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# **R E P O R T**

## **on CARBON FOOTPRINT**

### **of Public Institutions in Municipalities Berovo, Delcevo, Pehcevo & Vinica**

**(Macedonian version)**

In frame of the Project:

**"JOINT INTEGRATED POLICY FOR LOW-CARBON ECONOMY IN CROSS-BORDER REGION"**

Ref. No.CB006.1.11.165

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## INTRODUCTION

This document has been developed within the framework of the project “JOINT INTEGRATED POLICY FOR LOW-CARBON ECONOMY IN CROSS-BORDER REGION” Ref. No.CB006.1.11.165, financially supported within the framework of the cross-border program between Bulgaria and Macedonia. Within this project, one of the activities is to prepare a Carbon Footprint Analysis and evidence of the CO<sub>2</sub> emission contribution of the public and private entities.

A special methodology was developed for that purpose, for the analysis of the carbon footprint of public and business facilities in the territory of the four municipalities that were covered by this project: the municipality of Berovo, municipality of Delchevo, municipality of Vinica and municipality of Pehchevo:

- Mapping of public and business facilities that will be covered with the analysis
- Preparation of a questionnaire for data collection;
- Distribution and collection of questionnaires;
- Data processing and data analysis of the gained questionnaires;
- Preparation of a report on the carbon emission rate from public and business objects with conclusions and recommendations;

For the first step mapping of public and business objects (subjects) that will be covered within the analysis itself was discussed at the first consultative meeting with the stakeholders in Pehchevo and the following subjects were proposed to be included in the analysis:

- Municipal buildings of the four municipalities;
- Public utility companies;
- Primary schools from the four municipalities;
- Buildings of kindergartens - gardeners;
- Business sector (hotels and accommodation facilities as well as production activities)

For the needs of the analysis, a specific questionnaire was prepared, which is attached to this report, in which the following data were requested:

- Basic data for the subjects, name, activity, number of employees, address, etc.
- Data related to the objects, area, age, construction, heating / cooling of the building, lighting in the facility, equipment and installed consumers of the building, using alternative energy sources;
- Mobility, or means of transport, mileage, etc.
- Resources used by the facility, such as electricity consumption, energy, water consumption, etc. ;
- Internal cuisine and nutrition for employees or users;
- Production of waste

The prepared questionnaire was sent to 30 subjects by e-mail, of which 20 were returned and they were processed and entered in this report. The complete list of sent questionnaires and returned questionnaires is provided in Appendix 2.

Questionnaire processing and comparative analysis is done according to the input data, and the calculation of the greenhouse gas emissions (footprint) is carried out via the MyClimate online software calculator [MyClimate https://co2.myclimate.org/en/company\\_calculators/new](https://co2.myclimate.org/en/company_calculators/new)

The conclusions and recommendations are derived from the submitted data and according to the results obtained for the rate of greenhouse gas emissions.

## MUNICIPALITY OF BEROVO



Total number of employees: 30 employees

### A. THE OBJECT

The administrative building of the municipality of Berovo is a two-story building built in 1997 with a total useful floor area of 1060 m<sup>2</sup> and it is heated. The building is made of solid construction, built of concrete and bricks, without built-in special insulating materials on the façade. The roof construction is with shingles without opening, and the exterior windows and doors are made of wooden carpentry.

The illumination of the object is mixed with ordinary light bulbs 10 numbers of 75W, and neon pipes of 206 neoki with 18W and 80 news of 36W.

The total installed capacity of other consumers placed in the building is 25kW.

### Heating of the object

For heating of the municipal premises, a special boiler heating system from ES-250kW is used, which uses oil as a fuel with 30 heaters (radiators) installed. Some of the rooms are additionally heated with 10 electric heaters with a total capacity of 20kW.

One cooling system with a capacity of 2.5kW has been installed for cooling.

### B. MOBILITY / TRAFFIC

Major part of the employees use private vehicles (at their own expense) for coming and departing from work and annually, and a total of about 60,000 kilometers per year.

The municipality has two official vehicles used for the execution of the tasks and duties.

Average of 10 nights per year (accommodation in hotels) are realized by the employees in the municipality through participation in seminars, meetings, etc. organized by different organizations and entities outside the municipality.

### C. ENERGY, FUEL AND WASTE

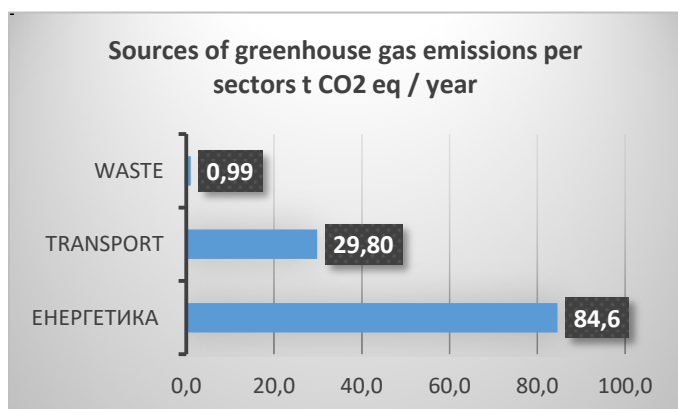
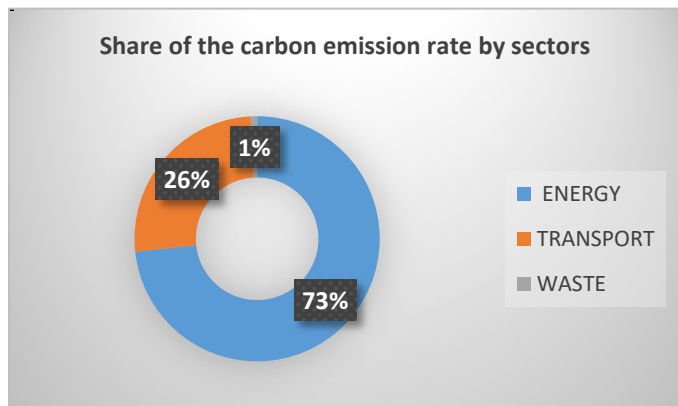
According to the collected data, the Municipality of Berovo uses about 50,000 kWh per year for electricity, about 5600 liters of fuel oil for heating the facility and about 3000 liters of oil as fuel for its own motor vehicles. The total annual water consumption of the water supply system is 200 m<sup>3</sup> / year.

no	Type of energy used in the facility annually	Quantity
1.	Total amount of electricity spent annually	50.600 kWh/y
2.	Fuel for vehicles - Petrol	l/y
	Fuel for vehicles - Diesel	3 000 l/y
	Fuel for vehicles - LPG (gas)	l/y
7.	Water consumption from the water supply system	200 m <sup>3</sup> /y
8.	Consumption of water from another system (wells, rainwater, etc.)	m <sup>3</sup> /y

There is no selection and record of the type and type of waste generated by the facility, therefore the quantities supplied are by free calculation by the municipal officials. The total amount of generated waste is estimated at 2750 kg / year.

NO	Item	Quantity
1	Plastic waste (PVC), polystyrene, foil etc	100 kg/y
2	Paper / Printed materials	200 kg/y
9	Other:	1500 kg/y
Total waste production:		1800 kg/y

#### D. RATE OF CARBON EMISSION (FOOTPRINT)



Total emission of GHG per year:

**115,4**  
tons eq CO<sub>2</sub>

Coefficient of emission per m<sup>2</sup> area:

**0,11**  
tons eq CO<sub>2</sub>/m<sup>2</sup>

#### E. MEASURES FOR REDUCTION OF EMISSION

- Implementation of measures for thermal insulation of the walls and roof construction of the building / premises in order to reduce the consumption of electricity for heating in the winter period;
- Change of fuel in the heating system, application of biomass (pellets) as a measure for reducing the consumption of electricity and reduction of greenhouse gas emissions;
- Procurement and installation of a photovoltaic system for independent production of electricity and direct use in the power supply system (eg lighting of the facility) or by compensating for the generated electricity, since the facility has a large, favorable and well-oriented a southeast position that can provide a good angle of sunburn;
- Purchase of hybrid or electric vehicles for official needs of the municipality and thus reduction of greenhouse gas emissions for transport;
- Selection and evidence of waste



Total number of employees: 40 employees

Address: Ul. Svetozar Markovic br. 1, Delcevo

### A. THE OBJECT

The premises of the municipality of Delchevo are located in a joint building "Center for Culture" in which besides the municipal premises, the building is jointly used by other public and business entities. The premises in which the municipality of Delcevo is located are used for about 15 years, with a total useful area of 300 m<sup>2</sup>. The building is built of concrete and bricks, with tin roofing and aluminum windows on windows without built-in special insulating materials. The illumination of the building is with neon lights with a total number of 150 with a power of 36W.

### Heating of the object

or the heating of the municipal premises, a special central heating system is used, and some of the rooms are heated by heaters. The facility does not use alternative energy sources such as photovoltaic panels, solar collectors for hot water, etc.

### Installed devices (consumers)

Installed devices and equipment that use electricity (eg Computers, laptops printers, heaters, air conditioners refrigerators, water heaters, etc.)

NO	Consumer	pices	Power	Total installed power
1.	Refrigerator	1	1500W	1500W
2.	Boiler for hot water	1	3000W	3000W
3.	Personal Computer	31	420W	13020W
4.	Lap top	4	250W	1000W
5.	Server	1	420W	420W
6.	Heaters	5	2000 W	10000W
7.	air conditioners	6	2500 KW	15000W

### B. MOBILITY / TRAFFIC

Most of the employees use private vehicles (at their own expense) for coming and departing from work and annually, and a total of about 142200 km per year.

The municipality has 3 official vehicles used for the execution of the work tasks and obligations with which the total of about 95000 km.

no	Type of the vehicle	fuel	Year of manufacturing	Average passed километри/год.
1	PASAT	diesel	2011	40.000 km/y
2	FORD	gasoline	2011	40.000 km/y
3	POLO	gasoline	1995	15.000 km/y

Average of 30 nights per year (accommodation in hotels) are realized by the employees in the municipality through participation in seminars, meetings, etc. organized by different organizations and entities outside the municipality.

### C. ENERGY, FUEL AND WASTE

According to the collected data, the Municipality of Delcevo uses about 66,660 kWh per year for electricity, about 1750 liters of oil and about 1750 liters of gasoline for their own motor vehicles. The total annual water consumption of the water supply system is 150 m<sup>3</sup> / year.

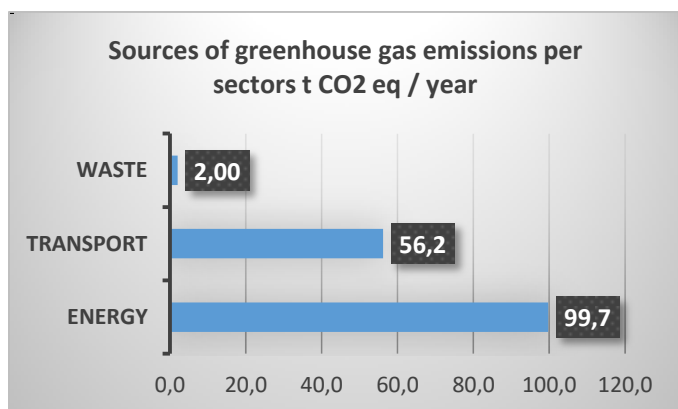
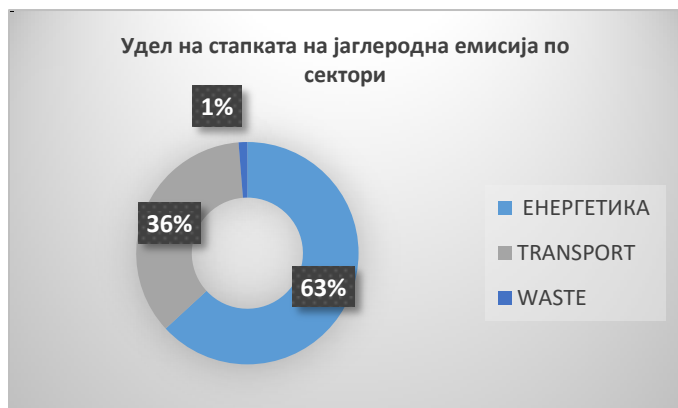
P. 6.	Type of energy used in the facility annually	Количина
1.	Total amount of electricity spent annually	66.600 kWh/г
2.	Fuel for vehicles - Petrol	1.750 л/г
	Fuel for vehicles - Diesel	1.750 л/г
	Fuel for vehicles - LPG (gas)	л/г
7.	Water consumption from the water supply system	150 m <sup>3</sup> /г

8.	Consumption of water from another system (wells, rainwater, etc.)	m <sup>3</sup> /r
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here is no selection and record of the type and category of waste generated by the facility, therefore the quantities supplied are by free calculation by the municipal officials. The total amount of generated waste is estimated at 2750 kg / year.

P.6.	Item	
1	Plastic waste (PVC), polystyrene, foil etc	50 kg/r
2	Paper / Printed materials	700 kg/r
9	Other:	2.000 kg/r
Total waste production		

#### D. RATE OF CARBON EMISSION (FOOTPRINT)



Вкупна емисија на стакленички гасови годишно:

**157,9**

тони eq CO<sub>2</sub>

Coefficient of emission per m<sup>2</sup> area:

**0,53**

tons eq CO<sub>2</sub>/m<sup>2</sup>

#### E . MEASURES FOR REDUCTION OF EMISSION

- Implementation of measures for thermal insulation of the walls and roof construction of the building / premises in order to reduce the consumption of electricity for heating in the winter period;
- Change of fuel in the heating system, application of biomass (pellets) as a measure for reducing the consumption of electricity and reduction of greenhouse gas emissions;
- Installation of an outer insulating blind and reduction of the occupancy of the premises due to the exposure of the premises on the southern exposition and heating of the premises in the summer time and the consumption of electricity for cooling the premises;
- Procurement and installation of a photovoltaic system for independent production of electricity and direct use of it in the power supply system (eg lighting of the facility) or by compensating for the generated electricity, since the facility has a large, favorable and well-oriented a southeast position that can provide a good angle of sunburn;
- Purchase of hybrid or electric vehicles for official needs of the municipality and thus reduction of greenhouse gas emissions for transport;
- Selection and record of waste;



Total number of employees: 140 persons / employees

#### A. THE OBJECT

The building in which the municipality of Vinca is located is a joint building of several municipal institutions and part of state institutions that are users of the area of the building, such as: Vinica Municipality, regional ministries, Museums, House of Culture, Library and Library. The building was built 30 years ago. With concrete construction and bricks, with tin roofing on which there are built-in insulating materials, but without special insulation on the walls and the facade of the building. The outer carpentry is aluminum and part of the wooden carpentry. The total surface area and the useful area that is heated / cooled is 1800 m<sup>2</sup>. Lighting is complete with 18W compact fluorescent lamps with a total of 1120 light bulbs.

#### Heating and colling of the object

The facility has its own central steam heating system, over 120 radiators and two steam boilers of 408kW for which oil is used as a fuel, there are also 15 electric heaters used for heating or heating where no radiators are set. For cooling of the premises in the building there are separate units of splicing systems (air-conditioning)

total of 33 in number with total installed capacity of 85 kw.

The facility does not use alternative energy sources such as photovoltaic panels, solar collectors for hot water, etc.

Installed devices and equipment that use electricity (eg Computers, laptops printers, heaters, air conditioners refrigerators, water heaters, etc.)

no	Consumer	pices	Power	Total installed power
1.	computers	110	420W	46200W
2.	printers	60	250W	15000W
3.	heaters	15	2000W	30000W
4.	air conditioners	33	2500W	82500W

#### B. MOBILITY / TRAFFIC

There is no organized transport for the arrival and departure of employees from work. Most of the employees use private vehicles for their arrival and departure from work, and some of them use public transport, but no data is available on the kilometers covered on this basis.

The municipality has 7 official vehicles used for carrying out work tasks and obligations, with which they spend about 150,000 annually per year.

no	Type of the vehicle	fuel	Year of manufacturing	Average passed километри/year
1	Citroen C4	Gasoline	2009	30000 km/y
2	Citroen C5	Gasoline	2009	50000 km/y
3	Skoda felicia	LPG	1996	30000 km/y
4	LADA NIVA	Gasoline	2001	25000 km/y
5	Yugo tempo 1.1	Gasoline	1997	km/y
6	Fiat panda	Gasoline	2005	km/y
7	Ford fiesta	Gasoline	2006	10000 km/y

There are no accommodation in hotels that are realized by the employees in the municipality through participation in seminars, meetings, etc. organized by different organizations and entities outside the municipality.

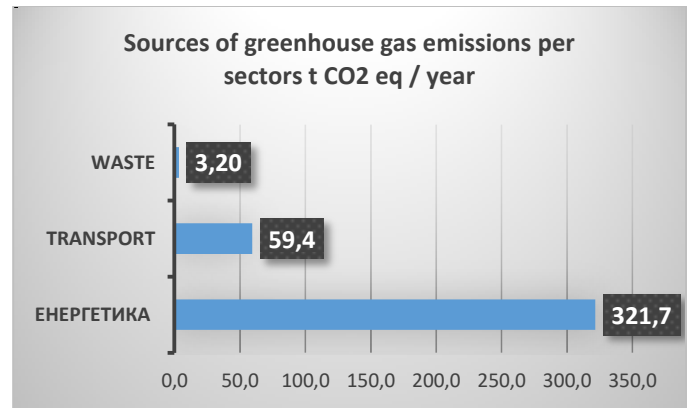
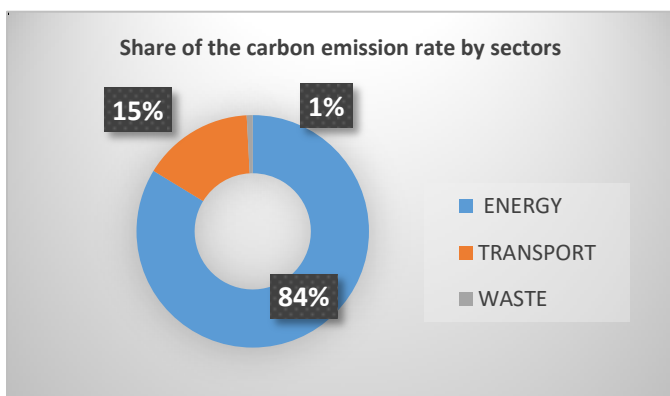
## C. ENERGY, FUEL AND WASTE

The municipality of Vinica spend 158.000 kWh per year for electricity, about 15.000 liters of gasoline and 1000 liters of LPG as fuels for their own motor vehicles. For heating the object uses about 32,000 liters of oil (heavy fuel oil). The total annual water consumption of the water supply system is 4500 m<sup>3</sup> / year. According to the assessment of the employees of the Municipality of Vinica, the annual production of waste is 5,400 kg / year.

no	Type of energy used in the facility annually	Quantity
1.	Total amount of electricity spent annually	158.000 kWh/y
2.	Fuel for vehicles - Petrol	15.000 l/y
	Fuel for vehicles - Diesel	l/y
	Fuel for vehicles - LPG (gas)	1.000 l/y
3.	Water consumption from the water supply system	32.000 l/y
7.	Consumption of water from another system (wells, rainwater, etc.)	4.500 m <sup>3</sup> /y

P.6.	Item	Quantity
1	Plastic waste (PVC), polystyrene, foil etc	50 kg/r
2	Paper / Printed materials	350 kg/r
3	Metals (spare parts, iron, aluminum)	0 kg/r
4	Organic waste (food, cooking oil, etc.)	0 kg/r
5	Chemicals (detergents, motor oil, colours etc.)	0 kg/r
6	Electronic waste (computers, TVs, radios, batteries, cables)	0 kg/r
7	Non-organic waste (minerals, clay, construction rubble, etc.)	0 kg/r
8	Glass and packaging	0 kg/r
9	Other:	5.000 kg/r
Total waste production:		5.400 kg/r

## D. RATE OF CARBON EMISSION (FOOTPRINT)



Total emission of GHG per year:

**384,3**  
тони eq CO<sub>2</sub>

Coefficient of emission per m<sup>2</sup> area:

**0,21**  
tons eq CO<sub>2</sub>/m<sup>2</sup>

## E . MEASURES FOR REDUCTION OF EMISSION

- Implementation of measures for thermal insulation of the walls and of the building / premises, installation of an outer insulating blind (grille) and reduction of the installation of the premises due to reduction of the consumption of electricity for cooling and reduction of the energy consumption for heating in the winter period;
- Installation of a central system for ventilation and cooling of the building;
- Change of fuel in the heating system, application of biomass (pellets) as a measure for reducing the consumption of electricity and reduction of greenhouse gas emissions;
- Purchase and installation of a photovoltaic system for independent production of electricity and direct use of it in the electricity supply system (eg lighting of the facility) or by compensating for the generated electricity.
- Purchase of hybrid or electric vehicles for official needs of the municipality and thus reduction of greenhouse gas emissions for transport;
- Selection and record of waste;



total number of employees: 22

Address: Ul. "Raven" No.8, Pehcevo

#### A. THE OBJECT

The building of the municipality of Pehchevo was built 10 years ago and it houses the municipal administration and offices of the regional ministries. The total useful area that is heated / cooled is 285 m<sup>2</sup>. The building is constructed of concrete and bricks with built-in thermal insulation on the walls and a roof construction made of ceramic. The exterior windows and doors are completely made of PVC. No photovoltaics or hot water collectors have been set up for the use of alternative solar energy.

The illumination of the object is with neon lights (36W) about 30 numbers and very small part with ordinary lamps (70W) about 5 numbers.

#### Heating and cooling of the object

The facility has a central heating system with 23 heaters (radiators) and is heated by a 110kW boiler that uses fuel wood as a fuel source with a total consumption of about 50m<sup>3</sup> / year. There are also 8 heaters used in extremely cold periods for warming up the premises. Cooling in the building is carried out with one air conditioning unit of 2.5 kW.

Installed devices and equipment that use electricity (eg Computers, laptops printers, heaters, air conditioners refrigerators, water heaters, etc.)

No	Consumer	pices	Power	Total installed power
1	computers	15	420W	6300W
2.	Lap top	2	250W	500W
3.	printers	12	250W	3000W
4.	Air conditioner	1	2500W	2500W
5.	refrigerators	2	1500W	3000W
6.	heaters	8	2000W	16000W

#### B. MOBILITY / TRAFFIC

here is no organized transport for the arrival and departure of employees from work. Most employees use private vehicles to arrive and leave the work with an estimate of 60,000 km / year, and some of the employees also use public transport by bus with an estimate of around 2600 km a year.

The municipality has 3 official vehicles used to perform work duties and obligations, with which they spend about 60,000 km / year annually.

P.6	Type of the vehicle	fuel	Year of manufacturing	Average passed километри/year
1	SKODA SUPERB	Diesel	2013	35000 km/r
2	HYNDAL MATRIX	Diesel	2001	15000 km/r
3	NIVA LADA	LPG/gasoline	2012	10000 km/r

An average of 8-10 overnights annually (accommodation in hotels) are realized by the employees in the municipality through participation in seminars, meetings, etc. organized by different organizations and entities outside the municipality.

#### C. ENERGY, FUEL AND WASTE

According to the acquired data, the Municipality of Pehchevo uses about 38,000 kWh per year for electricity, about 2900 liters of oil, about 150 liters of gasoline and 1400 liters of gas for their own motor vehicles. For heating the object, a firewood of about 50m<sup>3</sup> is used. The total annual water consumption of the water supply system is 80 m<sup>3</sup> / year. There is no selection and record of the type and type of waste generated by the facility, therefore the quantities supplied are by free calculation by the municipal

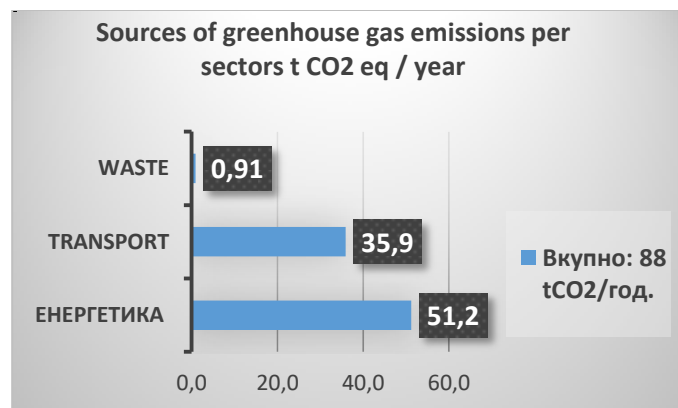
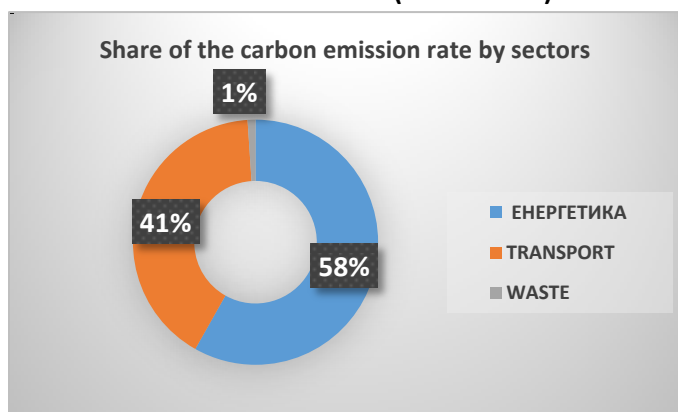
officials. The total amount of generated waste is estimated at 1,300 kg / year.

no	Type of energy used in the facility annually	Quantity
1.	Total amount of electricity spent annually	38 000 kWh/y
2.	Fuel for vehicles - Petrol	150 l/y
	Fuel for vehicles - Diesel	2900 l/y
	Fuel for vehicles - LPG (gas)	1400 l/y
6.	Water consumption from the water supply system	40000 kg/y
7.	Consumption of water from another system (wells, rainwater, etc.)	80 m <sup>3</sup> /y

\*1m3 wood ≈ 800 kg

no	Item	Quantity
1	Plastic waste (PVC), polystyrene, foil etc	50 kg/r
2	Paper / Printed materials	250 kg/r
3	Metals (spare parts, iron, aluminum)	0 kg/r
4	Organic waste (food, cooking oil, etc.)	0 kg/r
5	Chemicals (detergents, motor oil, colours etc.)	0 kg/r
6	Electronic waste (computers, TVs, radios, batteries, cables)	0 kg/r
7	Non-organic waste (minerals, clay, construction rubble, etc.)	0 kg/r
8	Glass and packaging	0 kg/r
9	Other:	1.000 kg/r
<b>Total waste production:</b>		<b>1.300 kg/r</b>

#### D. RATE OF CARBON EMISSION (FOOTPRINT)



Total emission of GHG per year:

**88,0**  
tons eq CO<sub>2</sub>

Coefficient of emission per m<sup>2</sup> area:

**0,31**  
tons eq CO<sub>2</sub>/m<sup>2</sup>

#### E . MEASURES FOR REDUCTION OF EMISSION

- Change of fuel in the heating system, application of biomass (pellets) as a measure for reducing the consumption of electricity and reduction of greenhouse gas emissions and improvement of the energy efficiency and effectiveness of the facility;
- Purchase and installation of a photovoltaic system for independent production of electricity and direct use of it in the electricity supply system (eg lighting of the facility) or by compensating for the generated electricity.
- Purchase of hybrid or electric vehicles for official needs of the municipality and thus reduction of greenhouse gas emissions for transport;
- Stimulation for use of a bicycle as a means of transport for employees for coming and going to work;
- Selection and record of waste;

## PUBLIC UTILITIES

### BEROVO: JABHO ПРЕТПPUBLIC UTILITY “USLUGA”

The public UTILITY USLUGA from Berovo has three facilities through which it performs its activities in the field of water supply, waste water treatment and collection and disposal of communal waste in the territory of the municipality of Berovo. The total number of employees is 90 people.

#### A. THE OBJECTS

##### Head quater (Marsal Tito bb Berovo)

The surface of the building is 150m<sup>2</sup> and with a period of exploitation over 50 years. It is built of concrete and bricks, with wooden windows and doors, covered with shingles. Isolated the roof. In the building there is installed own heating system with a steam boiler of 35kW which uses as energy fuel wood. The object is illuminated with 11 ordinary 60W light bulbs with a total installed power of 660W.

no.	Consumer/installed equipment	pices	Power	Total installed power
1.	computer	11	500 W	5500 W
2.	Lap top	1	250 W	250 W
3.	boiler	1	3500 W	3500 W
4.	Pump water heating	1	350 W	350 W
Total installed power of divaces and equipmnet:				9,6 kW

##### Drinking water purification station

The facility filter station for drinking water purification has been in operation for more than 30 years, with a total area of 150 m<sup>2</sup>, of which only 64m<sup>2</sup> is heated / cooled. The structure of the building is made of bricks and concrete, there are no built-in insulation materials, roof construction is made of saloon tiles (boards) with wooden windows and doors.

Heat is done with individual heaters of electricity (total power of 60kW), but also on firewood stoves,

no	Type of illumination in the building:	number/quantity	installed power of bulbs unit	Total installed power
1.	Ordinary bulbs	4	100 W	400 W
2.	Neon lighting	14	40 W	560 W
3.	Compact fluorescents (CFC) bulbs	1	36 W	36 W
4.	Metal Halogen Lighting	2	30 W	60 W
5.	Metal Halogen Lighting	2	400	800 W
6.	Metal Halogen Lighting	4	250W	1000 W
7.	Other	6	400 W	2400 W
Total installed power of illumination:				3.82 kW

no	Consumer/ installed devices	pices	Power	Total installed power
1.	computer	3	300 W	900 W
2.	heaters	11	500 W	5500 W
3.	boiler	1	2000W	2000 W
4.	Pump	2	2200 W	4400 W
5.	stirrers	3	550 W	1650 W
6.	stirrers	1	3500W	3500W
7.	air conditioner	1	1700 W	1700 W
8.	process equipmnet	1	35 W	35 W
9.	blower for air	1	45000W	45000 W
10.	wall heater	1	2000 W	2000 W
11.	room heater	2	2000W	400 W
Total installed power of divaces and equipmnet:				67 kW

#### C. Wastewater treatment plant

The building is used for about 10 years, with a total area of 100m<sup>2</sup>, built of concrete and bricks, with built-in thermal facade of the building and tin roof with built-in insulation. The exterior doors and windows are made of PVC.

Heating of the building is carried out with own steam heating system with steam boiler of 23kW and as a fuel

uses a firewood, with eight heating elements (radiators).

no.	Type of illumination in the building:	number/ quantity	installed power of bulbs unit	Total installed power
1.	Ordinary bulbs	18	18W	324W
2.	Neon lighting	16	20W	320W
3.	Compact fluorescents (CFC) bulbs	2	150W	300W
4.	Poultices high-pressure lamps	7	250W	1750W
Total installed power of illumination:				2.7 kW

no	Consumer/ installed devices	pices	Power	Total installed power
1.	Circular pump for heating	1	25W	25W
2.	Electric water heater	1	2000W	2000W
3.	Spit system	2	2400W	2400W
4.	Electric stove	1	6000W	6000W
5.	TV set	1	500W	500W
6.	Refrigerator	1	1000W	1000W
7.	Thermostat	1	1000W	1000W
8.	Mouflon furnace	1	1200W	1200W
9.	Computer	2	500W	1000W
Total installed power of divaces and equipmnet:				15.1 kW

## B. MOBILITY / TRAFFIC

There is no organized transportation for arrival and departure from the workplace, so the employees themselves organize themselves with their own transport. The estimate is that about 110,000km / year the employees leave for coming and going out of work.

The public company has its own fleet of vehicles to carry out everyday duties

no	Type of the vehicle	fuel	Year of manufacturing	Average passed километри/year
1	Reno cango	gasoline	2007	12000 km/r
2	FAP	diesel	1976	6000 km/r
3	Backhoe loaders FIAT cobelco	diesel	2004	20000 km/r
4	Dacia	diesel	2003	10000 km/r
5	tarctor 1	diesel	1971	10000 km/r
6	tractor2	diesel	1971	10000 km/r
7	LADA NIVA	gasoline	2005	70000 km/r
8	Reanaoult 2619	diesel	2000	25000 km/r
9	Reanault 210.15	diesel	2001	25000 km/r

Around 5-6 nights annually (accommodation in hotels) are realized by the municipal employees through participation in seminars, meetings, etc. Organized by different organizations and entities outside the municipality.

## C. ENERGY, FUEL AND WASTE

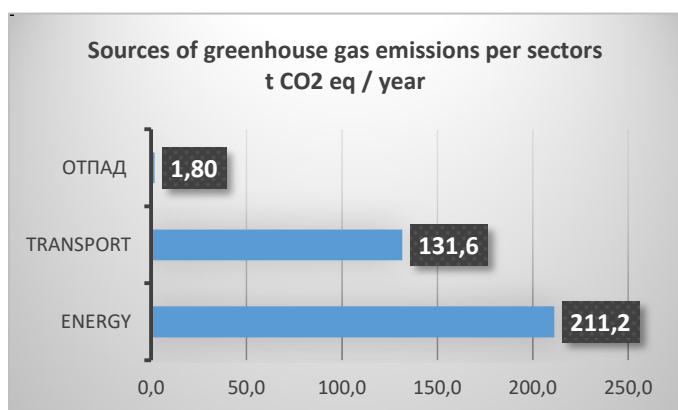
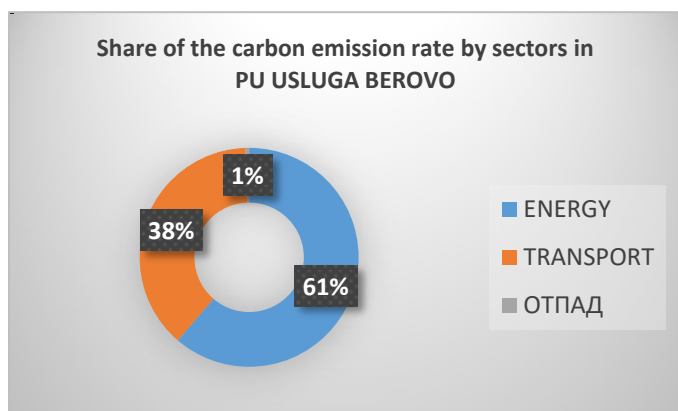
According to the collected data, PE Usluga-Berovo has an annual consumption of 155580 kWh, about 5000 liters of gasoline, about 20000 liters of diesel, about 100m3 of firewood and about 200m3 of water.

no	Type of energy used in the facility annually	Quantity
1.	Total amount of electricity spent annually	155580 kWh/годишно
2.	Fuel for vehicles - Petrol	5000 л/г
	Fuel for vehicles - Diesel	20000 л/г
	Fuel for vehicles - LPG (gas)	л/г
3.	Water consumption from the water supply system	80000 kg/r
4.	Consumption of water from another system (wells, rainwater, etc.)	360 m <sup>3</sup> /r

## D. MATERIALS AND WASTE

no.	Item	Quantity
1	Plastic waste (PVC), polystyrene, foil etc	100 kg/y
2	Paper / Printed materials	200 kg/y
3	Metals (spare parts, iron, aluminum)	200 kg/y
4	Organic waste (food, cooking oil, etc.)	800 kg/y
5	Chemicals (detergents, motor oil, colours etc.)	200 kg/y
6	Electronic waste (computers, TVs, radios, batteries, cables)	kg/y
7	Non-organic waste (minerals, clay, construction rubble, etc.)	kg/y
8	Glass and packaging	kg/y
9	Other:	1500 kg/y
Total waste production:		3000 kg/y

#### D. RATE OF CARBON EMISSION (FOOTPRINT)



Total emission of GHG per year:

**344,6**

tons eq CO<sub>2</sub>

Coefficient of emission per m<sup>2</sup> area:

**0,87**

Tons eq CO<sub>2</sub>/m<sup>2</sup>

#### E . MEASURES FOR REDUCTION OF EMISSION

- Implementation of measures for thermal insulation of the walls and of the building / premises for reducing the consumption of the energy for heating in the winter period;
- Change of fuel in the heating system, application of biomass (pellets) as a measure for reducing the consumption of electricity and reduction of greenhouse gas emissions;
- Procurement and installation of a photovoltaic system for independent production of electricity and direct use of it in the power supply system (eg lighting of the facility) or by compensating for the generated electricity;
- Replacing lighting with LED bulbs;
- Purchase of hybrid or electric vehicles for official needs of the municipality and thus reduction of greenhouse gas emissions for transport;
- Stimulation for use of a bicycle as a means of transport for employees for coming and going to work;

## DELCEVO: PUBLIC UTILITY FOR COMUNAL WORKS "BREGALNICA"

The Public Utility Enterprise is responsible for supplying water and collecting municipal waste from households and legal entities on the territory of the municipality of Delchevo. There are a total of 87 employees.

### A. CONSTRUCTION OF THE OBJECT

The building in which the Public Enterprise is located has a total area of 272m<sup>2</sup>, of which about 190m<sup>2</sup> is heated or cooled in the summer period. The building is of solid construction with concrete and bricks, without insulation, with carpentry (windows and doors) made of wood, roof construction from a tile. The building has been in operation for more than 50 years. The illumination in the building is varied in which there are 10 ordinary bulbs of 100W, 22 neons of 36W, 10 compact fluorescent of 40W each and two 250W poultry. The facility does not have equipment for alternative sources of energy.

no	Type of illumination in the building:	number/quantity	installed power of unit/lamp	Total installed power
1.	Ordinary bulbs	10	100 W	1000W
2.	Neon lighting	22	36 W	792 W
3.	Compact fluorescents (CFC) bulbs	1	40 W	40 W
5.	LED lights	/	W	W
6.	Other	2	250 W	500 W
Total installed power of illumination:				2332 W

### Heating and cooling of the object

The facility has a separate central heating system with a 50kW boiler that uses fuel wood as a fuel for about 145m<sup>3</sup> annually. In addition, there are 7 electric heaters of 2000W each, which are used for additional heating of the offices.

For cooling of the building there is only one air conditioner of 3,5kW installed.

no	Consumer/ installed devices	pices	Power	Total installed power
1.	computers	11	400 W	4400
2.	printers	7	400 W	2800
3.	heaters	7	2000 W	14000 W
4.	Air conditioner	1	3500 W	3500 W
5.	refrigerators	1	1500 W	1500 W
6.	boiler	1	2000 W	2000 W
Total installed power of divaces and equipmnet:				28,2

### B. MOBILITY / TRAFFIC

There is no organized transport for the arrival and departure of employees from work. Most employees use private vehicles to arrive and leave the work with an estimate of a total of 24,000 km / year,

Public enterprise has got 8 official vehicles, out of which 3 passengers, 3 freight and 2 tracts used for performing work duties and obligations.

P.6	Type of the vehicle	fuel	Year of manufacturing	Average passed километри/year
1	Skoda Yeti	diesel	2011	38000 km/y
2	Opel Vectra	gasoline	1994	9078 km/y
3	Lada Riva 1300	gasoline /LPG	1989	9686 km/y
4	Iveco 65c 15/35	diesel	2014	9222 km/y
5	IMT 539	diesel	1988	8890 km/y
6	IMT 565	diesel	1984	9217 km/y
7	MAN 8.136 F36	diesel	1986	2586 km/y
8	Mercedes 1213	diesel	1981	4443 km/y

About 6-8 overnights annually (accommodation in hotels) are realized by the employees through participation in seminars, meetings, etc. organized by different organizations and entities outside the municipality.

### C. ENERGY, FUEL AND WASTE

According to the obtained data, the BPBD Bregalnica from Delcevo spends about 23,280 kWh per year for electricity, about 25,200 liters of oil, about 4300 liters of gasoline and about 1300 liters of LPG for its own motor vehicles. For the heating of the object, a firewood of about 145 m<sup>3</sup> is used. The total annual water

consumption of the water supply system is 3600 m<sup>3</sup> / year.

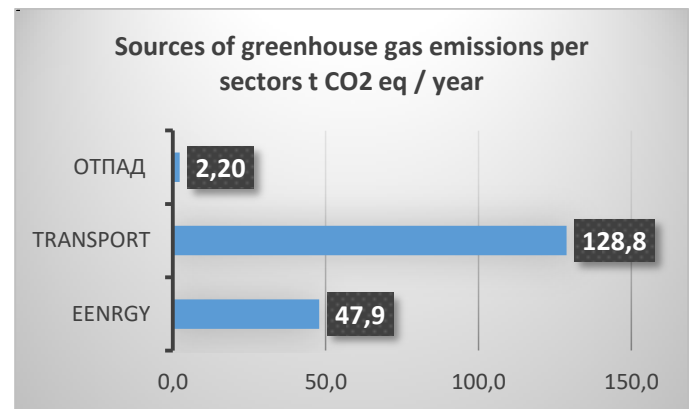
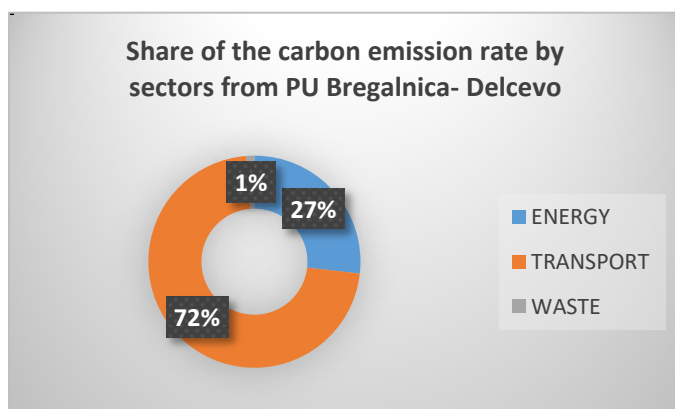
no	Type of energy used in the facility annually	Quantity
1.	Total amount of electricity spent annually	23280 kWh/y
2.	Fuel for vehicles - Petrol	4300 l/y
	Fuel for vehicles - Diesel	25200 l/y
	Fuel for vehicles - LPG (gas)	1300 l/y
3	Water consumption from the water supply system	115200 kg/y
4.	Consumption of water from another system (wells, rainwater, etc.)	3600 m <sup>3</sup> /y

\*1m<sup>3</sup> forewood ≈ 800 kg

There is no selection and evidence of the type and category of waste generated by the facility, therefore the quantities supplied are by free calculation by the municipal officials. The total amount of generated waste is estimated at 3000 kg / year.

no	Item	Quantity
1	Plastic waste (PVC), polystyrene, foil etc	200 kg/y
2	Paper / Printed materials	100 kg/y
3	Metals (spare parts, iron, aluminum)	1200 kg/y
4	Organic waste (food, cooking oil, etc.)	/ kg/y
5	Chemicals (detergents, motor oil, colours etc.)	1300 kg/y
6	Electronic waste (computers, TVs, radios, batteries, cables)	/ kg/y
7	Non-organic waste (minerals, clay, construction rubble, etc.)	/ kg/y
8	Glass and packaging	200 kg/y
9	Other:	/kg/y
Total waste production:		3000 kg/y

#### D. RATE OF CARBON EMISSION (FOOTPRINT)



Total emission of GHG per year

**178,9** tons eq CO<sub>2</sub>

Coefficient of emission per m<sup>2</sup> area:

**0,94** tons eq CO<sub>2</sub>/m<sup>2</sup>

#### E . MEASURES FOR REDUCTION OF EMISSION

- Implementation of measures for thermal insulation of the walls and of the building / premises for reducing the consumption of the energy for heating in the winter period;
- Change of fuel in the heating system, application of biomass (pellets) as a measure for reducing the consumption of electricity and reduction of greenhouse gas emissions;
- Procurement and installation of a photovoltaic system for independent production of electricity and direct use of it in the power supply system (eg lighting of the facility) or by compensating for the generated electricity;
- Replacing and unifying the lighting of LED bulbs;
- Regular maintenance of vehicles in order to reduce fuel consumption;
- Purchase of hybrid or electric vehicles for official needs of the municipality and thus reduction of greenhouse gas emissions for transport;
- Stimulation for use of a bicycle as a means of transport for employees for coming and going to work;

the public utility company is in charge of water supply and collection of municipal waste from households and legal entities on the territory of the municipality of Pehcevo. There are 27 employees in total.

#### A. CONSTRUCTION OF THE OBJECT

The building in which the public enterprise is located has a total area of 66 m<sup>2</sup>, of which about 60 m<sup>2</sup> is heated or cooled in the summer period. The building is of solid construction with concrete and bricks, without insulation, with carpentry (windows and doors) made of wood and part of PVC, roof construction made of tile. The building has been in operation for more than 30 years. The illumination in the building is varied in which there are 3 ordinary bulbs of 100W and 6 neons of 36W. The facility does not have equipment for alternative sources of energy.

no	Type of illumination in the building:	number/quantity	installed power of unit/lamp	Total installed power
1.	Ordinary bulbs	3	100W	300 W
2.	Neon lighting	6	36W	216 W
Total installed power of illumination:				516 W

#### Heating and cooling of the object

In the building there are individual heaters (6 wood stoves) installed a separate heating system with a total annual consumption of firewood of about 40 m<sup>3</sup>. No cooling system for the building.

no	Consumer/ installed devices	pices	Power	Total installed power
1.	computer	5	400 W	2000 W
2.	server	1	1000 W	1000 W
3.	laptop	2	250 W	500W
Total installed power of divaces and equipmnet:				3500 kW

#### B. MOBILITY / TRAFFIC

There is no organized transport for the arrival and departure of employees from work. Most of the employees use private vehicles for their arrival and departure from work, but no data on the past kilometers per year

Public utility has got 5 official vehicles, out of which 2 passengers, 1 freight and 1 tractor and 1 backhoe that use for performing work duties and obligations.

no	Type of the vehicle	fuel	Year of manufacturing	Average passed километри/year
1	Трактор IMT 533	дизел	1976	300 km/y
2	Ровокопач BN 80	дизел	1978	1200 km/y
3	Лада Нива	бензин	1987	2000 km/y
4	Лада Караван	бензин	1991	2500 km/y
5	Камион за собирање смет Мерцедес Атего	дизел	2010	4500 km/y

No overnight stays per year (accommodation in hotels) are realized by the employees for participation in seminars, meetings, etc. organized by different organizations and entities outside the municipality.

#### C. ENERGY AND FUEL

According to the collected data, JPK Komunalec from Pehcevo spends about 70,200 kWh per year for electricity, about 5,880 liters of oil and about 1,150 liters of gasoline for its own motor vehicles. For heating the object, a firewood of about 40 m<sup>3</sup> is used. The total annual water consumption of the water supply system is 150 m<sup>3</sup> / year.

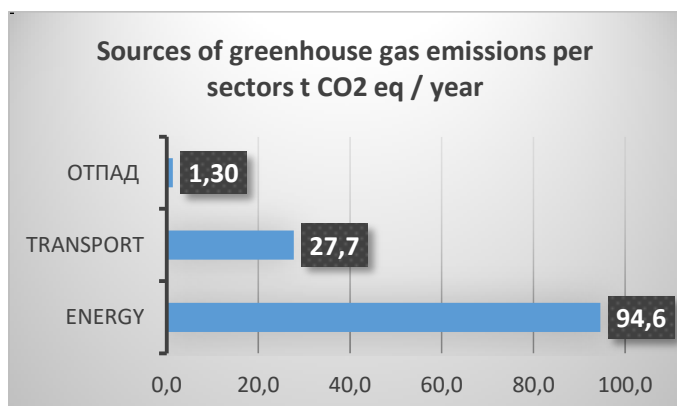
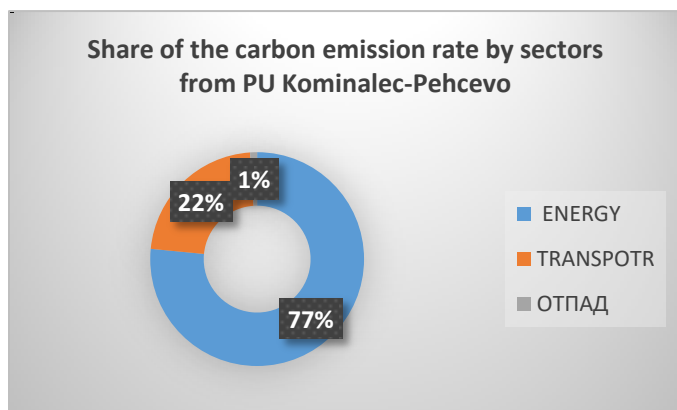
no	Type of energy used in the facility annually	Quantity
1.	Total amount of electricity spent annually	70200 kWh/r
2.	Fuel for vehicles - Petrol	1156 л/г
	Fuel for vehicles - Diesel	5880 л/г
	Fuel for vehicles - LPG (gas)	/ л/г
3.	Water consumption from the water supply system	40 m <sup>3</sup> /г
4.	Consumption of water from another system (wells, rainwater, etc.)	150 m <sup>3</sup> /г

\*1m<sup>3</sup> firewood ≈ 800 kg

There is no selection and record of the type and type of waste generated by the facility, therefore the quantities supplied are by free calculation by the municipal officials. The total amount of generated waste is estimated at 2400 kg / year.

no	Item	Quantity
1	Plastic waste (PVC), polystyrene, foil etc	300 kg/y
2	Paper / Printed materials	100 kg/y
3	Metals (spare parts, iron, aluminum)	1000 kg/y
4	Organic waste (food, cooking oil, etc.)	0 kg/y
5	Chemicals (detergents, motor oil, colours etc.)	0 kg/y
6	Electronic waste (computers, TVs, radios, batteries, cables)	0 kg/y
7	Non-organic waste (minerals, clay, construction rubble, etc.)	1000 kg/y
8	Glass and packaging	0 kg/y
9	Other:	0 kg/y
Total waste production:		<b>2400 kg/y</b>

#### D. RATE OF CARBON EMISSION (FOOTPRINT)



Total emission of GHG per year

**123,6** tons eq CO<sub>2</sub>

Coefficient of emission per m2 area:

**2,06** tons eq CO<sub>2</sub>/m<sup>2</sup>

#### E . MEASURES FOR REDUCTION OF EMISSION

- Implementation of measures for thermal insulation of the walls and of the building / premises for reducing the consumption of the energy for heating in the winter period;
- Change of fuel in the heating system, application of biomass (pellets) as a measure for reducing the consumption of electricity and reduction of greenhouse gas emissions;
- Procurement and installation of a photovoltaic system for independent production of electricity and direct use of it in the power supply system (eg lighting of the facility) or by compensating for the generated electricity;
- Replacing and unifying the lighting of LED bulbs;
- Regular maintenance of vehicles in order to reduce fuel consumption;
- Purchase of hybrid or electric vehicles for official needs of the municipality and thus reduction of greenhouse gas emissions for transport;

The public enterprise for management of forests from Pehcevo is in charge of managing and managing the forests and forest funds on the territory of the Municipality of Pehcevo. There are 32 employees in total.

#### A. CONSTRUCTION OF THE OBJECT

The building in which the Public Enterprise is located has a total area of 374 m<sup>2</sup> and it is completely heated or cooled in the summer period. The building is of solid construction with concrete and bricks, without insulation, with carpentry (windows and doors) made of wood, roof construction made of saloon boards. The building has been in operation for more than 50 years. The illumination in the building is varied in which there are 15 ordinary bulbs of 100W, 16 neons of 36W and 4 compact fluorescent lamps. The facility does not have equipment for alternative sources of energy.

no	Type of illumination in the building:	number/quantity	installed power of unit/lamp	Total installed power
1.	Ordinary bulbs	15	100 W	300 W
2.	Neon lighting	16	36 W	576 W
3.	Compact fluorescents (CFC) bulbs	4	40 W	160 W
Total installed power of illumination::				1036 W

#### Heating and cooling of the object

The facility has a separate central heating system with a 120kW boiler with 18 heaters (radiators) that uses firewood as a fuel of about 100 m<sup>3</sup> per year. In addition, there are 3 electric heaters of 2000W each, which are used for further heating of the offices.

There are no devices for cooling the object.

no.	Consumer/ installed devices	pices	Power	Total installed power
1.	computers	9	400 W	3 600 W
2.	printers	2	400 W	800 W
3	refrigerators	1	1500 W	1 500 W
4.	heaters	3	2000 W	6 000 W
5.	boiler	1	2000 W	2 000 W
Total installed power of divaces and equipmnet:				13 900 kW

#### B. MOBILITY / TRAFFIC

There is no organized transport for the arrival and departure of employees from work. Most of the employees use private vehicles for their arrival and departure from work, but no data on the past kilometers per year

Public enterprise has got 2 official passenger vehicles.

P.6	Type of the vehicle	fuel	Year of manufacturing	Average passed километри/year
1	Дациа Дастер	дизел	2014	18000 km/г
2	Лада нива	бензин	2012	15000 km/г

About 6-8 overnights annually (accommodation in hotels) are realized by the employees through participation in seminars, meetings, etc. organized by different organizations and entities outside the municipality.

#### B. ENERGY AND FUEL

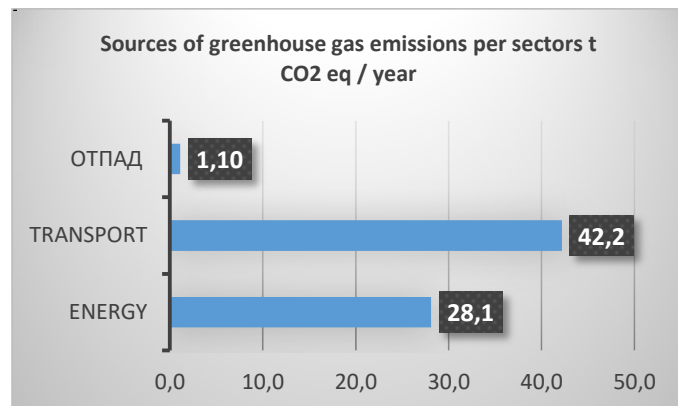
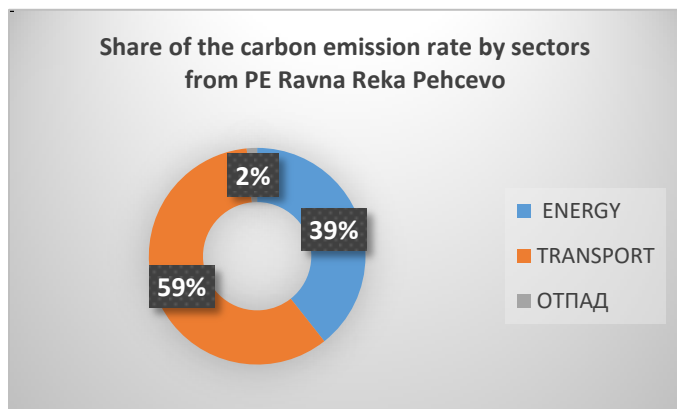
According to the obtained data, PU Komunalec from Pehcevo spends about 70,200 kWh per year for electricity, about 7,700 liters of oil and about 3100 liters of gasoline for their own motor vehicles. For heating the object, a firewood of about 100 m<sup>3</sup> is used. The total annual water consumption of the water supply system is 2400 m<sup>3</sup> / year.

no	Type of energy used in the facility annually	Количина
1.	Total amount of electricity spent annually	12120 kWh/r
2.	Fuel for vehicles - Petrol	3100 л/г
	Fuel for vehicles - Diesel	7700 л/г
	Fuel for vehicles - LPG (gas)	л/г
6.	Water consumption from the water supply system	80000 kg/r
7.	Consumption of water from another system (wells, rainwater, etc.)	2400 m <sup>3</sup> /r

There is no selection and record of the type and category of waste generated by the facility, therefore the quantities supplied are by free calculation by the municipal officials. The total amount of generated waste is estimated at 2400 kg / yea.

no	Item	Quantity
1	Plastic waste (PVC), polystyrene, foil etc	kg/y
2	Paper / Printed materials	kg/y
3	Metals (spare parts, iron, aluminum)	kg/y
4	Organic waste (food, cooking oil, etc.)	kg/y
5	Chemicals (detergents, motor oil, colours etc.)	kg/y
6	Electronic waste (computers, TVs, radios, batteries, cables)	kg/y
7	Non-organic waste (minerals, clay, construction rubble, etc.)	kg/y
8	Glass and packaging	kg/y
9	Other:	kg/y
Total waste production:		1000 kg/y

#### D. RATE OF CARBON EMISSION (FOOTPRINT)



Total emission of GHG per year

**74,1** tons eq CO<sub>2</sub>

Coefficient of emission per m2 area:

**0,19** tons eq CO<sub>2</sub>/m<sup>2</sup>

#### E . MEASURES FOR REDUCTION OF EMISSION

- Implementation of measures for thermal insulation of the walls and of the building / premises for reducing the consumption of the energy for heating in the winter period;
- Change of fuel in the heating system, application of biomass (pellets) as a measure for reducing the consumption of electricity and reduction of greenhouse gas emissions;
- Procurement and installation of a photovoltaic system for independent production of electricity and direct use of it in the power supply system (eg lighting of the facility) or by compensating for the generated electricity;
- Replacing and unifying the lighting of LED bulbs;
- Regular maintenance of vehicles in order to reduce fuel consumption;
- Purchase of hybrid or electric vehicles for official needs of the municipality and thus reduction of the greenhouse gas emissions for transport;

The public health institution "Health Center" - Pehcevo is an institution responsible for primary and secondary health in the municipality of Pehcevo. There are a total of 37 employees

### A. CONSTRUCTION OF THE OBJECT

The building in which the Health Center is located has a total area of 1000 m<sup>2</sup> and it is completely heated or cooled in the summer period. The building is of solid construction with concrete and bricks, without insulation of the walls and roof, with carpentry (windows and doors) made of wood, roof construction of tinplate boards. The facility has been in operation for more than 20 years.

Lighting in the building is mixed in which there are 15 ordinary bulbs of 60W, 80 neons of 36W and 4 compact fluorescent lamps. The facility does not have equipment for alternative sources of energy.

no.	Type of illumination in the building:	number/quantity	installed power of unit/lamp	Total installed power
1.	Ordinary bulbs	15	60 W	900 W
2.	Neon lighting	80	36 W	2880 W
Total installed power of illumination:				3780 W

### Heating and cooling of the object

The building is connected to a common (central) heating system with 60 heated bodies (radiators) installed. In addition, there are 10 electric heaters of 2000W each, which are used to further heat the offices.

In the facility there are 10 air conditioners of 2.5 kW used for cooling but for heating the object.

no	Consumer/ installed devices	pices	Power	Total installed power
1.	computers	15	400 W	6 000 W
2.	Lap top	1	250 W	250 W
3.	printers	15	400 W	6 000 W
4	refrigerators	4	1 500 W	6 500 W
5.	heaters	10	2 000 W	20 000 W
6.	Air conditioner	10	2 500 W	25 000 W
7.	Бојлер	10	2 000 W	20 000 W
Total installed power of divaces and equipmnet:				83 750 kW

### B. MOBILITY / TRAFFIC

There is no organized transport for the arrival and departure of employees from work. Most of the employees use private vehicles for arrival and departure from work estimated that about 8000 km / year pass by bus and around 11000 km / year with their own vehicles.

PHI Health Center from Pehcevo has got 6 official vehicles.

no	Type of the vehicle	fuel	Year of manufacturing	Average passed kilometers/year
1	OPEL CORSA	gasoline	2001	3000km/r
2	DACIA DASTER	gasoline	2013	25000km/r
3	FIAT DUKATO	diesel	1997	2000km/r
4	LADA NIVA	gasoline	2005	3000km/r
5	Ambulance TOJOTA	diesel	2007	16000km/r
6	Ambulance RENAULT	diesel	2012	31000km/r

### C. ENERGY AND FUEL

According to the acquired data, the PHI Health Center of Pehcevo spent about 59,000 kWh per year for electricity, about 6,500 liters of oil and about 3510 liters of gasoline for its own motor vehicles.

The total annual water consumption of the water supply system is 700 m<sup>3</sup> / year. Approximately 220 000 kWh for heating from central heating provided by the local company Fagus from Pehcevo.

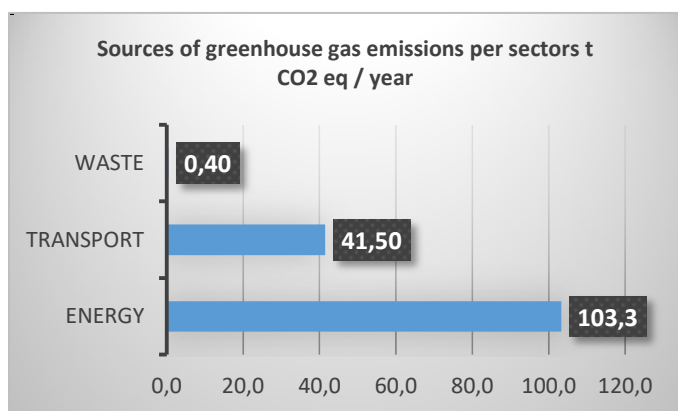
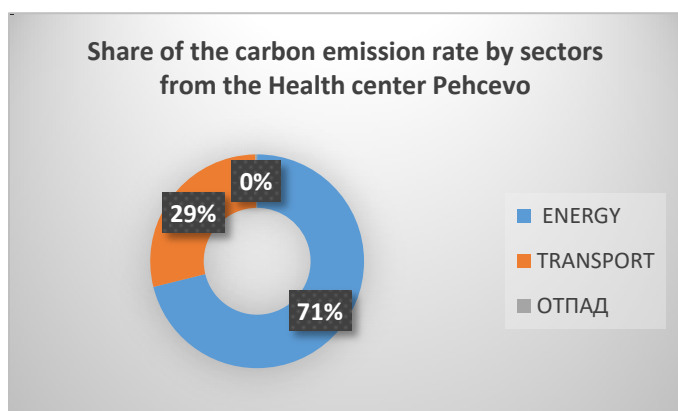
no	Type of energy used in the facility annually	Quantity
1.	Total amount of electricity spent annually	59000 kWh/y
2.	Fuel for vehicles - Petrol	3150 l/y
	Fuel for vehicles - Diesel	6500 l/y
	Fuel for vehicles - LPG (gas)	l/y
4	Water consumption from the water supply system	220 000 kWh
5	Consumption of water from another system (wells, rainwater, etc.)	700 m <sup>3</sup> /y

There is no selection and record of the type and type of waste generated by the facility, therefore the quantities supplied are by free calculation by the municipal

officials. The total amount of generated waste is estimated at 430 kg / year.

no.	Item	Quantity
1	Plastic waste (PVC), polystyrene, foil etc	145kg/y
2	Paper / Printed materials	70kg/y
3	Metals (spare parts, iron, aluminum)	130kg/y
4	Organic waste (food, cooking oil, etc.)	60kg/y
5	Chemicals (detergents, motor oil, colours etc.)	kg/y
6	Electronic waste (computers, TVs, radios, batteries, cables)	15kg/y
7	Non-organic waste (minerals, clay, construction rubble, etc.)	kg/y
8	Glass and packaging	12kg/y
9	Other:	kg/y
Total waste production:		430 kg/y

#### D. RATE OF CARBON EMISSION (FOOTPRINT)



Total emission of GHG per year

**145,2** tons eq CO<sub>2</sub>

Coefficient of emission per m2 area:

**0,145** tons eq CO<sub>2</sub>/m<sup>2</sup>

#### E . MEASURES FOR REDUCTION OF EMISSION

- Implementation of measures for thermal insulation of the walls and of the building / premises for reducing the consumption of the energy for heating in the winter period;
- Setting up own heating system for the building and changing the fuel in the heating system, applying biomass (pellets) as a measure for reducing the consumption of electricity and reducing the greenhouse gas emissions;
- Procurement and installation of a photovoltaic system for independent production of electricity and direct use of it in the power supply system (eg lighting of the facility) or by compensating for the generated electricity;
- Use of solar energy and installation of solar collectors for hot water in the building;
- Replacing and unifying the lighting of LED bulbs;
- Regular maintenance of vehicles in order to reduce fuel consumption;
- Purchase of hybrid or electric vehicles for official needs of the municipality and thus reduction of the greenhouse gas emissions for transport;

## VINICA: PUBLIC UTILITY "SOLIDARNOST"

he public utility company is in charge of water supply and municipal waste collection from households and legal entities in the territory of the municipality of Vinca. There are 104 employees in total.

### A. CONSTRUCTION OF THE OBJECT

The building in which the Public Enterprise is located has a total area of 362 m<sup>2</sup>, of which only 187 m<sup>2</sup> is heated or cooled in the summer period. The building is of solid construction with concrete and bricks, without insulation, with carpentry (windows and doors) of PVC, roof construction made of shingles. The building has been in operation for more than 30 years. The illumination in the building is varied in which there are 6 ordinary bulbs of 75W, 25 neons of 36W and 7 compact fluorescent lamps of 23W. The facility does not have equipment for alternative sources of energy.

no	Type of illumination in the building:	number/quantity	installed power of unit/lamp	Total installed power
1.	Ordinary bulbs	6	75 W	450 W
2.	Neon lighting	25	36 W	900 W
3.	Compact fluorescents (CFC) bulbs	7	23 W	161 W
Total installed power of illumination:				1511 W

### Heating and cooling of the object

The facility has a separate steam heating system boiler running on combined fuel from oil and pellets, has 18 built-in heaters (radiators). In addition, there are 5 electric heaters of 2500W each, which are used for additional heating of the offices.

For cooling of the building there are three air-conditioning units of 3.5kW.

no	Consumer/ installed devices	pices	Power	Total installed power
1.	computers	11	400 W	4.400 W
2.	Lap top	1	250 W	250 W
3.	printers	8	400 W	3.200 W
4.	heaters	5	2.500 W	12.500 W

5.	Air conditioner	3	3.500 W	10.500 W
6.	heaters	2	1 500 W	3.000 W
7.	refrigerators	4	2.000 W	8.000 W
Total installed power of divaces and equipmnet::				41850

### B. MOBILITY / TRAFFIC

There is no organized transport for the arrival and departure of employees from work. Most of the employees use private vehicles for coming and going. There is also a public transport bus with which they travel around 22 000 km / year.

A public utility is with a large fleet of its own vehicles that it uses to carry out everyday tasks.

no	Type of the vehicle	fuel	Year of manufacturing	Average passed километри/year
1	SHKODA OCTAVIA	diesel	2013	30.000 km/r
2	HYNDAI ACCENT	gasoline	2000	12.350 km/r
3	LADA NIVA	LPG	2007	36.500 km/r
4	RENO DACHIA	diesel	2004	12.350 km/r
5	RENO DACHIA	diesel	2004	15.000 km/r
6	FIAT PANDA	gasoline	1996	15.000 km/y
7	FIAT PANDA	gasoline	1997	15.000 km/y
8	FORD MONDEO	diesel	1997	15.000 km/y
9	ZASTAVA 650 TRUCK	diesel	1984	20.000 km/y
10	ZASTAVA 615 TRUCK	diesel	1985	3.000 km/y
11	TRACTOR ИМТ 539	diesel	1997	4.940 km/y
12	TRACTOR ИМТ 539	diesel	1986	4.940 km/y
13	TRACTOR ИМТ 539	diesel	1997	7.800 km/y
14	MAN 16/22 TRUCK	diesel	1985	10.400 km/y
15	FIAT OTOJOL TRUCK	diesel	1996	3.000 km/y
16	IVECO TRUCK	diesel	2013	10.400 km/y
17	IVECO EURO CARGO TRUCK	diesel	2013	10.400 km/y
18	Cystern IVECO	diesel	2004	8.000 km/y

About 86 overnights annually (accommodation in hotels) are realized by the employees through participation in seminars, meetings, etc. organized by different organizations and entities outside the municipality.

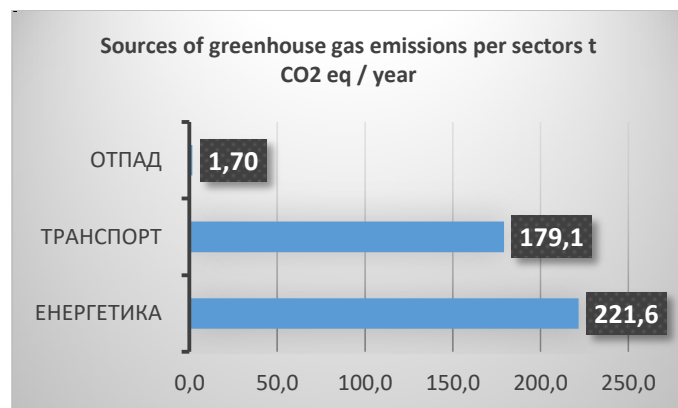
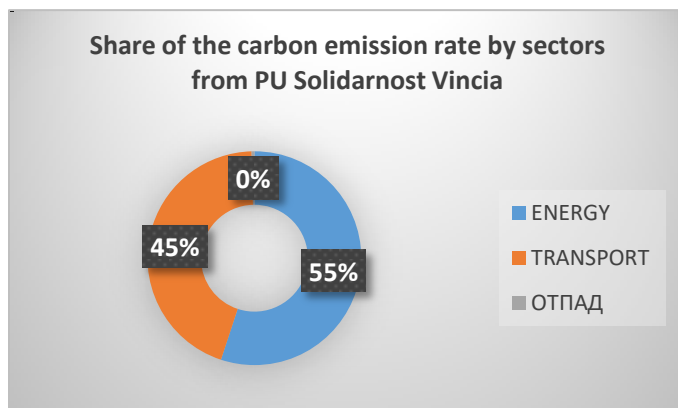
### C. ENERGY AND FUEL

According to the collected data, PU Solidarnost from Vinica uses 70,200 kWh per year for electricity, about 7,700 liters of oil and about 3100 liters of gasoline for its own motor vehicles. For heating the object, a firewood of about 100 m3 is used. The total annual water consumption of the water supply system is 2400 m3 / year.

Р.б	Type of energy used in the facility annually	Количина
1.	Total amount of electricity spent annually	164.385 kWh/y
2.	Fuel for vehicles - Petrol	7.200 l/y
	Fuel for vehicles - Diesel	34.100 l/y
	Fuel for vehicles - LPG (gas)	2.500 l/y
3.	Water consumption from the water supply system	1.500 l/y
6.	Consumption of water from another system (wells, rainwater, etc.)	39.000 kg/y
7.		3 000 m <sup>3</sup> /y

no	Item	Quantity
1	Plastic waste (PVC), polystyrene, foil etc	100 kg/y
2	Paper / Printed materials	720 kg/y
3	Metals (spare parts, iron, aluminum)	kg/y
4	Organic waste (food, cooking oil, etc.)	494 kg/y
Total waste production:		<b>1.314 kg/y</b>

### D. RATE OF CARBON EMISSION (FOOTPRINT)



Total emission of GHG per year

**402,4** tons eq CO<sub>2</sub>

Coefficient of emission per m2 area:

**2,15** tons eq CO<sub>2</sub>/m<sup>2</sup>

### E . MEASURES FOR REDUCTION OF EMISSION

- Implementation of measures for thermal insulation of the walls and of the building / premises for reducing the consumption of the energy for heating in the winter period;
- Change of fuel in the heating system, full application of biomass (pellets) as a measure for reducing the consumption of electricity and reduction of greenhouse gas emissions;
- Procurement and installation of a photovoltaic system for independent production of electricity and direct use of it in the power supply system (eg lighting of the facility) or by compensating for the generated electricity;
- Replacing and unifying the lighting of LED bulbs;
- Regular maintenance of vehicles in order to reduce fuel consumption;
- Purchase of hybrid or electric vehicles for official needs of the municipality and thus reduction of the greenhouse gas emissions for transport;

## ELEMENTARY SCHOOLS

### BEROVO: ELEMENTARY SCHOOL "NIKOLA PETROV-RUSINSKI"

The elementary school "Nikola Petrov-Rusinski" is located in the village Rusinovo in the municipality of Berovo. It includes classes for students from the first to the ninth grade. There are a total of 21 employees.

#### A. CONSTRUCTION OF THE OBJECT

The building of the primary school "Nikola Petrov" Rusinski is a total area of 1588m<sup>2</sup>, of which only 1400 m<sup>2</sup> is heated. The building is of solid construction with concrete and bricks, without insulation of the façade, with PVC joinery (windows and doors), a roof construction made of sandwich sheet with insulation and one part with saloon boards. The building has been in operation for more than 50 years. Lighting in the building is mixed in which there are 12 ordinary bulbs of 100 W and 106 neons of 36 W. The facility has only installed devices for using alternative energy.

no	Type of illumination in the building:	number/quantity	installed power of unit/lamp	Total installed power
1.	Ordinary bulbs	12	100 W	1 200 W
2.	Neon lighting	106	36 W	3 816 W
Total installed power of illumination:				5016 W

#### Heating and cooling of the object

The facility has a separate steam heating system with a boiler of 166 kW which uses oil as a fuel/ energy.

P.6.	Consumer/ installed devices	pices	Power	Total installed power
1.	PC in the offices	5	220 W	1100 W
2.	Photocopiers/printers	3	220 W	660 W
3.	TV set	1	220 W	220 W
4.	LCD projector	4	700W	2800 W
5.	Radio/CD player	4	14W	56 W
6.	PC in the classrooms	28	920 W	
7.	note book computer for students	74	40W	2960 W
8.	note book computer for teachers	17	36W	612 W
9.	radio	2	14 W	28 W

10.	music system	1	500 W	500 W
11.	sound device	2	3900 W	7800 W
Total installed power of devices and equipment:				34,696 kW

#### B. MOBILITY / TRAFFIC

There is organized transport and employees, three of them traveling by bus and traveling around 3060 km / year and eight employees travel by car around 3060 km a year.

Elementary schools do not have their own vehicles. No recorded overnights in hotels.

#### C. ENERGY AND FUEL

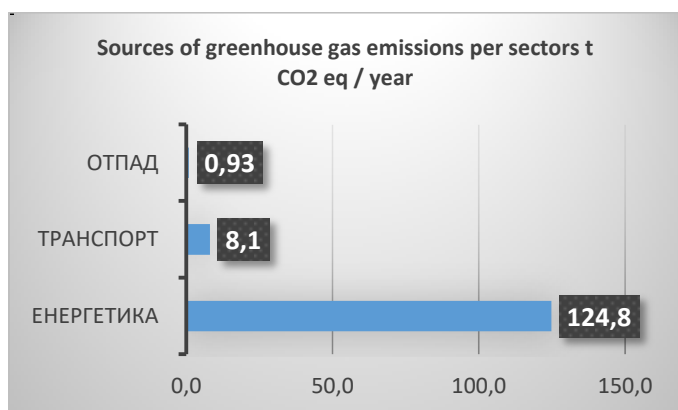
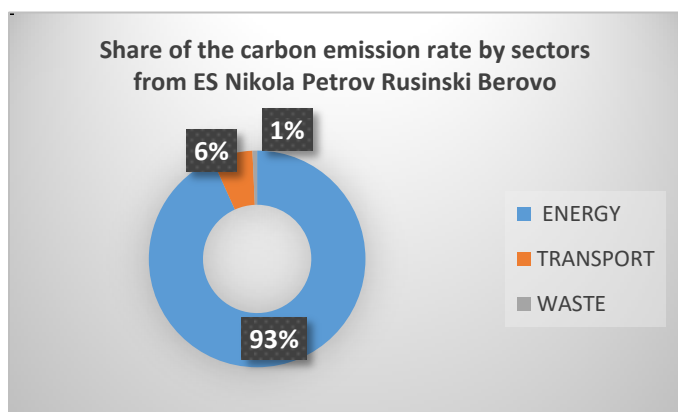
According to the acquired data, the Vanko Prke Elementary School from Delchevo spent 10 415 kWh per year of electricity, about 30000 liters of oil for heating the object. The total annual water consumption of the water supply system is 516 m<sup>3</sup> / year.

no	Type of energy used in the facility annually	Quantity
1.	Total amount of electricity spent annually	10415 kWh/r
2.	Fuel for vehicles - Petrol	/ l/r
	Fuel for vehicles - Diesel	/ l/r
	Fuel for vehicles - LPG (gas)	/ l/r
3.	Water consumption from the water supply system	30 000 l/r
6.	Consumption of water from another system (wells, rainwater, etc.)	kg/r
7.		516 m <sup>3</sup> /r

There is no selection and record of the type and category of waste generated by the facility, therefore the quantities supplied are by free calculation by the municipal officials. The total amount of generated waste is estimated at 1000 kg / year

no	Item	Quantity
1	Plastic waste (PVC), polystyrene, foil etc	200 kg/r
2	Paper / Printed materials	300 kg/r
3	Metals (spare parts, iron, aluminum)	kg/r
4	Organic waste (food, cooking oil, etc.)	500 kg/r
Total waste production:		

#### D. RATE OF CARBON EMISSION (FOOTPRINT)



Total emission of GHG per year

**133,8** тони eq CO<sub>2</sub>

Coefficient of emission per m<sup>2</sup> area:

**0,089** тони eq CO<sub>2</sub>/m<sup>2</sup>

#### E. MEASURES FOR REDUCTION OF EMISSION

- Implementation of measures for thermal insulation of the walls and of the building / premises for reducing the consumption of the energy for heating in the winter period;
- Change of fuel in the heating system, full application of biomass (pellets) as a measure for reducing the consumption of electricity and reduction of greenhouse gas emissions;
- Procurement and installation of a photovoltaic system for independent production of electricity and direct use of it in the power supply system (eg lighting of the facility) or by compensating for the generated electricity;
- Replacing and unifying the lighting of LED bulbs;
- Selecting waste, collecting and recycling

The elementary school "Vanco Prke" from Delcevo is one of the two primary schools located in the municipality of Delchevo. It started work in 1962 in which classes for students from the first to the ninth grade are taking place. There are a total of 82 employees.

### A. CONSTRUCTION OF THE OBJECT

The building of the elementary school "Vanco Prke" has a total area of 5120m<sup>2</sup>, of which only 4700 m<sup>2</sup> is heated. The building is of solid construction with concrete and bricks, without insulation of the façade, with aluminum carpentry (windows and doors), roof construction of sandwich sheet with insulation. The building has been in operation for more than 30 years. The illumination in the building is varied in which there are 90 ordinary bulbs of 100 W, 484 neons of 36 W and 16 metal halide lamps of 120 W, as well as 8 metal halide reflexes of 1500 W. In the building there is only a solar cell for hot water.

no	Type of illumination in the building:	number/quantity	installed power of unit/lamp	Total installed power
1.	Ordinary bulbs	90	100 W	9 000 W
2.	Neon lighting	484	36 W	17 424 W
3.	Metalhalogen	16	120 W	1 920 W
4.	Metalhalogen reflectors	8	1500 W	12 000 W
Total installed power of illumination:				40 344 W

### Heating and cooling of the object

In the building there is a separate heating system for heating two boilers, one in which oil is used as fuel and in the other firewood.

no	Consumer/ installed devices	pices	Power	Total installed power
1.	computers	50	400 W	20 000 W
2.	lap top	8	250 W	2 000 W
3.	printers	7	400 W	2 800 W
4.	boilers	5	3000 W	15 000 W
Total installed power of divaces and equipmnet:				39 800 W

### B. MOBILITY / TRAFFIC

There is no organized transport for the arrival and departure of employees from work. Most of the employees use private vehicles for coming and going. It also uses public transport by bus, which spans about 26 280 km / year and 108 km / year of car trips

About 15 overnights per year (accommodation in hotels) are realized by the employees through participation in seminars, meetings, etc. organized by different organizations and entities outside the municipality.

### C. ENERGY AND FUEL

According to the acquired data, the Vanco Prke ES from Delchevo spent 28,000 kWh per year for electricity, about 33,000 liters of oil for heating the building and about 30m<sup>3</sup> of firewood. The total annual water consumption of the water supply system is 1100 m<sup>3</sup> / year.

no	Type of energy used in the facility annually	Quantity
1.	Total amount of electricity spent annually	28 000 kWh/r
2.	Fuel for vehicles - Petrol	/ n/r
	Fuel for vehicles - Diesel	/ n/r
	Fuel for vehicles - LPG (gas)	/ n/r
3.	Water consumption from the water supply system	33 000 n/r
6.	Consumption of water from another system (wells, rainwater, etc.)	34000 kg/r
7.		1100 m <sup>3</sup> /r

There is no selection and record of the type and category of waste generated by the facility, therefore the quantities supplied are by free calculation by the municipal officials. The total amount of generated waste is estimated at 3600 kg / year

no	Item	Quantity
1	Plastic waste (PVC), polystyrene, foil etc	1 000 kg/r
2	Paper / Printed materials	600 kg/r
3	Metals (spare parts, iron, aluminum)	kg/r
4	Organic waste (food, cooking oil, etc.)	2 000 kg/r
Total waste production:		3 600 kg/r

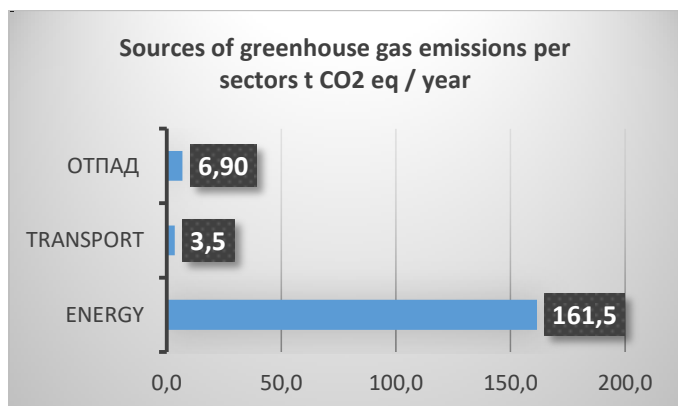
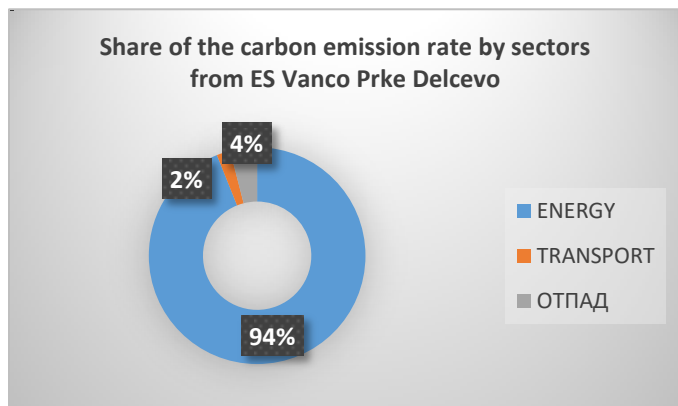
Total emission of GHG per year

**171,9** тони eq CO<sub>2</sub>

Coefficient of emission per m2 area:

**0,037** тони eq CO<sub>2</sub>/m<sup>2</sup>

#### D. RATE OF CARBON EMISSION (FOOTPRINT)



#### E . MEASURES FOR REDUCTION OF EMISSION

- Implementation of measures for thermal insulation of the walls and of the building / premises for reducing the consumption of the energy for heating in the winter period;
- Change of fuel in the heating system, full application of biomass (pellets) as a measure for reducing the consumption of electricity and reduction of greenhouse gas emissions;
- Procurement and installation of a photovoltaic system for independent production of electricity and direct use of it in the power supply system (eg lighting of the facility) or by compensating for the generated electricity;
- Replacing and unifying the lighting of LED bulbs;
- Selecting waste, collecting and recycling

The elementary school "Kliment Ohridski" from Delcevo is the second elementary school located in the municipality of Delchevo. It teaches classes for students from the first to the ninth grade. There are 109 employees in total.

## A. CONSTRUCTION OF THE OBJECT

The building of the elementary school "Kliment Ohridski" from Delcevo is with a total area of 3951m<sup>2</sup> and the whole is a sin. The building is of solid construction with concrete and bricks, without insulation of the facade, without insulation of the roof, the roof construction is made of ceramic and part of the saloon boards, the carpentry (windows and doors) is made of wood. The building has been in operation for more than 50 years. Lighting in the building is mixed in which there are 50 ordinary 75 W light bulbs and 500 number of non-volatile 36W. In the building there is only a solar cell for hot water.

no	Type of illumination in the building:	number/quantity	installed power of unit/lamp	Total installed power
1.	Ordinary bulbs	50	75 W	3 750 W
2.	Neon lighting	500	36 W	18 000 W
Total installed power of illumination:				41 750 W

## Heating and cooling of the object

There is installed a separate heating system In the building for heating two boilers, one in which oil is used as fuel and the other firewood. No cooling system is installed in the building.

no	Consumer/ installed devices	pices	Power	Total installed power
1.	computers	50	400 W	20 000 W
2.	photocopiers	2	400 W	800 W
3.	printers	6	400 W	2 400 W
4.	boilers	10	2000 W	20 000 W
Total installed power of divaces and equipmnet:				43 200 W

## B. MOBILITY / TRAFFIC

There is no organized transport for the arrival and departure of employees from work. Most of the employees use private vehicles for coming and going. There is also a public bus service with a bus that runs about 510 km / year, with a taxi of about 160 km / year and car trips around 600 km / year.

About 10 nights per year (accommodation in hotels) are usually made by the employees through participation in seminars, meetings, etc. organized by different organizations and entities outside the municipality.

## C. ENERGY AND FUEL

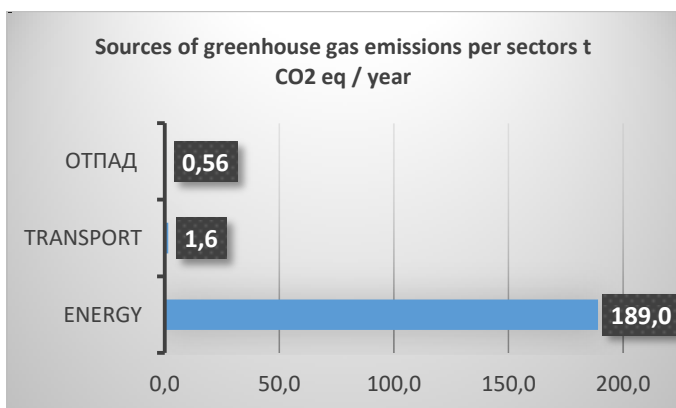
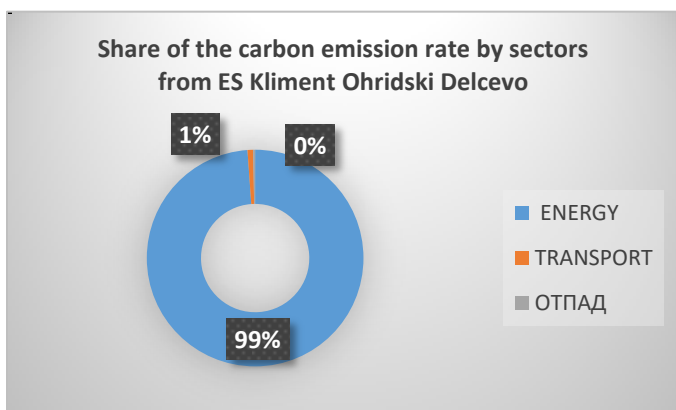
According to the acquired data, the Kliment Ohridski ES from Delcevo spent 51 180 kWh per year for electricity, about 25 000 liters of oil for heating the building and about 30 m<sup>3</sup> of firewood. The total annual water consumption of the water supply system is 1100 m<sup>3</sup> / year.

no	Type of energy used in the facility annually	Quantity
1.	Total amount of electricity spent annually	51 180 kWh/r
2.	Fuel for vehicles - Petrol	/ л/г
	Fuel for vehicles - Diesel	/ л/г
	Fuel for vehicles - LPG (gas)	/ л/г
3.	Water consumption from the water supply system	25 000 л/г
6.	Consumption of water from another system (wells, rainwater, etc.)	250 м3/г
7.		3000 м <sup>3</sup> /г

There is no selection and record of the type and category of waste generated by the facility, therefore the quantities supplied are by free calculation by the municipal officials. The total amount of generated waste is estimated at 2600 kg / year

P.6.	Item	Quantity
1	Plastic waste (PVC), polystyrene, foil etc	1 000 kg/r
2	Paper / Printed materials	600 kg/r
3	Metals (spare parts, iron, aluminum)	kg/r
4	Organic waste (food, cooking oil, etc.)	1 000 kg/r
Total waste production:		2 600 kg/r

#### D. RATE OF CARBON EMISSION (FOOTPRINT)



Total emission of GHG per year

**191,2** тони eq CO<sub>2</sub>

Coefficient of emission per m<sup>2</sup> area:

**0,048** тони eq CO<sub>2</sub>/m<sup>2</sup>

#### E . MEASURES FOR REDUCTION OF EMISSION

- Implementation of measures for thermal insulation of the walls and the building and reconstruction of the roof for reducing the consumption of the energy for heating in the winter period;
- Change of fuel in the heating system, full application of biomass (pellets) as a measure for reducing the consumption of electricity and reduction of greenhouse gas emissions;
- Procurement and installation of a photovoltaic system for independent production of electricity and direct use of it in the power supply system (eg lighting of the facility) or by compensating for the generated electricity;
- Replacing and unifying the lighting of LED bulbs;
- Selecting waste, collecting and recycling

The elementary school "Vanco Kitanov" is the only school in Pehcevo. It teaches classes for students from the first to the ninth grade. There are a total of 65 employees.

#### A. CONSTRUCTION OF THE OBJECT

The building of the primary school "Vanco Kitanov" from Pehcevo is with a total area of 2612m<sup>2</sup>, and 2452m<sup>2</sup> is heated. The building is of solid construction with concrete and bricks, with thermal insulation of the façade, without roof insulation, the roof construction is made of tin sheets, the carpentry (windows and doors) is made of PVC and part of aluminum. The building has been in operation for more than 30 years. Lighting in the building is mixed in which there are 76 ordinary bulbs of 100 W, 25 number of non-volatile 36W and 172 CFC lamps of 18W. There are no devices for utilizing solar energy in the building.

no	Type of illumination in the building:	number/quantity	installed power of unit/lamp	Total installed power
1.	Ordinary bulbs	76	100 W	7 600 W
2.	Neon lighting	25	36 W	900 W
3.	Compact fluorescents (CFC) bulbs	172	18 W	3 096W
Total installed power of illumination:				11 596 W

#### Heating and cooling of the object

There is a separate central heating system in the building with installed two boilers, one in which oil is used as fuel (500 kW), and the other firewood (SA 520kW). Only one air-conditioning unit has been set up.

no.	Consumer/ installed devices	pices	Power	Total installed power
1.	computer	41	400 W	16 400 W
2.	lap top-note books	133	250 W	33 250W
2.	Air conditioner	1	3 500 W	3 500 W
3.	printer	10	400 W	4 000 W
4.	refrigerators	1	1 500 W	1500 W
Total installed power of divaces and equipmnet:				55 150 W

#### B. MOBILITY / TRAFFIC

There is no organized transport for the arrival and departure of employees on/from work. Most of the employees use private vehicles for coming and going. The school has no own vehicles No use of hotel accommodation has been reported.

#### C. ENERGY AND FUEL

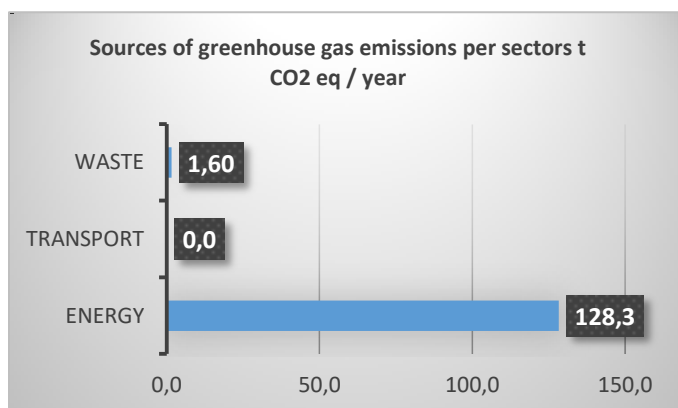
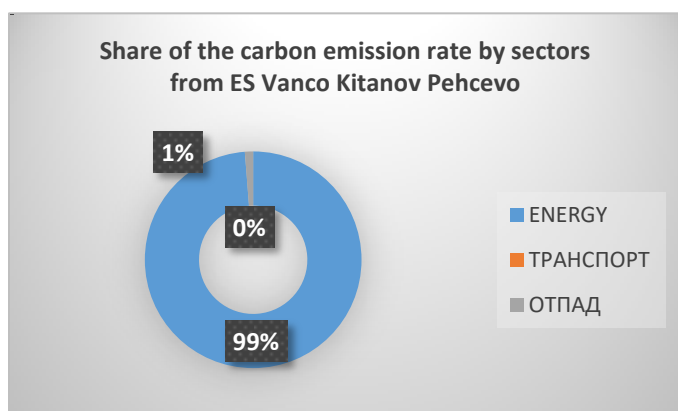
According to the collenced data, the Kliment Ohridski PS from Delcevo uses 51 180 kWh per year for electricity, about 25 000 liters of oil for heating the building and about 30 m<sup>3</sup> of firewood. The total annual water consumption of the water supply system is 1100 m<sup>3</sup> / year.

no	Type of energy used in the facility annually	Quantity
1.	Total amount of electricity spent annually	30 723 kWh/r
2.	Fuel for vehicles - Petrol	/ л/r
	Fuel for vehicles - Diesel	/ л/r
	Fuel for vehicles - LPG (gas)	/ л/r
3.	Water consumption from the water supply system	18.000 л/r
6.	Consumption of water from another system (wells, rainwater, etc.)	175 м3/r
7.		1200 м <sup>3</sup> /r

There is no selection and record of the type and category of waste generated by the facility, therefore the quantities supplied are by free calculation by the municipal officials. The total amount of generated waste is estimated at 2500 kg / year.

no	Item	Quantity
1	Plastic waste (PVC), polystyrene, foil etc	1 000 kg/r
2	Paper / Printed materials	300 kg/r
3	Metals (spare parts, iron, aluminum)	kg/r
4	Organic waste (food, cooking oil, etc.)	1 200 kg/r
Total waste production:		2 500 kg/r

## D. RATE OF CARBON EMISSION (FOOTPRINT)



Total emission of GHG per year

**129,9** тони eq CO<sub>2</sub>

Coefficient of emission per m<sup>2</sup> area:

**0,053** тони eq CO<sub>2</sub>/m<sup>2</sup>

## E. MEASURES FOR REDUCTION OF EMISSION

- Implementation of measures for thermal insulation of the roof due to reduction of the consumption of the fuel for heating in the winter period;
- Change of fuel in the heating system, full application of biomass (pellets) as a measure for reducing the consumption of electricity and reduction of greenhouse gas emissions;
- Procurement and installation of a photovoltaic system for independent production of electricity and direct use of it in the power supply system (eg lighting of the facility) or by compensating for the generated electricity;
- Replacing and unifying the lighting of LED bulbs;
- Selecting waste, collecting and recycling

## BEROVO: MUNICIPAL PUBLIC INSTITUTION FOR CHILDREN – KINDERGARTEN „23 AUGUST“

The kindergarten "23 August" Berovo is a pre-school institution. There are 49 employees in total.

### A CONSTRUCTION OF THE OBJECT

The building of Berovo kindergarten has a total area of 1280 m<sup>2</sup> and the whole area is heated. The building is of solid construction with concrete and bricks, without thermal insulation of the façade, without roof insulation, the roof construction is made of shingle, the carpentry (windows and doors) is made of PVC. The building has been in operation for more than 30 years. Lighting in the building is mixed energy efficient, featuring 15 numbers of 36W nonwoven and 201 LED 9W lamps. In the building there is only a solar collector for hot water of 6kW.

no	Type of illumination in the building:	number/quantity	installed power of unit/lamp	Total installed power
2.	Ordinary bulbs	15	36 W	540 W
3.	Neon lighting	201	9 W	1 809W
Total installed power of illumination:				2 349 W

### Heating and cooling of the object

In the building there is a separate steam heating system with boiler on firewood (CTK 500kW). Two heaters for additional heating are also available. There is no cooling device installed.

P.6.	Consumer/ installed devices	pices	Power	Total installed power
1.	computers (PC)	3	400 W	1 200 W
2.	computers (laptop)	3	250 W	750 W
3.	computers (notebook)	6	250 W	1 500 W
4.	boilers	2	2000 W	4 000 W
5.	washing mashine	2	1 950 W	3 900 W
6.	Ironing	1	2 200 W	2 200 W
7.	Dryers	1	9 300 W	9 300 W
8.	Stoves	2	2 000 W	4 000 W
9.	Cooking stoves	3	1 700 W	5 400 W
10.	refrigerators	2	2 600 W	5 200 W
11.	frezers	2	2 000 W	4 000 W

12.	TVsets	5	250 W	1 250 W
13.	Казан	1	1 800 W	1 800 W
14.	Vacume cleaner	2	1 200 W	2 500 W
15.	Heaters	3	2 000 W	6 000 W
Total installed power of divaces and equipmnet::				53 000 W

### B. MOBILITY / TRAFFIC

There is no organized transport for the arrival and departure of employees to/from work. Most of the employees use private vehicles to arrive and leave the work, which is estimated to be around 10,000 km / year.

The kindergarten has got 2 official passenger vehicles.

P.6	Type of the vehicle	fuel	Year of manufacturing	Average passed километри/year
1	Dacia stepway Sandero	дизел	2013	3000 km/r
2	Subaru Libero wan	бензин	1994	10000 km/r

### C. ENERGY AND FUEL

According to the collected data, a kindergarten from Berovo uses 107 836 kWh per year for electricity and about 150 m<sup>3</sup> of firewood. The total annual water consumption of the water supply system is 2200 m<sup>3</sup> / year.

no	Type of energy used in the facility annually	Quantity
1.	Total amount of electricity spent annually	107 836 kWh/r
2.	Fuel for vehicles - Petrol	600 л/г
	Fuel for vehicles - Diesel	700 л/г
	Fuel for vehicles - LPG (gas)	/ л/г
3.	Water consumption from the water supply system	л/г
6.	Consumption of water from another system (wells, rainwater, etc.)	150 м3/г
7.		2200 м <sup>3</sup> /г

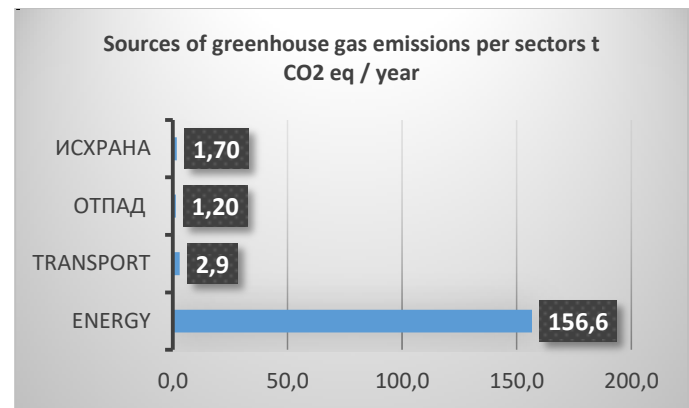
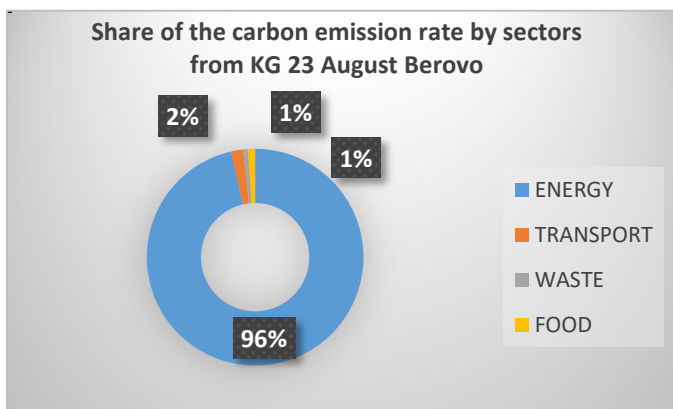
## D. FOOD AND DRINKS

no	Food and drinks	quantity		
1	Type of meals	Total number of meals per day	Percentage of vegetarian food	Seson and local food
	<b>Hot meals per day</b>	303	60	<b>yes</b>
	<b>Cold meals per day</b>	430	60	<b>yes</b>
2.	Drinks			
-	alcoholic drinks			l/day.
-	Non-alcoholic drinks			8 l/day..
-	Water (bottled)			l/day..
-	Koffe/tea			150 no/day.

There is no selection and record of the type and category of waste generated by the facility, therefore the quantities supplied are by free calculation by the municipal officials. The total amount of generated waste is estimated at 2300 kg / year.

no	Item	Quantity
1	Plastic waste (PVC), polystyrene, foil etc	1 000 kg/r
2	Paper / Printed materials	300 kg/r
3	Metals (spare parts, iron, aluminum)	kg/r
4	Organic waste (food, cooking oil, etc.)	
5	Comunal waste	1 200 kg/r
Total waste production:		<b>2 300 kg/r</b>

## D. RATE OF CARBON EMISSION (FOOTPRINT)



Total emission of GHG per year

**162,4** тони eq CO<sub>2</sub>

Coefficient of emission per m2 area:

**0,127** тони eq CO<sub>2</sub>/m<sup>2</sup>

## F . MEASURES FOR REDUCTION OF EMISSION

- Implementation of measures for thermal insulation of the roof due to and external facade facade reduction of the consumption of the fuel for heating in the winter period;
- Purchase of high energy devices and equipment
- Purchase and installation of a photovoltaic system for independent production of electricity and direct use thereof in the power supply system (eg lighting of the facility) or by compensating for the electricity produced

The kindergarten "Veseli Cvetovi" Delchevo is a pre-school institution. It is built in 1981. There are 70 employees in total.

#### A. CONSTRUCTION OF THE OBJECT

The building of the kindergarten from Berovo is with a total area of 4473 m<sup>2</sup>, and the space that is heated is 1237 m<sup>2</sup>. The building is of solid construction with concrete and bricks, without thermal insulation of the façade, without roof insulation, the roof construction is made of shingle, the carpentry (windows and doors) is made of PVC. The building has been in operation for more than 30 years. For sanctification, installed equipment as well as embedded devices for the use of solar energy were not delivered.

#### Heating and cooling of the object

The facility has a separate central heating system with two boilers of 495kW of fuel oil.

For cooling of the facility there are 3 air conditioners of 5.4 kW.

#### B. MOBILITY / TRAFFIC

There is no organized transport for the arrival and departure of employees from work. Most of the employees use private vehicles for coming and going out of work, which is estimated to be around 15000 km / year.

The kindergarten has 2 official passenger vehicles.

#### C. ENERGY AND FUEL

According to the collected data, Kindergarten "Veseli Cvetovi" Delcevo spent 25000 kWh per year for electricity, about 17000 liters of oil for heating the object. The total annual water consumption of the water supply system is 2000 m<sup>3</sup> / year.

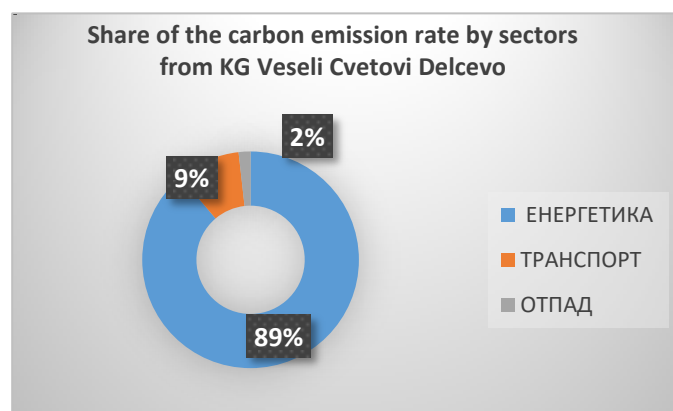
no	Type of energy used in the facility annually	Quantity
1.	Total amount of electricity spent	25 000 kWh/r

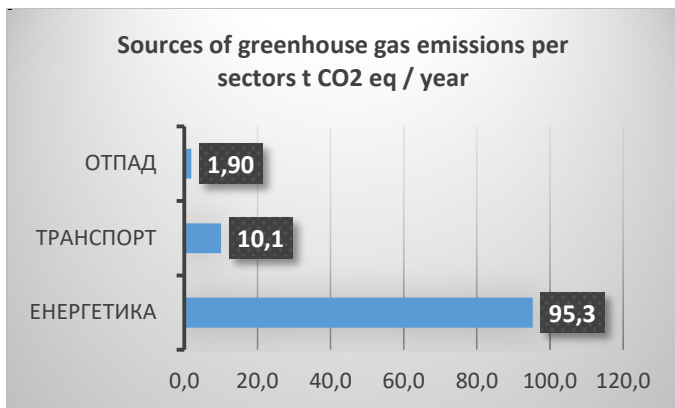
annually	
2.	Fuel for vehicles - Petrol л/г
	Fuel for vehicles - Diesel 1.400 л/г
	Fuel for vehicles - LPG (gas) / л/г
3.	Water consumption from the water supply system 17 000 л/г
6.	Consumption of water from another system (wells, rainwater, etc.) м3/г
7.	2000 м <sup>3</sup> /г

There is no selection and record of the type and category of waste generated by the facility, therefore the quantities supplied are by free calculation by the municipal officials. The total amount of generated waste is estimated at 3000 kg / year

no.	Item	Quantity
1	Plastic waste (PVC), polystyrene, foil etc	1 000 kg/r
2	Paper / Printed materials	300 kg/r
3	Metals (spare parts, iron, aluminum)	kg/r
4	Organic waste (food, cooking oil, etc.)	
5	Comunal waste	1 200 kg/r
Total waste production:		2 300 kg/r

#### D. RATE OF CARBON EMISSION (FOOTPRINT)





Total emission of GHG per year

**107,3** тони eq CO<sub>2</sub>

Coefficient of emission per m<sup>2</sup> area:

**0,087** тони eq CO<sub>2</sub>/m<sup>2</sup>

#### F . MEASURES FOR REDUCTION OF EMISSION

- Implementation of measures for thermal insulation of the roof due to and external facade facade reduction of the consumption of the fuel for heating in the winter period;
- Change of fuel in the heating system, full application of biomass (pellets) as a measure for reducing the consumption of electricity and reduction of greenhouse gas emissions;
- Purchase of high energy devices and equipment
- Procurement and installation of a photovoltaic system for independent production of electricity and direct use of it in the power supply system (eg lighting of the facility) or by compensating for the generated electricity;

Kindergarten "7 September" in Pehcevo is the only institution for pre-school care in the Municipality of Pehcevo. There are 25 employees in total.

#### A. CONSTRUCTION OF THE OBJECT

The kindergarten Pehcevo building has a total area of 800 m<sup>2</sup> and only 650 m<sup>2</sup> is heated. The building is of solid construction with concrete and cylinders, with thermal insulation of the facade, with a tin roof construction, carpentry (windows and doors) is made of PVC. The building has been in operation for more than 30 years. Lighting in the building is entirely from neon lighting with a total of 200 light bulbs of 36W each and installed 7200W lighting power. In the building there is only a solar collector for hot water.

#### Heating and cooling of the object

The facility has a separate central heating system with boiler 200kW on pellets. There is no cooling device installed.

P.6.	Consumer/ installed devices	pices	Power	Total installed power
1.	PC computers	2	400 W	800 W
2.	computers (laptop)	2	250 W	500 W
3.	boilers	4	2000 W	8 000 W
4.	refrigerators	2	1500 W	3 000 W
Total installed power of divaces and equipmnet:				<b>12 300 W</b>

#### B. MOBILITY / TRAFFIC

There is no organized transport for the arrival and departure of employees from work. Most of the employees use private vehicles for coming and going. The kindergarten has no official vehicles.

#### C. ENERGY AND FUEL

According to the collected data, Kindergarten from Pehcevo spent 35 000 kWh per year for electricity, about 20 000 kg pellets for heating the object. The total annual water consumption of the water supply system is 600 m<sup>3</sup> / year.

no	Type of energy used in the facility annually	Quantity
1.	Total amount of electricity spent annually	107 836 kWh/r
2.	Fuel for vehicles - Petrol	600 л/г
	Fuel for vehicles - Diesel	700 л/г
	Fuel for vehicles - LPG (gas)	/ л/г
3.	Water consumption from the water supply system	л/г
6.	Consumption of water from another system (wells, rainwater, etc.)	150 м3/г
7.		2200 м <sup>3</sup> /г

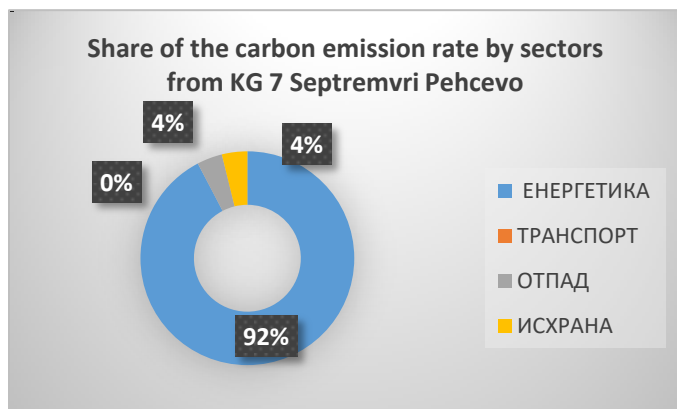
#### D. FOOD AND DRINKS

P.6.	Food and drinks	Quantity		
1	Type of meals	Total number of meals per day	Percentage of vegetarian food	Seson and local food
	Hot meals per day	148		yes
	Cold meals per day	148		yes
2.	Drinks			
-	alcoholic drinks			l/day
-	Non-alcoholic drinks			7 l/day.
-	Water (bottled)			10 l/day.
-	Koffe/tea			150 no/day

There is no selection and record of the type and category of waste generated by the facility, therefore the quantities supplied are by free calculation by the municipal officials. The total amount of generated waste is estimated at 1500 kg / year

no	Item	Quantity
1	Plastic waste (PVC), polystyrene, foil etc	200 kg/г
2	Paper / Printed materials	100 kg/г
3	Metals (spare parts, iron, aluminum)	kg/г
4	Organic waste (food, cooking oil, etc.)	
5	Comunal waste	1 200 kg/г
Вкупна продукција на отпад:		<b>1 500 kg/г</b>

#### D. RATE OF CARBON EMISSION (FOOTPRINT)

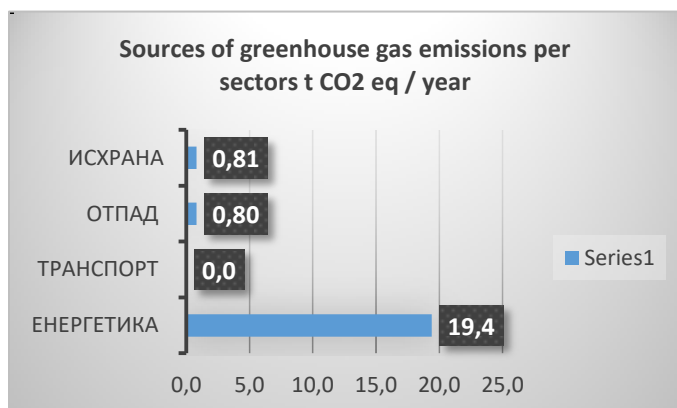


Total emission of GHG per year

**21,0** тони eq CO<sub>2</sub>

Coefficient of emission per m2 area:

**0,032** тони eq CO<sub>2</sub>/m<sup>2</sup>



#### F . MEASURES FOR REDUCTION OF EMISSION

- Implementation of measures for thermal insulation of the roof due to and external facade facade reduction of the consumption of the fuel for heating in the winter period;
- Purchase of high energy devices and equipment
- Purchase and installation of a photovoltaic system for independent production of electricity and direct use thereof in the power supply system (eg lighting of the facility) or by compensating for the electricity produced;

The public institution kindergarten "Goce Delcev" from Vinica has two separate facilities for pre-school children. In the building 1 a total of 49 employees.

### A. CONSTRUCTION OF THE OBJECT

The object 1 of the kindergarten from Vinica is with a total area of 1205 m<sup>2</sup>, and the space that is heated is 1100 m<sup>2</sup>. The building is of solid construction with concrete and bricks, without thermal insulation of the façade, without roof insulation, the roof construction is made of tin sheets, the carpentry (windows and doors) is made of PVC and part of aluminum. The building has been in operation for more than 30 years. Lighting in the building is mixed energy efficient, featuring 150 numbers of CFC lamps of 20W and 10 LEDs of 15W. The facility has only installed a solar collector for hot water of 15kW.

### Heating and cooling of the object

There is a separate steam heating system in the building, with boiler of 524kW of the mousetus. There are also 5 heaters for additional heating.

For cooling of the facility 6 air conditioners of 3.5kW are installed.

no	Consumer/ installed devices	pieces	Power	Total installed power
1.	PC computers	3	400 W	800 W
2.	computers (laptop)	2	250 W	500 W
3	printer	3	400 W	1 200 W
4.	heater	5	2000 W	10 000 W
5	boiler	10	2000 W	8 000 W
6.	Air conditioner	6	3500 W	21 000W
7	refrigerators	2	1500 W	3 000 W
Total installed power of divaces and equipmnet::				<b>44 500 W</b>

### B. MOBILITY / TRAFFIC

There is no organized transport for the arrival and departure of employees from work. Most of the employees use private vehicles for coming and going.

The kindergarten has got an official passenger vehicle, Peugeot Partner, produced in 2010, with a diesel engine with an average of around 13000 km / year.

### C. ENERGY AND FUEL

According to the collected data, kindergarten-object 1 from Vinica uses 12 000 kWh per year for electricity and about 20000 kg of pellets. The total annual water consumption of the water supply system is 2000 m<sup>3</sup> / year.

no	Type of energy used in the facility annually	Quantity
1.	Total amount of electricity spent annually	12 000 kWh/r
2.	Fuel for vehicles - Petrol	л/г
	Fuel for vehicles - Diesel	800 л/г
	Fuel for vehicles - LPG (gas)	/ л/г
3.	Water consumption from the water supply system	20 000 л/г
6.	Consumption of water from another system (wells, rainwater, etc.)	м3/г
7.		2000 м <sup>3</sup> /г

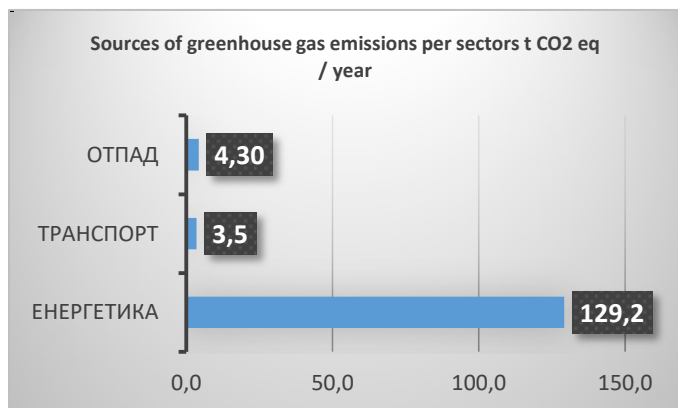
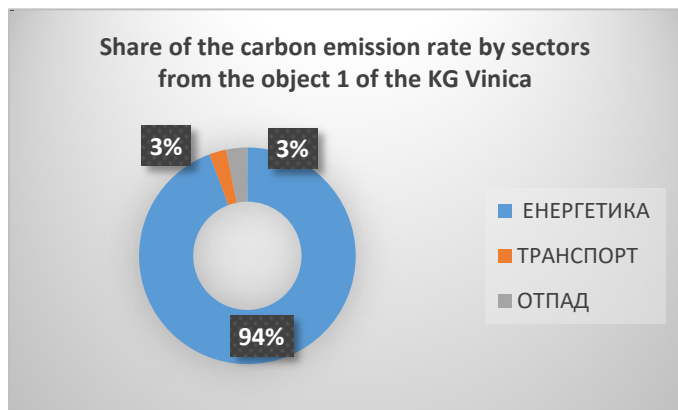
### D. FOOD AND DRINKS

Р.б.	Храна и пијалоци	Количина		
1	Type of meals	Total number of meals per day	Percentage of vegetarian food	Seson and local food
	<b>Hot meals per day</b>	350	30	<b>yes</b>
	<b>Cold meals per day</b>	380	30	<b>yes</b>
2.	Drinks			
-	Alcoholic drinks			l/day.
-	Non-alcoholic drinks			10л l/day.
-	Water (bottled)			l/day.
-	Koffe/tea			60 nol/day

There is no selection and record of the type and category of waste generated by the facility, therefore the quantities supplied are by free calculation by the municipal officials. The total amount of generated waste is estimated at 2800 kg / year.

no.	Item	Quantity
1	Plastic waste (PVC), polystyrene, foil etc	300 kg/r
2	Paper / Printed materials	100 kg/r
3	Metals (spare parts, iron, aluminum)	kg/r
4	Organic waste (food, cooking oil, etc.)	kg/r
5	Comunal waste	1 100 kg/r
Total waste production:		1 500 kg/r

#### D. RATE OF CARBON EMISSION (FOOTPRINT)



Total emission of GHG per year

**137,4** тони eq CO<sub>2</sub>

Coefficient of emission per m<sup>2</sup> area:

**0,125** тони eq CO<sub>2</sub>/m<sup>2</sup>

#### F . MEASURES FOR REDUCTION OF EMISSION

- Implementation of measures for thermal insulation of the roof due to and external facade facade reduction of the consumption of the fuel for heating in the winter period;
- Change of fuel in the heating system, full application of biomass (pellets) as a measure for reducing the consumption of electricity and reduction of greenhouse gas emissions;
- Purchase of high energy devices and equipment
- Purchase and installation of a photovoltaic system for independent production of electricity and direct use of it in the power supply system (eg lighting of the facility) or by compensating for the production with consumed electricity;

## A. CONSTRUCTION OF THE OBJECT

The object 2 of the kindergarten from Vinica is with a total area of 880 m<sup>2</sup>, and the area that is heated is 820 m<sup>2</sup>. The building is of solid construction with concrete and bricks, with thermal insulation of the façade and with insulation of the roof, the roof construction is from the sheet metal tin panels. Joinery (windows and doors) is made of PVC and aluminum. The building has been in operation for more than 30 years. Lighting in the building is mixed and energy efficient, featuring 100 numbers of 20W CFC lamps and 10 LEDs of 15W. The facility has only installed a solar collector for hot water of 10kW.

### Heating and cooling of the object

The facility has a separate central heating system with boiler of 300kW which uses biomass (pellets). There are also 3 electric heaters available for further heating.

For cooling of the facility there are 2 air conditioners of 3.5kW each.

no	Consumer/ installed devices	pices	Power	Total installed power
1.	PC computers	1	400 W	400 W
2.	heaters	3	2000 W	6 000 W
3	boilers	3	2000 W	6 000 W
4.	Air conditioner	2	3500 W	7 000 W
4	refrigerators	1	1500 W	1 500 W
Total installed power of divaces and equipmnet::				20 900 W

## B. MOBILITY / TRAFFIC

There is no organized transport for the arrival and departure of employees from work. Most of the employees use private vehicles to arrive and leave the work, which is estimated to be around 10,000 km / year.

The kindergarten has got an official passenger vehicle, Peugeot Partner, produced in 2010, with a diesel engine with an average of around 13000 km / year.

## C. ENERGY AND FUEL

Согласно прибавените податоци, детска градинка-објект 1 од Винаца користи 43000 kWh годишно за електрична енергија и околу 20000 литри мазут за загревање на објектот, и околу 800 литра дизел за возилото . Вкупната годишна потрошувачка на вода од системот на водоснабдување изнесува 2000 m<sup>3</sup>/годишно.

N o	Type of energy used in the facility annually	quantity
1.	Total amount of electricity spent annually	107 836 kWh/r
2.	Fuel for vehicles – Petrol	л/г
	Fuel for vehicles – Diesel	800 л/г
	Fuel for vehicles – LPG (gas)	/ л/г
3.	Water consumption from the water supply system	20 000 л/г
6.	Consumption of water from another system (wells, rainwater, etc.)	м3/г
7.		2000 m <sup>3</sup> /г

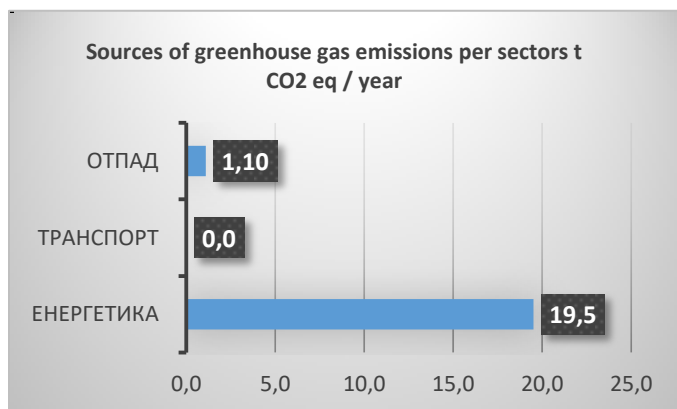
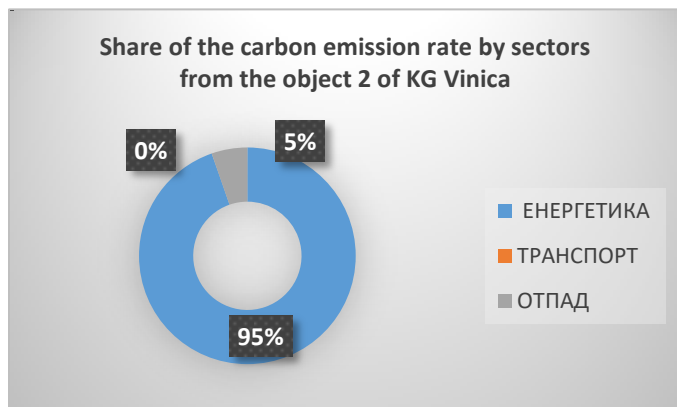
## D. FOOD AND DRINKS

Р.б.	Храна и пијалаци	Количина		
1	Type of meals	Total number of meals per day	Percentage of vegetarian food	Seson and local food
	Hot meals per day	350	30	yes
	Cold meals per day	380	30	yes
2.	drinks			
-	Alcoholic drinks			l/day.
-	Non-alcoholic drinks			10l/day.
-	Water (bottled)			l/day.
-	Koffe/tea			60 no/day

There is no selection and record of the type and type of waste generated by the facility, therefore the quantities supplied are by free calculation by the municipal officials. The total amount of generated waste is estimated at 2800 kg / year.

no	Item	Quantity
1	Plastic waste (PVC), polystyrene, foil etc	1 000 kg/r
2	Paper / Printed materials	200 kg/r
3	Metals (spare parts, iron, aluminum)	kg/r
4	Organic waste (food, cooking oil, etc.)	1000 kg/r
5	Comunal waste	500 kg/r
Total waste production:		<b>2 800 kg/r</b>

#### D. RATE OF CARBON EMISSION (FOOTPRINT)



Total emission og GHG per year

**20,6** тони eq CO<sub>2</sub>

Coefficient of emission per m<sup>2</sup> area:

**0,025** тони eq CO<sub>2</sub>/m<sup>2</sup>

#### F . MEASURES FOR REDUCTION OF EMISSION

- Implementation of measures for thermal insulation of the roof due to and external facade facade reduction of the consumption of the fuel for heating in the winter period;
- Purchase of high energy devices and equipment
- Purchase and installation of a photovoltaic system for independent production of electricity and direct use thereof in the power supply system (eg lighting of the facility) or by compensating for the electricity produced;

## PEHCEVO: COMPANY NOVA REFRACTORY

The company NOVA REFRAKTROTI is an industrial company for the production of fireproof materials in Pehcevo. The company has a total of 101 employees.

### A. CONSTRUCTION OF THE OBJECT

The total area of the building is 73121m<sup>2</sup>, and the area that is heated is 7200m<sup>2</sup>. The building is of solid construction with concrete and bricks, and one part is a metal construction, without thermal insulation on the façade, with roof insulation, the roof construction is part of the sheet metal panels and part ceramides. carpentry (windows and doors) is made of PVC and part wooden. The building has been in operation for more than 30 years. Lighting in the building is mixed in which there are 40 ordinary 100W light bulbs, 240 neon light bulbs of 36w and 60 metal halide lamps of 250W each. There are no devices for utilizing solar energy or other alternative sources of energy in the facility

no	Type of illumination in the building:	number/quantity	installed power of unit/lamp	Total installed power
1.	Ordinary bulbs	40	100W	4 000W
2.	Neon lighting	240	36 W	8640 W
3.	Metalhalogen	60	250 W	15 000 W
Total installed power of illumination:				27 640 W

### Heating and cooling of the object

there is a separate central heating system In the building, with a boiler of 2300kW at the masters. There are also electric heaters available for further heating.

For cooling of the facility 5 air conditioners of 1,5kW are installed.

no	Consumer/ installed devices	pices	Power	Total installed power
1.	PC comnputers	20	400 W	8 000 W
2.	Computers (note book)	8	250 W	2 000 W
3	boilers	2	2000 W	4 000 W
4.	Air conditioners	5	1500 W	7 500 W
5	refrigerators	5	1500 W	7 500 W
Total installed power of divaces and equipmnet::				44 500 W

### B. MOBILITY / TRAFFIC

There is no organized transport for the arrival and departure of employees from work. Most of the employees use private vehicles for coming and going from work that spend about 12 000 km / year.

The company has 8 official vehicles.

P.6	Type of the vehicle	fuel	Year of manufacturing	Average passed километри/year
1	Mercedes 13-17	DIESEL	1988	8000 km/Y
2	ULT 160C	DIESEL	1995	1000 km/Y
3	Termalift CHL	DIESEL	2014	900 km/Y
4	Mitsubishi (viljuskar)	DIESEL	2014	900 km/y
5	Komatsu (viljuskar)	DIESEL	2008	900 km/y
6	INDUS (viljuskar)	DIESEL	1989	900 km/y
7	INDUS (viljuskar)	DIESEL	1988	900 km/y
8	INDUS (viljuskar)	DIESEL	1991	900 km/y

Around 50 overnights annually (accommodation in hotels) are realized by the employees through participation in seminars, meetings, etc. organized by different organizations and entities outside the municipality.

### C. ENERGY AND FUEL

According to the collected data, the Company Nova Refractors from Pehcevo uses 1516000 kWh per year for electricity and about 50000 liters of fuel oil for heating the object. Also about 11800 liters of diesel for

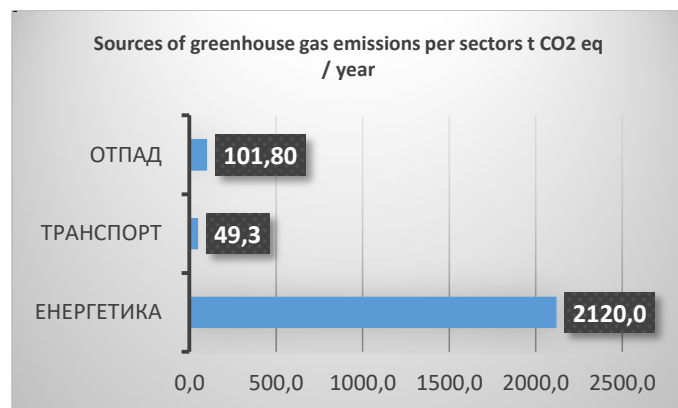
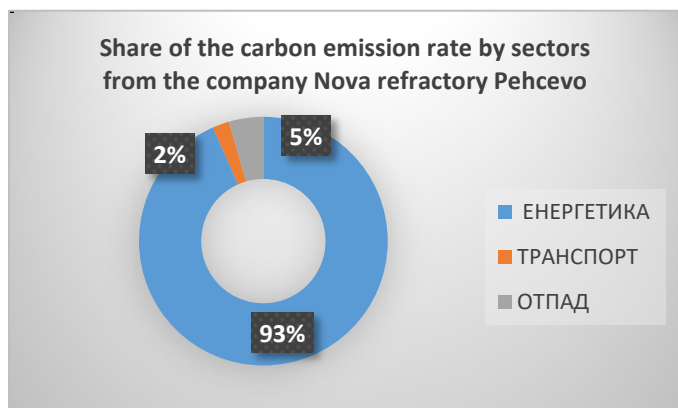
vehicles. The total annual water consumption of the water supply system is 23 000 m<sup>3</sup> / year.

no	Type of energy used in the facility annually	Quantity
1.	Total amount of electricity spent annually	1 516 000 kWh/r
2.	Fuel for vehicles - Petrol	л/г
	Fuel for vehicles - Diesel	11 800 л/г
	Fuel for vehicles - LPG (gas)	/ л/г
3.	Water consumption from the water supply system	50 000 л/г
6.	Consumption of water from another system (wells, rainwater, etc.)	м3/г
7.		23 000 м <sup>3</sup> /г

There is no selection and record of the type and category of waste generated by the facility, therefore the quantities supplied are by free calculation by the municipal officials. The total amount of generated waste is estimated at 3700 kg / year.

P.б.	Item	Quantity
1	Plastic waste (PVC), polystyrene, foil etc	50 kg/г
2	Paper / Printed materials	200 kg/г
3	Metals (spare parts, iron, aluminum)	1000 kg/г
4	Organic waste (food, cooking oil, etc.)	400 kg/г
5	Chemicals (detergents, motor oil, colours etc.)	/ kg/г
6	Electronic waste (computers, TVs, radios, batteries, cables)	/ kg/г
7	Non-organic waste (minerals, clay, construction rubble, etc.)	2000 kg/г
8	Glass and packaging	50 kg/г
9	Other:	kg/г
Total waste production:		3 700 kg/г

#### D. RATE OF CARBON EMISSION (FOOTPRINT)



Total emission of GHG per year

**2271,1** тони eq CO<sub>2</sub>

Coefficient of emission per m<sup>2</sup> area:

**0,315** тони eq CO<sub>2</sub>/m<sup>2</sup>

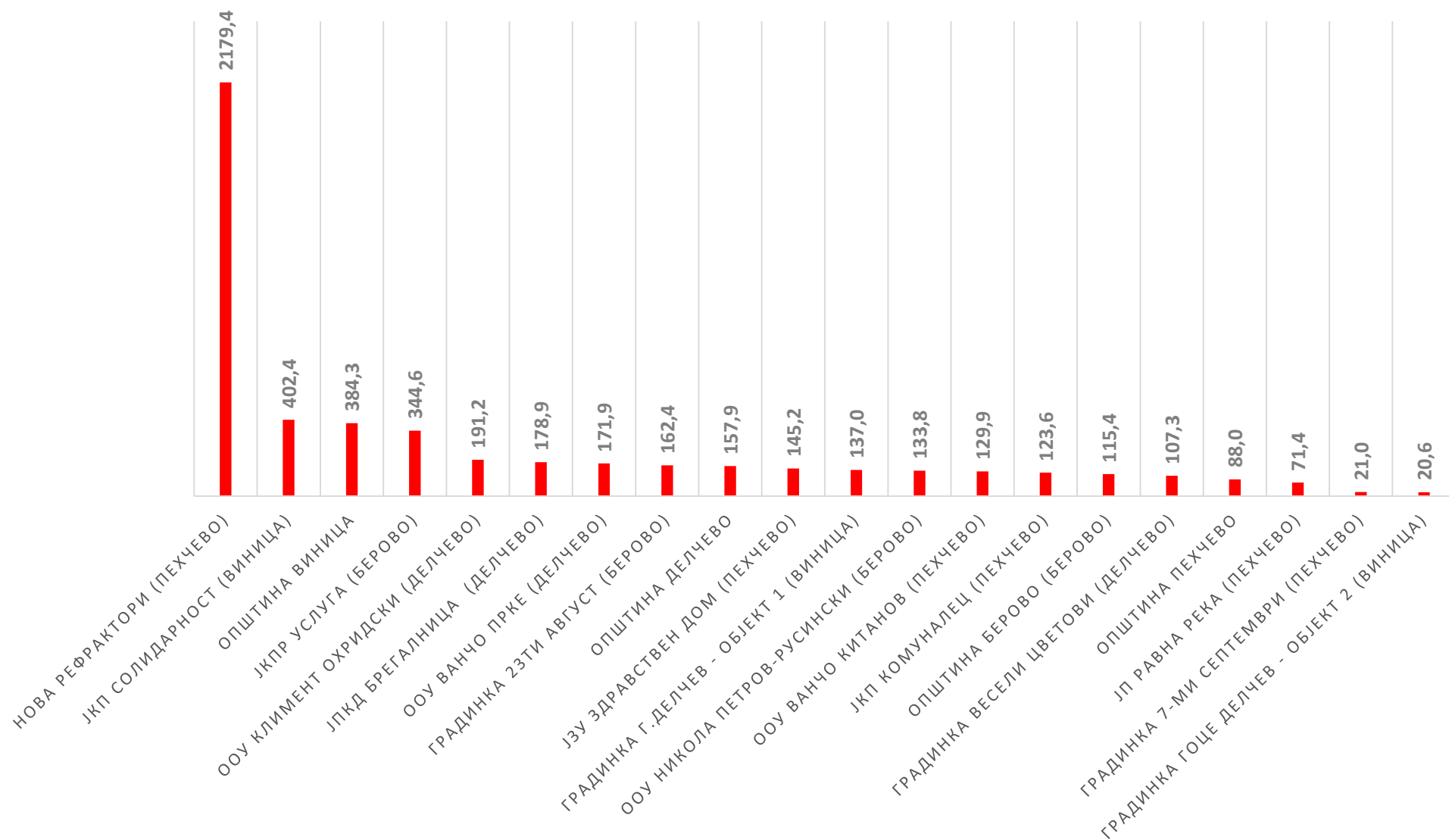
#### F . MEASURES FOR REDUCTION OF EMISSION

- Implementation of measures for thermal facade of external walls reducing the consumption of energy for heating in the winter period;
- Change of fuel in the heating system, full application of biomass (pellets) as a measure for reducing the consumption of electricity and reduction of greenhouse gas emissions;
- Exchange of energy (electricity) with another more economical and more efficient energy (gas / gas) through the installation of own gas / gas supply system.
- Purchase of high energy devices and equipment
- Procurement and installation of a photovoltaic system for independent production of electricity and direct use of it in the power supply system (eg lighting of the facility) or by compensating for the generated electricity;

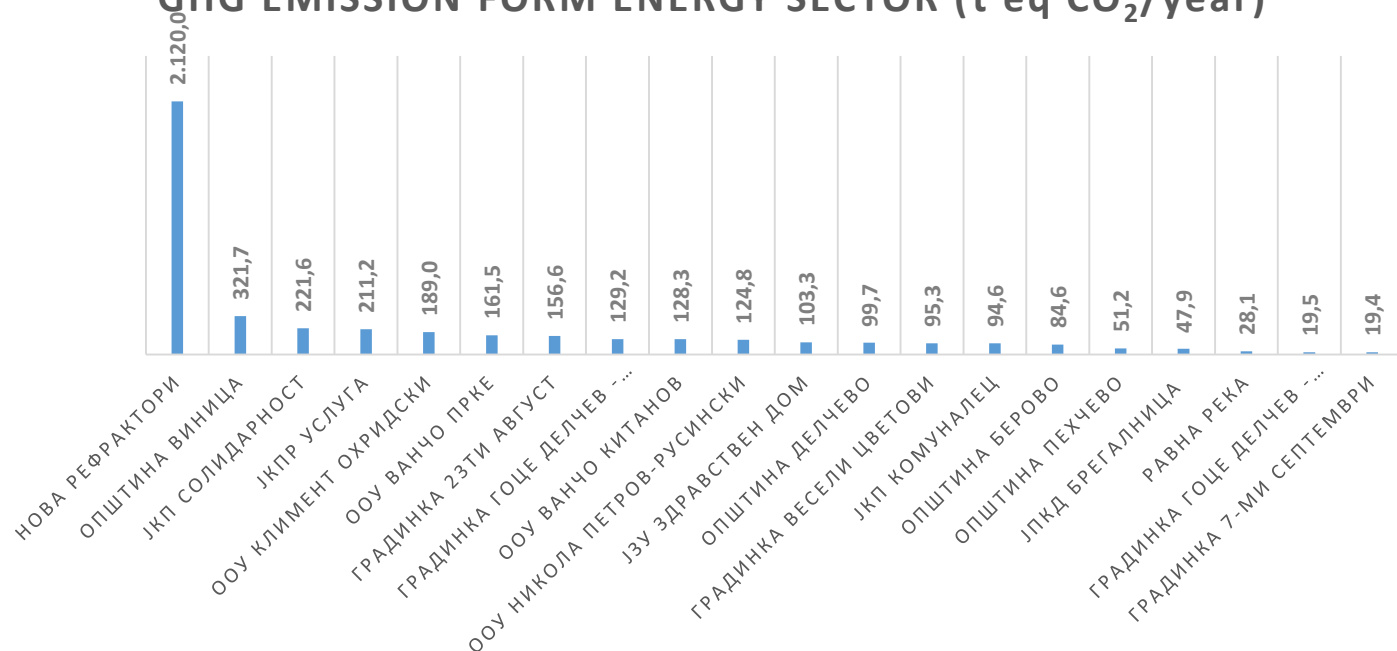
## TOTAL OVERVIEW OF THE EMISSIONS

MUNICIPALITY			SUBJECT		BTOTAL tCO2/YEAR	ENERGY	TRANSPORT	WASTE	FOOD	GHG EMISSION IN t of CO2 eq /m2	number of employees	Total area of the object(m2)	Heating/ cooling area (m2)
1.	Pehcevo	NOVA REFRACTORY			2179,4	2120,0	49,30	10,10	/	0,32	101	73121	7200
2.	Berovo	PUBLIC UTILITY USLUGA			344,6	211,2	131,60	1,80	/	0,87	90	550	394
3.	Vinica	PUBLIC UTILITY SOLIDARNOST			402,4	221,6	179,10	1,70	/	2,15	104	362	187
4.	Vinica	MUNICIPALITY VINICA			384,3	321,7	59,40	3,20	/	0,21	140	1800	1800
5.	Delcevo	ELEMENTARY SCHOOL KLIMENT OHRIDSKI			191,2	189,0	1,60	0,56	/	0,05	109	3951	3951
6.	Delcevo	PUBLIC UTILITY BREGALNICA			178,9	47,9	128,80	2,20	/	0,94	87	272	190
7.	Delcevo	ELEMENTARY SCHOOL ВАНЧО ПРКЕ			171,9	161,5	3,50	6,90	/	0,04	49	5140	4700
8.	Berovo	KINDERGARTEN 23ти AUGUST			162,4	156,6	2,90	1,20	1,70	0,13	49	1280	1280
9.	Delcevo	MUNICIPALITY DELCEVO			157,9	99,7	56,20	2,00	/	0,53	40	300	300
10.	Pehcevo	PI HEALTH CENTER PEHCEVO			145,2	103,3	41,50	0,40	/	0,15	37	1000	1000
11.	Vinica	KINDERGARTEN GOCE DELCEV OBJECT 1			137,0	129,2	3,50	4,30	/	0,12	49	1205	1100
12.	Berovo	ELEMENTARY SCHOOL NIKOLA PETROV-RUSINSKI			133,8	124,8	8,10	0,93	/	0,09	21	1588	1400
13.	Pehcevo	ELEMENTARY SCHOOL VANKO KITANOV			129,9	128,3	0,00	1,60	/	0,05	65	2612	2452
14.	Pehcevo	PUBLIC UTILITY KOMUNALEC			123,6	94,6	27,70	1,30	/	2,06	27	66	60
15.	Berovo	MUNICIPALITY BEROVO			115,4	84,6	29,80	0,99	/	0,11	35	1060	1060
16.	Delcevo	KINDERGARTEN VESELI CVETOVI			107,3	95,3	10,10	1,90	/	0,09	70	4473	1237
17.	Pehcevo	MUNICIPALITY PEHCEVO			88,0	51,2	35,90	0,91	/	0,31	22	285	285
18.	Pehcevo	PUBLIC ENTERPRISE RAVNA REKA			71,4	28,1	42,20	1,10	/	0,19	32	374	374
19.	Pehcevo	KINDERGARTEN 7 SEPTEMBER			21,0	19,4	0,00	0,80	0,81	0,03	27	800	650
20.	Vinica	KINDERGARTEN GOCE DELCEVO OBJECT 2			20,6	19,5	0,00	1,10	/	0,03	40	880	820
TOTAL					5357,9	4407,5	811,2	136,70	2,51				

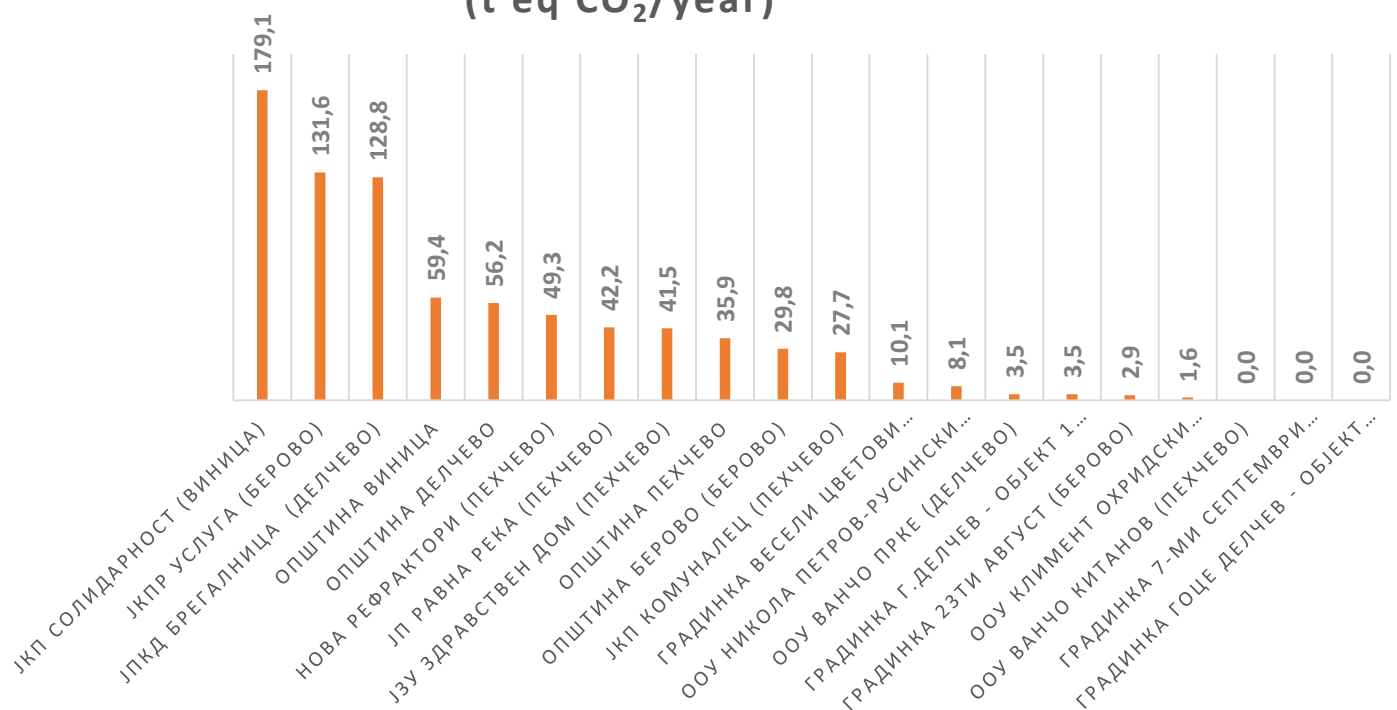
## TOTAL GHG EMISSION (t eq CO<sub>2</sub>/year.)



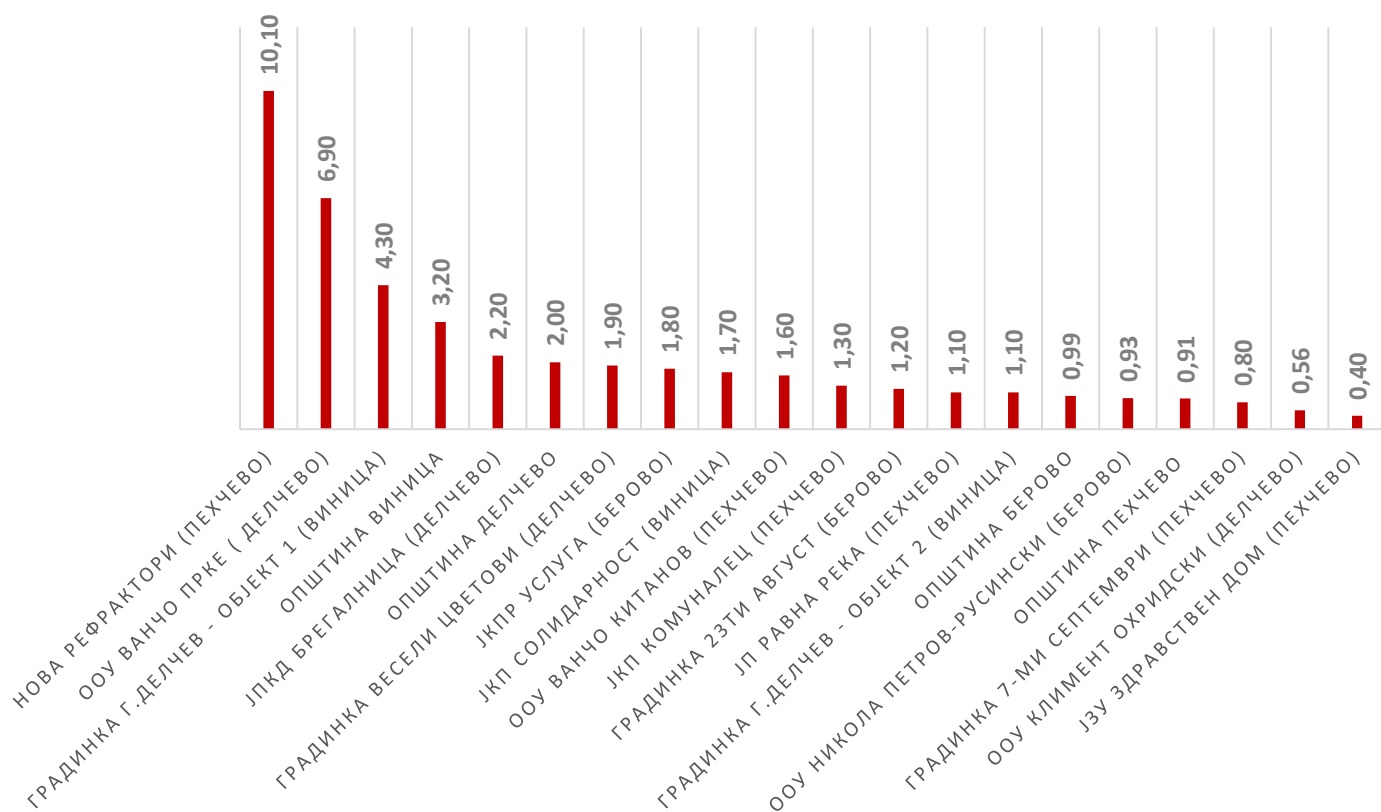
## GHG EMISSION FORM ENERGY SECTOR (t eq CO<sub>2</sub>/year)



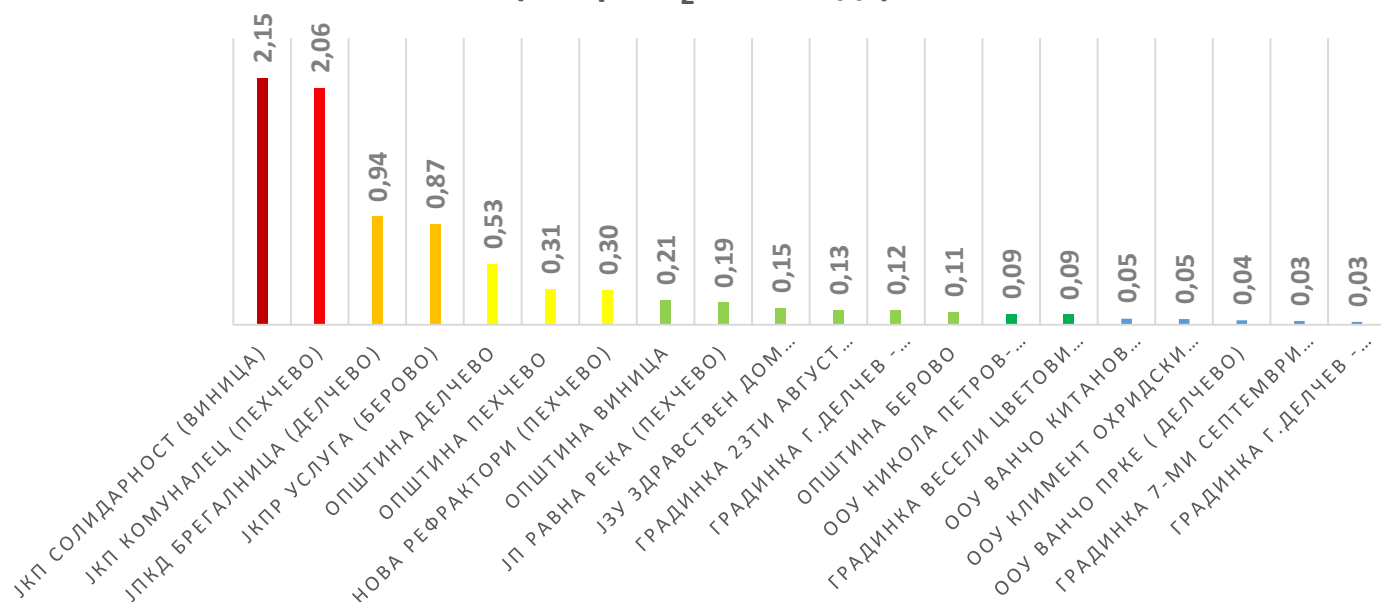
## GHG EMISSION FORM TRANSPORT SECTOR (t eq CO<sub>2</sub>/year)



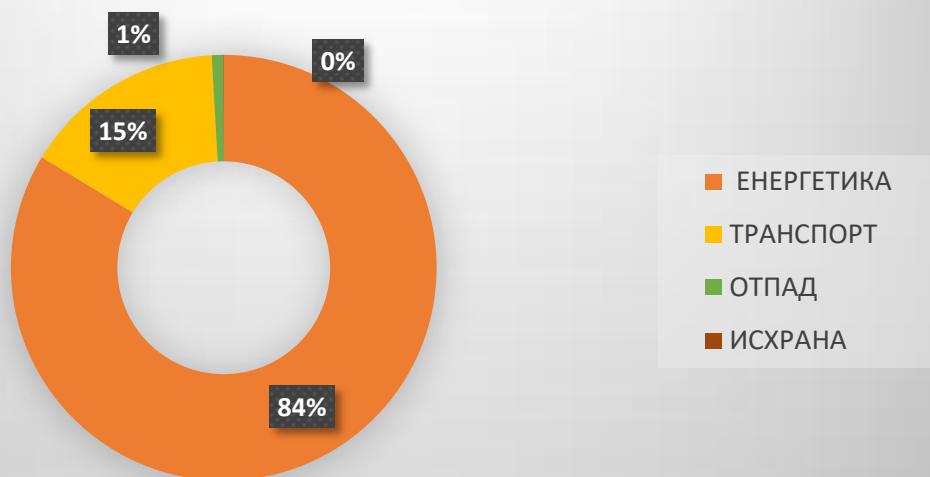
## GHG EMISSION FORM WASTE SECTOR(t eq CO<sub>2</sub>/год.)



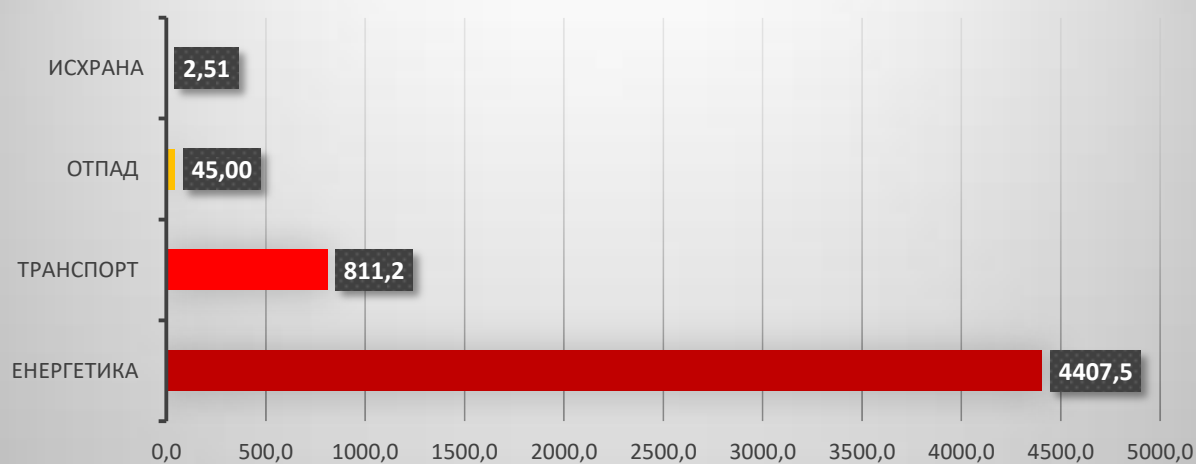
## GHG EMISSION PER USED AREA OF THE OBJECT (t eq CO<sub>2</sub>/m2 год.)



## PARTICIPATION IN TOTAL GHG EMISSIONS OF ANALYZED OBJECTS



## Total GHG emission of the analysed objects (t eq CO<sub>2</sub>/год.)



### CONCLUSIONS

- The emission of greenhouse gases depends on the activity carried out by the specified entity (production vs. services), according to the obtained and processed data it can be noticed that in the entities that are engaged in production activity (eg with the company NOVA Refractory), due to the large consumption of electricity for the production of refractory materials, the emission of greenhouse gases is over 2000 tons of CO<sub>2</sub>-eq / year, which compared to other analyzed subjects has the highest emission rate.
- Major part of the sources of greenhouse gas emissions come from the energy sector energy and energy consumption. This is evident in all subjects covered in this analysis.
- The use of fossil fuels significantly contributes to the emission of greenhouse gases, ie it is evident that facilities using fossil fuels (oil / fuel oil) for heating the facilities have a higher GHG emission.
- The utilization of biomass (pellets) significantly reduces the greenhouse gas emissions, this has been noted in two buildings (kindergarten 7th September - Pehchevo and Kindergarten Gotse Delchev - building 2, Vinica) which, in fact, have the lowest GHG emission rate due to the use of biomass (pellets) instead of fossil fuel.
- Also, the type of construction and the use of insulating materials in the buildings evidently reduce the consumption of energy, thereby indirectly reducing the greenhouse gas emissions by direct energy savings.

### RECOMENDATIONS

- In the case of large electricity consumption, especially in the production plants, it is recommended to replace the energy (electricity) with another more economical and more efficient energy (gas / gas) through the installation of its own gas / gas supply system. Setting up independent photovoltaics as renewable sources of electricity;
- For public institutions (kindergartens, municipal buildings, schools) to replace heating systems, ie replacing energy with biomass (pellets) as a more efficient, economical and low-carbon greenhouse gas emission); Other possibility that can be considered is building a central gasification system for public buildings.
- Thermal insulation of the buildings, replacement of the carpentry and renovation of the roof construction of the facilities; Replacement of lighting of objects with energy efficient LEDs and their connection with photovoltaic systems for electricity generation.
- Public enterprises can make a change of the source of energy through the use of biomass (pellets) or the construction of a regional biogas production center that would be used as a fuel for heating in the facilities of Public Enterprises;
- Due to the high costs of mobility, ie for vehicles of public enterprises, the use of biodiesel from own production for the stationary vehicles, ie the conversion of vehicles that are gasoline to LPG or biogas / methane.
- Consideration should also needs to be given to the purchase of new electric vehicles by installing charging systems but also to the production of electricity with photovoltaics or changing vehicles that are on gas to biogas and the use of vehicles

## ANNEX 1 – QUESTIONNAIRE

**QUESTIONNAIRE FOR CALCULATION OF THE INSTITUTION / COMPANY CONTRIBUTION  
TO CLIMATE CHANGE (CO<sub>2</sub> EMISSIONS)**

**GENERAL INFORMATION**

Name of the subject:

Economic area:


Total number of employees:

Total working days / year:

Location:

Municipality:

**A. CONSTRUCTION OF THE BUILDING**

	Area of the building:	Years of exploitation	Construction materials:
	Total area:	<input type="radio"/> 1 to 5 years	<input type="radio"/> Concrete and bricks
	_____ m <sup>2</sup>	<input type="radio"/> 6 – 15 years	<input type="radio"/> Wooden construction
	Useful area that is heated/cooled:	<input type="radio"/> 16 – 30 years	<input type="radio"/> Panel construction
	_____ m <sup>2</sup>	<input type="radio"/> 31 – 50 years	<input type="radio"/> Other: _____
		<input type="radio"/> More than 50 years	

Insulation materials in the building	Roof construction:	Windows and doors
<input type="radio"/> Termo facade of the building	<input type="radio"/> Shingles	<input type="radio"/> Wooden carpentry
<input type="radio"/> Sandwich isolation with styrofoam	<input type="radio"/> Salonite	<input type="radio"/> PVC – carpentry
<input type="radio"/> Insulation of the roof with a trench or other insulating elements	<input type="radio"/> Shingle	<input type="radio"/> Aluminum carpentry
	<input type="radio"/> Tin construction	<input type="radio"/> Other _____
	<input type="radio"/> Other: _____	

**HEATING IN THE BUILDING****INSTALLED HEATING BODIES**

- ☐ The building is connected to a central heating system
- ☐ The building has its own heating system
- ☐ The building has set individual heaters

Type of heating element: \_\_\_\_\_

Installed power: \_\_\_\_\_ kW

Number of heating elements: \_\_\_\_\_.

☐ The building is not heated

Energy: \_\_\_\_\_

No.	Type of illumination in the building:	Quantity Number.	Installed power of single bulb	Total Installed power
1.	Ordinary bulbs		W	W
2.	Neon lighting		W	W
3.	Compact fluorescents (CFC) bulbs		W	W
4.	Metal Halogen Lighting		W	W
5.	LED lights		W	W
6.	Other		W	W
Total Installed power of illumination:				kW

No	We use alternative sources of energy in the facility	YES	NO	Installed power
1.	Installed solar collector for thermal energy?	<input type="radio"/>	<input type="radio"/>	kW
2.	Installed solar panels for electricity?	<input type="radio"/>	<input type="radio"/>	kW
3.	Installed mini-wind power plants?	<input type="radio"/>	<input type="radio"/>	kW
4.	Installed combined (hybrid) systems for utilizing solar energy	<input type="radio"/>	<input type="radio"/>	kW

No	Installed devices and equipment of electricity (eg Computers, laptops printers, heaters, air conditioners refrigerators, water heaters, etc.)	Quantity Number.	Installed power	Total Installed power
1.			W	W
2.			W	W
3.			W	W
4.			W	W
5.			W	W

6.			W	W
7.			W	W
8.			W	W
9.			W	W
10.			W	W
11.			W	W
12.			W	W
13.			W	W
Total Installed power of equipment and devises:				kW

#### B. MOBILITY / TRAFFIC:

*Airplane flights throughout the year for all employees:*

No	Type of lights	Number of flights of total flights	Using business class (%)
1.	Short regional flights		
2.	Medium continental flights		
3.	Long intercontinental flights		

*Use of transport for employees to come to work or performing work tasks annually:*

No	Type of transportation	Kilometers per year.
1.	Buss	km/r
2.	Local train	km/r
3.	International trains (long-distance connections)	km/r
4.	Taxi	km/r
5.	Car trips	km/r

*Vehicles owned by the company:*

No	Type of vehicle	Fuel (gasoline / diesel / TNG)	Year of production	Average kilometers per year.
1				km/r
2				km/r

3				km/г
4				km/г
5				km/г
6				km/г
7				km/г
8				km/г
9				km/г
10				km/г

Participation on seminars, meetings, etc. (accommodation in hot tubs) that included employees:

No	Total overnights per year (no.)
1. Overnight	

#### C. ENERGY

No.	Type of energy used in the facility annually	Quantity
1.	Total electricity annually	kWh/г
2.	Fuel for vehicles - Petrol	л/г
	Fuel for vehicles - Diesel	л/г
	Fuel for vehicles – TNG (gas)	л/г
3.	Heating oil (fuel oil)	л/г
4.	Heating gas (natural gas)	m <sup>3</sup> /г
5.	Central heating	kWh/г
6.	Coal (Cox)	kg/г
6.	Biomass / wood / pellets, etc..*	kg/г
7.	Water consumption from the water supply system	m <sup>3</sup> /г
8.	Consumption of water from another system (wells, rainwater, etc.)	m <sup>3</sup> /г

\*1m3 firewood ≈ 800 kg

#### Г. FOOD AND DRINKS

No	Food and drinks	Quantity
1.	Does your organization have its own restaurant??	<input type="radio"/> Yes <input type="radio"/> No

		If your answer is No, proceed to point D.		
		Total number of meals per day (no.)	Percentage of vegetarian foods	Seasonal and local food
-	Warm meals per day			<input type="radio"/> Yes <input type="radio"/> No
-	Cold meals per day			<input type="radio"/> Yes <input type="radio"/> No
<b>2. Drinks</b>				
-	Alcoholic drinks			l/day.
-	Non-alcoholic drinks			l/day
-	Water (bottled)			l/day
-	Coffee/ Tee			no/day

#### D. MATERIALS AND WASTE

No	Item	Количина
1	Plastic waste (PVC), polystyrene, foil, etc..	kg/y
2	Paper/ printed materials	kg/y
3	Metals (spare parts, iron, aluminum)	kg/y
4	Organic waste (food, cooking oil, etc.)	kg/y
5	Chemicals (detergents, motor oil, paints and varnishes, etc.)	kg/y
6	Electronic waste (computers, TVs, radios, batteries, cables)	kg/y
7	Non-organic waste (minerals, clay, construction rubble, etc.)	kg/y
8	Glass and packaging	kg/y
9	Other:	kg/y
<b>Total waste generation:</b>		kg/y

**Thank you for your cooperation.**

Send the completed questionnaire to [stole.georgiev@gmail.com](mailto:stole.georgiev@gmail.com)

## ANNEX 2- LIST OF SUBJECT INCLUDED IN THE CARBON FOOTPRINT ANALYSIS

### Distributed Questionnaires for CO2 Footprint

#### MUNICIPALITY OF BEROVO

P.6	Title of the Institution/ Compani	Type	E-mail	Cell Phone	Responsible Person	Status
1.	OOU Dedo Ilyo Maleshevski - Berovo	Public Institution / School	<a href="mailto:dedo.iljo.malesevski@gmail.com">dedo.iljo.malesevski@gmail.com</a>	070 309 553	Natasa Avramska	<b>Not Recieved</b>
2.	OOU Nikola Petrov Rusinski – Berovo	Public Institution / School	<a href="mailto:rusinski_rusinovo@yahoo.com">rusinski_rusinovo@yahoo.com</a>	033 448 522		<b>Received</b>
3.	OJUGD 23 Avgust – Berovo	Public Institution/ Kindergarten	<a href="mailto:detskagradinka@yahoo.com">detskagradinka@yahoo.com</a>	033 471 039		<b>Received</b>
4.	JKP Usluga - Berovo	Municipal Public Enterprise / Waste & water management	<a href="mailto:usluga.berovo@gmail.com">usluga.berovo@gmail.com</a>	071 696 656	Sanja	<b>Received</b>
5.	Alkaloid AD – Berovo	Private Company / Textile	<a href="mailto:alkaloidtanja@yahoo.com">alkaloidtanja@yahoo.com</a> <a href="mailto:alkaloidberovo@gmail.com">alkaloidberovo@gmail.com</a>	078 390 300	Blagojco	<b>Not Recieved</b>
6.	Hotel Manastir – Berovo	Private Company/ Accommodation, hostile	<a href="mailto:hotelmanastirdoo@yahoo.com">hotelmanastirdoo@yahoo.com</a>	033 279 000	Irena 070 282 854	<b>Not Recieved</b>

#### MUNICIPALITY OF DELCEVO

P.6	Title of the Institution/ Compani	Type	E-mail	Cell Phone	Responsible Person	Status
7.	SOU M.M. Birco - Delcevo	Public Institution / High School	<a href="mailto:petrovskab@gmail.com">petrovskab@gmail.com</a>	033411864, 033411828	Biljana Petrovska	<b>Not Recieved</b>
8.	OOU Kliment Ohridski – Delcevo	Public Institution / School	<a href="mailto:mihailovskavalentina@yahoo.com">mihailovskavalentina@yahoo.com</a>	033410920	Jagoda Eftimova	<b>Received</b>
9.	OOU Vanco Prke – Delcevo	Public Institution / School	<a href="mailto:ouvancoprkedelcevo@yahoo.com">ouvancoprkedelcevo@yahoo.com</a>	033411119, 033411704	Valentina	<b>Received</b>
10.	OJUGD “Veseli Cvetovi” – Delcevo	Public Institution/ Kindergarten	<a href="mailto:ojudgveselicvetovi@yahoo.com">ojudgveselicvetovi@yahoo.com</a>	033411872	Beti	<b>Received</b>
11.	JPKD Bregalnica – Delcevo	Municipal Public Enterprise / Waste & water management	<a href="mailto:darkogocevski1981@gmail.com">darkogocevski1981@gmail.com</a>			<b>Received</b>
12.	Viteks-Stil DOOEL - Delcevo	Private Company / Textile	<a href="mailto:viteks-de@t-home.mk">viteks-de@t-home.mk</a>	033413304		<b>Not Recieved</b>

13.	Rudine DOO Skopje, Branch Office Delcevo	Private Company/ Meat and food production	<a href="mailto:rudine@t-home.mk">rudine@t-home.mk</a>	070244847		<b>Not Recieved</b>
14.	Krzn Tekst DOO – Delcevo	Private Company / Textile	<a href="mailto:krznodoel@t-home.mk">krznodoel@t-home.mk</a>	033413555		<b>Not Recieved</b>

#### MUNICIPALITY OF PEHCEVO

P.6	Title of the Institution/ Compani	Type	E-mail	Cell Phone	Responsible Person	Status
15.	OU “Vanco Kitanov” - Pehcevo	Public Institution / School	<a href="mailto:vanco.kitanov@yahoo.com">vanco.kitanov@yahoo.com</a>	072241720	Mr. Vanco Sivevski	<b>Received</b>
16.	OJUGD “7mi Septemvri”- Pehcevo	Public Institution/ Kindergarten	<a href="mailto:detskagradinkapehcevo@yahoo.com">detskagradinkapehcevo@yahoo.com</a>	071385611	Ms. Gordana Vazaliska	<b>Received</b>
17.	JZU “Zdraven Dom” - Pehcevo	Public Institution/ Hospital	<a href="mailto:todorovska irena10@yahoo.com">todorovska irena10@yahoo.com</a>	070213723	Ms. Irena Todortovska	<b>Received</b>
18.	JP Makedonski Sumi AD, Skopje, Branch Office Pehcevo	State Public Enterprise / Forestry Management	<a href="mailto:dpavlovski1982@gmail.com">dpavlovski1982@gmail.com</a>	075358188	Mr. Borce Bojcovski	<b>Received</b>
19.	Fagus DOOEL – Pehcevo	Private Company/ Furniture production	<a href="mailto:marija@mebel.com.mk">marija@mebel.com.mk</a>	072264332	Ms. Zorica Takovska	<b>Not Recieved</b>
20.	Nova Refraktori DOO Pehcevo	Private Company / Fire retardant materials production	<a href="mailto:info@novarefraktori.mk">info@novarefraktori.mk</a> <a href="mailto:jasminka.s@novarefraktori.mk">jasminka.s@novarefraktori.mk</a>	070387868	Ms. Jasminka Stanoevska	<b>Recieved</b>
21.	JKP Komunalac - Pehcevo	Municipal Public Enterprise / Waste & water management	<a href="mailto:palepeh@yahoo.com">palepeh@yahoo.com</a>		Pavlina Trencevska	<b>Received</b>

#### MUNICIPALITY OF VINICA

P.6	Title of the Institution/ Compani	Type	E-mail	Cell Phone	Responsible Person	Status
22.	OOU Vanco Prke – Vinica	Public Institution / School	<a href="mailto:makedoncogg@yahoo.com">makedoncogg@yahoo.com</a>	070 592-900	Makedonco Gorgiev	<b>Not Recieved</b>
23.	OJUGD “Goce Delcev”- Vinica	Public Institution/ Kindergarten	<a href="mailto:gradinka_vinica@t.mk">gradinka_vinica@t.mk</a>	070 337-198	Iliya	<b>Received</b>
24.	JKP Solidarnost - Vinica	Municipal Public Enterprise / Waste & water management	<a href="mailto:igorsolidarnost@t.mk">igorsolidarnost@t.mk</a>	070 309-318	Igor Spasovski	<b>Received</b>

25.	Vinarija Vik Angelo – Vinica	Private Company/ Wine production	<a href="mailto:rozetagligorova@gmail.com">rozetagligorova@gmail.com</a>	075 945-783	Gligorova Rozeta	<b>Not Recieved</b>
26.	Motel Konak – Vinica	Private Company/ Hostile	<a href="mailto:rozetagligorova@gmail.com">rozetagligorova@gmail.com</a>	075 945-783	Gligorova Rozeta	<b>Not Recieved</b>