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SUSTAINABLE ENERGY ACTION PLAN OF CHERNIVTSI FOR 2015 -2020

2015

CONTENTS

INTRODUCTION

Having adopted the EU package of initiatives on climate and energy issues in 2008, the European Commission launched the Covenant of Mayors initiative to endorse and support the efforts deployed by local authorities in the implementation of sustainable energy policies.

One of the priority targets of the aforesaid Covenant has been determined as that of 20% CO2 emissions reduction by 2020 at the expense of 20% of energy efficiency increase and introduction of 20% share of renewable power sources in energy sources structure. Local authorities are considered to be leading actors in the project as 80% of power supply and CO2 emissions are connected with urban activities.

Due to the implementation of Covenant of Mayors European initiative, the EU institutions have taken bold steps in direct involvement of local and regional authorities to solve the climate change issues and its negative consequences, thus recognizing the important role of self-governing bodies in achievement of the determined targets in the sphere of energy and climate preservation.

Many towns and cities across Europe and Ukraine have supported the Covenant of Mayors initiative. Today this figure reaches 6019 city-signatories with the population of more than 192 million people.

Realizing that safe and accessible power supply from sustainable energy sources is a pledge of successful future of the city and the necessity of implementation of large-scale projects in the energetic sphere aimed at reduction of greenhouse gas emissions, Chernivtsi City Council joined the Covenant of Mayors European initiative in 2014 (City Council Resolution of July 31, 2014, No 1290 “On Joining the Covenant of Mayors European Initiative”). The support of the Covenant of Mayors creates the favorable conditions for the city to be involved in major research and financial EU projects, encourages local bodies of self-governing to reduce local greenhouse gas emissions by 20% by 2020.

Prior to joining the Covenant of Mayors, the city of Chernivtsi had made some progress towards more sustainable future by adopting "Comprehensive Energy-Saving Program in Chernivtsi for 2010-2014", "Programs on Energy Auditing of Residential and Municipal Property Buildings in Chernivtsi for 2010-2014", "Municipal Energy Plan of Chernivtsi for 2012-2015" and other crucial documents on energy-saving and energy efficiency issues.

The city of Chernivtsi is a regional centre of Bukovyna development in the sphere of innovations, tourism, industry, trade, and so on. The city is a home for more than 260 thousand people with many enterprises and institutions. The city faces challenges of a new future and the inhabitants of the city as well as the city enterprises can live and work successfully employing energy sources in a sustainable way. The city potential and ambitions require technological and social changes. Sustainable Energy Action Plan – SEAP– is a step forward to such a future. The increase in well-being of the city and its inhabitants is based on the people's ability to develop and implement new scientific, engineering, economical and social solutions capable to change and improve their up to date life.

The Chernivtsi SEAP (CSEAP) is a strategic document that determines a long-term planning of the territorial community policies aimed at fighting global climate change by greenhouse gas emissions reduction. CSEAP is an instrument of ensuring a qualitative and efficient realization of local policy in the sphere of energy efficiency and environmental protection.

The major goal of CSEAP is more than 20% greenhouse gas emissions reduction (first and foremost CO2) as compared with 2010. The basic measures to achieve this goal are reduction and optimization of traditional energy sources and implementation and use of renewable energy sources.

The key parameter of achieving these targets is local partnership – the cooperation of the bodies of executive power and economic agents as well as

inhabitants concerning greenhouse gas emissions reduction in the sectors they are in charge or competent of.

CSEAP determines a complex of measures in every sphere of activity or target group. The implementation of the above said measures will permit to achieve the desirable total CO2 emissions reduction in the city of Chernivtsi within the indicated period.

CSEAP is developed to form future, more detailed planning and is a directive for the priorities and measures; it illustrates in general how the targets as for CO2 emissions reduction can be achieved.

CSEAP is not of a mandative character but rather a directive for strategic thinking and outlining influence spheres, contains programs the realization of which may ensure a substantial carbon dioxide emission reduction and local production and consumption of energy.

Chapter I. The Necessity of Sustainable Energy Action Plan Development for Chernivtsi

1.1. Global warming and its consequences

Ukraine on the whole, as well as each of its regions in particular, possesses its peculiar features determined by special natural conditions, climate, relief, soil, vegetation, water resources etc. The natural conditions influence economic activity and outlook of the people, their beliefs, customs, traditions and lifestyle. Improving technology and techniques, the mankind has made a lot of scientific discoveries. On the one hand, it has led to improving the well-being in many countries; on the other hand it has caused serious problems.

Significant climate changes have occurred during recent years. Summer is becoming hotter, winters – milder. Scientific research shows that the atmosphere of the Earth has noticeably warmed up during last 100-130 years and this process is unceasingly continuing. On average temperature is permanently rising. Annual temperature has gone up at least 0,3-0,6ºC during last 100 years. Global warming is explained by the so-called "greenhouse" effect. The main point is that our planet gets sun energy mainly in visual spectrum, and being itself much colder body it radiates infrared rays into outer space. Many atmosphere gases (steam, carbon dioxide, methane, nitric oxides etc.) are transparent for visual rays but at the same time they actively absorb infrared rays, thus retaining heat they otherwise would give to the outer space. So, the temperature on the Earth's surface is maintained at the livable level. By retaining heat in the atmosphere these gases cause the so-called "greenhouse" effect and they are respectively known as greenhouse gases.

Greenhouse effect has existed since atmosphere appeared on our planet. Greenhouse effect itself is not a negative phenomenon. Without it the temperature of circumterrestrial layers of atmosphere would be at the average 30 ºC lower than the present one, on the surface it would be only -18 ºC. This means the conditions

for living would be absent because water on the earth surface would exist only in the form of ice.

There are 6 main greenhouse gases that make up chemical structure of the atmosphere:

- steam;
- carbon dioxide;
- methane;
- ozone;
- nitrous oxide and lately chlorofluorocarbon.

All other greenhouse gases except for the mentioned above are found in nature.

Carbon dioxide (CO_2) is the most significant among anthropogenic gases. Although this gas is of natural origin, the biggest amount of it is produced by human activities. Industrialization has caused increase in the use of fuel extracted from the Earth interior: coal, oil, gas (fossil fuel). While being burnt CO_2 is emitted in large amounts.

Transport, electric power and heat production are the major sources of CO_2 emissions. Among other sources are chemical industry, forestry and land utilization changes. While extracting of burning fossil fuel 95% of CO_2 emissions occur in Ukraine. The cement production is responsible for the most impressive share of CO_2 emissions. Ukraine is the tenth in the world as for CO_2 emission amount. Forests, oceans and soil absorb CO_2, keeping balance between CO_2 amounts in the atmosphere, water and soil. But human activities affect the balance.

Human activity strengthens “greenhouse” effect by emissions of CO_2, CH_4, N_2O and other gases. As a result of human activities, the content of carbonic acid in the atmosphere has increased by more than one quarter, the content of methane – 2,5 times during the last century. During last 20 years the share of CO_2 emissions in total amount of greenhouse gases emissions estimates about 50%, CH_4 - 18%,

N_2O – 6%, chlorofluorocarbon – 14%, that substantially speeds up the global warming process. The results of computer simulation have shown that if the content of greenhouse gases in the atmosphere continues to grow, the average temperatures will increase by 1,4ºC – 5,8ºC at the end of 21st century. World ocean level will rise by several dozens of centimeters – due to thermal expansion of upper heated level rather than polar ice melting. Some seaside countries can completely disappear under the water.

In order to decrease the negative consequences of global warming we should reduce the amount of exhaust gases and increase the amount of greenhouse gases absorbers. The best absorbers of greenhouse gases are biomass (forests) and the world ocean.

Climate changes have also affected agriculture correspondingly. Early spring causes tension in the processes of farming equipment preparation and field work. Optimal terms of sowing early spring crops should be specified. The reduction in air temperature reduction in summer makes for longer period of the ripening of heat-loving crops. Consequently the terms of harvest ripening and its gathering are late every year.

92% of Ukraine's land is used for economic activity. There is no more ecologically clean land left. The annual amount of contaminants per 1 km^2 is 3,2 times higher in Ukraine than in Western European countries. Due to the disaster at Chornobyl nuclear power plant more than 5 million hectares are contaminated by radionuclides. Garbage abounds in cities, excessive noise and heat pollution are observed everywhere. Clouds of smoke, soot, exhaust gases and different gas-like waste products containing vast amounts of chemicals are continually hanging over industrial centres and cities. Most enterprises are equipped with low-capacity disposal facilities, while some of them are not equipped at all. Almost 50% of tillage is being damaged by water and winter erosion, some animal and plant species are disappearing, shallow rivers are vanishing, middle-sized and big rivers are being contaminated and silted up. As a result of environmental pollution and

contaminated products consumption different diseases are spreading, life span is shortening. This is the result of negligent attitude of mankind towards the environment.

1.2. Chernivtsi Sustainable Energy Action Plan Development: Background

Sustainable Energy Action Plan in Chernivtsi is the main strategic document that determines ways of reduction the amount of greenhouse gases emission up to 2020 and decrease of negative consequences of global warming in the world.

SEAP uses the results of Baseline Emission Inventory during 2008-2013 in order to reach preplanned indicators of CO_2 reduction at the local level and to determine contaminated areas and possibilities for taking urgent actions to reduce CO_2 emissions. Special measures are determined aimed at reducing the amount of emissions and also terms and obligations division that show transition from long-term strategy to specific actions.

SEAP is a flexible document. The present document may be amended if circumstances change and certain results and experiences of conducted actions emerge.

The basis of SEAP is measures aimed at reduction of CO_2 emissions and final energy consumption by ultimate consumers. Due to the fact that SEAP measures are connected with infrastructure objects which are in the scope of local authorities the main role in implementing measures belongs to city council and its executives.

Energy analysis (initial state evaluation) of energy sphere in Chernivtsi has identified zones threatening energy safety and containing the highest potential of energy efficiency (energy conservation). In compliance with the energy analysis public sector, residential area, “Chernivtsi Teplocomunenergo” (municipal heat and energy supply company), “Chernivtsi Vodokanal” (water supply and sewage company), “Mis’ksvitlo” (municipal city electricity company) and “Chernivtsi Trolleybus company” are defined as municipal energy priority sectors with high energy efficiency. Accordingly, the SEAP objective in Chernivtsi as to kinds of energy is: heat energy ued for heating buildings, natural gas for heat production

and “Chernivtsi Teplocomunenergo” needs, natural gas for daily living needs and electric power in the mentioned sectors, particularly in “Chernivtsi Vodokanal”.

Therefore SEAP Signatories in Chernivtsi are:

- city council and its executive committee;
- city council executives managing public buildings of municipal property of Chernivtsi territorial community (education management, health management, culture management etc.);
- population, in particular apartment building residents organized in Multi-apartment homeowners association;
- “Chernivtsi Teplocomunenergo” (municipal heat and energy supply company);
- “Chernivtsi Vodokanal” (water supply and sewage company);
- “Misk’svitlo” (municipal city electricity company);
- “Chernivtsi trolleybus company”.

1.3. Regulatory and Legal Framework of Chernivtsi Sustainable Energy Action Plan Development

- Law of Ukraine on Ratification of the United Nations Framework Convention on Climate Change of 29.10.1996 № 435/96-BP;

- Law of Ukraine on Energy Conservation of 01.07.1994 № 74/94-BP;

- Law of Ukraine on Local Self-Governing in Ukraine of 21.05.1997 № 280/97-BP;

- Law of Ukraine on Alternative Energy Sources of 20.02.2003 № 555-IV;

- Law of Ukraine on the Main Principles (Strategy) of the National Environmental Policy of Ukraine for the Period until 2020 of 21.12.2010 № 2818-VI;

- Cabinet of Ministers of Ukraine Resolution on Passing State target Economic Program of Energy efficiency and development of Energy Carriers Production from Renewable Energy Resources and Alternative Fuels during 2010-2015 of 01.03.2010 № 243;

- Cabinet of Ministers of Ukraine Resolution on Comprehensive State Program of Energy Conservation in Ukraine of 05.02.1997 № 148;

- Cabinet of Ministers of Ukraine Order on Approval of Energy Strategy in Ukraine by 2030 of 24.07.2013 № 1071-p;

- Cabinet of Ministers of Ukraine Resolution on Outlining of Energy Conservation Priority Measures of 04.07.2006 № 631;

- United Nations Framework Convention on Climate Change of 09.05.1992;

- Kyoto Protocol to the United Nations Framework Convention on Climate Change of 11.12.1997;

- Chernivtsi Municipal Energy Plan for Period of 2011-2015;

- The Covenant of Mayors - European Cooperation Movement to increase municipal services efficiency and CO_2 emissions reduction initiated by the European Commission of 15.01.2009.

Chapter II. State of the Art

2.1. The City of Chernivtsi: General Information

The city of Chernivtsi is the regional center of Chernivtsi Region, which consists of two historical regions - the North Bukovyna and Bassarabia. The city of Chernivtsi is located in southwestern Ukraine in the interfluves of the Prut River. The distance from Chernivtsi to Kyiv by rail - 560 km, highways - 540 km. The distances to the capitals of Europe: to Chisinau - 345 km, Bucharest - 490 km, Budapest - 600 km, Warsaw - 640 km, Prague - 700 km, Vienna - 890 km, Moscow - 1330 km.

The first documentary record of Chernivtsi dates back to October 8, 1408. The city in different historical times was part of the various states (Kievan Rus and Galicia-Volyn and Moldovan principality, Turkish Empire, Austria and Austria-Hungary, Romania, Russian Empire, USSR).

The bulk of Austrian historical buildings were formed around the central square. An adopted radial beam principle of street location and urban area arrangement allowed a rational use of rugged relief and architectural landscape, vista and panorama creation. Architectural scene of the historical center of Chernivtsi is a city monument of world importance, holistic, almost pristine ensemble of mid XIX-XX centuries. State monument register encompasses 631objects, 17 of which are of national importance.

Significant population growth in Chernivtsi occurred in the 70s-80s of the last century, conditioned by the construction and deployment of large industrial enterprises ("Graviton", "Quartz," "Electronmash" and others). It increased work-force flow from the eastern regions and the surrounding areas. Since 90s stabilization and the tendency to permanent growth has been maintained. Population of Chernivtsi was 264,333 inhabitants by 01.01.2012. Total population growth mainly depends on immigration.

Table 2.1.1

ChernivtsiPopulation in 2007-2013

Indicator	Units of measurement	Years					
		2008	2009	2010	2011	2012	2013
Resident population	People	243182	245779	248018	252171	255084	258372
Born	People	2556	2564	2560	2624	2605	2751
Dead	People	2665	2577	2494	2396	2424	2446
Natural population growth	People	-109	-13	66	228	181	305
Arrived	People	6212	5753	5570	5464	6419	6719
Emigrants	People	3506	3501	3569	3606	3687	3736
Mechanical increase	People	2706	2252	2001	1858	2732	2983
Total increase (decrease)	People	2597	2239	2067	2086	2913	3288
Chain Index - population	%	100,76	101,06	100,91	101,67	101,15	101,28

Note: "Chain Index" - a percentage of the total population compared to the previous year (like in a chain - each link is connected to the previous).

The area of the city is 153 square kilometers. Climatic conditions of the city of Chernivtsi are favorable for all seasons: temperate continental humid climate, mild summer and mild winter. The average duration of the period with temperatures above 0 º C is 260-265 days a year, the vegetative period - 215-220 days a year.

Table 2.1.2

The average temperature in Chernivtsi
in 2011 - 2015 during the heating season (° C)

Months	Years							
	2008	2009	2010	2011	2012	2013	2014	2015
January	-2,2	-2,7	-7,8	-2,5	-3,1	-4,4	-3,0	-0,3
February	2,1	-0,5	-3,1	-2,8	-9,4	-0,9	-1,7	-0,1
March	5,6	2,8	3,5	2,3	4,8	-0,4	7,2	4,5
April	10,1	11,4	10,1	8,2	8,4	6,9	8,1	7,4
October	10,0	9,1	6,1	4	8,5	9,9	1,2	
November	4,0	5,6	7,8	2,7	4,9	7,1	2,9	
December	0,8	-2,7	-4,5	1,4	-5,5	-0,1	-0,8	

2.2. Analysis and Estimation in Sectors

2.2.1. Housing and Communal Services

The total area of Chernivtsi housing fund was over 5.3 million square meters at 01.01.2014. Most of the residential buildings were built before 1940, their level of technical equipment, technical condition and improvement do not

meet modern requirements and need significant investment for replacement and repair (tab. 2.2.1).

Table 2.2.1

Total area of residential premises in Chernivtsi by the forms of ownership (sqm)

Forms of ownership	2008	2009	2010	2011	2012	2013
Total	**4933025**	**4956655**	**4995218**	**5083713**	**5266672**	**5304683**
State	138249	138084	140414	138573	139492	*
Public	281802	257533	181008	164750	155320	*
Private	4512974	4561038	4672619	4779173	4970643	*

* - for 2013 no statistical data available

The housing stock of territorial community public ownership of Chernivtsi at 01.01.2015 consisted of 3020 buildings with total area of 2.084 million square meters, among them 83% are provided with plumbing, 82.5% with sewerage, 69% with central heating, 99.6% with gas. In 2014 seven public and six private companies carried out the maintenance and servicing of housing stock of Chernivtsi. At01.01.2015 there were 249 multi-apartment homeowners' associations in the city, including 14 that were created in 2014. The proportion of total area of the multi-apartment housing stock, which is being served by multi-apartment homeowners' associations, has increased by 7.8% comparing to 2013.

The total area of multi-apartment housing stock, which is being served by multi-apartment homeowners' associations or other forms of community self-organization is 937.6 square meters, including multi-apartment homeowners' associations - 569.09 square meters. There is no multi-apartment housing stock given under control to the residential complex administration in Chernivtsi. The proportion of total area of multi-apartment housing stock that is managed by public companies is 53.1%.

The process of housing services reform is slow. (table 2.2.2)

Table 2.2.2

Information on the housing economy reform in Chernivtsi
(as of December 2014)

Multi-apartment homeowners associations			**Private enterprises servicing house adjacent areas**			**Private enterprises servicing housing stock**		
apartment homeowners associations, units	apartment homeowners associations were created, units	Total area of houses serviced by, multi-apartment homeowners associations, units/thousand.m^2	Number of created private enterprises, units	Number of houses serviced by private enterprises, units	Total area, serviced by private enterprises, thousand.m^2	Number of created private enterprises, units	Number of houses serviced by private enterprises, units	private enterprises, units/thousand.m^2
203	203	218/468,792	6	926	271891,7	5	665	665/881,276

In 2014 276 (16,527 sq m) roofs and cold water supply networks were renovated in 240 houses, sewage networks in 130 houses (1338 lm), switchboard - 103 objects, heating stoves - 48 units, smoke ventilation channel- 179 objects.

2.8 km of water supply networks conducive to accident were repaired and replaced costing 466.6 thousand UAH.,0.174 km of sewage networks, 40 fire hydrants and 44 valves were also repaired. 3 reservoirs of potable water were cleaned, chlorinated and refined on pumping stations 2nd, 3rd of water supply "Dnister-Chernivtsi" and "Popova" costing 24.7 thousand UAH.Heating networks were replaced by pre-insulated pipes – 1241 metres costing 3307 thousand UAH.

More than 24 thousand square meters of roads and passages were overhauled, 1.7 km of new kerbs were set, about 14.1 thousand square meters of asphalt-paved streets were repaired.

Protective layers were made through surface treatment method on four streets covering total area of 66.8 thousand sq m costing 1.6 million UAH.

In Chernivtsi according to the studies there are 69 landslide areas with landslide process at different stages (long shifts - 49, active – 18, dangerous - 5), with 36 industrial and 33 linear objects. Despite the measures taken by the city council within the possibilities of the city budget to cease landslides, the level of landslides danger in Chernivtsi is continually growing. The issues on preventing the city from landslides require a comprehensive solution with government support and involvement of the budgets of all levels.

From 1981 to 1994, about 1.0 million sq m of housing area, social, cultural and industrial facilities were built without implementing seismic measures. Bearing structural elements of these buildings give dangerous cracks at the 3, 4-magnitude earthquakes that are a fairly significant phenomenon in Chernivtsi. City Council Executive Committee itself has no means to financially support fundamental inspections, and provide with necessary documentation to strengthen supporting structures of buildings and fulfillment of seismic preventing measures.

2.2.2 Public transport

Public transport is one of the basic elements of the social infrastructure that meets the needs of residents in urban traffic. Reliable and efficient work of public transport is the most important indicator of socio-political and economic stability of the city.

The transportation of residents in Chernivtsi is held by electric transport (trolleybuses) and car transport of public use.

Passenger flows are characterized by significant daily and seasonal inequality. Especially it can be noticed during the morning (6.45-8.45) and evening (16.30-19.00) rush hours. All areas with the highest passenger flows are interconnected by several trunk roads. All routes of public transport go through these trunk roads.

Currently in Chernivtsi, passenger transportation services are provided by 35 economic entities of different forms of ownership. 340 units of vehicles provide passenger transportation with 8 trolleybus routes and 47 bus routes. 260 buses and 80 trolleybuses are involved daily to transport passangers.

In 2014 55.3 million passengers (74.9% of the total volume) were transported by means of passenger transport, which is 14.7% less comparing to the previous year.

In 2014 31.4 million passengers were transported by public electric transport, which is 56.8% of total traffic. The amount of passenger transportation done by car transport was 24.0 million passengers, or 43.3% of total traffic by all means of transport. This number has decreased by 7.2% as compared to 2013

Electric trasport. Passenger transportation by urban electric transport is carried out by Municipal Enterprise "Chernivtsi trolleybus company", which is the public property of Chernivtsi community and is under control of the Department of Housing Economy of Chernivtsi City Council.

The capacity of depot is 200 trolleybus machines. Inventory park of Municipal Enterprise "Chernivtsi trolleybus bereau" consists of 80 units of rolling stock, including: SKODA-9Tr - 3 units., SKODA-14Tr - 55 units LAZE183D1

(low-deck) - 10 units, LAZ-52522 - 8 units, Volvo - 4 units. The company provides 100% of urban electric transportation at 8 trolleybus routes.

The total length of the contact network of trolleybus routes is 80 km, the length of high-voltage cable lines (10 kV, 0.6 kV) - 76.406 km.

Basic characteristics of enterprise activity are given in table 2.2.3

Table2.2.3

Basic characteristics of
Municipal Enterprise "Chernivtsi trolleybus management" activity
for 2004–2014

Year	Consumption of electric energy kWh	Number of units of rolling stock	Length of the routs (km)	Traffic characteristics		number of accidents (breakage of network)
				total annual mileage	number of passengers (people)	
2008	8582200	87	80,7		38077796	90
2009	10394800	106	80,7		42234088	45
2010	10036000	100	86,8		45251868	122
2011	9377500	95	86,8		46110831	111
2012	9424700	93	86,8		3858008	86

					3	
2013	8963400	89	86,8		3900757 1	97
2014	8228200	80	86,8		3137528 2	84

As table 2.2.3. shows in recent years, compared to that of 2010, there is a tendency to reduction of the number of available electric transport and amount of passenger transportation.

Passenger car transportation on city bus routes of public use. Passenger transportation on city bus routes of public use is provided by 34 economic entities in Chernivtsi (10 legal entities and 24 individual entrepreneurs of different forms of ownership). Passenger transportation is carried out by 260 vehicles at 47 routes. The distribution of routes between business entities is carried out through competitive selection and is approved by the decision of the Executive Committee of the City Council. The order of rendering the services of passenger car transportation on the city bus routes is determined by the terms of agreement between the executive committee of the Chernivtsi City Council and designated business entity (service provider).

Currently, the passenger car transportation on city bus routes of public use is provided by public buses of small class brand "PAZ", "Bohdan", "IVAN", "MAN-LN» (number of seats - from 15 to 22. The total number of seats - 35 to 42) and large buses brands MAN-NL-202 (the number of seats – 38, the total number of seats - 98).

Car transport routes in Chernivtsi mainly coincide with electric transport routes, but in certain cases (power outages, breakage of the power grid, etc.) it ensures the continuity of traffic and passenger transportation.

2.2.3 Power Supply

Electricity is provided by Chernivtsi power system substation «Chernivtsi-Pivnichna" with the voltage of 330/110/35 kV, located at a distance of 35 km. from the city (in the town of Kitsman') through electric two-circle line of 110 kV, which circles the city and consists of 13 substations. Public joint-stock company «Power Supply Company «Chernivtsioblenergo ", established in 1998 on the basis of Chernivtsi regional enterprise of electric networks, provides city residents with electric power supply. Besides Chernivtsi PSA (Private Stockholders Assosiation) PJSC "Chernivtsioblenergo" supplies electricity for the needs of all types consumers in Chernivtsi region. Approximately 47.3% of the total electricity is directly the share of Chernivtsi REM.

There are 72 substations with the voltage of 35-110 kV and 3282 units of transformer substations with the voltage of 10 / 0.4 kV in the balance sheet of the enterprise. The length of overhead lines is 16,675 km, cable lines - 381 km.

2.2.4 Gas Supply

Chernivtsi is provided with natural gas by the gas-main pipeline Kremenchuk-Ananiev-Bohorodchany through AHRS (autonomous gas distribution station), located in the northern suburbs of the city near the village of Shubranets.

Natural gas supply is carried out by the public joint-stock company engaged in gas supply and gasification "Chernivtsihaz" (founded as a result of reorganization of Chernivtsi Regional State enterprise for gas supply and gasification "Chernivtsihaz" into the public joint stock company). The PJSC "Chernivtsihaz" consists of 8 administrations of gas sector that are engaged in similar activity, the branch dealing with the sale of liquefied natural gas to meet the needs of the population and other consumers in the field of liquefied gas (90,668 consumers are currently using liquefied gas).

In 2014 the company supplied natural gas to 23917 consumers in the residential sector, 6 industrial enterprises, 236 housing utility companies and 114

budget institutions. PJSC "Chernivtsihaz" services 1,941.2 km of gas pipelines with different pressure: high pressure - 251.0 km, average pressure - 1,656.4 km, low pressure - 33.8 km. 72 gas distribution stations and 60 cabinet-type gas distribution stations are maintained by the enterprise.

2.2.5 Heat supply

Central heating in Chernivtsi is used by housing, public and industrial facilities, low-rise buildings, located in areas equipped with district heating networks. Detached houses and low-rise buildings, remote from district heating networks are heated by autonomous sources of heat (stoves, home heat generators, etc.).

The production, transportation and central heat supply are provided by Chernivtsi City Municipal Heat Supply Enterprise (further – CMP) “Chernivtsiteplokomunenergo”.

The main sources of heat supply and their locations are shown in Fig. 2.2.1.

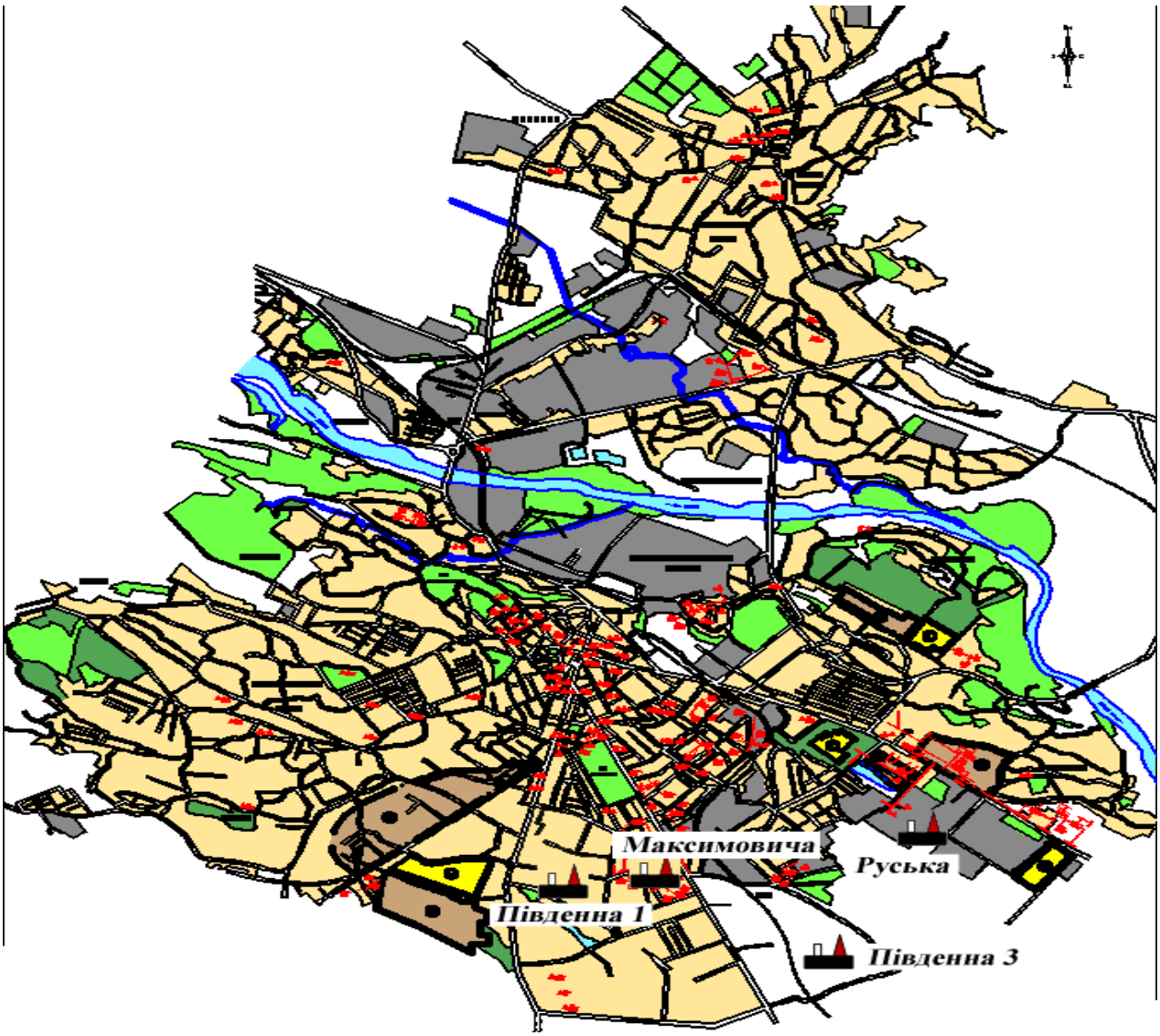


Fig. 2.2.1 The zone of the main sources of heat

Assets of CMP "Chernivtsiteplokomunenergo" comprise 86 boiler rooms, the largest of which - "Pivdenna 1", "Rus'ka", "Pivdenna 3" and "Maksymovycha" (Fig. 2.2.1). Other heat-generating centers are less powerful, but in total terms, they constitute almost 20% of the total heat generating capacity.

Almost all heat-generating centers of heat production make use of natural gas from city gas networks of medium and low pressure. It should also be noted that all sources of large unit capacity are located in the southern part of the city.

Table 2.2.4

The structure of the heating loads of CMP "Chernivtsiteplokomunenergo"

№ s/n	**Object**	**Temperature graph**	**Thermal power, Gcal / hour (MW)**	**The associated heat load, Gcal / hour (MW)**	**Work load%**
1	Pivdenna 1	130–70°C 95*-70°C	102 (118,6) 170** (197,7)	67,33 (78,3)	66
2	Rus'ka	130–70°C 95*-70°C	83,5 (97,1) 125,2** (145,6)	25,35 (29,48)	30
3	Pivdenna 3	130–70°C 95*-70°C	83,5 (97,1) 125,2** (145,6)	53,39 (62,1)	64
4	Maksymovych	115–70°C 95*-70°C	19,5 (22,7)	16,59 (19,29)	85
5	Uzbets'ka	95–70°C	7,5 (8,7)	4,03 (4,69)	54
6	The rest of the district boiler (37)	95–70°C	97,5 (113,4)	27,13 (31,55)	28

7	Local boiler (44)	95–70°C	21,8 (25,4)	11,57 (13,46)	53
	All sectors		566,7 (659,02)	204,4 (238,9)	49

* Temperature schedule of the quarterly networks

** Installed capacity with consideration of the preserved boilers.

As Table 2.2.4 demonstrates, the city faces a significant excess of the operating heating capacity. Only the large boiler house in Maksymovych Street is sufficiently loaded, and the least loaded boiler house is represented by the one on Rus'ka str (30%). Services for central hot water supply are not available in Chernivtsi, which also affected the formation of significant excess of heat capacity.

The efficiency of heat energy production. Main technical performance of the district heating is shown in table 2.2.5.

Table 2.2.5

Main technical performance of CMP "Chernivtsiteplokomunenergo" in 2008-2013.

№ п/п	**Heat supply organization**	**Year**					
		2008	**2009**	**2010**	**2011**	**2012**	**2013**
	The length of heating networks, km	100.3	98.4	98.4	98.4	98.4	98.4
	Area subscribers sq.m.	2935.9	2738.7	2835.6			
	The usage of gas, thousand cubic meters.	41977.3	47800.3	56053.5	52145,8	54362,9	50267,7

	The volume of heat energy Gcal						
	produced	87625,98	99945,4	115857,5	114762,0	119116,3	114194,7
	sold	295999	338334	394109			
	released	269820	308929	356534			
	Electricity consumption, ths. KW • h	10650	12256	13910	13534	12472	12533
	Water consumption, cbm						
	system filling	14405	14383	14133			
	Additional supplies	259280	234479	160191			

The efficiency of the district heating organizations is evaluated by specific fuel consumption for heat production (mal.2.2.2) and specific electric power consumption for technological needs (mal.2.2.3). The level of energy used for personal needs and heat energy losses is to acknowledged as an important indicator here.

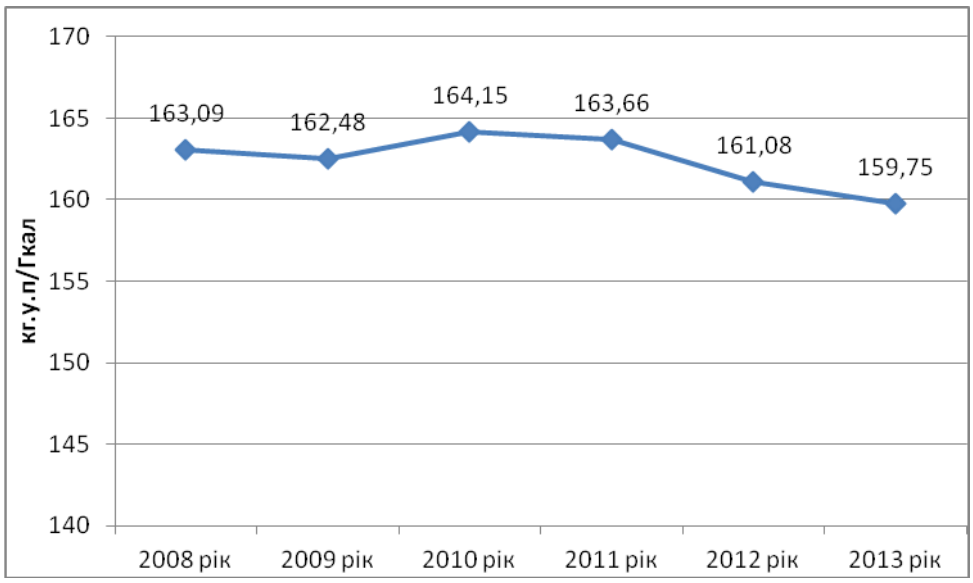


Fig. 2.2.2. The cost of gas (in KgCE) for production of 1 Gcal of heat energy

The index of natural gas unit cost (in kg of oil equivalent) to produce 1 Gcal of heat in Chernivtsi in recent years has remained virtually unchanged (Fig.2.2.2) at the level of 160 kg / ce / Gcal (mean figure for Ukraine is 169 kh.u.p. / Gcal) that fixes the efficiency of the boiler equipment at the level of 89.3%.

Heat energy loss in networks is also acceptable (Fig.2.2.3) - within 12% of the total amount of heat.

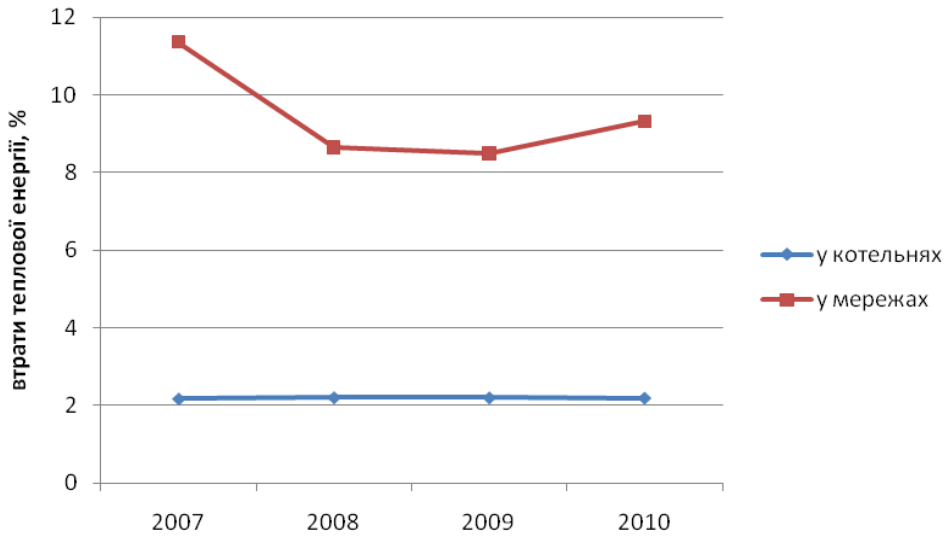


Fig. 2.2.3. The volume of heat energy wastage in heating systems

The volume of coolant leakage from the system decreases every year (Fig. 2.2.4.).

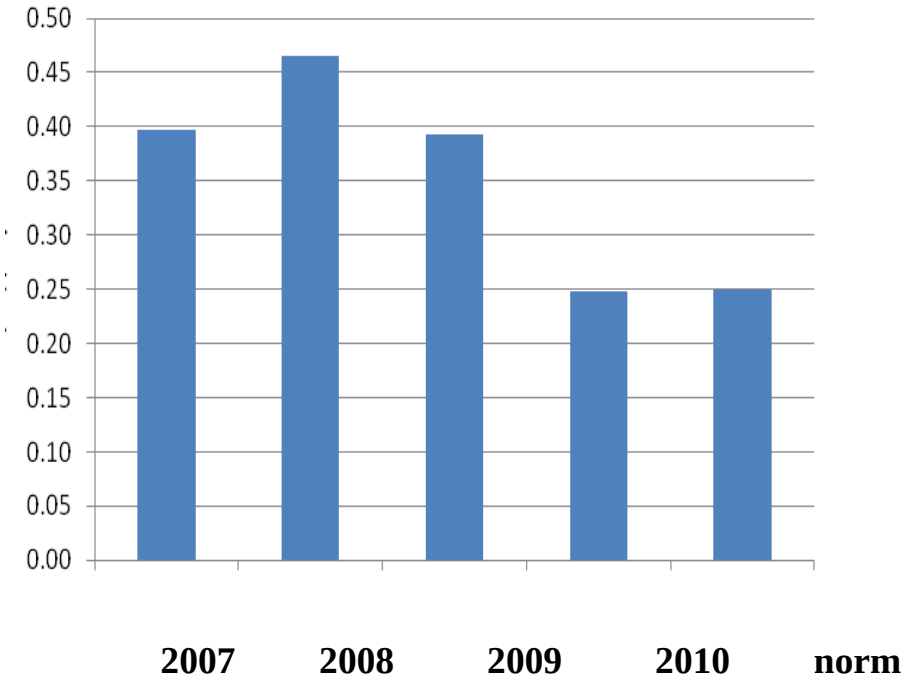


Fig. 2.2.4. The volume of coolant leakage from the system

In 2013, the leakage was 0.249% / hour, corresponding normative value of 0.25% / hour. However, in spite of systematic work to reduce the amount of coolant leakage and of positive results, currently the amount of coolant leakage from the system substantially exceeds the European figures.

In addition, in the production of heat energy by "Chernivtsiteplokomunenergo" consumption exceeds twice as much the recommended parameters (for high power sources the marginal cost of electricity is set at the level of 18 kW • h / Gcal, for low power sources – at 20 kW • h / Hkal1) (Fig. 2.2.5).

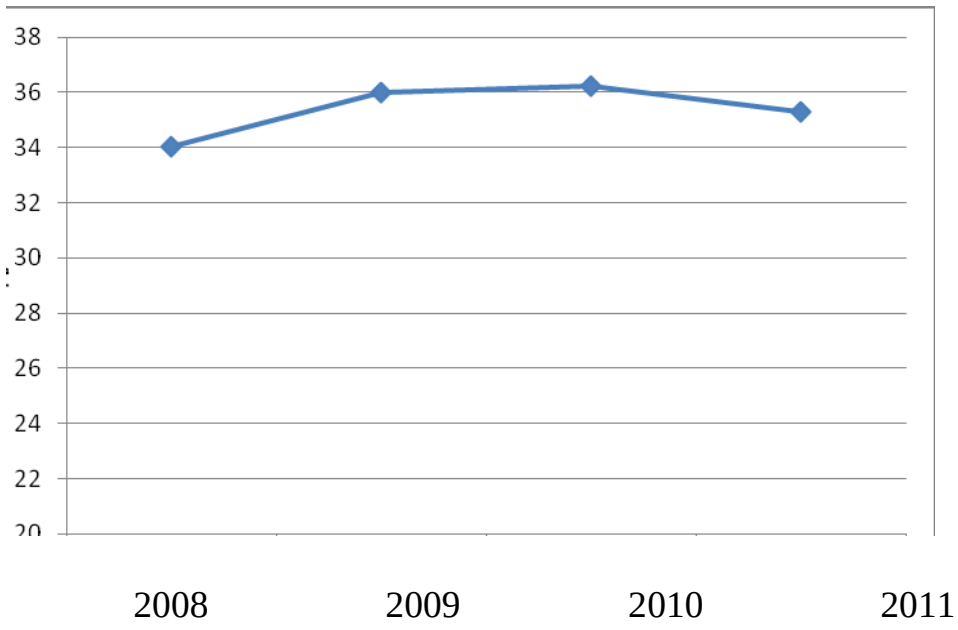


Fig. 2.2.5 Electrical energy costs to transport 1 Gcal of heat energy

The disadvantage of the heating systems of "Chernivtsiteplokomunenergo" is the lack of heat consumption, and, therefore, production regulation systems, what prevents from rational and saving using of heat and leads to significant cost overruns of energy. Also, it should be added that most of the heat-generating equipment and heating systems have been operating for over 40 years, which twice as much exceeds the nominal technical resource of equipment.

2.2.6 Water Supply and Sewage

The services of water supply and sewage in the city of Chernivtsi are provided by the municipal company „ChernivtsiVodokanal" (water supply and sewage company), the monopolist in the aforesaid sphere on the local market.

The main source of drinking water supply is the surface water intake (78%), built in 1981 on the Dniester river near the village of Mytkiv, Zastavna District. Several underground water intakes (22%) are included into the centralized water supply system of the city apart from the Dniester water intake, which is regarded as the main one.

The dynamics of water consumption volumes by different categories of consumers is represented in Table. 2.2.6

Table 2.2.6

Water sales rates among the consumers of the city of Chernivtsi in 2008-2013

(thousand cubic meters)

Calendar year

Consumer Category	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Budgetary institutions	956,7	831,6	802,0	750,7	757,2	675,1
Population	7725,0	7164,3	6804,3	6811,1	6748,9	6817,2
Other consumers	1678,8	1476,3	1497,3	1362,7	1311,4	1361,1
Total	**10360,6**	**9472,2**	**9103,7**	**8924,5**	**8817,5**	**8853,5**

As it is shown in Fig. 2.2.6, the bulk of water is spent on the needs of population (77% of total consumption), the lowest share (8%) drops to the budgetary institutions.

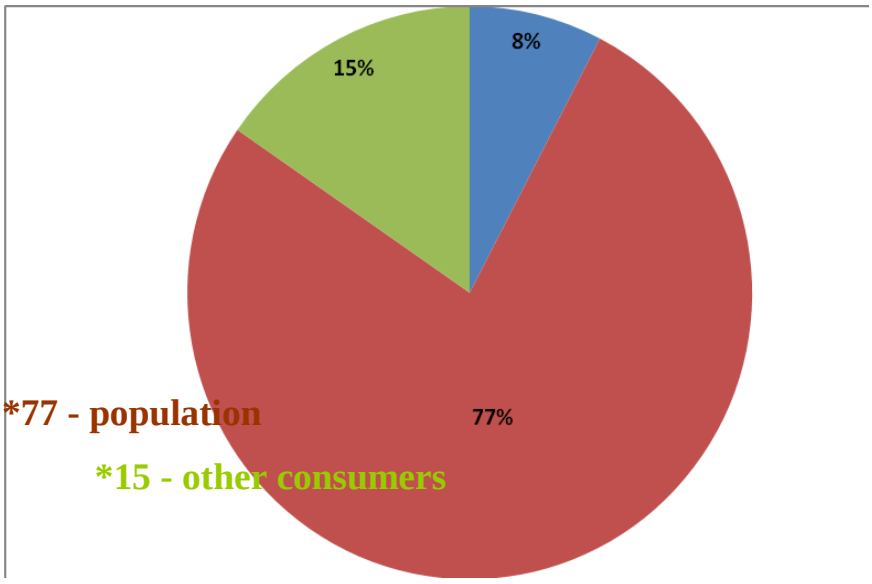


Fig. 2.2.6. Water consumption distribution among different categories of consumers

The main indices characterizing the performance of the municipal company „ChernivtsiVodokanal" (water supply and sewage company) are represented in Table. 2.2.7.

The electric power inputs on water delivery to the city consumers are insignificant due to the water being supplied to some of the highest points of the city (these electric power inputs are granted the category "water delivery"), wherefrom the water is supplied by gravity.

The amount of water supply to the population has been constantly decreasing in recent years. Together with the total supply decrease, the average amount of water expenditures per 1 person are reducing (see Fig. 2.2.7). Today they are equal to 105.3 liters per day per person, which is considerably lower compared with the same index in many European countries.

Table 2.2.7

„ChernivtsiVodokanal" (water utility company) performance indices in 2004-2013

Index	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Water lifting thousand cubic metres	29628	29676	31471	32298	31338	27815
Network water supply thousand cubic metres	23062	21234	24135	23190	22514	23409
Water sales rates	12434	11434	11905	9224	9142	9176

thousand cubic metres						

Technical electric power expenditures ths. kW / h	44743	42157	38456	37437,9	37209,8	30887,2
Delivery	44148,8	41580,3	37962,8	36903,8	36792	30308,5
Distribution	594,5	576,6	493,8	534,1	417,8	578,7
Number of accidents, unity	2226	2591	2909	2579	2848	1799

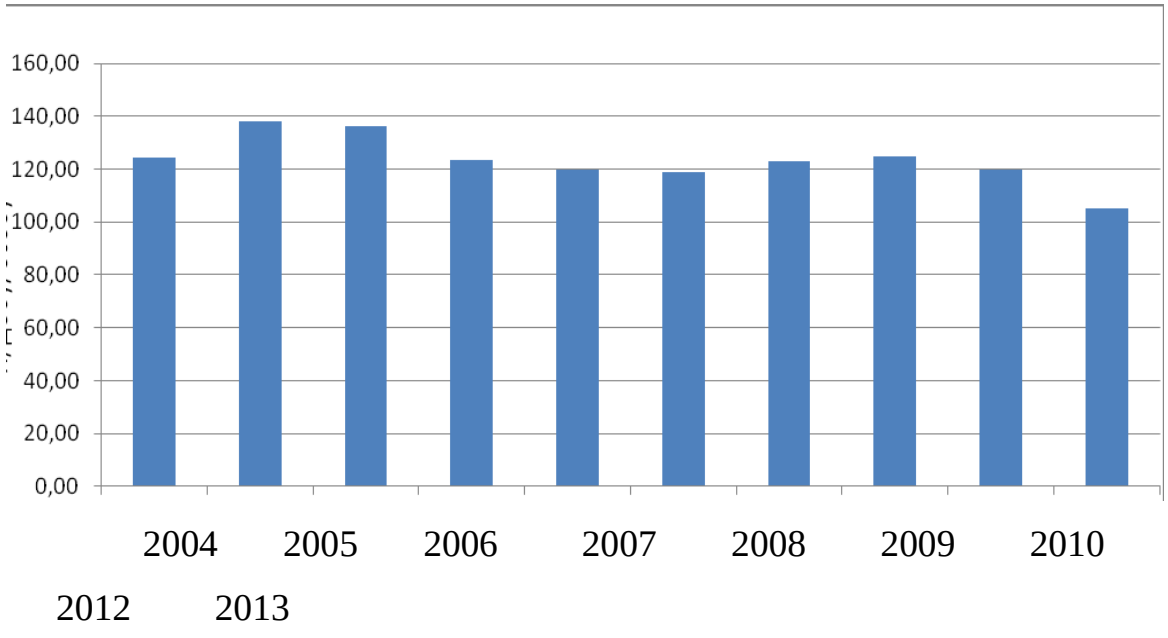


Fig. 2.2.7 Daily average water expenditures per person

Concurrently, the electric power expenditures on water transportation have been practically unchanged determining the constant growth of the level of specific

electric power expenditures on water transportation, although a positive tendency to their decrease is observed (see Fig. 2.2.8).

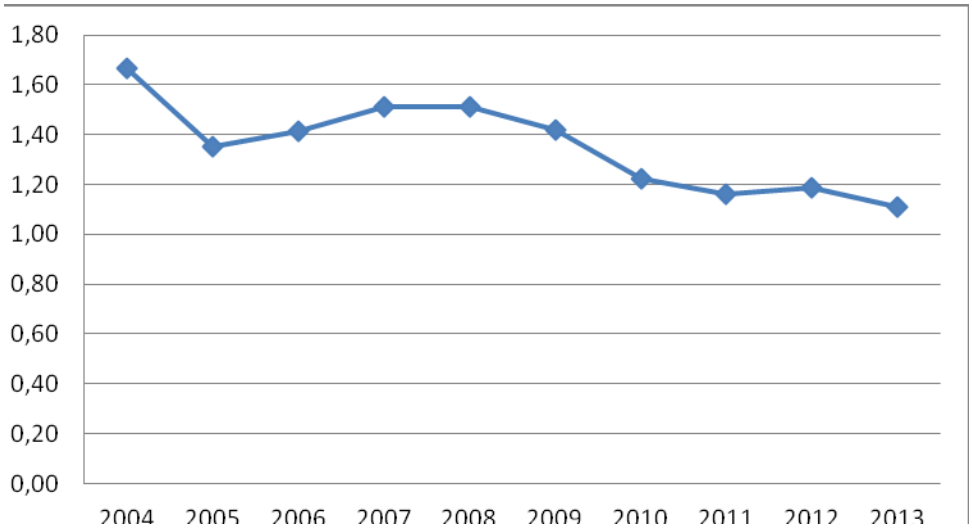


Fig. 2.2.8 Specific electric power expenditures on water transportation

Another factor affecting the results of financial and business operations of the municipal company „ChernivtsiVodokanal" (water supply and sewage company) is considerable water leakage from the network (see Fig. 2.2.9). The leakage might be caused by the imperfect system of the registration of aquifer flows.

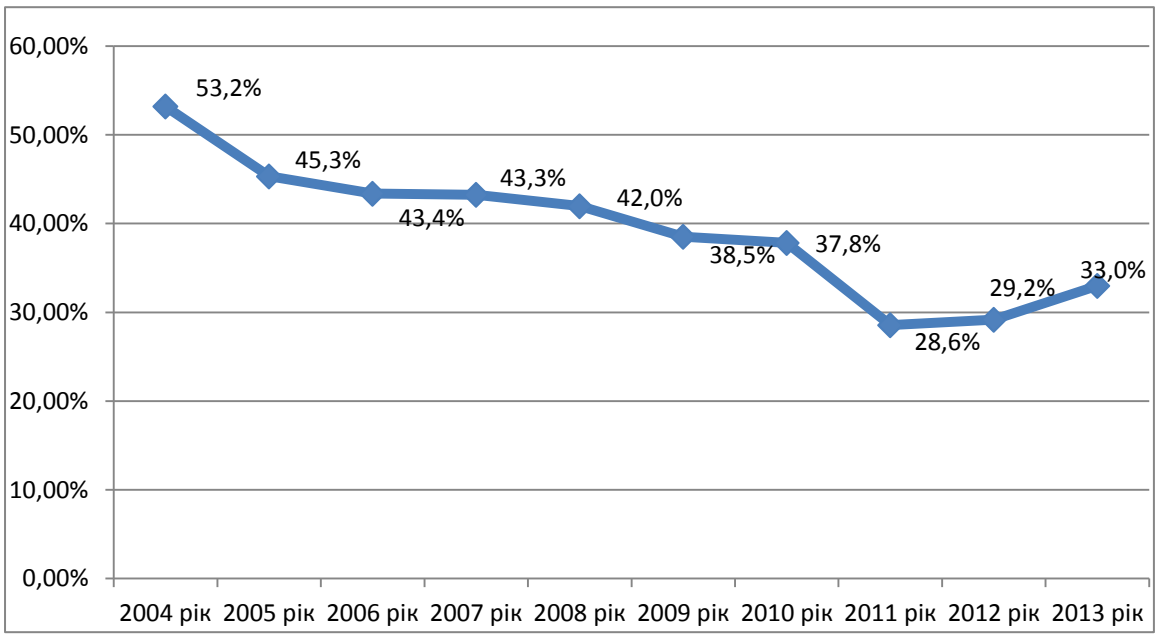


Fig. 2.2.9 Leakages from water supply network

2.3 Cadastre and Major Sources of CO_2 Emissions in Chernivtsi

The essential inventory of emissions determines the amount of CO2carbon dioxide that is released into the atmosphere as a result of energy consumption in the city in the base year. It allows to identify the principal anthropogenic sources of carbon dioxide emissions and therefore to develop special measures aimed at the emissions reduction. The essential inventory of emissions is an instrument that enables municipal authority to evaluate the changes in carbon dioxide emission volumes quantitatively. This is implemented by means of the offered measures, directed at the reduction of the volume of emissions and improvement of the situation in the city.

To determine the base year and to calculate the essential inventory of carbon dioxide emissions, the consumption of energy resources in Chernivtsi within 2008-2013 has been analyzed.

The year of 2010 was chosen as the base year for the evaluation of the current level of carbon dioxide emissions for the city of Chernivtsi. This choice is explained by the availability of full and reliable information for the given year on the numbers of consumption volume indices of all the types of the sources of

energy and relative stabilization of the economic situation in the city after the world economic crisis of 2008.

To calculate the essential inventory of emissions, the database of the indices of the main types of the sources of energy consumption was formed. The database includes the most important sources of carbon dioxide emission from different types of activities in Chernivtsi in 2008-2013 in the following sectors:

- **the housing sector, the sector of municipal buildings, equipment/objects (the budget sphere) –** including emissions from burning the natural gas, consumption of electric and heat power from the centralized system of heat supply in the buildings mentioned;
- **public transport –** including emissions from fuel consumption by the municipal road transport used for passenger transportation services, namely public utility en-route buses (grounding on the evidence presented by the Transport, Connection and Energy Department of the Public Utility Sector of the City Council about fuel consumption by municipal public road transport) and electric power consumption by municipal electric transport (consumption volumes of the electric power by municipal electric transport are defined on the basis of the data presented by "Chernivtsi Trolleybus Transportation Board");
- **the municipal system of street illumination –** including emissions from electric power consumption for the demands of municipal illumination (based on the data presented by the state utility "Mis'ksvitlo", the municipal electricity company);
- **industry (municipal enterprises)** – including emissions from the sources of energy consumption (electric power, natural gas) used to produce heat energy and water supply (based on the data presented by the Municipal heat and energy supply company (Teplocomunenergo) and Water utility company (Vodokanal)).

The dynamics of power resources consumption in 2008-2013 in physical measurement is presented in table 2.3.1

Table 2.3.1

Energy resources consumption in 2008-2013

№	Sectors included in EIE[1]	2008	2009	2010	2011	2012	2013
1. Municipal buildings, equipment/objects							
1.1	Natural gas, thousands m³	3 399,70	2 506,70	1 336,60	1 093,00	1 165,80	1 178,20
1.2	Electric power, MW*h	17 623,00	16 312,00	16 604,00	16 525,00	16 608,00	17 096,00
1.3	Heat power, Gcal	17 210,35	17 769,60	20 925,45	20 960,14	21 618,97	21 611,84
2. Housing							
2.1	Natural gas, thousands m³	105 949,50	109 236,80	107 939,60	100 667,80	104 581,70	100 373,70
2.2	Electric power, MW*h	167 334,00	184 049,00	186 057,00	175 210,00	184 740,00	191 965,00
2.3	Heat power, Gcal	41 262,23	52 593,11	61 225,80	61 967,36	65 490,97	62 332,24
3. Municipal street illunimation							
3.1	Electric power, MW*h	6 191,00	6 071,00	6 746,00	6 578,00	6 745,00	6 584,00
4. Transport							
4.1	Electric power, MW*h	9 850,00	10 367,00	10 421,00	9 314,00	9 391,00	8 932,00
4.2	Liquefied petroleum gas, thousands L	0,00	0,00	0,00	0,00	0,00	0,00
4.3	Diesel fuel, thousands L	3 790,00	3 828,00	4 049,00	4 017,00	4 365,00	4 504,00

[1] EIE – essential inventory of emissions

5. Industries (municipal enterprises)							
5.1	Natural gas, thousands m³	945,74	1 074,99	1 260,17	1 181,17	1 229,04	1 124,47
5.2	Electric power, MW*h	62 588,00	61 237,00	59 400,00	57 921,00	56 590,10	50 435,80

To determine the amount of carbon dioxide emissions for the energy resources consumed (see table 2.3.1.), the consumption amount of all types of energy resources with the common unit of measurement (MW*h) have been recalculated using the following coefficient:

Energy resourse type	**Conversion coefficient**
Natural gas	9,77MW*h/1000 m³
Liquefied petroleum gas	12,30MW*h/t
Diesel fuel	10 kW*h/L
Wood	3,484 MW/t

The recalculation of heat power in Gcal into the equivalent volume of heat power in MW*h was carried out basing on the data on natural gas and electrical power costs to produce 1 Gcal of heat power. The data were given by the Municipal heat and energy supply company (Teplocomunenergo) for each year from 2008 to 2013. Accordingly, in 2010 the costs needed to produce 1 Gkal of heat power were equal to 142,43 m³ of natural gas and 35,3 kW*h of electrical energy.

The dynamins of energy resources consumption in 2008-2013 is represented in Table 2.3.2

Table 2.3.2

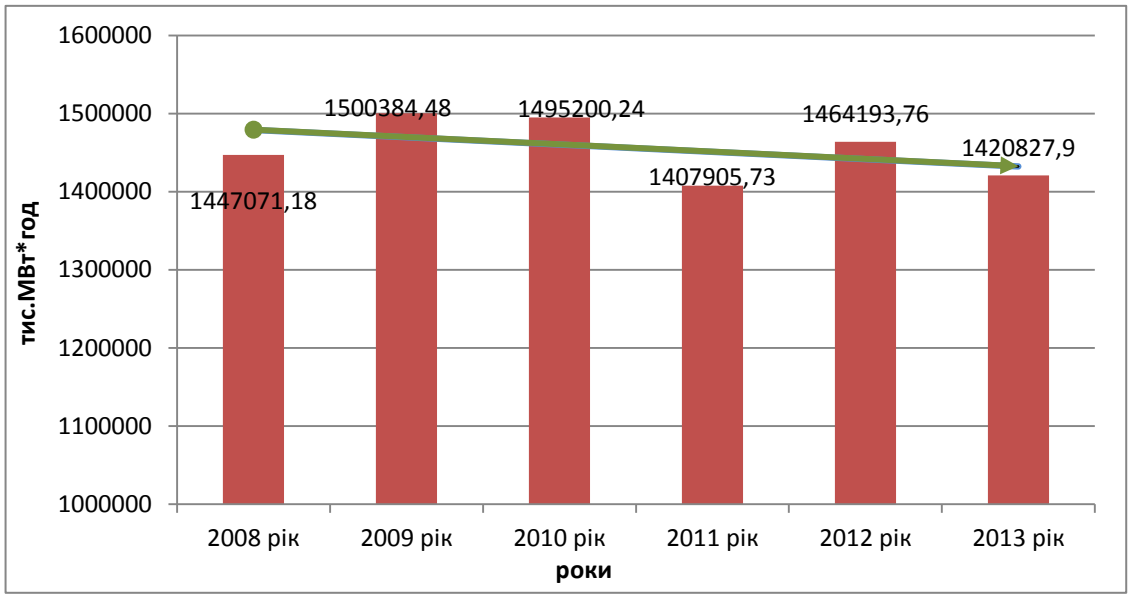
Energy resources consumption in 2008-2013 (MW*h)

№	Sectors	2008	2009	2010	2011	2012	2013

	included in EIE						
1. Municipal buildings, equipment/objects							
1.1	Natural gas	33215,07	24490,46	13058,58	10678,61	11389,87	11511,01
1.2	Electric power	17623,00	16312,00	16604,00	16525,00	16608,00	17096,00
1.3	Heat power	20015,64	20666,04	24336,30	24376,64	25142,86	25134,57
	Total	**70853,71**	**61468,50**	**53998,88**	**51580,25**	**53140,73**	**53741,58**
2. Housing							
2.1	Natural gas	1035126,62	1067243,54	1054569,89	983524,41	1021763,21	980651,05
2.2	Electric power	167334,00	184049,00	186057,00	175210,00	184740,00	191965,00
2.3	Heat power	47987,97	61165,79	71205,61	72068,04	76166,00	72492,40
	Total	**1250448,59**	**1312458,32**	**1311832,50**	**1230802,45**	**1282669,21**	**1245108,44**
3. Municipal street illunimation							
3.1	Electric power	6191,00	6071,00	6746,00	6578,00	6745,00	6584,00
	Total	**6191,00**	**6071,00**	**6746,00**	**6578,00**	**6745,00**	**6584,00**
4. Transport							
4.1	Electric power	9850,00	10367,00	10421,00	9314,00	9391,00	8932,00
4.2	Liquidpetroleumgas	0,00	0,00	0,00	0,00	0,00	0,00
4.3	Diesel fuel	37900,0	38280,0	40490,0	40170,0	43650,0	45040,0

		0	0	0	0	0	0
	Total	**47750,00**	**48647,00**	**50911,00**	**49484,00**	**53041,00**	**53972,00**
5. Industries (municipal enterprises)							
5.1	Natural gas	9239,88	10502,65	12311,86	11540,03	12007,72	10986,07
5.2	Electric power	62588,00	61237,00	59400,00	57921,00	56590,10	50435,80
	Total	**71827,88**	**71739,65**	**71711,86**	**69461,03**	**68597,82**	**61421,87**
	Sum total of all sectors	**1447071,17**	**1500384,48**	**1495200,24**	**1407905,73**	**1464193,76**	**1420827,90**

For the dynamics of energy resources consumption in the sectors selected for the calculation of the essential inventory of emissions in the city of Chernivtsi see Fig. 2.3.1.



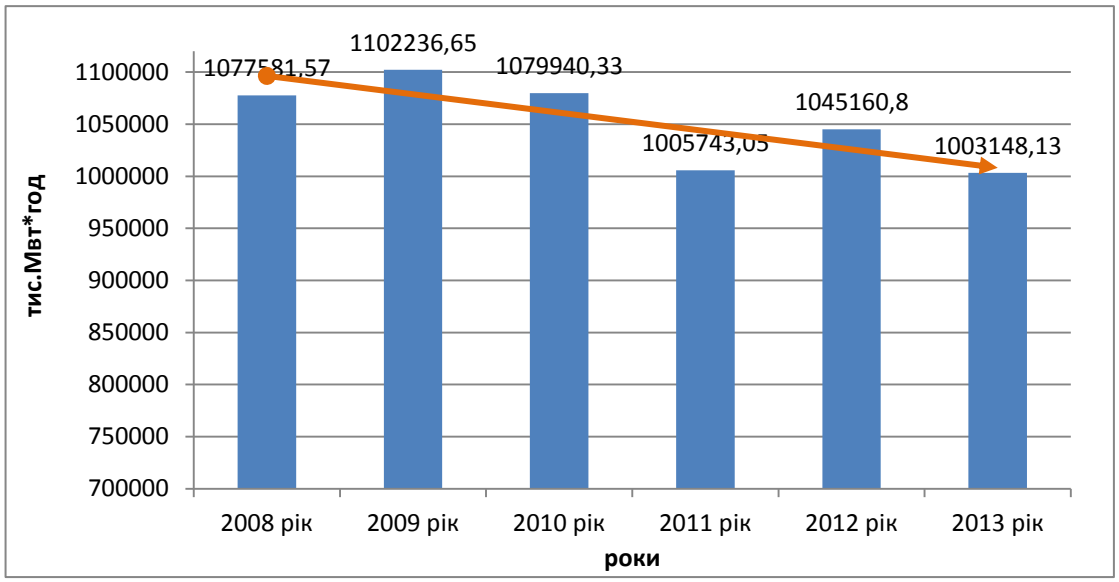
↑ thousand MW*h

→years

Figure 2.3.1. The dynamics of energy resources consumption in Chernivtsi in

2008-2013 in general numbers, thousand MW*h

For the dynamics of gas consumption in residential buildings, municipal institutions and for the internal industrial use beyond state utilities see Fig. 2.3.2.

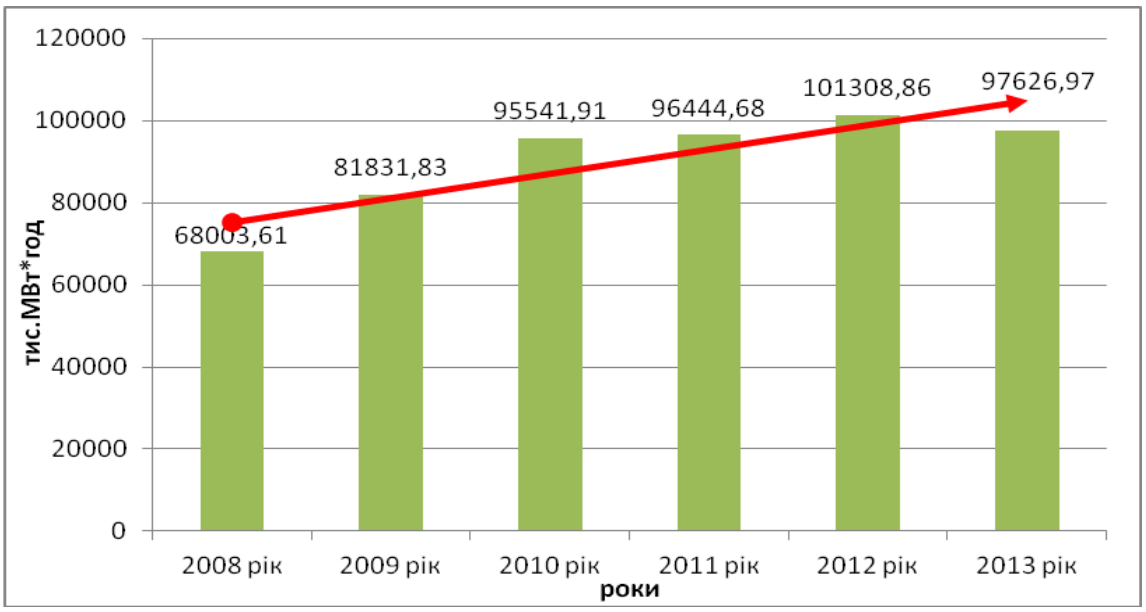


↑ thousand MW*h

→ years

Figure 2.3.2. Dynamics of natural gas consumption in Chernivtsi in 2008-2013 (thousand MW*h)

When analyzing the dynamics of gas consumption in Chernivtsi, it should be noted that a positive tendency to decrease is observed, first of all in the municipal sector. The reason for such situation is the establishment of the constant monitoring of the energy resources consumption and in particular the natural gas consumption in the public buildings of communal ownership in Chernivtsi. The dynamics of natural gas consumption (Fig 2.3.2), has a reverse tendency to gradual growth of consumption volumes of the centralized heat.



↑ thousand MW*h

→years

Figure 2.3.3. The dynamics of heat power consumption in Chernivtsi in 2008-2013 (thousand MW*h)

In 2011 the consumption of electric power in the city was reduced. When analyzing the reasons for such decrease, it should be noted that it took place owing to the housing sector. To a greater extent, it is connected with the temperature conditions and therefore the reduction in the use of the electric appliances for heating .

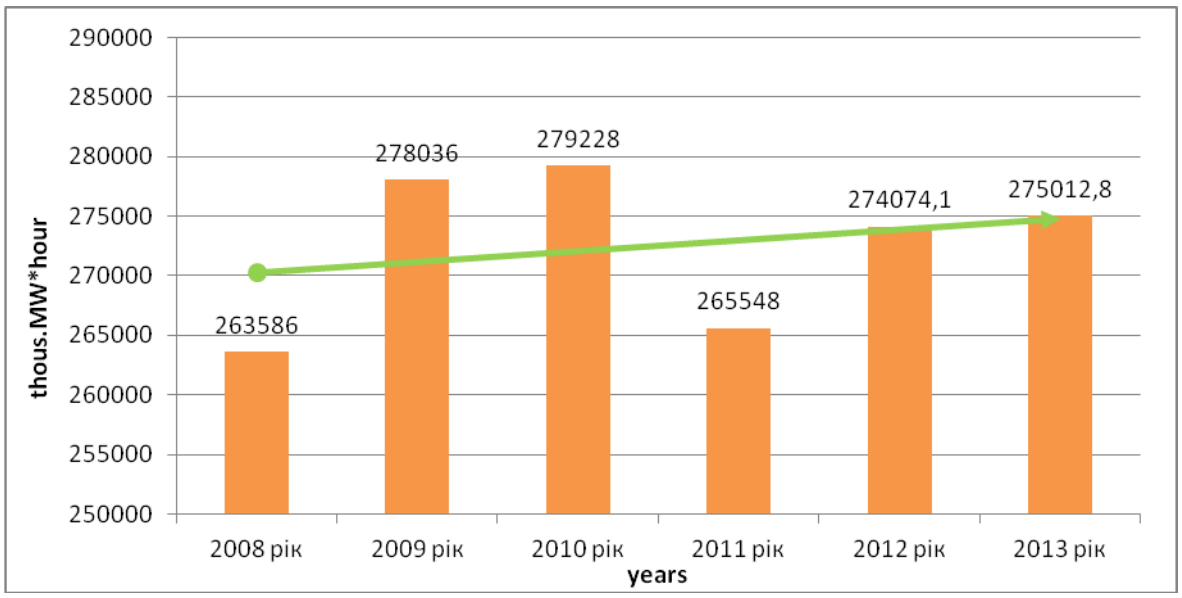


Figure 2.3.4 The dynamics of electric power consumption in Chernivtsi in 2008-2013 (thousand MW * h)

The consumption of liquid petroleum gas and diesel fuel by public transport in Chernivtsi has a gradual tendency to increase, as during the years 2008-2013 the amount of passenger transportation and the number of public transport vehicles have increased. Such tendency will be observed due to the expansion of the city boundaries (Fig 2.3.5).

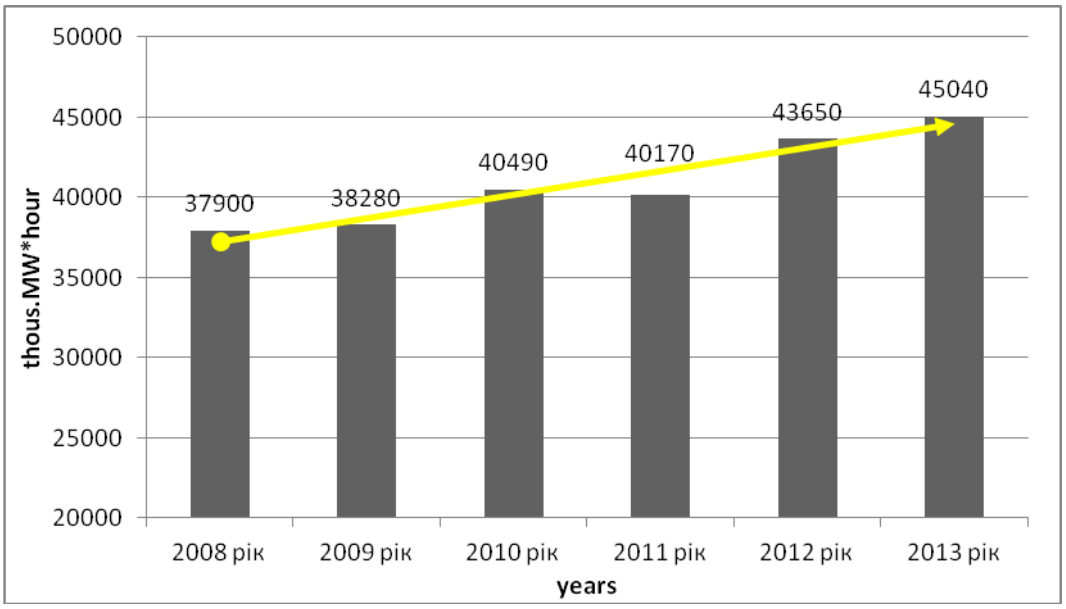


Figure 2.3.5. The dynamics of liquefied petroleum gas and diesel fuel consumption by public transport in Chernivtsi in 2008-2013 (thousand MW * h)

Based on the data on the main energy resources consumed with the common unit of measurement (MW*h), the amount of carbon dioxide emissions in 2008-2013 has been recalculated (Fig 2.3.3).

The coefficients used in the calculation of the essential inventory of emissions

Energy resourse type **Coefficient of carbon dioxide emissions**

(t/MW * h)

Natural gas ..... ……0,202

Liquefied petroleum gas ..... …….0,227

Diesel fuel ..... ……..0,267

Electric power…….....0,880 (in 2010)

Wood..... ……..0,007

To calculate carbon dioxide emissions in electric power consumption in 2008-2013, the coefficients according to Table 5 in the manual "How to Develop a Sustainable Energy Action Plan", part II.

Table 2.3.3

The amount of carbon dioxide emissions in 2008-2013

№	**Sectors included in EIE**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
1. Municipal buildings, equipment/objects							
1.1	Natural gas	6709,44	4947,07	2637,83	2157,08	2300,75	2325,22
1.2	Electric power	16283,65	15186,47	14611,52	14855,98	15146,50	15591,55
1.	Heat	5391,85	5558,13	6547,27	6582,39	6608,82	6606,83

3	power						
Total		**28384,94**	**25691,67**	**23796,62**	**23595,45**	**24056,06**	**24523,60**
2. Housing							
2.1	Natural gas	209095,58	215583,19	213023,12	198671,93	206396,17	198091,51
2.2	Electric power	154616,62	171349,62	163730,16	157513,79	168482,88	175072,08
2.3	Heat power	12927,08	16450,53	19156,67	19460,44	20020,27	19055,21
Total		**376639,27**	**403383,34**	**395909,94**	**375646,16**	**394899,32**	**392218,81**
3. Municipal street illumination							
3.1	Electric power	5720,48	5652,10	5936,48	5913,62	6151,44	6004,61
Total		**5720,48**	**5652,10**	**5936,48**	**5913,62**	**6151,44**	**6004,61**
4. Public transport							
4.1	Electric power	9101,40	9651,68	9170,48	8373,29	8564,59	8145,98
4.2	Liquid petroleum gas	0,00	0,00	0,00	0,00	0,00	0,00
4.	Diesel fuel	10119,3	10220,7	10810,8	10725,3	11654,5	12025,6

3		0	6	3	9	5	8
Total		**19220,70**	**19872,44**	**19981,31**	**19098,68**	**20219,14**	**20171,66**
5. Industries (municipal enterprises)							
5.1	Natural gas	1866,46	2121,54	2487,00	2331,09	2425,56	2219,19
5.2	Electric power	57831,31	57011,65	52272,00	52070,98	51610,17	45997,45
Total		**59697,77**	**59133,18**	**54759,00**	**54402,07**	**54035,73**	**48216,64**
	Sum total of all sectors	**489663,16**	**513732,74**	**500383,35**	**478655,97**	**499361,70**	**491135,32**

The distribution of the amount of carbon dioxide emissions in 2010 (see Fig. 2.3.6).

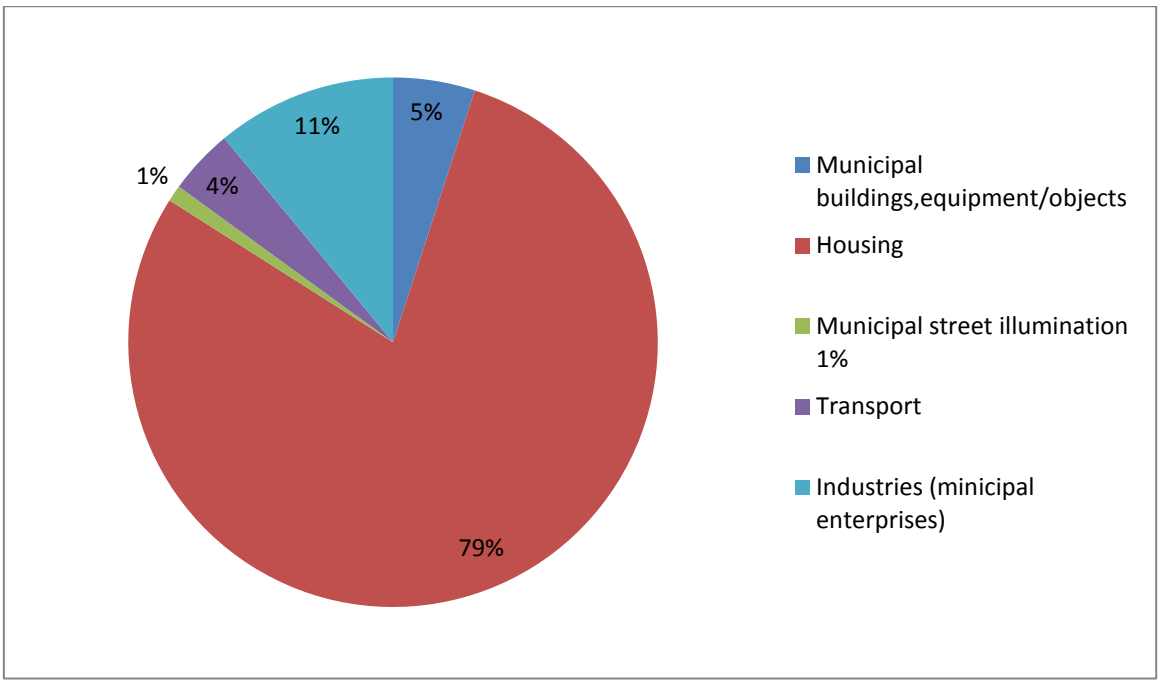


Figure 2.3.6. Specific gravity of the amount of carbon dioxide emissions in 2010

The analysis of the specific gravity of the amount of carbon dioxide emissions in the essential sectors determines that the amount of carbon dioxide that is released into the atmosphere drops to the housing, municipal buildings and industries (municipal enterprises)(Fig. 2.3.6).

However, the biggest part of the amount of carbon dioxide emissions that is released into the atmosphere includes the heat supply in the buildings. The reason of such a tendency is the growth in the construction of buildings and the efficiency of buildings to conserve energy.

The disposition of the amount of carbon dioxide emissions depending on the energy source in 2010 is represented in Figure 2.3.7.

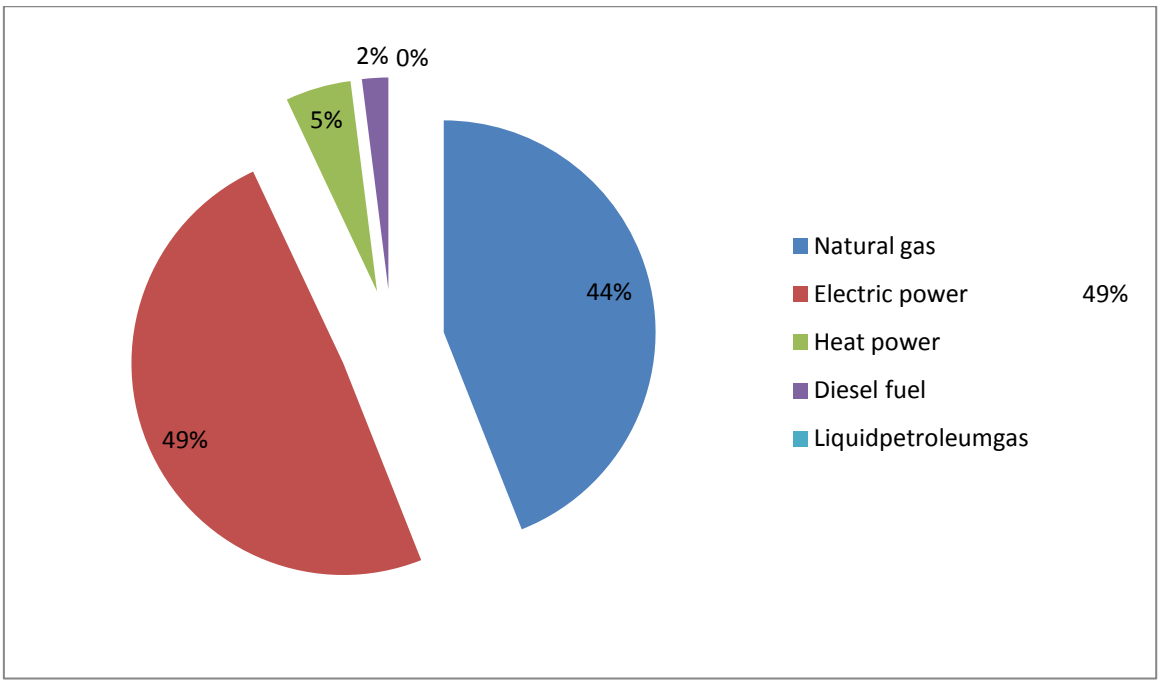


Fig. 2.3.7. The distribution of the volumes of carbon dioxide emissions depending on the energy source in 2010

When analyzing the volumes of carbon dioxide emissions depending on the energy source in 2010 (Fig. 2.3.7.), it is obvious , that the natural gas, electric power and heat power consumption produce most of the amount of carbon dioxide emissions. The total amount of the carbon dioxide emissions in 2010 is **500383,35 tons.** The population of Chernivtsi in 2010 was 255794 people. 1,96 ton/per capita was the specific gravity of carbon dioxide emissions per one person in 2010 (Fig. 2.3.8.)

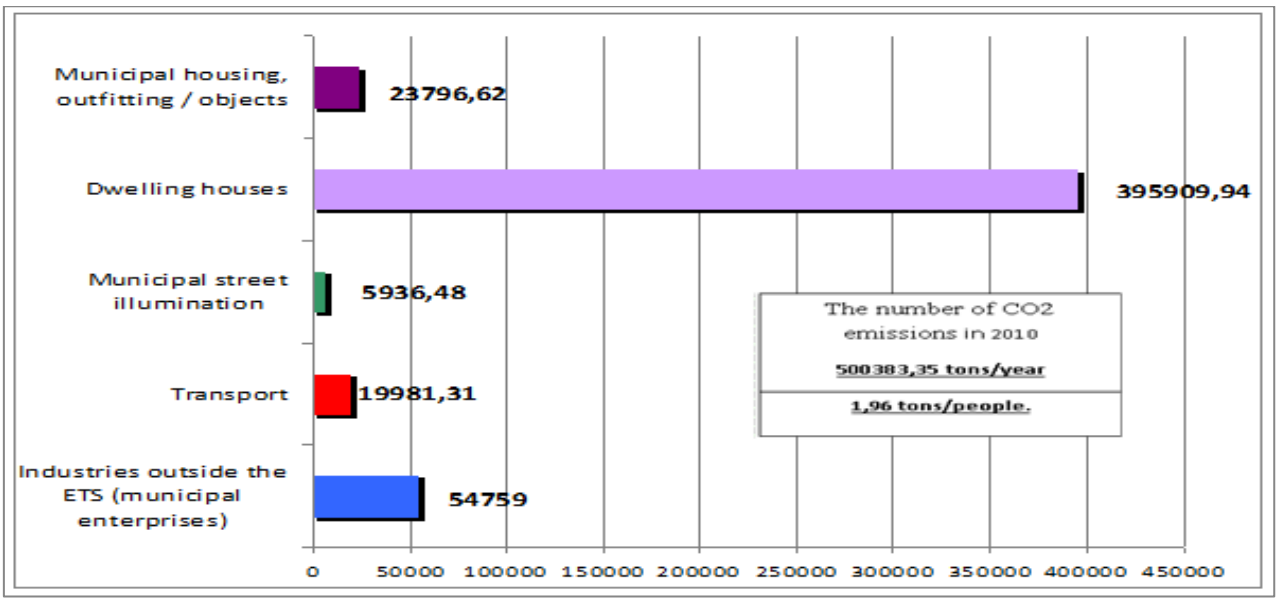


Fig. 2.3.8.The volumes of carbon dioxide emissions in Chernivtsi in a range of sectors in 2010

The total amount of essential energy resources consumption and the inventory of emissions in Chernivtsi in 2010 are represented in the table 2.3.6 and 2.3.7.

The End-use Conversion of the Essential Energy Resources in Chernivtsi in 2010

Category	The end-use conversion of energy**[MWh]**						
	Electric Power	**Heat power / Cold**	**Fossil fuels**				
			Natural gas	Liquefied petroleum gas	**Communal fuel (fuel oil)**	**Diesel**	**Petrol**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
BUILDINGS, EQUIPMENT AND INDUSTRIAL ENTERPRISES							
Municipal buildings,	16604,00	24336,30	13058,58	0,00	0,00	0,00	0,00

equipment / objects							
Buildings	186057,00	710205,61	1054569,89	0,00	0,00	0,00	0,00
Municipal street illumination	6746,0	0,00	0,00	0,00	0,00	0,00	0,00
Industries (MUNICIPAL ENTERPRISES)	59400	0,00	12311,86	0,00	0,00	0,00	0,00
Buildings, equipment / facilities and industry	268807,00	95541,91	1079940,00	0,00	0,00	0,00	0,00
TRANSPORT:							
Municipal car park	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Public transport	10421,00	0,00	0,00	0,00	0,00	40490,00	0,00
Transport index	10421,00	0,00	0,00	0,00	0,00	40490,00	0,00
Total	279228,00	95541,91	1079940,00	0,00	0,00	40490,00	0,00

Table 2.3.6 (Cntd)

The End-use Conversion of the Essential Energy Resources in Chernivtsi in 2010

The end-use conversion of the essential energy **[MWh]**								
Fossil fuels			**Renewable energy sources**					
Lignite	**Coal**	**Other fossil fuels**	**Biofuel**	**Vegetable oils**	**Other biomass**	**Solar thermal**	**Geothermal**	**All sectors**
9	**10**	**11**	**12**	**13**	**14**	**14**	**16**	**17**
0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	40940,3
0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	1311832,5
0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	6746,0
0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	71711,86

0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	1431230,66
0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	50911
0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	1482141,66

Table 2.3.7

The Essential Inventory of Emissions in Chernivtsi in 2010

Category	Carbon dioxide emissions [t] / equivalent carbon dioxide emissions [t]						
	Electricity	Heat power / Cold	Fossil fuels				
			Natural gas	Liquefied petroleum gas	Communal fuel (fuel oil)	Diesel	Petrol
1	2	3	4	5	6	7	8
BUILDINGS, EQUIPMENT AND INDUSTRIAL ENTERPRISES							
Municipal buildings, equipment / objects	14611,52	6547,27	2637,83	0,00	0,00	0,00	0,00

Buildings	163730,16	19156,67	213023,12	0,00	0,00	0,00	0,00
Municipal street illumination l	5936,48	0,00	0,00	0,00	0,00	0,00	0,00
Industries (MUNICIPAL ENTERPRISES)	52272,00	0,00	2487,00	0,00	0,00	0,00	0,00
Buildings equipment / facilities and industry	236550,16	25703,94	218147,95	0,00	0,00	0,00	0,00
TRANSPORT:							
Municipal car park	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Public transport	9170,48	0,00	0,00	0,00	0,00	10810,83	0,00

transport index	9170,48	0	0	0	0	10810,83	0
All sectors	245720,64	25703,94	218147,95	0	0	10810,83	0
equivalent carbon dioxide emissions [t / MWh]	0,88	0,219	0,202	0,227		0,267	

Table 2.3.7 (continued)

The Essential Inventory of Emissions in Chernivtsi in 2010.

Emissions of CO2 [t] / equivalent emissions of CO2 [t]								
Fossil fuels			**Renewable energy sources**					
Lignite	**Coal**	**Other fossil fuel**	**Biofuel**	**Vegetable Oil**	**Other biomass**	**Solar thermal**	**Geothermal**	**All sectors**
9	**10**	**11**	**12**	**13**	**14**	**14**	**16**	**17**
0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	23796,62
0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	395909,95

0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	59364,8
0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	54759,0
0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	480402,05

0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	19981,31
0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	19981,31
0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	500383,35

Chapter 3. Measures to Meet the Commitments Envisaged by the Plan

3.1 Adaptation of Organizational Structure to Implement SEAP

Energy saving and energy efficiency are becoming more and more priority directions of power policy of Chernivtsi, which is caused by the growth of the cost of fuel and energy resources, increasing technogenic impact on the environment, disparity in proper resources supply and demand for it.

The efforts of Chernivtsi City Council and its executive bodies are directed on the solution of main problems on energy saving and energy efficiency among which are as follows:

- rational expenses of budgetary funds for acquisition of energy resources;

- optimizing the structure of energy resources consumption;

- increasing the efficiency of using all types of energy carriers;

- improving the quality of power services and opportunities for their regulation;

- attracting investments into the processes of technological renovation and power effective modernization of infrastructure of the city;

- establishing energy efficient maintenance of buildings, structures, houses, systems of electricity, water, central heating and power generation equipment;

- introducing innovative solutions with application of the latest technologies, materials, raw materials;

- formation of consumers' saving behavior what concerns energy services.

For the purpose of realization of the specified tasks, Chernivtsi City Council accepted "The Concept on Introduction of Power Management System in Chernivtsi".

For the implementation of the Concept, Chernivtsi City Council developed and approved "The Regulation on Information Collection as for Energy Resources and Water Consumption by the Chernivtsi Budgetary Municipal Institutions".

The purpose of applying the present Regulations is organizational support for introduction of a constantly operating system of dynamic supervision and receiving reliable information on energy consumption by the daily energy meters readings information from in the budgetary city institutions for further analysis and assessment of the main indicators of the condition of using energy resources by the budgetary city institutions. According to the Regulation there has been formed an organizational and executive structure headed by the deputy mayor and an organizational and administrative structure the purpose of which is to take daily energy meters readings, analyse the corresponding information and prevent overexpenditure and inappropriate use of energy resources.

The city council departments of education, culture, health care, physical education and sport, social protection of population have been engaged in the system of power management in order to organize accounting of energy consumption. The mentioned department subordinates 140 establishments, 255 buildings. The total number of workers involved in monitoring the consumption of energy resources makes 140 people.

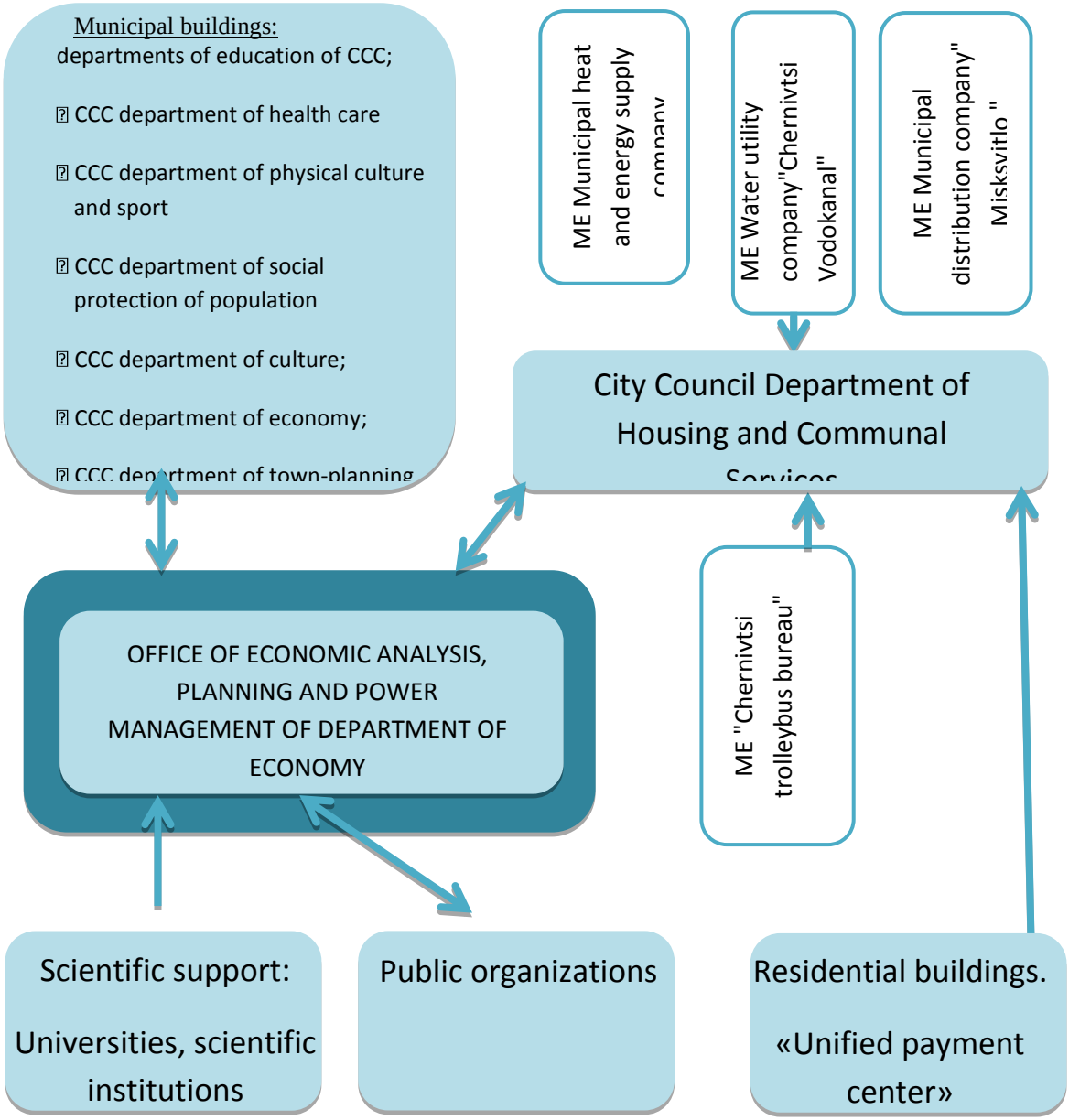


Fig. 3.1.1 Power Management Scheme of the city of Chernivtsi

3.2 Measures in the Sector of Municipal Buildings, Maintenance/Objects

Chart 3.2.1

Measures in the sector of municipal buildings, equipment/objects

№ п/п	Title of the project/activity	Content of the project	Funding	Implementation, start and completion dates (years)	Perfomer	Expected energy savings [MW/h]	Expected reduction of CO2 emissions (tons)	Total cost of implementing activity, UAH

1.	Deep thermomodernization of educational institutions in Chernivtsi)	Replacement of windows and external doors into repoussage ones; renovation of pipeline heat insulation; installation of heat reflective screens between walls and radiators; equipping individual heating centers; sanitation of engineering networks of the secondary school №33.	Loan funds, City budget	2017	2018	Department of education of the City Council, departments of economics, city planning complex and land relations of the City Council.	443,10	117,67	5405,9

2.	Use of solar systems based on vacuum solar collectors for replacement of thermal load of hot water supply system.	“Reconstruction of hot water supply system for kindergarten №41 by means of installing vacuum solar collectors” on the Politaev street, 19 Chernivtsi city.	Project GIZ “Energy efficiency in communities”, city budget	2015	2016	Department of education of the City Council, City Council	43,89	40,03	775,0
3.	The target program on energy savings in educational, health care and cultural institutions as well as administrative buildings.	Development of an energy-saving program in educational, health care, cultural and physical education institutions as well as administrative buildings.	City budget	2016	2016	Department of economics and management of the City Council	161,99	147,73	100,0

4.	Increase of energy efficiency in state financed buildings of Chernivtsi (33 educational and health care institutions of the City Council)	Replacement of windows and external doors into repoussage ones; renovation of pipeline heat insulation; installation of heat reflective screens between walls and radiators; equipping individual heating centers; sanitation of engineering networks; heat insulation of the roof, installation of local ventilation systems with recuperation.	City budget, project GIZ «Energy efficiency in communities", loan funds of NEFCO, SIDA	2015	2016	Department of Education and Health care of the City Council	9761,24	8902,25	233925,43

5.	"School campaign aimed at increasing students' awareness on energy savings" 20 schools.	Introducing courses and elective lessons on energy savings and efficiency into school learning process.	City budget, project GIZ "Energy efficiency in communities"	2011	2020	Department of education, City Council Department of economics	53,99	49,238	-

6.	Setting limits for state financed institutions (140 state financed institutions) 4,3% energy savings.	Continuation of installing annual, quarterly and monthly limits on consumption of energy resources of all types, taking into account weather conditions, age, condition of buildings and energy-saving measures which have been carried out.	-	2012	2020	Department of education, Department of economics of the City Council	37,8	34,472	-
7.	Optimization of energy monitoring system in municipal buildings (all state financed institutions, 255 buildings).	Improving the energy management system; further introduction of “Common information system of e-monitoring”, training of the stuff at sites and other organizational activities.	City budget	2015	2020	Department of education, Department of economics of City Council	70,198	64,02	-

8.	All sectors	You can take 10% of all energy compared 2015 to 2010 over municipal offices and divide.					**10572,21**	**9355,42**	**240190,00**

3.3 Measures in Housing Sector

Table 3.3.1

Measures in the Housing Sector

№ п/п	Title of the project/activity	Content of the project	Funding	Implementation, Start and completion dates (years)	Perfomer	Expected energy savings [MW/h]	Expected reduction of CO2 emissions (tons)	The total cost of implementing activity, UAH.

1.	Deep thermomodernization of 10 houses in Chernivtsi	Integrated thermomodernizttion.	Funds of residents, co-financing, city budget, loan funds	2015	2020	Department of housing and communal services of the City Council, residents.	6054,64	5521,83	16790,0
2.	Heat and hydro isolation of soft roofs.	Cellular plastic insulation of soft roofs.	City budget	2010	2014	Department of housing and communal services of the City Council	22225,78	5050,48	4258,3

3.	Projects of major repairs and renovation of 25 houses.	Heat insulation of façade, roof, socle; replacement of windows and doors, installation of professional and engineering staff, sluice, hydraulic balancing of the heating system, replacement of windows in stairwells; replacement of input groups; renewal of pipeline thermal insulation; repair of roofs; repair of joints in panel houses; sanitation of engineering networks.	Co-financing residents' funds, city budget 20/80%	2015	2016	Department of housing and communal services of the City Council, Department of housing and communal services of the City Council, Condominiums, HBC, HBS	16327,21	3370	6300,0

4.	Shifting households to energy-saving lighting devices.	Replacement of incandescent lamps by energy-saving ones in residents' houses.	Residents' funds	2011	2020	Residents of buildings	4776,0	4355,01	Residents' funds
5.	Installation of gas meters in residential dwellings.	Installation of gas meters in residential dwellings; economy is to be achieved through the behavioural effect.	Residents' funds, Budget funds	2011	2018	Gas Supply Department "Chernivtsi-gas"	36149,0	7302,1	Residents' funds, Department of gas economy exploitation "Chernivtsi-gas"

6.	Conducting enlightening educational campaigns for housing.	Informing about the use of energy-efficient devices and household appliances (it is planned that the informative campaign among the residents will result in the increasing use of household appliances of classes A, A++ and above); running the enlightening campaign on the necessity of installing windows in homes in conformity with the requirements of Ukraine Building Code (it is planned that the informative campaign among the residents will result in the installation of new windows with the coefficient R> = 0,75); taking other measures	City budget, funds of international technical assistance projects and public utility companies	2015	2020	Department of economy, housing and communal services of the City Council	23601,25	16232,31	0,3

7.	Deep thermo-modernization of the 31st dwelling house in Chernivtsi	Integrated thermo-modernization	Residents' funds, co-financing, city budget, loan funds	2015	2020	Department of housing and communal services of the City Council, house dwellers	10010,00	9129,12	65800,0
8.	Total cost of projects / measures						**102816,67**	**47590,85**	**93148,3**

3.4 Measures in Municipal Public Lighting Sector

Table 3.4.1

The measures in the sector of municipal public lighting

№	Name of the project / measure	Content of the project / measure	Funding sources	Implementation, starting date and completion (years)		Person / institution in charge	Expected energy savings [MW per hour]	Expected reduction of the volume of CO2 emissions (tonnes)	Total cost of implementing the project / measure, (thousands UAH)
	Replacing incandescent bulbs	Replacing physically outworn external lighting	ME “Misksvitlo”, city			ME “Misksvitlo”,	1563,0	1425,45	5339,80

1.	with sodium street lamps	lamps and installing energy-efficient sodium lamps (12208 lights)	budget	2007	2010	Department of housing and communal services of the City Council			
2.	Replacing sodium lamps with LED street light bulbs	Carrying out extensive repairs to street lighting by technically upgrading 150-watt sodium street lamps (1200 pcs) to 65-watt LED street light bulbs	Credit funds (NEFCO), ME "Misksvitlo"	2015	2016	ME "Misksvitlo", Department of housing and communal services of the City Council	410,514	374,39	4004,4
	Carrying out	Carrying out	City			ME	323,44	294,98	776,5

3.	extensive repairs to outdoor lighting in Chernivtsi with the help of highly efficient lamps and alternative energy sources / solar energy	extensive repairs to street lighting by technically upgrading outworn street lamps to LED lamps which draw power supply from solar panels (30 pcs)	budget, project GIZ "Energy efficiency in communities"	2015	2016	"Misksvitlo", Department of housing and communal services of the City Council	9		
4.	Carrying out extensive repairs to the monitoring system of the municipal enterprise "Misksvitlo"	Carrying out extensive repairs to the automatic system of monitoring street lighting in Chernivtsi	ME "Misksvitlo", city budget	2012	2012	ME "Misksvitlo", Department of housing and communal services of the City	59,3648	54,14	586,4

						Council			

Table 3.4.1 (continued)

5.	Replacing sodium lamps with LED street light bulbs	"Modernization of street lighting by introducing innovative energy-efficient technologies in Chernivtsi"; replacing the installed 70-150-watt sodium lamps with 50-watt LED street light bulbs	ME "Misksvitlo", city budget, EBRD, grant funds	2017	2020	ME "Misksvitlo", Department of housing and communal services of the City Council	3128	2852,736	104714,5
6.	Total cost of projects / measures						**5884,327**	**5001,706**	**115481,6**

3.5 Measures in Public Transport Sector

Table 3.5.1

Measures in the transport sector

№ p/p	Name of the project/measure	Content of the project / measure	Financing sources	Implementation, starting date and completion (years)	Person / institution in charge	Expected energy savings [MW per hour]	Expected reduction of the volume of CO2 emissions (tonnes)	Total cost of implement-ting the project / measure, (thousands UAH)

1.	Using liquefied gas to power public buses	Switching from petrol to LPG to power city buses (240 pcs.)	Funds of carriers of different ownership forms	2015	2020	Local carriers of different ownership forms	607,35	162,16	Carriers' funds
2.	Acquisition of new trolleybuses	"Modernization of the electrical transport in Chernivtsi". Purchasing of new trolleybuses, reconstruction of traction substations and contact networks	City budget, EBRD, grant funds	2016	2020	ME "Trolleybus department of Chernivtsi"	4185,00	3816,72	156000,0

3.	Optimizing the network of the ME “Trolleybus department of Chernivtsi”	Reconstructing two traction substations, decommissioning underloaded transformers	City budget, ME “Trolleybus department of Chernivtsi”	2012	2013	ME “Trolleybus department of Chernivtsi”	701,0	639,31	252,0
4.	Optimizing the network of the ME “Trolleybus Company of Chernivtsi”	“Introduction of innovative electrical equipment for traction substations of the ME “Trolleybus Company of Chernivtsi”	City budget, ME “Trolleybus Company of Chernivtsi”, credit and grant money	2016	2020	ME “Trolleybus department of Chernivtsi”	900,0	820,8	2560,0

5.	Total cost of projects / measures						**6393,35**	**5438,99**	**158810,0**

3.6 Measures in Industry Sector Except GHG Trading (Communal Enterprises)

Table 3.6.1

Measures in the field of heat production and transportation

№ p/p	Name of the project / measure	Content of the project / measure	Financing sources	Implementation, starting date and completion (years)	Person / institution in charge	Expected energy savings [MW per hour]	Expected reduction of the volume of CO2 emissions (tonnes)	Total cost of implement-ting the project / measure, (thousands UAH)

1.	Reconstruction and modernization of the heat supply system – CME “Chernivtsiteplocomunenergo”	Carrying out extensive repairs and technical upgrading of boilers, including the equipment of the boiler house “Uzbetska”	City budget, CME “Chernivtsi-teplocomunenergo”	2013	2014	CME “Chernivtsiteplo-comunenergo”, Department of housing and communal services of the City Council	450,89	411,21	1625,0

2.		Construction of the boiler house on Chekhov Street, 25	City budget, CME “Chernivtsi - teplocomunenergo”	2013	2014	CME “Chernivtsiteplo-comunenergo”, Department of housing and communal services of the City Council	101,24	92,33	1787,0

3.		Boiler houses reconstruction and replacement of “NISTU-5” and “Universal” boilers	City budget, CME “Chernivtsi - teplocomunenergo”	2014	2016	CME “Chernivtsiteplocomunenergo”, Department of housing and communal services of the City Council	6417,51	1308,46	1917,41

4		Automation of combustion modes in boilers	City budget, CME “Chernivtsi-teplocomun-energo”	2015	2016	CME “Chernivtsiteplo-comunenergo”, Department of housing and communal services of the City Council	4796,5	1252,89	7187,5

5		Replacing 25 boilers with more energy-efficient ones ("Infant school №50", "Infant school №26"," Infant school №3", " Infant school №39", " Infant school №48", " Infant school №18", " Infant school №14", "School №25", "Blood transfusion station")	City budget, CME “Chernivtsi-teplocomunenergo”	2013	2014	CME “Chernivtsiteplo-comunenergo”, Department of housing and communal services of the City Council	201,71	183,96	1917,41

6		Modernization of the boiler house “Zalozetskiy” including the connection of the boiler house “S. Schedrina” and the installation of solid fuel boilers	City budget, CME “Chernivtsi-teplocomunenergo”, project GIZ “Energy efficiency in communities” NEFCO.	2016	2017	CME “Chernivtsiteplo-comunenergo”, Department of housing and communal services of the City Council	-	1220,8	15000,0

7		Construction of the modular boiler house “Darwin-Shchepkin”	City budget, CME “Chernivtsi-teplocomunenergo”, state budget, credit money	2016	2017	CME “Chernivtsiteplo-comunenergo”, Department of housing and communal services of the City Council	-	84,6	6900,0

Table 3.6.1 (continued)

8	Improving the energy management system of the CME “Chernivtsi – teplocomunenergo”	Establishing the energy management system of the CME “Chernivtsiteplocomunenergo”; introducing the system of operational control, analysis and regulation of the efficient use of fuel - energy resources in the heat boroughs	CME “Chernivtsi- teplocomunenergo”	2015	2017	CME “Chernivtsiteplo-comunenergo”, Department of housing and communal services of the City Council	28106	6209,91	14375,0

9	Reconstruction of the “Chekhov” boiler house	Reconstruction of the “Chekhov” boiler house	City budget, CME “Chernivtsi-teplocomunenergo”	2016	2017	CME “Chernivtsiteplo-comunenergo”, Department of housing and communal services of the City Council	18,9	17,24	170,488

10	Replacing heat networks with pre-insulated pipes.	Replacing heat networks (of various diameters) with pre-insulated pipes (MP 6508)	City budget, CME “Chernivtsi-teplocomunenergo”	2012	2014	CME “Chernivtsiteplo-comunenergo”, Department of housing and communal services of the City Council	867,32	791,004	9864,8

11	Modernization of the district heating infrastructure in Chernivtsi	Modernization of the district heating infrastructure in Chernivtsi	City budget, CME “Chernivtsi-teplocomunenergo”, EBRD, grant funds	2016	2020	CME “Chernivtsiteplo-comunenergo”, Department of housing and communal services of the City Council	49600,0	10551,70	364 000,0
12	Total cost of projects / measures						90620,08	22124,11	424740,0

Table 3.6.2

Measures in the field of water supply/water removal

№ p/p	The name of the project/event	Content of the event	Financing sources	Implementation The start and the end date (years)	Executor	Expected energy economy [MWh]	Expected Contraction of the CO2 emissions (tonnes)	The total cost of the impleme-ntation (ths.UAH)

1.	Reconstructionand modernizationof pump-powerequipmentat thepumpingstation 1st lifting "Mytkiv" plumbing "Dnister-Chernivtsi"	Reconstructionandmodernization of pump-powerequipmentatthepumpingstation 1st lifting "Mytkiv" plumbing "Dnister-Chernivtsi"	Municipalutilityservices Chernivtsivodocanal, city budget	2012	2014	Municipalutilityservices Chernivtsivodocanal, department of Housing City Council	2724	2484,288	2410,0
2.	Reconstructionand modernizationof pump-powerequipmentfor TRP Chernivtsi	Reconstructionandmodernization of pump-powerequipmentfor TRP Chernivtsi №№ 3,4A, 6A, 1YU, 3YU, 4YU, 9YU, 10YU (2012 year) 149.3 tonsofstandardfueleconomy	Municipalutilityservices Chernivtsivodocanal, city budget	2012	2014	Municipalutilityservices Chernivtsivodocanal, department of Housing City Council	459,38	418,96	298,0

3.	Replacing emergency water supply services	Replacing emergency water supply services(10850 m.)	Municipalutilityservic esChernivt sivodocana l, city budget	2012	2014	Municipalutil ityservicesCh ernivtsivodoc anal, department of Housing City Council	315,0	287,28	2797,3
4.	Reconstructionand modernizationof pump-powerequipmentat thepumpingstation 3rd lift "Shubranets" plumbing "Dnister-Chernivtsi"	Reconstructionandmoderniza tionof pump-powerequipmentatthepumpin gstation 3rd lift "Shubranets" plumbing "Dnister-Chernivtsi"	Municipalutilityservic esChernivt sivodocana l, city budget	2012	2014	Municipalutil ityservicesCh ernivtsivodoc anal, department of Housing City Council	2655,6	2421,9072	258,6

5.	Installation of the frequency converter at the pumping station "Rohizna"	Installation of the frequency converter at the pumping station "Rohizna"	Municipal Utility Services Chernivtsi Water Utility Company (Vodokanal), city budget	2012	2014	Municipal Utility Services Chernivtsi Water Utility Company (Vodokanal), Department of Housing, Utilities and Amenities City Council	172,8	157,59	1158,6

6.	Reconstruction and modernization of pump-power equipment at the water supply system "Dnister-Chernivtsi" 3rd stage pump "Shubranets"	Reconstruction and modernization of pump-power equipment at the water supply system "Dnister-Chernivtsi" 3rd stage pump "Shubranets"	Municipal Utility Services Chernivtsi Water Utility Company (Vodokanal), city budget KFW credit aid	2016	2020	Municipal Utility Services Chernivtsi Water Utility Company (Vodokanal), Department of Housing, Utilities and Amenities City Council	2190,0	2030,13	7810,266

7.	Reconstruction and modernization of pump-power equipment for TRP Chernivtsi	Reconstruction and modernization of pump-power equipment for TRP Chernivtsi	Municipal Utility Services Chernivtsi Water Utility Company (Vodokanal), city budget KFW credit aid	2016	2020	Municipal Utility Services Chernivtsi Water Utility Company (Vodokanal), Department of Housing, Utilities and Amenities City Council	363,3	337,05	4032,81

8.	Reconstruction, modernization of the system of waste facilities filtering at the water supply "Dnister-Chernivtsi" water treatment plant with retooling of isolation valves in Vikno, Zastavna district, Chernivtsi region	Reconstruction, modernization of the system of waste facilities filtering at the water supply "Dnister-Chernivtsi" water treatment plant with retooling of isolation valves in Vikno, Zastavna district, Chernivtsi region	Municipal Utility Services Chernivtsi Water Utility Company (Vodokanal), city budget KFW credit aid	2016	2020	Municipal Utility Services Chernivtsi Water Utility Company (Vodokanal), Department of Housing, Utilities and Amenities City Council	334,6	310,17	1013,2

9.	Replacement of Chernivtsi emergency networks, 37.1 km.	Replacement of Chernivtsi emergency networks, 37.1 km.	Municipal Utility Services Chernivtsi Water Utility Company (Vodokanal), city budget KFW credit aid	2016	2020	Municipal Utility Services Chernivtsi Water Utility Company (Vodokanal), Department of Housing, Utilities and Amenities City Council	2427,2	2250,01	8652,0

10.	Reconstruction, modernization, repairs of RKNS - 1 with control cabinet and automation retooling and operational instrument for sewer recordkeeping tooling in Pivdenno-Kiltseva Street, Chernivtsi	Reconstruction, modernization, repairs of RKNS -1 with control cabinet and automation retooling and operational instrument for sewer recordkeeping tooling in Pivdenno-Kiltseva Street, Chernivtsi	Municipal Utility Services Chernivtsi Water Utility Company (Vodokanal), city budget KFW credit aid	2016	2020	Municipal Utility Services Chernivtsi Water Utility Company (Vodokanal), Department of Housing, Utilities and Amenities City Council	161,1	149,1	625,6

11.	Reconstruction, modernization, repairs of “Denysivka” pump station with control cabinet and automation retooling and operational instrument for sewer recordkeeping tooling in Denysivska Street, 21, Chernivtsi	Reconstruction, modernization, repairs of “Denysivka” pump station with control cabinet and automation retooling and operational instrument for sewer recordkeeping tooling in Denysivska Street, 21, Chernivtsi	Municipal Utility Services Chernivtsi Water Utility Company (Vodokanal), city budget KFW credit aid	2016	2020	Municipal Utility Services Chernivtsi Water Utility Company (Vodokanal), Department of Housing, Utilities and Amenities City Council	14,9	13,81	403,8

12.	Reconstruction, modernization, repairs of “Hotynska” pump station with control cabinet and automation retooling and operational instrument for sewer recordkeeping tooling in Hotynska Street, 47-B, Chernivtsi	Reconstruction, modernization, repairs of “Hotynska” pump station with control cabinet and automation retooling and operational instrument for sewer recordkeeping tooling in Hotynska Street, 47-B, Chernivtsi	Municipal Utility Services Chernivtsi Water Utility Company (Vodokanal), city budget KFW credit aid	2016	2020	Municipal Utility Services Chernivtsi Water Utility Company (Vodokanal), Department of Housing, Utilities and Amenities City Council	1,5	1,39	315,7

13.	Major repairs of RKNS-1A with operational instrument for sewer recordkeeping tooling in Pivdenno-Kiltseva Street, Chernivtsi	Major repairs of RKNS-1A with operational instrument for sewer recordkeeping tooling in Pivdenno-Kiltseva Street, Chernivtsi	Municipal Utility Services Chernivtsi Water Utility Company (Vodokanal), city budget KFW credit aid	2016	2020	Municipal Utility Services Chernivtsi Water Utility Company (Vodokanal), Department of Housing, Utilities and Amenities City Council	138,4	128,29	302,8

14.	Implementation of activities in accordance with feasibility study "Reconstruction of water supply system in Chernivtsi" – replacement of the main pipeline after River Prut "StaraTruba"; – main pipeline from Shubranets to River Prut; – replacement of pipes in shift zones (7,4 km)	Implementation of activities in accordance with feasibility study "Reconstruction of water supply system in Chernivtsi" – replacement of the main pipeline after River Prut "StaraTruba"; – main pipeline from Shubranets to River Prut; – replacement of pipes in shift zones (7,4 km)	Municipal Utility Services Chernivtsi Water Utility Company (Vodokanal), city budget KFW credit aid	2016	2020	Municipal Utility Services Chernivtsi Water Utility Company (Vodokanal), Department of Housing, Utilities and Amenities City Council	2912,7	2700,07	26058,02

15.	All measures in total						14870,48	13690,05	53340,0

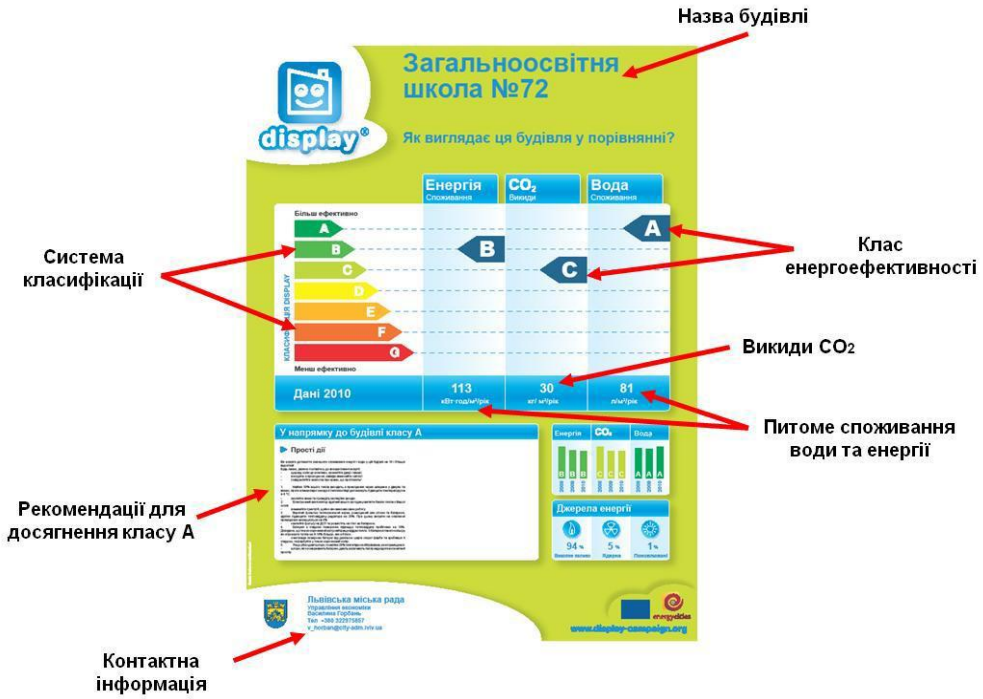
3.7 The System of Measures to Change People's Consciousness

While adopting the measures aimed at increasing public awareness about the issues of efficient energy resources use, it is reasonable to focus on the energy consumption sectors that were included into basic emission inventory. However, municipal and residential buildings should be a priority.

As for the ways and methods to change visitors' awareness, knowledge and competence in questions related to efficient energy resources use in public buildings of Chernivtsi, we should mention that the city is going to use effective tools of European municipal networks – Energie-Cites. First of all, we mean the general European information and education campaign "Display".

The "Display" campaign was developed and implemented by energy experts from 20 European Union cities and towns with organisational assistance of the European Municipal Association "Energie-Cities". The campaign mainly focuses on owners and users of public buildings. The campaign is voluntary and is funded by its signatories and encourages local authorities to display publicly environmental figures and energy expenses of buildings which are paid by local budgets.

The "Display" campaign classifies buildings according to a seven-stage scale of European complex index of building energy performance and helps to get buildings energy figures in the form of a printable colourful poster which also serves as Building Energy Efficiency Certificate. (pic. 3.7.1.).



Pic. 3.7.1. An Example of "Display" Poster

Another effective tool of the European Municipal Network – "Energie-Cites", that Chernivtsi is going to use, is the "Engage" campaign. The campaign mainly focuses on the process of communication and binds all city citizens and other interested parties to take their part in the establishment of sustainable energy future by creating a creative poster series that reflects signatories and their obligations in the appropriate energy efficient sector.

Thanks to a handy form of the online-tool, local authorities can make unique posters with specific obligations of signatories concerning efficient energy use and climate change. Individual posters encourage the participants to make effective steps in order to achieve efficient energy saving. Posters can be displayed on the city`s web-site and can also be printed and used to implement appropriate measures.

This tool is the most effective to spread ideas of the efficient energy use by city`s authorities, deputies and also by leading companies, which produce and use energy in the public sector.

As we have already mentioned, to increase public awareness is highly important for city energy use reduction and further efficient energy use.

The key problems that prevent implementation of energy efficiency measures in the residential areas are as following:

- low awareness of residents about the condition of energy sphere and dangerous trends of its development for the nearest future;
- low level of citizens organization;

- enormous expenses to modernize heat supply of residential buildings;
- lack of effective state measures to support energy saving projects in the residential area.

To encourage immediate action in this field, the city council can suggest different educational campaigns for residents, spread of information by publishing manuals, contributing to the creation of Multi-apartment homeowners association, creating consulting centres on energy efficiency technologies, presenting best examples of energy efficiency achievement in residential buildings, supporting heat supply renovation projects etc.

We should gain other countries` municipalities experience of constant carrying out a purposeful work with inhabitants to increase public awareness of energy saving principles and spread of energy saving policy.

Among other important measures which aim at efficient usage of energy resources in sectors under investigation, it is necessary to mention the importance of informational campaigns, in particular to commemorate the Energy Days in the framework of European Sustainable Energy Week.

Therefore, the measures aimed at increasing inhabitants` awareness concerning efficient energy resources use can be divided into such groups:

1. **Demonstrational measures:**

- the «Open Day» in public and private buildings, at the municipal and industrial enterprises, where modern energy efficient technologies, equipment and materials are applied;
- exhibitions, trade fairs and technological festivals (displaying the best achievements) with the assistance of energy efficient equipment and materials manufacturers and also designers and builders of low level of energy consumption buildings etc;
- movie festivals dedicated to the promotion of environmental topics such as energy saving and global climate change etc.

2. **Educational measures:**

- conferences, seminars, debate forums and round tables, learning games and trainings on climate change, foundations of sustainable development and its practical use in the production-consumption energy sphere for different strata of population;
- presenting school curricula on energy saving and environmental defense, appropriate learning materials and games;
- practical learning of fire safety rules for children etc.

3. **Cultural events:**

- thematic press conferences with musicians and performers;
- theater performances about environmental issues;
- competitions for the best drawing, photo, composition, handmade goods related to sufficient energy usage and environmental defense, in schools, kindergartens etc.

4. **Sport events:**

- family sport competition with participation of famous sportsmen as judges and fans;
- bicycle and roller skates races «Clear Air»;
- running competition «Improving Health» etc.

5. **City events:**

- solemn opening and closing ceremonies of Sustainable Energy Days;
- open session of city council dedicated to consideration of **Action plan of Sustainable Energy Development in Chernivtsi city** with participation of all interested parties and citizens;
- public hearings concerning arranged events and appropriate investment packages etc.

Also, it is necessary to pay considerable attention to the development of comprehensive measures aimed at increasing public awareness about efficient energy resources usage in all sectors under investigation. The shared action of the

city council, the people and public organizations is essential to gain positive results of reducing energy consumption.

Table 3.7.1.

	A project / measure name	Overview	Financial enforcement	Implementation, start and finish date (years)		Executive
1.	Public information dissemination about the importance of energy saving via mass media	Promotion of efficient energy usage in state establishments, residential and office buildings, at factories via local media (television, radio, printed media, the Internet and other sources); Informing about modern technologies, equipment and materials that help to save energy, increase comfort and improve the environmental situation.	City budget Grant money Other sources of funding	2013	2020	Department of Economics, Housing and Municipal Department, Public relations Department of the City Council

2.	Organisation of conferences and learning seminars on energy efficiency for different strata of consumers, engaging professionals and scientists	Holding of seminars and conferences on energy sufficient technologies, renewable sources of energy, ecology, ESKO-mechanism and energy management	City budget Grant money Other sources of funding	2011	2020	Department of Bridge-building complex and Land Recourses of City Council, Department of Economics of the City Council, of Housing and Municipal Department of the City Council

3.	Creation of the Energy Efficiency Counseling Centre	Promotion of the idea of energy resources conservation in budget-funded institutions, residential and office buildings, and enterprises. Public awareness campaign concerning modern technologies, equipment and materials capable of saving energy, increasing comfort and improving environment.	Municipal budget Grant money Other sources of funding	2016	2020	Department of Economics of the City Council

4.	Reception of partners (delegations) including foreign ones; Organization of missions for sharing experience	Reception of partners (delegations) including foreign ones; organization of missions for sharing experience in the field of energy efficiency and conservation	Municipal budget Other sources of funding	2011	2020	Department of Economics of the City Council, Department of Housing and Communal Services of the City Council
5.	Holding the Sustainable Energy Day	Holding annual events aimed at improving energy efficiency and incensing the use of renewable energy (in late June)	Municipal budget Grant money Other sources of funding	2014	2020	Department of Economics of the City Council, Department of Education of the City Council

6.	Organization of printing, subscription and distribution of thematic information bulletins, business cards, presentation information and specialized periodicals to promote energy efficiency among various categories of consumers	Promotion of ideas of energy resources conservation in budget-funded institutions, residential and office buildings, and enterprises. Public awareness campaign concerning modern technologies, equipment and materials capable of saving energy, increasing comfort and improving environment.	Municipal budget Grant money Other sources of funding	2016	2020	Department of Economics of the City Council, Department of Housing and Communal Services of the City Council, Public Relations Department of the City Council

7.	Holding the Earth Hour	Introduction in the town of Chernivtsi of the annual international event, which is held every last Saturday of March and calls economies and commercial institutions for switching off unnecessary light and electrical appliances for one hour in order to stimulate interest in the need to counter climate changes.	Municipal budget Grant money Other sources of funding	2015	2020	Department of Economics of the City Council, Department of Housing and Communal Services of the City Council, Public Relations Department of the City Council

8.	Cooperation with the the European Association of local authorities in energy transition «Energy cities» and ЕЕМУ	Participation in seminars and exhibitions; participation in the «Engage» campaign; translation and distribution of informational materials, holding of competitive tenders; involvement of «Energy-cites» and ЕЕМУ representatives into the events taking place in the town and aiming at energy resources conservation	Municipal budget Other sources of funding	2016	2020	Department of Economics of the City Council

9.	Energy certification of budget-funded buildings using the «Display» Campaign’s approach	Implementation of the standardized energy efficiency labeling, aimed at making building owners and users more enlightened on the subject of energy consumption, and helping them to make important decisions concerning the reduction of energy consumptions, decrease of harmful environmental impact and cutdown in spending.	Municipal budget Grant money Other sources of funding	2016	2020	Department of Economics of the City Council, міське бюро технічної інвентаризації

10.	Setting up classes and extracurricular activities into school educational process concerning energy efficiency and conservation	Conducting extracurricular lessons on energy conservation, energy efficiency and the usage of alternative fuels. Discussion of these issues at the lessons of physics, chemistry, geography and nature study; involving students in conducting researches on the energy consumption at their schools; Involvement of pupils in the process of meter readings check; getting students acquainted with basic utilities systems used by schools for receiving different sources of energy; organization of different contests on economical use of energy (e.g. “Get your class ready for winter”); organization of other competitive events for students, related to the topic of energy saving; ensuring educational	Municipal budget Grant money Other sources of funding	2014	2020	Department of Economics of the City Council, Department of Education of the City Council

3.8 Renewable and Alternative Power Sources

An important issue in the set of energy-saving measures, in addition to all-around development and application of energy-saving technologies, equipment and materials, as well as to production management, must be the involvement of renewable and non-traditional (for the current power economy) sources of energy into the fuel-power balance of the city.

The increase of the town's self-sufficiency in energy through the implementation of technologies allowing using alternative and non-traditional sources of energy and alternative fuels will result in reducing dependency of the town on fossil fuels.

This includes the use of solar energy for heating water in heating systems by means of solar energy collectors allowing heating water up to 40-50 ºC, and the use of siliceous solar batteries for producing electricity.

One of the solutions for the problem of the regular heating supply may become the use of the low-grade energy of natural or anthropogenic origin. This becomes possible through the implementation of heat pumps, which "taking away" the low-grade heat from soil, air or water transform it into the energy needed for heating water for heating up buildings and for hot-water supply. Moreover, the sources of low-grade rejected heat of anthropogenic origin also include ventilation emissions, cooling water of manufacturing and power-generating facilities of plants, industrial and household effluences. The experience of the leading countries shows that the most efficient source is the use of heating energy of sewage.

In Chernivtsi there has already been initiated the usage of green wastes (biofuels) as the source of renewable energy for the production of heating energy; this initiative must be developed further.

The analysis of the operation of the energy facilities using renewable and alternative sources of energy, as well as of the international practices in this field, shows that in the current conditions the priority is given to the development and implementation of cogeneration of heat and power that gives possibility to obtain additional electrical power without additional consumption of fossil fuels.

Since the extensive implementation of the use of renewable and alternative sources of energy in Chernivtsi is just about to commence, the most important tasks in this direction in the nearest future are:

- estimation of reserves and resources; elaboration and testing of efficient schemes, technologies and equipment; implementation of pilot projects (including the study of the possibility of installing solar systems for hot-water supply in pre-school educational institutions and of the use of the heat pump technology for their heating);

- creation of specialized companies for manufacturing equipment, its certification, installation and service; providing research and project work; specialist training;

- elaboration of projects dealing with the use of alternative energy forms by research and project-designing institutions, and universities; holding of competitive tenders for financing these projects;

- use of the credit money of the European Bank for Reconstruction and Development and of the World Bank, as well as of other international financial organizations, for the realization of actions aimed at the implementation of renewable and non-traditional sources of energy (Chernivtsi municipal heat and energy supply company (“Chernivtsi Teplocomunenergo” - using boilers being heated as a result of biomass incineration, Chernivtsi water supply and sewage company (“Chernivtsi Vodokanal”) – usage of sewage biogas).

3.9. Financial Enforcement of SEAP

The financial component of the **SEAP** is crucial in the implementation of energy efficiency projects and it affects on the ability of implement the **SEAP**.

With a view to the implementation of **SEAP** in Chernivtsi, the following sources of funding for the efficient use of energy resources are defined:

1.The funds of enterprises which function in the field of thermal energy production and transportation, are the part of power-consuming production (part of the profit, short-term capital investments).

2.State budget (state target program).

3.City budget (city target programs).

4.Sponsors' grants. Usually grant funds for the implementation of infrastructure investment projects are given to the cities and enterprises participating in the international technical assistance projects. Since the grant is irrevocable targeted funding, allocation of grant funds to finance investment projects is limited and mostly aimed at financing small demonstration projects, and / or pre-design studies. By empowering and improving the efficiency of the energy management system there is a fairly good chance of attracting grant money in the short and medium term to finance "soft" measures, demonstration and pilot projects. Grant money is the most desirable source in the short term because Chernivtsi needs to speed up work to raise the maximum amount of grant funds in energy efficiency of the city.

5. Bank credits. The most common form of financing the investment projects in the sphere of housing, production, transportation and consumption of thermal energy is a bank credit for financing both short-term and medium-term projects, as well as credits from international financial institutions and foreign state institutions, such as: World Bank, ICFI, EBRD, EIB, classification of property and others (for medium-term and long-term investments)

6. Commercial credit. Commercial credit is the type of commodity credit that is given by the sellers to clients in a form of payment postponement for the realized goods and services. With the help of commercial credit, the client reaches temporary economy of the money costs, reduces the need in bank credit. Commercial credit is given in most cases for a short-term period. Specific terms and credit amount depend on the type and cost of goods, financial situation of counterparties and market situation.

7. Loan (bonds). For financing of their middle-term investment projects enterprises and local authorities can attract the investment resources firm internal or external financial markets by producing obligations.

8. Specific deposits of co-owners of multi-apartments. Specific deposits are paid by co-owners of block of flats in the amount set at the general meeting of multi-apartment homeowners association, and are spent on maintenance improvement of engineering housing systems and major repairs of the building. Although the amount of costs, which can be mobilized in a short term, is very limited, there is a possibility to combine this source with the others on the terms of co-financing.

9. Financial leasing. Financial leasing is one of the most reliable legislatively regulated instruments of attraction of financing of medium-term investment projects in the sphere of production, transportation and delivery of thermal energy.

10. Attraction of the private capital. Attraction of the private capital to the funding of long-term investment projects can be carried out in the following way:
- financing is attracted by the company contractor (the performer of repair works), granting a delay of payment for the performed works;

- financing is attracted by the company which carries out works on thermal modernization of the building and provides further public utility services in the house, or in a public institution according to the long-term contract.

The budget has been the key and guaranteed source of funding of energy saving measures in recent years in Chernivtsi. Only since 2014 the city has managed to attract additional funds from the leading international financial institutions to the energy saving measures. Taking into account the difficult economic situation in the state and certain difficulties with accumulating the revenue, emphasis on the financial sources the of projects must be shifted in favour of the usage of credit and grant resources.

While analyzing the budget of Chernivtsi it should be noted that the revenue of the city 2015 budget is planned 1160 746,9 thousand UAH and expenditure- 1160 746,9 thousand UAH.

In 2010 which is defined as basic by SEAP, the income of the budget was 726 113,2 thousand UAH, expenditure - 732 790,6 thousand UAH. Thus, the growth of the income of the city budget by 59,86% can be noticed, and the growth of expenditure of city budget - by 58,40% .

The detailed amount of the income and expenditures of the budget of Chernivtsi within 2010-2014 is given in Table 3.9.1.

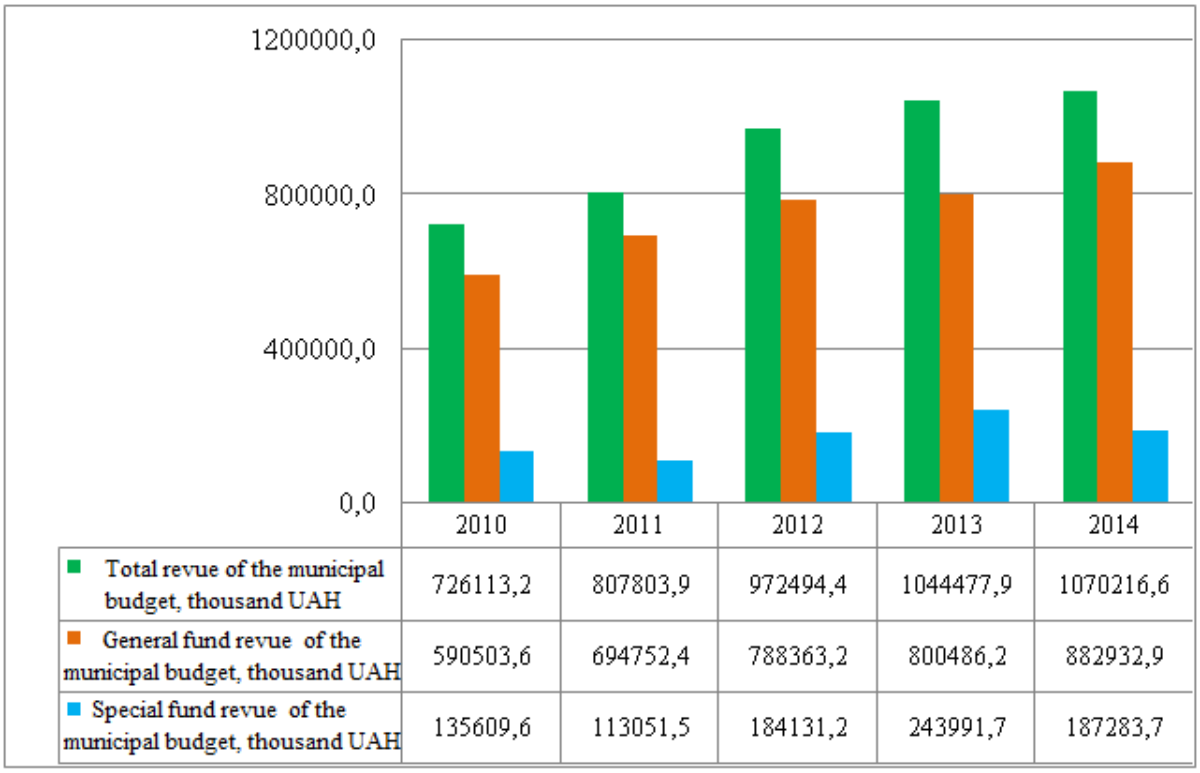
Table 3.9.1.

Amount of the Income and Expenditure of the Chernivtsi Budget (2010-2014)

Elements of the city budget	Years	In general, Thousand, UAN	Pool, Thousand, UAN	Special Fund , Thousand, UAN	
				sum total	including budget for development

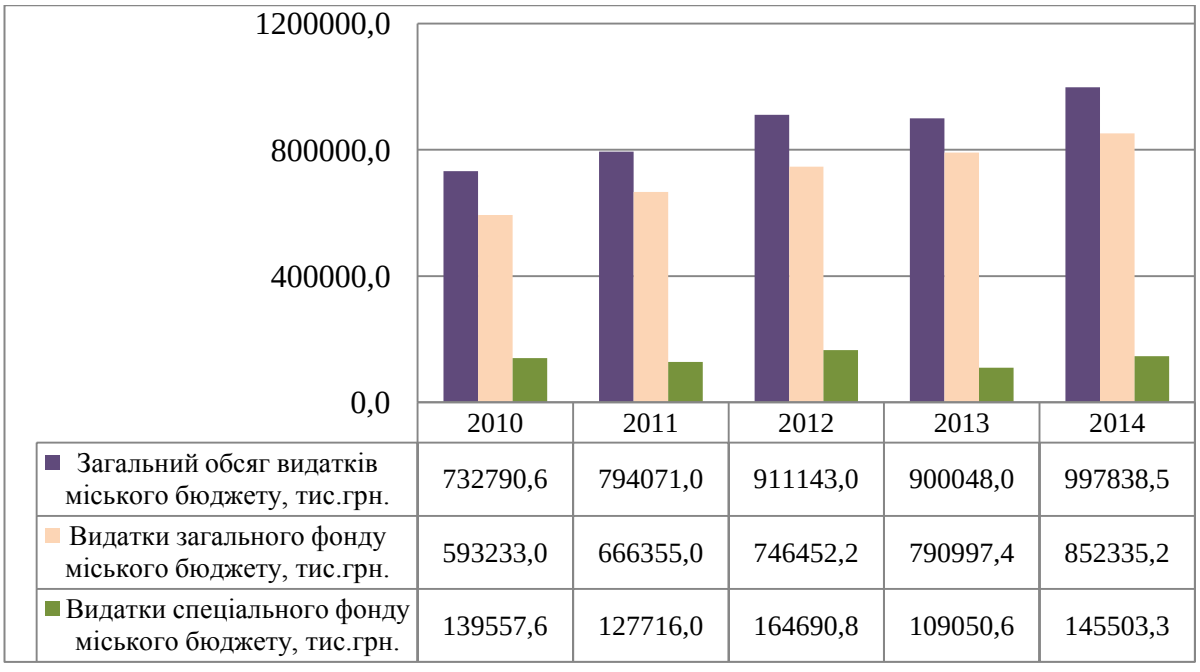
Income	2010	726113,2	590503,6	135609,6	38030,2
Expensess		732790,6	593233,0	139557,6	39994,9
Income	2011	807803,9	694752,4	113051,5	33382,1
Expensess		794071,0	666355,0	127716,0	58285,7
Income	2012	972494,4	788363,2	184131,2	56335,7
Expensess		911143,0	746452,2	164690,8	51074,9
Income	2013	1044477,9	800486,2	243991,7	71632,9
Expensess		900048,0	790997,4	109050,6	39043,0
Income	2014	1070216,6	882932,9	187283,7	86495,8
Expensess		997838,5	852335,2	145503,3	46976,8

Detailed elaboration of revenue and expenditure structure of Chernivtsi municipal budget is shown in Tables 3.9.1 and 3.9.2.



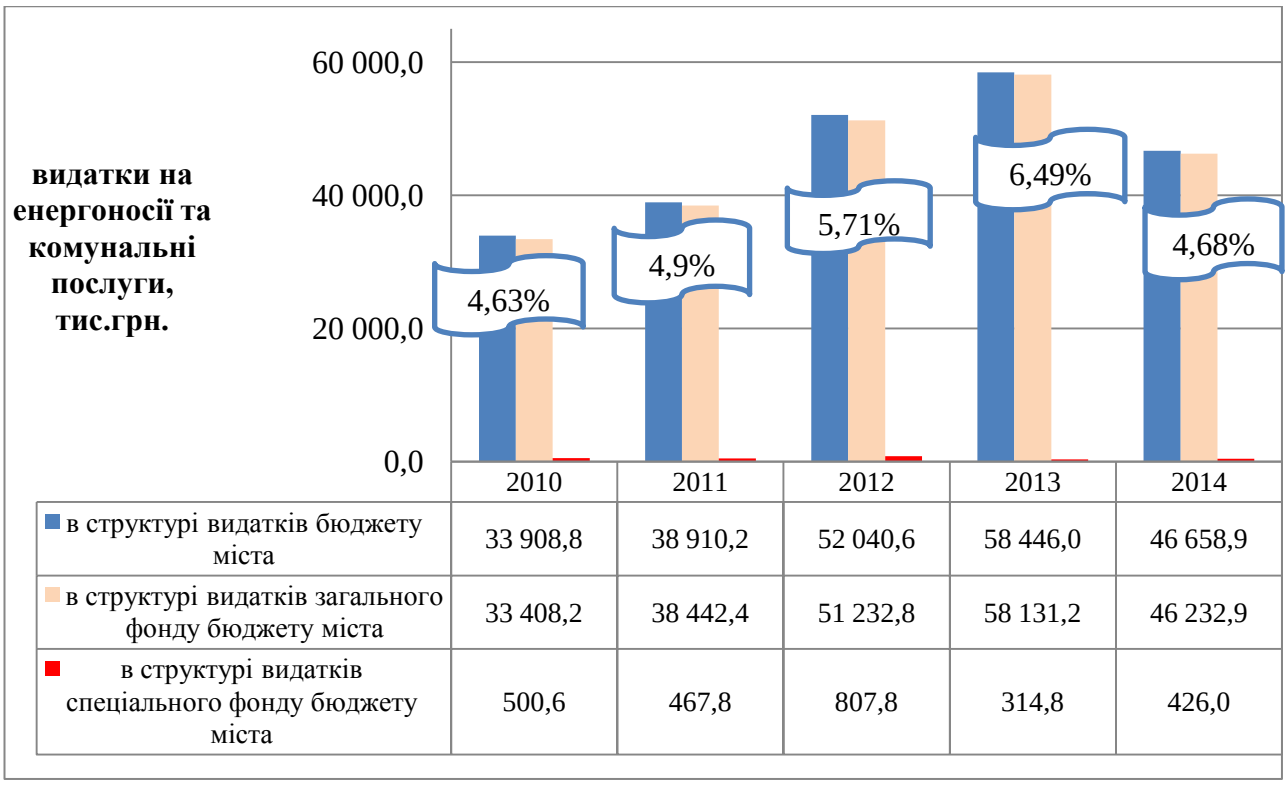
	2010	2011	2012	2013	2014
Total revue of the municipal budget, thousand UAH	726113,2	807803,9	972494,4	1044477,9	1070216,6
General fund revue of the municipal budget, thousand UAH	590503,6	694752,4	788363,2	800486,2	882932,9
Special fund revue of the municipal budget, thousand UAH	135609,6	113051,5	184131,2	243991,7	187283,7

Table. 3.9.1. The structure of Chernivtsi budget for 2010-2014.



	2010	2011	2012	2013	2014
Загальний обсяг видатків міського бюджету, тис.грн.	732790,6	794071,0	911143,0	900048,0	997838,5
Видатки загального фонду міського бюджету, тис.грн.	593233,0	666355,0	746452,2	790997,4	852335,2
Видатки спеціального фонду міського бюджету, тис.грн.	139557,6	127716,0	164690,8	109050,6	145503,3

Table. 3.9.2. Expenses of Chernivtsi budget for 2010-2014.



	2010	2011	2012	2013	2014
в структурі видатків бюджету міста	33 908,8	38 910,2	52 040,6	58 446,0	46 658,9
в структурі видатків загального фонду бюджету міста	33 408,2	38 442,4	51 232,8	58 131,2	46 232,9
в структурі видатків спеціального фонду бюджету міста	500,6	467,8	807,8	314,8	426,0

Table 3.9.3. The Share of Spending on Energy Utilities in the Structure of City Budget Expenditures. Chernivtsi for 2010-2014.

expenditures on energy and utilities, thousand, UAH

the structure of expenditures of the city

the structure of the general fund of the city budget

the structure of expenditures of the special fund the city budget

Table 3.9.3. The share of spending on energy utilities in the structure of city budget expenditures Chernivtsi for 2010-2014.

It is obvious that the amount of funds allocated from the city budget (including the development budget), or which were received from international financial institutions is not enough, especially for the implementation of projects of deep thermo buildings. Thus, the emphasis on funding sources energy efficiency projects should be significantly shifted in favor of the use of credit, grant resources and other funding sources mentioned above. The city budget should be guided primarily at providing the necessary co-financing the fate of energy efficiency projects. Possible options for cooperation for future energy efficiency are seen following international financial institutions: NEFCO (Nordic Environment Finance Corporation (NEFCO)), UNDP (United Nations Development Programme in Ukraine), IFC (International Finance Corporation), EBRD (European Bank for Reconstruction and Development) E5P - Eastern Europe Energy Efficiency and Environmental Partnership (Eastern Europe "Energy Efficiency" and the Environmental Partnership), WB (World Bank) and others.

In the state financed sector, the main source of financing was considered credit and grant funds with providing co-financing on the part of the city budget. For residential buildings – there were additionally included funds of residents in the structure of funding sources (about 20-50% co-financing depending on the complexity of the implementation of energy efficiency measures), besides there is the possibility of attraction of bank loans for implementation of energy efficiency measures which are allowed by Ukrainian banks. For other sectors (chart 3.4.3) - determinative source of funding, except credit and grant funds are own funds of enterprises suppliers of energy resources, other agencies, and organizations.

The planned amount of funds needed to be directed to the implementation of energy efficiency projects in selected sectors of SEAP is 1081 754.0 mln. UAH. (tab. 3.9.2).

Table 3.9.2

Investment stock necessity of implementation energy saving measures meeting SEAP commitments in Chernivtsi

Sectors	Investment costs, thousand UAH
1. Municipal buildings, equipment/objects	240 186,33
2. Residential buildings	93 148,3
3. Municipal public lighting	115 481,6
4. Transport	158 810,0
5. Industries except GHG Trading (Communal Enterprises)	480 881,304
6. The System of People's Consciousness Change Measures	300,0
Total	1 088 749,134

3.10 Estimation of CO2 Emissions Reduction till 2020 by Sectors

Table 3.10.1

Amount of Reduction of CO2 Emission till 2020 in Sectors

№	Sectors	Total number of emission in base 2010 Tons per year	Emission reduction, Tons per year	Emission reduction, CO2, %
1.	Municipal buildings, equipment/objects	23796,62	9355,42	39,31
2.	Residential buildings	395909,94	50960,85	12,87
3.	Municipal public lighting	5936,48	5001,706	84,25
4.	Transport	19981,31	5438,99	27,22
5.	Industries except GHG Trading (Communal Enterprises)	54759,00	35814,16	65,4
	Total	**500383,35**	**106571,12**	**21,3**

By 2020 amount of emission of CO_2 in Chernivtsi is planned to be reduced up to **21,3%** in comparison with 2010.

SUMMARY

The scenario of CSEAP is a strategic document, which is aimed at raising energy efficiency in fiscal institutions, residential buildings, public transport, municipal public light and on the communal enterprises of the city.

According to the results of development of SEAP the current state of the art in production spheres and consumption of fuel and energy resources in the city was analyzed and estimated. The dynamics of consumption of energy resources for the last 6 years(2008-2013) was analyzed through the view of basic sectors (municipal buildings, equipping/ facility, houses, municipal public light, transport, branches of industry beyond communal enterprise). According to received data emission survey of CO_2 was made up with choosing 2010 as the basic year according to which in 2020 it is planned to reach reduction of emission of CO_2 to 106571,12 tons per year or to 12,3%. Moreover it is planned to reduce consumption of all main kinds of energy resources to 247084,33 Megawatt per year.

the availability of institutional and management structure of Chernivtsi city council to introduction and monitoring of the state of execution of scenario of constant energy development, effectiveness of the system's work of energy management in the city was estimated. The proposals as to improvement the system of energy management in Chernivtsi were provided.

In the context of the offered measures and financial resources which are necessary for its realization the opportunities of city's budget were examined as to financing (co-financing) measures directed to reducing emission of CO_2. It is determined that for the basic sources of financing energy effective projects it is necessary to examine lending, grant assets and other sources of financing, which are not forbidden by current legislation, assets of city's budget mainly is better to use for co-financing of measures with energy – saving.

List of measures, realization of which is offered for reducing emissions of greenhouse gases, and its cost, during the realization of the scenario of constant

energy development, can be revised and become actual connected with the advent of new technology, needs, change of market situation, taken administrative decisions etc.

Mayor of Chernivtsi **O. Kaspruk**