Covenant of Mayors
Committed to local sustainable energy

Final Report

SUSTAINABLE ENERGY ACTION PLAN
THE STATUTORY CITY OF OSTRAVA

ENVIROS, s. r. o. - November 2013

THE STATUTORY CITY OF OSTRAVA

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Prepared by:

Ing. Vladimíra Henelová – Project Manager

Ing. Jana Adamiecová, ENVIROS, s.r.o.

Ing. Michael ten Donkelaar, ENVIROS, s.r.o.

Ing. Otakar Hrubý, HO Base

Ing. Jiří Jedlička, Ing. Ivo Dostál, CDV, v.v.i.

Approved by:

Ing. Jaroslav Vích – Executive Director

Client's Address: Statutory City of Ostrava
Prokešovo náměstí 8
729 30 Ostrava

Contact Person: Ing. Magda Vrbová, Ph.D.
Phone No.: +420 599 442 202
E-mail: mvrbova@ostrava.cz

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1. EXECUTIVE SUMMARY – CITY OF OSTRAVA

The Covenant of Mayors is a European initiative aimed at the bodies of local and regional administration, who undertake voluntarily to increase energy performance and use renewable energy sources in the territories administered by them. The signatories of the Covenant commit themselves to meet and exceed the goal of the European Union to reduce CO_2 emissions by 20 % by the year of 2020. The Statutory City of Ostrava accessed officially the initiative of the Covenant of Mayors and signed the latter on 2nd November 2011.

1.1 Obligations of the City of Ostrava Resulting from Its Accession to the Covenant

From the wording of the Covenant, supporting materials, examples of other cities and relevant methodological recommendations it clearly follows that, in order to manage its accession to the Covenant of Mayors successfully, the city shall take a number of steps, which the city has not needed to provide for up to now, such as:

a) To determine (calculate) an achievable target value for 2020 (the need to reduce CO_2 emissions on the Territory of the city by implementing the Sustainable Energy Action Plan in the areas of activity related to the mandate of the Municipality); by 2020 the CO_2 emissions in considered sectors shall be lowered by 20 % at least, as compared to the value in the baseline year.

b) To ratify both the undertaking and the Action Plan using applicable procedures;

c) To prepare the Baseline Emission Inventory as the basis of the Sustainable Energy Action Plan;

d) To prepare the Action Plan in compliance with the applicable methodologies of the European Commission;

e) To adjust the administrative structure of municipality and allocate (re-allocate) human resources in order the implementation of required actions to be allowed;

f) At least once in each two years, after submitting the Action Plan, to present the relevant implementation report in order the implementation of the Plan to be evaluated, monitored and verified (the municipality shall have defined mechanisms established for monitoring and evaluation of SEAP performance in required formats);

g) To organize Energy Days or Days of Signatories of the Covenant of Mayors in cooperation with the European Commission and other involved parties, allowing citizens to make direct use of the opportunities and advantages offered by smarter methods of energy use;

h) On a regular basis to inform local media on the progress of Action Plan fulfilment; to set the performance monitoring of activities and projects in a way making the presentation of relevant reports possible;

i) To attend and take an active part in the annual EU conferences of mayors on sustainable energy in Europe;

j) To spread the message of the Covenant on suitable forums and, in particular, to encourage other mayors to participate in the Covenant.

1.2 Determining the Year of Baseline Emission Inventory (BEI)

The year of 2000 is defined as the baseline year, which the reduction of emissions is to be compared to. The Municipality attempted to determine the emission inventory for 1995, but the efforts to establish relevant reliable and complete data on the consumption of fuel, heat and

electric power for included sectors in required structure were unsuccessful. The inventory of fuel and energy consumption had been first prepared for the city as a whole and subsequently, in compliance with the methodology of the European Commission, it was narrowed to include only those sectors (so called "included sectors") that the Municipality could influence by its activities. The final consumption of those included sectors amounts to almost 20 % of the total consumption of fuels occurring on the Territory of the city.

The Municipality of Ostrava will evaluate the reduction of CO_2 emissions achieved by the implementation of proposed measures by comparing it to the data of 2000, in order to demonstrate the achievement of the set targets.

Table 1: Sectors Included in the Baseline Emission Inventory (to EC Methodology)

Included Sector	Included in BEI	Remark
Final energy consumption in buildings, facilities, equipment and industries		
Municipal buildings, equipment/facilities	YES	Those sectors include the total consumption of energy in buildings, facilities and consumers not included in other sectors, such as, e.g., energy consumption for drinking water treatment, waste water treatment, etc. n.
Tertiary (non-municipal) buildings, equipment/facilities	YES	
Residential buildings	YES	
Municipal public lighting	YES	
Municipal fleet (service vehicles, municipal waste transport, police and ambulance vehicles)	YES	This part includes the emissions generated from all transportation by those vehicles.
City road transport, public transport	YES	
City road transport: passenger and company transport	YES	It includes the part of passenger transport on the roads owned by the Municipality
City railway transport	YES	The sector comprises the municipal railway transport within the Territory of the city, such as trams, metro and local trains.

The resulting CO_2 emissions produced by included sectors in 2000 amounted to 1 524 971 tpy. From the included sectors the highest consumption of fuels and energy - and, consequently, the highest CO_2 emissions – were as follows:

Table 2: Initial Inventory of CO_2 Emissions in Territory if Ostrava (BEI, tpy)

Sector of Consumption	CO_2 Emissions in 2000	Share of Individual Sectors in Total CO_2 Emissions
Municipal buildings, equipment/facilities	105 689	6,9%
Tertiary (non-municipal) buildings, equipment/facilities	332 093	21,8%
Residential buildings	946 583	62,1%
Municipal public lighting	14 329	0,9%
Municipal vehicle fleet	7 757	0,5%
Public transport	56 503	3,7%
Private and commercial transport	62 017	4,1%
TOTAL	1 524 971	100,0%

1.3 Developments in CO_2 Emissions from 2000 through 2010

In order to determine the developments in CO_2 emissions intermediate inventories of fuel/energy consumption and related CO_2 emissions (MEI) were prepared employing for the years of 2005 and 2010.

CO_2 Emissions	BEI 2000	MEI 2005	MEI 2010
Municipal buildings, equipment/facilities	105 689	88 026	79 315
Tertiary (non-municipal) buildings, equipment/facilities	332 093	270 309	284 691
Residential buildings	946 583	848 583	677 664
Municipal public lighting	14 329	11 848	9 311
Municipal vehicle fleet	7 757	7 853	5 691
Public transport	56 503	45 233	37 077
Private and commercial transport	62 017	70 443	67 548
TOTAL	1 524 971	1 342 296	1 161 298
Development in comparison to BEI	0,0 %	-12,0%	-23,8%

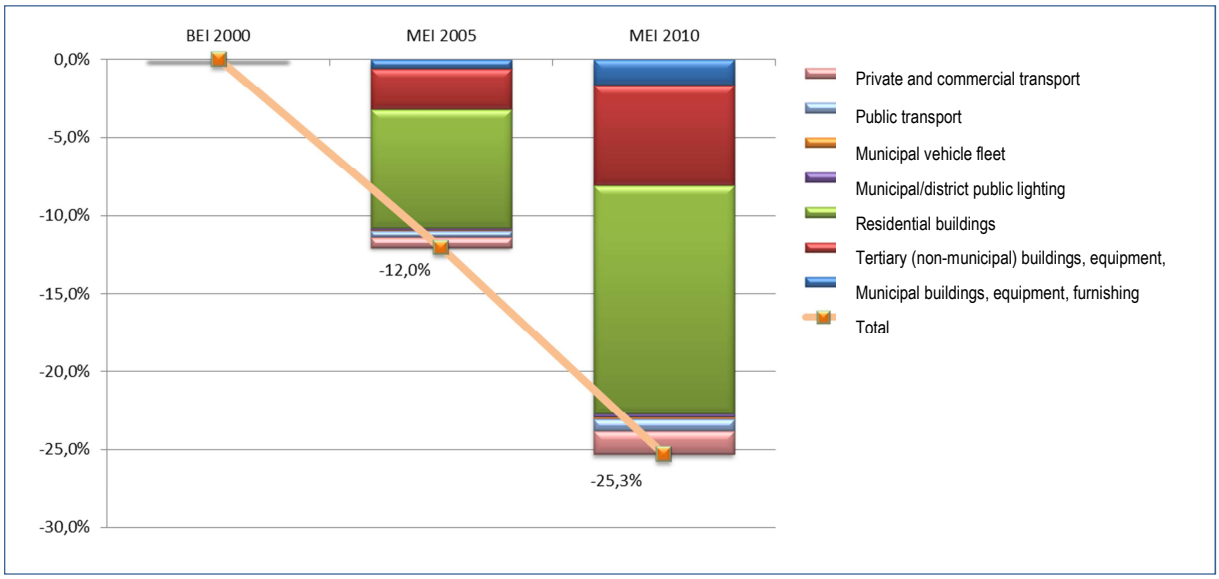
The decline in CO_2 emissions is caused particularly by saving that take place in the consumption of heat and natural gas and, in addition, owing to favourable developments of the emission factor in electric power production in the Czech Republic.

1.4 The Target of Ostrava Statutory City in the Reduction in CO_2 Emissions

A scenario was prepared of the possible development in CO_2 emissions up to 2020, which includes the development and new construction activities to occur in the involved sectors by 2020, as well as the contributions of measures to be taken for reducing the consumption of fuel and energy and for CO_2 emission abatement. From the proposed scenario of emission development up to 2020 it follows that CO_2 emissions (BEI 2000) can be reduced on the Territory of Ostrava City by more than 29 % as of 2020. Even in spite of very conservative estimation of contributions to be achieved by the proposed measures it is recommended the Municipality **should undertake the target of 25 % reduction** as a reserve for development of the city and to eliminate some possible risks, such as uncertainties in fuel/energy prices, availability of financial sources, development of energy savings in the residential sector, etc.

Table 3: Inventory of CO_2 Emissions for 2000 and 2020 (Scenario Including Implementation of Measures, tons of CO_2 per year)

Sector of Consumption Included in Inventory	BEI 2000	2020
Municipal buildings, equipment/facilities	105 689	70 880
Tertiary (non-municipal) buildings, equipment/facilities	332 093	288 213
Residential buildings	946 583	604 074
Municipal public lighting	14 329	8 045
Municipal vehicle fleet	7 757	5 407
Public transport	56 503	31 967
Private and commercial transport	62 017	71 465
TOTAL	1 524 971	1 080 051



1.5 Measures for Reducing CO_2 Emissions by 2020

The nature of membership in the Covenant consists in the implementation of specific selected municipal projects that will lead to the reduction of CO_2 emissions at least by 20 % as of 2020, as compared to the initial year, which the Baseline CO_2 Emission Inventory was prepared for.

At present, the Statutory City of Ostrava is found within the agglomeration of Ostrava - Karviná – Frýdek-Místek in which the limit concentrations of air pollutants are significantly exceeded. For the Statutory City of Ostrava the removal of air pollution has been always deemed an absolute priority and SEAP proposes such measures that will contribute to the abatement of emissions of both CO_2 and pollutants into air.

The projects and strategies included in SEAP relate particularly to the areas, which the Municipality is able to influence by its activities – such as residential, municipal and, possibly, other buildings, public lighting, the use of other municipal services (drinking water purification, waste water treatment, waste disposal, public transport, improvement of municipal management in the field of fuel / energy consumption – by supporting information activities, making use of cooperation with the Smart Cities initiative and promoting activities and information in the household sector.

Table 4: Proposed SEAP Measures and Projects

Measure Name	State of Implementation as of 10/11/2013	Measure Owner	Period of Implementation	Contributions of Measure			Total Costs of Measure	Out of It: Municipality	Out of it: Subsidy	Specific Costs	
				GJ/year	MWh/year	CO_2	CZK x 10^3	CZK x 10^3	CZK x 10^3	CZK x 10^3/GJ	CZK x 10^3/ton of CO_2 savings
Group A of the measures under implementation after 2011, or approved for implementation											
EKOTERMO II A ZŠ Ostrčilova, MŠ Výhledy, ZŠ Chrustova, DPS Hladnovská, MŠ Polanecká, ZŠ Bílovecká 1,10, Fire Station Nová Ves, Repinova, Várenská, Škrobálková	Accepted, approved for funding,	MMO OER	2013 -2014	6 580	1 828	442	123 775	66 895	56 880	18,81	280
EKOTERMO II B MŠ Těšínská, ZŠ Trnkovecká	Project rejected Submission to OPŽP 2014+ is proposed	MMO OER	2016-2020	810	225	45	24 651	13 482	11 169	30,43	548
EKOTERMO III MŠ A. Kučery, MŠ P. Lumumby, ZŠ Zelená, ZŠ Havláskova, MŠ Za školou, Senior House Čujkovova, ZŠ Vrchlického	Accepted, approved for funding,	MMO - OER	2013 - 2014	5 711	1 586	525	74 004	40 654	33 350	12,96	141
Reconstruction of the pavilion of ZŠ Gen. Píky 13a	Approved for funding,	ZŠ Píky		1 760	489	248	61 258	47 640	13 618	34,81	247

Measure Name	State of Implementation as of 10/11/2013	Measure Owner	Period of Implementation	Contributions of Measure			Total Costs of Measure	Out of It: Municipality	Out of it: Subsidy	Specific Costs	
				GJ/year	MWh/year	CO_2	CZK x 10^3	CZK x 10^3	CZK x 10^3	CZK x 10^3/GJ	CZK x 10^3/ton of CO_2 savings
Energy savings of the building of district office ofRadvanice and Bartovice	Completed	SMO - ÚMOb	2012	273	76	15	4 935	2 489	2 446	18,08	325
EKOTERMO Ostrava Jih 2nd part (Project A)	Completed	MMO - OER	2012-2013	2 943	818	420	58 469	31 157	27 312	19,87	139
Thermal insulation and window replacement in ZŠ Srbská	Approved	MMO - OER	2012-2013	971	270	156	15 774	8 091	7 683	16,25	101
Energy savings of the building of MŠ Mitrovická in Stará Bělá	Approved	MMO - OER	2012-2013	305*	85*	17*	4 955	2 484	2 471		291
Thermal insulation of school buildings in Polanka nad Odrou	Application accepted	MMO - OER	2012-2014	1 936	538	108	13 525	6 423	7 102	6,99	126
Energy savings of the building of local office in Stará Bělá	Application accepted	MMO - OER	2012-2013	186*	52*	10*	3 021	302	2 719		291
Thermal insulation of ZŠO, Nádražní	Application in preparation	MMO - OER	2014	797	221	91	20 261	10 746	9 515	25,44	222
Creation of low-energy buildings for leisure time of SVČ Korunka	Completed	MMO - OER	2011-2012	946	263	53	6 699	3 662	3 037	7,08	127

Measure Name	State of Implementation as of 10/11/2013	Measure Owner	Period of Implementation	Contributions of Measure			Total Costs of Measure	Out of It: Municipality	Out of it: Subsidy	Specific Costs	
				GJ/year	MWh/year	CO_2	CZK x 10^3	CZK x 10^3	CZK x 10^3	CZK x 10^3/GJ	CZK x 10^3/ton of CO_2 savings
Thermal insulation of the building shell, window replacement and roof reconstruction of SVČ Ostrava - Moravská Ostrava	Completed, additional roof thermal insulation is necessary to SFŽP	MMO - OER	2012	1 040	289	145	11 765	5 690	6 075	11,31	81
Building rehabilitation - SVČ Ostrava - Zábřeh, p.o.	Approved-implementation in preparation	MMO - OER	2012-2013	802	223	49	12 196	7 054	5 142	15,22	251
Thermal insulation of the building of Children & Youth House, Ostrava - Poruba, p.o.	Approved-implementation in preparation	MMO - OER	2012-2013	788	219	89	8 635	4 907	3 728	10,96	97
Energy savings, MNO – Children Rehabilitation Short Stand Hosp., pavilions D & Refectory	Approved by SFŽP	MNO	2012-2013	3 002	834	245	31 719	20 137	11 582	10,57	130
Energy savings, MNO – service building, pavilions G and Pathology	Approved by SFŽP	MNO	2012-2013	5 174	1 437	402	43 194	27 901	15 293	8,35	107
Thermal insulation of Traumatology	Approved-implementation in preparation	MNO	2012-2013	1 891	525	43	26 524	22 404	4 120	14,03	612

Measure Name	State of Implementation as of 10/11/2013	Measure Owner	Period of Implementation	Contributions of Measure			Total Costs of Measure	Out of It: Municipality	Out of it: Subsidy	Specific Costs	
				GJ/year	MWh/year	CO_2	CZK x 10^3	CZK x 10^3	CZK x 10^3	CZK x 10^3/GJ	CZK x 10^3/ton of CO_2 savings
(pavilion), in-patient part, Ostrava Municipal Hospital p.o. (Reconstruction of the Central sterilisation and hemodialysis station											
Energy savings, MNO- pavilions H & E	Approved by SFŽP	MNO	2012-2013	4 432	1 231	344	60 679	38 466	22 213	13,69	176
Regeneration of building outer shell, OK, a.s.	Approved by SFŽP	OK, a.s.	2014	2 697	749	295	16 524	10 504	6 020	6,13	56
Senior House reconstruction, Kamenec I (MPSV 113 310)	Taken from the store, submission in 2014+ is proposed	SMO OER	2013	859	239	83	21 084	5 271	15 813	24,54	254
Thermal insulation of the Children & Youth House Ostrava - Poruba p.o. (3 buildings)	Project preparation	SMO OER	2013-2014	776*	215*	92*	12 600	0	0		136
Primary School of Arts Ostrava - Zábřeh, Sologubova 9/A, contributory organisation	Under implementation	ZUŠ	2013	478	133	63	3 795	1 413	2 382	7,94	61
Already proposed projects, OPŽP &				45 071	12 387	3 976	660 042	376 359	267 288	14,64	166

Measure Name	State of Implementation as of 10/11/2013	Measure Owner	Period of Implementation	Contributions of Measure			Total Costs of Measure	Out of It: Municipality	Out of it: Subsidy	Specific Costs	
				GJ/year	MWh/year	CO_2	CZK x 10^3	CZK x 10^3	CZK x 10^3	CZK x 10^3/GJ	CZK x 10^3/ton of CO_2 savings
other OP, ZÚ, in total											
Ecologisation of local furnaces I	303 boilers – under implementation	Household - RD	2013	5 904	1 640	580	24 240		12 120	4,11	42
Ecologisation of local furnaces II	1500 boilers, stoves, etc.	Household - RD	2013 - 2020	35 438	9 844	3 514	150 000			4,23	43
Construction of a biogas station in ZOO Ostrava	Project approved, implementation stopped. Quite new analysis of feasibility and a new proposal are required.	ZOO	2020	6 480	1 800	550	69 163	51 100	18 063	10,67	126
New projects for thermal insulation and window replacement, OPŽP 2014+	Proposal for 2014+	MMO OER, ÚMOb	2020	19 253	5 348	2 184	385 067	250 000	135067*	20,00	176
Savings in flat block houses	Proposal for 2014+	SVJ, Housing associations	2020	513 186	142 552	57 856	5 645 045			11,00	98
Savings in public lighting	Only for 2012 and 2013	OKAS	2013	1 296	360	175	10000	10000		7,72	57
Ecologisation of public transport operation I	100 pcs of CNG buses	DP Ostrava	2020			981	620 000				632
Ecologisation of public transport	50 pcs of electric buses	DP Ostrava	2020			3 033	445 000				147

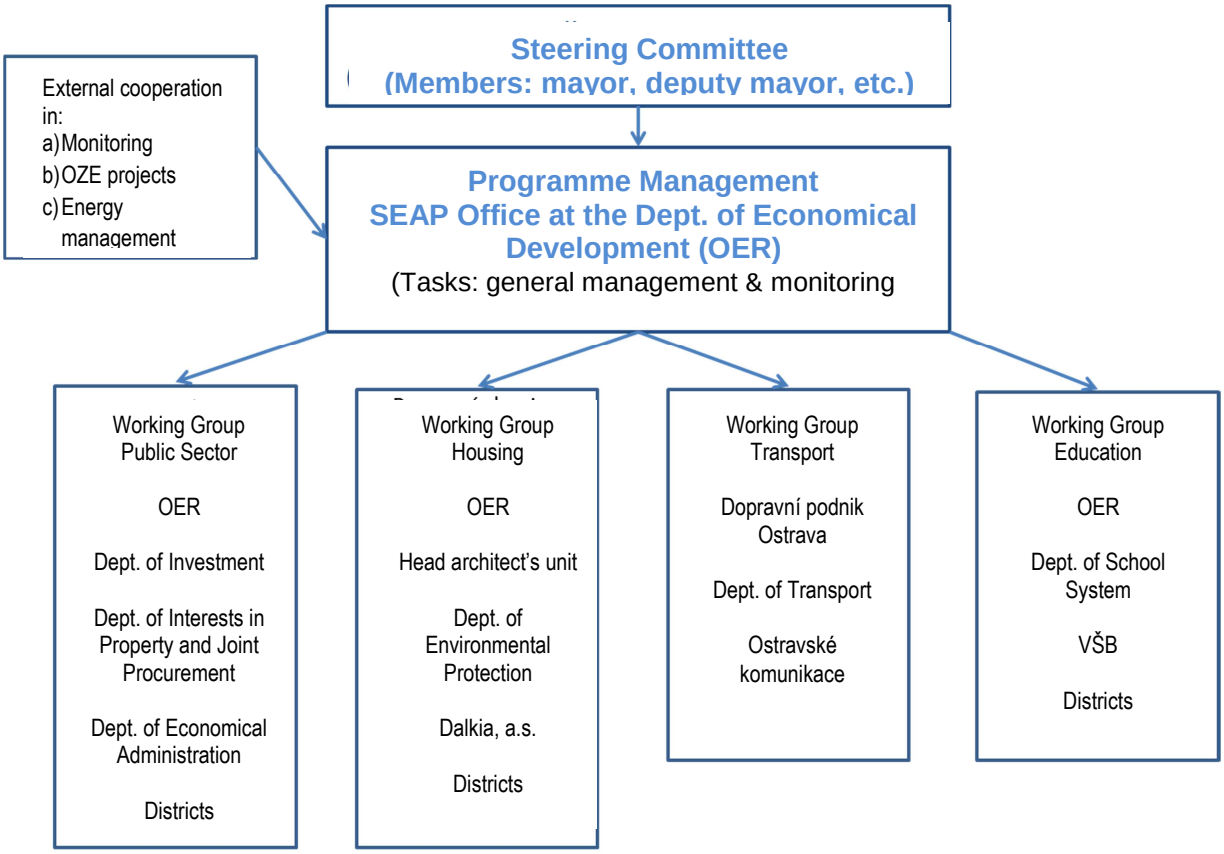
Measure Name	State of Implementation as of 10/11/2013	Measure Owner	Period of Implementation	Contributions of Measure			Total Costs of Measure	Out of It: Municipality	Out of it: Subsidy	Specific Costs	
				GJ/year	MWh/year	CO_2	CZK x 10^3	CZK x 10^3	CZK x 10^3	CZK x 10^3/GJ	CZK x 10^3/ton of CO_2 savings
operation II											
Construction of transport terminals	Reduction of the output of suburban buses in favour of MHD electric traction	Building of own terminals in four locations	2020								
Support to RESs (solar/photo-voltaic systems)	Proposal for 2014+	Household	2020		1 200	356	35 538				100
Introduction of the energy management system into the management of buildings & facilities owned by Municipality		SMO	2014				800				
New measures TOTAL			20 186	581 558	162 744	69 229	7 384 053	311 100	30 183		

**Own estimate*

1.6 SEAP Implementation and Monitoring

Implementation of the Action Plan of Sustainable Energy and its monitoring requires the a relevant control and management structure to be established for implementing the Action Plan and monitoring its contributions. A proposal for such structure is shown in the following diagram.

Figure 1: Organisational Chart of SEAP Support (Involved Municipality Departments, Commercial Organisations, External Organisations)



1.7 SEAP Funding

Table 5: Possible Sources of SEAP Funding

Measure Type	Possible Funding Source
Projects for thermal insulation & window replacement – already submitted and approved for funding	OP "The Environment" 2007-2013 Green Light for Savings MPSV Programme
Projects on public facilities, identified and recommended for implementation in 2014+	OP "The Environment" 2014+, priority axis 5 Energy Performance Contracting (guaranteed energy services)
Energy management introduction	Subsidy title E1 of EFEKT MPO Programme for 2014
Savings on public lighting systems	OP "The Environment" 2014+, priority axis 5
Savings achieved in residential houses	Programme of ČS, a.s., incl. subsidy of 10 % IROP 2014+
Transport	OP "The Environment" 2014+ Operational Programme "Transport" 2014+
Project preparation, technical assistance	EU Tools: ELENA, IEE (HORIZON), JASPERS

1.8 Contributions from the Accession to the Covenant of Mayors and from the Prepared SEAP

One of the main demands made in the case of Municipality's accession to the Covenant of Mayors consists in systematic management of the issues of fuel & energy consumption. The consumption of energy is closely related to both the production of CO_2 emissions and the costs the municipality and particular city districts pay for the provision of fuel & energy supplies. The costs of energy represent one of the highest items of the economy of particular organisations. Through implementation of the well prepared Sustainable Energy Action Plan and as a result of Municipality's accession to the Covenant of Mayors the city will gain the following contributions, in particular:

- Reduction of costs for fuels and energy through implementation of already prepared and proposed measures applied to buildings and facilities owned by the Municipality - for the purpose of monitoring of those contributions and to make use of already available data for joint procurement of fuels and energy the introduction of energy management is recommended.
- Access to selected financial sources that are available particularly for the signatories of the Covenant. Those and other sources will be used for the preparation, proposal and implementation of measures within the framework of SEAP.
- Reduction of the emissions of pollutants into the air – taking account of the fact the proposed measures will contribute not only to the reduction of fuel and energy consumption and abatement of CO_2 emissions on the Territory of Ostrava, but also to he reduction of the emissions of other pollutants.
- Improved management and control – any improvement in the efficient use of energy is not a purely technological issue. Gaining and maintaining the control over fuel and energy consumption is primarily the function of management. That is why the clear provision for monitoring the consumption of fuels and energy (including the execution of emission inventories) appears to be the main feature of the performance of the Covenant. Such management will make it possible to plan better the costs of energy, monitor the economic contributions gained from investments, evaluate them and use the results for further decision making.
- Making use of the potential of innovation – the activities and projects proposed in the field of research and development within the framework of SEAP will contribute to the implementation of progressive and timeless solutions that create the space for technically advanced and energy efficient technologies. The emphasis put on energy performance, reduction of fuel/energy consumption to the minimum and the use of renewable energy sources on the Territory of the city – particularly in any new developments and brownfield solutions – will create new jobs. The efforts aimed at searching for new and fresh investment intentions may also reveal additional potential existing in the human resources found in the universities and the technological park of Ostrava.

2. CO_2 EMISSION INVENTORY AND THE BASELINE EMISSION INVENTORY (BEI)

2.1 Preparing the Baseline Emission Inventory and the Year of BEI

2.1.1 Sectors Included in the BEI

Preparation of the Baseline Emission Inventory shall be the key step in the formulation of a quality action plan for sustainable energy. However, the preparation of emission inventory for so long-term time horizon appears to put extreme demands on required data inputs. For the creation the baseline emission inventory the year of 1990 is usually recommended. However, a very extensive restructuring of the energy sector took place in the course of 1990's, followed by separation of the distribution activities of power distribution companies from their business activities (so-called "Unbunding"). That is why it is almost impossible to obtain historical data on power supply at present, as the companies that supplied the concerned territory with power at that time do not exist.

The procedure of emission inventory preparation respected the requirements of the JRC methodology and calculations were made in the following sequence:

- Final power consumption;
- Emissions of CO_2 or CO_2 equivalent that correspond to the final consumption;
- Local generation of power and related CO_2 / CO_2 equivalent emissions;
- Local district heating and cooling systems, combined heat and power generation (CHP) and related CO_2 / CO_2 equivalent emissions.

The inventory of CO_2 emissions was made for the entire cadastral area of the statutory city of Ostrava. In order the target group of emissions to be evaluated, the CO_2 emissions coming from the overall consumption of fuels and power on the Territory of the Ostrava city were recorded. Then, the final total consumption was reduced by the sectors not belonging to the inventory according to the methodology of the Covenant of Mayors. The consumptions of fuel and power in the included sectors were converted into CO_2 emissions using IPCC emission factors. The emission factors for electric power and centralized heat supply were determined using the actual structure of fuels employed for their production and are explained in a separate chapter herein below.

The Baseline Emission Inventory was prepared for the following years:

- 1995 (the preparation of a complete inventory failed)
- 2000
- 2005
- 2010

The Baseline Emission Inventory (BEI) includes only those sectors that the Municpality of the Statutory City can influence by its activity and for which the measures for CO_2 emission reduction will be incorporated in the Sustainable Energy Action Plan (SEAP), as shown in Table 6 below.

Table 6: Sectors Included in the Baseline Emission Inventory (to EC Methodology)

Sector	Included in BEI	Remark
Final energy consumption in buildings, facilities, equipment and industries		
Municipal buildings, equipment/facilities	YES	Those sectors include the total consumption of energy in buildings, facilities and consumers/appliances not included in other sectors, such as, e.g., energy consumption for drinking water treatment, waste water treatment, etc. Municipal waste incineration shall be included there, too, provided that it does not serve for energy generation. to
Tertiary (non-municipal) buildings, equipment/facilities	YES	
Residential buildings	YES	
Municipal public lighting	YES	
Industries (excluding industries involved in the EU Emission trading scheme - ETS)	NO	The emissions from those sources have not been included in the Inventory.
Other industries	NO	As regards the city of Ostrava only the sources owned fully (100 %) by the Municipality were included in the sector of other industries (NACE 38 – Waste gathering, collection and disposal; Waste treatment for future use - OZO Ostrava s.r.o., Technické služby, a.s. Slezská Ostrava). The consumption of fuels and power and resulting CO_2 emissions from other industrial sources were not included in the BEI.
Final fuel and energy consumption in transport		
Municipal fleet (service vehicles, municipal waste transport, police and ambulance vehicles)	YES	This part includes the emissions generated from all transportation by those vehicles.
City road transport, public transport	YES	
City road transport: passenger and company transport	YES	
Other road transport	NO	The sector comprises road transport carried out on roadways within the administrative territory of the city, which do not come under authority of the Municipality (incl. road of 1st, 2nd and 3rd class, motorways and highways).
	YES	The sector comprises the municipal railway transport withon the Territory of the city, such as trams, metro and local trains.
Other railway transport	NO	This sector includes the long-distance, intercity, suburban/regional and freight railway transport that may take place withon the Territory of the city. However, the sector serves not only to the city territory, but to a wider area, too (not taken into account in the case of Ostrava City).
Air transport	NO	The consumption of fuels and energy (power/heat) in transport-related buildings and facilities (airports, ports) will be included in the consumption of the tertiary sector. However, any consumption of aircraft and mobile systems shall not be included. The item is not included for Ostrava City.
Shipment	NO	
Local shipment	NO	This type of transport does not operate as any part of municipal transport.
Other emission sources (not related to the consumption of fuels and energy)		
Technological emissions from sources subjected to the emission trading within the EU ETS.	NO	Not included.

Sector	Included in BEI	Remark
Technological emissions from sources not subjected to the emission trading and to the EU ETS Directive.	NO	Not included.
Agriculture (such as fermentation, manure handling, fertilizer application)	NO	
Waste water treatment	NO	It concerns the emissions that do not relate to any energy consumption (CH_4 and N_2O emissions, e.g.).
Waste processing, waste handling	NO*	It concerns other emissions, such as, e.g., the emissions of landfill gas (methane, CH_4 produced by landfills. Both the energy consumption of and related emissions from those landfills are included under "Buildings and Facilities".
Energy generation		
Consumption of fuels for power generation	YES*	In general, the sources may be included only, whose power output is lower than 20 MW_t and are not included in the emission trading.
Consumption of fuels for heat/cold	YES*	Those sources will be included only if the heat supplied by them is consumed on the Territory of the Municipality. For Ostrava the consumption of fuels and CO_2 emissions resulting from the supply of heat made by distributors for the household and tertiary sectors (Dalkia ČR, a.s., ČEZ, a.s. – Vítkovice Heating Plant).

2.1.2 Data Sources for Determining the Final Fuel & Energy Consumption

Table 7: Data & Information Sources for the Inventory of Emissions on the Territory of the Statutory City of Ostrava

Data & Information Sources	Provider
Relevant, registered stationary point sources of air pollution, listed in Supplement 2 to Act No. 201/2012 (REZZO 1, REZZO 2)	ČHMÚ (Czech H Operators – combustion sources and technologies, whose installed power output exceeds 0,2 MW_t
Small non-point monitored stationary air pollution sources (REZZO 3)	ČHMÚ Model calculation of fuel consumption based on the data provided by the SLDB for the territory of Ostrava Municipality and on the data provided by natural gas & heat suppliers from the Central Heat Supply System ("CHP") – sources and local furnaces of power output s below 0.2 MW.
Transport (REZZO 4)	Calculations of the Centre of Transportation Research Brno (CDV, v.v.i.) Municipality of Ostrava City (Municipal Public Transport System), consumption of passenger cars in the property of MOC and city districts..
Climatic conditions	ČHMÚ Degree days D_{21} for heating periods of 1995, 2000, 2005, 2010 plus the average values (I - V and IX – XII respectively)
SLBD (Population census data)	ČSÚ (Czech Statistic Inst.) Population census data from 1991, 2001, 2011
Natural gas supply	RWE Gas Net, s.r.o.

	The supply of natural gas for customers on the Territory of Ostrava City according to customer category (VO, MO, DOM) in the years of 2000, 2005 and 2010 [MWh/yr]
Electric power supply	ČEZ Distribuce, a. s. The supply of electric power on the Territory of the Statutory City of Ostrava according to customer category (VO, MO, DOM) and relevant tariff rates. [MWh/yr]
Heat supply	Dalkia Česká republika, a.s. (Třebovice Power Plant, Přívoz. Heating Plant, Mariánské Hory Heating Station and other local steam boiler plants) ČEZ, a.s. – Vítkovice Heating Plant ArcelorMittal Energy Ostrava s.r.o. – Company Heating Plant Heat supply [GJ/yr] structured to the sectors of consumption (industry, tertiary sector, households); the share of fuel consumption in the generation of heat and power in CHP, for1995, 2000, 2005 and 2010
Consumption of fuels and energy in the buildings of the Statutory City of Ostrava, consumption of electric power for public lighting, consumption of fuels by the municipal vehicle fleet.	Municipality of Ostrava – Municipality departments, the offices of individual city districts, particular commercial companies and contributory organisations
Emission factors for imported electric power (not generated on the Territory of Ostrava Statutory City)	ENVIROS, s.r.o., emission factors for calculating the projections of CO_2 emissions for the ČHMÚ, based on the structure of power generation on system power plants.
Power generation on the Territory of the City	Dalkia Česká republika, a.s., ČEZ, a.s. –Vítkovice Heating Plant, Atlas – a system employing renewable energy sources (www.calla.cz/atlas) , ERÚ (Energy Control Office)

2.1.3 Listed Relevant Stationary Point-Registered Sources

The data of Summary Operating Files (SPE) monitored by the ČHMÚ through the Integrated System of Reporting Obligation Performance (ISPOP) operated by CENIA according to Act no. 25/2008 Sb.. ČHMÚ Praha, Section of Air Purity, Dept. of Emissions and Sources, keeps the database of relevant stationary sources. The data were provided for determining the inventory of fuels and emissions.

The number of listed stationary sources (to Supplement 2 to the Air Protection Act no. 201/2012 Sb.) found on the Territory of the Statutory City of Ostrava is shown in the following Table 3.

Table 8: Number of listed, point registered relevant stationary sources on the Territory of the Statutory City of Ostrava structured to the consumption sectors in the years of 1995 – 2010

Year	Power & Heat Sources	Other Industry	Agriculture (buildings)	Tertiary Sphere	transport (buildings)	No. of Sources, Total
1995	42	97	8	148	14	**309**
2000	24	128	20	205	24	**401**
2005	14	111	24	178	35	**362**
2010	18	129	12	167	27	**353**

Data source: ČHMÚ

As only certain sections of consumption are included in the Baseline Emission Inventory in compliance with ordering documentation and requirements set in the methodological and technical manuals issued by the Covenant of Mayors office (see Table 2), it was necessary first to single out all the sources which would not be included in the Emission Inventory.

In the first step those sources were eliminated, which do not belong to the European Emission Trading System (EU ETS).The following sources located on the Territory of the Statutory City of Ostrava were concerned::

- ArcelorMittal Energy Ostrava s.r.o.
- ArcelorMittal Engineering Products Ostrava s.r.o.
- ArcelorMittal Ostrava a.s.
- ArcelorMittal Ostrava Tubular Products Ostrava a.s.
- ČEZ, a. s., Vítkovice Heating Plant
- Dalkia Česká republika, a.s., Třebovice Power Plant
- Dalkia Česká republika, a.s., Přívoz Heating Plant
- Dalkia Česká republika, a.s., Mobile Boiler Plant “Jižní město”
- EVRAZ VÍTKOVICE STEEL, a.s., Steelworks I
- VÍTKOVICE HEAVY MACHINERY a.s.

In the subsequent step other industrial sources were eliminated, as the Municipality was not able to influence positively their operation by its measures, orders, regulations or incentives. The relevant consumption of fuels and energy for producing electric power, heat or cold of the sources located on the Territory of the City and supplying facilities located on the same territory (households, tertiary sphere buildings, e.g.) makes an exception.

For clearness the comparison was made of the total consumption of fuels in combustion processes (not including technologies) in stationary sources located in particular districts of the Statutory City of Ostrava in 2010 to the consumption of sources incorporated in the Baseline Inventory of CO_2 emissions, as shown in Fig. 4 and Fig. 5, respectively (the same scale of the diagrams was maintained).

2.2 Consumption of Heat in Fuel in the Listed Stationary Sources of Air Pollution on the Territory of the Statutory City of Ostrava, Combustion Processes in Total [GJ/yr], Structured to Fuel Types and Districts, for 2010

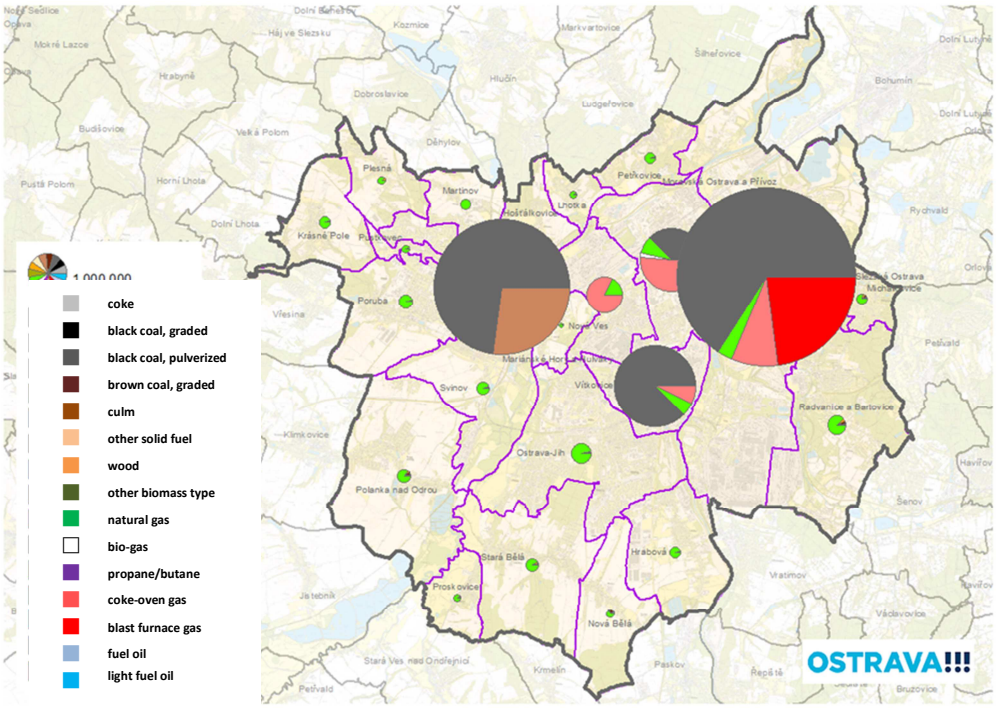


Figure 2:

Figure 3: Consumption of heat in fuel in the stationary sources of air pollution located on the Territory of the Statutory City of Ostrava; combustion processes included in the BEI [GJ/yr], structured according to the fuel type and city district, for 2010.

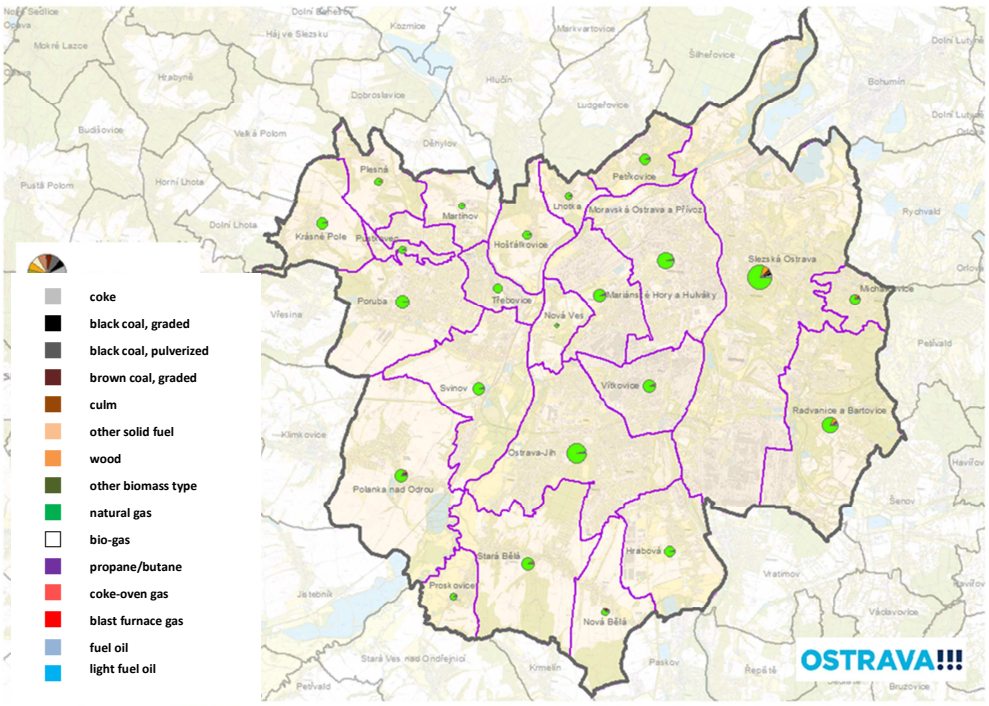
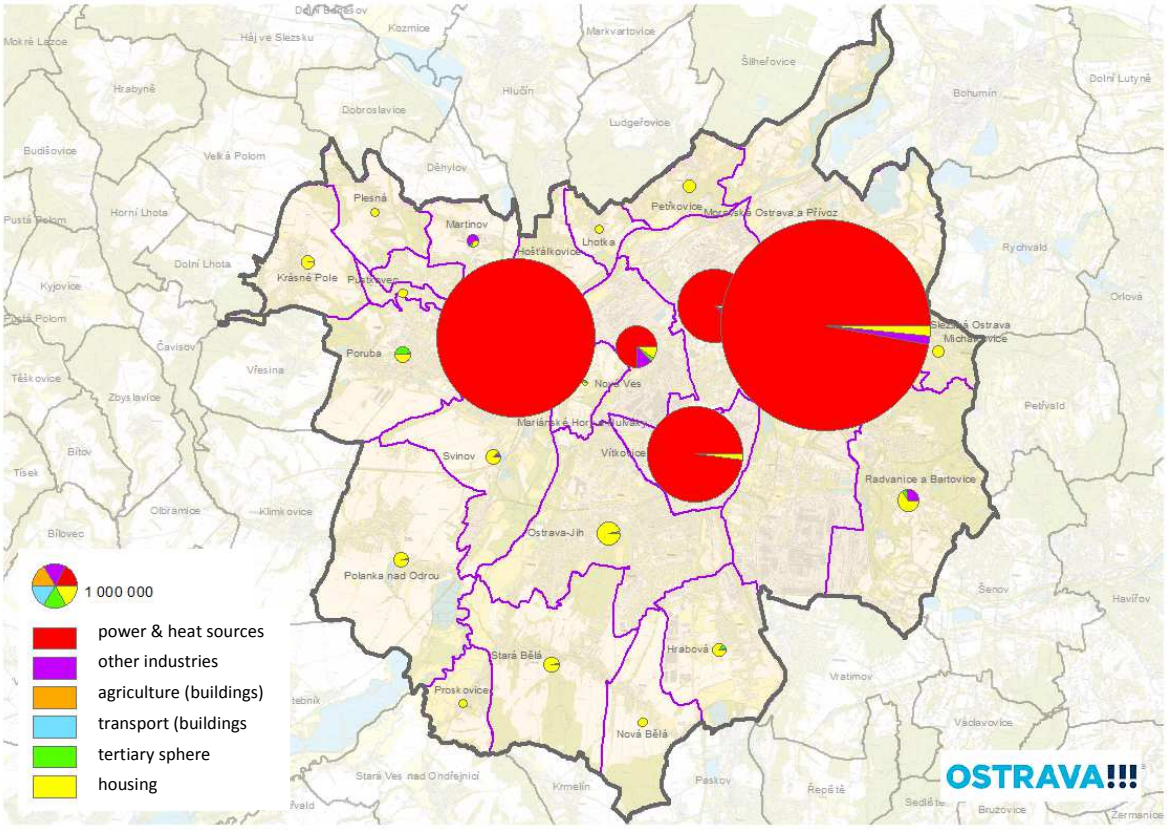


Figure 3 shows the structure, by sectors, of the total consumption of heat in fuel for the processes of combustion in the stationary sources of air pollution before elimination of the sources not incorporated in the Baseline Emission Inventory (BEI).

Figure 4: Consumption of heat in fuel in the stationary sources of air pollution located on the Territory of the Statutory City of Ostrava; combustion processes in TOTAL [GJ/yr], structured according to the fuel type and city districts, for 2010.



The number of listed point-registered relevant stationary sources found on the Territory of the Statutory City of Ostrava, which were incorporated in the BEI after making the above mentioned adjustments, is shown in the following Table 4. A part of emissions from the production of heat in the sources located outside of the territory of the City was included in the Baseline Emission Inventory because the concerned sources supply heat and hot water for the buildings belonging to the tertiary and household sectors, which are contained in SEAP.

From the industrial sources contained in the database of listed stationary sources of pollution only those companies were incorporated in the BEI, which had been founded by the Statutory City of Ostrava and in which the Municipality holds 100 % interest. (NACE 38 – Waste gathering, collection and disposal, waste processing for reuse).

- OZO Ostrava s.r.o.
- Technické služby, a.s., Slezská Ostrava

Table 9: The number of listed, point-registered relevant stationary sources found on the Territory of the Statutory City of Ostrava, structured to consumption sectors in the years of 1995 – 2010 incorporated in the BEI

Year	Industry[1]	Tertiary Sphere	Transport (buildings)	No. of sources in TOTAL
1995	2	148	14	166
2000	2	205	24	237
2005	4	177	35	222
2010	4	167	27	198

Data source: ČHMÚ

[1] Companies owned fully (100 %) by the Municipality: OZO Ostrava, s.r.o, Technické služby,a.s., Slezská Ostrava

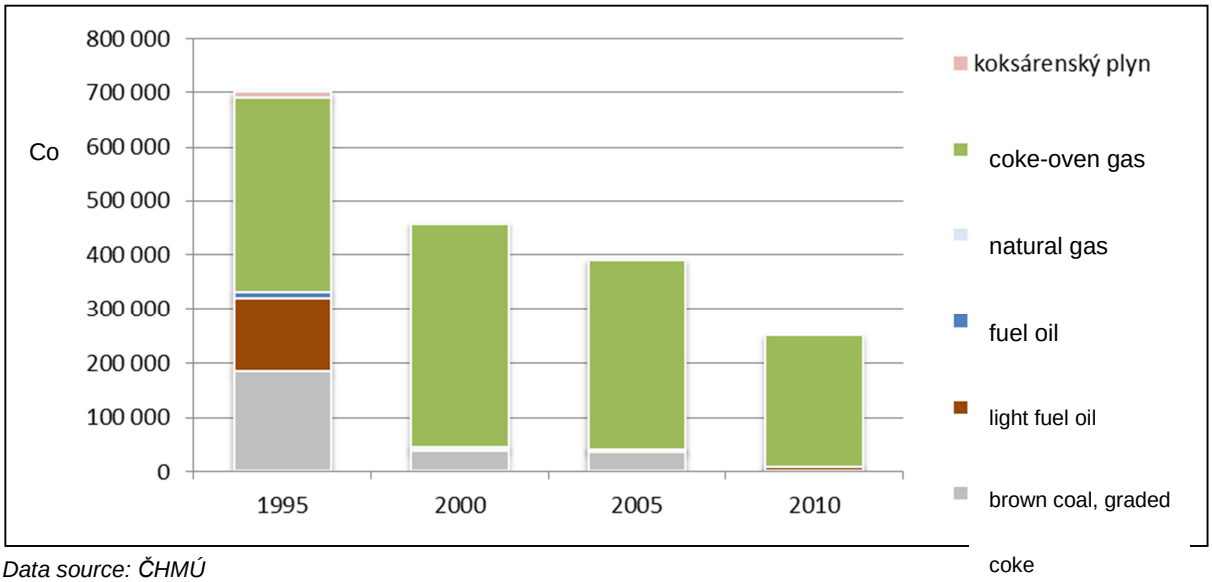
Results are available for individual sources. For comparison the annual fuel consumption in natural units was converted into the annual consumption of heat in the fuel [GJ/yr].

Table 10: Consumption of heat in fuel in the listed, point-registered relevant stationary sources of air pollution located on the Territory of the Statutory City of Ostrava incorporated in the BEI in the years of1995, 2000, 2005 and 2010 [GJ/yr]

Fuel Type	1995	2000	2005	2010
coke	186 340	35 918	37 285	6 667
brown coal, graded	133 533	2 944	4 216	3 636
light fuel oil (sulphur content < 1 % b.w.)	11 717	4 653	102	
fuel oil				129
natural gas	358 453	409 938	349 726	241 557
coke-oven gas	12 304	1 728		
TOTAL [GJ/yr]	**702 347**	**455 789**	**387 113**	**251 989**

Data source: ČHMÚ

Figure 5: Consumption of heat in fuel in the listed, point-registered relevant stationary sources of air pollution located on the Territory of the Statutory City of Ostrava incorporated in the BEI in the years of 1995, 2000, 2005 and 2010 [GJ/yr]

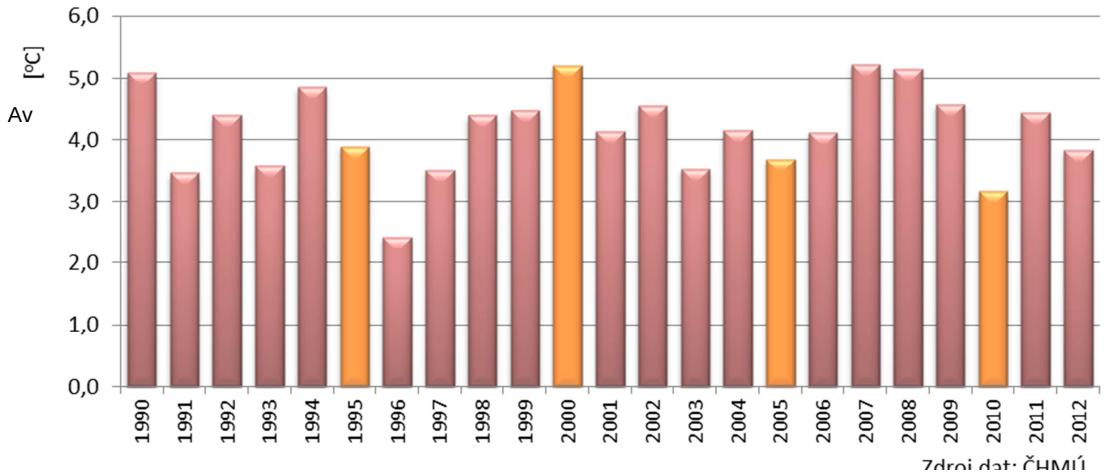


Data source: ČHMÚ

2.2.1 Adjustment of Fuel & Energy Consumption to Average Climatic Conditions

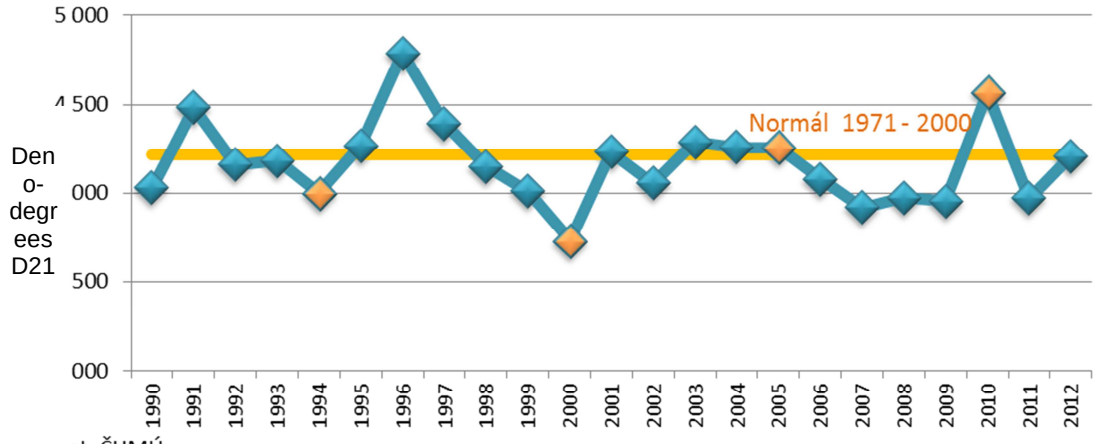
The level of fuel consumption in combustion sources depends on the climatic conditions prevailing in the heating period. The following figures show the development of average temperature in the course of the heating season and the development of the number of degree days in recent years. The values of consumption of fuel and energy in the climate-dependent part of fuel/energy consumption (fuel/energy consumption for heating) were adjusted to the average climatic conditions.

Figure 6: Average temperature in heating days in the CR in 1990-2012



Data source: ČHMÚ

Figure 7: Degree days D21 for heating periods of 1990-2012 (average values for all climatologic stations for the periods of I - V and IX – XII)



Data source: ČHMÚ

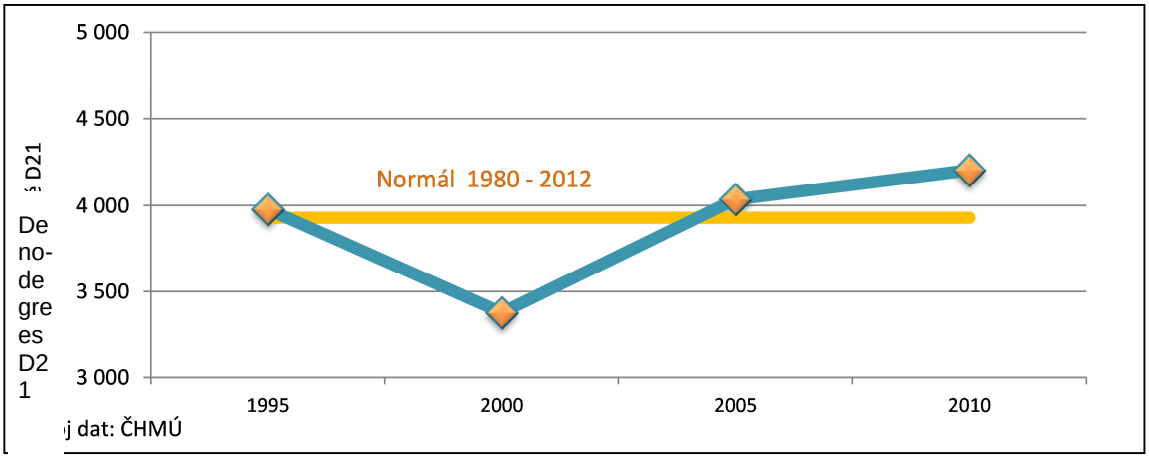
In the evaluated time profiles the numbers of deno-degrees for the interior temperature of 21 °C for the Statutory City of Ostrava were as follows:

Table 11: Degree days D_{21} for heating periods of 1995, 2000, 2005, 2010 and the average (I-V and IX XII)

Year	No. of degree days for interior temperature of 21 °C
1995	3 979
2000	3 378
2005	4 036
2010	4 205
Normal 1980-2012	3 930

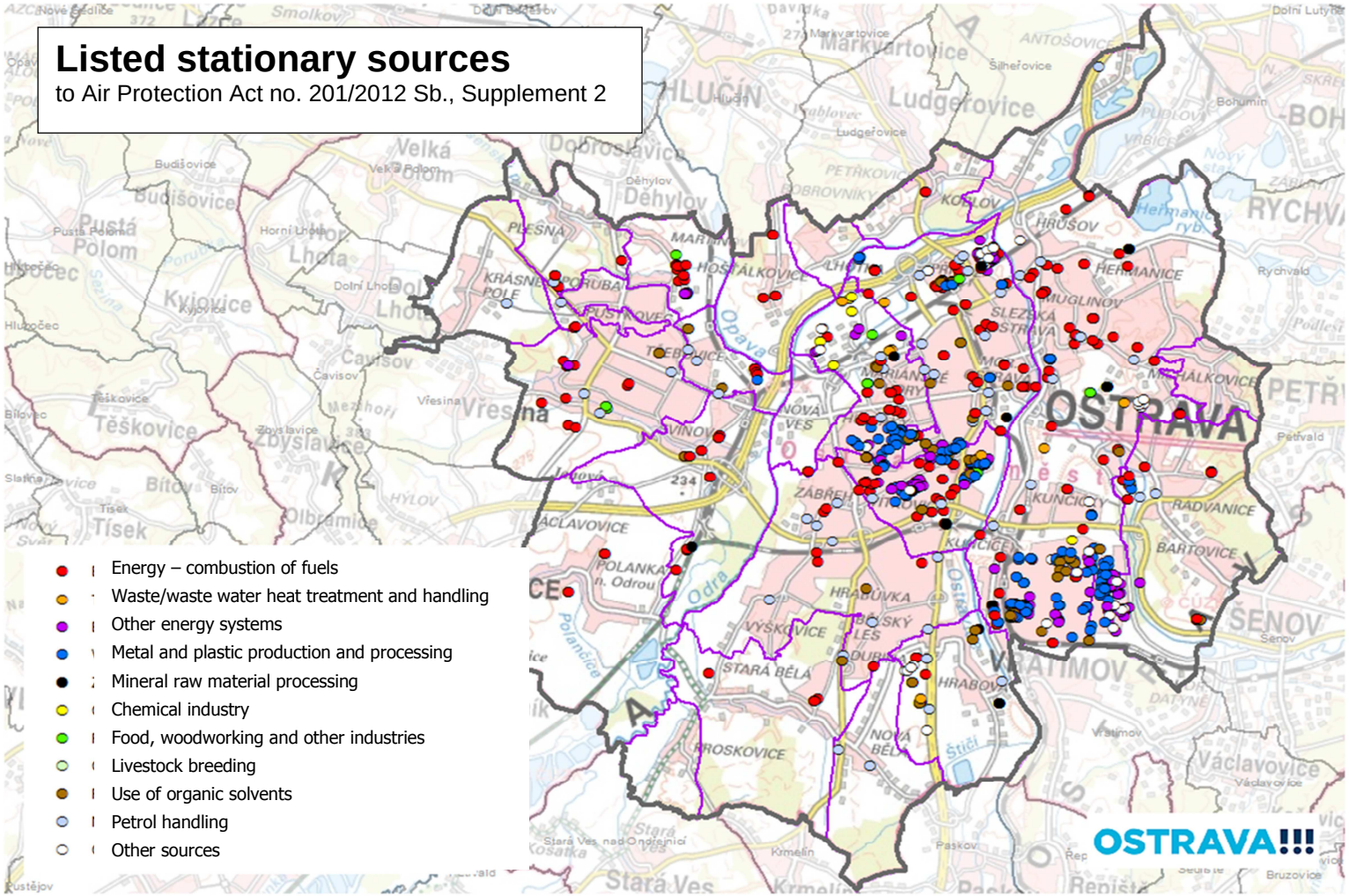
Data source: ČHMÚ

Figure 8: Degree days D_{21} for heating periods of 1995, 2000, 2005, 2010 and the average value (I - V and IX – XII)



Data source: ČHMÚ

Figure 9: Situation of the listed, point-registered relevant stationary sources located on the Territory of the Statutory City of Ostrava in 2011, structured to the way of source use



2.2.2 Non-Point Monitored Stationary Sources

The consumption of fuels calculated by the ČHMÚ from statistical data coming from the census of population, houses and living flats in 2010/2011 made by the ČSÚ, were used as initial data for the calculation of CO_2 emissions from unregistered small, non-point monitored stationary sources of air pollution (so-called "local furnaces"). The data were updated and verified using the data provided by gas companies to obtain the fuel structure for the year of evaluation. In the consumption of fuels the qualitative parameters were taken into account of solid fuels combusted on the Territory of the Region of Moravia-Silesia (supporting data of TEKO Praha). The calculated model consumption of natural gas was replaced with the actual supply of natural gas, provided by RWE Gas Net, s.r.o., for the purpose of preparing the Baseline CO_2 Emission Inventory.

Table 12: Natural gas supply for customers located on the Territory of the Statutory City of Ostrava in 2000, 2005 a 2010 [MWh/r]

Year	2000	2005	2010
Households	616 730	621 846	582 695
Small gas users	239 053	302 286	324 865
Medium and large gas users	2 219 920	2 605 864	2 602 355
TOTAL [MWh/r]	**3 075 703**	**3 529 996**	**3 509 915**

Data source: RWE Gas Net, s.r.o.

The results are aggregated for the territories of particular city districts (23 non-point stationary sources). For comparison the annual fuel consumption in natural units was converted into heat consumption if the fuel [GJ/yr]. Current data on the building and housing funds are shown on the following maps that come from the Census of Population, Living Flats and Houses of 2011:

Figure 10: Number of inhabited living flats, structured to the method of heating, the Statutory City of Ostrava, SLDB 2011

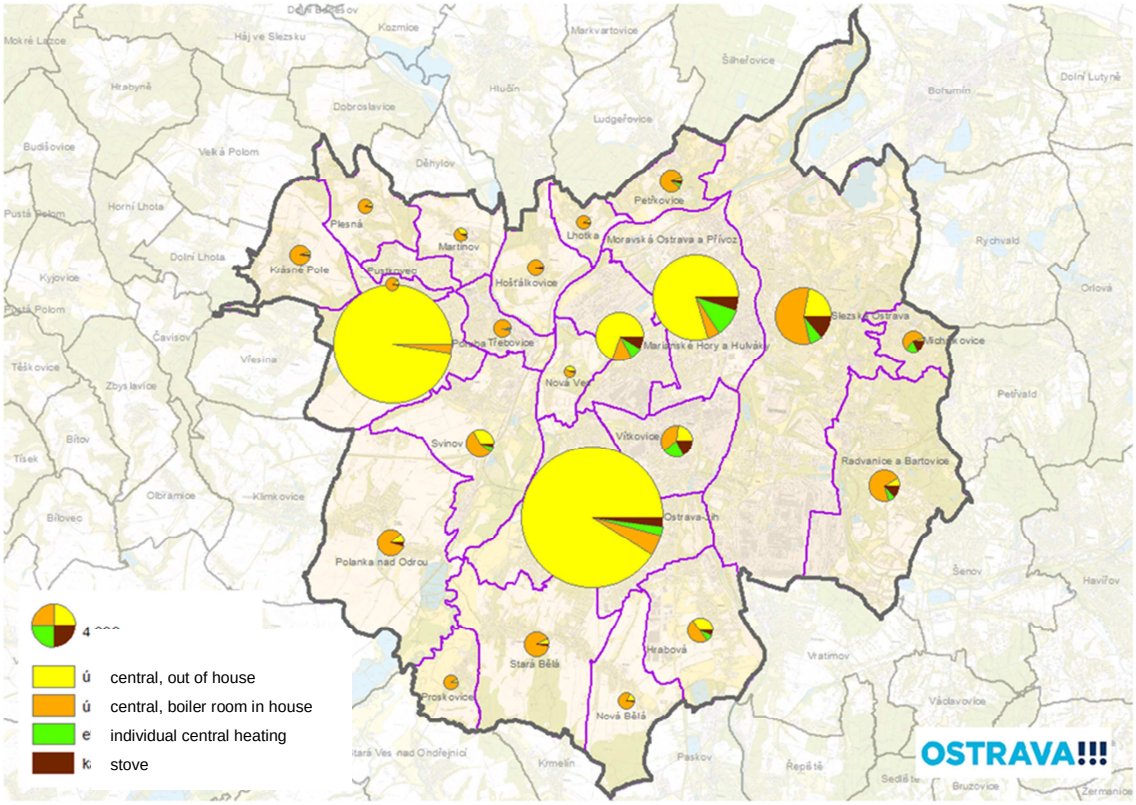


Figure 11: Number of inhabited living flats to the energy type used, the Statutory City of Ostrava, SLDB 2011

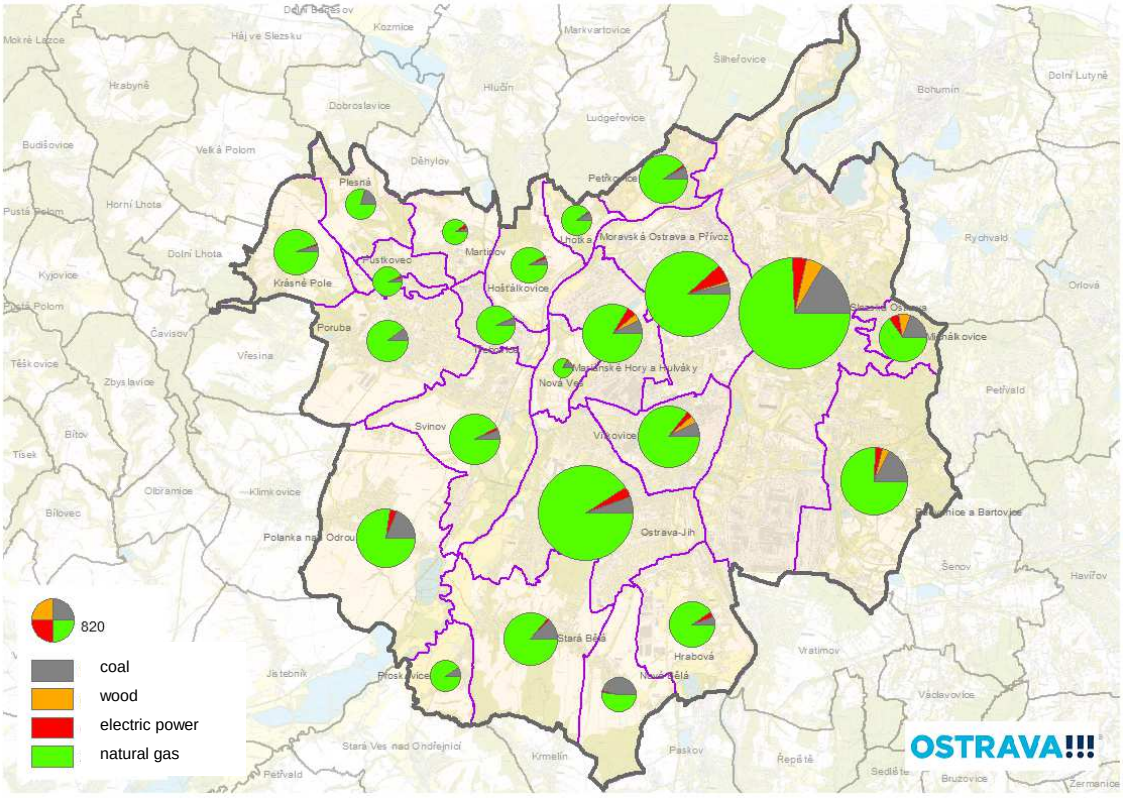


Figure 12: Number of inhabited houses to the material of bearing masonry walls, the Statutory City of Ostrava, SLDB 2011

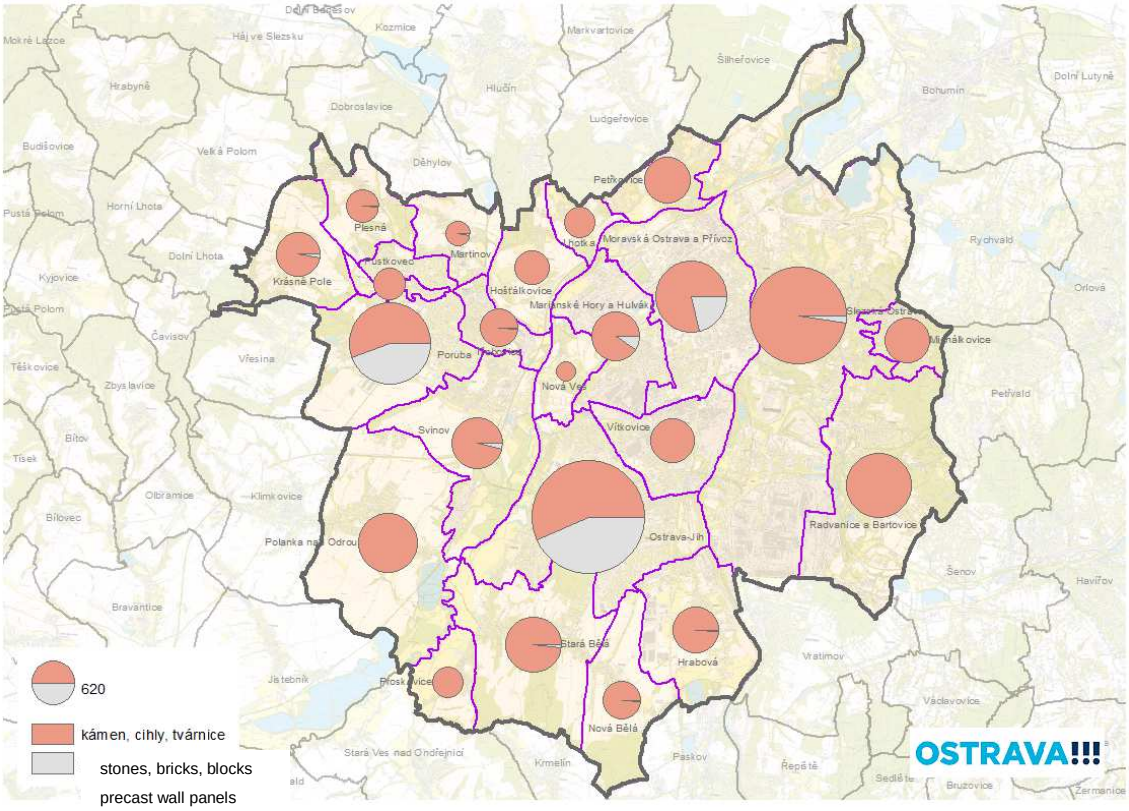


Figure 13: Average living space of flats [m^2], the Statutory City of Ostrava, SLDB 2011

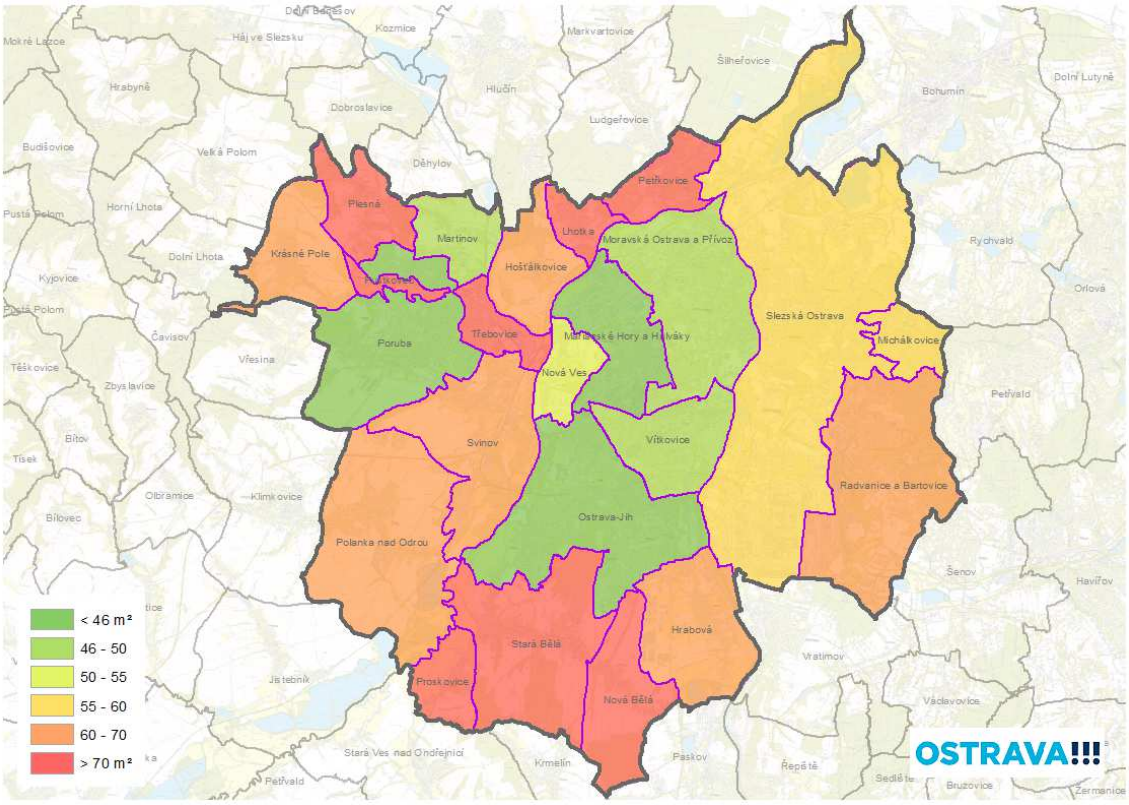


Figure 14: Average age of permanently inhabited houses, the Statutory City of Ostrava, SLDB 2011

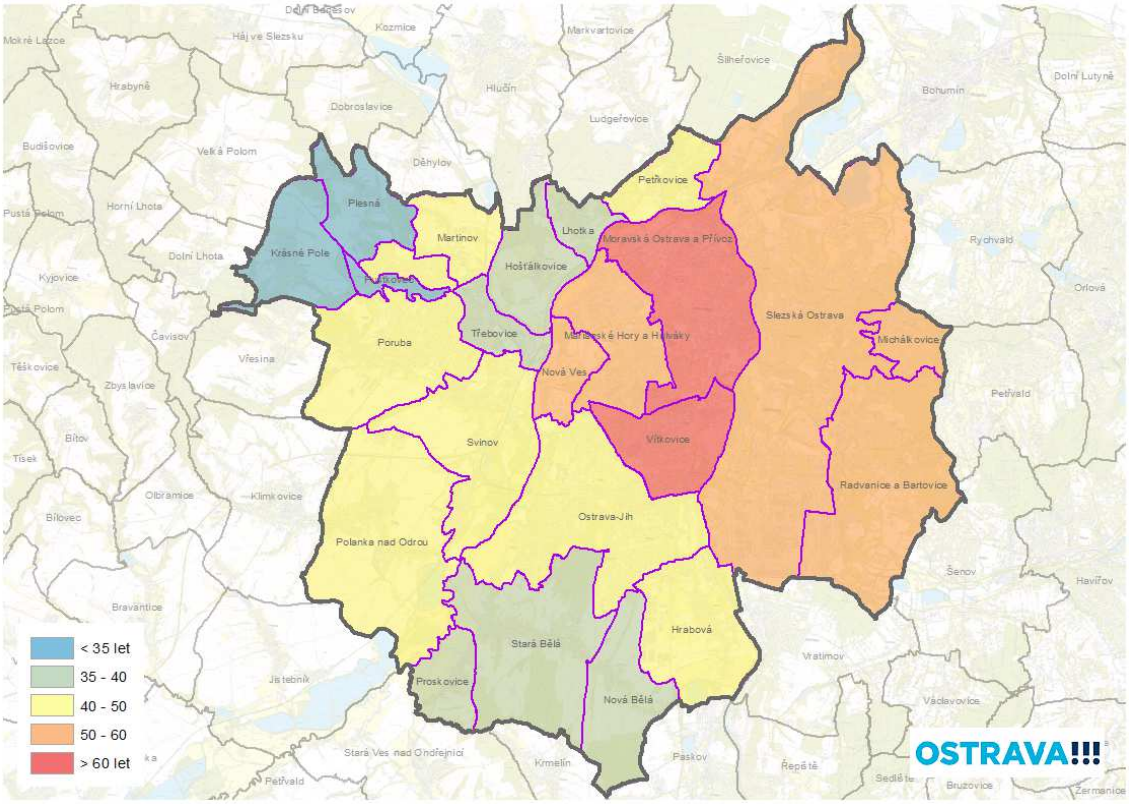


Table 13: Consumption of heat in fuel in small, non-point monitored stationary sources on the Territory of the Statutory City of Ostrava in 2000, 2005 and 2010 [GJ/yr]

Fuel Type	2000	2005	2010
black coal, graded	72 339	44 461	33 553
wood	31 530	37 179	106 874
brown coal, graded	52 099	108 697	65 916
coke	90 696	106 418	29 640
propane-butane	789	1 233	6 716
light fuel oil	235	255	748
natural gas	1 998 205	2 014 781	1 887 932
TOTAL [GJ/yr]	**2 245 893**	**2 313 025**	**2 131 379**

Data source: ČHMÚ, RWE Gas Net, s.r.o.

Figure 15: Consumption of heat in fuel in small, non-point monitored stationary sources on the Territory of the Statutory City of Ostrava in 1995, 2000, 2005 and 2010 [GJ/yr]

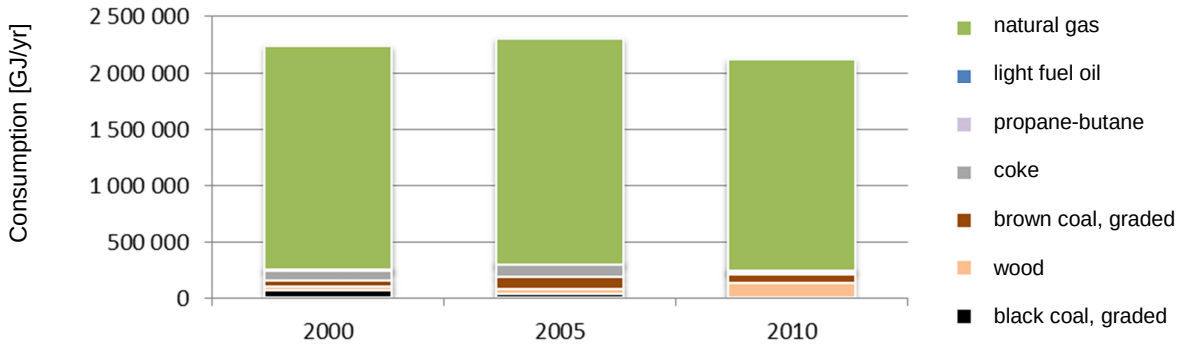
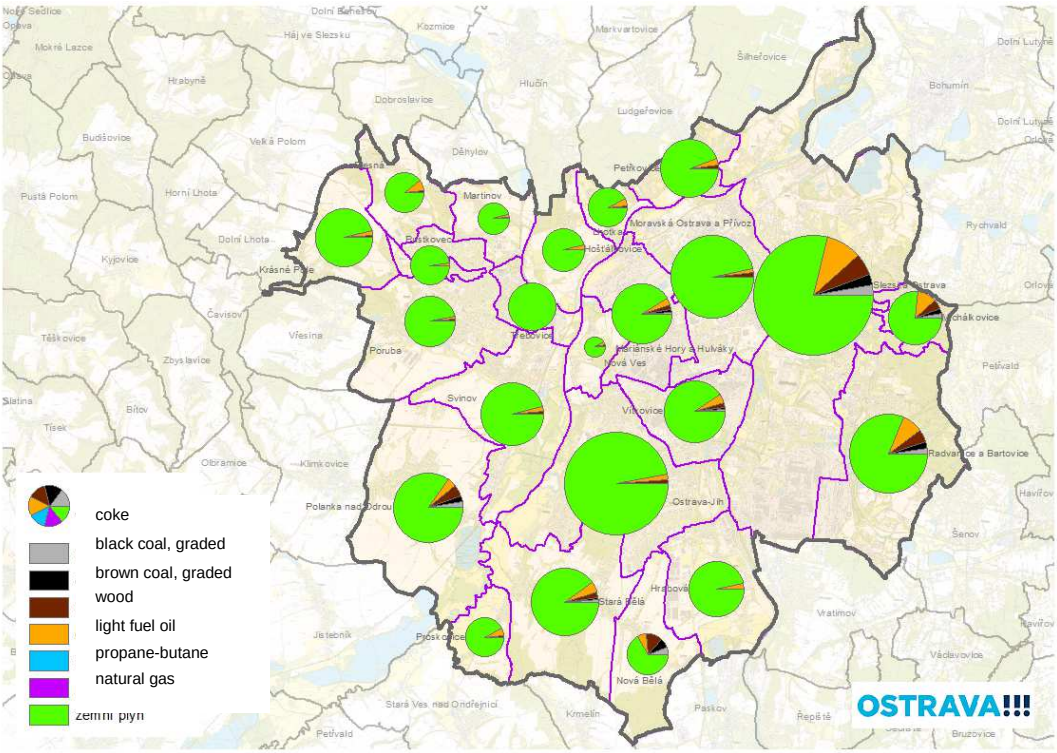


Figure 16: Consumption of heat in fuel in small, non-point monitored stationary sources of air pollution on the Territory of the Statutory City of Ostrava, whose combustion processes are included in the BEI [GJ/yr], structured to the fuel type and city districts, 2010



Non-point monitored stationary air pollution sources located on the Territory of the Statutory City of Ostrava (often called “local furnaces”) which are fired with solid fuels include the sources falling into the following living flat categories[2] (to SLBD 2011):

- Inhabited flats in family houses or flat block houses (BJ RD); heating system: central heating incl. a boiler installed in the house and fired with solid fuels;
- Inhabited flats in family houses or flat block houses (BJ RD); heating system: a boiler room in the house, fired with solid fuels;
- Inhabited flats in family houses; heating system: individual central heating; energy source used: coal, coke, coal briquettes;
- Inhabited flats in flat block houses; heating system: individual central heating; energy source used: coal, coke, coal briquettes;
- Inhabited flats in family houses; heating system: individual central heating; energy source used: wood, wood briquettes;
- Inhabited flats in flat block houses; heating system: individual central heating; energy source used: wood, wood briquettes;
- Inhabited flats in family houses; heating system: stove; energy source used: coal, coke, coal briquettes;
- Inhabited flats in flat block houses; heating system: stove; energy source used: coal, coke, coal briquettes;
- Inhabited flats in family houses; heating system: stove; energy source used: wood, wood briquettes;
- Inhabited flats in flat block houses; heating system: stove; energy source used: wood, wood briquettes.

From the following table one can learn which city districts have the highest number of flats heated using solid fuels and at which districts the actions of local furnace ecologisation should be best aimed. Those districts include:

- Slezská Ostrava
- Radvanice and Bartovice
- Vítkovice
- Nová Bělá and Stará Bělá.

In this context the term “ecologisation” includes not only the replacement of obsolete furnaces with new, modern ones, but also gas installation

[2] ČSÚ, SLBD 2011

Table 14: No. of flats heated by solid fuels, to particular city districts

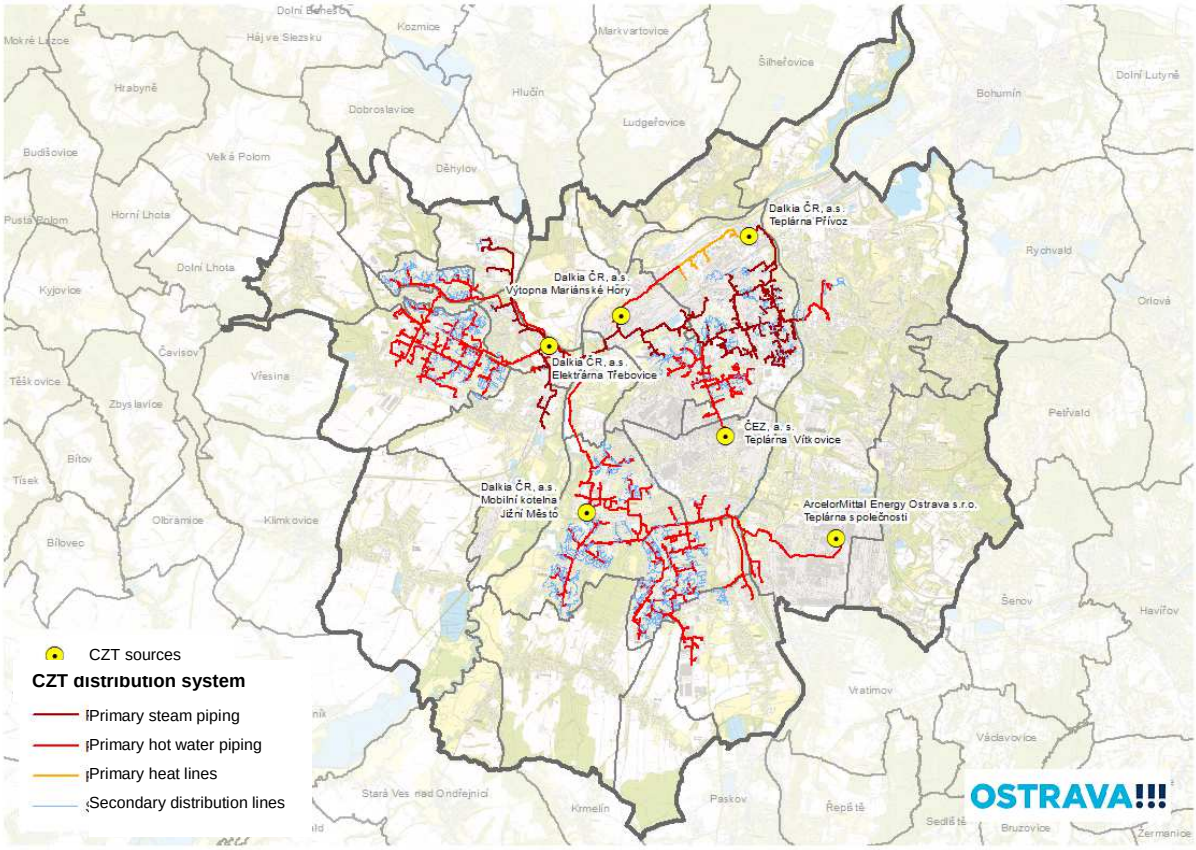
ID of the area (district)	Name	MO	Inhabited flats in FHs, total	Inhabited flats in RHs, total	RU FH coal	RU FH wood	RU RH coal	RU RH wood	% RU FH coal	% RU FH wood	% RU RH coal	% RU RH wood
CR_19	CZECH REPUBLIC		1 795 065	2 257 978	536 365	50 696	58 988	16 249	29,9%	2,8%	2,6%	0,7%
OBEC_554821	Ostrava TOTAL		20 298	106 287	2 611	247	619	432	12.9%	1.2%	0.6%	0.4%
MC_545911	Moravská Ostrava and Přívoz	8	224	17278	32	5	85	35	14.3%	2.2%	0.5%	0.2%
MC_546046	Slezská Ostrava	19	3 711	4041	717	135	164	145	19.3%	3.6%	4.1%	3.6%
MC_546135	Ostrava-Jih	11	2 126	43692	182	3	36	32	8.6%	0.1%	0.1%	0.1%
MC_546224	Poruba	15	694	30606	52	0	21	0	7.5%	0.0%	0.1%	0.0%
MC_554219	Nová Bělá	9	593	26	231	5	6	0	39.0%	0.8%	23.1%	0.0%
MC_554227	Vítkovice	23	475	2112	45	13	90	46	9.5%	2.7%	4.3%	2.2%
MC_554235	Stará Bělá	20	1 324	20	145	5	6	0	11.0%	0.4%	30.0%	0.0%
MC_554243	Pustkovec	17	394	35	16	1	0	0	4.1%	0.3%	0.0%	0.0%
MC_554286	Mariánské Hory and Hulváky	5	458	5071	55	5	54	54	12.0%	1.1%	1.1%	1.1%
MC_554308	Petřkovice	12	847	259	64	7	10	4	7.6%	0.8%	3.9%	1.5%
MC_554324	Lhotka	4	433	0	29	5	0	0	6.7%	1.2%		
MC_554332	Hošťálkovice	1	536	55	28	5	3	0	5.2%	0.9%	5.5%	0.0%
MC_554367	Nová Ves	10	116	151	17	0	3	2	14.7%	0.0%	2.0%	1.3%
MC_554375	Proskovice	16	431	23	37	1	0	0	8.6%	0.2%	0.0%	0.0%
MC_554430	Michálkovice	7	692	480	124	16	71	61	17.9%	2.3%	14.8%	12.7%
MC_554537	Radvanice and Bartovice	18	1 672	625	281	21	56	49	16.8%	1.3%	9.0%	7.8%
MC_554561	Krásné Pole	3	891	33	43	2	0	0	4.8%	0.2%	0.0%	0.0%
MC_554570	Martinov	6	276	162	13	0	0	0	4.7%	0.0%	0.0%	0.0%
MC_554588	Polanka / Odra	14	1 602	93	271	9	11	0	16.9%	0.6%	11.8%	0.0%
MC_554669	Hrabová	2	729	736	53	2	0	2	7.3%	0.3%	0.0%	0.3%
MC_554685	Svinov	21	1 010	745	64	1	3	2	6.3%	0.1%	0.4%	0.3%
MC_554715	Třebovice	22	628	35	36	2	0	0	5.7%	0.3%	0.0%	0.0%
MC_554723	Plesná	13	436	9	76	4	0	0	17.4%	0.9%	0.0%	0.0%

2.2.3 Heat Production and Supply from Centralized Heat Supply Systems (CHP)

The heat producers and suppliers, who deliver heat to the centralized heat supply systems on the Territory of the Statutory City of Ostrava are as follows:

- Dalkia Česká republika, a.s. (Třebovice Power Plant, Přívoz Heating Plant, Mariánské Hory Heating Station and other local boiler houses);
- ČEZ, a.s. – Vítkovice Heating Plant
- ArcelorMittal Energy Ostrava s.r.o. – Company heating plant

Figure 17: Centralized Heat Supply System, the Statutory City of Ostrava, 2010



Data source: ČHMÚ, ÚAP

Out of the total heat supply for customers the supply for the tertiary sphere and households only is incorporated. The heat supply for industries from CHP networks is included only, if a given industrial customer has been incorporated in SEAP at the same time.

While both Dalkia and ČEZ deliver heat from their sources not only to industrial customers, but also to end users in the tertiary sphere and housing on the Territory of Ostrava, ArcelorMittal, in addition to covering its own consumption of heat in company's industrial facilities, sells a part of its production of heat to the systems of Dalkia, which, in turn, carries out its resale and distribution (about 20 %) and supplies heat for Vratimov (this supply is not included in the Baseline Emission Inventory as a separate item – supplies for industry, supplies outside of the territory of concern). The incorporated supply of heat by Dalkia includes only the relevant portion of the overall production of heat by Dalkia.

The sources of Dalkia Česká republika, a.s., are fired with a mix of powdered black coal, other types of biomass, coke-oven gas, culm, light fuel oil and natural gas. The source of ČEZ, a.s. – Vítkovice Heating Plant - is fired with powdered black coal, wood, other solid fuels, coke-oven

gas, blast furnace gas and natural gas. At the same time, the two heat producers and distributors generate electric power in those sources (in the years of evaluation, the share of heat production in the combined heat/power output amounted to about 80 % - 92.2 % in Dalkia).

Table 15: Supply of heat from the CHP system of Dalkia ČR, a.s. and ČEZ, a.s. –Vítkovice Heating Plant for end customers on the Territory of the Statutory City of Ostrava in 1995, 2000, 2005 and 2010, [GJ/yr]

Producer	Supply of heat from CHP systems [GJ]							
	Industry				Tertiary Sphere			
	1995	2000	2005	2010	1995	2000	2005	2010
Dalkia Česká republika, a.s.	1 480 950	1 057 350	986 720	1 032 320	2 764 440	1 973 720	1 762 000	2 000 120
ČEZ, a.s. (formerly Energetika Vítkovice, a.s.) - Vítkovice HP	3 020 198	1 398 158	1 204 679	984 597	164 920	80 879	108 893	90 506
Total [GJ/yr]	**4 501 148**	**2 455 508**	**2 191 399**	**2 016 917**	**2 929 360**	**2 054 599**	**1 870 893**	**2 090 626**

Data source: Dalkia Česká republika, a.s., ČEZ, a.s.

Table 16: Supply of heat from the CHP system of Dalkia ČR, a.s. and ČEZ, a.s. –Vítkovice Heating Plant for end customers on the Territory of the Statutory City of Ostrava in 1995, 2000, 2005 and 2010, [GJ/yr]

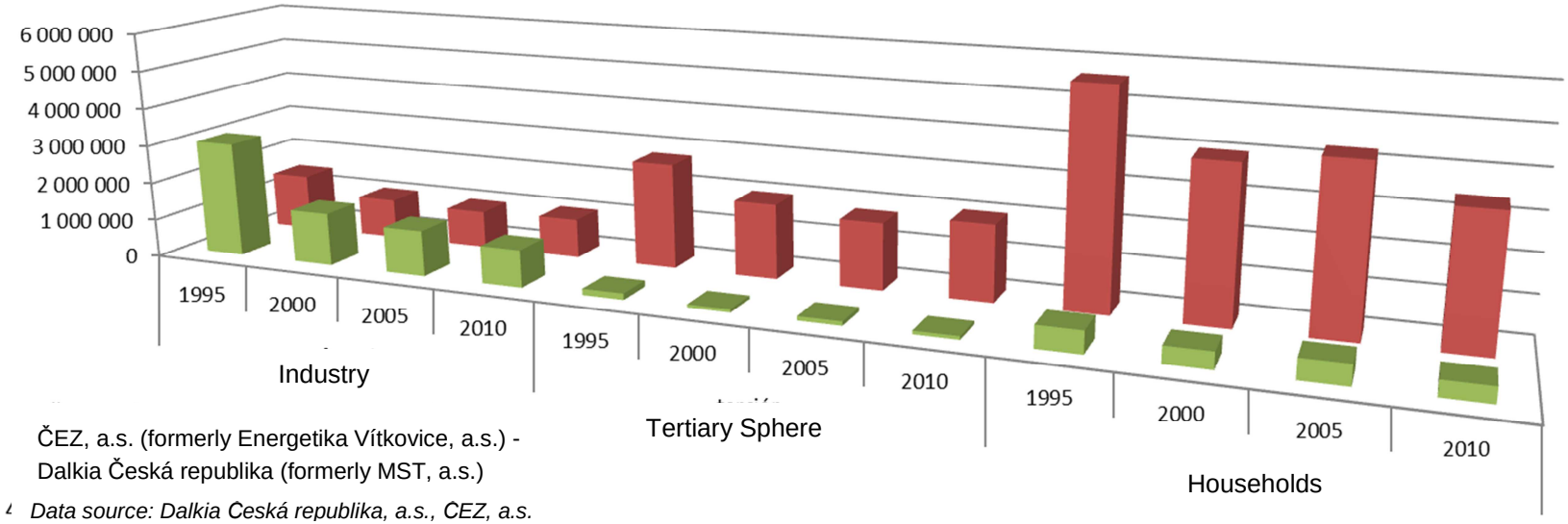
Producer	Supply of heat from CHP systems [GJ]			
	Households			
	1995	2000	2005	2010
Dalkia Česká republika, a.s.	5 627 610	4 017 930	4 299 280	3 419 560
ČEZ, a.s. (formerly Energetika Vítkovice, a.s.) - Vítkovice HP	574 278	433 823	511 992	392 356
Total [GJ/yr]	**6 201 888**	**4 451 753**	**4 811 272**	**3 811 916**

Table 17: Consumption of fuels and overall CO_2 emissions from the supply of heat from CHP systems on the Territory of the Statutory City of Ostrava in 1995, 2000, 2005 and 2010

Producer	Fuel consumption for heat production [GJ]				Overall CO_2 emissions from heat production [kt]			
	1995	2000	2005	2010	1995	2000	2005	2010
Dalkia Česká republika, a.s.	10 841 921	8 803 489	8 164 859	7 405 932	942.51	757.39	713.87	645.25
ČEZ, a.s. (formerly Energetika Vítkovice, a.s.) - Vítkovice HP	1 404 620	737 795	838 963	647 217	147.12	63.60	73.74	57.55
Total [GJ/yr]	**12 246 541**	**9 541 284**	**9 003 822**	**8 053 149**	**1089.62**	**820.99**	**787.62**	**702.81**

Data source: ČHMÚ

Figure 18: Heat supply from the CHP systems of Dalkia ČR, a.s. and ČEZ, a.s. –Vítkovice Heating Plant, Statutory City of Ostrava



Data source: Dalkia Česká republika, a.s., ČEZ, a.s.

Figure 19: Source of ČEZ, a. s. - Vítkovice Heating Plant – air view (Google maps)

Figure 20: Source of Dalkia Česká republika - Třebovice Power Plant – air view (Google maps)

Figure 21: Source of Dalkia Česká republika – Přívoz Heating Plant – air view (Google maps**)**

Figure 22: Source of Dalkia Česká republika – Mariánské Hory Heating Station CO_2 emission factor for locally produced heat **– air view** (Google maps

2.2.4 Emission Factors for CO_2 Calculation

In compliance with the principles of IPCC[3], "**standard**" emission factors were used for the calculation of CO_2 emissions from the final consumption of fuels and energy

These factors take account of all and any CO_2 emissions generated as a result of energy consumption in an area in the sphere of competence of a local authority, whether directly from fuel combustion within the area, or indirectly due to fuel combustion related to the use of power and heat or cold in the same area. This approach is based on the quantity of carbon contained in each fuel, similarly as it is made in the national inventory of glasshouse gases related to the UN Framework Convention on Climate Change and the Kyoto Protocol. In this procedure the CO_2 emissions generated in relation to the use of renewable energy and the emissions arising from certified "green" power are deemed zero.

Emission factors for calculating CO_2 emissions coming from **combustion processes** were taken from the emission database of the Register of Emissions and Air Pollution Sources kept by the Czech Hydro-Meteorological Institute for the purpose of emission inventories.

Table 18: Emission factors for fuel combustion

State	Fuel Type	CO_2 Emission Factor [kg/TJ_{fuel}]	CO_2 Emission Factor [t/MWh_{fuel}]
Solid fuels	black coal, powdered	92 640.58	0.334
	black coal, graded	92 640.58	0.334
	brown coal, graded	99 103.87	0.357
	other solid fuel	94 076.86	0.339
	coke	105 926.24	0.381
	culm	94 076.86	0.339
Liquid fuels	heavy fuel oil (sulphur content <1 % b.w., incl,) – low-sulphur	76 537.30	0.276
	heavy fuel oil (sulphur content ≥1 % b.w.,) – high-sulphur	76 537.30	0.276
	other liquid fuels	76 559.28	0.276
	oil	73 272.67	0.264
	gas oil (sulphur content <0.1 % b.w., incl,)	73 272.67	0.264
Gaseous fuels	natural gas	55 778.90	0.201
	coke-oven gas	47 393.84	0.171
	propane-butane	62 705.70	0.226
	blast furnace gas	240 614.88	0.866
	other gaseous fuel	54 685.20	0.197
Renewable energy sources	bio-gas	0	0
	wood	0	0
	other biomass type	0	0

Data source: ČHMÚ

Emission factors for calculating CO_2 emission from the consumption of electric power are based on the statistical data of ČSÚ and the data on the structure of power generation in the CR. Their prospect up to 2020 was determined using scenarios made by Enviros, s.r.o., for the Ministry of Industry and Trade, CR.

[3] The IPCC (Intergovernmental Panel on Climate Change) is a scientific body founded in 1988 to evaluate the risks of climate changes. CO_2 emission factors are calculated using the IPCC methodology.

Table 19: Emission factors for power supply from system power stations

Rok	CO_2 emission factor [kg/TJ]	CO_2 emission factor [t/MWh]
1995	228 243.0	0.8217
2000	197 828.8	0.7122
2005	170 041.0	0.6122
2010	136 596.6	0.4917
2015	135 955.2	0.4894
2020	121 150.5	0.4361

Data source: Enviros, s.r.o.

Local emission factors for the supply of heat (heating) from centralized heat supply systems were calculated from the actual delivery of heat, corresponding consumption of fuel for heat production and calculated CO_2 emissions (employing the emission factors shown in the following table). The calculation was based on the operating data of fuel producers and suppliers Dalkia Česká republika, a.s., and ČEZ, a.s. – Vítkovice Heating Plant in the years of evaluation.

Table 20: CO_2 emission factor from the heat supplied by CHS systems on the territory of the Statutory City of Ostrava in 1995, 2000, 2005 and 2010

Producer	CO_2 emission factor for locally produced heat [t/MWh]				CO_2 emission factor for locally produced heat [t/TJ]			
	1995	2000	2005	2010	1995	2000	2005	2010
Dalkia Česká republika, a,s,	0,404	0,455	0,424	0,429	112,3	126,4	117,8	119,1
ČEZ, a,s, (formerly Energetika Vítkovice, a,s,) - Vítkovice Heating Plant	0,716	0,445	0,428	0,429	199,0	123,6	118,8	119,2
Total	**0,430**	**0,454**	**0,424**	**0,429**	**119,3**	**126,2**	**117,9**	**119,1**

Data source: ČHMÚ, Dalkia Česká republika, a.s., ČEZ, a.s.

2.2.5 Local Power Generation and Supply

On the Territory of the Statutory City of Ostrava electric power is generated both in conventional steam heating plants employing fuel combustion for power generation and in sources employing renewable energy sources for the purpose.

Regrettably, according to the methodology of SEAP, power generation in large steam heating plants is not incorporated in the CO_2 inventory, because these sources comprise a part of the European Emission Trading System (EU ETS) and, at the same time, their installed heat power exceeds the limit value of 20 MW_t. These sources include:

- ArcelorMittal Energy Ostrava s.r.o.
- ČEZ, a. s., Vítkovice Heating Plant
- Dalkia Česká republika, a.s., Třebovice Power Plant
- Dalkia Česká republika, a.s., Přívoz Heating Station

Out of other small power generation plants[4] operating on the Territory of the Statutory City of Ostrava the highest power outputs are generated from the sources employing combined cycle gas turbine (CCGT) technology and those fired by biogas (TKO Ostrava landfill, 700 kW_e, ÚČOV Ostrava – cogeneration units, 400 kW_e). Lower outputs are provided by small hydraulic power

[4] For more information see chapter “Power Generation from RESs”.

plants (SHPPs) and photovoltaic systems (). However, the small sources (SHPPs and PVPSs) were put into operation as late as after the year of 2000 and, therefore, their production was not incorporated in the Baseline Emission Inventory. Nevertheless, it has been included in subsequent monitoring inventories (MEI 2005 and MEI 2010) in compliance with their date of putting into operation. As those production units employ renewable energy sources for power generation only, the emission factor applicable to such power equals zero. Increase in the share of these small power generation sources in the overall relevant power consumption of the city (not including that of industry) will efficiently reduce the production of CO_2 emissions from power generation.

Table21: Production of electric power in small power stations (CHPs, SHPPs, PVEs) on the Territory of the Statutory City of Ostrava in 2005 and 2010 [MWh/yr] included in MEI)

Fuel/Energy	Sector of Consumption	NACE Section	2000 [MWh]	2005 [MWh]	2010 [MWh]
Photovoltaic systems	Housing	Housing			3.1
	Transport (buildings)	Transport and storage			43.4
	Industry	Processing industry			84.2
		Administration and supporting activities			38.3
	Tertiary sphere	Education		17.2	17.2
		Health and social care			73.1
Photovoltaic power, total				17.2	259.1
Hydraulic power	Power/heat sources	Production of power, gas, heat and conditioned air		2 349.4	2 739.6
Hydraulic power, total				2 349.4	2 739.6
TOTAL				**2 366.6**	**2 998.7**

Data source: Atlas of Facilities Employing RESs (ERÚ)

The quantification of power supply on the Territory of the Statutory City of Ostrava was based on the data of the Territorial Energy Policy of the Moravian-Silesian Region (prepared in 2000) and relevant data provided by ČEZ Distribuce, a.s., (Rieger Square 1493, Hradec Králové). Regrettably, the data form ČEZ were not received in the required structuring (according to consumption sectors). That was why it was not possible to subtract the consumption in industry (which will not come in the BEI) from the summary consumptions in the off-take categories of small & medium enterprises (SMEs) and large users (LUs). Therefore, the data of power consumption in the facilities owned by the Municipality and city districts (municipal buildings, equipment and furnishing), the data of power consumption in the public lighting system and consumption of power in the category “Low off-takes of inhabitants” (LOI) l were used as inputs for preparing the inventory of emissions. The tertiary sector (non-municipal buildings) was represented by the consumption shown in the category “Low off-takes of SMEs”.

2.2.6 Using RESs for Covering Energy Consumption on the Territory of the City

On the Territory of the Statutory City of Ostrava both heat and electric energy is produced from renewable energy sources.

In particular, boilers fired with biomass (wood, wood chips, pellets, pulp), solar thermal systems and thermal pumps[5] are used for heat production. Power is generated by small hydraulic power stations, co-generation sources fired with biogas and, additionally, using roof-mounted photovoltaic systems.

Table22: Summary production of heat in RES employing sources in 2000, 2005 and 2010 [GJ/yr] not including the household sector, point-registered sources only.

Fuel/Energy	Sector of Consumption	NACE Section	2000 [MWh]	2005 [MWh]	2010 [MWh]
Wood pellets, chips	Transport (buildings)	Transport and storage			
	Industry	Construction industry		1 500	1 500
Wood, total				1 500	1 500
Solar energy	Housing	Housing		233	430
	Tertiary sphere	Cultural, amusement and leisure activities			98
		Education		207	222
		Health and social care		1 115	1 720
Solar energy, total				1 555	2 471
TOTAL				**3 055**	**3 971**

In addition to above mentioned point-registered sources wood was used in the household sector in 2000 (according to calculations made by ČHMÚ based on SLBD 2001) in quantities corresponding to the annual consumption of 9760 MWh/yr. By 2010 this consumption increased up to 28 328 MWh per year (calculated employing data of SLBD 2011).

The detailed description of particular systems employing RESs is given in Supplement 1 to SEAP. Figures 23 through 25 show the increase in the use of RESs from 2000 to 2010.

[5] For the use of thermal pumps for heat production see Chapter “Power Generation and Supply”

Figure 23: Use of RESs for heat and power production, the Statutory City of Ostrava, condition of 2000

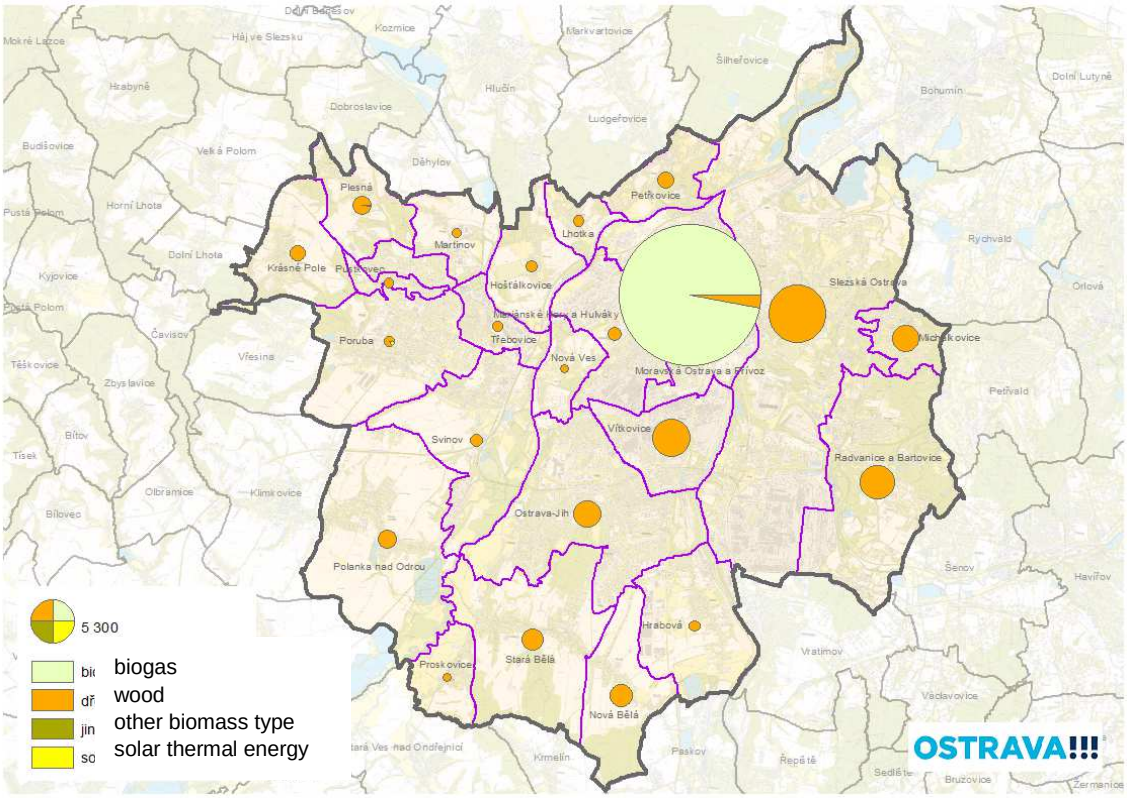


Figure 24: Use of RESs for heat and power production, the Statutory City of Ostrava, condition of 2005

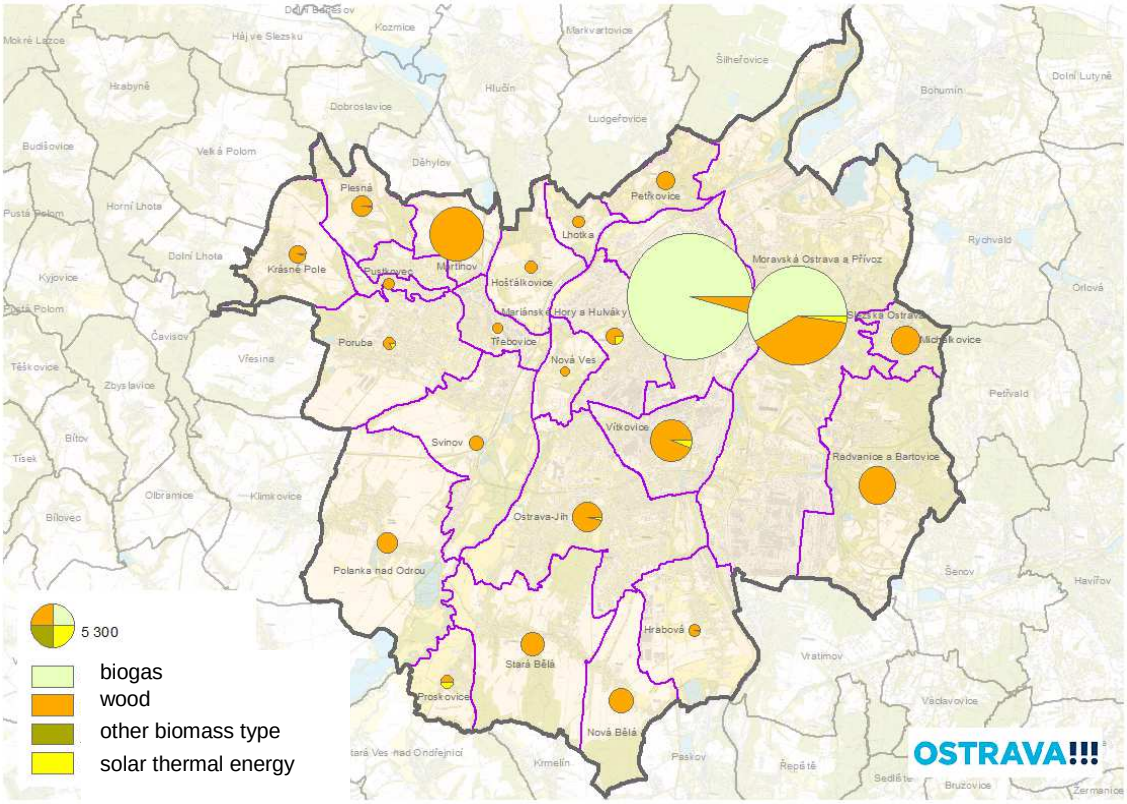
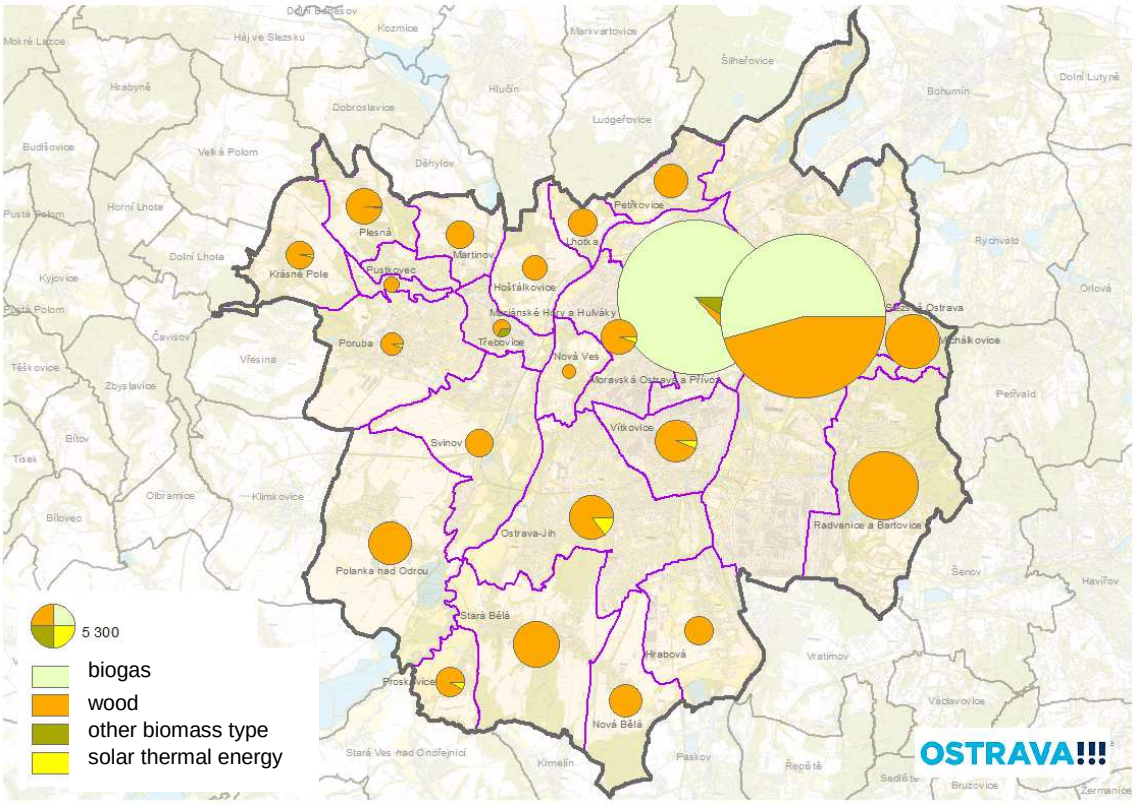


Figure 25: Use of RES for heat and power production, the Statutory City of Ostrava, condition of 2010



2.2.7 Description of Mobile Sources on the Territory of Ostrava City

Road Network

In 2012 the overall length of roads designed for road transport on the Territory of the Statutory City of Ostrava amounted to 1 033 km in total, including 68 km of roads owned by the Czech Republic and administered by the Road and Motorway Directorate of the Czech Republic (RMD) comprising motorways (17.5 km) and A-roads (50.5 km). There are also B-roads and C-roads (143.7 km in total) owned by the Moravian-Silesian Region. These roads are complemented with local roads owned by the City of Ostrava of the overall length of 821.5 km. In total, on the Territory of Ostrava City there are roads designed for motor traffic in the entire length of 1 033 km.

The basic road system of the city features, in most, a grate structure and is, therefore, able to carry relatively high traffic volumes. The traffic density of the most loaded roads in the city exceeds the value of 40 thousand vehicles in 24 hrs (see Chapter 2.9.3 for details). Due to the eccentric location of the city on the Territory of the CR, the through traffic does not represent too strong component of local traffic, except the D1 motorway.

The D1 motorway was opened on the Territory of city before the end of 2007 as an isolated length between the traffic interchange Ostrava Rudná and Bohumín and two years later it was connected to the motorway network of the CR with the section Bělotín – Bílovec. The section markedly improved connection of Ostrava to the rest of the Republic, but any connection to neighbouring Poland was still missing. As late as in November 2012 was the border-crossing section put into operation and connected to the Polish A1 motorway. However the new road serves only for vehicles up to the weight of 3.5 t because of problems caused by a bridge made in the tying-on Polish section Świerklany - Gorzyczki. The road will not be open for long-way haulage earlier than in 2014. In this way the transit traffic between the Czech Republic and Poland is stepwise shifted from I/48 (R48) highway routed through Frýdek-Místek and Český Těšín to the newly built motorway connection

Motor Vehicle Fleet Structure

The static structure of the vehicle fleet comprises information on the numbers of vehicles registered in the Central Register oi Vehicles (CRV), giving information of the place of vehicle registration, vehicle category, used fuel, year of production and other relevant data. The statistical analysis of CRV data is given in **Chyba! Nenalezen zdroj odkazů.** structured according to the basic vehicle types: motorcycles (of categories L1-L5, LA-LE), passenger cars and LTVs (M1 and N1), medium and heavy trucks (N2, N3) and buses (M2, M3).

Table 23: Static structure of vehicles registered with the district of Ostrava-City, to fuel category, as of 1st January 2012

Vehicle Category	Petrol	Diesel	CNG	Electric Drive	Other / not given	Total
L1-L5, LA-LE	16 197	15	0	17	12	16 240
M1 + N1	96 275	44 358	71	0	12	140 716
N2 + N3	67	5 295	1	0	27	5 390
M2 + M3	63	1 301	3	4	2	1 373
Total	**112 602**	**50 969**	**75**	**21**	**53**	**163 719**

Source: Central Register of Vehicles

The number of registered vehicles is influenced by the fact the corporate vehicles are registered with the place of company's headquarters, notwithstanding the locality, where they will be routinely operated. This fact may markedly influence vehicle statistics, particularly as to the categories comprising less numerous vehicles, such as medium and heavy trucks and buses. In Ostrava there is established the biggest bus carrier Arriva Morava (ex Veolia Transport Morava), operating almost 800 buses in the whole Moravian-Silesian and Olomouc regions, all registered with Ostrava. For instance, three buses driven with compressed natural gas (CNG) the carrier operates on their premises in Jeseník and, therefore, those buses are not included in the calculation of CO_2 emissions. Similarly, the static structure of vehicles is biased by vehicles acquired on lease as such vehicles remain registered with the register of vehicles in the place of lessor's head office for the entire time of leasing.

Public Transport

The system of public transport in Ostrava is operated by Dopravní podnik Ostrava, a.s. (DPO, Municipal Transport Enterprise) comprising three subsystems, the tramway one forms the system backbone. Other subsystems include trolleybuses and buses. The system of municipal public transport is fully integrated in the Integrated Transport System (ODIS) of the Moravian-Silesian Region.

Table 24. Statistics of DPO outputs in 2012

Traction	No. of Lines	No. of Vehicles [pcs]	Transportation Output [vehicle-km[6] thousands]	Transported Persons [thousands]
Tramways	17	273	13 519	48 299
Trolleybus	10	62	3 064	7 324
Bus	57	297	17 190	40 766
Total	**84**	**632**	**33 773**	**96 389**

Source: DPO, Association of Transport Enterprises

The DPO operates about 630 vehicles of the above-mentioned tractions. Within the framework of financial possibilities the vehicle fleets are modernised by replacement of older vehicle types with

[6] vzkm = „vehicle-kilometer"

more advanced and efficient ones on a running basis. In case of trams the most of old trams with power output resistance control were either taken out of service or reconstructed. The newly acquired motor tramcars of Vario LF type are fitted with new efficient electric outfit "Europulse" supporting power recuperation while the tram is braking. In the trolleybus traction obsolete Škoda 14 Tr vehicles are replaced with new ones based on the body of a Polish manufacturer (Solaris) and equipped with electric outfit supplied by Škoda Electric. The current trend in the renewal of the bus transport fleet consists in the replacement of older buses "Karosa" dated back to the half of 1990's (EURO I and EURO II emission standards), with modern coaches "Solaris" meeting the requirements of EURO VI standard and EURO VI from 2014 on. Regular operation of the foursome of SOR buses fitted with purely electric drive units appears to be an unique project, not only in the CR, but on the global scale, too.

Table 25: Development of the tram coach fleet of DPO from 1995 to 2013

Tram Coach Type	1995	2000	2005	2010	2013
Tatra T2	19	0	0	0	0
Tatra T2R	9	0	0	0	0
Tatra T3	73	71	48	13	0
Tatra T3M	21	7	0	0	0
Tatra T3SU	7	7	6	4	4
Tatra T3SUCS	116	96	53	49	37
Tatra T3G	5	46	46	46	44
Tatra T3R.P	0	1	42	44	44
Tatra T3R.E	0	0	2	2	2
T3R.EV	0	0	1	1	1
Tatra K2	8	3	1	1	0
Tatra K2YU	2	0	0	0	0
Tatra K2G	0	7	6	6	6
Tatra K2R.P	0	0	2	2	2
Tatra KT8D5	16	16	11	1	0
Tatra KT8D5.N1	0	0	5	15	16
Tatra T6A5	10	38	38	38	38
Škoda Astra 03T	0	9	14	14	14
Inekon Trio 2001	0	0	9	9	9
VarioLFR.E	0	0	6	24	47
VarioLF2	0	0	0	1	1
VarioLF2+	0	0	0	1	1
VarioLF3	0	0	0	2	2
VarioLF3/2	0	0	0	1	3
No of Vehicles**, Total**	286	301	290	274	271

Table 26: Development of the trolleybus fleet of DPO from1995 to 2013

Trolleybus Type	1995	2000	2005	2010	2013
Škoda 9TrHT26	6	0	0	0	0
Škoda 9TrHT28	9	0	0	0	0
Škoda 14Tr03	0	6	0	0	0
Škoda 14Tr05	12	12	0	0	0
Škoda 14Tr07	7	7	7	3	0
Škoda 14Tr08/6	14	14	12	12	5
Škoda 14Tr10/6	5	5	5	5	5
Škoda 15Tr02/6	8	8	8	7	6
Škoda 15Tr03/6	3	3	2	2	2

Trolleybus Type	1995	2000	2005	2010	2013
Škoda 17Tr	0	2	3	0	0
Škoda 21Tr	0	6	15	15	12
Solaris Trollino 12 AC	0	0	5	14	14
Solaris Trollino 15 AC	0	0	3	4	4
Solaris Trollino 18 AC	0	0	0	1	1
SOR TN 12C	0	0	0	1	1
SOR TNB 18	0	0	0	0	1
SOR TNB 12	0	0	0	0	1
Škoda 26Tr	0	0	0	0	7
Škoda 27Tr	0	0	0	0	3
No.of Vehicles, Total	64	63	60	64	62

Table 27: Development of the bus fleet of DPO from1995 to 2013

Bus Type	1995	2001	2005	2010	2013
Karosa B 731	n/a	19	1	0	0
Karosa B 732	n/a	146	92	30	0
Karosa B 741	n/a	41	28	3	0
Karosa B 932	n/a	59	59	58	44
Karosa B 941	n/a	38	38	37	31
Karosa B 952	n/a	0	36	45	45
Karosa B 961	n/a	0	8	8	7
Karosa C 732	n/a	3	0	0	0
Karosa C 744	n/a	3	0	0	0
Karosa C 954	n/a	0	1	1	1
Karosa LC 736	n/a	1	0	0	0
Karosa LC 936	n/a	2	0	0	0
Renault Citybus 12	n/a	13	13	13	7
Irisbus Citelis 12	n/a	0	0	11	11
Mercedes-Benz 412D	n/a	5	5	5	4
Mave CIBus ENA 54A	n/a	0	0	3	3
Solaris Urbino 10	n/a	0	0	5	20
Solaris Urbino 12	n/a	5	24	46	86
Solaris Urbino 12H	n/a	0	1	1	1
Solaris Urbino 15	n/a	0	16	15	30
Solaris Urbino 18	n/a	0	0	7	7
Škoda 21Ab	n/a	2	2	0	0
No. of Vehicles, Total	n/a	337	324	303	301

Table 28: Development of the electro-bus fleet of DPO from1995 to 2013

Electro-Bus Type	1995	2000	2005	2010	2013
SOR EBN 10.5	0	0	0	2	4
No. of Vehicles, Total	**0**	**0**	**0**	**2**	**4**

Road Traffic Intensities and Their Development

For the purpose of this study a data file was created in the GIS environment to cover the network of important roads on the Territory of Ostrava City, including all the roads owned by the state (motorways, A-roads) and by the region (B-roads and C-roads), complemented with selected local roads fulfilling the function of a traffic, or traffic/frontage roads. Roads, whose frontage function prevails, are not included. The valuation takes account of the constructions completed in recent years: D1 motorway, I/56 extended Mísecká road, reconstruction of Svinov bridges. On contrary, the file does not contain a new street ("Porážková"). The range of evaluated roads is clearly shown in the following figure.

Figure 26: Range of evaluated roads (red – state owned roads, orange – region owned roads; blue – municipality owned roads)

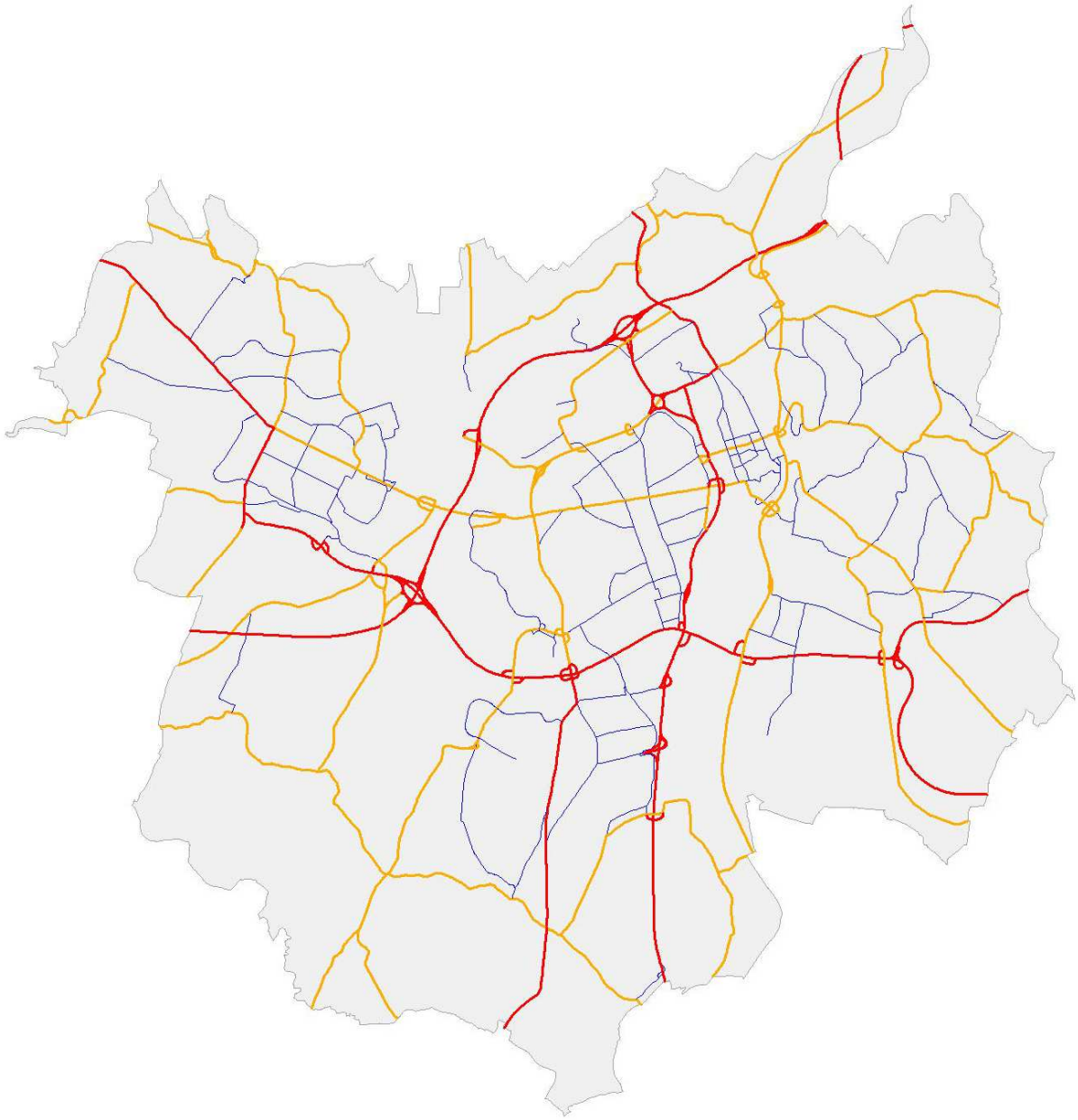


Table 29: Statistics of roads included in the evaluation

Roads, to Their Owner	Road Length [km]*
State	91.4
Region	151.7
Municipality	126.0
Total	369.1

** Incl. road crossing branches and slip roads of traffic interchanges (not included in the official statistical road lengths)*

For about each of 650 evaluated road sections traffic intensities were determined for particular years of 1995, 2000, 2005, 2010 and 2013 using:

- Actual traffic intensities of the 1st half of 2013 obtained by the statistical analysis of the records of induction loops installed at 30 important light signal controlled crossroads in the city;
- The cartogram of traffic loads of Ostrava roads in 2012, issued as a supplement to the publication titled "Information on Transport in Ostrava 2012 (OK. 2013);
- National Traffic Censuses of 1995, 2000, 2005 and 2010;
- Coefficients for establishing the forecast of automotive traffic intensities (conversion between 2010 and 2013) according to the technical conditions set by the Ministry of Transport, CR (Bartoš et al., 2012).

For the roads, where any exact traffic intensity could not be determined using the said sources, the intensity was established by an expert estimate employing an older traffic model of Ostrava, prepared by the CDV in 2009. Both the character and functional exploitation of the territory were taken into account.

In the sections, where any older traffic surveys were not available (from a National Traffic Census), older intensities were estimated on the basis of conversion coefficients taking account of the overall development of traffic output. The employed conversion coefficients between particular time cuts are shown in the following table.

Table 30: Coefficients of traffic intensity development from 1995 to 2013

Year	1995	2000	2005	2010	2013
1995	1.0000	1.1997	1.3980	1.3746	1.4296
2000	0.8335	1.0000	1.1653	1.1457	1.1916
2005	0.7153	0.8582	1.0000	0.9832	1.0226
2010	0.7275	0.8728	1.0171	1.0000	1.0400
2013	0.6995	0.8392	0.9779	0.9615	1.0000

Table 31: Total traffic output per day in the evaluated road network (vehicle-km x 1000)

Roads to Their Owners	1995	2000	2005	2010	2013
State	782.2	892.4	1 186.0	1 404.4	1 662.6
Region	936.2	1 116.9	1 303.6	1 191.9	1 308.9
Municipality	543.4	653.6	763.3	746.3	777.0
Total	2 261.9	2 662.8	3 253.0	3 342.7	3 748.5

The most loaded road sections of the network in Ostrava, with the traffic intensities in excess of 34 000 vehicles/24 hrs include (in a long term) Rudná Street (a part of the clearway of I/11 A-road) along its entire length between its traffic interchange (TI) with D1 motorway and TI with the I/59 A-road (direction Petřvald), while the absolutely highest intensity is achieved in the section between its TI with Výškovická and Plzeňská Streets (about 50 000 vehicles in 24 hours). .In Místecká Street (I/56) intensities in the range of 40 000 – 48 000 vehicles / 24 hours are achieved

betwenn the end of R56 and the TI with Rudná Street. Opavská/28. října Street (B-road II/479) appears to be other highly loaded section, as highest intensities are achieved in its section between its crossing with Sjízdná Street (Tesco Třebovice) and Mariánskohorská Street (crossroad "U vodárny"), amounting to 35 000 vehicles / 24 hrs, approximately.

In the city centre the highest traffic intensities are achieved in 28. října Street in the area of Frýdlant Bridges (28 – 30 000 vehicles per 24 hrs) and in Českobratrská Street between Hornopolní and Poděbradova Streets (24 000 vehicles in 24 hours).

Table 32: Traffic intensity in selected section of Ostrava road network [1000 vehicles / 24 hours]

Section	Intensity 2013
I/11 Rudná : traffic interchange Motorway D1 – traffic interchange Výškovická	46.3
I/11 Rudná : traffic interchange Výškovická – traffic interchange Plzeňská	50.3
I/11 Rudná : traffic interchange Plzeňská – traffic interchange Závodní	40.8
I/11 Rudná : traffic interchange Závodní – traffic interchange Místecká	36.6
I/11 Rudná : traffic interchange Místecká – traffic interchange Frýdecká	47.4
I/11 Rudná : traffic interchange Frýdecká – traffic interchange Fryštátská	38.8
I/56 Místecká : traffic interchange Rudná – traffic interchange Moravská	48.5
I/56 Místecká : traffic interchange Moravská – traffic interchange Dr. Martínka	44.7
I/56 Místecká : traffic interchange Dr. Martínka – traffic interchange Paskovská x Prodloužená	43.9
II/479 Opavská : Sjízdná – traffic interchange Bílovecká	35.6
II/479 Opavská : traffic interchange Bílovecká – traffic interchange Fričova	36.2
II/479 28. října : traffic interchange Fričova – Mariánskohorská x Plzeňská	36.2
D1 : traffic interchange Rudná – traffic interchange km357	19.0
D1 : traffic interchange km357 – traffic interchange Místecká	14.8
D1 : traffic interchange Místecká – traffic interchange km365	12.1
II/479 Českobratrská : Hornopolní - Poděbradova	24.1
II/479 28. října : Frýdlantské mosty	28.0
II/479 28. října : Poděbradova – Na Karolíně	30.6

2.2.8 Calculation of CO_2 Emissions from Included Traffic on the Territory of Ostrava City

Determining the Factor of CO_2 Road Traffic Emissions

Statistical data on the number of vehicles and the structure of road traffic vehicle fleet are prepared based on the data available in the Central Register of Vehicles (since July 2012 fully in the competence of the Ministry of Transport instead of the Ministry of Interior) and on the information of its dynamic structure dealt with in three studies prepared in 2001, 2005 and 2010, respectively, for the Road and Motorway Directorate by Atem, s.r.o. The studies provide information on the dynamic structure of the vehicle fleet based on measurements made on selected additive profiles over the entire Czech Republic, which is modified for the purpose of this study using data available from the Central Register of Vehicles. The vehicle fleet structure to fuel type shows that passenger cars and LTVs up to the weight of 3.5 t use petrol, diesel fuel, LPG and CNG, while in the vast majority, in all monitored years, it was the vehicles with petrol or diesel engines. The traffic output of diesel vehicles, as well as it is in the case of passenger cars and LTVs shows an increasing trend and one can expect it will grow moderately in the future, contrary to the vehicles with petrol engines, whose traffic output is expected to show a steady decline. For trucks and buses only diesel vehicles are taken into consideration. Taking account of the fact the buses driven by LPG and CNG engines are used particularly in public transport and no carrier operates any LPG or CNG driven buses in Ostrava, they are not included in the statistics. As to relevant control regulations, the structure of vehicle fleet is further divided subject to applicable emission standards (EURO 0-6) and one can state that the vehicle fleet is stepwise modernised, particularly by putting stepwise the vehicles with conventional drive units (EURO 0) and vehicles meeting only some of older EURO emission standards out of routine operation.

The calculation of the production of CO_2 emissions from road traffic in the City of Ostrava is based primarily on the data on traffic intensity (see Chapter 2). For the purpose of calculation the overall traffic intensities have been divided to the basic categories of traffic, i.e., passenger cars (PCs), light utility vehicles (LTVs), heavy goods vehicles (trucks, HGVs), buses (Bs) and motorcycles (Ms) according to their respective traffic outputs given in the Traffic Census of 2010. The data are further subdivided to groups according to combusted fuels and applicable emission standards, as mentioned above. For calculating the production of CO_2 emissions, the emission factors are used, as established by the European Environmental Agency (EEA) obtained using the European methodology of CORINAIR. In view that emission factors are quoted in this document in the units related to the quantity of consumed fuel only, and should to be applicable to traffic intensities, they have to be converted using respective average fuel consumptions. The data of average fuel consumption are used for the purpose, employing the advanced Tier 2 methodology.

CO_2 Emissions Coming from Municipal Public Transport (MPT)

The initial material used for calculating the production of CO_2 emissions from municipal public transport consisted in the fuel consumption data of MPT buses and power consumption data of the UPT electric traction, in the time sequence from 2001 (2002 for buses) prepared by Dopravní podnik Ostrava, a.s. (DPO). The data were then interpolated back to 1995 taking account of the development of the average fuel/power consumption of vehicles, traffic output, (SDP 2001, DPO data), the number and structure of vehicles (CDV database) as well. In the case of buses, where their overall fuel consumption showed marked fluctuation, while the average consumption saw only minimum dependence on vehicle fleet structure, the overall consumption of diesel oil up to 2002 was calculated using the data of traffic output and the average consumption of diesel oil.

Table 33: Diesel fuel consumption (l/yr x 1000) and traction power (MWh/year) in DPO for 2002 – 2012

Traction	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Trams	45 186	39 715	39 620	38 180	35 569	32 978	32 900	32 554	32 996	31 348	30 845
Trolleybuses	6 949	6 859	6 807	6 688	6 400	6 082	6 060	6 398	6 444	6 149	6 096
Buses	6 964	6 744	6 688	6 891	6 964	7 028	6 899	6 484	6 834	6 381	6 358

For buses the volume of consumed fuels was subsequently converted into consumed energy employing the conversion factors given in the methodology of SEAP (SEAP 2010). The calculation of the production of CO_2 emissions was based on the energy consumed by the municipal public transport and emission factors prepared by ČHMÚ.

Table 34: Energy consumption (MWh) in municipal public transport in Ostrava

Energy Source/Year	1995	2000	2005	2010	2012
Electric Power	63 083	53 373	44 868	39 440	36 941
Diesel Oil	77 679	70 102	66 882	68 313	63 555
Total	**140 762**	**123 475**	**113 750**	**107 753**	**100 496**

Production of CO_2 Emissions from the Operation of Vehicles Owned by the Municipality and Organisations Established by It

The calculation of the production of CO_2 emissions coming from operation of the vehicle fleet in the property of the Municipality and the organisations established by it was based on the data of fuel consumption reported by those organisations in particular years from 1995 on. The data comprise both vehicle numbers and related fuel consumptions. The following vehicle groups were taken into calculation:

- Vehicles of the City District Offices (ÚMOb);
- Vehicles of Municipal Police (MP);
- Vehicles for waste removal and handling (OZO);
- Vehicles of municipal technical services (TS),

- Ambulance vehicles;
- Vehicles of the City Hospital in Ostrava (MNOF);
- Vehicles of other organisations.

Table 35: Fuel and lubricant (PHM) consumption of vehicles owned by the Municipality and organisations established by it

Fuel/Lubricant per Year	1995	2000	2005	2010	2012
Petrol [l x 1000]	221.l3	1 892.l7	1 925.l1	2 120.l9	1 820.l4
Diesel fuel [tons]	0	1 104.l0	1 111.l4	281.l3	294.l0
LPG [litres]	0	950.l0	950.l0	950.l6	686.l7

The volumes of fuel and lubricant consumption were converted into weight units and consumed energy was calculated using conversion factors given in The SEAP methodology (SEAP 2010). The production of CO_2 emissions was then calculated employing the consumption of energy of the municipal public transport and emission factors prepared by ČHMÚ.

Table 36: Energy consumption (MWh) of vehicles owned by the municipality and organisations established by it

Energy Source/Year	1995	2000	2005	2010	2012
Petrol	2 014	17 227	17 523	19 305	16 570
Diesel fuel	0	13 138	13 226	3 348	3 499
LPG	7	7	7	7	5
Total	2 021	30 372	30 756	22 660	20 074

The next table shows the resulting weighted CO_2 emission factor for the integrated traffic stream of private and commercial vehicles, calculated using the methodology referred to in Chapter 3.1.1, while the subsequent table shows summary daily and annual production of CO_2 emissions structured to the road type. The roads are divided into roads subject to the administration of the Directorate of Roads and Motorways (ŘSD), the regions and the Municipality, respectively.

Table 37: Weighted CO_2 emission factor for the overall traffic stream

Unit	1995	2000	2005	2010	2013
kg/km	0.l278271	0.l260048	0.l254834	0.l251821	0.250659

Table 38: Summary daily production of CO_2 emissions within the evaluated road network [kg]

Road Owner	1995	2000	2005	2010	2013
State	217 676	232 066	302 245	353 659	416 752
Region	260 526	290 430	332 208	300 157	328 095
Municipality	151 215	169 972	194 528	187 948	194 758
Total	629 417	692 468	828 981	841 764	939 605

Table 39: Summary production of CO_2 emissions within the evaluated road network [t]

Road Owner	1995	2000	2005	2010	2013
State	79 447	84 705	109 496	127 171	149 887
Region	95 089	106 014	120 353	107 929	118 000
Municipality	55 193	62 038	70 471	67 579	70 048
Total	229 729	252 757	300 320	302 679	337 935

The following table shows the summary annual consumption of energy in road transport, structured to the vehicle owner, while in the case of private and commercial vehicles the consumption is limited to local roads only. Table 41 shows the summary annual production of CO_2 emissions in road transport in the same structure and including the same limitation as in the preceding table of energy consumption.

Table 40: Summary annual energy consumption in road transport [MWh]

Vehicle Owner	1995	2000	2005	2010	2012
Vehicles owned by Municipality and organisations established by it.	2 021.l0	30 371.l7	30 755.l5	22 659.l2	20 073.l5
Vehicles of municipal public transport system	140 761.l9	123 474.l9	113 750.l4	107 752.l7	100 495.l6
Private and commercial vehicles – local roads only	216 481.l9	243 345.l5	275 321.l6	262 969.l9	272 577.l8
Total	359 264.l8	397 192.l1	419 827.l5	393 381.l8	393 146.l9

Table 41: Summary annual production of CO_2 emissions in road transport [t]

Vehicle Owner	1995	2000	2005	2010	2012
Vehicles owned by Municipality and organisations established by it.	503.l1	7 759.l5	7 856.l4	5 692.l2	5 050.l7
Vehicles of municipal public transport system	72 342.l5	56 519.l2	45 648.l7	37 427.l2	34 942.l3
Private and commercial vehicles – local roads only	55 192.l5	62 038.l2	70 470.l6	67 579.l0	70 048.l3
Total	128 038.l1	126 316.l9	123 975.l7	110 698.l4	110 041.l3

2.2.9 Consumption of Fuels and Energy in Municipality Owned Buildings and in Public Lighting

Details concerning the consumption of fuels and energy in the buildings owned by the Municipality, managed both by the Municipality of Ostrava and the individual district offices, resulting from investigations made in cooperation with relevant departments of the Municipality of Ostrava, are given in Supplement 3 to the Sustainable Energy Action Plan (SEAP) together with evaluation of the potential for savings in the Municipality owned buildings. The following table gives the consumptions as incorporated in the inventory of final consumption of fuels and energy and in the inventory of emissions for the years of 2000, 2005 and 2010

Table 42: Consumption of fuels and energy on the territory of the Statutory City of Ostrava in 2000, 2005 and 2010 [MWh/yr], included in BEI and MEI

Final Consumption of Energy in Buildings, Facilities and Equipment		2000	2005	2010
Municipality owned buildings, facilities & equipment (i.e. all buildings of DOs, Municipality and organisations, not intended for living	No. of buildings	873	985	889
	Power (kWh)	34 002 915	39 541 386	45 621 727
	Gas (m^3)	4 559 910	4 412 447	4 610 265
	Heat, steam incl. (GJ)	498 332	481 062	429 737
Residential buildings owned by Municipality	No. of buildings	1 246	1 206	1 191
	Power (kWh)	1 928 240	1 814 209	1 608 355
	Gas (m^3)	1 153 697	1 143 327	1 304 954
	Heat, steam incl. (GJ)	323 628	313 485	312 265
Public lighting	No. of light points	*33 755*	35 704	37 737
	Consumption (MWh)	20 120	19 642	19 270

Source: Information provided by PO and OS SMO, data form DOs, Municipality, organisations

2.3 CO_2 Emission Inventory Results

As already referred to hereinbefore, the year of 2000 is chosen as the initial and reference year for CO_2 emission inventory. The final consumption of fuels and energy is shown in the following diagrams and tables for the included sectors using the relevant, required structure for 2000 and its further development up to 2010 is shown for the same sectors incorporated in BEI.

Table 43: developments of the final consumption of fuels and energy for selected sectors, MWh/year

Sector Incorporated in BEI - CO_2 Emission Development	BEI 2000	MEI 2005	MEI 2010
Municipal buildings, equipment/furnishing	240 307	212 756	201 700
Tertiary (non-municipal) buildings, equipment/furnishing	714 074	612 111	668 694
Residential buildings	2 317 868	2 204 186	1 854 234
Municipal/district public lighting	20 120	19 642	19 270
Municipal vehicle fleet	30 372	30 756	22 659
Public transport	123 475	113 750	107 753
Private and commercial transport	243 346	275 322	262 970
TOTAL	3 689 560	3 468 523	3 137 279

Table 44: : Hitherto developments of CO_2 emissions in sectors included in BEI (tpy)

Sector Incorporated in BEI - CO_2 Emission Development	BEI 2000	MEI 2005	MEI 2010
Municipal buildings, equipment/furnishing	105 689	88 026	79 315
Tertiary (non-municipal) buildings, equipment/furnishing	332 093	270 309	284 691
Residential buildings	946 583	848 583	677 664
Municipal/district public lighting	14 329	11 848	9 311
Municipal vehicle fleet	7 757	7 853	5 691
Public transport	56 503	45 233	37 077
Private and commercial transport	62 017	70 443	67 548
TOTAL	1 524 971	1 342 296	1 161 298

Table 45: Hitherto developments of CO_2 emissions in sectors included in BEI (%)

Sector Incorporated in BEI - CO_2 Emission Development	BEI 2000	MEI 2005	MEI 2010
Municipal buildings, equipment/furnishing	0,0%	-0,79%	-1,63%
Tertiary (non-municipal) buildings, equipment/furnishing	0,0%	-2,41%	-5,85%
Residential buildings	0,0%	-7,57%	-13,92%
Municipal/district public lighting	0,0%	-0,11%	-0,19%
Municipal vehicle fleet	0,0%	-0,07%	-0,12%
Public transport	0,0%	-0,40%	-0,76%
Private and commercial transport	0,0%	-0,63%	-1,39%
TOTAL	0,0%	-12,0%	-23,8%

Therefore, from the previous inventory outputs it follows that the CO_2 emissions decreased **by 23,8 %** in the monitored sectors within the period from 2000 to 2010. The year of 2000, the initial year of emission inventories was recommended as the baseline, i.e., any further emission inventories should be compared to the data o that year.

Table 46: Final consumption of fuels and energy – EU Format – Year 2000 – Baseline Year of the Inventory

Category	FINAL ENERGY CONSUMPTION [MWh]															
			Fossil fuels								Renewable energies					
	Electricity	Heat/cold	Natural gas	Liquid gas	Heating Oil	Diesel	Gasoline	Lignite	Coal	Other fossil fuels	Plant oil	Biofuel	Other biomass	Solar thermal	Geothermal	Total
BUILDINGS, EQUIPMENT/FACILITIES AND INDUSTRIES:																
Municipal buildings, equipment/facilities	34984,1	154259,7	48006,1	534,9				911,2		1610,7						240306,6
Tertiary (non municipal) buildings, equipment/facilities	126918,6	481745,6	95316,4		366,6					9507,9					218,4	714073,6
Residential buildings	242047,9	1378049,1	618548,4	244,2	72,8			16127,4	22392,7	28075,0		9760,3		18,2	2531,8	2317867,7
Municipal public lighting	20120,0															20120,0
Industries (excluding industries involved in the EU Emission trading scheme - ETS)																
Subtotal buildings, equipments/facilities and industries	424070,6	2014054,3	761870,9	779,1	439,4			17038,6	22393	39193,6		9760,3		18,2	2750,2	3292367,9
TRANSPORT:																
Municipal fleet				6,7		13137,6	17227,4									30371,7
Public transport	53373,0					70101,9										123474,9
Private and commercial transport				3,7		96350,5	146991,3									243345,5
Subtotal transport	53373,00			10,44		179590,04	164218,69									397192,2
Total	**477443,6**	**2014054,3**	**761870,9**	**789,6**	**439,4**	**179590,0**	**164218,7**	**17038,6**	**22392,7**	**39193,6**		**9760,3**		**18,2**	**2750,2**	**3689560,0**

Municipal purchases of certified green electricity (if any) **[MWh]:**	
CO2 emission factor for certified green electricity purchases (for LCA approach)**:**	

Locally generated heat/cold	Locally generated heat/cold [MWh]	Energy carrier input [MWh]										CO2 / CO2-eq emissions [t]	Corresponding CO2-emission factors for heat/cold production in [t/MWh]
		Fossil fuels					Waste	Plant oil	Other biomass	Other renewable	other		
		Natural gas	Liquid gas	Heating oil	Lignite	Coal							
Combined Heat and Power	**2014054,3**	9748,9		2467,0		2519668,0					421639,6	**914901,2**	**0,4543**
District Heating plant(s)													
Other *Please specify: _____*													
Total	**2014054,3**	**9748,9**		**2467,0**		**2519668,0**					**421639,6**	**914901,2**	

Table 47: Final consumption of fuels and energy – EU Format – Year 2005 – Monitoring Year of the Inventory

Category	FINAL ENERGY CONSUMPTION [MWh]															
			Fossil fuels								Renewable energies					
	Electricity	Heat/cold	Natural gas	Liquid gas	Heating Oil	Diesel	Gasoline	Lignite	Coal	Other fossil fuels	Plant oil	Biofuel	Other biomass	Solar thermal	Geothermal	Total
BUILDINGS, EQUIPMENT/FACILITIES AND INDUSTRIES:																
Municipal buildings, equipment/facilities	39358,0	131171,6	40919,0					1149,7				158,1				212756,4
Tertiary (non municipal) buildings, equipment/facilities	151542,7	378966,6	70770,6		27,9					10166,4				360,5	276,6	612111,3
Residential buildings	258327,5	1311894,2	549372,3	336,3	69,5			29638,4	12123,4	29017,2		10137,6		63,5	3205,9	2204185,8
Municipal public lighting	19642,0															19642,0
Industries (excluding industries involved in the EU Emission trading scheme - ETS)																
Subtotal buildings, equipments/facilities and industries	468870,2	1822032,4	661061,9	336,3	97,4			30788,1	12123,4	39183,6		10295,7		424,0	3482,5	3048695,5
TRANSPORT:																
Municipal fleet				6,7		13226,3	17522,5									30755,5
Public transport	44868,0					68882,4										113750,4
Private and commercial transport			69,8	20,5		127960,1	147271,2									275321,6
Subtotal transport	44868,0		69,8	27,2		210068,8	164793,8									419827,5
Total	**513738,2**	**1822032,4**	**681734,4**	**363,5**	**97,4**	**210068,8**	**164793,8**	**30788,1**	**12123,4**	**39183,6**		**10295,7**		**424,0**	**3482,5**	**3489125,8**

Municipal purchases of certified green electricity (if any) **[MWh]:**	
CO2 emission factor for certified green electricity purchases (for LCA approach)**:**	

Locally generated heat/cold	Locally generated heat/cold [MWh]	Energy carrier input [MWh]										CO2 / CO2-eq emissions [t]	Corresponding CO2-emission factors for heat/cold production in [t/MWh]
		Fossil fuels					Waste	Plant oil	Other biomass	Other renewable	other		
		Natural gas	Liquid gas	Heating oil	Lignite	Coal							
Combined Heat and Power	**1822032,4**	13753		1917	487076	1668515					283820	**773135,8**	**0,4243**
District Heating plant(s)													
Other *Please specify: _____*													
Total	**1822032,4**	**13753**		**1917**	**487076**	**1668515**					**283820**	**773135,8**	

Table 48: Final consumption of fuels and energy – EU Format – Year 2010 – Monitoring Year of the Inventory

Category	FINAL ENERGY CONSUMPTION [MWh]															
			Fossil fuels								Renewable energies					
	Electricity	Heat/cold	Natural gas	Liquid gas	Heating Oil	Diesel	Gasoline	Lignite	Coal	Other fossil fuels	Plant oil	Biofuel	Other biomass	Solar thermal	Geothermal	Total
BUILDINGS, EQUIPMENT/FACILITIES AND INDUSTRIES:																
Municipal buildings, equipment/facilities	45115,3	113906,6	41560,3					963,8				153,7				201699,8
Tertiary (non municipal) buildings, equipment/facilities	177477,3	440237,7	47570,1							1767,2				540,9	1100,7	668693,9
Residential buildings	271985,6	1010391,9	500417,9	1780,2	198,4			17471,7	8893,7	7856,5		28328,1		114,0	6795,7	1854233,7
Municipal public lighting	19270,0															19270,0
Industries (excluding industries involved in the EU Emission trading scheme - ETS)																
Subtotal buildings, equipments/facilities and industries	513848,2	1564536,3	589548,3	1780,2	198,4			18435,5	8893,7	9623,7		28481,8		654,9	7896,5	2743897,4
TRANSPORT:																
Municipal fleet				6,7		3348,0	19304,5									22659,2
Public transport	39440,0					68312,7										107752,7
Private and commercial transport			136,4	35,8		140460,6	122337,1									262969,9
Subtotal transport	39440,0		136,4	42,6		212121,3	141641,6									393381,8
Total	**553288,2**	**1564536,3**	**589684,7**	**1822,8**	**198,4**	**212121,3**	**141641,6**	**18435,5**	**8893,7**	**9623,7**		**28481,8**		**654,9**	**7896,5**	**3137279,2**

Municipal purchases of certified green electricity (if any) **[MWh]:**	
CO2 emission factor for certified green electricity purchases (for LCA approach)**:**	

Locally generated heat/cold	Locally generated heat/cold [MWh]	Energy carrier input [MWh]										CO2 / CO2-eq emissions [t]	Corresponding CO2-emission factors for heat/cold production in [t/MWh]
		Fossil fuels					Waste	Plant oil	Other biomass	Other renewable	other		
		Natural gas	Liquid gas	Heating oil	Lignite	Coal							
Combined Heat and Power	**1564536,3**	1660		1270	429572	1437815			852		263409	**670631,9**	**0,4286**
District Heating plant(s)													
Other *Please specify: _____*													

Table 49: CO_2 Emissions Inventory. EU Format – Year 2000 – Baseline Year of the Inventory

Category	CO2 emissions [t]/ CO2 equivalent emissions [t]															
			Fossil fuels								Renewable energies					
	Electricity	Heat/cold	Natural gas	Liquid gas	Heating Oil	Diesel	Gasoline	Lignite	Coal	Other fossil fuels	Biofuel	Plant oil	Other biomass	Solar thermal	Geothermal	Total
BUILDINGS, EQUIPMENT/FACILITIES AND INDUSTRIES:																
Municipal buildings, equipment/facilities	24915,09	70073,76	9639,82	120,75				325,08		614,20						105688,7
Tertiary (non municipal) buildings, equipement/facilities	90389,39	218837,00	19139,91		101,02					3625,70						332093,0
Residential buildings	172382,55	625990,45	124207,02	55,14	20,05			5753,84	7468,10	10705,97						946583,1
Municipal public lighting	14329,14															14329,1
Industries (excluding industries involved in the EU Emission trading scheme - ETS)																
Subtotal buildings, equipments/facilities and industries	302016,2	914901,2	152986,8	175,9	121,1			6078,9	7468,1	14945,9						1398694,0
TRANSPORT:																
Municipal fleet				1,52		3465,46	4289,61									7756,59
Public transport	38011,38					18491,60										56502,98
Private and commercial transport				0,84		25415,49	36600,84									62017,17
Subtotal transport	38011,38			2,36		47372,55	40890,45									126276,74
OTHER:																
Waste management																
Waste water management																
Please specify here your other emissions																
Total	**340027,54**	**914901,22**	**152986,76**	**178,24**	**121,07**	**47372,55**	**40890,45**	**6078,92**	**7468,10**	**14945,87**						**1524970,72**

Corresponding CO2-emission factors in [t/MWh]	0,712	0,4543	0,2008	0,2257	0,2755	0,2638	0,2490	0,3568	0,3335	0,3813						
CO2 emission factor for electricity not produced locally [t/MWh]	0,7122															

Locally generated electricity (excluding ETS plants , and all plants/units > 20 MW)	Locally generated electricity [MWh]	Energy carrier input [MWh]											CO2 / CO2-eq emissions [t]	Corresponding CO2-emission factors for electricity production in [t/MWh]
		Fossil fuels					Steam	Waste	Plant oil	Other biomass	Other renewable	other		
		Natural gas	Liquid gas	Heating oil	Lignite	Coal								
Wind power														
Hydroelectric power														
Photovoltaic														
Combined Heat and Power														
Other *Please specify: _____*														
Total														

Table 50: CO_2 Emissions Inventory. EU Format – Year 2005 – Monitoring Year of the Inventory

Category	CO2 emissions [t]/ CO2 equivalent emissions [t]															
			Fossil fuels								Renewable energies					
	Electricity	Heat/cold	Natural gas	Liquid gas	Heating Oil	Diesel	Gasoline	Lignite	Coal	Other fossil fuels	Biofuel	Plant oil	Other biomass	Solar thermal	Geothermal	Total
BUILDINGS, EQUIPMENT/FACILITIES AND INDUSTRIES:																
Municipal buildings, equipment/facilities	23740,04	55659,51	8216,70					410,18								88026,4
Tertiary (non municipal) buildings, equipement/facilities	91407,82	160805,41	14211,02		7,69					3876,80						270308,7
Residential buildings	155818,50	556670,86	110316,17	75,92	19,16			10574,20	4043,21	11065,27						848583,3
Municipal public lighting	11847,70															11847,7
Industries (excluding industries involved in the EU Emission trading scheme - ETS)																
Subtotal buildings, equipments/facilities and industries	282814,1	773135,8	132743,9	75,9	26,8			10984,4	4043,2	14942,1						1218766,2
TRANSPORT:																
Municipal fleet				1,52		3488,86	4363,11									7853,48
Public transport	27063,57					18169,92										45233,49
Private and commercial transport			14,01	4,62		33753,52	36670,54									70442,69
Subtotal transport	27063,57		14,01	6,14		55412,29	41033,65									123529,66
OTHER:																
Waste management																
Waste water management																
Please specify here your other emissions																
Total	**309877,64**	**773135,78**	**132757,90**	**82,07**	**26,85**	**55412,29**	**41033,65**	**10984,38**	**4043,21**	**14942,06**						**1342295,83**

Corresponding CO2-emission factors in [t/MWh]	0,6032	0,4243	0,2008	0,2257	0,2755	0,2638	0,2490	0,3568	0,3335	0,3813						
CO2 emission factor for electricity not produced locally [t/MWh]	0,6121															

Locally generated electricity (excluding ETS plants , and all plants/units > 20 MW)	Locally generated electricity [MWh]	Energy carrier input [MWh]											CO2 / CO2-eq emissions [t]	Corresponding CO2-emission factors for electricity production in [t/MWh]
		Fossil fuels					Steam	Waste	Plant oil	Other biomass	Other renewable	other		
		Natural gas	Liquid gas	Heating oil	Lignite	Coal								
Wind power														
Hydroelectric power	**2349,43**													
Photovoltaic	**17,17**													
Combined Heat and Power														
Other *Please specify: _____*	**5157,64**										21762,7			
Total	**7524,23**										**21762,7**			

Table 51: CO_2 Emissions Inventory. EU Format – Year 2010 – Monitoring Year of the Inventory

Category	CO2 emissions [t]/ CO2 equivalent emissions [t]															
			Fossil fuels								Renewable energies					
	Electricity	Heat/cold	Natural gas	Liquid gas	Heating Oil	Diesel	Gasoline	Lignite	Coal	Other fossil fuels	Biofuel	Plant oil	Other biomass	Solar thermal	Geothermal	Total
BUILDINGS, EQUIPMENT/FACILITIES AND INDUSTRIES:																
Municipal buildings, equipment/facilities	21800,05	48825,60	8345,48					343,85								79315,0
Tertiary (non municipal) buildings, equipement/facilities	85758,32	188706,04	9552,26							673,89						284690,5
Residential buildings	131425,37	433100,26	100485,94	401,86	54,65			6233,45	2966,11	2995,96						677663,6
Municipal public lighting	9311,40															9311,4
Industries (excluding industries involved in the EU Emission trading scheme - ETS)																
Subtotal buildings, equipments/facilities and industries	248295,1	670631,9	118383,7	401,9	54,7			6577,3	2966,1	3669,8						1050980,5
TRANSPORT:																
Municipal fleet				1,52		883,14	4806,82									5691,475181
Public transport	19057,69					18019,62										37077,3144
Private and commercial transport			27,38	8,09		37050,94	30461,93									67548,33906
Subtotal transport	19057,69		27,38	9,61		55953,70	35268,75									110317,13
OTHER:																
Waste management																
Waste water management																
Please specify here your other emissions																
Total	267352,82	670631,90	118411,07	411,47	54,65	55953,70	35268,75	6577,29	2966,11	3669,85						1161297,62

Corresponding CO2-emission factors in [t/MWh]	0,4170	0,4286	0,2008	0,2257	0,2755	0,2638	0,2490	0,3568	0,3335	0,3813					
CO2 emission factor for electricity not produced locally [t/MWh]	0,4243														

Locally generated electricity (excluding ETS plants , and all plants/units > 20 MW)	Locally generated electricity [MWh]	Energy carrier input [MWh]											CO2 / CO2-eq emissions [t]	Corresponding CO2-emission factors for electricity production in [t/MWh]
		Fossil fuels					Steam	Waste	Plant oil	Other biomass	Other renewable	other		
		Natural gas	Liquid gas	Heating oil	Lignite	Coal								
Wind power														
Hydroelectric power	**2739,64**													
Photovoltaic	**259,08**													
Combined Heat and Power														
Other *Please specify: _____*	**6610,73**										16375,00			
Total	**9609,44**										**16375,00**			

3. SUSTAINABLE ENERGY ACTION PLAN (SEAP)

The Statutory City of Ostrava with its area of 214.22 km^2 and 296 224 inhabitants appears to be the third largest city of the Czech Republic. Its position in Europe is shown on the following map.

Figure 27: Geographic position of Ostrava in Europe

Source: Investor's Guide, Statutory City of Ostrava

The city is structured into 23 city districts, the highest numbers of inhabitants live in the districts of Ostrava-South, Poruba, Moravská Ostrava and Přívoz, and Slezská Ostrava – almost 80 % of all the inhabitants live in those four districts. .

Figure 28: City districts of Ostrava

Source: Ostrava City Profile

3.1 Overall SEAP Strategy

On 2nd November v2011 the Statutory City of Ostrava became officially involved in the initiative of the Covenant of Mayors and became one of its signatories. The nature of membership in the Covenant consists in the implementation of specific selected municipal projects that will lead to the reduction of CO_2 emissions at least by 20 % as of 2020, as compared to the initial year, which the Baseline CO_2 Emission Inventory was prepared for.

At present, the Statutory City of Ostrava is found within the agglomeration of Ostrava - Karviná – Frýdek-Místek, where the limit concentrations of air pollutants are significantly exceeded. For the Statutory City of Ostrava the removal of air pollution has been always deemed an absolute priority and **SEAP proposes preferably such measures that will contribute to the abatement of emissions of both CO_2 and pollutants into air.**

The projects and strategies included in SEAP relate particularly to the areas, which the Municipality is able to influence by its activities – such as residential, municipal and, possibly, other buildings, public lighting, the use of other municipal services (drinking water purification, waste water treatment, waste disposal, public transport, improvement of municipal management in the field of fuel / energy consumption – by supporting information activities, making use of cooperation with the Smart Cities initiative and promoting activities and information in the household sector

3.2 Integration of SEAP and Other Development Strategies of the City

SEAP is created in the integration and harmony with the strategic and development objectives of the Statutory City of Ostrava ("SMO") as well as in compliance with the principles of protection of other components of the environment, air protection in particular. The following documents and initiatives are deemed essential in this respect:

a) **City Strategic Plan** (its update), as a principal document establishing the development of the Statutory City of Ostrava, comprises strategic objectives of city development in sectors included in SEAP (housing, public services And other tertiary sphere, transport) and projects approved within the framework, respected in SEAP and whose impact on CO_2 emissions is taken into consideration in SEAP up to 2020 – as the impact of development plans on the increase in CO_2 generation.

b) **Integrated City Development Plan**: OSTRAVA – MAGNET OF THE REGION – Energy requirements of development projects are taken into account in the calculation of CO_2 emissions as of 2020.

c) **City Planning Scheme**: SEAP maps the assumed development of the city including the development in housing and civil amenities, taking due account of compliance with the Real Estate Report, delimitation of the space for development and the character of particular development areas as well.

d) **Programme for Air Quality Improvement in the Moravian-Silesian Region** – Ostrava City, certain its locations in particular, are frequently exposed to air pollution in excess of the concentration limits permitted for the levels of pollutants in air and the permitted number of violations of those limits. In order to improve the situation the Programme contains measures aimed air quality improvement and the city of Ostrava owns its own Action Plan for Air Quality Improvement. In 2014 the agglomeration of Ostrava – Karviná – Frýdek-Místek will have its own programme for air quality improvement, too. The programmes will ask for the integration of objectives in climate protection with the objectives in air protection, search for mutual synergies and support of activities aimed at the protection of climate (CO_2 emissions abatement) and the protection of air, as well. .

e) **EU Initiative Smart Cities** – The city of Ostrava is involved in the EU initiative "Smart Cities and Communities", whose aim consists in the promotion and support of energy savings and use of RESs and, primarily, new and smart solutions in the fields of building, transport and ITC uses.

Ad a) The **City Strategic Plan** is based on 3 strategic objectives:

1. To create the environment for the dynamic development of local economy in key business lines;
2. To become the city providing top quality services in all areas related to the development of local economy and prosperity of its citizens and visitors;
3. To be a regional magnet for tourists, offering extraordinary experience in selected areas.

Ad b) **Integrated City Development Plan**: OSTRAVA – MAGNET OF THE REGIONU is aimed at the areas of the environment, availability and mobility, tourism, cultural and social life and infrastructure for education.

I.1 Extension of the Municipal Public Transport

IV. Increase and extension of the quality of city public amenities and the development of tourism

IV. 1. 1 Modernisation of ZOO Ostrava

IV. 1. 2 Development of new services, products and infrastructure for the field of tourism

IV. 2.1 Revitalisation of cultural monuments and leisure facilities

IV. 2. 2 Development of the area of the "Černá louka" centre

Ad d) **Action Plan for Air Quality Improvement** comprises particularly measures aimed at transport and small sources for household heating ("so-called "local furnaces") including:

- Preference for the vehicles of municipal public transport (MPT);
- Support to MPT, electric traction in particular, from the budget of the Statutory City of Ostrava MHD;
- Support to vehicle fleet modernisation;
- Implementation of investments in the field of transport infrastructure;
- Energy savings in public buildings.

Ad e) Smart Cities is an initiative that falls, in terms of organisation, within the framework of the Strategic Plan of Energy Technologies (SET-Plan) and is aimed at science and research of new technologies in energy sector. Its objective consists in the support provided to towns and regions in meeting their ambitious targets as to the abatement of emissions through the methods of sustainable energy use in transport, energy performance of buildings and use of advance energy technologies that increase energy performance and energy savings. The initiative is under control of the Directorate-General for Energy (DG Ener) of the European Commission.

Based on the Resolution of the Chamber of Deputies no. 1670 of 14th April 2010, made as Amendment to the Report of Methods for Solution of Unsuitable Environmental Situation in the Region of Moravia-Silesia (hereinafter referred to as "the Report") and, further, according to the specification of Report measures, whose performance was assigned by the Resolution of Government no. 260 of 9th April 2010, relevant tasks were specified, which are to be covered mostly from the budget of the Ministry of the Environment and organisations of its sector í (SFŽP ČR, ČIŽP, ČHMÚ), possibly other cooperating sectors (MPO, MD, MF, MMR, MŠMT).

One of the tasks accepted within the framework of the Resolution of Government no. 260 of 9th April 2010 consists in Measure 5.5 – Supporting the engagement of the SMO, MSK and VŠB-TUO in the European industrial initiative "Smart Cities", providing adequate state funds for science and research. Therefore, the involvement and support of the Statutory City of Ostrava and VŠB-TUO are in compliance with the valid Resolution of Government, CR, no. 260 of 9th April 2010 and with the Resolution of the Chamber of Deputies no. 1670 of 14th April 2010 as well.

Involvement of the SMO in the Smart Cities initiative is supported by important business entities in the city and the region, who understand the potential of their engagement in the projects prepared and implemented in compliance with the initiative.

The main challenge consists in the abatement of CO_2 emissions at various levels. Usually it involves particular attention paid to the field of transport and its solutions. Following steps may include, e.g., concentration on the means of public transport, thermal insulation of buildings, heat and waste management and related cooperation with individual citizens and entrepreneurial entities. For the city it will mean, primarily, improvements in the environment, increased energy performance and savings and, in general, improvements in the quality of life of inhabitants.

Additional impacts will be seen on the field of public services, as the city council purposefully and specifically contributes to environmental improvements by implementing the project in a long-term horizon. The Municipality should invest in the technologies that provide an increase in energy performance and savings or more efficient transport also for the currently existing opportunity to receive subsidies for such technologies. Such subsidies will not be accessible in the future.

Project Objectives

A framework should be prepared for the city, with ties to the region, universities, research facilities and industry:

- For implementation of projects aimed at the fulfilment of a vision, particularly in the field of the improvement of environment and increase in energy performance;
- For creation of new competitive products and services of a high added value, based on research and development;
- To demonstrate the results of interconnected interdisciplinary projects within the framework of individual pillars of Smart City Ostrava.

These activities within the framework of the EU initiative “Smart Cities and Communities” will be complemented with the measures of the Action Plan for the Covenant of Mayors. As to the abatement of CO_2 emissions the measures will be aimed particularly at:

- Incorporation and control of local sources, RESs inclusive;
- Making use of information and communication technologies (ICT)
- Highly efficient heating and cooling systems (such as the use of biomass, solar thermal energy, ambient heat energy and geothermal energy with heat accumulation, combined heat & power generation, district heating);
- Development of “green“ infrastructure with the view to limit the requirements for heating and cooling and to reduce air pollution;
- Smart public lighting systems;
- Construction of building with almost zero energy consumption and buildings and districts with positive energy balance;
- Wide additional furnishing of existing buildings and sustainable construction materials (reduction of energy consumption by 50 %, at least).

In order to interconnect various activities within the framework of the Covenant of Mayors and the Smart Cities Initiative cooperation was established between the authors of SEAP and the VŠB-Technical University Ostrava, ENET Centre. The cooperation contributed both to the detailed certification of RE sources on the territory of Ostrava and to the proposal of projects for RES use, particularly as pilot projects for the application of research results in practice. The activities include also the certification and promotion of low-energy and passive buildings.

Figure 29: Shares of all sectors incorporated in SEAP in consumption of fuels/energy and CO_2 emissions

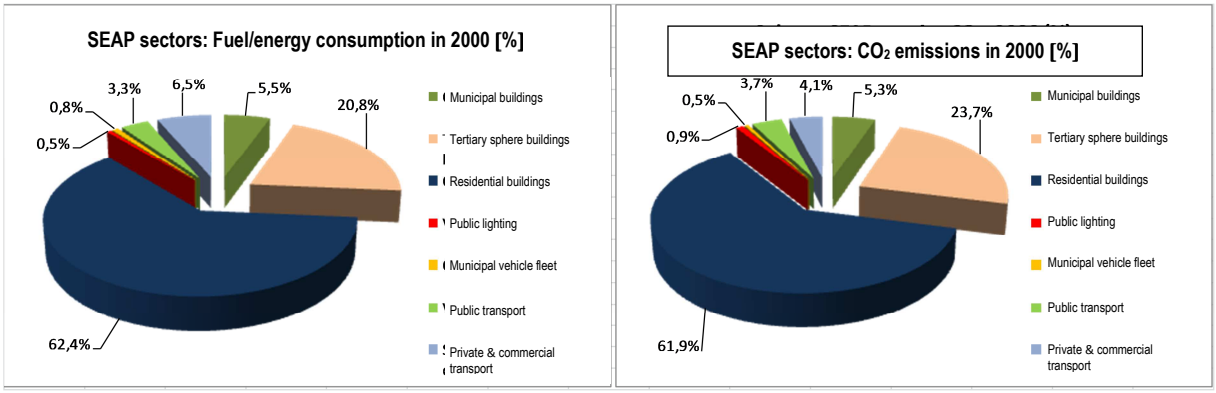


Figure 30 Shares of sectors incorporated in SEAP in production of CO_2 emissions – Development from 2000

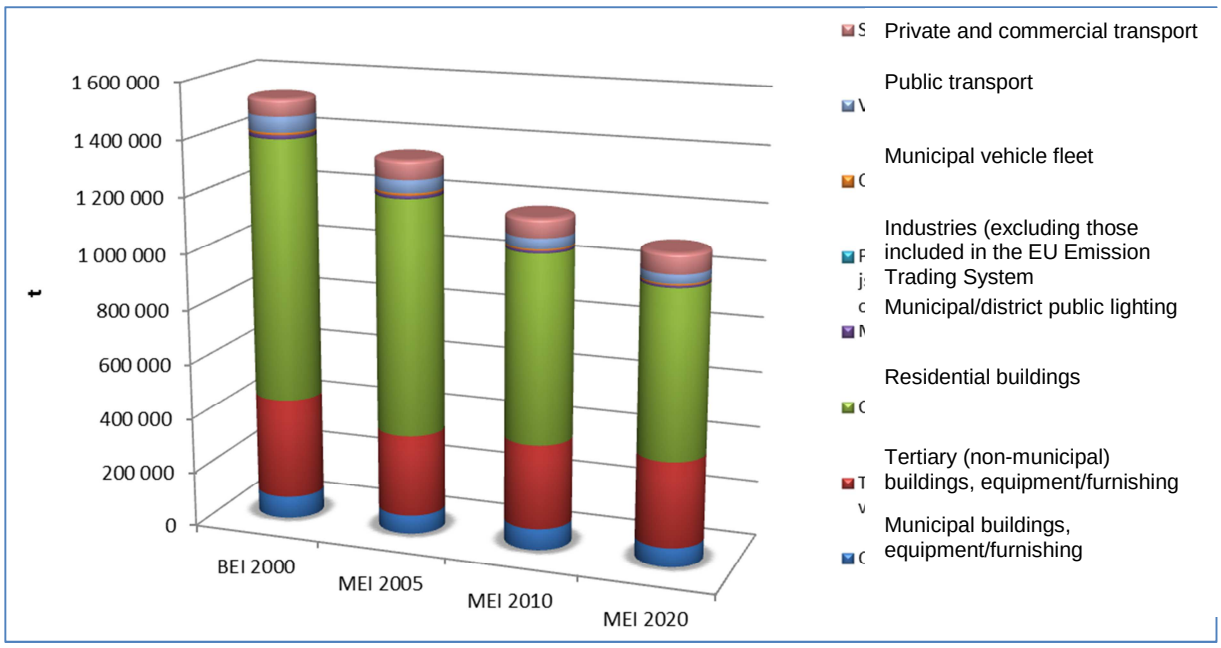


Figure 31: Consumption of fuels/energy and CO_2 emissions in the sector of buildings in 2000 (initial inventory structured to fuel/energy type)

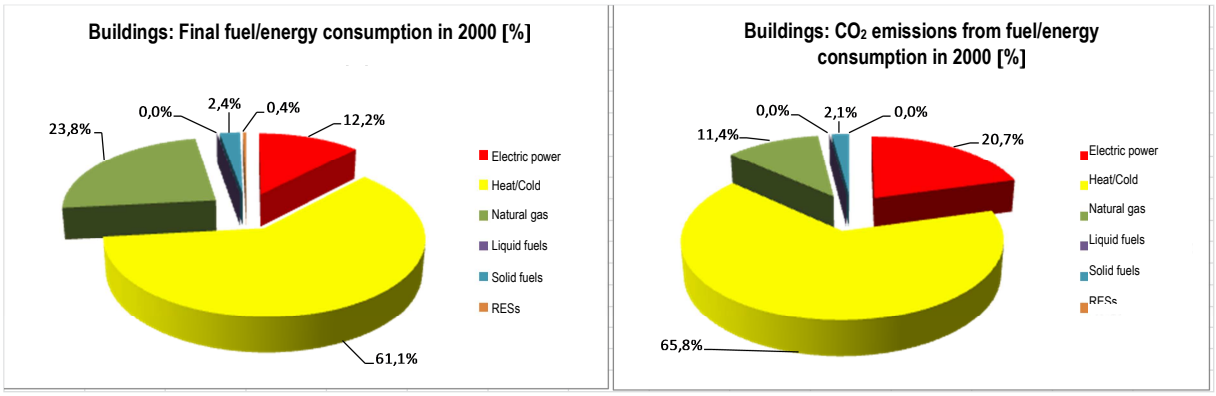
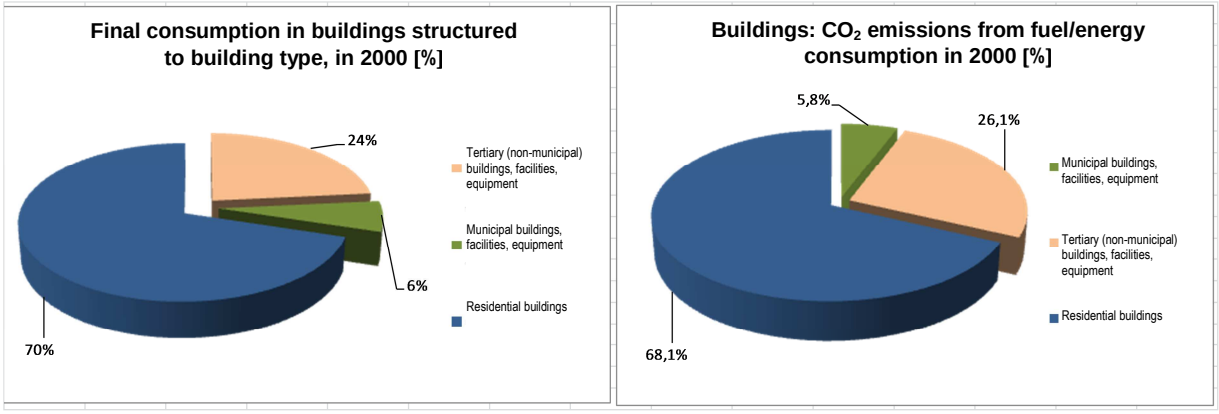


Figure 32: Consumption of fuels/energy and CO_2 emissions in the sector of buildings in 2000 (initial inventory structured to particular sectors)



In view of the majority share of the residential buildings (family and flat block houses) in CO_2 emissions (68 %) it I necessary, in order to achieve any required emission abatement, to aim efforts at this sector. The flat blocks are, in a part, owned by the Municipality. Certain measures are proposed for the sector.

Buildings of the tertiary sphere, owned particularly by private persons and entities, takes the second place (26 %).The private sectors is strongly encouraged for further development and creation of new jobs. This segment includes also the facilities of public administration (schools, hospitals, etc.) in the property of the Moravian-Silesian Region and other bodies (such as, e.g.., the VŠB). Additional measures are proposed for the sector.

The sector of building owned by the Municipality of Ostrava, takes the 3rd place in the list of emission inventory with its share of about 6 % in the emissions coming from fuel/energy consumption in buildings. This part of buildings is managed either directly by the MMO, or by individual district offices and includes various schools, administration, social, health care, sports, cultural and other facilities existing as contributory organisations or business companies. .

More than 8 % of CO_2 emissions are generated by fuel combustion in transport incorporated in SEAP. In this part the Municipality has the highest influence on the segment of public transport. Relevant measures intended for achievement of savings in transport are included in SEAP.

The inventory does not comprise any emissions from renewable energy sources, waste water treatment and municipal waste disposal, as their emission factors equals zero. However, the RESs are represented in the inventory of fuel and energy consumption. In other words, the higher use of RESs in heating, hot water preparation and power generation, the lower CO_2 production on the territory of the city. In view of the problems existing in air quality and air pollution, the application of non-combusting technologies is preferred.

3.3 SEAP Priorities

SEAP Priorities - Measures

- In respect of buildings, Ostrava City, similarly as other member towns of the Covenant of Mayors, concentrates its efforts on the improvement of energy performance and subsequent economic operation of buildings (including, e.g., the application of additional thermal insulation, replacement of windows, heating control systems, energy management, economic lighting). In addition to the Municipality-owned buildings, SEAP will be aimed at flat block houses and family houses.
- As to the field of transport, there is a wide choice of feasible projects, how CO_2 emissions could be reduced and a more cost efficient and emission-friendly urban transport could be achieved. In this respect town and cities address both the individual

automotive traffic (controlled access to the towns/cities, efficient traffic control systems) and the public transport as well. The main intent of such efforts consists, of course, the shift of passengers from automobiles to the means of public transport. The highest support is given and emphasis put to the rail transport (such as trams, the development of suburban and integrated railway (commuting) systems.

- Production of electric power and heat from renewable energy sources (RESs).

3.4 Scenarios for Emission Development until 2020 and CO_2 Emission Abatement Targets

Ostrava City undertook to reduce CO_2 emissions by more than 20 % by 2020, as compared to the initial year of CO_2 emission inventory, i.e., the year of 2000. This target is put in writing as an absolute value (absolute reduction of the emissions from sector included in SEAP on the territory of the Statutory City of Ostrava).

Attainability of this target was subject to the modelling possible CO_2 emissions as of 2020 in the sectors incorporated in SEAP. The process of modelling relied on the following inputs:

- Calculation of energy requirements on the development areas of the city, related, apart from other things, to the implementation of prepared and approved plans of development – **approved as a part of the Strategy up to 2015**. The projects are described in detail in *Supplement 2 hereto* – Development in SEAP Sectors and Consumption of Fuels and Energy.
- Potential for the reduction of final consumption of individual fuels and energies and CO_2 emissions abatement in the sectors incorporated in BEI, including transport and public lighting, as described in detail in *Supplement 3 hereto* – Potential for Savings in SEAP
- Developments in the application of RESs – to the production of heat and electric power. The details of the current condition in RES application and in the development after 2010 are described in *Supplement 1 hereto* – Production of Energy from RESs.
- Development in emission factors – electric power from the system power plants in the CR (in connection with the updated State Energy Concept) and heat from the heat and electricity sources locate on the territory of Ostrava – moreover, the emission factor for electric power is lowered by the share of electric power generated locally from renewable energy sources.

Table 52: Scenario for the development of final consumption of fuel and energy by 2020 in selected sectors (MWH/year)

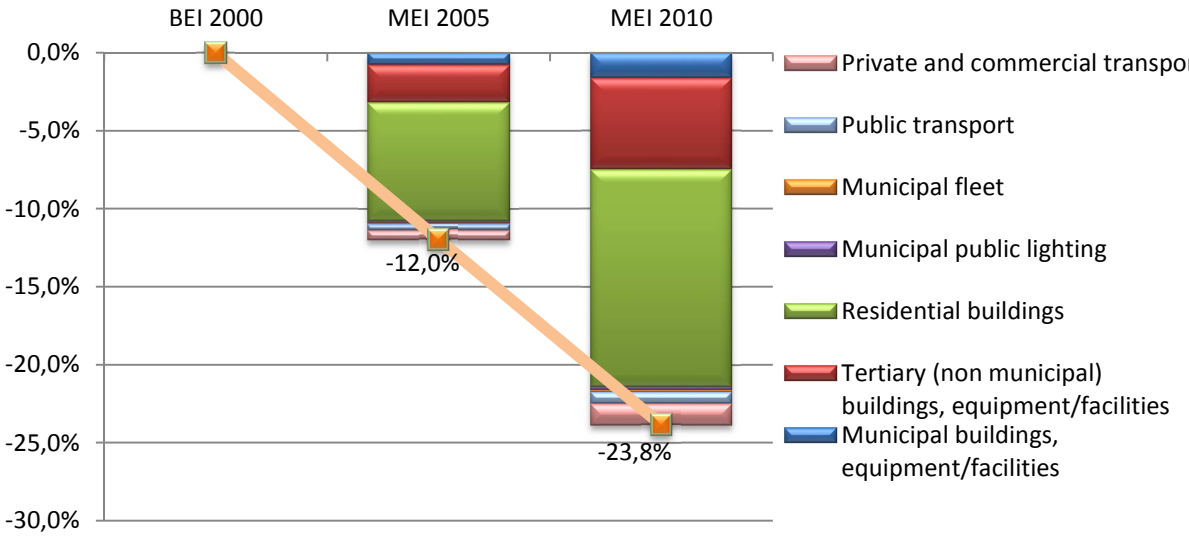
Sector Included in BEI – Development in CO_2 Emissions	BEI 2000	MEI 2005	MEI 2010	Year 2020
Municipal buildings, equipment/furnishing	240 307	212 756	201 700	185 305
Tertiary (non-municipal) buildings, equipment/furnishing	714 074	612 111	668 694	705 544
Residential buildings (residential and family houses)	2 317 868	2 204 186	1 854 234	1 713 103
Municipal/District public lighting	20 120	19 642	19 270	18 911
Municipal vehicle fleet	30 372	30 756	22 659	21 526
Public transport	123 475	113 750	107 753	100 363
Private and commercial transport	243 346	275 322	262 970	280 301
TOTAL	3 689 560	3 468 523	3 137 279	2 025 053

Table 53: Scenario for the development in CO_2 emissions for sectors included in BEI (t/year) by 2020

Sector Included in BEI – Development in CO_2 Emissions	BEI 2000	MEI 2005	MEI 2010	Year 2020
Municipal buildings, equipment/furnishing	105 689	88 026	79 315	70 880
Tertiary (non-municipal) buildings, equipment/furnishing	332 093	270 309	284 691	288 213
Residential buildings (residential and family houses)	946 583	848 583	677 664	604 074
Municipal/District public lighting	14 329	11 848	9 311	8 045
Municipal vehicle fleet	7 757	7 853	5 691	5 407
Public transport	56 503	45 233	37 077	31 967
Private and commercial transport	62 017	70 443	67 548	71 465
TOTAL	1 524 971	1 342 296	1 161 298	1 080 051

Table 54: Development in CO_2 emissions in sectors included in BEI I (%) by 2020

Sector Included in BEI – Development in CO_2 Emissions	BEI 2000	MEI 2005	MEI 2010	Year 2020
Municipal buildings, equipment/furnishing	0,0%	-0,79%	-1,63%	-1,91%
Tertiary (non-municipal) buildings, equipment/furnishing	0,0%	-2,41%	-5,85%	-7,79%
Residential buildings (residential and family houses)	0,0%	-7,57%	-13,92%	-16,32%
Municipal/District public lighting	0,0%	-0,11%	-0,19%	-0,22%
Municipal vehicle fleet	0,0%	-0,07%	-0,12%	-0,15%
Public transport	0,0%	-0,40%	-0,76%	-0,86%
Private and commercial transport	0,0%	-0,63%	-1,39%	-1,93%
TOTAL	0,0%	-12,0%	-23,8%	-29,2%



From the proposed scenario for emission development up to 2020 it follows the CO_2 emissions can be reduced by more than 28 % as of 2020 as compared to the value for 2000. From the values given in the scenario of CO_2 development and with our knowledge of limitations and risks associated with the calculations of potential savings on CO_2 emissions and, far from it, their growth due to the development of included sectors **we recommend the Municipality should undertake the conservative target of 25 % reduction**

Table 55: Final consumption of fuels and energy – scenario as of 2020 [MWH/year]

Category	FINAL ENERGY CONSUMPTION [MWh]															
			Fossil Fuels								Renewable Energies					
	Electricity	Heat/Cold	Natural Gas	Liquefied Gas	Heating Oil	Diesel Fuel	Gasoline	Lignite	Coal	Other Fossil Fuels	Plant Oil	Biofuel	Other Biomass	Solar Thermal Energy	Geothermal Energy	TOTAL
BUILDINGS, EQUIPMENT/FURNISHING AND INDUSTRIES:																
Municipal buildings, equipment/furnishing	44915.32	103419.62	35352.42					963.76				153.74		500.00		185304.86
Tertiary (non-municipal) buildings, equipment/furnishing	197577.34	448437.70	56120.07							1767.18				540.85	1100.73	705543.88
Residential buildings (flat block and family houses)	283591.01	892180.70	473766.71	890.10	198.35			7425.47	8893.72			35977.71		391.81	9786.86	1713103.41
Municipal/District public lighting	18911.01															18911.01
Industries (except those incorporated in the EU Emission Trading System ETS)																
Subtotal: Buildings, equipment/furnishing and industries	544995.64	1444038.02	565239.20	890.10	198.35			8389.24	8893.72	1767.18		36131.44		1432.60	10887.60	2622863.16
TRANSPORT																
Municipal vehicle fleet				6.38		3 180.58	18 339.28									21526.24
Public transport	44 219.46		26 253.15			29 889.98										100362.59
Private and commercial transport			10 186.80	38.02		146 257.20	123 819.20									280301.22
Subtotal: Transport	44 219.46		36 439.95	44.40		179 327.77	142158.48									402190.05
TOTAL	**589215.-10**	**1444038.02**	**601679.15**	**934.50**	**198.35**	**179 327.77**	**142 158.48**	**8389.24**	**8893.72**	**1767.18**		**36131.44**		**1432.60**	**10887.60**	**3025053.21**

Purchases of certified green electricity (if any) from Municipality's side:	
Emission factors of electricity for the purchases of certified green electricity (within the LCA method):	

Table 56: CO_2 Emissions scenario as of 2020 [t CO_2/year]

Category	FINAL ENERGY CONSUMPTION [MWh]															
			Fossil Fuels								Renewable Energies					
	Electricity	Heat/Cold	Natural Gas	Liquefied Gas	Heating Oil	Diesel Fuel	Gasoline	Lignite	Coal	Other Fossil Fuels	Biofuel	Plant Oil	Other Biomass	Solar Thermal Energy	Geothermal Energy	TOTAL
BUILDINGS, EQUIPMENT/FURNISHING AND INDUSTRIES:																
Municipal buildings, equipment/furnishing	19106.90	44330.39	7098.91					343.85								70880.04
Tertiary (non-municipal) buildings, equipment/furnishing	84049.08	192220.94	11269.14							673.89						288213.04
Residential buildings (flat block and family houses)	120639.55	382429.53	95134.27	200.93	54.65			2649.22	2966.11							604074.25
Municipal/District public lighting	8044.71															8044.71
Industries (except those incorporated in the EU Emission Trading System ETS)																
Subtotal: Buildings, equipment/furnishing and industries	231840.25	618980.84	113502.31	200.93	54.65			2693.06	2966.11	673.89						971212.04
Municipal vehicle fleet				1.44		838.98	4566.48									5406.899464
Public transport	18810.89		5271.74			7884.43										31967.05197
Private and commercial transport			2045.55	8.58		38579.98	30830.98									71465.07332
Subtotal: Transport	18810.89		7317.29	10.02		47303.37	35397.46									108839.0245
OTHER ACTIVITIES																
Waste management																
Waste water management																
Give here, please, other your emissions, if any																
TOTAL	250651.13	618980.84	120819.60	210.95	54.65	47303.37	35397.46	2693.06	2966.11	673.89						1080051.07

Relevant CO_2 emission factors [t/MWh]	0.4254	0.4286	0.2008	0.2257	0.2755	0.2638	0.2490	0.3568	0.3335	0.3813						
Emission factor of electricity not locally produced [t/MWh]	0.4361															

Locally produced electric power (except any equipment and units incorporated in ETS and all equipment and units of rated output >20 MW)	Locally produced electric power	Energy Input Carrier [MWh]											CO_2 emissions in CO_2 equi-valents [t]	Relevant CO_2 emission factors for heat/cold produced [t/MWh]
		Fossil Fuels					Steam	Waste	Vegetable oil	Other biomass	Other renewable sources	Other		
		Natural Gas	LPG	Fuel oil	Brown coal	Coal								
Wind energy	33.00													
Water energy	4386.77													
Photovoltaic energy	4700.00													
Combined heat & power generation														
Combined heat & power generation (ÚČOV, TKO landfill)	5364.32										17453.79			
Total	**14514.10**										**17453.89**			

3.4.1 Calculation of New Energy Requirements in Development Areas

The energy requirements of the areas of new development were calculated using the data given in the Real Estate Report. Quantification of the requirements is given in the following Table.

Table 57: Energy requirement of new development

	Heating + HWP (MWh)	OST (MWh)	ZP (MWh)	CZT (MWh)	EL (MWh)
Residential buildings	39 908	10 653	29 823	10 085	10 653
Public amenities	16 750	20 100	8 550	8 200	20 100

15% and 5 % of those requirements would covered by biomass and heat pumps, respectively. The final consumption of the house-building in development areas was taken into account in the inventories of final consumption as an increase due to the development up to 2020.

3.4.2 Reduction of CO_2 Emissions in Particular SEAP Sectors

Potential for the reduction of fuel and energy consumption in all sectors is derived from the measures that were implemented in those sectors up to 2010 and will be implemented by 2020. Un the sector of municipal buildings it includes also the implementation of measured financed using subsidies provided by the operating programme “The Environment” (OPŽP). This potential will reflect itself in the consumption in 2020 as follows:

Figure 33: Developments in CO_2 emissions in SEAP sectors by 2020, not including house-building in development areas. Structured to particular fuel/energy types (t CO_2/year)

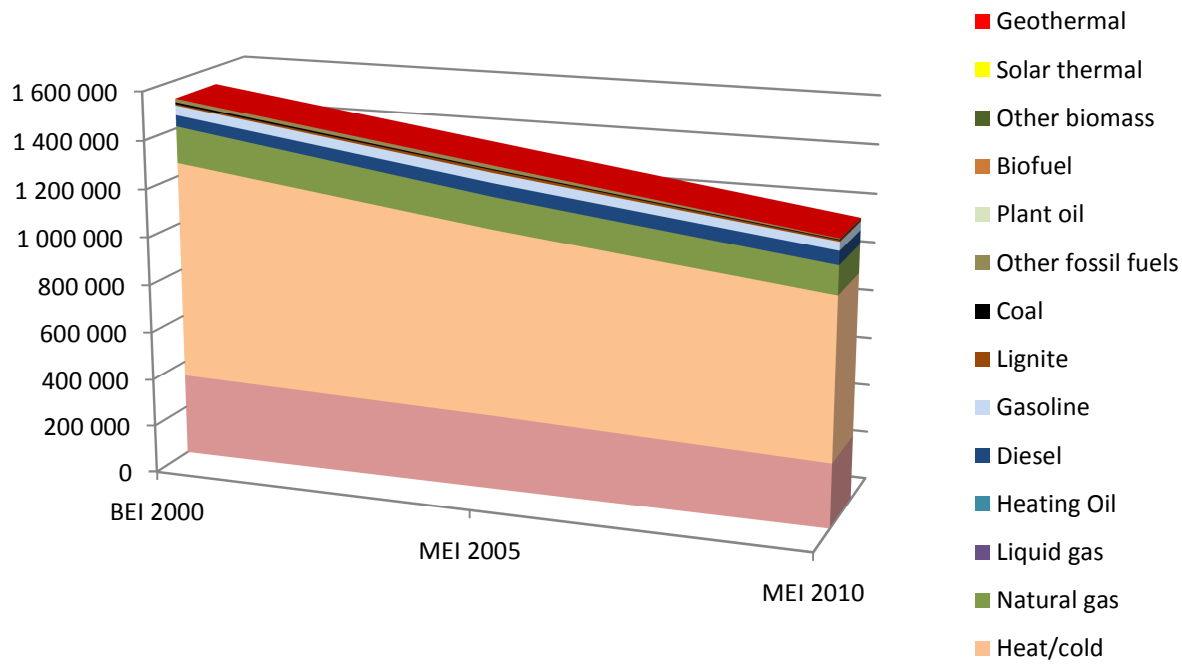
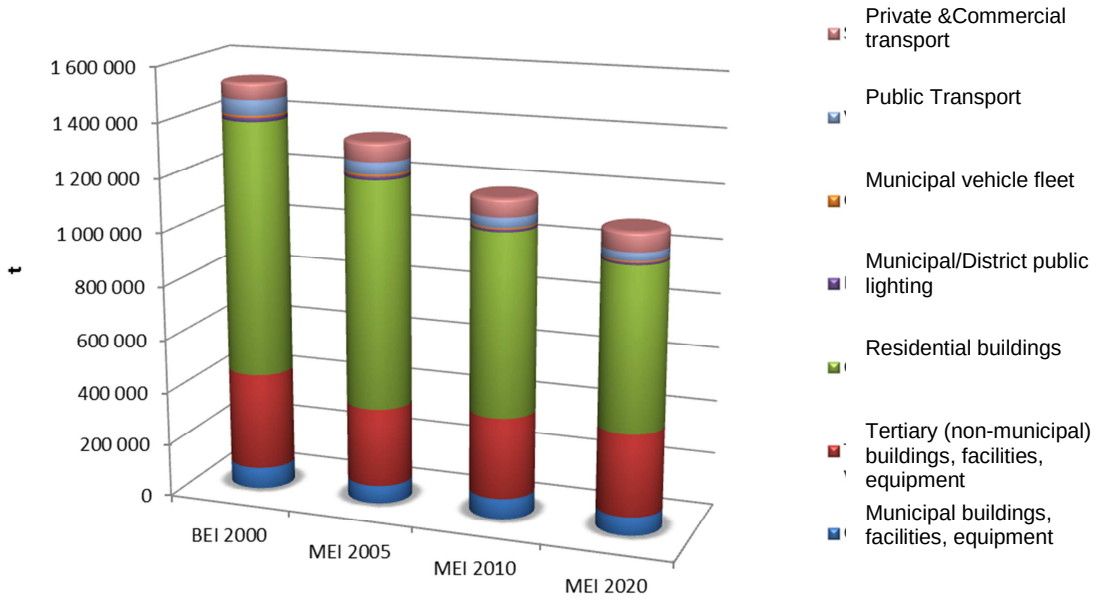


Figure 34: Developments in CO_2 emissions in SEAP sectors by 2020, not including house-building in development areas. Structured to particular SEAP sectors (t CO_2/year)



Source: Authors' calculations

Contributions Resulting from the Measures Taken in the Sector of Municipal Buildings up to 2010

The measures referred to in the following table have been already reflected in the emission inventory of 2010.

Table 58: Contributions from SMO projects implemented by 2011

SMO projects	State before implementation		State after implementation		Savings	
	CO_2 (t)	GJ	CO_2 (t)	GJ	CO_2 (t)	GJ
EKOTERMO I	257,7	3430,1	155,8	1892,1	101,9	1538
Building of the District Office Ostrava-Nová Ves – construction modifications, thermal insulation, energy performance improvement, provision of an access adapted for wheel chairs.	1744,0	211,4	1735,9	62,2	8,2	149,25
ZŠ Provaznická 64, Ostrava-Hrabůvka (realisation of energy savings)	395,2	2821	225,9	1501	169,3	1320
ZŠ Jugoslávská, Ostrava-Zábřeh (realisation of energy savings)	536,2	3505	352,0	2065	184,2	1440
Energy savings in the facilities of MOb Poruba	4064,9	36195,1	1932,5	17104,9	2132,4	19090,2
EKOTERMO - Jih	1220,0	11464,7	645,4	6201,7	574,6	5263
Thermal insulation of the children pavilion of the Municipal Hospital Ostrava, contributory organisation	806,8	3363	670,7	2156	136,1	1207
Creation of low-energy buildings for leisure time of SVČ Korunka	155,7	1779,6	103,2	833,5	52,6	946,1
Total	**9180,7**	**62769,9**	**5821,5**	**31816**	**3654,7**	**33650,55**

Source: MMO OER data

Contributions Resulting from the Measures to Be Taken in the Sector of Municipal Buildings up to 2020

Projects currently under implementation or projects, whose implementation was already approved subject to the subsidy from the OPŽP will bring the CO_2 saving amounting to 3361 tons and energy savings on Consumption amounting to 39 768 GJ in total in the period from 2010 to 2020. Details of those projects can be found particularly in *Supplement 3 hereto*,

Other savings are proposed for the implementation after 2015 and are based on the detailed analysis of the facilities owned by SMO, where any energy saving measures have not been implemented and for which additional thermal insulation and window replacement were declared as needful. The list of those facilities is given in *Supplement 3 hereto* - Potential for Savings in the Sector of Public Buildings and Residential Houses.

Table 59: Additional savings in Municipality owned facilities

Projects for OPŽP	Year of Implementation	Electricity (MWh)	Natural Gas (MWh)	Centralized Heat Supply (GJ)
Municipal facilities	do 2020	200	485	4 664

Savings in Public Lighting

The Municipality of Ostrava decided on the modernisation of public lighting in the period of 2010 – 2013. The number of lighting points increased as well as did their energy performance. More than 1000 LED light fixtures have been already installed in total, i.e. about 2.5 % of the overall number of street lights. Additional replacement of light fixtures is currently in preparation. Savings due to the reduction of power consumption have been included in SEAP and quantified at the level of almost 400 MWh as of 2020, compared to the value of 2000.

Savings in Residential Houses

Calculations of potential savings result from investigation of the state of thermal insulation and replacement of windows (measures critical for any achievement of savings in residential houses) that are referred to in *Supplement 3 hereto*. In the following table savings are shown that are included in the scenario of development of the final consumption of fuels and energy in the sector of residential buildings:

Table 60: Savings to be achieved in the dwelling stock according to the scenario as of 2020

Savings:	Heat/Cold	Natural Gas	Liquefied Gas	Lignite	Coal	Celkem
GJ/year	461 867	181 834	3 204	31 449	16 009	694 363
MWh/year	128 296	50 509	890	8 736	4 447	192 879

3.4.3 Increased Application of Power and Heat Generation Using RESs

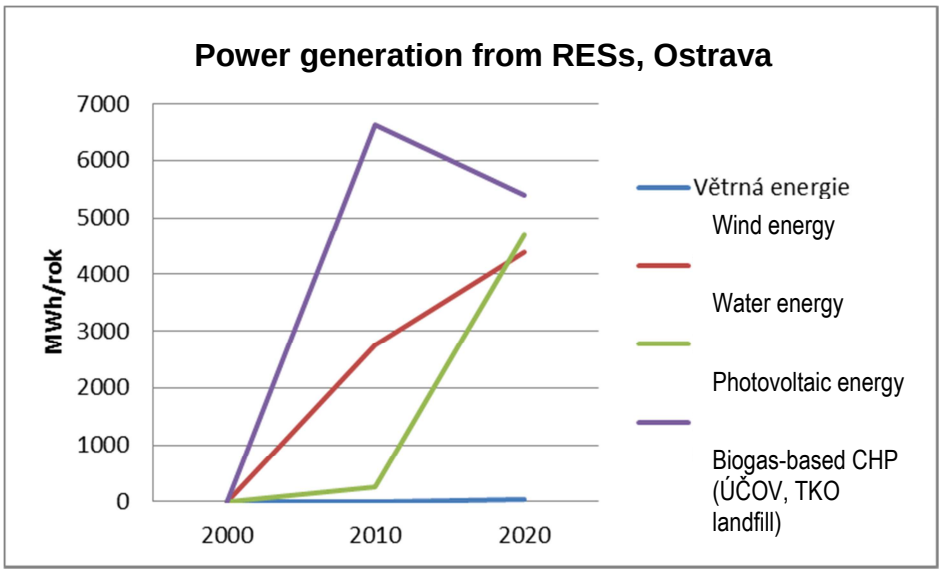
The City of Ostrava is ranked, in the category of large cities, among the best ones in the use of solar energy. Solar panels are installed on pensioner houses and in water parks. Many photovoltaic systems are installed on buildings and geothermal energy found wide application in the heating systems of various buildings. Assumed development in the production of electric power from renewable energy sources by 2020 is shown in the following diagram. This estimate should be deemed conservative; the ZOO Ostrava has not been included in the production of electric power from biogas.

Production of Electricity from RESs

Table 61: Development of electric power generation from RESs, Ostrava City, MWh/year

Locally produced electricity (except the units included in the ETS and all facilities/units > 20 MW)	Locally produced electric power [MWh]		
	2000	2010	2020
Wind energy	0	0	33
Water (hydraulic) energy	0	2740	4387
Photo voltaic power	0	259	4700
Biogas-based CHP generation (ÚČOV, TKO landfill)	0	6611	5394
Total	0	9609	14514

Figure 35: Development of electric power production from RESs, Ostrava City, MWh/year



Source: Authors' own investigation, VŠB investigation

Data on the production of heat and electricity from renewable energy sources were complemented with the data obtained in the investigation made by VŠB. The data include the installation built particularly in the period of 2010 – 2012 and, therefore, included in the potential for increased use of RESs from 2010 to 2020. The data of identified photovoltaic plants and their installed outputs were complemented with the calculation of annual production of electric power. The estimated increase in the production of power, to be achieved after 2013, amounts to 400 MWh. Details are given in *Supplement 1 hereto*.

Production of Heat from RESs

Increased production of heat fro renewable energy sources is assumed to occur as a result of:

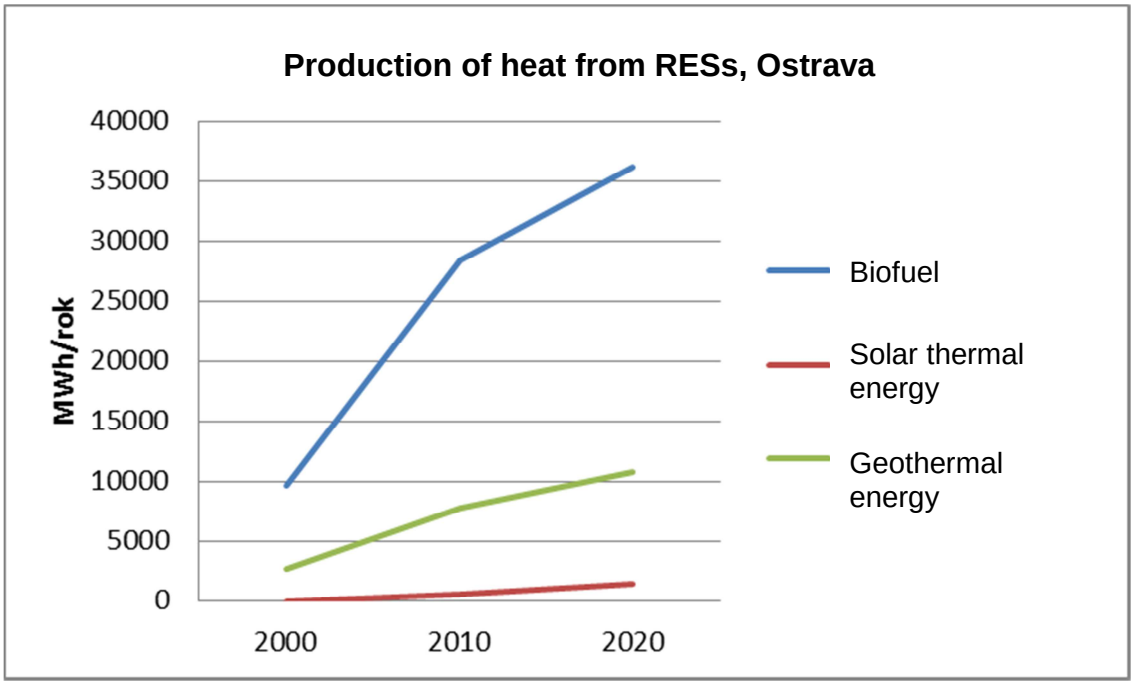
a) The growing use of bio-fuels (firewood and wood pellets) in household heating in connection with the programme of subsidies provided by the Ministry of Environment and the Moravian-Silesian Region, aimed at the support of the replacement of obsolete boilers for household heating with more modern ones producing less emissions. Through the programme subsidies are granted to those households that will replace manually filled boilers fired with solid fuels (coal and/or wood) for low-emission fully automatic boilers fired with coal or biomass (pellets) or their combinations. Since 2011 303 boilers were replaced on the territory of Ostrava for the 1st, 2nd and 3rd programme calls.

b) Installation of boilers fired with pellets, such as those used in the post office building in Ostrava-Hrušov, and on the entrepreneurial premises at Provozní Street in Ostrava – Martinov. Biofuels are not proposed for use in municipal buildings, unless used as a replacement fuel instead of lignite. ZOO Ostrava makes an exception, where, to complement the already existing boiler house fired by biomass and a set of solar panels, there is a biogas station unit under construction, which will comprise a CHP unit to supply the ZOO with heat and power.

c) The use of heating by heat pump systems increasingly replaces electric heating ones According to author's proposal heat pumps for heating should be used in 5 % of newly built family houses. The heat pumps are classified in the segment of geothermal energy even if the heat pumps of air-water type are involved.

d) Installation of new solar thermal systems used preferably for hot service water preparation. However, there are progressively used for household heating, too, employing necessary heat accumulation.

Figure 34: Development of heat production from RESs, Ostrava City, MWh/year



4. DETAILS OF MEASURES FOR SEAP IMPLEMENTATION

In this chapter the measures are summarized that are proposed for implementing SEAP within the period from 2010 to 2020. Their contributions were included into the emission scenario.

4.1 Energy Saving Measures in Municipality Owned Buildings

Buildings and facilities that have been included in the projects already approved by SFŽP and will be implemented later than in 2011 are shown in the following table (therefore, their contributions are not taken into account in the inventory of 2010).

Table 62: Contributions of SMO projects, envisaged for implementation or actually implemented after 2011

SMO Projects	Condition before Implementation		Condition after Implementation		Savings	
	CO_2 (t)	GJ	CO_2 (t)	GJ	CO_2 (t)	GJ
EKOTERMO II A	1 522,00	14 339,30	1 080,45	7 759,10	441,56	6 580,20
EKOTERMO II B	173,59	1 638,00	128,59	828,00	45,00	810,00
EKOTERMO III	1 615,58	16 931,00	1 090,32	11 220,00	525,25	5 711,00
Reconstruction of the pavilion of ZŠ Gen. Píky 13a	833,60	5 911,00	585,40	4 151,00	248,20	1 760,00
Energy savings of the building of district office of Radvanice and Bartovice	49,65	408,00	34,46	135,00	15,19	273,00
Revitalisation of the flat block house at Úprkova 18					0,00	0,00
EKOTERMO Ostrava Jih Part 2 (Project A)	805,74	6 837,00	385,45	3 893,90	420,30	2 943,10
Thermal insulation and window replacement in ZŠ Srbská	247,18	2 010,00	91,47	1 039,00	155,71	971,00
Thermal insulation of school buildings in Polanka nad Odrou	292,54	3 311,00	184,97	1 375,00	107,57	1 936,00
Thermal insulation of ZŠO, Nádražní	300,08	2 186,36	208,80	1 389,85	91,28	796,51
Thermal insulation of the building shell, window replacement and roof reconstruction of SVČ Ostrava - Moravská Ostrava	418,16	2 317,00	272,75	1 277,00	145,41	1 040,00
Building rehabilitation - SVČ Ostrava - Zábřeh, p.o.	258,21	2 306,20	209,59	1 504,70	48,62	801,50
Thermal insulation of the building of Children & Youth House, Ostrava - Poruba, p.o.	0,03	1 254,00	0,02	466,00	0,01	788,00
Energy savings, MNO – Children Rehabilitation Short Stand Hosp., pavilions D & Refectory	1 203,55	5 292,00	958,64	2 290,00	244,91	3 002,00
Energy savings, MNO – service building, pavilions G and Pathology	2 030,77	10 460,00	1 628,58	5 286,00	402,19	5 174,00
Thermal insulation of Traumatology (pavilion), in-patient part, Ostrava Municipal Hospital p.o. (Reconstruction of the Central sterilisation and hemodialysis station)	104,15	3 528,00	60,83	1 636,89	43,32	1 891,11
Energy savings, MNO- pavilions H & E	2 526,57	11 801,00	2 182,15	7 369,00	344,42	4 432,00
Senior House reconstruction, Kamenec I (MPSV 113 310)	248,34	4 476,00	165,48	3 617,00	82,86	859,00
Total	**12 629,7**	**95 005,9**	**9 267,9**	**55 237,4**	**3 361,80**	**39 768,4**

This saving is taken into account in the emission inventory as of 2020.

The executed analysis of municipal property identified additional 21 organisations in which neither window replacement, nor additional thermal insulation have not been carried out and which are, therefore, eligible for preparing relevant applications in the following programming period of 2014+. The programme assumes that subsidies for the implementation of additional thermal insulation and other energy saving measures in public buildings will continue – within the framework of OP5 of the Operational Programme of the Ministry of Environment (OPŽP). The conditions of utilisation, subsidy amounts, requirements on projects and their contributions will not be still known for about a year. In this period it would be appropriate:

a) Preliminary studies should be ordered to verify possible contributions of measures intended for the improvement of thermal technical properties and suitability of concerned buildings to achieve the parameters requested by the future OPŽP 2014+ within the Priority Axis 5;

b) Energy audits, project documentations and applications should be prepared for recommended projects.

The term of implementation of the measure: 2014 - 2015.

Contributions of the measure in the 21 identified facilities have been tentatively set and included in the inventory at the level of additional 2194 tons of CO_2. The following table lists the proposed facilities.

Table 63: Facilities proposed for consideration of a subsidy in the period of 2014+

ID	DISTRICT	ORGANISATION NAME, PO + OS	Consumption of EE (MWh)	Consumption of ZP (MWh)	Consumption of TE (GJ)
ID036	0	Technické služby, a.s. Slezská Ostrava	258	500	1 871
ID038	8	Centre of Culture and Education Ostrava	51	92	239
ID041	11	Property Management Office Ostrava – Jih	86	23	0
ID047	8	Nursery School Ostrava, Na Jízdárně 19a, contributory organisation	13	11	581
ID053	5	Alternative Nursery School Ostrava - Mariánské Hory, U Dvoru 22a, contributory organisation	5	0	487
ID055	5	Christian Nursery School Ostrava - Mariánské Hory, U Dvoru 22, contributory organisation	20	6	1 314
ID072	9	Nursery School Ostrava-Nová Bělá, Kokešova 22, contributory organisation	19	0	21
ID077	8	Nursery School Ostrava, Blahoslavova 6, contributory organisation	12	229	40
ID082	8	Nursery School Ostrava, Šafaříkova 9, contributory organisation	7	6	529
ID083	23	Nursery School Ostrava-Vítkovice, Prokopa Velikého 37, contributory organisation	16	464	137
ID089	11	Nursery School Ostrava - Hrabůvka, Adamusova 7, contributory organisation	35	24	2 169
ID090	11	Nursery School Ostrava - Dubina, A. Gavlase 12A, contributory organisation	44	0	1 597
ID099	11	Primary School a Nursery School Ostrava-Dubina, V. Košaře 6, contributory organisation	130	11	4 836
ID100	11	Primary School a Nursery School Ostrava-Zábřeh, Kosmonautů 13, contributory organisation	79	6	3 628
ID102	11	Primary School a Nursery School, Ostrava-Zábřeh, Horymírova 100, contributory organisation	106	11	3 945
ID104	11	Primary School a Nursery School Ostrava-Zábřeh, Volgogradská 6B, contributory organisation	60	35	4 512

ID	DISTRICT	ORGANISATION NAME, PO + OS	Consumption of EE (MWh)	Consumption of ZP (MWh)	Consumption of TE (GJ)
ID106	11	Primary School a Nursery School Ostrava-Bělský Les, B. Dvorského 1, contributory organisation	237	0	7 052
ID114	8	Primary School Ostrava, Gajdošova 9, contributory organisation	21	0	883
ID124	8	Primary School Ostrava, Gebauerova 8, contributory organisation	25	0	1 933
ID127	8	Primary School Ostrava, Kounicova 2, contributory organisation	31	1	1 264
ID130	11	Primary School Ostrava-Dubina, Františka Formana 45, contributory organisation	141	11	3 184

The measures proposed for application in the facilities include:

- Additional thermal insulation of the building shell;
- Replacement of windows, or its completion;
- Thermal insulation of ceilings;
- Modernisation of the boiler or the heat exchanger plant, as appropriate;
- Heating control (incl. the use of IRC - Individual Room Control).

Index	EE (MWh)	ZP (MWh)	TE (GJ)
Added saving (in MWh/year)	**200**	**485**	**4 664**

Details of the facilities are given in Supplement 3 hereto

In addition to the facilities proposed for grants of subsidies for additional thermal insulation and window replacement, by analysis of energy audits and already realised measures the following opportunities were identified for implementation of energy saving measures:

Table 64: Facilities proposed for application of additional energy saving measures

Measure Owner	Possible Energy Saving Measures	Condition
Statutory City of Ostrava, Municipality of Ostrava City,í, Prokešovo nám. 8, 729 30 Ostrava	Removal of HW distribution system from offices, use of solar energy for HW preparation, energy management, installation of a watchdog system for ¼ hr maximums, computing HW switch-off control, replacement of widows/display windows, door replacement, thermal insulation of floor above outdoor space, insulation of walls (with "thermo" plaster), thermal insulation of single-shell roofs, ceilings below attics and basement floors.	
ZOO Ostrava, Michálkovická 197, 710 00 Ostrava - Slezská Ostrava	Installation of TRVs, additional thermal insulation and temp. control systems of selected facilities (workshop, big cats, parrots, safari, small house, ZOO kitchen, store)	Application submitted to OPŽP
"Four-Leaf" Centre for Disabled Persons Ostrava, Hladnovská 751/119, 712 00 Ostrava-Muglinov	Replacement of incandescent lamp fixtures, additional insulation of the building shell and roof structure, replacement of filler panels of building openings, installation of TRVs and a thermal solar system for hot water preparation	
Národní divadlo Moravskoslezské, ul. Čs. Legií 148/14, 701 04 Ostrava + Divadlo Antonína Dvořáka + Building of theatre workshops and stores	Reflective foils behind CH bodies, additional insulation of doors, improved insulation of hot service water/ hot water lines, TRV installation, hot service water circulation switching-off in out-of service parts of the premises.	

Primary School, B. Dvorského 1049/1, 700 30 Ostrava - Bělský les	Additional thermal insulation of roofs, building shell, replacement of filler panels of wall openings, installation of TRVs and heating control system.	
"Sluníčko" Senior Home, Syllabova 19, Ostrava-Vítkovice	Boiler room reconstruction planned. The facility was reconstructed in 2000 in respect of heat/heating technology	
" Domeček" Children Centre, Jedličkova 5, 700 44 Ostrava - Zábřeh	Reconstruction of hot water distribution system, installation of TRVs.	

4.2 Energy Management in Municipality Owned Buildings and Facilities

Since 2001, when Act no. 406/2000 Sb. came into force, the most of municipality buildings on the territory of the city was subjected to a mandatory energy audit, required by law for all the buildings owned by the Municipality supplied with heat from the district heating system (CZT) and all freestanding buildings with annual heat consumption in excess of 700 GJ. Any complete list of energy audits was not available. There is no coherent database and mapping of available audits and energy performance certificates, certificates of boiler & air conditioning system inspections, etc. Therefore, the requirements of Act no. 406/2000 Sb., as last amended, have not been met.

Updated energy audits are now available for all facilities included in the applications for funding the measures with the use of OPŽP subsidies. Except the data gathered by the Department of Interests in Property and Joint Procurement, there is no database available on fuel and energy consumption in the facilities and there is no possibility to monitor the development of those consumptions in technical units. Fuel and energy savings achieved using the subsidy and means obtained from the municipal budget must be verified after one year of use, but there is no possibility of continuous monitoring and evaluation of the consumption and achieved savings.

That is why the recommended measure includes the introduction of energy management in the management of buildings and facilities owned by the Municipality and managed both by the MMO and district offices. The basic components of energy management are usually as described below and may be appropriately linked together with the establishment of control and monitoring made for meeting the needs of the Covenant of Mayors. Introduction of energy management is supported by ČSN EN 50001 Standard and the subsidies granted by the Ministry of Industry and Trade within their programme EFEKT (grant title E1) – as far as it leads to the certification of the energy control system to the said standard.

The activities assumed to occur within this measure may take various range of implementation; SEAP monitoring is deemed suitable, at least, and the activities should include:

- Collection of data on fuel and energy consumption and related costs at a single central point, preparation of an appropriate system interconnected with other data of the facilities;
- Implementation of a monitoring and purposeful energy control system;
- Monitoring of fluctuations in consumption, analyses taking account of climate-dependent factors of consumption, evaluation of achieved fuel and energy savings, particularly in the buildings/facilities, where investments were made in energy savings;
- Identification of additional suitable measures to reduce consumption;
- Continue (from 2014 on) in the selection of facilities eligible to funding through the Operational Programme; the facilities should make use of the potential of savings in compliance with programme conditions and criteria for the evaluation of applications.
- Systematic identification of facilities suitable for the use of RESs (in cooperation with VŠB);

- Provision of the integration of efficient use of energy in the design and planning of all processes, buildings and equipment;
- Provision of professional energy education/training for meeting identified needs;
- Running of promotional and advertising campaigns;
- Observation and evaluation of implementation of the recommendations of energy audits and their possible updates;
- Provision of continuous compliance with legal requirements resulting from Act no. 458/2000 Sb., as last amended, for the buildings and installations owned by the Municipality.

Deadline for measure implementation: forthwith – the application for subsidy from the EFEKT programme shall to be submitted by 02/2014 at the latest. Costs of introduction (software and initial data collection): CZK 0.8 mil., approx.

Benefits ensuing from the measure are often quantifies at the level of about 2 % of annual costs of energy. Contributions to CO_2 abatement are not estimated.

4.3 Energy Saving Measures in Dwelling and Housing Stock

Already in previous years extensive investments were made in additional insulation and window replacement of flat block houses on the city territory. The share of houses provided with replaced windows and additionally insulated shell was determined by investigation carried out in particular city districts. The results of investigation are referred to in *Supplement 3* and summarized in the following table.

Table 65: Situation in thermal insulation and window replacement of flat block houses to Ostrava districts

Name	FBHs - Bearing wall material: stone, bricks, blocks	FBHs - Bearing wall material: wall panels	% of insulated house, total	% of insulated houses with replaced windows - panel	% of insulated houses with replaced windows - bricks	% of houses with replaced windows, total	% of houses with replaced windows - panel	% of houses with replaced windows - bricks
Moravská Ostrava a Přívoz	1 104	349	48%	65%	32%	48%	34%	63%
Slezská Ostrava	454	59	30%	56%	26%	54%	31%	57%
Ostrava-Jih	905	1 722	64%	65%	53%	35%	34%	44%
Poruba	681	940	54%	59%	40%	40%	35%	56%
Vítkovice	323	4	25%	57%	0%	54%	0%	75%
Mariánské Hory and Hulváky	357	72	28%	0%	28%	70%	0%	70%
Svinov	43	23	25%	0%	25%	58%	0%	58%

Energy saving measures implemented in the dwelling and housing stock in recent years include particularly:

- Rehabilitation of the existing stock of dwelling houses made of precast panels by additional thermal insulation, replacement of windows and, possibly, using other energy performance improving measures. Completion of the measures is expected as well as overall modernisation of the dwelling houses of concern. Implementation of measures of this type is advantageous provided that a credit from ČS, a.s., is

utilised for the purpose. The Integrated Regional Operational Programme for 2014+, too, assumes certain financial sources will be earmarked for the projects of thermal insulation of dwelling houses.

- Reconstruction and modernisation of old dwelling stock – brick walled houses: The achievement of significant energy savings in those houses requires higher costs than with the panel ones. Implementation of concerned measures is advantageous provided that a credit from ČS, a.s., is utilised for the purpose. The Integrated Regional Operational Programme for 2014+, too, assumes certain financial sources will be earmarked for the projects of thermal insulation of dwelling houses.
- Thermal insulation of family houses, utilisation of RESs in family houses – the growing interest in these measures might be caused also by the existence of a grant title – "New Green Light for Savings" - designed for such energy saving measures aimed particularly at the area of CO_2 emission abatement.
- Modernisation of sources and insulation consisting in the modernisation of heating systems, domestic heat exchanger substations and other technological equipment. Such measures will suitably complement additional thermal insulation and window replacement.
- Support to new housing designed for target groups of inhabitants (pensioners, people in poverty, youth leaving youth/children homes, socially weaker youth families, adult children gaining independence) completed at a low-energy standard;
- Education and provision of information concerning the opportunities for the implementation of such measures and possibilities of their funding – advisory centres or, possibly an informational database accessible on municipality's website.

Contributions of Particular Measures

The potential for savings that can be met in flat block and family houses supplied with natural gas or, so far, with solid fuels or heated by electric power may be realised through many measures:

- Measures improving operational economy of the house heating system

Installation of thermostatic control valves in any place permitted by the technical execution of the system may significantly increase its operational economy. The valves will limit excessive heating of particular rooms and make it possible to employ both internal and external heat gains, e.g., from the façade heated by sunshine. The adjustment of the system comprises a necessary component of system installation, particularly after the application additional insulation to the building shell. The correct operation of valves in larger heating systems is suitably enhanced by installation of pressure difference controllers and removal of dirt from piping. However, sufficient motivation of flat users for responsible economic behaviour appears to be an important condition for any reduction on heat consumption.

- Measures improving heat resistance of the main house structures

Additional insulation of a roof (in flat block houses) or a ceiling below the roof (in both FBHs and FHs): The measure solves insufficient thermal insulation properties of the roof structure and allows any defects caused by water leaks to be removed (on flat roofs).

Additional insulation of perimeter walls: A number of technologies suitable for any residential building type have been developed and are in use. Heat resistance of the wall structure can be increased up to the level recommended by ČSN 730540 Standard by applying a suitable system of additional insulation to the building façade.

- Measures reducing the heat loss in windows and doors

Sealing of windows and doors: Sealing of window and door gaps using neoprene seals inserted in the grooves milled out in the frame will significantly reduce the heat loss caused by infiltration, particularly with buildings exposed to strong winds.

Window repair including installation of special glass panes: in case the condition of windows does not call for replacement and their design does not permit additional glazing, their inner panes can be replaced with those of special glass with a reflective layer. Heat transmission through the window will drop from the value of 2,9 W/m^{2}K down to 2,2 W/m^{2}K, at least.

Replacement of windows with plastic ones of increased insulation properties: In case the condition of windows calls for replacement with new ones, the highest quality windows are recommended for the purpose. Heat transmission through the window will drop from the value of 2,9 W/m^{2}K down to 2,0 W/m^{2}K, at least.

- Installation of gas in the heating systems fired by solid fuels

Savings resulting from the replacement of solid fuels with gas follows from the significantly higher operational efficiency of the heating system, its better controllability that permits the consumption of gas and electricity to be reduced, while maintaining comparable heat comfort and utilisation of interior heat gains and insolation of the building. The investment in such more modern heating system is usually accompanied with the improvement of technical properties of the heated building due to additional insulation of its perimeter walls and roof and to improved sealing of windows. For quantification of costs of measures required for meeting the potential for savings, the sum amounting to CZK 3000 – 4000 per square meter will be used (data from "Panel" programme) divided among the perimeter wall insulation, roof insulation and window replacement in the ratio of 30:15:55 (%).

- Other savings

Other saving can be achieved on t hot water consumption, e.g., by installation of solar thermal panels, in cooking, washing and other activities related to the household, building and garden, if any, through the replacement of appliances and technologies, modernisation of cooling an air conditioning systems, etc.

Energy saving measures applicable to heating and their typical contributions/benefits are shown in the following table.

Table 66: Economies in the buildings of the housing (and tertiary) sector

Measure	% of Savings	Remark
Replacement of windows and entrance door	10 – 20%	It depends on window type, the saving corresponds to the replacement of 20 years old windows (U= 2,9 W/(m^{2}K) and worse ones, with new windows with the overall value of heat transmission factor of U=1,2 W/(m^{2}K); replacement with a window with even better parameters is possible and would bring additional savings. However, Iit is recommended the energy saving measures to be optimized.
Thermal insulation of building perimeter walls (shell)	15 - 30%	The per cent value of savings refers to the comparison of a building with perimeter walls of 35 cm thickness after applying insulation of 15 cm thickness. Insulation of a higher thickness will offer an additional saving, but the result will depend on the execution of insulation from round and the solution of heat bridges.
Thermal insulation of the building – roof, floor, foundations, plinths, etc.	10 - 20%	Thermal insulation of roof might be demanding on execution, but will bring an effect even in summer as protection against overheating (if 35 cm thick) Insulation of foundations and floor above ground will substantially contribute to increased thermal comfort.
Change of the heating system	5%	Significant savings can be achieved through effective control of the heating system and installation of energy saving equipment, fittings, control valves, insulated distribution lines and fittings in unheated spaces, etc. User's behaviour will have a very important impact on any achievement of savings.
Ventilation incl. recuperation	5%	Energy savings in forced ventilation are given by efficiency of recuperation (about 75 % heat of exhausted air is utilized for preheating the incoming air, contrary to natural ventilation, in which this heat discharged with no use.

Solar heating, incl. heat accumulation	8%	The number expresses the saving on heat for water heating, if its requirement is covered by the solar system in 60 %. If used for additional heating, the saving can rise by about a half (to 12 %).
Total	40-60%	The shares (%) of savings achieved by various measures cannot be directly added together (e.g., insulation Installed after windows had been replaced will save the corresponding percentage of heat, but calculated from the reduced value resulted from the replacement of windows, not from the consumption of heat of the building in its initial condition.

The programme "New Green Light for Savings" support additional thermal insulation, replacement of windows (improvement of building energy performance) the use of solar thermal panels for hot water preparation in family houses, the use of heat pumps and solar panels in new development – the activities that the Municipality should promote and provide assistance in terms of information and references published on its website. It can also contribute to the costs of the preparation of projects and/or applications.

4.4 Modernisation of Heating Systems and Boilers

Older gas fired boilers of obsolete design cannot provide any smooth modulation of their heat output (automatic adjustment to the current heat requirement of the building or its user) and their overall control cannot flexibly response to possible changes. Not negligible portion of the produced heat will then leave through the chimney or is dissipated into the outer space. Modern low-temperature gas fired boilers feature their average efficiency of about 92 % and gas fired boilers operating in the condensation mode (i.e. the boilers able to utilize the heat of steam coming from gas combustion) declare the efficiency of 98 % and more. Similarly, modern boilers fired with solid fuels are much more efficient and comfortable in terms of operation. Moreover, these boilers eliminate possibility of combusting unsuitable fuels, used particularly on the territory of Ostrava City.

Within the framework of subsidies granted by the Moravian-Silesian Region and SFŽP (State Fund of the Environment) for the replacement of boilers in households (the joint programme of the Moravian-Silesian Region and the Ministry of Environment for supporting the replacement of existing manually operated boilers fired with solid fuels with new low-emission automatic boilers firing biomass, coal or coal and biomass in the said region) 303 boilers were replaced on the territory of Ostrava, i.e. almost 10 % of those boilers operated on the territory.

We assume that as much as 60 % of those boilers will be replaced until 2020 subject to the availability of relevant funds.. Even the proposal of PO2 of the new OPŽP for the period of 2014+ tries to concentrate support on those sources. The savings on CO_2 emissions resulting from the replacement of a part of coal-fired boilers with boilers fired with biomass and due to significantly increased efficiency of the new boilers are expected to amount about 6 500 tpy. Accomplishment of the target will depend on the possibilities in the sphere of grants. The said additional annual savings of 6 500 tons of CO_2 emissions should result from the following:

- Replacement of a part of coal fired boiler with boilers fired with biomass (the CO_2 emission factor for biomass is zero);
- Replacement of a part of coal fired boiler with boilers fired with natural gas;
- Significantly higher efficiency of the new boilers;
- The use of renewable energy sources for hot water preparation (using solar thermal systems);
- Additional thermal insulation of a part of houses (suitably carried out on the opportunity of new rendering application at lower overall costs), possibly combined with window replacement;
- Better operating parameters of automatic boilers and use of control.

Activities of the city in the area include:

- Continuing support given to the grants fo the Moravian-Silesian Region;
- Support of the Ministry of Environment in the proposal of PO2 – the proposal of the specific target 2.1;
- Awareness of citizens;
- Awareness of the firms and designers engaged in the installation of new combustion units and thermal insulation or in window replacement.

4.5 Making the Municipal Public Transport Environmentally Friendly

Within the framework of the programme “Green and Clean Ostrava 2025” the DP Ostrava plans the purchase of as much as 100 CNG driven buses and about 50 electric buses.

Most probably, these vehicles will be laid on as follows:

- CNG buses: bus lines interconnecting various districts, lines with a long daily run;
- Electric buses: intra-district service lines, preferably in the areas of Poruba and Zábřeh.

The MHD is rightly rated among ecological means of transport, as it transports more persons per a unit of covered distance (and per the quantity of produced emissions) than individual motor transport. This positive feature of MHD is, however, deteriorated by higher emission levels.

Assumed CO_2 emission savings as of 2020

The implementation of the proposed measure could result in the saving of about 3.27 t CO_2 a day in case 100 CNG buses were purchased and about 10.11 t CO_2 per day if 50 electric buses were acquired. Benefits ensuing from these measures consist particularly in the abatement of air pollution by the reduction of local immission load in the environs both with BaP and other PAHs, but also with PM, NOx and unburned hydrocarbons produced by diesel engines. Reduction of noise, particularly near bus stops..

In clearly ensues that the replacement of diesel buses with CNG ones and electric buses will bring relatively important savings within the framework of bus traffic. Moreover, it will also promote the use of that environment-friendly fuel in individual transport, which could encourage the interest in CNG and result in increased CO_2 emission savings. However, it requires the public CNG filling stations to be built and open for use not only for the MHD vehicles, but also for passenger car drivers and other owners of CNG driven vehicles, such as municipal waste collecting vehicles, the vehicles of the Municipality and Municipality controlled organisations, etc.

4.6 Organisational and Economical Measures in Transport

Other measures to be taken in transport, which can be, in most cases, quantified with difficulties only and whose contributions are rather modest, include:

- Support of motor-free transport (cyclist, pedestrians
- Strategic thinking in the preparation of town planning scheme from the standpoint of transport;
- Teaching and training of the considerate way of driving (ECO-driving)
- Efficient means of transport and vehicle fleet in the Municipality managed organisations and organisations that provide services to it.

Eco-driving – The assumed impact o proposed measures include the general decline in the consumption of fuels and consequent CO_2 emission abatement. Possible reduction in fuel consumption by 5 %– 20 %, subject to local conditions, is estimated. In the year of prospect of 2020 implementation of the proposed measure could save (to a pessimistic scenario, reduction in fuel consumption by 5 % only) about 745.5 tons of CO_2 a year in the public transport and approximately 284.6 t CO_2 in the organisations established and managed by the Municipality, about 1030.1 t CO_2 in total. The reduction was taken into account in the prospective inventory of CO_2 emissions, under the item "Transport".

Restricted entry to city centre or to selected city parts may be imposed subject on the compliance with limit setting technical regulations (weight, emissions) in certain time period(s) or subject to payment of an entrance charge. A combination of those options is possible, too.

- Construction of transport terminals,
- Parking strategy,
- Imposition (or extension) of the zones o restricted entry
- Increased attractiveness of public transport.

As shown by foreign and domestic studies, in most cases the imposition of low-emission zones will not change the overall transportation output on city roads too much. In the evaluation of relevant scenarios the trend was maintained of the growth transportation output in the city without considering the impact of the proposed measure. The proposed measure was modelled employing the changes in the dynamic structure of vehicles. From the modelling it followed that, after implementation of the measure, about 4008.7 t CO_2 could be saved in 2020 as compared to the data of 2010.

Construction of transport terminals – Limitations applied to the transportation outputs of suburban buses in favour of the electric traction of MHD: The measure is intended to support the development of the electric traction of MHD, in particular. That is why interchange terminals should be built in suitable locations at city outskirt. The terminals should provide comfortable changes from the MHD electric traction to suburban bus lines, which would terminate at those points and would not run in the Central Bus Station in the city centre. In this way the currently existing parallel operation of suburban lines and MHD would be limited. The saved outputs could be then utilised to increase the frequency of lines supporting the suburban zone.

The Activities include:

- Constructions of the terminals as such at four points to cover the main directions of approach to the city.
- Upgrade of the tied-in lines of electric MHD traction, incl. increased travelling speed, increased preference at light signals controlled crossroads, improved ties with other MHD lines through suitably designed platform ("edge-to edge" changes), etc.
- Provision of attractive intervals and sufficient number of connections on backbone lines supporting the terminals.

In connection with the construction of transport terminals and putting them into operation a postulation is set for increasing the transportation outputs of electric traction by 2 %, while the decrease by 6% in the output of suburban lines is assumed to occur at the same time. It corresponds to the annual saving on CO_2 emissions of 178.6 tons.

4.7 Measures to Be Taken in New Development

In the field of new construction particularly the buildings owned by the Municipality built to the low-energy standard and possibly, to the passive standard, will gain support. Other measures comprise:

- Support given to new housing built to the low-energy and passive standards (after considering related economic benefits) - at the values “A” of the energy performance certificate of the building;
- Support to the new constructions within the tertiary sector, built to the low-energy standard, without requirements for power consumption for air conditioning.
- Use of district heating systems and renewable energy sources, particularly in new commercial buildings.

The building shape and its orientation with respect to cardinal points play an important role in terms of its heating, cooling and interior lighting. A well-chosen orientation, arrangement and vicinity of the building can suppress current trends for installing an air conditioning system. Planting of trees around the house and green roofs will lead to the substantial reduction of energy, electric power in particular, for air conditioning. Building proportions (its length, width and height), the relative size of glazed area, as well as its orientation should be always well analysed in the building design in respects of its requirements for energy consumption.in a long prospect.

Suitable and recommended measures contributing to CO_2 emission abatement in urban planning can be proposed as follows:

- Creation of an offer of development areas, particularly in the strategic directions of development and in the scope and quality competitive to the offer of development areas found outside of the boundaries of city’s administrative boundaries;
- The functional structure of development areas has to be balanced and shall contribute to mobility reduction – within residential areas sufficient space has to be reserved for both commercial facilities and public amenities;
- The conditions for quality dwelling environment of the city competitive shall be improved to become competitive to that outside of the administrative boundaries of Brno – through the reduction of environmental loads, preservation of landscape and natural values, sufficient offer of areas for sports, recreation and leisure activities.
- The aspects of the construction to low-energy and passive standards should be supported already at the stage of drafting the use of the area.

Cooperation with students, developers and investors in the proposed solutions of brownfields and development areas proved successful abroad (organisation take part in competitions for tenders, etc.).

4.8 Costs of Implementation

The costs of implementation of the measures are summarised in the following table.

Table 67: Proposed SEAP measures and projects

Measure Name	Contributions of the Measure			Total Costs of the Measure	Out of It: Municipality	Out of It: Subsidies	Specific Costs	
	GJ/year	MWh /year	CO_2	CZK thousands	CZK thousands	CZK thousands	CZK thousands per GJ	CO_2 savings, CZK th:/t
EKOTERMO II A	6 580	1 828	442	123 775	66 895	56 880	18,81	280
EKOTERMO II B	810	225	45	24 651	13 482	11 169	30,43	548
EKOTERMO III	5 711	1 586	525	74 004	40 654	33 350	12,96	141
Reconstruction of the pavilion of ZŠ Gen. Píky 13a	1 760	489	248	61 258	47 640	13 618	34,81	247
Energy savings of the building of district office of Radvanice and Bartovice	273	76	15	4 935	2 489	2 446	18,08	325
EKOTERMO Ostrava Jih 2nd part (Project A)	2 943	818	420	58 469	31 157	27 312	19,87	139
Thermal insulation and window replacement in ZŠ Srbská	971	270	156	15 774	8 091	7 683	16,25	101
Energy savings of the building of MŠ Mitrovická in Stará Bělá	305*	85*	17*	4 955	2 484	2 471		291
Thermal insulation of school buildings in Polanka nad Odrou	1 936	538	108	13 525	6 423	7 102	6,99	126
Energy savings of the building of local office in Stará Bělá	186*	52*	10*	3 021	302	2 719		291
Thermal insulation of ZŠO, Nádražní	797	221	91	20 261	10 746	9 515	25,44	222
Creation of low-energy buildings for leisure time of SVČ Korunka	946	263	53	6 699	3 662	3 037	7,08	127
Thermal insulation of the building shell, window replacement and roof reconstruction of SVČ Ostrava - Moravská Ostrava	1 040	289	145	11 765	5 690	6 075	11,31	81
Building rehabilitation - SVČ Ostrava - Zábřeh, p.o.	802	223	49	12 196	7 054	5 142	15,22	251
Thermal insulation of the building of Children & Youth House, Ostrava - Poruba, p.o.	788	219	89	8 635	4 907	3 728	10,96	97
Energy savings, MNO - (1)	3 002	834	245	31 719	20 137	11 582	10,57	130
Energy savings, MNO – (2)	5 174	1 437	402	43 194	27 901	15 293	8,35	107
Municipal Hospital Ostrava p.o. (3)	1 891	525	43	26 524	22 404	4 120	14,03	612
Energy savings, MNO-pavilions H & E	4 432	1 231	344	60 679	38 466	22 213	13,69	176
Regeneration of building outer shell, OK, a.s.	2 697	749	295	16 524	10 504	6 020	6,13	56

Measure Name	Contributions of the Measure			Total Costs of the Measure	Out of It: Municipality	Out of It: Subsidies	Specific Costs	
	GJ/year	MWh /year	CO_2	CZK thousands	CZK thousands	CZK thousands	CZK thousands per GJ	CO_2 savings, CZK th:/t
Senior House reconstruction, Kamenec I (MPSV 113 310)	859	239	83	21 084	5 271	15 813	24,54	254
Thermal insulation of the Children & Youth House Ostrava - Poruba p.o. (3 buildings)	776*	215*	92*	12 600	0	0		136
Primary School of Arts Ostrava - Zábřeh, Sologubova 9/A, contributory organisation	478	133	63	3 795	1 413	2 382	7,94	61
Already proposed projects, OPŽP & other OP, ZÚ, in total	45 071	12 387	3 976	660 042	376 359	267 288	14,64	166
Ecologisation of local furnaces I	5 904	1 640	580	24 240		12 120	4,11	42
Ecologisation of local furnaces II	35 438	9 844	3 514	150 000			4,23	43
Construction of a biogas station in ZOO Ostrava	6 480	1 800	550	69 163	51 100	18 063	10,67	126
New projects for thermal insulation and window replacement, OPŽP 2014+	19 253	5 348	2 184	385 067	250 000	135 067*	20,00	176
Savings in flat block houses	513 186	142 552	57 856	5 645 045			11,00	98
Savings in public lighting	1 296	360	175	10000	10000		7,72	57
Ecologisation of MHD operation I			981	620000				632
Ecologisation of MHD operation II			3 033	445000				147
Construction of transport terminals								
Support to RESs (solar/photo-voltaic systems)		1 200	356	35 538				100
Introduction of the energy management system into the management of buildings & facilities owned by Municipality				800				
New measures TOTAL	581 558	162 744	69 229	7 384 053	311 100	30 183		

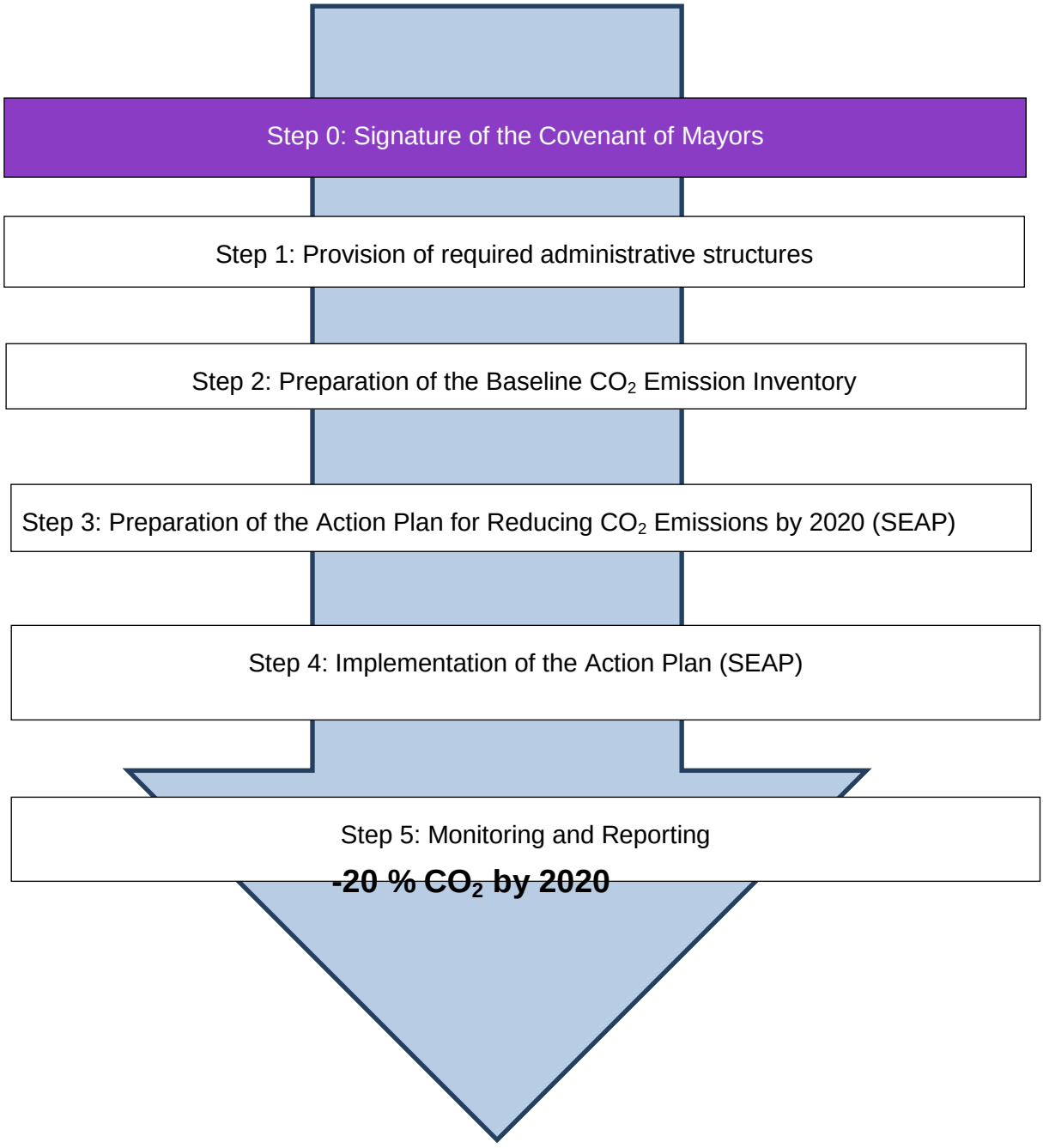
**Own estimate*

5. CREATION OF REQUIRED ADMINISTRATIVE STRUCTURES

5.1 Procedure Recommended by EU

The recommended procedure of SEAP preparation is indicated in the following diagram:

Figure 35: Recommended procedure in the event of accession to the Covenant of Mayors



Source: Action_plan_guidance_elements.en (redrawn)

Preparation of the municipal policy and the Action Plan is lengthy and deserve careful planning and management. Cooperation and coordination of various municipal departments is necessary. The plan for reducing emissions may be successful only if all the departments take it as if it were their own, becomes a part of their routine work and is not perceived as a thing not falling in their scope of service.

A clearly established organisation structure and assignment of responsibilities are prerequisite to successful and sustainable fulfilling of the action plan. Wrong coordination of strategic materials and policies, activities of particular departments and external organisations very often pose a problem, frequently experienced by local authorities when having implemented, e.g., energy management or energy and transport planning.

That is why the requirement of involvement and possible adaptation of the city organisational structure and allocation of the required number of employees to action plan preparation and implementation, including monitoring, becomes the formal obligation for those, who access the Covenant. Covenant signatories create their separate machinery provided with sufficient competence, financial and human resources for managing the tasks associated with the obligations of the Covenant. How the city organisational structure should be adapted?

At the beginning of the entire process of accession to and preparation of the Action Plan the **Covenant Coordinator** should be appointed. He (she) should enjoy full political support, the required time space and budget for managing the task. In big cities the coordinator should have at hand a separate group counting a few people, to deal only with the plan issues. One member of the group could apply himself (herself) to data collection and CO_2 inventory (in Ostrava an involvement of the VŠB TUO is proposed, too).

As an example two groups can be established:

- The Steering Committee consisting of politicians and managers to decide on strategic directions and to provide necessary political support;
- One or a few working groups comprising a manager for the energy planning area and key officers from particular cooperating departments, agencies, etc. Those people shall prepare the Action Plan and follow-up activities. They will also work to involve interest groups (stakeholders), organize and provide for necessary monitoring, prepare reports, etc. Such working groups should be open for other external persons.

Both the Steering Committee and working groups require a clearly defined leadership, even though they should work together. The objectives and functions of the two should be clearly delimited. Report, agenda, time schedule are the things required for successful management of SEAP preparation.

The sustainable energy management has to be integrated in other activities and initiatives of the relevant departments and shall become a part of the general development planning of the municipality/city. Responsibilities for particular areas of activity should be clearly divided, defined and shared and a good process organisation comprising the appointment of task owners is a must. A special communication campaign aimed at the employees of various office departments may be useful.

Technical education and training in specific fields of knowledge, such as energy performance, renewable energy sources, efficient transport, etc., as well as managerial skills, project management and data processing, financial control, investment project preparation, communication shall not be underestimated, as any deficiency in those areas could have unfavourable consequences.

5.2 Examples of Possible Methods of SEAP Management in EU

Vienna

Among available good examples of cities Vienna deserves mention in respect of their Programme of Climate Protection (KliP). The programme was launched already in 2000 but the city accessed the Covenant of Mayors later, in 2012. However, all required structures had been already established. In Vienna they first assessed all really feasible measures and then established the target - the abatement of emissions per inhabitant by 21 % by 2020 (compared to 1990). The KliP, which represents, at the same time, the Sustainable Energy Action Plan to the EU methodology, comprises five areas of activity, as follows:

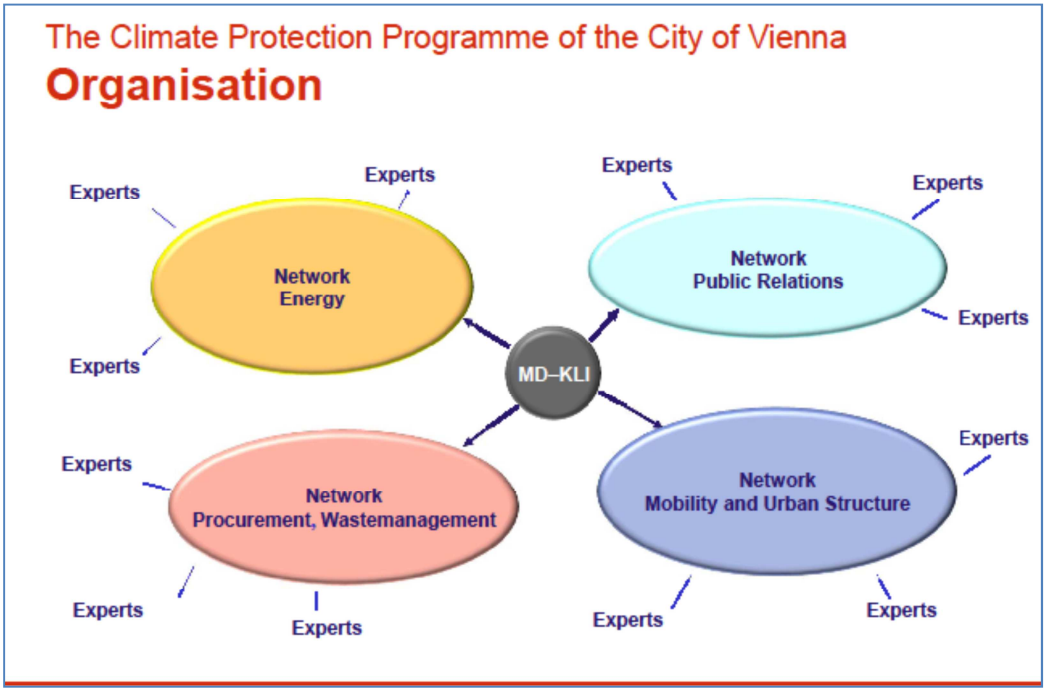
1. Energy production
2. Use of energy, savings on energy
3. Mobility and infrastructure
4. Public orders, waste management, agriculture and forestry
5. Marketing

The implementation structure of KliP is shown on Fig.36 below. The KliP office (MD-KLI) has 5 employees and is supported by various municipal departments, organisations and external experts. Four working groups were created for the purpose:

- Energy (energy production and savings on energy)
- Mobility and infrastructure
- Public orders, waste management (other issues - agriculture and forestry)
- Marketing (cooperation with the public)

Experts are present in each working group, who come from the municipality and municipal organisations (the municipal heating plant, technical services, social housing organisation, etc.). Their expertise finds use as the basis for proposals and implementation of new measures.

Figure 36: Organisational Chart – KliP Vienna



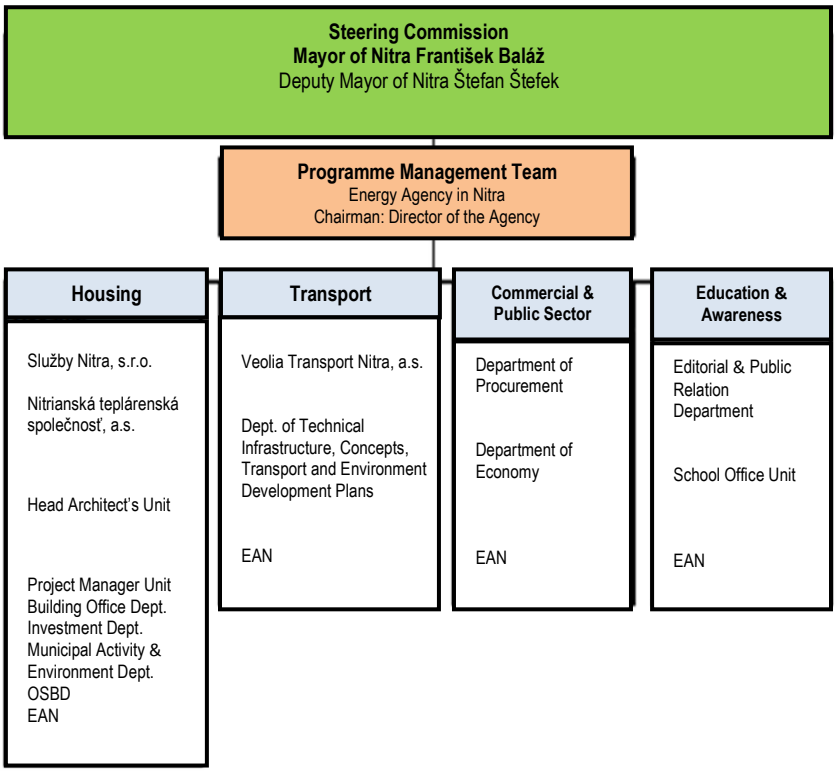
Nitra

The Slovak town of Nitra operates according to a relatively simple scheme. Nitra signed the Covenant of Mayors as the first Slovak city, in 2008. The organisational chart created by the town for the purpose, is relatively simple. It comprises three layers::

1. Steering Commission consisting of the mayor, deputy mayor etc.,
2. Programme Management responsible for action plan coordination and implementation, while the Energy Agency in Nitra (EAN) is the responsible organisation.
3. Working groups where municipal departments and organisations and various interest groups are represented. The working groups are divided according to the type of their activities, as follows:
   - Housing
   - Transport
   - Commercial and public sector
   - Education/education of the public

Both Vienna and Nitra have special organisations established for SEAP implementation. In Vienna it is the KliP Office, while in Nitra it is the said energy agency.

Figure 37: Organisational Chart – SEAP Nitra



Source: EAN

Nitra, in particular, let inspired itself by the scheme found in the SEAP Manual from the office of the Covenant of Mayors at http://www.paktstarostuaprimatoru.eu/IMG/pdf/seap_guidelines_en-2.pdf

The following bodies form the basis of every SEAP organisational chart:

- The Steering Committee, comprising, e.g., politicians and other prominent representatives of the city;
- The Programme Management, or the SEAOP Office, responsible for SEAP implementation;
- Several Working Groups whose expertise is purposefully utilised in the implementation of SEAP.

5.3 Structure of SEAP Management Proposed for Ostrava

The implementation structure for SEAP in Ostrava could be similar to the structures described hereinbefore for Vienna od Nitra. The most probable one is given below. The Municipality of Ostrava should establish a programme management, responsible for SEAP implementation.

In view that the Department of Economic Development is currently responsible for SEAP in the city, it would be most appropriate to create a specific SEAP implementing section within that. The section should be supported by the Steering Committee composed of the top city representatives.

Figure 38: Organisational chart of SEAP implementation (engaged organisations)

According to proposed activities formation of the four following Working Groups may be considered:

- Public sector
- Housing
- Transport
- Education/education of public

Key organisations, which, owing to their expertise and competence, should be involved in the implementation of SEAP, include::

- Departments of the Municipality (their description is given below)
- City districts
- Dopravní podnik Ostrava (providing municipal transport)
- Ostravské komunikace (care of municipal roads)
- Dalkia a.s. (owner of the system of city heat plants)
- Institute of Mining Technology – Technical University (VŠB - TU)

Three activities have been identified, for which the Municipality should obtain external support, as the current staffs of the magistrate may not have enough capacity to cope with them. In particular, the following tasks are concerned:

4. Monitoring of SEAP implementation (every two years after SEAP submission);
5. Implementation of more extensive projects in the field of energy (e.g. certain RESs projects);
6. Establishment of energy management in the facilities owned by the Municipality (managed both by the magistrate and by city districts).

5.4 Engagement of Municipal Departments

The following table gives the list of municipal departments and their proposed engagement in SEAP implementation.

Table 68: Activities of particular municipal departments and organisations in respect of SEAP

Department	Activities	Role in SEAP
Department of Environmental Protection (OŽP)	The department provides for activities in the field of the protection and creation of the environment, water management and agriculture. Within the framework of delegated competence it exercises state administration, among others in the sectors of nature/landscape preservation, forestry, air protection, waste management, water supply and sewerage systems and protection of water. It provides coordination with the bodies of Moravian-Silesian region in the field of air quality.	The department presents the contributions of the applications for subsidy for coal fired boiler replacement in households and other facilities of the Department of Economic development (OER) to the management of SEAP. In respect of municipal waste management and its use in energy production the department monitors plans in OZO and ÚČOV and fulfilment of SEAP targets in electric power production (through OS).
Department of Investment	It is the department to rectify and control construction on the territory of the city. It fulfils investor's role on constructions included and approved in the city budget. It sets priorities in the field of investment. Provides for all required administrative acts (from the preparation of a construction up to its final approval for use) for the constructions built on the city territory, which are included in the city budget. (	He department sets investment priorities in the field of energy savings in the facilities managed by the magistrate, calculates their assumed contributions to the reduction of energy consumptions, costs and CO_2 emissions. It will provide for monitoring the contributions of those investments.
Department of Transport	By its activity the department provides the execution of state administration and tasks in the self-governmental field of (municipal public) transport and road management. It issues permits for road construction, provides for the provision of transport services by the lines of municipal bus transport, issues licences authorising the carrier to provide transport service on a	The department acts as a partner in the implementation of SEAP in all its fields and measures related to transport. It is responsible for implementation of all SEAP measures in the transport areas it manages.

	given line, approves timetables (the licences and timetables of DP Ostrava, a.s.) It exercises state professional supervision in the field of taxi service and municipal bus transport. It provides the execution of state administration on the tram and trolleybus ways operated within the territorial area of the city of Ostrava. The department operates stations measuring vehicle emissions (it grants licences and issues certificates within the exercise of state professional supervision).	
Department of Interests in Property and Joint Procurement	Under so-called Joint Procurement Scheme the department provides cooperation with the operator of "Nákupní portal" (purchase portal) from the side of SMO and other entities of SMO portfolio within the joint procurement system and evaluates, on a running basis, the results achieved through the joint procurement system. It makes checks of documents submitted for the calculation of the remuneration (and of its rightness) for the portal operator based on the submitted documents.	The department is responsible for joint procurement of natural gas and electric power for all facilities owned by the Municipality, including the purchase of heat. The data available to the department for that purpose are the initial data required for the monitoring of SEAP. The purchase of energy and natural gas has an important current impact on the municipal economy. The effect of austerity measures implemented on municipal property on the energy consumption and the costs of purchased natural gas and energy can be, therefore, observed through the updated data. We propose the activities in the field of joint procurement to be interconnected with the activities performed by the energy (a measure proposed in SEAP). It appears the establishment of energy management is absolutely necessary for the monitoring of SEAP.
Department of Economic Administration	This department takes care of facilities owned by the magistrate. It may set priorities for reconstructions, repairs and use of RESs in such buildings. The department employs its own power engineering specialist. The department provides operating requisites, equipment inspections and building and equipment audits.	The department will cooperate with the investment dept. in the proposal and monitoring of contributions from investments in the field of energy saving (for facilities owned by the magistrate).
Head Architect's Unit	It is the magistrate department dealing with urban planning, monument preservation and with the concept of the territorial development of the city. It performs the activities of the urban planning office, provides the municipal bodies and other magistrate departments with professional services in the fields of urban planning, urbanism, architecture, monument preservation and city development and plays its role in the urbanistic/architectonic preparation of investments on the territory of the city. The head architect of the city act also as the head of the unit.	The unit is responsible for the urban plan, whose update is now ready for approval. The urban plan contains, among others, so-called areas eligible for development and reserved areas (i.e. the areas that could be built-up). It further states, where new industrial areas may be located. The current urban plan does not permit any disconnection from the district heating system (CZT). It is not quite clear, if such blocking may be contained in the urban plan. In some individual case such disconnection was already permitted. This trend puts in jeopardy both the stability and efficiency of CZT systems and the supply of heat as a whole.

Department of Social Issues, Education, Sports and Leisure	It is the magistrate department that provides competence in the sector of social care, education, sports and leisure activities. It plans, coordinates and implements the development of social services, education and sports. Creates conditions and supports leisure activities, provides social and legal protection of children as well as the full scope of social work.	The department cooperates with the Department of Investments in the setting investment priorities in school buildings. It will cooperate also with OMÚ in the provision of documentation for the execution of energy management..
Dopravní podnik Ostrava	The company operates urban public transport in Ostrava (bus, trolleybus and tram lines).	The company sets investment priorities in the field of public transport and prepares, as the case may be, applications for subsidies/grants for the sphere of MHD.
Ostravské komunikace	The company provides practicability of roads on the territory of the city and operates public lighting systems in Ostrava.	The company proposes new projects in the field of public lighting. It observes the contributions gained from austerity measures implemented in SEAP in the field of public lighting and urban roads..

6. OUTLINE OF SOURCES FOR FINANCING THE MEASURES OF SEAP

The successful implementation of the Action Plan will not be managed without financial sources. Appropriate financial sources have to be identified as well as the procedures and methods, how such sources can be exploited for performing activities within the framework of the Covenant. Decisions on energy performance shall comply with the budgetary rules of towns and municipalities. In the years to come the municipal budget may be reduced by the achieved savings. It is due particularly to the fact the investments in energy saving projects go through the investment budget, but bills for energy are paid from operating funds.

The funds that are necessary for the implementation of actions within the framework of the Covenant should be included in annual budgets and a related clear obligation should be set for the years to follow. However, as the budgetary sources are still limited, other possible sources of finances should be sought. As to the obligation to finance the actions in subsequent years, the conclusion of an agreement of political parties in this respect is recommended. Problems that could arise after new municipality leaders have been elected can be avoided in this way.

Towns often decide to finance first energy saving projects of a short payback time. This course of action, however, will not allow making use of the biggest portion of energy savings that can be gained in the way of general modernisation, particularly from additional thermal insulation, replacement of windows, etc. Such measures are profitable even at the payback period as long as 15 years, e.g., owing to their long service life.
For funding the austerity measures within the framework of the Action Plan the following sources may be possibly used:

- Municipal budget, on responsibility of the following departments:
    - Department of Finance, responsible for municipal budget+
    - Department of Interests in Property and Joint Procurement, responsible for the purchase of energy;
    - Department of Investment plans future investments, including those having an impact on energy consumption.
    - Department of Economic Development, responsible for the preparation of applications for subsidy.
- External sources of financing, including:
    - Operating programmes (OPŽP, IROP, OPPIK, OPD) for the period of 2014+
    - Other mechanisms of the EU (JESSICA, ELENA, JASPERS, IEE)
    - Other international funds (e.g., Norwegian or Swiss funds);
    - National programmes (e.g., Green Light for Savings, or the State Fund of Housing Development)
    - EU funds available through private financial institutions
    - Energy Performance Contracting

In the following the brief description of all opportunities for external financing is given:

Financial schemes recommended by the secretariat of the Covenant are accessible at: : http://www.paktstarostuaprimatoru.eu/support/funding-instruments_cs.html

Table 69: Outline of possible sources of financing

Funding Type	Name	Target Group/Priorities	Conditions	Support Type
Operating programme	OPŽP	Public buildings, public lighting Priority axis (PO) 5: Support to energy performance and use of energy from renewable energy sources in public infrastructures and in the housing sector	Beneficiaries in all areas of support may include an entity that owns a public building (in the area of support "B" the beneficiary will be the owner of a building under construction). The group of possible recipients of the support from OPŽP in the current programming period could be considered. *Any detailed conditions of drawing the support for the period of 2014+ have not been available up to now.*	*In the period of 2007 – 2013 the support provided within the framework of PO3 amounted to 85 % of the total eligible public costs, at most (maximum), for the projects submitted by public entities.*
	IROP	Investment priority (IP) 4c: Support to energy performance and use of energy from renewable energy sources in public infrastructures (buildings) and in the housing sector IP 4e: Support to low-carbon strategies for areas of any type, particularly urban areas, including the support of sustainable urban mobility and adaptation measures aimed at climate mitigation.	Beneficiaries shall include: : Building users, towns, municipalities. Beneficiary types: Owners of residential buildings (SVJs, associations, municipalities, private landlords) *Any detailed conditions of drawing the support for the period of 2014+ have not been available up to now.*	*In the period of 2007-2013, within the framework of ROP "Moravia –Silesia the non-returnable direct aid (subsidy) amounted to 85 % of the total eligible public costs, at most (maximum).*
	OPPIK	PO 3: Efficient energy handling, development of energy infrastructure and renewable energy sources, support to the introduction of new technologies in the field of energy and secondary raw material handling.	Beneficiaries shall include private entities. As in the OPPI programme the small and medium-sized enterprises will probably receive the subsidy at a higher rate (in %), *Any detailed conditions of drawing the support for the period of 2014+ have not been available up to now.*	*In the period of 2007-2013, the subsidy amounted to 40 - 60% of the eligible costs, at most (maximum), subject to the enterprise size and location.*
Other mechanisms of the EU	ELENA	European Local energy Assistance	Funding of technical assistance to larger investment plans. Examples: feasibility studies, programme documents, energy audits, documentation for public orders.	Technical assistance covered up to the level of 90% the cost of technical assistance.
	JESSICA	Joint European Support for Sustainable Investment in City Areas	JESSICA makes it possible to employ a part of its grants from structural funds for the implementation of returnable investments that are parts of an integrated plan of the sustainable development of towns. The investments may take the form of own capital, a credit or a guarantee.	The programme employs existing means from structural funds (a type of technical assistance)
	JASPERS		JASPERS is designed for 12 EU member states that accessed to the EU in 2004-7. Projects should be identified and prepared, which can have a chance to be financed from the means of structural funds. Technical assistance at all project stages may be financed.	Grants to cover the costs of technical assistance

	IEE	Intelligent Energy Europe	In 2012 and 2013 the programme Intelligent Energy Europe (IEE) offered technical assistance to towns that signed the Covenant of Mayors.	Subsidy for non-investment activities (75% of the costs)
Other international financing	Swiss Funds	Programme of Swiss-Czech cooperation	Subsidies were granted for projects in the field of transport infrastructure. Dopravní podnik Ostrava a.s. drew the subsidy.	Programme of grants provided in selected fields (the environment, infrastructure, etc.)
National programme	New Green Light for Savings	Launched in August 2013 for family houses. The first phase for family houses only.	Implementation of thermal insulation of family houses, construction and replacement of sources fired with solid fossil fuels and installation of solar thermal systems for hot water preparation started after 1st January 2013 in compliance with programme conditions. At the new stage the replacement of boilers fired with solid fossil fuels with new heat sources featuring better operational parameters and installation of solar thermal systems for hot water preparation become eligible to the subsidy.	A grant programme
	Programme PANEL 2013+	Since January 2013 it offers low-interest credits for repairs and modernisation of flat block houses.	Applications may be filed by all flat block house owners, both legal and physical persons, towns, municipalities, owners' associations and housing associations.	Low-interest loans
	Joint programme of the Moravian-Silesian Region and the Ministry of Environment for supporting replacement of existing manually operated boilers fired with solid fuels with new low-emission boilers fired with coal, biomass or coal and biomass in the Moravian-Silesian Region.		Support granted to the replacement of boiler (up to 50 kW) fired with solid fuels, with new low-emission automatic boilers. Applicants shall be physical persons and owners of the real estate.	Grants (up to CZK 60 000), according to the boiler type
Financing from the EU trough private banks	Programme „Savings in Flat Block Houses" "of ČS a.s.	SVJ (associations of dwelling unit owners) and housing associations	Projects for flat block house reconstruction aimed at energy savings in building heating or, possibly, in hot water preparation, are supported. Savings at the level of 30 % should be achieved.	Grant from KfW – 10% of the loan drawn from Česká spořitelna, a.s.
	EIB Green Initiative	Small and medium-sized enterprises, housing associations and SVJs	The projects shall meet at lest one of the following basic criteria: Energy saving at the level of 30 % at least, in the case of building reconstruction, or 20 % at least in other austerity projects; Reduction of greenhouse gas emissions by 20 % at least; Typical projects include reconstructions of building designed for dwelling or entrepreneurial purposes.	Grant from EIB Grants amounting to 14% of investment costs at most (maximum). Loans provided through Česká spořitelna, a.s., or Raiffeisen Bank
Energy Performance Contracting		Provision of energy services with guaranteed savings.	No subsidies are granted, investments are paid from savings – 90 % of EPC projects in the CR are realised within the public sector.	The client repays the investment gradually using the achieved financial savings.

7. RISKS OF SEAP IMPLEMENTATION – IN MEETING THE OBLIGATION OF CO2 REDUCTION[7]

1. One of the risks of implementation lies in the area of financing. At the present time it is difficult to propose the way of access to the grant sources. The programming period 2014+ is under preparation.

2. Other risks consist in the ability of the city to monitor and evaluate both the costs of energy in buildings owned by the municipality or city district and the realised SEAP measures and their contributions.

3. Coordination of the project with other activities of the city ("Smart Cities", e.g.),

4. Allocation of financial means from the municipal budget to co-finance the proposed measures,

5. Clear administrative structure of SEAP management,

6. Establishment of the activities required for the evaluation of implementation and contributions of SEAP.

[7] Borrowed from the conclusions of the seminar on the action plans (SEAP) held in Ispra on 18th and 19th May 2009

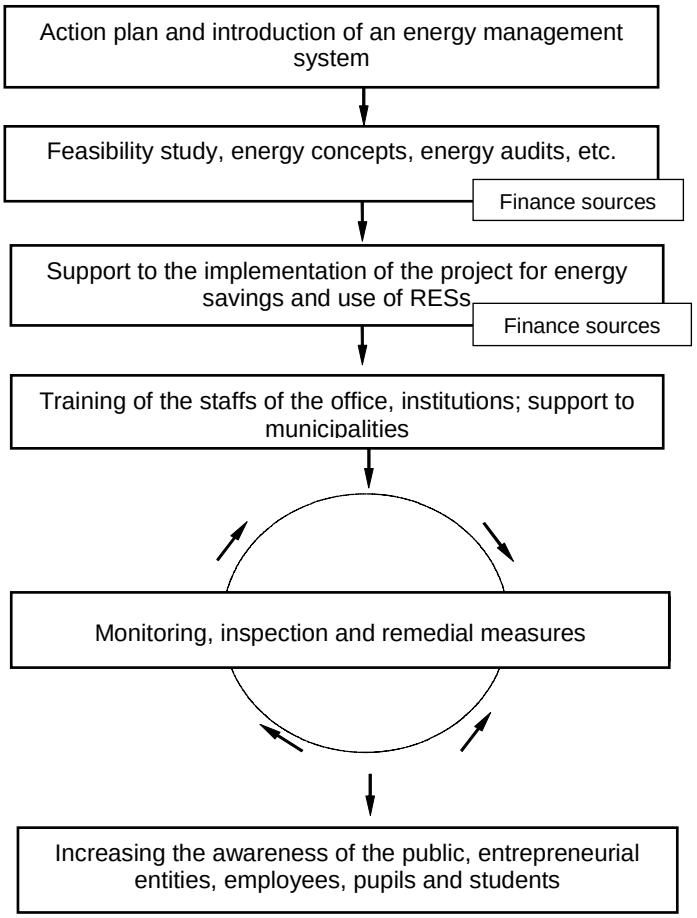
8. ACTION PLAN MONITORING AND EVALUATION

The initial inventory of CO_2 emissions (BEI – baseline emission inventory) quantifies the amount of CO_2, emitted into the air due to the consumption of fuels and energy on the territory of the city in the initial and reference year of 2000.

Baseline Emissions Inventory (BEI) represents a tool providing the Municipal Office with the information on the initial state of the emissions. The task of the Municipality consist in monitoring, the current development of emission in relation to the target set for 2020. Such monitoring carried out in a running mode and updating the inventory are important also for the motivation of all stakeholders, who contribute to meet the target for CO_2 emission abatement as it allows them to observe the results of their efforts[8].

8.1 Procedure for Controlling the Action Plan Implementation

After signing the Covenant the Municipality shall be obliged, among others, to monitor the employed measures once in each two years and to evaluate them in accordance with the set of prescribed indices, comprising, among the indices of contributions, the levels of CO_2 emissions. The results will used for the report of achieved results, submitted to the DG TREN and the secretariat of the Covenant. The determinations made from the very beginning of implementation of the monitoring, verification and evaluation system are very important.



[8] Guidebook „How To Develop A Sustainable Energy Action Plan (SEAP)“, Part II, Baseline Emission Inventory, Point Research Centre of the European Commission, 2010

8.2 Deadlines for Action Plan Evaluation

The Action Plan should be evaluated regularly once in every two years. Nevertheless, certain activities should be carried out on a running basis and include:

- Evaluation and monitoring of consumption in municipal buildings and facilities on condition that the existing database of building and facilities will be complemented and tied in with all offtake points, where possible.
- Following-up the implemented projects, their contributions and costs (see project follow-up by the Department of EU Funds Implementation) carried out by all concerned departments.
- Monitoring the data given in the description of inventory preparation.
- Monitoring the auxiliary data - not hitherto shown – using the indices given for particular measures.

The method of data collection and processing should allow calculating the CO_2 emissions and should respect the Action Plan structure.

8.3 Monitoring and Evaluation Indices

The indices for evaluation should be chosen to comply with the following requirements:

Relevance + Availability + Reliability + Quantification

The proposal of suitable indices for follow-up forms a part of the Action Plan preparation and of the preparation of each SEAP measure and the method of its evaluation. The indices are chosen preferably at the level of results and impacts, while those necessary for meeting the reporting requirements of Covenant of Mayors secretariat should be included.

Parameters that can be followed-up **at the input level:**

- Data of fuel and energy consumption in particular REZZO 1 and 2 sources;
- Supplies of natural gas and electric power structured according to particular sectors, facilities, buildings;
- Supplies of heat structured according to particular sectors, facilities, buildings;
- Production of electric power from RESs, waste, etc., according to the description of the preparation of CO_2 emissions inventory.

Parameters that can be followed-up **at the output level**:

- Number of implemented projects for CO_2 emission abatement;
- Number of public educational actions carried out;
- Number of houses and living flat units provided with thermal insulation, in m^2;
- Parameters achieved by thermal insulation, contributions from the insulation, expressed in technical units;
- Parameters achieved in the specific consumption of heat for heating;
- Energy savings structured according to particular fuel and energy types;
- Number of RESs (OZE) projects
- Number of installed solar panels, in m^2;
- Capacity of installed heat pumps, in kW;
- Capacity of installed photovoltaic panels, in kW_p;
- Number of structures with tightened requirements for thermal protection and energy performance of buildings in total – the numbers of low-energy and passive buildings;

- Number of structures in which the use of non-combustion technologies of renewable sources was implemented.

The results of measures that can be followed up include, e.g.:

- Growth of outputs and emissions (both CO_2 and other air pollutants) from new sources;
- Reduction of emissions from reconstructed sources
- Reduction of the consumption of fuels and energy due to the implementation of thermal insulation projects;
- Numbers of the participants in seminars, visitors to the website;
- Generation of electric power from renewable energy sources;
- Generation of electric power from the sources of heat production.

It is recommended the results of measures to be verified (using, e.g., the method to The International Performance Measurement and Verification Protocol (IPMVP®) , distributed in the CR within the PERMANENT project – see www.permanent-project.eu. The verification of savings to IPMVP is used in the EPC projects, too.

At the level of **contributions (benefits) and impacts** of the measures the follow-up should be carried out of the indices to be used for demonstration of the achievement of targets in particular sectors included in the BEI, including:

- Reduction of emissions, structured to the source category;
- Reduction of CO_2 emissions in the production of heat;
- Reduction of CO_2 emissions through thermal insulation of municipal buildings+
- Reduction of CO_2 emissions through the reconstruction of other flat block and family houses;
- Reduction of CO_2 emissions through the production of energy from a renewable energy source;
- and so on.

Action Plan monitoring will allow evaluating the achievement of the target - always in two-year intervals the CO_2 emission inventories shall be repeatedly prepared and target achievement evaluated.

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