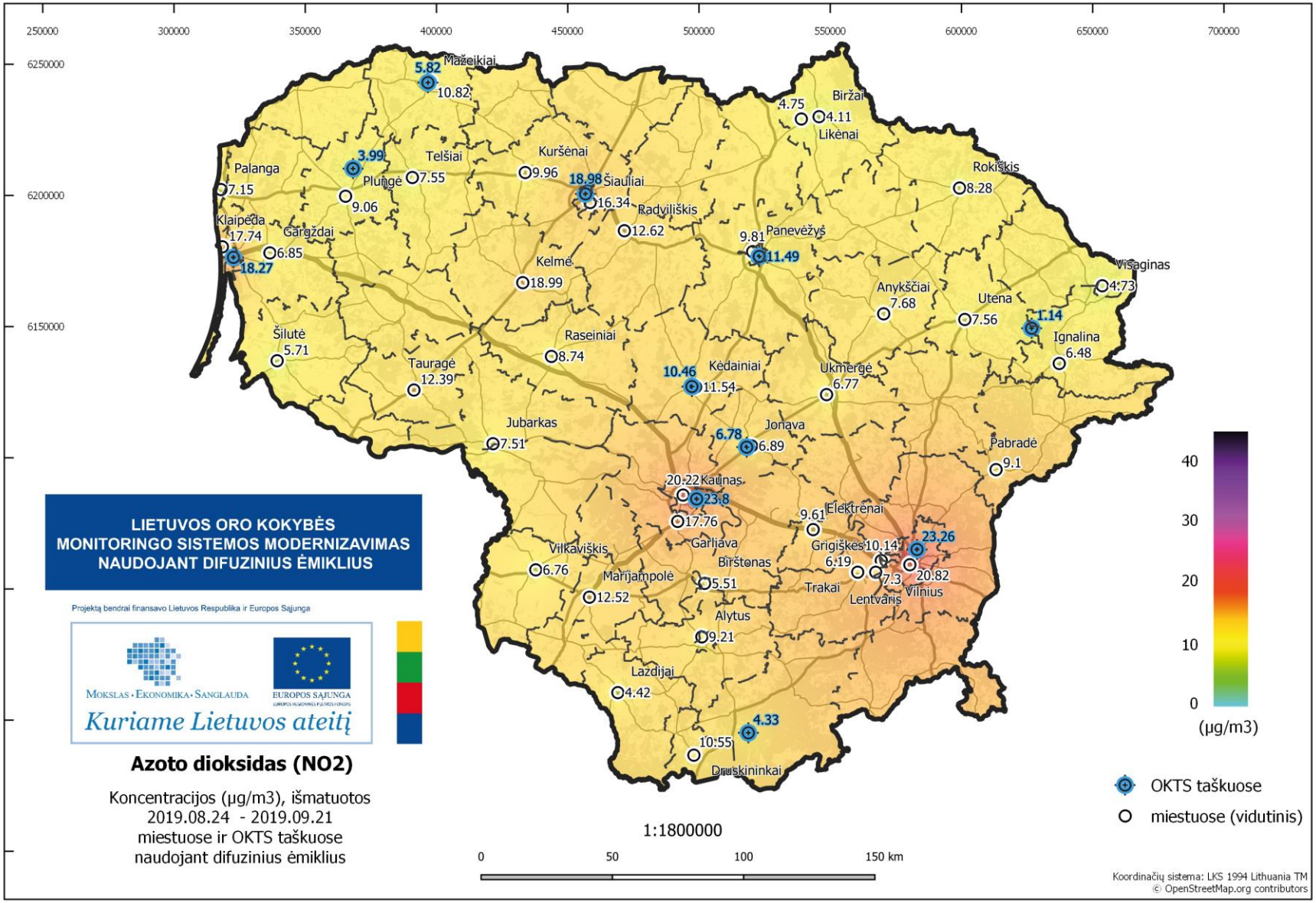


Fig. 76: Map of distribution of NO_2 concentration – 3rd campaign.

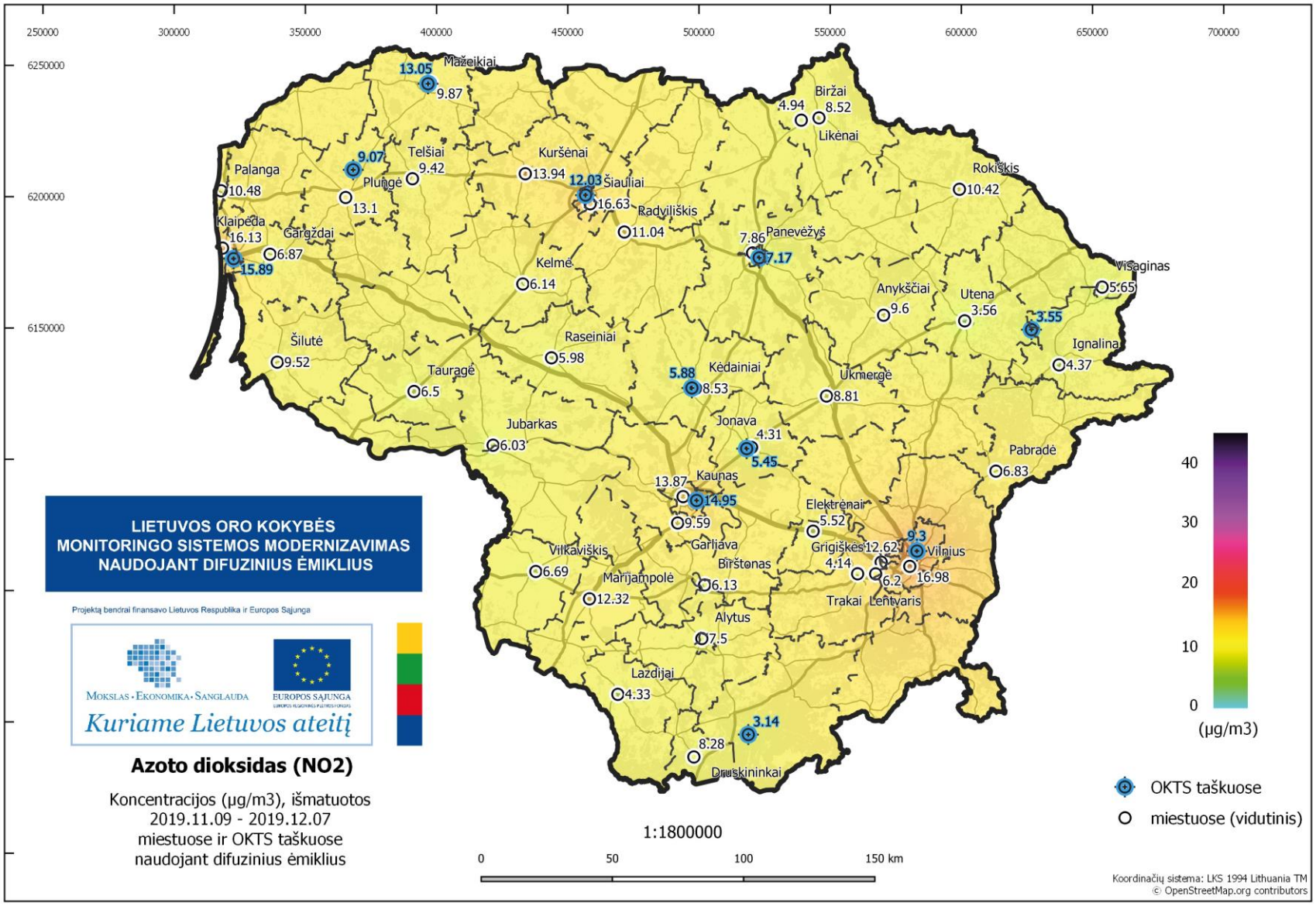


Fig. 77: Map of distribution of NO_2 concentration – 4th campaign.

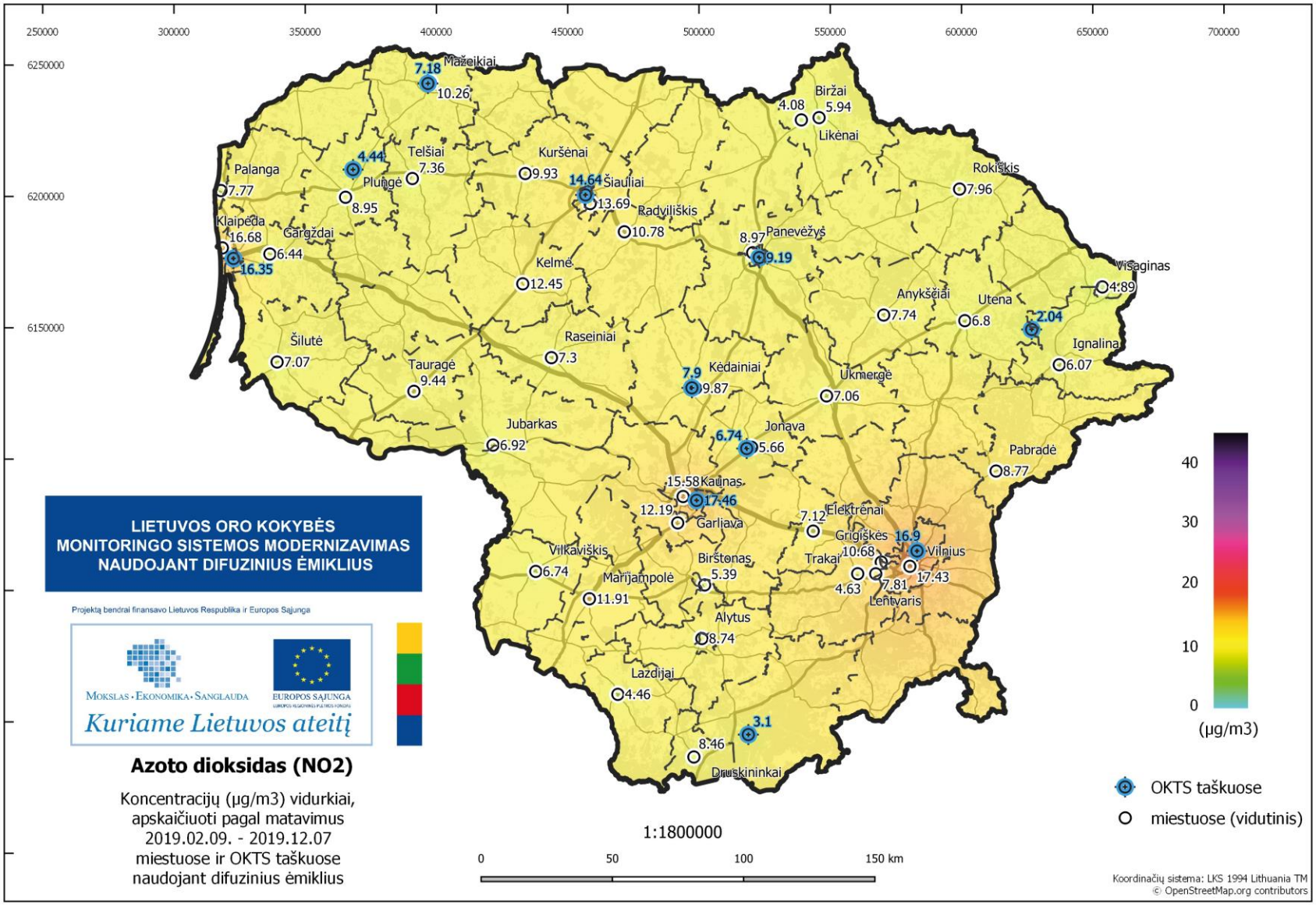


Fig. 78: Map of distribution of NO_2 concentration – average from all campaigns.

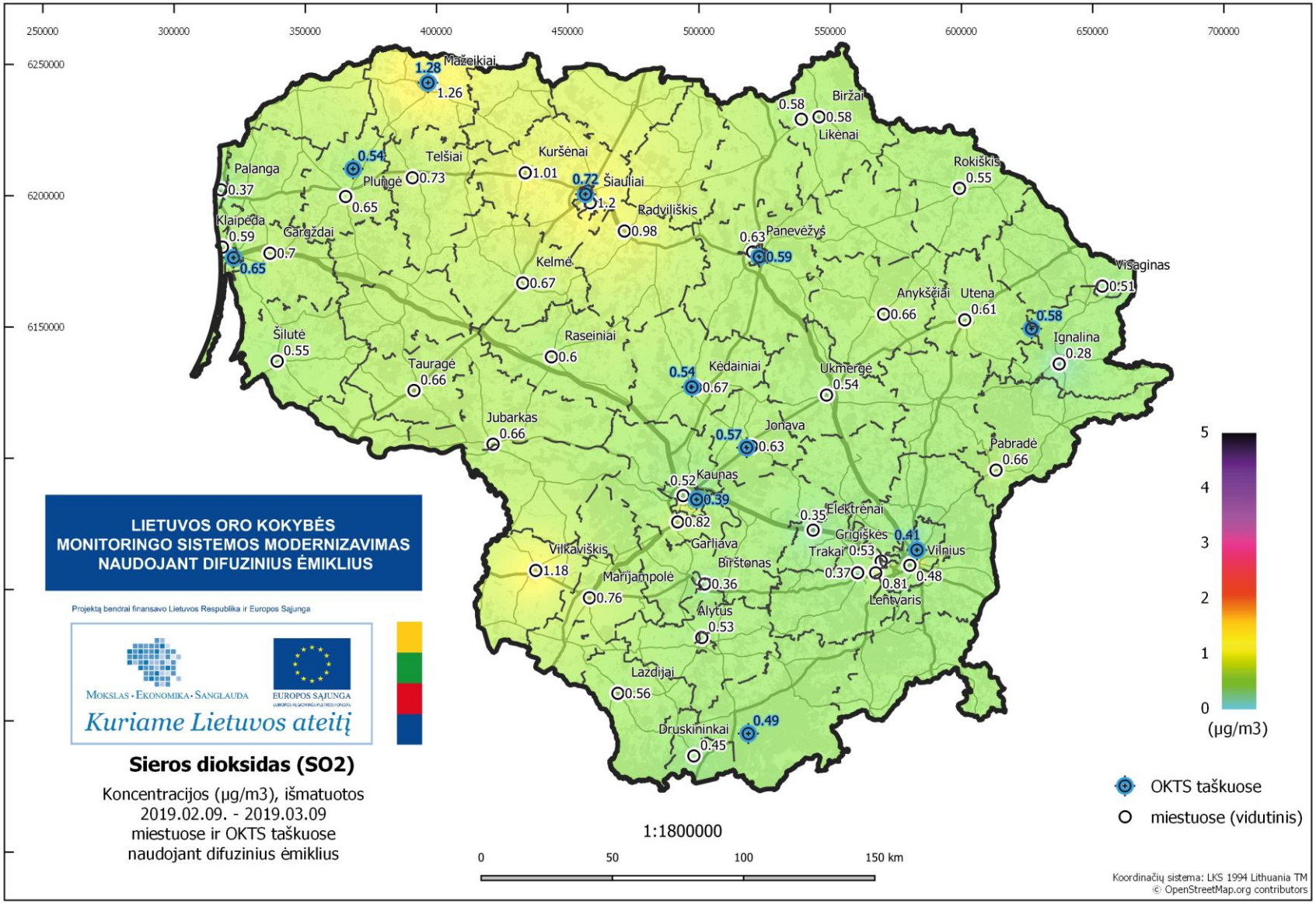


Fig. 79: Map of distribution of SO_2 concentration – 1st campaign.

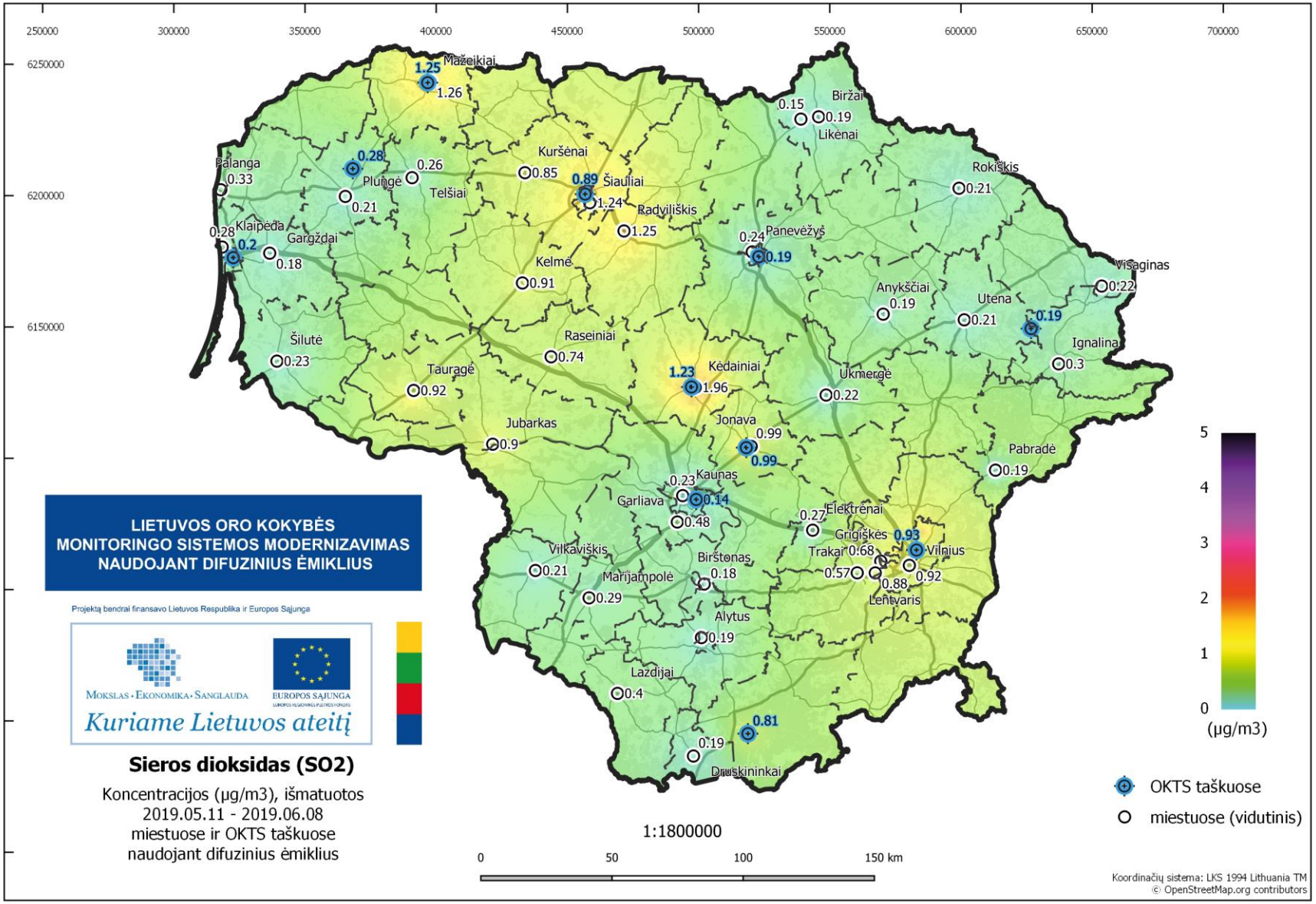


Fig. 80: Map of distribution of SO_2 concentration – 2nd campaign.

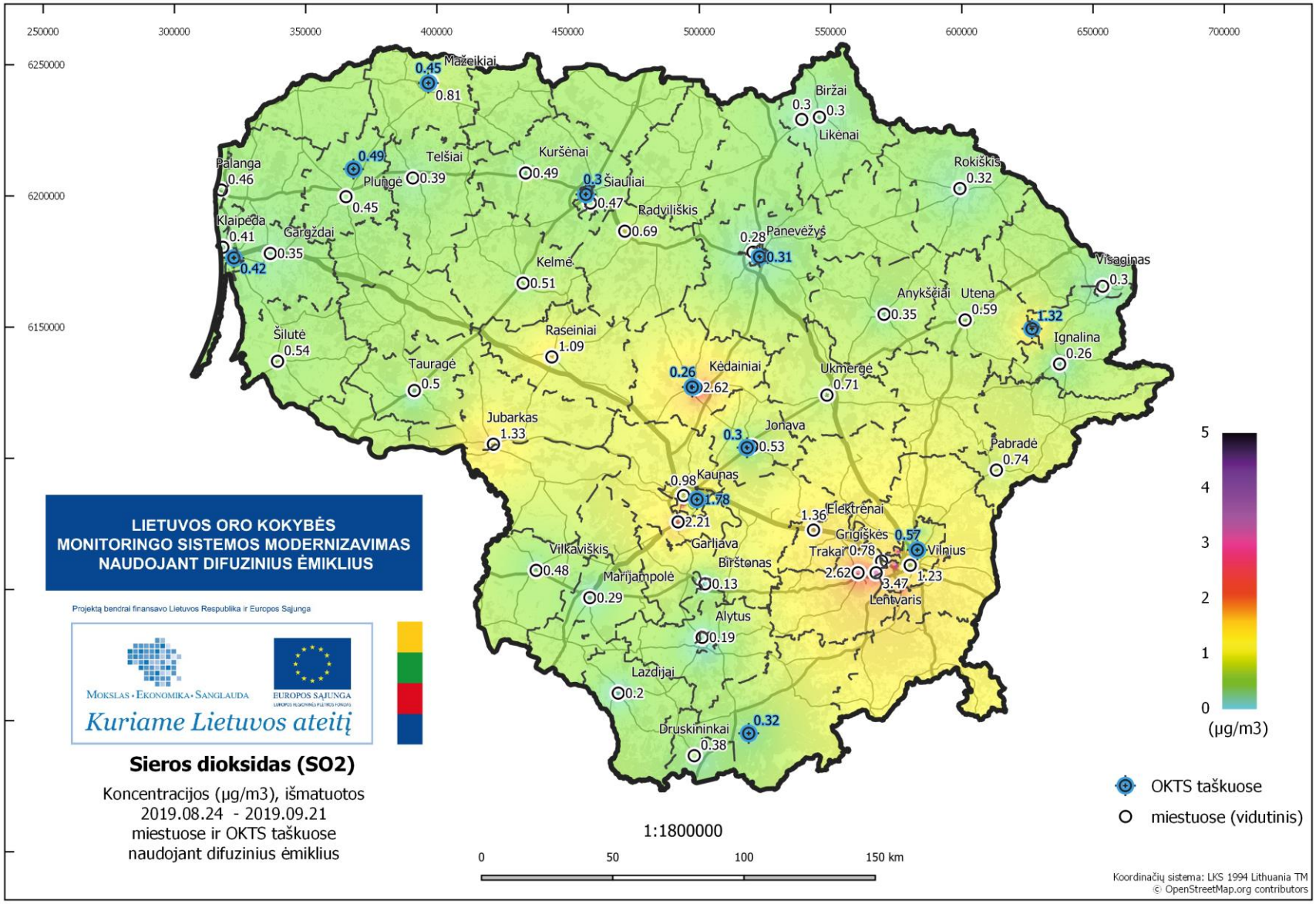


Fig. 81: Map of distribution of SO_2 concentration – 3rd campaign.

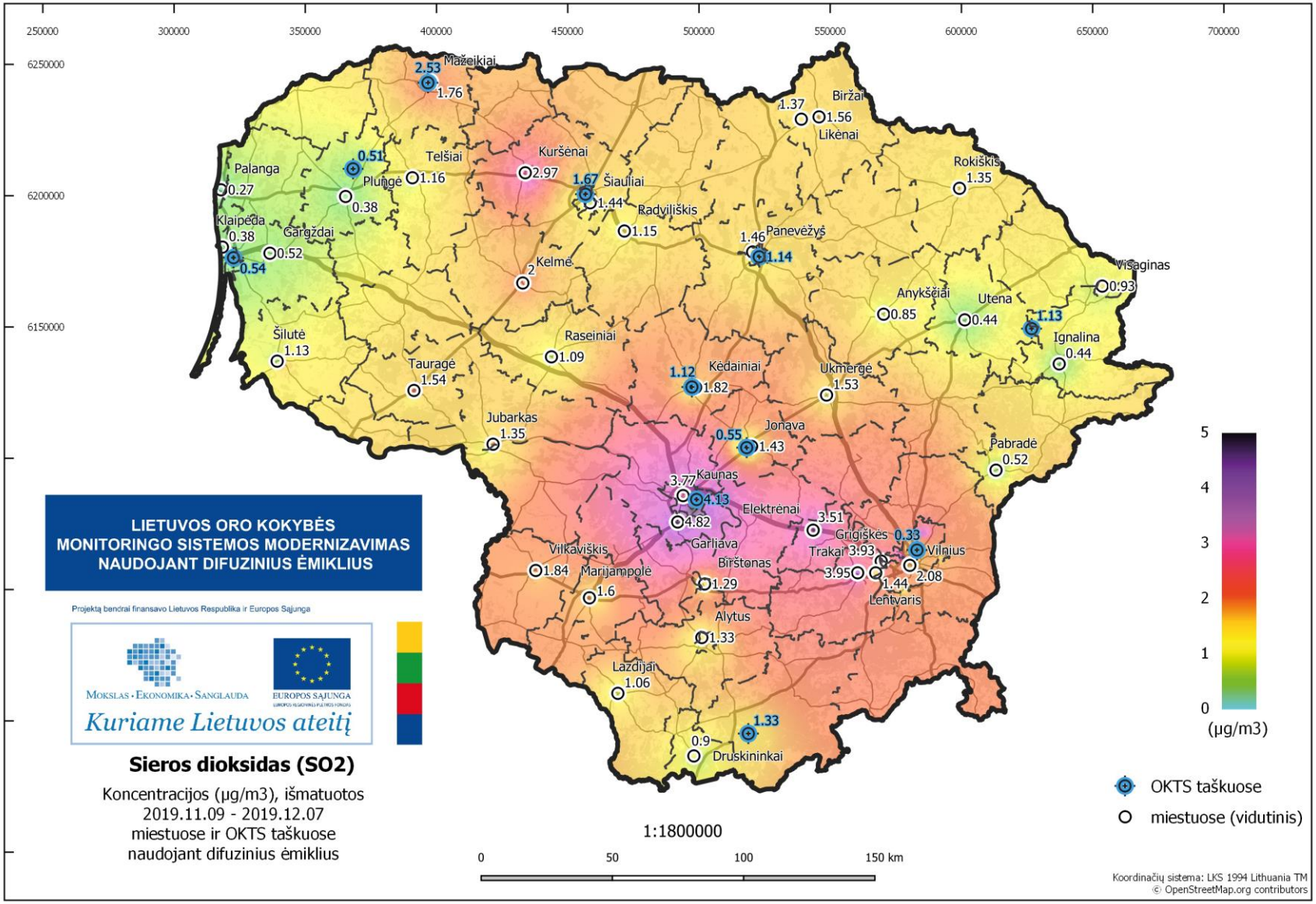


Fig. 82: Map of distribution of SO_2 concentration – 4th campaign.

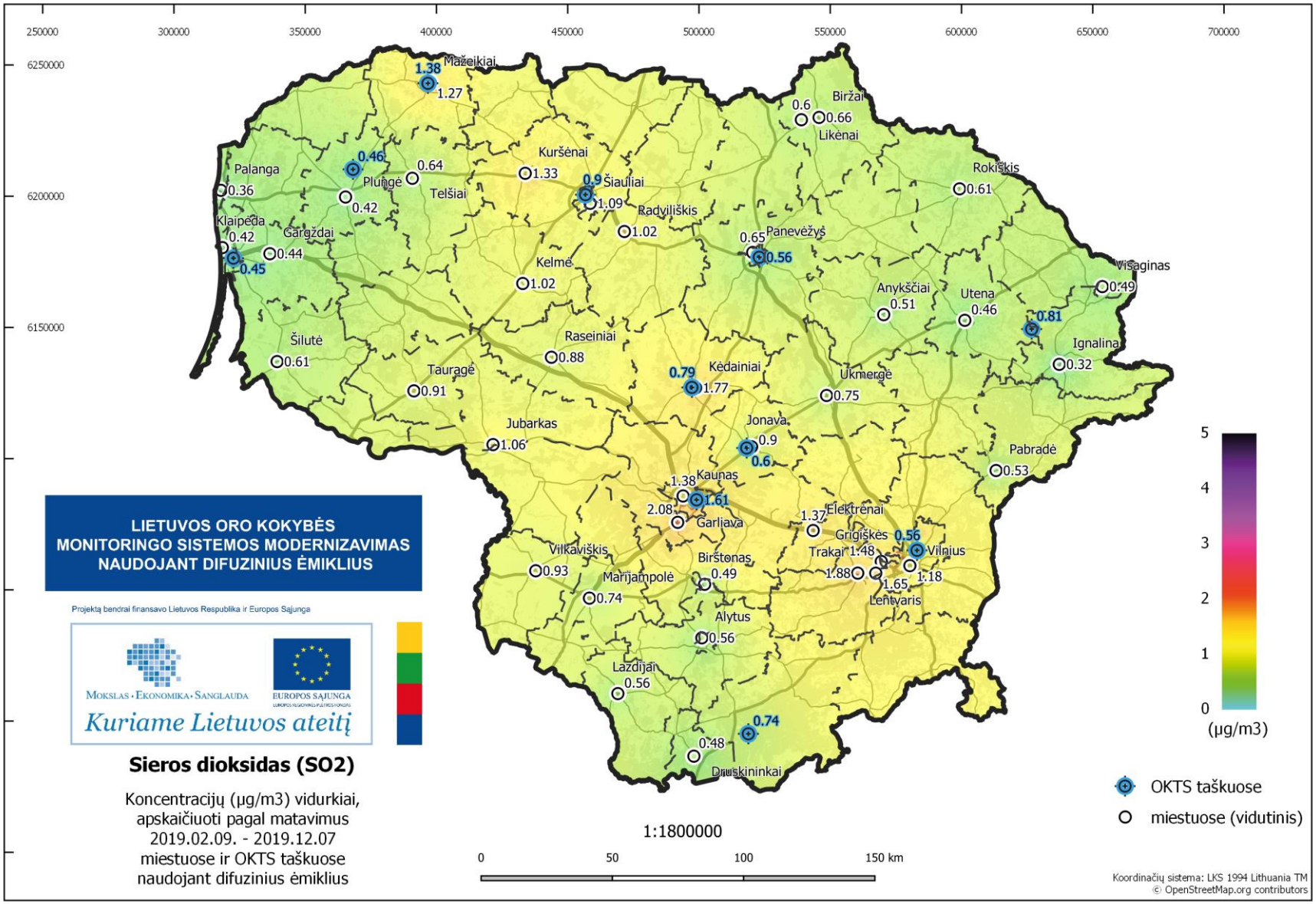


Fig. 83: Map of distribution of SO_2 concentration – average from all campaigns.

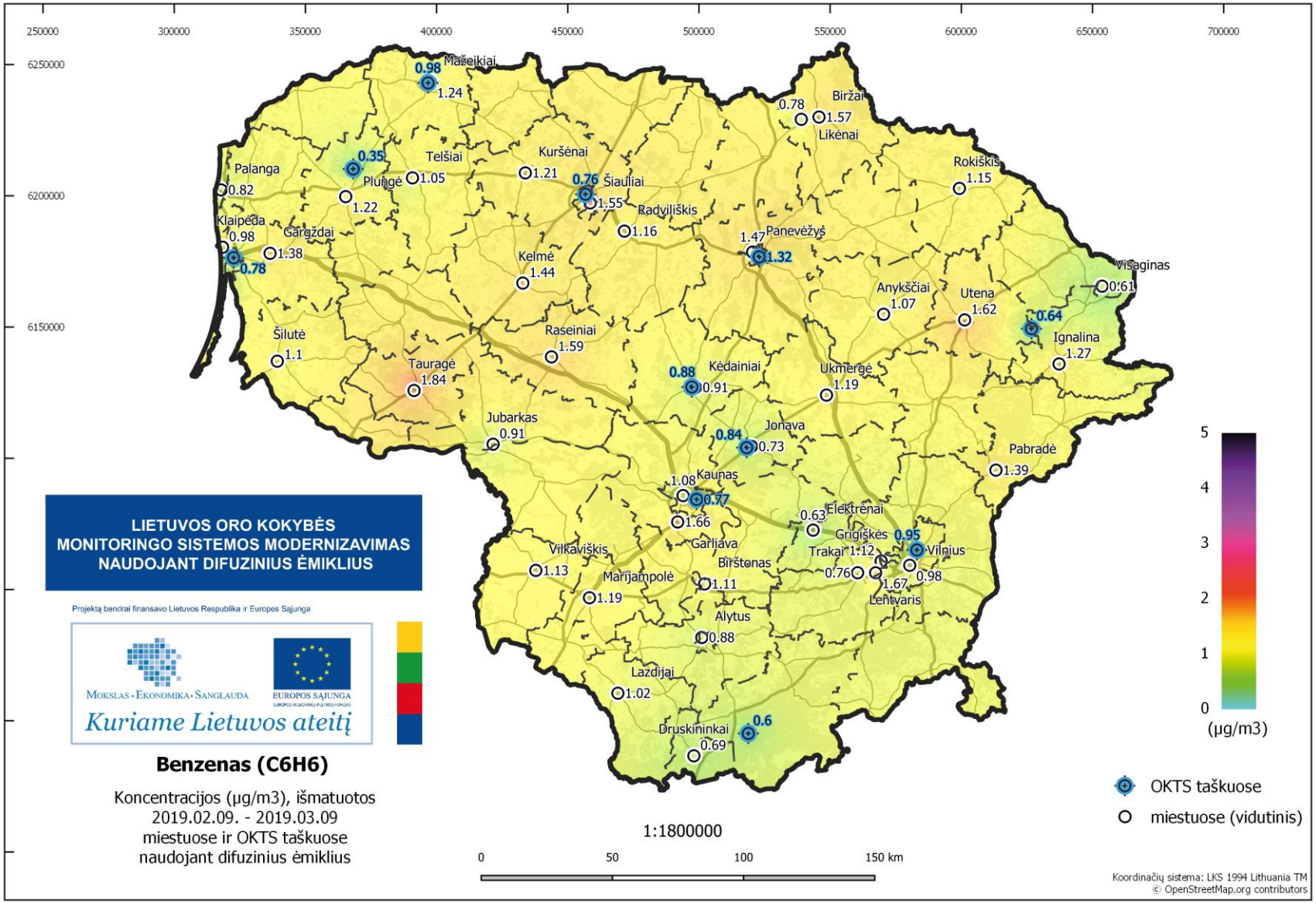


Fig. 84: Map of distribution of benzene concentration – 1st campaign.

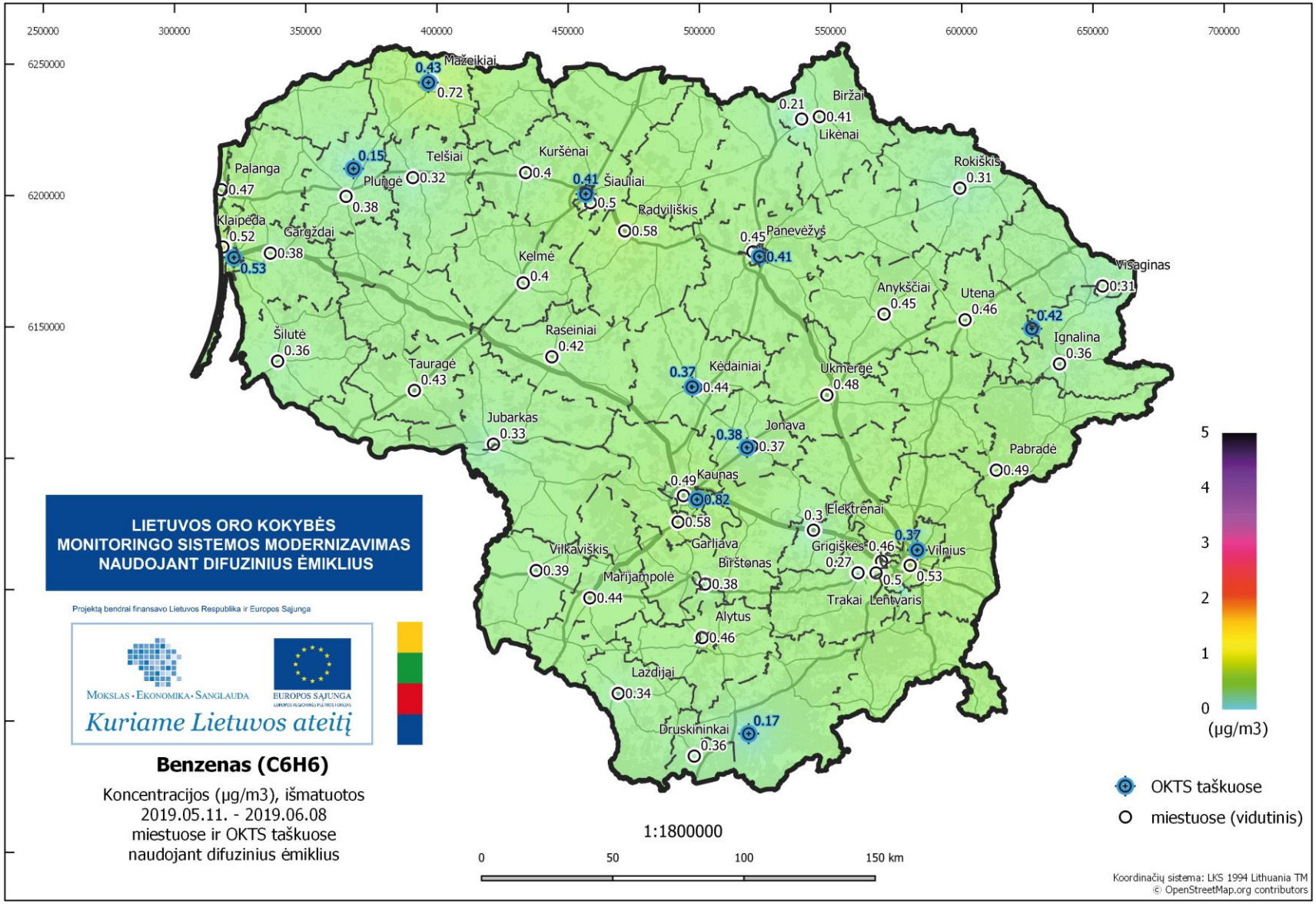


Fig. 85: Map of distribution of benzene concentration – 2nd campaign.

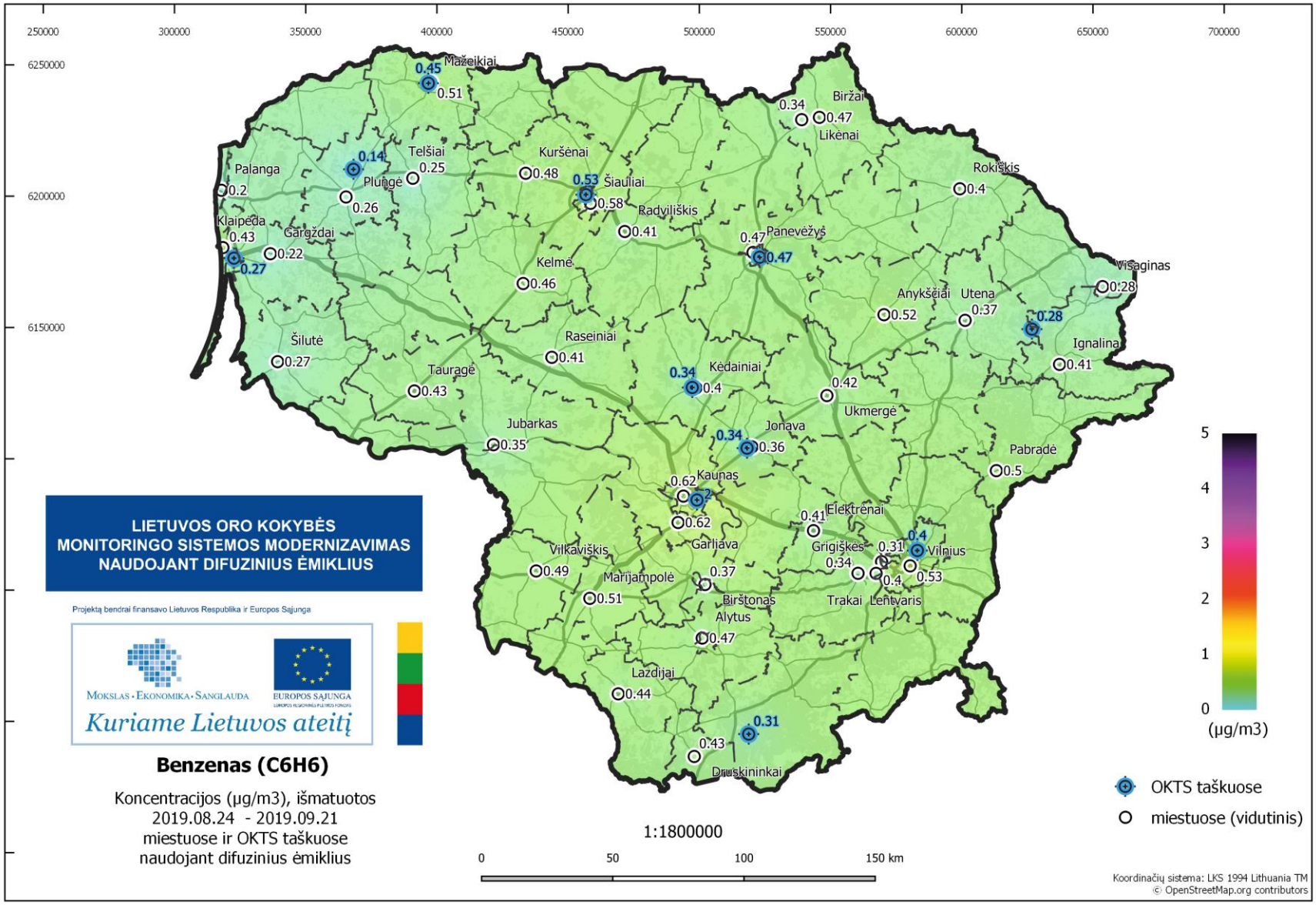


Fig. 86: Map of distribution of benzene concentration – 3rd campaign.

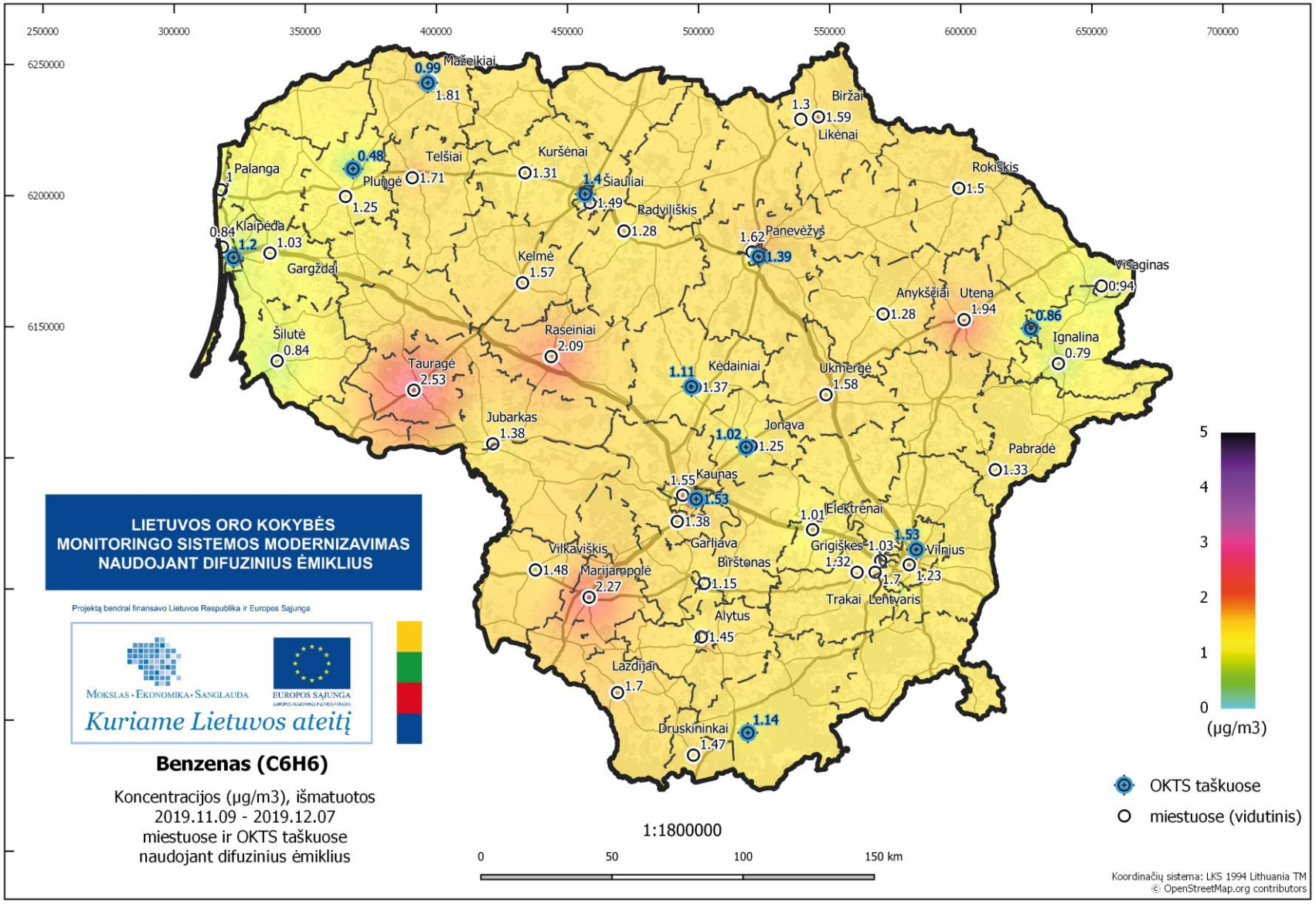


Fig. 87: Map of distribution of benzene concentration – 4th campaign.

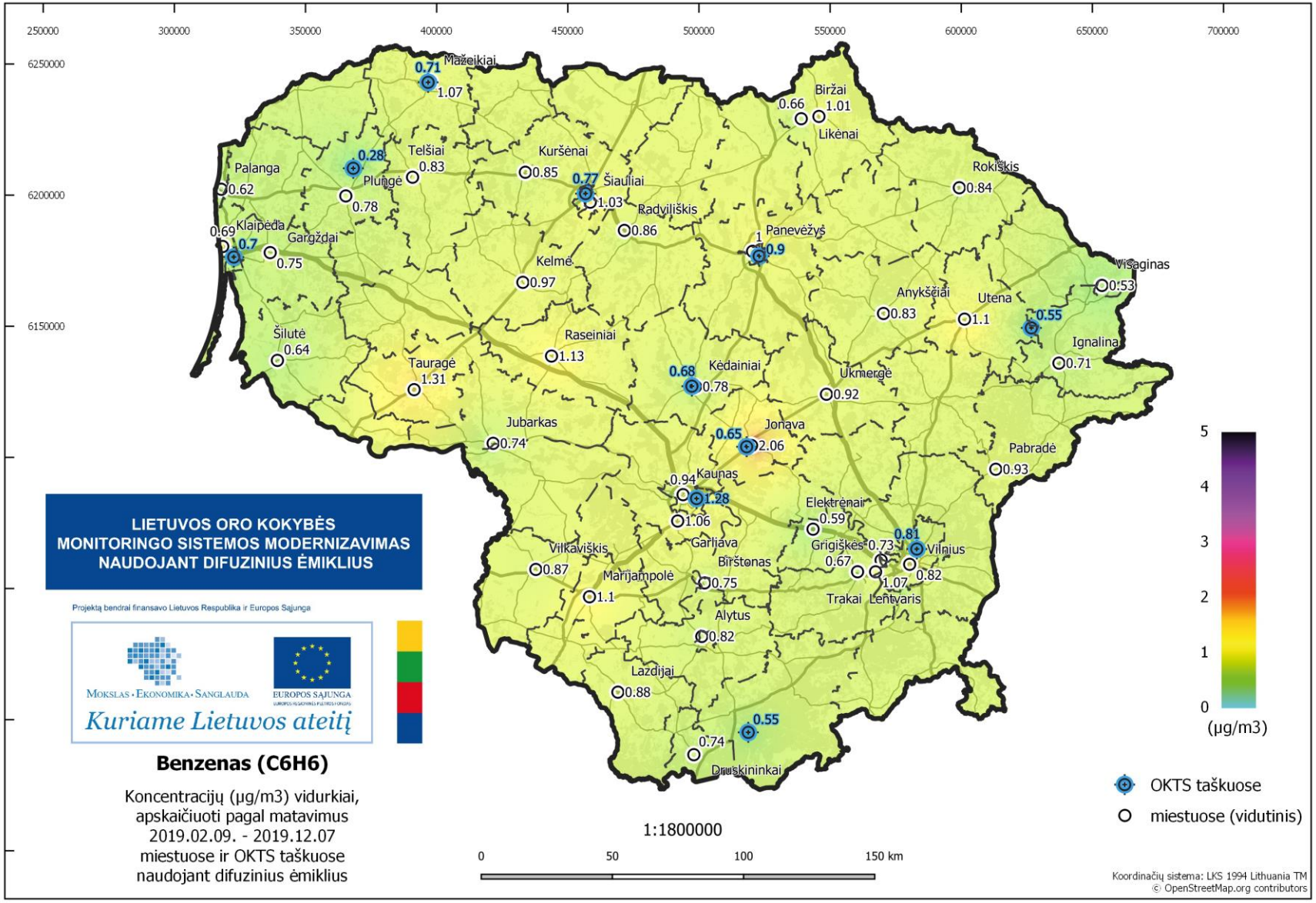


Fig. 88: Map of distribution of benzene concentration – average from all campaigns.

8.3.2 Gaseous Compounds Concentration Maps – Agglomeration Vilnius

In Fig. 89 - 103 interpolated concentrations of NO_2, SO_2 and benzene are shown on the maps of the Vilnius agglomeration both by individual campaigns and by their average values. NO_2 concentrations are highest in the central part of the Vilnius agglomeration, which is probably due to the higher concentration of car traffic in this area. SO_2 concentrations are very low throughout the entire Vilnius agglomeration. Slightly higher values were found in the peripheral parts of the agglomeration, mainly in the residential zone. The spatial variability of benzene concentrations is relatively small and a slightly greater diversity is evident only in the 4th campaign in the southern part of the agglomeration, where the values are significantly higher.

All maps were modeled using data Kriging and inverse distance interpolation reflecting (showing) methods. The white markers show locations measured by Radiello passive samplers, while the blue markers show locations with an automatic measuring program using reference analyzers. In the figures the maps in A4 format are shown. The A2 maps are attached as attachments to this report in both electronic and printed form.

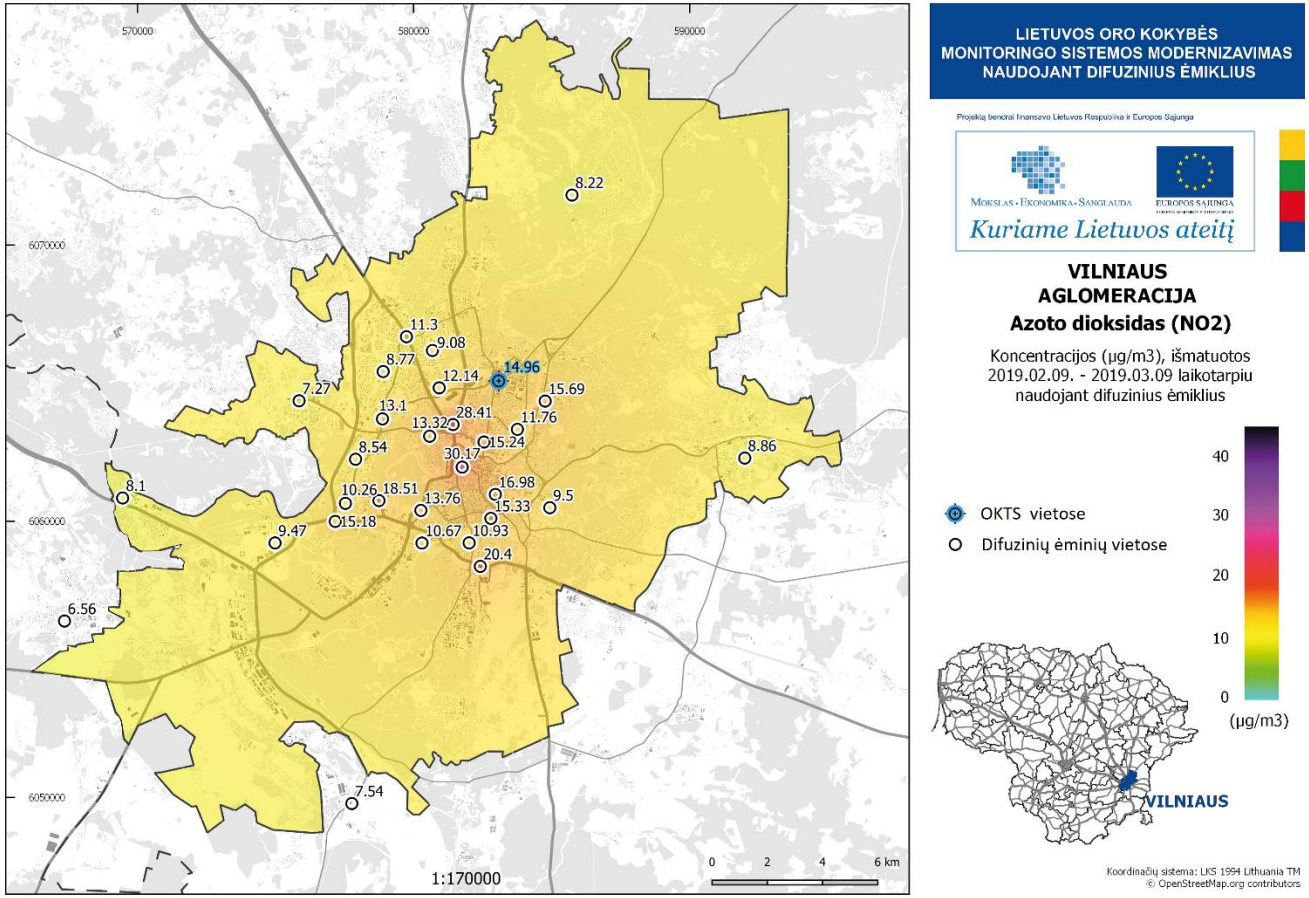


Fig. 89: Vilnius Agglomeration - Map of distribution of NO_2 concentration – 1st campaign.

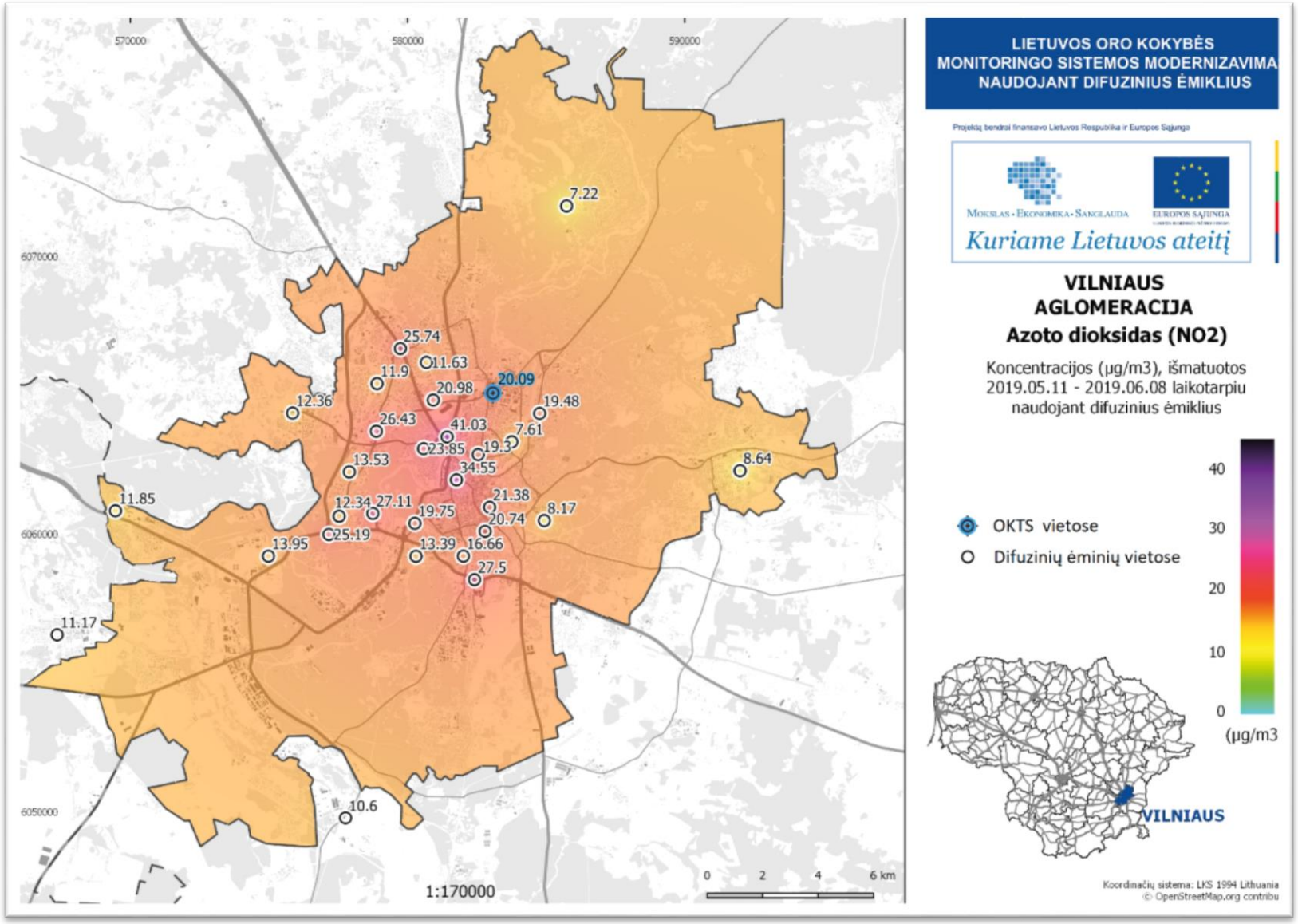


Fig. 90: Vilnius Agglomeration - Map of distribution of NO_2 concentration – 2nd campaign.

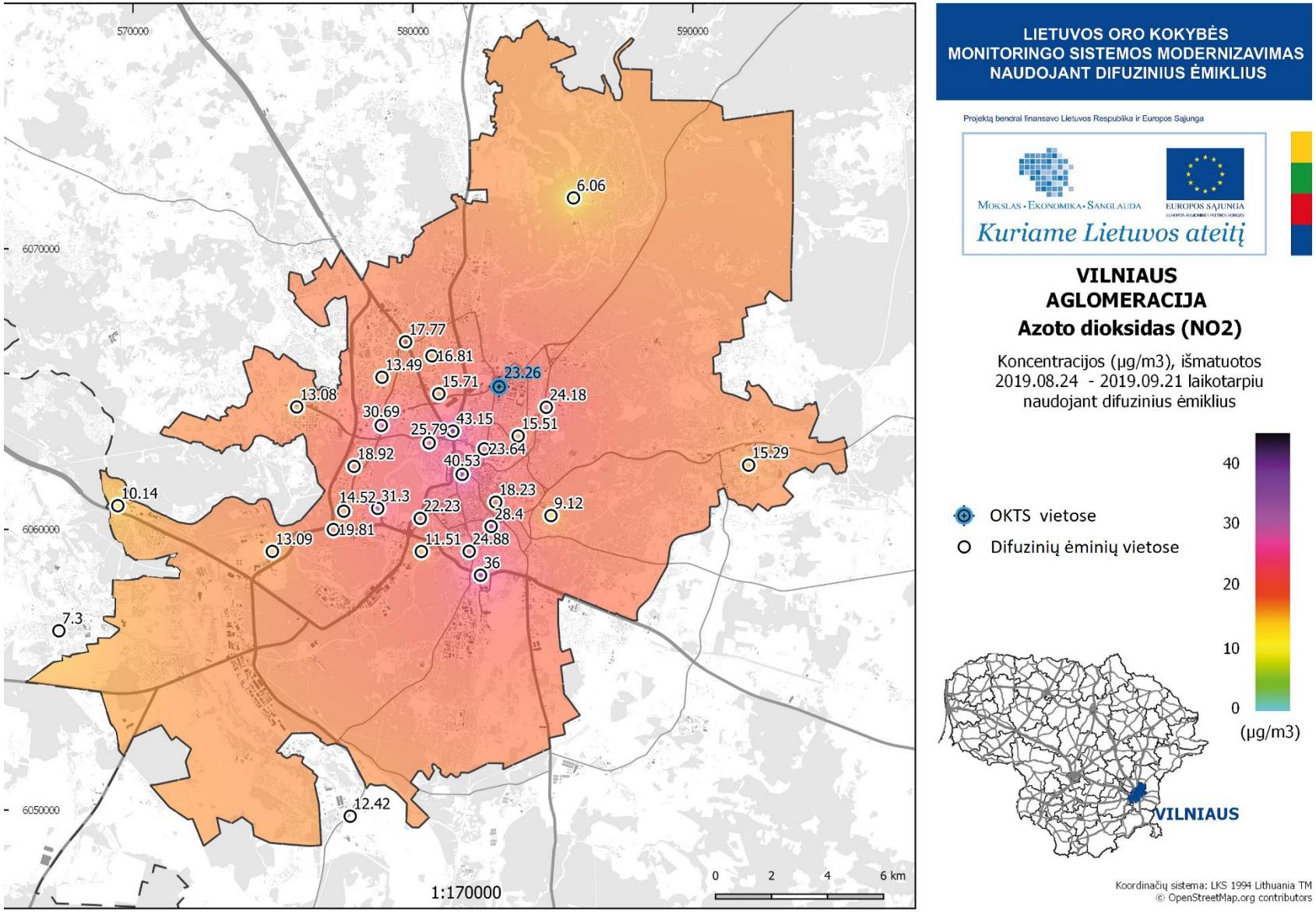


Fig. 91: Vilnius Agglomeration - Map of distribution of NO_2 concentration – 3rd campaign.

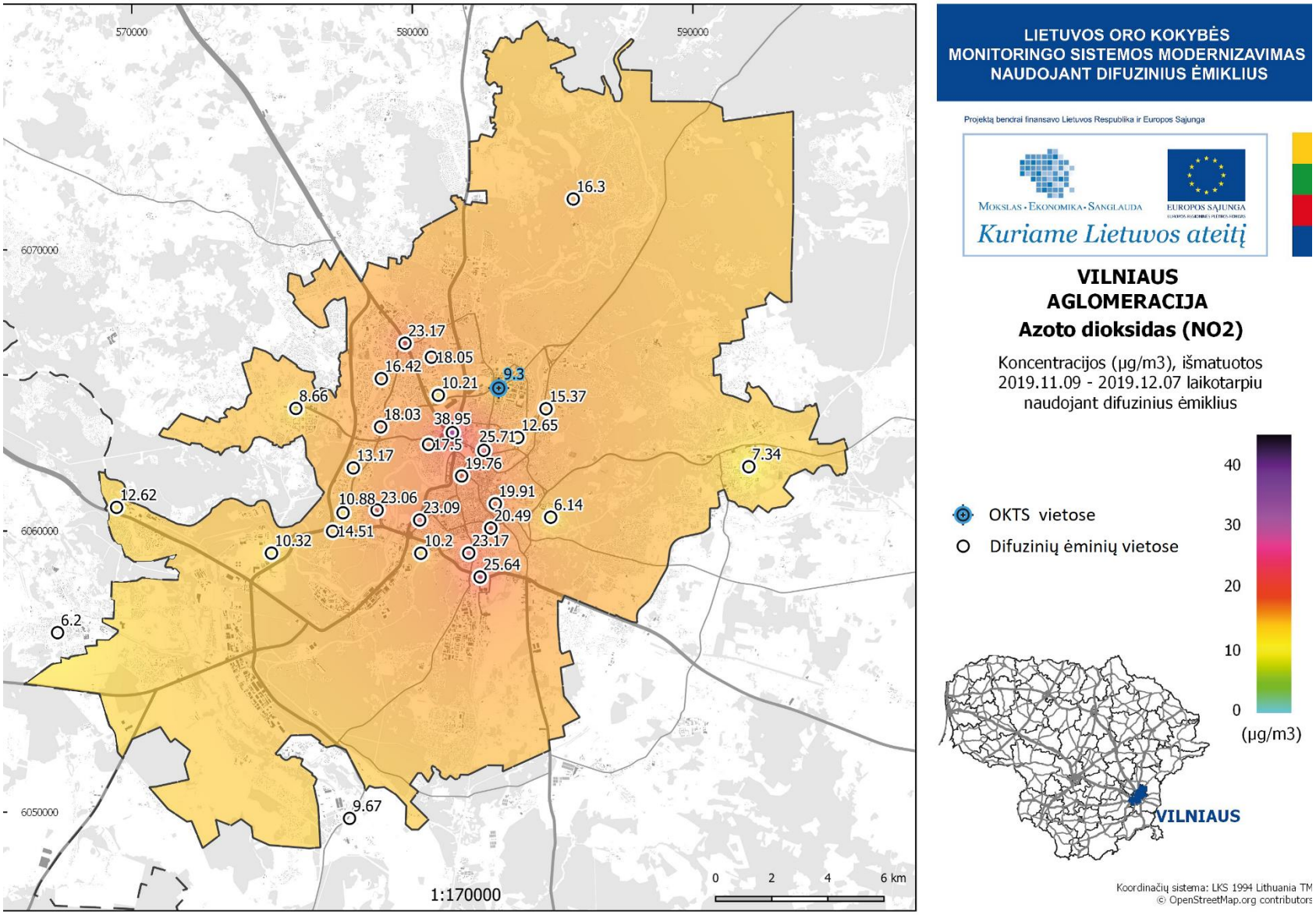


Fig. 92: Vilnius Agglomeration - Map of distribution of NO_2 concentration – 4th campaign.

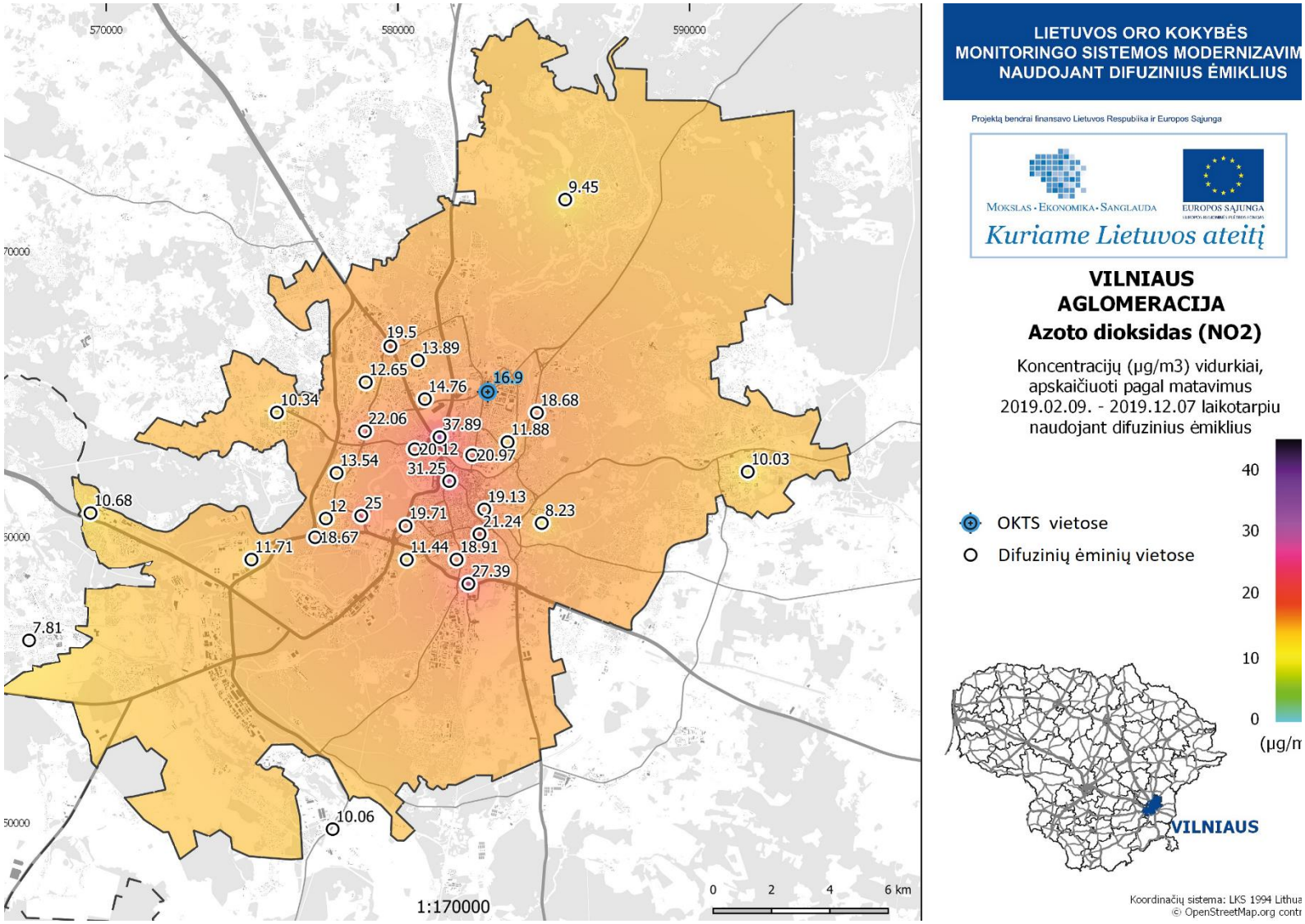


Fig. 93: Vilnius Agglomeration - Map of distribution of NO_2 concentration – average from all campaigns

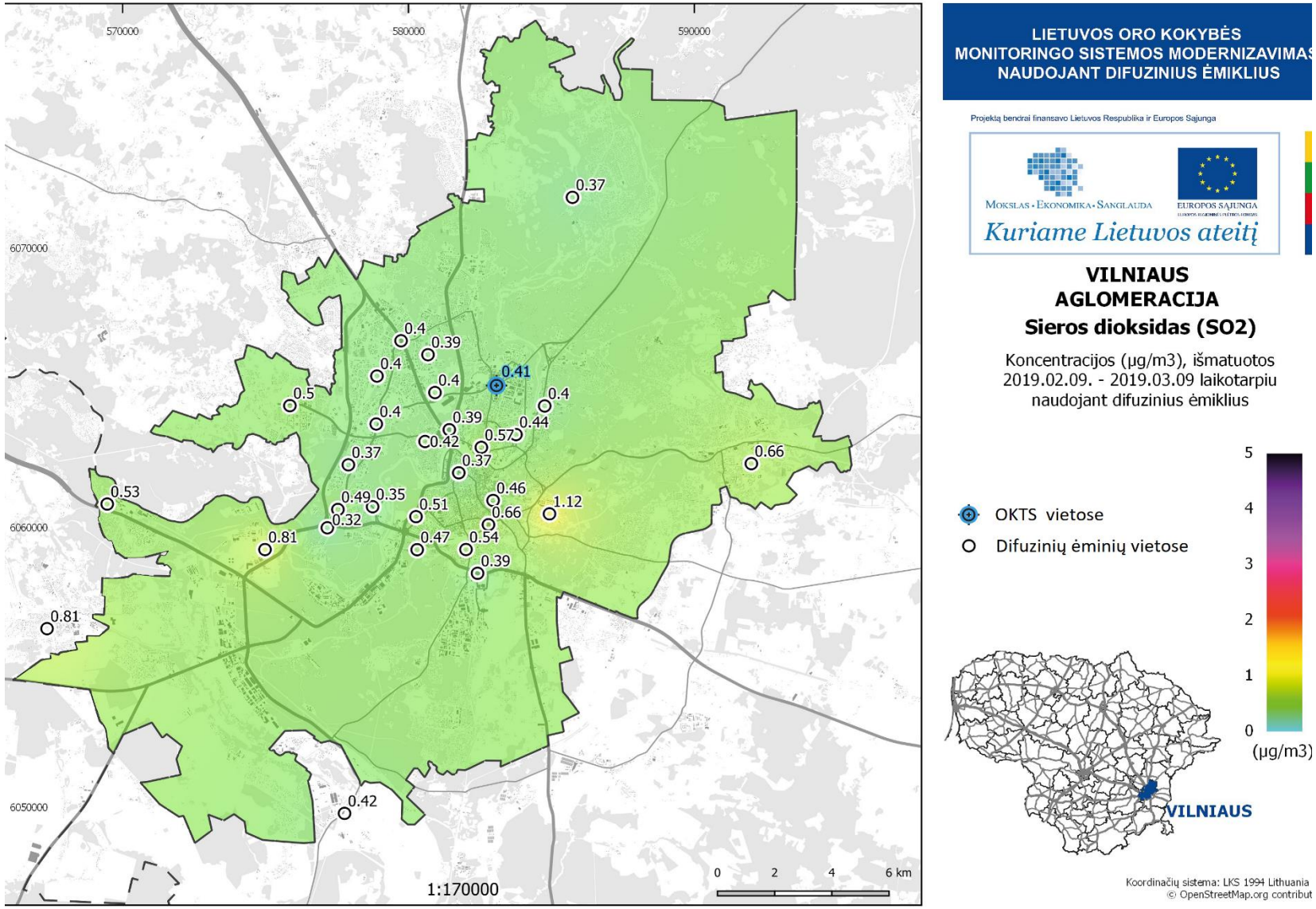


Fig. 94: Vilnius Agglomeration - Map of distribution of SO_2 concentration – 1st campaign.

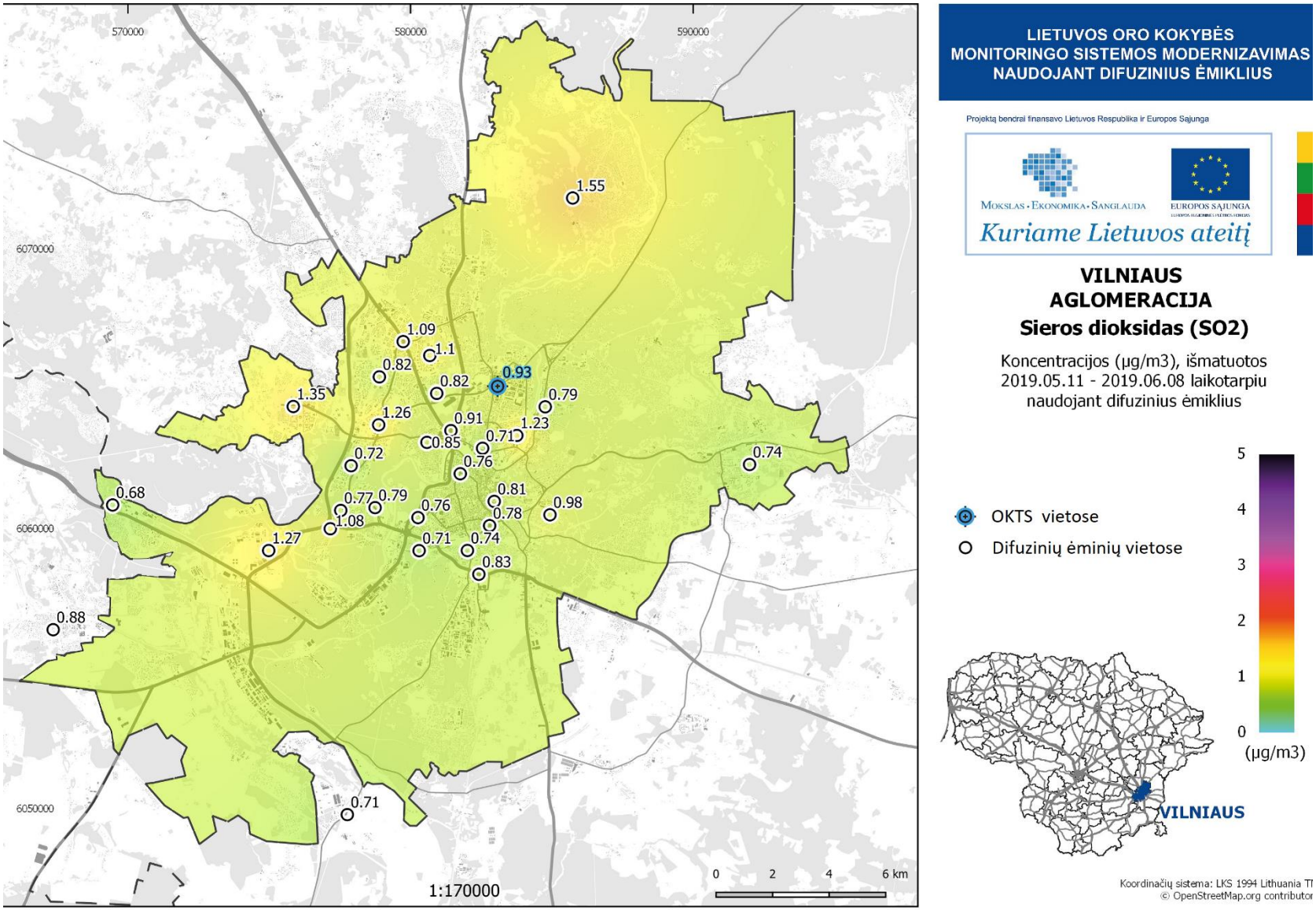


Fig. 95: Vilnius Agglomeration - Map of distribution of SO_2 concentration – 2nd campaign.

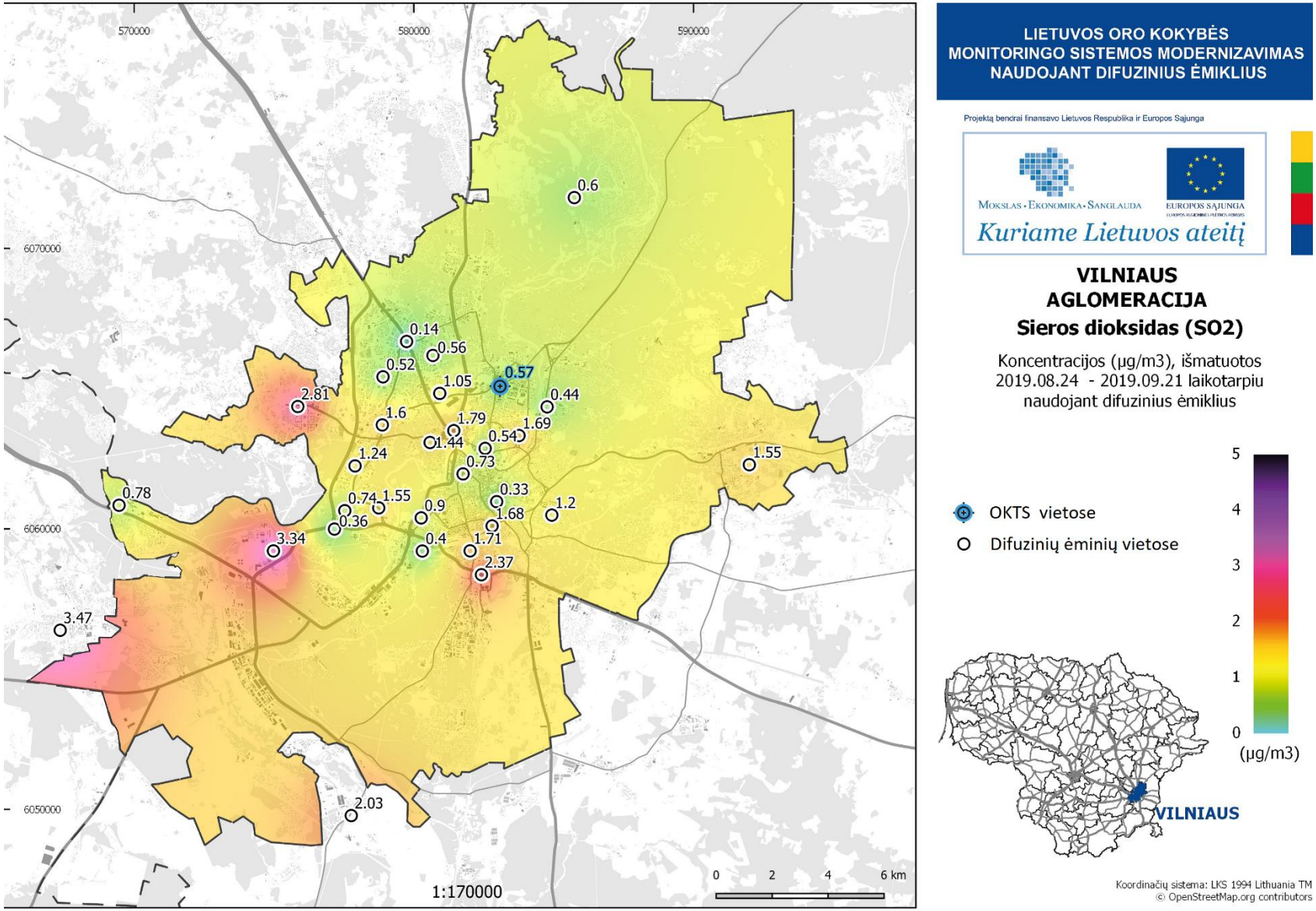


Fig. 96: Vilnius Agglomeration - Map of distribution of SO_2 concentration – 3rd campaign.

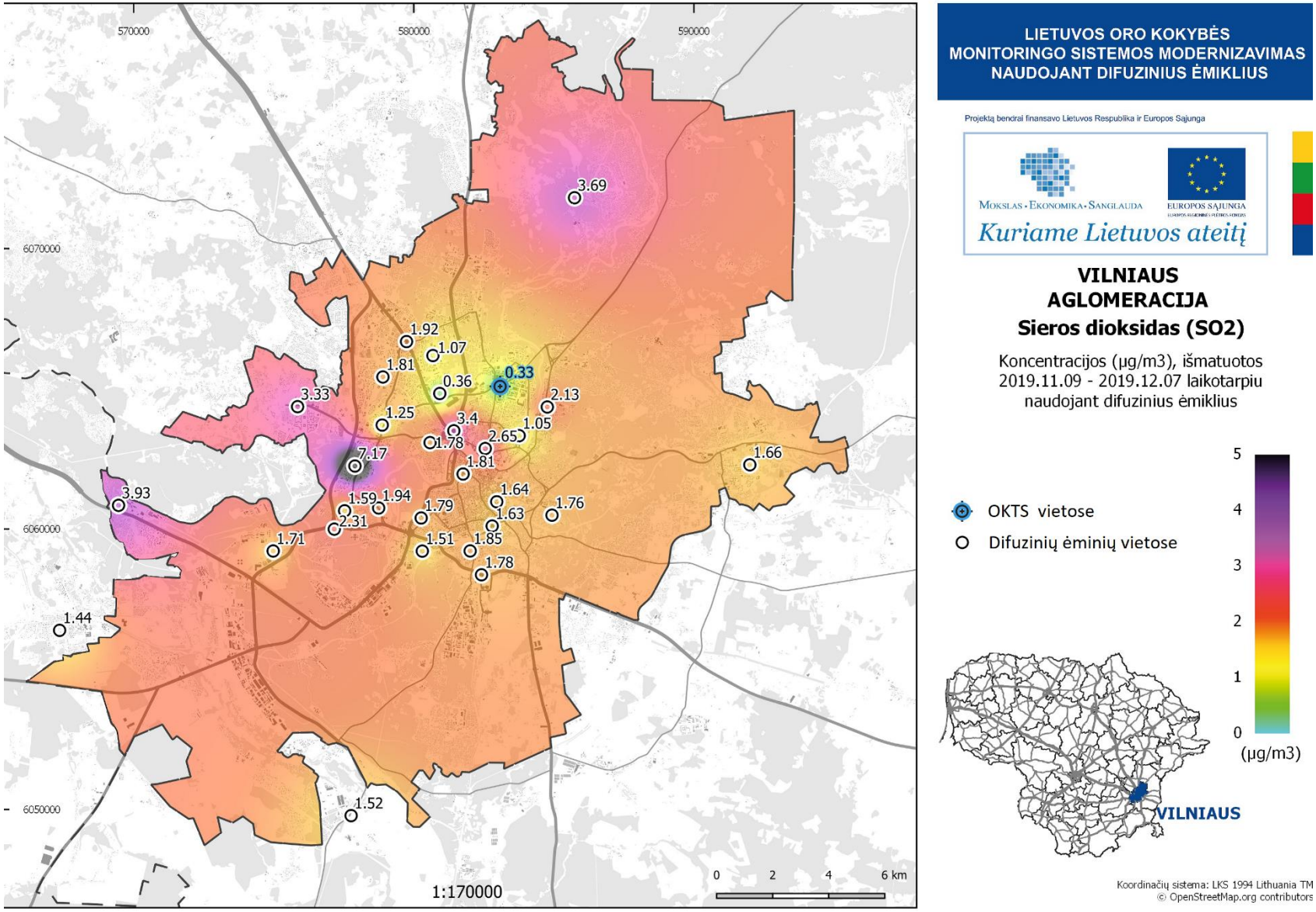


Fig. 97: Vilnius Agglomeration - Map of distribution of SO_2 concentration – 4th campaign.

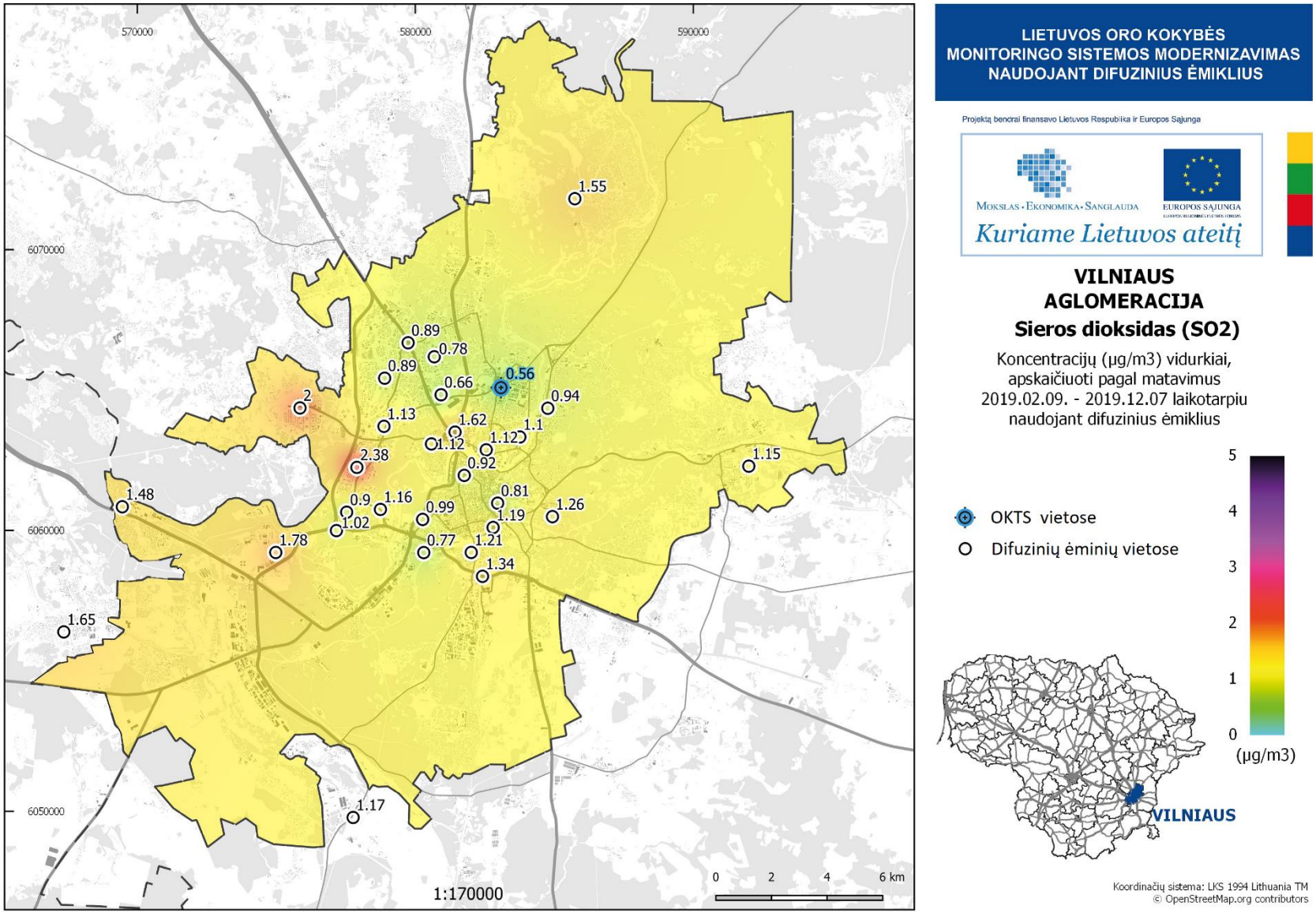


Fig. 98: Vilnius Agglomeration - Map of distribution of SO_2 concentration – average from all campaigns.

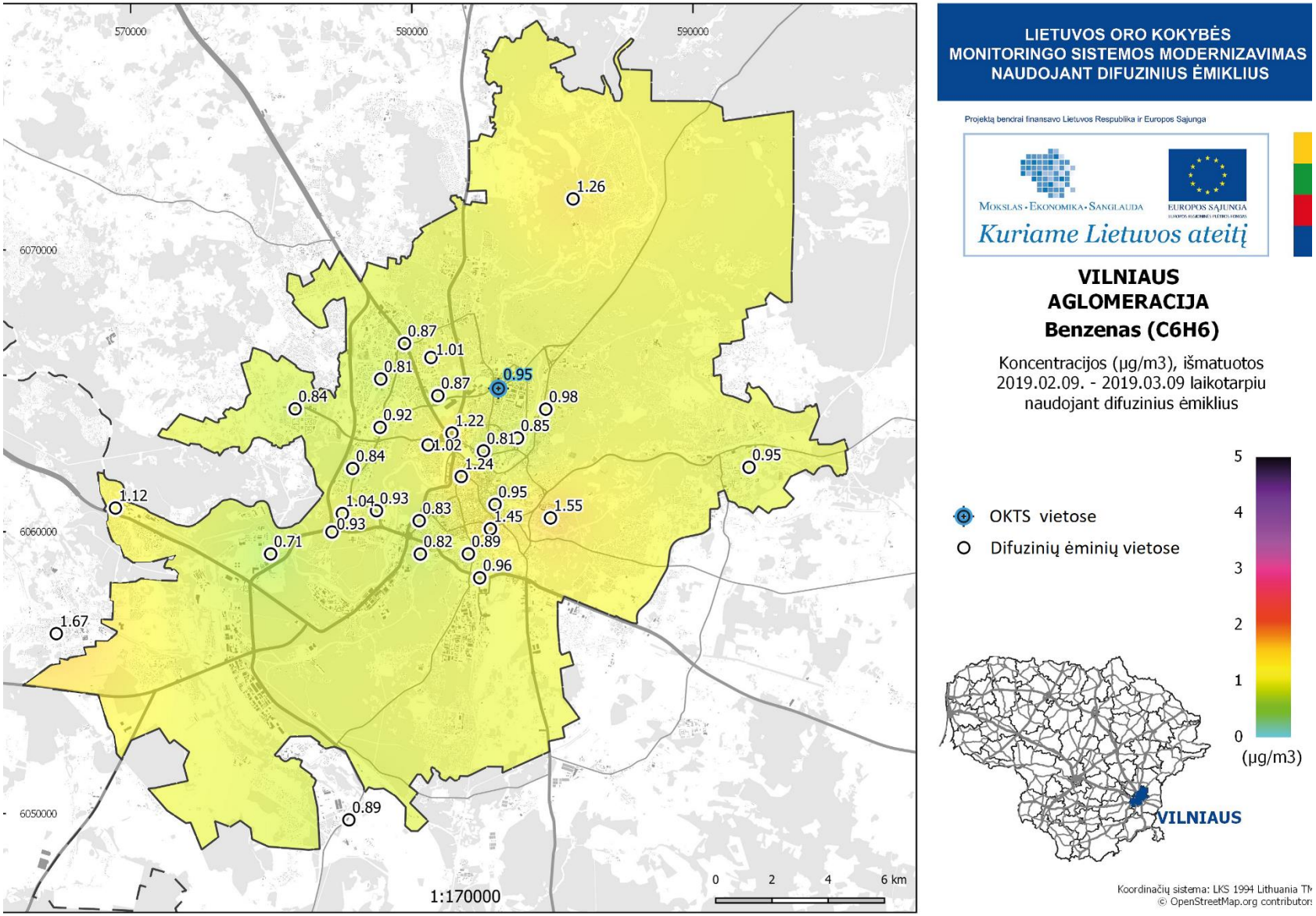


Fig. 99: Vilnius Agglomeration - Map of distribution of benzene concentration – 1st campaign.

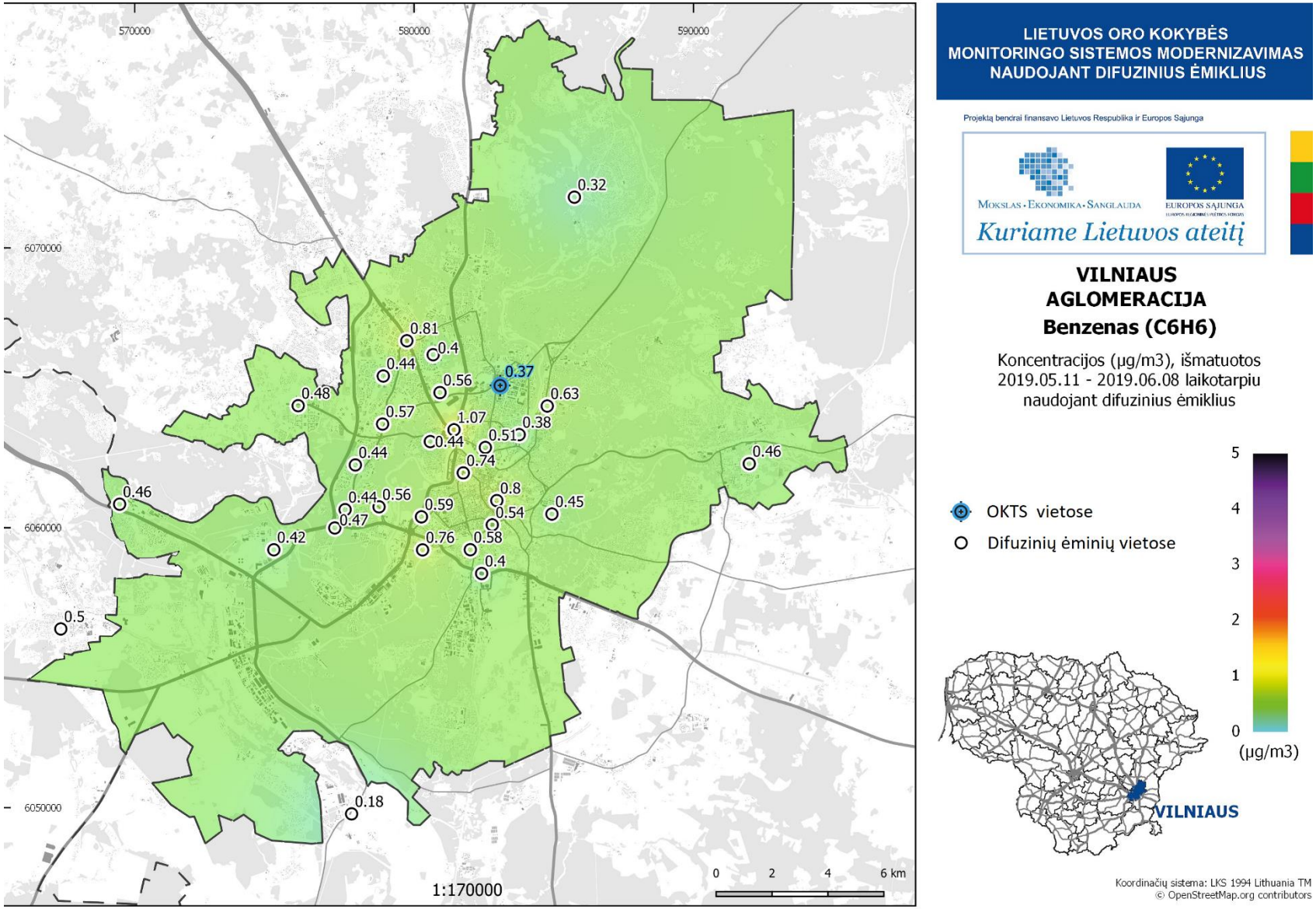


Fig. 100: Vilnius Agglomeration - Map of distribution of benzene concentration – 2nd campaign.

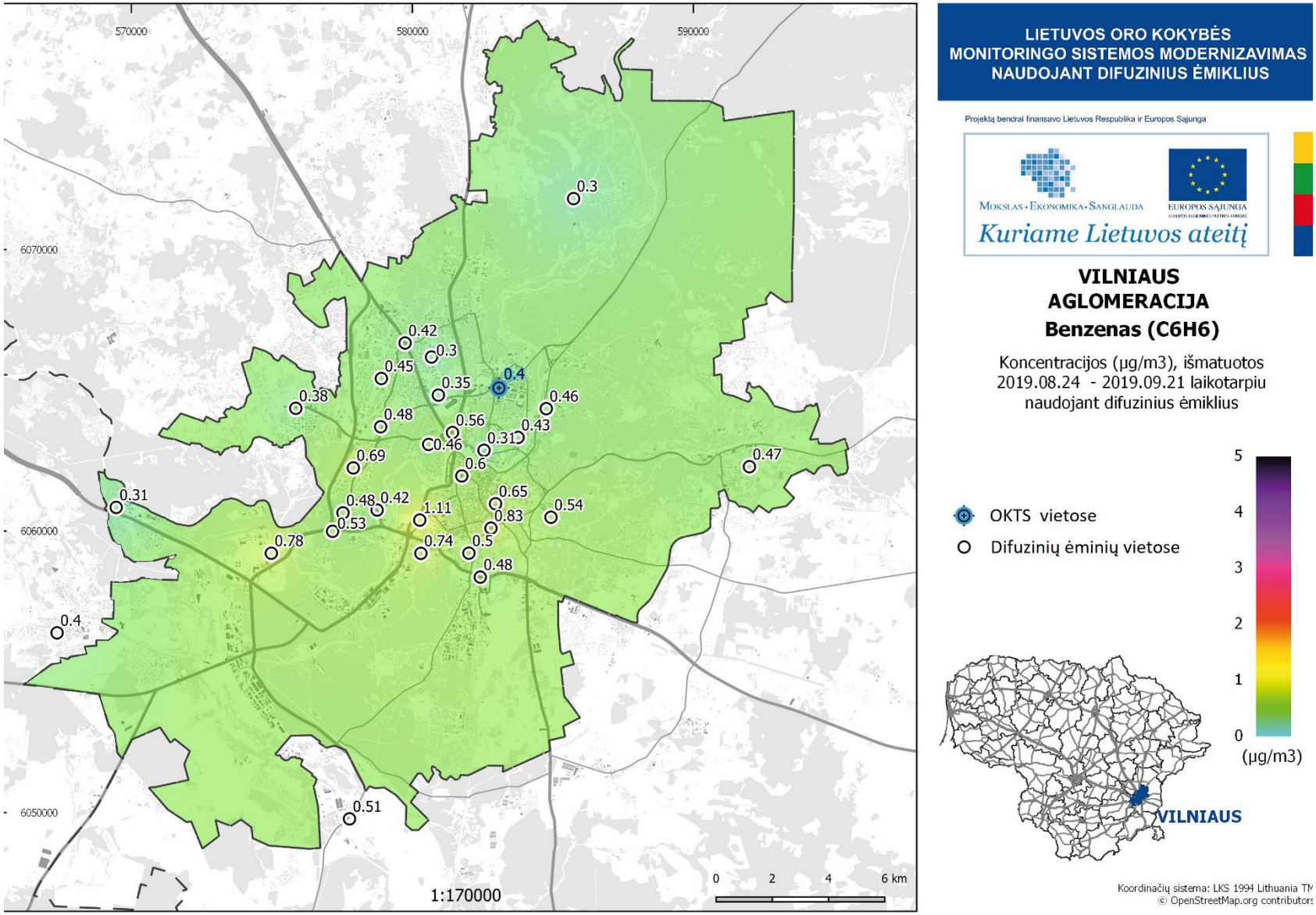


Fig. 101: Vilnius Agglomeration - Map of distribution of benzene concentration – 3rd campaign.

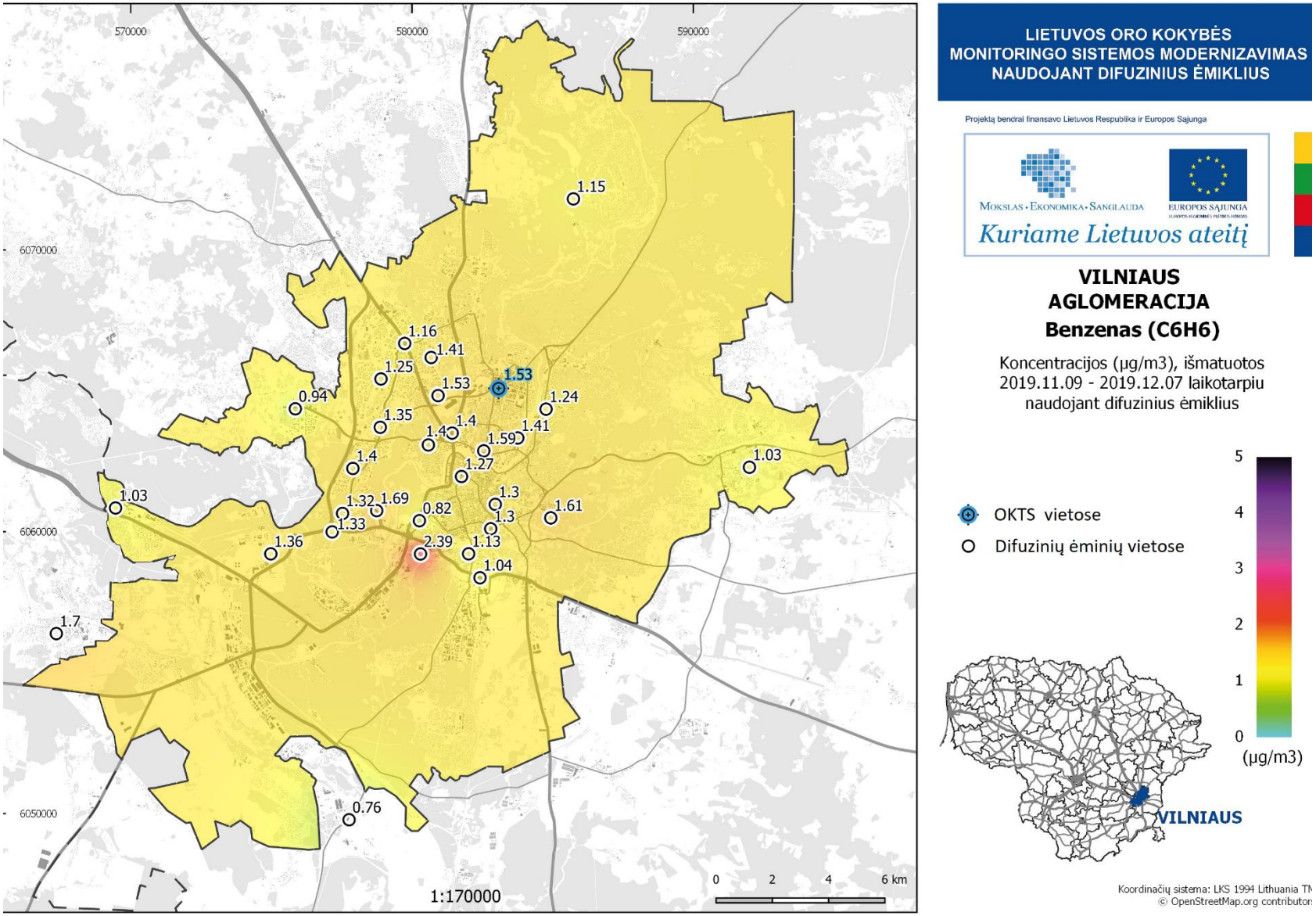


Fig. 102: Vilnius Agglomeration - Map of distribution of benzene concentration – 4th campaign.

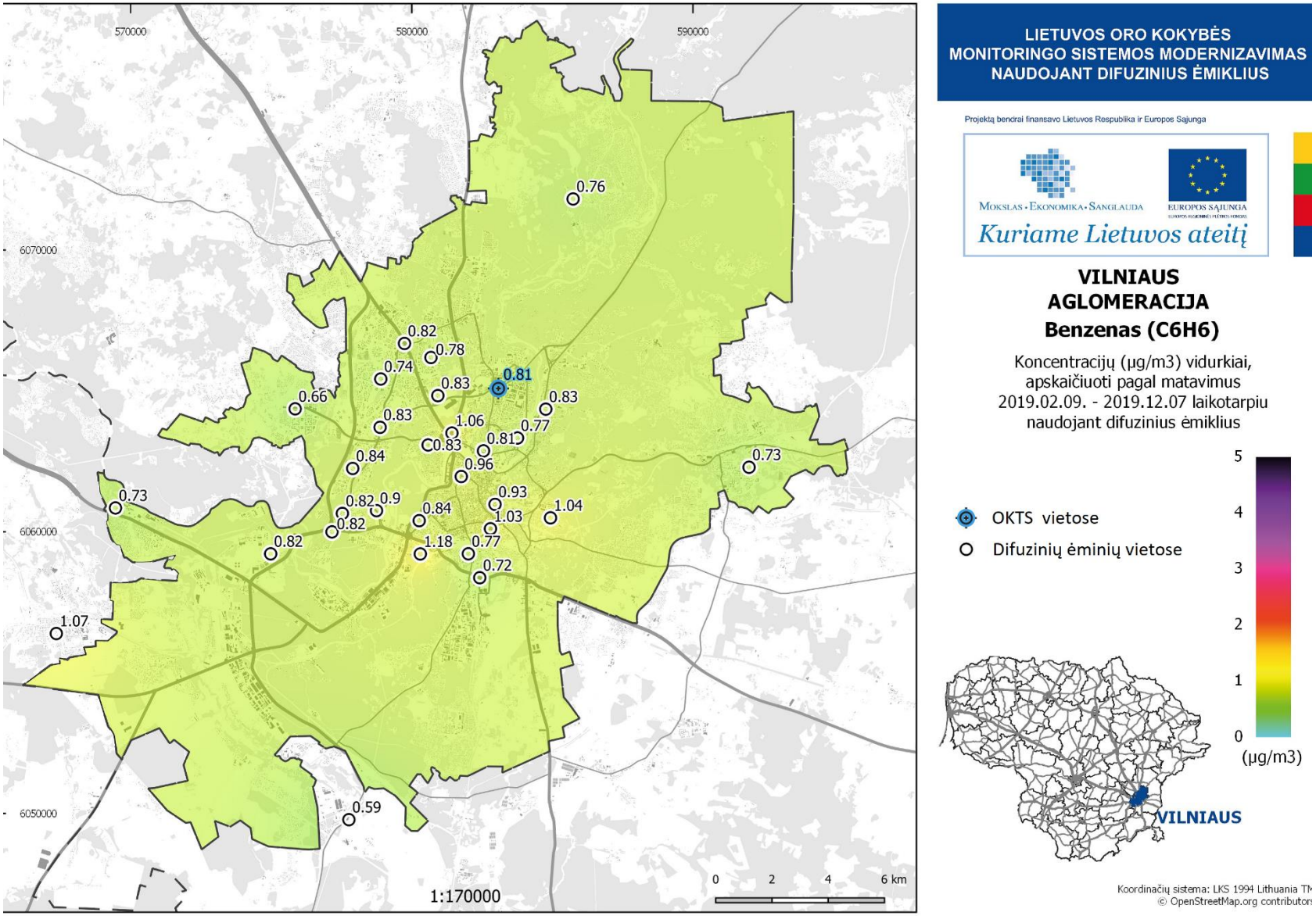


Fig. 103: Vilnius Agglomeration - Map of distribution of benzene concentration – average from all campaigns.

8.3.3 Gaseous Compounds Concentration Maps – Agglomeration Kaunas

In Fig. 104 - 118 the maps of the Kaunas agglomeration show interpolated concentrations of NO_2, SO_2 and benzene, both by individual campaigns and by their average values. NO_2 concentrations are highest in the central part of the Kaunas agglomeration, which is probably due to the higher concentration of car traffic in this area. SO_2 concentrations are very low throughout the entire Kaunas agglomeration. Slightly higher values were found in the southern marginal parts of the agglomeration, mostly in the residential zone. Spatial variability of benzene concentrations is more apparent in the cold part of the year, especially in the 4th campaign, when the highest concentrations were measured in the southern part of the agglomeration.

All maps were modeled using data Kriging and inverse distance interpolation reflecting (showing) methods. The white markers show locations measured by Radiello passive samplers, while the blue markers show locations with an automatic measuring program using reference analyzers. In the figures the maps in A4 format are shown. The A2 maps are attached as attachments to this report in both electronic and printed form.

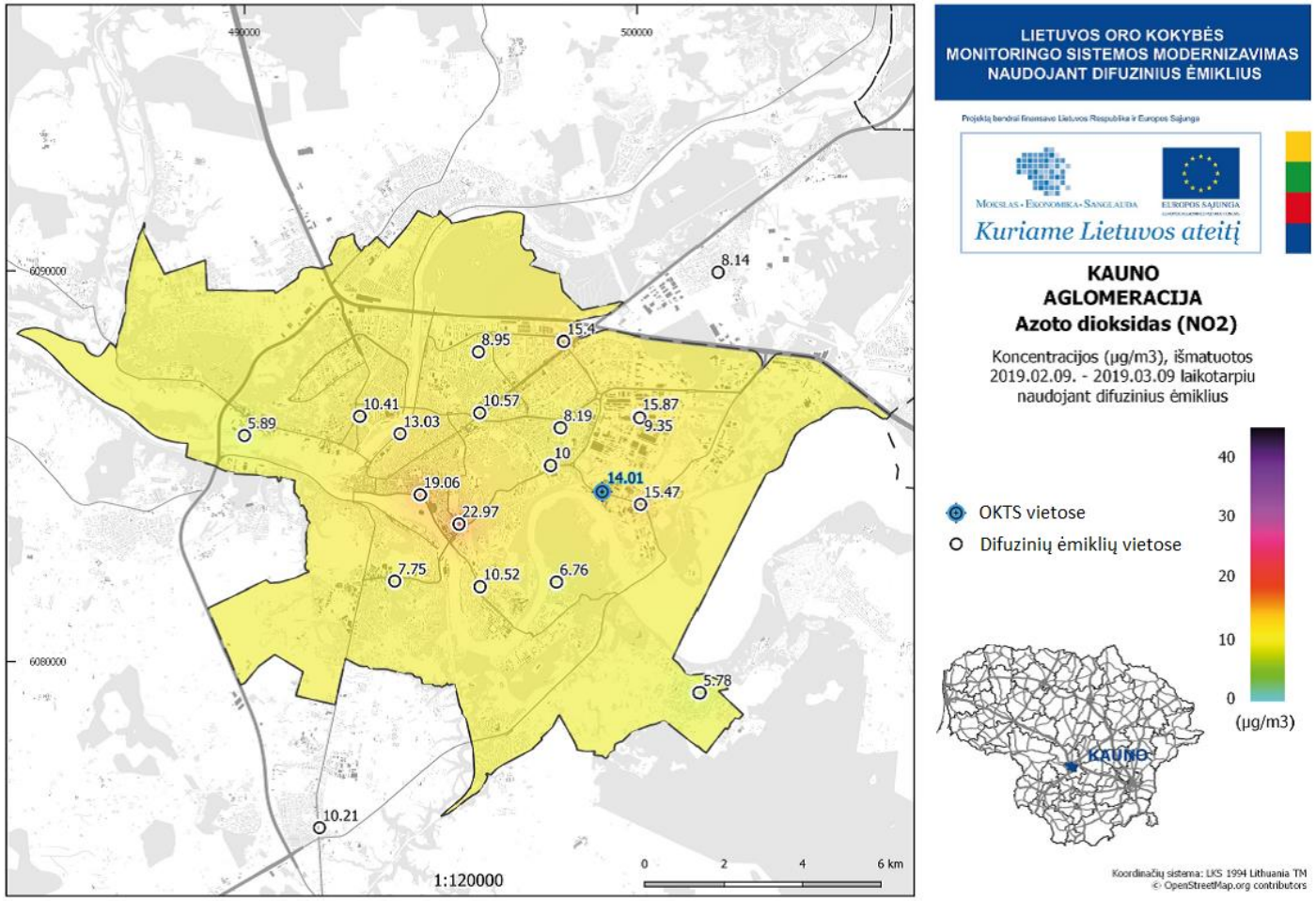


Fig. 104: Kaunas Agglomeration - Map of distribution of NO_2 concentration – 1st campaign.

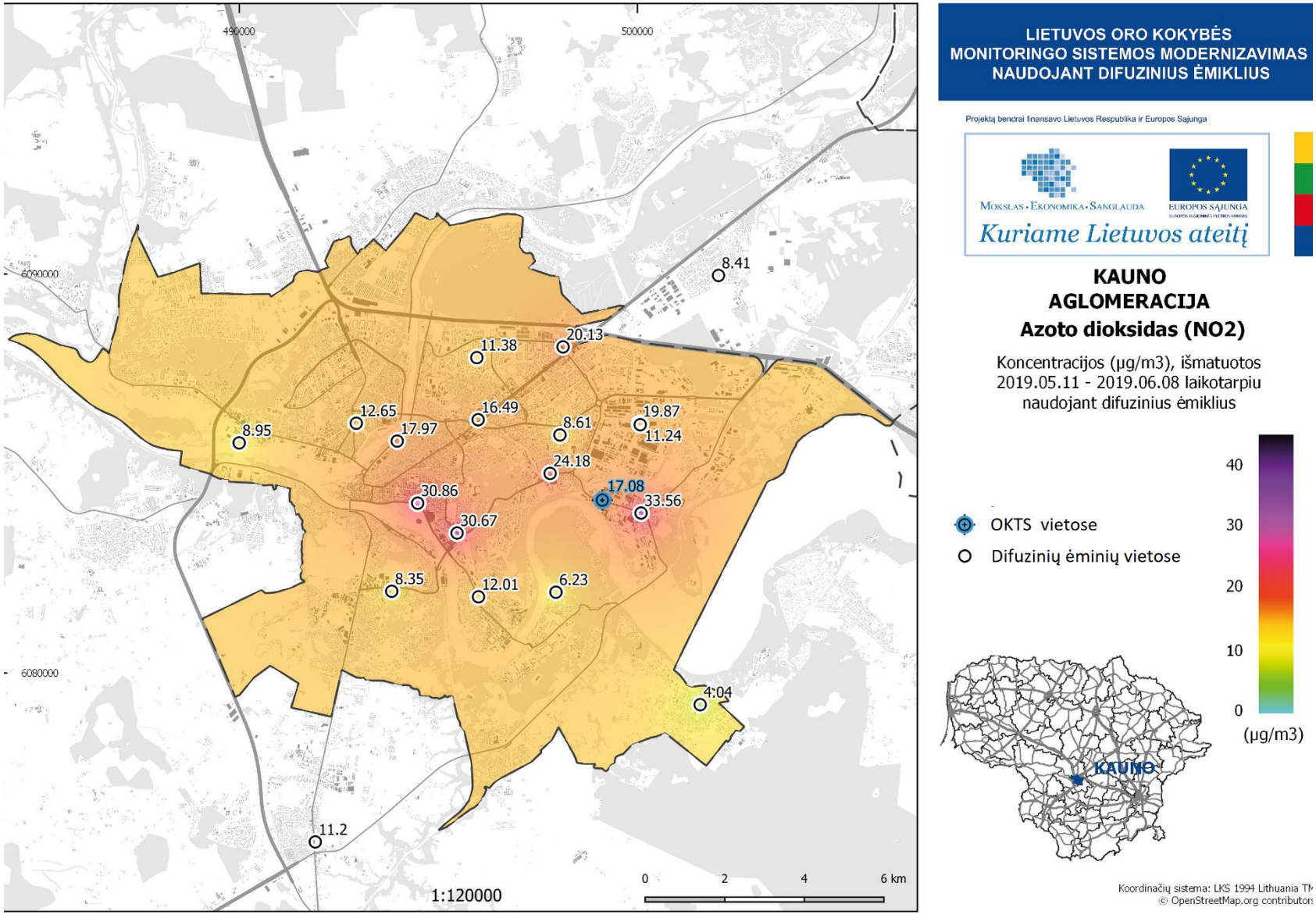


Fig. 105: Kaunas Agglomeration - Map of distribution of NO_2 concentration – 2nd campaign.

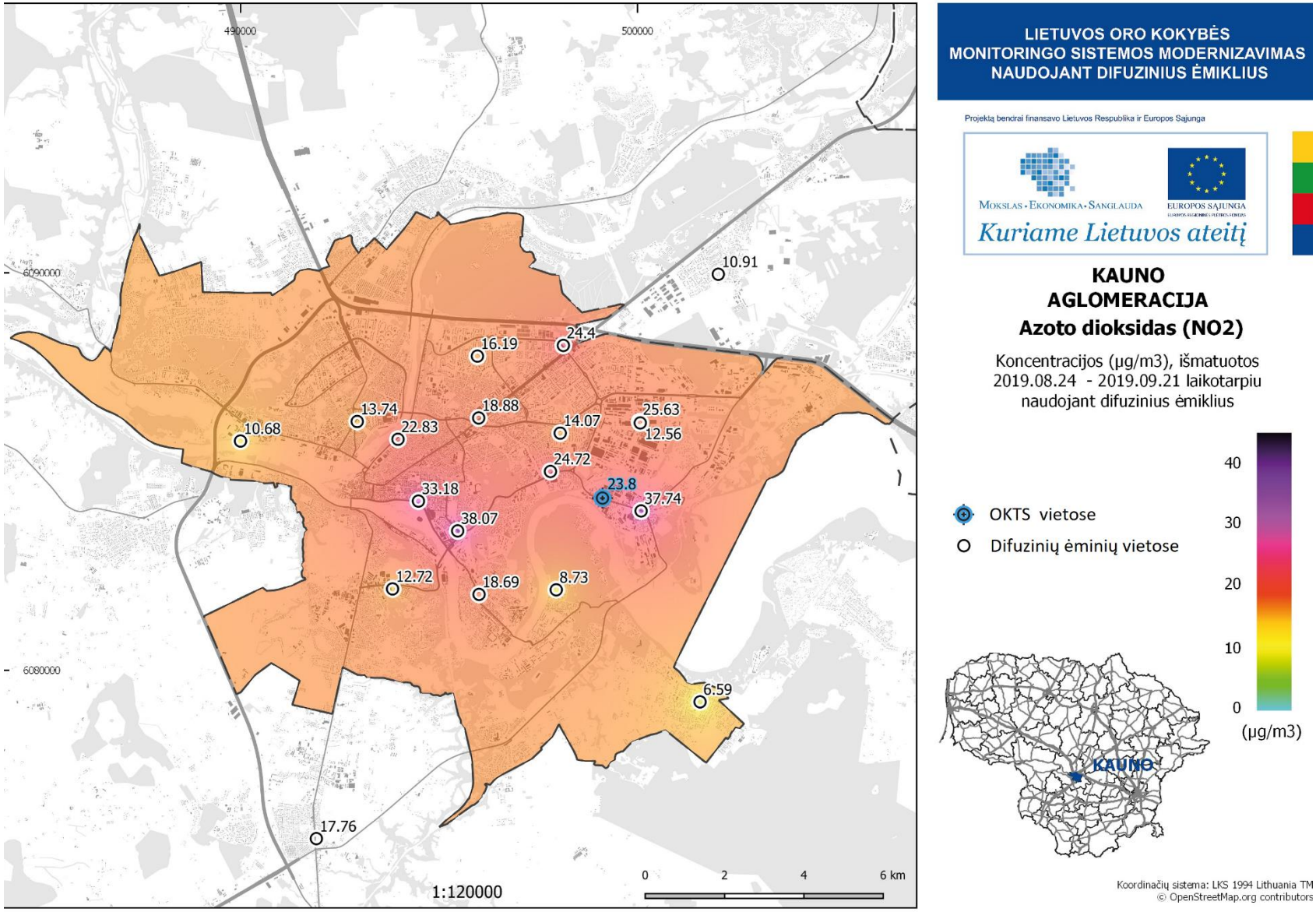


Fig. 106: Kaunas Agglomeration - Map of distribution of NO_2 concentration – 3rd campaign.

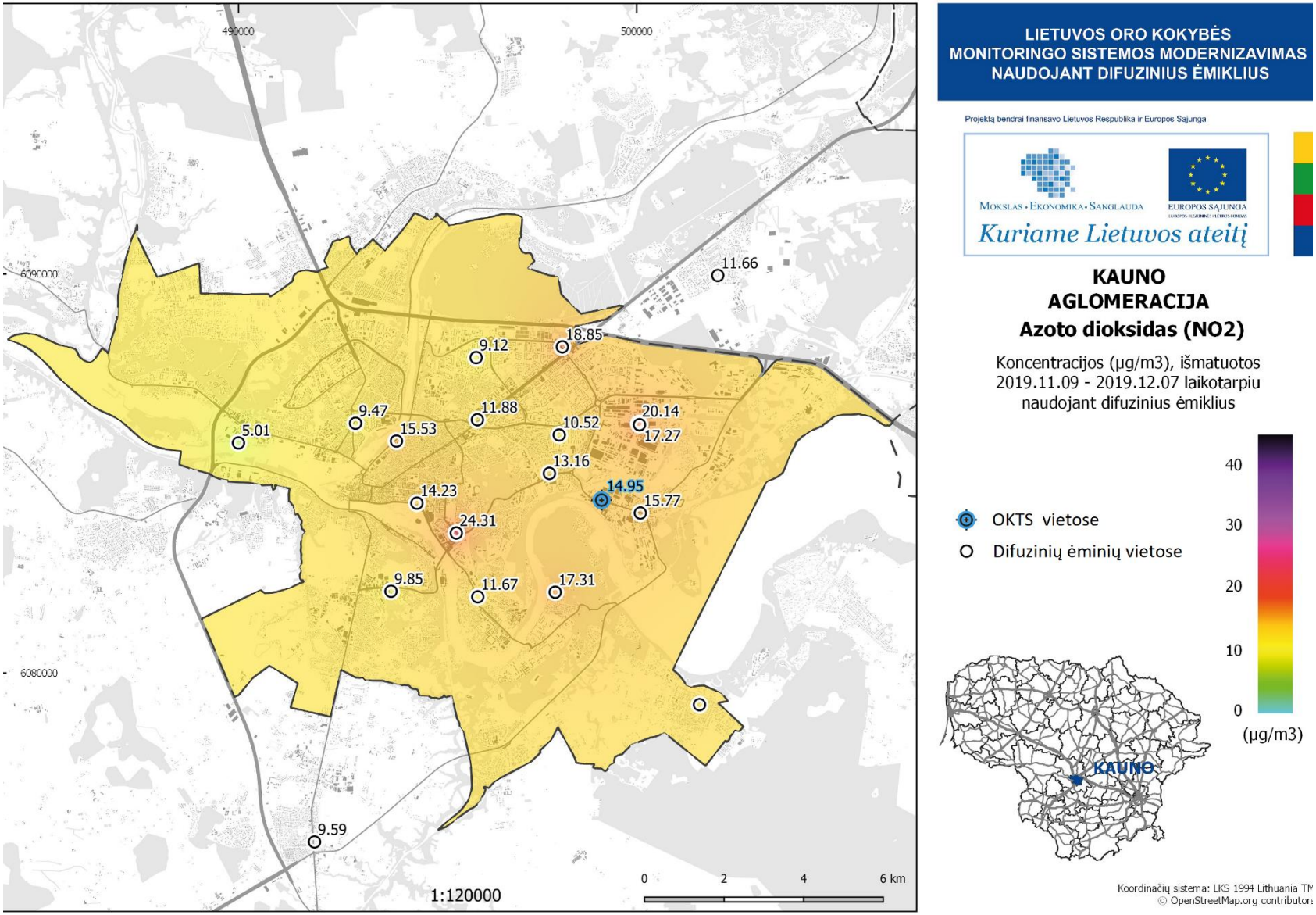


Fig. 107: Kaunas Agglomeration - Map of distribution of NO_2 concentration – 4th campaign.

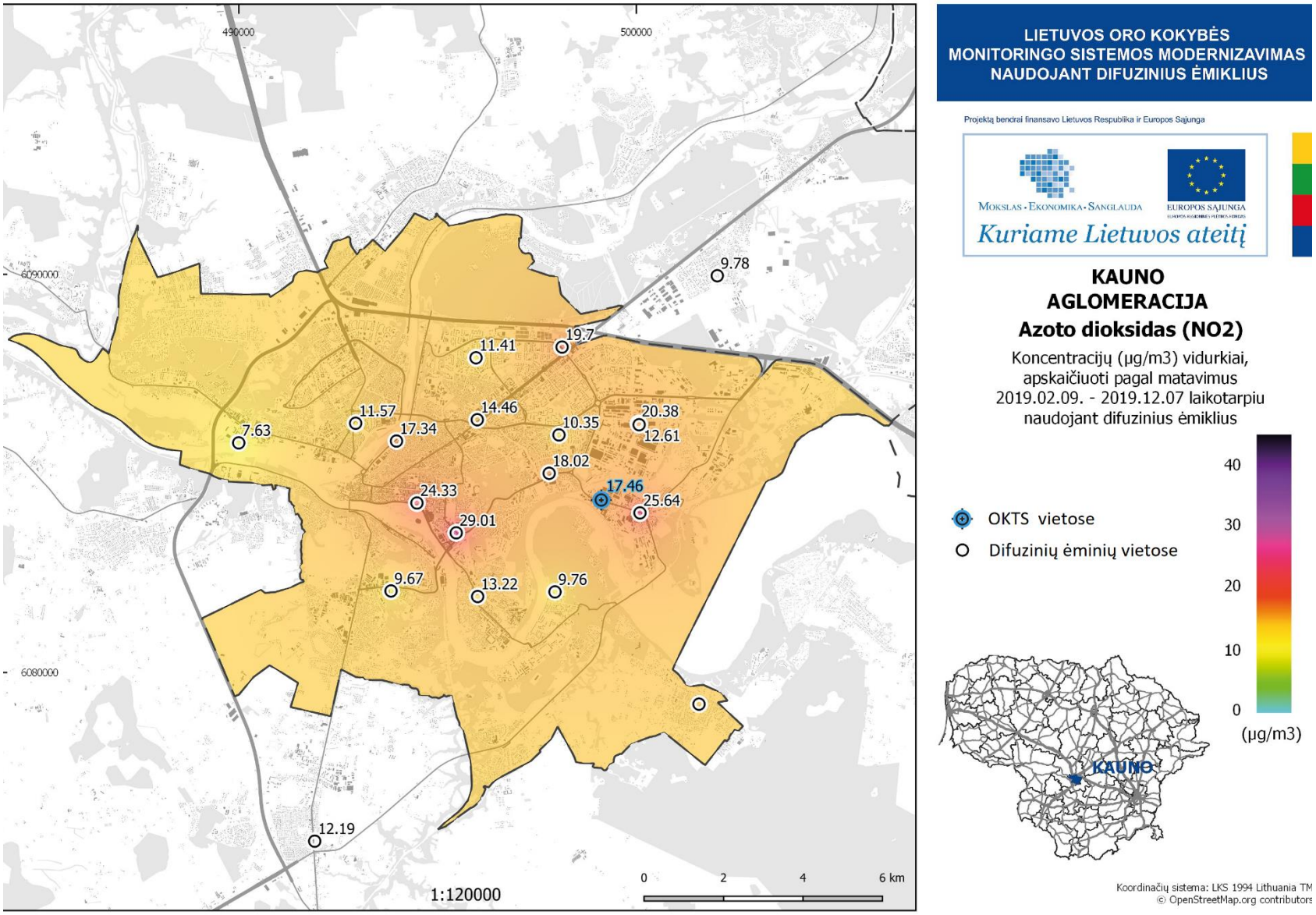


Fig. 108: Kaunas Agglomeration - Map of distribution of NO_2 concentration – average from all campaigns.

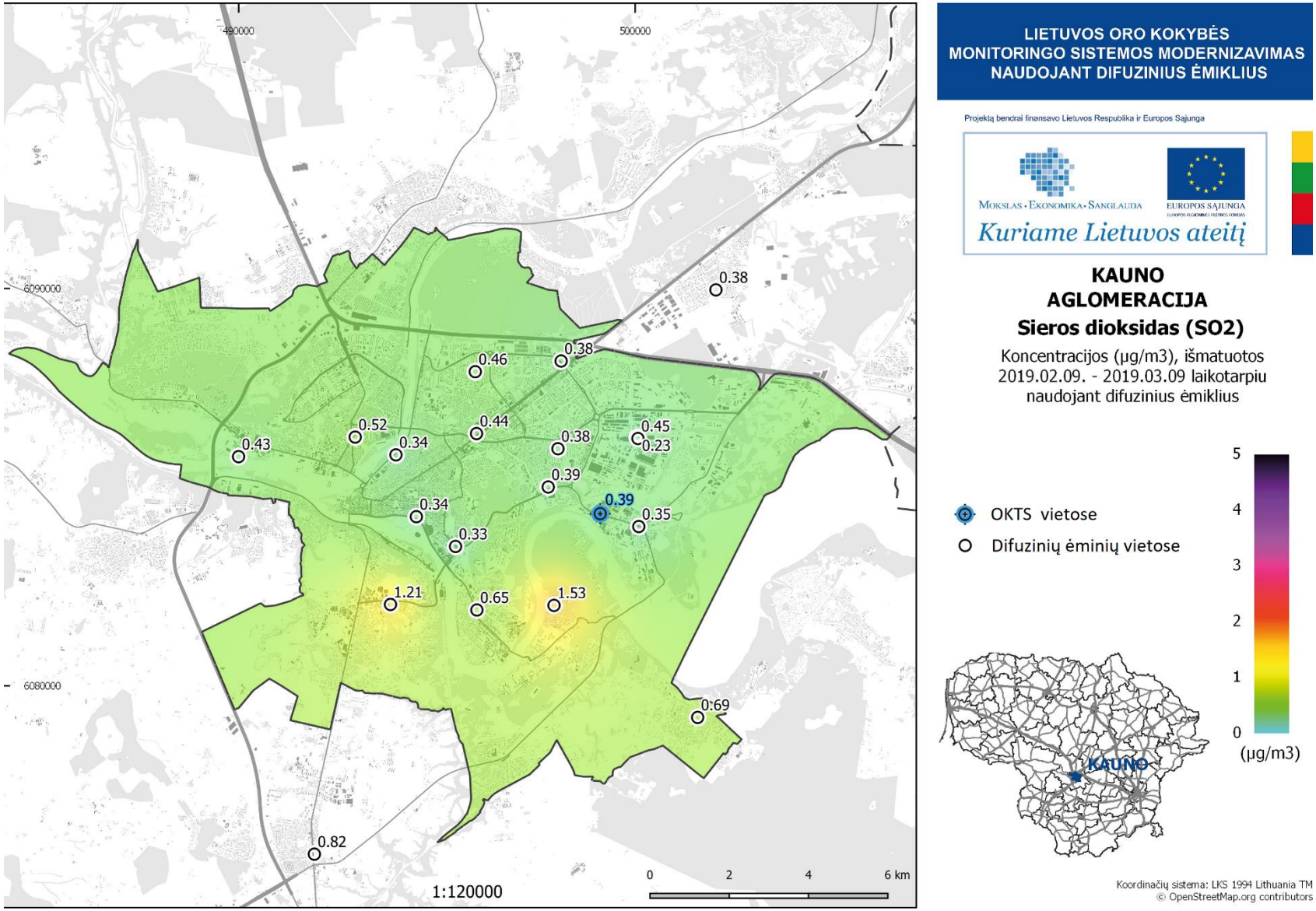


Fig. 109: Kaunas Agglomeration - Map of distribution of SO_2 concentration – 1st campaign.

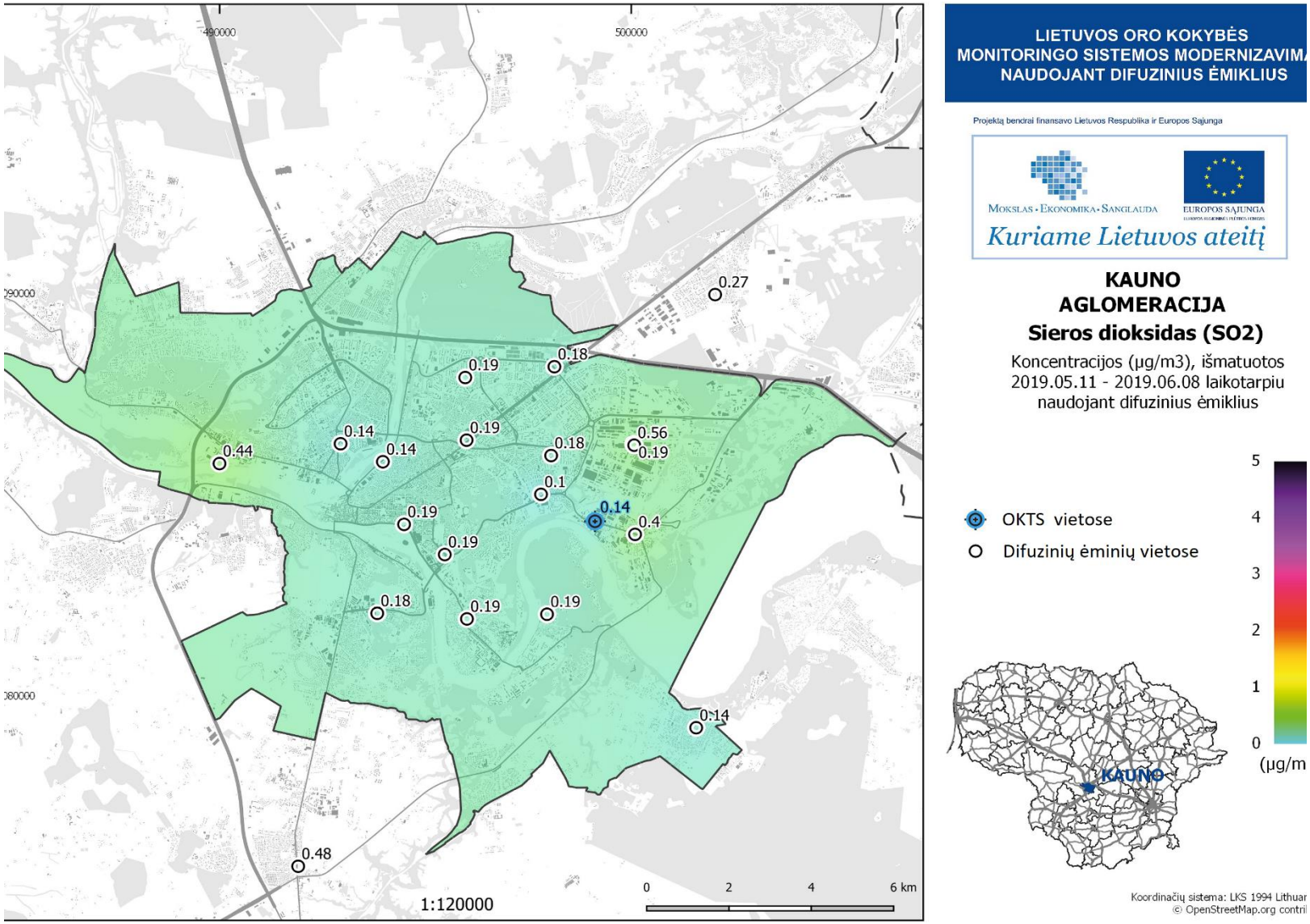


Fig. 110: Kaunas Agglomeration - Map of distribution of SO_2 concentration – 2nd campaign.

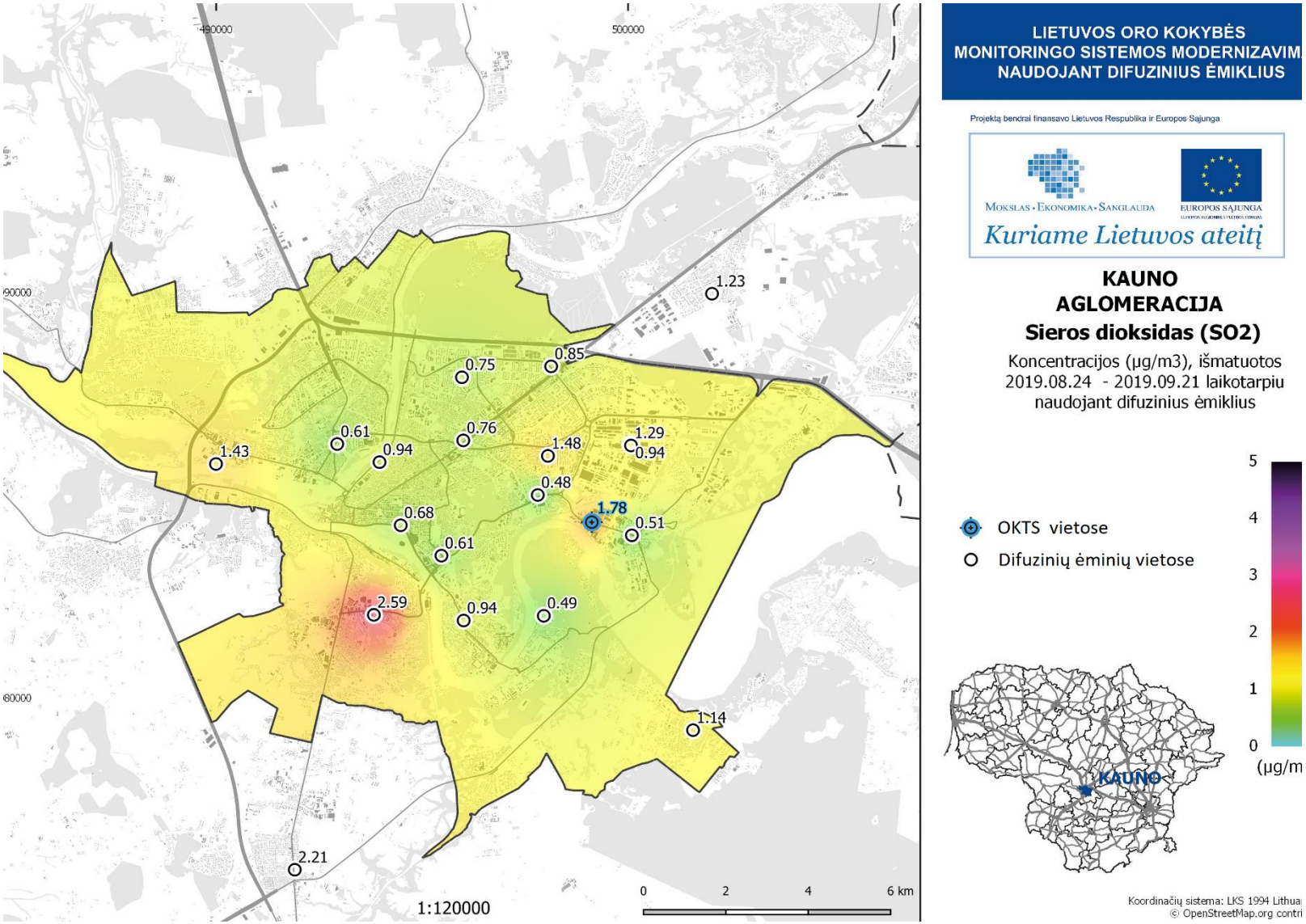


Fig. 111: Kaunas Agglomeration - Map of distribution of SO_2 concentration – 3rd campaign.

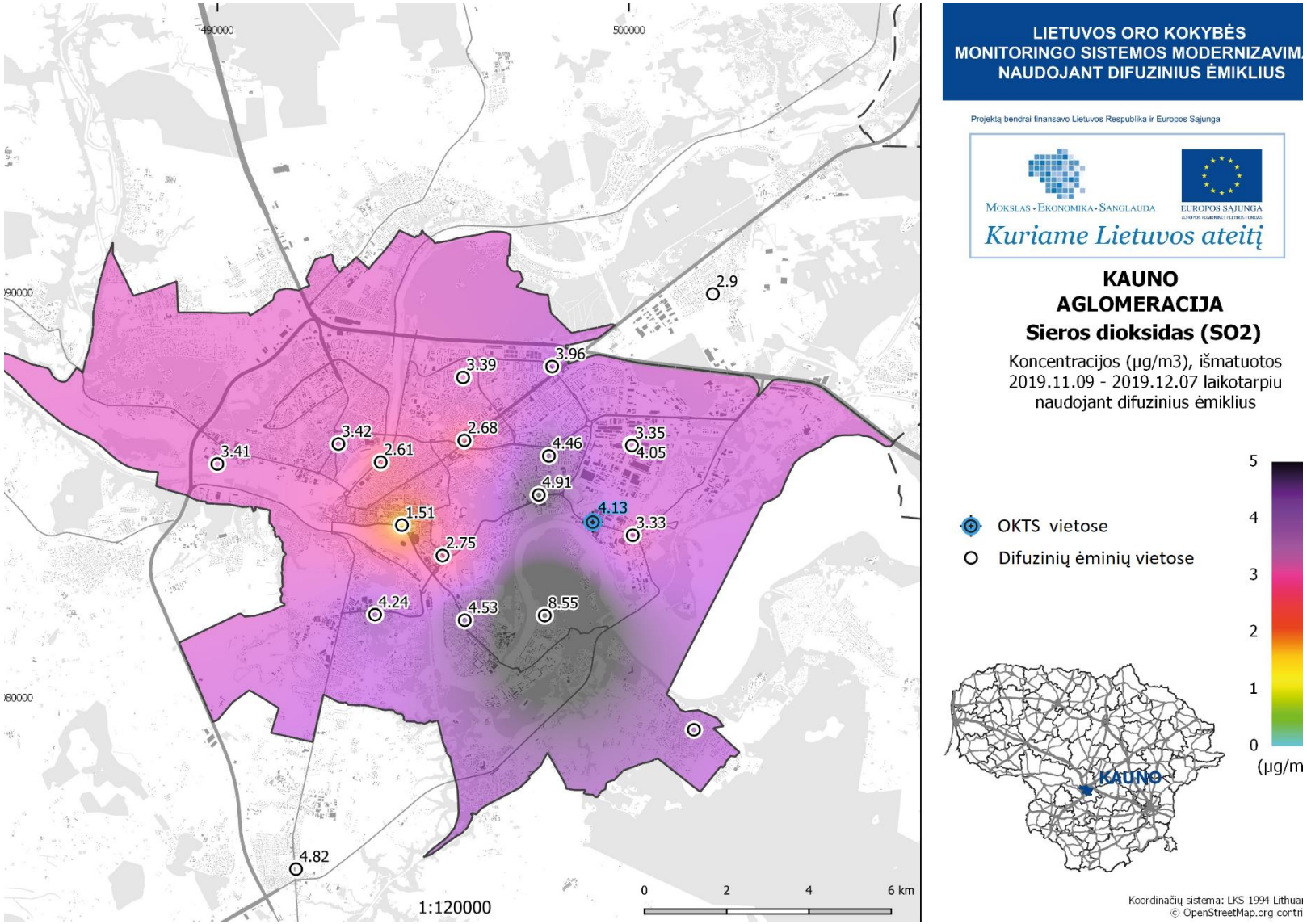


Fig. 112: Kaunas Agglomeration - Map of distribution of SO_2 concentration – 4th campaign.

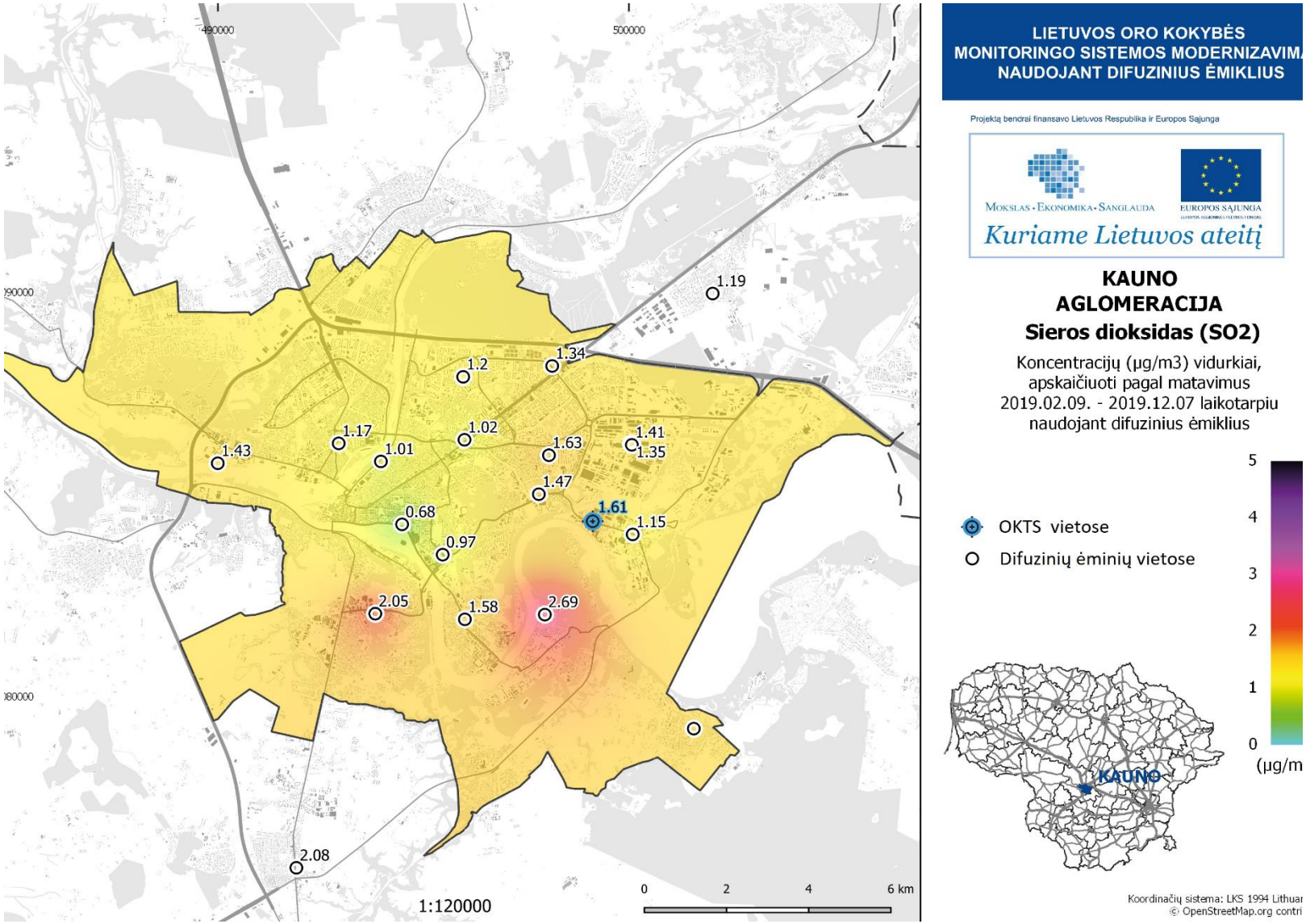


Fig. 113: Kaunas Agglomeration - Map of distribution of SO_2 concentration – average from all campaigns.

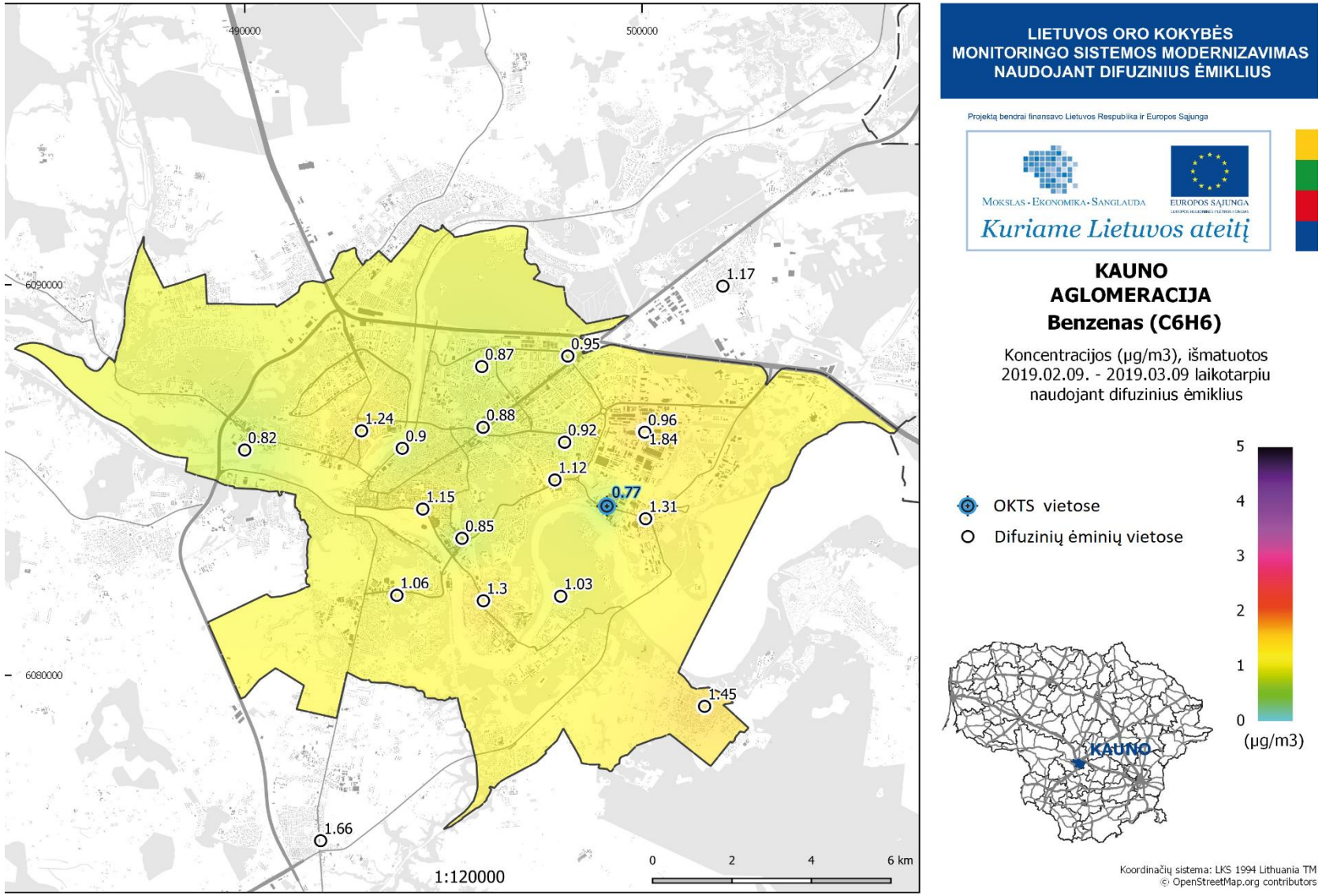


Fig. 114: Kaunas Agglomeration - Map of distribution of benzene concentration – 1st campaign

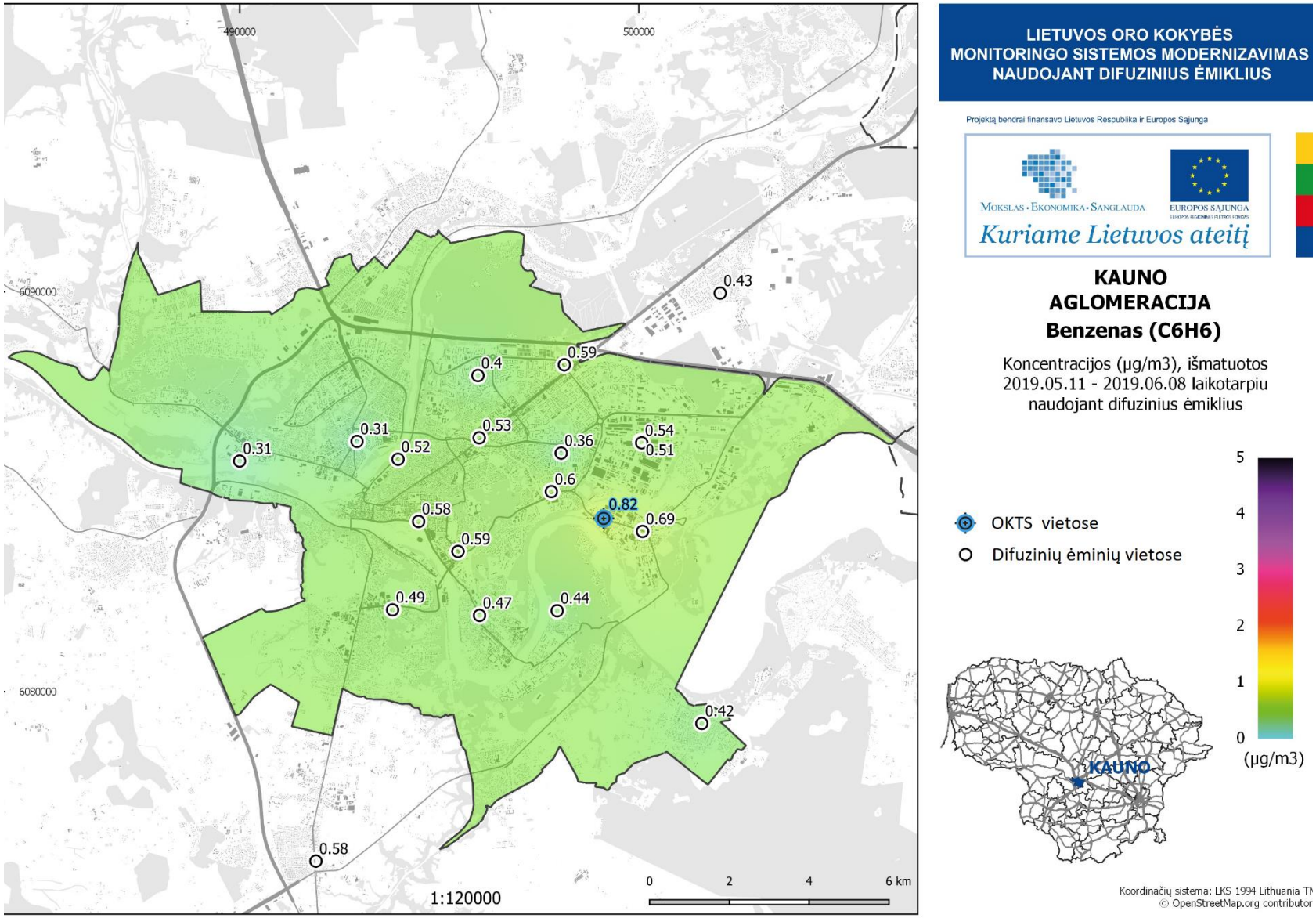


Fig. 115: Kaunas Agglomeration - Map of distribution of benzene concentration – 2nd campaign.

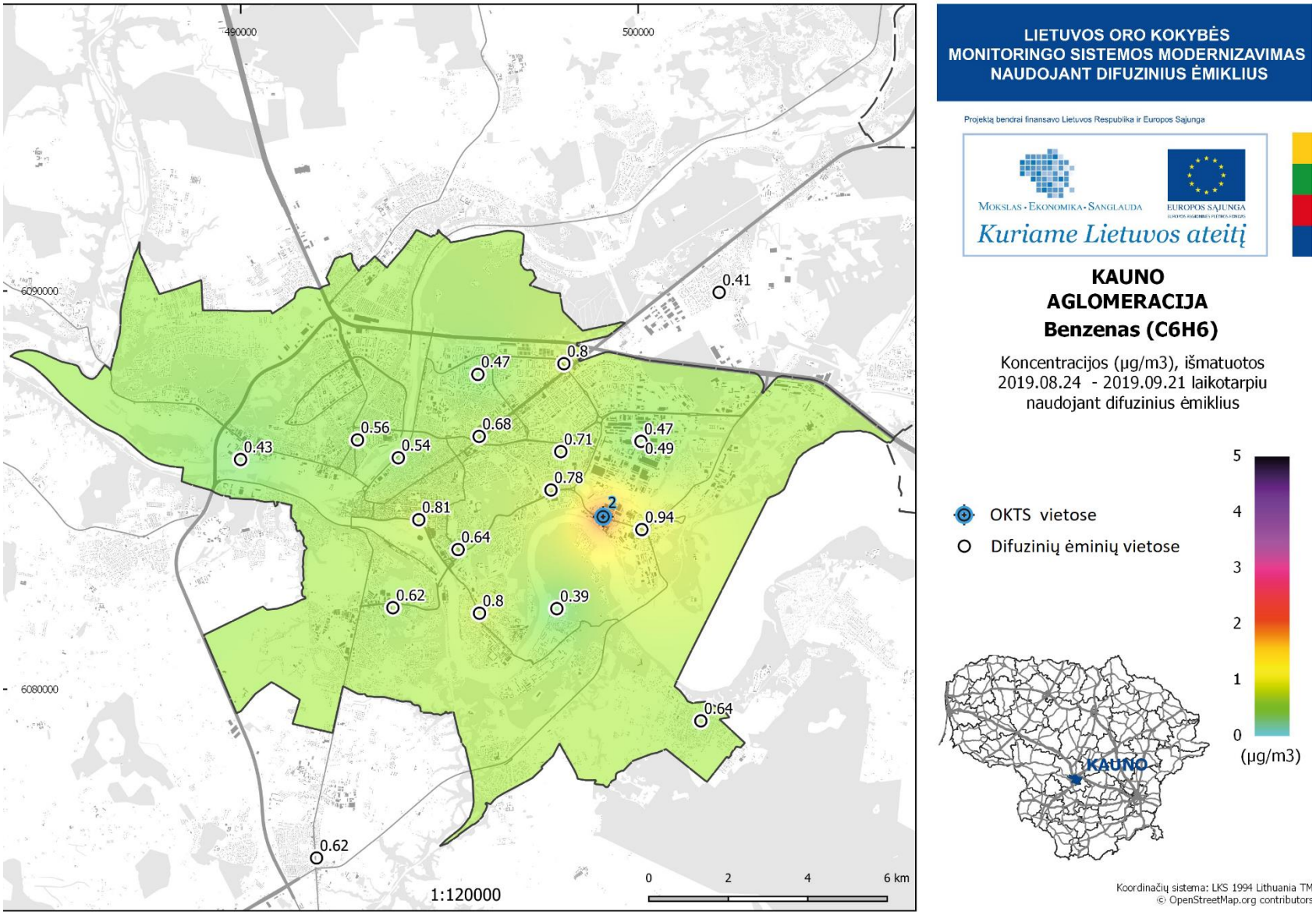


Fig. 116: Kaunas Agglomeration - Map of distribution of benzene concentration – 3rd campaign.

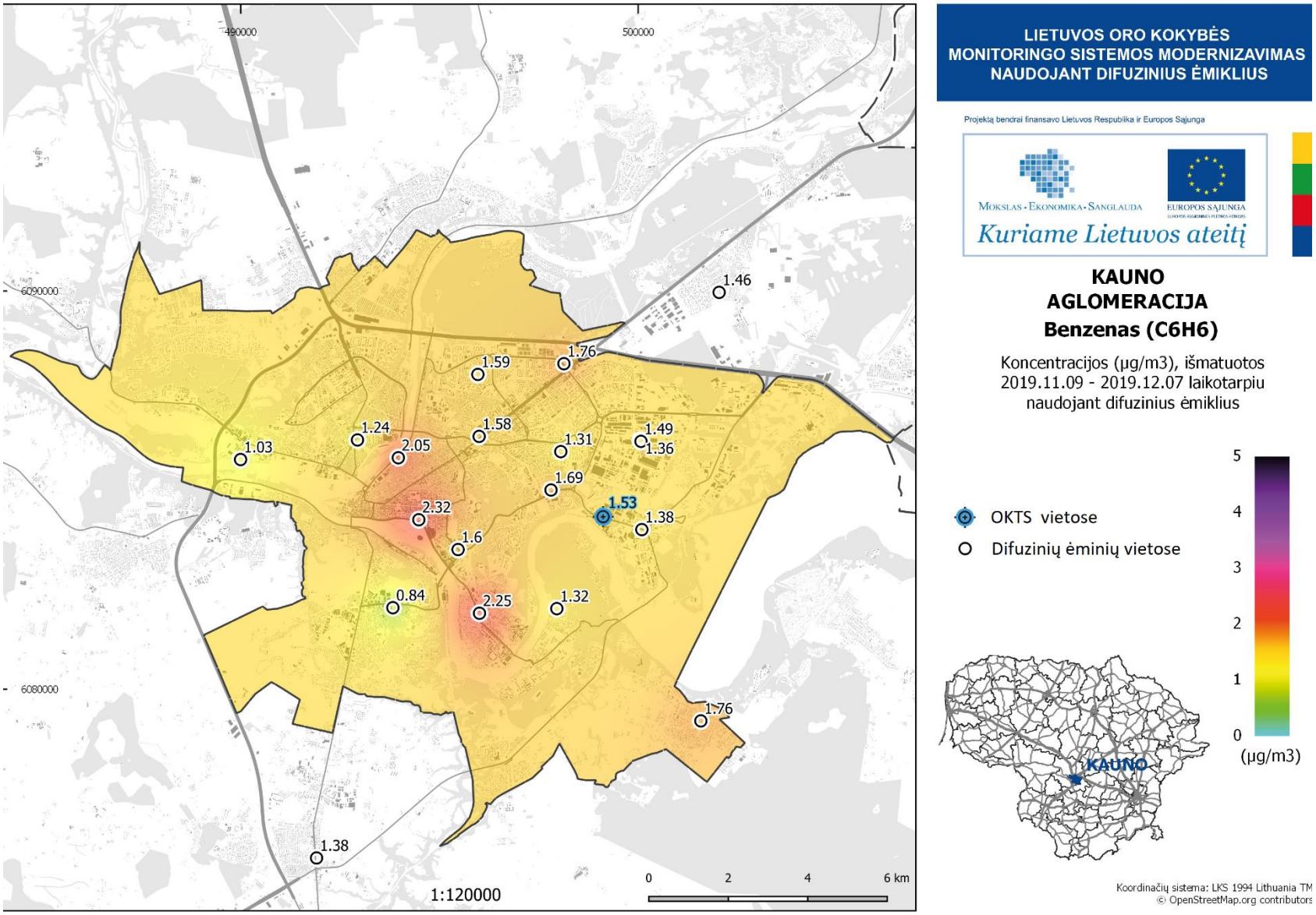


Fig. 117: Kaunas Agglomeration - Map of distribution of benzene concentration – 4th campaign.

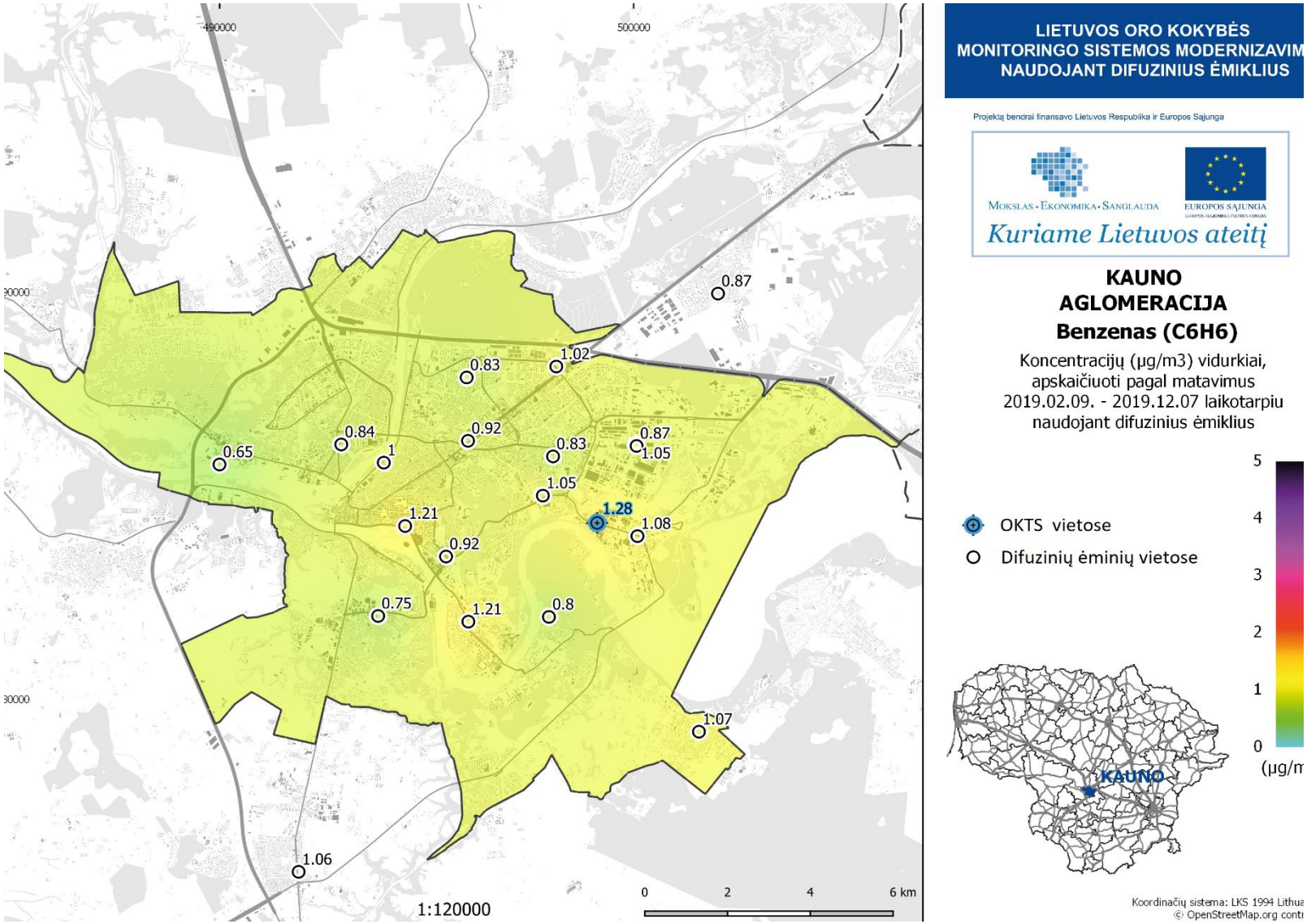


Fig. 118: Kaunas Agglomeration - Map of distribution of benzene concentration – average from all campaigns.

8.3.4. Evaluation of NO_2

8.3.4.1. NO_2 - Agglomeration Kaunas

Location	Mean [µg/m³]	Mean LCL [µg/m³]	Mean UCL [µg/m³]	Minimum [µg/m³]	Maximum [µg/m³]	Range [µg/m³]	Median [µg/m³]
Kaunas 02	20,4	14,9	25,9	10	33,7	23,7	20,1
Kaunas 04	9,8	7,4	12,2	6	15,1	9,1	9,4
Kaunas 09	11,4	7,6	15,2	6,6	21,6	14,9	11,1
Kaunas 10	19,7	14,7	24,7	11,4	28,2	16,9	20
Kaunas 14	7,6	4,8	10,5	4,6	14,9	10,3	6,9
Kaunas 16	17,3	12,5	22,1	9,6	28,9	19,3	16,7
Kaunas 17	14,5	10,2	18,7	7,6	23,2	15,6	15,3
Kaunas 18	9,3	4,7	13,9	0	19,3	19,3	8,7
Kaunas 19	12,6	7,8	17,4	6,5	24,4	17,8	11,2
Kaunas 21	11,6	9	14,2	5,9	14,9	9	12,7
Kaunas 24	24,3	15,8	32,9	9,7	41,6	31,8	24,4
Kaunas 25	29	19,4	38,7	12	48,1	36,1	29,4
Kaunas 26	18	10,5	25,5	7,8	34,2	26,4	15,9
Kaunas 27	25,6	14,5	36,8	6,3	47,7	41,4	26,5
Kaunas 29	9,7	6	13,4	2,9	16,8	13,9	9,6
Kaunas 30	13,2	9,3	17,2	7	20,7	13,8	13,1
Kaunas 31	9,8	5,4	14,1	5,1	20,2	15	7,5
Kaunas 35	4,1	1,3	6,9	0	9,8	9,8	3,9

Tab. 11. Statistical evaluation of NO_2; Kaunas agglomeration

Explanations:
Mean LCL = Mean lower control limit
Mean UCL = Mean upper control limit
The interval between LCL a UCL in statistics is an interval of values in which the occurrence of an unknown parameter can be expected. Mean LCL and Mean UCL are the reliable interval limits estimate for the mean based on a t-distribution with N – 1 degrees of freedom. The estimates are made assuming that the standard deviation is not known and that the variable is normaly distributed.

Tab. 11 and Fig. 119 provide information on the basic parameters of the NO_2 dataset in the Kaunas agglomeration. Data from individual 14-day campaigns are used for the evaluation. The maximum value was measured in the Kaunas 25 location, namely 48.1 µg/m^3. The highest variance of the measured data was measured in the Kaunas 27 location, namely 41.4 µg/m^3. The highest average value of all campaigns was again measured in the Kaunas 25 location, namely 29.0 µg/m^3. On the other hand, the lowest average value of all campaigns was measured in Kaunas 35, namely only 4.1 µg/m^3. This shows that the spatial variability of NO_2 concentrations in the Kaunas agglomeration is relatively large. This is probably due to the fact that one of the main sources of NO_2 is car traffic, which is relatively concentrated in the Kaunas agglomeration.

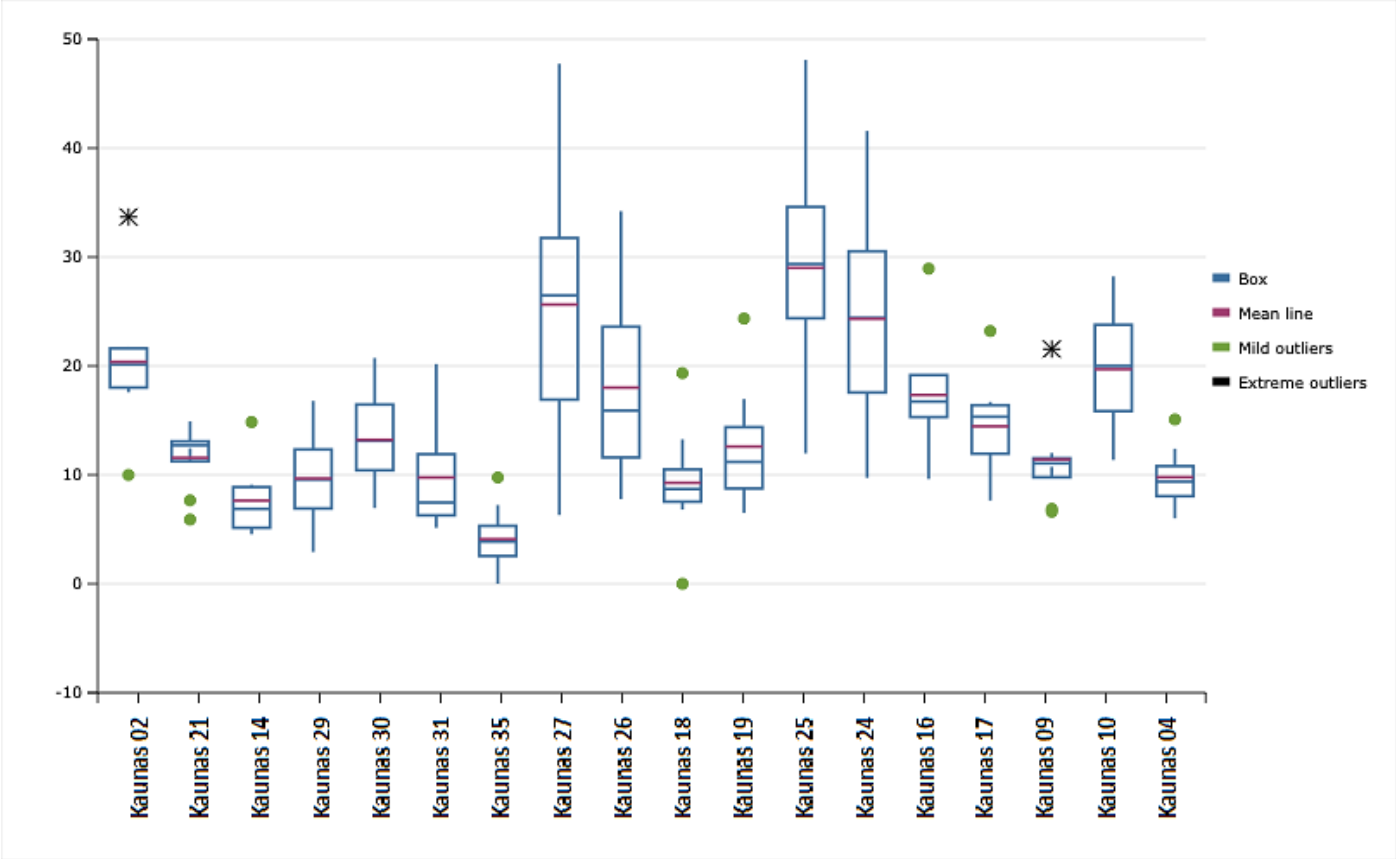


Fig. 119: Box plot - statistical evaluation of NO_2; Kaunas agglomeration

8.3.4.2. NO_2 - Agglomeration Vilnius

Location	Mean [µg/m³]	Mean LCL [µg/m³]	Mean UCL [µg/m³]	Minimum [µg/m³]	Maximum [µg/m³]	Range [µg/m³]	Median [µg/m³]
Vilnius 01	11,9	7,7	16,1	2	18,7	16,8	12,8
Vilnius 02	18,7	13,7	23,7	9,2	26,4	17,1	21
Vilnius 07	13,9	8,5	19,3	6,5	27,2	20,7	11,7
Vilnius 08	19,5	13,9	25,1	8,7	27,3	18,6	19,9
Vilnius 09	19,1	15,9	22,3	11,7	22,3	10,6	21,3
Vilnius 10	21,2	14,5	28	9,5	31,5	22,1	20,7
Vilnius 12	18,9	13,3	24,5	8,6	29,3	20,7	18,5
Vilnius 13	27,4	19,7	35,1	16,2	45,3	29,1	26,6
Vilnius 14	8,2	6,2	10,2	3,3	11,5	8,3	8,3
Vilnius 15	10	6,8	13,2	5,8	17,6	11,8	9
Vilnius 17	21	16	25,9	10	30	20	20,4
Vilnius 18	37,9	31,5	44,3	21,1	44,3	23,2	40,6
Vilnius 19	20,1	14,2	26	9,6	31,9	22,3	20,8
Vilnius 20	31,3	23,8	38,7	16,3	42,8	26,4	34,6
Vilnius 21	19,7	15,3	24,1	8,6	25,2	16,6	20,3
Vilnius 23	18,7	13,7	23,7	8,6	27,9	19,3	19,8
Vilnius 24	12	9,6	14,4	7,7	16,3	8,6	12,6
Vilnius 25	13,5	8,9	18,2	6,4	20,7	14,3	13,5
Vilnius 26	10,3	7,5	13,1	5,1	14,7	9,6	11,5
Vilnius 27	22,1	15	29,1	8,1	35,3	27,2	23,7
Vilnius 28	12,6	8,3	17	5,4	23,7	18,3	12,3
Vilnius 30	14,8	10,4	19,1	7,5	22,9	15,4	15,7
Vilnius 31	25	19,7	30,3	16,4	31,3	15	26,8
Vilnius 32	11,4	9,8	13	8,9	14,9	6	11,6
Vilnius 33	11,7	9,5	13,9	7,1	14,5	7,5	11,9
Vilnius 34	9,5	3,7	15,2	5,2	25,7	20,5	6,9
Vilnius 35	10,1	7,2	12,9	5,6	16,1	10,5	9,8

Tab.12. Statistical evaluation of NO_2; agglomeration of Vilnius

Tab. 12 and Fig. 120 provide information on the basic parameters of the NO_2 dataset in the Vilnius agglomeration. Data from individual 14-day sub-campaigns are used for the evaluation. The maximum value was measured at the Vilnius 13 location, namely 45.3 µg/m^3. The highest variance of the measured data was again measured at the Vilnius 13 location, namely 29.1 µg/m^3. The highest average of all campaigns was measured in Vilnius 18, namely 37.9 µg/m^3. On the contrary, the lowest average value of all campaigns was measured in the Vilnius 14 location, i.e. only 8.2 µg/m^3. This shows that the spatial variability of NO_2 concentrations in the Vilnius agglomeration is relatively high. This is probably due to the fact that one of the main sources of NO_2 is car traffic, which is relatively concentrated in the Vilnius agglomeration as in case of the Kaunas agglomeration.

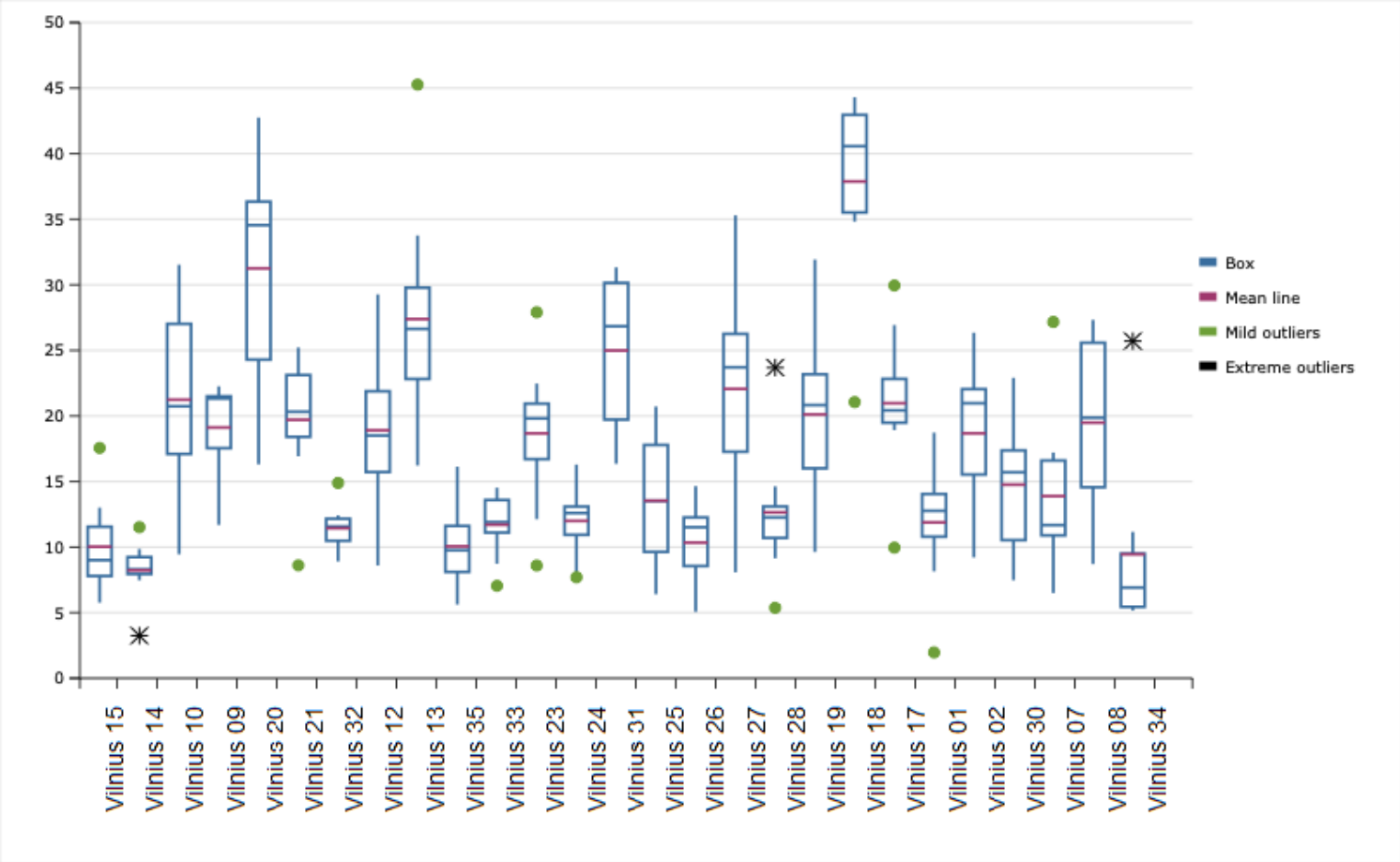


Fig. 120: Box plot - statistical evaluation of NO_2; agglomeration of Vilnius

8.3.4.3. NO_2 - Zone Lithuania

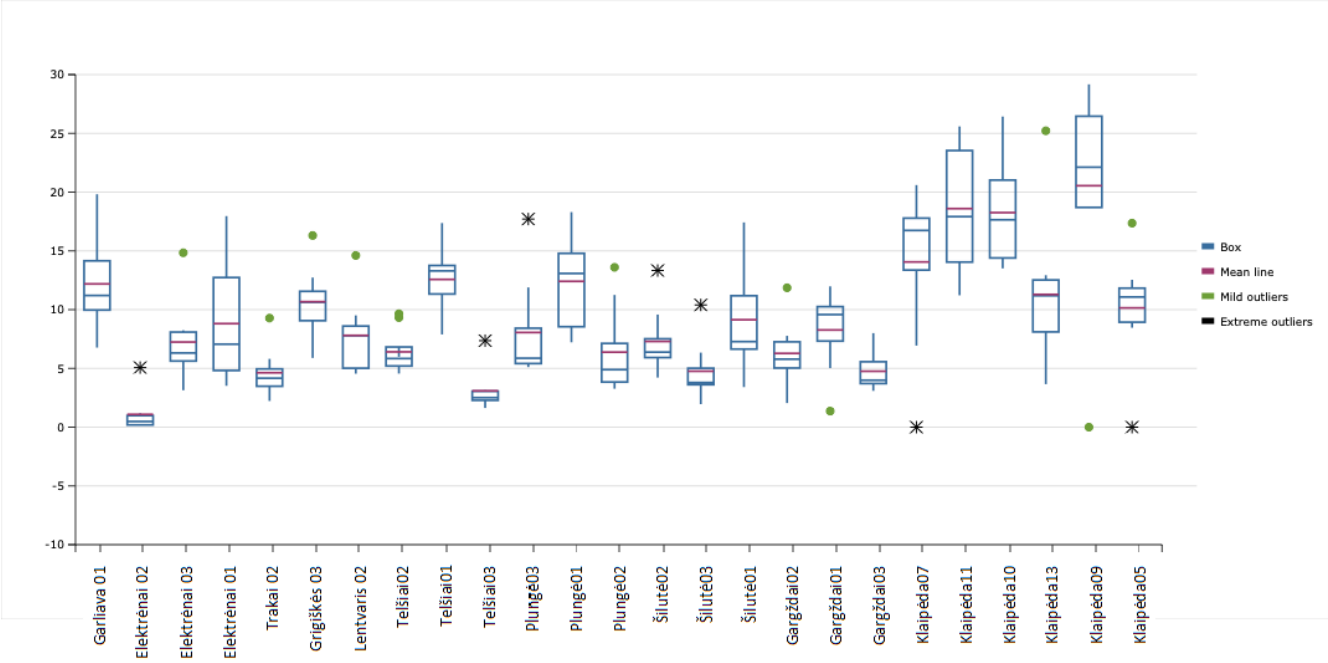
Location	Mean [µg/m³]	Mean LCL [µg/m³]	Mean UCL [µg/m³]	Minimum [µg/m³]	Maximum [µg/m³]	Range [µg/m³]	Median [µg/m³]
Alytus 01	6,8	5,1	8,6	4,5	11	6,5	6,6
Alytus 02	5,6	4,8	6,4	3,8	7	3,2	5,6
Alytus 03	13,1	6,2	15,8	7,4	17,1	9,7	12
Anykščiai 02	7,7	5,9	9,6	4,4	12,2	7,8	7,5
Birštonas 01	5,4	4,7	6,1	4,1	6,2	2,1	5,5
Biržai 01	6,4	3,4	9,5	2,1	14,3	12,3	5,7
Biržai 02	5,4	4	6,9	3,3	8,8	5,5	5,6
Druskininkai 01	8	6,1	9,8	4,3	10,9	6,6	7,8
Druskininkai 02	12,5	5,5	15,9	7,5	20,7	13,2	10,1
Druskininkai 03	4,9	3,4	6,5	2,6	7,7	5	4,4
Elektrėnai 01	8,8	4,5	13,1	3,5	18	14,4	7,1
Elektrėnai 02	5,3	4,1	6,5	2,9	6,7	3,8	5,6
Elektrėnai 03	7,2	4,3	10,1	3,1	14,8	11,7	6,3
Gargždai 01	8,3	5,4	11,2	1,4	12	10,6	9,6
Gargždai 02	6,3	3,9	8,6	2,1	11,9	9,8	5,8
Gargždai 03	4,8	3,4	6,1	3,1	8	4,9	4
Garliava 01	12,2	8,7	15,6	6,8	19,8	13,1	11,2
Grigiškės 03	10,7	8,1	13,2	5,9	16,3	10,4	10,6
Ignalina 01	6,1	4,8	7,3	3,6	7,9	4,3	6
Jonava 02	5,4	4,3	6,5	3,1	6,9	3,8	6
Jonava 03	5,9	4,4	7,5	2,7	8,8	6,1	6,4
Jubarkas 01	10,3	5,8	12,9	7,2	12,8	12,8	10,6
Jubarkas 02	4,5	2,4	6,7	1,7	9,9	8,2	4,6
Jubarkas 03	5,4	3,6	7,3	1,8	8,3	6,5	5,4
Kėdainiai 01	5,8	4,5	7,2	4,2	8,7	4,5	5,2
Kėdainiai 03	13,9	11,2	16,7	9,6	18,6	9,1	15
Kelmė 01	12,4	7,6	17,2	5,5	21,7	16,2	11
Klaipėda 05	11,5	6	14,3	8,5	17,4	8,9	11,1
Klaipėda 07	16,6	8,2	19,9	6,9	20,6	13,7	16,7
Klaipėda 09	23,8	12,7	28,3	18,6	29,2	10,6	22,1
Klaipėda 10	18,3	14,3	22,2	13,5	26,4	12,9	17,6
Klaipėda 11	18,6	13,9	23,3	11,2	25,6	14,4	17,9
Klaipėda 13	11,3	5,8	16,8	3,7	25,2	21,6	11,2
Kuršėnai 01	13,5	7	20,1	4,2	26,1	21,9	13,1
Kuršėnai 02	9,5	4,9	14,1	3,1	19,4	16,4	8,2

Location	Mean [µg/m³]	Mean LCL [µg/m³]	Mean UCL [µg/m³]	Minimum [µg/m³]	Maximum [µg/m³]	Range [µg/m³]	Median [µg/m³]
Kuršėnai 03	6,7	4	9,5	3,9	14	10,1	5,5
Lazdijai 02	4,5	3,7	5,3	3,1	5,7	2,6	4,5
Lentvaris 02	7,8	5	10,6	4,6	14,6	10,1	7,8
Likėnai 01	4,1	2,8	5,3	2,7	6,8	4,2	3,5
Marijampolė 01	18,1	14,4	21,8	10,8	24	13,2	19
Marijampolė 02	9,6	7,7	11,5	6,1	12,2	6,2	10,1
Marijampolė 04	8	6,1	10	4,5	12,2	7,7	7,5
Mažeikiai 01	10,6	7,5	13,7	3,2	14,1	10,9	11,6
Mažeikiai 03	9,9	4,7	15,1	2,5	21,2	18,7	8,4
OKTS 03	16,9	12	21,8	8,8	24,1	15,2	18,8
OKTS 12	9,2	7	11,4	5,4	13	7,6	8,7
OKTS 22	14,6	7	17,6	8,1	19	10,9	13,5
OKTS 23	7,2	4	10,3	4,1	14,4	10,3	5,5
OKTS 33	16,4	11,3	21,4	7,3	24,5	17,2	16,6
OKTS 41	17,5	13,3	21,6	10,2	27	16,8	17,3
OKTS 42	6,7	5,6	7,9	5	9	4	6,8
OKTS 43	7,9	5,8	10	4,2	11,6	7,5	8,2
OKTS 51	2	1,2	2,9	1,1	3,7	2,7	1,8
OKTS 52	3,1	2,3	3,9	1,9	4,3	2,4	2,8
OKTS 53	4,4	0,2	8,7	1,6	16,3	14,8	1,9
Pabradė 01	8,8	7	10,6	5,7	11,6	6	9,1
Palanga 02	7,8	6,1	9,5	5,4	11,2	5,8	7,1
Panevėžys 03	10,3	8,8	11,8	7,4	13	5,6	10,6
Panevėžys 04	9,4	7,3	11,6	4,8	13	8,2	9
Panevėžys 06	7,5	6,1	8,8	6,1	11	4,8	6,7
Panevėžys 07	8,7	6,9	10,6	5,1	11,8	6,8	8,6
Panevėžys 08	7,5	3	12	5	20,7	15,7	5,3
Panevėžys 12	10,4	8	12,7	6,2	14,7	8,5	10,6
Plungė 01	12,4	8,9	15,9	7,2	18,3	11,1	13,1
Plungė 02	6,4	3,1	9,6	3,3	13,6	10,3	4,9
Plungė 03	8,1	4,3	11,8	5,1	17,7	12,6	5,9
Radviliškis 01	14,7	9,1	20,3	4,9	22,3	17,4	15,5
Radviliškis 02	7,8	5,6	10,1	4,3	11,8	7,5	7,5
Radviliškis 03	9,8	7,2	12,5	5,5	14,5	9	9,8
Raseiniai 01	9,5	6,6	12,3	4,8	14,5	9,7	9
Raseiniai 02	5,6	4,7	6,5	3,4	7,2	3,8	5,5
Raseiniai 03	6,9	5	8,7	4,8	10,3	5,5	5,8
Rokiškis 01	10,3	7,6	13	6,2	16,1	10	9,8
Rokiškis 02	6,5	3,6	9,3	3,9	14,3	10,4	4,8
Rokiškis 03	7,1	5,1	9,1	3,8	10,5	6,7	6,5
Šiauliai 02	16,1	10,8	21,4	8	27,3	19,3	17,7
Šiauliai 05	14,9	9,4	20,5	7,1	23,2	16,1	13,7
Šiauliai 07	11,7	7,6	15,8	5	19,7	14,7	11,9
Šiauliai 09	10,6	6	15,1	6,2	23	16,8	9,2

Location	Mean [µg/m³]	Mean LCL [µg/m³]	Mean UCL [µg/m³]	Minimum [µg/m³]	Maximum [µg/m³]	Range [µg/m³]	Median [µg/m³]
Šiauliai 10	19,3	13,7	24,9	7,7	27	19,4	20,1
Šiauliai 11	9,5	5,1	13,9	5,7	21,1	15,4	7,4
Šilutė 01	9,1	5,3	13	3,4	17,4	14	7,3
Šilutė 02	7,3	4,9	9,7	4,2	13,3	9,1	6,4
Šilutė 03	4,8	2,6	6,9	2	10,4	8,4	3,8
Tauragė 01	13,4	5,9	16,3	7,2	19,6	12,4	11
Tauragė 02	7,9	5,4	10,4	4,3	12,7	8,4	8,1
Tauragė 03	7	4,4	9,6	3,8	13,5	9,7	6,4
Telšiai 01	12,6	10,1	15,1	7,9	17,4	9,5	13,3
Telšiai 02	6,4	4,8	8,1	4,6	9,7	5,1	5,8
Telšiai 03	3,1	1,6	4,6	1,6	7,4	5,7	2,5
Trakai 02	4,6	2,8	6,4	2,2	9,3	7,1	4,2
Ukmergė 01	9,1	7,6	10,6	6,4	12,3	6	9,1
Ukmergė 02	6,2	4,4	7,9	3,8	10,3	6,5	5,5
Ukmergė 03	5,9	4,1	7,7	4,3	11	6,7	5,3
Utena 01	10	6,4	13,6	4,3	16,4	12,2	9,4
Utena 02	5,6	3,7	7,5	3,8	10,8	7	5,2
Utena 03	4,8	3,2	6,4	1,9	7,1	5,2	5
Vilkaviškis 01	7,2	5,9	8,4	4,9	9,3	4,4	7
Vilkaviškis 02	6,6	5	8,2	3,4	9	5,6	6,7
Vilkaviškis 03	6,5	5,3	7,7	4,4	8,7	4,2	6,5
Visaginas 01	6	4,6	7,3	3,9	8,3	4,4	5,6
Visaginas 02	4,6	3	6,3	2,6	8	5,4	3,8
Visaginas 03	4,1	2	6,2	1,2	7,4	6,1	4,5

Tab. 13.: Statistical evaluation of NO_2; Lithuania zone

Tab. 13 and Fig. 121 provide information on the basic parameters of the NO_2 dataset across the whole of Lithuania (excluding the agglomerations of Vilnius and Kaunas). Data from individual 14-day sub-campaigns are used for the evaluation. The maximum value was measured at the location of Klaipėda 09, namely 29.2 µg/m³. The greatest variance of the measured data was then measured again in the Kuršėnai 01 location, namely 21.9 µg/m³. The highest average value of all campaigns was measured in the location Klaipėda 09, namely 23.8 µg/m³. On the other hand, the lowest average value of all campaigns was measured at the background air pollution monitoring station in Utena dist. - OKTS 51, only 2.0 µg/m³. This shows that the spatial variability of NO_2 concentrations throughout the Lithuania zone is lower than in case of the Kaunas and Vilnius agglomerations, which significantly exceed the rest of the Lithuania zone by the measured NO_2 concentrations. This shows that the traffic load in the Kaunas and Vilnius agglomerations is greater than in the rest of Lithuania.



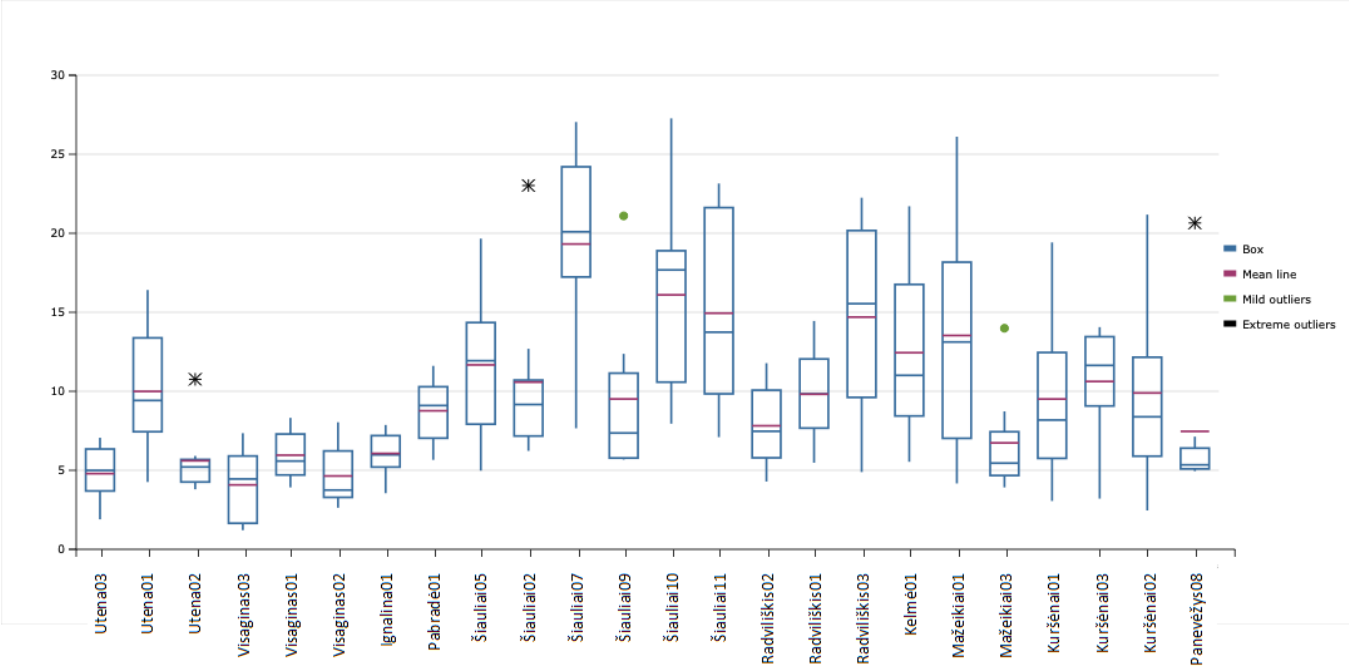


Fig. 121 (1): Box plot - statistical evaluation of NO_2; Lithuania zone

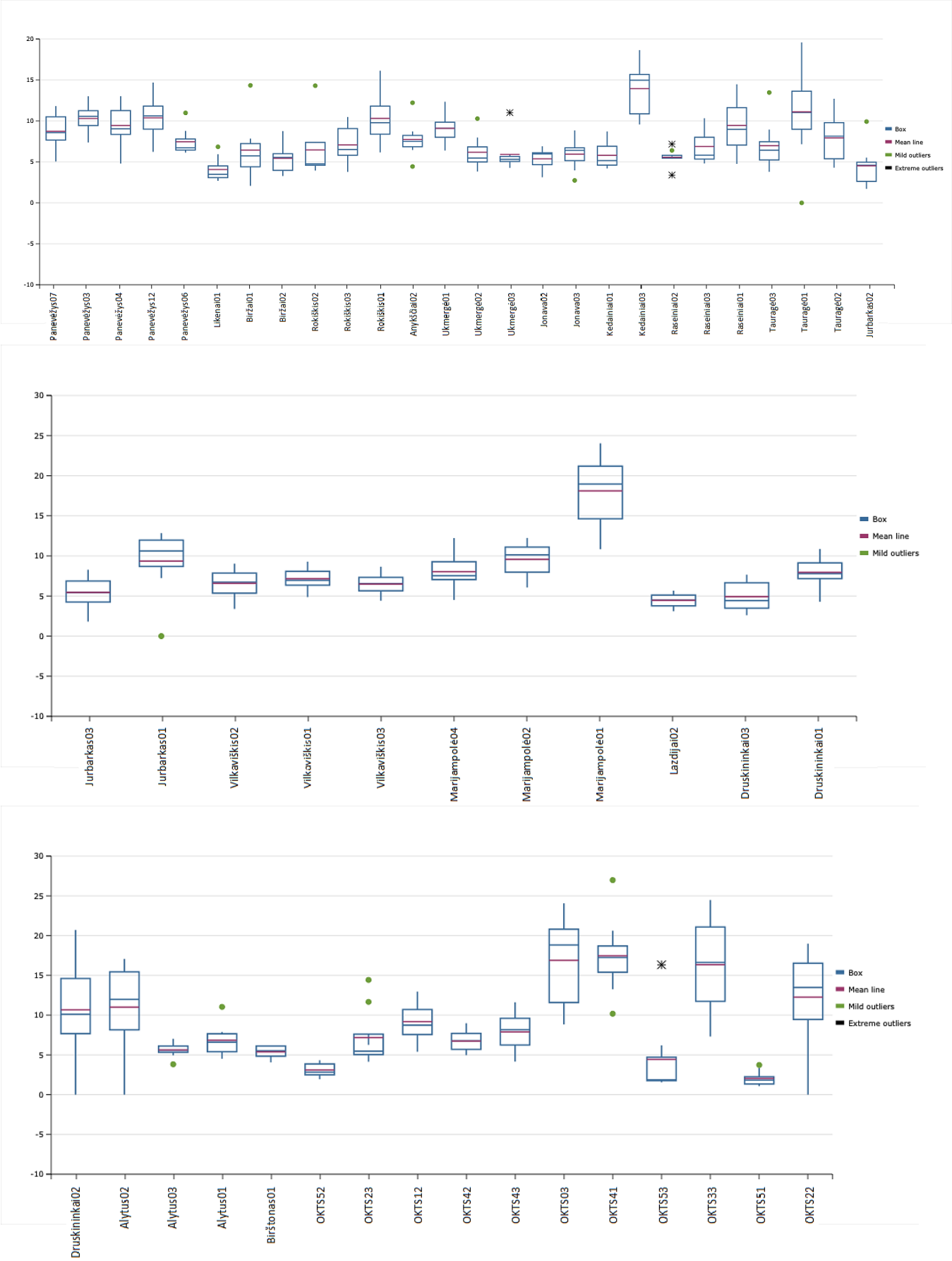


Fig. 121 (2): Box plot - statistical evaluation of NO_2; Lithuania zone

8.3.5. Evaluation of SO_2

8.3.5.1. SO_2 - Agglomeration Kaunas

Location	Mean [µg/m³]	Mean LCL [µg/m³]	Mean UCL [µg/m³]	Minimum [µg/m³]	Maximum [µg/m³]	Range [µg/m³]	Median [µg/m³]
Kaunas 02	1,4	-0,7	3,4	0,2	7,4	7,2	0,4
Kaunas 04	1,2	0,2	2,2	0,2	3,4	3,2	0,7
Kaunas 09	1,2	0	2,4	0,2	4,1	3,9	0,7
Kaunas 10	1,3	-0,1	2,7	0,2	4,2	4	0,4
Kaunas 14	1,4	0	2,9	0,2	5,5	5,3	0,8
Kaunas 16	1	0,1	1,9	0	3,2	3,2	0,6
Kaunas 17	1	0,1	1,9	0,2	2,9	2,7	0,5
Kaunas 18	1,6	-0,1	3,3	0	5,9	5,9	0,6
Kaunas 19	1,4	0,1	2,7	0,2	4,8	4,6	0,8
Kaunas 21	1,2	-0,6	2,9	0	6,3	6,3	0,5
Kaunas 24	0,7	0,1	1,3	0,2	2,4	2,2	0,5
Kaunas 25	1	-0,3	2,3	0,1	4,7	4,6	0,4
Kaunas 26	1,4	-1	3,9	0	8,6	8,6	0,4
Kaunas 27	1,1	-0,5	2,8	0,1	5,9	5,8	0,5
Kaunas 29	2,1	-0,4	4,5	0	8,5	8,5	0,9
Kaunas 30	1,6	-0,2	3,4	0,2	6,5	6,3	0,7
Kaunas 31	2,7	-1	6,4	0,2	13,2	13	1
Kaunas 35	0,5	0	0,9	0	1,3	1,3	0,3

Tab.14.: SO_2 statistical evaluation; Kaunas agglomeration

Tab. 14 and Fig. 122 provide information on the basic parameters of the SO_2 data set in the Kaunas agglomeration. Data from individual 14-day sub-campaigns are used for the evaluation. The maximum value was measured at Kaunas 31, namely 13.2 µg/m³. The highest variance of the measured data was again measured in the Kaunas 31 location, namely 13.0 µg/m³. The highest average value of all campaigns was measured again in Kaunas 31, namely 2.7 µg/m³. On the other hand, the lowest average value of all campaigns was measured in Kaunas 35, only 0.5 µg/m³. This shows that the spatial variability of SO_2 concentrations in the Kaunas agglomeration is relatively low.

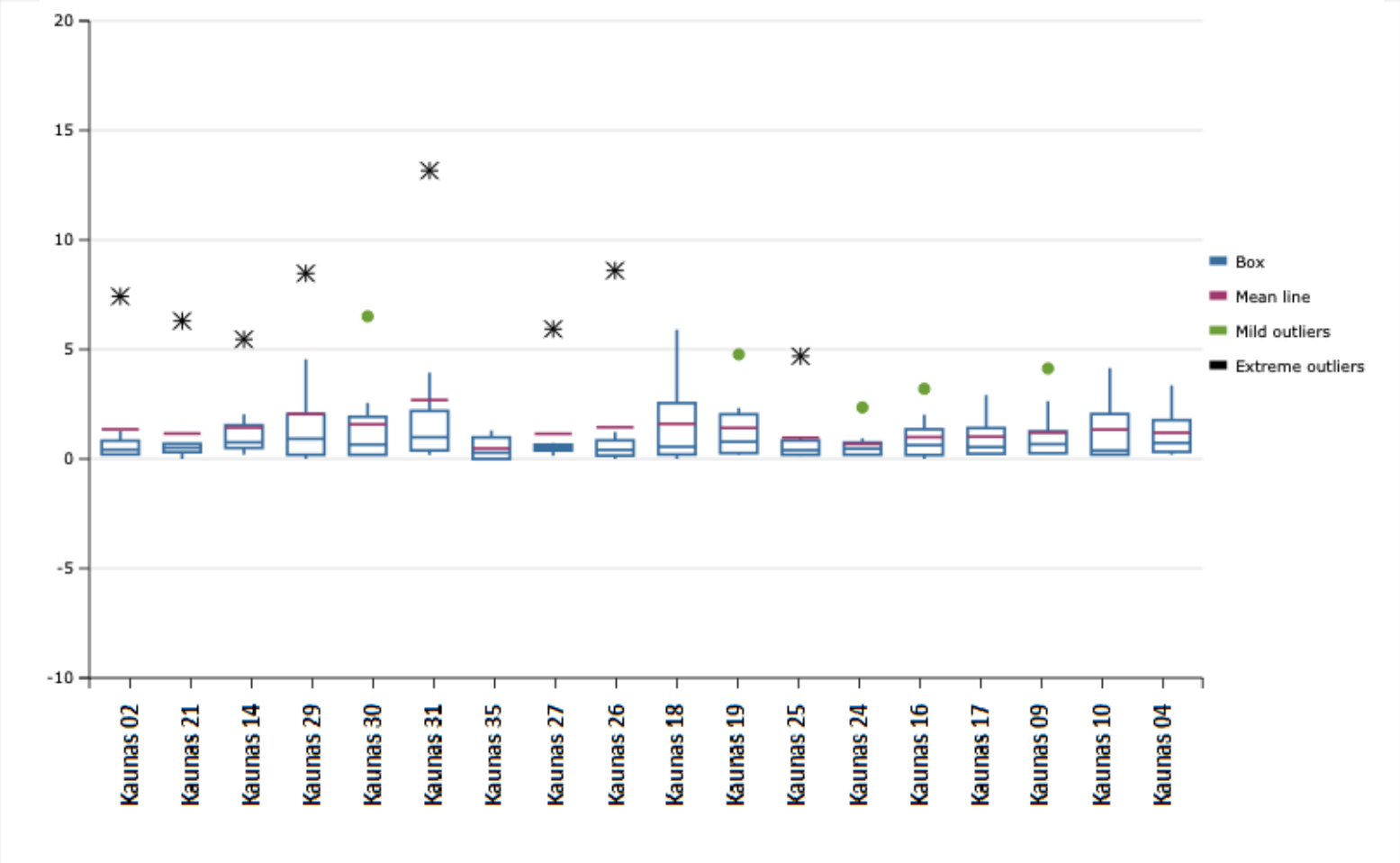


Fig. 122: Box plot - SO_2 characteristics – Agglomeration Kaunas

8.3.5.2. SO_2 - Agglomeration Vilnius

Location	Mean [µg/m³]	Mean LCL [µg/m³]	Mean UCL [µg/m³]	Minimum [µg/m³]	Maximum [µg/m³]	Range [µg/m³]	Median [µg/m³]
Vilnius 01	1,1	0,3	1,9	0,3	3,1	2,7	0,7
Vilnius 02	0,9	0,3	1,6	0,2	2,4	2,3	0,7
Vilnius 07	0,8	0,2	1,3	0	2,1	2,1	0,7
Vilnius 08	0,9	0,2	1,5	0	2,2	2,2	0,7
Vilnius 09	0,8	0	1,6	0	2,9	2,9	0,6
Vilnius 10	1,2	0,4	2	0,2	3,1	2,9	0,8
Vilnius 12	1,2	0,4	2	0,5	3,1	2,6	0,7
Vilnius 13	1,3	0	2,6	0,3	4,4	4,1	0,6
Vilnius 14	1,3	0,5	2	0,2	3,4	3,2	1,2
Vilnius 15	1,2	0,3	2	0,2	3,2	3	0,7
Vilnius 17	1,1	0	2,2	0,2	4,4	4,2	0,8
Vilnius 18	1,6	0,2	3,1	0,3	5,3	5	0,9
Vilnius 19	1,1	0,4	1,9	0,3	2,9	2,6	0,7
Vilnius 20	0,9	0	1,8	0,2	3,4	3,2	0,6
Vilnius 21	1	0,3	1,7	0,5	3,1	2,6	0,6
Vilnius 23	1	0,2	1,9	0	3,2	3,2	0,7
Vilnius 24	0,9	0,2	1,6	0,2	2,9	2,7	0,7
Vilnius 25	2,4	-1,6	6,3	0,2	14,1	13,8	0,6
Vilnius 26	2	0,6	3,4	0,3	4,8	4,5	1,4
Vilnius 27	1,1	0,7	1,6	0,3	1,6	1,3	1,3
Vilnius 28	0,9	0,3	1,4	0,3	2,2	1,9	0,7
Vilnius 30	0,7	0,3	1	0	1,3	1,3	0,7
Vilnius 31	1,2	0,4	1,9	0,3	3,1	2,8	0,8
Vilnius 32	0,8	0,1	1,4	0,2	2,7	2,5	0,6
Vilnius 33	1,8	0,5	3	0,2	4,5	4,3	1,5
Vilnius 34	1,5	0,2	2,9	0,3	4,6	4,3	0,8
Vilnius 35	1,2	0,5	1,8	0,3	2,2	1,9	0,8

Tab.15. Statistical evaluation of SO_2; Vilnius agglomeration

Tab. 15 and Fig. 123 provide information on the basic parameters of the SO_2 data set in the Vilnius agglomeration. Data from individual 14-day campaigns are used for the evaluation. The maximum value was measured at the Vilnius 25 location, namely 14.1 µg/m^3. The highest variance of the measured data was again measured in the Vilnius 25 location, namely 13.8 µg/m^3. The highest average of all campaigns was measured again in the Vilnius 25 location, namely 2.4 µg/m^3. On the contrary, the lowest average value of all campaigns was measured in the Vilnius 30 location, ie. only 0.7 µg/m^3. This shows that the spatial variability of SO_2 concentrations in the Vilnius agglomeration is relatively small.

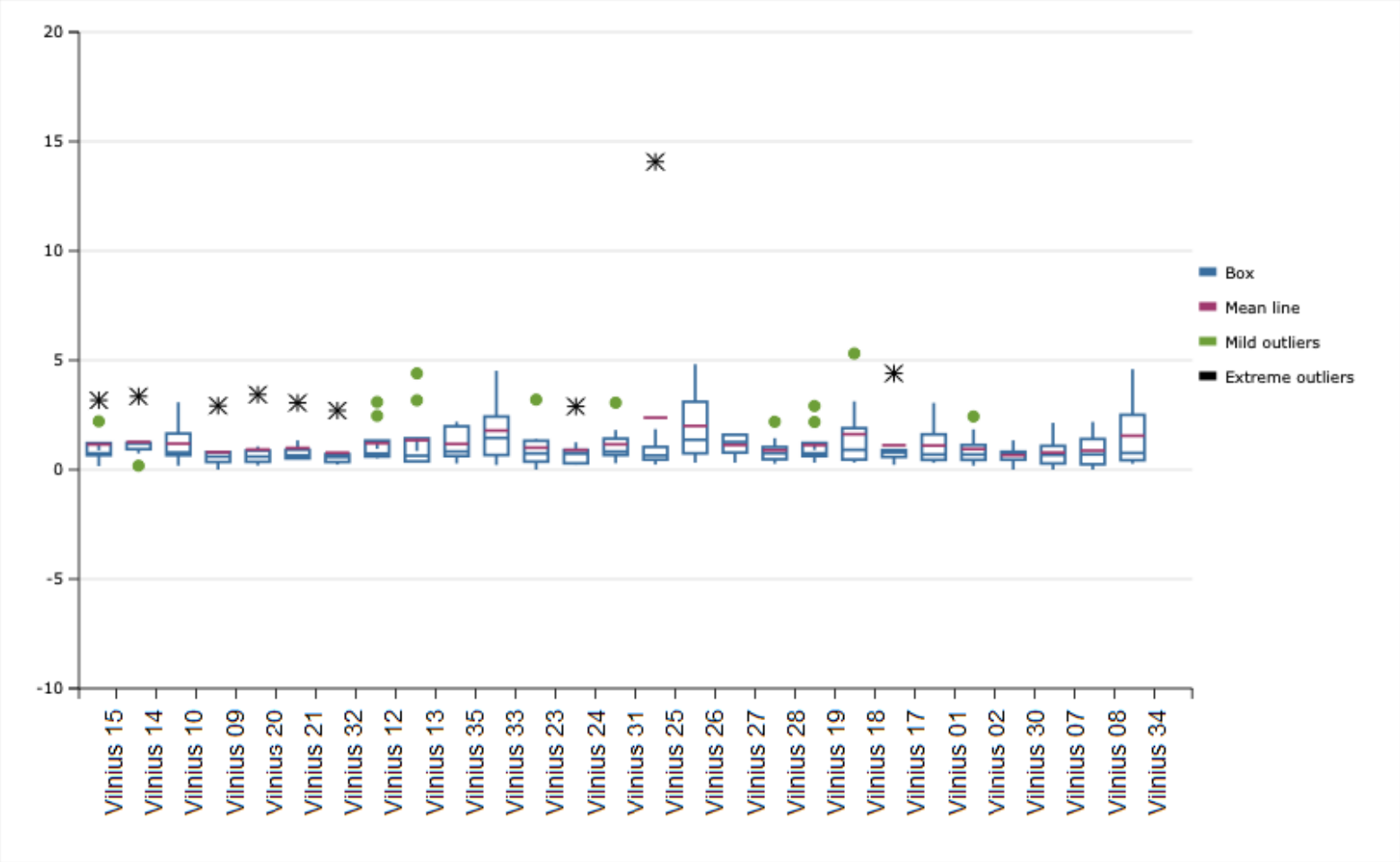


Fig. 123: Box plot - SO_2 characteristics – Agglomeration Vilnius

8.3.5.3. SO_2 – Zone Lithuania

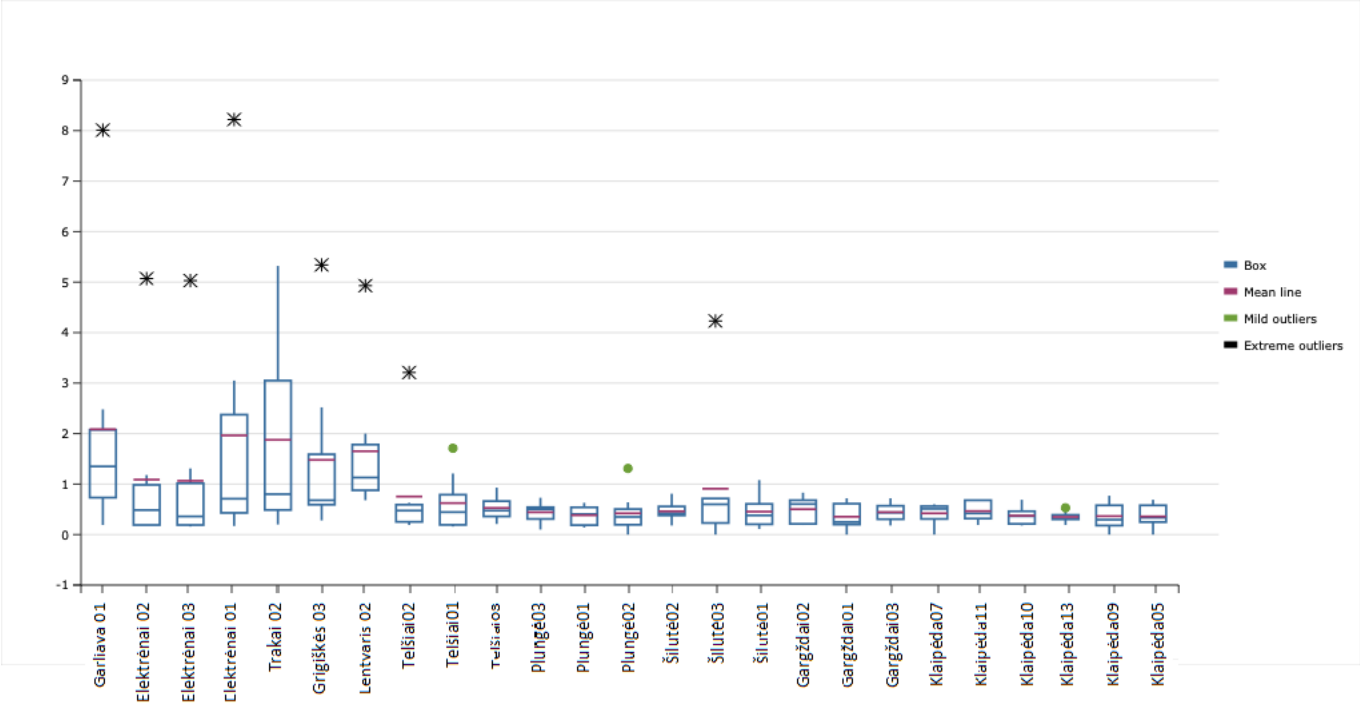
Location	Mean [µg/m³]	Mean LCL [µg/m³]	Mean UCL [µg/m³]	Minimum [µg/m³]	Maximum [µg/m³]	Range [µg/m³]	Median [µg/m³]
Alytus 01	0,6	0,1	1	0,1	1,4	1,3	0,4
Alytus 02	0,5	0,2	0,8	0,1	1,1	1	0,4
Alytus 03	0,6	0	1,3	0	2,3	2,3	0,4
Anykščiai 02	0,5	0	1	0	1,7	1,7	0,4
Birštonas 01	0,5	0	0,9	0	1,5	1,5	0,2
Biržai 01	0,7	-0,2	1,6	0,2	3,3	3,1	0,3
Biržai 02	0,6	0,2	1,1	0,2	1,7	1,5	0,4
Druskininkai 01	0,7	0,3	1,1	0,2	1,4	1,2	0,5
Druskininkai 02	0,4	0,1	0,7	0	1,1	1,1	0,2
Druskininkai 03	0,4	0,1	0,6	0,1	1,1	1	0,2
Elektrėnai 01	2	-0,3	4,2	0,2	8,2	8,1	0,7
Elektrėnai 02	1,1	-0,3	2,5	0,2	5,1	4,9	0,5
Elektrėnai 03	1,1	-0,3	2,4	0,2	5	4,9	0,4
Gargždai 01	0,4	0,1	0,6	0	0,7	0,7	0,3
Gargždai 02	0,5	0,3	0,7	0,2	0,8	0,6	0,6
Gargždai 03	0,4	0,3	0,6	0,2	0,7	0,5	0,4
Garliava 01	2,1	0	4,2	0,2	8	7,8	1,4
Grigiškės 03	1,5	0	2,9	0,3	5,3	5,1	0,7
Ignalina 01	0,3	0,1	0,5	0	0,9	0,9	0,3
Jonava 02	0,9	0,4	1,4	0,4	2,4	2	0,7
Jonava 03	0,9	0,4	1,3	0	1,7	1,7	0,9
Jubarkas 01	0,9	0,3	1,4	0	2,2	2,2	0,7
Jubarkas 02	0,6	0,1	1,1	0	2,1	2,1	0,6
Jubarkas 03	1,4	0,7	2,2	0,6	3,2	2,6	1,1
Kėdainiai 01	2,3	0,3	4,4	0,5	7,6	7,1	1,2
Kėdainiai 03	1,2	0,3	2,1	0,1	3,7	3,6	0,9
Kelmė 01	1	0,5	1,6	0,3	2,3	2	0,7
Klaipėda 05	0,4	0,1	0,6	0	0,7	0,7	0,3
Klaipėda 07	0,4	0,3	0,6	0	0,6	0,6	0,5
Klaipėda 09	0,4	0,1	0,6	0	0,8	0,8	0,3
Klaipėda 10	0,4	0,2	0,5	0,2	0,7	0,5	0,4
Klaipėda 11	0,5	0,3	0,6	0,2	0,7	0,5	0,4
Klaipėda 13	0,4	0,3	0,4	0,2	0,5	0,3	0,3
Kuršėnai 01	1,3	0,2	2,4	0,3	4,2	3,9	0,9

Location	Mean [µg/m³]	Mean LCL [µg/m³]	Mean UCL [µg/m³]	Minimum [µg/m³]	Maximum [µg/m³]	Range [µg/m³]	Median [µg/m³]
Kuršėnai 02	1,7	0,3	3,2	0,3	5,8	5,5	1,3
Kuršėnai 03	0,9	0,4	1,5	0,3	1,9	1,6	0,8
Lazdijai 02	0,6	0,2	0,9	0,2	1,2	1,1	0,5
Lentvaris 02	1,7	0,5	2,8	0,7	4,9	4,3	1,1
Likėnai 01	0,6	0,1	1	0	1,7	1,7	0,4
Marijampolė 01	0,9	-0,2	2	0,1	4,1	4	0,5
Marijampolė 02	0,6	0,1	1,1	0	1,8	1,8	0,5
Marijampolė 04	0,7	0,1	1,3	0	2,1	2,1	0,5
Mažeikiai 01	1,3	0,8	1,8	0,3	2,2	1,9	1,2
Mažeikiai 03	1,3	0,8	1,7	0,4	2,2	1,8	1,2
OKTS 03	0,6	0,3	0,8	0,2	1,1	0,9	0,5
OKTS 12	0,6	0,1	1	0,2	1,8	1,6	0,4
OKTS 22	0,9	0,2	1,5	0	2,7	2,7	0,7
OKTS 23	1,4	0,6	2,2	0,3	3,4	3,1	1,3
OKTS 33	0,5	0,3	0,6	0,2	0,8	0,6	0,4
OKTS 41	1,6	-0,2	3,4	0	6,3	6,3	0,8
OKTS 42	0,6	0,3	0,9	0	1,1	1,1	0,6
OKTS 43	0,8	0,4	1,2	0,1	1,7	1,6	0,7
OKTS 51	0,8	0,4	1,2	0,2	1,5	1,3	0,9
OKTS 52	0,7	0,3	1,1	0,1	1,4	1,3	0,5
OKTS 53	0,5	0,3	0,6	0,2	0,8	0,6	0,4
Pabradė 01	0,5	0,2	0,8	0,2	1,2	1	0,5
Palanga 02	0,4	0,1	0,6	0	0,7	0,7	0,4
Panevėžys 03	0,7	0,2	1,2	0,2	1,7	1,5	0,5
Panevėžys 04	0,7	0,3	1,2	0,3	1,6	1,3	0,6
Panevėžys 06	0,8	0	1,6	0	2,7	2,7	0,5
Panevėžys 07	0,5	0,1	0,9	0	1,6	1,6	0,4
Panevėžys 08	0,5	0	1	0	1,8	1,8	0,4
Panevėžys 12	0,6	0,2	1,1	0	1,5	1,5	0,5
Plungė 01	0,4	0,2	0,5	0,1	0,6	0,5	0,4
Plungė 02	0,4	0,1	0,8	0	1,3	1,3	0,4
Plungė 03	0,4	0,3	0,6	0,1	0,7	0,6	0,5
Radviliškis 01	1,4	0,8	2,1	0,3	2,4	2,1	1,5
Radviliškis 02	0,7	0,5	0,9	0,3	1,1	0,8	0,8
Radviliškis 03	0,9	0,4	1,4	0,3	2,3	2	0,8
Raseiniai 01	0,9	0,2	1,5	0	2,6	2,6	0,7
Raseiniai 02	0,8	0,3	1,2	0	1,8	1,8	0,7
Raseiniai 03	1	0,1	1,8	0	2,7	2,7	0,6
Rokiškis 01	0,7	0	1,3	0	2,3	2,3	0,4
Rokiškis 02	0,5	0	0,9	0	1,7	1,7	0,3
Rokiškis 03	0,7	0,2	1,1	0,2	1,8	1,6	0,5
Šiauliai 02	1,5	0,1	2,9	0,3	5,4	5,1	1
Šiauliai 05	1,3	0,6	2	0,3	2,9	2,7	1,3

Location	Mean [µg/m³]	Mean LCL [µg/m³]	Mean UCL [µg/m³]	Minimum [µg/m³]	Maximum [µg/m³]	Range [µg/m³]	Median [µg/m³]
Šiauliai 07	1	0,6	1,4	0,4	1,7	1,3	0,9
Šiauliai 09	0,9	0,5	1,3	0,3	2	1,7	0,8
Šiauliai 10	1,1	0,1	2,1	0	3,9	3,9	0,7
Šiauliai 11	0,7	0,4	1	0,3	1,3	1	0,7
Šilutė 01	0,5	0,2	0,7	0,1	1,1	1	0,4
Šilutė 02	0,5	0,3	0,6	0,2	0,8	0,6	0,4
Šilutė 03	0,9	-0,2	2,1	0	4,2	4,2	0,6
Tauragė 01	1,1	-0,1	2,2	0	4,4	4,4	0,7
Tauragė 02	0,7	0,1	1,3	0	2,1	2,1	0,6
Tauragė 03	0,9	0,7	1,2	0,6	1,4	0,8	0,9
Telšiai 01	0,6	0,2	1,1	0,2	1,7	1,6	0,4
Telšiai 02	0,8	-0,1	1,6	0,2	3,2	3	0,5
Telšiai 03	0,5	0,3	0,7	0,2	0,9	0,7	0,5
Trakai 02	1,9	0,2	3,6	0,2	5,3	5,1	0,8
Ukmergė 01	0,4	0,1	0,7	0	1,1	1,1	0,2
Ukmergė 02	1	0,2	1,7	0,3	3	2,7	0,5
Ukmergė 03	0,9	0,2	1,7	0,2	2,8	2,6	0,6
Utena 01	0,4	0,2	0,5	0,2	0,6	0,4	0,3
Utena 02	0,4	0,3	0,5	0,2	0,6	0,4	0,4
Utena 03	0,6	0,2	1,1	0,2	1,7	1,5	0,4
Vilkaviškis 01	1	0,2	1,8	0,1	2,7	2,6	0,8
Vilkaviškis 02	0,8	0,1	1,5	0	2,4	2,4	0,6
Vilkaviškis 03	1	0,4	1,7	0,1	2,2	2,1	1,2
Visaginas 01	0,6	-0,1	1,3	0,1	2,6	2,4	0,3
Visaginas 02	0,4	0,1	0,7	0,2	1,1	0,9	0,3
Visaginas 03	0,5	0,2	0,7	0,2	1	0,8	0,4

Tab.16.: Statistical evaluation of SO_2; zone Lithuania

Tab. 16 and Fig. 124 provide information on the basic parameters of the SO_2 dataset across the whole Lithuania zone (excluding Vilnius and Kaunas agglomerations). Data from individual 14-day sub-campaigns are used for the evaluation. The maximum value was measured in the location Elektrėnai 01, namely 8.2 µg/m³. The largest variance of the measured data was then measured again in the location Elektrėnai 01, namely 8.1 µg/m³. The highest average value from all campaigns was then measured in the location Kėdainiai 01, namely 2.3 µg/m³. On the contrary, the lowest average value from all campaigns was measured in the location Ignalina 01, only 0.3 µg/m³. It is clear from this data that the spatial variability of SO_2 concentrations in the whole zone of Lithuania is similarly small as in the case of the agglomerations Kaunas and Vilnius.



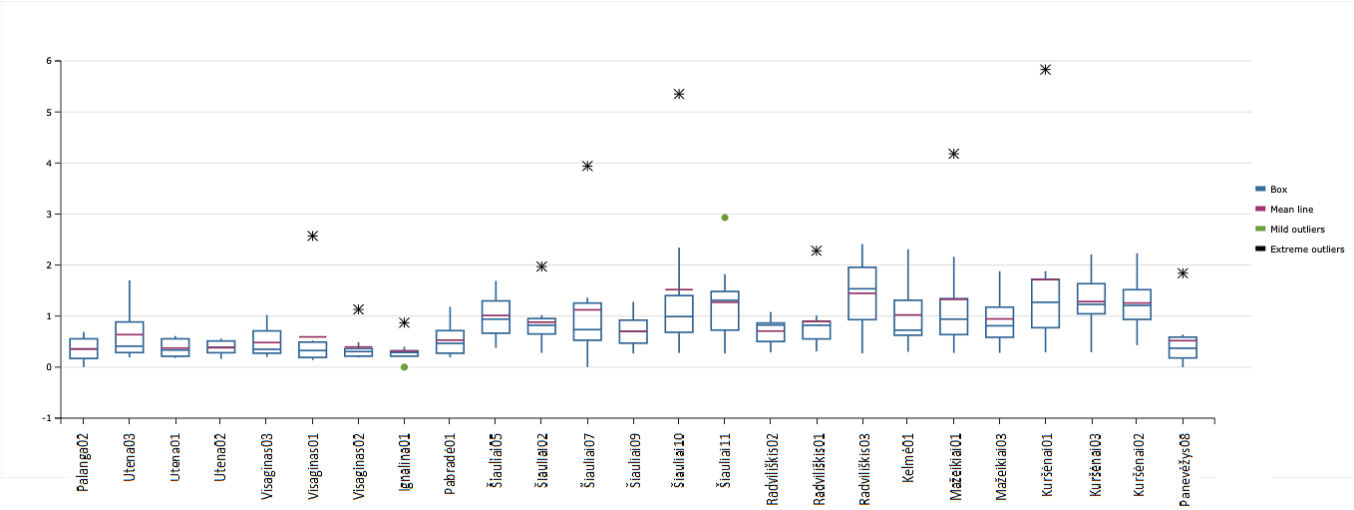
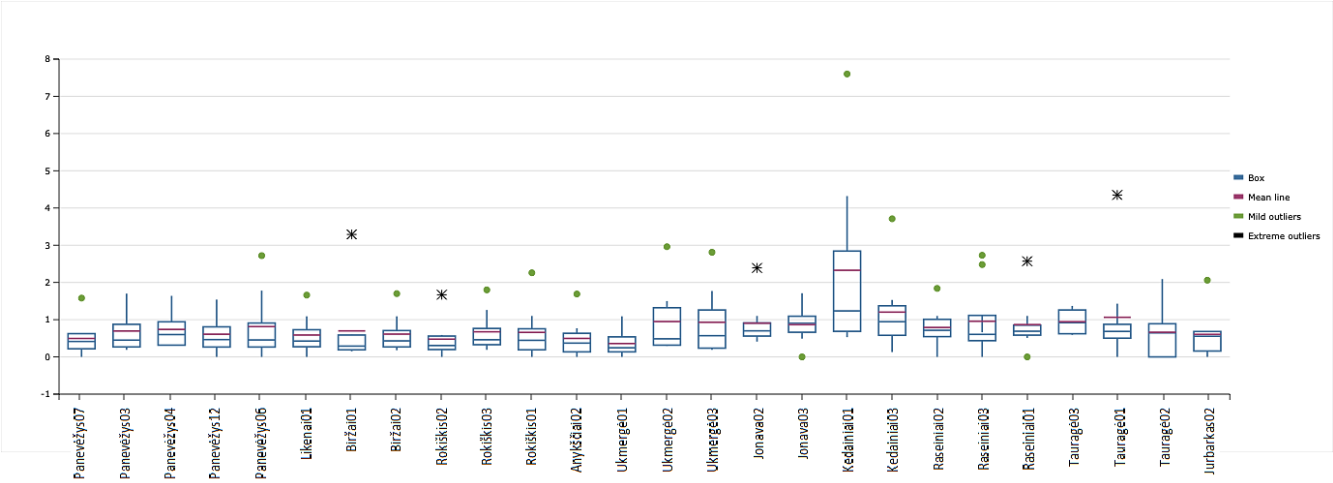
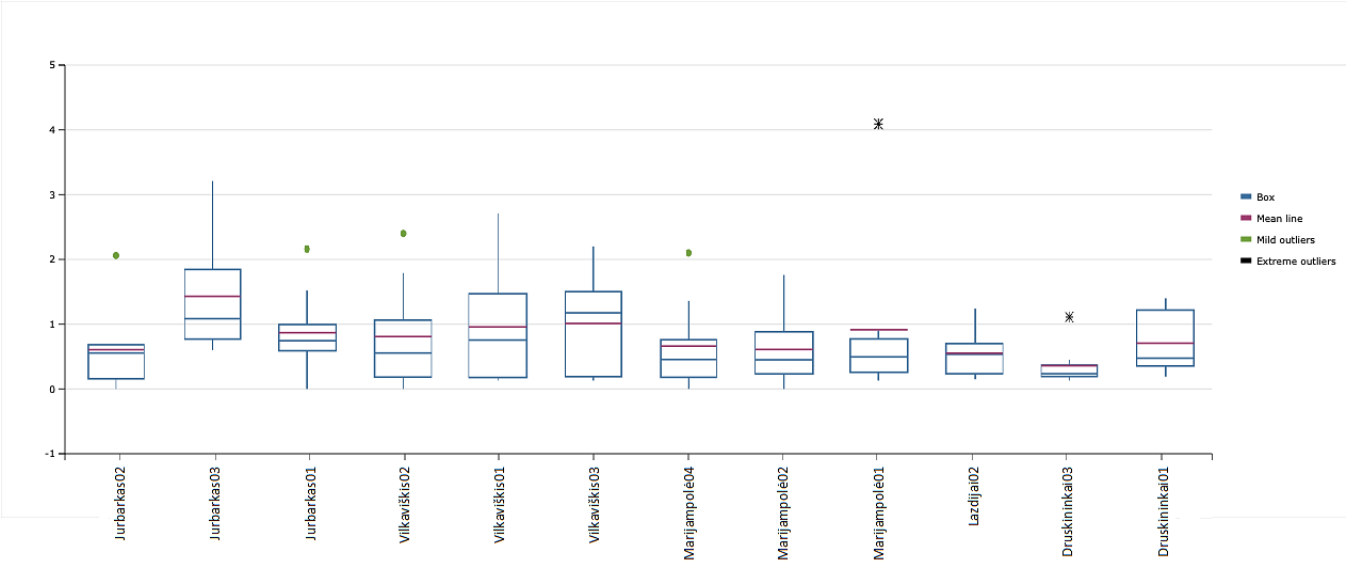


Fig. 124 (1): Box plot - SO_2 characteristics – Lithuania zone





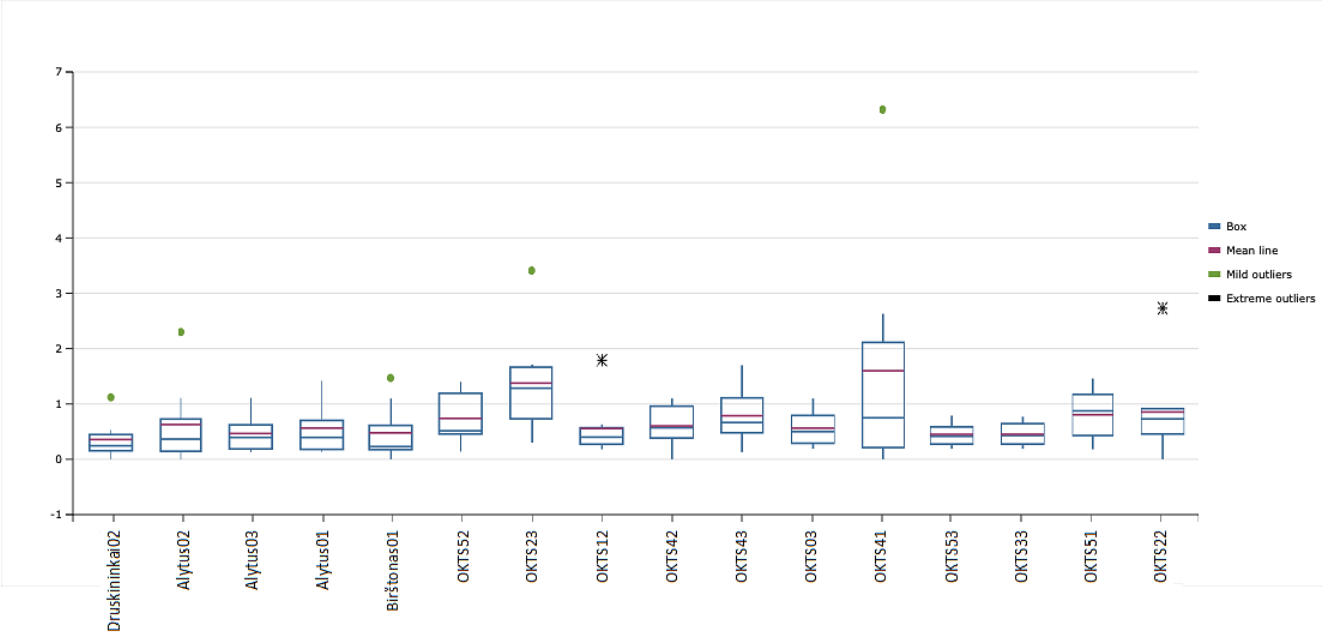


Fig. 124 (2): Box plot - SO_2 characteristics – Lithuania zone

8.3.6. Evaluation of Benzene

8.3.6.1. Benzene - Agglomeration Kaunas

Location	Mean [µg/m³]	Mean LCL [µg/m³]	Mean UCL [µg/m³]	Minimum [µg/m³]	Maximum [µg/m³]	Range [µg/m³]	Median [µg/m³]
Kaunas 02	1	0,5	1,6	0,4	2,2	1,9	0,8
Kaunas 04	0,9	0,4	1,3	0,3	1,8	1,4	0,8
Kaunas 09	0,8	0,4	1,3	0,3	1,6	1,3	0,7
Kaunas 10	1	0,6	1,4	0,5	1,8	1,3	0,9
Kaunas 14	0,6	0,4	0,9	0,3	1,1	0,8	0,6
Kaunas 16	1	0,4	1,6	0,4	2,1	1,7	0,8
Kaunas 17	0,8	0,4	1,3	0	1,8	1,8	0,7
Kaunas 18	0,8	0,4	1,2	0	1,3	1,3	0,9
Kaunas 19	0,9	0,4	1,3	0,4	2	1,6	0,8
Kaunas 21	0,8	0,4	1,3	0,3	1,7	1,5	0,7
Kaunas 24	1,2	0,6	1,8	0,5	2,5	2	1
Kaunas 25	0,9	0,5	1,3	0,4	1,7	1,3	0,8
Kaunas 26	1	0,6	1,5	0,5	2	1,5	1,1
Kaunas 27	1,1	0,8	1,4	0,6	1,5	0,9	1,2
Kaunas 29	0,8	0,5	1	0,4	1,2	0,8	0,7
Kaunas 30	1,2	0,6	1,8	0,5	2,6	2,1	1
Kaunas 31	0,8	0,3	1,3	0,4	2	1,6	0,6
Kaunas 35	1,1	0,5	1,6	0,4	2,2	1,8	0,9

Tab. 17: statistical evaluation of benzene; Kaunas agglomeration

Tab. 17 and Fig. 125 provide information on the basic parameters of the benzene data set in the Kaunas agglomeration. Data from individual 14-day sub-campaigns are used for the evaluation. The maximum value was measured in the location Kaunas 30, namely 2.6 µg/m^3. The largest variance of the measured data was then measured again in the Kaunas 30 location, namely 2.1 µg/m^3. The highest average value of all campaigns was measured in the locations Kaunas 30 and Kaunas 24, namely 1.2 µg/m^3. On the other hand, the lowest average value of all campaigns was measured in the Kaunas 14 location, ie. only 0.6 µg/m^3. This shows that the spatial variability of benzene concentrations in the Kaunas agglomeration is not significant.

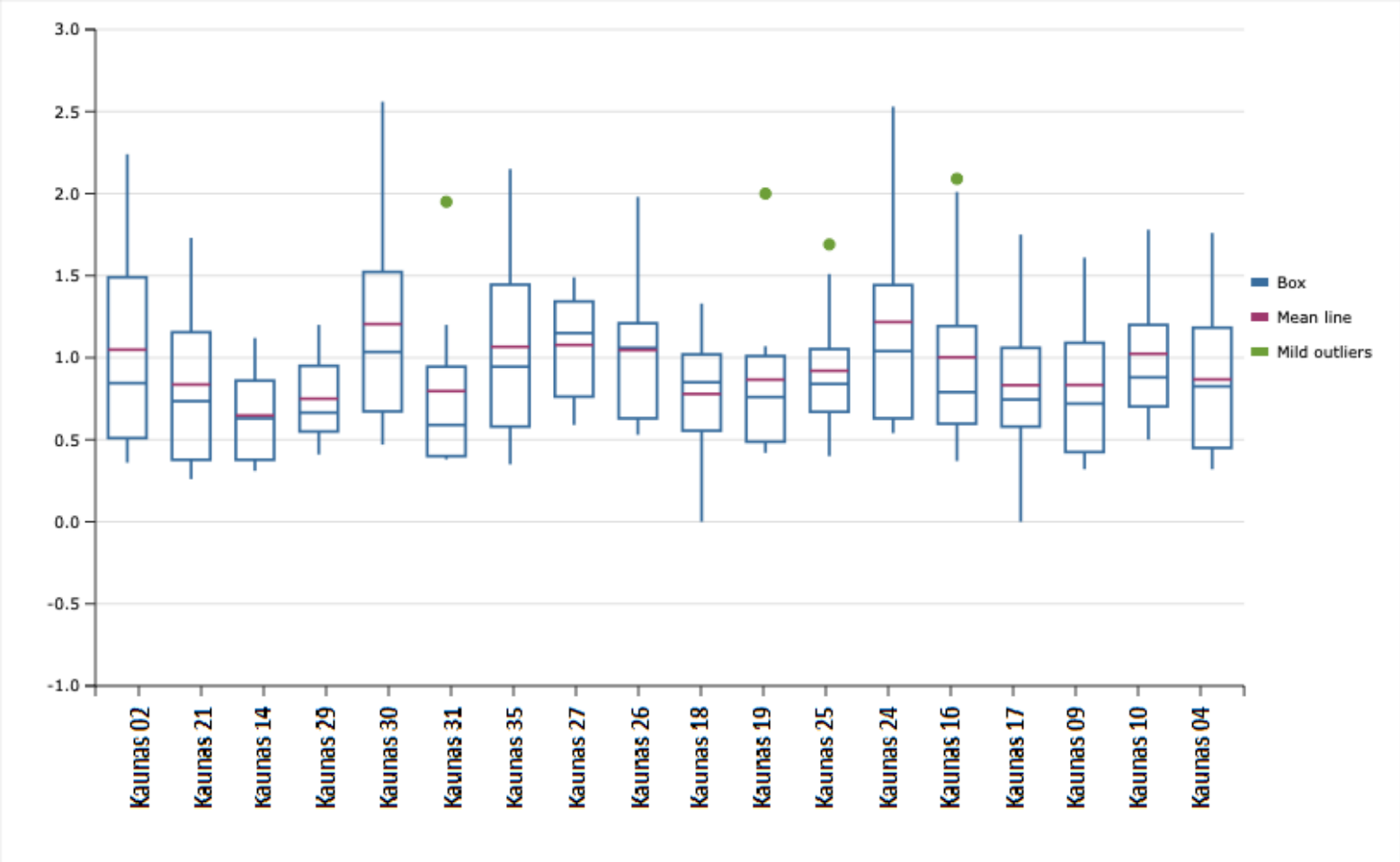


Fig. 125: Box plot - benzene characteristics – Agglomeration Kaunas

8.3.6.2. Benzene - Agglomeration Vilnius

Location	Mean [µg/m³]	Mean LCL [µg/m³]	Mean UCL [µg/m³]	Minimum [µg/m³]	Maximum [µg/m³]	Range [µg/m³]	Median [µg/m³]
Vilnius 01	0,8	0,4	1,2	0,3	1,6	1,2	0,6
Vilnius 02	0,8	0,5	1,1	0,3	1,5	1,2	0,9
Vilnius 07	0,8	0,4	1,2	0,2	1,5	1,3	0,6
Vilnius 08	0,8	0,6	1,1	0,4	1,2	0,8	0,9
Vilnius 09	0,9	0,7	1,2	0,5	1,4	1	0,9
Vilnius 10	1	0,6	1,5	0,4	1,7	1,3	1,1
Vilnius 12	0,8	0,5	1	0,4	1,4	0,9	0,7
Vilnius 13	0,7	0,4	1	0,2	1,1	0,9	0,7
Vilnius 14	1	0,5	1,5	0,3	1,8	1,5	1
Vilnius 15	0,7	0,5	1	0,3	1,2	0,9	0,7
Vilnius 17	0,8	0,4	1,2	0,2	1,6	1,4	0,7
Vilnius 18	1,1	0,7	1,4	0,5	1,7	1,2	1,1
Vilnius 19	0,8	0,4	1,3	0,4	1,9	1,5	0,7
Vilnius 20	1	0,7	1,3	0,4	1,4	1	0,9
Vilnius 21	0,8	0,6	1,1	0,5	1,6	1,1	0,7
Vilnius 23	0,8	0,4	1,2	0,3	1,7	1,3	0,6
Vilnius 24	0,8	0,5	1,2	0,4	1,3	0,9	0,7
Vilnius 25	0,8	0,5	1,2	0,4	1,7	1,3	0,8
Vilnius 26	0,7	0,4	0,9	0,4	1	0,7	0,6
Vilnius 27	0,8	0,5	1,1	0,4	1,4	1	0,7
Vilnius 28	0,7	0,4	1	0,3	1,3	1	0,7
Vilnius 30	0,8	0,4	1,3	0,2	1,9	1,7	0,8
Vilnius 31	0,9	0,5	1,3	0,4	1,8	1,5	0,7
Vilnius 32	1,2	0,5	1,8	0,7	2,8	2,1	0,8
Vilnius 33	0,8	0,4	1,2	0,3	1,5	1,2	0,7
Vilnius 34	0,8	0,3	1,2	0,2	1,3	1,1	0,7
Vilnius 35	0,6	0,3	0,9	0	0,9	0,9	0,7

Tab. 18: Statistical evaluation of benzene; Vilnius agglomeration

Tab. 18 and Fig. 126 provide information on the basic parameters of the benzene data set in the Vilnius agglomeration. Data from individual 14-day sub-campaigns are used for the evaluation. The maximum value was measured at the Vilnius 32 location, namely 2.8 µg/m^3. The highest variance of the measured data was measured again in the Vilnius 32 location, namely 2.1 µg/m^3. The highest average value from all campaigns was then measured again in the Vilnius 32 location, namely 1.2 µg/m^3. On the other hand, the lowest average of all campaigns was measured in Vilnius 35, ie. only 0.6 µg/m^3. It is clear from this data that the spatial variability of benzene concentrations in the Vilnius agglomeration is not significant.

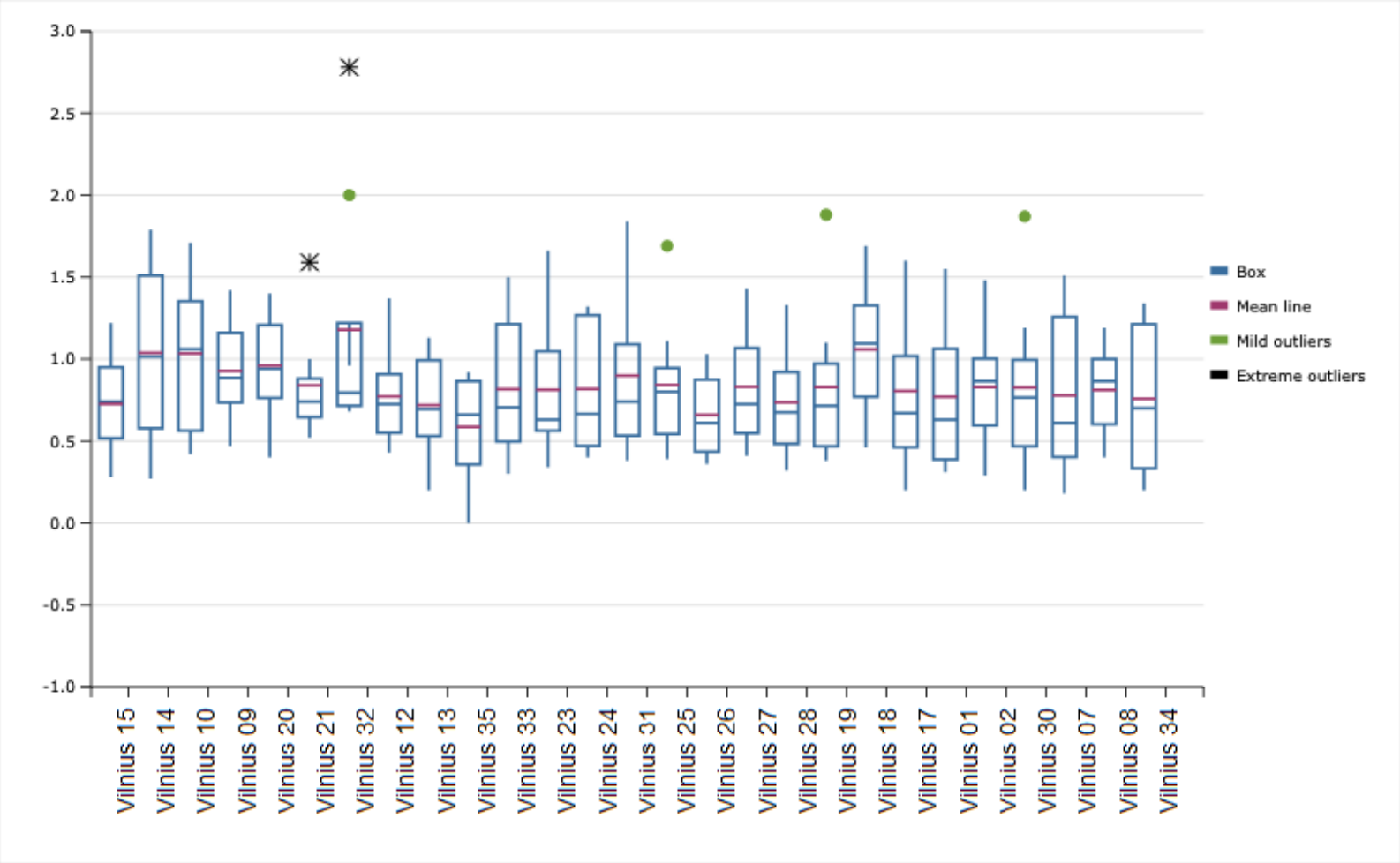


Fig. 126: Box plot - benzene characteristics – Agglomeration Vilnius

8.3.6.3. Benzene – Zone Lithuania

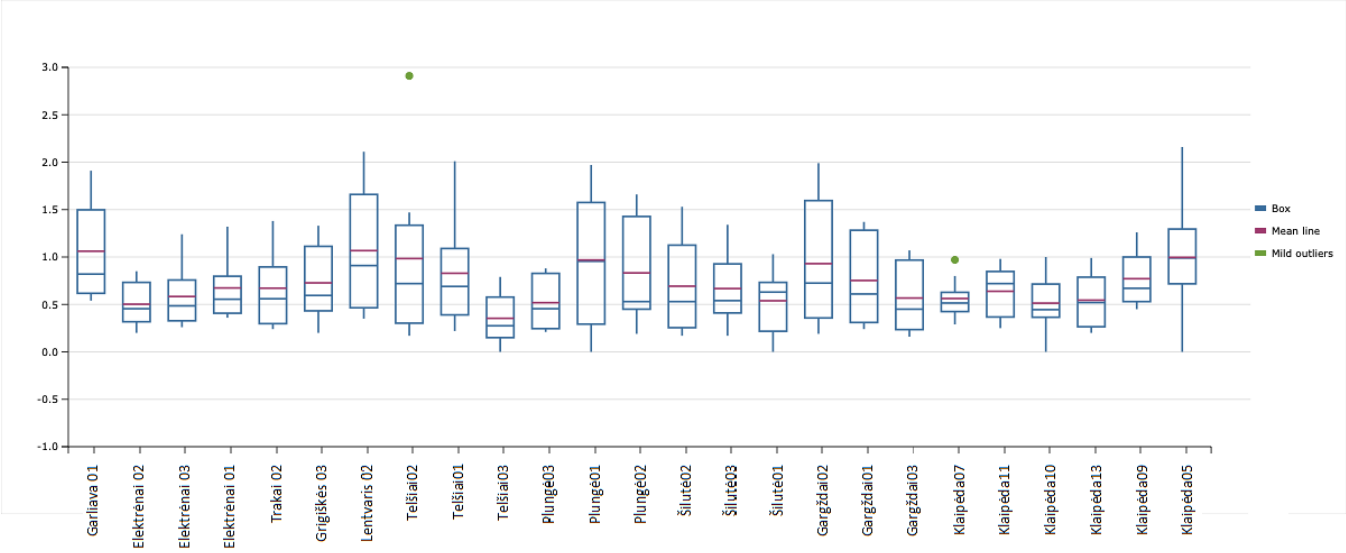
Location Benzene	Mean [µg/m³]	Mean LCL [µg/m³]	Mean UCL [µg/m³]	Minimum [µg/m³]	Maximum [µg/m³]	Range [µg/m³]	Median [µg/m³]
Alytus 01	0,7	0,4	1	0,3	1,5	1,1	0,6
Alytus 02	0,7	0,4	1	0,3	1,4	1,1	0,6
Alytus 03	1	0,5	1,5	0,5	2,4	1,9	0,9
Anykščiai 02	0,8	0,5	1,2	0,4	1,7	1,3	0,8
Birštonas 01	0,8	0,4	1,1	0,4	1,4	1,1	0,6
Biržai 01	1,1	0,5	1,7	0,2	2,1	1,9	1
Biržai 02	0,9	0,5	1,4	0,4	1,6	1,2	0,8
Druskininkai 01	0,8	0,3	1,3	0,3	2,2	1,9	0,6
Druskininkai 02	0,8	0,3	1,2	0,1	1,7	1,6	0,5
Druskininkai 03	0,6	0,3	1	0,2	1,2	1	0,6
Elektrėnai 01	0,7	0,4	1	0,4	1,3	1	0,6
Elektrėnai 02	0,5	0,3	0,7	0,2	0,9	0,7	0,5
Elektrėnai 03	0,6	0,3	0,9	0,3	1,2	1	0,5
Gargždai 01	0,8	0,3	1,2	0,2	1,4	1,1	0,6
Gargždai 02	0,9	0,3	1,5	0,2	2	1,8	0,7
Gargždai 03	0,6	0,2	0,9	0,2	1,1	0,9	0,5
Garliava 01	1,1	0,6	1,5	0,5	1,9	1,4	0,8
Grigiškės 03	0,7	0,4	1,1	0,2	1,3	1,1	0,6
Ignalina 01	0,7	0,3	1,1	0,3	1,3	1,1	0,5
Jonava 02	0,7	-3	9,9	0,3	1,4	1,1	0,7
Jonava 03	0,7	0,3	1,1	0,2	1,7	1,5	0,6
Jubarkas 01	0,7	0,2	1,1	0	1,6	1,6	0,5
Jubarkas 02	0,6	0,3	0,9	0,2	1,1	0,9	0,6
Jubarkas 03	0,7	0,2	1,2	0,2	2,1	1,8	0,5
Kėdainiai 01	0,6	0,3	0,8	0,3	1,1	0,9	0,5
Kėdainiai 03	1	0,5	1,5	0,4	2,1	1,7	0,9
Kelmė 01	1	0,5	1,5	0,3	1,9	1,6	0,8
Klaipėda 05	1	0,5	1,5	0	2,2	2,2	1
Klaipėda 07	0,6	0,4	0,7	0,3	1	0,7	0,5
Klaipėda 09	0,8	0,5	1	0,5	1,3	0,8	0,7
Klaipėda 10	0,5	0,3	0,8	0	1	1	0,4
Klaipėda 11	0,6	0,4	0,9	0,3	1	0,7	0,7
Klaipėda 13	0,5	0,3	0,8	0,2	1	0,8	0,5
Kuršėnai 01	1	0,5	1,5	0,4	2	1,6	1
Kuršėnai 02	0,9	0,5	1,4	0,4	1,7	1,3	0,8

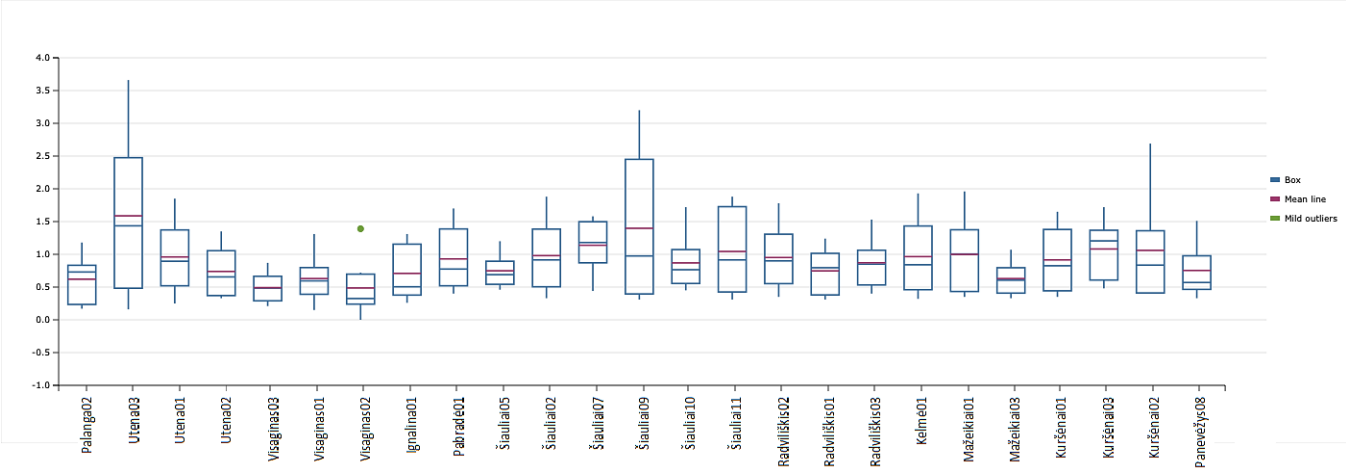
Location Benzene	Mean [µg/m³]	Mean LCL [µg/m³]	Mean UCL [µg/m³]	Minimum [µg/m³]	Maximum [µg/m³]	Range [µg/m³]	Median [µg/m³]
Kuršėnai 03	0,6	0,4	0,9	0,3	1,1	0,7	0,6
Lazdijai 02	0,9	0,4	1,4	0,3	2	1,7	0,7
Lentvaris 02	1,1	0,5	1,7	0,4	2,1	1,8	0,9
Likėnai 01	0,6	0,2	1	0	1,5	1,5	0,6
Marijampolė 01	1,2	0,4	2	0,4	2,7	2,2	0,8
Marijampolė 02	1,2	0,4	2	0,4	3,1	2,6	1
Marijampolė 04	0,9	0,4	1,4	0,3	1,8	1,4	0,8
Mažeikiai 01	1,1	0,7	1,5	0,5	1,7	1,2	1,2
Mažeikiai 03	1,1	0,4	1,7	0,4	2,7	2,3	0,8
OKTS 03	0,8	0,4	1,3	0,3	1,7	1,5	0,7
OKTS 12	0,9	0,5	1,3	0,2	1,6	1,3	0,9
OKTS 22	0,8	0,4	1,1	0,3	1,6	1,3	0,6
OKTS 23	0,7	0,4	1	0,2	1,1	0,9	0,7
OKTS 33	0,7	0,4	1	0,2	1,3	1	0,7
OKTS 41	1,3	0,7	1,8	0,6	2,2	1,6	1
OKTS 42	0,6	0,4	0,9	0,3	1,1	0,9	0,7
OKTS 43	0,7	0,3	1,1	0,2	1,7	1,5	0,5
OKTS 51	0,6	0,3	0,8	0,2	1,1	1	0,6
OKTS 52	0,6	0,2	0,9	0,2	1,2	1	0,4
OKTS 53	0,3	0,1	0,4	0,1	0,5	0,4	0,3
Pabradė 01	0,9	0,5	1,4	0,4	1,7	1,3	0,8
Palanga 02	0,6	0,3	0,9	0,2	1,2	1	0,7
Panevėžys 03	1	0,4	1,5	0,4	2,1	1,7	0,8
Panevėžys 04	0,8	0,3	1,2	0	1,7	1,7	0,7
Panevėžys 06	1,5	0,6	2,4	0,5	3,4	2,9	1,2
Panevėžys 07	1	0,4	1,6	0,4	2,4	2	0,8
Panevėžys 08	0,8	0,4	1,1	0,3	1,5	1,2	0,6
Panevėžys 12	1	0,4	1,6	0,2	2,1	1,8	0,9
Plungė 01	1	0,3	1,6	0	2	2	1
Plungė 02	0,8	0,3	1,3	0,2	1,7	1,5	0,5
Plungė 03	0,5	0,3	0,8	0,2	0,9	0,7	0,5
Radviliškis 01	0,9	0,5	1,2	0,4	1,5	1,1	0,9
Radviliškis 02	1	0,5	1,4	0,4	1,8	1,4	0,9
Radviliškis 03	0,7	0,4	1,1	0,3	1,2	0,9	0,8
Raseiniai 01	1	0,4	1,5	0,3	2,2	1,9	0,8
Raseiniai 02	1,3	0,5	2,2	0,3	2,8	2,5	1,2
Raseiniai 03	1,1	0,4	1,7	0,3	2,1	1,9	0,9
Rokiškis 01	0,7	0,3	1,1	0	1,4	1,4	0,7
Rokiškis 02	0,9	0,5	1,3	0,3	1,6	1,3	0,8
Rokiškis 03	1	0,3	1,6	0,3	2,2	1,9	0,8
Šiauliai 02	0,9	0,5	1,2	0,5	1,7	1,3	0,8
Šiauliai 05	1	0,5	1,6	0,3	1,9	1,6	0,9
Šiauliai 07	0,7	0,5	1	0,5	1,2	0,7	0,7
Šiauliai 09	1	0,5	1,5	0,3	1,9	1,6	0,9

Location Benzene	Mean [µg/m³]	Mean LCL [µg/m³]	Mean UCL [µg/m³]	Minimum [µg/m³]	Maximum [µg/m³]	Range [µg/m³]	Median [µg/m³]
Šiauliai 10	1,1	0,8	1,5	0,4	1,6	1,1	1,2
Šiauliai 11	1,4	0,4	2,4	0,3	3,2	2,9	1
Šilutė 01	0,5	0,2	0,8	0	1	1	0,6
Šilutė 02	0,7	0,3	1,1	0,2	1,5	1,4	0,5
Šilutė 03	0,7	0,3	1	0,2	1,3	1,2	0,5
Tauragė 01	1,1	0,4	1,8	0	2,4	2,4	1
Tauragė 02	1,2	0,5	1,9	0,4	2,3	2	1
Tauragė 03	1,6	0,6	2,7	0,4	3,2	2,9	1,5
Telšiai 01	0,8	0,3	1,3	0,2	2	1,8	0,7
Telšiai 02	1	0,2	1,8	0,2	2,9	2,7	0,7
Telšiai 03	0,5	-7,4	19,6	0,2	0,8	0,6	0,5
Trakai 02	0,7	0,3	1	0,2	1,4	1,1	0,6
Ukmergė 01	0,8	0,5	1,2	0,4	1,5	1,1	0,8
Ukmergė 02	1	0,5	1,5	0,4	2,1	1,7	0,8
Ukmergė 03	0,9	0,4	1,5	0,3	2,1	1,7	0,9
Utena 01	1	0,5	1,4	0,3	1,9	1,6	0,9
Utena 02	0,7	0,4	1,1	0,3	1,4	1	0,7
Utena 03	1,6	0,5	2,7	0,2	3,7	3,5	1,4
Vilkaviškis 01	0,8	0,5	1,2	0,3	1,3	1	0,9
Vilkaviškis 02	0,9	0,4	1,3	0,4	2	1,6	0,7
Vilkaviškis 03	0,9	0,3	1,5	0,3	2,5	2,1	0,7
Visaginas 01	0,6	0,3	0,9	0,2	1,3	1,2	0,6
Visaginas 02	0,5	0,1	0,9	0	1,4	1,4	0,3
Visaginas 03	0,5	0,3	0,7	0,2	0,9	0,7	0,5

Tab. 18: Statistical evaluation of benzene; Zone Lithuania

Tab. 18 and Fig. 127 provide information on the basic parameters of the benzene dataset across the whole Lithuania zone (excluding Vilnius and Kaunas agglomerations). Data from individual 14-day sub-campaigns are used for the evaluation. The maximum value was measured in the location Utena 03, namely 3.7 µg/m^3. The highest variance of the measured data was again measured in the location of Utena 03, namely 3.5 µg/m^3. The highest average of all campaigns was measured in the Tauragė 03 and Utena 03 locations, namely 1.6 µg/m^3. On the contrary, the lowest average value from all campaigns was then measured at the background air pollution station in Plateliai - OKTS 53, only 0.3 µg/m^3. It is evident from this data that the spatial variability of benzene concentrations in the whole zone of Lithuania is similarly small as in the case of the agglomerations Kaunas and Vilnius.





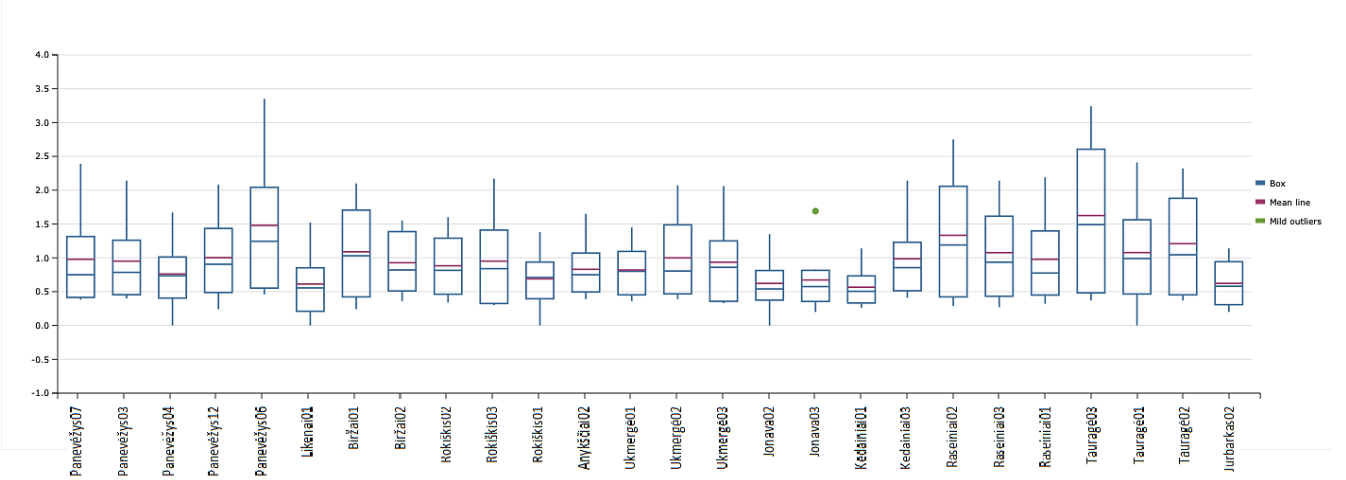
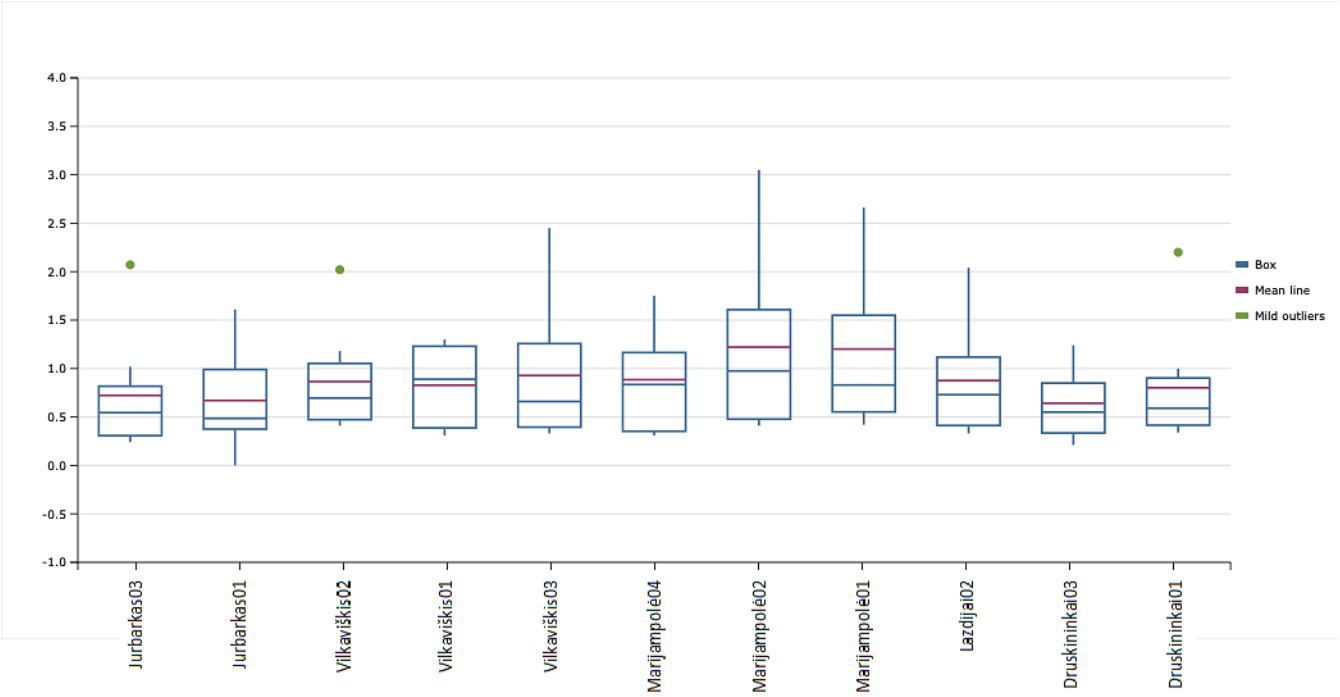


Fig. 127 (1): Box plot - benzene characteristics – Zone Lithuania



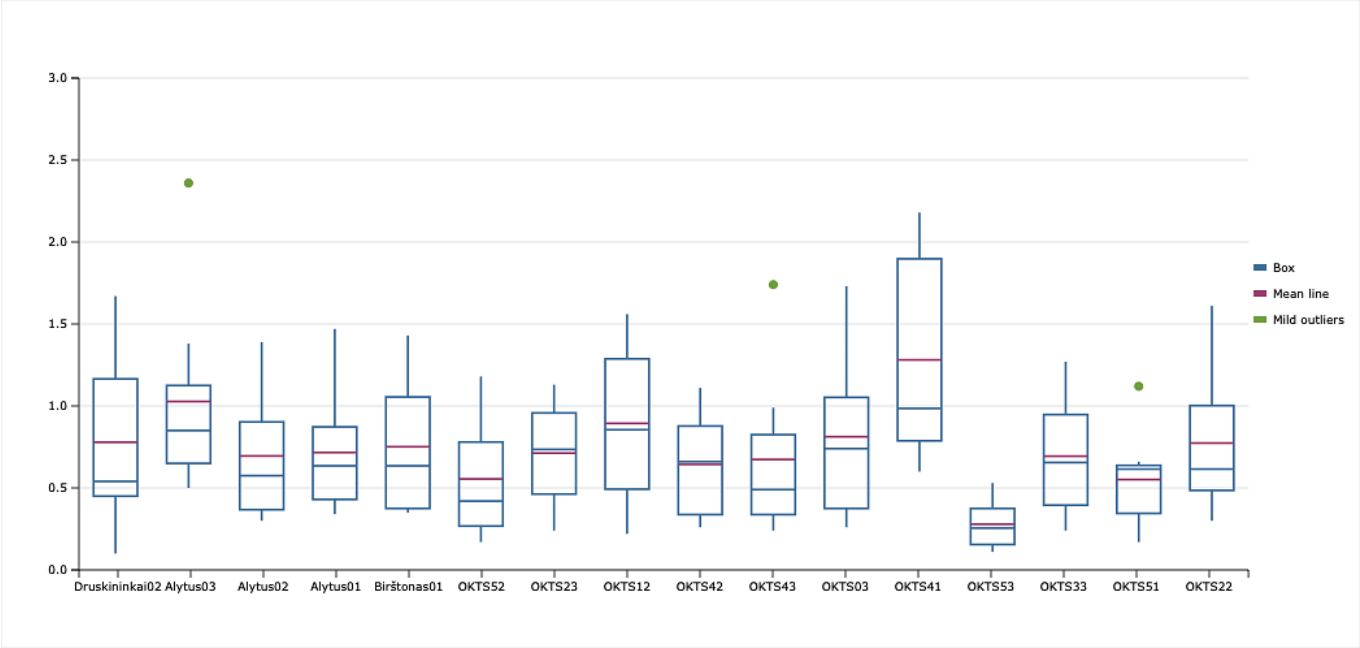


Fig. 127 (2): Box plot - benzene characteristics – Zone Lithuania

8.3.7. Evaluation of Particulates – Zone Lithuania

Location	Data recovery [number of days]	Mean [µg/m³]	Mean LCL [µg/m³]	Mean UCL [µg/m³]	Minimum [µg/m³]	Maximum [µg/m³]	Range [µg/m³]	Median [µg/m³]
Kaunas	363	27,5	25,7	29,2	4,1	80,0	75,8	22,7
Telšiai	337	31,0	28,5	33,5	5,8	124,6	118,8	21,9
Alytus	365	22,9	21,1	24,7	1,9	107,4	105,5	17,9
Rokiškis	333	21,6	20,0	23,1	3,0	77,1	74,1	17,5
Tauragė	363	23,8	21,9	25,8	4,0	97,4	93,4	16,3
Utena	365	24,9	23,3	26,5	5,2	87,3	82,1	21,0
Druskininkai	365	24,6	22,6	26,5	2,8	111,3	108,6	18,0
Vilnius	365	28,7	27,0	30,5	4,7	97,7	93,0	26,0
Šilutė	365	25,7	23,7	27,7	3,2	112,1	108,9	18,9
Klaipėda	365	23,3	21,6	25,0	2,6	109,0	106,4	17,6
Biržai	365	28,8	26,9	30,7	5,4	120,5	115,1	23,5
Marijampolė	349	26,3	24,4	28,3	4,6	103,4	98,7	20,3
Panevėžys	337	24,8	23,2	26,4	3,4	91,2	87,9	22,3
Raseiniai	365	25,2	23,1	27,2	3,6	99,6	96,0	16,9
Elektrėnai	365	19,2	17,7	20,6	0,0	100,0	100,0	14,5

Tab. 19: Statistical evaluation of PM_{10}; zone Lithuania

Tab. 19 and Fig. 128 provide information on the basic parameters of the PM_{10} data set in the whole zone of Lithuania (including the agglomerations of Vilnius and Kaunas). Complete data for the whole year of measurement are used for the evaluation. The maximum value was measured in the Telšiai location, namely 124.6 µg/m³. The highest variance of the measured data was measured again in the Telšiai location, namely 118.8 µg/m³. The highest average value from all campaigns was again measured in the location of Telšiai, namely 31.0 µg/m³. On the contrary, the lowest average value from all campaigns was then measured in the Elektrėnai location, namely 19.2 µg/m³. This shows that the spatial variability of PM_{10} concentrations across the whole Lithuania zone is rather lower compared to other European countries.

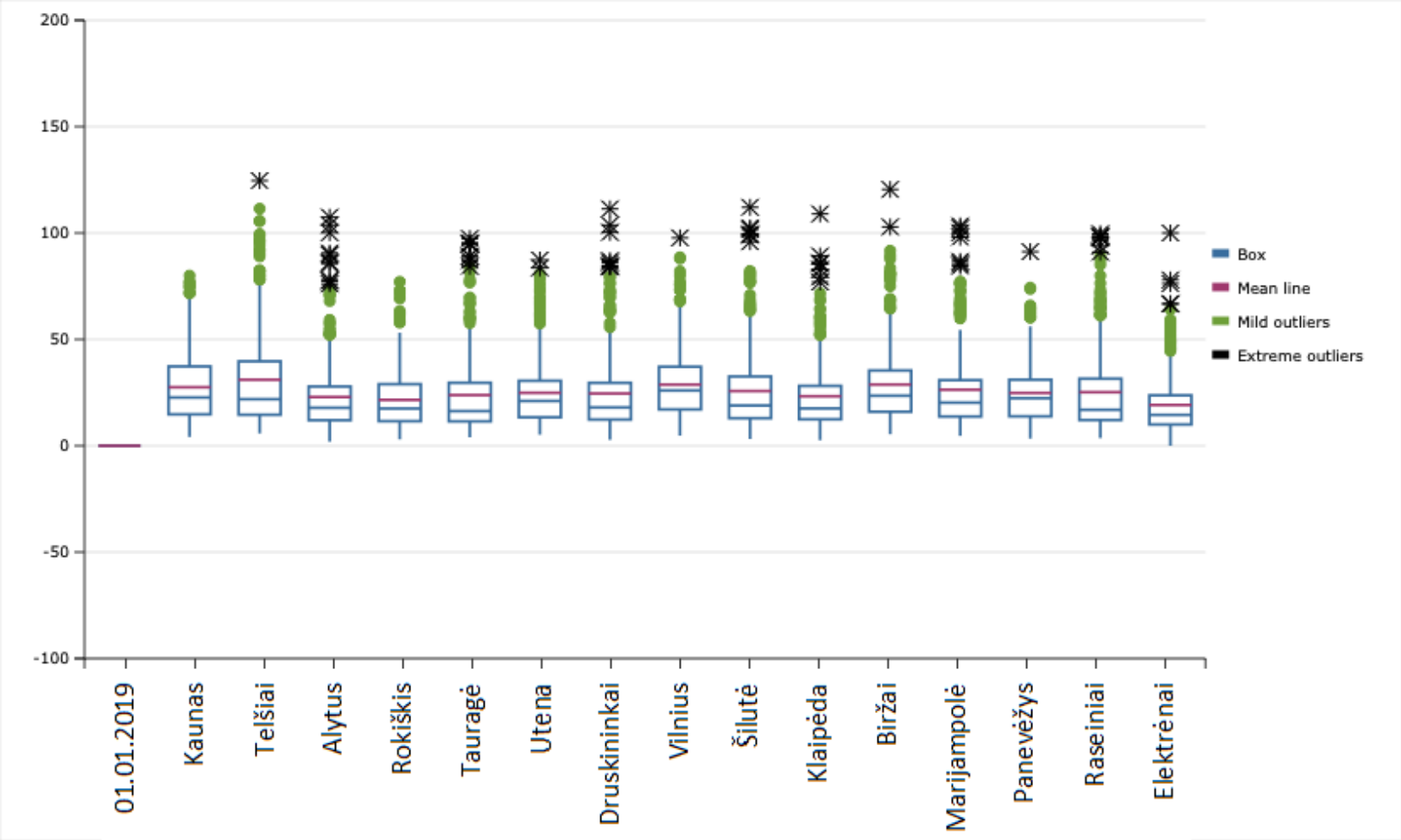


Fig. 128: Box plot - particulates characteristics – Lithuania Zone

8.4. Data Recovery; Missing Samples

Data recovery from all measurements exceeded the required 90%. Tab. 20 shows data recovery values for all measurements performed within the project. Daily averages were used to calculate the recovery of the measured concentrations of dust particles. The recovery of concentrations of gaseous substances was calculated from 14-day sub-campaigns. If the value for one of the sub-campaigns was missing, the value from the 2nd 14-day sub-campaign was used for the entire 28-day campaign. The measured value is thus available for each campaign (28-day) at all locations, with the exception of the NO_2 and SO_2 concentrations at Kaunas 35 for the 4th campaign, and the real data recovery is thus almost 100%. The following tables show the data recovery values for the 14-day sub-campaigns.

At 9 locations out of 15, where the concentrations of dust particles were measured, it was possible to ensure 100% data recovery. In the remaining locations where the outage (or outages) occurred, the sensor monitor was always replaced with a replacement unit to ensure the required data recovery.
Sampling of gaseous substances using passive samplers Radiello caused a loss of measurement mainly due to electricity masts reconstruction, vandalism or theft of the sampler, even though the sampler was located at a height of approx. 3 – 4 m at most locations. 3 values were then deleted during the validation of the measured data as they were considered as remote or unrealistic.

Parameter	Valid data	Invalid data	Data recovery [%]
PM_{10}	5395	109	98,0
$PM_{2.5}$	5395	109	98,0
PM_1	5395	109	98,0
NO_2	1173	11	99,1
SO_2	1181	3	99,7
Benzene	1172	12	99,0
POPs	8	0	100

Tab. 20: Total data recovery statistics.

Location	PM_{10}	$PM_{2.5}$
Kaunas	99,5	99,5
Telšiai	92,3	92,3
Alytus	100,0	100,0
Rokiškis	91,2	91,2
Tauragė	99,5	99,5
Utena	100,0	100,0
Druskininkai	100,0	100,0
Vilnius	100,0	100,0
Šilutė	100,0	100,0
Klaipėda	100,0	100,0
Biržai	100,0	100,0
Marijampolė	95,6	95,6
Panevėžys	92,3	92,3
Raseiniai	100,0	100,0
Elektrėnai	100,0	100,0
Total	98,0	98,0

Tab.21: Statistics of PM_x data recovery by location

Sub-campaign	NO_2	SO_2	Benzene
1	100,0	100,0	100,0
2	100,0	100,0	100,0
3	98,0	99,3	98,6
4	98,6	100,0	97,3
5	100,0	100,0	98,0
6	98,0	99,3	99,3
7	99,3	100,0	99,3
8	98,6	99,3	99,3
Total	99,1	99,7	99,0

Tab. 22: Statistics of data recovery of gaseous compounds by sampling sub-campaigns

Location	Data recovery [%]	Location	Data recovery [%]	Location	Data recovery [%]
Alytus 01	100	**Klaipėda 13**	100	**Šilutė 02**	100
Alytus 02	100	**Kuršėnai 01**	100	**Šilutė 03**	100
Alytus 03	100	**Kuršėnai 02**	100	**Tauragė 01**	87,5
Anykščiai 02	100	**Kuršėnai 03**	100	**Tauragė 02**	100
Birštonas 01	100	**Lazdijai 02**	100	**Tauragė 03**	100
Biržai 01	100	**Lentvaris 02**	100	**Telšiai 01**	100
Biržai 02	100	**Likėnai 01**	100	**Telšiai 02**	100
Druskininkai 01	100	**Marijampolė 01**	100	**Telšiai 03**	100
Druskininkai 02	100	**Marijampolė 02**	100	**Trakai 02**	100
Druskininkai 03	100	**Marijampolė 04**	100	**Ukmergė 01**	100
Elektrėnai 01	100	**Mažeikiai 01**	100	**Ukmergė 02**	100
Elektrėnai 02	100	**Mažeikiai 03**	100	**Ukmergė 03**	100
Elektrėnai 03	100	**OKTS 03**	100	**Utena 01**	100
Gargždai 01	100	**OKTS 12**	100	**Utena 02**	100
Gargždai 02	100	**OKTS 22**	87,5	**Utena 03**	100
Gargždai 03	100	**OKTS 23**	100	**Vilkaviškis 01**	100
Garliava 01	100	**OKTS 33**	100	**Vilkaviškis 02**	100
Grigiškės 03	100	**OKTS 41**	100	**Vilkaviškis 03**	100
Ignalina 01	100	**OKTS 42**	100	**Vilnius 01**	100
Jonava 02	100	**OKTS 43**	100	**Vilnius 02**	100
Jonava 03	100	**OKTS 51**	100	**Vilnius 07**	100
Jubarkas 01	100	**OKTS 52**	100	**Vilnius 08**	100
Jubarkas 02	100	**OKTS 53**	100	**Vilnius 09**	100
Jubarkas 03	100	**Pabradė 01**	100	**Vilnius 10**	100
Kaunas 02	100	**Palanga 02**	100	**Vilnius 12**	100
Kaunas 04	100	**Panevėžys 03**	100	**Vilnius 13**	100
Kaunas 09	100	**Panevėžys 04**	100	**Vilnius 14**	100
Kaunas 10	100	**Panevėžys 06**	100	**Vilnius 15**	100
Kaunas 14	100	**Panevėžys 07**	100	**Vilnius 17**	100
Kaunas 16	100	**Panevėžys 08**	100	**Vilnius 18**	100
Kaunas 17	100	**Panevėžys 12**	100	**Vilnius 19**	100
Kaunas 18	87,5	**Plungė 01**	100	**Vilnius 20**	100
Kaunas 19	100	**Plungė 02**	100	**Vilnius 21**	100
Kaunas 21	100	**Plungė 03**	100	**Vilnius 23**	100

Location	Data recovery [%]	Location	Data recovery [%]	Location	Data recovery [%]
Kaunas 24	100	**Radviliškis 01**	100	**Vilnius 24**	100
Kaunas 25	100	**Radviliškis 02**	100	**Vilnius 25**	100
Kaunas 26	100	**Radviliškis 03**	100	**Vilnius 26**	100
Kaunas 27	100	**Raseiniai 01**	100	**Vilnius 27**	100
Kaunas 29	100	**Raseiniai 02**	100	**Vilnius 28**	100
Kaunas 30	100	**Raseiniai 03**	100	**Vilnius 30**	100
Kaunas 31	100	**Rokiškis 01**	100	**Vilnius 31**	100
Kaunas 35	75	**Rokiškis 02**	100	**Vilnius 32**	100
Kėdainiai 01	100	**Rokiškis 03**	100	**Vilnius 33**	100
Kėdainiai 03	100	**Šiauliai 02**	100	**Vilnius 34**	100
Kelmė 01	100	**Šiauliai 05**	100	**Vilnius 35**	100
Klaipėda 05	87,5	**Šiauliai 07**	100	**Visaginas 01**	100
Klaipėda 07	87,5	**Šiauliai 09**	100	**Visaginas 02**	100
Klaipėda 09	87,5	**Šiauliai 10**	100	**Visaginas 03**	100
Klaipėda 10	100	**Šiauliai 11**	100		
Klaipėda 11	100	**Šilutė 01**	100		

Tab. 23: Statistics of NO_2 data recovery by location

Location	Data recovery [%]	Location	Data recovery [%]	Location	Data recovery [%]
Alytus 01	100	**Klaipėda 13**	100	**Šilutė 02**	100
Alytus 02	100	**Kuršėnai 01**	100	**Šilutė 03**	100
Alytus 03	100	**Kuršėnai 02**	100	**Tauragė 01**	87,5
Anykščiai 02	100	**Kuršėnai 03**	100	**Tauragė 02**	100
Birštonas 01	100	**Lazdijai 02**	100	**Tauragė 03**	100
Biržai 01	100	**Lentvaris 02**	100	**Telšiai 01**	100
Biržai 02	100	**Likėnai 01**	100	**Telšiai 02**	100
Druskininkai 01	100	**Marijampolė 01**	100	**Telšiai 03**	100
Druskininkai 02	100	**Marijampolė 02**	100	**Trakai 02**	100
Druskininkai 03	100	**Marijampolė 04**	100	**Ukmergė 01**	100
Elektrėnai 01	100	**Mažeikiai 01**	100	**Ukmergė 02**	100

Location	Data recovery [%]	Location	Data recovery [%]	Location	Data recovery [%]
Elektrėnai 02	100	**Mažeikiai 03**	100	**Ukmergė 03**	100
Elektrėnai 03	100	**OKTS 03**	100	**Utena 01**	100
Gargždai 01	100	**OKTS 12**	100	**Utena 02**	100
Gargždai 02	100	**OKTS 22**	87,5	**Utena 03**	100
Gargždai 03	100	**OKTS 23**	100	**Vilkaviškis 01**	100
Garliava 01	100	**OKTS 33**	100	**Vilkaviškis 02**	100
Grigiškės 03	100	**OKTS 41**	100	**Vilkaviškis 03**	100
Ignalina 01	100	**OKTS 42**	100	**Vilnius 01**	100
Jonava 02	100	**OKTS 43**	100	**Vilnius 02**	100
Jonava 03	100	**OKTS 51**	100	**Vilnius 07**	100
Jubarkas 01	100	**OKTS 52**	100	**Vilnius 08**	100
Jubarkas 02	100	**OKTS 53**	100	**Vilnius 09**	100
Jubarkas 03	100	**Pabradė 01**	100	**Vilnius 10**	100
Kaunas 02	100	**Palanga 02**	100	**Vilnius 12**	100
Kaunas 04	100	**Panevėžys 03**	100	**Vilnius 13**	100
Kaunas 09	100	**Panevėžys 04**	100	**Vilnius 14**	100
Kaunas 10	100	**Panevėžys 06**	100	**Vilnius 15**	100
Kaunas 14	100	**Panevėžys 07**	100	**Vilnius 17**	100
Kaunas 16	100	**Panevėžys 08**	100	**Vilnius 18**	100
Kaunas 17	100	**Panevėžys 12**	100	**Vilnius 19**	100
Kaunas 18	87,5	**Plungė 01**	100	**Vilnius 20**	100
Kaunas 19	100	**Plungė 02**	100	**Vilnius 21**	100
Kaunas 21	100	**Plungė 03**	100	**Vilnius 23**	100
Kaunas 24	100	**Radviliškis 01**	100	**Vilnius 24**	100
Kaunas 25	100	**Radviliškis 02**	100	**Vilnius 25**	100
Kaunas 26	100	**Radviliškis 03**	100	**Vilnius 26**	100
Kaunas 27	100	**Raseiniai 01**	100	**Vilnius 27**	100
Kaunas 29	100	**Raseiniai 02**	100	**Vilnius 28**	100
Kaunas 30	100	**Raseiniai 03**	100	**Vilnius 30**	100
Kaunas 31	100	**Rokiškis 01**	100	**Vilnius 31**	100
Kaunas 35	75	**Rokiškis 02**	100	**Vilnius 32**	100
Kėdainiai 01	100	**Rokiškis 03**	100	**Vilnius 33**	100
Kėdainiai 03	100	**Šiauliai 02**	100	**Vilnius 34**	100
Kelmė 01	100	**Šiauliai 05**	100	**Vilnius 35**	100
Klaipėda 05	87,5	**Šiauliai 07**	100	**Visaginas 01**	100
Klaipėda 07	87,5	**Šiauliai 09**	100	**Visaginas 02**	100
Klaipėda 09	87,5	**Šiauliai 10**	100	**Visaginas 03**	100

Location	Data recovery [%]	Location	Data recovery [%]	Location	Data recovery [%]
Klaipėda 10	100	**Šiauliai 11**	100		
Klaipėda 11	100	**Šilutė 01**	100		

Tab. 24: Statistics of SO_2 data recovery by location

Location	Data recovery [%]	Location	Data recovery [%]	Location	Data recovery [%]
Alytus 01	100	**Klaipėda 13**	100	**Šilutė 02**	100
Alytus 02	100	**Kuršėnai 01**	100	**Šilutė 03**	100
Alytus 03	87,5	**Kuršėnai 02**	100	**Tauragė 01**	100
Anykščiai 02	100	**Kuršėnai 03**	100	**Tauragė 02**	100
Birštonas 01	100	**Lazdijai 02**	100	**Tauragė 03**	100
Biržai 01	100	**Lentvaris 02**	100	**Telšiai 01**	100
Biržai 02	100	**Likėnai 01**	87,5	**Telšiai 02**	100
Druskininkai 01	100	**Marijampolė 01**	100	**Telšiai 03**	100
Druskininkai 02	87,5	**Marijampolė 02**	100	**Trakai 02**	100
Druskininkai 03	100	**Marijampolė 04**	100	**Ukmergė 01**	100
Elektrėnai 01	100	**Mažeikiai 01**	100	**Ukmergė 02**	100
Elektrėnai 02	100	**Mažeikiai 03**	100	**Ukmergė 03**	100
Elektrėnai 03	100	**OKTS 03**	100	**Utena 01**	100
Gargždai 01	100	**OKTS 12**	100	**Utena 02**	100
Gargždai 02	100	**OKTS 22**	100	**Utena 03**	100
Gargždai 03	100	**OKTS 23**	100	**Vilkaviškis 01**	100
Garliava 01	100	**OKTS 33**	100	**Vilkaviškis 02**	100
Grigiškės 03	100	**OKTS 41**	100	**Vilkaviškis 03**	100
Ignalina 01	100	**OKTS 42**	100	**Vilnius 01**	100
Jonava 02	100	**OKTS 43**	100	**Vilnius 02**	100
Jonava 03	100	**OKTS 51**	100	**Vilnius 07**	100
Jubarkas 01	87,5	**OKTS 52**	100	**Vilnius 08**	100
Jubarkas 02	100	**OKTS 53**	100	**Vilnius 09**	100
Jubarkas 03	100	**Pabradė 01**	100	**Vilnius 10**	100
Kaunas 02	100	**Palanga 02**	100	**Vilnius 12**	100
Kaunas 04	100	**Panevėžys 03**	100	**Vilnius 13**	100

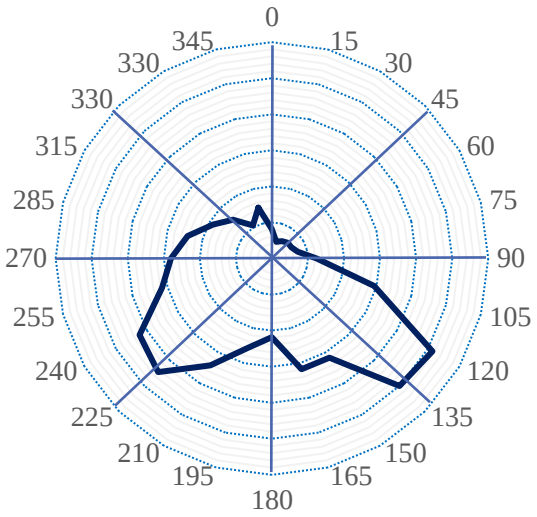
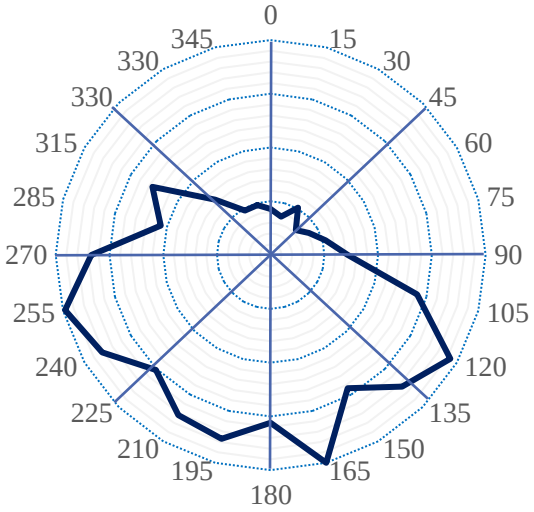
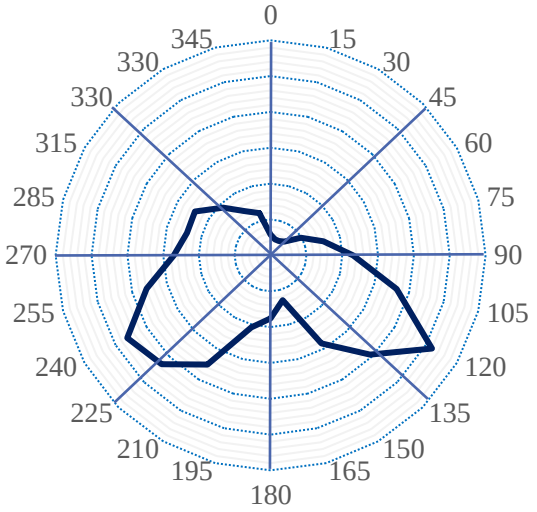
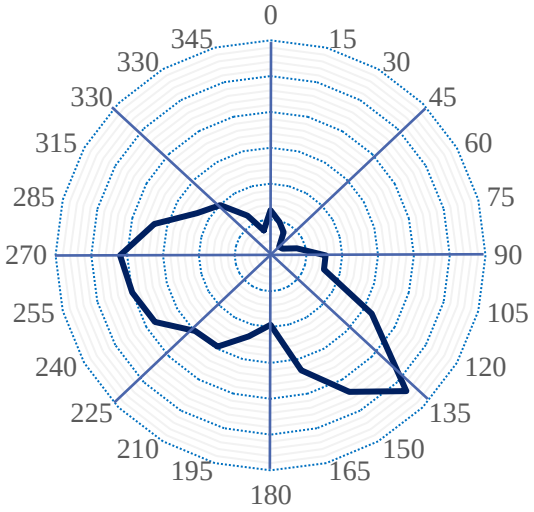
Location	Data recovery [%]	Location	Data recovery [%]	Location	Data recovery [%]
Kaunas 09	100	**Panevėžys 04**	87,5	**Vilnius 14**	100
Kaunas 10	100	**Panevėžys 06**	100	**Vilnius 15**	100
Kaunas 14	100	**Panevėžys 07**	100	**Vilnius 17**	100
Kaunas 16	100	**Panevėžys 08**	100	**Vilnius 18**	100
Kaunas 17	87,5	**Panevėžys 12**	100	**Vilnius 19**	100
Kaunas 18	87,5	**Plungė 01**	100	**Vilnius 20**	100
Kaunas 19	100	**Plungė 02**	100	**Vilnius 21**	100
Kaunas 21	100	**Plungė 03**	100	**Vilnius 23**	100
Kaunas 24	100	**Radviliškis 01**	100	**Vilnius 24**	100
Kaunas 25	100	**Radviliškis 02**	100	**Vilnius 25**	100
Kaunas 26	100	**Radviliškis 03**	100	**Vilnius 26**	100
Kaunas 27	100	**Raseiniai 01**	100	**Vilnius 27**	100
Kaunas 29	100	**Raseiniai 02**	100	**Vilnius 28**	100
Kaunas 30	100	**Raseiniai 03**	100	**Vilnius 30**	100
Kaunas 31	100	**Rokiškis 01**	100	**Vilnius 31**	100
Kaunas 35	100	**Rokiškis 02**	100	**Vilnius 32**	100
Kėdainiai 01	100	**Rokiškis 03**	100	**Vilnius 33**	100
Kėdainiai 03	100	**Šiauliai 02**	100	**Vilnius 34**	100
Kelmė 01	100	**Šiauliai 05**	100	**Vilnius 35**	100
Klaipėda 05	87,5	**Šiauliai 07**	100	**Visaginas 01**	100
Klaipėda 07	100	**Šiauliai 09**	100	**Visaginas 02**	100
Klaipėda 09	100	**Šiauliai 10**	100	**Visaginas 03**	100
Klaipėda 10	100	**Šiauliai 11**	100		
Klaipėda 11	100	**Šilutė 01**	87,5		

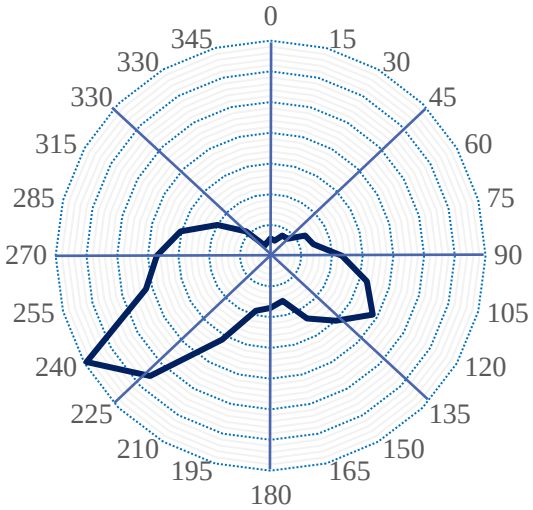
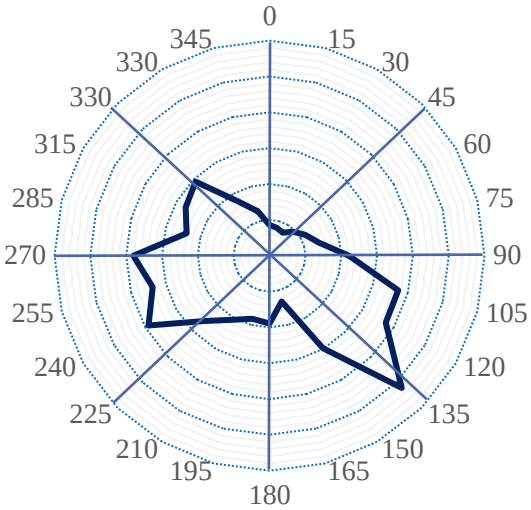
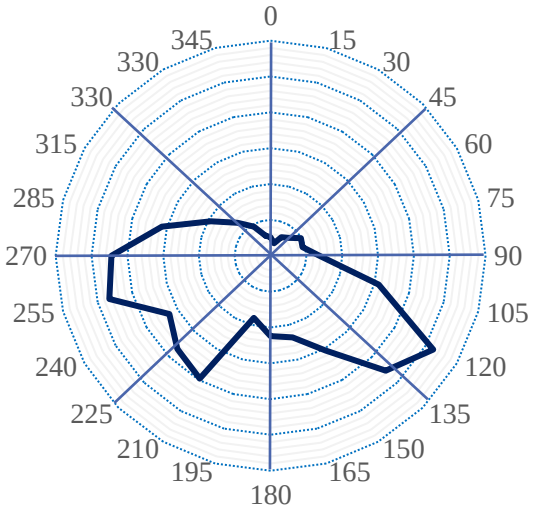
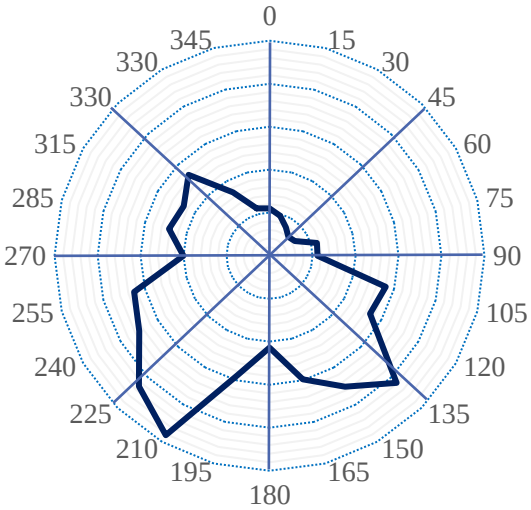
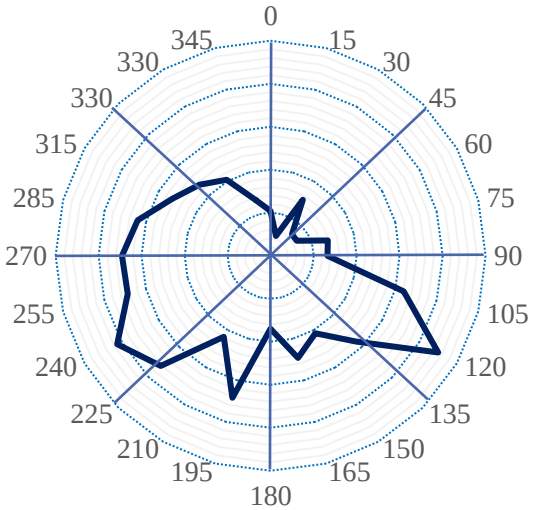
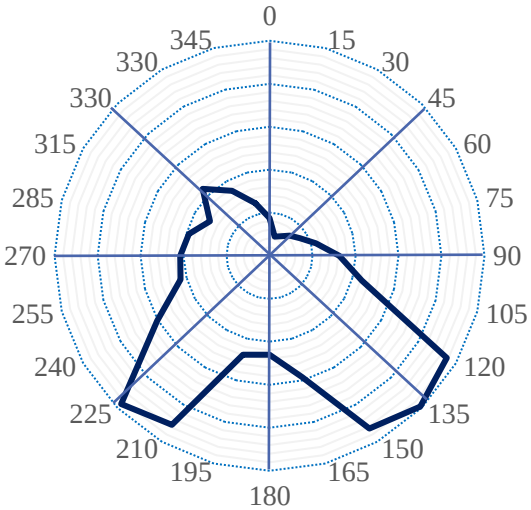
Tab. 25: Statistics of benzene data recovery by location

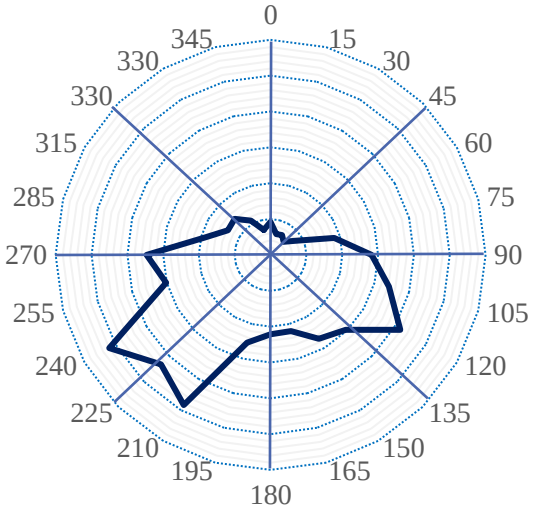
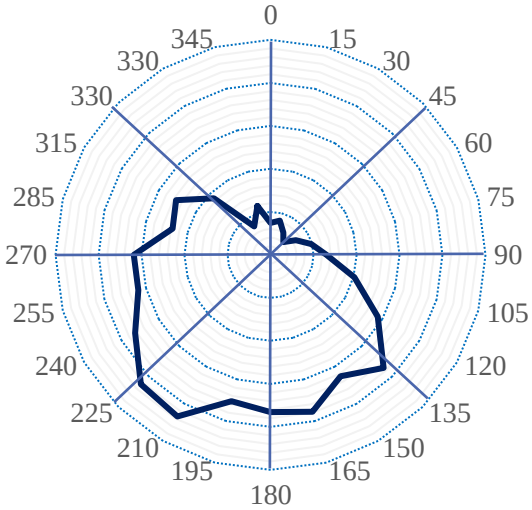
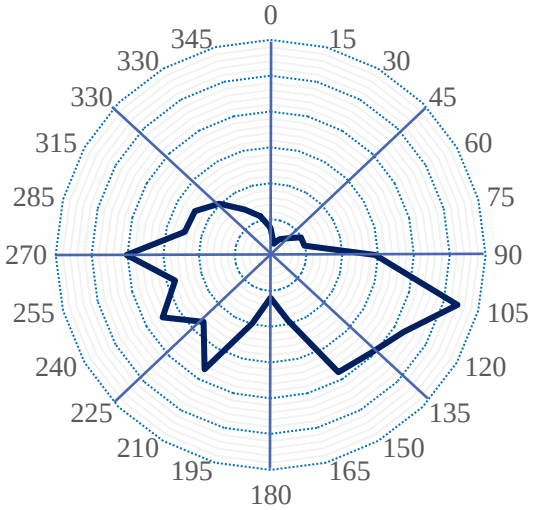
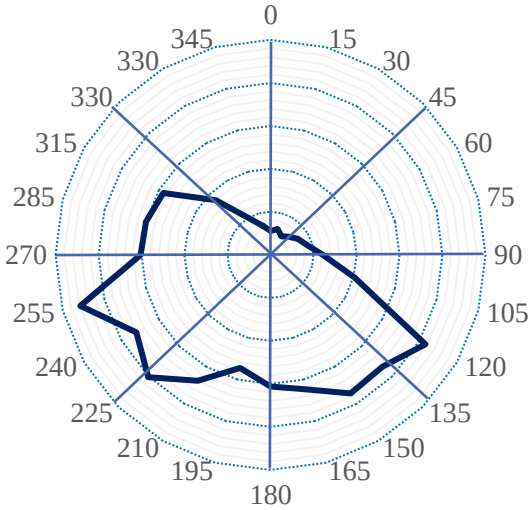
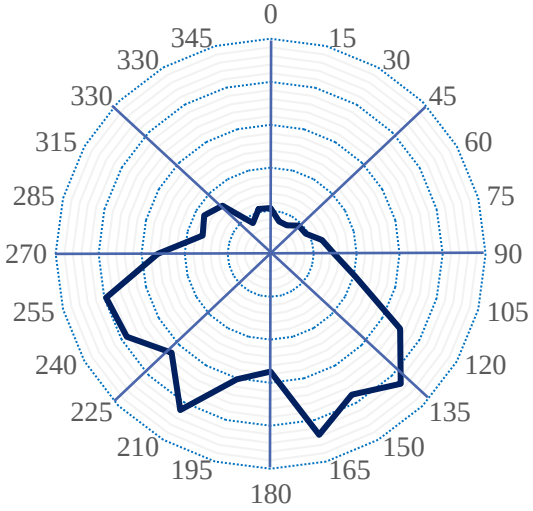
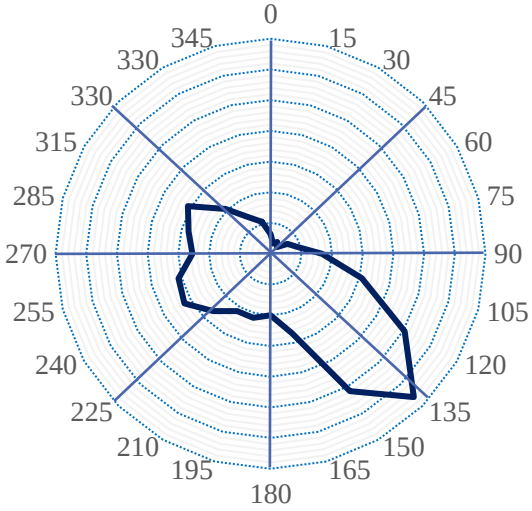
8.5. Meteorology

All interpretations made below relate to the implemented sampling campaigns, they are not year-round data. In this report, only the basic meteorological parameters for air quality assessment are analyzed, namely wind direction and speed and air temperature. The meteorological data were not used for modeling and the results described below are only informative and can be used for subsequent evaluation of project results.

8.5.1. Wind Roses

Biržai	Dotnuva
	
Dūkštas	**Kaunas**
	

Kybartai	Klaipėda
	
Laukuva	Ladzijai
	
Nida	Panevėžys
	

Raseiniai	Šiauliai
	
Šilutė	**Telšiai**
	
Ukmergė	**Utena**
	

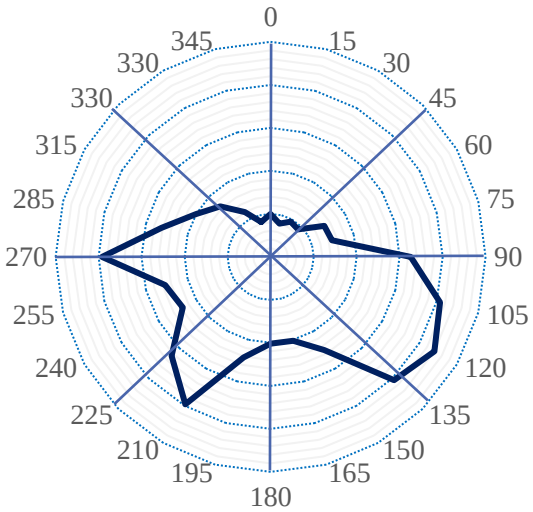
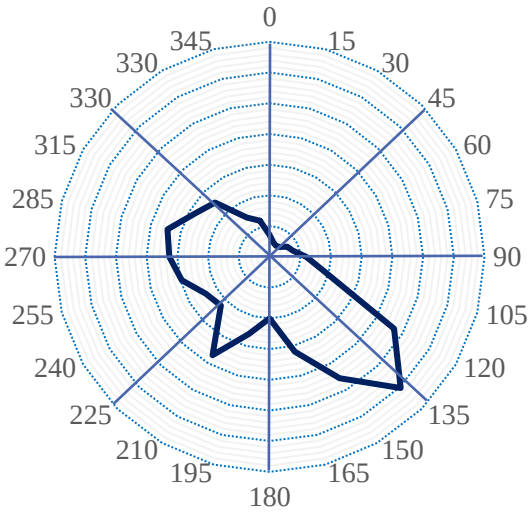
Varėna	Vilnius
	

Fig. 129: Wind roses - occurrence of wind directions by frequency

Data was obtained from Lithuanian Hydrometeorological Service under the Ministry of Environment (Lietuvos hidrometeorologijos tarnyba <LHMT> prie Aplinkos ministerijos). The wind roses show the prevailing wind direction at all the stations. They were calculated simply as the distribution of frequencies from the individual directions of air flow. The azimuth 0 ° corresponds to the north; The azimuth 90° corresponds to the east; The azimuth 180 ° corresponds to the south; The azimuth 270 ° corresponds to the west.

8.5.2. Wind Speed

Location	Average [m/s]	Median [m/s]	Daily average maximum [m/s]
Biržai	2,8	2,8	7,7
Dotnuva	3,3	3,2	10,7
Dūkštas	2,9	3,0	9,8
Kaunas	3,9	3,9	11,5
Kybartai	3,9	3,7	12,7
Klaipėda	3,5	3,2	11,5
Laukuva	4,3	4,2	11,4
Ladzijai	3,4	3,5	10,8
Nida	4,5	4,3	15,0
Panevėžys	3,4	3,5	9,7
Raseiniai	3,9	3,9	10,0
Šiauliai	3,1	3,3	8,6
Šilutė	4,1	3,9	15,7
Telšiai	3,6	3,5	9,8
Ukmergė	3,2	3,2	10,6
Utena	2,5	2,6	7,5
Varėna	2,6	2,7	8,8
Vilnius	3,3	3,3	8,8

Tab. 26.: Average concentrations and maximum wind speeds

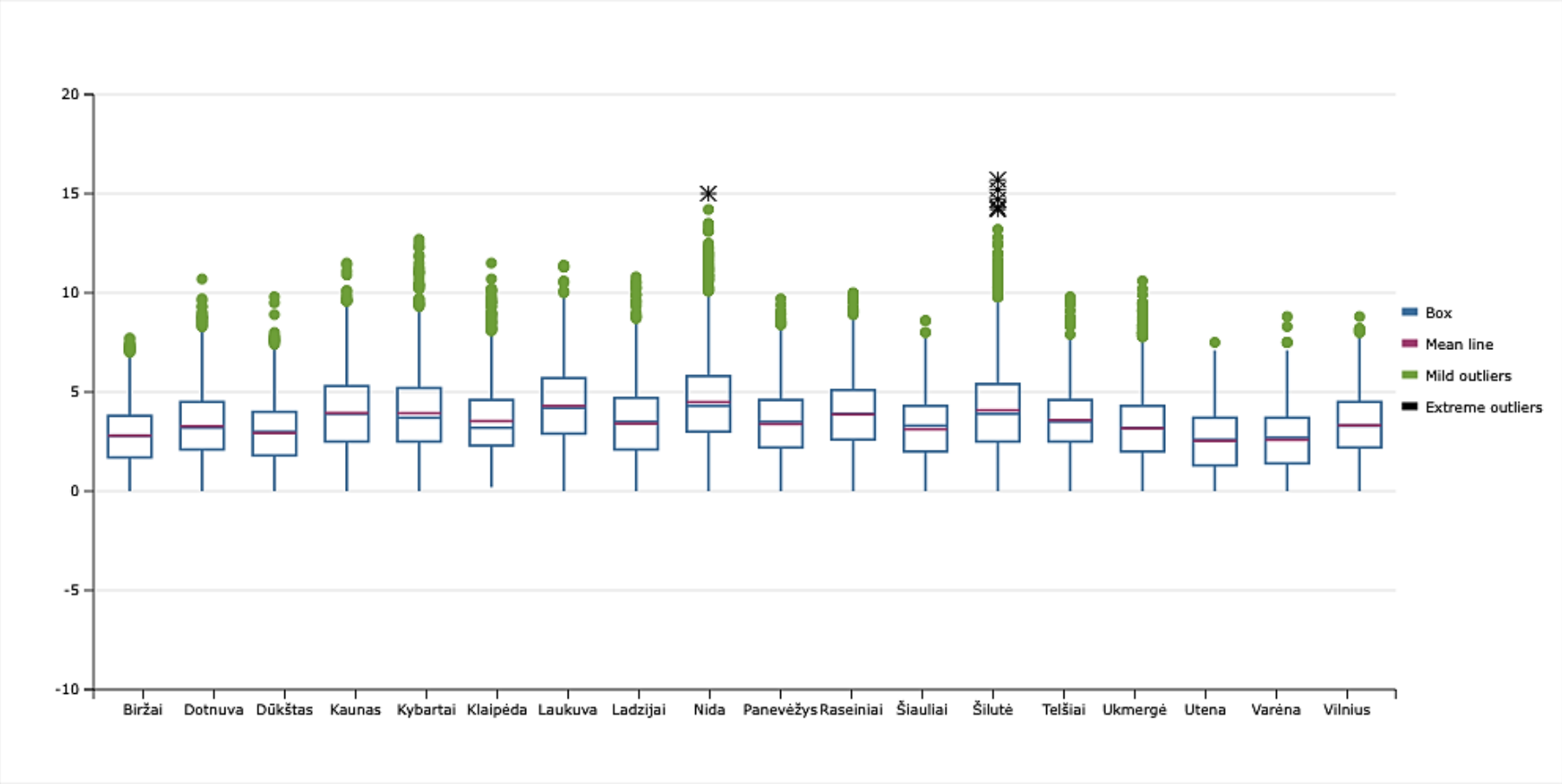
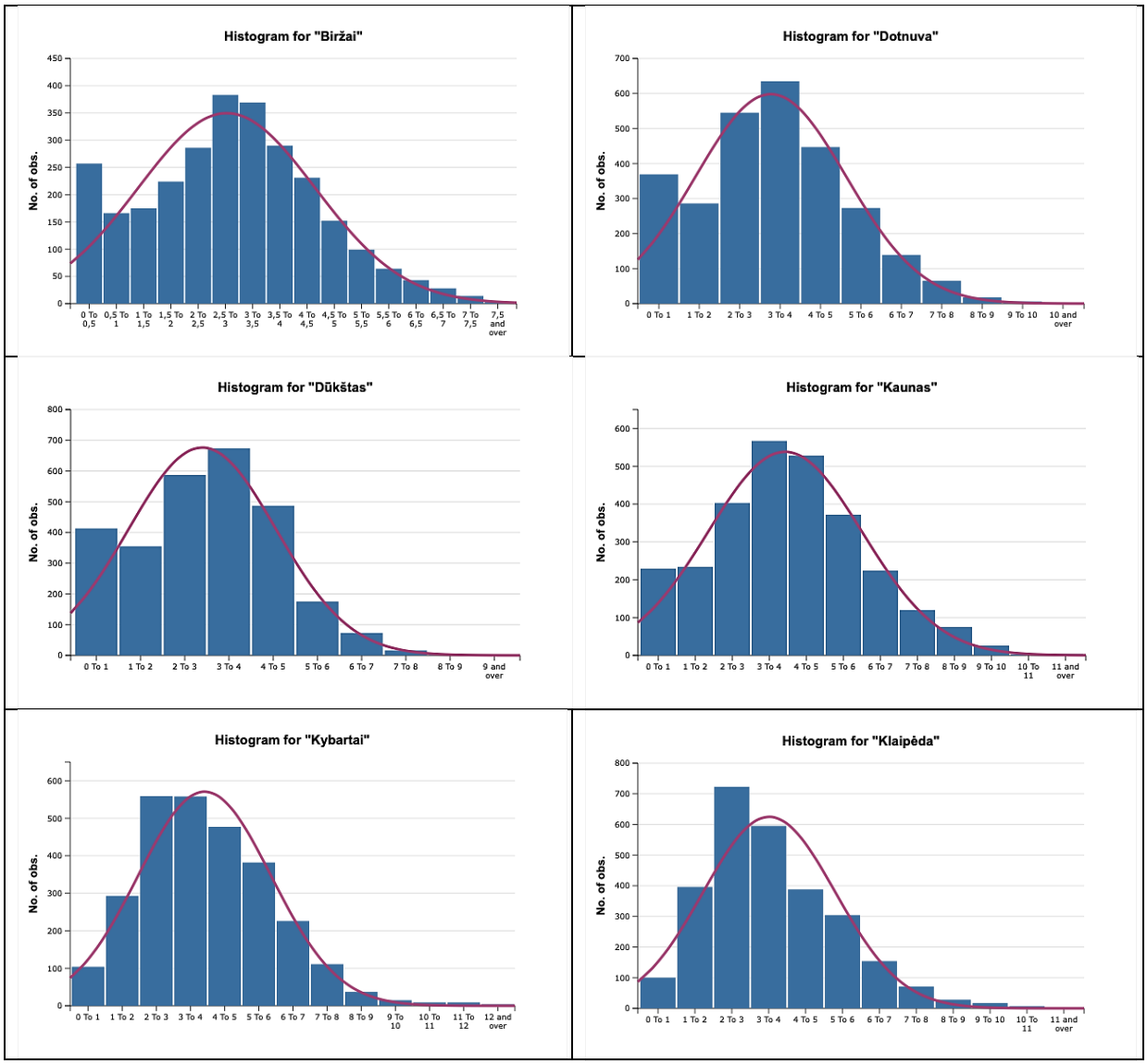
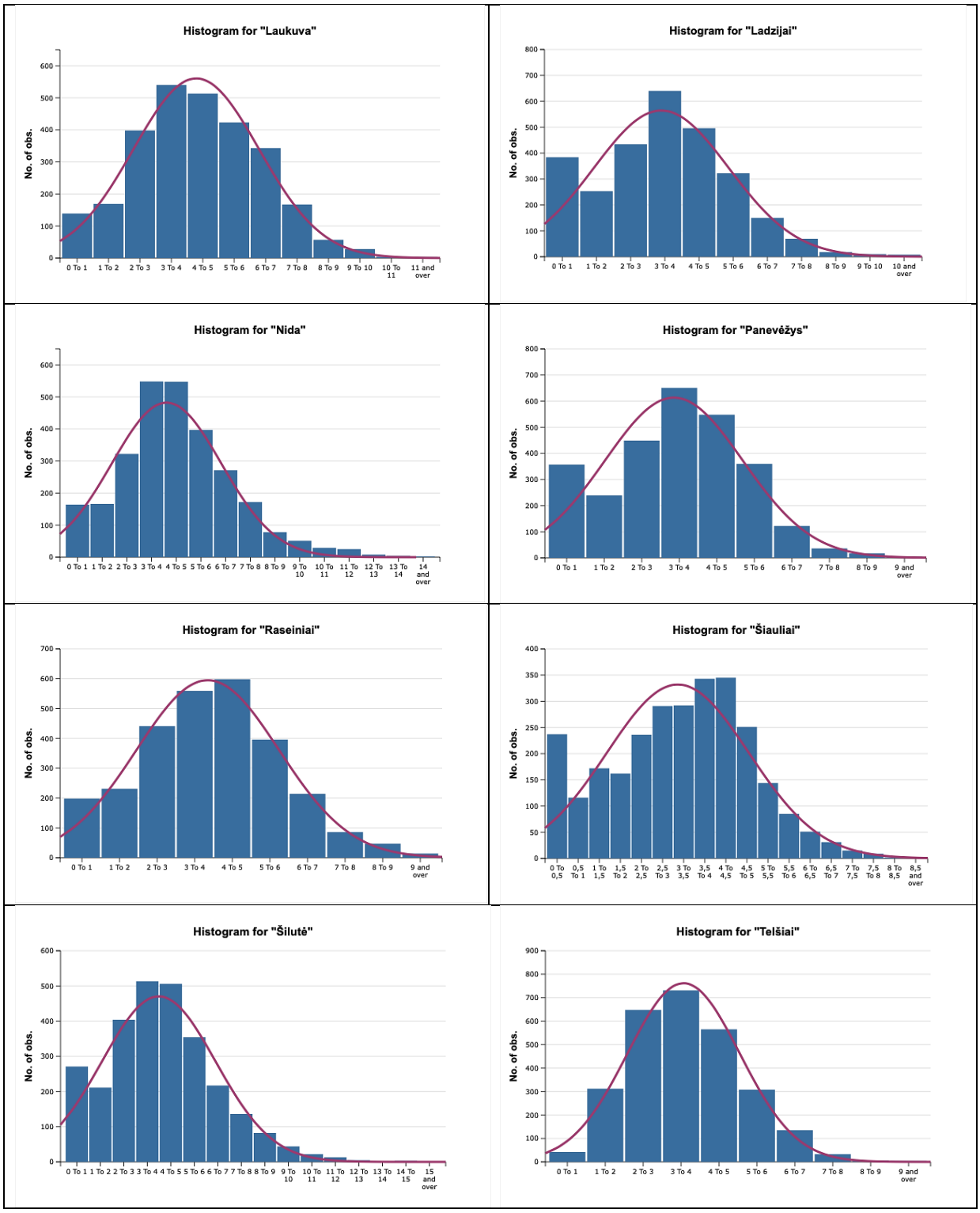


Fig. 130.: Range of average daily wind speeds at individual locations - box graph

Daily average wind speed [m/s]	%
< 0,5	6,4
0,5 - 2	28,3
2 - 5	58,6
> 5	6,7

Tab. 27: Frequency of wind direction in speed classes




Histogram for "Laukuva"
No. of obs.
0 To 1
1 To 2
2 To 3
3 To 4
4 To 5
5 To 6
6 To 7
7 To 8
8 To 9
9 To 10
10 To 11
11 and over
Histogram for "Ladzijai"
No. of obs.
0 To 1
1 To 2
2 To 3
3 To 4
4 To 5
5 To 6
6 To 7
7 To 8
8 To 9
9 To 10
10 and over
Histogram for "Nida"
No. of obs.
0 To 1
1 To 2
2 To 3
3 To 4
4 To 5
5 To 6
6 To 7
7 To 8
8 To 9
9 To 10
10 To 11
11 To 12
12 To 13
13 To 14
14 and over
Histogram for "Panevėžys"
No. of obs.
0 To 1
1 To 2
2 To 3
3 To 4
4 To 5
5 To 6
6 To 7
7 To 8
8 To 9
9 and over
Histogram for "Raseiniai"
No. of obs.
0 To 1
1 To 2
2 To 3
3 To 4
4 To 5
5 To 6
6 To 7
7 To 8
8 To 9
9 and over
Histogram for "Šiauliai"
No. of obs.
0 To 0,5
0,5 To 1
1 To 1,5
1,5 To 2
2 To 2,5
2,5 To 3
3 To 3,5
3,5 To 4
4 To 4,5
4,5 To 5
5 To 5,5
5,5 To 6
6 To 6,5
6,5 To 7
7 To 7,5
7,5 To 8
8 To 8,5
8,5 and over
Histogram for "Šilutė"
No. of obs.
0 To 1
1 To 2
2 To 3
3 To 4
4 To 5
5 To 6
6 To 7
7 To 8
8 To 9
9 To 10
10 To 11
11 To 12
12 To 13
13 To 14
14 To 15
15 and over
Histogram for "Telšiai"
No. of obs.
0 To 1
1 To 2
2 To 3
3 To 4
4 To 5
5 To 6
6 To 7
7 To 8
8 To 9
9 and over

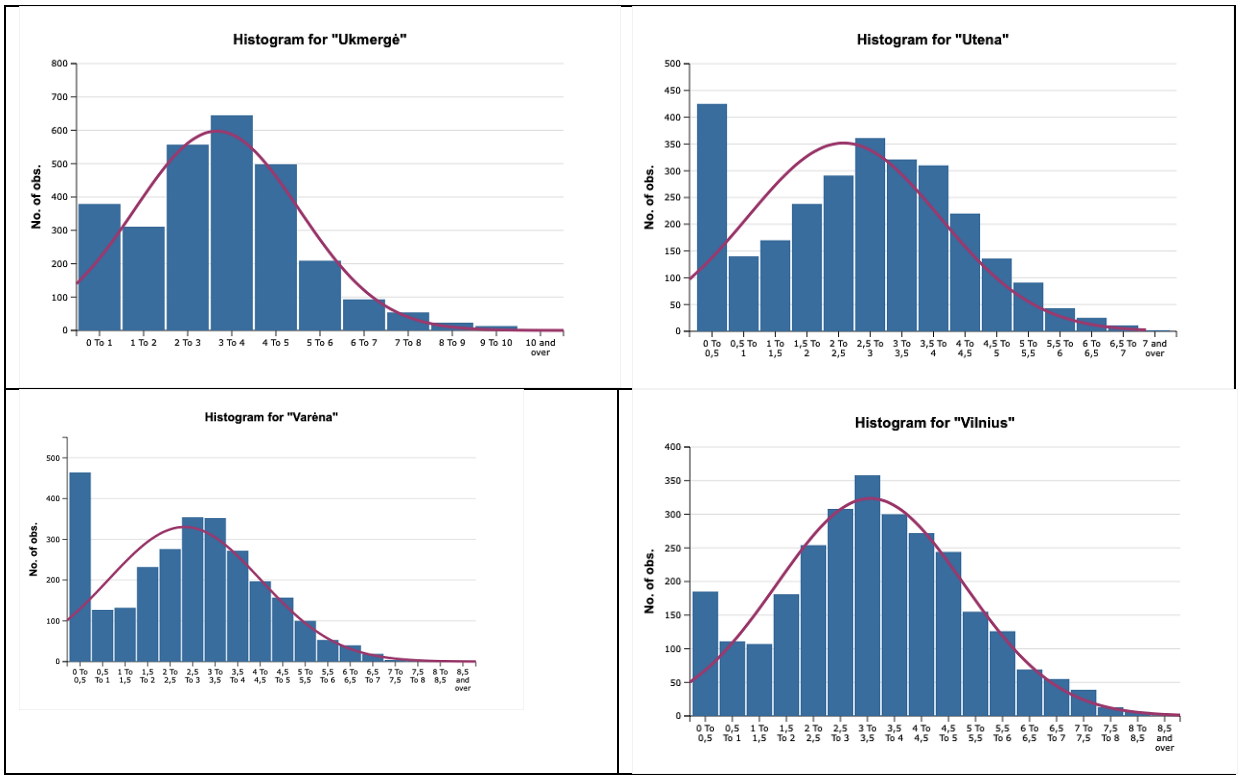


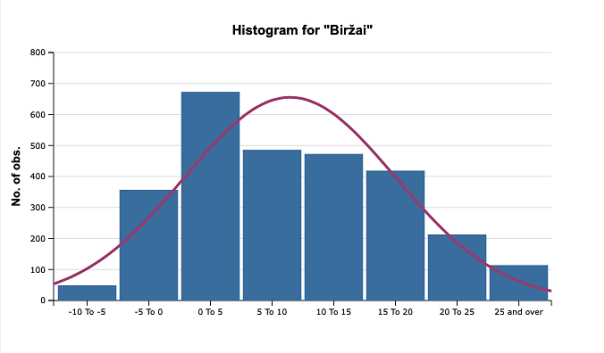
Fig. 131: Histogram of wind speeds by class - all locations

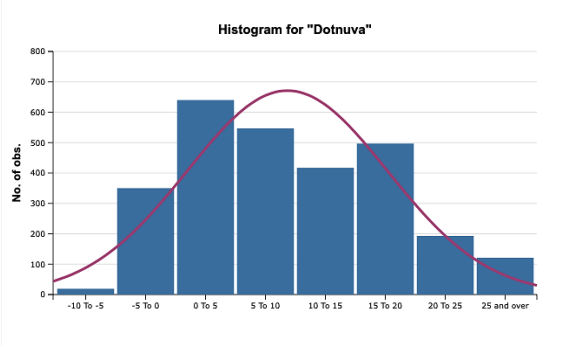
The normality test showed normally distributed data - in all classes, except for windless conditions. In Tab. 28 the percentage of windless conditions (up to 0.5 m / s) in individual locations is presented.

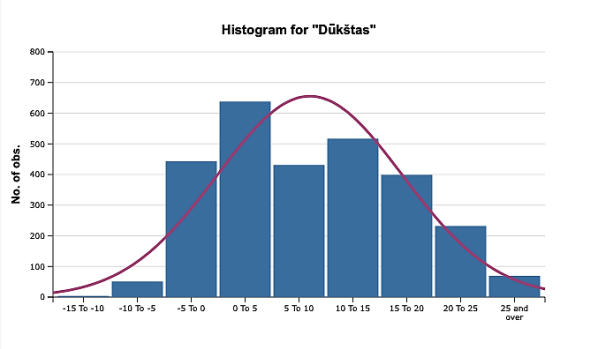
Location	Percentage of windless conditions (%)
Biržai	9,2
Dotnuva	8,4
Dūkštas	9,1
Kaunas	5,5
Kybartai	1,7
Klaipėda	0,6
Laukuva	2,9
Ladzijai	10,2
Nida	3,5
Panevėžys	8,9
Raseiniai	4,2
Šiauliai	8,5
Šilutė	7,1
Telšiai	5
Ukmergė	9,5
Utena	6,1
Varėna	7,9
Vilnius	6,6

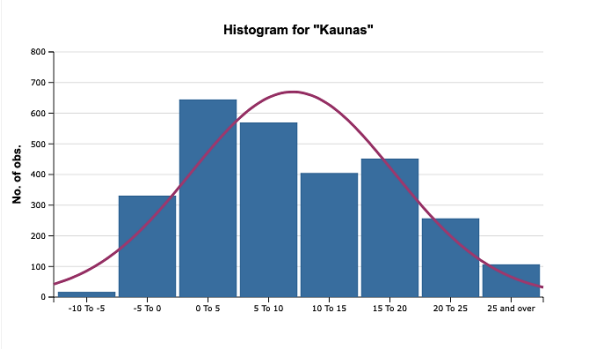
Tab. 28: Percentage of windless conditions (%) in the monitored locations in the period of implementation of sampling campaigns.

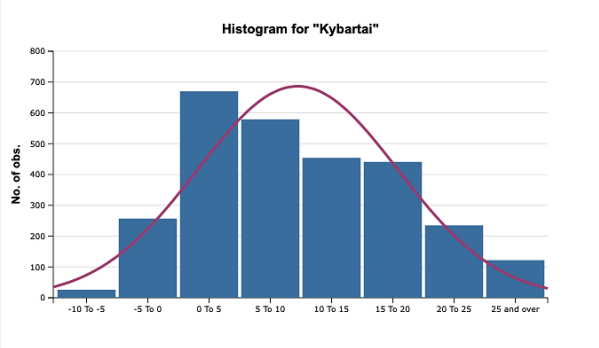
8.5.3. Air Temperature

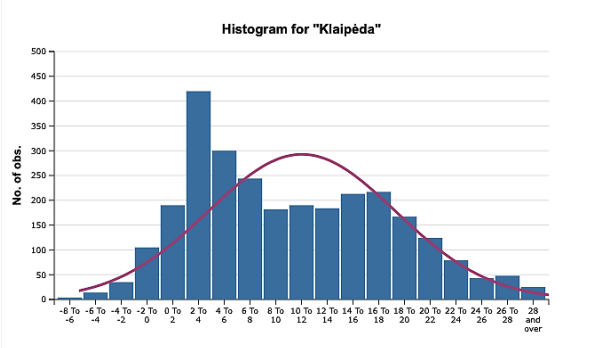


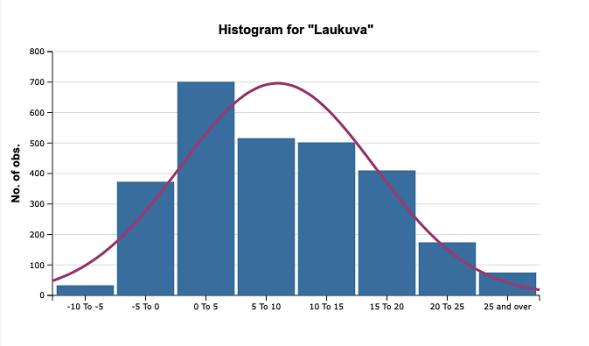


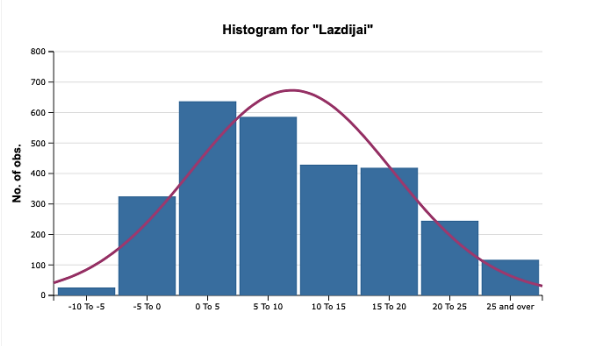


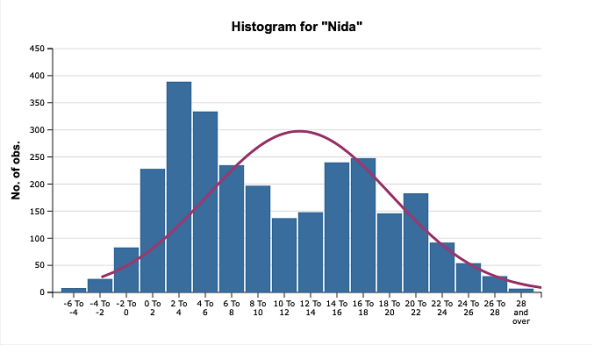


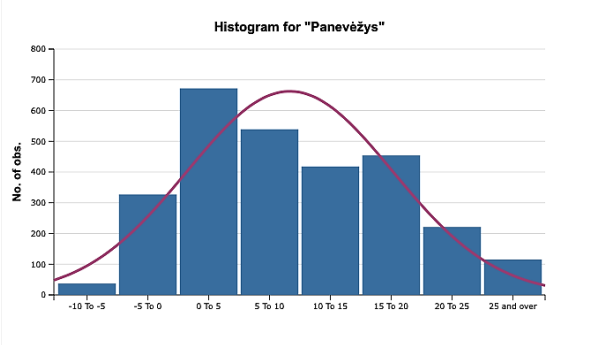












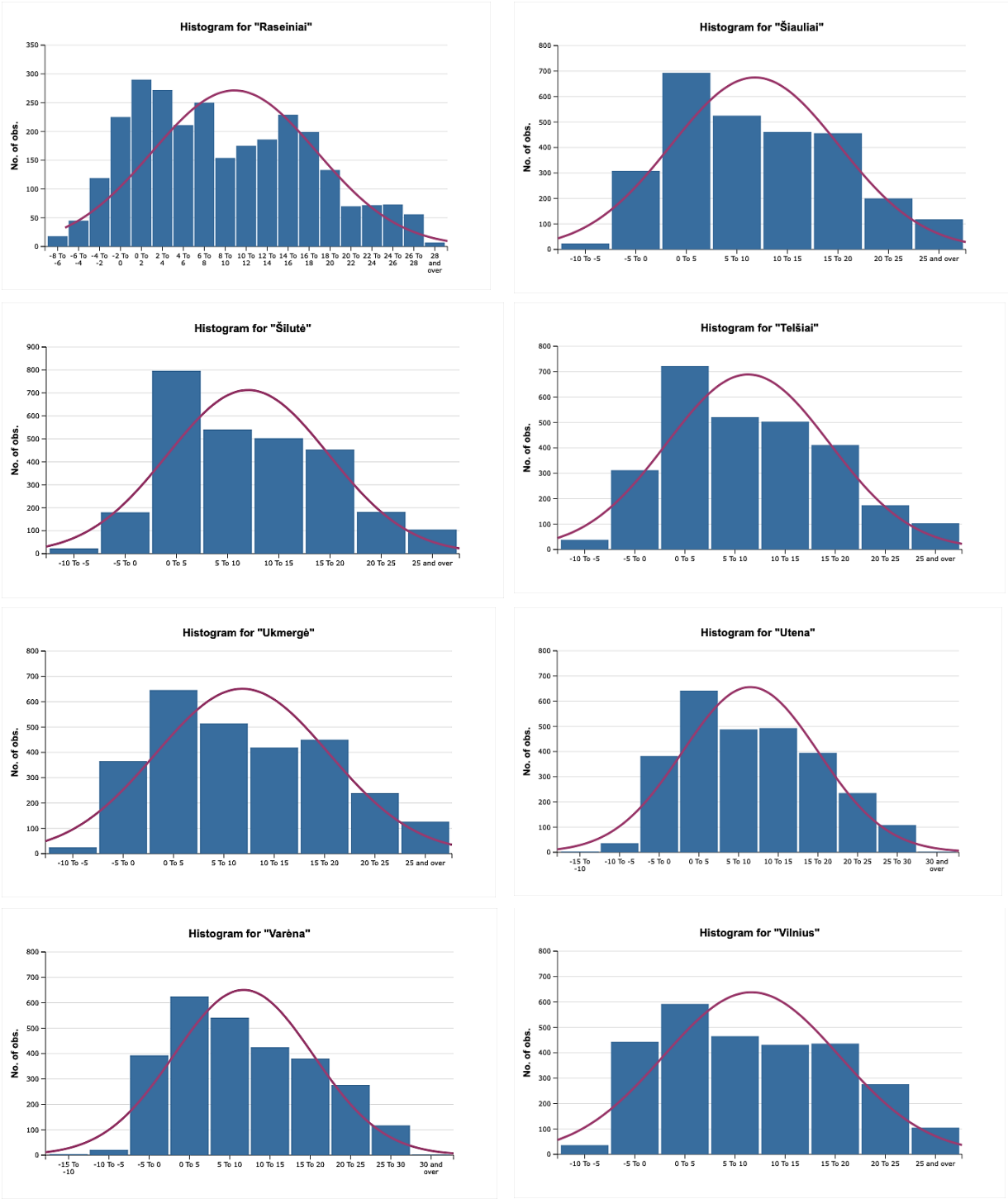


Fig. 132: Histogram of temperatures in classes by 5°C

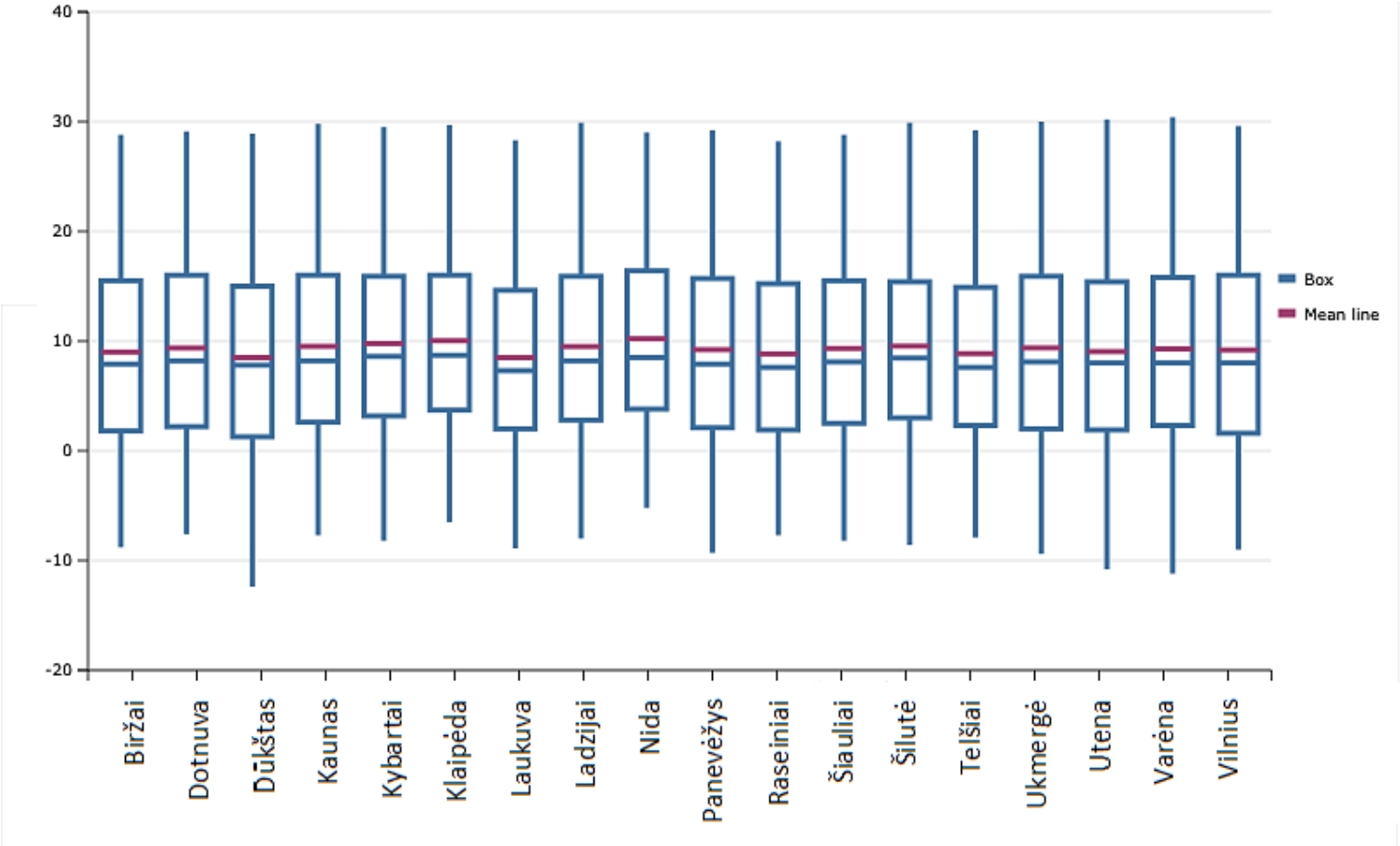


Fig. 133: Range of air temperature at individual locations - box graph

9. Tables with Data

9.1. NO_2 – concentrations – all campaigns

Location NO_2	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Alytus 01	6,2	7,21	8,29	5,68	6,84
Alytus 02	4,9	5,99	6,11	5,48	5,62
Alytus 03	10,95	17,06	13,22	11,33	13,14
Anykščiai 02	5,45	8,23	7,68	9,6	7,74
Birštonas 01	5,12	4,78	5,51	6,13	5,38
Biržai 01	5,29	6,57	3,24	10,69	6,45
Biržai 02	5,75	4,68	4,98	6,34	5,44
Druskininkai 01	5,22	7,77	9,76	9,06	7,95
Druskininkai 02	9,46	14,63	14,76	11,17	12,5
Druskininkai 03	4,06	3,84	7,15	4,63	4,92
Elektrėnai 01	4,75	12,78	13,05	4,67	8,81
Elektrėnai 02	3,87	6,26	5,24	5,84	5,3
Elektrėnai 03	4,24	8,14	10,54	6,06	7,24
Gargždai 01	9,18	5,17	11,09	7,64	8,27
Gargždai 02	5,2	6,96	5,53	7,43	6,28
Gargždai 03	4,58	4,99	3,92	5,55	4,76
Garliava 01	10,21	11,21	17,76	9,59	12,19
Grigiškės 03	8,1	11,85	10,14	12,62	10,68
Ignalina 01	5,98	7,44	6,48	4,37	6,07
Jonava 02	4,9	5,97	6,58	4,05	5,37
Jonava 03	5,2	6,81	7,19	4,56	5,94
Jubarkas 01	9,45	11,63	12,72	7,23	10,25
Jubarkas 02	3,67	4,67	3,95	5,82	4,52
Jubarkas 03	5,46	5,42	5,86	5,04	5,44
Kaunas 02	15,88	19,87	25,63	20,14	20,38

Location NO_2	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Kaunas 04	8,14	8,41	10,91	11,66	9,78
Kaunas 09	8,95	11,38	16,19	9,12	11,41
Kaunas 10	15,4	20,14	24,4	18,86	19,7
Kaunas 14	5,9	8,96	10,69	5,02	7,64
Kaunas 16	13,03	17,97	22,83	15,53	17,34
Kaunas 17	10,57	16,5	18,88	11,88	14,46
Kaunas 18	8,2	8,61	14,07	10,52	10,35
Kaunas 19	9,35	11,24	12,56	17,28	12,6
Kaunas 21	10,41	12,66	13,74	9,48	11,57
Kaunas 24	19,06	30,86	33,18	14,23	24,33
Kaunas 25	22,97	30,67	38,07	24,31	29
Kaunas 26	10	24,18	24,72	13,16	18,01
Kaunas 27	15,48	33,56	37,74	15,77	25,63
Kaunas 29	7,75	8,35	12,72	9,86	9,67
Kaunas 30	10,52	12,01	18,69	11,67	13,22
Kaunas 31	6,76	6,24	8,73	17,32	9,76
Kaunas 35	5,78	4,04	6,59		5,47
Kėdainiai 01	4,42	6,42	7,76	4,63	5,8
Kėdainiai 03	10,32	17,68	15,32	12,44	13,94
Kelmė 01	9,76	14,89	18,99	6,14	12,44
Klaipėda 05	10,34	10,57	10,5	14,48	11,47
Klaipėda 07	16,35	17,32	20,6	12,27	16,63
Klaipėda 09	18,72	26,11	26,46	23,95	23,81
Klaipėda 10	14,14	20,95	19,97	17,98	18,26
Klaipėda 11	19,8	22,75	18,55	13,3	18,6
Klaipėda 13	11,99	8,03	10,33	14,83	11,29
Kuršėnai 01	5,71	11,43	13,53	23,48	13,53
Kuršėnai 02	5,45	11,53	7,4	13,68	9,51
Kuršėnai 03	5,46	7,87	8,96	4,67	6,74
Lazdijai 02	4,19	4,89	4,42	4,34	4,46
Lentvaris 02	6,56	11,18	7,3	6,2	7,81
Likėnai 01	2,89	3,73	4,75	4,94	4,08
Marijampolė 01	15,04	19,81	19,34	18,23	18,1
Marijampolė 02	9,58	10,13	9,57	9,01	9,57
Marijampolė 04	5,91	7,86	8,64	9,73	8,03
Mažeikiai 01	8,73	12,36	13,49	7,92	10,62

Location NO_2	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Mažeikiai 03	6,08	13,54	8,14	11,82	9,89
OKTS 03	14,96	20,09	23,26	9,31	16,9
OKTS 12	7,9	10,22	11,49	7,17	9,19
OKTS 22	10,49	17,06	18,98	12,03	14,64
OKTS 23	5	4,85	5,82	13,05	7,18
OKTS 33	11,44	19,81	18,27	15,89	16,35
OKTS 41	14,01	17,09	23,8	14,96	17,46
OKTS 42	6,34	8,4	6,78	5,45	6,74
OKTS 43	5,59	9,66	10,46	5,88	7,89
OKTS 51	1,83	1,63	1,14	3,55	2,04
OKTS 52	2,62	2,31	4,33	3,15	3,1
OKTS 53	1,81	2,89	3,99	9,07	4,44
Pabradė 01	7,87	11,28	9,1	6,83	8,77
Palanga 02	6,38	7,08	7,15	10,49	7,77
Panevėžys 03	11,39	11,14	9,94	8,72	10,3
Panevėžys 04	8,61	11,12	11,49	6,57	9,45
Panevėžys 06	8,13	6,45	8,92	6,36	7,46
Panevėžys 07	8,58	11,16	9,22	5,99	8,74
Panevėžys 08	4,99	5,76	6,24	12,88	7,47
Panevėžys 12	9,7	12,08	13,08	6,67	10,38
Plungė 01	8,29	13,78	15,49	12,09	12,41
Plungė 02	4,46	3,35	5,3	12,43	6,38
Plungė 03	5,28	5,75	6,4	14,8	8,06
Radviliškis 01	6,66	20,74	15,5	15,88	14,7
Radviliškis 02	5,64	7,47	10,9	7,28	7,82
Radviliškis 03	7,15	10,69	11,46	9,97	9,82
Raseiniai 01	7,35	12,24	12,33	5,93	9,46
Raseiniai 02	6,39	5,43	5,96	4,47	5,56
Raseiniai 03	5,72	6,3	7,92	7,57	6,88
Rokiškis 01	8,04	10,86	11,2	11,15	10,31
Rokiškis 02	4,59	4,33	6,12	10,83	6,47
Rokiškis 03	6,35	5,17	7,52	9,27	7,08
Šiauliai 02	9,48	17,84	23,2	13,9	16,1
Šiauliai 05	7,62	19,32	16,81	16,04	14,94
Šiauliai 07	5,91	11,06	13,38	16,35	11,67
Šiauliai 09	7,86	9,9	9,94	14,63	10,58

Location NO_2	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Šiauliai 10	9,56	20,1	25,47	22,16	19,32
Šiauliai 11	5,76	6,36	9,22	16,74	9,52
Šilutė 01	6,64	10,55	6,77	12,62	9,14
Šilutė 02	7,83	6,37	6,22	8,78	7,3
Šilutė 03	4,09	3,64	4,15	7,17	4,76
Tauragė 01	9,96	15,66	18,46	9,59	13,42
Tauragė 02	8,14	9,99	8,57	5	7,92
Tauragė 03	7,96	4,89	10,15	4,92	6,98
Telšiai 01	8,37	13,58	14,77	13,58	12,57
Telšiai 02	5,24	4,97	5,94	9,49	6,41
Telšiai 03	2,51	2,73	1,94	5,19	3,09
Trakai 02	3,01	5,18	6,19	4,14	4,63
Ukmergė 01	7,18	9,1	9,03	11,06	9,09
Ukmergė 02	4,95	6,13	6,55	7,06	6,17
Ukmergė 03	5,05	5,58	4,72	8,3	5,91
Utena 01	8,43	14,76	12,24	4,55	10
Utena 02	8,1	5,45	4,8	4,08	5,61
Utena 03	6,5	5	5,63	2,05	4,79
Vilkaviškis 01	7,77	7,59	7,61	5,68	7,16
Vilkaviškis 02	6,09	6,97	7,03	6,21	6,58
Vilkaviškis 03	5,81	6,32	5,63	8,18	6,48
Vilnius 01	11,76	7,61	15,51	12,65	11,88
Vilnius 02	15,69	19,48	24,18	15,37	18,68
Vilnius 07	9,08	11,63	16,81	18,05	13,89
Vilnius 08	11,3	25,74	17,77	23,17	19,49
Vilnius 09	16,98	21,38	18,23	19,91	19,12
Vilnius 10	15,34	20,74	28,4	20,49	21,24
Vilnius 12	10,93	16,66	24,88	23,17	18,91
Vilnius 13	20,41	27,51	36	25,64	27,39
Vilnius 14	9,5	8,17	9,12	6,14	8,23
Vilnius 15	8,86	8,64	15,29	7,34	10,03
Vilnius 17	15,24	19,3	23,64	25,71	20,97
Vilnius 18	28,41	41,03	43,15	38,95	37,88
Vilnius 19	13,32	23,86	25,79	17,51	20,12
Vilnius 20	30,17	34,55	40,53	19,77	31,25
Vilnius 21	13,76	19,75	22,23	23,1	19,71

Location NO_2	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Vilnius 23	15,19	25,19	19,81	14,52	18,68
Vilnius 24	10,26	12,34	14,52	10,88	12
Vilnius 25	8,54	13,53	18,93	13,17	13,54
Vilnius 26	7,27	12,36	13,08	8,67	10,34
Vilnius 27	13,1	26,43	30,69	18,04	22,06
Vilnius 28	8,78	11,91	13,49	16,42	12,65
Vilnius 30	12,14	20,99	15,71	10,22	14,76
Vilnius 31	18,51	27,11	31,3	23,06	24,99
Vilnius 32	10,67	13,4	11,51	10,2	11,44
Vilnius 33	9,48	13,95	13,09	10,32	11,71
Vilnius 34	8,22	7,23	6,06	16,3	9,45
Vilnius 35	7,55	10,6	12,42	9,67	10,06
Visaginas 01	4,57	6,37	5,75	7,14	5,96
Visaginas 02	3,01	4,58	7,23	3,75	4,64
Visaginas 03	4,57	4,45	1,22	6,07	4,08

Tab.29: NO_2 – concentrations – all campaigns

9.2. SO_2 – concentrations – all campaigns

Location SO_2	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Alytus 01	0,48	0,18	0,24	1,37	0,56
Alytus 02	0,55	0,19	0,2	0,93	0,47
Alytus 03	0,57	0,19	0,14	1,71	0,65
Anykščiai 02	0,66	0,19	0,32	1,69	0,71
Birštonas 01	0,37	0,18	0,11	1,29	0,48
Biržai 01	0,6	0,19	0,29	1,72	0,7
Biržai 02	0,57	0,19	0,3	1,4	0,61
Druskininkai 01	0,48	0,19	0,8	1,37	0,71
Druskininkai 02	0,48	0,19	0,15	0,71	0,38
Druskininkai 03	0,4	0,2	0,2	0,64	0,36
Elektrėnai 01	0,34	0,43	1,9	5,19	1,96

Location SO_2	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Elektrėnai 02	0,37	0,19	1,05	2,75	1,09
Elektrėnai 03	0,34	0,19	1,12	2,62	1,07
Gargždai 01	0,69	0,22	0,2	0,42	0,38
Gargždai 02	0,69	0,19	0,43	0,71	0,5
Gargždai 03	0,72	0,19	0,43	0,44	0,44
Garliava 01	0,83	0,49	2,21	4,83	2,09
Grigiškės 03	0,53	0,68	0,78	3,93	1,48
Ignalina 01	0,29	0,3	0,26	0,44	0,32
Jonava 02	0,62	0,77	0,49	1,75	0,91
Jonava 03	0,63	1,22	0,55	1,1	0,87
Jubarkas 01	0,71	0,8	0,89	2,16	1,14
Jubarkas 02	0,56	0,69	1,11	0,16	0,63
Jubarkas 03	0,71	1,21	2	1,8	1,43
Kaunas 02	0,23	0,19	0,94	4,05	1,35
Kaunas 04	0,38	0,28	1,23	2,9	1,2
Kaunas 09	0,47	0,19	0,75	3,39	1,2
Kaunas 10	0,38	0,18	0,85	3,96	1,34
Kaunas 14	0,43	0,44	1,43	3,42	1,43
Kaunas 16	0,34	0,18	0,94	2,61	1,02
Kaunas 17	0,44	0,19	0,76	2,69	1,02
Kaunas 18	0,38	0,18	1,48	4,46	1,62
Kaunas 19	0,45	0,56	1,29	3,36	1,41
Kaunas 21	0,52	0,12	0,61	3,42	1,16
Kaunas 24	0,35	0,19	0,68	1,52	0,68
Kaunas 25	0,33	0,19	0,61	2,75	0,97
Kaunas 26	0,4	<0,10	0,48	4,92	1,93
Kaunas 27	0,36	0,4	0,51	3,33	1,15
Kaunas 29	1,21	0,19	2,59	4,24	2,06
Kaunas 30	0,66	0,19	0,94	4,54	1,58
Kaunas 31	1,53	0,19	0,49	8,55	2,69
Kaunas 35	0,69	0,12	1,14		0,65
Kėdainiai 01	0,62	2,6	4,98	1,12	2,33
Kėdainiai 03	0,73	1,31	0,27	2,52	1,2
Kelmė 01	0,67	0,91	0,51	2,01	1,02
Klaipėda 05	0,65	0,33	0,57	0,34	0,47

Location SO_2	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Klaipėda 07	0,58	0,44	0,54	0,4	0,49
Klaipėda 09	0,61	0,19	0,21	0,55	0,39
Klaipėda 10	0,63	0,19	0,32	0,38	0,38
Klaipėda 11	0,68	0,25	0,61	0,33	0,47
Klaipėda 13	0,4	0,25	0,44	0,32	0,35
Kuršėnai 01	0,94	0,91	0,29	3,17	1,33
Kuršėnai 02	1,36	0,76	0,89	3,86	1,72
Kuršėnai 03	0,74	0,89	0,29	1,87	0,95
Lazdijai 02	0,56	0,4	0,2	1,06	0,55
Lentvaris 02	0,81	0,89	3,47	1,45	1,65
Likėnai 01	0,58	0,19	0,3	1,38	0,61
Marijampolė 01	0,82	0,45	0,21	2,19	0,91
Marijampolė 02	0,9	0,25	0,42	1,76	0,83
Marijampolė 04	0,55	0,18	0,21	1,73	0,67
Mažeikiai 01	1,03	1,22	0,97	1,92	1,29
Mažeikiai 03	1,5	1,29	0,65	1,6	1,26
OKTS 03	0,41	0,93	0,58	0,34	0,56
OKTS 12	0,59	0,19	0,31	1,14	0,56
OKTS 22	0,72	0,89	0,3	1,67	0,89
OKTS 23	1,29	1,25	0,45	2,53	1,38
OKTS 33	0,65	0,2	0,42	0,55	0,45
OKTS 41	0,4	0,12	1,78	4,13	1,61
OKTS 42	0,57	0,99	0,3	1,1	0,74
OKTS 43	0,54	1,23	0,26	1,12	0,79
OKTS 51	0,58	0,19	1,32	1,14	0,81
OKTS 52	0,5	0,82	0,32	1,33	0,74
OKTS 53	0,54	0,28	0,49	0,51	0,45
Pabradė 01	0,66	0,19	0,74	0,53	0,53
Palanga 02	0,37	0,34	0,46	0,54	0,43
Panevėžys 03	0,61	0,2	0,3	1,69	0,7
Panevėžys 04	0,78	0,39	0,3	1,49	0,74
Panevėžys 06	0,62	0,19	0,3	2,25	0,84
Panevėžys 07	0,58	0,64	0,3	1,58	0,77
Panevėžys 08	0,61	0,18	0,17	1,15	0,53
Panevėžys 12	0,64	0,19	0,3	1,41	0,63

Location SO_2	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Plungė 01	0,58	0,19	0,37	0,41	0,38
Plungė 02	0,81	0,05	0,45	0,43	0,43
Plungė 03	0,59	0,35	0,54	0,3	0,44
Radviliškis 01	1,18	1,96	1,34	1,31	1,45
Radviliškis 02	0,95	0,87	0,3	0,71	0,71
Radviliškis 03	0,83	0,93	0,42	1,42	0,9
Raseiniai 01	0,56	0,75	1,62	0,55	0,87
Raseiniai 02	0,66	0,85	0,22	1,47	0,8
Raseiniai 03	0,59	0,64	1,39	2,48	1,27
Rokiškis 01	0,61	0,19	0,18	1,68	0,67
Rokiškis 02	0,57	0,2	0,31	1,67	0,69
Rokiškis 03	0,48	0,27	0,43	1,53	0,68
Šiauliai 02	1,04	0,91	0,29	3,85	1,52
Šiauliai 05	1,35	2,11	0,28	1,35	1,27
Šiauliai 07	0,94	1,42	0,53	1,17	1,01
Šiauliai 09	0,72	0,9	1,13	0,78	0,88
Šiauliai 10	2,33	0,99	0,31	0,9	1,13
Šiauliai 11	0,81	1,1	0,28	0,62	0,7
Šilutė 01	0,47	0,28	0,49	0,6	0,46
Šilutė 02	0,48	0,31	0,7	0,37	0,46
Šilutė 03	0,72	0,14	0,42	2,43	0,93
Tauragė 01	0,68	0,69	<0,10	2,89	1,42
Tauragė 02	0,72	1,39	<0,10	1,1	1,07
Tauragė 03	0,6	0,69	1,31	1,2	0,95
Telšiai 01	0,93	0,28	0,35	0,94	0,62
Telšiai 02	0,51	0,2	0,42	1,9	0,75
Telšiai 03	0,76	0,3	0,4	0,65	0,53
Trakai 02	0,38	0,57	2,62	3,95	1,88
Ukmergė 01	0,56	0,19	0,18	1,09	0,5
Ukmergė 02	0,49	0,3	0,91	2,11	0,95
Ukmergė 03	0,57	0,19	1,01	1,95	0,93
Utena 01	0,56	0,19	0,26	0,5	0,37
Utena 02	0,34	0,26	0,51	0,41	0,38
Utena 03	0,93	0,2	1,01	0,41	0,64
Vilkaviškis 01	1,39	0,19	0,14	2,12	0,96

Location SO_2	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Vilkaviškis 02	0,81	0,25	0,16	2,1	0,83
Vilkaviškis 03	1,37	0,19	1,17	1,33	1,01
Vilnius 01	0,44	1,23	1,69	1,05	1,1
Vilnius 02	0,4	0,79	0,44	2,14	0,94
Vilnius 07	0,39	1,1	0,56	2,14	1,05
Vilnius 08	0,4	1,1	0,17	1,92	0,89
Vilnius 09	0,47	0,81	0,3	1,65	0,81
Vilnius 10	0,66	0,79	1,68	1,63	1,19
Vilnius 12	0,54	0,74	1,71	1,85	1,21
Vilnius 13	0,39	0,83	2,37	1,78	1,34
Vilnius 14	1,12	0,98	1,2	1,77	1,27
Vilnius 15	0,66	0,75	1,55	1,67	1,15
Vilnius 17	0,57	0,71	0,54	2,65	1,12
Vilnius 18	0,39	0,91	1,79	3,4	1,62
Vilnius 19	0,42	0,85	1,44	1,78	1,12
Vilnius 20	0,37	0,77	0,73	1,81	0,92
Vilnius 21	0,51	0,76	0,9	1,79	0,99
Vilnius 23	0,32	1,08	0,34	2,31	1,01
Vilnius 24	0,5	0,77	0,74	1,59	0,9
Vilnius 25	0,38	0,72	1,24	7,17	2,38
Vilnius 26	0,5	1,35	2,81	3,34	2
Vilnius 27	0,4	1,27	1,6	1,25	1,13
Vilnius 28	0,41	0,82	0,52	1,82	0,89
Vilnius 30	0,4	0,83	1,05	0,72	0,75
Vilnius 31	0,35	0,79	1,55	1,94	1,16
Vilnius 32	0,47	0,72	0,4	1,51	0,77
Vilnius 33	0,82	1,27	3,34	1,72	1,79
Vilnius 34	0,37	1,55	0,6	3,69	1,55
Vilnius 35	0,42	0,72	2,03	1,53	1,17
Visaginas 01	0,25	0,19	0,39	1,55	0,59
Visaginas 02	0,41	0,2	0,26	0,72	0,4
Visaginas 03	0,87	0,29	0,26	0,52	0,48

Tab. 30: SO_2 – concentrations – all campaigns

9.3. Benzene – concentrations – all campaigns

Location Benzene	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Alytus 01	0,83	0,45	0,39	1,21	0,72
Alytus 02	0,78	0,33	0,39	1,29	0,7
Alytus 03	1,03	0,59	0,63	1,87	1,03
Anykščiai 02	1,07	0,45	0,52	1,29	0,83
Birštonas 01	1,11	0,39	0,37	1,15	0,75
Biržai 01	1,6	0,39	0,42	1,96	1,09
Biržai 02	1,54	0,44	0,51	1,23	0,93
Druskininkai 01	0,8	0,4	0,41	1,6	0,8
Druskininkai 02	0,59	0,47	0,5	1,56	0,78
Druskininkai 03	0,71	0,24	0,39	1,24	0,64
Elektrėnai 01	0,67	0,39	0,44	1,21	0,67
Elektrėnai 02	0,58	0,21	0,44	0,79	0,5
Elektrėnai 03	0,65	0,3	0,35	1,04	0,58
Gargždai 01	1,32	0,46	0,25	1	0,75
Gargždai 02	1,8	0,43	0,2	1,3	0,93
Gargždai 03	1,01	0,26	0,21	0,8	0,57
Garliava 01	1,66	0,59	0,62	1,39	1,06
Grigiškės 03	1,13	0,46	0,31	1,03	0,73
Ignalina 01	1,27	0,37	0,41	0,8	0,71
Jonava 02	0,69	0,42	0,36	1,24	0,68
Jonava 03	0,77	0,32	0,35	1,26	0,67
Jubarkas 01	1,02	0,46	0,4	1,61	0,87
Jubarkas 02	0,98	0,21	0,35	0,97	0,62
Jubarkas 03	0,73	0,32	0,31	1,55	0,72
Kaunas 02	1,84	0,51	0,49	1,36	1,05
Kaunas 04	1,17	0,43	0,41	1,47	0,87
Kaunas 09	0,88	0,4	0,47	1,59	0,83
Kaunas 10	0,95	0,59	0,8	1,76	1,02
Kaunas 14	0,82	0,31	0,43	1,04	0,65
Kaunas 16	0,9	0,52	0,54	2,05	1
Kaunas 17	0,88	0,53	0,68	1,59	0,92
Kaunas 18	0,92	0,36	0,71	1,31	0,82
Kaunas 19	0,97	0,54	0,47	1,5	0,87
Kaunas 21	1,24	0,32	0,56	1,24	0,84

Location Benzene	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Kaunas 24	1,16	0,59	0,81	2,32	1,22
Kaunas 25	0,85	0,59	0,64	1,6	0,92
Kaunas 26	1,12	0,6	0,78	1,69	1,05
Kaunas 27	1,31	0,69	0,94	1,38	1,08
Kaunas 29	1,06	0,49	0,62	0,84	0,75
Kaunas 30	1,3	0,47	0,8	2,26	1,21
Kaunas 31	1,03	0,45	0,39	1,32	0,8
Kaunas 35	1,45	0,42	0,64	1,76	1,07
Kėdainiai 01	0,7	0,31	0,33	0,94	0,57
Kėdainiai 03	1,12	0,56	0,47	1,81	0,99
Kelmė 01	1,44	0,4	0,46	1,57	0,97
Klaipėda 05	1,49	0,91	0,74	1,3	1,11
Klaipėda 07	0,67	0,5	0,35	0,74	0,56
Klaipėda 09	1,04	0,62	0,55	0,88	0,77
Klaipėda 10	0,91	0,2	0,37	0,6	0,52
Klaipėda 11	0,84	0,5	0,32	0,91	0,64
Klaipėda 13	0,93	0,36	0,24	0,65	0,55
Kuršėnai 01	1,42	0,4	0,55	1,63	1
Kuršėnai 02	1,4	0,4	0,48	1,39	0,92
Kuršėnai 03	0,82	0,4	0,4	0,91	0,63
Lazdijai 02	1,03	0,35	0,44	1,7	0,88
Lentvaris 02	1,67	0,5	0,4	1,7	1,07
Likėnai 01	0,78	0,21	0,34	1,3	0,66
Marijampolė 01	1,11	0,53	0,53	2,65	1,2
Marijampolė 02	1,48	0,46	0,48	2,48	1,22
Marijampolė 04	0,98	0,34	0,53	1,71	0,89
Mažeikiai 01	1,25	1,04	0,58	1,46	1,08
Mažeikiai 03	1,23	0,41	0,45	2,16	1,06
OKTS 03	0,95	0,37	0,4	1,53	0,81
OKTS 12	1,32	0,41	0,47	1,39	0,89
OKTS 22	0,76	0,41	0,53	1,4	0,77
OKTS 23	0,99	0,43	0,45	1	0,71
OKTS 33	0,78	0,54	0,27	1,2	0,69
OKTS 41	0,78	0,82	2	1,54	1,28
OKTS 42	0,84	0,38	0,34	1,02	0,64
OKTS 43	0,88	0,37	0,34	1,11	0,67

Location Benzene	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
OKTS 51	0,65	0,42	0,28	0,86	0,55
OKTS 52	0,6	0,17	0,31	1,15	0,56
OKTS 53	0,35	0,16	0,14	0,48	0,28
Pabradė 01	1,4	0,49	0,5	1,34	0,93
Palanga 02	0,82	0,47	0,2	1	0,62
Panevėžys 03	1,24	0,46	0,44	1,68	0,95
Panevėžys 04	1,07	0,4	0,54	1,31	0,83
Panevėžys 06	2,22	0,59	0,51	2,61	1,48
Panevėžys 07	1,37	0,41	0,41	1,73	0,98
Panevėžys 08	1,41	0,52	0,36	0,73	0,75
Panevėžys 12	1,49	0,32	0,55	1,66	1
Plungė 01	1,38	0,33	0,26	1,93	0,97
Plungė 02	1,45	0,48	0,29	1,12	0,83
Plungė 03	0,85	0,32	0,22	0,69	0,52
Radviliškis 01	1,14	0,63	0,48	1,25	0,87
Radviliškis 02	1,24	0,61	0,4	1,57	0,95
Radviliškis 03	1,11	0,52	0,35	1,01	0,75
Raseiniai 01	1,48	0,47	0,41	1,57	0,98
Raseiniai 02	1,88	0,41	0,41	2,64	1,33
Raseiniai 03	1,43	0,39	0,42	2,08	1,08
Rokiškis 01	0,89	0,54	0,38	1,22	0,76
Rokiškis 02	1,2	0,35	0,5	1,49	0,88
Rokiškis 03	1,38	0,32	0,32	1,79	0,95
Šiauliai 02	1,08	0,55	0,54	1,31	0,87
Šiauliai 05	1,8	0,36	0,54	1,48	1,04
Šiauliai 07	0,92	0,55	0,51	1,03	0,75
Šiauliai 09	1,61	0,52	0,47	1,32	0,98
Šiauliai 10	1,44	0,64	0,93	1,55	1,14
Šiauliai 11	2,47	0,36	0,48	2,29	1,4
Šilutė 01	0,98	0,4	0,22	0,67	0,57
Šilutė 02	1,32	0,31	0,25	0,89	0,69
Šilutė 03	1,01	0,37	0,34	0,96	0,67
Tauragė 01	1,41	0,34	0,46	2,13	1,08
Tauragė 02	1,68	0,48	0,39	2,3	1,21
Tauragė 03	2,44	0,46	0,45	3,16	1,63
Telšiai 01	1,17	0,39	0,33	1,43	0,83

Location **Benzene**	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Telšiai 02	1,38	0,3	0,27	1,99	0,98
Telšiai 03	0,6	0,28	0,15	0,79	0,45
Trakai 02	0,76	0,27	0,34	1,33	0,67
Ukmergė 01	1,01	0,5	0,44	1,34	0,82
Ukmergė 02	1,24	0,5	0,47	1,79	1
Ukmergė 03	1,32	0,46	0,36	1,62	0,94
Utena 01	1,39	0,54	0,39	1,53	0,96
Utena 02	0,97	0,38	0,34	1,27	0,74
Utena 03	2,5	0,46	0,37	3,03	1,59
Vilkaviškis 01	1,18	0,33	0,55	1,26	0,83
Vilkaviškis 02	0,95	0,5	0,42	1,6	0,87
Vilkaviškis 03	1,28	0,37	0,5	1,58	0,93
Vilnius 01	0,85	0,39	0,43	1,42	0,77
Vilnius 02	0,98	0,63	0,46	1,25	0,83
Vilnius 07	1,01	0,4	0,3	1,41	0,78
Vilnius 08	0,87	0,81	0,42	1,16	0,81
Vilnius 09	0,96	0,8	0,65	1,31	0,93
Vilnius 10	1,46	0,55	0,83	1,31	1,03
Vilnius 12	0,89	0,58	0,5	1,13	0,77
Vilnius 13	0,96	0,4	0,48	1,04	0,72
Vilnius 14	1,55	0,46	0,54	1,61	1,04
Vilnius 15	0,95	0,47	0,47	1,03	0,73
Vilnius 17	0,81	0,52	0,31	1,59	0,81
Vilnius 18	1,22	1,07	0,56	1,4	1,06
Vilnius 19	1,02	0,45	0,46	1,4	0,83
Vilnius 20	1,24	0,74	0,6	1,27	0,96
Vilnius 21	0,83	0,59	1,11	0,83	0,84
Vilnius 23	0,93	0,48	0,53	1,33	0,81
Vilnius 24	1,04	0,44	0,48	1,32	0,82
Vilnius 25	0,84	0,44	0,69	1,4	0,84
Vilnius 26	0,84	0,49	0,38	0,94	0,66
Vilnius 27	0,93	0,57	0,48	1,35	0,83
Vilnius 28	0,82	0,44	0,45	1,25	0,74
Vilnius 30	0,87	0,56	0,35	1,53	0,83
Vilnius 31	0,93	0,56	0,42	1,69	0,9
Vilnius 32	0,82	0,77	0,74	2,39	1,18

Location Benzene	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Vilnius 33	0,71	0,43	0,78	1,36	0,82
Vilnius 34	1,26	0,32	0,3	1,16	0,76
Vilnius 35	0,89	0,36	0,51	0,77	0,63
Visaginas 01	0,79	0,41	0,28	1,05	0,63
Visaginas 02	0,72	0,26	0,29	1,04	0,58
Visaginas 03	0,67	0,27	0,29	0,74	0,49

Tab. 31: Benzene – concentrations – all campaigns

9.4. Toluene – concentrations – all campaigns

Location Toluene	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Alytus 01	0,46	0,74	0,55	0,78	0,63
Alytus 02	0,41	0,59	0,5	0,79	0,57
Alytus 03	0,88	1,05	1,34	1,27	1,13
Anykščiai 02	0,4	0,63	0,65	0,85	0,63
Birštonas 01	0,49	0,68	0,59	1,04	0,7
Biržai 01	0,96	0,76	0,48	1	0,8
Biržai 02	0,54	0,49	0,59	0,63	0,56
Druskininkai 01	0,44	4,55	0,71	0,97	1,66
Druskininkai 02	0,64	2,92	1,49	1,26	1,58
Druskininkai 03	0,29	0,45	0,56	0,82	0,53
Elektrėnai 01	0,38	0,67	0,59	1,03	0,67
Elektrėnai 02	0,28	0,36	0,54	0,95	0,53
Elektrėnai 03	0,36	0,47	0,46	0,94	0,55
Gargždai 01	0,86	0,75	0,61	1,24	0,86
Gargždai 02	0,76	0,63	0,43	1,19	0,75
Gargždai 03	0,44	0,36	0,33	0,66	0,45
Garliava 01	0,74	0,69	0,94	0,81	0,79
Grigiškės 03	0,61	0,67	0,68	0,75	0,67
Ignalina 01	0,58	0,62	0,68	0,9	0,69
Jonava 02	0,33	1,44	2,62	1,13	1,38
Jonava 03	0,32	0,5	0,47	0,95	0,56

Location **Toluene**	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Jubarkas 01	0,49	0,69	0,65	1,31	0,78
Jubarkas 02	0,37	0,31	0,42	0,86	0,49
Jubarkas 03	0,28	0,44	0,39	1,35	0,61
Kaunas 02	0,92	0,71	0,89	1,35	0,97
Kaunas 04	0,57	0,67	0,63	1,25	0,78
Kaunas 09	0,54	0,65	0,73	1,18	0,77
Kaunas 10	0,73	0,92	1,23	1,61	1,12
Kaunas 14	0,4	0,4	0,62	1,07	0,62
Kaunas 16	0,66	0,78	0,76	1,72	0,98
Kaunas 17	0,6	0,8	1,09	1,41	0,97
Kaunas 18	0,56	0,68	1,1	1,3	0,91
Kaunas 19	0,79	0,74	1,06	2,03	1,15
Kaunas 21	0,73	0,45	0,97	1,21	0,84
Kaunas 24	2,12	1,89	2,06	3,93	2,5
Kaunas 25	0,89	0,87	1,08	1,38	1,05
Kaunas 26	0,76	0,91	1,8	1,46	1,23
Kaunas 27	1,14	1,15	1,69	1,76	1,43
Kaunas 29	0,68	0,76	0,93	0,86	0,8
Kaunas 30	0,91	0,74	1,27	1,39	1,08
Kaunas 31	0,54	0,6	0,69	1,07	0,72
Kaunas 35	0,59	0,52	0,5	0,98	0,65
Kėdainiai 01	0,31	0,48	0,33	0,71	0,46
Kėdainiai 03	0,7	0,92	7,01	1,67	2,57
Kelmė 01	0,74	0,71	0,72	1,25	0,85
Klaipėda 05	2,08	0,99	0,74	1,27	1,27
Klaipėda 07	0,62	0,75	0,72	0,99	0,77
Klaipėda 09	0,95	1,02	0,89	1,08	0,98
Klaipėda 10	0,65	0,34	0,66	1,01	0,66
Klaipėda 11	0,78	0,78	0,6	1,03	0,8
Klaipėda 13	0,57	0,5	0,39	0,57	0,5
Kuršėnai 01	0,55	0,54	0,95	1,24	0,82
Kuršėnai 02	0,56	0,57	0,65	0,97	0,69
Kuršėnai 03	0,35	0,5	0,47	0,65	0,49
Lazdijai 02	0,36	0,55	0,72	0,82	0,61
Lentvaris 02	0,86	0,73	0,67	0,96	0,8
Likėnai 01	0,24	0,24	0,33	0,72	0,38

Location **Toluene**	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Marijampolė 01	0,69	0,87	0,92	1,7	1,04
Marijampolė 02	0,61	0,69	0,76	1,2	0,81
Marijampolė 04	0,38	0,52	0,8	0,9	0,65
Mažeikiai 01	0,91	1,77	0,91	1,41	1,25
Mažeikiai 03	0,59	0,57	0,56	1,64	0,84
OKTS 03	0,91	0,73	0,79	1,42	0,96
OKTS 12	0,86	0,63	0,59	1,18	0,81
OKTS 22	0,49	0,67	0,75	1,17	0,77
OKTS 23	0,76	0,58	0,56	0,92	0,7
OKTS 33	0,51	0,85	0,51	1,18	0,76
OKTS 41	1,13	1,89	5,15	2,51	2,67
OKTS 42	0,34	0,69	0,46	0,82	0,58
OKTS 43	0,45	0,62	0,6	1,05	0,68
OKTS 51	0,25	0,74	0,32	0,85	0,54
OKTS 52	0,21	0,31	0,47	0,6	0,39
OKTS 53	0,17	0,21	0,21	0,44	0,26
Pabradė 01	0,68	0,86	0,75	1,25	0,88
Palanga 02	0,59	0,66	0,37	1,04	0,66
Panevėžys 03	0,56	0,62	0,64	1,61	0,86
Panevėžys 04	1,84	1,57	0,17	1,52	1,28
Panevėžys 06	0,86	0,98	0,67	1,48	1
Panevėžys 07	0,67	0,69	0,55	1,23	0,78
Panevėžys 08	0,49	0,66	0,51	0,63	0,57
Panevėžys 12	0,64	0,47	0,78	1,01	0,72
Plungė 01	0,95	0,47	0,67	1,32	0,85
Plungė 02	0,63	0,63	0,48	0,9	0,66
Plungė 03	0,51	0,47	0,5	0,8	0,57
Radviliškis 01	0,52	1,62	0,65	1,13	0,98
Radviliškis 02	0,47	0,67	0,47	1,21	0,7
Radviliškis 03	0,47	0,67	0,44	0,78	0,59
Raseiniai 01	0,64	0,71	0,7	1,77	0,95
Raseiniai 02	0,62	0,49	0,46	1,45	0,75
Raseiniai 03	0,69	0,65	0,51	1,07	0,73
Rokiškis 01	0,42	0,74	0,52	1,24	0,73
Rokiškis 02	0,4	0,48	0,6	0,83	0,58
Rokiškis 03	0,53	0,46	0,39	1,14	0,63

Location **Toluene**	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Šiauliai 02	0,64	0,86	0,79	1,34	0,91
Šiauliai 05	0,8	0,45	0,75	1,14	0,78
Šiauliai 07	0,65	0,91	1,33	1,27	1,04
Šiauliai 09	0,77	0,71	0,66	1,23	0,84
Šiauliai 10	1,57	1,36	1,49	1,94	1,59
Šiauliai 11	0,98	0,46	0,53	2,01	0,99
Šilutė 01	0,62	0,66	0,41	0,74	0,61
Šilutė 02	0,84	0,47	0,5	1,03	0,71
Šilutė 03	0,5	0,52	1	0,87	0,72
Tauragė 01	0,69	0,49	0,67	1,43	0,82
Tauragė 02	0,64	0,74	0,59	1,66	0,91
Tauragė 03	0,85	0,64	0,56	1,93	0,99
Telšiai 01	0,85	0,63	0,74	1,26	0,87
Telšiai 02	0,58	0,38	0,43	0,98	0,59
Telšiai 03	0,24	0,34	0,25	0,47	0,32
Trakai 02	0,39	0,4	0,45	1,06	0,57
Ukmergė 01	0,4	0,62	0,53	1,21	0,69
Ukmergė 02	0,45	0,61	0,82	1,03	0,73
Ukmergė 03	0,49	0,61	0,47	0,91	0,62
Utena 01	0,72	0,76	0,83	1,69	1
Utena 02	0,43	0,56	0,57	1	0,64
Utena 03	0,82	0,56	0,47	2,16	1
Vilkaviškis 01	0,45	0,49	0,71	0,66	0,57
Vilkaviškis 02	0,42	0,84	0,76	0,81	0,71
Vilkaviškis 03	0,5	0,48	0,77	1,04	0,7
Vilnius 01	0,72	0,71	0,87	0,94	0,81
Vilnius 02	1,27	1,2	0,94	1,13	1,13
Vilnius 07	0,77	0,68	0,7	1,12	0,81
Vilnius 08	0,87	1,3	0,91	1,19	1,07
Vilnius 09	1,08	2,76	0,96	0,95	1,44
Vilnius 10	1,41	0,94	1,26	0,82	1,1
Vilnius 12	0,78	1,07	0,88	0,93	0,91
Vilnius 13	0,81	0,67	0,76	1,02	0,82
Vilnius 14	0,8	0,65	0,67	0,64	0,69
Vilnius 15	0,77	0,99	0,82	0,9	0,87
Vilnius 17	0,71	0,97	0,65	1,08	0,85

Location Toluene	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Vilnius 18	1,33	1,71	1,12	1,3	1,36
Vilnius 19	0,77	0,77	0,8	1,12	0,86
Vilnius 20	1,72	1,51	1,05	1,16	1,36
Vilnius 21	0,77	1,21	2,8	0,86	1,41
Vilnius 23	0,58	0,91	0,87	0,85	0,8
Vilnius 24	0,83	1,15	0,88	0,85	0,92
Vilnius 25	0,7	0,73	1	0,99	0,85
Vilnius 26	0,58	0,44	0,72	0,84	0,64
Vilnius 27	0,77	0,99	0,75	1,35	0,96
Vilnius 28	0,75	0,93	0,96	1,03	0,92
Vilnius 30	0,84	1,08	0,84	1,24	1
Vilnius 31	0,91	1,15	0,76	1,31	1,03
Vilnius 32	1,13	1,47	1,36	1,21	1,29
Vilnius 33	0,49	0,98	0,87	0,99	0,83
Vilnius 34	0,67	0,56	0,61	0,72	0,64
Vilnius 35	0,52	0,59	0,84	0,6	0,64
Visaginas 01	0,45	0,56	0,46	1,2	0,66
Visaginas 02	0,3	0,37	0,47	0,9	0,51
Visaginas 03	0,23	0,36	0,34	0,67	0,4

Tab. 32: Toluene – concentrations – all campaigns

9.5. Ethylbenzene – concentrations – all campaigns

Location Ethylbenzene	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Alytus 01	0,11	0,47	4,09	0,27	1,23
Alytus 02	<0,09	1,52	3,55	0,36	1,81
Alytus 03	0,17	0,44	6,85	0,41	1,96
Anykščiai 02	0,13	0,36	0,47	0,18	0,28
Birštonas 01	0,25	3,7	3,84	3,15	2,73
Biržai 01	0,28	0,4	0,4	0,22	0,32
Biržai 02	0,2	0,44	0,47	0,21	0,33
Druskininkai 01	0,17	0,64	3,31	0,36	1,12

Location **Ethylbenzene**	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Druskininkai 02	0,18	0,42	5,59	0,59	1,69
Druskininkai 03	0,13	0,3	3,76	0,55	1,18
Elektrėnai 01	0,11	0,62	0,4	0,47	0,4
Elektrėnai 02	0,08	0,88	0,4	0,4	0,44
Elektrėnai 03	0,11	0,57	0,35	0,46	0,37
Gargždai 01	0,21	0,69	0,42	0,47	0,44
Gargždai 02	0,31	0,58	0,52	0,39	0,45
Gargždai 03	0,13	0,54	0,44	0,46	0,39
Garliava 01	0,34	1,61	0,59	0,3	0,71
Grigiškės 03	0,18	0,33	0,37	0,21	0,27
Ignalina 01	0,16	0,73	0,28	1,04	0,55
Jonava 02	0,16	3,59	0,94	3,09	1,94
Jonava 03	0,09	3,17	0,98	1,94	1,54
Jubarkas 01	0,12	3,2	0,99	4,31	2,15
Jubarkas 02	0,1	1,58	1,25	2,68	1,4
Jubarkas 03	0,1	3,95	0,94	6	2,75
Kaunas 02	0,3	1,02	0,71	0,39	0,6
Kaunas 04	0,22	0,83	0,41	0,57	0,51
Kaunas 09	0,17	1,49	0,42	0,47	0,64
Kaunas 10	0,24	0,85	0,59	0,54	0,55
Kaunas 14	0,13	0,57	0,48	0,56	0,43
Kaunas 16	0,19	0,69	0,5	0,53	0,48
Kaunas 17	0,17	0,7	0,45	0,51	0,46
Kaunas 18	0,21	1,01	0,77	0,36	0,59
Kaunas 19	0,52	0,8	0,95	1,04	0,82
Kaunas 21	0,2	0,42	0,64	16,35	4,4
Kaunas 24	0,49	4,28	0,69	0,82	1,57
Kaunas 25	0,23	0,7	0,89	0,43	0,56
Kaunas 26	0,26	0,95	0,95	0,65	0,7
Kaunas 27	0,75	2,37	1,12	0,66	1,22
Kaunas 29	0,2	0,88	0,66	0,28	0,5
Kaunas 30	0,27	0,74	0,87	0,42	0,57
Kaunas 31	0,17	0,94	0,59	0,24	0,48
Kaunas 35	0,17	0,76	0,38	0,32	0,4
Kėdainiai 01	0,43	2,44	0,41	1,73	1,25
Kėdainiai 03	0,2	3,18	1,21	3,35	1,98

Location **Ethylbenzene**	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Kelmė 01	0,2	0,84	0,4	0,28	0,43
Klaipėda 05	0,52	0,75	0,3	0,48	0,51
Klaipėda 07	0,19	0,5	0,47	0,46	0,4
Klaipėda 09	0,33	0,72	0,44	0,44	0,48
Klaipėda 10	0,24	0,29	0,45	0,37	0,34
Klaipėda 11	0,28	0,54	0,44	0,49	0,43
Klaipėda 13	0,18	0,65	0,32	0,3	0,36
Kuršėnai 01	0,15	0,46	0,58	4,4	1,4
Kuršėnai 02	0,34	0,55	0,51	0,31	0,43
Kuršėnai 03	0,08	0,42	0,46	0,23	0,29
Lazdijai 02	<0,09	1,57	4,66	0,47	2,23
Lentvaris 02	0,22	0,38	0,35	0,38	0,33
Likėnai 01	0,09	0,27	0,33	0,2	0,22
Marijampolė 01	0,22	0,44	5,9	0,62	1,79
Marijampolė 02	0,23	0,43	4,69	0,83	1,55
Marijampolė 04	0,08	0,41	7,44	0,68	2,15
Mažeikiai 01	0,23	13,65	0,54	0,35	3,69
Mažeikiai 03	0,24	0,4	0,41	0,62	0,41
OKTS 03	0,29	0,3	0,58	0,46	0,41
OKTS 12	0,27	0,55	0,54	0,34	0,42
OKTS 22	0,14	0,42	0,69	0,94	0,55
OKTS 23	0,46	0,71	0,51	0,22	0,47
OKTS 33	0,19	2,01	0,41	0,49	0,77
OKTS 41	0,31	1,25	2,17	0,66	1,09
OKTS 42	0,26	2,9	0,85	2,5	1,62
OKTS 43	0,14	2,72	0,87	2,77	1,62
OKTS 51	<0,09	0,54	0,31	0,95	0,6
OKTS 52	<0,09	0,66	3,67	0,53	1,62
OKTS 53	<0,09	0,3	0,35	0,3	0,32
Pabradė 01	0,17	0,93	0,37	1,27	0,69
Palanga 02	0,32	6,35	0,28	0,39	1,83
Panevėžys 03	0,2	0,53	0,5	0,38	0,4
Panevėžys 04	0,26	0,49	0,75	0,33	0,45
Panevėžys 06	0,23	0,5	0,52	0,33	0,39
Panevėžys 07	0,23	0,44	0,5	0,3	0,37
Panevėžys 08	0,21	0,79	0,49	0,18	0,42

Location **Ethylbenzene**	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Panevėžys 12	0,2	0,29	0,54	0,23	0,31
Plungė 01	0,24	0,49	0,66	2,5	0,97
Plungė 02	0,17	0,43	0,5	0,27	0,34
Plungė 03	0,2	0,73	0,66	0,71	0,57
Radviliškis 01	0,16	0,82	0,52	0,36	0,46
Radviliškis 02	0,13	0,73	0,39	0,55	0,45
Radviliškis 03	0,14	0,56	0,41	0,28	0,35
Raseiniai 01	0,19	3,69	1,27	2,02	1,79
Raseiniai 02	0,15	3,02	1,06	2,91	1,78
Raseiniai 03	0,17	3,09	0,99	2,08	1,58
Rokiškis 01	0,15	0,7	0,47	1,02	0,58
Rokiškis 02	0,1	0,36	0,47	0,24	0,29
Rokiškis 03	0,15	0,32	0,34	0,26	0,27
Šiauliai 02	0,22	0,66	0,56	0,37	0,45
Šiauliai 05	0,23	0,54	0,71	0,33	0,45
Šiauliai 07	0,35	0,76	0,58	0,5	0,54
Šiauliai 09	0,36	0,71	0,64	0,44	0,54
Šiauliai 10	0,35	0,69	0,7	0,45	0,55
Šiauliai 11	0,24	0,5	0,45	27,11	7,07
Šilutė 01	0,16	0,57	0,43	0,33	0,37
Šilutė 02	0,19	0,53	0,42	0,3	0,36
Šilutė 03	0,08	0,63	7,17	0,29	2,04
Tauragė 01	0,19	3,92	0,98	3,34	2,1
Tauragė 02	0,2	3,24	1,12	3,44	2
Tauragė 03	0,21	3,58	0,87	2,31	1,74
Telšiai 01	0,24	0,49	0,48	0,59	0,45
Telšiai 02	0,27	0,46	0,44	0,31	0,37
Telšiai 03	<0,09	0,52	0,34	0,36	0,41
Trakai 02	0,16	0,46	0,36	0,43	0,35
Ukmergė 01	0,11	0,39	0,38	0,23	0,28
Ukmergė 02	0,1	0,43	0,52	0,22	0,32
Ukmergė 03	0,15	0,44	0,36	0,26	0,3
Utena 01	0,2	0,77	0,32	1,41	0,67
Utena 02	0,11	0,54	0,36	0,42	0,36
Utena 03	0,22	0,65	0,29	1,26	0,6
Vilkaviškis 01	0,12	0,48	5,97	0,23	1,7

Location Ethylbenzene	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Vilkaviškis 02	0,09	0,5	4,02	0,48	1,27
Vilkaviškis 03	0,1	0,43	6,85	0,42	1,95
Vilnius 01	0,2	0,33	0,48	0,31	0,33
Vilnius 02	0,36	0,45	0,49	0,29	0,4
Vilnius 07	0,27	0,33	0,4	0,37	0,34
Vilnius 08	0,3	0,44	0,39	0,47	0,4
Vilnius 09	0,33	2,23	0,9	0,33	0,95
Vilnius 10	1,06	0,46	0,98	0,23	0,68
Vilnius 12	0,25	0,44	0,52	0,28	0,37
Vilnius 13	0,25	0,33	0,54	0,39	0,38
Vilnius 14	0,31	0,37	0,81	0,14	0,41
Vilnius 15	0,54	0,49	0,6	0,23	0,47
Vilnius 17	0,22	0,37	0,41	0,36	0,34
Vilnius 18	0,44	0,59	0,53	0,43	0,5
Vilnius 19	0,24	0,32	0,49	0,35	0,35
Vilnius 20	0,49	0,75	0,69	0,29	0,55
Vilnius 21	0,25	0,51	1	0,14	0,47
Vilnius 23	0,37	0,4	0,59	0,28	0,41
Vilnius 24	0,29	0,38	0,59	0,42	0,42
Vilnius 25	0,22	0,33	0,66	0,32	0,38
Vilnius 26	0,21	0,44	0,51	0,27	0,36
Vilnius 27	0,24	0,41	0,48	0,41	0,38
Vilnius 28	0,21	0,33	0,53	0,3	0,34
Vilnius 30	0,25	0,44	0,45	0,29	0,35
Vilnius 31	0,27	0,43	0,47	0,8	0,49
Vilnius 32	0,5	0,57	0,62	0,25	0,48
Vilnius 33	0,17	0,44	0,76	0,43	0,45
Vilnius 34	0,13	0,29	0,35	0,29	0,26
Vilnius 35	0,17	0,31	0,76	0,26	0,37
Visaginas 01	0,14	0,88	0,27	1,28	0,64
Visaginas 02	<0,09	0,73	0,26	1,36	0,78
Visaginas 03	0,09	0,83	0,33	0,53	0,44

Tab. 33: Ethylbenzene – concentrations – all campaigns

9.6. m,p-xylene – concentrations – all campaigns

Location m,p-xylene	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Alytus 01	0,29	0,62	0,95	0,26	0,53
Alytus 02	0,24	1,49	0,86	0,3	0,72
Alytus 03	0,48	0,71	1,74	0,52	0,86
Anykščiai 02	0,25	0,36	0,49	0,35	0,36
Birštonas 01	0,27	2,86	1,05	0,81	1,24
Biržai 01	0,56	0,33	0,39	0,26	0,39
Biržai 02	0,28	0,36	0,44	0,2	0,32
Druskininkai 01	0,24	0,71	0,88	0,31	0,53
Druskininkai 02	0,39	0,64	1,46	0,51	0,75
Druskininkai 03	0,24	0,35	0,9	0,35	0,46
Elektrėnai 01	0,19	0,42	0,39	0,42	0,35
Elektrėnai 02	0,09	0,42	0,39	0,39	0,32
Elektrėnai 03	0,19	0,35	0,33	0,45	0,33
Gargždai 01	0,5	0,54	0,43	0,53	0,5
Gargždai 02	0,4	0,48	0,38	0,44	0,42
Gargždai 03	0,3	0,31	0,31	0,27	0,29
Garliava 01	0,29	0,74	0,64	0,4	0,52
Grigiškės 03	0,26	0,51	0,49	0,53	0,45
Ignalina 01	0,33	0,42	0,42	0,43	0,4
Jonava 02	0,28	0,78	0,69	0,81	0,64
Jonava 03	0,21	0,68	0,47	0,74	0,52
Jubarkas 01	0,29	0,79	0,52	1,16	0,69
Jubarkas 02	0,24	0,4	0,46	0,66	0,44
Jubarkas 03	0,17	0,74	0,41	1,38	0,67
Kaunas 02	0,46	0,63	0,66	0,58	0,58
Kaunas 04	0,36	0,56	0,5	0,69	0,53
Kaunas 09	0,27	0,71	0,48	0,61	0,51
Kaunas 10	0,43	0,7	0,83	0,88	0,71
Kaunas 14	0,15	0,35	0,42	0,56	0,37
Kaunas 16	0,3	0,64	0,54	0,76	0,56
Kaunas 17	0,31	0,61	0,56	0,7	0,54
Kaunas 18	0,29	0,61	0,78	0,61	0,57
Kaunas 19	1,11	0,88	1,24	2,22	1,36
Kaunas 21	0,33	0,36	0,65	0,5	0,46

Location m,p-xylene	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Kaunas 24	1,04	9,82	0,99	1,36	3,3
Kaunas 25	0,41	0,62	0,83	0,74	0,65
Kaunas 26	0,41	0,77	1,04	1,07	0,82
Kaunas 27	1,33	1,3	1,96	1,36	1,49
Kaunas 29	0,31	0,59	0,61	0,34	0,46
Kaunas 30	0,5	0,59	1,01	0,59	0,67
Kaunas 31	0,24	0,54	0,51	0,34	0,4
Kaunas 35	0,24	0,43	0,36	0,3	0,33
Kėdainiai 01	0,18	0,54	0,3	0,47	0,37
Kėdainiai 03	0,45	0,87	1,29	1,15	0,94
Kelmė 01	0,42	0,61	0,52	0,49	0,51
Klaipėda 05	0,98	0,73	0,45	0,6	0,69
Klaipėda 07	0,47	0,61	0,56	0,49	0,53
Klaipėda 09	0,7	0,8	0,68	0,54	0,68
Klaipėda 10	0,48	0,26	0,59	0,51	0,46
Klaipėda 11	0,68	0,61	0,5	0,54	0,58
Klaipėda 13	0,41	0,48	0,34	0,31	0,38
Kuršėnai 01	0,32	0,41	0,67	0,47	0,47
Kuršėnai 02	0,36	0,47	0,52	0,41	0,44
Kuršėnai 03	0,21	0,38	0,42	0,25	0,31
Lazdijai 02	0,2	1,02	1,1	0,29	0,65
Lentvaris 02	0,31	0,54	0,46	0,8	0,53
Likėnai 01	0,14	0,21	0,32	0,23	0,22
Marijampolė 01	0,46	0,64	1,43	0,68	0,8
Marijampolė 02	0,38	0,55	1,19	0,57	0,67
Marijampolė 04	0,28	0,49	1,6	0,55	0,73
Mažeikiai 01	0,55	3,27	0,72	0,72	1,32
Mažeikiai 03	0,56	0,52	0,51	1,4	0,75
OKTS 03	0,5	0,56	0,72	1,2	0,74
OKTS 12	0,51	0,44	0,49	0,39	0,46
OKTS 22	0,3	0,46	0,61	0,68	0,51
OKTS 23	0,69	0,52	0,54	0,42	0,54
OKTS 33	0,41	0,88	0,44	0,6	0,58
OKTS 41	0,58	1,91	3,48	1,44	1,85
OKTS 42	0,26	0,64	0,43	1,36	0,67
OKTS 43	0,32	0,67	0,47	0,83	0,57

Location m,p-xylene	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
OKTS 51	0,16	0,32	0,26	0,34	0,27
OKTS 52	0,15	0,66	0,78	0,26	0,46
OKTS 53	0,16	0,2	0,23	0,2	0,2
Pabradė 01	0,36	0,59	0,51	0,6	0,51
Palanga 02	0,42	0,89	0,31	0,44	0,51
Panevėžys 03	0,35	0,5	0,45	0,62	0,48
Panevėžys 04	0,57	0,56	0,73	0,44	0,57
Panevėžys 06	0,42	0,57	0,53	0,49	0,5
Panevėžys 07	0,38	0,42	0,47	0,42	0,42
Panevėžys 08	0,26	0,46	0,52	0,18	0,35
Panevėžys 12	0,42	0,35	0,63	0,4	0,45
Plungė 01	0,58	0,34	0,53	1,45	0,72
Plungė 02	0,32	0,42	0,4	0,31	0,36
Plungė 03	0,4	0,43	0,52	0,48	0,46
Radviliškis 01	0,37	0,69	0,52	0,5	0,52
Radviliškis 02	0,26	0,62	0,4	0,59	0,47
Radviliškis 03	0,32	0,47	0,38	0,32	0,37
Raseiniai 01	0,37	0,83	0,61	0,74	0,63
Raseiniai 02	0,23	0,65	0,49	0,83	0,55
Raseiniai 03	0,31	0,72	0,56	0,65	0,56
Rokiškis 01	0,32	0,87	0,65	2,63	1,12
Rokiškis 02	0,22	0,37	0,52	0,37	0,37
Rokiškis 03	0,31	0,33	0,37	0,4	0,35
Šiauliai 02	0,51	0,62	0,61	0,62	0,59
Šiauliai 05	0,51	0,44	0,64	0,51	0,52
Šiauliai 07	0,47	0,64	0,67	0,61	0,59
Šiauliai 09	0,55	0,62	0,62	0,72	0,63
Šiauliai 10	0,9	0,82	0,95	0,87	0,88
Šiauliai 11	0,5	0,41	0,44	7,08	2,1
Šilutė 01	0,42	0,5	0,36	0,32	0,4
Šilutė 02	0,49	0,42	0,4	0,4	0,42
Šilutė 03	0,25	0,44	1,14	0,32	0,54
Tauragė 01	0,41	0,72	0,57	1,07	0,69
Tauragė 02	0,34	0,89	0,63	1,19	0,76
Tauragė 03	0,33	0,75	0,5	0,87	0,61
Telšiai 01	0,49	0,44	0,49	0,57	0,49

Location m,p-xylene	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Telšiai 02	0,33	0,31	0,35	0,33	0,33
Telšiai 03	0,13	0,29	0,24	0,2	0,21
Trakai 02	0,14	0,32	0,32	0,49	0,32
Ukmergė 01	0,23	0,41	0,43	0,44	0,38
Ukmergė 02	0,24	0,41	0,75	0,34	0,43
Ukmergė 03	0,26	0,44	0,38	0,27	0,34
Utena 01	0,39	0,57	0,47	0,71	0,53
Utena 02	0,24	0,43	0,5	0,31	0,37
Utena 03	0,32	0,43	0,35	0,63	0,43
Vilkaviškis 01	0,26	0,48	1,28	0,19	0,55
Vilkaviškis 02	0,27	0,64	1,06	0,36	0,58
Vilkaviškis 03	0,28	0,44	1,41	0,35	0,62
Vilnius 01	0,41	0,51	0,64	0,87	0,61
Vilnius 02	0,78	0,79	0,69	0,81	0,76
Vilnius 07	0,52	0,61	0,54	1,02	0,67
Vilnius 08	0,54	0,87	0,6	1,13	0,78
Vilnius 09	0,61	9,41	1,56	1,11	3,17
Vilnius 10	0,91	0,9	1,17	0,77	0,93
Vilnius 12	0,45	0,8	0,65	1,22	0,78
Vilnius 13	0,48	0,56	0,55	1,09	0,67
Vilnius 14	0,39	0,78	0,63	0,54	0,58
Vilnius 15	0,45	0,42	0,61	0,69	0,54
Vilnius 17	0,38	0,63	0,57	0,99	0,64
Vilnius 18	0,8	1,29	0,79	1,23	1,03
Vilnius 19	0,39	0,57	0,63	0,95	0,63
Vilnius 20	0,92	2,34	1,02	1,18	1,36
Vilnius 21	0,46	1,03	1,89	0,66	1,01
Vilnius 23	0,3	0,77	0,64	0,75	0,61
Vilnius 24	0,42	0,65	0,65	1,25	0,74
Vilnius 25	0,38	0,57	0,74	0,78	0,62
Vilnius 26	0,3	1,07	0,54	0,9	0,7
Vilnius 27	0,41	0,74	0,56	1,11	0,71
Vilnius 28	0,37	0,59	0,66	0,82	0,61
Vilnius 30	0,49	1	0,62	0,89	0,75
Vilnius 31	0,48	0,79	0,58	2,3	1,04
Vilnius 32	1,15	1,16	1,27	0,82	1,1

Location m,p-xylene	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Vilnius 33	0,25	1,04	0,68	1,14	0,78
Vilnius 34	0,3	0,49	0,45	0,58	0,45
Vilnius 35	0,26	0,42	0,71	0,81	0,55
Visaginas 01	0,25	0,44	0,31	0,5	0,37
Visaginas 02	0,17	0,31	0,29	0,45	0,31
Visaginas 03	0,16	0,34	0,27	0,23	0,25

Tab. 34: m,p-xylene – concentrations – all campaigns

9.7. o-xylene – concentrations – all campaigns

Location o-xylene	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Alytus 01	<0,09	0,43	1,14	0,16	0,57
Alytus 02	<0,09	1,02	0,86	0,19	0,69
Alytus 03	0,14	0,46	1,67	0,33	0,65
Anykščiai 02	<0,09	0,33	0,36	0,19	0,29
Birštonas 01	<0,09	1,72	1,2	0,61	1,17
Biržai 01	0,16	0,3	0,3	0,18	0,24
Biržai 02	0,07	0,3	0,33	0,15	0,21
Druskininkai 01	<0,09	0,49	0,86	0,19	0,51
Druskininkai 02	<0,09	0,42	1,68	0,32	0,81
Druskininkai 03	<0,09	0,26	0,91	0,3	0,49
Elektrėnai 01	0,09	0,26	0,34	0,3	0,25
Elektrėnai 02	0,14	0,4	0,35	0,22	0,28
Elektrėnai 03	0,09	0,27	0,31	0,27	0,23
Gargždai 01	0,12	0,44	0,31	0,34	0,3
Gargždai 02	<0,09	0,39	0,28	0,24	0,3
Gargždai 03	<0,09	0,26	0,25	0,33	0,28
Garliava 01	0,07	0,64	0,53	0,24	0,37
Grigiškės 03	0,12	0,37	0,32	0,32	0,28
Ignalina 01	<0,09	0,33	0,39	0,29	0,34
Jonava 02	<0,09	0,72	0,47	0,88	0,69
Jonava 03	<0,09	0,53	0,39	0,5	0,47

Location o-xylene	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Jubarkas 01	0,36	0,64	0,37	1,29	0,66
Jubarkas 02	<0,09	0,41	0,4	0,67	0,49
Jubarkas 03	<0,09	0,71	0,34	1,29	0,78
Kaunas 02	0,13	0,47	0,48	0,35	0,35
Kaunas 04	0,28	0,38	0,4	0,43	0,37
Kaunas 09	0,15	0,71	0,37	0,42	0,41
Kaunas 10	0,33	0,53	0,51	0,46	0,46
Kaunas 14	0,17	0,29	0,42	0,34	0,3
Kaunas 16	0,12	0,38	0,49	0,63	0,4
Kaunas 17	0,09	0,4	0,38	0,49	0,34
Kaunas 18	0,14	0,37	0,49	0,44	0,36
Kaunas 19	0,45	0,54	0,82	1,11	0,73
Kaunas 21	0,1	0,29	0,57	0,34	0,32
Kaunas 24	0,43	3,74	0,65	0,82	1,41
Kaunas 25	0,17	0,42	0,49	0,46	0,38
Kaunas 26	0,24	0,48	0,62	0,59	0,48
Kaunas 27	0,66	1,07	1,16	0,78	0,92
Kaunas 29	0,09	0,41	0,4	0,26	0,29
Kaunas 30	0,19	0,4	0,51	0,37	0,37
Kaunas 31	0,08	0,34	0,37	0,23	0,25
Kaunas 35	<0,09	0,3	0,4	0,19	0,29
Kėdainiai 01	<0,09	0,41	0,26	0,34	0,33
Kėdainiai 03	0,08	0,6	0,74	0,85	0,57
Kelmė 01	0,09	0,37	0,39	0,31	0,29
Klaipėda 05	0,29	0,53	0,35	0,47	0,41
Klaipėda 07	0,09	0,42	0,37	0,31	0,29
Klaipėda 09	0,21	0,57	0,39	0,35	0,38
Klaipėda 10	0,13	0,23	0,36	0,35	0,27
Klaipėda 11	0,23	0,44	0,38	0,36	0,35
Klaipėda 13	0,1	0,37	0,25	0,21	0,23
Kuršėnai 01	<0,09	0,3	0,41	0,29	0,33
Kuršėnai 02	0,07	0,4	0,35	0,3	0,28
Kuršėnai 03	<0,09	0,29	0,32	0,18	0,26
Lazdijai 02	<0,09	0,65	1,32	0,22	0,73
Lentvaris 02	0,19	0,43	0,32	0,47	0,35
Likėnai 01	<0,09	0,22	0,28	0,16	0,22

Location o-xylene	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Marijampolė 01	0,14	0,43	1,8	0,44	0,7
Marijampolė 02	0,07	0,37	1,23	0,35	0,5
Marijampolė 04	<0,09	0,35	1,62	0,43	0,8
Mažeikiai 01	0,15	5,66	0,44	0,42	1,67
Mažeikiai 03	0,16	0,36	0,35	0,83	0,42
OKTS 03	0,24	0,36	0,46	0,68	0,43
OKTS 12	0,13	0,34	0,36	0,27	0,28
OKTS 22	<0,09	0,35	0,34	0,6	0,43
OKTS 23	0,27	0,45	0,38	0,28	0,34
OKTS 33	0,09	0,96	0,31	0,37	0,43
OKTS 41	0,29	0,97	1,84	0,73	0,95
OKTS 42	<0,09	0,51	0,37	0,95	0,61
OKTS 43	0,07	0,53	0,37	0,77	0,44
OKTS 51	<0,09	0,26	0,23	0,24	0,24
OKTS 52	<0,09	0,56	0,93	0,22	0,57
OKTS 53	<0,09	0,2	0,19	0,15	0,18
Pabradė 01	0,07	0,44	0,38	0,47	0,34
Palanga 02	<0,09	2,62	0,24	0,26	1,04
Panevėžys 03	0,09	0,36	0,33	0,37	0,29
Panevėžys 04	0,18	0,41	0,51	0,26	0,34
Panevėžys 06	0,1	0,4	0,35	0,28	0,28
Panevėžys 07	0,15	0,32	0,34	0,29	0,27
Panevėžys 08	<0,09	0,37	0,36	0,32	0,35
Panevėžys 12	0,11	0,33	0,76	0,2	0,35
Plungė 01	0,18	0,26	0,35	1,4	0,55
Plungė 02	<0,09	0,32	0,29	0,22	0,28
Plungė 03	0,12	0,32	0,32	0,31	0,27
Radviliškis 01	0,07	0,42	0,39	0,36	0,31
Radviliškis 02	<0,09	0,4	0,3	0,39	0,36
Radviliškis 03	0,07	0,34	0,36	0,22	0,25
Raseiniai 01	0,12	0,69	0,47	0,6	0,47
Raseiniai 02	<0,09	0,57	0,38	0,69	0,55
Raseiniai 03	<0,09	0,72	0,39	0,54	0,55
Rokiškis 01	<0,09	0,53	0,42	1,21	0,72
Rokiškis 02	<0,09	0,29	0,35	0,2	0,28
Rokiškis 03	0,07	0,26	0,32	0,27	0,23

Location o-xylene	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Šiauliai 02	0,14	0,45	0,34	0,41	0,33
Šiauliai 05	0,14	0,3	0,49	0,34	0,32
Šiauliai 07	0,14	0,45	0,38	0,38	0,34
Šiauliai 09	0,17	0,42	0,48	0,42	0,37
Šiauliai 10	0,29	0,46	0,67	0,51	0,48
Šiauliai 11	0,13	0,32	0,32	16,02	4,2
Šilutė 01	0,17	0,35	0,26	0,18	0,24
Šilutė 02	0,2	0,33	0,28	0,28	0,27
Šilutė 03	<0,09	0,36	3,11	0,19	1,22
Tauragė 01	0,08	0,75	0,43	1,08	0,58
Tauragė 02	0,07	0,9	0,5	1,89	0,84
Tauragė 03	<0,09	0,62	0,37	0,78	0,59
Telšiai 01	0,46	0,35	0,36	0,47	0,41
Telšiai 02	<0,09	0,31	0,27	0,2	0,26
Telšiai 03	<0,09	0,25	0,21	0,2	0,22
Trakai 02	0,08	0,23	0,34	0,28	0,23
Ukmergė 01	<0,09	0,37	0,32	0,25	0,31
Ukmergė 02	<0,09	0,33	0,57	0,27	0,39
Ukmergė 03	<0,09	0,35	0,29	0,19	0,28
Utena 01	0,11	0,44	0,32	0,39	0,31
Utena 02	<0,09	0,32	0,3	0,21	0,28
Utena 03	<0,09	0,35	0,32	0,35	0,34
Vilkaviškis 01	<0,09	0,39	1,18	0,13	0,56
Vilkaviškis 02	<0,09	0,42	1,03	0,25	0,56
Vilkaviškis 03	<0,09	0,34	1,3	0,23	0,62
Vilnius 01	0,14	0,33	0,43	0,49	0,35
Vilnius 02	0,42	0,47	0,41	0,47	0,44
Vilnius 07	0,24	0,44	0,35	0,68	0,43
Vilnius 08	0,23	0,53	0,38	0,63	0,44
Vilnius 09	0,27	4,38	0,87	0,39	1,48
Vilnius 10	0,45	0,53	0,77	0,36	0,53
Vilnius 12	0,17	0,52	0,51	0,48	0,42
Vilnius 13	0,17	0,43	0,44	0,52	0,39
Vilnius 14	0,17	0,52	0,51	0,15	0,33
Vilnius 15	0,23	0,62	0,45	0,23	0,38
Vilnius 17	0,14	0,4	0,43	0,56	0,38

Location o-xylene	1st campaign [µg/m³]	2nd campaign [µg/m³]	3rd campaign [µg/m³]	4th campaign [µg/m³]	Average [µg/m³]
Vilnius 18	0,26	0,74	0,49	0,69	0,54
Vilnius 19	0,14	0,37	0,43	0,49	0,35
Vilnius 20	0,41	1,37	0,7	0,51	0,75
Vilnius 21	0,11	0,6	0,94	0,44	0,52
Vilnius 23	0,1	0,51	0,43	0,48	0,38
Vilnius 24	0,2	0,41	0,43	0,68	0,43
Vilnius 25	0,11	0,37	0,52	0,4	0,35
Vilnius 26	0,1	0,72	0,38	0,56	0,44
Vilnius 27	0,18	0,48	0,44	0,61	0,43
Vilnius 28	0,17	0,37	0,43	0,46	0,36
Vilnius 30	0,24	0,7	0,39	0,54	0,47
Vilnius 31	0,21	0,51	0,43	1,1	0,56
Vilnius 32	0,58	0,65	0,74	0,27	0,56
Vilnius 33	0,07	0,76	0,47	0,59	0,47
Vilnius 34	0,08	0,37	0,33	0,34	0,28
Vilnius 35	0,1	0,31	0,47	0,45	0,33
Visaginas 01	<0,09	0,38	0,26	0,38	0,34
Visaginas 02	<0,09	0,29	0,24	0,34	0,29
Visaginas 03	<0,09	0,29	0,23	0,19	0,23

Tab. 35: o-xylene – concentrations – all campaigns

9.8. PM_{10} – concentrations

Date PM_{10}	Kaunas	Telšiai	Alytus	Rokiškis	Tauragė	Utena	Druskininkai	Vilnius	Šilutė	Klaipėda	Biržai	Marijampolė	Panevėžys	Raseiniai
01.01.2019	20,36	17,87	18,99	9,59	27,62	12,22	25,03	19,27	23,21	22,22	21,06	18,49	11,88	30,87
02.01.2019	10,58	7,29	5,27	5,05	5,77	13,23	5,56	11,33	6,73	4,54	10,12	8,95	4,50	7,00
03.01.2019	4,13	14,31	5,41	5,16	11,86	5,74	6,91	6,87	11,26	7,35	7,25		3,36	5,62
04.01.2019	20,50	37,95	18,15	7,75	26,57	17,68	17,99	12,26	21,47	12,98	31,87		15,92	31,65
05.01.2019	8,25	21,88	12,29	6,31	12,14	12,31	18,47	21,90	6,70	4,16	13,26		7,00	12,93
06.01.2019	22,04	40,13	17,21	9,87	28,68	18,09	14,33	12,29	24,45	13,80	28,22		16,86	41,40
07.01.2019	44,42	44,07	37,20	19,50	49,32	24,42	36,71	32,19	34,89	25,33	64,48		48,44	69,04
08.01.2019	42,75	67,91	52,18	26,32	48,28	47,50	50,64	51,45	64,94	58,02	50,25		31,39	49,50
09.01.2019	34,18	81,92	50,03	34,93	45,78	29,37	26,67	26,06	67,19	69,07	36,36		30,94	43,69
10.01.2019	56,91	96,52	70,53	50,78	42,70	69,70	50,11	57,80	56,78	57,74	80,47		55,41	61,24
11.01.2019	77,24	82,53	89,64	59,52	84,37	75,80	100,28	77,24	65,66	43,77	87,78		64,62	85,06
12.01.2019	28,36	53,83	26,78	20,83	42,02	35,57	35,87	68,84	22,48	15,92	40,55		29,66	58,63
13.01.2019	40,98	62,49	52,57	21,44	44,56	28,94	50,09	49,32	31,10	22,76	62,03		48,80	62,04
14.01.2019	18,08	25,56	19,64	6,15	20,42	12,55	16,62	19,69	12,17	5,48	24,15	12,77	11,21	26,86
15.01.2019	16,89	10,65	10,79	6,67	7,85	21,27	10,70	23,26	11,78	6,54	36,58	14,38	10,24	13,38
16.01.2019	31,53	13,91	28,39	12,75	28,12	25,42	26,72	39,53	23,90	26,53	41,07	33,48	27,08	38,45

Date PM_{10}	Kaunas	Telšiai	Alytus	Rokiškis	Tauragė	Utena	Druskininkai	Vilnius	Šilutė	Klaipėda	Biržai	Marijampolė	Panevėžys	Raseiniai
17.01.2019	41,41	30,69	31,80	23,14	53,10	35,57	36,94	40,86	19,99	17,23	33,20	36,41	20,39	44,47
18.01.2019	12,24	14,68	22,26	5,97	12,41	12,66	20,20	25,28	14,28	8,66	26,06	22,55	9,02	17,67
19.01.2019	13,45	19,35	25,82	6,90	19,84	14,64	21,95	29,18	16,55	5,64	24,13	20,99	11,53	31,52
20.01.2019	23,54	23,78	25,78	10,27	39,81	27,51	22,75	27,04	29,08	9,71	45,76	32,55	21,55	41,10
21.01.2019	32,22	24,49	43,35	20,90	49,58	30,58	44,58	34,47	43,35	15,66	38,65	36,22	23,52	56,11
22.01.2019	68,74	33,31	107,42	57,87	88,84	72,57	111,32	80,10	101,61	85,95	81,63	98,00	74,35	93,83
23.01.2019	61,86	92,29	77,93	44,82	97,38	57,43	65,82	51,43	112,07	89,21	102,86	75,98	65,00	98,60
24.01.2019	70,37	111,44	71,12	38,90	87,05	87,32	55,69	75,63	77,75	54,33	91,71	103,35	60,67	76,33
25.01.2019	60,12	90,23	59,18	33,44	44,49	23,60	25,54	37,14	40,37	27,73	37,73	51,11	29,23	38,82
26.01.2019	68,05	78,12	44,37	25,20	56,78	46,02	69,76	57,95	79,79	61,14	56,00	64,72	32,24	79,95
27.01.2019	32,88	75,55	100,14	32,29	95,33	46,94	86,04	73,08	102,43	79,22	58,15	84,47	53,86	67,56
28.01.2019	64,47	58,26	52,35	23,69	76,77	29,55	66,07	35,15	98,96	82,89	28,04	76,82	32,89	57,46
29.01.2019	51,76	105,51	71,24	58,56	83,84	83,62	103,69	97,72	70,90	60,68	62,66	100,15	63,03	87,29
30.01.2019	40,23	70,68	90,61	69,23	48,10	66,14	63,78	68,72	63,81	45,69	50,52	49,71	38,39	56,35
31.01.2019	68,79	91,66	73,13	43,38	66,90	37,11	40,29	55,66	77,27	44,74	41,45	75,97	32,30	55,57
01.02.2019	51,16	53,75	52,45	22,39	47,64	17,74	35,69	20,51	44,42	40,97	20,25	49,86	17,44	47,20
02.02.2019	52,78	65,85	45,96	17,94	50,90	15,82	21,50	16,89	40,05	29,14	15,60	34,46	16,53	26,02
03.02.2019	34,58	99,53	27,63	32,50	42,50	55,87	49,86	63,23	34,12	21,35	60,04	67,75	35,99	56,41
04.02.2019	27,86	55,07	76,07	49,75	47,06	33,42	35,25	35,87	17,02	10,82	27,05	19,71	14,50	11,30
05.02.2019	37,03	58,23	12,66	7,47	26,73	17,87	25,74	16,28	44,80	44,98	35,38	36,91	21,21	31,08
06.02.2019	32,74	47,72	57,70	37,58	55,38	44,49	50,62	53,06	28,46	12,85	54,11	51,17	31,72	43,29
07.02.2019	37,99	14,12	42,00	15,90	44,36	18,81	26,57	17,11	42,88	52,13	39,35	30,62	18,71	29,70
08.02.2019	47,40	36,19	29,24	41,38	45,24	60,45	64,14	58,70	51,42	49,50	62,86	71,97	44,60	57,86
09.02.2019	36,72	34,45	86,28	77,07	66,67	61,97	57,73	53,01	49,13	39,48	68,53	61,57	45,62	64,95

Date PM_{10}	Kaunas	Telšiai	Alytus	Rokiškis	Tauragė	Utena	Druskininkai	Vilnius	Šilutė	Klaipėda	Biržai	Marijampolė	Panevėžys	Raseiniai
10.02.2019	44,15	59,59	42,84	29,89	32,18	42,64	30,29	33,93	22,54	18,30	38,25	29,07	23,65	23,79
11.02.2019	62,71	60,49	27,06	24,46	67,71	30,11	41,37	36,47	42,62	48,80	47,47	42,20	28,09	48,80
12.02.2019	41,56	70,85	28,98	22,98	8,05	7,80	4,81	10,14	9,27	6,47	11,63	9,99	4,23	8,88
13.02.2019	47,69	30,31	6,54	5,91	17,03	9,95	12,48	14,75	17,15	15,12	19,86	16,90	8,08	16,59
14.02.2019	9,92	89,00	32,38	15,49	28,20	29,85	24,86	41,16	46,44	36,21	51,85	45,64	22,54	55,49
15.02.2019	16,47	20,68	40,90	47,46	76,97	61,59	48,93	65,51	79,17	56,14	89,46	63,80	50,32	99,63
16.02.2019	27,98	12,85	54,40	73,25	89,10	46,50	50,06	36,51	37,58	38,22	37,73	39,75	25,09	41,64
17.02.2019	52,49	17,59	50,78	21,18	37,93	23,63	72,64	49,24	80,88	56,75	37,37	66,75	30,52	66,00
18.02.2019	44,04	80,35	103,76	17,66	81,69	28,01	76,76	41,33	48,23	41,88	54,46	62,59	53,01	54,69
19.02.2019	60,54	75,34	57,42	39,91	60,17	42,70	51,75	31,73	64,13	71,69	66,40	62,18	39,71	71,85
20.02.2019	71,95	76,40	48,22	32,54	62,43	10,82	17,96	11,99	18,55	14,60	18,41	13,35	7,88	13,06
21.02.2019	46,99	42,94	8,27	23,87	16,13	11,66	6,37	18,71	11,63	14,36	7,73	11,39	5,95	8,80
22.02.2019	41,24	35,50	5,79	7,26	9,84	13,75	14,69	17,71	18,36	12,95	22,55	11,11	7,62	9,49
23.02.2019	11,67	56,25	15,42	7,22	24,57	16,42	13,25	15,32	12,87	11,37	28,79	17,92	10,64	14,79
24.02.2019	11,18	75,08	20,08	31,32	16,10	48,48	23,27	31,49	38,56	25,97	57,31	33,73	30,15	32,02
25.02.2019	12,10	12,19	49,36	45,27	50,43	28,52	32,17	36,42	35,28	24,91	30,88	43,28	17,86	35,94
26.02.2019	28,56	15,36	32,26	28,54	34,04	11,79	13,42	9,19	18,86	13,86	10,84	22,20	6,70	22,52
27.02.2019	47,06	36,45	11,60	11,66	14,46	28,99	18,15	29,82	60,01	52,80	24,49	36,65	17,26	24,03
28.02.2019	18,90	32,21	45,86	42,70	78,25	21,34	45,02	46,23	31,88	25,37	29,25	41,00	25,48	23,22
01.03.2019	15,05	37,66	33,45	5,75	31,42	5,19	4,15	9,93	12,95	7,53	11,70	4,89	4,27	5,12
02.03.2019	48,85	27,72	3,96	6,53	21,57	8,86	9,80	10,79	14,26	12,50	15,90	12,58	6,50	10,37
03.03.2019	10,42	15,47	13,88	6,08	25,59	39,95	52,80	42,56	47,03	38,50	64,61	43,65	31,23	38,48
04.03.2019	5,19	54,96	51,06	34,69	43,69	29,89	36,28	37,64	20,44	23,21	34,70	22,63	28,89	42,63
05.03.2019	19,93	31,49	34,30	25,35	30,31	5,67	6,54	7,13	11,08	12,22	5,61	8,80	3,45	6,08

Date PM_{10}	Kaunas	Telšiai	Alytus	Rokiškis	Tauragė	Utena	Druskininkai	Vilnius	Šilutė	Klaipėda	Biržai	Marijampolė	Panevėžys	Raseiniai
06.03.2019	38,99	12,23	10,80	20,51	11,37	7,51	11,79	24,75	14,13	12,82	9,14	11,11	10,49	14,72
07.03.2019	23,54	13,76	18,89	5,35	13,67	9,18	9,29	12,19	17,34	16,69	12,18	13,66	9,04	13,98
08.03.2019	7,97	41,86	19,42	7,01	13,96	12,87	11,81	14,54	15,02	12,91	13,23	14,30	10,07	19,32
09.03.2019	26,95	57,94	18,38	8,28	16,40	11,02	10,47	10,93	16,27	20,85	13,36	11,80	10,31	14,42
10.03.2019	22,67	9,49	12,15	7,33	15,25	9,11	17,18	12,42	13,68	14,81	16,43	18,74	6,71	11,78
11.03.2019	13,30	14,50	22,08	10,80	11,70	6,35	10,86	15,80	7,07	3,52	15,38	9,43	3,79	6,47
12.03.2019	17,10	15,51	5,27	5,26	6,10	14,62	12,54	14,24	15,33	10,26	25,52	13,16	9,68	15,41
13.03.2019	14,97	13,45	13,81	7,88	16,91	31,41	32,03	22,11	27,15	25,57	34,85	29,70	26,63	37,84
14.03.2019	9,22	17,04	31,04	31,69	30,11	30,21	29,20	21,04	11,91	12,97	32,21	24,76	23,03	21,29
15.03.2019	28,44	16,81	28,53	29,74	25,64	18,58	35,85	16,04	25,10	22,02	23,44	28,17	20,00	37,35
16.03.2019	42,73	7,95	27,50	13,00	29,61	7,95	7,60	8,41	19,91	14,20	13,83	9,36	8,42	10,63
17.03.2019	36,32	21,07	8,56	10,93	13,01	9,79	36,60	12,85	19,18	20,23	20,12	29,60	16,49	32,45
18.03.2019	31,52	39,49	30,23	12,09	23,95	12,36	9,47	14,38	5,23	7,46	13,69	8,52	6,52	8,23
19.03.2019	14,67	32,69	13,96	10,33	7,39	6,27	13,65	8,53	8,66	5,82	10,59	8,42	3,37	5,46
20.03.2019	38,37	54,14	11,01	4,47	8,22	7,64	7,91	14,26	25,77	13,30	9,89	8,59	5,00	17,03
21.03.2019	22,08	16,37	15,37	11,88	39,17	22,78	14,94	18,40	61,30	48,99	36,96	45,66	21,58	59,86
22.03.2019	18,85	27,49	44,82	19,33	60,14	18,85	21,41	18,43	32,96	21,89	11,17	26,41	8,25	20,02
23.03.2019	35,92	13,93	18,06	18,06	27,47	14,00	12,63	13,44	38,41	31,14	26,90	28,40	14,72	27,20
24.03.2019	41,47	7,18	28,27	17,48	41,25	19,71	16,67	20,76	21,96	21,84	27,65	27,00	11,46	19,21
25.03.2019	33,25	41,94	36,41	21,15	35,43	27,17	32,46	31,35	34,97	28,66	35,02	36,32	22,98	42,69
26.03.2019	27,66	98,57	11,74	12,45	16,99	12,85	6,25	14,30	9,63	7,08	14,17	9,72	7,39	11,16
27.03.2019	26,04	28,09	9,43	8,21	8,25	14,82	7,61	18,66	26,34	20,28	22,26	11,19	8,03	15,07
28.03.2019	21,93	36,11	12,59	17,35	25,80	38,29	19,84	24,06	21,32	27,87	20,48	18,02	9,17	23,53
29.03.2019	14,67	23,35	27,03	24,32	29,08	27,12	22,36	23,76	36,92	37,18	25,99	20,72	15,65	35,22

Date PM_{10}	Kaunas	Telšiai	Alytus	Rokiškis	Tauragė	Utena	Druskininkai	Vilnius	Šilutė	Klaipėda	Biržai	Marijampolė	Panevėžys	Raseiniai
30.03.2019	30,23	21,11	28,48	28,55	49,41	42,47	24,35	27,22	76,62	64,37	43,19	36,66	38,36	58,18
31.03.2019	52,86	10,84	37,82	34,58	69,63	32,66	27,29	25,31	32,56	29,75	36,41	28,86	23,55	33,90
01.04.2019	45,96	49,71	38,31	71,50	60,24	32,24	22,90	41,28	24,80	21,77	39,09	39,66	19,48	22,65
02.04.2019	49,26	54,11	48,37	16,09	28,00	26,76	24,56	46,85	26,52	34,73	15,99	29,08	55,42	25,92
03.04.2019	14,91	73,90	26,42	28,25	25,41	20,96	17,78	49,77	39,05	43,00	19,29	21,04	34,83	25,41
04.04.2019	36,08	124,61	25,93	11,03	28,57	23,63	24,85	46,83	36,72	35,93	23,81	28,69	36,75	29,51
05.04.2019	20,81	105,75	35,22	17,53	27,58	32,51	30,40	64,81	35,86	34,52	43,79	32,43	34,38	31,11
06.04.2019		14,92	34,65	19,35	27,79	37,27	33,62	49,92	36,13	32,66	41,54	39,52	37,67	31,45
07.04.2019		36,70	42,38	26,53	28,81	35,69	40,82	49,39	45,90	41,21	46,99	35,37	48,00	30,13
08.04.2019	28,18	26,21	50,45	25,94	33,76	49,19	49,90	68,83	32,93	28,14	37,97	45,98	48,79	27,36
09.04.2019	29,43	28,04	33,14	35,20	33,76	39,35	16,79	26,54	16,98	10,47	20,02	16,56	18,30	12,65
10.04.2019	36,47	35,01	15,06	23,89	10,23	42,89	13,45	38,16	18,05	9,22	21,71	20,26	27,90	26,98
11.04.2019	33,14	41,46	20,78	17,48	18,09	33,02	29,77	37,16	18,03	14,30	27,44	23,98	16,90	13,62
12.04.2019	19,13	50,32	17,97	21,41	31,58	46,84	5,37	34,01	17,51	17,38	28,75	24,13	22,86	15,25
13.04.2019	26,12	53,71	14,11	18,90	21,95	21,13	6,12	26,63	15,88	16,38	25,28	26,49	19,31	14,07
14.04.2019	25,40	18,29	14,11	17,50	19,85	22,05	25,15	25,68	10,78	12,02	14,22	25,28	11,96	9,30
15.04.2019	26,32	15,72	11,07	14,25	13,74	51,12	29,54	46,73	20,25	21,25	27,91	31,43	22,70	20,27
16.04.2019	17,43	22,26	18,58	21,22	27,38	50,81	29,88	39,90	26,27	31,02	34,18	33,01	18,33	20,03
17.04.2019	23,69	29,55	18,54	37,32	36,16	48,65	28,45	41,48	24,95	31,96	38,81	42,29	32,94	22,43
18.04.2019	33,45	26,23	25,59	36,23	28,62	59,17	27,42	63,31	36,08	32,69	39,26	36,95	41,32	20,39
19.04.2019	30,39	18,00	25,99	47,13	36,76	44,89	16,70	47,79	28,98	27,42	33,01	32,03	25,49	16,62
20.04.2019	40,20	23,50	31,22	40,68	36,70	27,70	13,16	27,84	22,90	15,25	21,09	22,56	23,73	13,79
21.04.2019	28,91	30,55	14,26	21,14	21,71	15,87	25,63	32,39	19,51	16,10	13,74	17,68	22,81	12,21
22.04.2019	19,54	26,06	17,02	15,86	12,70	19,21	33,49	34,59	23,80	23,11	25,31	23,84	26,97	17,64

Date PM_{10}	Kaunas	Telšiai	Alytus	Rokiškis	Tauragė	Utena	Druskininkai	Vilnius	Šilutė	Klaipėda	Biržai	Marijampolė	Panevėžys	Raseiniai
23.04.2019	12,67	43,88	25,12	17,21	18,97	36,74	84,24	59,12	45,12	48,10	43,64	30,46	42,97	29,70
24.04.2019	15,94	27,62	37,96	18,71	34,00	50,59	28,94	88,62	99,49	108,99	57,49	77,18	64,04	65,35
25.04.2019	43,14	20,62	55,16	30,18	94,68	44,47	36,13	87,98	31,77	42,76	51,49	27,93	65,95	33,99
26.04.2019	59,05	16,31	32,24	36,21	34,38	53,70	51,94	75,88	37,03	45,52	55,19	30,84	62,56	40,75
27.04.2019	43,28	23,74	41,54	29,61	31,12	42,59	69,73	55,51	50,74	46,56	51,95	41,15	42,07	31,19
28.04.2019	51,77	38,61	85,57	38,21	95,06	27,73	71,53	40,73	32,85	42,14	31,08	66,56	22,94	24,06
29.04.2019	34,44	55,15	37,45	33,82	69,62	22,52	24,27	33,34	25,04	25,44	34,97	23,26	18,36	18,47
30.04.2019	43,34	58,31	22,37	18,69	25,66	38,70	20,35	41,80	24,11	24,40	31,94	30,85	25,16	17,03
01.05.2019	27,80	42,97	23,02	20,26	25,90	28,41	19,81	36,69	43,97	44,73	29,55	23,65	41,09	22,20
02.05.2019	24,05	42,37	22,38	20,64	52,34	31,67	13,48	30,20	44,81	52,14	41,67	22,39	50,50	37,32
03.05.2019	27,58	34,45	29,81	32,16	46,35	13,27	25,85	26,76	9,95	7,99	24,69	10,59	22,93	12,31
04.05.2019	30,78	23,12	20,61	11,07	15,44	14,06	29,58	29,17	12,50	8,96	23,88	15,44	29,90	10,07
05.05.2019	13,64	21,83	33,82	11,69	12,77	12,82	13,38	22,73	8,90	6,48	18,49	8,99	40,35	7,67
06.05.2019	12,41	21,68	10,43	11,84	23,03	25,22	17,12	20,92	18,28	18,41	29,55	11,16	28,02	11,17
07.05.2019	11,91	55,21	12,37	14,66	15,70	23,35	20,59	21,22	21,18	21,35	22,52	22,90	25,68	13,85
08.05.2019	14,64	16,45	19,46	10,90	29,61	30,55	15,71	35,87	17,56	18,06	20,06	17,41	31,04	16,36
09.05.2019	14,90	12,66	20,61	16,61	19,31	23,27	20,18	27,22	24,69	33,12	19,72	13,48	16,94	15,13
10.05.2019	21,85	12,02	19,47	19,51	17,47	18,28	35,60	32,31	21,16	17,49	17,87	20,74	33,56	16,98
11.05.2019	30,00	33,97	30,27	15,51	24,30	26,54	40,80	35,33	46,33	38,03	44,85	45,65	47,39	26,27
12.05.2019	19,93	21,11	77,32	61,37	31,32	78,24	42,49	67,83	15,29	20,09	120,48	31,67	91,22	21,59
13.05.2019	31,23	31,59	18,92	49,96	17,25	32,17	18,00	34,39	12,70	11,62	52,29	10,79	26,71	7,83
14.05.2019	38,41	23,14	17,71	62,67	9,31	20,64	17,02	31,48	9,91	10,78	15,01	17,91	18,05	8,86
15.05.2019	20,83	17,05	17,05	18,84	11,98	27,97	16,62	26,27	11,07	10,42	13,93	24,48	13,56	11,56
16.05.2019	13,18	22,76	14,58	13,94	16,23	23,93	19,09	22,51	20,78	26,79	17,36	19,80	18,62	13,23

Date PM_{10}	Kaunas	Telšiai	Alytus	Rokiškis	Tauragė	Utena	Druskininkai	Vilnius	Šilutė	Klaipėda	Biržai	Marijampolė	Panevėžys	Raseiniai
17.05.2019	16,03	34,25	18,81	20,05	18,73	21,59	18,62	29,37	12,62	15,23	21,52	18,80	22,23	11,51
18.05.2019	12,49	15,02	24,71	18,01	10,90	15,36	17,54	25,41	23,77	19,17	20,03	24,45	18,23	13,63
19.05.2019	10,66	15,94	25,82	17,46	17,13	13,32	21,32	22,48	15,56	14,03	16,14	13,71	19,42	11,59
20.05.2019	19,44	11,51	28,16	12,12	13,96	25,13	19,85	39,18	15,97	19,42	18,78	15,87	25,69	12,40
21.05.2019	19,20	14,77	26,92	9,18	18,64	25,23	8,98	43,81	16,88	21,61	22,73	16,63	28,73	15,59
22.05.2019	21,21	17,74	28,35	15,86	17,52	28,42	17,15	30,57	18,00	24,37	23,36	11,07	22,81	14,77
23.05.2019	24,06	20,07	14,57	15,58	14,36	29,70	29,19	38,35	31,63	34,07	18,74	27,69	51,95	25,94
24.05.2019	22,75	19,51	38,79	33,80	34,03	46,39	30,01	66,51	18,62	21,14	53,24	25,85	54,63	20,67
25.05.2019	23,29	16,99	33,64	18,94	26,29	30,02	10,15	27,20	15,40	14,24	15,98	12,67	21,74	12,09
26.05.2019	30,33	18,56	13,59	42,23	14,71	19,78	13,19	17,21	14,39	24,68	12,86	11,59	19,74	14,60
27.05.2019	18,62	21,39	13,49	19,93	19,37	18,74	24,77	29,53	28,70	37,50	31,51	12,36	27,79	23,60
28.05.2019	10,97	24,05	17,91	10,70	19,52	17,85	20,63	23,23	28,46	15,95	29,38	22,40	39,82	25,35
29.05.2019	13,65	26,73	68,04	15,44	17,48	16,19	16,12	29,32	14,73	16,48	16,77	27,85	17,36	10,83
30.05.2019	16,77	12,53	30,18	16,67	11,82	13,33	10,10	24,34	11,73	15,84	9,31	12,33	17,84	8,08
31.05.2019	27,45	17,59	12,95	15,69	11,03	28,78	7,78	28,18	51,98	43,30	29,02	16,20	37,16	26,07
01.06.2019	11,46	27,67	21,40	12,97	39,05	8,59	9,74	15,36	19,79	15,55	17,63	9,90	14,88	11,39
02.06.2019	14,39	34,33	10,19	17,51	15,72	12,82	11,57	17,08	18,86	21,93	14,47	11,88	17,56	11,42
03.06.2019	18,63	46,51	12,77	6,84	17,68	15,30	12,16	26,23	32,94	17,69	18,04	11,23	15,98	12,26
04.06.2019	10,93	12,14	16,21	9,36	9,87	14,97	17,35	31,59	29,86	14,29	17,93	11,68	43,56	11,43
05.06.2019	10,98	22,06	23,51	6,89	12,41	22,86	17,07	38,02	22,83	18,30	26,22	13,74	73,68	13,80
06.06.2019	17,47	23,10	28,65	11,32	14,15	21,27	11,99	38,95	20,27	21,29	32,68	15,19	48,96	16,39
07.06.2019	25,68	16,54	27,94	14,49	16,62	12,79	12,65	29,48	22,39	14,20	19,49	14,04	15,05	13,83
08.06.2019	20,69	15,76	25,96	13,57	14,27	10,96	8,43	19,46	23,42	15,04	24,71	17,46	16,52	11,83
09.06.2019	21,06	12,81	22,54	12,65	17,60	13,49	11,91	17,68	8,73	10,29	17,09	11,51	18,20	7,25

Date PM_{10}	Kaunas	Telšiai	Alytus	Rokiškis	Tauragė	Utena	Druskininkai	Vilnius	Šilutė	Klaipėda	Biržai	Marijampolė	Panevėžys	Raseiniai
10.06.2019	18,03	18,85	12,20	8,81	10,12	22,61	15,19	27,38	17,43	18,58	19,29	13,30	21,01	12,13
11.06.2019	12,75	19,72	20,78	11,80	11,61	24,95	18,10	35,43	14,22	13,84	28,83	14,20	20,39	14,63
12.06.2019	13,32	19,65	31,28	10,07	14,43	24,75	22,98	42,29	16,16	25,86	31,69	16,26	21,35	17,78
13.06.2019	18,77	16,83	30,95	12,33	17,77	21,94	14,09	30,24	26,41	36,33	27,11	21,52	16,57	18,37
14.06.2019	19,89	20,05	32,81	20,65	22,71	18,28	11,67	20,90	30,68	43,59	21,58	11,84	12,79	16,61
15.06.2019	29,30	22,13	21,02	15,80	12,43	11,80	11,91	21,48	14,52	15,50	13,16	14,58	15,28	9,92
16.06.2019	48,57	24,14	14,52	14,75	8,87	10,87	7,75	25,28	20,38	27,95	11,95	11,78	26,10	9,36
17.06.2019	22,42	19,44	17,30	7,38	29,60	14,97	7,02	20,36	13,13	24,73	14,84	16,58	24,41	17,98
18.06.2019	18,04	11,29	18,05	6,97	15,87	19,22	11,56	30,16	11,31	11,10	17,36	15,76	28,17	16,92
19.06.2019	12,60	20,66	13,38	12,07	12,31	27,28	14,42	33,86	11,33	13,66	17,91	12,67	21,35	10,65
20.06.2019	20,83	16,23	18,91	11,60	10,85	21,04	14,50	29,11	15,32	17,34	22,93	13,19	7,86	12,34
21.06.2019	75,76	19,44	39,05	10,57	13,55	30,13	12,15	22,38	9,99	13,25	17,51	16,84	20,01	17,52
22.06.2019	76,74	12,83	22,02	14,11	13,13	13,76	10,40	14,99	10,54	9,30	15,39	9,87	25,54	8,33
23.06.2019	71,89	16,55	9,50	18,57	9,74	12,79	9,70	18,47	10,46	8,18	25,66	11,27	16,19	7,42
24.06.2019	41,66	13,41	9,44	13,64	9,04	13,38	12,76	23,32	12,25	10,83	15,21	13,78	15,30	7,19
25.06.2019	27,51	11,64	10,57	8,43	9,60	24,60	21,42	31,35	14,63	15,19	28,68	13,49	23,41	12,10
26.06.2019	37,27	10,93	18,58	9,45	14,70	29,77	18,55	28,31	19,19	20,68	25,76	17,01	35,28	13,65
27.06.2019	54,40	10,45	32,41	11,04	18,43	17,62	11,52	19,50	21,27	15,58	16,18	17,08	12,85	13,11
28.06.2019	64,02	15,08	14,51	14,59	14,87	10,99	7,66	13,16	38,36	7,82	9,92	9,68	11,59	7,27
29.06.2019	71,62	18,39	11,27	14,79	8,21	14,23	8,86	22,88	18,40	20,47	14,28	9,83	11,32	11,53
30.06.2019	13,63	16,43	11,90	9,07	14,02	22,85	14,55	28,43	11,96	12,27	28,41	10,94	17,38	27,35
01.07.2019	17,51	13,21	17,02	7,77	13,27	32,90	13,52	20,80	15,14	25,54	14,67	13,91	29,61	13,41
02.07.2019	20,99	32,81	16,28	14,94	16,25	20,24	10,94	17,53	13,08	18,43	14,02	12,92	19,21	12,51
03.07.2019	57,34	19,25	14,98	17,93	12,25	12,34	8,16	18,70	8,65	14,18	7,27	9,49	12,02	6,25

Date PM_{10}	Kaunas	Telšiai	Alytus	Rokiškis	Tauragė	Utena	Druskininkai	Vilnius	Šilutė	Klaipėda	Biržai	Marijampolė	Panevėžys	Raseiniai
04.07.2019	31,15	18,73	10,21	12,65	7,88	16,73	8,79	16,27	12,09	17,85	9,45	8,95	23,80	11,42
05.07.2019	27,03	14,09	11,04	6,33	11,43	9,41	7,48	11,30	7,70	10,37	6,42	7,56	25,15	6,64
06.07.2019	20,27	8,21	9,36	7,76	9,24	7,49	11,51	15,49	7,12	6,97	7,74	8,36	24,35	5,65
07.07.2019	19,58	14,27	13,60	7,38	6,22	9,18	10,47	12,76	9,29	11,29	9,92	13,94	16,83	9,55
08.07.2019	18,66	8,60	10,11	5,76	8,36	9,65	11,43	14,82	10,10	16,13	12,30	12,85	8,82	11,28
09.07.2019	20,88	6,47	14,61	8,63	6,44	12,02	9,71	14,01	6,75	8,12	17,61	9,65	15,71	12,13
10.07.2019	18,09	10,01	14,65	14,20	5,50	10,08	14,01	25,96	10,07	10,71	8,11	13,64	9,62	8,53
11.07.2019	17,03	21,13	17,86	12,42	6,25	15,19	9,73	20,22	11,17	11,40	18,84	18,01	9,57	9,70
12.07.2019	16,40	19,78	14,31	8,60	14,69	14,53	9,89	21,38	15,03	13,21	13,96	14,31	13,79	17,51
13.07.2019	17,37	10,89	17,78	11,55	14,41	13,10	9,92	16,56	8,81	9,02	14,20	12,45	19,10	5,70
14.07.2019	13,55	19,36	11,04	8,70	6,47	12,56	9,59	21,35	9,22	7,74	13,22	11,88	19,93	5,63
15.07.2019	15,71	24,31	10,39	5,51	6,48	22,79	13,41	39,27	13,13	11,17	13,13	14,04	18,97	7,87
16.07.2019	19,18	8,03	12,10	7,27	9,31	21,17	10,30	28,21	10,67	10,11	11,45	17,59	20,63	13,44
17.07.2019	17,22	9,07	23,44	10,12	14,81	11,34	10,64	23,88	8,02	8,50	16,76	15,42	11,63	7,58
18.07.2019	21,40	11,82	12,71	11,07	10,07	12,53	12,74	21,59	14,94	11,92	15,31	33,76	10,89	20,85
19.07.2019	21,62	14,58	23,94	8,28	14,78	15,92	16,04	27,13	29,97	13,07	12,27	27,17	9,76	10,63
20.07.2019	20,34	13,10	14,81	12,27	16,57	14,23	18,77	20,46	14,46	11,90	17,68	23,23	12,31	11,12
21.07.2019	17,21	13,15	19,48	14,82	10,66	16,08	12,33	25,22	13,23	13,63	22,89	19,42	38,58	12,85
22.07.2019	23,44	10,52	33,38	9,81	12,00	16,89	12,67	23,85	14,94	17,29	28,40	22,40	27,40	12,09
23.07.2019	50,17	11,01	17,03	12,02	14,90	15,20	12,82	19,88	12,54	10,94	14,51	15,57		14,74
24.07.2019	48,39	17,08	11,70	18,41	15,17	18,03	14,47	28,20	15,36	13,49	14,67	20,79		11,89
25.07.2019	16,66	17,94	17,47	16,32	12,68	18,31	11,00	25,31	14,42	11,91	18,46	18,21		11,54
26.07.2019	29,34	14,08	16,57	13,30	13,27	18,43	17,02	37,99	16,38	17,90	17,69	15,77		14,93
27.07.2019	30,47	11,06	14,11	14,49	14,75	21,61	23,66	50,35	16,28	13,68	22,25	28,95		12,40

Date PM_{10}	Kaunas	Telšiai	Alytus	Rokiškis	Tauragė	Utena	Druskininkai	Vilnius	Šilutė	Klaipėda	Biržai	Marijampolė	Panevėžys	Raseiniai
28.07.2019	38,44	23,44	27,60	14,24	29,49	31,38	24,38	52,01	22,45	18,36	29,46	30,34		27,73
29.07.2019	6,22	19,57	24,72	12,99	20,39	17,61	19,37	23,97	27,84	26,26	21,15	26,06		22,19
30.07.2019	5,85	17,90	24,10	14,94	21,02	18,15	14,12	29,38	14,39	17,16	13,50	20,63		12,04
31.07.2019	31,91	27,28	15,50	15,62	12,70	24,88	24,50	28,15	11,74	10,70	14,59	19,02		14,85
01.08.2019	30,40	20,85	13,55	14,50	10,24	23,33	13,93	28,42	20,73	15,57	26,03	25,30		15,08
02.08.2019	21,80	13,89	15,52	14,83	17,24	27,34	14,83	28,51	19,93	15,68	27,67	20,39		18,64
03.08.2019	6,71	20,07	14,82	14,33	15,95	20,05	13,60	17,99	17,11	13,40	21,51	27,83		13,00
04.08.2019	14,49	18,01	12,29	15,26	11,93	12,20	11,61	23,81	11,24	7,31	13,48	15,42		8,27
05.08.2019	26,84	34,15	10,54	18,00	8,20	20,43	14,74	38,17	11,17	11,31	24,17	15,90		14,73
06.08.2019	21,65	12,10	13,90	19,78	11,73	28,34	12,80	26,83	25,10	24,90	23,03	18,84		13,60
07.08.2019	27,02	9,26	26,87	22,61	12,17	16,06	23,48	31,33	13,57	17,28	30,68	17,05		17,98
08.08.2019	26,77	15,82	23,30	24,20	14,49	22,77	28,33	27,73	19,05	20,23	37,36	23,90		12,09
09.08.2019	37,73	15,64	20,37	18,72	13,47	22,79	21,99	21,59	15,17	18,66	43,26	20,52		14,66
10.08.2019	51,34	17,16	21,31	41,25	10,37	10,13	16,00	21,84	14,60	15,80	31,73	18,90		14,23
11.08.2019	20,37	19,04	22,29	39,91	15,58	14,99	14,71	40,99	15,39	16,14	16,20	17,13		19,88
12.08.2019	23,99	42,13	15,22	23,28	12,00	18,31	19,32	30,99	22,59	14,21	18,50	18,37		13,41
13.08.2019	23,29	19,80	19,47	25,41	12,77	19,07	17,45	39,37	21,60	18,20	19,91	18,48		11,15
14.08.2019	46,96	10,74	15,40	53,14	11,63	17,96	13,28	31,36	11,88	8,63	11,51	12,54		12,15
15.08.2019	37,98	15,43	13,15	6,34	7,01	12,63	12,01	28,42	8,58	8,74	12,50	12,60		9,00
16.08.2019	13,14		12,42	12,17	6,99	13,45	13,64	20,12	12,76	14,93	16,34	12,31		11,87
17.08.2019	27,14		12,10	36,35	9,80	10,30	12,74	17,99	13,83	13,95	14,31	14,12		16,36
18.08.2019	24,57		12,50	33,80	9,38	11,80	10,52	23,71	10,86	10,15	18,78	10,61		12,11
19.08.2019	37,32		12,13	40,93	8,02	23,36	12,08	25,10	13,32	10,64	14,77	14,80		11,52
20.08.2019	60,36		20,27	10,75	11,20	27,00	18,42	23,76	19,05	19,18	33,74	17,70	23,21	15,46

Date PM_{10}	Kaunas	Telšiai	Alytus	Rokiškis	Tauragė	Utena	Druskininkai	Vilnius	Šilutė	Klaipėda	Biržai	Marijampolė	Panevėžys	Raseiniai
21.08.2019	27,80		15,84	13,98	13,32	28,34	13,98	52,22	13,87	18,39	33,28	21,14	28,70	12,06
22.08.2019	30,31		23,57	16,58	10,13	17,09	13,79	38,22	17,02	21,83	47,04	18,19	41,51	12,94
23.08.2019	10,83		23,21	14,69	13,81	12,97	16,21	29,48	17,94	21,18	19,57	15,55	22,42	13,70
24.08.2019	6,57		15,26	21,54	11,65	17,15	17,60	24,59	16,24	17,00	17,87	16,04	23,51	11,79
25.08.2019	8,27		15,55	13,84	12,60	15,22	19,75	36,52	16,10	14,86	17,90	14,89	20,30	10,49
26.08.2019	8,42		13,68	15,84	11,36	31,36	17,72	41,61	20,07	19,39	25,85	18,23	25,12	14,44
27.08.2019	18,29		17,54	63,36	14,08	28,96	17,52	33,16	21,53	24,42	39,18	17,61	25,42	14,44
28.08.2019	22,33		15,57	26,16	12,83	24,83	29,65	35,44	19,02	23,29	30,08	14,89	22,33	15,01
29.08.2019	37,08		15,56	30,98	14,29	24,28	23,56	39,26	33,94	31,38	38,50	28,39	49,88	24,74
30.08.2019	32,78		38,17	38,63	59,05	73,46	26,95	35,23	46,29	41,01	75,02	69,55	60,35	67,41
31.08.2019	15,60		52,82	24,04	38,64	30,78	24,70	20,97	20,91	12,74	31,02	28,25	30,86	10,59
01.09.2019	5,65		37,97	20,67	11,85	14,02	15,35	26,21	12,46	12,42	19,31	23,20	29,16	14,18
02.09.2019	8,25		21,31	17,26	12,24	17,52	11,41	19,19	13,58	14,07	16,09	16,60	24,14	12,96
03.09.2019	13,90		16,67	10,44	12,77	33,57	8,93	28,82	10,61	14,05	17,67	10,07	20,81	10,31
04.09.2019	24,33		11,57	22,03	7,64	13,57	12,92	25,22	12,01	12,28	31,91	12,83	29,37	11,21
05.09.2019	6,11		12,05	36,13	7,66	12,90	11,63	22,14	13,47	12,43	30,76	12,56	26,86	11,57
06.09.2019	6,24		12,40	29,89	11,26	23,40	16,15	26,81	13,08	12,24	16,78	20,46	22,51	14,93
07.09.2019	5,80		11,24	28,55	13,34	15,60	21,55	28,50	14,20	13,30	26,34	15,91	23,23	13,44
08.09.2019	7,80		11,68	24,96	9,74	17,54	36,12	44,18	18,99	15,12	19,20	24,21	31,35	14,14
09.09.2019	5,87		15,07	16,29	12,60	21,08	16,99	40,39	29,41	25,17	34,32	29,12	44,81	18,64
10.09.2019	5,97		19,54	6,17	16,24	22,74	14,54	25,48	14,95	16,01	23,51	13,85	24,56	17,22
11.09.2019	5,88		10,65	8,17	11,51	16,68	14,81	38,99	12,27	11,10	18,61	16,59	24,74	12,66
12.09.2019	12,92		10,54	11,57	9,37	29,94	15,99	29,19	17,09	19,20	19,42	18,85	26,14	16,79
13.09.2019	6,21	6,00	12,20		13,96	22,21	19,58	17,49	12,96	16,58	19,49	19,03	26,28	17,99

Date PM_{10}	Kaunas	Telšiai	Alytus	Rokiškis	Tauragė	Utena	Druskininkai	Vilnius	Šilutė	Klaipėda	Biržai	Marijampolė	Panevėžys	Raseiniai
14.09.2019	6,64	9,03	12,52		12,90	11,69	27,01	27,23	14,05	17,29	9,43	21,32	23,74	14,32
15.09.2019	7,53	15,39	11,11		12,24	26,61	25,73	38,55	18,39	26,30	23,41	21,63	31,88	20,31
16.09.2019	6,95	17,95	11,55		15,61	23,57	15,73	7,48	20,22	22,87	18,94	24,40	24,96	17,89
17.09.2019	5,87	12,24	15,99		16,55	8,70	4,68	4,90	10,01	10,51	7,53	10,83	30,13	8,01
18.09.2019	5,91	21,45	11,57		8,63	12,60	4,91	4,91	12,71	9,56	25,32	6,51	21,48	5,79
19.09.2019	6,72	22,25	6,58		5,18	12,91	7,85	5,33	12,54	8,04	26,87	6,72	15,55	15,90
20.09.2019	6,52	12,99	6,30		5,85	8,89	10,58	9,69	7,04	7,05	11,41	9,91	29,96	13,33
21.09.2019	5,70	8,08	16,96		11,14	15,30	12,87	5,02	14,02	14,82	20,40	20,22	22,31	37,79
22.09.2019	22,88	7,21	10,16		14,53	46,03	23,67	8,69	14,29	15,10	46,78	15,49	11,90	24,08
23.09.2019	47,13	9,31	9,78		14,70	49,26	14,68	18,17	11,92	14,14	61,65	18,82	13,59	11,30
24.09.2019	52,04	30,01	18,74		8,83	16,67	19,36	14,97	13,60	13,59	21,08	15,16	14,23	23,00
25.09.2019	45,35	23,80	16,52		10,13	13,51	35,76	13,81	19,74	18,17	8,68	23,63	10,99	19,24
26.09.2019	74,68	29,25	24,94		12,88	32,53	28,00	22,63	30,92	24,95	16,62	27,90	24,32	17,90
27.09.2019	79,97	19,05	23,40		25,35	30,18	62,62	17,30	26,09	21,98	41,51		42,53	25,30
28.09.2019	74,43	19,61	21,13		21,39	49,76	53,83	36,38	44,25	35,55	56,70		50,62	49,61
29.09.2019	65,40	34,15	52,67		25,08	45,42	19,60	11,82	32,45	15,20	79,43		26,12	61,69
30.09.2019	58,11	41,77	33,74		18,72	16,31	21,12	10,13	14,66	15,73	35,14		16,60	24,38
01.10.2019	15,69	35,07	8,03		6,05	7,67	14,47	12,61	7,81	13,89	5,89		7,50	12,63
02.10.2019	20,78	23,00	8,09		6,90	5,88	7,20	9,82	12,54	17,59	9,50	10,37	13,15	12,66
03.10.2019	10,61	6,45	8,45		6,19	11,50	12,71	9,82	11,52	17,33	12,92	7,46	31,40	8,57
04.10.2019	11,53	6,61	4,50		6,41	8,16	5,23	11,01	8,12	7,54	16,48	7,53	25,71	8,78
05.10.2019	7,50	13,36	5,09		5,56	9,09	7,50	4,73	3,63	8,57	11,21	12,14	16,26	8,50
06.10.2019	9,40	10,52	2,97		8,47	10,74	9,17	8,93	12,37	9,62	21,18	25,26	9,58	8,39
07.10.2019	8,46	7,74	7,53		16,54	12,97	19,03	12,19	18,92	18,79	15,84	10,73	4,66	21,68

Date PM_{10}	Kaunas	Telšiai	Alytus	Rokiškis	Tauragė	Utena	Druskininkai	Vilnius	Šilutė	Klaipėda	Biržai	Marijampolė	Panevėžys	Raseiniai
08.10.2019	5,27	6,04	6,61		9,51	10,31	32,26	16,97	23,28	29,82	12,27	16,57	5,65	34,16
09.10.2019	10,65	5,78	9,98		10,42	17,04	27,91	28,22	17,55	22,72	24,96	17,82	5,04	19,05
10.10.2019	17,44	10,19	9,60		9,61	22,95	12,31	11,00	17,56	22,70	27,51	10,79	7,82	14,28
11.10.2019	14,18	23,89	7,82		8,48	11,91	5,37	9,19	12,03	26,63	10,83	10,45	16,81	13,49
12.10.2019	19,90	21,42	7,42		11,37	8,59	17,17	8,71	6,98	17,55	7,10	6,95	8,19	7,72
13.10.2019	15,51	20,03	5,16		4,71	10,93	13,54	19,08	12,87	23,44	24,37	28,40	14,14	10,23
14.10.2019	18,37	10,82	15,23		7,93	10,74	12,37	23,78	9,26	21,20	12,60	16,69	15,66	10,07
15.10.2019	9,51	6,44	9,46	13,76	6,48	9,61	11,82	14,46	13,94	29,18	5,43	15,89	19,79	11,20
16.10.2019	19,13	13,31	17,84	6,78	6,93	15,78	6,20	10,23	16,27	31,90	16,05	15,28	8,22	13,69
17.10.2019	15,27	11,76	10,67	7,83	10,71	12,19	15,28	14,10	15,41	26,00	17,02	8,74	7,17	14,14
18.10.2019	17,44	15,15	5,47	9,72	18,54	11,46	35,91	17,28	25,52	42,48	17,29	20,94	9,75	18,26
19.10.2019	17,23	21,86	15,27	16,55	35,69	34,23	32,25	31,93	15,01	20,23	49,23	54,45	7,00	33,09
20.10.2019	11,72	32,00	19,94	28,96		28,06	27,54	25,03	35,26	52,39	30,37	30,03	5,55	36,43
21.10.2019	17,30	32,31	15,97	21,61		21,01	31,70	28,49	38,04	59,15	19,88	46,06	11,33	26,00
22.10.2019	31,97	29,17	18,55	21,04	26,34	24,22	26,73	22,67	33,25	43,48	25,23	50,70	10,01	34,70
23.10.2019	38,49	45,89	21,38	14,65	9,59	15,48	31,77	19,87	11,26	13,67	13,80	25,52	13,83	11,97
24.10.2019	34,04	36,73	12,00	12,55	30,50	13,98	72,08	55,06	41,65	64,19	13,28	48,26	43,60	17,58
25.10.2019	39,28	23,04	13,51	30,68	52,75	52,69	47,51	61,28	42,25	76,98	57,12	102,21	24,78	53,63
26.10.2019	25,46	10,76	42,83	18,93	16,13	24,36	18,24	19,43	11,49	15,83	12,66	36,79	21,03	30,49
27.10.2019	31,66	43,20	22,66	39,78	7,01	11,27	11,19	9,69	6,53	15,51	7,55	14,14	26,42	8,98
28.10.2019	54,91	53,99	9,09	13,08	15,26	8,30	11,86	7,63	19,79	10,96	15,71	15,59	7,91	13,86
29.10.2019	47,55	12,14	6,88	6,77	7,06	6,29	11,12	10,65	8,94	5,98	29,89	9,37	10,50	9,41
30.10.2019	14,85	7,32	3,29	6,58	18,97	19,71	26,38	24,63	8,78	11,60	24,05	20,25	47,78	24,96
31.10.2019	11,11	9,98	23,24	10,99	13,91	21,23	38,84	27,17	12,15	8,19	22,05	18,88	15,06	33,40

Date PM_{10}	Kaunas	Telšiai	Alytus	Rokiškis	Tauragė	Utena	Druskininkai	Vilnius	Šilutė	Klaipėda	Biržai	Marijampolė	Panevėžys	Raseiniai
01.11.2019	7,99	7,02	13,76	11,01	23,02	22,07	16,87	14,34	17,22	7,78	31,90	30,43	7,84	49,56
02.11.2019	14,59	13,22	13,25	13,92	32,42	18,50	15,46	22,62	54,75	40,96	33,63	24,96	18,32	30,07
03.11.2019	22,65	16,74	10,73	26,67	33,80	34,69	19,42	8,47	48,30	50,08	41,21	21,00	27,63	41,32
04.11.2019	41,55	25,13	11,12	13,03	18,96	15,86	17,70	18,22	40,35	18,39	51,86	25,62	22,78	35,93
05.11.2019	20,75	54,25	10,58	25,56	9,78	19,32	21,55	26,81	6,83	3,91	21,66	12,28	16,79	17,29
06.11.2019	24,43	66,89	8,86	11,69	3,98	22,88	41,59	19,70	3,19	2,61	10,64	28,68	20,17	8,71
07.11.2019	16,28	39,69	10,77	12,84	4,96	14,79	14,81	35,16	10,21	5,01	23,07	37,88	23,75	15,88
08.11.2019	24,32	17,24	25,54	28,01	28,08	35,95	36,88	13,52	53,70	51,08	47,69	36,99	41,10	53,84
09.11.2019	26,28	6,25	19,77	4,26	16,37	15,91	31,00	38,08	25,25	20,10	29,97	33,13	25,23	23,36
10.11.2019	17,67	17,50	11,88	30,69	14,35	36,06	27,47	20,58	10,42	7,65	28,01	28,37	19,53	20,76
11.11.2019	48,31	48,30	10,01	7,13	16,71	20,82	17,80	24,89	21,25	19,91	24,80	45,56	30,12	34,63
12.11.2019	14,00	33,69	12,85	18,63	19,92	16,14	24,23	16,76	29,97	27,96	23,19	26,38	23,49	29,12
13.11.2019	27,69	25,68	7,70	19,50	24,54	26,27	29,22	37,20	53,06	30,94	29,16	27,34	22,93	28,44
14.11.2019	26,34	40,05	15,02	29,63	14,81	34,20	76,10	82,05	23,73	29,65	29,79	21,77	18,09	28,01
15.11.2019	25,20	25,72	10,76	18,45	23,87	48,14	63,67	56,83	39,57	26,49	50,31	65,45	43,11	47,97
16.11.2019	17,85	47,84	37,06	50,32	48,58	67,87	53,87	41,74	68,67	51,22	68,01	63,11	46,03	73,35
17.11.2019	25,50	34,09	22,44	32,88	37,44	48,26	35,33	35,15	57,13	34,57	78,59	73,20	52,70	71,55
18.11.2019	42,17	79,81	18,38	48,08	23,95	42,13	73,39	42,79	39,45	32,71	50,06	40,73	34,29	34,92
19.11.2019	62,08	78,44	19,59	34,39	36,62	40,50	48,55	26,93	48,49	40,09	57,25	68,66	38,97	55,78
20.11.2019	49,67	71,52	23,97	33,36	40,63	26,90	11,48	12,50	50,98	35,74	29,53	43,29	42,16	54,44
21.11.2019	36,17	55,85	14,12	26,01	9,28	9,01	6,95	8,35	13,53	12,32	8,27	17,29	13,85	13,83
22.11.2019	55,17	69,14	10,41	24,65	7,77	9,15	10,48	7,43	12,14	13,18	6,36	11,18	11,78	12,88
23.11.2019	38,17	69,70	5,63	5,06	5,84	10,55	12,30	7,64	9,81	10,77	10,31	16,22	10,41	11,66
24.11.2019	17,99	21,52	11,22	4,97	8,47	11,33	41,30	19,18	15,84	13,43	12,18	22,03	11,18	15,30

Date PM_{10}	Kaunas	Telšiai	Alytus	Rokiškis	Tauragė	Utena	Druskininkai	Vilnius	Šilutė	Klaipėda	Biržai	Marijampolė	Panevėžys	Raseiniai
25.11.2019	15,37	10,29	16,54	10,49	29,65	29,93	79,40	43,87	48,02	37,89	30,26	61,18	30,39	34,52
26.11.2019	12,79	13,40	23,80	31,10	57,66	69,60	87,01	50,24	95,90	85,39	83,55	66,04	56,03	97,85
27.11.2019	13,68	23,96	22,78	62,37	36,11	67,03	84,62	55,50	58,89	59,99	80,85	59,81	60,20	90,98
28.11.2019	26,65	73,49	18,39	48,83	47,85	64,43	24,41	52,91	81,35	60,33	77,61	86,66	61,69	98,05
29.11.2019	56,76	94,39	33,35	49,86	24,75	32,45	9,94	6,88	18,52	11,20	42,42	32,64	42,97	40,72
30.11.2019	46,65	82,08	15,96	45,58	4,43	7,01	23,57	8,46	10,60	3,64	14,85	9,21	14,45	9,45
01.12.2019	61,00	96,06	3,58	21,00	19,08	14,70	49,01	44,12	20,26	5,87	31,16	29,46	24,13	31,48
02.12.2019	53,24	38,82	19,16	37,10	27,94	49,31	14,53	15,45	35,02	12,60	57,44	48,98	20,82	48,34
03.12.2019	8,65	9,22	18,67	14,97	24,27	25,75	47,24	30,64	20,44	5,60	29,17	24,44	23,66	42,19
04.12.2019	21,36	24,26	9,07	26,62	25,22	33,24	39,87	30,66	22,73	12,10	51,72	27,39	34,19	61,24
05.12.2019	42,21	30,34	8,88	39,88	28,30	48,23	62,79	42,19	29,92	23,17	69,10	42,15	47,61	46,09
06.12.2019	19,22	25,72	23,44	46,93	63,26	62,64	45,67	73,64	63,31	37,47	80,69	67,34	51,14	64,27
07.12.2019	33,39	32,70	31,41	47,52	50,97	50,36	7,81	9,27	30,71	29,53	41,01	36,74	32,05	53,90
08.12.2019	38,53	54,60	20,58	46,43	7,49	10,74	21,09	21,15	7,50	10,69	16,92	11,93	11,93	15,03
09.12.2019	53,96	71,88	5,34	34,29	6,83	13,92	32,26	51,85	7,30	11,75	16,49	18,00	11,04	12,62
10.12.2019	55,78	19,85	10,54	23,79	16,29	34,45	18,92	9,72	17,75	11,84	29,78	24,31	15,51	20,35
11.12.2019	12,54	8,08	11,04	8,93	13,74	15,72	28,74	12,02	14,91	11,51	14,26	29,24	22,04	26,13
12.12.2019	14,57	21,92	15,84	18,23	21,39	16,53	23,54	18,18	28,31	26,48	36,44	47,44	28,68	24,74
13.12.2019	30,36	18,54	15,58	17,79	23,57	19,78	28,16	30,48	43,93	35,55	23,41	29,59	19,47	40,13
14.12.2019	21,73	18,34	9,76	18,83	17,67	27,22	14,83	13,03	28,47	24,40	32,69	30,41	24,15	33,07
15.12.2019	26,76	55,52	10,88	13,37	9,66	12,06	18,01	11,46	12,04	13,39	16,15	13,84	12,33	16,03
16.12.2019	31,12	41,54	5,76	18,39	15,52	14,10	79,34	56,55	13,79	15,44	18,98	20,26	12,95	15,66
17.12.2019	21,84	36,53	12,16	49,30	52,54	80,72	26,54	32,40	77,10	68,02	81,05	76,32	56,10	89,25
18.12.2019	16,39	13,80	35,68	40,80	26,75	28,50	28,14	14,33	21,43	15,10	19,91	21,14	18,01	25,14

Date PM_{10}	Kaunas	Telšiai	Alytus	Rokiškis	Tauragė	Utena	Druskininkai	Vilnius	Šilutė	Klaipėda	Biržai	Marijampolė	Panevėžys	Raseiniai
19.12.2019	15,09	38,80	11,17	51,39	24,40	11,53	84,03	38,72	27,46	22,22	25,81	40,29	20,50	28,89
20.12.2019	48,25	78,13	11,45	24,39	48,95	41,05	34,36	38,41	56,28	39,77	46,36	85,55	50,63	68,41
21.12.2019	33,42	28,69	27,84	38,40	49,74	47,68	49,67	42,86	66,47	47,45	65,29	53,96	45,21	64,24
22.12.2019	22,34	35,96	19,31	35,98	43,27	32,15	53,83	33,11	44,02	25,40	61,76	73,20	46,25	58,54
23.12.2019	35,49	82,28	19,38	32,15	34,43	28,41	18,75	24,45	82,18	45,55	29,97	62,54	44,96	69,60
24.12.2019	12,03	71,71	16,61	37,88	39,17	43,70	6,78	7,16	33,65	17,45	45,73	39,18	38,44	61,58
25.12.2019	6,31	66,74	5,15	16,45	12,17	27,44	4,10	6,31	29,70	7,01	24,78	14,52	16,56	9,61
26.12.2019	5,23	79,86	2,42	11,82	15,87	7,06	2,77	5,00	51,64	17,30	7,65	12,39	7,03	8,19
27.12.2019	4,40	47,70	2,23	9,98	6,95	5,21	3,80	6,92	10,11	4,46	8,49	6,81	7,94	5,91
28.12.2019	7,47	13,71	2,20	3,46	5,56	11,54	9,76	9,92	4,53	4,62	7,43	4,64	9,20	3,61
29.12.2019	14,12	12,70	1,93	2,99	8,46	11,23	11,90	11,22	7,82	5,65	17,93	14,23	6,44	10,53
30.12.2019	11,20	8,55	5,90	7,74	6,92	16,93	9,90	13,82	10,00	16,13	18,56	11,30	9,76	12,41
31.12.2019	7,13	6,56	8,86	20,97	8,44	31,04	6,45	12,64	25,16	25,86	13,36	12,58	8,78	17,40

Tab. 36: PM_{10} – daily averages [µg/m^3].

In Table 9.2., all concentrations exceeding the valid daily limit value for PM10 are highlighted in red 73,20 and all concentrations exceeding this limit value by more than twice are highlighted in yellow. 102,21

10. Comparison with the Results from the Period 2010-2011

Part of the results of this project is comparable with the results of a similar project, which was implemented in Lithuania in the years 2010 - 2011. These are concentrations of NO_2, SO_2 and benzene. In the previous project, many more locations were measured. The following tables and graphs compare the results for these substances from all locations where the results from both projects are available. Due to the fact that the sampling campaigns do not correspond to each other and due to the relatively short sampling period (16 weeks per year) only "annual" averages from all sampling campaigns were compared. Due to this fact, this comparison can be slightly misleading.

10.1 Comparison of NO_2 Concentrations

It is clear from Tab.37 – 39 and from the graphs in the Fig. 134 – 136 that between 2010/2011 and 2019 there was a significant decrease in NO_2 concentrations, both in the whole zone of Lithuania and in the agglomerations of Vilnius and Kaunas. The increase in NO_2 concentrations occurred only in 4 locations out of 97 compared in the Lithuania zone and even in none of the locations in the agglomerations of Vilnius and Kaunas. In addition, all 4 locations reached very low values, when the potential measurement uncertainty is higher.

The average NO_2 concentration from all campaigns and from all locations in the Lithuania zone in 2010/2011 was 15.47 µg/m^3, while in 2019 only 9.08 µg/m^3. NO_2 concentrations in individual locations of the Lithuania zone in 2019 mostly ranged at approximately 55-70% of concentrations from 2010/2011. The largest percentage decrease (to 37% of the value from 2010/2011) occurred in the Klaipėda 11 location.

In the agglomerations of Vilnius and Kaunas, the development of NO_2 concentrations is very similar to the whole zone Lithuania. In all compared locations there was a significant decrease in NO_2 concentrations in a similar percentage of values as in the case of the Lithuania zone. The average NO_2 concentration from all campaigns and from all locations in the Vilnius agglomeration in 2010/2011 was 27.57 µg/m^3, while in 2019 only 17.42 µg/m^3. The largest percentage decrease (to 39% of the value from 2010/2011) occurred in Vilnius 33. The average NO_2 concentration from all campaigns and from all locations in the Kaunas agglomeration was 21.56 µg/m^3 in 2010/2011, while in 2019 only 15.02 µg/m^3. The largest percentage decrease (to 45% of the value from 2010/2011) occurred in the Kaunas 35 location.
Despite the fact that the compared values may be influenced by other factors (such as different periods of sampling campaigns, different passive samplers, meteorological situation, etc.) it is

probably indisputable that between 2010/2011 and 2019 there was a significant decrease in NO_2 concentrations throughout the whole territory of Lithuania.

Location	NO_2 concentration 2010/2011 [µg/m³]	NO_2 concentration 2019 [µg/m³]	Location	NO_2 concentration 2010/2011 [µg/m³]	NO_2 concentration 2019 [µg/m³]
Alytus 01	11,68	6,84	**OKTS 53**	3,01	4,44
Alytus 02	9,43	5,62	**Pabradé 01**	16,24	8,77
Alytus 03	19,74	13,14	**Palanga 02**	12,76	7,77
Anykščiai 02	10,25	7,74	**Panevėžys 03**	16,94	10,30
Biržai 01	9,68	6,45	**Panevėžys 04**	19,00	9,45
Biržai 02	8,58	5,44	**Panevėžys 06**	12,81	7,46
Druskininkai 01	11,06	7,95	**Panevėžys 07**	13,94	8,74
Druskininkai 02	18,41	12,50	**Panevėžys 08**	9,91	7,47
Druskininkai 03	4,21	4,92	**Panevėžys 12**	19,46	10,38
Elektrėnai 01	11,21	8,81	**Plungė 01**	26,74	12,41
Elektrėnai 02	7,59	5,30	**Plungė 02**	8,86	6,38
Elektrėnai 03	14,83	7,24	**Plungė 03**	13,10	8,06
Gargždai 01	13,85	8,27	**Radviliškis 01**	20,84	14,70
Gargždai 02	8,00	6,28	**Radviliškis 02**	12,51	7,82
Gargždai 03	8,30	4,76	**Radviliškis 03**	16,03	9,82
Garliava 01	21,06	12,19	**Raseiniai 01**	16,53	9,46
Grigiškės 03	9,23	10,68	**Raseiniai 02**	8,45	5,56
Ignalina 01	12,71	6,07	**Raseiniai 03**	8,21	6,88
Jonava 02	10,28	5,37	**Rokiškis 01**	17,75	10,31
Jonava 03	9,41	5,94	**Rokiškis 02**	9,35	6,47
Jubarkas 01	19,90	10,25	**Rokiškis 03**	13,59	7,08
Jubarkas 02	6,44	4,52	**Šiauliai 02**	33,93	16,10
Jubarkas 03	6,55	5,44	**Šiauliai 05**	20,93	14,94
Kėdainiai 01	12,39	5,80	**Šiauliai 07**	23,79	11,67
Kėdainiai 03	31,67	13,94	**Šiauliai 10**	26,00	19,32
Kelmė 01	23,33	12,44	**Šiauliai 11**	11,98	9,52
Klaipėda 05	20,23	11,47	**Šiluté 01**	18,91	9,14
Klaipėda 07	26,79	16,63	**Šiluté 02**	14,41	7,30
Klaipėda 09	44,61	23,81	**Šiluté 03**	7,04	4,76
Klaipėda 10	24,41	18,26	**Tauragé 01**	34,35	13,42
Klaipėda 11	50,50	18,60	**Tauragé 02**	14,20	7,92
Kuršėnai 01	16,15	13,53	**Tauragé 03**	11,15	6,98
Kuršėnai 02	12,83	9,51	**Telšiai 01**	28,14	12,57
Kuršėnai 03	10,30	6,74	**Telšiai 02**	10,54	6,41
Lazdijai 02	8,00	4,46	**Telšiai 03**	4,78	3,09
Lentvaris 02	10,64	7,81	**Trakai 02**	8,13	4,63

Location	NO_2 concentration 2010/2011 [µg/m³]	NO_2 concentration 2019 [µg/m³]	Location	NO_2 concentration 2010/2011 [µg/m³]	NO_2 concentration 2019 [µg/m³]
Marijampolė 01	24,24	18,10	**Ukmergé 01**	17,44	9,09
Marijampolė 02	15,65	9,57	**Ukmergé 02**	8,44	6,17
Marijampolė 04	17,30	8,03	**Ukmergé 03**	10,94	5,91
Mažeikiai 01	17,44	10,62	**Utena 01**	26,65	10,00
Mažeikiai 03	16,51	9,89	**Utena 02**	8,88	5,61
OKTS 03	40,86	16,90	**Utena 03**	10,86	4,79
OKTS 12	15,18	9,19	**Vilkaviškis 01**	14,63	7,16
OKTS 22	27,78	14,64	**Vilkaviškis 02**	10,41	6,58
OKTS 33	27,00	16,35	**Vilkaviškis 03**	9,94	6,48
OKTS 41	20,74	17,46	**Visaginas 01**	11,30	5,96
OKTS 42	11,89	6,74	**Visaginas 02**	9,33	4,64
OKTS 51	2,10	2,04	**Visaginas 03**	4,19	4,08
OKTS 52	2,18	3,10			

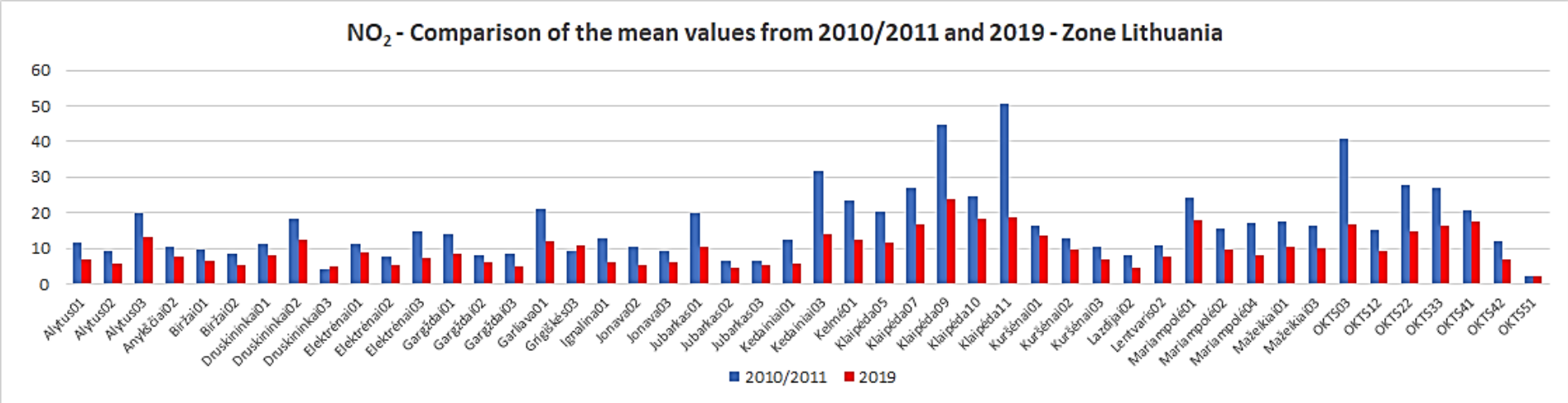
Tab. 37: NO_2 - Comparison of the mean values from 2010/2011 and 2019 - Zone Lithuania (without Vilnius and Kaunas agglomerations)

Location	NO_2 concentration 2010/2011 [µg/m³]	NO_2 concentration 2019 [µg/m³]	Location	NO_2 concentration 2010/2011 [µg/m³]	NO_2 concentration 2019 [µg/m³]
Vilnius 01	20,24	11,88	**Vilnius 21**	22,61	19,71
Vilnius 02	22,29	18,68	**Vilnius 23**	26,70	18,68
Vilnius 07	19,11	13,89	**Vilnius 24**	17,46	12,00
Vilnius 08	30,96	19,49	**Vilnius 25**	20,41	13,54
Vilnius 09	34,44	19,12	**Vilnius 26**	13,09	10,34
Vilnius 10	42,14	21,24	**Vilnius 27**	40,01	22,06
Vilnius 12	22,63	18,91	**Vilnius 28**	16,58	12,65
Vilnius 13	52,69	27,39	**Vilnius 30**	29,34	14,76
Vilnius 14	15,98	8,23	**Vilnius 31**	43,31	24,99
Vilnius 15	12,87	10,03	**Vilnius 32**	20,33	11,44
Vilnius 17	29,29	20,97	**Vilnius 33**	30,11	11,71
Vilnius 18	55,64	37,88	**Vilnius 34**	10,26	9,45
Vilnius 19	30,44	20,12	**Vilnius 35**	11,15	10,06
Vilnius 20	54,45	31,25			

Tab. 38: NO_2 - Comparison of the mean values from 2010/2011 and 2019 - Vilnius agglomeration

Location	NO_2 concentration 2010/2011 [µg/m³]	NO_2 concentration 2019 [µg/m³]	Location	NO_2 concentration 2010/2011 [µg/m³]	NO_2 concentration 2019 [µg/m³]
Kaunas 02	26,59	20,38	**Kaunas 21**	23,98	11,57
Kaunas 04	11,17	9,78	**Kaunas 24**	26,89	24,33
Kaunas 09	18,25	11,41	**Kaunas 25**	41,14	29,00
Kaunas 10	28,36	19,70	**Kaunas 26**	24,33	18,01
Kaunas 14	15,43	7,64	**Kaunas 27**	26,35	25,63
Kaunas 16	25,04	17,34	**Kaunas 29**	15,23	9,67
Kaunas 17	22,00	14,46	**Kaunas 30**	27,24	13,22
Kaunas 18	16,84	10,35	**Kaunas 31**	11,90	9,76
Kaunas 19	15,41	12,60	**Kaunas 35**	12,04	5,47

Tab. 39: NO_2 - Comparison of the mean values from 2010/2011 and 2019 - Kaunas agglomeration



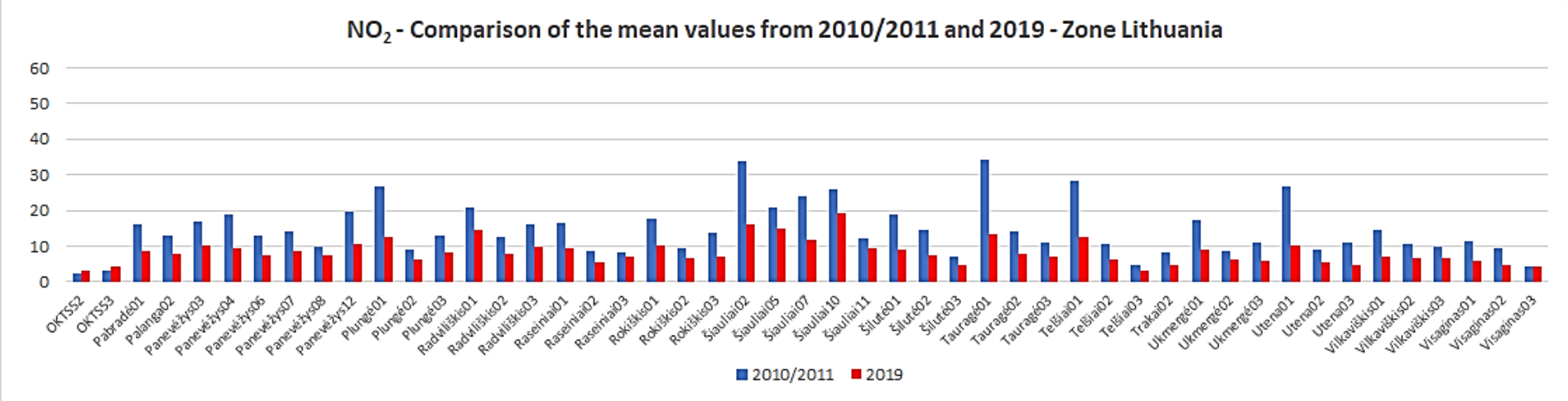


Fig. 134: NO_2 - Comparison of the mean values from 2010/2011 and 2019 - Zone Lithuania (without Vilnius and Kaunas agglomerations)

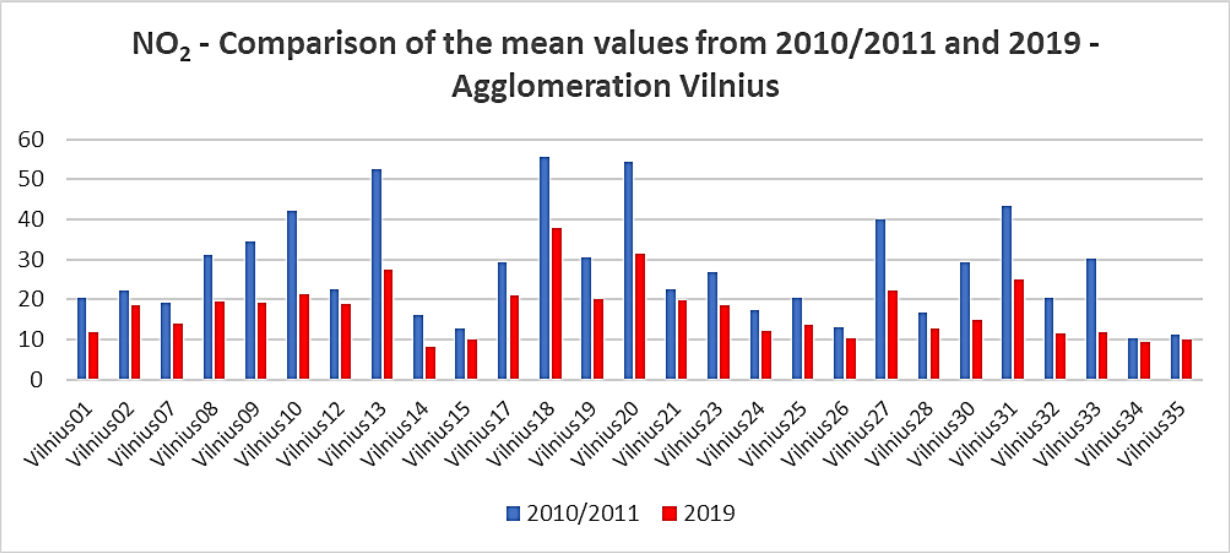


Fig. 135: NO_2 - Comparison of the mean values from 2010/2011 and 2019 - Vilnius agglomeration

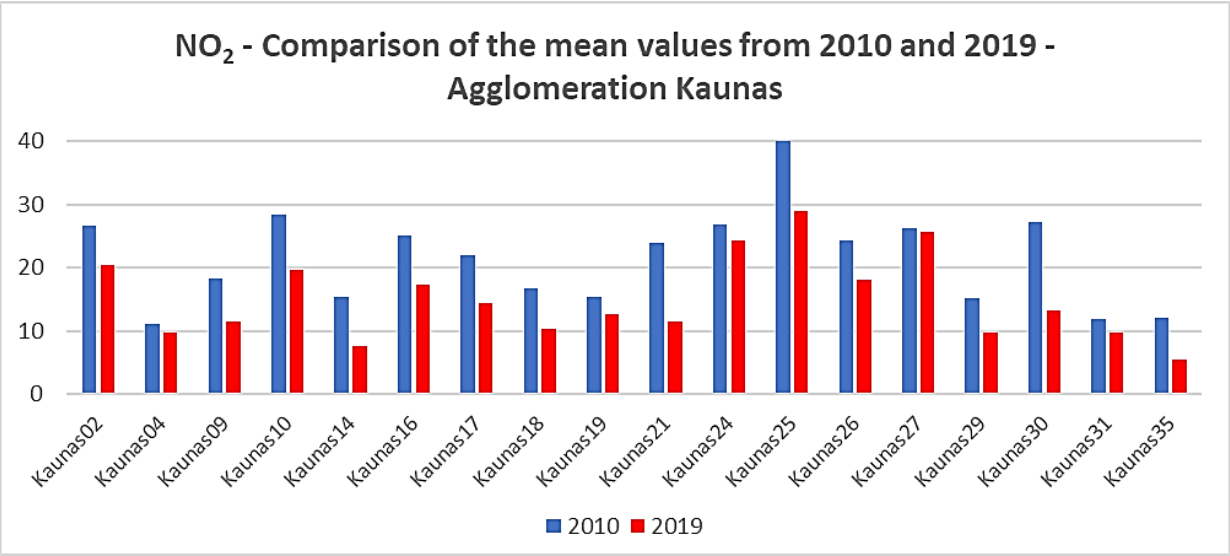


Fig. 136: NO_2 - Comparison of the mean values from 2010/2011 and 2019 - Kaunas agglomeration

10.2 Comparison of SO_2 Concentrations

It is clear from Tab. 40 - 42 and the graphs in the Fig. 137 – 139 that in the case of SO_2 the situation is significantly different, as between 2010/2011 and 2019 there was far no such significant decrease in its concentrations as in the case of NO_2. There was only a slight decrease in the Lithuania zone, while concentrations in the agglomerations of Vilnius and Kaunas even stagnated or increased slightly. SO_2 concentrations increased in 25 out of 90 locations compared within the Lithuania zone, in 5 locations out of 10 compared within the Vilnius agglomeration and even in 6 locations out of 8 compared within the Kaunas agglomeration.

The average SO_2 concentration from all campaigns and from all locations in the Lithuania zone in 2010/2011 was 1.13 µg/m^3, while in 2019 0.84 µg/m^3. NO_2 concentrations in individual locations of the Lithuania zone in 2019 were mostly at a slightly lower level than concentrations from 2010/2011. The largest percentage decrease (to 26% of the value from 2010/2011) occurred in the location Druskininkai 03. The largest percentage increase (to 264% of the value from 2010/2011) occurred in the location Elektrėnai 01.

The average SO_2 concentration from all campaigns and from all locations in the Vilnius agglomeration was 1.15 µg/m^3 in 2010/2011 and it was almost identical in 2019 – namely 1.14 µg/m^3. The largest percentage decrease (to 45% of the value from 2010/2011) occurred in the Vilnius 09 location. The largest percentage increase (to 165% of the value from 2010/2011) occurred in the Vilnius 33 location.

The average SO_2 concentration from all campaigns and from all locations in the Kaunas agglomeration was 0.93 µg/m^3 in 2010/2011, while in 2019 it was 1.41 µg/m^3. The largest percentage decrease (to 77% of the value from 2010/2011) occurred in the location of Kaunas 25. The largest percentage increase (to 271% of the value from 2010/2011) occurred in the location of Kaunas 31.
Between 2010/2011 and 2019, there was no significant decrease or increase in SO_2 concentrations. SO_2 concentrations are very low in both years compared and it is likely that this trend / situation will continue.

Location	SO_2 concentration 2010/2011 [µg/m³]	SO_2 concentration 2019 [µg/m³]	Location	SO_2 concentration 2010/2011 [µg/m³]	SO_2 concentration 2019 [µg/m³]
Alytus 01	1,53	0,56	**OKTS 53**	0,74	0,45
Alytus 02	1,20	0,47	**Pabradė 01**	1,21	0,53
Alytus 03	1,32	0,65	**Palanga 02**	1,05	0,43
Anykščiai 02	2,35	0,71	**Panevėžys 06**	0,90	0,84
Biržai 01	0,84	0,70	**Panevėžys 08**	0,70	0,53
Biržai 02	0,96	0,61	**Panevėžys 12**	1,29	0,63
Druskininkai 01	1,68	0,71	**Plungė 01**	1,07	0,38
Druskininkai 02	1,19	0,38	**Plungė 02**	1,08	0,43
Druskininkai 03	1,38	0,36	**Plungė 03**	1,34	0,44
Elektrėnai 01	0,74	1,96	**Radviliškis 01**	1,05	1,45
Elektrėnai 02	0,89	1,09	**Radviliškis 02**	0,79	0,71
Elektrėnai 03	0,93	1,07	**Radviliškis 03**	1,10	0,90
Gargždai 01	0,83	0,38	**Raseiniai 01**	0,91	0,87
Gargždai 02	0,88	0,50	**Raseiniai 02**	0,88	0,80
Gargždai 03	1,11	0,44	**Raseiniai 03**	0,79	1,27
Garliava 01	1,03	2,09	**Rokiškis 01**	1,01	0,67
Grigiškės 03	1,03	1,48	**Rokiškis 02**	0,84	0,69
Ignalina 01	0,88	0,32	**Rokiškis 03**	1,34	0,68
Jonava 02	0,73	0,91	**Šiauliai 05**	1,81	1,27
Jonava 03	1,71	0,87	**Šiauliai 07**	1,01	1,01
Jubarkas 01	0,59	1,14	**Šiauliai 09**	1,04	0,88
Jubarkas 02	1,25	0,63	**Šiauliai 10**	2,00	1,13
Jubarkas 03	0,84	1,43	**Šiauliai 11**	0,80	0,70
Kėdainiai 01	0,91	2,33	**Šilutė 01**	0,76	0,46
Kėdainiai 03	0,93	1,20	**Šilutė 02**	0,79	0,46
Klaipėda 05	1,29	0,47	**Šilutė 03**	1,26	0,93
Klaipėda 09	1,24	0,39	**Tauragė 01**	0,99	1,42
Klaipėda 11	1,39	0,47	**Tauragė 02**	2,12	1,07
Kuršėnai 01	1,24	1,33	**Tauragė 03**	0,93	0,95
Kuršėnai 02	0,67	1,72	**Telšiai 01**	1,24	0,62
Kuršėnai 03	0,68	0,95	**Telšiai 02**	1,23	0,75
Lazdijai 02	1,52	0,55	**Telšiai 03**	0,83	0,53
Lentvaris 02	1,56	1,65	**Trakai 02**	0,83	1,88
Marijampolė 02	1,80	0,83	**Ukmergė 01**	0,69	0,50
Marijampolė 04	1,39	0,67	**Ukmergė 02**	0,95	0,95
Mažeikiai 01	0,69	1,29	**Ukmergė 03**	1,40	0,93
Mažeikiai 03	1,09	1,26	**Utena 01**	0,69	0,37
OKTS 03	0,71	0,56	**Utena 02**	0,68	0,38
OKTS 12	2,01	0,56	**Utena 03**	1,59	0,64

Location	SO_2 concentration 2010/2011 [µg/m³]	SO_2 concentration 2019 [µg/m³]	Location	SO_2 concentration 2010/2011 [µg/m³]	SO_2 concentration 2019 [µg/m³]
OKTS 22	1,13	0,89	**Vilkaviškis 01**	2,31	0,96
OKTS 33	1,53	0,45	**Vilkaviškis 02**	1,64	0,83
OKTS 41	0,95	1,61	**Vilkaviškis 03**	1,32	1,01
OKTS 42	0,71	0,74	**Visaginas 01**	0,89	0,59
OKTS 51	0,69	0,81	**Visaginas 02**	1,18	0,40
OKTS 52	1,51	0,74	**Visaginas 03**	1,38	0,48

Tab. 40: SO_2 - Comparison of the mean values from 2010/2011 and 2019 - Zone Lithuania (without Vilnius and Kaunas agglomerations)

Location	SO_2 concentration 2010/2011 [µg/m³]	SO_2 concentration 2019 [µg/m³]	Location	SO_2 concentration 2010/2011 [µg/m³]	SO_2 concentration 2019 [µg/m³]
Vilnius 09	1,79	0,81	**Vilnius 21**	0,77	0,99
Vilnius 12	1,27	1,21	**Vilnius 24**	1,11	0,90
Vilnius 15	1,60	1,15	**Vilnius 27**	0,76	1,13
Vilnius 17	0,69	1,12	**Vilnius 31**	1,04	1,16
Vilnius 19	1,41	1,12	**Vilnius 33**	1,08	1,79

Tab. 41: SO_2 - Comparison of the mean values from 2010/2011 and 2019 - Vilnius agglomeration

Location	SO_2 concentration 2010/2011 [µg/m³]	SO_2 concentration 2019 [µg/m³]	Location	SO_2 concentration 2010/2011 [µg/m³]	SO_2 concentration 2019 [µg/m³]
Kaunas 10	0,88	1,34	**Kaunas 27**	0,85	1,15
Kaunas 16	0,83	1,02	**Kaunas 29**	0,91	2,06
Kaunas 19	0,94	1,41	**Kaunas 31**	0,99	2,69
Kaunas 25	1,26	0,97	**Kaunas 35**	0,79	0,65

Tab. 42: SO_2 - Comparison of the mean values from 2010/2011 and 2019 - Kaunas agglomeration

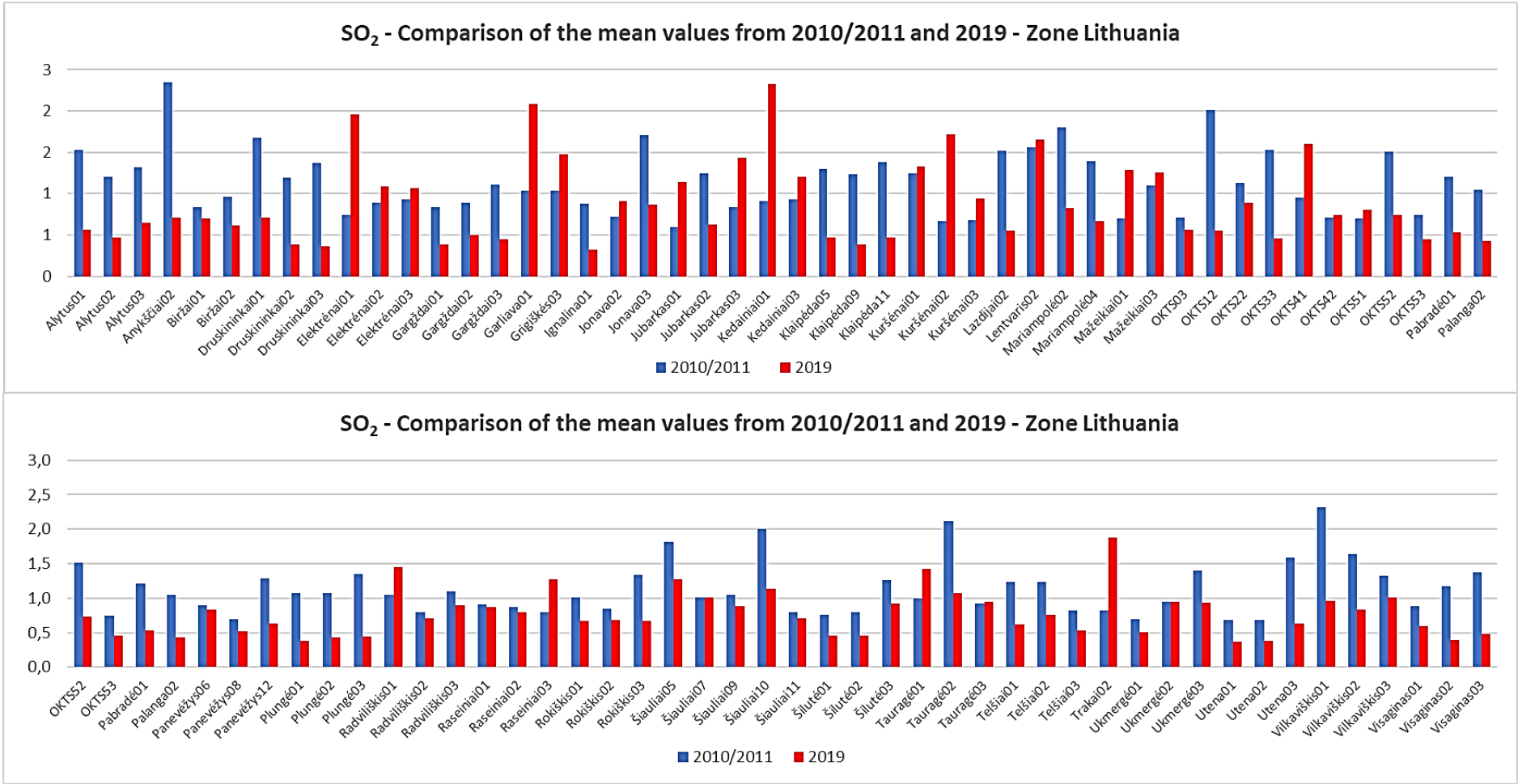


Fig. 137: SO_2 - Comparison of the mean values from 2010/2011 and 2019 - Zone Lithuania (without Vilnius and Kaunas agglomerations)

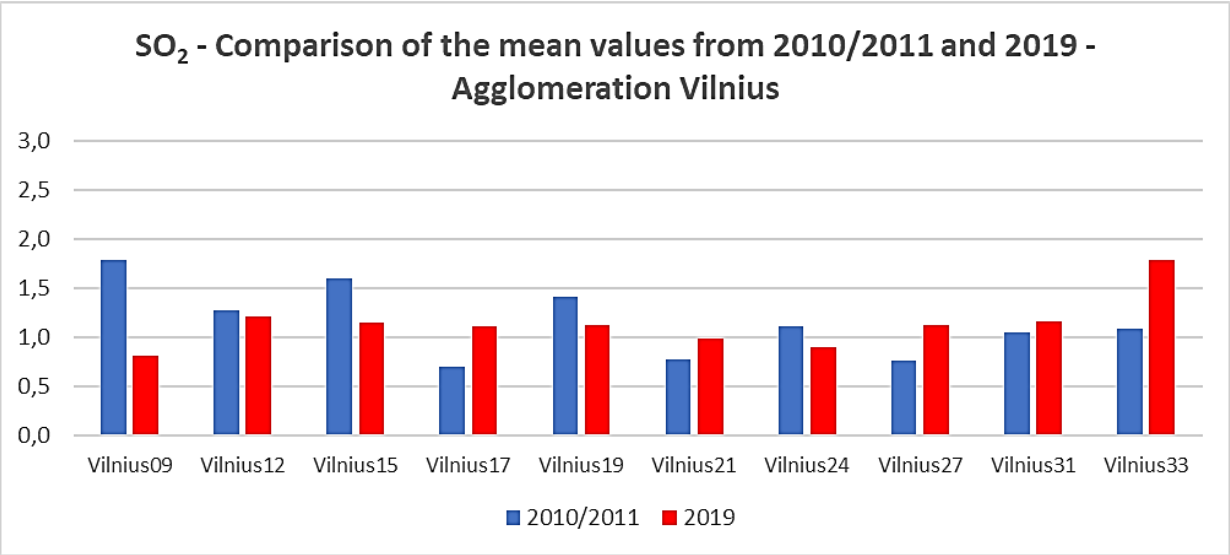


Fig. 138: SO_2 - Comparison of the mean values from 2010/2011 and 2019 - Vilnius agglomeration

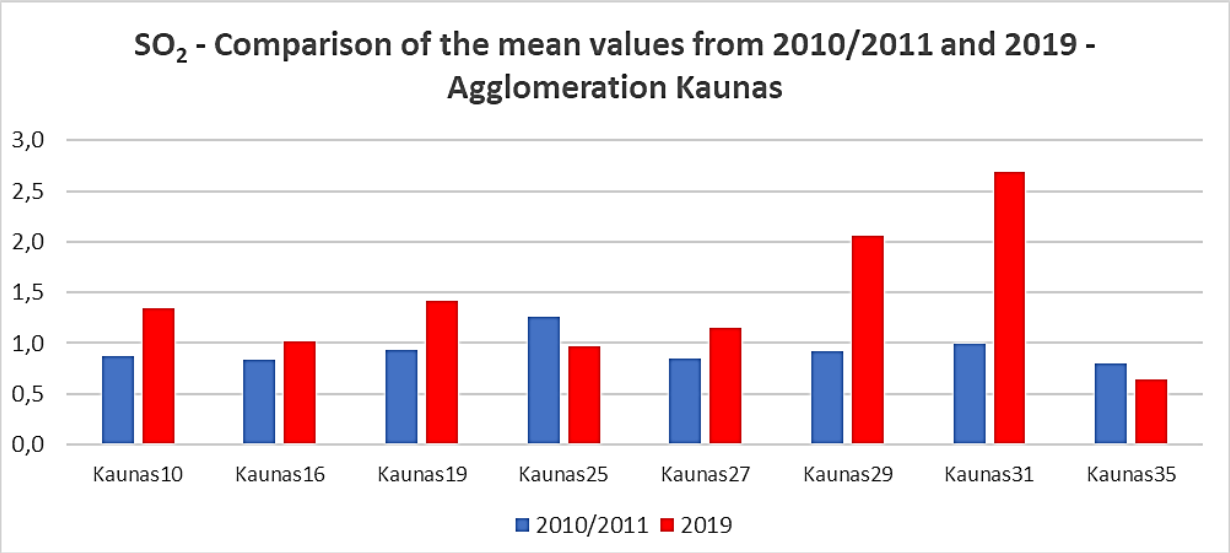


Fig. 139: SO_2 - Comparison of the mean values from 2010/2011 and 2019 - Kaunas agglomeration

10.3 Comparison of Benzene Concentrations

It is clear from Tab. 43 - 45 and the graphs in the Fig. 140 - 142 that between 2010/2011 and 2019 there was a significant decrease in benzene concentrations, both in the whole zone of Lithuania and in the agglomerations of Vilnius and Kaunas. There was no increase in benzene concentrations at any of the compared locations, neither in the Lithuania zone nor in the Vilnius and Kaunas agglomerations.

The average benzene concentration from all campaigns and from all locations in the Lithuania zone in 2010/2011 was 1.85 µg/m^3, while in 2019 it was only 0.86 µg/m^3. Benzene concentrations in individual locations of the Lithuania zone in 2019 were mostly at the level of approximately 40-55% of concentrations from 2010/2011. The largest percentage decrease (to 30% of the value from 2010/2011) occurred in the Šilutė 01 location.

In the agglomerations of Vilnius and Kaunas, the development of benzene concentrations is very similar to the whole zone Lithuania. In all compared locations there was a significant decrease in benzene concentrations in a similar percentage as in the case of the Lithuania zone. The average benzene concentration from all campaigns and from all locations in the Vilnius agglomeration was 1.75 µg/m^3 in 2010/2011, while in 2019 it was only 0.83 µg/m^3. The largest percentage decrease (to 34% of the value from 2010/2011) occurred in the Vilnius 13 location. The average benzene concentration from all campaigns and from all locations in the Kaunas agglomeration was 2.00 µg/m^3 in 2010/2011, while in 2019 only 0.94 µg/m^3. The largest percentage decrease (to 39% of the value from 2010/2011) occurred in Kaunas 14 location.

Despite the fact that the compared values may be influenced by other factors (such as different periods of sampling campaigns, different passive samplers, meteorological situation, etc.) it is probably indisputable that between 2010/2011 and 2019 there was a significant decrease in benzene concentrations throughout the whole territory of Lithuania.

Location	Benzene concentration 2010/2011 [µg/m³]	Benzene concentration 2019 [µg/m³]	Location	Benzene concentration 2010/2011 [µg/m³]	Benzene concentration 2019 [µg/m³]
Alytus 01	1,46	0,72	**OKTS 53**	0,81	0,28
Alytus 02	1,48	0,70	**Pabradė 01**	2,02	0,93
Alytus 03	2,06	1,03	**Palanga 02**	1,46	0,62
Anykščiai 02	1,67	0,83	**Panevėžys 03**	1,59	0,95
Biržai 01	2,10	1,09	**Panevėžys 04**	1,63	0,83
Biržai 02	2,30	0,93	**Panevėžys 06**	3,20	1,48
Druskininkai 01	1,50	0,80	**Panevėžys 07**	2,01	0,98
Druskininkai 02	1,93	0,78	**Panevėžys 12**	2,16	1,00
Druskininkai 03	1,59	0,64	**Plungė 01**	2,48	0,97
Elektrėnai 01	1,31	0,67	**Plungė 02**	2,44	0,83
Elektrėnai 02	1,25	0,50	**Plungė 03**	1,56	0,52
Elektrėnai 03	1,38	0,58	**Radviliškis 01**	1,91	0,87
Gargždai 01	1,69	0,75	**Radviliškis 02**	1,60	0,95
Gargždai 02	2,04	0,93	**Radviliškis 03**	1,57	0,75
Gargždai 03	1,51	0,57	**Raseiniai 01**	2,19	0,98
Garliava 01	3,04	1,06	**Raseiniai 02**	2,60	1,33
Grigiškės 03	1,25	0,73	**Raseiniai 03**	1,67	1,08
Ignalina 01	1,44	0,71	**Rokiškis 01**	1,43	0,76
Jonava 02	1,39	0,68	**Rokiškis 02**	2,25	0,88
Jonava 03	1,36	0,67	**Rokiškis 03**	2,31	0,95
Jubarkas 01	2,44	0,87	**Šiauliai 02**	1,75	0,87
Jubarkas 02	1,43	0,62	**Šiauliai 09**	2,08	0,98
Jubarkas 03	1,40	0,72	**Šiauliai 10**	1,96	1,14
Kėdainiai 01	1,47	0,57	**Šiauliai 11**	2,48	1,40
Kėdainiai 03	2,32	0,99	**Šilutė 01**	1,88	0,57
Kelmė 01	2,43	0,97	**Šilutė 02**	2,09	0,69
Klaipėda 05	1,95	1,11	**Šilutė 03**	1,49	0,67
Klaipėda 07	1,36	0,56	**Tauragė 01**	3,08	1,08
Klaipėda 10	1,42	0,52	**Tauragė 02**	2,61	1,21
Kuršėnai 01	2,41	1,00	**Tauragė 03**	3,37	1,63
Kuršėnai 02	1,80	0,92	**Telšiai 01**	2,66	0,83
Kuršėnai 03	1,47	0,63	**Telšiai 02**	2,18	0,98
Lazdijai 02	1,52	0,88	**Telšiai 03**	1,37	0,45
Lentvaris 02	2,50	1,07	**Trakai 02**	1,51	0,67
Marijampolė 01	2,16	1,20	**Ukmergė 01**	2,11	0,82
Marijampolė 02	2,56	1,22	**Ukmergė 02**	1,78	1,00
Marijampolė 04	1,50	0,89	**Ukmergė 03**	1,88	0,94
Mažeikiai 01	2,03	1,08	**Utena 01**	2,17	0,96
Mažeikiai 03	1,67	1,06	**Utena 02**	1,43	0,74

Location	Benzene concentration 2010/2011 [µg/m³]	Benzene concentration 2019 [µg/m³]	Location	Benzene concentration 2010/2011 [µg/m³]	Benzene concentration 2019 [µg/m³]
OKTS 03	1,89	0,81	**Utena 03**	2,49	1,59
OKTS 12	1,81	0,89	**Vilkaviškis 01**	2,17	0,83
OKTS 22	1,74	0,77	**Vilkaviškis 02**	1,72	0,87
OKTS 33	1,13	0,69	**Vilkaviškis 03**	2,05	0,93
OKTS 41	2,09	1,28	**Visaginas 01**	1,07	0,63
OKTS 42	1,28	0,64	**Visaginas 02**	1,07	0,58
OKTS 51	1,30	0,55	**Visaginas 03**	1,03	0,49
OKTS 52	0,93	0,56			

Tab. 43: Benzene - Comparison of the mean values from 2010/2011 and 2019 - Zone Lithuania (without Vilnius and Kaunas agglomerations)

Location	Benzene concentration 2010/2011 [µg/m³]	Benzene concentration 2019 [µg/m³]	Location	Benzene concentration 2010/2011 [µg/m³]	Benzene concentration 2019 [µg/m³]
Vilnius 01	1,49	0,77	**Vilnius 23**	1,43	0,81
Vilnius 07	1,49	0,78	**Vilnius 26**	1,76	0,66
Vilnius 09	1,78	0,93	**Vilnius 28**	1,64	0,74
Vilnius 13	2,09	0,72	**Vilnius 30**	1,70	0,83
Vilnius 15	1,66	0,73	**Vilnius 32**	1,55	1,18
Vilnius 18	2,30	1,06	**Vilnius 35**	1,48	0,63
Vilnius 20	2,33	0,96			

Tab. 44: Benzene - Comparison of the mean values from 2010/2011 and 2019 - Vilnius agglomeration

Location	Benzene concentration 2010/2011 [µg/m³]	Benzene concentration 2019 [µg/m³]	Location	Benzene concentration 2010/2011 [µg/m³]	Benzene concentration 2019 [µg/m³]
Kaunas 02	2,50	1,05	**Kaunas 24**	1,92	1,22
Kaunas 04	2,14	0,87	**Kaunas 26**	1,94	1,05
Kaunas 14	1,68	0,65	**Kaunas 27**	2,32	1,08
Kaunas 18	1,65	0,82	**Kaunas 31**	1,83	0,80

Tab. 45: Benzene - Comparison of the mean values from 2010/2011 and 2019 - Kaunas agglomeration

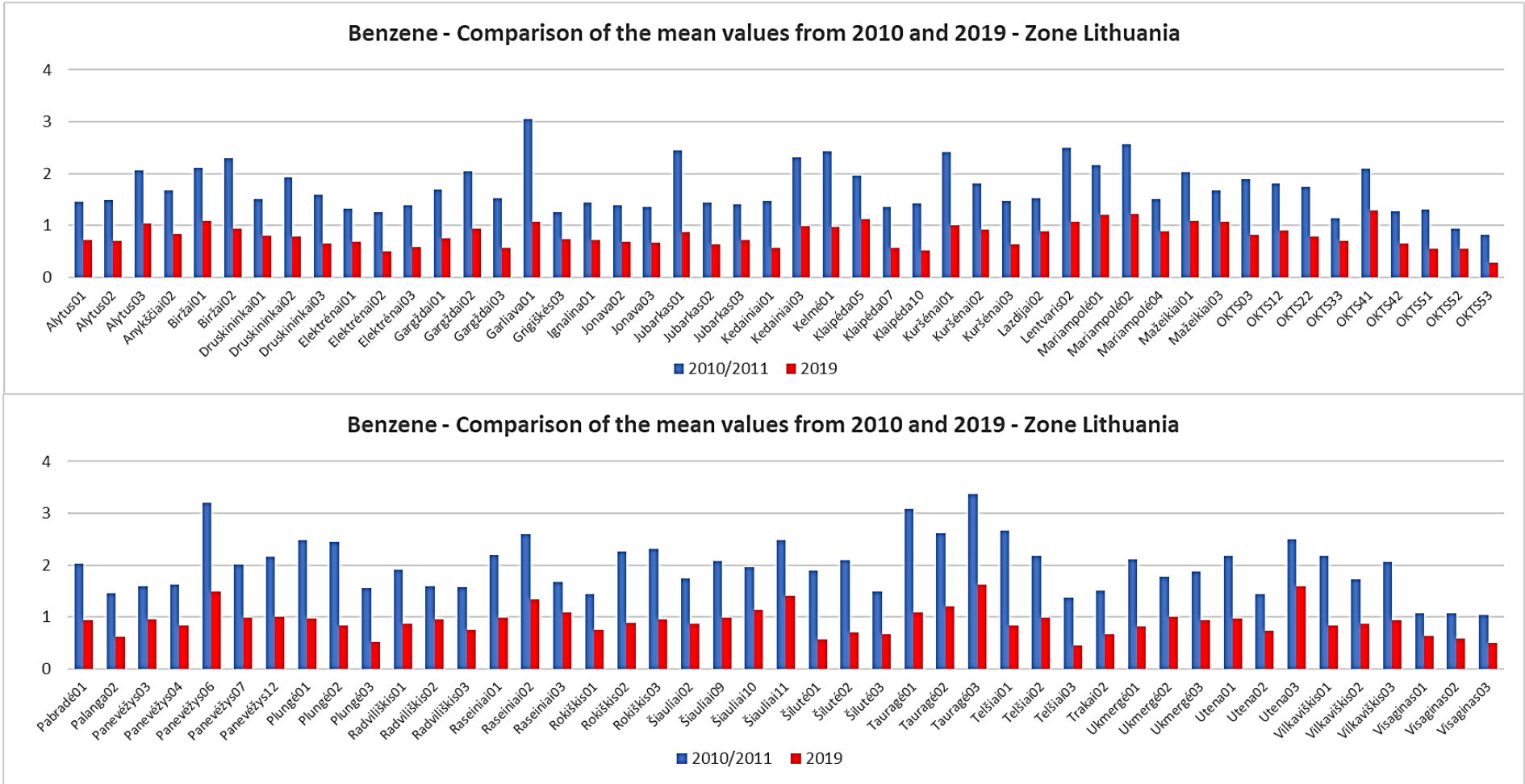


Fig. 140: Benzene - Comparison of the mean values from 2010/2011 and 2019 - Zone Lithuania (without Vilnius and Kaunas agglomerations)

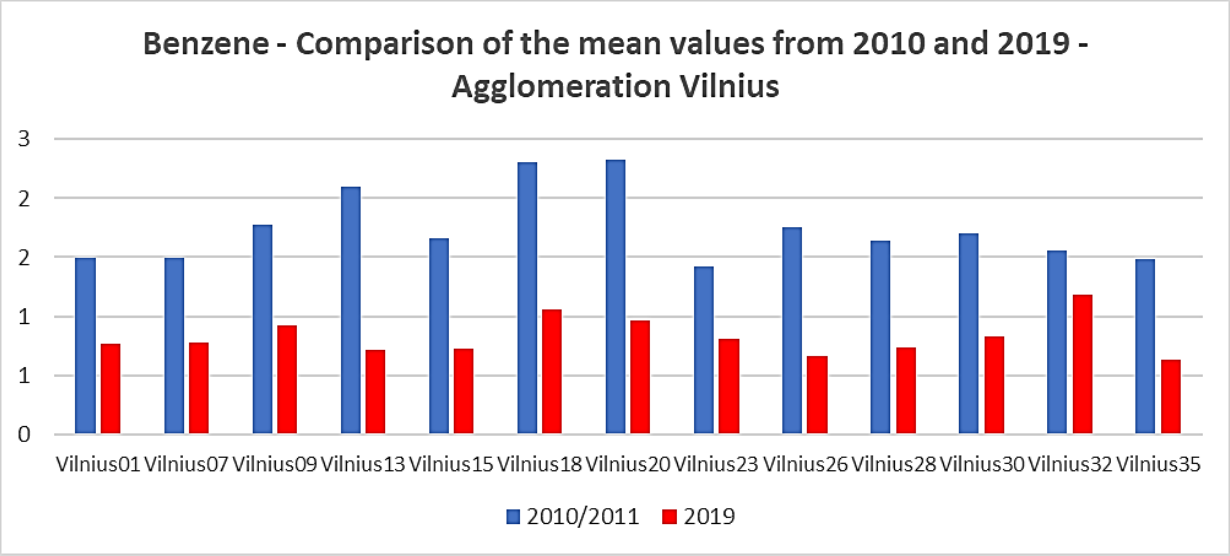


Fig. 141: Benzene - Comparison of the mean values from 2010/2011 and 2019 - Vilnius agglomeration

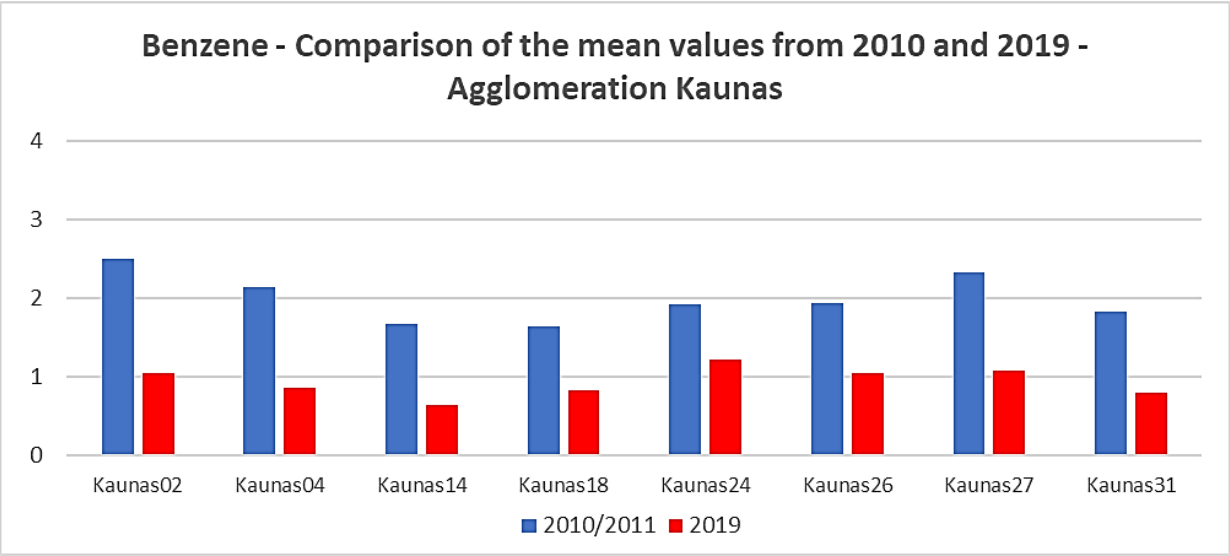


Fig. 142: Benzene - Comparison of the mean values from 2010/2011 and 2019 - Kaunas agglomeration

11. Optimization of the Zones and Agglomerations Defined for the Air Quality Assessment

Establishment of zones and agglomerations is specified in the Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe (Current consolidated version: from 18/09/2015) as follows: „It is appropriate to classify the territory of each Member State into zones or agglomerations reflecting the population density. Member States shall establish zones and agglomerations throughout their territory. Air quality assessment and air quality management shall be carried out in all zones and agglomerations. 'Zone' shall mean part of the territory of a Member State, as delimited by that Member State for the purposes of air quality assessment and management; 'Agglomeration' shall mean a zone that is a conurbation with a population in excess of 250 000 inhabitants or, where the population is 250 000 inhabitants or less, with a given population density per km^2 to be established by the Member States;"

From the above definitions and from the maps it is clear that the current division of the country into 1 zone (the whole territory of Lithuania) and 2 agglomerations (Vilnius and Kaunas) is perfectly satisfactory. There are currently 2 cities and their suburbs in Lithuania, where the population exceeds 250 thousand. - Vilnius (with a population of 580,020 as of 2020 - Wikipedia) and Kaunas (with a population estimated at 289,380 as of 2020 - Wikipedia). It is clear from the maps that even the concentrations of some pollutants (especially NO_2) are slightly increased in these agglomerations.

It follows from the above that the results of this project confirm the current setting of zones and agglomerations for the air quality assessment and the study contractor does not recommend changing it now.

12. Optimization of the Air Quality Monitoring Network

Determination of the scope of air pollution monitoring and the location of air pollution monitoring stations is specified in the Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe (Current consolidated version: from 18/09/2015), axactly in ANNEX III – „Assessment of ambient air quality and location of sampling points for the measurement of sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter (PM_{10} and $PM_{2.5}$), lead, benzene and carbon monoxide in ambient air" and in ANNEX V – „Criteria for determining minimum numbers of sampling points for fixed measurement of concentrations of sulphur dioxide, nitrogen dioxide

and oxides of nitrogen, particulate matter (PM_{10}, $PM_{2.5}$), lead, benzene and carbon monoxide in ambient air".
The current number of measuring locations, as well as their typology, is in full compliance with the above-mentioned legislative regulations.
In Tab. 46 the required numbers of monitoring locations are given depending on the population and on the measured concentrations of individual pollutants. Below the table, there are also additional notes to the number of measuring locations for dust particles of different fractions:
„Where $PM_{2.5}$ and PM_{10} are measured in accordance with Article 8 at the same monitoring station, these shall count as two separate sampling points. The total number of $PM_{2.5}$ and PM_{10} sampling points in a Member State required under Section A(1) shall not differ by more than a factor of 2, and the number of $PM_{2.5}$ sampling points in the urban background of agglomerations and urban areas shall meet the requirements under Section B of Annex V."

Given that there are currently 15 locations in the territory of Lithuania where PM_{10} is monitored and only 7 sites where $PM_{2.5}$ is monitored, the contractor recommends adding at least 1 additional site where the $PM_{2.5}$ fraction would be monitored. Due to the minimization of potential costs and the size of the city, the contractor would recommend adding $PM_{2.5}$ measurement to the existing air pollution monitoring station Panevėžys, Centras.

In addition to this, the legislative contractor also recommends the construction of one air pollution monitoring station (urban background location), eg. in the Tauragė location. Such a station should have a regional representativeness. At this station, the contractor would recommend monitoring of PM_{10}, $PM_{2.5}$, NO_2 and basic meteorological parameters.

Population of agglomeration or zone (thousands)	If maximum concentrations exceed the upper assessment threshold (1)		If maximum concentrations are between the upper and lower assessment thresholds	
	Pollutants except PM	PM (2) (sum of PM_{10} and $PM_{2.5}$)	Pollutants except PM	PM (2) (sum of PM_{10} and $PM_{2.5}$)
0-249	1	2	1	1
250-499	2	3	1	2
500-749	2	3	1	2
750-999	3	4	1	2
1 000 -1 499	4	6	2	3
1 500 -1 999	5	7	2	3
2 000 -2 749	6	8	3	4
2 750 -3 749	7	10	3	4
3 750 -4 749	8	11	3	6
4 750 -5 999	9	13	4	6
≥ 6 000	10	15	4	7

(1) For nitrogen dioxide, particulate matter, benzene and carbon monoxide: to include at least one urban background monitoring station and one traffic-orientated station provided this does not increase the number of sampling points. For these pollutants, the total number of urban-background stations and the total number of traffic oriented stations in a Member State required under Section A(1) shall not differ by more than a factor of 2. Sampling points with exceedances of the limit value for PM_{10} within the last three years shall be maintained, unless a relocation is necessary owing to special circumstances, in particular spatial development.

(2) Where PM2.5 and PM10 are measured in accordance with Article 8 at the same monitoring station, these shall count as two separate sampling points. The total number of PM2.5 and PM10 sampling points in a Member State required under Section A(1) shall not differ by more than a factor of 2, and the number of PM2.5 sampling points in the urban background of agglomerations and urban areas shall meet the requirements under Section B of Annex V.

Tab. 46: Criteria for determining minimum numbers of sampling points for fixed measurement of concentrations of sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter (PM_{10}, $PM_{2.5}$), lead, benzene and carbon monoxide in ambient air (source: Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe)

13. POPs Monitoring

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Passive air sampling of persistent organic pollutants in Lithuania

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Roman Prokeš, Petra Přibylová, Jakub Martiník and Petr Kukučka: Passive air sampling of persistent organic pollutants in Lithuania, Masaryk University, RECETOX. RECETOX-TOCOEN REPORT No. 709. February 2020.

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13.1 Introduction

Based on the agreement between ENVItech Bohemia s.r.o. and RECETOX Centre, Faculty of Science, Masaryk University in Brno, Czech Republic, RECETOX performed the study focused on passive air sampling of persistent organic pollutants (POPs) in Lithuania.
The project goal was to collect 16 samples using passive air sampling method in two sites in Lithuania during one year study and analyzed them for the levels of polychlorinated dibenzo-p-dioxins and -furans (PCDDs/Fs), polychlorinated biphenyl (PCBs), organochlorinated pesticides (OCPs) and polycyclic aromatic hydrocarbons (PAHs).

13.2 Background

Passive air sampling of ambient air has started at RECETOX since 2003 and it has been applied in various case studies and projects. Nowadays three monitoring networks MONET Czech Republic, MONET Europe and MONET Africa are operated on basis of this simple, easy to install and handle, low-cost and robust technique. Passive air samplers were calibrated in central Europe, artic and African climate and the results were compared with the conventional active air sampling method (Klanova et al., 2006, Chaemfa et al., 2008, Pribylova et al., 2012).

The main issue in case of the ambient air monitoring is the comparability of data from active and passive sampling of persistent organic pollutants in the air. It is hindered by uncertainties related to the derivation of sampling rates and concentrations, as well as differences in the duration, volume and frequency of sampling (Bohlin et al., 2014, Holt et al., 2017).

Applied analytical techniques and quality assurance/quality control procedures (QA/QC) are also an important source of uncertainty. While the round interlaboratory tests are well established in the analytical community, the long-term intercomparison of the sampling networks using different sampling techniques is rare.

Another important factor potentially limiting the comparability of data is data handling, i.e. using various methods of aggregation, summing, exclusion of extreme values etc. This was clearly demonstrated in the first data collection campaign of the Global Monitoring. A lack of standardization of the data collection process together with missing metadata caused significant losses of reported data during the validation process.

To derive a sampling rates and to calculate air concentrations of POPs from PUF-PAS (Polyurethane Foam - Passive Air Samplers) measurements data from a long-term monitoring program in Košetice, Czech Republic were used to derive site-based/sampler specific variables: sampling rates, calculated using a site calibration, provided similar results for most gas-phase POPs and enabled to derive air concentrations using “default” values (commonly accepted sampling rates). Nevertheless, monthly PUF passive sampling derived air concentrations for the majority of the target compounds were significantly different to active samples regardless of the input values (site/sampler based or default) used to calculate them, which reveals seasonal differences between both methods of sampling. Annual average PUF passive sampling derived air concentrations were within the same order of magnitude as AAS (Active Air Sampling) measurements except for the particle-phase compounds (Kalina et al., 2018b and 2019).

Another attempt for processing data from passive monitoring was developed by Harner et al. in 2016 and further improved by Herkert et al. in 2018, using various meteorological characteristics.

A set of 14 passive sampling sites across the Czech Republic was utilized to assess spatial distribution between sites with different natural and cultural character and helped to understand clusters of sites with similar characteristics. It showed there are background sites mainly of high altitude (mountains), agriculturally burdened sites and sites with an industrial and/or traffic source of pollution.
To overcome this seasonal and spatial differences within and between the monitoring networks, a method of trend analysis of the passive monitoring data was developed and tested on extensive sets of POPs. A parallel passive (MONET) and active (EMEP) monitoring data spanning over 10 years were used for calibration of that method on both single site (Košetice, Czech Republic) and set of collocated monitoring stations over the Central and Northern Europe. Both papers showed that there is a very good agreement between trend results of the active and the passive sampling even in case when the derived sampling rates are substantially different (Kalina et al., 2018a).

13.3 Persistent Organic Pollutants

13.3.1 Stockholm Convention on Persistent Organic Pollutants

The Stockholm Convention on Persistent Organic Pollutants (POPs) (*UNEP, 2001*) entered into force on May 17th, 2004, and has currently 184 Parties. The objective of the Stockholm Convention is to protect human health and environment from persistent organic pollutants by reducing or eliminating their releases into the environment.

Parties to the Stockholm Convention are required to develop their National Implementation Plan to demonstrate their implementation of the Stockholm Convention's obligations including the arrangements necessary for evaluating the effectiveness of adopted measures. It was agreed that a mechanism providing Parties with a comparable monitoring data is needed, in particular for evaluation whether the objective of Stockholm Convention is being reached. Although a number of regional and global monitoring programs have so far been established to report on the presence of POPs in the environment, there is a very little previous experience with POPs monitoring designed to help to evaluate the effectiveness of a legally binding international agreement.

Reliable identification of trends requires that a statistical evaluation is carried out within the design of each national monitoring program contributing to the Global Monitoring Plan (GMP), to ensure that it is powerful enough to detect trends in time. In order to meet the objectives of the GMP (support the preparation of regional reports of comparable information on environmental background levels), further guidance must be provided on how information is to be collected, analyzed, statistically treated, and reported.

Substantial geographic differences between regions currently exist in the availability of monitoring capacity to provide comparable data for the purposes of the effectiveness evaluation of the Stockholm Convention. Differences in capacity within and between regions provide opportunities for regional capacity building focused on providing capability to detect regional trends. In order to put the GMP into regional reality, capacity building and sustainability will be a crucial aspects for its effective implementation (www.pops.int, 2020).

13.3.2 POPs

Persistent organic pollutants (POPs) is a generic term, encompassing several classes of organic contaminants including polychlorinated dibenzo-*p*-dioxins and furans (PCDDs/Fs), polychlorinated biphenyls (PCBs), organochlorine pesticides (OCPs) and other industrial and agricultural chemicals. Due to their former wide distribution, ability to bioaccumulate in the biotic tissues, and potential harmful effects such as immunotoxicity, neurotoxicity, developmental toxicity, carcinogenicity, mutagenicity, and endocrine disruption potentials, POPs have remained in the centre of scientific attention for the last decades. In addition, polycyclic aromatic hydrocarbons (PAHs) are often included in this group of compounds because of their potential for a long-range transport even though their physicochemical properties do not suggest the persistency and bioaccumulation potential.

Beyond the original "dirty dozen" (polychlorinated biphenyls, polychlorinated dibenzo-*p*-dioxins and furans, and organochlorine pesticides such as DDT, HCB or cyclodien pesticides), several new classes of chemicals were added to the annexes of the Stockholm Convention in the last years. Among them, two important classes of industrial chemicals: polybrominated flame retardants (polybrominated diphenylethers, PBDEs), hexabromobiphenyl, HBB, since 2009 and hexabromododecane, HBCDD since 2013; and perfluorinated compounds (perfluorooctan sulfonate, PFOS, since 2009).

13.4 Sampling

13.4.1 Passive air sampling characterization

Passive air sampling method was used in this study, the technique is certified by Ministry of Environment of the Czech Republic (Nmet, Certificate No. 91393/ENV/15, Čupr et al., 2015).
Passive air sampler consists of two stainless steel bowls attached to the common axes to form a protective chamber for the polyurethane foam disk (PUF disk). The disk is attached to the same rod and it is sheltered against the wet and dry atmospheric deposition, wind and UV light. The air flux is stabilized by the PUF disk positioning as well. The sampling period depends on type and concentration level of measured pollutants, and it was 84 days in this case.

PUF disks were made from non-colored foam (type T3037, Molitan, CZ) with defined thickness (1,5 cm) and diameter (15 cm), and small hole in the middle. All disks were cleaned in Soxhlet extractors in set of solvents chosen according to the group of pollutants that is targeted for sampling. PUF disk extracted in acetone and dichloromethane (DCM) is appropriate for the analyses of organochlorinated pesticides (OCPs), polychlorinated biphenyls (ind-PCBs). PUF disk

pre-extracted in acetone and toluene (TOL) is appropriate for the analyses of polychlorinated dibenzo-p-dioxins (PCDD), dibenzofurans (PCDD/Fs) and dioxins-like PCBs (dl-PCBs).

Each disk with the metal insert was wrapped in two layers of aluminium foil. The date of cleaning and type of cleaning (solvents like DCM or TOL) was noted on the package. The labeled wrapped PUF disks were placed into a zip-lock polyethylene bag, excess air was removed and bag is closed. Clean disks were stored in a freezer at -18°C prior to deployment. Samplers and sampling medium were distributed directly to our partners with the methodology and sampling protocols.

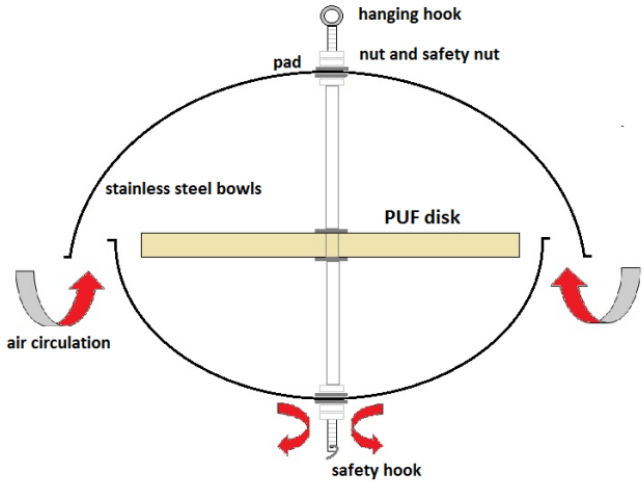

Fig. 143: Scheme of the passive air sampler with PUF disk.

Passive air sampler was only hanged in vertical position with the bigger bowl up and placed ideally in the man breathing zone 1,5 – 2 m above the ground. The metal construction was commonly used for the sampler installation and the samplers were located in the open terrain location without significant obstacles for free air stream around. Details of passive air sampling methodology are given in Prokeš et all, 2019.

13.4.2 Location of sampling sites

Two parallel samplers were deployed at each site in Lithuania, see Table 47. PUF disks were collected every 12 weeks (84 days) for the PAHs, PCBs, OCPs and PCDD/Fs analysis.

Sampling site	Site type	Longitude	Latitude
Plateliai	background	56.01	21.886948
Rūgšteliškės	background	55.440556	26.066668

Tab. 47: Sampling sites in Lithuania

Fig. 144: Map of sampling sites operating in Lithuania in 2019 and two reference sites in Czech Republic.

13.5 Sampling Analytical Procedures

All samples were analyzed in RECETOX: Trace Analysis Laboratories, which are accredited in accordance with ISO standards: ČSN EN ISO/IEC 17025:2018(Certificate of Accreditation No. 586/2019, the Testing Laboratory No. 1666).

13.5.1 PAHs, PCBs and OCPs

The recovery standards (^{2}H for PAHs, PCB 30 and PCB 185 for PCBs and OCPs) were spiked on each sample prior to extraction. One laboratory blank and one reference material were also analyzed with each set of samples. All samples (DCM disks) were extracted with dichloromethane in a Büchi System B-811 automatic extractor (Büchi, Switzerland). After extraction, the sample volume was reduced under a gentle stream of nitrogen at ambient temperature and all samples were split 1/9 (PAHs/PCBs, OCPs).

Aliquot of 90% was used for PCBs and OCPs analyses. Fractionation was achieved on a silica gel column; a sulphuric acid modified silica gel column was used for PCB/OCP samples, following by elution of 30 ml of DCM/hexane mixture (50%). The extract was reduced for the final volume of 50 µl and PCB 121 was used as the internal standards for PCBs and OCPs.

The 10 % of extract for PAHs was fractionated on a silica column (5 g of activated silica 0.063 – 0.200 mm). The first fraction (10 mL n-hexane), containing aliphatic hydrocarbons, was discarded. The second fraction (20 mL DCM), containing PAHs, was collected and then reduced by stream of nitrogen and transferred into an insert in a vial. Terphenyl was added as syringe standard (final volume 50 µl).

Samples (PCBs, OCPs) were analyzed by gas chromatography-mass spectrometry (GC-MS/MS) system Agilent QQQ 7000B combined to gas chromatography Agilent 7890 equipped with a 60 m x 0.25 mm x 0.25 µm SGE- HT8 column. The MS was operated in positive electron ionization impact mode (EI+) using multiple reaction monitoring (MRM). Injection was splitless 1 µl at 280°C, with He as carrier gas at 1.5 ml min^{-1}. The GC temperature programme was 80°C (1 min hold), then 15°C min^{-1} to 180°C, and finally 5°C min^{-1} to 300°C (5 min hold).

PAHs were analyzed by gas chromatography-mass spectrometry (GC-MS/MS) system Agilent QQQ 7000B combined to gas chromatography Agilent 7890 equipped with a 60 m x 0.25 mm x 0.25 µm Rxi-5SilMS column (Restek, USA) column in SIM mode. Injection was 1 µl splitless at 280°C, with He as carrier gas at constant flow 1.5 ml min^{-1}. The GC programme was 80°C (1 min hold), then 15°C min^{-1} to 180°C, followed 5°C min^{-1} to 310°C (20 min hold). The MS was operated in EI+ SIM mode.

13.5.2 PCDDs/Fs and dl-PCBs

All samples (TOL disks) were extracted with toluene in a Soxhlet extractor (60 minutes warm Soxhlet followed by 30 minutes of solvent rinsing) with toluene in a B-811 extraction unit. Prior to extraction, the samples were spiked with ^{13}C PCDDs/Fs, ^{13}C dl-PCBs (77, 81, 126, 169, 105, 114, 118, 123, 156, 157, 167 and 189).

For dl-PCBs, PCDDs, PCDFs of extract was cleaned-up using glass column (1 cm i.d.) filled with silanized glass wool, silica, potassium silicate, silica, H_2SO_4 on silica (44%, w/w), silica and anhydrous Na_2SO_4. Elution was done using *n*-hexane and the eluates were concentrated by a Turbovap evaporator (Biotage, Sweden) and the residues were dissolved in cyclohexane. Fractionation was achieved in a micro column (6 mm i.d) containing from bottom to top: 50 mg silica gel, 70 mg charcoal/silica gel (1:40) and 50 mg of silica gel. The column was prewashed with 5 ml of toluene, followed by 5 ml of DCM/cyclohexane mixture (30%), then the sample was applied and eluted with 9 ml DCM/cyclohexane mixture (30%) in fraction 1 (mono-ortho dl-PCBs) and 40 ml of toluene in fraction 2 (PCDDs/Fs, non-ortho dl-PCBs). Each fraction was concentrated using stream of nitrogen in a TurboVap concentrator unit and transferred into an insert in a vial. The syringe standards (^{13}C PCDDs) were added to all samples, the final volume was 50 µl.

Two gas chromatographs coupled to a high-resolution mass spectrometer (Thermo Scientific dual GC Trace 1310 and HRMS DFS) were used for the separation and quantification of the analytes. The dl-PCB fraction was splitless injected (260 °C) into a 60 m × 0.25 mm × 0.25 µm SGE HT8 column operating at the oven program: initial temperature of 120°C held for 1.5 min, ramp of 30°C min^{-1} to 200°C, and ramp of 3°C min^{-1} to 310°C, hold time 10 min. The PCDDs/Fs fraction was splitless injected (280°C) into a 60 m × 0.25 mm × 0.25 µm Restek Rtx-Dioxin2 column at the oven temperature program: initial temperature of 120°C held for 1.5 min, ramp

30°C min^{-1} to 200°C, hold time of 0 min, ramp of 3°C min^{-1} to 300°C, hold time of 2.5 min, ramp of 30°C min^{-1} to 320°C, hold time of 20 min. Helium at a constant flow of 1 m, min^{-1} was used as carrier gas for both columns. The mass spectrometer was operating at 10,000 resolution (10% valley) and 45 eV energy of electrons. Thermo Scientific™ TargetQuan 3 data processing software was used for isotope dilution quantification.

13.6 Data comparability

The whole procedure from sampling to final analysis has been performed using standard operation procedure (SOP) which guarantees the best data comparability. All material and samples were prepared and analyzed in RECETOX: Trace Analysis Laboratories, which are working under the QA/QC regime, and successfully participate in the international intercalibration tests on the annual basis.

Method performance was tested prior to sample preparation by analyzing a reference material. Recovery of native analytes measured in the reference material varied from 88 to 100% for PCBs, from 75 to 98% for OCPs. The results for dl-PCBs, and PCDDs/Fs samples were recovery corrected through the isotope dilution analytical method. The remaining analytes were not recovery corrected. PUF-PAS field blanks were analyzed within each set. Field blanks were used to determine method detection limits (MDLs), based on the average + 3x standard deviation of the field blanks. For compounds that were not detected in the field blanks, the instrument detection limits, determined as 3*signal:noise ratio were used.

13.7 Data storage

The data are stored in the GENASIS (**G**lobal **EN**vironmental **AS**sessment **I**nformation **S**ystem) database system operated by RECETOX and IBA (Institute of biostatistics and analyses) institutes of Masaryk University, Brno, Czech Republic. See the web page: www.genasis.cz.

For the needs of GMP, data aggregated are available to eligible persons on the website: http://www.pops-gmp.org/index.php?pg=gmp-data-warehouse.

13.8 Results

The results presented here were determined in passive air samples during one-year case study.

All data reported are given as an amount of the compound per sample (=PUF disk). These values can be easily re-calculated to the air concentrations (=per cubic meter) using various models (Harner, 2016 and Herkert at al., 2018). As these models are still a subject to development and verification, we keep raw data in their original format.

Passive air concentrations from four sampling periods in Lithuania are compared in this report together with passive air data derived from two reference sampling sites in Czech Republic (EMEP background station Košetice and urban background station in Praha).

13.8.1 PAHs

Concentrations of PAHs determined in the passive air samples are presented in Tab. 48 - 49. The highest concentration of PAHs was measured in Rūgšteliškės in last winter campaign. The lowest levels of PAHs are typically measured in summer season. PAHs data measured in Lithuania were compared with PAHs levels in Košetice and Praha (Fig. 145 - 146). These data showed similar concentration levels during monitored period of sampling in 2019.

SAMPLING SITE	Plateliai	Plateliai	Plateliai	Plateliai
Sampling start	22.01.2019	16.04.2019	09.07.2019	01.10.2019
Sampling end	16.04.2019	09.07.2019	01.10.2019	24.12.2019
Naphthalene	110,00	37,10	121,00	218,00
Acenaphthylene	2,71	1,77	4,53	6,52
Acenapthene	9,36	1,33	4,12	35,10
Fluorene	290,00	15,70	43,50	407,00
Phenathrene	1330,00	129,00	162,00	1510,00
Anthracene	6,62	1,44	3,10	16,30
Fluoranthene	650,00	93,50	65,90	571,00
Pyrene	295,00	45,20	33,80	322,00
Benzo(a)anthracene	16,00	3,01	3,09	19,00
Chrysene	41,10	7,82	4,90	35,60
Benzo(b)fluoranthene	23,70	4,54	3,80	22,90
Benzo(k)fluoranthene	11,00	3,46	<1,49	7,73
Benzo(a)pyrene	4,54	<1,81	<1,81	7,02
Indeno(123cd)pyrene	11,90	3,01	0,81	5,14
Dibenzo(ah)anthracene	<0,730	<0,730	<0,730	<0,730
Benzo(ghi)perylene	8,46	2,53	<0,990	4,13
SUM_16PAH	2810,00	349,00	451,00	3190,00
Biphenyl	75,40	10,90	28,00	156,00
Retene	79,50	17,90	11,00	117,00
Benzo(b)fluorene	21,70	2,45	2,34	29,30
Benzo-nafto-thiophene	2,40	1,17	0,64	2,13
Benzo(ghi)fluoranthene	25,70	3,96	3,18	29,90
Cyclopenta(cd)pyrene	<0,410	<0,410	<0,410	<0,410
Triphenylene	12,50	3,56	2,42	11,80
Benzo(j)fluoranthene	20,20	5,64	1,66	10,50
Benzo(e)pyrene	12,20	3,48	8,02	10,90
Perylene	<1,58	<1,58	<1,58	<1,58
Dibenzo(ac)anthracene	<0,730	<0,730	<0,730	<0,730
Anthanthrene	<1,52	<1,52	<1,52	<1,52
Coronene	<1,89	<1,89	<1,89	<1,89
SUM_29PAH	3060,00	398,00	508,00	3550,00

Tab 48: Concentrations of PAHs determined in passive air samplers (ng per sample) in Plateliai.

SAMPLING SITE	Rūgšteliškės	Rūgšteliškės	Rūgšteliškės	Rūgšteliškės
Sampling start	22.01.2019	16.04.2019	09.07.2019	01.10.2019
Sampling end	16.04.2019	09.07.2019	01.10.2019	24.12.2019
Naphthalene	78,30	29,60	129,00	305,00
Acenaphthylene	4,29	1,68	5,63	28,50
Acenapthene	14,70	2,11	4,23	40,10
Fluorene	220,00	19,60	38,80	455,00
Phenathrene	1080,00	232,00	199,00	1860,00
Anthracene	35,60	6,59	9,68	65,90
Fluoranthene	395,00	135,00	76,70	589,00
Pyrene	209,00	87,90	49,00	339,00
Benzo(a)anthracene	10,50	5,63	4,66	17,10
Chrysene	21,00	10,80	6,00	32,00
Benzo(b)fluoranthene	12,30	4,36	2,64	18,10
Benzo(k)fluoranthene	6,30	3,43	<1,49	6,00
Benzo(a)pyrene	2,95	<1,81	<1,81	5,75
Indeno(123cd)pyrene	5,55	1,91	<0,740	4,15
Dibenzo(ah)anthracene	<0,730	<0,730	<0,730	<0,730
Benzo(ghi)perylene	4,51	1,63	<0,990	3,32
SUM_16PAH	2100,00	542,00	525,00	3770,00
Biphenyl	96,30	11,10	28,90	199,00
Retene	147,00	46,90	98,00	282,00
Benzo(b)fluorene	12,80	6,40	3,92	24,90
Benzo-nafto-thiophene	1,00	1,07	0,63	1,89
Benzo(ghi)fluoranthene	16,50	7,27	4,62	26,70
Cyclopenta(cd)pyrene	<0,410	<0,410	<0,410	<0,410
Triphenylene	7,14	4,27	2,55	8,69
Benzo(j)fluoranthene	11,70	4,23	<1,45	8,35
Benzo(e)pyrene	7,31	2,61	1,89	9,45
Perylene	<1,58	<1,58	<1,58	<1,58
Dibenzo(ac)anthracene	<0,730	<0,730	<0,730	<0,730
Anthanthrene	<1,52	<1,52	<1,52	<1,52
Coronene	<1,89	<1,89	<1,89	<1,89
SUM_29PAH	2400,00	626,00	666,00	4330,00

Tab. 49: Concentrations of PAHs determined in passive air samplers (ng per sample) in Rūgšteliškės.

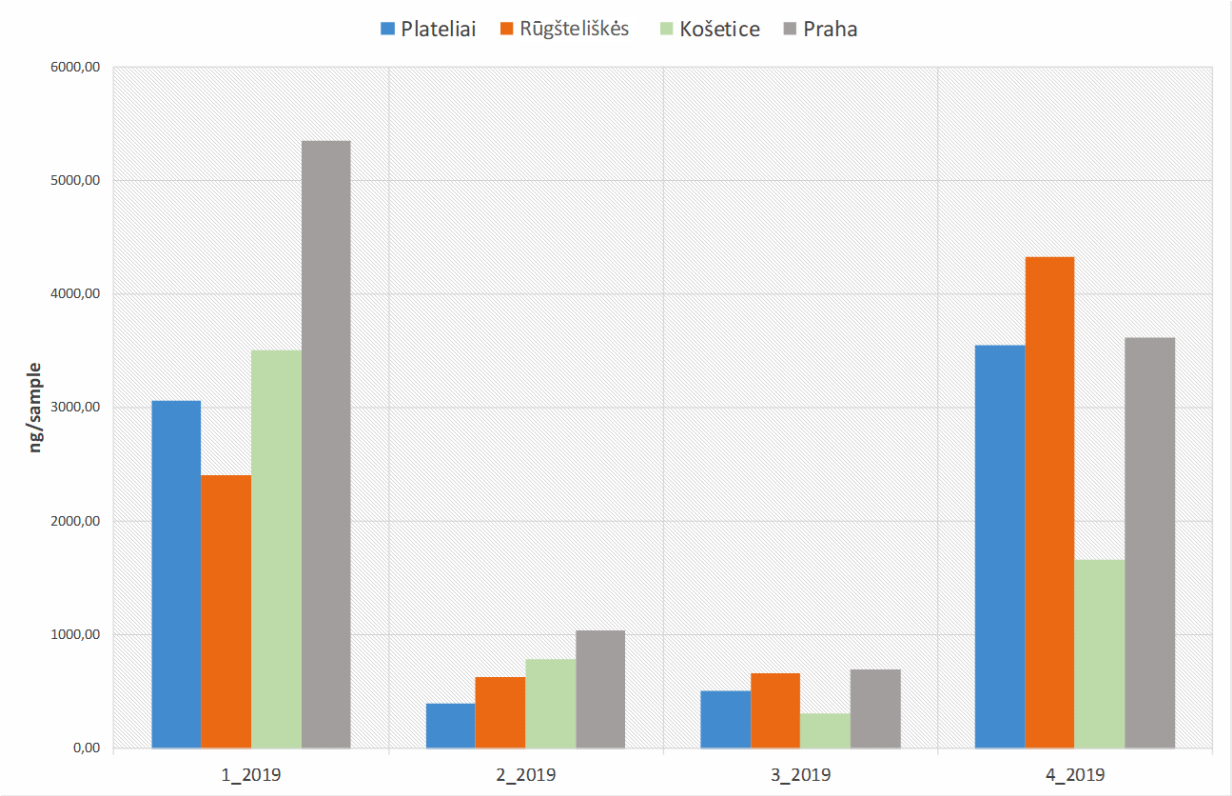

Fig. 145: Comparison of sum 29 PAHs levels in Plateliai and Rūgšteliškės with two Czech sites in Košetice and Praha.

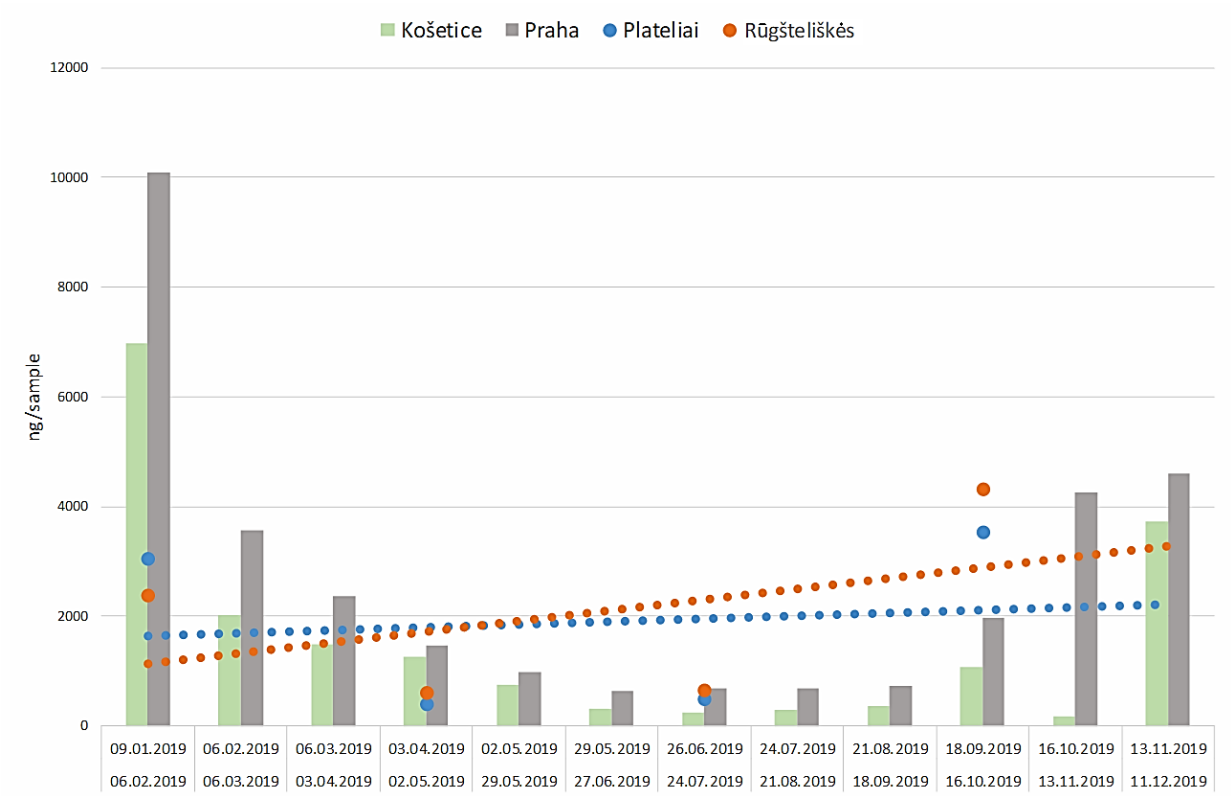

Fig. 146: Comparison of sum 29 PAHs levels in Košetice and Praha (28-days period of sampling) with linear interpolation of sum 29 PAHs levels in Plateliai and Rūgšteliškės for 84-days sampling interval in 2019.

13.8.2 OCPs and ind-PCBs

All data are shown in Tab. 50 and 51. The mean concentrations of the sum of 6 indicator polychlorinated biphenyls varied in the concentration range from 0.98 ng sample^{-1} to 2.01 ng sample^{-1}. The highest concentration was determined in Plateliai in spring season and the lowest in Rūgšteliškės in summer. The levels of ind-PCBs in Plateliai, Rūgšteliškės and Košetice are comparable. The highest levels of ind-PCB were measured at urban background station in Praha (Fig. 147 - 148).

Hexachlorocyclohexanes were measured as a group of four isomers where higher levels of HCHs were detected in Plateliai. These levels are higher than HCHs concentrations in Košetice and Praha (Fig. 149 - 150). The increasing linear trend of HCHs was also observed in Lithuania in 2019.

Similar to HCHs, DDT and its metabolites were also detected at all sampling sites. The highest concentrations of DDX were measured in Plateliai with maximum during last sampling period. Increasing trend can be found in Lithuania during presented case study (Fig. 152).

SAMPLING SITE	Plateliai	Plateliai	Plateliai	Plateliai
Sampling start	22.01.2019	16.04.2019	09.07.2019	01.10.2019
Sampling end	16.04.2019	09.07.2019	01.10.2019	24.12.2019
PCB 28	0,66	0,65	0,50	0,72
PCB 52	0,45	0,44	0,37	0,50
PCB 101	0,34	0,42	0,31	0,36
PCB 138	0,12	0,19	0,14	0,13
PCB 153	0,22	0,30	0,21	0,22
PCB 180	<0,0799	<0,0799	<0,0799	<0,0799
SUM_6PCB	1,79	2,01	1,53	1,92
OP_DDT	0,27	0,55	0,43	0,62
PP_DDD	0,06	0,08	0,08	0,09
OP_DDE	0,09	0,08	0,07	0,17
PP_DDE	1,64	1,56	1,61	4,59
OP_DDD	0,05	0,08	0,07	0,10
PP_DDT	0,29	0,60	0,45	0,56
SUM_DDX	2,39	2,95	2,70	6,12
A_HCH	0,58	0,91	0,93	0,97
B_HCH	0,05	0,11	0,09	0,09
G_HCH	0,39	0,53	0,64	0,64
D_HCH	<0,0611	<0,0611	<0,0611	<0,0611
SUM_HCH	1,01	1,55	1,65	1,70
PECB	1,24	0,39	0,58	1,27
HCB	8,18	4,31	6,36	7,68

Tab. 50: Concentrations of ind-PCBs and OCPs determined in passive air samplers (ng per sample) in Plateliai.

SAMPLING SITE	Rūgšteliškės	Rūgšteliškės	Rūgšteliškės	Rūgšteliškės
Sampling start	22.01.2019	16.04.2019	09.07.2019	01.10.2019
Sampling end	16.04.2019	09.07.2019	01.10.2019	24.12.2019
PCB 28	0,44	0,51	0,32	0,64
PCB 52	0,30	0,35	0,23	0,41
PCB 101	0,22	0,31	0,20	0,28
PCB 138	0,10	0,13	0,09	0,09
PCB 153	0,15	0,21	0,14	0,16
PCB 180	<0,0799	<0,0799	<0,0799	<0,0799
SUM_6PCB	1,20	1,51	0,98	1,58
OP_DDT	0,16	0,33	0,21	0,42
PP_DDD	0,04	0,04	0,04	0,06
OP_DDE	0,06	0,05	0,04	0,13
PP_DDE	0,95	0,88	0,65	3,20
OP_DDD	0,03	0,05	0,03	0,06
PP_DDT	0,17	0,32	0,24	0,34
SUM_DDX	1,40	1,68	1,21	4,22
A_HCH	0,47	0,71	0,62	0,93
B_HCH	0,04	0,09	0,05	0,08
G_HCH	0,25	0,36	0,34	0,49
D_HCH	<0,0611	<0,0611	<0,0611	<0,0611
SUM_HCH	0,75	1,16	1,01	1,50
PECB	1,22	0,30	0,52	1,29
HCB	6,15	3,34	5,52	7,24

Tab. 51: Concentrations of ind-PCBs and OCPs determined in passive air samplers (ng per sample) in Rūgšteliškės.

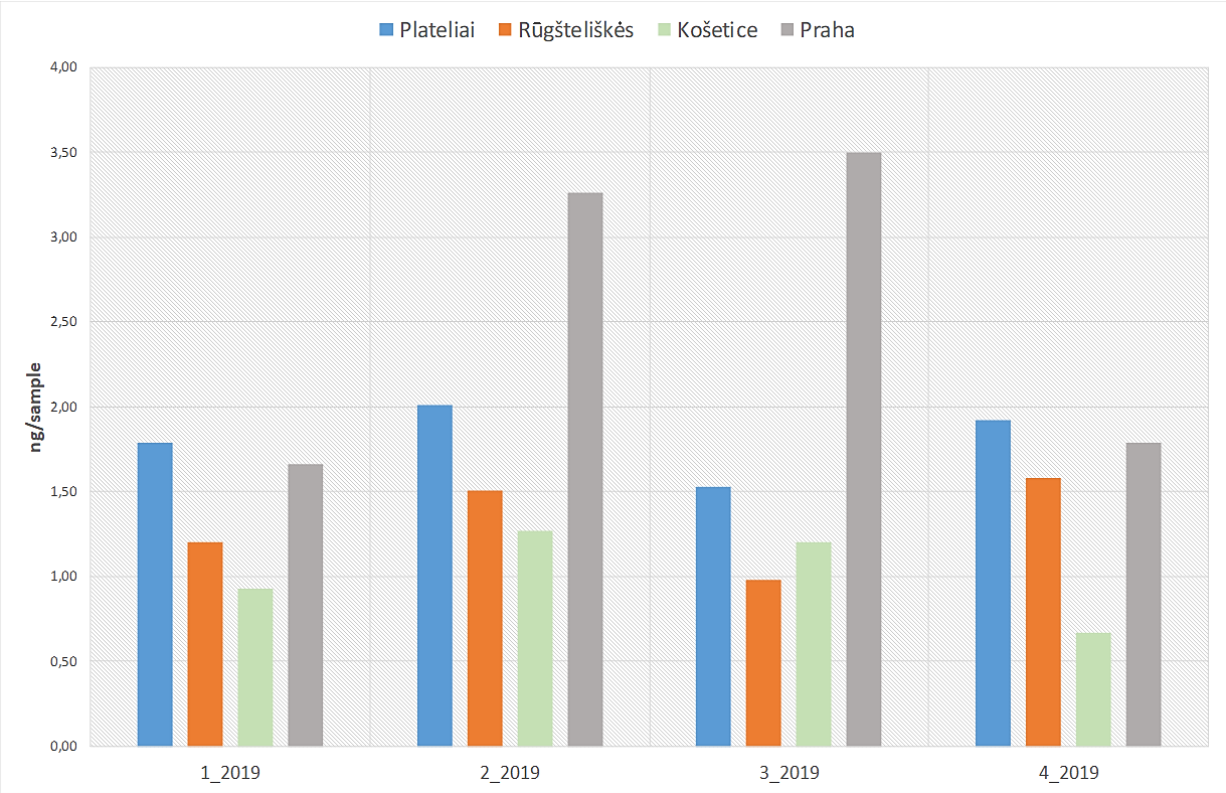

Fig. 147*: Comparison of sum ind-PCBs levels in Plateliai and Rūgšteliškės with two Czech sites in Košetice and Praha.*

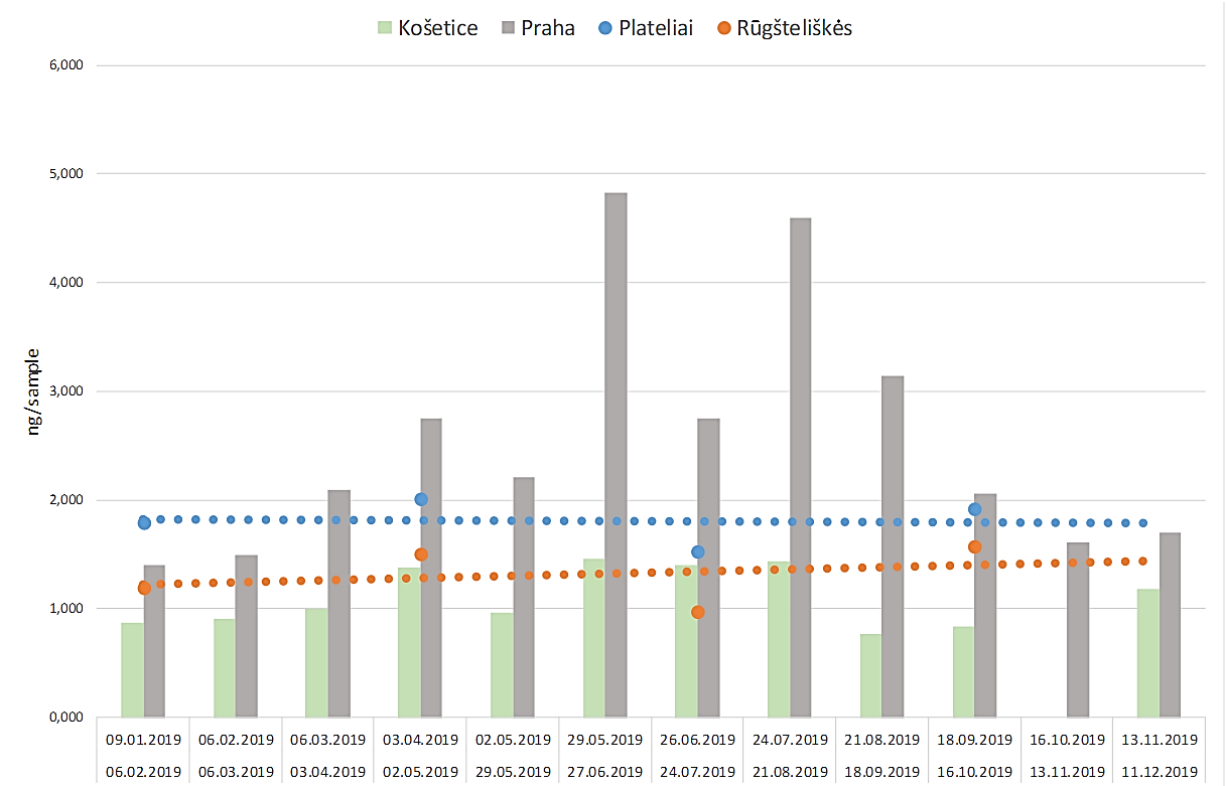

Fig. 148*: Comparison of sum ind-PCBs levels in Košetice and Praha (28-days period of sampling) with linear interpolation of sum ind-PCBs levels in Plateliai and Rūgšteliškės for 84-days sampling interval in 2019.*

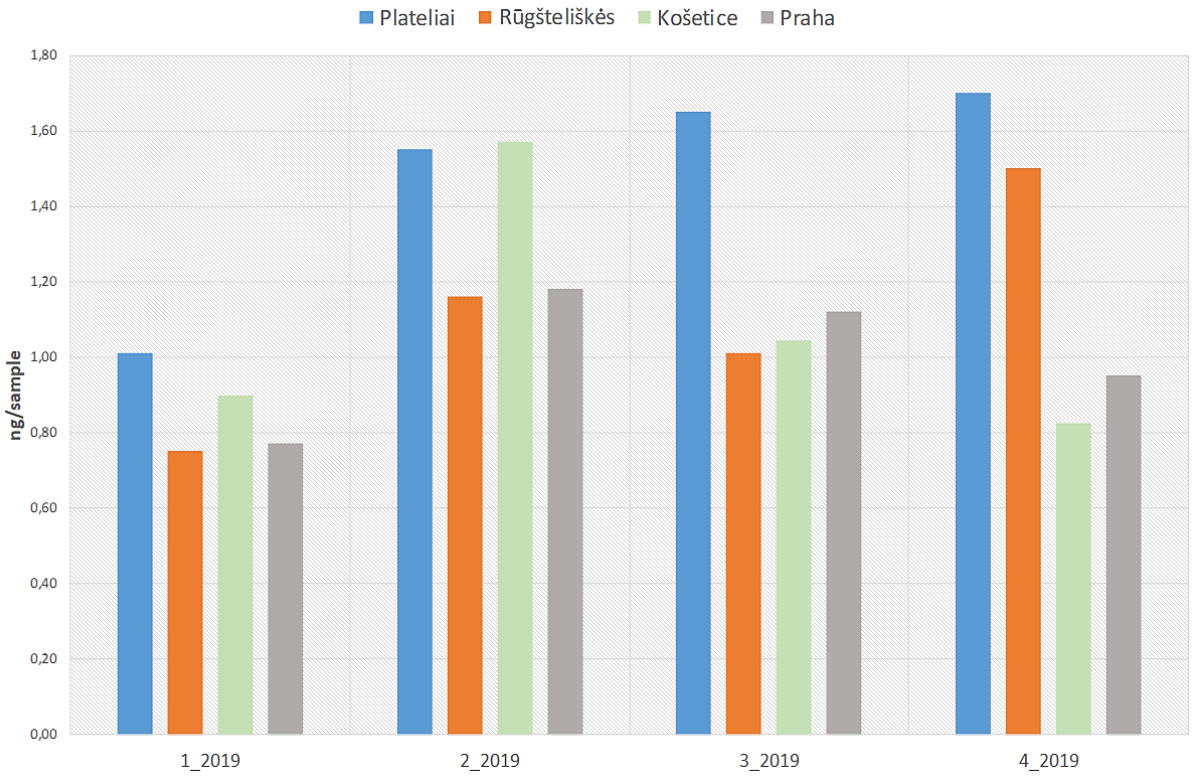

Fig. 149*: Comparison of sum HCHs levels in Plateliai and Rūgšteliškės with two Czech sites in Košetice and Praha.*

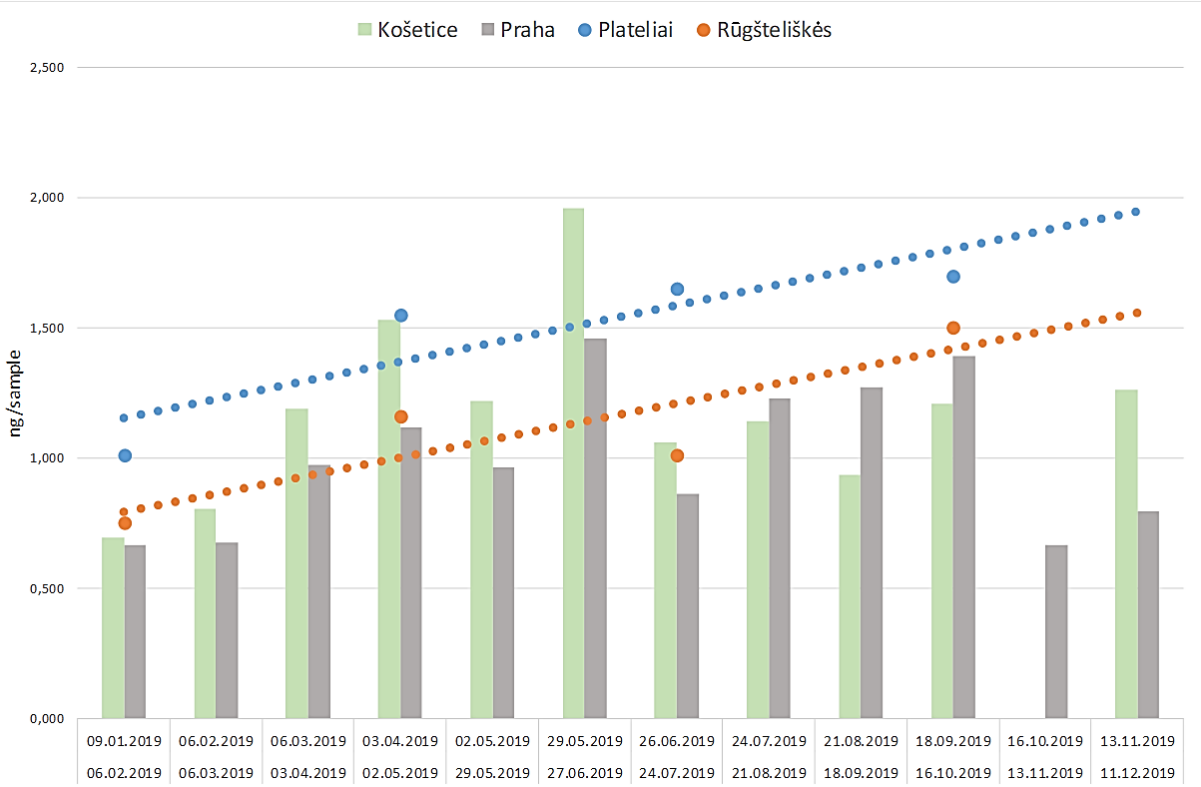

Fig. 150*: Comparison of sum HCHs levels in Košetice and Praha (28-days period of sampling) with linear interpolation of sum HCHs levels in Plateliai and Rūgšteliškės for 84-days sampling interval in 2019.*

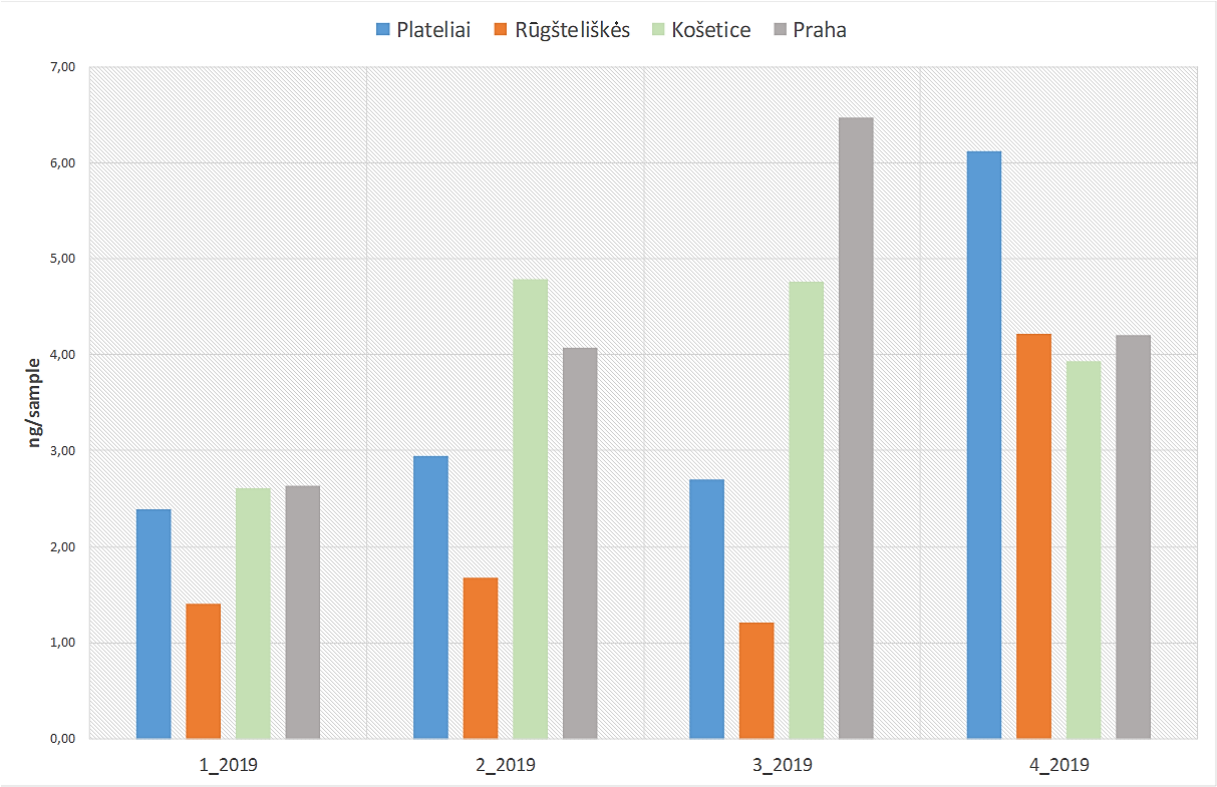

Fig. 151*: Comparison of sum DDX levels in Plateliai and Rūgšteliškės with two Czech sites in Košetice and Praha.*

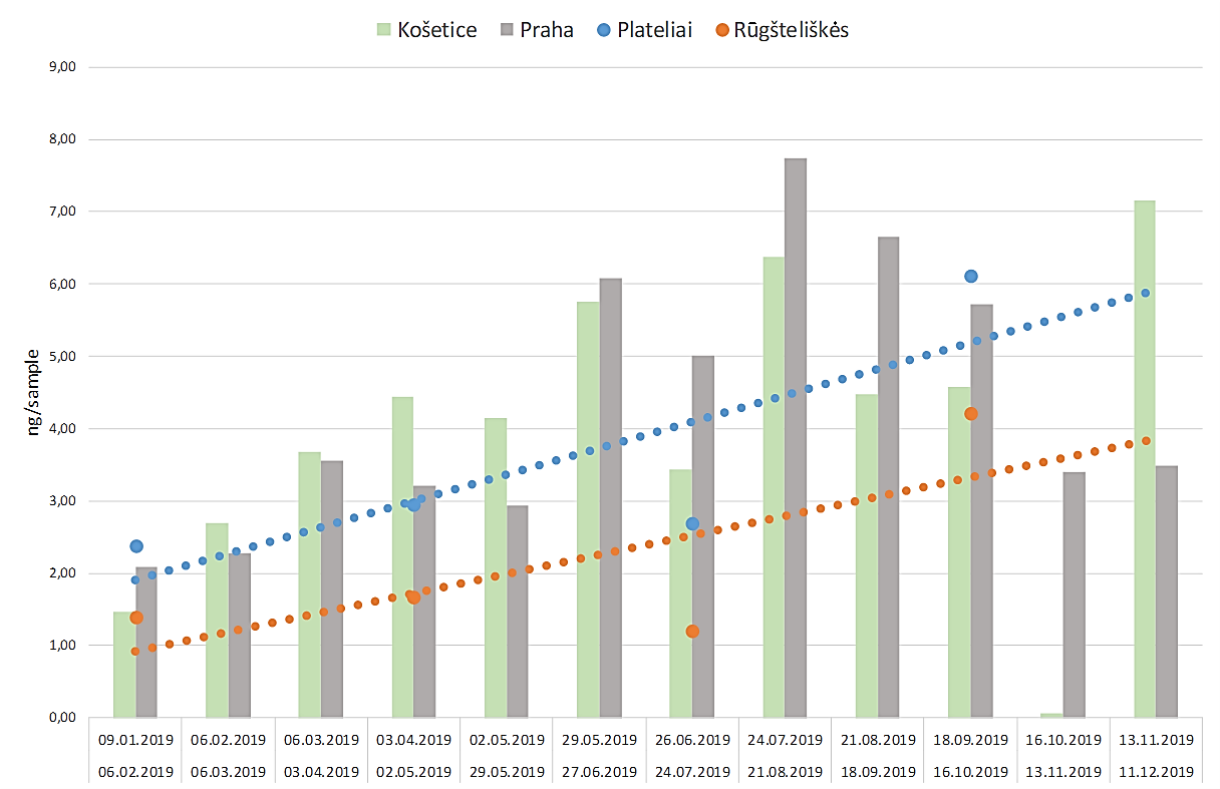

Fig. 152: Comparison of sum DDX levels in Košetice and Praha (28-days period of sampling) with linear interpolation of sum DDX levels in Plateliai and Rūgšteliškės for 84-days sampling interval in 2019.

13.8.3 dl-PCBs

Dioxin-like polychlorinated biphenyls (dl-PCBs), which are in the center of interests as the compounds with similar effects as PCDDs/Fs, were measured. Concentrations of all dl-PCBs detected in ambient air are shown in table 6 and 7. The highest concentration was detected in Plateliai during spring campaign. WHO-dl-PCBs TEQ (mb) was 0.33 pg sample^{-1} in Plateliai. Sum of dl-PCBs determined in Plateliai, Rūgšteliškės and Košetice is almost similar. Sum of dl-PCBs in Praha is four times higher than in other three sites (Fig. 153) during last two decades.

SAMPLING SITE	Plateliai	Plateliai	Plateliai	Plateliai
Sampling start	22.01.2019	16.04.2019	09.07.2019	01.10.2019
Sampling end	16.04.2019	09.07.2019	01.10.2019	24.12.2019
PCB 118	152,00	214,00	130,00	147,00
PCB 105	57,50	80,80	45,30	49,30
PCB 114	4,82	6,17	3,69	4,25
PCB 123	3,17	4,10	2,29	3,32
PCB 156	9,58	9,04	5,59	6,70
PCB 157	1,74	2,20	1,06	1,42
PCB 167	4,54	5,76	2,96	3,85
PCB 189	0,90	<1,14	0,54	0,61
PCB 77	15,60	23,10	10,20	11,70
PCB 81	2,18	1,64	0,94	1,34
PCB 126	<2,42	<5,73	1,07	1,17
PCB 169	<0,801	<2,21	<0,446	<0,367
SUM_DL-PCB	252,00	347,00	204,00	231,00
TEQ PCB (ub)	0,28	0,65	0,13	0,14
TEQ PCB (mb)	0,14	0,33	0,12	0,13
TEQ PCB (lb)	0,01	0,01	0,11	0,13
TEQ nonorth PCB (mb)	0,14	0,32	0,12	0,12
TEQ monorth PCB (mb)	0,01	0,01	0,01	0,01

Tab. 52: Concentrations of dl-PCBs determined in passive air samplers (pg per sample) in Plateliai.

SAMPLING SITE	Rūgšteliškės	Rūgšteliškės	Rūgšteliškės	Rūgšteliškės
Sampling start	22.01.2019	16.04.2019	09.07.2019	01.10.2019
Sampling end	16.04.2019	09.07.2019	01.10.2019	24.12.2019
PCB 118	182,00	197,00	126,00	173,00
PCB 105	85,50	76,60	45,50	61,60
PCB 114	5,70	6,16	3,46	4,72
PCB 123	3,53	4,24	2,32	3,97
PCB 156	7,37	7,84	4,57	7,29
PCB 157	1,96	1,76	0,99	1,86
PCB 167	4,07	4,30	2,49	3,70
PCB 189	0,57	0,69	<0,803	<0,819
PCB 77	17,20	17,00	9,22	14,90
PCB 81	1,82	1,11	<3,14	1,92
PCB 126	<1,70	<1,33	<2,46	1,18
PCB 169	<0,958	<0,907	<1,27	<0,345
SUM_DL-PCB	310,00	317,00	195,00	274,00
TEQ PCB (ub)	0,21	0,17	0,29	0,14
TEQ PCB (mb)	0,11	0,09	0,15	0,13
TEQ PCB (lb)	0,01	0,01	0,01	0,13
TEQ nonorth PCB (mb)	0,10	0,08	0,14	0,13
TEQ monorth PCB (mb)	0,01	0,01	0,01	0,01

Tab. 53: Concentrations of dl-PCBs determined in passive air samplers (pg per sample) in Rūgšteliškės.

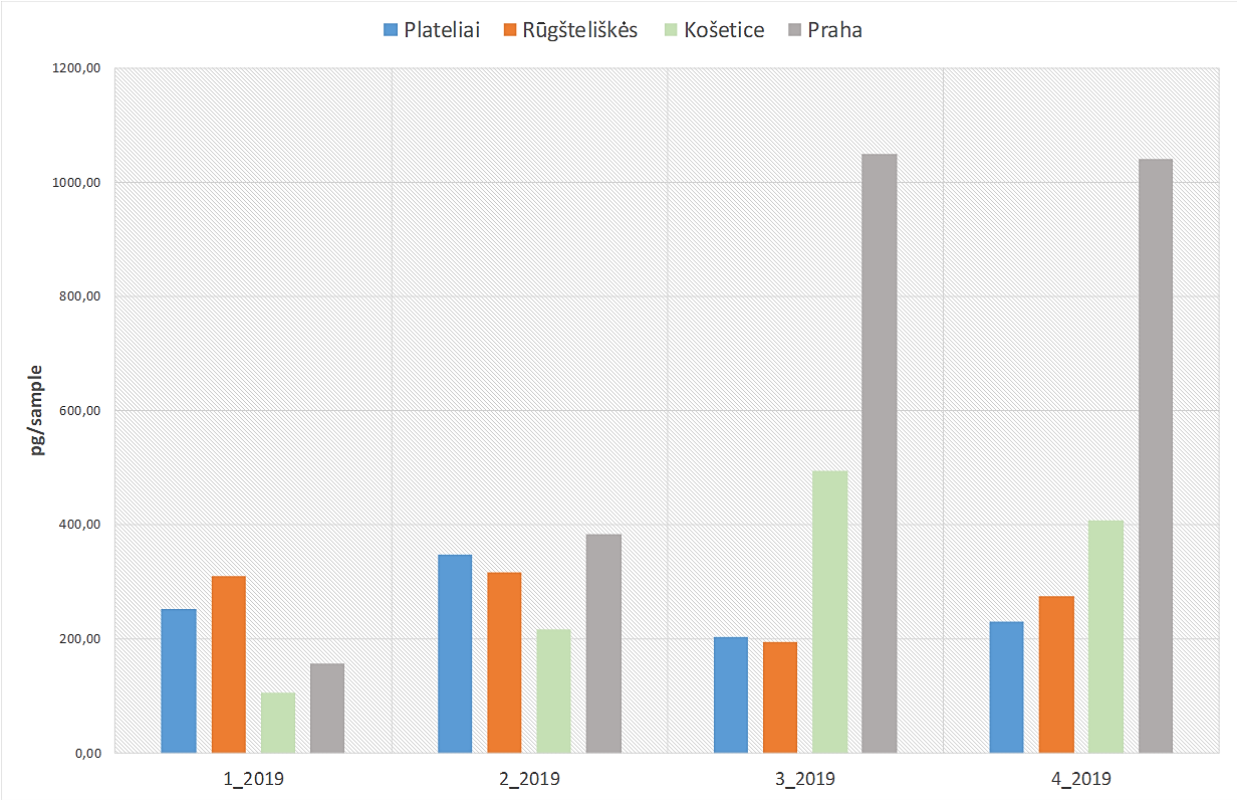

Fig. 153: Comparison of sum dl-PCBs levels in Plateliai and Rūgšteliškės with two Czech sites in Košetice and Praha.

13.8.4 PCDDs/Fs

Concentrations of polychlorinated dibenzo-*p*-dioxins and furans (PCDDs/Fs) in PUFs disks are provided in table 54 and 55. The highest level of WHO-PCDDs/Fs TEQ (mb) detected in Plateliai station site was 0.77 pg sample^{-1} during the last campaign. The lowest levels of WHO-PCDDs/Fs TEQ (mb) were detected in the sampling site Rūgšteliškės 0.33 pg sample^{-1}. Comparison of PCDDs/Fs TEQ (mb) levels is presented in Fig. 154.

SAMPLING SITE	Plateliai	Plateliai	Plateliai	Plateliai
Sampling start	22.01.2019	16.04.2019	09.07.2019	01.10.2019
Sampling end	16.04.2019	09.07.2019	01.10.2019	24.12.2019
2,3,7,8-TCDD	<0,209	<0,105	<0,177	<0,0900
1,2,3,7,8-PeCDD	<0,100	<0,146	<0,307	<0,277
1,2,3,4,7,8-HxCDD	<0,103	<0,100	<0,301	<0,401
1,2,3,6,7,8-HxCDD	0,23	<0,104	<0,291	<0,448
1,2,3,7,8,9-HxCDD	0,18	<0,107	<0,279	<0,453
1,2,3,4,6,7,8-HpCDD	1,05	0,42	0,31	0,90
OCDD	2,05	1,14	0,75	1,52
2,3,7,8-TCDF	1,30	0,68	0,27	1,09
1,2,3,7,8-PeCDF	0,85	0,31	0,29	0,66
2,3,4,7,8-PeCDF	0,59	0,22	0,38	0,69
1,2,3,4,7,8-HxCDF	0,44	0,20	0,25	0,56
1,2,3,6,7,8-HxCDF	0,48	0,22	0,30	0,65
2,3,4,6,7,8-HxCDF	0,49	0,17	<0,221	0,24
1,2,3,7,8,9-HxCDF	0,11	<0,111	<0,256	<0,247
1,2,3,4,6,7,8-HpCDF	1,11	0,56	0,39	1,16
1,2,3,4,7,8,9-HpCDF	0,19	<0,159	<0,169	<0,287
OCDF	0,53	0,59	0,54	0,49
TEQ PCDD/F (ub)	0,87	0,51	0,83	1,03
TEQ PCDD/F (mb)	0,71	0,36	0,52	0,77
TEQ PCDD/F (lb)	0,55	0,21	0,21	0,50
TEQ PCDD/F+PCB (ub)	1,14	1,16	0,96	1,16
TEQ PCDD/F+PCB (mb)	0,85	0,69	0,64	0,90
TEQ PCDD/F+PCB (lb)	0,56	0,22	0,33	0,63
TEQ PCDD (mb)	0,21	0,15	0,29	0,26
TEQ PCDF (mb)	0,50	0,21	0,23	0,51

Tab. 54: Concentrations of PCDDs/Fs determined in passive air samplers (pg per sample) in Plateliai.

SAMPLING SITE	Rūgšteliškės	Rūgšteliškės	Rūgšteliškės	Rūgšteliškės
Sampling start	22.01.2019	16.04.2019	09.07.2019	01.10.2019
Sampling end	16.04.2019	09.07.2019	01.10.2019	24.12.2019
2,3,7,8-TCDD	<0,198	<0,0970	<0,135	0,11
1,2,3,7,8-PeCDD	<0,355	<0,226	<0,204	<0,149
1,2,3,4,7,8-HxCDD	<0,196	<0,0730	<0,138	<0,198
1,2,3,6,7,8-HxCDD	<0,241	0,09	0,16	<0,198
1,2,3,7,8,9-HxCDD	<0,213	<0,0820	<0,150	<0,219
1,2,3,4,6,7,8-HpCDD	0,85	0,38	<0,290	0,82
OCDD	2,50	0,84	0,73	1,48
2,3,7,8-TCDF	1,14	0,56	0,32	1,74
1,2,3,7,8-PeCDF	0,39	0,39	0,14	0,60
2,3,4,7,8-PeCDF	0,47	0,21	<0,142	0,58
1,2,3,4,7,8-HxCDF	0,26	0,24	0,29	0,53
1,2,3,6,7,8-HxCDF	0,26	0,18	0,17	0,53
2,3,4,6,7,8-HxCDF	0,24	0,15	<0,168	0,23
1,2,3,7,8,9-HxCDF	<0,153	<0,0950	<0,198	<0,112
1,2,3,4,6,7,8-HpCDF	0,74	0,46	<0,278	0,95
1,2,3,4,7,8,9-HpCDF	<0,210	0,09	<0,329	<0,196
OCDF	1,41	0,65	<0,435	0,92
TEQ PCDD/F (ub)	1,00	0,55	0,56	0,85
TEQ PCDD/F (mb)	0,68	0,38	0,33	0,74
TEQ PCDD/F (lb)	0,36	0,21	0,10	0,63
TEQ PCDD/F+PCB (ub)	1,21	0,73	0,85	0,99
TEQ PCDD/F+PCB (mb)	0,79	0,47	0,48	0,87
TEQ PCDD/F+PCB (lb)	0,37	0,22	0,11	0,75
TEQ PCDD (mb)	0,32	0,18	0,20	0,23
TEQ PCDF (mb)	0,36	0,20	0,13	0,51

Tab. 55: Concentrations of PCDDs/Fs determined in passive air samplers (pg per sample) in Rūgšteliškės.

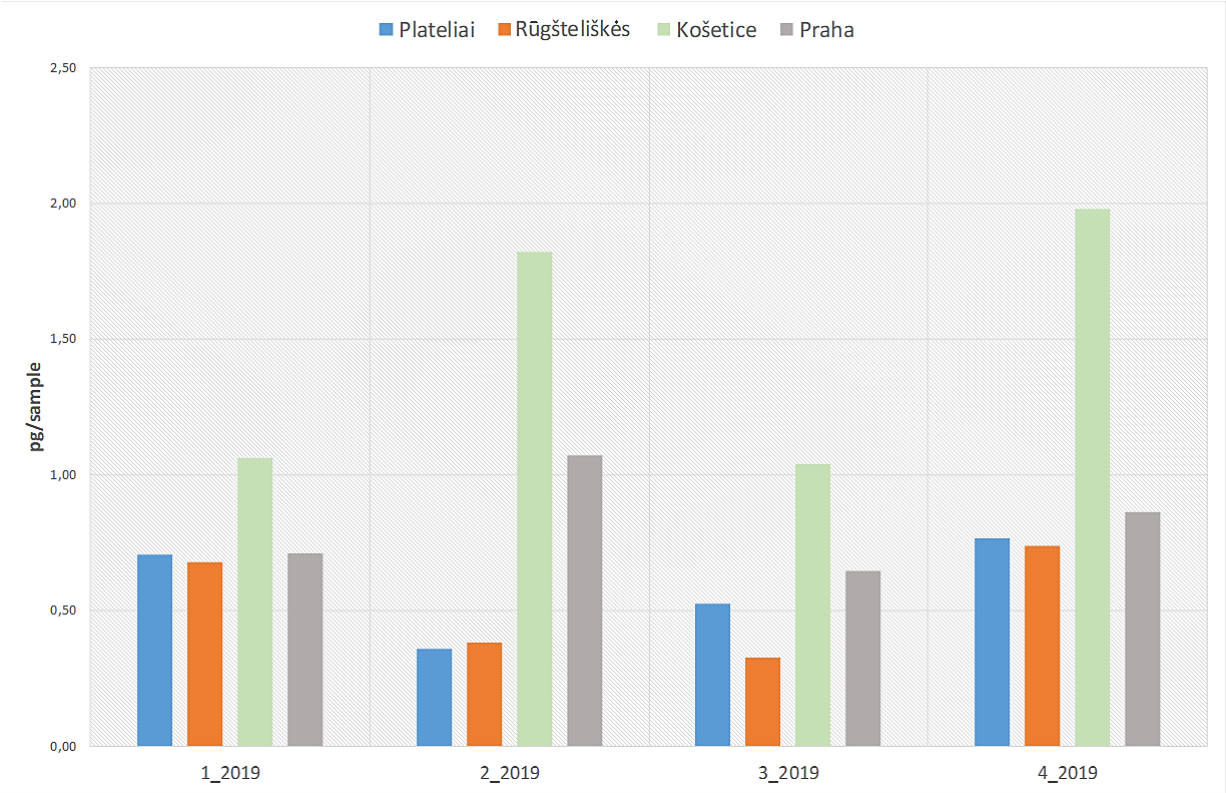

Fig. 154: Comparison of TEQ PCDD/F (mb) levels in Plateliai and Rūgšteliškės with two Czech sites in Košetice and Praha.

13.9 Conclusions

This report summarizes the results of the ambient air monitoring study in two background stations in Lithuania during one year campaign in 2019. All results based on passive air sampling are reported in ng or pg per sample in this report in order to preserve the original analytical information.

The observed concentrations of determined pollutants represent levels comparable with the levels from background sites in Czech Republic. It can be concluded that levels of POPs in ambient air including PCDDs/Fs in the regions selected in this study are not higher than European background.

The concentrations of PAHs are higher in colder period and lower in warmer period of year. This trend was observed in all sampling sites. There is no significant trend in case of ind-PCBs. Opposite of this, increasing trends were found in the case of HCHs and DDX. The level of dl-PCBs and PCDDs/Fs detected in Plateliai and Rūgšteliškės are similar or lower than their levels in Czech Republic.

Based on the presented results, it can be recommended to prepare the POPs broader study focused on the whole territory of Lithuania and using the results of this study to prepare the

design of long-term monitoring of the most relevant industrial sources using the active and passive samplers and periodic soil and water monitoring.

13.10 Acknowledgement

Project activities were supported by the RECETOX Research Infrastructure (project of the Ministry of Education of the Czech Republic LM2011028), the National program of sustainability (project of the Ministry of Education of the Czech Republic LO1214), and Technology Agency of the Czech Republic (TA ČR TB010MZP058).

Local partners are acknowledged for performance of the sampling procedures in their countries.

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13.12 Annexes

- Certificate of Accreditation No. 360/2018 of 10/07/2018, the Testing Laboratory No. 1666, RECETOX: Trace Analysis Laboratories
- Test Report No. 25/2019
- Test Report No. 2/2020
- Test Report No. 3/2020

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Český institut pro akreditaci, o.p.s.
Olšanská 54/3, 130 00 Praha 3

issues

according to section 16 of Act No. 22/1997 Coll., on technical requirements for products, as amended

CERTIFICATE OF ACCREDITATION

No. **360/2018**

Masarykova univerzita
with registered office Žerotínovo náměstí 617/9, 602 00 Brno, Company Registration No. 00216224

to the Testing Laboratory No. **1666**
RECETOX: Trace Analysis Laboratories

Scope of accreditation:

Special trace and ultratrace analysis of organic compounds and elements in environmental samples, biotic samples, food and feed; sampling of air, surface water, soils, and bottom sediments to the extent as specified in the appendix to this Certificate.

This Certificate of Accreditation is a proof of Accreditation issued on the basis of assessment of fulfillment of the accreditation criteria in accordance with

ČSN EN ISO/IEC 17025:2005

In its activities performed within the scope and for the period of validity of this Certificate, the Body is entitled to refer to this Certificate, provided that the accreditation is not suspended and the Body meets the specified accreditation requirements in accordance with the relevant regulations applicable to the activity of an accredited Conformity Assessment Body.

This Certificate of Accreditation replaces, to the full extent, Certificate No.: 195/2017 of 28. 3. 2017, or any administrative acts building upon it.

The Certificate of Accreditation is valid until: **28. 3. 2022**

Prague: 10. 7. 2018

Český institut pro akreditaci, o.p.s. NÁRODNÍ AKREDITAČNÍ ORGÁN -2-

Jiří Růžička
Director
Czech Accreditation Institute
Public Service Company

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The Appendix is an integral part of
Certificate of Accreditation No. 360/2018 of 10/07/2018

Accredited entity according to ČSN EN ISO/IEC 17025:2005:

Masarykova univerzita
RECETOX: Trace Analysis Laboratories
Kamenice 753/5, pavilon A29, 625 00 Brno

The Laboratory is qualified to update standards identifying the test procedures.
The Laboratory has a flexible scope of accreditation permitted as detailed in the Annex.
Updated list of activities provided within the flexible scope of accreditation is available at the Laboratory (from the Laboratory Manager).
The Laboratory is qualified to carry out independent sampling.

Tests:

Ordinal number	Test procedure/method name	Test procedure/method identification	Tested object
1	Determination of persistent organic pollutants by isotope dilution method HRGC/HRMS[1]	SOP-LSA-031 (except chap. 3, *b* to *o*, US EPA 1613B, US EPA 1668B, US EPA 1614, ČSN EN 1528-1, ČSN EN 1528-2, ČSN EN 1528-3, ČSN EN 1528-4)	Outdoor and indoor air
2	Determination of persistent organic pollutants by isotope dilution method HRGC/HRMS[1]	SOP-LSA-031 (except chap. 3, *a* and chap. 3, *c* to *o*, US EPA 1613B, US EPA 1668B, US EPA 1614, ČSN EN 1528-1, ČSN EN 1528-2, ČSN EN 1528-3, ČSN EN 1528-4)	Surface water
3	Determination of persistent organic pollutants by isotope dilution method HRGC/HRMS[1]	SOP-LSA-031 (except chap. 3, *a* to *b* and chap. 3, *g* to *o*, US EPA 1613B, US EPA 1668B, US EPA 1614, ČSN EN 1528-1, ČSN EN 1528-2, ČSN EN 1528-3, ČSN EN 1528-4)	Solid samples [8]
4	Determination of persistent organic pollutants by isotope dilution method HRGC/HRMS[1]	SOP-LSA-031 (except chap. 3, *a* to *f* and chap. 3, *o*, US EPA 1613B, US EPA 1668B, US EPA 1614, ČSN EN 1528-1,	Food and feedstuffs

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Ordinal number	Test procedure/method name	Test procedure/method identification	Tested object
		ČSN EN 1528-2, ČSN EN 1528-3, ČSN EN 1528-4)	
5	Determination of persistent organic pollutants by isotope dilution method HRGC/HRMS[1]	SOP-LSA-031 (except chap. 3, *a* to *n*, US EPA 1613B, US EPA 1668B, US EPA 1614, ČSN EN 1528-1, ČSN EN 1528-2, ČSN EN 1528-3, ČSN EN 1528-4)	Cell tissues, body fluids[7]
6	Determination of organic pollutants by GC-MS/MS method[2]	SOP-LSA-055 (EPA-TO-13A)	Outdoor and indoor air
7	Determination of organic pollutants by GC-MS/MS method[3]	SOP-LSA-056 (EPA-TO-4A)	Outdoor and indoor air
8	Determination of selected elements by ICP-MS method[4]	SOP-LSA-807[5]	Body fluids[7]
9	Determination of dry matter by gravimetry and water content (moisture content) by calculation from measured values	SOP-LSA-057 (ČSN EN 14346, part A)	Solid samples[8], feedstuffs, biological material[9]
10	Determination of fat by gravimetry	SOP-LSA-058[6]	Food and feedstuffs
11	Determination of selected polar pesticides by SPE-LC-MS/MS[10]	SOP-LSA-500	Surface, drinking and sea water
12	Determination of selected polar per- and polyfluorated substances (PFASs) by LC-MS/MS method[11]	SOP-LSA-510 (except chap. 2 *b* to *d*)	Surface, drinking and sea water
13	Determination of selected polar per- and polyfluorated substances (PFASs) by LC-MS/MS method[11]	SOP-LSA-510 (except chap. 2 *a* to *c*)	Body fluids[7]
14	Determination of mercury by a single-purpose analyzer	SOP-LSA-808	Body fluids[7], hair, solid samples[8]

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Explanations:

[1] in the range: 2378-substituted PCDD and PCDF (2378-TCDD, 12378-PeCDD, 123678-HxCDD, 123478-HxCDD, 234678-HxCDD, 1234678-HpCDD, OCDD, 2378-TCDF, 12378-PeCDF, 23478-PeCDF, 123678-HxCDF, 123478-HxCDF, 234678-HxCDF, 123789-HxCDF, 1234678-HpCDF, 1234789-HpCDF, OCDF, calculation of TEQ PCDD/F parameters from measured values); PCBs similar to dioxins (PCB 77, PCB 81, PCB 105, PCB 114, PCB 118, PCB 123, PCB 126, PCB 156, PCB 157, PCB 167, PCB 169, PCB 189, calculation of the sums of PCBs and TEQ parameters from measured values); indicator PCBs (PCB 28, PCB 52, PCB 101, PCB 118, PCB 138, PCB 153, PCB 180, calculation of the sums of PCBs from measured values); polybrominated diphenylethers (BDE 28, BDE 47, BDE 99, BDE 100, BDE 153, BDE 154, BDE 183, BDE 209)

[2] in the range: PAH (Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(123cd)pyrene, Dibenzo(ah)anthracene, Benzo(ghi)perylene, Biphenyl, Retene, Benzo(b)fluorene, Benzo-naphtho-thiophene, Benzo(ghi)fluoranthene, Cyclopenta(cd)pyrene, Triphenylene, Benzo(j)fluoranthene, Benzo(e)pyrene, Perylene, Dibenzo(ac)anthracene, Anthanthrene, Coronene) and calculation of the sums of PAH from measured values

[3] in the range: indicator PCBs (PCB 28, PCB 52, PCB 101, PCB 118, PCB 138, PCB 153, PCB 180, calculation of the sums of PCBs from measured values); heptachlor, heptachloroepoxide cis- (= exo, B), heptachloroepoxide trans- (= endo, A),
aldrin, dieldrin, endrin, endrin aldehyde, endrin ketone, isodrin, oxychlordane, cis-nonachlor, trans-nonachlor, trans-chlordane (= gamma), cis-chlordane (= alpha), endosulfan I (= alpha), endosulfan II (= beta), endosulfan sulfate, chlordecon, methoxychlor, mirex, HCH (alpha-HCH, beta-HCH, gamma-HCH, delta-HCH, epsilon-HCH), DDX (p,p'-DDT, o,p'-DDT, p,p'-DDE, o,p'-DDE, p,p'-DDD, o,p'-DDD), pentachlorobenzene, hexachlorobenzene, calculation of the sums of HCH and DDX from measured values

[4] in the range: As, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Se, Zn

[5]Gajek, R., Barley, F., & She, J. W. (2013). Determination of essential and toxic metals in blood by ICP-MS with calibration in synthetic matrix. Analytical Methods, 5(9), 2193-2202;

Wahlen, R., Evans, L., Turner, J., & Hearn, R. (2005). The Use of Collision/Reaction Cell ICP-MS for the Simultaneous Determination of 18 Elements in Blood and Serum Samples. Agilent ICP-MS application literature.

[6] ČSN 57 0146, ČSN EN ISO 3727-1, ČSN EN ISO 3727-2, ČSN EN ISO 3727-3, ČSN 58 8786, ČSN EN ISO 17189, ČSN ISO 1443, ČSN EN ISO 1211, ČSN 57 0104, part 4, ČSN EN ISO 7208, ČSN EN ISO 2450, ČSN EN ISO 1736, ČSN EN ISO 1737, ČSN 46 7092-7, ČSN 56 0116-6, ČSN 56 0512-18, ČSN ISO 7302, ČSN 56 0130-6, ČSN 56 0146-part 4, ČSN 58 0703-6, ČSN 58 0120, ČSN EN ISO 1735, ČSN EN ISO 1854, ČSN 57 2301, ČSN 58 0170, ČSN 56 0290-6, ČSN 57 0105, part 4, ČSN EN ISO 8381, ČSN ISO 8262-1, ČSN ISO 8262-2, ČSN ISO 8262-3, ČSN EN ISO 7328, ČSN 56 0176, part 10, ČSN EN ISO 3947

[7]blood and its components (serum, plasma), urine and breast milk for scientific purposes

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[8] soils, sediments, ash, moss, pine needles

[9] of animal and vegetable origin

[10] Alachlor, Atrazine, Azinphos-methyl, Chlorotoluron, Chlorpyrifos, Diazinon, Diuron, Fenitrothion, Isoproturon, Malathion, Metamitron, Parathion-methyl, Pirimicarb and Simazine

[11] PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFNA, PFDA, PFBS, PFHxS, PFOS

HRGC/HRMS – High Resolution Gas Chromatography/High Resolution Mass Spectrometry

Annex:
Flexible scope of accreditation

Ordinal numbers of tests
1-14

The Laboratory is allowed to modify the test methods listed in the Annex within the specified scope of accreditation provided the measuring principle is observed.

The flexible approach to the scope of accreditation cannot be applied to the tests not included in the Annex.

Sampling:

Ordinal number	Sampling procedure name	Sampling procedure identification	Sampled object
1	Sampling of air for the determination of persistent organic pollutants (POPs)[1]	SOP-LSA-921 (ČSN EN 12341, ČSN EN 14902, ISO 12884)	Outdoor and indoor air
2	Sampling of surface water	SOP-LSA-965 (ČSN EN ISO 5667-3, ČSN ISO 5667-4, ČSN EN ISO 5667-6, ČSN ISO 5667-17)	Surface water
3	Sampling of bottom sediments	SOP-LSA-980 (ČSN ISO 5667-12, ČSN EN ISO 5667-15	Bottom sediments
4	Sampling of soils	SOP-LSA-985 (ČSN ISO 10381-6, ČSN EN ISO 16133)	Soil

Explanations:

[1] in the range: PCDD/F, ind-PCB, dl-PCB, PAU, OCP.

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Protokol o zkoušce č. 25/2019

Zkušební laboratoř č. 1666 akreditovaná ČIA dle ČSN EN ISO/IEC 17025:2018

Masarykova univerzita
RECETOX: Laboratoře stopové analýzy
Kamenice 753/5, pavilon A29
625 00 Brno

Základní údaje	
Zákazník:	Ovocná 1021/34 Praha 6
Datum přijetí vzorků	18.9.2019
Provádění analýz:	18.9.2019 - 10.10.2019

Zkušební metoda:	Akreditace
SOP-LSA-031 (US EPA 1613B)	A

Použité přístroje
1S05 - Dual GC Trace 1310 / HRMS DFS (ThermoScientific)

Informace o odběru:		
Odebral :	RNDr. Roman Prokeš, Ph.D.	
Způsob odběru :	Pasivní vzorkovač (PUF)	
Protokol o přijetí vzorku	126	
Metoda vzorkování:	Metoda pasiv. vzorkování TB010MZP057	Akreditovaný odběr: NE

A - metoda v rozsahu akreditace
N - metoda není v rozsahu akreditace

Výsledky zkoušek (viz. Tabulka výsledků zkoušek)

Prohlášení
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V případě odběru vzorků zákazníkem (*Vzorek vzorkován zákazníkem*), se výsledky vztahují na vzorek, jak byl přijat.

Datum vystavení protokolu: 31.10.2019
Vypracoval: RNDr. Petra Přibylová, Ph.D. Podpis:

Schválil: Podpis:
RNDr. Petra Přibylová, Ph.D.
Vedoucí laboratoře / Head of Testing Laboratory

Masarykova univerzita
RECETOX: Laboratoře stopové analýzy
Kamenice 753/5, pavilon A29, 625 00 Brno
L 1666

Strana 1 / 3

Protokol o zkoušce č. 25/2019

Tabulka výsledků zkoušek:

Č.vzorku	Odběr (Od - Do)	Matrice	Lokalita / označení vzorku
3465	22.1.2019 10:00 16.4.2019 10:00	A-Venkovní ovzduší venkovní ovzduší-PAS_PUF	Plateliai LI-PLA-T1
3466	16.4.2019 12:00 9.7.2019 13:00	A-Venkovní ovzduší venkovní ovzduší-PAS_PUF	Plateliai LI-PLA-T2
3467	22.1.2019 9:00 16.4.2019 9:00	A-Venkovní ovzduší venkovní ovzduší-PAS_PUF	Rugsteliskes, EMEP LI-RUG-T1
3468	16.4.2019 17:00 9.7.2019 17:00	A-Venkovní ovzduší venkovní ovzduší-PAS_PUF	Rugsteliskes, EMEP LI-RUG-T2
3474		A-Venkovní ovzduší venkovní ovzduší-PAS_PUF	 solvent blank

PCB		3465/19	3466/19	3467/19	3468/19	3474/19
PCB 118	pg/vzorek	152	214	182	197	2,91
PCB 105	pg/vzorek	57,5	80,8	85,5	76,6	<1,33
PCB 114	pg/vzorek	4,82	6,17	5,70	6,16	<1,33
PCB 123	pg/vzorek	3,17	4,10	3,53	4,24	<1,14
PCB 156	pg/vzorek	9,58	9,04	7,37	7,84	<0,775
PCB 157	pg/vzorek	1,74	2,20	1,96	1,76	<0,773
PCB 167	pg/vzorek	4,54	5,76	4,07	4,30	<0,602
PCB 189	pg/vzorek	0,904	<1,14	0,570	0,688	<0,342
PCB 77	pg/vzorek	15,6	23,1	17,2	17,0	<1,31
PCB 81	pg/vzorek	2,18	1,64	1,82	1,11	<1,18
PCB 126	pg/vzorek	<2,42	<5,73	<1,70	<1,33	<1,81
PCB 169	pg/vzorek	<0,801	<2,21	<0,958	<0,907	<1,03
SUM_DL-PCB	pg/vzorek	252	347	310	317	2,91
WHO-PCB-TEQ (ub)	pg/vzorek	0,275	0,652	0,210	0,171	0,213
WHO-PCB-TEQ (mb)	pg/vzorek	0,14226	0,33213	0,11036	0,091096	0,10637
WHO-PCB-TEQ (lb)	pg/vzorek	0,00924	0,0125	0,0110	0,0110	0,0000873
WHO-non-ortho-PCB-TEQ (mb)	pg/vzorek	0,135	0,322	0,102	0,0821	<0,106
WHO-mono-ortho-PCB-TEQ (mb	pg/vzorek	0,00703	0,00968	0,00872	0,00896	0,000182

PCDD/F		3465/19	3466/19	3467/19	3468/19	3474/19
2,3,7,8-TCDD	pg/vzorek	<0,209	<0,105	<0,198	<0,0970	<0,205
1,2,3,7,8-PeCDD	pg/vzorek	<0,100	<0,146	<0,355	<0,226	<0,241
1,2,3,4,7,8-HxCDD	pg/vzorek	<0,103	<0,100	<0,196	<0,0730	<0,126
1,2,3,6,7,8-HxCDD	pg/vzorek	0,233	<0,104	<0,241	0,0870	<0,146
1,2,3,7,8,9-HxCDD	pg/vzorek	0,179	<0,107	<0,213	<0,0820	<0,143
1,2,3,4,6,7,8-HpCDD	pg/vzorek	1,05	0,423	0,847	0,384	0,133
OCDD	pg/vzorek	2,05	1,14	2,50	0,844	0,446
2,3,7,8-TCDF	pg/vzorek	1,30	0,678	1,14	0,561	<0,203
1,2,3,7,8-PeCDF	pg/vzorek	0,848	0,308	0,391	0,392	<0,178
2,3,4,7,8-PeCDF	pg/vzorek	0,585	0,216	0,474	0,209	<0,160
1,2,3,4,7,8-HxCDF	pg/vzorek	0,435	0,196	0,262	0,237	<0,140
1,2,3,6,7,8-HxCDF	pg/vzorek	0,484	0,221	0,258	0,183	<0,132
2,3,4,6,7,8-HxCDF	pg/vzorek	0,493	0,174	0,237	0,151	<0,148
1,2,3,7,8,9-HxCDF	pg/vzorek	0,106	<0,111	<0,153	<0,0950	<0,177
1,2,3,4,6,7,8-HpCDF	pg/vzorek	1,11	0,562	0,738	0,460	0,176
1,2,3,4,7,8,9-HpCDF	pg/vzorek	0,188	<0,159	<0,210	0,0880	<0,0910
OCDF	pg/vzorek	0,531	0,592	1,41	0,649	0,889
WHO-PCDD/F-TEQ (ub)	pg/vzorek	0,867	0,506	0,996	0,554	0,625
WHO-PCDD/F-TEQ (mb)	pg/vzorek	0,708	0,359	0,678	0,380	0,314
WHO-PCDD/F-TEQ (lb)	pg/vzorek	0,548	0,211	0,361	0,206	0,00349

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Masarykova univerzita
RECETOX: Laboratoře stopové analýzy
Kamenice 753/5, pavilon A29, 625 00 Brno
L 1666

Protokol o zkoušce č. 25/2019

PCDD/F		3465/19	3466/19	3467/19	3468/19	3474/19
WHO-PCDD/F-PCB-TEQ (ub)	pg/vzorek	1,14	1,16	1,21	0,725	0,838
WHO-PCDD/F-PCB-TEQ (mb)	pg/vzorek	0,850	0,691	0,789	0,471	0,421
WHO-PCDD/F-PCB-TEQ (lb)	pg/vzorek	0,557	0,224	0,372	0,217	0,00358
WHO-PCDD-TEQ (mb)	pg/vzorek	0,212	0,146	0,318	0,182	0,245
WHO-PCDF-TEQ (mb)	pg/vzorek	0,496	0,213	0,360	0,198	0,0692

Vysvětlivky:

Při výpočtech toxických ekvivalentů (TEQ) se použili faktory ekvivalentní toxicity (TEF) ustanovené Světovou zdravotnickou organizací v roce 2005.

< {hodnota} menší než mez stanovitelnosti (LOQ)

ub (upper-bound) při výpočtu TEQ se použila hodnota LOQ, jestliže kongenér byl přítomný pod svou mezí stanovitelnosti (< LOQ)

mb (medium-bound) při výpočtu TEQ se použila polovina LOQ, jestliže kongenér byl přítomný pod svou mezí stanovitelnosti (< LOQ)

lb (lower-bound) při výpočtu TEQ se použila nula, jestliže kongenér byl přítomný pod svou mezí stanovitelnosti (< LOQ)

---------- **Konec protokolu o zkoušce** ----------

Masarykova univerzita
RECETOX: Laboratoře stopové analýzy
Kamenice 753/5, pavilon A29, 625 00 Brno
L 1666

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TEST REPORT č. 2/2020

Testing laboratory No. 1666 accredited CIA by the ČSN EN ISO/IEC 17025:2018

Masaryk University
RECETOX: Trace Analytical Laboratories
Kamenice 753/5, pavilon A29
625 00 Brno, CZE

Basic data	
Customer:	Ovocná 1021/34 Praha 6
Date of receipt of samples:	29.1.2020
Analysis (from - to):	29.1.2020 - 19.2.2020

Testing methods:	accr.
SOP-LSA-031 (US EPA 1613B)	YES

Measuring instruments:
1S05 - Dual GC Trace 1310 / HRMS DFS (ThermoScientific)

Information about sampling		
Sampling:	Obsluha vzorkovací stanice	
Sampling medium:	Pasivní vzorkovač (PUF)	
Sampling protocol	21	
Sampling method	Metoda pasiv. vzorkování TB010MZP057	Accredited sampling: NO

YES - accredited method
NO - non-accredited method

Test results (see table of test results)

Statement
The test results relate to the subject test and do not replace other documents (such as administrative in nature).
The test report may be reproduced in whole, for its part only with the written consent of the accredited laboratory.
The Testing Laboratory disclaims responsibility for information supplied by the customer that could affect the validity of the results.
In the case of customer sampling (*Sample sampled by the customer*), the results apply to the sample as received.
In case of dispute, the Czech language translation shall be decisive.

Date of issue of the test report: 24.2.2020
Prepared: RNDr. Petra Přibylová, Ph.D. Signature

Approved Signature
RNDr. Petra Přibylová, Ph.D.
Vedoucí laboratoře / Head of Testing Laboratory

Masaryk university
RECETOX: Trace analytical laboratories
Kamenice 753/5, building A29, 625 00 Brno
L 1666

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Test report no. 2/2020

Table of results :

Sample	Sampling date (from - to)	Matrix	Location, labeling by customer
898	9.7.2019 12:00 1.10.2019 12:00	A-Venkovní ovzduší venkovní ovzduší-PAS_PUF	Plateliai LI-PLA-T3
899	1.10.2019 12:00 24.12.2019 10:00	A-Venkovní ovzduší venkovní ovzduší-PAS_PUF	Plateliai LI-PLA-T4
900	1.10.2019 12:00	A-Venkovní ovzduší venkovní ovzduší-PAS_PUF	Plateliai LI-PLA-T-BL
901	9.7.2019 17:00 1.10.2019 17:00	A-Venkovní ovzduší venkovní ovzduší-PAS_PUF	Rugsteliskes, EMEP LI-RUG-T3
902	1.10.2019 17:00 24.12.2019 10:00	A-Venkovní ovzduší venkovní ovzduší-PAS_PUF	Rugsteliskes, EMEP LI-RUG-T4
903	1.10.2019 17:00	A-Venkovní ovzduší venkovní ovzduší-PAS_PUF	Rugsteliskes, EMEP LI-RUG-T-BL
904			Solvent Blank

PCBs		898/20	899/20	900/20	901/20	902/20	903/20	904/20
PCB 118	pg/vzorek	130	147	16,7	126	173	3,28	2,12
PCB 105	pg/vzorek	45,3	49,3	5,35	45,5	61,6	0,891	<1,56
PCB 114	pg/vzorek	3,69	4,25	<0,834	3,46	4,72	<0,530	<1,42
PCB 123	pg/vzorek	2,29	3,32	1,10	2,32	3,97	<0,544	<1,54
PCB 156	pg/vzorek	5,59	6,70	1,42	4,57	7,29	0,531	0,637
PCB 157	pg/vzorek	1,06	1,42	<0,568	0,991	1,86	<0,339	<0,525
PCB 167	pg/vzorek	2,96	3,85	<0,760	2,49	3,70	<0,524	<0,905
PCB 189	pg/vzorek	0,544	0,607	0	<0,803	<0,819	<0,280	<0,611
PCB 77	pg/vzorek	10,2	11,7	1,63	9,22	14,9	<0,637	<1,21
PCB 81	pg/vzorek	0,937	1,34	<1,14	<3,14	1,92	<0,748	<1,33
PCB 126	pg/vzorek	1,07	1,17	<0,861	<2,46	1,18	<0,547	<1,59
PCB 169	pg/vzorek	<0,446	<0,367	<0,694	<1,27	<0,345	<0,414	<0,690
SUM_DL-PCB	pg/vzorek	204	231	26,2	195	274	4,70	2,76
WHO-PCB-TEQ (ub)	pg/vzorek	0,127	0,136	0,108	0,292	0,138	0,0676	0,180
WHO-PCB-TEQ (mb)	pg/vzorek	0,12073	0,13057	0,054564	0,14901	0,13294	0,033878	0,090291
WHO-PCB-TEQ (lb)	pg/vzorek	0,114	0,125	0,000900	0,00648	0,128	0,000141	0,0000827
WHO-non-ortho-PCB-TEQ	pg/vzorek	0,115	0,124	0,0538	0,143	0,125	<0,0337	<0,0901
WHO-mono-ortho-PCB-TE	pg/vzorek	0,00574	0,00649	0,000770	0,00557	0,00770	0,000174	0,000181

PCDD/Fs		898/20	899/20	900/20	901/20	902/20	903/20	904/20
2,3,7,8-TCDD	pg/vzorek	<0,177	<0,0900	<0,112	<0,135	0,113	<0,229	<0,264
1,2,3,7,8-PeCDD	pg/vzorek	<0,307	<0,277	<0,318	<0,204	<0,149	<0,172	<0,257
1,2,3,4,7,8-HxCDD	pg/vzorek	<0,301	<0,401	<0,227	<0,138	<0,198	<0,172	<0,152
1,2,3,6,7,8-HxCDD	pg/vzorek	<0,291	<0,448	<0,240	0,159	<0,198	<0,196	<0,160
1,2,3,7,8,9-HxCDD	pg/vzorek	<0,279	<0,453	<0,260	<0,150	<0,219	<0,214	<0,186
1,2,3,4,6,7,8-HpCDD	pg/vzorek	0,314	0,903	<0,436	<0,290	0,816	<0,289	<0,303
OCDD	pg/vzorek	0,752	1,52	<0,928	0,730	1,48	<0,804	<0,656
2,3,7,8-TCDF	pg/vzorek	0,272	1,09	<0,310	0,323	1,74	0,176	<0,187
1,2,3,7,8-PeCDF	pg/vzorek	0,289	0,655	0,140	0,142	0,598	<0,160	<0,145
2,3,4,7,8-PeCDF	pg/vzorek	0,380	0,692	0,202	<0,142	0,582	<0,157	<0,157
1,2,3,4,7,8-HxCDF	pg/vzorek	0,251	0,563	<0,187	0,286	0,530	<0,0690	<0,150
1,2,3,6,7,8-HxCDF	pg/vzorek	0,303	0,652	<0,215	0,173	0,530	<0,0770	<0,170
2,3,4,6,7,8-HxCDF	pg/vzorek	<0,221	0,242	<0,236	<0,168	0,225	<0,0860	<0,181
1,2,3,7,8,9-HxCDF	pg/vzorek	<0,256	<0,247	<0,275	<0,198	<0,112	<0,0970	<0,200
1,2,3,4,6,7,8-HpCDF	pg/vzorek	0,391	1,16	0,274	<0,278	0,949	<0,175	<0,362
1,2,3,4,7,8,9-HpCDF	pg/vzorek	<0,169	<0,287	<0,285	<0,329	<0,196	<0,201	<0,391

Masaryk university
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Kamenice 753/5, building A29, 625 00 Brno
L 1668

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Test report no. 2/2020

PCDD/Fs		898/20	899/20	900/20	901/20	902/20	903/20	904/20
OCDF	pg/vzorek	0,540	0,485	0,609	<0,435	0,921	0,489	0,418
WHO-PCDD/F-TEQ (ub)	pg/vzorek	0,833	1,03	0,700	0,555	0,850	0,569	0,722
WHO-PCDD/F-TEQ (mb)	pg/vzorek	0,523	0,766	0,384	0,327	0,738	0,293	0,361
WHO-PCDD/F-TEQ (lb)	pg/vzorek	0,213	0,503	0,0677	0,0986	0,626	0,0177	0,000125
WHO-PCDD/F-PCB-TEQ (u	pg/vzorek	0,961	1,16	0,808	0,846	0,988	0,636	0,902
WHO-PCDD/F-PCB-TEQ (	pg/vzorek	0,644	0,896	0,439	0,476	0,871	0,327	0,451
WHO-PCDD/F-PCB-TEQ (l	pg/vzorek	0,327	0,628	0,0686	0,105	0,754	0,0179	0,000208
WHO-PCDD-TEQ (mb)	pg/vzorek	0,289	0,258	<0,254	0,201	0,227	<0,231	<0,287
WHO-PCDF-TEQ (mb)	pg/vzorek	0,234	0,507	0,130	0,125	0,511	0,0620	0,0740

Explanatory notes:

Toxic equivalency factors (TEFs) established by the World Health Organization in 2005 were used for toxic equivalent (TEQ) calculations.

< {value} less than the limit of quantification (LOQ)

ub (upper-bound) the LOQ was used for TEQ calculation if a congener was present below its limit of quantification (< LOQ)

mb (medium-bound) half of the LOQ was used for TEQ calculation if a congener was present below its limit of quantification (< LOQ)

lb (lower-bound) zero was used for TEQ calculation if a congener was present below its limit of quantification (< LOQ)

---------- **End of test report**----------

Masaryk university
RECETOX: Trace analytical laboratories
Kamenice 753/5, building A29, 625 00 Brno
L 1668

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TEST REPORT č. 3/2020

Testing laboratory No. 1666 accredited CIA by the ČSN EN ISO/IEC 17025:2018

Masaryk University
RECETOX: Trace Analytical Laboratories
Kamenice 753/5, pavilon A29
625 00 Brno, CZE

Basic data	
Customer:	Ovocná 1021/34 Praha 6
Date of receipt of samples:	29.1.2020
Analysis (from - to):	29.1.2020 - 24.2.2020

Testing methods:	accr.
PAHs_GC-MS_Air (SOP-LSA-055)	YES
PCBs_OCPs-GC-MS/MS	NO

Measuring instruments:
232 - GC 7890 / MS-MS Triple Quadrupole 7000B (Agilent) - B

Information about sampling	
Sampling:	Obsluha vzorkovací stanice
Sampling medium:	Pasivní vzorkovač (PUF)
Sampling protocol	22
Sampling method	Metoda pasiv. vzorkování TB010MZP057 Accredited sampling: NO

YES - accredited method
NO - non-accredited method

Test results (see table of test results)

Statement
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Date of issue of the test report: 24.2.2020
Prepared: RNDr. Petra Přibylová, Ph.D. Signature

Approved Signature
RNDr. Petra Přibylová, Ph.D.
Vedoucí laboratoře / Head of Testing Laboratory

Masaryk university
RECETOX: Trace analytical laboratories
Kamenice 753/5, building A29, 625 00 Brno
L 1666

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Test report no. 3/2020

Table of results :

Sample	Sampling date (from - to)	Matrix	Location, labeling by customer
905	9.7.2019 12:00 1.10.2019 12:00	A-Venkovní ovzduší venkovní ovzduší-PAS_PUF	Plateliai LI-PLA-D3
906	1.10.2019 12:00 24.12.2019 10:00	A-Venkovní ovzduší venkovní ovzduší-PAS_PUF	Plateliai LI-PLA-D4
907	1.10.2019 12:00	A-Venkovní ovzduší venkovní ovzduší-PAS_PUF	Plateliai LI-PLA-D-BL
908	9.7.2019 17:00 1.10.2019 17:00	A-Venkovní ovzduší venkovní ovzduší-PAS_PUF	Rugsteliskes, EMEP LI-RUG-D3
909	1.10.2019 17:00 24.12.2019 10:00	A-Venkovní ovzduší venkovní ovzduší-PAS_PUF	Rugsteliskes, EMEP LI-RUG-D4
910	1.10.2019 17:00	A-Venkovní ovzduší venkovní ovzduší-PAS_PUF	Rugsteliskes, EMEP LI-RUG-D-BL
911			Solvent Blank

PCBs		905/20	906/20	907/20	908/20	909/20	910/20	911/20
PCB 28	ng/vzorek	0,502	0,718	0,0787	0,320	0,639	<0,0222	<0,0222
PCB 52	ng/vzorek	0,369	0,498	0,0587	0,226	0,408	<0,0278	<0,0278
PCB 101	ng/vzorek	0,311	0,358	<0,0655	0,201	0,278	<0,0655	<0,0655
PCB 138	ng/vzorek	0,140	0,127	<0,0688	0,0937	0,0935	<0,0688	<0,0688
PCB 153	ng/vzorek	0,207	0,220	<0,0599	0,138	0,164	<0,0599	<0,0599
PCB 180	ng/vzorek	<0,0799	<0,0799	<0,0799	<0,0799	<0,0799	<0,0799	<0,0799
SUM_6PCB (ICES-6)	ng/vzorek	1,53	1,92	0,137	0,979	1,58	0	0
PCB 9	ng/vzorek	0,0174	0,0548	<0,0111	0,0123	0,0622	<0,0111	<0,0111
PCB 11	ng/vzorek	0,436	0,665	0,286	0,710	0,827	0,194	0,0532
13C12 PCB 19	ng/vzorek	76,3	65,5	73,1	67,1	69,2	72,6	65,5
13C12 PCB 104	ng/vzorek	96,0	86,6	82,5	83,4	78,2	85,5	82,3
13C12 PCB 178	ng/vzorek	100	97,3	93,9	98,1	94,0	96,6	99,0

OCPs		905/20	906/20	907/20	908/20	909/20	910/20	911/20
OP_DDT	ng/vzorek	0,434	0,621	<0,0599	0,207	0,419	<0,0599	<0,0599
PP_DDD	ng/vzorek	0,0767	0,0877	<0,0366	0,0370	0,0635	<0,0366	<0,0366
A_HCH	ng/vzorek	0,925	0,970	0,0972	0,621	0,933	<0,0278	<0,0278
B_HCH	ng/vzorek	0,0866	0,0905	<0,0278	0,0539	0,0779	<0,0278	<0,0278
G_HCH	ng/vzorek	0,635	0,641	0,0709	0,335	0,486	<0,0333	<0,0333
D_HCH	ng/vzorek	<0,0611	<0,0611	<0,0611	<0,0611	<0,0611	<0,0611	<0,0611
OP_DDE	ng/vzorek	0,0654	0,172	<0,0211	0,0392	0,132	<0,0211	<0,0211
PP_DDE	ng/vzorek	1,61	4,59	0,389	0,653	3,20	0,0615	0,0379
OP_DDD	ng/vzorek	0,0699	0,0952	<0,0233	0,0344	0,0649	<0,0233	<0,0233
PP_DDT	ng/vzorek	0,446	0,558	<0,0588	0,235	0,339	<0,0588	<0,0588
PECB	ng/vzorek	0,584	1,27	0,470	0,523	1,29	0,0413	<0,0122
HCB	ng/vzorek	6,36	7,68	1,50	5,52	7,24	0,0869	<0,0377
SUM_HCH	ng/vzorek	1,65	1,70	0,168	1,01	1,50	0	0
SUM_PP_DDX	ng/vzorek	2,13	5,24	0,389	0,925	3,60	0,0615	0,0379
SUM_DDX	ng/vzorek	2,70	6,12	0,389	1,21	4,22	0,0615	0,0379
E_HCH	ng/vzorek	<0,0488	<0,0488	<0,0488	<0,0488	<0,0488	<0,0488	<0,0488
13C6 PeCB	ng/vzorek	69,9	58,2	63,2	62,2	58,2	64,7	62,5
13C6 HCB	ng/vzorek	77,5	65,7	70,2	65,9	68,9	70,3	61,3
13C12 PP_DDE	ng/vzorek	105	99,8	101	98,4	97,7	100	98,5
13C12 PP_DDD	ng/vzorek	101	96,6	96,3	92,8	98,8	94,6	96,4
13C12 PP_DDT	ng/vzorek	96,3	104	99,5	99,5	97,5	103	[illegible]
13C6 betaHCH	ng/vzorek	95,9	91,0	77,5	80,3	78,2	82,9	[illegible]

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Masaryk university
RECETOX: Trace analytical laboratories
Kamenice 753/5, building A29, 625 00 Brno

Test report no. 3/2020

OCPs		905/20	906/20	907/20	908/20	909/20	910/20	911/20
13C6 gamaHCH	ng/vzorek	95,1	79,6	74,6	74,2	73,8	77,5	72,6

PAHs		905/20	906/20	907/20	908/20	909/20	910/20	911/20
Naftalen	ng/vzorek	121	218	284	129	305	93,4	59,7
Acenaftylen	ng/vzorek	4,53	6,52	8,53	5,63	28,5	1,61	0,728
Acenaften	ng/vzorek	4,12	35,1	8,72	4,23	40,1	2,28	0,910
Fluoren	ng/vzorek	43,5	407	91,5	38,8	455	9,51	5,80
Fenantren	ng/vzorek	162	1510	212	199	1860	29,2	24,3
Antracen	ng/vzorek	3,10	16,3	3,26	9,68	65,9	<1,07	<1,07
Fluoranten	ng/vzorek	65,9	571	78,7	76,7	589	10,6	7,85
Pyren	ng/vzorek	33,8	322	39,1	49,0	339	5,32	4,09
Benzo(a)antracen	ng/vzorek	3,09	19,0	3,61	4,66	17,1	0,919	0,564
Chrysen	ng/vzorek	4,90	35,6	5,42	6,00	32,0	1,03	0,868
Benzo(b)fluoranten	ng/vzorek	3,80	22,9	4,11	2,64	18,1	<1,38	<1,38
Benzo(k)fluoranten	ng/vzorek	<1,49	7,73	<1,49	<1,49	6,00	<1,49	<1,49
Benzo(a)pyren	ng/vzorek	<1,81	7,02	<1,81	<1,81	5,75	<1,81	<1,81
Indeno(123cd)pyren	ng/vzorek	0,805	5,14	0,778	<0,740	4,15	<0,740	<0,740
Dibenzo(ah)antracen	ng/vzorek	<0,730	<0,730	<0,730	<0,730	<0,730	<0,730	<0,730
Benzo(ghi)perylen	ng/vzorek	<0,990	4,13	<0,990	<0,990	3,32	<0,990	<0,990
Bifenyl	ng/vzorek	28,0	156	69,5	28,9	199	13,4	7,71
Reten	ng/vzorek	11,0	117	10,6	98,0	282	1,83	1,31
Benzo(b)fluoren	ng/vzorek	2,34	29,3	3,69	3,92	24,9	0,430	<0,380
Benzo-nafto-thiofen	ng/vzorek	0,635	2,13	0,449	0,632	1,89	<0,310	<0,310
Benzo(ghi)fluoranten	ng/vzorek	3,18	29,9	4,08	4,62	26,7	0,680	0,544
Cyclopenta(cd)pyren	ng/vzorek	<0,410	<0,410	0,473	<0,410	<0,410	<0,410	<0,410
Trifenylen	ng/vzorek	2,42	11,8	2,14	2,55	8,69	0,658	0,505
Benzo(j)fluoranten	ng/vzorek	1,66	10,5	1,86	<1,45	8,35	<1,45	<1,45
Benzo(e)pyren	ng/vzorek	8,02	10,9	2,05	1,89	9,45	<1,34	<1,34
Perylen	ng/vzorek	<1,58	<1,58	<1,58	<1,58	<1,58	<1,58	<1,58
Dibenzo(ac)antracen	ng/vzorek	<0,730	<0,730	<0,730	<0,730	<0,730	<0,730	<0,730
Antantren	ng/vzorek	<1,52	<1,52	<1,52	<1,52	<1,52	<1,52	<1,52
Coronen	ng/vzorek	<1,89	<1,89	<1,89	<1,89	<1,89	<1,89	<1,89
SUM_16PAH	ng/vzorek	451	3190	740	525	3770	154	105
SUM_29PAH	ng/vzorek	508	3550	835	666	4330	171	115

---------- **End of test report**----------

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14. Conclusions

The project „The Evaluation of the Air Pollution Level in Lithuania by Using of Diffusive Samplers“ was carried out in the year 2019 and the final report was prepaired in the second quarter of 2020. The contractor was the consortium of companies UAB „Adranas“ and ENVItech Bohemia s.r.o.

The monitoring of gaseous compounds was carried out on 151 locations, the monitoring of particulates was carried out on 15 locations and the monitoring of POPs was carried out on 2 locations in Lithuania. For sampling of gaseous pollutants were used passive samplers Radiello, for monitoring of particulates were used dust sensors enviDUST and for sampling of POPs were used passive air samplers with PUF disks made by Masaryk University, Faculty of Science – RECETOX.

1. The average annual concentrations of PM_{10} from all measuring locations did not exceed the limit value of 40 µg/m^3. The range of annual average PM_{10} concentrations was 12.1 - 34.1 µg/m^3, which is about 60% of the limit value. The limit value for annual average $PM_{2.5}$ concentration is 25 µg/m^3 and was not exceeded at any of the measuring locations. At most stations the annual average concentrations reach about 65% of the limit value. Annual average $PM_{2.5}$ concentration limit from 2020 decreased to 20 µg/m^3, thus paying attention to whether 5 urban averages exceed and 2 cities are very close to the newly set limit values.
2. In one location (Vilnius 18), NO_2 concentration almost reached the limit value for the calendar year, otherwise, the values from the vast majority of the location were far below the LAT (lower assessment threshold) or they were even very low.
3. SO_2 concentrations were very low in all locations and they were far from any limit values, including limit values for vegetation protection.
4. Also the measured concentrations of benzene were very low and in all locations the values were lower than the LAT (lower assessment threshold).
5. In most cases, the spatial variability of NO_2, SO_2 and benzene concentrations is relatively small with the exception of slightly elevated values for the Vilnius and Kaunas agglomerations.
6. Regarding the comparison of concentrations between 2010/2011 and 2019 there was a significant decrease in NO_2 and benzene concentrations, both in the whole zone of Lithuania and in the agglomerations of Vilnius and Kaunas. In the case of SO_2 the situation is significantly different, as between 2010/2011 and 2019 there was far no such significant decrease in its concentrations as in the case of NO_2 and benzene. There was only a slight decrease in the Lithuania zone, while concentrations in the agglomerations of Vilnius and Kaunas even stagnated or increased slightly.
7. The results of this project confirm the current setting of zones and agglomerations for the air quality assessment and the contractor does not recommend changing it now.
8. The study contractor recommends adding at least 1 additional site where the $PM_{2.5}$ fraction would be monitored and the construction of one air pollution monitoring station (urban background location), eg. in the Tauragė location.
9. Levels of POPs in ambient air including PCDDs/Fs in the regions selected in this study are not higher than European background.

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16. Acronyms and abbreviatons

EPA – Enviroment protection agency
AAS – Active Air Sampling
DDX – Dichlorodiphenyltrichloroethane and its derivatives
GMP – Global Monitoring Plan
HCH – Hexachlorocyclohexane
PM – Particulate matter
QC – Quality control
QA – Quality assurance
VOC – Volatile organic compounds
MDL – Method detection limits
Max. – Maximum
Min. – Minimum
LAT –Lower assessment threshold
OCP - Organochlorinated pesticides
AQM – Air quality monitoring (station)
PAH – Polycyclic aromatic hydrocarbons
PBDE – Polybrominated diphenylethers
PCB – Polychlorinated biphenyls
PCDD / F – Polychlorinated dibenzo-p-dioxins and -furans
PE – Polyethylene
PAS – Passive Air Sampler
POP – Persistent organic pollutants
PUF – Polyurethane foam
CRM – Certified reference materials
SOP – Standard operation procedure
EDA – Exploratory Data Analysis
Mean LCL – Mean lower control limit
Mean UCL – Mean upper control limit